2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley
Final

2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley

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The Final 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley (Final SEIR) is being made available to the public in accordance with the California Environmental Quality Act.

Visit the Environmental Review page on the Marin County Community Development Agency’s website [http://www.marincounty.org/depts/cd/divisions/environmental-review](http://www.marincounty.org/depts/cd/divisions/environmental-review) where you can view and download the Final SEIR, the 2007 CWP EIR and related materials.
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## ACRONYMS AND ABBREVIATIONS

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<tr>
<td>ac</td>
<td>acre</td>
</tr>
<tr>
<td>BIO</td>
<td>Biological Resources</td>
</tr>
<tr>
<td>ºC</td>
<td>Degrees Celsius</td>
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<tr>
<td>CCR</td>
<td>California Code of Regulations</td>
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<tr>
<td>CD</td>
<td>Community Development</td>
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<tr>
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<td>California Environmental Quality Act</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
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<td>cm</td>
<td>centimeter</td>
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<tr>
<td>cm/s</td>
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<tr>
<td>CWA</td>
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<tr>
<td>CWP</td>
<td>Countywide Plan</td>
</tr>
<tr>
<td>DBH</td>
<td>diameter at breast height</td>
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<tr>
<td>DPS</td>
<td>distinct population segment</td>
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<tr>
<td>DPW</td>
<td>Department of Public Works</td>
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<tr>
<td>ECR</td>
<td>Existing Conditions Report</td>
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<tr>
<td>EHS</td>
<td>Department of Environmental Health Services</td>
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<tr>
<td>EIA</td>
<td>Effective Impervious Area</td>
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<tr>
<td>EIR</td>
<td>Environmental Impact Report</td>
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<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
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<tr>
<td>ESU</td>
<td>evolutionarily significant unit</td>
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<tr>
<td>eWRIMS</td>
<td>Electronic Water Rights Information Management System</td>
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<tr>
<td>ºF</td>
<td>Fahrenheit</td>
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<tr>
<td>FAR</td>
<td>floor area ratio</td>
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<tr>
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<tr>
<td>IBI</td>
<td>Index of Biological Integrity</td>
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<tr>
<td>in</td>
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<tr>
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<tr>
<td>LID</td>
<td>low impact development</td>
</tr>
<tr>
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<td>large woody debris</td>
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<td>mi</td>
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<tr>
<td>MMWD</td>
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<tr>
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<td>Salmon Enhancement Plan</td>
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<td>San Francisco Bay Regional Water Quality Control Board</td>
</tr>
<tr>
<td>SMP</td>
<td>Standard Management Practice</td>
</tr>
<tr>
<td>SPAWN</td>
<td>Salmon Protection and Watershed Network</td>
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<tr>
<td>SWRCB</td>
<td>California State Water Resources Control Board</td>
</tr>
<tr>
<td>TIA</td>
<td>Total Impervious Area</td>
</tr>
<tr>
<td>TMDL</td>
<td>total maximum daily load</td>
</tr>
<tr>
<td>USFWS</td>
<td>U.S. Fish and Wildlife Service</td>
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<tr>
<td>USGS</td>
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</tr>
<tr>
<td>WCA</td>
<td>Wetland Conservation Area</td>
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<td>Water Resources</td>
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EXECUTIVE SUMMARY

Project Location
The San Geronimo Valley, is located in western Marin County, California, and is a subwatershed of the larger Lagunitas Creek watershed that drains to Tomales Bay and eventually the Pacific Ocean.

Proposed Project
The Proposed Project is future land use and development specific to the San Geronimo Valley, consistent with the goals, policies, and programs of the Marin Countywide Plan (Marin CWP [2007]) that serve to avoid or minimize adverse impacts on biological and wetland resources in the County. The Final Environmental Impact Report (EIR) for the Marin CWP (2007) was certified by the Marin County Board of Supervisors in November 2007 and the Marin CWP (2007) was adopted. Following the County's certification of the Final EIR, the Salmon Protection and Watershed Network (SPAWN) filed a lawsuit challenging the adequacy of the EIR. SPAWN's challenge was limited to the application of the Marin CWP and EIR to the San Geronimo Valley. On appeal, SPAWN's challenge was further narrowed to two primary contentions: that the EIR failed to properly analyze the cumulative impacts on threatened salmonids of future development in the San Geronimo Valley watershed as contemplated by the Marin CWP (2007), and that the EIR relied on inadequate mitigation measures to reduce the impacts of development to a less-than-significant level.

SEIR Requirement
This Final Supplemental EIR (Final SEIR) has been prepared in accordance with the decision of the Court of Appeal of the State of California First Appellate District Division Three, which directed the County to set aside its approval of the Marin CWP (2007) and certification of the EIR with respect to San Geronimo Valley, pending the following:

(1) analysis of potential cumulative impacts, and the range of potential consequences, on salmonids in San Geronimo Valley resulting from future buildout in the watershed in conformity with State California Environmental Quality Act (CEQA) Guidelines Section 15130, subdivision (b), and the Court opinion, and

(2) a description of mitigation measures relevant to salmonids in San Geronimo Valley in conformity with State CEQA Guidelines Section
As specified in the Court’s opinion, the principal action considered in this Final SEIR is adoption and implementation of the Marin CWP (2007) with respect to the San Geronimo Valley and the potential for effects on salmonids. The Final SEIR will be used to fulfill the Court’s mandate, and it will be used by the Marin County Board of Supervisors in considering approval of the Proposed Project (Marin CWP [2007]) and certification of the EIR, with respect to the San Geronimo Valley.

Summary of Impacts

Impact 5.1. Reduced Survival of Fry and Juvenile Salmonid Life Stages Due to Reduced Winter Rearing Habitat Quality. This impact was determined to be potentially significant due to alterations in hydrodynamic processes resulting from projected increases in total impervious area (TIA) and other urbanization effects under the Proposed Project, which would make a cumulatively considerable contribution to increased winter storm flow magnitude and frequency, in turn causing additional habitat simplification and further compromising the ability of rearing coho salmon to find adequate refuge during high flows. Implementation of Mitigation Measure 5.1-1: Expanded Stream Conservation Area (SCA) Ordinance and Mitigation Measure 5.1-2: Require Biotechnical Techniques and Salmonid Habitat Enhancement Elements for All Bank Stabilization Projects would reduce this impact to a less-than-significant level.

Impact 5.2. Reduced Salmonid Spawning Success Due to Increased High Flow Frequency and Magnitude and Elevated Sediment Delivery. This impact was determined to be potentially significant due to alterations in hydrodynamic processes resulting from projected increases in TIA and other urbanization effects under the Proposed Project, which would increase winter storm flow magnitude and frequency, and inputs of development-related fine sediment to stream channels. These conditions would further increase the risk of streambed and redd scour, thus making a cumulatively considerable contribution to the existing adverse impacts on coho salmon and steelhead spawning success. Implementation of Mitigation Measure 5.1-1: Expanded Stream Conservation Area (SCA) Ordinance and Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams would reduce this impact to a less-than-significant level.
Potential Impact 5.3. Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature. This impact was determined to be less than significant because potential reductions in stream habitat quality and riparian function related to future development in the watershed would be relatively minor and likely too small to substantially or measurably reduce the ability of juvenile salmonids to rear and grow during the summer rearing period. The potential for impacts on salmonid summer rearing success due to development-related reductions in summer baseflows could not be determined due to lack of available data on the potential hydrologic and biologic effects of groundwater pumping and surface water diversions in San Geronimo Valley. While the Proposed Project is not capable of fully avoiding or eliminating impacts to water quality, sediment delivery, and instream habitat complexity associated with future development, it is unlikely that any such impacts would make a considerable contribution to the existing cumulative impacts on coho salmon and steelhead summer rearing success.

Although Potential Impact 5.3 is less than significant, the County has nonetheless elected to pursue a voluntary mitigation measure consistent with its commitment to avoiding or minimizing impacts to the maximum extent practicable. **Voluntary Mitigation Measure 5.3-1: Groundwater Study** would provide required information to help determine whether existing and future groundwater pumping, surface water diversions, altered watershed hydrology, and other effects related to development are or would be likely to adversely impact summer baseflow in San Geronimo Creek. This measure would improve understanding of development-related effects on salmonid summer rearing habitat in the watershed and assist with County efforts to protect and conserve habitat for these species.

**Significant Unavoidable Adverse Impacts**

There would be no significant and unavoidable adverse impacts due to the Proposed Project.
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1 INTRODUCTION

1.1 Project Background and History

The Marin Countywide Plan (Marin CWP [2007]) sets policy guidelines for future conservation and development in the unincorporated portion of Marin County, California. The Marin CWP (2007) is the subject of this Supplemental Environmental Impact Report, which supplements the Final Environmental Impact Report (EIR) for the 2007 Marin Countywide Plan (Final EIR) that was certified and adopted by the Marin County Board of Supervisors in November 2007. The Final EIR evaluated the impact of land uses and development consistent with the Marin CWP (2007) on the County’s sensitive biological and wetland resources. Numerous goals, policies, and programs of the Marin CWP (2007), especially in the Natural Systems and Agricultural Element, serve to avoid or minimize adverse impacts on biological and wetland resources in the County. The Final EIR analyzed the effectiveness of the relevant goals, policies and programs in the Marin CWP (2007) to reduce or avoid adverse changes to the environment resulting from proposed land-use designations and development applications and the degree to which they would mitigate identified impacts to a less-than-significant level. Cumulative impacts were also analyzed in the Final EIR in Section 4.6 Biological Resources and Section 6.2 Cumulative Impacts.

Following the county’s certification of the Final EIR, the Salmon Protection and Watershed Network (SPAWN) filed a lawsuit challenging the adequacy of the EIR. SPAWN’s challenge was limited to the application of the Marin CWP and EIR to the San Geronimo Valley.

Following certification of the Final EIR, Marin County undertook the following two studies as a means to develop recommendations to improve and maintain habitat conditions that will support viable populations of salmon and steelhead trout in San Geronimo Valley:


In March 2014, the Court of Appeal of the State of California First Appellate District Division Three issued its opinion in regard to SPAWN’s challenge. The Court’s opinion focused on two issues in regard to the adequacy of the EIR:
• Cumulative Impacts
• Inadequate Mitigation Measures

These two issues are discussed further in the below sections.

1.1.1 Cumulative Impacts

The Court’s opinion cites information in the EIR regarding the numbers of housing units and square feet of nonresidential floor area that can be built. The opinion asserts:

"but neither the countywide plan nor the EIR go further to estimate or evaluate in any meaningful terms by how much such construction is likely to affect the streams abutting these sites".

The opinion further states:

The report fails to estimate the maximum potential impact, the range of potential impacts, or the likely net impact if the policies and implementation programs described in the Marin CWP (2007) are applied. What, for example, is the maximum amount of impervious surface that may reasonably be placed in the watershed under the plan? With application of the policies and programs described in the plan, will any salmonid habitat be eliminated and if so what is a reasonable estimate of the loss, and what variables will determine its extent? While the Marin CWP (2007) provides that noncompliance with Stream Conservation Area (SCA) standards may be permitted if a parcel falls entirely within an SCA or development on the parcel entirely outside the SCA is either infeasible or would have greater impacts than development within the SCA, how many and what size of lots are estimated to fall within this exception and what is the significance of such exceptions?

The opinion further states:

What is missing in the present case, however, is not an analysis of how salmonids will be affected by the construction of a single building, but a meaningful analysis of the likely cumulative impacts of a widespread buildout, regardless of the details of individual projects.

While the opinion does appear to agree with the EIR that the policies and measures laid out in the Marin CWP (2007) will tend to reduce the adverse
ecological impacts of development within the San Geronimo Valley watershed, and that the extent of the impacts will depend on the details of future development plans, it goes on to say:

The report provides no help to decision-makers or the public to understand the likely consequences, or at least the range of potential consequences, of a buildout within the watershed of the scope described in the countywide plan. Providing that long-term view is the point of a cumulative impact analysis and, the ability to make that analysis is one of the advantages of using a program EIR. The program EIR fails to provide the information—if no more than rationally-based estimates - necessary to make informed judgments about the advisability, so far as the San Geronimo Valley watershed is concerned, of adopting the countywide plan.

1.1.2 Inadequate Mitigation Measure

SPAWN raised a concern with the adequacy of Mitigation Measure 4.6-1 in the Final EIR. This mitigation measure adds a new policy to the Biological Resources section of the CWP to continue to actively participate in the FishNet 4C program and work cooperatively with participating agencies to implement recommendations to improve and restore aquatic habitat for listed anadromous fish species and other fishery resources. The Court’s opinion states that Mitigation Measure 4.6-1 is deficient in multiple respects. The opinion states:

It defines no specific measures to be taken to reduce the impact of buildout on the threatened fish species, nor does it specify performance standards by which to evaluate measures that may be recommended by FishNet 4C. Moreover, while the county has committed itself to be cooperative, it has not committed to adopt recommendations made by FishNet 4C, whatever they may be.

The Court's direction to Marin County is as follows:

[The Court directed Marin County] to set aside its approval of the [Marin] CWP (2007) and certification of the related EIR with respect to the San Geronimo watershed only, pending preparation of a supplemental EIR with respect to the San Geronimo watershed only that includes an analyzes cumulative impacts in conformity with State California Environmental Quality Act (CEQA) Guidelines section 15130, subdivision (b) and [the Court]’s opinion, and that describes mitigation measures in
conformity with State CEQA Guidelines section 15126.4 and the Court's opinion, or makes other findings in conformity with State CEQA Guidelines section 15091.

1.2 SEIR Requirement

This Final Supplemental EIR (Final SEIR) has been prepared in accordance with the Court's decision to set aside its approval of the Marin CWP (2007) and certification of the EIR with respect to San Geronimo Valley, pending the following:

(1) analysis of potential cumulative impacts, and the range of potential consequences, on salmonids in San Geronimo Valley resulting from future buildout in the watershed in conformity with State CEQA Guidelines Section 15130 and the Court's opinion, and

(2) a description of mitigation measures relevant to salmonids in San Geronimo Valley in conformity with State CEQA Guidelines Section 15126.4 and the Court's opinion or a description of other findings in conformity with State CEQA Guidelines Section 15091.

Further, this Final SEIR has been prepared in accordance with State CEQA Guidelines Section 15163, which states the following:

(a) The Lead or Responsible Agency may choose to prepare a supplement to an EIR rather than a subsequent EIR if:

(1) Any of the conditions described in Section 15162 would require the preparation of a subsequent EIR, and

(2) Only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation.

(b) The supplement to the EIR need contain only the information necessary to make the previous EIR adequate for the project as revised.

(c) A supplement to an EIR shall be given the same kind of notice and public review as is given to a Draft EIR under Section 15087.

(d) A supplement to an EIR may be circulated by itself without recirculating the previous Draft or Final EIR.

(e) When the agency decides whether to approve the project, the decision-making body shall consider the previous EIR as revised by the supplemental EIR. A finding under Section 15091 shall be made for each significant effect shown in the previous EIR as revised.
For the purposes of this Final SEIR, the Proposed Project is land use and development specific to the San Geronimo Valley under the goals, policies and programs of the Marin CWP (2007) (see also Section 2 Project Description). Marin County Development Agency (CDA) is the CEQA Lead Agency and has the principal responsibility for compliance of this Final SEIR with CEQA (Public Resource Code [PRC] Section 21067).

In accordance with CEQA ([PRC Section 21000 et seq.], and the State CEQA Guidelines (California Code of Regulations [CCR] Section 15000 et seq.), the Marin County Board of Supervisors will use the Final SEIR in considering approval of the Proposed Project (Marin CWP [2007]) and certification of the Final EIR with respect to San Geronimo Valley.

With regard to the analysis of potential cumulative impacts, Section 15130 of the State CEQA Guidelines subdivision (a) states that an EIR shall discuss cumulative impacts of a project when the project’s incremental effect is “cumulatively considerable”, where cumulatively considerable means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

Section 15130 of the State CEQA Guidelines subdivision (d) (3) states that an EIR may determine that a project's contribution to a significant cumulative impact will be rendered less than cumulatively considerable, and thus not significant, if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact (see below, Section 1.2.3 Mitigation Measures). In this case, the analysis in the EIR must identify facts and analysis supporting its conclusion that the contribution will be rendered less than cumulatively considerable. However, the mere existence of significant cumulative impacts caused by other projects alone shall not constitute evidence that the proposed project’s incremental effects are cumulatively considerable. State CEQA Guidelines Section 15064(h)(4). Further, a project’s contribution to a significant cumulative impact can be rendered less than significant through project-specific mitigation measures. State CEQA Guidelines Section 15064(h)(2).

1.2.1 Cumulative Impact Analysis

Section 15130 of the State CEQA Guidelines subdivision (b) (1) states that an adequate discussion of significant cumulative impacts requires one of the following:
(1) A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or

(2) A summary of projections contained in an adopted local, regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect.

Consistent with (2) above, the cumulative impacts analysis in this SEIR relies upon projections of future development that could occur under the Marin CWP (2007). The methods and information used to derive these projections are described in Section 2.6. The mechanisms by which future development (i.e., urbanization) in the watershed may affect salmonids and their habitat are discussed in Section 3.2 and in the Cumulative Impacts Analysis in Section 5.

1.2.2 Program SEIR

Consistent with the Final EIR for the Marin CWP (2007), this Final SEIR is a program EIR. As described in State CEQA Guidelines Section 15168(a)(3), a program EIR “may be prepared on a series of actions that can be characterized as one large project and are related...in connection with the issuance of rules, regulations, plans, or other general criteria to govern the conduct of a continuing program.” As a program SEIR, this document focuses on the overall effect of the Marin CWP (2007) on salmonids in San Geronimo watershed. This analysis does not examine the effects of site-specific projects that may occur within the overall umbrella of this program in the future. The nature of general plans is such that many proposed policies are intended to be general, with details to be worked out during implementation. Thus, many of the impacts and mitigation measures are only intended to be described in general or qualitative terms. The analysis in this program SEIR is considered the first tier of environmental review, creating the foundation upon which future, project-specific CEQA documents can build. A program SEIR can be incorporated by reference into subsequently prepared CEQA documents to address issues such as cumulative impacts and growth inducing impacts, allowing the subsequent documents to focus on new or site-specific impacts.

1.2.3 Mitigation Measures

State CEQA Guidelines Section 15370 defines mitigation as including the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
• Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
• Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment;
• Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
• Compensating for the impact by replacing or providing substitute resources or environments.

Further, Section 15126.4 subdivision (a) (2) of the State CEQA Guidelines states that mitigation measures must be fully enforceable through permit conditions, agreements, or other legally-binding instruments. In the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design.

In this case, since the Proposed Project is the Marin CWP (2007), mitigation to accomplish the above outcomes is in the form of:
• Modified goals, policies or implementing programs proposed in the Marin CWP (2007);
• New goals, policies or implementing programs not currently proposed in the Marin CWP (2007);
• Modified land uses (locations, type and/or amount), capable of reducing or eliminating a potentially significant impact; and
• Other actions (e.g., actions performed by another agency, other).

1.3 Information Used to Prepare the SEIR

The following are the primary information sources used to prepare the SEIR:
• Marin Countywide Plan (CWP), Marin County Community Development Agency, November 2007.
• Marin Countywide Plan Final Environmental Impact Report (Final EIR), Marin County CDA, November 2007.
• Spatial data (e.g., number of developed parcels, number of developed units, impervious area) provided by Marin County Department of Public Works (DPW), 2005–2016.
• San Geronimo Valley Enhancement Plan ECR, Stillwater Sciences, January 2009.
1.4 Public Review and Comment

The Draft SEIR was distributed to the public and affected government agencies for review and comment during a 45-day public review period (in compliance with CCR Section 15087 of the State CEQA Guidelines), starting on May 1, 2017 and ending on June 15, 2017. This Final SEIR and written responses to public and agency comments on the Draft SEIR (CCR Section 15088 of the State CEQA Guidelines) are available for a 21-day public review and comment period. Written comments must be received no later than 4:00 pm on August 24, 2018 at the following address:

Marin County Community Development Agency
Attention: Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Comments may also be sent via e-mail to envplanning@marincounty.org or faxed to the Community Development Agency Office at (415) 473-7880. The Planning Commission will then hold a hearing to consider recommendation of Final SEIR certification by the Marin County Board of Supervisors, and then the Marin County Board of Supervisors will hold a hearing to consider certification of the Final SEIR. These hearings will be subject to public notice and open for public attendance.
1.5 **Report Organization**

The Final SEIR is organized as follows:

**Table of Contents.** Location of chapters/sections, tables, figures, and technical appendices.

**Acronyms and Abbreviations.** List of acronyms and abbreviations used in the SEIR.

**Summary.** Summary of Project description, cumulative impacts, and the potential areas of known controversy/issues to be resolved.

**Section 1:** Introduction. Project background and history, California Environmental Quality Act (CEQA) requirements, SEIR requirement, uses of the SEIR, and organization of the SEIR.

**Section 2:** Project Description. Project context including location, objectives, and description of Project components including future land use and development. Also defines the boundaries of the Area of Analysis.

**Section 3:** Environmental Setting. Existing conditions relevant to salmonid impact analysis, including hydrology, water quality, urbanization, life history and habitat requirements, associated sensitive natural communities (i.e., riparian zone), and habitat quality.

**Section 4:** Significance Criteria. Description of criteria used to determine whether the Proposed Project would have a significant cumulative impact on anadromous fisheries in the Area of Analysis.

**Section 5:** Cumulative Impacts. Describes the impact analyses and associated significance calls.

**Section 6:** Summary of Findings. Provides a summary of findings for the Final SEIR.

**Section 7:** Public Comments and Responses to Comments on the Draft SEIR.

**Section 8:** References.

**Appendix A:** Results of the San Geronimo Creek 2015 low-flow habitat survey.
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2  PROJECT DESCRIPTION

2.1  Project Location

The San Geronimo Valley is located in western Marin County, California. For the purposes of this SEIR, the San Geronimo Valley is often referred to more specifically as the San Geronimo Creek watershed, which is a subwatershed of the larger Lagunitas Creek watershed that drains to Tomales Bay and eventually the Pacific Ocean (Figure 2-1).

2.2  Project Overview

The Marin CWP (2007) (Proposed Project) is the latest update to the CWP, with prior updates including 1994, 2004, and 2005. The Final EIR provides an overview of the various updates to the CWP. The purpose of the Proposed Project is to set policy guidelines for future conservation and development in the unincorporated portion of Marin County and to address changed conditions since the last revision of the CWP. The CWP establishes an overall framework and set of goals for countywide development. While cities within Marin County retain control over specific development within their jurisdictions, the County is responsible for specific development decisions in the unincorporated areas. In addition, the Marin CWP (2007) has been expanded to include such social equity and cultural issues as public health, environmental justice, child care, the economy, and arts and culture.
Figure 2-1. San Geronimo Watershed Geographic Context.
2.3 Project Objectives

The objectives of the Proposed Project include the following:

- **Preserved and restored natural environment.** Marin watersheds, natural habitats, wildlife corridors, and open space shall be protected, restored, and enhanced.

- **Sustainable agriculture community.** Marin’s working agricultural landscapes shall be protected and the agricultural community shall remain viable and shall successfully produce and market a variety of healthy foods and produces products.

- **High-quality built environment.** Marin’s community character, architectural heritage of its downtowns and residential neighborhoods, and the vibrancy of its business and commercial centers shall be preserved and enhanced.

- **More affordable housing.** Marin’s members of the workforce, the elderly, and special needs groups shall have increased opportunities to live in well-designed, socially and economically diverse affordable housing strategically located in mixed use sites near employment or public transportation.

- **Less traffic congestion.** Marin community members shall have access to flexible work schedules, car pools and additional transportation choices for pedestrians, bicycles, and transit users that reduce traffic congestion.

- **A reduced ecological footprint.** Marin residents and businesses shall increasingly use renewable energy, fuel-efficient transportation choices, and green building and businesses practices similar to the level of Western Europe.

Of the aforementioned Project Objectives, preserving and restoring the natural environment and maintaining a sustainable agricultural community are the most relevant to the assessment of cumulative impacts on salmonids in San Geronimo Valley (see also Section 2.4).

2.4 Goals, Policies, and Implementing Programs

The overarching theme presented in the Marin CWP (2007) is sustainability. To address this theme, the Proposed Project contains three main elements: the Natural Systems and Agriculture Element, the Built Environment Element, and the Socioeconomic Element. Multiple topics included in the Natural Systems and Agriculture Element and the Built Environment Element are germane to the
assessments of potential cumulative impacts on salmonids in San Geronimo Valley and are summarized below.

2.4.1 Natural Systems and Agriculture Element

The *Natural Systems and Agriculture Element* includes the following main topics:

- Biological Resources
- Water Resources
- Environmental Hazards
- Atmosphere and Climate
- Open Space
- Trails
- Agriculture and Food

The *Biological Resources and Water Resources* topics are the most relevant to the assessment of potential cumulative impacts on salmonids in San Geronimo Valley. Although some policies and implementing programs included under the *Environmental Hazards, Atmosphere and Climate, Open Space, and Agriculture and Food* topics are generally pertinent to salmonid habitat quality, land use designations, which include prescriptions for stewardship and management of open space and agricultural lands and thus more directly affect habitat and salmonid health, are specified in the *Built Environment Element*. Accordingly, the SEIR analyses focus on the *Built Environment Element*. The *Environmental Hazards, Atmosphere and Climate, Open Space, and Agriculture and Food* topics of the Marin CWP (2007) are not considered further in this document.

**Biological Resources**

This section of the Marin CWP (2007) addresses special status species (i.e., plants and animals legally protected under the State and/or federal Endangered Species Act or other regulations) and other sensitive natural communities, such as wetlands, riparian habitat, and baylands. The *Biological Resources* topic increases environmental protection and review for streamside areas, wetlands, and special status species through a series of 5 goals, 50 policies, and 49 implementing programs.

Goal BIO-4 *Riparian Conservation* is one of the most important in the Proposed Project for protection of salmonid habitat. Goal BIO-4 includes policies that define the SCA, including a development setback of at least 100 feet from the top of the bank in the inland rural corridor (including San Geronimo Valley) with certain
exceptions, including driveways if no other location is feasible, utility crossings, and the repair or retrofit of existing permitted or legal non-conforming structures or improvements within the existing footprint (CWP Policies Bio-4.1, 4.2). Exceptions may be allowed if the parcel “falls entirely within the SCA, or development outside SCA is either infeasible or would have greater impacts” provided that development does not adversely alter hydraulic capacity; cause a net loss in habitat acreage, value, or function; or degrade water quality (CWP Policy BIO-4.1). The biological resources goals, policies and implementing programs most relevant to salmonid health in San Geronimo Valley are presented in Table 2-1.
Table 2-1. Marin CWP (2007) Biological Resources (BIO) Goals, Policies, and Implementing Programs Most Relevant to Salmonid Health in San Geronimo Valley.

<table>
<thead>
<tr>
<th>Policy Number</th>
<th>Policy Description</th>
<th>Implementing Programs</th>
</tr>
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<tbody>
<tr>
<td>BIO-1.1</td>
<td>Protect Wetlands, Habitat for Special Status Species, Sensitive Natural Communities, and Important Wildlife Nursery Areas and Movement Corridors</td>
<td>Protect sensitive biological resources and wetlands through careful environmental review and proposed development applications, including consideration of cumulative impacts, participation in comprehensive habitat management programs, and continued acquisition and management of open space lands that provide permanent protection of important natural habitats.</td>
</tr>
<tr>
<td>BIO-1.2</td>
<td>Acquire Habitat</td>
<td>Continue to acquire habitat areas containing sensitive resources for use as permanent open space, and encourage and support public and private partnerships formed to acquire and manage important natural habitat areas.</td>
</tr>
<tr>
<td>BIO-1.3*</td>
<td>Protect Woodlands, Forests, and Tree Resources</td>
<td>Protect large native trees and forest habitats. Prevent the untimely removal of trees and encourage local agencies to adopt tree preservation ordinances to protect native trees and woodlands, regardless of whether they are located in urban or undeveloped areas.</td>
</tr>
<tr>
<td>BIO-1.5*</td>
<td>Promote Use of Native Plant Species</td>
<td>Encourage use of a variety of native or compatible non-native, non-invasive plants species indigenous to the site vicinity as part of project landscaping to improve wildlife habitat values.</td>
</tr>
<tr>
<td>BIO-1.6</td>
<td>Control Spread of Invasive Exotic Plants</td>
<td>Prohibit the use of invasive species in required landscaping as part of the discretionary review of proposed development.</td>
</tr>
<tr>
<td>BIO-1.7</td>
<td>Remove Invasive Exotic Plants</td>
<td>Require the removal of invasive exotic species, to the extent feasible, when considering applicable measures in discretionary permit approvals for development projects unrelated to agriculture, and include monitoring to prevent re-establishment in managed areas.</td>
</tr>
<tr>
<td>BIO-1.8*</td>
<td>Restrict Use of Herbicides, Insecticides, and Similar Materials</td>
<td>Encourage the use of integrated pest management and organic practices to manage pests with the least possible hazard to the environment. Encourage nontoxic strategies for pest control, such as habitat management using physical and biological controls, as an alternative to chemical treatment, and allow use of toxic chemical substances only after other approached have been tried and determined unsuccessful.</td>
</tr>
</tbody>
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- BIO-1.a*Map Natural Communities
- BIO-1.b Develop Habitat Monitoring Programs
- BIO-1.c Maintain a Natural Resource Information Program
- BIO-1.d* Reevaluate County Native Tree Preservation and Protection Ordinance #3291
- BIO-1.e Protect Against Vegetation and Wildlife Diseases
- BIO-1.f Prepare Appropriate Landscape Lists
- BIO-1.g Expand Education, Outreach, and Regulatory Programs Regarding Control of Invasive Exotic Species
- BIO-1.h Encourage Community Forest Programs
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<th>Policy Number</th>
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<th>Description</th>
<th>Implementing Programs</th>
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<tbody>
<tr>
<td>GOAL BIO-2</td>
<td>Protection of Sensitive Biological Resources</td>
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</tr>
</tbody>
</table>
| BIO-2.1       | Include Resource Preservation in Environmental Review                  | Require environmental review pursuant to CEQA of development applications to assess the impact of proposed development on native species and habitat diversity, particularly special-status species, sensitive natural communities, wetlands, and important wildlife nursery areas and movement corridors. Achieve “no net loss” of sensitive habitat acreage, values, and function.                                                                                       | **BIO-2.a Require Site Assessments**  
**BIO-2.b Conduct Habitat Connectivity Assessment**  
**BIO-2.c Facilitate Agency Review**  
**BIO-2.d Promote Early Agency Consultation**  
**BIO-2.e** Participate in FishNet 4C Program                                                                                                                                                                                                                     |
| BIO-2.2       | Limit Development Impacts                                              | Restrict or modify proposed development in areas that contain essential habitat for special-status species, sensitive natural communities, wetlands, baylands coastal habitat, and riparian habitats, as necessary to ensure the continued health and survival of these species and sensitive areas.                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                |
| BIO-2.3       | Preserve Ecotones                                                      | Condition or modify development permits to ensure that ecotones\(^1\) are preserved and enhanced, particularly those along the margins of riparian corridors, baylands and marshlands, vernal pools, and woodlands and forests.                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                |
| BIO-2.6*      | Identify Opportunities for Safe Wildlife Movement                      | Ensure that existing stream channels and riparian corridors continue to provide for wildlife movement at roadway crossings, preferably through the use of bridges, or through over-sized culverts, while maintaining or restoring a natural channel bottom.                                                                                                                                  | **BIO-2.a Require Site Assessments**  
**BIO-2.b Conduct Habitat Connectivity Assessment**  
**BIO-2.c Facilitate Agency Review**  
**BIO-2.d Promote Early Agency Consultation**  
**BIO-2.e** Participate in FishNet 4C Program                                                                                                                                                                                                                     |
| BIO-2.8*      | Coordinate with Trustee Agencies                                       | Consult with trustee agencies during environmental review when special-status species, sensitive natural communities, or wetlands may be adversely affected.                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                |
| BIO-2.9*      | Promote Early Consultation with Other Agencies                         | Require applicants to consult with all agencies with review authority for projects in areas supporting wetlands and special-status species at the outset of project planning.                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                |

\(^1\) Ecotone: The transition zone between two biotic communities, such as between oak woodlands and grasslands (Marin CWP 2007).
<table>
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<tr>
<th>Policy Number</th>
<th>Policy</th>
<th>Description</th>
<th>Implementing Programs</th>
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</table>
| GOAL BIO-4    | Riparian Conservation | SCA is established to protect the active channel, water quality and flood control functions, and associated fish and wildlife habitat values along streams. Development shall be set back to protect the stream and provide and upland buffer, which is important to protect the significant resources that may be present and provides a transitional zone. Best management practices (BMPs) shall be adhered to in all designated SCAs and strongly encouraged in ephemeral streams not defined as SCAs. | - BIO-4.a Adopt Expanded SCA Ordinance for Parcels Traversed by or Adjacent to a Mapped Anadromous Fish Stream and Tributary)  
- BIO-4.b Reevaluate SCA Boundaries  
- BIO-4.c Prepare County Stream Map  
- BIO-4.d Establish Functional Criteria for Land Uses in SCAs  
- BIO-4.e Identify Proposals Within SCAs  
- BIO-4.f Identify Potential Impacts to Riparian Systems  
- BIO-4.g Require Site Assessment  
- BIO-4.h Comply with SCA Criteria and Standards  
- BIO-4.i Replace Vegetation in SCAs  
- BIO-4.j Continue Funding Fencing of Sensitive Stream Areas  
- BIO-4.k Locate Trails Appropriately  
- BIO-4.l Monitor Stream Conservation Areas  
- BIO-4.m Encourage Conservation Plans Within the Stream Conservation Area  
- BIO-4.n Provide Information to Reduce Soil Erosion and Sedimentation  
- BIO-4.o Consider Culvert Restoration  
- BIO-4.p Implement NPDES Phase II  
- BIO-4.q Develop Standards Promoting Use of Permeable Materials  
- BIO-4.r Review Septic System Setbacks in SCA and WCA (Wetland Conservation Area)  
- BIO-4.s Continue Collaboration with the Marin Resource Conservation District and Agricultural Commissioner  
- BIO-4.t Collaborate with Groups to Address Implementation of Protections to SCAs and WCAs  
- BIO-4.u Investigate Tax Delinquent Properties |
| BIO-4.1*      | Restrict Land Use in Stream Conservation Areas | Comply with SCA Regulations Implement established setback criteria for protection of SCAs through established discretionary permit review processes and/or through adoption of new ordinances. Environmental review shall be required where incursion into an SCA is proposed and a discretionary permit is required. | - BIO-4.1 Monitor Stream Conservation Areas  
- BIO-4.2 Prevent Retrograde Development in SCAs  
- BIO-4.3 Ensure Adequate Riparian Corridors  
- BIO-4.4* Promote Natural Stream Channel Function Retain and, where possible, restore the hydraulic capacity and natural functions of stream channels in SCAs. Discourage alteration of the bed or banks of the stream, including filling, grading, excavating, and installation of storm drains and culverts. When feasible, replace impervious surfaces with pervious surfaces. Retain woody debris. No alterations that create barriers to fish migration in streams mapped as historically supporting salmonid. | - BIO-4.1 Monitor Stream Conservation Areas  
- BIO-4.2 Prevent Retrograde Development in SCAs  
- BIO-4.3 Ensure Adequate Riparian Corridors  
- BIO-4.4* Promote Natural Stream Channel Function Retain and, where possible, restore the hydraulic capacity and natural functions of stream channels in SCAs. Discourage alteration of the bed or banks of the stream, including filling, grading, excavating, and installation of storm drains and culverts. When feasible, replace impervious surfaces with pervious surfaces. Retain woody debris. No alterations that create barriers to fish migration in streams mapped as historically supporting salmonid. |
| BIO-4.2*      | Comply with SCA Regulations | Manage SCAs Effectively Review proposed land divisions in SCAs to allow management of a stream by one property owner to the extent possible. | - BIO-4.3 Prevent Retrograde Development in SCAs  
- BIO-4.4* Promote Natural Stream Channel Function Retain and, where possible, restore the hydraulic capacity and natural functions of stream channels in SCAs. Discourage alteration of the bed or banks of the stream, including filling, grading, excavating, and installation of storm drains and culverts. When feasible, replace impervious surfaces with pervious surfaces. Retain woody debris. No alterations that create barriers to fish migration in streams mapped as historically supporting salmonid. |
<p>| BIO-4.3       | Manage SCAs Effectively | Promote Natural Stream Channel Function | - BIO-4.4* Promote Natural Stream Channel Function Retain and, where possible, restore the hydraulic capacity and natural functions of stream channels in SCAs. Discourage alteration of the bed or banks of the stream, including filling, grading, excavating, and installation of storm drains and culverts. When feasible, replace impervious surfaces with pervious surfaces. Retain woody debris. No alterations that create barriers to fish migration in streams mapped as historically supporting salmonid. |
| BIO-4.4*      | Promote Natural Stream Channel Function | Restore and Stabilize Stream Channels Pursue stream restoration and appropriate channel redesign where sufficient right-of-way exists that includes the following: a hydraulic design, a channel plan form, a composite channel cross-section that incorporates low flow and bankfull channels, removal and control of invasive exotic plant species, and biotechnical bank stabilization methods to promote quick establishment of riparian trees and other native vegetation. | - BIO-4.5 Restore and Stabilize Stream Channels Pursue stream restoration and appropriate channel redesign where sufficient right-of-way exists that includes the following: a hydraulic design, a channel plan form, a composite channel cross-section that incorporates low flow and bankfull channels, removal and control of invasive exotic plant species, and biotechnical bank stabilization methods to promote quick establishment of riparian trees and other native vegetation. |
| BIO-4.5       | Restore and Stabilize Stream Channels | Control Exotic Vegetation Remove and replace invasive exotic plants with native plants as part of stream restoration projects and as a condition of site-specific development approval in an SCA, and include monitoring to prevent reestablishment. | - BIO-4.6 Control Exotic Vegetation Remove and replace invasive exotic plants with native plants as part of stream restoration projects and as a condition of site-specific development approval in an SCA, and include monitoring to prevent reestablishment. |
| BIO-4.6       | Control Exotic Vegetation | |</p>
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<tbody>
<tr>
<td>BIO-4.7*</td>
<td>Protect Riparian Vegetation</td>
<td>Retain riparian vegetation for stabilization of streambanks and floodplains, moderating water temperatures, trapping and filtering sediments and other water pollutants, providing wildlife habitat, and aesthetic reasons.</td>
<td>See page 2-8</td>
</tr>
<tr>
<td>BIO-4.8</td>
<td>Reclaim Damaged Portions of SCAs</td>
<td>Restore damaged portions of SCAs to their natural state wherever possible, and reestablish as quickly as possible any herbaceous and woody vegetation that must be removed within an SCA, replicating the structure and species composition of indigenous native riparian vegetation.</td>
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<tr>
<td>BIO-4.9*</td>
<td>Restore Culverted Streams</td>
<td>Replace storm drains and culverts in SCAs with natural drainage and flood control channels wherever feasible. Detailed hydrologic analysis may be required to address possible erosion and flooding implications of reopening culverted reaches. Incentives should be provided to landowners. Modify culverts to allow fish passage when replacement of culverts is not possible.</td>
<td></td>
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<tr>
<td>BIO-4.10</td>
<td>Promote Interagency Cooperation</td>
<td>Work in close cooperation with flood control districts, water districts, and wildlife agencies in the design and choice of materials for construction and alterations within SCAs.</td>
<td></td>
</tr>
<tr>
<td>BIO-4.11</td>
<td>Promote Riparian Protection</td>
<td>Support agencies, organizations, and programs in Marin County that protect, enhance, and restore riparian areas.</td>
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<tr>
<td>BIO-4.12</td>
<td>Support and Provide Riparian Education Efforts</td>
<td>Educate the public and County staff about the values, functions, and importance of riparian areas. An emphasis will be placed on public outreach to owners of developed properties encompassing or adjacent to SCAs where minimum setback distances are not provided. An updated list of regulatory agencies and their contact information should be maintained as part of the Natural Resource Information Program.</td>
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<tr>
<td>BIO-4.13</td>
<td>Provide Appropriate Access in SCAs</td>
<td>Ensure that public access to publicly owned land within SCAs respects the environment, and prohibit access if it will degrade or destroy riparian habitat. Acquire public lands adjacent to streams where possible to make resources more accessible and usable for passive recreation, and to protect and enhance streamside habitat.</td>
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<tr>
<td>BIO-4.14</td>
<td>Reduce Road Impacts in SCAs</td>
<td>Locate new roads and roadfill slopes outside SCAs, except at stream crossings, and consolidate new road crossings wherever possible to minimize disturbance in the SCA, and take special care to stabilize soil surfaces.</td>
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<td>Policy Number</td>
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<tr>
<td>BIO-4.15*</td>
<td>Reduce Wet Weather Impacts</td>
<td>Ensure that development work adjacent to and potentially affecting SCAs is not done during the wet weather or when water is flowing through streams, except for emergency repairs, and that disturbed soils are stabilized and replanted, and areas where woody vegetation has been removed are replanted with suitable species before the beginning of the rainy season.</td>
<td>See page 2-8</td>
</tr>
<tr>
<td>BIO-4.16</td>
<td>Regulate Channel and Flow Alteration</td>
<td>Allow alteration of stream channels or reduction in flow volumes only after completion of environmental review, commitment to appropriate mitigation measures, and issuance of appropriate permits by jurisdictional agencies based on determination of adequate flows necessary to protect fish habitats, water quality, riparian vegetation, natural dynamics of stream functions, groundwater recharge areas, and downstream users.</td>
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<tr>
<td>BIO-4.17</td>
<td>Continue Collaboration with the Marin Resource Conservation District</td>
<td>Continue to collaborate with, support, and participate in programs provided by the Marin Resource Conservation District and the Natural Resource Conservation Service to encourage agricultural operators who conduct farm or ranch activities within an SCA to minimize sedimentation and erosion to enhance habitat value.</td>
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<tr>
<td>BIO-4.18</td>
<td>Promote the Use of Permeable Surfaces When Hardscapes Are Unavoidable in the SCA and WCA</td>
<td>Permeable surfaces rather than impermeable surfaces shall be required wherever feasible in the SCA and WCA.</td>
<td></td>
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<tr>
<td>BIO-4.19</td>
<td>Maintain Channel Stability</td>
<td>Applicants for development projects may be required to prepare hydraulic and/or geomorphic assessment of on-site and downstream drainage ways that are affected by project area runoff. This assessment should be required where evidence that significant current or impending channel instability is present.</td>
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<tr>
<td>BIO-4.20</td>
<td>Minimize Runoff</td>
<td>In order to decrease stormwater runoff, the feasibility of developing a peak stormwater management program shall be evaluated to provide mitigation opportunities such as removal of impervious surface or increased stormwater detention in the watershed.</td>
<td></td>
</tr>
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</table>

* Denotes policies and/or implementing programs that were initiated through Marin County participation in the FishNet 4C Program (see discussion of Mitigation Measure 4.6-1 below).
** The FishNet 4C Program status is discussed on pages 2-11 and 2-12.
Mitigation Measure 4.6-1 Voluntary Compliance Efforts
As part of the Biological Resources impact analysis in the Final EIR, Mitigation Measure 4.6-1 was developed to reduce potential impacts to special-status species due to land-use policies and development consistent with the updated CWP. Mitigation Measure 4.6-1 recommended adding a new policy to the Biological Resources section of the CWP as follows:

Participate in FishNet 4C Program. Continue to actively participate in the FishNet 4C program and work cooperatively with participating agencies to implement recommendations to improve and restore aquatic habitat for listed anadromous fish species and other fishery resources.

The impact analysis indicated that adoption of Mitigation Measure 4.6-1, together with effective implementation of relevant programs, and oversight by regulatory agencies entrusted with enforcement of State and federal regulations that address protection and management of special-status species, would substantially reduce adverse effects to special-status species resulting from land uses and development consistent with the Draft 2005 CWP Update. The impact analysis indicated that this would be a less-than significant project impact and the project’s contribution to cumulative impacts would be less than cumulatively considerable. Accordingly, implementing program BIO-2.e Participate in FishNet 4C Program was added to the Marin CWP (2007) (Table 2-1).

The original intent of Mitigation Measure 4.6-1, was that the Marin County Board of Supervisors would be responsible for adopting the new policy as described in the Marin CWP (2007). The Marin County CDA and the Marin County Department of Public Works (DPW) would share responsibility for ensuring adequate environmental review and avoidance of sensitive resources, for continued participation in the FishNet 4C program, and for monitoring implementation.

FishNet 4C Program Status
The Fishery Network of Central California Coastal Counties (FishNet 4C) comprised the counties of Mendocino, Sonoma, Marin, San Mateo, Santa Cruz and Monterey, where the counties worked together to implement fisheries restoration projects with a focus on recovering endangered and threatened coho salmon and steelhead trout populations. The organization functioned to bring resource agencies together (e.g., California State Water Resources Control Board [SWRCB], regional Water Quality Control Boards [WQCBs], U.S. Fish and Wildlife Service [USFWS], NMFS, CDFW), catalyzing support and raising funds.
for projects across the six participating counties. Marin County actively participated in the FishNet 4C Program from 1998–2011, during which time the structural aspects of the network (e.g., administration, regular meetings) were funded by a combination of state and local grants, and a number of foundational policies were developed to protect fish habitat from development impacts, such as streamflow quantity modification, riparian vegetation and floodplain management, sedimentation, instream habitat modification, water quality impacts, and fish migration barriers. Although funding for FishNet 4C ended in 2011, the projects, policies, and programs created under FishNet 4C have continued, including the following policies and implementing programs under the Proposed Project that are relevant to salmonid Health in San Geronimo Valley (see also Tables 2-1 and 2-2):

**Policies**

- BIO-1.3 Protect Woodlands, Forests, and Tree Resources
- BIO-1.5 Promote Use of Native Plant Species
- BIO-1.8 Restrict Use of Herbicides, Insecticides, and Similar Materials
- BIO-2.8 Coordinate with Trustee Agencies
- BIO-2.9 Promote Early Consultation with Other Agencies
- BIO-4.1 Restrict Land Use in Stream Conservation Areas
- BIO-4.2 Comply with SCA Regulations
- BIO-4.4 Promote Natural Stream Channel Function
- BIO-4.7 Protect Riparian Vegetation
- BIO-4.9 Restore Culverted Streams
- BIO-4.15 Reduce Wet Weather Impacts

**Implementing Programs**

- BIO-1.a Map Natural Communities
- BIO-1.d Reevaluate County Native Tree Preservation and Protection Ordinance
- WR-1.2 Restore and Enhance Watersheds
- WR-2.3 Avoid Erosion and Sedimentation
- WR-2.5 Take Part in Water Quality Education
Water Resources

The Water Resources section of the Marin CWP (2007) focuses on the environmental aspects of watersheds, hydrology, flooding, septic alternative waste options, and water conservation through a series of 3 goals, 11 policies, and 22 implementing programs. The water resources goals, policies and implementing programs most relevant to salmonid health in San Geronimo Valley are presented in Table 2-2.

<table>
<thead>
<tr>
<th>Policy Number</th>
<th>Policy</th>
<th>Description</th>
<th>Implementing Programs</th>
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<tr>
<td>GOAL WR-1</td>
<td>Healthy Watersheds</td>
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<tr>
<td>WR-1.1</td>
<td>Protect Watersheds and Aquifer Recharge</td>
<td>Give high priority to the protection of watersheds, aquifer-recharge areas, and natural drainage systems in any consideration of land use.</td>
<td>• WR-1.a Support Watershed Education and Outreach</td>
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<td>• WR-1.b Establish Development Standards for Infiltration</td>
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<td>Support watershed restoration efforts, coordinate County watershed activities with efforts by other groups, and simplify permit acquisition for watershed restoration and enhancement projects.</td>
<td>• WR-1.c Seek Watershed Assessment and Monitoring Assistance</td>
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<td>Enhance water infiltration throughout watersheds to decrease accelerated runoff rates and enhance groundwater recharge. Whenever possible, maintain or increase a site's predevelopment infiltration to reduce downstream erosion and flooding.</td>
<td>• WR-1.d Coordinate Watershed Efforts WR-1.e Require Restoration of Degraded Areas</td>
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<td>Improve Infiltration</td>
<td>Limit development and grazing on steep slopes and ridgelines in order to protect download areas from erosion and to ensure that runoff is dispersed adequately to allow for effective infiltration.</td>
<td>• WR-1.f Require Stream Restoration Projects</td>
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<tr>
<td>WR-1.4</td>
<td>Protect Upland Vegetation</td>
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<td>Policy Number</td>
<td>Policy</td>
<td>Description</td>
<td>Implementing Programs</td>
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| GOAL WR-2     | Clean Water | Reduce the volume of urban runoff from pollutants - such as pesticides from homes, golf courses, cleaning agents, swimming pool chemicals, and road oil - and of excess sediments and nutrients from agricultural operations. | • WR-2.a Participate in Updating Standards  
• WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities  
• WR-2.c Research and Implement Safe and Effective Alternative Waste Options  
• WR-2.d Continue Alternative Septic/Waste System Monitoring  
• WR-2.e Continue Providing High-Priority Inspections  
• WR-2.f Continue Alternative Septic System Monitoring  
• WR-2.g Inspect Septage Haulers  
• WR-2.h Establish Additional County Service Areas  
• WR-2.i Establish a Septic Inspection, Monitoring, and Maintenance District  
• WR-2.j Continue Public Outreach Regarding Toxic Chemical Use  
• WR-2.k Establish Educational Partnerships to Protect Water Quality  
• WR-2.l Implement County Ordinances  
• WR-2.m Nontoxic Building Materials Standards  
• WR-2.n Implement Least Toxic Methods for Maintenance and Pest Control  
• WR-2.o Establish a Groundwater Monitoring Program for Unincorporated County Areas |
| WR-2.1       | Reduce Toxic Runoff | Reduce the volume of urban runoff from pollutants - such as pesticides from homes, golf courses, cleaning agents, swimming pool chemicals, and road oil - and of excess sediments and nutrients from agricultural operations. |  |
| WR-2.2       | Reduce Pathogen, Sediment, and Nutrient Levels | Support programs to maintain pathogen and nutrient levels at or below target levels set by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), including the efforts of ranchers, dairies, agencies, and community groups to address pathogen, sediment, and nutrient management in urban and rural watersheds. | • WR-2.a Participate in Updating Standards  
• WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities  
• WR-2.c Research and Implement Safe and Effective Alternative Waste Options  
• WR-2.d Continue Alternative Septic/Waste System Monitoring  
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• WR-2.n Implement Least Toxic Methods for Maintenance and Pest Control  
• WR-2.o Establish a Groundwater Monitoring Program for Unincorporated County Areas |
| WR-2.3*      | Avoid Erosion and Sedimentation | Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and water bodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and if necessary, require continued monitoring and maintenance of these facilities upon project completion. | • WR-2.a Participate in Updating Standards  
• WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities  
• WR-2.c Research and Implement Safe and Effective Alternative Waste Options  
• WR-2.d Continue Alternative Septic/Waste System Monitoring  
• WR-2.e Continue Providing High-Priority Inspections  
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• WR-2.k Establish Educational Partnerships to Protect Water Quality  
• WR-2.l Implement County Ordinances  
• WR-2.m Nontoxic Building Materials Standards  
• WR-2.n Implement Least Toxic Methods for Maintenance and Pest Control  
• WR-2.o Establish a Groundwater Monitoring Program for Unincorporated County Areas |
| WR-2.4       | Design County Facilities to Minimize Pollutant Input | Design, construct, and maintain County buildings, landscaped areas, roads, bridges, drainages, and other facilities to minimize the volume of toxics, nutrients, sediment, and other pollutants in stormwater flows, and continue to improve road maintenance methods to reduce erosion and sedimentation potential. | • WR-2.a Participate in Updating Standards  
• WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities  
• WR-2.c Research and Implement Safe and Effective Alternative Waste Options  
• WR-2.dContinue Alternative Septic/Waste System Monitoring  
• WR-2.e Continue Providing High-Priority Inspections  
• WR-2.f Continue Alternative Septic System Monitoring  
• WR-2.g Inspect Septage Haulers  
• WR-2.h Establish Additional County Service Areas  
• WR-2.i Establish a Septic Inspection, Monitoring, and Maintenance District  
• WR-2.j Continue Public Outreach Regarding Toxic Chemical Use  
• WR-2.k Establish Educational Partnerships to Protect Water Quality  
• WR-2.l Implement County Ordinances  
• WR-2.m Nontoxic Building Materials Standards  
• WR-2.n Implement Least Toxic Methods for Maintenance and Pest Control  
• WR-2.o Establish a Groundwater Monitoring Program for Unincorporated County Areas |
| WR-2.5*      | Take Part in Water Quality Education | Continue to support local stormwater and community watershed group efforts to inform the public about practices and programs to minimize water pollution. | • WR-2.a Participate in Updating Standards  
• WR-2.b Integrate Bay Area Stormwater Management Agencies Association (BASMAA) Stormwater Quality Protection Guidelines into Permitting Requirements for All Development and Construction Activities  
• WR-2.c Research and Implement Safe and Effective Alternative Waste Options  
• WR-2.d Continue Alternative Septic/Waste System Monitoring  
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• WR-2.m Nontoxic Building Materials Standards  
• WR-2.n Implement Least Toxic Methods for Maintenance and Pest Control  
• WR-2.o Establish a Groundwater Monitoring Program for Unincorporated County Areas |
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<tr>
<td>GOAL WR-3</td>
<td>Adequate Water for Wildlife and Humans</td>
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| WR-3.1        | Conserve Water and Develop New Sustainable Sources | Reduce the waste of potable water through efficient technologies, conservation efforts, and design and management practices, and by better matching the source and quality of water to the user’s needs. | • WR-3.a Support Water Conservation Efforts  
                 |                                             |                                                              | • WR-3.b Support and Integrate Water District Conservation Efforts |
| WR-3.2        | Mitigate Water Demand in New Development   | Assess and mitigate the impacts of new development on potable water supplies and water available for wildlife. |                                                            |

* Denotes policies and/or implementing programs that were initiated through Marin County participation in the FishNet 4C Program (see discussion of Mitigation Measure 4.6-1 above).
2.4.2 Built Environment Element

The *Built Environment Element* section of the Marin CWP (2007) identifies the degree of allowable growth, sets forth a pattern for land use, and sets out standards for the density of population and the intensity of development for each type of allowable use. The *Built Environment Element* also establishes a direct tie between the timing, amount, type, design, and location of development and the traffic, service, and infrastructure resources available to serve additional demand. The *Built Environment Element* includes the following main topics:

- Community Development
- Community Design
- Energy and Green Building
- Mineral Resources
- Housing
- Transportation
- Noise
- Public Facilities and Services
- Planning Areas

The *Community Development and Planning Area* topics are highly relevant to the assessment of cumulative impacts on salmonids in San Geronimo Valley because they provide specific land-use designations and allowable development within those land-use designations. These are summarized further below.

**Community Development**

The *Community Development* section of the Marin CWP (2007) focuses on the urban forms that are intended to shape development in the unincorporated county and provide guidance to the cities and towns of Marin County. Four corridors are designated to shift existing development potential from environmentally constrained sites to more appropriate locations and thus protect environmental resources; San Geronimo Valley is included in the *Inland Rural Corridor*. The *Inland Rural Corridor* is located in the central and northwestern part of the County, and is designated for agriculture and compatible uses and for preservation of existing small communities.

The *Community Development* topic generally directs land use to appropriate areas, with urban areas having concentrated development, and sensitive natural areas having much less. It includes 8 development goals, 36 policies, and 62
implementing programs. The community development goals, policies and implementing programs most relevant to salmonid health in San Geronimo Valley are presented in Table 2-3.

Although not specific to the Community Development topic, zoning implements the land use policies identified in the Marin CWP (2007) by dividing the county into zones, which specify allowable uses for real property and size restrictions for buildings within these areas. Regulations for the various zoning districts are defined and specified by the Development Code, Title 22 of the Marin County Municipal Code. In unincorporated Marin, there are two fundamental types of zoning districts: conventional and planned (Marin CWP 2007). Conventional zoning districts have specific numerical subdivision and development standards, including minimum lot area, minimum setbacks, height limits, and floor area ratio limits. Provided a development project conforms to those standards, no discretionary permits are required. In contrast, planned zoning districts have few specific numerical standards. Instead, they encourage development to be clustered in the areas most suitable for development on a given site to conserve a larger portion of that site in its natural state (Marin CWP 2007).

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<tr>
<td>GOAL CD-1</td>
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| CD-1.1        | Direct Land Uses to Appropriate Areas | Concentrate urban development in the City-Centered Corridor, where infrastructure and facilities can be made available most efficiently. Emphasize agricultural uses in the Inland Rural Corridor, along with preservation of resources, habitat, and existing communities. | CD-1.a Keep Urban Uses in the City-Centered Corridor  
CD-1.c Reduce Potential Impacts  
CD-1.d Maintain Agriculture in the Inland Rural Corridor |
| CD-1.2        | Direct Urban Services | Discourage extension of urban levels of service to serve new development beyond urban service areas. | |
| CD-1.3        | Reduce Potential Impacts | Calculate potential residential densities and commercial floor area ratio (FAR) at the lowest end of the applicable range on sites with sensitive habitat, on sites within the Ridge and Upland Greenbelt or Baylands Corridor, or on sites lacking public water or sewer systems. | |
| GOAL CD-8     |        |             |                       |
| CD-8.1        | Establish Land Use Plan Map Designations | Land use designations are established as shown on the Land Use Policy Maps (Figure 2-2 through Figure 2-5) based on such factors as natural resource protection, existing and surrounding land uses, and environmental hazards. | |
| CD-8.2        | Establish Land Use Categories | Established land use categories are generalized groupings of land uses that define a predominant land use type. Some listed uses will be conditional uses under zoning, will require a use permit or other discretionary approval, and may be allowed only in limited areas or under limited circumstances. | CD-8.a Review of Development Code  
CD-8.b Revise Zoning Maps |
<p>| CD-8.3        | Establish Land Use Intensity Standards | Standards of building intensity expressed as floor area ratios or residential densities (dwelling units per acre) are established for each land use designation. To convert residential units to population densities, 2.3 persons per household shall be assumed. | |</p>
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<th>Implementing Programs</th>
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<tr>
<td>CD-8.4</td>
<td>Establish Agriculture and Conservation Land Use Categories</td>
<td>Agriculture and Conservation land use categories are established for land with resource values both for agriculture production and for wetlands and wildlife habitat. These lands may also have physical constraints, such as heavily wooded hillsides and ridgelines, that limit their potential for agricultural production and deserve protection on the basis of their habitat and visual resource values. See page 2-19</td>
</tr>
<tr>
<td>CD-8.5</td>
<td>Establish Agricultural Land Use Categories</td>
<td>Agriculture land use categories are established to preserve and protect a variety of agricultural uses, and to enable the potential for agricultural production and diversification. Historically, 60 ac has been the minimum parcel size for most agricultural lands in the county. Various policies regarding agricultural productivity, water availability, effects on water quality, and other factors govern the subdivision of such lands.</td>
</tr>
<tr>
<td>CD-8.6</td>
<td>Establish Residential Land Use Categories and Densities</td>
<td>Residential development is designated at a full range of densities, with an emphasis on providing more affordable housing, while also recognizing that physical hazards, fire risk, development constraints, protection of natural resources, and the availability of public services and facilities can limit housing development in some areas.</td>
</tr>
<tr>
<td>CD-8.9</td>
<td>Establish Public Facility, Quasi-Public Facility, and Open Space Land Use Categories</td>
<td>Lands in public ownership for open space purposes, such as recreation, watershed, and habitat protection and management, are designated Open Space. In addition, private lands may be designated Open Space when subject to deed restrictions or other agreements limiting them to open space and compatible uses. Lands designated Open Space are subject to a floor area ratio (FAR) of 0.01 to 0.09.</td>
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Planning Areas

In addition to the four environmental corridors, there are seven planning areas that define Marin County. San Geronimo Valley is included in the West Marin Planning Area, and includes the villages of Forest Knolls, Lagunitas, San Geronimo, and Woodacre. The Marin CWP (2007) references the San Geronimo Valley Community Plan (Plan) (1997), which defines land-use and conservation guidelines for planning decisions. The Plan presents goals, objectives, policies, and programs designed to preserve the unique natural attributes of the Valley and its communities as well as the historical character of the built environment. The guidelines are used by CDA staff, the County Planning Commission and the Marin County Board of Supervisors to review specific development proposals within San Geronimo Valley. The Plan provides direction to property owners, community groups and interested individuals in formulating and reviewing new developments. The Plan sets the number of units per acre for different land-use categories (Figure 2-2).
Figure 2-2. San Geronimo Valley Land Use Policy Map (Marin CWP [2007]).
2.5 Area of Analysis

The area of analysis for existing conditions and future development under the Proposed Project is the San Geronimo Creek watershed, where the downstream boundary of the watershed is defined as the confluence of San Geronimo Creek and Lagunitas Creek (Figure 2-3). Study reaches within mainstem San Geronimo Creek and the major tributary subbasins (Woodacre Creek, Larsen Creek, Montezuma Creek, and the Arroyo/Barranca/El Cerrito Complex) are also defined in Figure 2-3, consistent with the *San Geronimo Valley Existing Conditions Report* (Stillwater Sciences 2009a).
Figure 2-3. San Geronimo Valley Watershed, Marin County, Area of Analysis. Study reaches within mainstem San Geronimo Creek and the major tributary subbasins are shown in differing colors on the map and legend.
2.6 Future Development

2.6.1 Development Metrics

Prior to development policies established in the 1994 and 2007 CWPs, buildout potential in San Geronimo Valley was based on original zoning ordinance criteria. Under the Proposed Project, specific policies have changed the amount and type of allowable development (Section 2.4.2). The following sections use several metrics to characterize existing conditions as well as future development under the Proposed Project, where the metrics have been selected based upon available data and potential relationship to habitat conditions for salmonids. Consistent with CEQA requirements, existing conditions for this SEIR are defined as conditions at the time that Marin County published the revised Notice of Preparation (NOP) for the Final EIR, which was 2005. The existing conditions and future development metrics used in this SEIR are briefly described below.

*Number of improved parcels* – the number of land parcels possessing electricity, telephone, road (paved or unpaved) access, and/or connection to potable water and wastewater services, using parcel use designation as assigned by the Marin County Assessor’s Office.

*Number of developed units* – the number of commercial or residential buildings or structures erected according to applicable building codes, using unit designation as assigned by the Marin County Assessor’s Office.

*Total Impervious Area* – the total area of constructed, non-infiltrating surfaces, such as rooftops, parking lots, and roads, expressed as an absolute value and a percentage of the total land area in the watershed. Additional discussion of the total impervious area (TIA) metric with respect to San Geronimo Valley is provided in Sections 2.6.2 through 2.6.4.

*Number of parcels with municipal domestic water supply* – the number of land parcels that are served by MMWD as their primary water supply, using parcel associations provided by MMWD.

*Number of parcels with groundwater wells* – the number of land parcels that possess one or more active groundwater wells, as defined using parcel associations provided by the Marin County Department of Environmental Health Services (EHS).
Number of groundwater wells – the number of individual active wells, using well locations provided by the Marin County EHS.

Number of water diversions – the number of individual water diversions, as defined by the California State Water Resources Control Board Electronic Water Rights Information Management System (eWRIMS).

Using the above metrics, existing conditions and future development in San Geronimo Valley under the Proposed Project are characterized at the following three scales:

- Watershed scale, as defined by the Area of Analysis (Section 2.5);
- Scale of the subbasin or reach, consistent with study reaches defined in the San Geronimo Valley Existing Conditions Report (Stillwater Sciences 2009a). This scale is included in the analysis in order to best support planning efforts, because aquatic-resource problems, and their solutions, are ultimately “place-based.” Note that solutions to those problems may not always be most effective at the location where the symptom is apparent—recognizing the spatial relationship between in-stream conditions and the contributing watershed is essential to identifying effective solutions.
- Stream Conservation Area (SCA), as defined by a development setback on each side of the streamside top of bank that is the greater of either (a) 50 ft landward from the outer edge of woody riparian vegetation associated with the stream or (b) 100 feet landward from the top of bank (Figure 2-4) (Marin CWP [2007]). The SCA has been established to protect the active channel, water quality and flood control functions, as well as associated fish and wildlife habitat values along streams, and development within its boundaries has the potential for relatively greater impacts. Ephemeral streams that are not otherwise subject to SCA setbacks have their own setback measurements (Figure 2-5).

In addition to the aforementioned existing conditions and future development metrics, the following metric is used in this SEIR to characterize past, current (i.e., existing) and future development in San Geronimo Valley at the scale of the watershed:

Population – the number of individuals living in San Geronimo Valley by decade, as defined by the San Geronimo Community Plan (1997) for 1980 and 1990; the U.S. Census Bureau for 2000 and 2010; and the Marin CWP (2007) estimate of average household size (2.35 people/unit) multiplied times the hypothetical maximum number of units that may be developed (future theoretical buildout) under the Proposed Project.
“Imperviousness” has long been recognized as an important determinant of the health of an urban watershed, whether measured by physical, chemical, or biological metrics (USEPA 1983, Booth and Jackson 1997, Jones et al. 2005). Over the last decade, a number of correlations have been drawn between
watershed imperviousness and stream conditions, initiated by the definition of
generalized classifications of instream habitat quality as “sensitive” at 1–10% imperviousness; “impacted” at 11–25% imperviousness; and “non-supporting” at greater than 25% imperviousness (Center for Watershed Protection 1998). However, these thresholds are not site-specific and the boundaries between the different conditions are not absolute, such that even at low levels of residential and commercial development (urbanization), impacts to stream ecosystems can be recognized (Booth et al. 2002, National Academy of Sciences 2008, Stillwater Sciences 2009a). An overview of urbanization effects on stream ecosystem function is presented in Section 3.2, followed by a discussion of hydrology, water quality, the riparian zone, and habitat quality, as these topics pertain to anadromous fish habitat in the San Geronimo Valley (Sections 3.3–3.6).

Not all studies use identical methods for determining “imperviousness,” and a review of the literature (Booth et al. 2002) found that not every study makes the fundamental discrimination between TIA and effective impervious area (EIA). The latter, defined as the impervious surfaces with direct hydraulic connection to the downstream drainage (or stream) system, is the parameter normally used to characterize urban development in hydrologic models and excludes any part of the TIA that drains onto pervious (i.e., “green”) ground allowing for interception and infiltration of runoff. Direct connection of impervious surfaces to streams, which is better represented by EIA, means that even small rainfall events can produce sufficient surface runoff to cause frequent disturbance through regular delivery of water and pollutants. Although TIA and EIA offer important analysis distinctions, the commonalities are far more dramatic than the differences—imperviousness is a coarse but powerful predictor of stream condition and there is little to be gained by a highly precise delineation of TIA versus EIA in San Geronimo Valley (Stillwater Sciences 2009a).

The methodology for estimating existing conditions TIA in the San Geronimo Valley followed the standard U.S. Geological Survey (USGS) approach, as described by Tilley and Slonecker (2007) and previously reported in Stillwater Sciences (2009a). TIA for San Geronimo Valley includes the area of buildings, roads (paved, gravel, other), parking lots, driveways, and sidewalks (via a conservative buffer on paved roads), which should characterize more than 90% of the impervious areas in the watershed (Stillwater Sciences 2009a). Existing conditions and future conditions estimated TIA are presented by type in Table 2-4. Additional detail regarding the methodology for estimating building- and road-associated TIA is presented below.
Table 2-4. Estimated TIA by Type in San Geronimo Valley.

<table>
<thead>
<tr>
<th>TIA Type</th>
<th>Existing Conditions (2005) (acre)</th>
<th>Proposed Project (acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads¹</td>
<td>220.5</td>
<td>229.6</td>
</tr>
<tr>
<td>Buildings²</td>
<td>74.8</td>
<td>108.4</td>
</tr>
<tr>
<td>Parking lots³</td>
<td>15.1</td>
<td>17.3</td>
</tr>
<tr>
<td>Total¹</td>
<td>301.7</td>
<td>345.3</td>
</tr>
</tbody>
</table>

¹ Includes driveways and sidewalks (Stillwater Sciences 2009a). Existing conditions road layer provided by Marin County Open Space District.

² The existing conditions building footprint source was the “Building Footprint” feature class from Marin County CDA Enterprise (based on 2004 aerial photos).

³ Existing conditions parking lots were digitized at a scale of 1:1,500 based on 2006 color orthorectified aerial photos of 1-meter resolution (Stillwater Sciences 2009a).

⁴ Individual estimates for each TIA type sum to greater than 301.7 acres (Existing Conditions) and 345.3 (Proposed Project) acres because the boundaries for roads, buildings, and parking lots overlap in multiple places. To avoid double counting, total estimated TIA is based on a single, combined TIA layer rather than summing the individual TIA type layers. We assume that the degree of overlap between the three TIA types remains the same under the Proposed Project as that of existing conditions (i.e., 2.8%).

**Buildings**

The existing conditions building footprint source relied upon 2004 aerial photos and the “Building Footprint” feature class provided by Marin County CDA Enterprise. Future potential TIA for buildings (units) under the Proposed Project was estimated by:

1) Determining existing TIA for each unit in a given parcel;

2) For parcels with existing units, determining the average TIA of a single unit by parcel and land use type, multiplying the average by the number of additional units allowable for that parcel, and adding it to the existing TIA;

3) For parcels without existing units, applying the average unit size for the associated land use category (based on the parcel land use) (Table 2-5).
Table 2-5. Average Building (Unit) Footprint by Land Use Category Used for Estimating Future Potential TIA Under the Proposed Project.

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Existing Conditions (2005) (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>1,289</td>
</tr>
<tr>
<td>Community Open Space &amp; Facilities</td>
<td>1,840</td>
</tr>
<tr>
<td>Institutional</td>
<td>2,955</td>
</tr>
<tr>
<td>Multi-Family Commons</td>
<td>242</td>
</tr>
<tr>
<td>Multi-Family Residential</td>
<td>1,096</td>
</tr>
<tr>
<td>Open Space – Public</td>
<td>2,113</td>
</tr>
<tr>
<td>Rural</td>
<td>550</td>
</tr>
<tr>
<td>Single Family Residential</td>
<td>2,675 (2)</td>
</tr>
<tr>
<td>Utility</td>
<td>2,065</td>
</tr>
</tbody>
</table>

1 Data provided by Marin County (2005). There has been no substantial development in San Geronimo Valley since 2005 and therefore no change to estimated TIA under existing conditions.

2 Mean house size in San Geronimo Valley increased over time from approximately 1,400 ft² in 1920 to approximately 2,675 ft² for the period 2000–2017 (data provided by Marin County [2017]). The longer-term San Geronimo Valley trend mirrors that of the broader U.S. over a shorter period, where mean house size increased from approximately 1,650 ft² in 1975 to approximately 2,700 ft² in 2015 (U.S. Department of Commerce 2015).

**Roads and Parking Lots**

Existing conditions roads were considered impervious based on their surface type using the following USGS definition: "Long, narrow areas of gravel, paved or other hard surfaces that are utilized primarily for public transportation by automobile and are maintained and regulated by Federal, State or local government" (Tilley and Slonecker 2007). Thus, roads having surface types of 'paved', 'gravel', and 'other' were included in the existing conditions TIA estimate, where ‘other’ includes features such as paved bridges. Dirt roads or unclassified segments were excluded from TIA calculations because they do not conform to the standard USGS definition of impervious roads (Stillwater Sciences 2009a). Roads were buffered based on road width attributes. For those roads without an assigned width attribute, the average width for the surface type was used, as follows (Stillwater Sciences 2009a):

- Paved: 36 feet
- Gravel: 26 feet
- Other: 12 feet

Sidewalks were implicitly included in the existing conditions TIA analysis by using the presumptive 36-foot width for paved roads (Stillwater Sciences 2009a). Note that road width buffer accounts for sidewalks in addition to a variety of hard surfaces that are visible in the 2004 aerial photos of San Geronimo Valley and
not rigorously captured by the digitization process, including the full extent of intersection shoulders, driveway shoulders, swimming pool (hardscape) patios, paved paths between parking lots and building entrances, small sheds, and domestic animal-related features (e.g., chicken coops, dog runs). These features are located both inside and outside of the SCA. Thus, although there are not sidewalks along all of the paved roads in San Geronimo Valley under existing conditions, the use of a standard buffer on the paved roads category allows the TIA estimate to account for the numerous other small impervious surfaces located throughout developed portions of the valley.

The future conditions road area was estimated assuming no change to the ‘gravel’ and ‘other’ surface types because there is no compelling evidence to suggest that either of these surface types would significantly increase with future development. Future conditions for the paved road surface type assumes no new paved roads would be developed since the Marin CWP (2007) does not include plans for road construction in San Geronimo Valley. However, future driveways, including driveways for unimproved single family residential parcels that do not currently appear to possess immediate road access, and sidewalk-related TIA could result in additional TIA. The analysis assumes approximately 9 acres of new paved surfaces, where driveway and/or sidewalk configurations would vary.

While not included in the TIA analysis, unpaved roads are also important to the health of San Geronimo Creek because they contribute a substantial amount of sediment to the creek (Stillwater Sciences 2010, SFBRWQCB 2014a). Approximately 40% of the total roads in the watershed are unpaved (Table 2-6) and are not maintained by Marin County DPW. Including both paved and unpaved roads in the calculations, existing conditions road density in the San Geronimo Creek watershed (9.3 mi/mi²) is the highest of any Lagunitas Creek tributary.

The future conditions parking lot area was estimated assuming no change in the relative amount of parking lot area to total TIA in the watershed (i.e., 5%) from existing conditions, which results in a small increase in the absolute acreage of parking lot area (i.e., approximately 2 acres). This is a conservative estimate since the vast majority of future improved parcels would be single-family residential rather than other land use categories that could include parking lots (e.g., commercial, institutional).
Table 2-6. Paved and Unpaved (Dirt) Roads in San Geronimo Valley.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Existing Conditions (2005) (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paved roads</td>
<td>49.2</td>
</tr>
<tr>
<td>Gravel roads</td>
<td>3.6</td>
</tr>
<tr>
<td>Other roads</td>
<td>0.1</td>
</tr>
<tr>
<td>Dirt roads</td>
<td>33.6</td>
</tr>
<tr>
<td>Total</td>
<td>86.5</td>
</tr>
</tbody>
</table>

1 Data provided by Marin County (2005). Methodology for estimating road miles is provided above and in Stillwater Sciences (2009a).
2 Shapefile overlays for the paved roads type create small, overlapping lines that sum to 0.1–0.3 road miles.
3 Road type estimates may not sum to the total shown due to rounding errors.

2.6.2 Watershed Scale

Under the Proposed Project, there is potential for an increased number of improved parcels within the watershed, as well as an increased number of developed units (Table 2-7). Despite this, remaining parcels zoned for future development tend to have significant environmental constraints, which either substantially increase construction costs or preclude development altogether (e.g., inadequate percolation for on-site septic systems, lack of access via paved roads, steep topography necessitating engineered foundation designs). For example, in 2016 Marin County issued 19 building permits in San Geronimo Valley, compared with approximately 1,200 building permits issued for the County as a whole. The San Geronimo Valley 2016 building permits were issued for remodels of existing buildings, and construction of decks and retaining walls, which as a group represent a mixture of projects that may or may not extend respective development footprints. While it is not possible to quantitatively reduce the estimate of improved parcels under the Proposed Project without a parcel-by-parcel analysis that assumes specific design attributes for future development, the relatively low number of San Geronimo Valley building permits issued by Marin County in recent years (e.g., 2016) indicates that the number of additional improved parcels and developed units anticipated under the Proposed Project (Table 2-7) is likely to be an overestimate.
Table 2-7. Development Metrics for San Geronimo Valley at the Scale of the Watershed.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference (and % change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved parcels</td>
<td>1,415</td>
<td>1,738</td>
<td>323 (+23%)</td>
</tr>
<tr>
<td>Unimproved parcels</td>
<td>474</td>
<td>151</td>
<td>-323 (-68%)</td>
</tr>
<tr>
<td>Other parcels</td>
<td>144</td>
<td>144</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Developed units</td>
<td>1,598</td>
<td>1,956</td>
<td>358 (+22%)</td>
</tr>
<tr>
<td>TIA (ac)</td>
<td>301.7</td>
<td>345.3</td>
<td>43.6 (+14%)</td>
</tr>
<tr>
<td>%TIA</td>
<td>5.0%</td>
<td>5.8%</td>
<td>0.7% (+14%)</td>
</tr>
<tr>
<td>Parcels with municipal domestic water supply</td>
<td>1,305</td>
<td>1,617</td>
<td>312 (+24%)</td>
</tr>
<tr>
<td>Parcels with groundwater wells</td>
<td>36</td>
<td>≥ 36</td>
<td>-</td>
</tr>
<tr>
<td>Groundwater wells</td>
<td>36</td>
<td>≥ 36</td>
<td>-</td>
</tr>
<tr>
<td>Water diversions</td>
<td>6</td>
<td>≥ 6</td>
<td>-</td>
</tr>
</tbody>
</table>

1 Data provided by Marin County CDA in 2005. There has been no substantial development (≥ 2% of parcels or units) in San Geronimo Valley since 2005, which serves as the CEQA baseline for this SEIR. Therefore, the number of improved parcels, unimproved parcels, other parcels, units, and TIA as of 2005 comprise the CEQA existing conditions.

2 The following land use designations are included in ‘Other’: Common Area; Exemption – Vacant; Mobile Homes; Road; Tax Exempt; Blank.

3 Data provided by MMWD in 2016.

4 This analysis assumes that all new improved parcels under the Proposed Project would possess municipal domestic water supply. Existing information indicates that there are currently a small number of unimproved parcels that already possess municipal domestic water supply; some of these parcels would be improved under the Proposed Project, while others would not. The net effect is that the number of parcels that would possess municipal water supply (n=312) under the Proposed Project is less than the number of parcels that would be improved (n=323).

5 Data provided by Marin County Department of Environmental Health Services (EHS) in 2016. Only groundwater wells likely to be active are included in the analysis.


As described in the San Geronimo Valley Existing Conditions Report (Stillwater Sciences 2009a), San Geronimo Valley displays modest imperviousness at levels that have been well correlated with various measures of resource degradation throughout the western United States and in temperate regions across the globe. Under the Proposed Project, there would be a small increase in TIA (43.6 ac) and %TIA (5.8%, reflecting a 14% increase from the existing TIA level of 5.0%) resulting from future theoretical buildout under the Marin CWP (2007) (Table 2-7). Because the number of additional improved parcels and developed units anticipated under the Proposed Project would likely be lower than those presented in Table 2-7, the projected TIA and %TIA estimates are also likely to be an overestimate.

Available data indicate that the vast majority of parcels in San Geronimo Valley currently possess municipal water supply (Table 2-7). Available data also
suggest that there are 36 parcels possessing the same number of wells that are likely to be active for domestic and/or irrigation use. With respect to the potential for establishment of new groundwater wells on future improved parcels, current permit requirements are likely to preclude well installation and maintenance for the vast majority of new development. San Geronimo Valley is within the MMWD Service District Boundary (MMWD 2016), meaning that MMWD is obligated to supply water to future improved parcels to the extent that supply is available. MMWD has studied the potential for municipal groundwater supply in Marin County since the 1970s and has indicated that production capacities are very limited (MMWD 2016). In recognition of the lack of groundwater supply in the area, MMWD adopted Policy No. 3 “Wells and Other Private Water Sources” that focuses on the use of groundwater wells for non-potable uses such as landscaping, and notes that the supplies are subject to shortage during hydrologically dry periods and should only be a supplement to municipal water service (MMWD 2005). Currently, Marin County Department of Environmental Health Services (EHS) oversees and issues well construction permits to drill, install, repair, and reconstruct groundwater wells in Marin County, ensuring that the installation of any groundwater well meets California Department of Water Resources’ Well Standards. In order to obtain the requisite domestic water permit, the applicant must demonstrate sustained water yield for the well, and may be required by MMWD to install backflow prevention devices and undertake annual testing to demonstrate the quality of their water supply. Overall, the SEIR analysis assumes that because all new improved parcels in San Geronimo Valley are likely to receive municipal water supply, there is a general lack of groundwater supply in the area, and installation and maintenance of groundwater supply would be relatively expensive, new development under the Proposed Project would be unlikely to use groundwater as the designated source of water for the parcel (Table 2-7). As a conservative assumption, the number of existing active groundwater wells would represent the minimum number of wells for San Geronimo Valley under the Proposed Project.

Available data indicate that there are six appropriative water rights for surface water diversions in San Geronimo Valley (Table 2-7). There is no known information regarding surface water diversions created without a permit for the Area of Analysis. It is not known whether any of the six surface water diversions are typically active, nor the rate of diversion for each. As a conservative assumption, the number of existing permitted surface water diversions would represent the minimum number of such diversions for San Geronimo Valley under the Proposed Project.
Lastly, the total population in the San Geronimo Valley (Census Tract 1130) has grown from 2,952 in 1970 to an estimated 4,149 in 2010 (Table 2-8). Countywide population growth between 1980 and 2000 averaged 0.6% per year (Marin CWP 2007), whereas growth in San Geronimo Valley between 1980 and 2000 averaged 0.9% per year.

Table 2-8. Total Population for San Geronimo Valley by Decade (1980–2010) and for Future Theoretical Buildout Under the Proposed Project.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970 Actual¹</td>
<td>2,952</td>
</tr>
<tr>
<td>1980 Actual²</td>
<td>3,200</td>
</tr>
<tr>
<td>1990 Actual²</td>
<td>3,345</td>
</tr>
<tr>
<td>2000 Actual¹</td>
<td>3,797</td>
</tr>
<tr>
<td>2010 Actual¹</td>
<td>4,149</td>
</tr>
<tr>
<td>Future Theoretical Buildout³</td>
<td>4,814</td>
</tr>
</tbody>
</table>

¹ Data from the U.S. Census Bureau for Census Tract 1130 (https://factfinder.census.gov).
² Data from San Geronimo Community Plan (1997) for Census Tract 1130.
³ Calculated using Marin CWP (2007) estimate of average household size at 2.35 people/unit x 358 additional units to be developed beyond 2005 existing conditions (Table 2-7).

2.6.3 Subbasin/Reach Scale

Under the Proposed Project, all subbasins and/or reaches of the mainstem creek would experience an increase in the number of improved parcels (Table 2-9), as well as an increase in the number of developed units (Table 2-10). Lower San Geronimo Creek and Woodacre Creek would experience the largest increase in number of parcels and units under the Proposed Project; however, since these reaches exhibit the greatest number of parcels and units under existing conditions, their relative increase under the Proposed Project would be moderate. The largest relative increase in both parcels and units under the Proposed Project would occur in Upper San Geronimo Creek. As noted for the watershed scale (Section 2.6.2), the number of additional improved parcels and developed units anticipated under the Proposed Project likely represents an overestimate due to a number of environmental constraints that are likely to reduce the number of buildable parcels at the subbasin/reach scale.
Table 2-9. Number of Improved Parcels by Subbasin or Mainstem Reach for San Geronimo Valley.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference (and % change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>17</td>
<td>19</td>
<td>2 (+12%)</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>554</td>
<td>648</td>
<td>94 (+17%)</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>46</td>
<td>67</td>
<td>21 (+46%)</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>12</td>
<td>14</td>
<td>2 (+17%)</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>108</td>
<td>141</td>
<td>33 (+31%)</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>142</td>
<td>164</td>
<td>22 (+15%)</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>536</td>
<td>679</td>
<td>143 (+27%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,415</strong></td>
<td><strong>1,738</strong></td>
<td><strong>323 (+23%)</strong></td>
</tr>
</tbody>
</table>

1 Data provided by Marin County CDA (2005). The number of improved parcels is defined as the number of land parcels possessing electricity, telephone, road (paved or unpaved) access, and/or connection to potable water and wastewater services, using parcel use designation as assigned by the Marin County Assessor’s Office.
2 Individual subbasin or mainstem reach values may not sum to the total shown due to rounding errors.
3 Total values may not sum due to a small number of parcels (n < 10) that do not have an assigned land use designation.

Table 2-10. Number of Developed Units by Subbasin or Mainstem Reach for San Geronimo Valley.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference (and % change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>60</td>
<td>66</td>
<td>6 (+10%)</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>586</td>
<td>685</td>
<td>99 (+17%)</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>40</td>
<td>66</td>
<td>26 (+65%)</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>11</td>
<td>15</td>
<td>4 (+36%)</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>113</td>
<td>147</td>
<td>34 (+30%)</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>159</td>
<td>191</td>
<td>32 (+20%)</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>629</td>
<td>786</td>
<td>157 (+25%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,598</strong></td>
<td><strong>1,956</strong></td>
<td><strong>358 (22%)</strong></td>
</tr>
</tbody>
</table>

1 Data provided by Marin County CDA (2005). The number of developed units is defined as the number of commercial or residential buildings or structures erected according to applicable building codes, using unit designation as assigned by the Marin County Assessor’s Office. Units include just the building or structure; they do not include associated roads, driveways, or paved infrastructure.

TIA in the tributary subbasins and mainstem reaches of San Geronimo Creek would increase under the Proposed Project, assuming future theoretical buildout, with %TIA ranging from 2.3% to 10% (Table 2-11). Woodacre Creek, which exhibits the greatest %TIA by subbasin or mainstem reach under existing conditions, would experience a moderate (+10%) increase in %TIA under the Proposed Project. Montezuma Creek, which exhibits a moderate amount of %TIA under existing conditions (3.9%), would experience the greatest potential...
increase (+37%) in %TIA. Under the Proposed Project, all subbasins and mainstem reaches would exhibit ≤10% TIA within their respective contributing areas (Table 2-11).

Table 2-11. Cumulative TIA and Percent TIA by Subbasin or Mainstem Reach for San Geronimo Valley1.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Contributing Area (acre)²</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference (acre) (and % change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>942.8</td>
<td>20.6</td>
<td>21.7</td>
<td>1.1 (+5%)</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>893.4</td>
<td>80.7</td>
<td>88.9</td>
<td>8.2 (+10%)</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>2,617.7</td>
<td>140.8</td>
<td>153.5</td>
<td>12.7 (+9%)</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>438.3</td>
<td>18.0</td>
<td>18.8</td>
<td>0.8 (4%)</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>244.2</td>
<td>9.4</td>
<td>12.9</td>
<td>3.5 (+37%)</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>898.6</td>
<td>35.1</td>
<td>39.8</td>
<td>4.7 (+13%)</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>6,001.0</td>
<td>301.7</td>
<td>345.3</td>
<td>43.6 (+14%)</td>
</tr>
</tbody>
</table>

1 Data provided by Marin County CDA (2005).
2 Contributing areas and TIA estimates are cumulative.

There are currently 36 parcels within the San Geronimo Valley possessing the same number of groundwater wells likely to be active. A majority of the parcels and wells (29 of 36) are located in the lower portion of the watershed, with most of the parcels and wells located in the Arroyo/Barranca/El Cerrito Complex (16 of 36, or 44%) and Lower San Geronimo Creek (11 of 36, or 31%) (Table 2-12). As noted for the watershed-scale analysis (Section 2.6.2), the SEIR assumes that because all new improved parcels in San Geronimo Valley are likely to receive municipal water supply, there is a general lack of groundwater supply in the area, and installation and maintenance of groundwater supply would be relatively expensive, new development under the Proposed Project would be unlikely to use groundwater as the designated source of water for the parcel. As a conservative assumption, the number of existing active groundwater wells is assumed to represent the minimum number of such wells by reach under the Proposed Project (Table 2-12).

Additionally, based on available information there are six appropriative water rights for surface water diversions in the San Geronimo Valley (Table 2-12). Four of these are located at a single site along the Larsen Creek reach, at a small
pond on the San Geronimo National Golf Course, adjacent to Nicasio Valley Road. At this location, Larsen Creek is subsumed within the pond and then becomes a grassy swale perennially connected to the pond, progressing west through the golf course and eventually becoming a distinct stream channel with a riparian zone (Stillwater Sciences 2009a). Two other appropriative water rights for surface water diversions are located in the Arroyo/Barranca/El Cerrito Complex and in Lower San Geronimo Creek. It is not known whether any of the six surface water diversions are typically active, nor the rate of diversion for each.

Table 2-12. Number of Parcels with Groundwater Wells and/or Surface Water Diversions by Subbasin or Mainstem Reach for San Geronimo Valley.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Parcels with Wells</td>
<td>Number of Parcels with Diversions</td>
<td>Number of Parcels with Wells</td>
</tr>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>6</td>
</tr>
</tbody>
</table>

1 Parcels with wells include improved (n=34), unimproved (n=1), and other (n=1).

2.6.4 Scale of the Stream Conservation Area (SCA)

Under the Proposed Project, all subbasins and/or reaches of mainstem San Geronimo Creek except Larsen Creek would experience an increase in the number of improved parcels either completely or partially within the SCA (Table 2-13, Figure 2-7). The distribution of parcel sizes and location relative to the SCA would vary by subbasin and/or reach, with relatively few parcels small enough to lack significant flexibility in development placement (0–0.5 ac) located completely within the SCA (Figure 2-6a, b). The majority of smaller parcels would be located only partially within the SCA, such that development within the SCA itself could be avoided, or they would be located outside the SCA (Figure 2-6a, b). Very few larger parcels (>0.5 ac) would be located completely within the SCA, since the...
SCA itself only extends 100 feet from the top of bank on either side of the stream.

All subbasins and/or reaches would experience an increase in the number of developed units either completely or partially within the SCA (Table 2-14). Lower San Geronimo Creek and Woodacre Creek would experience the largest increase in number of parcels and units under the Proposed Project either completely or partially within the SCA; however, since these reaches exhibit the greatest number of parcels and units within the SCA under existing conditions, their relative increase under the Proposed Project would be moderate. Large relative increases in parcels and units either completely or partially within the SCA under the Proposed Project would occur in Upper San Geronimo Creek and Montezuma Creek.

As noted for both the watershed and subbasin/reach scale (Sections 2.6.2 and 2.6.3, respectively), the number of additional improved parcels and developed units anticipated under the Proposed Project likely represents an overestimate due to a number of environmental constraints that are likely to significantly reduce the total number of buildable parcels. Within the SCA in particular, additional policies (BIO-4.1 to BIO-4.20, see Table 2-1) would further limit development activities, with Policy BIO-4.2 Comply with SCA Regulations requiring individual projects to undergo a discretionary permit process that involves design review for development within the SCA. Design review involves a detailed review by County staff of the design and placement of the proposed development on a site. Design reviews are the most common type of discretionary planning permit and are an important tool used to implement the policies contained within the Proposed Project.

However, the discretionary permit process, including design review, would only routinely apply to parcels in planned zoning districts; design review would be required to a significantly lesser extent in conventionally zoned districts (see Section 2.4.2 for discussion of zoning districts). Of the total number of SCA parcels to be developed under the Proposed Project, approximately 21% are in a planned zoning district (Marin County CDA 2013) and thus would be subject to design review under Policy BIO-4.2 for projects such as new residences, detached storage buildings, swimming pools, and retaining walls.

The remaining 79% of SCA parcels to be developed under the Proposed Project are in a conventional zoning district (Marin County CDA 2013) and would not require design review or another discretionary permit, such as a Variance from
minimum conventional zoning standards of height, setback, or floor area ratio. One notable exception is the requirement for design review for proposed development within the SCA of anadromous fish creeks on vacant, conventionally-zoned properties. Unless design review or another discretionary permit is triggered, development activities on a conventionally-zoned property within the SCA would not be subject to the SCA policies. Additionally, several types of development, such as sitework that does not increase lot coverage and does not exceed 18 inches above grade (decks, platforms, driveways), utility lines, water supply facilities (water supply lines), septic tanks (but not leachfields), vegetation removal (except native and heritage trees), and erosion control structures do not require a County building permit regardless of zoning district.

Lastly, of the 36 parcels in San Geronimo Valley possessing groundwater wells that are likely to be active, most (21 of 36, or 58%) are located near a stream channel and approximately 58% of these parcels are located at least partially within the SCA (i.e., within 100 feet [30.5 m]) of the stream channel) (Table 2-16). While the precise location of each groundwater well is not known, those parcels that are partially or completely within the SCA are more likely to have groundwater wells in relatively closer proximity to the steam channel than those that are completely outside the SCA (although this may not be true for larger parcels that are only partially within the SCA).
Table 2-13. Number of Improved Parcels by Subbasin or Mainstem Reach and Location Relative to the SCA for San Geronimo Valley¹.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference (and % increase)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completely within the SCA</td>
<td>Partially within the SCA</td>
<td>Outside the SCA</td>
</tr>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>1</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>24</td>
<td>198</td>
<td>332</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>0</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>0</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>15</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>1</td>
<td>83</td>
<td>58</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>52</td>
<td>274</td>
<td>210</td>
</tr>
<tr>
<td><strong>Total</strong>²</td>
<td>93</td>
<td>648</td>
<td>674</td>
</tr>
</tbody>
</table>

¹ Data provided by Marin County CDA (2005). The number of improved parcels is defined as the number of land parcels possessing electricity, telephone, road (paved or unpaved) access, and/or connection to potable water and wastewater services, using parcel use designation as assigned by the Marin County Assessor’s Office.

² Total values may not sum to those presented in Table 2-7 due to a small number of parcels (n < 10) that do not have an assigned land use designation.
Figure 2-6a. Improved Parcel Size Distribution by Subbasin or Mainstem Reach and Location Relative to the SCA for San Geronimo Valley.
Figure 2-6b. Improved Parcel Size Distribution by Subbasin or Mainstem Reach and Location Relative to the SCA for San Geronimo Valley.
Table 2-14. Number of Developed Units by Subbasin or Mainstem Reach and Location Relative to the SCA for San Geronimo Valley\(^1\).

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)</th>
<th>Proposed Project</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completely within the SCA</td>
<td>Partially within the SCA</td>
<td>Outside the SCA</td>
</tr>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>0</td>
<td>56</td>
<td>4</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>27</td>
<td>208</td>
<td>351</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>0</td>
<td>23</td>
<td>17</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>0</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>16</td>
<td>56</td>
<td>41</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>2</td>
<td>97</td>
<td>60</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>59</td>
<td>333</td>
<td>237</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104</strong></td>
<td><strong>780</strong></td>
<td><strong>714</strong></td>
</tr>
</tbody>
</table>

\(^1\) Data provided by Marin County CDA (2005). The number of developed units is defined as the number of commercial or residential buildings or structures erected according to applicable building codes, using unit designation as assigned by the Marin County Assessor’s Office. Units include just the building or structure; they do not include associated roads, driveways, or paved infrastructure.

\(^2\) The assignment of additional improved units relative to the SCA under the Proposed Project follows that of improved parcels (i.e., if the improved parcel is completely within the SCA, then the improved unit would be completely within the SCA; if the improved parcel is partially within the SCA, then the improved unit would be partially within the SCA).
Table 2-15. Cumulative TIA and Percent TIA by Subbasin or Mainstem Reach and Location Relative to the SCA for San Geronimo Valley.¹

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>SCA Contributing Area (acre)²</th>
<th>TIA in SCA Contributing Area (acre)²</th>
<th>% TIA in SCA²</th>
<th>Proposed Project</th>
<th>Difference (acre) (and % change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Fork San Geronimo Creek</td>
<td>213.6</td>
<td>12.3</td>
<td>5.8%</td>
<td>12.3</td>
<td>5.8%</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>171.5</td>
<td>19.8</td>
<td>11.5%</td>
<td>20.2</td>
<td>11.8%</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>525.3</td>
<td>40.8</td>
<td>7.8%</td>
<td>41.3</td>
<td>7.9%</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>98.9</td>
<td>6.1</td>
<td>6.2%</td>
<td>6.1</td>
<td>6.2%</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>48.9</td>
<td>4.3</td>
<td>8.8%</td>
<td>4.4</td>
<td>9.0%</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>174.0</td>
<td>11.7</td>
<td>6.7%</td>
<td>11.7</td>
<td>6.7%</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>1,186.2</td>
<td>94.5</td>
<td>8.0%</td>
<td>96.4</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

¹ Data provided by Marin County CDA (2005).
² Contributing areas and TIA estimates are cumulative.
Figure 2-7. Map of San Geronimo Watershed Showing the Distribution of Unimproved Parcels with Potential for Development of One (Green) or Two (Red) Additional Units Under the Marin CWP (2007). Yellow areas represent the Stream Conservation Area (SCA).
Table 2-16. Number of Parcels with Groundwater Wells by Subbasin or Mainstem Reach and Location Relative to the SCA for the San Geronimo Valley.

<table>
<thead>
<tr>
<th>Subbasin or Mainstem Reach</th>
<th>Existing Conditions (2005)(^1)</th>
<th>Proposed Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completely within the SCA</td>
<td>Partially within the SCA</td>
</tr>
<tr>
<td>North Fork San Geronimo Creek</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Upper San Geronimo Creek</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito Complex</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Lower San Geronimo Creek</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

\(^1\) 12 wells are identified as domestic, 18 as domestic and irrigation, and 6 as irrigation (Marin County 2016).
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3 ENVIRONMENTAL SETTING

3.1 Special-Status Anadromous Fish Species

Coho salmon, steelhead, and Chinook salmon are the three anadromous salmonid species that occur in the San Geronimo Creek watershed. These fish migrate between the ocean and freshwater streams and rivers to complete their remarkable life cycle, a phenomenon known as “anadromy” for species that spawn in freshwater and reach adulthood in saltwater. Populations of these species have experienced major declines along the central California coast and throughout California, leading to their listing as threatened or endangered at the federal and state levels (NMFS 2016a, CDFW 2016). Coho salmon in San Geronimo Valley streams, which belong to the Central California Coast evolutionarily significant unit (ESU), are listed as endangered under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Steelhead in the San Geronimo Valley are part of the Central California Coast distinct population segment (DPS), which is listed as threatened under the ESA. The Chinook salmon that occur sporadically in San Geronimo Creek have been tentatively grouped as part of the California Coastal ESU, which is listed as threatened under the ESA.

Coho salmon in the Lagunitas Creek watershed (including San Geronimo Creek) have declined from an estimated historical population of 4,000 adults to approximately 300 in the 2014–2015 spawning season (Ettlinger et al. 2015a) and approximately 580 in the 2015–2016 spawning season (Ettlinger et al. 2016a). Although these counts suggest modest improvements in recent years, regional abundance is well below the NMFS recovery targets and the population segment remains severely depressed (NMFS 2012). In its recent status reviews, NMFS (2016b, 2016c) reaffirmed that the Central California Coast coho salmon population is currently in danger of extinction. Despite this, the coho salmon population in the Lagunitas Creek watershed, including the San Geronimo Valley, is currently the largest and most stable population south of the Noyo River in Mendocino County (Ettlinger et al. 2015a, NMFS 2012).

Estimates of historical and current steelhead and Chinook salmon abundance in the Lagunitas Creek watershed are not available, but recent counts of redds made by spawning adult steelhead throughout the watershed have ranged from a low of approximately 16 in 2010–2011 (Ettlinger and Andrew 2012) to a high of approximately 239 in 2011–2012 (Ettlinger et al. 2012). Steelhead redd counts have generally declined since 2011–2012, with only 120 redds observed.
throughout the watershed in the 2015–2016 spawning season (Ettlinger et al. 2016a). In the recent status reviews, NMFS (2016b, 2016c) reaffirmed that the Central California Coast steelhead population is also likely to become extinct in the foreseeable future.


3.1.1 Life History and Habitat Requirements

As with most native Pacific Coast anadromous fish, coho and Chinook salmon spend the majority of their life rearing to adulthood in the Pacific Ocean, but they spawn and rear as juveniles in freshwater coastal streams. Steelhead may spend the majority of their life in the ocean, but they display wide variations in life history and can also spend a considerable fraction of life in freshwater. Spawning and rearing periods differ among the three species, as do the particular ways in which they take advantage of habitats within streams and estuaries. Salmon occupy a fairly narrow range of environmental conditions, especially in their freshwater phase where they do best in streams with cold, clean, free-flowing water rich in dissolved oxygen. Other habitat requirements include suitably sized gravels in which to allow spawning and egg incubation, adequate flow to provide prey and allow movement among suitable habitats, and instream habitat structure to provide cover from predators and refuge from high-velocity flows. A detailed description of the life cycles and habitat requirements of coho and steelhead specific to this region is presented in Stillwater Sciences (2008), as part a limiting factors analysis recently conducted for Lagunitas Creek (of which San Geronimo Creek is a major tributary).

The information in the following sections is summarized from the San Geronimo Valley Existing Conditions Report (Stillwater Sciences 2009a) to provide a brief and generalized overview of salmonid life stages and physical habitat requirements for coho, steelhead, and fall-run Chinook (species consistently observed in San Geronimo Creek) to set the stage for analysis of potential cumulative effects under the Proposed Project. A general discussion of water quality requirements for salmonids supports later discussion of existing water quality conditions and provides context for the assessment of potential impacts on salmonids related to water quality.
Coho salmon (*Oncorhynchus kisutch*)

Adult coho salmon typically migrate to the vicinity of their natal stream during the fall of their third year (Sandercock 1991), following a single winter spent in fresh water and a single winter spent in the Pacific Ocean. In response to increased stream flow resulting from fall and winter storm events, adult coho salmon move up into their natal stream throughout the spawning season (Shapovalov and Taft 1954). In the Lagunitas Creek watershed, coho generally enter spawning streams from November through January with peak spawning occurring during December (Ettlinger et al. 2008). Spawning sites are typically located in stream reaches with moderate gradients (i.e., < 3%); loose, silt-free, coarse gravel; and instream cover (Moyle et al. 1989). Eggs are deposited and fertilized in nests called “redds,” which are usually located in the transitional area at the downstream end (or tail) of pools and the upstream end of riffles where water becomes more turbulent (Hazzard 1932, Hobbs 1937, Smith 1941, Briggs 1953, Stuart 1953). Coho salmon egg incubation requires 35–50 days at temperatures of approximately 9 to 11°C (48 to 52°F) (Shapovalov and Taft 1954), with incubation time being inversely related to water temperature. In laboratory experiments, Murray and McPhail (1988) found that 14°C (57°F) is the upper water temperature limit for normal coho salmon embryo development. After hatching, salmon larvae (alevins) remain in the gravel while undergoing further development and absorption of the yolk sac, with emergence of the fry beginning about 2–3 weeks after hatching.

Upon emergence from the gravels, coho salmon fry begin feeding and seek low-velocity areas along shallow stream margins (Shapovalov and Taft 1954). As they grow with time, juvenile coho move to deeper habitats, although they continue to prefer low-velocity habitat throughout the freshwater rearing period. During winter, both instream cover and off-channel areas providing slow water are essential for protection against displacement by high flows, and for cover from predation (Bustard and Narver 1975, Mason 1976, Hartman et al. 1982, Bell 2001). Deep (> 18 in [> 45 cm]), slow (< 15 cm/s [< 0.5 ft/s]) areas within or near (< 3 ft [<1 m]) cover of roots, large wood, and flooded brush appear to constitute preferred habitat (Hartman 1965, Bustard and Narver 1975), especially during freshets (Tschaplinski and Hartman 1983, Swales et al. 1986, McMahon and Hartman 1989). When temperatures drop and base streamflows rise, juvenile coho residing within the stream channel may make seasonal or temporary shifts to off-channel habitats (Scarlett and Cederholm 1984), a strategy that apparently increases their chances for survival. Following winter peak flows, juvenile coho salmon emerge from winter hiding areas and feed heavily to grow in size in preparation for downstream migration.

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Coho smolt outmigration generally occurs in the spring approximately one year after they emerge from gravels (an age referred to as “1+”). A smaller portion of the outmigration is made up of age 0+ fish migrating downstream as fry, but these fish are believed to have low probability of surviving to adulthood (Otto 1971, Crone and Bond 1976, Hartman et al. 1982). Size at smolting has been correlated with ocean survival of anadromous salmonids (Peterman 1982, Bilton et al. 1982, Ward et al. 1989) and studies have associated higher smolt survivals with juvenile coho salmon migrating at sizes of at least 100 mm fork length (Drucker 1972, Crone and Bond 1976).

**Steelhead (Oncorhynchus mykiss)**

Steelhead return to spawn in their natal stream, usually in their fourth or fifth year of life (Shapovalov and Taft 1954, Behnke 1992). Steelhead are unique among salmon in that they can return to spawn multiple times over the course of their life. Winter-run steelhead, the species occurring in the Lagunitas Creek watershed and San Geronimo Valley, generally enter spawning streams from late fall through spring and spawn in late winter or spring (Roelofs 1985, Meehan and Bjornn 1991, Behnke 1992). Spawning in the Lagunitas Creek watershed occurs primarily from January through March (Ettlinger et al. 2008) but may begin as early as late December and may extend through April (Hallock et al. 1961). Female steelhead construct redds in gravels located in pool tailouts and heads of riffles, or in isolated patches in cobble-bedded streams. Steelhead egg incubation lasts for 3–14 weeks and is a function of water temperature (Shapovalov and Taft 1954, Barnhart 1991). Preferred incubation temperatures range from 9 to 11°C (48 to 52°F) (Bell 1986, McEwan and Jackson 1996, NMFS 2000) and temperatures >15°C (59°F) are lethal to incubating eggs (Myrick and Cech 2001). After hatching, alevins remain in the gravel for an additional 2–5 weeks while absorbing their yolk sacs, and then emerge in spring or early summer (Barnhart 1991). After emergence, steelhead fry move to shallow-water, low-velocity habitats, such as stream margins and low-gradient riffles, and forage in open areas lacking instream cover (Hartman 1965, Fontaine 1988). As fry grow and improve their swimming abilities in the late summer and fall, they increasingly use areas with cover and show a preference for higher velocity, deeper mid-channel areas near the thalweg (the deepest part of the channel) (Hartman 1965, Everest and Chapman 1972, Fontaine 1988).

Juvenile steelhead occupy a wide range of habitats, using deep pools as well as higher-velocity riffle and run habitats (Bisson et al. 1982, Bisson et al. 1988). They tend to ascend farther into channel networks than coho salmon, using

Juvenile emigration from freshwater to the ocean typically occurs from March through June. Depending partly on growing conditions in their rearing habitat, steelhead may migrate downstream to estuaries as age 0+ juveniles or may rear in streams for up to four years before outmigrating to the estuary and ocean (Shapovalov and Taft 1954). The duration of time juvenile steelhead spend in fresh water appears to be related to growth rate, with larger, faster-growing members of a cohort smolting earlier (Peven et al. 1994). Steelhead in northern and central California typically spend two years in freshwater prior to smolting (Shapovalov and Taft 1954). Steelhead migrating downstream as juveniles may rear for one month to a year in the estuary before entering the ocean (Shapovalov and Taft 1954, Barnhart 1991).

**Chinook salmon (Oncorhynchus tshawytscha)**

In the Lagunitas Creek system, adult fall-run Chinook migrate upstream in the fall, with peak spawning generally occurring in December, but occasionally in November or October (Ettlinger et al. 2007). Like other salmon, adult females dig shallow depressions or pits in suitably sized gravels, deposit eggs in the bottom during the act of spawning, and cover them with additional gravel (Healey 1991).

Most Chinook salmon generally spawn in the mainstem and lower reaches of low gradient (< 3%) large rivers or tributaries, although spawning has been observed over a broad range of smaller stream sizes (Vronskiy 1972, Healey 1991). Also like other salmon, their redds are typically located near pool tailouts (i.e., heads of riffles) where intragravel dissolved oxygen levels are high (i.e., greater than 7 mg/l [milligrams per liter]) and temperatures are low (less than approximately 14°C [57.2°F]). Chinook are capable of spawning within a wide range of water depths and velocities, provided that intragravel flow is adequate (Healey 1991). Depths and velocities most often recorded over Chinook redds range from 10 to 200 cm and 15 to 100 cm/s, respectively, although criteria may vary between races and stream basins.

Substrates sizes selected for spawning likely reflect a balance between flow and depth occurring at the spawning location, as well as the size of the fish. Gravels used by spawning Chinook salmon have been found to range from a D₅₀ (median
size) of 10.8 mm (Platts et al. 1979, as cited in Kondolf and Wolman 1993) to a D$_{50}$ of 78.0 mm (Chambers et al. 1954, 1955, as cited in Kondolf and Wolman 1993). For fall-run Chinook salmon, egg incubation in the gravel extends from October through January (Fisher 1994) and generally lasts between 40–90 days at water temperatures of 6–12°C (42.8–53.6°F) (Vernier 1969, Bams 1970, Heming 1982, all as cited in Bjornn and Reiser 1991). The alevins remain in the gravel for two to three weeks after hatching and absorb their yolk sac before emerging from the gravels into the water column.

Following emergence, fry occupy low-velocity, shallow water areas near stream margins, including backwater eddies and areas associated with bank cover such as large woody debris (Lister and Genoe 1970, Everest and Chapman 1972, McCain 1992), although larger fish may move into higher velocity water. Chinook fry are observed in small numbers in virtually all habitats sampled in early summer (Everest and Chapman 1972). As fry increase in size, they typically move to higher velocity, deeper areas farther from banks (Lister and Genoe 1970, Everest and Chapman 1972, Hillman et al. 1987). In general, fall Chinook fry (length < 50 mm [< 2.0 in]) and juveniles (length > 50 mm [> 2.0 in]) outmigrate from spawning areas between January and May, though the outmigration period for larger juveniles may extend into June in some stream systems. Juvenile Chinook salmon tend to use mainstem reaches and estuaries as rearing habitat more extensively than juvenile coho salmon and steelhead.

### 3.1.2 Basic Water Quality Requirements for Salmonids

As related to salmonid habitat requirements, “water quality” broadly defines the suitability of fresh and marine waters to meet the most fundamental physiological requirements of salmon and trout. The summary provided here is focused on water temperature and dissolved oxygen, which are the water quality parameters previously identified as most likely to limit salmonid populations in San Geronimo Creek (Stillwater Sciences 2009a) and most likely to be affected by the Proposed Project. Fine sediment deposition, while not a water quality parameter, is also discussed here because it affects delivery of dissolved oxygen to incubating salmonid eggs and other aspects of habitat quality, and was identified by Stillwater Sciences (2009a) as a potential limiting factor for salmonids in San Geronimo Creek.

While upper incipient lethal temperature for salmonids is reported to be 26.6°C (Brett 1952) and critical thermal maximum is 24.6°C (McGeer et al. 1991), adverse effects on early life history stages can occur at much lower temperatures. For salmonids, the development rate (in terms of days to hatching...
or complete yolk sac absorption) is typically faster in warmer water than in colder water, for all species. Review of the literature suggests that 5.8–14.2°C (42–58°F) is the optimum temperature range for incubating Chinook salmon eggs (Donaldson 1955, Combs and Burrows 1957, Combs 1965, Eddy 1972, Bell 1973, Healey 1979, Reiser and Bjornn 1979, Garling and Masterson 1985). This corresponds closely to the upper temperature limit for normal coho salmon embryo development (14°C [57°F]) reported from laboratory studies by Murray and McPhail (1988) and is slightly less (i.e., more protective) than the temperature at which steelhead eggs begin to experience significant mortality (15°C [59°F]; Myrick and Cech 2001). Based on this information, sub-lethal stress and/or mortality of incubating anadromous salmonid eggs resulting from elevated temperatures would be expected to begin at temperatures above approximately 14°C (57°F) for constant exposures.

For rearing juvenile coho salmon, Sullivan et al. (2000) has reported a 10% mean reduction in growth at 14.8°C Maximum Weekly Average Temperature (MWAT) for coho and 17°C (63°F) MWAT for steelhead (Sullivan et al. 2000). The MWAT (defined as maximum seasonal 7-day moving average of the daily mean temperature) is only one of several possible indices for assessing fish temperature thresholds (USEPA 1977, Sullivan et al. 2000), with the scientific rationale for its application based on data showing that moderate temperature fluctuations can be tolerated as long as the incipient lethal temperature is not exceeded for long periods. The method also assumes that optimum temperatures are neither necessary nor realistic at all times to maintain viable fish populations (NAS/NAE 1973).

Although temperature exerts the strongest influence on the rate of development for the embryos, dissolved oxygen also plays a key role. Delivery of dissolved oxygen to the egg pocket is the major factor affecting survival-to-emergence. Several studies have correlated reduced dissolved oxygen levels with mortality, impaired or abnormal development, delayed hatching and emergence, and reduced fry size at emergence in anadromous salmonids (Wickett 1954, Alderdice et al. 1958, Coble 1961, Silver et al. 1963, McNeil 1964, Cooper 1965, Shumway et al. 1964, Koski 1981). Silver et al. (1963) found that low dissolved oxygen concentrations are related to mortality and reduced size in Chinook salmon and steelhead embryos. Data suggest that growth may be restricted at oxygen levels below saturation (Silver et al. 1963). Dissolved oxygen varies as a function of temperature, decreasing with increasing water temperature (e.g., from 14.2 mg/L at 1°C [34°F]; 11.3, 10.2, 9.2 and 8.4 mg/L at 5, 10, 15, 20, and 25°C
[77°F]. Delivery of dissolved oxygen to the egg pocket is also impacted by the deposition of fine sediment in the spawning substrate.

Fine sediments in the gravel interstices can also physically impair the ability of fry to emerge through the gravel layer, trapping (or entombing) them within the gravel (Phillips et al. 1975, Hausle and Coble 1976). Elevated levels of fine sediment deposition in coarser bed substrates can adversely affect growth and survival of juvenile salmonids during the summer rearing period by reducing prey availability and increasing competitive interactions (Suttle et al. 2004, Harvey et al. 2009). The magnitude and duration of turbidity (i.e., suspended sediment) in the water column are two important characteristics used to gauge the overall influx of fine grained particles to stream channels. Direct measures of fine particles and their relationship to egg-to-emergent survival suggest that as the fine material exceeds 15–20% of the total of all substrate, there is a dramatic reduction in survival.

Effects of temperature and dissolved oxygen on salmonids are not limited only to these early developmental stages. When elevated stream temperatures persist, adult salmon migrating upstream can encounter thermal barriers that hinder their upstream quest, and impose additional metabolic requirements that sap resources that otherwise would be used to further their reproductive success (Berman and Quinn 1991, McCullough 1999, Quinn 2005). Juvenile salmonids rearing in streams with elevated temperatures in the summer may be so stressed that they lose weight or are forced to migrate downstream in search of cooler areas (Stillwater Sciences 2007). These premature downstream migrations may result in much lower survival (McCullough 1999, Poole et al. 2001, Quinn 2005).

3.2 Overview of Urbanization Effects on Stream Function

Consideration of residential and commercial development (urbanization) effects on stream function in the San Geronimo Valley is important because throughout California and the Pacific Northwest, urbanization is recognized as a major threat to the persistence and recovery of anadromous salmonid populations. Studies in the Pacific Northwest have shown that coho salmon abundance is significantly lower in rural, urban, and agricultural areas, and areas with high road density, than in watersheds with fewer human land uses (Sharma and Hilborn 2001, Pess et al. 2002). Of 14 potential threats to coho salmon in the greater Lagunitas Creek watershed evaluated by NMFS (2012), residential and commercial development was ranked as the greatest overall threat (“very high”) to the viability of the coho salmon population. For steelhead in the Lagunitas Creek
watershed, residential and commercial development and roads were considered the greatest threats to population viability, both ranked as “high” (NMFS 2015). Urbanization results in stresses on all salmonid life stages, but its most damaging impacts stem from the high potential for impairment of the watershed processes described below, the high level of resulting stress on rearing juvenile salmonids during winter and summer, and the irreversibility of these effects (without successful mitigation) (NMFS 2012).

The most common and obvious environmental effect of urbanization is an increase in impervious surface area and the corresponding loss of natural vegetation (Booth and Jackson 1997, Booth et al. 2002, Konrad and Booth 2005). Associated land clearing, forest cutting, soil compaction, road building, encroachment on riparian corridors, and modifications to the surface-water drainage network all typically accompany urbanization (Horner et al. 1997). Changes in land cover, particularly reduced forest cover and increased TIA, affect the characteristics of streamflow, especially the frequency, magnitude and duration of flows associated with storm events, and the consequent geomorphic changes as the channel adapts to altered hydraulic forces (Dunne and Leopold 1978, Booth 1991, Konrad and Booth 2005). The net effect of these changes is typically a significant increase in basin water yield and, correspondingly, an increase in the magnitude of peak flow events. Additionally, the flashiness of stream flow, or rate at which the flow rises during storms and recedes after storms, increases in response to reduced infiltration and a longer and more efficient drainage network (e.g., via culverts, roadside ditches, storm drains) (Konrad and Booth 2005). Analysis from the Pacific Northwest indicates that this results in an increase in the frequency of historical 2-year flow events to approximately four or five times that expected under forested watershed conditions in many streams (Booth 1991). Under the climate of central California, increases of a similar magnitude are also likely to occur (Stillwater Sciences 2009a).

Wet-season flow reversals were also recently identified as a robust indicator for characterizing the flashy nature of the urban hydrograph (Stillwater Sciences 2016, Booth and Konrad 2017), where this indicator is defined as the number of times that the daily average flow changes from an increase to a decrease or vice versa during October through April of a water year (DeGasperi et al. 2009). The hydrologic metric of wet-season flow reversals is calculated on a water year by water year basis (i.e., from October 1 of the prior year to April 30 of the named year). Each day’s flow is compared to the prior day and the subsequent day, where day-to-day changes of less than a small threshold (2% as recommended...
by King County [2012]) are designated as “no change.” Any reversal through three days’ record (e.g., 5→10→8 cfs, or 100→75→81 cfs) is tallied as such for that middle day. The total number of reversals over the 7 wet months of the water year provide an indication of the flashiness of the stream’s hydrology. This parameter has been shown in other applications to be closely tied to the degree to which land cover in the watershed encourages rapid runoff responses to rainfall (e.g., Stillwater Sciences 2016), primarily as a consequence of impervious surfaces and an efficient drainage network.

As a result of urbanization-related hydrologic changes, flow velocities within the channel during storms may exceed the ability of fish to occupy the stream channel, especially where off-channel (e.g., floodplain) and velocity refuge habitat is lacking. Under such conditions, juvenile salmonids may be unable to maintain their position in the channel and can be swept downstream, with potential adverse effects including injury or mortality from physical trauma, increased susceptibility to predation, and reduced ocean survival.

Changes to flow conditions in streams that drain urbanized watersheds cause simplification of instream habitat, and this damage is exacerbated by bank armoring and encroachment by buildings, bridges, and other structures which minimize or eliminate connections between streams and their floodplains. Urbanization alters both stream discharge and sediment supply in ways that are commonly observed to progress from an initial phase of increased sediment delivery from upland disturbances to a long-term erosional phase where increases in discharge from impervious areas overwhelm any remaining increase in sediment delivery and result in a scoured, incised channel form (Wolman and Schick 1967). Ongoing construction and the associated land disturbance can represent a chronic source of sediment delivery to streams. Effects of stream sedimentation on salmonids and other aquatic organisms include reduced pool volume, reduced cover complexity, degraded spawning gravel quality, increased redd scour, and depressed macroinvertebrate production. Streambed scour of sufficient depth can have direct adverse impacts on incubating salmonid eggs (see also Section 3.6.1).

As they adjust to the altered flow characteristics (increased frequency and magnitude of storm flows) and sediment fluxes, channels in urbanized watersheds typically downcut into their beds, creating deeply incised channels with steep, raw banks, reduced habitat complexity, and loss of floodplain connectivity (Booth and Fischenich 2015). Incised channels experience an increase in the amount of energy focused on the streambed (shear stress) during
peak flows, particularly where stream habitat has been further simplified by
channelization, removal of large woody debris (LWD) and riparian vegetation,
and other alterations that accompany urbanization and are pervasive in the San
Geronimo Valley (Stillwater Sciences 2009a, SFBRWQCB 2014a).

Urbanization and hardening of the landscape may reduce infiltration and aquifer
recharge, thereby reducing the amount of water supplied to streams via
groundwater inputs during the low flow season. Urbanization can also reduce
base flows as a result of increased surface drainage (through storm sewers and
ditches), surface water diversions, and groundwater pumping (Konrad and Booth
2005), although effects on dry season base flows are less clear cut than those on
winter base flows (Konrad and Booth 2002, Fitzpatrick and Peppler 2010).
California’s Mediterranean climate results in naturally low flows in most streams
during the summer and fall salmonid rearing period (Stillwater Sciences 2007,
NMFS 2012). Water diversions, groundwater pumping, and reduced groundwater
input to streams from depleted aquifers further reduce natural low flows during
the summer-fall rearing period, with potentially significant impacts to juvenile
survival (NMFS 2012). The effects of climate change, which are projected to
include increased summer air temperatures and longer dry seasons (DWR
2015), are likely to magnify these effects.

3.3 Hydrology
This section presents a broad overview of hydrology in the San Geronimo Creek
watershed. The implications of observed hydrologic patterns with respect to
salmonid health are discussed in Section 3.6 and the impact analyses (Section
5).

The San Geronimo Valley experiences a mild Mediterranean climate, dominated
by dry summers and wet winters, with winter periods exhibiting periodic intense
rainfall events (Fischer et al. 1996). Annual precipitation is approximately 43
inches, with about 85 percent of the annual total typically occurring during the
months of November through April (Questa Engineering 2011). Discharge within
San Geronimo Creek, as measured in the mainstem at the MMWD stream gage
located on Lagunitas Road Bridge near the outlet of the San Geronimo Creek
watershed (approximately 0.7 mi upstream of the Lagunitas Creek confluence),
corresponds to regional precipitation patterns, with flows during November
through April typically one to two orders of magnitude greater than those reported
during May through October. Winter peak flow events range approximately
1,000–4,000 cfs (Stillwater Sciences 2009a), and travel relatively quickly through
the watershed such that peak flow durations are typically on the order of hours to days (Owens et al. 2000, 2001, 2002), depending on location in the watershed. Monthly averaged maximum daily mean flows during the ‘high flow’ period (November through March) range approximately 90–320 cfs over the period of record (water year [WY]1982–WY2005), with individual daily mean flow values during this period ranging 0.1–2,200 cfs (Figure 3-1).

Minimum flows typically occur in late summer and early fall (i.e., August and September) (Figure 3-2). Monthly averaged minimum daily mean flows for the ‘low flow’ period (June through October) range 0.1–0.8 cfs over the period of record (WY1982–WY2005), with individual daily mean flow values during this period ranging 0.03–2.2 cfs (Figure 3-2).

![Figure 3-1. Monthly Averages of Maximum Daily Mean Flow During November through March for WY1982–WY2005 at San Geronimo Creek at Lagunitas Road Bridge. Bars show the range of maximum daily mean flows for each month. Data for WY 2004 are unavailable.](image-url)
In order to evaluate the past and potential future influence of watershed-scale land-cover changes on instream hydrology, the wet-season flow reversals indicator was calculated for San Geronimo Valley for each year for the period 1980–2016, using daily flows averaged from the raw 15-minute data collected at the MMWD stream gage and organized by water year (October 1–September 30) (J. Owens, Balance Hydrologics Inc., pers. comm., 2016). Only the wet-season flows (October through April) were used in the analysis, based on the assumption that flows during other times of the year are generally of much smaller magnitude and whose day-to-day changes have less significance for both biota and stream geomorphology.

Plotting the tally of flow reversals by year (Figure 3-3) shows a clear pattern of increasing reversals over time for San Geronimo Valley, a trend that is widely recognized in urbanizing watersheds (DeGasperi et al. 2009, Larson et al. 2009, Schoonover et al. 2006, King County 2012, Hasenmueller et al. 2016, Stillwater Sciences 2016, Booth and Konrad 2017). Results also indicate substantial scatter, with one standard deviation around the mean (i.e., the limits around the
central trend of the data that encompass about 2/3 of all points) being approximately ±13 reversals/year.

![Figure 3-3. Plot of Wet-season Flow Reversals Over the Full Period of Record (Water Year 1980–2016). Dotted lines show the boundaries of one standard deviation above and below the central trend (solid line), indicating the magnitude in year-to-year variability in this indicator. The equation of this trend suggests that about 4 additional reversals in the flow record occur with every passing decade.](image)

Lastly, with respect to groundwater, soils in the valley floor were primarily formed by accumulated erosion from the surrounding upland slopes and ridges, and in some places, are quite deep, ranging from 6 to 72 in. In general, valley floor soils are poorly to very poorly drained. Reported groundwater levels in Woodacre during winter months are typically less than three feet below the ground surface; however, localized soil saturation and ponding can occur during the wet season (Questa Engineering 2011). Poorly drained soils lead to less infiltration and more surface runoff.

### 3.4 Water Quality

The sections below briefly summarize water quality conditions in San Geronimo Creek for parameters potentially impacting salmonids. More detailed discussion of the implications of observed patterns with respect to salmonid health is presented in Section 3.6 and the SEIR impact analyses (Section 5).
3.4.1 Beneficial Uses

The San Francisco Bay Basin Plan (Basin Plan) lists existing and potential beneficial uses of water bodies throughout the San Francisco Bay Region, including Tomales Bay and Lagunitas Creek, and presents narrative and numeric water quality objectives for human consumptive, aquatic life, wildlife, and recreational uses (SFBRWQCB 2007). While San Geronimo Creek is not explicitly listed in the Basin Plan, as a major tributary to Lagunitas Creek and Tomales Bay it is included in consideration of potential impacts to beneficial uses for these explicitly listed water bodies. The Basin Plan lists twelve designated beneficial uses for these water bodies (Table 3-1). Of these, four (COLD, MIGR, RARE, and SPWN) directly relate to water quality conditions for salmonids.

Table 3-1. Existing Beneficial Uses for Tomales Bay and Lagunitas Creek.

<table>
<thead>
<tr>
<th>Beneficial Use</th>
<th>Tomales Bay</th>
<th>Lagunitas Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural supply (AGR)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Municipal and domestic supply (MUN)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Ocean, commercial, and sport fishing (COMM)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Shellfish harvesting (SHELL)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cold freshwater habitat (COLD)</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Fish migration (MIGR)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Preservation of rare and endangered species (RARE/T&amp;E)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Fish spawning (SPWN)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Warm freshwater habitat (WARM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wildlife habitat (WILD)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Water contact recreation (REC-1)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Noncontact water recreation (REC-2)</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Source: SFBRWQCB 2007

\(^1\) Only beneficial uses that apply to either or both water bodies are shown.

3.4.2 Sedimentation, Total Suspended Solids, and Turbidity

Lagunitas Creek (of which San Geronimo Creek is a major tributary) is included on the 2016 (current) Federal Clean Water Act (CWA) Section 303(d) list of impaired waters for sedimentation/siltation. To address this impairment, the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) developed a total maximum daily load (TMDL) allocation for sedimentation and channel incision in the Lagunitas Creek watershed, described causes and sources of sediment, established numeric targets for sediment and habitat complexity, and defined a course of action to restore water quality and habitat conditions (i.e., an implementation plan) (SFBRWQCB 2014a).
Data collected during the period 1996–2005 show that total suspended solids (TSS) ranged < 2 mg/L to 216 mg/L in San Geronimo Creek, with an annual mean of 4.6–5.1 mg/L (Piovarcsik and Andrew 2008). The measured peaks indicate that while wintertime peak TSS and turbidity values are generally below the range of anticipated sublethal effects on spawning success or juvenile survival (i.e., 100–500 mg/L) (see also Section 3.6.2), occasional high values within the range of expected effects can occur.

3.4.3 Coliform Bacteria

Lagunitas Creek (of which San Geronimo Creek is a major tributary) is included on the 2016 (current) Federal Clean Water Act (CWA) Section 303(d) list of impaired waters for pathogens. The SFBRWQCB established a TMDL for pathogens in the Tomales Bay watershed (2005) and developed the Conditional Waiver of Waste Discharge Requirements for Grazing Lands in the Tomales Bay Watershed (2008, 2013 Grazing Waiver). Within San Geronimo Valley, water quality sampling of Woodacre Creek and local storm drains has shown elevated levels of coliform bacteria in addition to nitrate, ammonia, and surfactants, in some cases exceeding receiving water quality standards (Questa Engineering 2011). Coliform levels are particularly high in San Geronimo Creek during storm events, with septic tank leakage into the creek as a likely cause (Questa Engineering 2011). High coliform levels are not expected to directly affect salmonids, and there is no conclusive evidence in the scientific literature linking elevated levels of coliform bacteria to the diversity or abundance of benthic macroinvertebrates, including those that serve as food for juvenile salmonids (Mulders 2015) (see also Sections 3.4.7 and 3.6.3).

3.4.4 Nutrients

Lagunitas Creek (of which San Geronimo Creek is a major tributary) is included on the 2016 (current) Federal Clean Water Act (CWA) Section 303(d) list of impaired waters for nutrients. A nutrient TMDL is required for the Lagunitas Creek watershed (including San Geronimo Creek) by 2022. While there are no numeric Basin Plan nutrient criteria, nitrate and orthophosphate in San Geronimo Creek have been measured at levels that can support excessive algal growth. Nitrate concentrations in San Geronimo Creek and its tributaries appear to vary seasonally. Wintertime concentrations typically range 0.5 to 1.5 mg/L, while limited summertime data (2005 only) show concentrations of 0.14 to 0.39 mg/L (Bouley and Lim 2005, Bouley et al. 2006, SFBRWQCB 2007). Nitrate levels appear to be elevated during storm events, suggesting septic tank leakage carried into the stream during runoff may contribute to elevated nitrate
concentrations in San Geronimo Creek (Questa Engineering 2011). Discharges of nitrogen-rich waste water into San Geronimo Creek and its tributaries may also contribute to the observed elevated nitrate concentrations (e.g., SFBRWQCB 2008). Measured orthophosphate ranges 0.01 mg/L to 0.05 mg/L during wintertime, and 0.01 mg/L to 0.09 mg/L during summertime (Bouley and Lim 2005, Bouley et al. 2006, SFBRWQCQB 2007). These data suggest San Geronimo Creek regularly exceeds USEPA reference guidelines for avoiding eutrophication (0.155 mg-N/L and 0.03mg-P/L) (USEPA 2000), resulting in the potential for excess algal production and decreases in dissolved oxygen concentrations. However, limited chlorophyll-a data in San Geronimo Creek (2001–2003) did not show excess algal growth, suggesting potential light limitation during some periods (Stillwater Sciences 2009a). While low dissolved oxygen levels can reduce suitability for salmonids (see Sections 3.4.5 and 3.6.3), excess growth of filamentous algae in response to nutrient and/or light increases is not known to reduce salmonid growth or food availability (Hicks et al. 1991), nor to degrade salmonid habitat suitability.

3.4.5 Dissolved Oxygen and Temperature

Reported dissolved oxygen levels do not consistently meet the Basin Plan minimum criterion of 7.0 mg/L for the cold freshwater habitat (COLD) or spawning (SPWN) beneficial uses in San Geronimo Creek. Based on data summarized in the Existing Conditions Report (Stillwater Sciences 2009a), dissolved oxygen concentrations occasionally fall below the 7.0 mg/L threshold in tributaries (North Fork San Geronimo Creek, Woodacre Creek, Arroyo Creek, and Montezuma Creek) during late fall/early winter, as well as several locations in mainstem San Geronimo Creek (Roy’s Pools, Meadow Way, and Castro Pools) during late summer/early fall.

Reported water temperatures in mainstem San Geronimo Creek and at least two of its major tributaries (i.e., Woodacre Creek, Montezuma Creek) have consistently been below the salmonid upper incipient lethal temperature (26.6°C, Brett 1952) and the critical thermal maxima (24.6°C; McGeer et al. 1991), although they have been observed to exceed optimal ranges for coho, steelhead, and Chinook salmon during summer low-flow periods (Stillwater Sciences 2009a). Winter temperatures currently appear to support spawning and egg incubation requirements.
3.4.6  Metals

Although a number of metal species have been measured in San Geronimo Creek and a few of its major tributaries, none were measured at water column concentrations of concern (Piovarcsik and Andrew 2008, SFBRWQCB 2007, TBWC 2006). However, sediment concentrations in San Geronimo Creek were high for chromium and nickel (> probable effects concentration [PEC]), as well as arsenic, copper, and mercury (> threshold effects concentrations [TECs]). The observed sediment metals concentrations were high enough to support possible acute toxicity to infaunal invertebrates (SFBRWQCB 2007, MacDonald et al. 2000), potentially affecting food conditions for juvenile salmonids (see also Sections 3.4.7 and 3.6.3).

3.4.7  Benthic Macroinvertebrate Bioassessment

Bioassessments of San Geronimo Creek benthic assemblages revealed signs of reduced biological integrity in comparison to other sites within the Lagunitas Creek watershed (Stillwater Sciences 2009a). Interestingly, the quality of the benthic community improved as it approached the confluence with the mainstem of Lagunitas Creek (i.e., in the upstream to downstream direction). The 2001–2003 bioassessment indicated that Lagunitas Creek has one of the healthiest benthic communities in the San Francisco Bay Area (see Stillwater Sciences 2009a). Water quality impairments, including fine sediment, nutrients, and metals described in the preceding sections, may alter the composition of the benthic macroinvertebrate assemblage in San Geronimo Creek relative to other portions of the Lagunitas Creek drainage. However, there is no evidence in the scientific literature (Mulders 2015) or from data collected in San Geronimo Creek that the availability of benthic macroinvertebrates used as food by salmonids has been or could be adversely affected by water quality degradation related to urbanization.

3.5  Riparian Zone

This section presents an overview of riparian habitat in the San Geronimo Creek watershed. The implications of observed habitat conditions with respect to salmonid health are discussed in Section 3.6 and the SEIR impact analyses (Section 5).

Riparian habitat conditions in the San Geronimo Valley have been most recently inventoried and described by MMWD (Ettlinger et al. 2013, Ettinger 2017) and Stillwater Sciences (2009a). Data summarized by Ettinger (2017) from 1998, 2003, 2006, 2011, and 2016 indicate that vegetation covering the stream banks

July 2018
(bank cover) declined from >70% bank cover in 1998 to 50–60% in 2003 and 2006, followed by an increase to 68–79% in 2011 and 2016. Much of the recent increase was driven by an increase in deciduous and evergreen riparian trees from 2006 to 2011 which remained relatively unchanged between 2011 and 2016 (Ettlinger 2017). In 2011 and 2016 the stream canopy cover provided by evergreen and deciduous riparian trees combined was 87–89% in lower mainstem San Geronimo Creek and 88–92% in the upper mainstem. As a result of the increased riparian tree coverage, the stream shading function of the riparian corridor along mainstem San Geronimo Creek has increased since the first data were reported in 2003, with little change between 2011 and 2016 (Ettlinger 2017). Field survey data from 2008 show that the riparian forest along San Geronimo Creek and its four major tributaries (North Fork San Geronimo Creek, Woodacre Creek, Larsen Creek, and the Arroyo/El Cerrito/Barranca Complex) is composed almost entirely of native trees (Stillwater Sciences 2009a). While the herbaceous understory vegetation in 2008 included a high percentage of non-native invasive species (Stillwater Sciences 2009a), the non-native vegetation did not appear to be preventing the establishment or growth of native riparian trees. More recent data collected by Ettlinger (2017) for mainstem San Geronimo Creek showed reduced bank coverage of shrub vegetation from 2006 to 2016.

Despite the recent increase in bank cover for the San Geronimo Valley, field survey data from 2008 show a high frequency (i.e., degree of occurrence) and stem density of smaller riparian trees and a very low frequency of large trees, indicating that the riparian forests along San Geronimo Creek and its major tributaries are in an early- to mid-seral stage and are likely still responding to past and ongoing disturbances including logging, grazing, and housing development (Stillwater Sciences 2009a), as well as a major flood in December 2005. Overall, the very low number and density of large (>76 cm [> 29.9 in] diameter at breast height [DBH]) trees in the riparian corridor suggests that existing conditions do not support an adequate supply of future LWD to provide high-quality rearing and overwintering habitat for salmonids. For the recent Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Plan, SFBRWQCB (2014a) developed a historical reference model for channel and floodplain habitat conditions in the watershed. Information compiled for this reference model indicates that hardened banks along many stream channels in the San Geronimo Valley have reduced the rate of LWD recruitment that otherwise would result from bank erosion and tree-fall (SFBRWQCB 2014a).
Development, as measured by impervious area, in the San Geronimo Creek watershed is concentrated in the riparian zone under existing conditions. This is shown by the %TIA in the SCA in portions of each subbasin or the mainstem reach, which exceeds the watershed-scale TIA of 5.0% and TIA for all subbasins and mainstem reaches (Figure 3-4). Percent impervious areas in the SCA range from 5.8% for North Fork San Geronimo Creek to 11.5% for Woodacre Creek. In the North Fork San Geronimo Creek and Montezuma Creek subbasins, the concentrations of impervious area within the SCA are a little more than twice the amount found in the subbasins as a whole (5.8% in the SCA vs. 2.2% in the North Fork San Geronimo Creek subbasin, and 8.8% in the SCA vs. 3.9% in the Montezuma Creek subbasin) (Figure 3-4).

![Figure 3-4. Existing Conditions Percent TIA versus Percent TIA in the SCA for Each Subwatershed/Reach. Dashed line indicates watershed-scale TIA from Table 2-7. Other data from Table 2-11 and Table 2-15.](image)

Development-related effects on salmonid habitat in the San Geronimo Valley riparian zone include changes in stormwater runoff patterns, reduced stream shading and nutrient input, and reduced LWD recruitment. As development (i.e., imperviousness) along stream corridors increases and the spatial extent of
vegetated riparian areas is reduced, an increasing proportion of runoff is routed directly to streams. This increased “hydrologic connectivity” can increase the magnitude and duration of storm flows, potentially reducing salmonid spawning and rearing success by scouring incubating eggs in the gravel and displacing rearing juveniles due to excessively high water velocities. These effects are exacerbated in streams that provide little high-flow refuge habitat due to reductions in the extent of functional floodplains and the amount of complex instream cover. The reduced extent of riparian vegetation can also contribute to increased bank erosion, increase solar heating and thus stream temperatures above those tolerated by salmonids, and reduce inputs of nutrients and terrestrial insects fed upon by salmonids. Fewer trees in the riparian zone mean fewer trees (i.e., LWD) entering the stream channel and contributing to habitat complexity.

3.6 Habitat Quality for Anadromous Fish Species

The following sections provide a summary of spawning habitat, overwintering habitat, and summer rearing habitat conditions in the San Geronimo Creek watershed based on existing data collected by MMWD and others, including a salmonid habitat survey conducted in 2016 by Ettlinger (2017) and a low-flow habitat survey by Stillwater Sciences conducted in October and November 2015 (Appendix A). When available, data on existing habitat conditions are compared with targets recommended in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010).

3.6.1 Spawning Habitat

Spawning habitat conditions for the San Geronimo Creek mainstem and its tributaries are characterized both qualitatively and quantitatively based primarily on observations of gravel and habitat type frequency, and fine sediment in channel bed substrates. Observations related to water quality (e.g., water temperature) conditions that support salmonid spawning requirements, and the relative frequency of observed coho salmon spawning activity, are also reported below.

The most recent spawning habitat information indicates a lower proportion of riffle habitat in 2016 relative to previous survey years (e.g., 2003, 2006, 2011) in upper and lower mainstem San Geronimo Creek and a substantial decline in the amount of potential spawning gravel in the lower mainstem of San Geronimo Creek (mouth to Larsen Creek) since the last survey in 2011 (Ettlinger 2017). Potential spawning gravel in upper mainstem San Geronimo Creek increased
markedly between 2011 and 2016 but a longer-term trend is not apparent. The proportion of fine sediment in the streambed increased slightly in both the upper and lower mainstem from 2011 to 2016 but no long-term trend is apparent (Ettlinger 2017). Given the lack of clear trends in the proportions of gravel and fine sediment, the data are insufficient to determine whether spawning habitat targets for sediment size and the percentage of fine sediment recommended in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010) are being met in the lower or upper mainstem of San Geronimo Creek (Table 3-2).

Pool tail embeddedness, a measure of fine sediment impacts on spawning gravel quality, in 2016 was slightly greater than 40% in the lower mainstem of San Geronimo Creek and 60% in the upper mainstem, continuing an increasing trend since 2006 (Ettlinger 2017). Despite a decreasing trend prior to 2006, pool tail embeddedness throughout the mainstem of San Geronimo Creek since 1997 has remained above the target of <25% gravel embeddedness recommended in the San Geronimo Valley Salmonid Enhancement Plan (Table 3-2PCI 2010) to support successful egg incubation and emergence (lower values indicate higher quality spawning habitat). High rates of fine sediment delivery can cause increased embeddedness of spawning gravel and entombment (smothering) of incubating salmonid eggs and emerging alevins, substantially reducing spawning success. While these effects have not been studied in the San Geronimo Creek watershed, recent research has documented elevated fine sediment delivery to San Geronimo Creek and its major tributaries that could contribute to these impacts (Stillwater Sciences 2010, SFBRWQCB 2014a, O’Connor Environmental 2015). SFBRWQCB (2014a) estimated that the average annual sediment delivery to San Geronimo Creek from 1983–2008 (450 tons/km²/yr) was greater than in any other Lagunitas Creek sub-watershed, with 240 tons/km²/yr (53%) of the total originating from channel processes, 130 tons/km²/yr (29%) originating from road erosion, and 80 tons/km²/yr (18%) originating from hillslope processes.
Table 3-2. Targets for Critical Elements of Salmonid Spawning Habitat to Support Returning Adults, Successful Egg Hatching, and Emergence. Source: San Geronimo Valley Salmonid Enhancement Plan (PCI 2010).

<table>
<thead>
<tr>
<th>Critical Habitat Element</th>
<th>Indicators</th>
<th>Targets</th>
<th>Do Current Conditions Meet Targets? ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Sediment Quality</td>
<td>Sediment size</td>
<td>D₅₀ = gravel w/increasing trend</td>
<td>Data inconclusive (mainstem)</td>
</tr>
<tr>
<td></td>
<td>Gravel permeability</td>
<td>TBD – increasing trend</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Gravel embeddedness</td>
<td>&lt;25% with decreasing trend (pending basin TMDL determinations)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>% fine sediment</td>
<td>TBD – decreasing trend</td>
<td>Data inconclusive (mainstem)</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Temperature</td>
<td>&lt;14°C</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Dissolved oxygen</td>
<td>7.0-9.0 mg/L or ≥85% of saturation²</td>
<td>No (not in all mainstem or tributary locations or in all seasons)</td>
</tr>
<tr>
<td>Passage</td>
<td>Man-made barriers to migration</td>
<td>90-100% of suitable habitat unimpeded</td>
<td>No</td>
</tr>
</tbody>
</table>

¹ Based on analysis presented in Stillwater Sciences (2009a) and conditions and trends reported by Ettlinger (2017)
² Basin Plan (SFBRWQCB 2007)

Redd scour during the winter incubation period may also reduce spawning success, and there is some evidence that high flows during this period may affect the subsequent summer abundance of juvenile coho (Ettlinger 2008, Stillwater Sciences 2008). While the frequency and occurrence of redd scour in San Geronimo Creek and its tributaries is currently unknown, channel incision, elevated sediment delivery to streams, and other impacts related to historical and current land uses have resulted in conditions that likely contribute to substantially increased streambed mobility and redd scour potential in the watershed. As shown locally by Cover (2012) in Woodacre Creek and by Lisle et al. (2000) in gravel-bedded channels elsewhere, the potential for redd scour is increased when sediment supply is relatively high and erosive power is sufficient to mobilize spawning gravels. Based on a comprehensive review of existing information, SFBRWQCB (2014a) predicts a “high risk” of redd scour in mainstem San Geronimo Creek and a “very high risk” in Woodacre Creek, due to the elevated supply of sediment entering these reaches and the effects of historical channel incision and LWD removal. The risk of redd scour is concentrated in reaches where the channel is narrow and floodplains are absent. In Woodacre Creek, the high sediment supply and incised, simplified channel...
contribute to high streambed mobility at bankfull flow (the channel-forming flow, with about a 1.5-year return interval) (Cover 2012).

Winter water temperatures in the San Geronimo Creek watershed appear to support salmonid spawning and egg incubation requirements (Table 3-2). During 2004 and 2006, winter temperatures ranged from 5–14°C (Bouley and Lim 2005, SPAWN 2008), which is below the expected threshold (14.4°C [58°F]) for temperature induced sub-lethal stress and/or mortality of constantly exposed incubating salmonid eggs (Section 3.1.2). While the upper end of the range of observed winter temperatures (5–14°C [41–57°F]) may be slightly greater than optimal egg incubation temperatures of 9–11°C (48–52°F) reported for steelhead and coho salmon, it does not represent a constant exposure to warm temperatures and is thus not expected to significantly affect salmonid incubation and emergence in San Geronimo Creek (Stillwater Sciences 2009a).

Reported dissolved oxygen levels do not consistently meet the Basin Plan minimum criterion of 7.0 mg/L for the cold freshwater habitat ("COLD") or spawning ("SPWN") beneficial uses in San Geronimo Creek (SFBRWQCB 2007, Bouley and Lim 2005, Bouley et al. 2006, SPAWN unpubl. 2008 data), both of which are relevant to salmonids (Table 3-2). For example, while dissolved oxygen in winter 2004–2005 was generally greater than 7.0 mg/L in mainstem San Geronimo Creek, during four instances in November and December dissolved oxygen was measured between 5.2 mg/L and 6.6 mg/L in tributaries to the mainstem (Montezuma Creek and the East and West Forks of Woodacre Creek) (Bouley and Lim 2005). Low dissolved oxygen levels during late fall/early winter are particularly problematic for attainment of the spawning beneficial use ("SPWN"), which is based upon the assumption that dissolved oxygen in spawning areas should ideally approach saturation levels in order to maintain well-oxygenated conditions around eggs deposited in sediments.

**Observed Salmonid Spawning Activity**

The San Geronimo Creek watershed provides habitat for spawning and rearing by coho salmon, steelhead, and occasionally Chinook salmon. However, salmonid access is currently blocked by culverts or other passage barriers in several locations throughout the watershed and the target of unimpeded access to 90–100% of suitable habitat is not currently met (Table 3-2). These include, but are not limited to, barriers in Creamery Creek, Sylvestris Creek, and Treatment Plant Creek, as well as all three major tributaries to the North Fork (i.e., Spirit Rock, Horse, and Flanders Creeks) due to the presence of Dickson...
weir (Stillwater Sciences 2009a). In Larsen Creek, steelhead access to significant stretches of potential upstream habitat is restricted by a large pond in the San Geronimo Golf Course and road crossings at Nicasio Valley Road and Meadow Way, while both coho and steelhead presence are restricted by an impassable culvert on Montezuma Road just upstream of the confluence between Montezuma and Candelero Creeks.

Since 2002, Marin County has undertaken efforts to reduce fish passage barriers in San Geronimo Valley in order to restore unimpeded salmonid access to stream habitat for coho salmon and steelhead. Under the Countywide Fish Passage and Creek Restoration Program, Marin County conducted an inventory and fish passage evaluation of county-maintained stream crossings (Taylor and Associates 2003). Based on recommendations presented in Taylor and Associates (2003), Marin County has since completed nine fish passage projects in San Geronimo Valley and developed designs for three projects:

**Fish Passage Projects Completed to Date**
- Sylvestris Creek at Meadow Way (2004)
- Willis Evans Canyon at San Geronimo Valley Dr. (2005)
- E. Fork Woodacre Creek #3 Woodacre Improvement Club (2005)
- Woodacre Creek #2 at Park St. (2006)
- Spring Creek at Mountain View Ave. (2006)
- Woodacre Creek #1 at San Geronimo Valley Dr. (2007)
- Woodacre Creek #3 at Carson Rd. (2008)
- Arroyo Creek at Castro St. (2010)
- San Geronimo Creek at Railroad (2016)

**Fish Passage Projects Designed and Seeking Funds for Construction**
- Larsen Creek at Sir Francis Drake Blvd. (design complete 2014)
- Montezuma Creek at Guadalupe Road (design complete 2015)
- San Geronimo Creek at San Geronimo Valley Dr. Bridge/Roy’s Pools (design complete 2017)

Recent surveys have documented spawning coho salmon, steelhead, and Chinook salmon in mainstem San Geronimo Creek downstream of the confluence with Treatment Plant Creek, while coho and steelhead have spawned in the mainstem as far upstream as Dickson Weir on the North Fork and within the low gradient (0–4%) reaches of the four major tributaries (Woodacre, Larsen,
Montezuma, and Arroyo creeks) (Ettlinger and Andrew 2012, Ettlinger et al. 2012, Ettlinger and Andrew 2013, Ettlinger and Andrew 2014, Ettlinger et al. 2015a, Ettlinger et al. 2016a). In accessible tributary reaches, steelhead presence extends upstream of coho presence into higher gradient reaches (4–8%). Spawning by each species may occur in any accessible reach with suitable habitat.

Since 2010, the upper and lower mainstem of San Geronimo Creek, particularly the reaches immediately downstream of Woodacre and Montezuma creeks, have consistently been among the most heavily used spawning locations for coho salmon and steelhead in the watershed (Ettlinger and Andrew 2012, Ettlinger et al. 2012, Ettlinger and Andrew 2013, Ettlinger and Andrew 2014, Ettlinger et al. 2015a, Ettlinger et al. 2016a). Most rearing is expected to take place in the same reaches where spawning occurred or in downstream reaches. Woodacre Creek also provides a substantial amount of spawning and rearing habitat and was heavily used by spawning coho salmon between 2000 and 2008. Surveys during the 2015-2016 spawning season documented 28 coho redds in tributaries to San Geronimo Creek, the largest total in the last 10 years (Ettlinger et al. 2016a). A total of 10 steelhead redds were documented in tributaries to San Geronimo Creek in 2015-2016.

3.6.2 Overwintering Habitat

Habitat features such as alcoves, side-channels, backwaters, LWD, and deep pools formed by rootwads and large wood provide refuge from high winter flows (Bustard and Narver 1975, Tschaplinski and Hartman 1983, Nickelson et al. 1992). Without these types of habitats, newly emerged salmonid fry and older juveniles that cannot find refuge from high flows are likely to be displaced downstream and experience higher rates of injury and mortality. Those that survive displacement and end up prematurely in the estuary or ocean are at increased risk of predation due to their relatively small size. Size at outmigration has been correlated with ocean survival of anadromous salmonids (Peterman 1982, Bilton et al. 1982, Ward et al. 1989), and coho salmon that enter the ocean prior to their second year of life (i.e., at a substantially smaller size than typical 1-year old outmigrants) are believed to have low probability of surviving to adulthood (Otto 1971, Crone and Bond 1976, Hartman et al. 1982).

A salmonid limiting factors analysis (LFA) for the entire Lagunitas Creek system (Stillwater Sciences 2008) found that overwintering habitat is likely to be limiting salmonid production under present conditions. The low abundance of LWD and other complex habitat features such as root wads and undercut banks, and the
lack of floodplains or disconnection of inset floodplains from the channel in much of the watershed, results in poor habitat conditions for juvenile salmonids seeking refuge during high-velocity winter flows (NMFS 2012, 2015). In the San Geronimo Creek watershed, impacts related to development in the SCA, including bridges and culverts, bank armoring, clearing of riparian vegetation, removal of LWD from channels, and the increasing amount of impervious area within the SCA and throughout the watershed, have contributed disproportionately to reductions in salmonid overwintering habitat quality and quantity (Stillwater Sciences 2009a, SFBRWQCB 2014a). Data collected by Ettlinger et al. (2008) and SPAWN (2008) in San Geronimo Creek are consistent with the LFA findings for the greater Lagunitas Creek watershed, showing a pattern of proportionate increases in winter mortality with increasing summer coho salmon abundance. However, salmonid use of San Geronimo Creek mainstem and tributary habitat during wintertime high flows has not yet been documented, and data gaps remain as to the types and arrangements of in-channel habitats (e.g., wood jams) and tributary habitat that promote winter fidelity in the San Geronimo Valley.

The following description of existing overwintering habitat conditions and recent trends in San Geronimo Creek and major tributaries is summarized from the Existing Conditions Report (Stillwater Sciences 2009a) and MMWD habitat surveys summarized by Ettlinger (2017). Habitat data reported by Ettlinger (2017) for surveys in 1998/1999, 2003, 2006, 2011, and 2016 is for mainstem San Geronimo Creek only.

In Woodacre Creek, there is a low accumulation of LWD and low potential for long-term LWD recruitment, and no apparent high-flow velocity refuge at the confluence with mainstem San Geronimo Creek. Despite this, limited high-flow velocity refuge is present in the form of localized undercut banks, complex root bases, and meanders with woody debris. The overall low number and density of large (> 76 cm [> 29.9 in] DBH) riparian trees in Woodacre Creek may not provide a sufficient long-term supply of LWD to meet salmonid overwintering habitat targets for increasing LWD loading, pool frequency, and shelter complexity (Table 3-3). No data are available on the amount or quality of high-flow refugia for winter rearing salmonids in North Fork San Geronimo Creek downstream of Dickson Weir.
Table 3-3. Targets for Critical Habitat Elements of Salmonid Overwintering Habitat to Support Emergent Fry Survival and Juvenile Survival to Smolting. Source: San Geronimo Valley Salmonid Enhancement Plan (PCI 2010).

<table>
<thead>
<tr>
<th>Critical Habitat Element</th>
<th>Indicators</th>
<th>Targets</th>
<th>Do Current Conditions Meet Targets? ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Bed Form</td>
<td>Pool frequency (# of pools/channel width)</td>
<td>0.25–0.5 ⁵</td>
<td>No (mainstem) ⁹</td>
</tr>
<tr>
<td></td>
<td>Pool/riffle ratio</td>
<td>1:1</td>
<td>Yes (mainstem) ⁹</td>
</tr>
<tr>
<td></td>
<td>Residual pool depths</td>
<td>Increasing trend &gt;2ft ⁶</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Shelter</td>
<td>Increasing trend</td>
<td>No (mainstem) ⁹</td>
</tr>
<tr>
<td></td>
<td>Large wood frequency</td>
<td>Increasing trend in loading and forced pool-riffle units (reach based) or 6–11 pieces/100 m ⁷</td>
<td>No (mainstem) ⁹</td>
</tr>
<tr>
<td></td>
<td>Floodplain connectivity</td>
<td>&gt; 80% in low gradient streams (&lt;2.5%) ⁸</td>
<td>Unknown</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Turbidity</td>
<td>Peak: &lt;100–500 mg/L TSS Chronic: trend toward sub-lethal concentrations by duration²</td>
<td>Data inconclusive</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>&lt;14°C MWAT ³</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Dissolved oxygen</td>
<td>7.0–9.0 mg/L or ≥85% of saturation ⁴</td>
<td>No (not in all mainstem or tributary locations or in all seasons)</td>
</tr>
</tbody>
</table>

¹ PCI (2010) unless otherwise noted
² Appendix B in Stillwater Sciences (2009b) for peak value; Newcombe and Jensen (1996) for chronic value.
³ Stillwater Sciences (2009a)
⁴ Basin Plan (SFBRWQCQ 2007)
⁵ Johnston and Slaney (1996)
⁶ Appendix B in Stillwater Sciences (2009b) citing Bjornn and Reiser (1991) and Ralph et al. (1994)
⁷ From Lisle and Church (2002) and Recovery Plan for Central California Coast coho salmon (NMFS 2012).
⁸ Recovery Plan for Central California Coast coho salmon (NMFS 2012).
⁹ Ettlinger (2017) and/or Ettlinger et al. (2013).

In upper mainstem San Geronimo Creek (Figure 2-3), much of the channel is incised and disconnected from its floodplain, with limited high-flow refugia for salmonid winter rearing. Pool frequency in this reach (measured from Larsen Creek to Dixon Weir), which ranged from a high of approximately 0.24 pools per channel width in 1998/1999 to a low of 0.17 in 2011 (Ettlinger et al. 2013), has consistently been below the recommended target of 0.25–0.5 (Table 3-3). Pool
frequency in 2016 was not reported by channel width but, based on the lack of substantial change in both the number of primary pools (> 2 ft) per mile and relative percentage of pools in this reach (Ettlinger 2017), pool frequency in this reach remains below the target. The proportion of pools has consistently exceeded the proportion of riffles in this reach (Ettlinger 2017), indicating the pool:riffle ratio target for overwintering habitat is being met. While this reach was described by Stillwater Sciences (2009a) as having a “relatively high density” of LWD in the channel (0.095 m³/m), LWD frequency declined from 2006 to 2011 and from 2011 to 2016 (Ettlinger 2017). As a result, this reach does not meet the recommended overwintering habitat target of an increasing trend in LWD loading (Table 3-3). In addition, the overall low number and density of large (> 76 cm [> 29.9 in] DBH) riparian trees may not provide a sufficient long-term supply of LWD to meet salmonid overwintering habitat targets in this reach (Table 3-3).

Overwintering habitat quality in lower Larsen Creek (downstream of the golf course) currently appears to be among the best in the San Geronimo Valley. During surveys in summer 2008, Stillwater Sciences (2009a) documented high quality overwintering habitat in lower Larsen Creek that includes relatively deep, complex pool habitat with undercut stream banks and large woody material that likely provides velocity refuge to rearing salmonids during high winter flows. The low number and density of large (> 76 cm [> 29.9 in] DBH) riparian trees in lower Larsen Creek indicates that the future LWD recruitment potential may not be adequate to create complex habitat and pool scour that would help meet overwintering habitat targets including increased LWD loading, pool frequency, and instream shelter.

Lower Montezuma Creek, downstream of the impassible culvert located just above the Candelero Creek confluence, has no inset floodplains and contains very little LWD or other complex habitat structure that would provide salmonid overwintering habitat. However, the relatively high density of large (> 76 cm [> 29.9 in] DBH) riparian trees in lower Montezuma Creek may be adequate to support future LWD recruitment and provide increased LWD loading, pool development, and complex shelter to meet targets for overwintering habitat.

In Arroyo, Barranca, and El Cerrito creeks, overwintering habitat is provided by undercut banks and root complexes, and LWD is present in El Cerrito Creek. Inset floodplains are present in Barranca and Arroyo creeks, but the channel in most of this sub-basin is incised and disconnected from the floodplain. The low number and density of large (> 76 cm [> 29.9 in] DBH) riparian trees in the sub-basin indicates that future LWD recruitment potential may not be adequate to
create complex habitat and pool scour that would help meet overwintering habitat targets including increased LWD loading, pool frequency, and instream shelter.

The channel of lower San Geronimo Creek (Figure 2-3) is moderately incised and disconnected from the few inset floodplains that are present. In 2008 this reach had some root complexes and LWD structures and a “relatively high” LWD frequency (0.095 m³/m), providing localized but limited high-flow refugia for overwintering salmonids (Stillwater Sciences 2009a). The frequency of LWD increased modestly from 2006 to 2011 in mainstem San Geronimo Creek downstream of Larsen Creek (Ettlinger et al. 2013) but declined substantially from 2011 to 2016, indicating that the “increasing trend” criterion of the recommended LWD target for overwintering habitat is currently not met in this reach (Table 3-3). The pool frequency in the mainstem downstream of Larsen Creek, which ranged from a high of approximately 0.19 pools per channel width in 2003 to a low of 0.11 in 2006, was below the recommended target of 0.25–0.5 in 2011 (Ettlinger et al. 2013) and declined further in 2016 (Ettlinger 2017). As in the upper mainstem, pool frequency has consistently exceeded riffle frequency in lower San Geronimo Creek (Ettlinger 2017), indicating the pool:riffle ratio target for overwintering habitat is being met. The low number and density of large (> 76 cm [> 29.9 in] DBH) riparian trees in lower San Geronimo Creek indicates that future LWD recruitment potential may not be adequate to create complex habitat and pool scour that would help meet overwintering habitat targets including increased LWD loading, pool frequency, and instream shelter (Table 3-3).

### 3.6.3 Summer Rearing Habitat

Limited information on summer rearing habitat quality or quantity is available for San Geronimo Creek because few studies or monitoring efforts have been conducted. Accordingly, summer rearing habitat was identified as a data gap in the Existing Conditions Report (Stillwater Sciences 2009a). With respect to flow, in its recovery plans for Central California Coast coho salmon and steelhead, NMFS (2012, 2015) rates summer baseflow conditions in the Lagunitas Creek watershed, including San Geronimo Creek, as “fair” for rearing juveniles and describes existing summer habitat complexity, shelter, and riparian tree canopy ratings as providing “poor” summer rearing conditions for juveniles. Data on pool frequency in upper and lower San Geronimo Creek indicate that this summer habitat target is not being met (Ettlinger 2017, Ettlinger et al. 2013). Fish cover (shelter) in pools increased throughout San Geronimo Creek between 2006 and 2011 but declined severely from 2011 to 2016 (Ettlinger 2017). With the exception of the 2011 increase, shelter in pools has declined since 1998 in the upper and lower mainstem, indicating that the target of an “increasing trend” is
not being met (Table 3-4). As described above for overwintering habitat, LWD frequency declined from 2006 to 2011 and from 2011 to 2016 in both mainstem reaches of San Geronimo Creek (Ettlinger 2017), indicating that the overwintering habitat target of an increasing trend in LWD loading is not being met (Table 3-4).

Table 3-4. Targets for Critical Elements of Salmonid Summer Rearing Habitat to Support Optimal Juvenile Growth and Survival. Source: San Geronimo Valley Salmonid Enhancement Plan (PCI 2010).

<table>
<thead>
<tr>
<th>Critical Habitat Element</th>
<th>Indicators</th>
<th>Targets</th>
<th>Do Current Conditions Meet Targets? 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Channel Bed Form</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pool frequency (# of pools/channel width)</td>
<td>0.25–0.5 2</td>
<td>No (mainstem) 7</td>
</tr>
<tr>
<td></td>
<td>Pool/riffle ratio</td>
<td>1:1</td>
<td>Yes 7</td>
</tr>
<tr>
<td></td>
<td>Residual pool depths</td>
<td>Increasing trend &gt;2ft</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Shelter</td>
<td>Increasing trend</td>
<td>No 7 (mainstem)</td>
</tr>
<tr>
<td></td>
<td>Large wood frequency</td>
<td>Increasing trend in loading and forced pool-riffle units (reach based) or 6–11 pieces/100 m²(2)</td>
<td>No 7</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>MWAT &lt;15°C</td>
<td>No (not all locations)</td>
</tr>
<tr>
<td></td>
<td>Dissolved oxygen</td>
<td>7.0–9.0 mg/L or &gt;85% of saturation 4</td>
<td>No (not in all mainstem or tributary locations or in all seasons)</td>
</tr>
<tr>
<td></td>
<td>Nutrients</td>
<td>Nitrates: 0.155 mg/L Orthophosphates: 0.03 mg/L 5</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Toxicity</td>
<td>No acute, sub-lethal, or chronic toxicity concentrations 6</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Riparian canopy</td>
<td>85–95% 4</td>
<td>Yes (mainstem) 7</td>
</tr>
<tr>
<td></td>
<td>Food Availability</td>
<td>“minimally disturbed” Index of Biological Integrity (IBI) value 4</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td>Riffle embeddedness</td>
<td>&lt;25% with decreasing trend 4</td>
<td>No 7 (based on pool tail embeddedness data)</td>
</tr>
</tbody>
</table>
Most water quality targets recommended to support summer rearing for juvenile salmonids are not being met in the San Geronimo Creek watershed. Available data indicate that low dissolved oxygen levels at some locations in combination with relatively warm water temperatures during summer months do not appear to support habitat for rearing juvenile salmonids in San Geronimo Creek and its tributaries (Stillwater Sciences 2009a). During a salmonid fish rescue operation in early July 2015, several juvenile coho salmon and steelhead were rescued from Roy’s Pools, where dissolved oxygen was measured at 3.7 mg/l, and relocated to habitat with more suitable conditions (SPAWN 2015). Nutrients and toxicity, as well as temperature-moderating shade provided by the riparian canopy, are also not meeting recommended targets for salmonid summer rearing habitat (Table 3-4). Despite these apparent water quality limitations in summer 2015 when flows in San Geronimo Creek were extremely low and air temperatures approached record highs, Ettlinger et al. (2016b) found little evidence that environmental conditions were limiting coho growth or physiological condition. The following spring, the estimated abundance of coho smolts outmigrating from San Geronimo Creek (1,097 smolts) was above average compared with recent years and represented 11% of the estimated coho salmon smolt production from the entire Lagunitas Creek watershed (Ettlinger et al. 2017a).

Conditions to support production and availability of benthic macroinvertebrates used as food by rearing salmonids appear somewhat degraded in San Geronimo Creek, but specific indicators have not been monitored. An evaluation of the benthic macroinvertebrate community by the SFBRWQCB (2007) found evidence of reduced biological integrity at sampling sites in Woodacre Creek and San Geronimo Creek near the water treatment plant, but the analysis did not include values for the IBI and attainment of this recommended target cannot be

<table>
<thead>
<tr>
<th>Critical Habitat Element</th>
<th>Indicators</th>
<th>Targets</th>
<th>Do Current Conditions Meet Targets? ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passage</td>
<td>Man-made barriers to migration</td>
<td>90-100% of suitable habitat unimpeded ⁴</td>
<td>No</td>
</tr>
<tr>
<td>Flooded riffle</td>
<td>Increasing trend</td>
<td>Unknown</td>
<td></td>
</tr>
</tbody>
</table>

¹ PCI (2010) unless otherwise noted
² Johnston and Slaney (1996)
³ From Lisle and Church (2002) and Recovery Plan for Central California Coast coho salmon (NMFS 2012)
⁴ SFBRWQCB (2007)
⁵ Stillwater Sciences (2009a), ECR Section 3.5.5
⁶ Appendix B in Stillwater Sciences (2009b)
⁷ Ettlinger (2017) and/or Ettlinger et al. (2013).
evaluated (Table 3-4). Ettlinger et al. (2015b) reported that growth of salmonids in San Geronimo Creek during the winters of 2012–2013 and 2013–2014 was higher than in Lagunitas Creek, indicating that availability of benthic macroinvertebrate prey resources in San Geronimo Creek is sufficient to support relatively high salmonid growth rates compared with less urbanized streams in the watershed. In years when summer salmonid rearing densities are high in San Geronimo Creek, summer growth has been found to be lower in San Geronimo Creek than in Lagunitas Creek (Ettlinger et al. 2016b, 2017b). The lower growth is attributed to density-dependent factors related to competition for resources that could include space, macroinvertebrate prey, and others. Embeddedness of gravel substrates in riffle habitats has not been systematically evaluated in the San Geronimo Creek watershed. However, pool tail embeddedness, which is used as an indicator of fine sediment impacts on spawning gravel quality, is a closely related metric measured periodically by MMWD since 1998/1999 (Ettlinger 2017). As described above for spawning habitat, pool tail embeddedness throughout the mainstem of San Geronimo Creek has remained above the target of <25% recommended in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010) for both spawning habitat quality (Table 3-2) and benthic macroinvertebrate food production (Table 3-4).

To provide a greater understanding of current influences on salmonid summer habitat conditions and to establish a baseline for a qualitative cumulative assessment of habitat conditions under the Proposed Project, Stillwater Sciences conducted low-flow aquatic habitat surveys in October and November of 2015. The following information is summarized from observations made during the 2015 low-flow habitat surveys (Appendix A), conducted in the following reaches (see also Figure 2-3):

- North Fork San Geronimo Creek
- Woodacre Creek
- Upper San Geronimo Creek
- Larsen Creek
- Montezuma Creek
- Arroyo/Barranca/El Cerrito Complex
- Lower San Geronimo Creek

Drought conditions were apparent during the surveys, with measured stream flows less than 0.03 cfs at all locations and no surface flow (i.e., 0 cfs) in each major tributary except Woodacre Creek. Flow at the MMWD stream gage located on Lagunitas Road Bridge (approximately 0.7 mi upstream of the Lagunitas
Creek confluence) averaged 0.05 cfs during the surveys. The low streamflow conditions provided insufficient inundation and water velocity in riffle habitats to support production and transport of benthic macroinvertebrates preferred as prey by rearing juvenile salmonids.

Upper and lower mainstem reaches of San Geronimo Creek were largely intermittent during the 2015 survey, with pool and run habitats separated by dry riffles. Age-0 salmonid rearing habitat in the lower mainstem San Geronimo Creek (Figure 2-3) was relatively abundant, with greater habitat area per unit length than in the upper mainstem. Water velocity in the upper and lower mainstem reaches of San Geronimo Creek and the tributaries surveyed was too low to provide summer rearing habitat for age-1 (yearling) salmonids, which generally require velocities of at least 0.25–0.5 ft/s to support feeding and growth (Shirvell 1990). Juvenile salmonids were observed during the survey at several locations in the upper mainstem of San Geronimo Creek. Although only non-salmonid fish species were observed during the survey in the lower mainstem, electrofishing surveys by MMWD documented juvenile coho salmon and steelhead in lower mainstem San Geronimo Creek during late summer 2015 (Ettlinger et al. 2016b) indicating that salmonids were likely present during the Stillwater Sciences surveys despite the lack of confirmed observations. Water quality conditions appeared to be marginal where surface flow was intermittent, but water quality parameters were not measured during the surveys. Overall, summer rearing habitat availability in the mainstem reaches of San Geronimo Creek is sensitive to small changes in flow, with any reductions in flow expected to reduce suitable habitat area, food availability, and growth for rearing salmonids.

Lower Woodacre Creek and the upper mainstem reaches of San Geronimo Creek immediately downstream of the confluence with Woodacre Creek contained surface flow sufficient to provide connectivity between aquatic habitats (e.g., pools and riffles), and had the best summer rearing habitat conditions observed in the San Geronimo Creek watershed during the 2015 surveys. Although juvenile salmonids (young-of-the-year, or age-0) were observed in lower Woodacre Creek and San Geronimo Creek immediately downstream of Woodacre Creek during the surveys, flow in this area appeared to be near the lower limit of suitability for age-0 salmonid rearing. Summer rearing habitat under these conditions is considered extremely sensitive to small changes in flow, where the latter could cause surface flow to become intermittent and deeper habitats such as pools and runs to become disconnected, with reductions in suitable rearing habitat area, food availability, and salmonid growth.
The channels of North Fork San Geronimo Creek, Larsen Creek, Montezuma Creek, and the Arroyo/Barranca/El Cerrito creeks complex were dry at the time of the survey and did not provide summer rearing habitat for salmonids. Due to the lack of surface water, summer rearing habitat in these reaches would not be sensitive to further reductions in flow during dry conditions such as those observed during 2015. However, these reaches could be sensitive to small dry-season flow reductions during wetter years when juvenile rearing habitat is present during summer and fall.
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4 SIGNIFICANCE CRITERIA

The Final SEIR has been prepared to analyze potential cumulative impacts on salmonids in the San Geronimo Valley in conformity with State CEQA Guidelines Section 15130 and the Court’s opinion (Section 1.2).

State CEQA Guidelines require that cumulative impacts be analyzed in an EIR when the resulting impacts are cumulatively considerable, and, therefore, potentially significant. (CCR 15130(a).) “Cumulatively considerable” means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. (15064(h)(1); 15065(a)(3).) The mere existence of significant cumulative impacts caused by other projects alone does not constitute substantial evidence that the proposed project’s incremental effects are cumulatively considerable. (CCR 15064(h)(4).) Instead, it must be shown that the project will contribute to an environmental impact to be characterized as a project-related cumulative impact. (See Sierra Club v. West Side Irrig. Dist. (2005) 128 CA4th 690.) Additionally, a lead agency may determine that the project will not have a significant cumulative impact because its incremental contribution to a cumulative effect is not cumulatively considerable. (CCR 15130(a); See Save the Plastic Bag Coalition v. City of Manhattan Beach (2011) 52 C4th 155 [An agency has discretion to find a project’s incremental effects less than significant when its contribution to a cumulative impact is insubstantial.]) Accordingly, CEQA requires that the lead agency analyze whether the project’s incremental effect should be considered significant by assessing both whether the cumulative impact is significant and whether the project’s incremental effect is cumulatively considerable. (Communities for a Better Environment v. California Resources Agency (2002) 103 CA4th 98, 120.)

Pursuant to the Guidelines and the Court’s opinion, the analysis in the Final SEIR is focused specifically on cumulative impacts and thus the criteria defining an impact’s significance are specific to cumulative impacts. The significance criteria used in the analysis have been modified from the criteria found in Appendix G of the State CEQA Guidelines to evaluate the principal action considered in the SEIR, namely the adoption and implementation of the Marin CWP (2007) with respect to the San Geronimo Valley and the potential for cumulative effects on salmonids.
The Proposed Project would have a potentially significant cumulative impact on anadromous fisheries in San Geronimo Valley if it would:

- Have a cumulatively considerable adverse effect, either directly or through modifications to habitat or critical watershed processes, on coho salmon, steelhead, or Chinook salmon, where the populations have already been significantly adversely impacted;

- Have a cumulatively considerable adverse effect on riparian habitat, where the habitat has already been significantly adversely impacted; or

- Substantially interfere with coho salmon, steelhead, or Chinook salmon migration patterns or impede the use of native spawning sites, where the latter have already been significantly adversely impacted.
5 CUMULATIVE IMPACTS AND MITIGATION MEASURES

5.1 Introduction and Approach to Impact Analyses

Anadromous salmonid populations along the central California coast have experienced major declines in the last century resulting from the loss and degradation of freshwater and estuarine habitat due to impacts from logging, grazing, agriculture, urbanization, dams and water diversions, as well as overfishing and many other influences (NMFS 2012, 2016b–d). The cumulative effects of historical and current stressors have reduced the abundance, distribution, and life history diversity of these populations to the point where, without human intervention, their natural resilience and adaptability may no longer provide a means for their recovery (NMFS 2012). Coho salmon regional abundance is well below the NMFS recovery targets and the population segment as a whole remains severely depressed (Section 3.1.1). Additional habitat alterations, if they are of sufficient magnitude, have the potential to make a cumulatively considerable contribution to the existing significant cumulative adverse impacts affecting salmonid populations.

5.1.1 Level of Analysis

Consistent with CEQA requirements, and the Court’s opinion as detailed in Section 1.1, this SEIR evaluates potential cumulative impacts of possible future development given the goals, policies, and implementing programs included in the Marin CWP (2007), on a plan-based, programmatic level. The focus of the analysis is the effects of residential development (urbanization) on anadromous salmonids and their habitat in the San Geronimo Valley, as characterized by the SEIR development metrics described in Section 2.6. While urbanization is only a single factor among many that have contributed to the decline of California’s salmon and steelhead, it is the only impact that may be directly affected by development under the Marin CWP [2007]. The attention is warranted, because the potential effects of urbanization on rivers, floodplains, and the surrounding watersheds may be particularly impactful and largely permanent. As described previously (Section 3.2), effects of urbanization include fundamental changes to the nature of a watershed’s hydrology (both surface flow and groundwater recharge), sediment inputs, channel form, streamside vegetation, nutrient inputs, water quality, solar inputs and primary productivity, the physical characteristics and suitability of instream habitats, and the biotic communities that rely on these habitats (Booth and Jackson 1997, Walsh et al. 2005, Fitzpatrick and Peppler 2010).
While the focus of this program-level, plan-based cumulative impacts analysis is future residential development (urbanization), this SEIR also considers the impacts of past actions that have affected anadromous salmonids and their habitat in San Geronimo Valley (Sections 3.2 through 3.6). Further, the following current and reasonably foreseeable future projects in San Geronimo Valley appear to be aligned with stated goals, policies, and/or implementing programs in the Marin CWP (2007):

- Community sewer system (e.g., Woodacre/San Geronimo Flats Wastewater Recycling Project) located in the Larsen Creek sub-basin, aligned with Goal WR-2 Clean Water and Implementing Program WR-2.c Research and Implement Safe and Effective Alternative Waste Options;
- Road repair, stream crossing upgrades, and stream habitat enhancement projects being implemented by the Marin County Department of Public Works, aligned with Policy BIO-4.5 Restore and Stabilize Stream Channels, Policy WR-2.4 Design County Facilities to Minimize Pollutant Input, and Implementing Program BIO-4.o Consider Culvert Restoration;
- Salmonid habitat enhancement projects planned by local environmental groups and granted funding under the California Department of Fish and Wildlife (CDFW) Watershed Restoration Grant Program, aligned with Policy BIO-4.5 Restore and Stabilize Stream Channels, Policy BIO-4.8 Reclaim Damaged Portions of SCAs, Policy BIO-4.11 Promote Riparian Protection, and Policy WR-1.2 Restore and Enhance Watersheds.

Because details of the Woodacre/San Geronimo Flats Wastewater Recycling Project are currently unknown, an assessment of potential cumulative impacts to salmonids within the context of future development under the Marin CWP (2007) would be speculative at this time and is not included in the cumulative impact analysis. The road, stream crossing, and stream habitat enhancement projects are designed to reduce sediment input to streams and improve aquatic habitat conditions, and would thus provide substantial benefits to salmonids in San Geronimo Valley. Likewise, CDFW-funded salmonid habitat enhancement projects are expected to benefit salmonids throughout the watershed. Based on the available information, it can reasonably be concluded that the impacts of these or similar projects either would not contribute considerably to adverse cumulative impacts on salmonids or cannot be considered in the analysis due to lack of sufficient information. Additionally, these projects may be considered to be within the projections and policies of the Marin CWP [2007], as detailed above, and as analyzed in this SEIR.
5.1.2 Consideration of Water Quality Impacts

Water quality impairment by a variety of substances may adversely affect salmonids, but the ecotoxicity, persistence in the environment, and the extent to which modest levels of urbanization could introduce these substances or increase their effects is poorly understood. In highly urbanized watersheds such as those draining to Puget Sound, recent evidence indicates the potential for adverse impacts on adult salmonids, including coho salmon, from highly concentrated toxins in highway runoff and other sources (e.g., Scholz et al. 2011, Spromberg and Scholz 2011). However, in a laboratory setting Spromberg et al. (2016) found that a mixture of metals and petroleum hydrocarbons intended to mimic polluted urban stormwater runoff resulted in no discernable adverse effects on coho salmon spawners, suggesting that additional substances or combinations of substances found in undiluted highway runoff, but not in the laboratory-tested mixture, were responsible for observed coho salmon mortality. Further, while high concentrations of pharmaceuticals and other personal care products have been found in juvenile salmon collected from urbanized estuaries (Meador et al. 2016), available information is insufficient to determine whether these contaminants have adverse effects on salmon. Lastly, despite evidence that the synergistic effects of common pesticides can cause neurotoxicity in salmon (Laetz et al. 2009), Scholz et al. (2011) determined that common pesticides were not responsible for observed mortality of coho salmon spawners in urbanized Puget Sound watersheds. Available water quality data for the San Geronimo Creek watershed do not include hydrocarbons, pharmaceuticals, pesticides, or herbicides (Section 3.4) and thus an explicit analysis of the potential for existing or future effects of these substances on salmonids is not feasible for the SEIR. However, given that the levels of urbanization and road use intensity associated with water quality impairment and coho salmon mortality in the aforementioned representative literature studies (i.e., major urban areas adjacent to Puget Sound) far exceed existing levels in the San Geronimo Valley, as well as levels that can be reasonably expected under the Proposed Project, the potential for significant cumulative impacts due to these substances in San Geronimo Valley would be considerably lower than that reported for heavily urbanized areas and is therefore not considered further in the analysis of cumulative impacts in this SEIR.

Although elevated fecal coliform levels have been documented in San Geronimo Creek (Section 3.4.3), high coliform levels are not expected to directly affect salmonids, and there is no conclusive evidence in the scientific literature linking elevated levels of coliform bacteria to the diversity or abundance of benthic macroinvertebrates, including those that serve as food for juvenile salmonids.
Regarding nutrients such as nitrate, potential effects on salmonids are either undocumented in the San Geronimo Creek watershed (e.g., increased algal growth) or addressed separately (i.e., reduced dissolved oxygen levels) in the SEIR impact analysis. In light of the uncertainty regarding effects on salmonids of many water quality constituents, and the lack of data on their presence in streams in San Geronimo Valley or the extent to which their concentrations could be increased by future development, the analysis of impacts to salmonids related to water quality is focused on potential changes in water temperature and dissolved oxygen—both of which affect salmonids in ways that are well understood.

Adverse effects on salmonids can result from fire control activities, including the use of flame retardant chemicals. However, available information provides no basis to conclude that future development in San Geronimo Valley would contribute to increased risk of wildland fire or adverse impacts on salmonids and their habitat. The EIR for the Marin CWP (2007) analyzed risk of wildland fire hazard and determined that the policies and requirements of the Marin CWP (2007) would reduce exposure of people and structures to loss, injury, or death from wildland fire hazard. This reduced risk would result from reduced likelihood of wildland fire spreading from structure fires and vice versa. With the improved policies and requirements in the Marin CWP (2007), it is likely that the risk of wildland fire and any associated salmonid impacts would be reduced under the Proposed Project. This impact is therefore not analyzed in the SEIR.

## 5.1.3 Consideration of Impacts Due to Non-native Species

Changes in biotic communities resulting from watershed urbanization commonly include increases in non-native riparian and upland vegetation to the detriment of native plant species (Stillwater Sciences 2009a, McKinney 2002), shifts in terrestrial and aquatic community composition (McKinney 2008), and reduced abundance or extirpation of native fish and other aquatic species (Moyle and Marchetti 2006). Increases in non-native vegetation in riparian areas can compromise riparian function, reducing recruitment of native riparian trees and the supply of LWD to the stream. Most introductions of non-native fishes and other aquatic vertebrates, however, occurred during the early Anglo-European colonization and population growth periods of the 19th and early 20th centuries (Dill and Cordone 1997) and contemporary urbanization—especially on a small scale as in San Geronimo Valley—is unlikely to increase the number or abundance of non-native fish species and other aquatic or semi-aquatic vertebrates that compete with or prey upon salmonids. Urbanization may contribute to the introduction and spread of non-native aquatic invertebrates and
aquatic plants, but these invaders are not typically associated with adverse impacts to salmonids in cold water streams. Effects of the Proposed Project related to invasive aquatic species are therefore not considered in the analysis of cumulative impacts in this SEIR.

5.1.4 Life Stage Analysis Approach

This cumulative impact analysis considers incremental increases in several development metrics (i.e., number of parcels, units, %TIA, wet-season flow reversals, groundwater wells, diversions) in the assessment of future urbanization in the San Geronimo Valley (Section 2.6). With respect to %TIA in particular, while this metric can provide a useful indicator of multiple forms of human disturbance in a watershed that are potentially correlated with stream condition, it alone is not an appropriate predictor of stream health or the fate of individual species, nor should it be used to define “acceptable” levels of development (Center for Watershed Protection 2003, Booth et al. 2004).

Numerous studies have demonstrated that stream ecosystem health is influenced by a complex interplay of factors that may not be adequately reflected by a threshold of impervious surface (Karr and Chu 2000, Alberti et al. 2003, Booth et al. 2004), and substantial biological impairment can occur at TIAs below the commonly cited 10% “threshold” level (Booth and Jackson 1997, May and Horner 1999, Karr and Chu 2000, Booth et al. 2001, Booth et al. 2004). Thus, the analysis considers additional factors related to the Proposed Project that could cumulatively impact anadromous salmonids in the San Geronimo Valley, with a focus on alterations that would reduce habitat quality and/or function. More specifically, this analysis evaluates the potential for cumulative impacts on the anadromous salmonid life stages that are most likely to be affected by future development in the watershed: incubating eggs and juveniles rearing during winter and summer. The analysis is based on the potential impacts of future development in the San Geronimo Creek watershed on habitat conditions that support these life stages, in combination with the impacts that have resulted or could result from other past, present, and reasonably foreseeable future influences on these conditions.

The SEIR analyzes impacts on life stages for which sufficient data are available from previous studies or from new analyses (e.g., the Lagunitas Fine Sediment Reduction and Habitat Enhancement Plan [SFBRWCQB 2014a]; TIA and hydromodification projections herein) to document a clear link between urbanization that would occur with implementation of the Marin CWP (2007) and salmonid life stage stressors or habitat impacts. The impact analysis does not include life stages (e.g., adult or juvenile migration) or ecological interactions
(e.g., competition between salmonid species) for which data are insufficient to establish a credible link between Proposed Project effects and salmonid impacts.

The cumulative impact analysis implicitly acknowledges the difficulties of showing direct links between land-use activities and instream conditions, and so the predictions of impacts are of necessity qualitative and conservative (i.e., potentially overestimated), except where sufficient quantitative information is readily available. This task is further complicated by the variety of stream, riparian, and watershed conditions that can also cause adverse impacts on salmonid habitat but that are not a consequence of development activities under the Proposed Project. Further, because incremental changes in the salmonid populations that utilize San Geronimo Creek during their freshwater life stages may not be discernible at the scale of the population (e.g., coho salmon in the Lagunitas Creek watershed) or ESU (e.g., Central California Coast coho salmon), this SEIR analysis seeks to evaluate the potential effect of alterations in habitat, riparian function, and watershed processes on three important aspects of salmonid habitat as a result of the Proposed Project: winter rearing (Impact 5.1), spawning (Impact 5.2), and summer rearing (Potential Impact 5.3). Summer juvenile salmonid monitoring data and smolt outmigration data, collected by MMWD and provided in its annual reports, was reviewed and incorporated into the impact analysis. Based on the data and analyses in these and other existing reports, we assumed that survival of coho salmon in the San Geronimo Creek watershed from egg incubation through fall rearing reflects the cumulative influence of factors acting on the egg, fry, and juvenile life stages. Together with evidence that poor winter habitat conditions are likely limiting salmonid production in the watershed (Stillwater Sciences 2008; Ettlinger et al. 2015c, 2016b, 2017b), this information provides substantial justification for the focus on spawning success, summer rearing success, and winter rearing success (i.e., multiple life stage approach) used for the impact analysis.

Because of the difficulties and uncertainties inherent in linking development-related effects to salmonid impacts and in discerning incremental effects at the population level, the SEIR adopts a more stringent and conservative impact analysis approach focused on impacts that would prevent salmonids from completing essential behaviors (i.e., migrating, reproducing, feeding, and sheltering). For the purpose of this analysis, additional alterations of stream habitat, riparian habitat, and watershed hydrology resulting from the Proposed Project have the potential to cause a cumulatively considerable contribution to significant impacts if, based on the best available information, the alterations would prevent salmonids in the San Geronimo Creek watershed from completing
these essential behaviors or substantially interfere with their ability to do so. This impact analysis approach is more conservative than a population-level impact analysis (e.g., a population viability analysis) because an effect that prevents completion of an essential behavior could be considered significant and adverse even if that effect would be unlikely to have a population-level impact. This is an accepted approach to environmental impact analysis for salmonids that has been used in program EIRs and other CEQA compliance documents for a variety of projects throughout California (e.g., SJRRP 2012, AECOM 2015, USBR and DWR 2017). The impacts evaluated herein are considered “indirect” impacts because they affect habitat conditions but do not directly impact individual fish. Because habitat requirements for each of the three anadromous salmonid species in the watershed and the threats to their persistence are very similar, the analysis generally considers them together as a group.

Impact 5.1. Reduced Survival of Fry and Juvenile Salmonid Life Stages Due to Reduced Winter Rearing Habitat Quality

Low abundance and quality of overwintering habitat has been identified as the freshwater habitat condition that is most likely limiting salmonid production in Lagunitas Creek and its tributaries, including the San Geronimo Creek watershed, under existing conditions (Section 3.6.2). The primary causes of the degraded winter rearing habitat are simplification of instream habitat, loss of off-channel (e.g., floodplain) habitat, and reduced connectivity between the stream channels and the little remaining floodplain. With the reduction in winter rearing habitat, juvenile salmonids have less available refuge from high winter flows, increasing their susceptibility to downstream displacement and reducing survival. In combination, the cumulative effects of historical and current stressors on winter rearing habitat quality are significant.

Additional development in the San Geronimo Creek watershed under the Proposed Project would increase the number of developed parcels, units, and TIA beyond existing conditions (Section 2.6). However, existing levels of development and the projected level of future development are not equally distributed among subbasins and reaches (Figure 5-1, Figure 5-2, see also Table 2-11 in Section 2.6.3). Woodacre Creek, which exhibits the greatest %TIA of any subbasin or mainstem reach, would experience a moderate increase in TIA acreage (8.2 ac) and %TIA (10%) under the Proposed Project, resulting in 10.0% TIA for the subbasin (Figure 5-3, see also Table 2-11 in Section 2.6.3). Woodacre Creek would remain the most impermeable subbasin in terms of %TIA, approaching the range of %TIA at which many indicators of water quality, instream habitat, and aquatic ecosystem function may become notably impacted.
Montezuma Creek, which exhibits a moderate amount of %TIA, would experience a relatively small increase in TIA acreage (3.5 ac) but a relatively larger increase in %TIA (37%). Overall however, TIA in the Montezuma Creek subbasin would remain moderate at 5.3% (Figure 5-3, see also Table 2-11 in Section 2.6.3). For the mainstem creek, TIA and %TIA estimates are cumulative with distance downstream. Thus, TIA and %TIA estimates for Lower San Geronimo Creek represent cumulative values for the valley as a whole. Lower San Geronimo Creek/San Geronimo Valley has a moderate amount of %TIA under existing conditions (5.0%), which would increase in TIA acreage by 43.6 ac and to %TIA of 5.8%. (Figure 5-3, see also Table 2-11 in Section 2.6.3).

Figure 5-1. Number of Improved Parcels by Subbasin or Mainstem Reach.
Figure 5-2. Number of Improved Units by Subbasin or Mainstem Reach.

Figure 5-3. Cumulative Percent TIA in Contributing Area by Subbasin or Mainstem Reach.
Within the SCA, the number of improved parcels would increase under the Proposed Project in the mainstem reaches of San Geronimo Creek and in all subbasins except Larsen Creek (Figure 5-4, see also Section 2.6.4). Marin County SCA setback policies (Figure 2-5), riparian conservation policies under Goals BIO-2 Protection of Sensitive Biological Resources and BIO-4 Riparian Conservation (Table 2-1), and water resources policies under Goals WR-1 Healthy Watersheds and WR-2 Clean Water (Table 2-2) would help protect instream and riparian habitat and riparian function by limiting the degree and types of development that can occur within the SCA; thus, they would reduce the potential for adverse impacts to runoff and sediment delivery related to future development under the Proposed Project, including parcels to be developed either completely or partially within the SCA (Table 2-13). These protections, however, would primarily apply to parcels in planned zoning districts (approximately 21% of parcels), since parcels in conventionally zoned districts (approximately 79% of parcels) would be largely exempt (Section 2.6.4). Further, for all parcels, exceptions to the policies would include a) allowing development in the SCA if the parcel is completely within the SCA or if development outside the SCA is infeasible or would have greater impacts; and b) allowing utility crossings and construction of driveways in the SCA if no other location is feasible.
Several other types of development activities, such as irrigation lines, septic tanks (but not leachfields), water supply facilities (water supply lines), sitework that does not exceed 18 inches above grade (decks, platforms, driveways, including the portion in the County maintained right-of-way), erosion control structures, and similar improvements that do not require a permit are currently allowed in the SCA and would not require compliance with SCA provisions. Similarly, new residences, additions, and other construction in conventionally zoned districts that meet all conventional standards (e.g., setback to property line, floor area ratio, height limits) and do not trigger a discretionary permit (such as design review\(^2\)) are also allowed in the SCA and do not require compliance with SCA provisions. Although new development, regardless of zoning district or its location relative to a SCA, would be subject to policies intended to help avoid

\(^2\) Design review involves a detailed review by County staff of the design and placement of the proposed development on a site. Design reviews are the most common type of discretionary planning permit and are an important tool used to implement the policies contained within the Proposed Project (see also Section 2.6.4).
or minimize impacts to stream and riparian habitat such as those included under Goals BIO-1, BIO-2, WR-1, and WR-2 and those intended to help avoid or minimize erosion, runoff, and alterations to watershed hydrology such as Policies BIO-4.16, BIO-4.18, BIO-4-19, BIO-4.20, WR-1.3, and WR-2.3 (Table 2-1 and Table 2-2), many of these policies do not require site review or impose mandatory conditions, and thus resource protections are not guaranteed.

Throughout the County, including the San Geronimo Valley, existing post-construction requirements for stormwater control and low impact development (LID) for municipal stormwater permits pursuant to the California State Water Resources Control Board Phase II NPDES Permit ("Phase II stormwater permit") for Small Municipal Storm Sewer Systems (MS4s) would reduce and disconnect runoff from watercourses, minimize impervious surfaces, limit soil disturbance, and minimize erosion and hydrologic alteration (BASMAA 2014, Marin County Stormwater Runoff Pollution Prevention Ordinance No. 3631 [Marin County Code 23.18, as amended]). These requirements would help to reduce runoff and minimize adverse impacts to watershed hydrology and stream sedimentation from future development projects. Additionally, to reduce the potential for construction-related increases in sediment delivery to streams from future development projects (e.g., single-family homes, small projects, regulated projects), roads (including “paper streets”3; Marin County Code 23.08.026) and linear utility projects, an approved Erosion and Sediment Control Plan (ESCP) is required prior to the issuance of grading permits, building permits where significant erosion and sediment discharge could occur, and other permits at the discretion of the Director of Marin County DPW (Marin County Municipal Code ad, MCSTOPPP 2015). In the inland rural corridor, which includes San Geronimo Valley, an ESCP is required for any project where grading will occur within 100 feet from the top of bank of any watercourse (Marin County Municipal Code 24.04.625 (b) 4).

While the existing post-construction stormwater control and LID measures, as well as the construction-related ESCP requirements, would in many cases provide protections to help reduce adverse impacts to watershed hydrology and reduce stream sedimentation, exceptions and exemptions would limit their effectiveness. The post-construction LID and stormwater requirements apply only to development of single-family homes that create or replace ≥ 2,500 ft² of impervious area (e.g., roofs and driveways), larger projects that create or replace ≥ 5,000 ft² of impervious area (“regulated projects”), and new road construction that results in ≥ 5,000 ft² of contiguous impervious area (BASMAA 2014). Based

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3 A “paper street” is a recorded undeveloped street that is shown on County maps.
on available data for San Geronimo Valley, nearly half of all new single-family home permits in the valley (48%, or 35 of 73) for the period 2000–2017 created under 2,500 square feet of new or replacement impervious area. Permits for additions have recently ranged from 50 ft² to 1,000 ft², with an average of approximately 400 ft² (based on 151 home additions for the period 2015–2017) (Marin County, unpublished data). Assuming that future trends for building additions would not be significantly changed in San Geronimo Valley, these data indicate that many projects involving single family homes and most, if not all, projects involving additions to existing homes would create or replace less than 2,500 ft² of impervious area and would thus be exempt from post-construction LID and stormwater requirements. Exemptions to erosion and sediment control requirements include allowing grading operations during the rainy season (October 15 – April 15) given approval from the Director of Marin County DPW (Marin County Municipal Code 24.04.625 (d)) and a lack of design standards for stream crossings that would accommodate predicted loads of woody debris and sediment in addition to the 100-year flood flow (Marin County Municipal Code 24.04.520 (c)). With exemptions and allowances to post-construction stormwater and construction-related erosion control requirements such as the above, future development under the Proposed Project would result in additional land disturbance, increased TIA and storm runoff, and modification of stream banks and riparian habitat.

Although the effects of land disturbance and stream and riparian habitat modification cannot be quantified, it is reasonable to expect further reduction of LWD recruitment potential due to localized clearing of riparian vegetation, and further reduction in the quality and extent of floodplain terraces or other off-channel habitat used by salmonids during high flow events. These effects would be particularly likely in the most heavily developed reaches and subbasins including Woodacre Creek (up to seven improved parcels completely within the SCA), lower San Geronimo Creek (up to 16 improved parcels completely within the SCA), and Montezuma Creek (up to two improved parcels completely within the SCA) (Table 2-13). Increased surface erosion and fine sediment production from developed areas would also be likely, but overall delivery of sediment to streams would be minimized through the County’s recent and ongoing fine sediment reduction program pursuant to the Basin Plan Amendment (SFBRWQCB 2014b), which establishes the total maximum daily load (TMDL) for fine sediment in the Lagunitas Creek watershed. As a result, adverse impacts on stream habitat and function are not expected.
With future theoretical buildout, the estimated amount of TIA in the SCA under the Proposed Project would exceed that of each subbasin/reach as a whole (Figure 5-5, see also Table 2-15 in Section 2.6.4). Montezuma Creek would experience a potential increase of 0.1 ac of TIA in the SCA, which would equate to a 2% increase in this small subbasin and result in a relatively high (9.0%) percentage of TIA in the SCA. Woodacre Creek is projected to have a 0.4-ac increase (2% increase) in TIA in the SCA and has the highest existing (11.5%) and expected (11.8%) percentages of TIA in the SCA. The reach of San Geronimo Creek immediately downstream of Woodacre Creek is another heavily used salmonid spawning and rearing reach, and Woodacre Creek has recently been a major spawning and rearing tributary for coho salmon and steelhead (Sections 3.6.1 and 3.6.2). For the mainstem creek, TIA in the SCA and %TIA in the SCA estimates are cumulative with distance downstream. Thus, TIA in the SCA and %TIA in the SCA estimates for Lower San Geronimo Creek represent cumulative values for the valley as a whole. Lower San Geronimo Creek/San Geronimo Valley has a moderate amount of %TIA in the SCA under existing conditions (8.0%), which would increase in TIA acreage by 1.9 ac and to %TIA in the SCA of 8.1%. (Figure 5-5, see also Table 2-15 in Section 2.6.4).
Figure 5-5. Cumulative Percent TIA Versus Percent TIA in the SCA under the Proposed Project for each Subbasin/Reach. Dashed line indicates watershed-scale TIA under the Proposed Project from Table 2-7. Other data from Table 2-11 and Table 2-15.

Although the projected relative increases in TIA are small to moderate when considered individually, their cumulative contribution to the increasingly modified hydrology of the San Geronimo Creek watershed and to additional degradation of already adversely impacted salmonid habitat conditions would be considerable. Analysis of hydrologic response to increasing urbanization, as indicated by the projected trend in wet-season flow reversals (Figure 5-6; see also Section 3.3), strongly suggests that development under the Proposed Project (i.e., future theoretical buildout; see Section 2.6) would continue to increase flow flashiness and the magnitude of winter storm flows in the watershed. Although much urban growth has already occurred in the watershed, the tally of remaining buildable lots suggests that a 16% increase in population, and thus presumably in additional impervious surface, could still occur (Section 2.6). By analogy to the hydrologic changes that accompanied population growth from 1980 to 2010, this additional future growth is projected to result in additive hydrologic changes to those that have already occurred over the prior two decades. Such changes, if unmitigated, would likely contribute to the existing adverse impacts on salmonid habitat.
Figure 5-6. Extrapolation of the Measured Trend in Wet-season Flow Reversals from the Gage Record (plotted in Figure 3-3) Forward to the Time of Future Theoretical Buildout. On a consistent trend of population growth, buildout would occur around 2030. Note that, regardless of when that buildout actually occurs, the central trend at buildout falls somewhat below the upper 1σ limit (i.e., 1 standard deviation) of the current data, approximately equivalent to the magnitude of hydrologic change that has already occurred between any two prior decades (e.g., the change that occurred between 1990 and 2010). This suggests the likelihood of modest additional hydrologic change that could be recognized despite year-to-year variability, if these relationships were to continue without change or mitigation.

An increased frequency and magnitude of winter storm flows, particularly in a watershed that already experiences winter peak flow events of 1,000–4,000 cfs over short periods (i.e., peak flow durations of hours to days, depending on location) (Section 3.3), would further increase the frequency with which rearing juvenile salmonids encounter water velocities that exceed their swimming ability, thus requiring them to find refuge in order to avoid downstream displacement and reduced survival. With the low abundance and degraded condition of winter rearing habitat in the watershed, the likelihood of downstream displacement and reduced survival under these conditions is substantial. In addition, the increased frequency and erosive power of the winter storm flows would likely cause additional bank erosion and simplification of instream habitat, thus exacerbating the already low abundance and poor quality of winter refuge habitat and the resulting effects on survival during high winter flows. The effects of climate change, which are projected to include increased frequency and magnitude of extreme precipitation events (DWR 2015), would magnify the hydrologic effects and increase the likelihood of further habitat simplification and the potential for...
juvenile salmonids to be displaced downstream during high flows. Effects are expected to be particularly pronounced in the Woodacre Creek subbasin, mainstem San Geronimo Creek from Woodacre Creek downstream to Roy’s Pools, and the lower mainstem of San Geronimo Creek—locations in which salmonid spawning and rearing are concentrated (Section 3.6.1) and future development and/or its effects on hydrologic and other watershed processes would be greatest (Section 2.6.3).

Impact Significance

Under the Proposed Project, alterations in hydrodynamic processes resulting from the projected increases in TIA and other urbanization effects would, in combination, make a cumulatively considerable contribution to increased winter storm flow magnitude and frequency, in turn causing additional habitat simplification and further compromising the ability of rearing coho salmon to find adequate refuge during high flows. Continued degradation of winter rearing habitat in the San Geronimo Creek watershed would conflict with Policy BIO-2.1 Include Resource Preservation in Environmental Review, which calls for “no net loss” of sensitive habitat acreage, values, and function (Table 2-1), and would make a cumulatively considerable contribution to the existing significant cumulative effect on coho salmon winter rearing success that has resulted from previous and current land and water uses. Given the currently low abundance of LWD, functional floodplains, and other complex habitat that would provide shelter and velocity refuge during high flows, these effects are likely to have adverse impacts on the ability of rearing juvenile coho salmon to occupy preferred habitat and would increase the frequency with which they experience downstream displacement resulting in low survival, injury, or mortality. As a result, the Proposed Project would have a potentially significant cumulative impact on winter survival of juvenile coho salmon. Equivalent impacts on steelhead are also likely, but the factors that limit their production in the watershed remain unclear and there is insufficient information to determine whether effects on winter habitat quality and quantity would be significant for steelhead. Similar effects on Chinook salmon are not expected because Chinook salmon in San Geronimo Creek and the Lagunitas Creek watershed exhibit an “ocean-type” life history in which juveniles rear in stream habitats for only a few months before emigrating to the ocean during their first spring or summer, and are therefore not present in streams during the winter high flow period.
Mitigation Measures

The following measures would mitigate for the potentially significant impact on coho salmon winter rearing success by avoiding, minimizing, or compensating for adverse impacts to the watershed processes and functions that create and maintain essential winter rearing habitat.

Mitigation Measure 5.1-1: Expanded SCA Ordinance

The County shall adopt an Expanded SCA Ordinance consistent with Goal BIO-4 and associated Implementing Programs under the Proposed Project. The County shall commence with development of the Expanded SCA Ordinance following certification of the Final SEIR and, barring unforeseen delays caused by continuing, new, or threatened litigation related to the SEIR process and/or the Ordinance, shall complete the Expanded SCA Ordinance within five years of Final SEIR certification. The County shall report on progress toward completing the Expanded SCA Ordinance to the Marin County Board of Supervisors no less than twice annually, and shall provide public noticing of the forthcoming Marin County Board of Supervisors meeting within 10 days prior to the meeting.

The Expanded SCA Ordinance shall incorporate provisions that would:

Provision 1

- Expand the set of development activities that require a discretionary permit and site assessment to include activities within the SCA that require vegetation clearing, increase impermeable area, increase surface runoff, result in exposed soil, or alter the bed, bank, or channel of any stream, with the following exemptions:

  Exemption 1: Dead, invasive, or exotic vegetation, including leaf-litter, may be removed without a permit. Consistent with Policy BIO-4.4 of the Marin CWP (2007) and the San Geronimo Valley Salmon Enhancement Plan (SEP)4, woody debris located below the streamside top of bank is not exempt. Prior to removal of such woody debris, consultation is required with Marin County5, the California Department of Fish and Wildlife (CDFW), and/or Marin Municipal Water District (MMWD) to determine its potential to induce erosion or threaten health and safety (including fire safety), and thus

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4 Diameters and lengths defined in Table 1 (pp. 11) of Prunuske Chatham and SWS (2010).
5 The current contact for woody debris consultation is Sarah Phillips – Marin Resource Conservation District Urban Streams Coordinator: mailto:sarah@marinrcd.org; phone: (415) 663-1170. For fire-related health and safety, contact the Marin County Fire Department Fire Marshall, Scott Alber: (415) 473-6566 or Fire Safe Marin: (415) 570-4FSM (4376).
whether a permit is needed to remove it. Top of bank shall be determined through a site inspection.

Exemption 2: Removal or trimming of pyrophytic\(^6\) combustible live trees and/or vegetation consistent with Title 16–Provision 16.16.040 does not require a permit.

Exemption 3: Planting of non-pyrophytic native vegetation is exempt.

Exemption 4: Repairs or replacements of septic systems\(^7\) that incorporate applicable Marin County Stormwater Pollution Prevention Program (MCSTOPPP) minimum erosion control, sediment control, and good housekeeping BMPs\(^8\) are exempt.

Exemption 5: Landowners who partner with the Marin Resource Conservation District to voluntarily restore creeks on their property shall not be required to obtain a discretionary permit for work within the SCA, or a Creek Permit\(^9\) for work below the streamside top of bank, providing that the proposed work is consistent with and authorized under the Marin Resource Conservation District’s Permit Coordination Program (http://www.marinrcd.org/pcp/) and the Resource Conservation District

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\(^6\) For the purposes of Exemption 2, pyrophytic combustible trees and/or vegetation are defined as fire-prone plants listed on the FIRESafe MARIN website: http://www.firesafemarin.org/plants/fire-prone. The hardwood and coniferous riparian species Tanoak, California Bay Laurel, and Douglas-fir are considered to be pyrophytic combustible trees and thus are included in this exemption. However, these trees are California native species and their potential to contribute to wildfire may be reduced through appropriate fuel management, including trimming, thinning and removal of branches and shoots to reduce the amount of woody material in the understory, such that the trees themselves may not need to be removed in all cases. While tanoak is also a native riparian and understory species in the San Geronimo Valley, tanoak is highly vulnerable to Sudden Oak Death and therefore can create dead and dry plant material (i.e., fuel), thereby increasing potential effects on wildfire (Forrestel et al. 2015).

\(^7\) Septic system is defined as an on-site sewage disposal system consisting of a septic tank, and a soil infiltration leach field, evapotranspiration mound, or other approved disposal facility. This captures all individual sewage disposal systems as defined in Title 18 of the Marin County Municipal Code of Ordinances.

\(^8\) For information regarding MCSTOPPP, please see: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp

\(^9\) For information regarding Creek Permits, please see: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/creek-permit-checklist

\(^10\) Includes paper streets (Marin County Municipal Code 24.04.627) and/or improvements to existing unpaved roads.
takes full responsibility for the work. Top of bank shall be determined through a site inspection.

**Provision 2**

- Enact consistent permit and site assessment requirements for development in planned zoning districts and conventional zoning districts.

**Provision 3**

- Require site assessments to be conducted by a qualified professional with at least five years of field experience assessing potential impacts to stream ecology, riparian ecology, and hydrology in coastal California, and the potential for impacts to anadromous salmonids from changes to these processes and conditions.

**Provision 4**

- Require Standard Management Practices (SMPs) to be incorporated into all development activities within the SCA, as defined in Provision 1, for the protection of hydrologic processes, stream and riparian habitat, and water quality. SMPs shall be reviewed and approved by CDFW or NMFS to ensure the SMPs are adequate to avoid or minimize impacts to salmonids.

The SMPs will include, at a minimum, the following information:

**For Riparian Vegetation and Habitat:**

- Identification (common names, scientific names, and images) of riparian vegetation important for salmonids;

- Requirements for replacement of riparian trees removed in association with development activities, including:
  - Riparian trees removed shall be replaced with native riparian trees on-site at a 2:1 ratio or, if on-site mitigation is not feasible, shall be replaced off-site at a 3:1 ratio in a functionally equivalent riparian area of San Geronimo Creek or its major tributaries (North Fork San Geronimo Creek, Woodacre Creek, Montezuma Creek, Arroyo/Barranca/El Cerrito Complex, Larsen Creek) within reaches accessible to anadromous salmonids.
  - Allowable woody riparian tree species (primarily non-pyrophytic) for replanting in riparian areas include:
    - Broadleaf – Bigleaf Maple (*Acer macrophyllum*), California Buckeye (*Aesculus californica*), White Alder (*Alnus rhombifolia*), Oregon Ash
(Fraxinus latifolia), Coastal Live Oak (Quercus agrifolia), and Arroyo Willow (Salix lasiolepis).

- Coniferous – Redwood (Sequoia sempervirens), Douglas-fir (Pseudotsuga menziesii)*.
  * Douglas-fir is a California native species and is considered to be a fire-prone plant, as listed on the FIRESafe MARIN website [http://www.firesafemarin.org/plants/fire-prone](http://www.firesafemarin.org/plants/fire-prone). Where planted, Douglas-fir should be set back from structures in compliance with Title 16 of the Marin County Municipal Code and the California Public Resources Code. Additionally, its potential to contribute to wildfire may be reduced through appropriate trimming, thinning, and removal of branches and shoots to reduce the density of woody plant material in the understory. While tanoak is also a native riparian and understory species in the San Geronimo Valley, tanoak is highly vulnerable to Sudden Oak Death and therefore can increase the amount of dead and dry plant material (i.e., fuel) and the potential for wildfire (Forrestel et al. 2015). The native riparian tree California Bay Laurel is currently considered to be a vector for Sudden Oak Death and is thus not included on the list of allowable woody riparian tree species for replanting in the SCA.
- Replacement trees should be of the same category as the tree being removed:
  - Broadleaf trees should be replaced by broadleaf trees using a #5 container.
  - Coniferous trees should be replaced by coniferous trees using a #15 container.
  - Willow trees should be replaced by willow trees using a 1-inch diameter, 4-foot length cutting.
- Replacement trees shall be irrigated as needed and monitored to ensure survival for a minimum of two years.
- Trees that do not survive for a minimum of two years shall be replaced according to the above requirements. Allowable vegetation removal and replacement techniques; and
- Allowable seasonal timing for vegetation removal.

For Water Quality and Hydraulic Capacity:
- Drainage requirements for new or replaced impervious areas;
- Runoff dispersal requirements from new or replaced impervious areas;
• Bioretention facility design standards; and
• Bioretention facility underdrain and overflow requirements.

For Pollution Prevention during Construction Phase:

• Erosion and sediment control requirements, such as MCSTOPPP
  “Minimum Erosion and Sediment Control Measures for Small Construction
  Projects” (2015); and
• Seasonal restrictions for construction activities.

Provision 5

• Require that discretionary permits for development projects\(^\text{10}\) within the
  SCA include low impact development (LID) practices and designs that are
demonstrated to prevent offsite discharge from events up to the 85th
percentile 24-hour rainfall event. Specifically:
  - Small projects, including single-family homes and driveways, that
    create or replace 500 ft\(^2\) or more of impervious surface shall be
    required to complete a stormwater control plan (SCP) that achieves
    retention of the 85th percentile, 24-hour design storm for the newly
    created or replaced impervious surface, or for an equivalent area of
    previously unretained impervious surface on the same site. For San
    Geronimo Valley the SCP cannot rely upon the existing runoff
    reduction measures as described in Appendix C of the Bay Area
    Stormwater Management Agencies Association (BASMAA) Post-
    Construction Manual (BASMAA 2014) to retain the 85th percentile, 24-
    hour design storm standard.
  - Regulated projects shall be required to complete a stormwater control
    plan (SCP) that achieves retention of the 85th percentile, 24-hour
    design storm for the newly created or replaced impervious surface, or
    for an equivalent area of previously unretained impervious surface on
    the same site. For San Geronimo Valley the SCP cannot rely upon the
    bioretention sizing factor (0.04) described in Appendix D of the
    BASMAA Post-Construction Manual (BASMAA 2014) to retain the 85th
    percentile, 24-hour design storm standard.
  - New roads (paved and unpaved) shall be required to meet the
    following design criteria:
      ▪ Surface drainage:

\(^{10}\) Includes paper streets (Marin County Municipal Code 24.04.627) and/or improvements to -
existing unpaved roads.
• Road surfaces and ditches are hydrologically "disconnected" from streams and stream crossing culverts, with a maximum allowable hydrologic connectivity of 25% of the total new road surface and compacted shoulder area (paved and unpaved). To be considered disconnected, road surface runoff is dispersed, rather than collected and concentrated, and does not return to a connected ditch farther downstream.

• Fine sediment contributions from roads, cutbanks and ditches are minimized by utilizing seasonal closures and installing a variety of surface drainage techniques including berm removal, road surface shaping (i.e., outsloping, insloping, crowning), rolling dips, ditch relief culverts, waterbars and other measures to disperse road surface runoff and reduce or eliminate sediment delivery to the stream.

  ▪ Stream crossings:
    • Stream crossings have a drainage structure designed to pass the 100-year flood flow including appropriate sizing and configuration to accommodate predicted loads of woody debris and sediment.
    • Stream crossings have no diversion potential (e.g., functional critical dips are in place).
    • Culvert inlets have low plug potential (trash barriers or deflectors installed where needed).
    • Approaching road surfaces and ditches are disconnected from streams and stream crossing culverts to the extent feasible, with a maximum allowable hydrologic connectivity of 25% of the total new road surface and compacted shoulder area, using road shaping and road drainage structures.
    • Class I (fish-bearing) stream crossings meet California Department of Fish and Wildlife and National Marine Fisheries Service fish passage criteria.

  ▪ Road fills:
    • Unstable and potentially unstable road fills that could deliver sediment to a stream are excavated (removed) or structurally stabilized.
• Excavated spoil is placed in locations where eroded material will not enter a stream.
• Excavated spoil is placed where it will not cause a slope failure or landslide.

  - Off-site retrofits
• If on-site avoidance or minimization of surface runoff and sediment erosion is not feasible using the above Provision 5 criteria, off-site retrofit of existing impaired sites (e.g., stream crossings currently diverted or with diversion potential, culverts likely to plug or undersized culverts), would occur at a 2:1 ratio for total runoff area in a functionally equivalent riparian area of San Geronimo Creek or its major tributaries (North Fork San Geronimo Creek, Woodacre Creek, Montezuma Creek, Arroyo/Barranca/El Cerrito Complex, Larsen Creek) within reaches accessible to anadromous salmonids. If functionally equivalent off-site mitigation opportunities cannot be identified within these locations, then opportunities can be selected elsewhere in San Geronimo Valley and/or in the downstream Lagunitas Creek watershed using existing site-specific sediment source assessments (e.g., San Geronimo Valley Non-County Maintained Roads Erosion Assessment and Implementation, Marin County, California, 2010; Lagunitas Creek Watershed Unpaved Roads Sediment Source Site Assessment, 2013).

Mitigation Measure 5.1-2: Require Biotechnical Techniques and Salmonid Habitat Enhancement Elements for All Bank Stabilization Projects
Marin County shall require that biotechnical techniques and salmonid habitat enhancement elements be included for all permitted bank stabilization projects. Biotechnical techniques provide structural and surface erosion protection through the use of vegetation and wood to reproduce elements of the natural system, thus providing beneficial ecosystem functions and habitat features (Wells 2002, WDFW 2003). Specific criteria, design specifications, and guidelines for individual bank stabilization and instream habitat enhancement projects shall be developed in coordination with and approved by CDFW, with input from agencies such as NMFS and other willing participants, as appropriate for project permitting.

Bank stabilization projects shall adhere to the following provisions:
• All stream bank stabilization work shall include biotechnical techniques, such as those described in Appendix H of the Salmonid Enhancement Plan (PCI 2010) and the Creek Bank Restoration and Repair Guidance available at: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/general-public/creeks-and-watersheds

• Stream bank stabilization structures that involve riprap, rock, or other structural components used to prevent localized stream erosion, sediment transport, or movement shall be used only in unusual circumstances and shall require justification in order to receive a permit. However, rock used to facilitate natural stream processes and dynamics with the purpose of achieving stream equilibrium between erosional and depositional processes shall be allowed, providing the proposed design is justified and approved by the appropriate resource agencies.

• All stream bank stabilization work shall also incorporate salmonid habitat enhancement elements such as anchored tree or branch bundles, overhanging woody vegetation, cobble/boulder substrate, or other features that improve the shelter complexity rating of each affected stream habitat unit by at least 20% or by a percentage equal to half the affected percentage of the bank length of each habitat unit, whichever is greater11. Habitat units and instream shelter complexity ratings shall be identified and determined before initiation of bank stabilization work and after completion of the work, and shall be identified and determined by a qualified professional according to the protocols described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2010, or most recent edition). The qualified professional conducting the identification of habitat units and instream shelter complexity ratings will possess field experience assessing potential impacts to stream ecology, riparian ecology, and hydrology in coastal California, and the potential for impacts to anadromous salmonids from changes to these processes and conditions.

• Habitat enhancement elements incorporated into bank stabilization projects must be stable (non-mobile) in the channel and provide instream shelter for salmonids at summer baseflow and bankfull flow, as determined by a qualified professional (see above) using protocols described in the

11 For example, a bank stabilization project that affects 60% of the bank length of a given stream habitat unit (e.g., a pool, riffle, or run) must provide instream habitat enhancement that increases the shelter complexity rating of the affected habitat unit by 30% (i.e., half of 60%). A project that affects 25% of the bank length of a given habitat unit must provide instream habitat enhancement that increases the shelter complexity rating of the affected habitat unit by 20%.
Significance After Mitigation
Implementation of Mitigation Measures 5.1-1 and 5.1-2 would avoid or substantially reduce adverse impacts to salmonid winter habitat associated with future development in the SCA and throughout the watershed. The expanded SCA ordinance under Mitigation Measure 5.1-1, including more rigorous permitting and compliance requirements subject to resource agency approval, would considerably improve protections for hydrologic processes, stream and riparian habitat, and water quality and prevent additional impacts to salmonid rearing habitat by minimizing future alteration to these processes and conditions. Similarly, the consistent permit and site assessment requirements that would be enacted for planned zoning districts and conventional zoning districts under Mitigation Measure 5.1-1 would greatly reduce permitting and compliance exemptions and expand protections for stream and riparian habitat and hydrologic processes throughout the watershed. In addition, the 2:1 (onsite) or 3:1 (offsite) replacement of riparian trees removed in association with development activities, which would be required under Mitigation Measure 5.1-1, would result in long-term enhancement of riparian function including recruitment of large woody debris that provides important winter shelter habitat for rearing salmonids.

The requirement to include more intensive LID practices (i.e., “drainage controls”) for single family homes, small projects, and new road surfaces, as specified under Mitigation Measure 5.1-1 would reduce or nearly eliminate the heretofore close coupling of population growth and increasing impervious area with increasing hydrologic flashiness and storm flow intensity. Given the modest increases in these hydrology indicators that historical urban development with little or no drainage control has imposed (see Figure 3-4), the successful application of effective drainage controls on future development should result in future flows that fall well within the range of recent historical variability. As such, they would constitute less than significant impacts to the stream hydrology, and thus to the stream habitat that is largely controlled by these flows.

The required use of biotechnical techniques in all permitted bank stabilization projects as specified under Mitigation Measure 5.1-2 would avoid additional bank hardening and flow constriction that would otherwise occur with traditional bank stabilization techniques. The inclusion of salmonid habitat enhancement elements in all permitted bank stabilization projects under Mitigation Measure
5.1-2 would improve stream habitat complexity and increase the availability of suitable winter rearing habitat for juvenile salmonids.

With the above measures to minimize the impacts of future increases in TIA, increase riparian and stream habitat protections, and reduce or compensate for impacts to hydrology and riparian function, the impacts of the Proposed Project on salmonid winter rearing habitat would be unlikely to contribute considerably to the existing cumulative effects that limit survival and production in the watershed. By substantially reducing the potential for future habitat degradation and improving winter rearing conditions, Mitigation Measures 5.1-1 and 5.1-2 may increase survival and production of coho salmon and steelhead from the watershed. As a result, the Proposed Project with these mitigations would have a less than significant impact, both individually and cumulatively, on winter survival of juvenile salmonids in the San Geronimo Creek watershed.

**Impact 5.2. Reduced Salmonid Spawning Success Due to Elevated Sediment Delivery and Increased High Flow Frequency and Magnitude**

Hydrologic effects and sedimentation resulting from development under the Proposed Project may reduce salmonid spawning success by increasing scour of gravels containing incubating eggs. If the streambed at spawning locations is scoured to a depth greater than the egg burial depth, it can cause substantial mortality of incubating salmonid eggs and alevins (Montgomery et al. 1996, Shellberg 2010). Gravel-bedded channels like those in portions of the San Geronimo Creek watershed naturally experience some degree of scour and deposition of gravel and other sediment in the channel bed during high flow events. The depth of streambed scour is directly related to the force exerted by flowing water on the streambed, the presence or absence of flow obstructions or channel restrictions (e.g., LWD, vegetation, bank armoring, bridge abutments), and the amount and size of sediment moving through the channel. Although redd scour has not been considered a major limiting factor for anadromous salmonids in the Lagunitas Creek watershed (Stillwater Sciences 2008; NMFS 2012, 2015), recent evidence indicates that the likelihood of redd scour in the San Geronimo Creek watershed is high, particularly in Woodacre Creek and the lower mainstem of San Geronimo Creek (Section 3.6.1).

The land uses and altered watershed processes that accompany urbanization (Section 3.2) have increased sediment delivery to streams in the San Geronimo Creek watershed and contributed to an increased frequency and depth of streambed mobilization and redd scour (Section 3.6.1). Average annual sediment delivery to San Geronimo Creek from 1983–2008 was greater than in any other
Lagunitas Creek subbasin (Section 3.6.1). Elevated fine sediment deposition in San Geronimo Creek is in part evidenced by spawning gravel embeddedness, which at 40–60% currently exceeds the target of <25% gravel embeddedness recommended in the Salmonid Enhancement Plan (Table 3-2) to support successful egg incubation and emergence. Substantial delivery of fine sediment to San Geronimo Creek and the portion of Lagunitas Creek upstream of Devil’s Gulch is partly the result of road-related erosion in the San Geronimo Creek watershed (29% of total supply), which has the highest road density (9.3 mi/m²) of any subbasin or reach of the greater Lagunitas Creek watershed (Section 2.6.1).

Other land uses related to development, such as vegetation removal, roadbuilding, paving, increased storm drainage, stream channelization, and bank armoring are known to increase storm runoff frequency and intensity, deliver fine sediment to streams, and increase the hydraulic energy focused on the streambed (Section 3.2). Resulting effects have included incision of stream channels and disconnection from their floodplains, elevated sedimentation in the streambed, and greater peak flow magnitude and flashiness resulting from increased TIA and storm drainage efficiency. The increasing trend in wet-season flow reversals in San Geronimo Creek, as discussed in Section 3.3 and shown in Figure 3-3, strongly suggests that the increased frequency and magnitude of peak flow events is a direct result of past development in the San Geronimo Valley and the resulting increases in TIA and drainage efficiency. All of these effects increase the stream’s sediment transport capacity and the likelihood of redd scour. The elevated sediment delivery rates in the San Geronimo Creek watershed and Woodacre Creek in particular (Sections 3.2 and 3.6), combined with the aforementioned increases in storm runoff frequency and intensity, have resulted in a predicted “high risk” of redd scour in mainstem San Geronimo Creek and a “very high risk” in Woodacre Creek (Section 3.6.1).

Recent (2015–2017) efforts by the Marin County Department of Public Works have addressed paved road-related fine sediment delivery to stream channels in the San Geronimo Valley and elsewhere in the county, pursuant to the Basin Plan Amendment, which establishes the TMDL for fine sediment in the Lagunitas Creek watershed (SFBRWQCB 2014b), and aligned with Policy BIO-4.5 *Restore and Stabilize Stream Channels*, Policy WR-2.4 *Design County Facilities to Minimize Pollutant Input*, and Implementing Program BIO-4.o *Consider Culvert Restoration*. The goal of these efforts is protection of water quality and improvements to stream and riparian habitat for salmonids. These efforts include an inventory and description of the road network; identification of erosion and
sediment control measures to achieve performance standard(s) specified in the Basin Plan Amendment; a schedule for implementation of identified control measures; and development and implementation of guidelines for road maintenance. Many of these actions are underway or substantially complete, and include minimizing delivery of sediment to channels from unstable or potentially unstable areas by managing existing roads and other infrastructure to prevent additional erosion of legacy sediment delivery sites, and/or delivery from other potentially unstable areas. While these efforts are substantially reducing road-related stream sedimentation in the watershed related to existing development, and presumably the associated effects on salmonid spawning habitat, there are few current or proposed measures to similarly mandate the control or reduction of fine sediment originating from future development in the SCA or elsewhere in the watershed.

Pursuant to the California State Water Resources Control Board Phase II NPDES Permit ("Phase II stormwater permit") for Small Municipal Storm Sewer Systems (MS4s), projects that create or replace impervious surface must incorporate specified measures (best management practices, or BMPs) to minimize impervious surfaces, reduce and disconnect runoff from watercourses, limit soil disturbance, and minimize erosion and hydrologic alteration (BASMAA 2014, Marin County Stormwater Runoff Pollution Prevention Ordinance No. 3631 [Marin County Code 23.18, as amended]). Measures to control erosion and sediment from roads and development throughout Marin County, including the San Geronimo Valley, are also required for projects that will include soil disturbance during construction. For these projects, applicants must submit an Erosion and Sediment Control Plan (ESCP) for approval by the municipality prior to the issuance of grading permits, most building permits, and other permits at the discretion of the municipality (Marin County Municipal Code 24.04.625, MCSTTOPP 2015).

While the existing post-construction stormwater control and LID measures, as well as the construction-related ESCP requirements, would in many cases provide protections to help reduce adverse impacts to watershed hydrology and reduce stream sedimentation, exceptions and exemptions would limit their effectiveness. The post-construction LID and stormwater requirements apply only to development of single-family homes that create or replace ≥ 2,500 ft² of impervious area (e.g., roofs and driveways), larger projects that create or replace ≥ 5,000 ft² of impervious area ("regulated projects"), and new road construction that results in ≥ 5,000 ft² of contiguous impervious area (BASMAA 2014). Based on available data for San Geronimo Valley, nearly half of all new single-family
home permits in the valley (48%, or 35 of 73) for the period 2000–2017 created under 2,500 square feet of new or replacement impervious area. Permits for additions have recently ranged from 50 ft² to 1,000 ft², with an average of approximately 400 ft² (based on 151 home additions for the period 2015–2017) (Marin County, unpublished data). Assuming that future trends for building additions would not be significantly changed in San Geronimo Valley, these data indicate that many projects involving single family homes and most, if not all, projects involving additions to existing homes would create or replace less than 2,500 ft² of impervious area and would thus be exempt from post-construction LID and stormwater requirements. Exemptions to erosion and sediment control requirements include allowing grading operations during the rainy season (October 15 – April 15) given approval from the Director of Marin County DPW (Marin County Municipal Code 24.04.625 (d)) and a lack of design standards for stream crossings that would accommodate predicted loads of woody debris and sediment in addition to the 100-year flood flow (Marin County Municipal Code 24.04.520 (c)). With exemptions and allowances to post-construction stormwater and construction-related erosion control requirements such as the above, future development under the Proposed Project would result in additional land disturbance, increased TIA and storm runoff, and modification of stream banks and riparian habitat.

Further, while SCA setback policies under the Proposed Project (Figure 2-5) and several of the policies for conservation of Biological Resources and Water Resources (Table 2-1, Table 2-2) would help minimize erosion and sedimentation by protecting riparian habitat and hydrologic function, the protections would primarily apply to parcels in planned zoning districts (approximately 21% of parcels), since parcels in conventionally zoned districts (approximately 79% of parcels) would be largely exempt (Section 2.6.4). Further, for all parcels, exceptions to the policies would include allowing development in the SCA if the parcel is completely within the SCA or if development outside the SCA is infeasible or would have greater impacts, and allowing utility crossings and construction of driveways in the SCA if no other location is feasible. Several other types of development activities that do not require a permit (see description under Impact 5.1) are currently allowed in the SCA and would not require compliance with SCA provisions. Similarly, new residences, additions, and other construction in conventionally zoned districts that meet all conventional standards (e.g., setback to property line, floor area ratio, height limits) and do not trigger a discretionary permit (such as design review) are also allowed in the SCA and do not require compliance with SCA provisions. With these exemptions and allowances, future development under the Proposed Project would result in
additional land disturbance and modification of riparian habitat, increased TIA and storm runoff, and continued delivery of fine sediment to streams. Thus, the Proposed Project would not substantially avoid or eliminate impacts to hydrology and sediment delivery associated with future development, even though planned development would be relatively modest compared with existing conditions.

Under the Proposed Project (i.e., theoretical future buildout), additional development in the San Geronimo Creek watershed would result in up to 323 improved parcels (22% increase) and 43.6 additional acres of TIA (14% increase) (Table 2-7). At the subbasin/reach scale, future development would increase the number of improved parcels and units (Figure 5-1, Figure 5-2, see also Section 2.6.3), with corresponding estimated increases in TIA acreage ranging from less than 5% (Larsen Creek) to 37% (Montezuma Creek) (Figure 5-3, see also Table 2-11 in Section 2.6.3). At the scale of the SCA, estimates are relatively greater (with the exception of Larsen Creek), with future development resulting in additional improved parcels and units either completely or partially within the SCA (Figure 5-4, see also Table 2-15 in Section 2.6.3). Estimated increases in TIA within the SCA under future theoretical buildout would range from 0.4 ac (2% increase, Woodacre Creek) to 1.9 ac (2% increase, Lower San Geronimo Creek/San Geronimo Valley) (Table 2-15). North Fork San Geronimo Creek, Larsen Creek, and the Arroyo/Barranca, El Cerrito creeks complex are projected to experience no increases in TIA within the SCA under the Proposed Project.

Although the projected relative increases in TIA at the subbasin/reach scale are small to moderate when considered individually, their cumulative contribution to the increasingly modified hydrology of the San Geronimo Creek watershed and to an increased risk of redd scour would be considerable. Analysis of hydrologic response to increasing urbanization, as indicated by the projected trend in wet-season flow reversals (Figure 5-6; see also Section 3.3), strongly suggests that development under the Proposed Project, including development outside of the SCA, would continue to increase flow flashiness and the magnitude of winter storm flows in the watershed. Such changes would further increase the frequency and magnitude of redd scour, thus making a cumulatively considerable contribution to the existing significant adverse impacts on spawning success. The effects of climate change, which are projected to include increased frequency and magnitude of extreme precipitation events (DWR 2015), can be expected to magnify these effects.
Impact Significance

Under the Proposed Project, increased winter storm flow magnitude and frequency due to an increase, albeit modest, in the number of developed parcels, units, and TIA at the subbasin/reach scale and the scale of the SCA, along with continued inputs of development-related fine sediment to stream channels, would further increase the risk of streambed and redd scour in important salmonid spawning reaches (e.g., Woodacre Creek, mainstem San Geronimo Creek from Woodacre Creek downstream to Roy’s Pools, Lower San Geronimo Creek). The increased redd scour risk would very likely reduce coho salmon and steelhead spawning success, thus making a cumulatively considerable contribution to the existing adverse cumulative impact. Given the uncertainty in exactly how development would occur, particularly for parcels partially or completely within the SCA, it is not possible to assess whether, where, or how much spawning habitat would be lost under the Proposed Project. However, this impact would exacerbate the currently degraded spawning habitat conditions for salmonids in the watershed as indicated by spawning gravel embeddedness, which at 40–60% currently exceeds the target of <25% gravel embeddedness recommended in the Salmonid Enhancement Plan (PCI 2010) to support successful egg incubation and emergence.

Increased redd scour resulting from further alterations to hydrology and additional sediment inputs under the Proposed Project would conflict with Policy BIO-2.1 Include Resource Preservation in Environmental Review, which calls for “no net loss” of sensitive habitat acreage, values, and function (Table 2-1). These mechanisms would similarly affect Chinook salmon spawning habitat and, despite the paucity of information on Chinook salmon population dynamics in San Geronimo Creek, impacts are likely to be equivalent to those described for coho salmon and steelhead due to the similarity of their spawning habitat requirements. Given the numerous existing stressors and constraints on salmonid production in the San Geronimo Creek and Lagunitas Creek watersheds, an increased risk of redd scour in San Geronimo Creek and its tributaries is likely to make a cumulatively considerable contribution to existing adverse effects on spawning success for anadromous salmonids. Such adverse effects would jeopardize recovery efforts, which include a projected future recovery trajectory with annual increases in coho salmon and steelhead abundance watershed-wide (NMFS 2012, 2015). As a result, the Proposed Project would have a potentially significant cumulative impact on coho salmon, steelhead, and Chinook salmon in the San Geronimo Creek watershed due to reduced spawning success.
Mitigation Measure

The following measure would mitigate for the potentially significant impact on salmonid spawning success by avoiding, minimizing, or compensating for adverse impacts to the watershed processes and functions that provide suitable spawning and egg incubation conditions in San Geronimo Creek and its major tributaries.

Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams

The provisions of the Expanded SCA Ordinance described under Mitigation Measure 5.1-1 will avoid or minimize the hydrologic effects and stream sedimentation associated with potential future development in the SCA, helping reduce the potential for redd scour and degradation of salmonid winter rearing habitat.

In addition, the County shall adopt changes to existing stormwater, LID, erosion and sediment control requirements within the San Geronimo watershed and outside of the SCA consistent with the following:

- Development projects requiring a permit shall be required to adhere to LID practices and designs specified in Mitigation Measure 5.1-1.
- Projects subject to a grading permit (Marin County Municipal Code 23.08.025, 23.08.026) shall not be conducted during the rainy season (October 15–April 15). No exceptions to this requirement shall be given by the Director of Marin DPW or by other parties except in cases of imminent threat to life or property.
- New roads (paved and unpaved) shall be required to adhere to design criteria specified in Mitigation Measure 5.1-1.

These actions would occur in addition to ongoing implementation of measures to control and reduce production and delivery of fine sediment to streams from existing development, including applicable waste discharge requirements (WDRs) or waiver of WDRs, in keeping with the requirements of the Basin Plan Amendment (SFBRWQCB 2014b) which establishes the TMDL for fine sediment in the Lagunitas Creek watershed.

Significance After Mitigation

With implementation of Mitigation Measures 5.1-1 and 5.2-1, future development under the Proposed Project would be subject to measures to avoid or minimize future increases in peak flow frequency and magnitude, as well as future
increases in erosion and sediment delivery, that can scour spawning gravels, degrade spawning habitat quality, and cause mortality of incubating salmonid eggs. Implementation of measures to control sediment production and delivery from future development, including roads, would reduce the amount of fine sediment moving through stream channels and lower the potential for redd scour in key salmonid spawning reaches.

With measures to avoid or substantially minimize future increases in redd scour, the impacts of the Proposed Project on salmonid spawning success would be unlikely to contribute considerably to the existing significant adverse impacts on spawning success that limit coho salmon and steelhead production in the watershed. As a result, the Proposed Project would have a less than significant impact, both individually and cumulatively, on spawning success of coho salmon and steelhead in the San Geronimo Creek watershed.

Potential Impact 5.3. Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature

Summer rearing habitat conditions for juvenile salmonids in the San Geronimo Creek watershed are degraded as a result of historical and ongoing land and water uses that have reduced pool frequency and depth, reduced instream habitat complexity, and reduced the abundance of in-channel LWD and large riparian trees. Channel incision due to altered watershed hydrology, as well as increased sediment delivery to channels from roads, grazing, and forest clearing, have simplified stream habitats in the watershed, degrading summer rearing conditions for salmonids. Several of the above conditions (e.g., instream shelter, LWD frequency, habitat complexity, and LWD recruitment potential) are currently rated by NMFS (2012, 2015) as providing “poor” habitat quality for summer rearing by juvenile coho salmon and steelhead in the Lagunitas Creek watershed. In combination, the cumulative effects of historical and current stressors on summer rearing habitat quality are significant.

Groundwater pumping and surface water diversions can reduce summer baseflows and contribute to elevated summer water temperatures, degraded water quality, and reductions in summer rearing habitat area and connectivity. While summer baseflow conditions are currently rated by NMFS (2012, 2015) as “fair” for juvenile coho salmon and steelhead in the Lagunitas Creek watershed, groundwater and surface water withdrawals or impoundments are considered potential threats to summer rearing success of juvenile coho salmon and steelhead in the greater Lagunitas Creek watershed (NMFS 2012, 2015).
Further, low summer streamflows periodically compromise habitat connectivity, prey availability, and rearing habitat quantity and may contribute to elevated water temperature and degraded water quality (Section 3.6.3 and Appendix A).

While summer rearing conditions are believed to be of lesser importance to salmonids than poor overwintering conditions (Impact 5.1) and redd scour (Impact 5.2) and are not currently considered to be limiting the production of coho salmon or steelhead in the watershed (Stillwater Sciences 2008, 2009; Ettlinger et al. 2015c, 2016b, 2017b), degraded summer habitat contributes to overall adverse conditions for juvenile coho salmon and steelhead in the San Geronimo Creek watershed and may reduce summer rearing success (though not necessarily the production of smolts from the watershed\textsuperscript{12}). Accordingly, the potential for impacts related to summer rearing habitat and salmonid summer rearing success under the Proposed Project are considered below.

Effects of reduced summer base flows on salmonids and the stream ecosystem include a reduction in wetted habitat area available for rearing and feeding, restricted habitat connectivity and diversity, reduced production and delivery of invertebrate prey, increased sedimentation, and degraded water quality (Hayes and Young 2001, Spina et al. 2006, Deitch et al. 2009, Rolls et al. 2012). As a result, carrying capacity is reduced, fish growth may be reduced or cease, and fish become more susceptible to predation, competition, and physiological stressors (Suttle et al. 2004, Stillwater Sciences 2007, Harvey et al. 2009, Rolls et al. 2012). These effects can be exacerbated in streams where pool depth and frequency are low and instream habitat complexity and riparian cover are degraded by impacts related to urbanization or other land and water uses (Hayes and Young 2001), which is currently the case in the Lagunitas Creek watershed, and the San Geronimo Valley in particular (Section 3.6.3).

Degraded water quality resulting from low summer streamflows can also be a major stressor for rearing juvenile salmonids. Summer rearing coho salmon and steelhead require cool water temperatures and adequate levels of dissolved oxygen to maintain positive growth and avoid physiological stress that can compromise survival and fitness (Section 3.1.2). During periods of very low surface flow, stream water temperatures, dissolved oxygen, and other water

\textsuperscript{12} Under the hypothesis that conditions other than summer rearing habitat (e.g., overwintering habitat) are the primary factors limiting the production of salmonid smolts from the watershed, it is plausible that modest reductions in summer rearing success would not affect overall smolt production.
quality parameters can reach levels that are unsuitable for rearing salmonids, particularly in areas where the amount of temperature-moderating stream shade is reduced due to a compromised riparian forest canopy. Riparian canopy intercepts solar radiation and moderates the effects of high summer temperatures, particularly in the relatively small tributary streams where juvenile coho salmon and steelhead predominantly rear (NMFS 2012, 2015). In San Geronimo Creek, dissolved oxygen levels do not consistently meet the generally accepted requirement of 7 mg/L for salmonid rearing (and spawning) habitats and water temperature does not meet the target of <15°C (MWAT) in all locations (Section 3.6.3). Because water temperature and dissolved oxygen conditions are currently degraded, the quality of summer rearing habitat is susceptible to further adverse impacts that could result from riparian canopy removal, reduced baseflow and groundwater inflow, and climate change.

In addition to suitable water quality, coho salmon and other salmonids also require sufficient space for rearing and connectivity between stream habitats for feeding and escape from predators. By reducing habitat area and connectivity, low summer flows can reduce feeding and growth, increase competitive interactions, and increase predation on juvenile salmonids.

Given theoretical future buildout under the Proposed Project, the projected increases in the number of developed parcels, units, and TIA at the sub-basin/reach scale and the scale of the SCA could cause minor increases in stream sedimentation and bank erosion, and may slightly reduce LWD recruitment potential. However, despite the aforementioned exemptions and allowances, SCA setback policies (Figure 2-5) and riparian conservation policies (Table 2-1, Table 2-2) under the Proposed Project offer some protections for riparian trees and other bank vegetation, as well as riparian function and instream habitat. Further, as the estimated increases in developed parcels, units, and TIA at all spatial scales (i.e., watershed, subbasin/reach, SCA) are small to moderate, their incremental contribution to reduced habitat complexity would be relatively minor and likely too small to substantially or measurably reduce the ability of juvenile salmonids to forage or find shelter during the summer rearing period.

With respect to the potential for summer baseflow impacts, currently there are 36 parcels possessing the same number of groundwater wells likely to be active in the San Geronimo Valley (Section 2.6). Of these, most are in the lower portion of the watershed (Arroyo/Barranca/El Cerrito Complex, Lower San Geronimo Creek) (Table 2-12) and are at least partially within the SCA (Table 2-16). While
these data give some indication that groundwater wells are likely to affect creek flow and salmonid habitat under existing conditions, particularly during summer low-flow periods, additional information would be required to ascertain the hydrologic and biologic effects of groundwater pumping, including a complete inventory of well locations, and known or estimated water use from each well. There are also six surface water diversions in the watershed; four are located at a single site along the Larsen Creek reach (i.e., small pond on the San Geronimo National Golf Course), and two are located in the Arroyo/Barranca/El Cerrito Complex and in Lower San Geronimo Creek (Table 2-12). It is not known whether any of the six surface water diversions is typically active, nor the rate of diversion for each (Section 2.6).

Available data are insufficient to determine the likely number and location of future groundwater wells, if any. Establishment of and pumping from new wells, if it occurs in the future, would be subject to County permitting and would be extremely limited (see also Section 2.6.2), thus unlikely to contribute to effects on salmonid summer habitat conditions. This is based on the County’s reasoned assumption that the vast majority, and very likely all, of the parcels that would be developed in the future under the Marin CWP (2007) would have municipal water supply and would not require groundwater wells or surface water diversions. Surface water diversions are not subject to County regulations and permitting. However, any new surface water diversions would be subject to state policies including those designed to maintain instream flows in northern California coastal streams (SWRCB 2013), water rights permitting requirements, lake and streambed alteration permitting requirements, CEQA compliance requirements, and potentially state and federal take prohibitions for listed salmonids. As a result, new permits for surface water diversion in the San Geronimo Valley would be extremely unlikely and thus effects of any such diversions on salmonid summer rearing habitat are also unlikely.

Due to the lack of available data on the potential hydrologic and biologic effects of groundwater pumping and surface water diversions in San Geronimo Valley, and the low likelihood that future groundwater pumping and surface water diversions would substantially increase under the Marin CWP (2007), the impact determination necessarily relies upon the aforementioned analysis of the incremental contributions of reduced habitat complexity on summer rearing conditions for salmonids. However, it is noted that under the Proposed Project, implementation of Policy WR-1.1 Protect Watersheds and Aquifer Recharge and Implementing Program WR-2.0 Establish a Groundwater Monitoring Program for Unincorporated County Areas (Table 2-2) would help to quantify the potential
effects of groundwater pumping and surface water diversions on instream flows and salmonid summer rearing habitat quantity and quality. Additionally, development of a peak stormwater runoff and detention program (per Policy BIO-4.20), and protection or creation of appropriately designed aquifer-recharge areas (per Policy WR-1.1) under the Proposed Project would also increase opportunities for groundwater recharge and potentially increase summer streamflow.

Impact Significance

Salmonid rearing habitat, both winter and summer, has been degraded and simplified by historical and existing development and other land and water uses in the San Geronimo Creek watershed. While the Proposed Project is not capable of fully avoiding or eliminating impacts to hydrology, sediment delivery, and instream habitat complexity associated with future development, planned development impacts are not expected to contribute considerably to the existing degradation of salmonid summer rearing habitat or measurably reduce coho salmon and steelhead summer rearing success in the watershed. While the low summer stream flows that currently occur in the watershed may reduce rearing habitat quantity and quality and interrupt aquatic habitat connectivity, data from juvenile salmonid surveys and smolt outmigration monitoring do not support the conclusion that low summer flows are limiting salmonid growth or production. Further, development-related reductions in summer stream flow are not expected to occur under the Proposed Project, due to the low likelihood of additional groundwater pumping or surface water diversions under the Proposed Project. Despite the currently low abundance of LWD, low pool quantity and quality, and paucity of other complex habitat that would provide suitable summer rearing habitat, effects of the Proposed Project are unlikely to have adverse impacts on the ability of juvenile salmonids to successfully rear and grow. As a result, the Proposed Project would have a less than significant cumulative impact on summer rearing success by juvenile coho salmon and steelhead as a result of reduced habitat complexity. Impacts on Chinook salmon are considered unlikely because Chinook salmon in the watershed are believed to exhibit an “ocean type” life history in which juveniles migrate downstream to the ocean during their first spring and are not subject to summer stream habitat conditions.

While the potential impact of the Proposed Project on salmonid summer rearing success due to a reduction in habitat complexity in the San Geronimo Valley is less than significant, the County has elected to pursue a voluntary mitigation measure consistent with its commitment to avoiding or minimizing impacts to the maximum extent practicable. The voluntary mitigation measure will provide
valuable information related to assessing potential impacts of shallow groundwater withdrawals and riparian water diversions on summer baseflows in San Geronimo Valley.

**Voluntary Mitigation Measure**

The mitigation measures described above under Impacts 5.1 and 5.2 would minimize and compensate for hydrologic effects and control and reduce production and delivery of fine sediment to streams associated with additional development in the watershed, helping to protect, enhance, and reduce future impacts to summer rearing habitat for salmonids in streams of the San Geronimo Valley. Replacement of riparian trees removed as a result of development at a 2:1 onsite or 3:1 offsite ratio, and inclusion of biotechnical measures and instream habitat enhancements in bank stabilization projects would improve summer rearing conditions and may increase salmonid summer rearing success in the watershed.

Further, requirements for LID practices and stormwater infiltration that would be implemented as part of the Expanded SCA Ordinance required under Mitigation Measure 5.1-1 would also contribute to groundwater recharge and may benefit summer rearing habitat by increasing summer baseflow.

**Voluntary Mitigation Measure 5.3-1: Groundwater Study**

The County shall undertake a voluntary study to determine whether existing and future groundwater pumping, surface water diversions, altered watershed hydrology, and other effects related to development (e.g., septic systems, landscape irrigation) are or would be likely to adversely impact summer baseflow in San Geronimo Creek. The study shall be completed within 3 years of certification of the Final SEIR and all results shall be made available to the public. This study would be consistent with Marin CWP (2007) Goal WR-2 Clean Water, which includes Implementing Program WR-2.0, Establish a Groundwater Monitoring Program for Unincorporated County Areas (Table 2-2). This study would include periodic water level measurement and water quality sampling with annual reporting. Data collection under this measure (WR-2.0 or similar studies) shall be structured to allow a better understanding of the links between groundwater pumping, surface water diversions, and summertime stream flow and water temperatures in the mainstem of San Geronimo Creek and its major tributaries. Results will be used to evaluate whether the existing well siting, yield, and storage requirements for pumped and gravity source wells are adequate to protect summer baseflows in San Geronimo Creek and perennial tributaries.
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6 SUMMARY OF FINDINGS

This Final SEIR has been prepared in accordance with the decision of the Court of Appeal of the State of California First Appellate District Division Three to set aside its approval of the Marin CWP (2007) and certification of the Final EIR with respect to San Geronimo Valley, pending the following:

1. analysis of potential cumulative impacts, and the range of potential consequences, on salmonids in San Geronimo Valley resulting from future buildout in the watershed in conformity with State CEQA Guidelines Section 15130 and the Court’s opinion, and

2. a description of mitigation measures relevant to salmonids in San Geronimo Valley in conformity with State CEQA Guidelines Section 15126.4 and the Court’s opinion or a description of other findings in conformity with State CEQA Guidelines Section 15091.

The cumulative impacts analysis in this Final SEIR evaluates the potential effects of future development (i.e., urbanization) on anadromous salmonids and their habitat in the San Geronimo Valley under the Marin CWP (2007). Based on the analyses in this Final SEIR, two new potentially significant cumulative impacts and one new less-than-significant cumulative impact could occur.

As summarized below, four new mitigation measures have been identified. These new mitigation measures will reduce the new potentially significant cumulative impacts to a less-than-significant level. Additionally, two new voluntary mitigation measures have been identified, consistent with the County’s commitment to avoiding or minimizing impacts to the maximum extent practicable. There would be no significant and unavoidable impacts.

Impact 5.1. Reduced Survival of Fry and Juvenile Salmonid Life Stages Due to Reduced Winter Rearing Habitat Quality. This impact was determined to be potentially significant due to alterations in hydrodynamic processes resulting from projected increases in TIA and other urbanization effects under the Proposed Project, which would make a cumulatively considerable contribution to increased winter storm flow magnitude and frequency, in turn causing additional habitat simplification and further compromising the ability of rearing coho salmon to find adequate refuge during high flows. Implementation of Mitigation Measure 5.1-1: Expanded SCA Ordinance and Mitigation Measure 5.1-2: Require Biotechnical Techniques and Salmonid Habitat Enhancement Elements for
All Bank Stabilization Projects would reduce this impact to a less-than-significant level.

Impact 5.2. Reduced Salmonid Spawning Success Due to Elevated Sediment Delivery and Increased High Flow Frequency and Magnitude. This impact was determined to be potentially significant due to alterations in hydrodynamic processes resulting from projected increases in TIA and other urbanization effects under the Proposed Project, which would increase inputs of development-related fine sediment to stream channels and winter storm flow magnitude and frequency. These conditions would further increase the risk of streambed and redd scour, thus making a cumulatively considerable contribution to the existing adverse impacts on coho salmon and steelhead spawning success. Implementation of Mitigation Measure 5.1-1: Expanded Stream Conservation Area (SCA) Ordinance and Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams would reduce this impact to a less-than-significant level.

Potential Impact 5.3. Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature. This impact was determined to be less than significant because potential reductions in stream habitat quality and riparian function related to future development in the watershed would be relatively minor and likely too small to substantially or measurably reduce the ability of juvenile salmonids to rear and grow during the summer rearing period. The potential for impacts on salmonid summer rearing success due to development-related reductions in summer baseflows could not be determined due to a lack of available data on the potential hydrologic and biologic effects of groundwater pumping and surface water diversions in San Geronimo Valley. While the Proposed Project is not capable of fully avoiding or eliminating impacts to water quality, sediment delivery, and instream habitat complexity associated with future development, it is unlikely that any such impacts would make a considerable contribution to the existing cumulative impacts on coho salmon and steelhead summer rearing success.

Although Potential Impact 5.3 is less than significant, the County has nonetheless elected to pursue a voluntary mitigation measure consistent with its commitment to avoiding or minimizing impacts to the maximum extent practicable. Voluntary Mitigation Measure 5.3-1: Groundwater Study would provide required information to help determine whether existing and future groundwater pumping, surface water diversions, altered watershed hydrology,
and other effects related to development are or would be likely to adversely impact summer baseflow in San Geronimo Creek. This measure would improve understanding of development-related effects on salmonid summer rearing habitat in the watershed and assist with County efforts to protect and conserve habitat for these species.

This supplement to the Final EIR for the Marin CWP (2007) now contains the information necessary to make the Final EIR adequate for the project as revised (State CEQA Guidelines Section 15163(b)). This SEIR may be circulated by itself without recirculating the Final EIR (State CEQA Guidelines Section 15163(c)).
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7 RESPONSES TO PUBLIC COMMENTS ON THE DRAFT SEIR

Purpose and Background

The purpose of this section is for Marin County to respond to public comments received regarding the Draft 2007 Marin Countywide Plan Supplemental SEIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley.

Following a 45-day comment period, Marin County received 44 written comment letters during the Draft SEIR public comment period, which have been parsed into individual comments with unique identification numbers. A list of agencies, local groups, tribes, and individuals who submitted comments on the Draft SEIR is provided in Table 7-1. All comment letters (1 through 44) submitted to the County on the Draft SEIR, are presented below preceding Marin County’s responses. Some responses refer readers to other comments or responses in this section of the Final SEIR, or to other sections of the Final SEIR above where specific topics are discussed.

Several of the comments received comprised consistent themes, which are responded to via Master Responses. Many commenters sought clarification regarding the types of activities that would require new permits and site assessments, as well as further detail regarding the analyses conducted for the Draft SEIR. Revisionsto the Draft SEIR are identified throughout this section and in Sections 1−5 above to provide the requested clarifications in this Final SEIR. Some of the comments received raise resource management issues which extend beyond the scope of achieving sustainable mitigation measures for the potential impacts of future theoretical buildout on salmonids. In these cases, Marin County has responded with clarifying information as to how resources are managed and where information can be found.

Consistent with Section 15088.5 (a) of the State CEQA Guidelines, the revisions that have been made to the Draft SEIR, including those that address public comments, do not require recirculation of the SEIR prior to certification because they do not constitute significant new information that would deprive the public of a meaningful opportunity to comment upon any substantial adverse environmental effects of the Proposed Project or a feasible way to mitigate or avoid such an effect (including a feasible project alternative) that Marin County has declined to implement. The modifications are not due to any of the following:
(1) A new significant environmental impact that would result from the project or from a new mitigation measure proposed to be implemented.

(2) A substantial increase in the severity of an environmental impact that would result unless mitigation measures are adopted that reduce the impact to a level of insignificance.

(3) A feasible project alternative or mitigation measure considerably different from others previously analyzed that would clearly lessen the environmental impacts of the project, but the project’s proponents decline to adopt it.

(4) The draft EIR was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded.

Rather, any new information that has been added to the Draft SEIR to address public comments clarifies or amplifies or makes insignificant modifications in an adequate EIR, consistent with Section 15088.5 (b) of the State CEQA Guidelines.

Next Steps in Project Review Process

This Final SEIR will be available for a 21-day public review and comment period. Subsequently, the Marin County Planning Commission will hold a hearing to consider recommending the Final SEIR for certification by the Marin County Board of Supervisors, and then the Board of Supervisors will hold a hearing to consider certification of the Final SEIR. These hearings will be subject to public notice and open for public attendance.
## Table 7-1. List of Agencies, Organizations, and Individuals Who Submitted Written Comments on the Draft SEIR.

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<tr>
<th>Letter Designation</th>
<th>Letter Date</th>
<th>Date Received</th>
<th>Agency or Organization</th>
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*Duplicate letter, not addressed (same as 28)*
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Master Responses

Master Response 1. Errata

The following errata have been made to the Draft SEIR and incorporated into this Final SEIR:

- Minor grammar and spelling corrections.
- Modifications and additions to citations and the reference list.
- Formatting changes to incorporate public comments and responses to comments on the Draft SEIR as Section 7 to the Final SEIR, instead of as Appendix A.
- Adjustments to figure and table numbering and descriptions.
- Replacement of Figure 2-2 San Geronimo Valley Land Use Policy Map with a higher resolution version of the same figure.
- Adjustments to tables and table footnotes in Sections 2 and 3 to correct small rounding errors, assumptions, and/or provide clarifications.
- Changes to ensure references to the Court’s opinion are consistent throughout.
- The term wastewater treatment plant in Section 3.6.3 has been corrected to water treatment plant.

Master Response 2. Consideration of What to Include in the Cumulative Impact Analysis

As was already stated in Section 5.1 of the Draft SEIR, historical damming and diversions (sometimes without fish passage), historical forest-clearing and logging, and overfishing have impacted anadromous salmonid populations along the central California coast (NMFS 2012, 2016b–d). While the focus of this program-level, plan analysis is the potential impacts of future residential development (urbanization) under the Marin CWP (2007), the SEIR also considers the impacts of past actions that have affected anadromous salmonids and their habitat in San Geronimo Valley (i.e., Sections 3.2 through 3.6). This is consistent with the Court’s direction to Marin County to prepare an SEIR that analyzes the cumulative impacts of built development (i.e., future theoretical buildout) on salmonids in San Geronimo Valley in conformity with State CEQA Guidelines Section 15130 (b) and the Court’s opinion, and that describes mitigation measures in conformity with State CEQA Guidelines Section 15126.4 and the Court’s opinion, or makes other findings in conformity with State CEQA
Guidelines Section 15091 (see Section 1 of the SEIR for further explanation). Although the County is required to minimize or mitigate significant impacts that would occur in the future as a result of the Proposed Project, CEQA does not require mitigating or otherwise compensating for past impacts.

Consideration of climate change as part of the future conditions assessment for salmonids in San Geronimo Valley is included in the SEIR with respect to projected increases in the frequency and magnitude of extreme precipitation events, which would affect seasonal flows in San Geronimo Creek and its tributaries, particularly peak flows, and would potentially exacerbate cumulative impacts from development under the Proposed Project (see Impact 5.1).

Section 5.1 of the SEIR includes language that clarifies that several current and reasonably foreseeable future projects in San Geronimo Valley appear to be aligned with stated goals, policies, and/or implementing programs in the Marin CWP (2007) and are thus implicitly included in the plan-type, program-level cumulative impact analysis. These include a potential community sewer system (e.g., Woodacre/San Geronimo Flats Wastewater Recycling Project) located in the Larsen Creek sub-basin, road repair, stream crossing upgrades, and stream habitat enhancement projects being implemented by the Marin County Department of Public Works, and salmonid habitat enhancement projects granted funding under the California Department of Fish and Wildlife (CDFW) Watershed Restoration Grant Program. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Another project noted in several public comments, the Spirit Rock Meditation Center, does not constitute a current or proposed project, but is an amended Master Plan, originally approved in 1988 for operation of a nonprofit religious/educational institution for the instruction and practice of silent meditation, allowing up to 315 persons onsite during peak capacity. Marin County Community Development Agency – Planning Division prepared an Initial Study in 2010 which determined that the impacts related to land use and planning policy, geophysical, water, air quality, transportation/circulation, biological resource, hazard, noise, aesthetics/visual resource, and cultural resource factors are avoided or mitigated to a point where clearly no significant effects would occur pursuant to CEQA requirements (Marin County Planning Commission, 2011). Subsequently, a Mitigated Negative Declaration of Environmental Impact, along with a Mitigation Monitoring and Reporting Program were adopted by the County Board of Supervisors in 2011.
Master Response 3. General CEQA Compliance and CEQA Requirements for an Economic Analysis

The SEIR has been prepared in compliance with the Court’s opinion and with applicable CEQA requirements, as was described in Section 1.2 of the Draft SEIR and was noted in numerous explicit references to specific sections of the State CEQA Guidelines throughout the rest of the Draft SEIR. With respect to comments specifically focused on CEQA requirements for an economic analysis, State CEQA Guidelines Section 15131(a) states the following:

*Economic or social effects of a project shall not be treated as significant effects on the environment. An EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the Project to physical changes caused in turn by the economic or social changes. The intermediate economic or social changes need not be analyzed in any detail greater than necessary to trace the chain of cause and effect. The focus of the analysis shall be on the physical changes.*

Section 5 of the Draft SEIR found that certain incremental impacts of the Proposed Project would contribute considerably to existing significant adverse impacts on salmonids and would require mitigation that includes discretionary permits for an expanded set of development activities in the SCA, as well as changes to other development approaches (e.g., LID) outside of the SCA (see also Master Responses 6 through 9). Anticipated economic or social changes resulting from the Proposed Project with mitigation would include increased permit requirements, which could increase the cost of development activities in the SCA and throughout the watershed. However, consistent with CEQA Guidelines Section 15131(a) and the Court’s opinion, the focus of this SEIR analysis is on the expected physical changes resulting from future theoretical buildout under the Marin CWP (2007), how those changes would affect salmonids in the San Geronimo Creek watershed, and how significant cumulative impacts to salmonids would be avoided or mitigated.

Additionally, State CEQA Guidelines Section 15131(c) states the following:

*Economic, social, and particularly housing factors shall be considered by public agencies together with technological and environmental factors in deciding whether changes in a project are feasible to reduce or avoid the significant effects on the environment identified in the EIR. If information*
on these factors is not contained in the EIR, the information must be added to the record in some other manner to allow the agency to consider the factors in reaching a decision on the Project.

Although the focus of this SEIR analysis is, appropriately, on the expected physical changes resulting from future theoretical buildout under the Marin CWP (2007), how those changes would affect salmonids in the San Geronimo Creek watershed, and how significant cumulative impacts to salmonids would be avoided or mitigated, development of this SEIR also included consideration of the feasibility of the proposed mitigation measures, such as implementation cost and timeline, administrative process, legal liability, and consistency and alignment with other existing local, state, and federal regulations. Lastly, public comments on the Draft SEIR expressing concern about the potential social and economic implications of the proposed mitigation measures raise important policy issues that will be considered by the Marin County Board of Supervisors as the process moves forward.

Further, the State CEQA Guidelines provide that an EIR may determine that a project's contribution to a significant cumulative impact will be less than significant if the project is required to implement or fund its fair share of a mitigation measure designed to alleviate the cumulative impact. Such a finding must be supported by an analysis coupled with supporting facts showing the basis for the mitigation determination. (14 Cal Code Regs Section 15130(a)(3)). Under CEQA, proposed mitigation measures should be reviewed to ensure that they are clearly defined and that each significant impact is addressed, and also to determine whether the measures are legally feasible and whether any might conflict with the requirements of other agencies that have authority over the project. The State CEQA Guidelines also recognize that for some projects the only feasible mitigation for cumulative impacts may be to adopt ordinances or regulations instead of imposing conditions on a project-by-project basis. 14 Cal Code Regs Section 15130(c). Mitigation Measure 5.1-1 Expanded SCA Ordinance is aligned with the aforementioned approach to feasible mitigation, where “feasible” is defined as capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors (State CEQA Guidelines Section 21061.1).
Master Response 4. Approach to Analyzing Future Development

4.1. Analysis of Future Numbers of Improved Parcels and Developed Units

As explained in Section 2.6.2 of the Draft SEIR, under the Proposed Project, there is potential for an increased number of improved parcels within the watershed as a whole, as well as an increased number of developed units under future theoretical buildout. Despite this, remaining parcels zoned for future development tend to have significant environmental constraints, which either substantially increase construction costs or preclude development altogether (e.g., inadequate percolation for on-site septic systems, lack of access via nearby paved roads, steep topography necessitating engineered foundation designs) (see SEIR Section 2.6.2). This SEIR conducts a program-level analysis under CEQA, because the Proposed Project includes a series of related actions that can be characterized as one large project. A program-level SEIR, by definition, includes consideration of reasonably foreseeable development projects based on existing information. This contrasts a project-level SEIR under CEQA, which would need to include a parcel-by-parcel analysis of potential future development constraints that necessarily assumes specific design attributes for a host of different project possibilities. While it is not possible to quantitatively reduce the estimate of improved parcels under the Proposed Project without such a parcel-by-parcel analysis, the relatively low number (n=19) of San Geronimo Valley building permits issued by Marin County in recent years (e.g., 2016) is indicative that the number of additional improved parcels and developed units anticipated under the Proposed Project is likely to be an overestimate.

4.2. Total Impervious Area (TIA) Methodology Justification

Several commenters requested additional information regarding how TIA was estimated for San Geronimo Valley existing conditions and how it was used to project future conditions under the Marin CWP (2007). The definition of TIA was provided on page 2-25 of the Draft SEIR as “The total area of constructed, non-infiltrating surfaces, such as rooftops, parking lots, and roads, expressed as an absolute value and a percentage of the total land area in the watershed.” A summary of the TIA methodology was provided in Section 2.6.1 (on pages 2-27 through 2-29) of the Draft SEIR, including a general discussion of watershed imperviousness as a coarse but powerful predictor of stream condition, application of the standard U.S. Geological Survey (USGS) approach for estimating TIA, and the use of average building (unit) footprint to project future conditions TIA by land use category in San Geronimo Valley. A new summary table (Table 2-4 Estimated TIA by Type in San Geronimo Valley) of TIA types (i.e., roads, buildings, parking lots) has been added to this section of the Final
SEIR to further clarify the TIA methodology, including details regarding how each of the TIA types was derived from existing aerial photos and other available information. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. The information includes a footnote that the 36-foot road width buffer accounts for sidewalks in addition to a variety of hard surfaces that are visible in the aerial photos of San Geronimo Valley and not rigorously captured by the digitization process, such as the full extent of intersection shoulders, driveway shoulders, swimming pool (hardscape) patios, paved paths between parking lots and building entrances, small sheds, and domestic animal-related features (e.g., chicken coops, dog runs). These features are located both inside and outside of the SCA. Thus, although there are not sidewalks along all of the paved roads in San Geronimo Valley under existing conditions, the use of a standard buffer on the paved roads category allows the TIA estimate to account for the numerous other small impervious surfaces located throughout developed portions of the valley.

Additionally, a new Table 2-6 Paved and Unpaved (Dirt) Roads in San Geronimo Valley has been added to the Final SEIR to address comments regarding the total miles of roads used in the TIA estimates for the Existing Conditions Report (Stillwater Sciences 2009c) and the Draft SEIR. The additional information provided in new Table 2-4 and Table 2-6 is for clarification purposes and does not alter the impact analyses, significance determinations, or proposed mitigation measures presented between the Draft and Final SEIR. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Much of the TIA methodology description had already been provided in the Existing Conditions Report (Stillwater Sciences 2009c). However, some of the TIA information previously reported in the Existing Conditions Report appears to have been misinterpreted by the commenters because it was not clearly presented in the original Existing Conditions Report.

In particular, Table 3-2 Preliminary Total Area, TIA and Percent Impervious by Land-use Classification for the San Geronimo Creek Watershed in the Existing Conditions Report (Stillwater Sciences 2009c), the source of the 301.7 acres of existing TIA estimated for San Geronimo Valley, appears to have been misunderstood by commenters. This table presents TIA by land-use classification (e.g., commercial, institutional, single-family residential, etc.). For example, as shown in Existing Conditions Report Table 3-2, the “Single Family Residential”
land use classification accounts for 1,816.8 acres, which is 30.3% of the total 6,001.0 acres in the watershed. Within the Single Family Residential land use, 101.7 acres (5.6%) are considered TIA. The 101.7 acres of TIA includes roads (plus buffered sidewalks), buildings, and parking lots, where the breakdown is not specified in Table 3-2. The “Road” land use classification (292.6 acres) is assigned by Marin County and includes not only the area of actual roadway but also easements along roads, areas between land use categories, and areas where there is land but no assigned parcel. Thus, much of the area included in the “Road” land use classification is not actually TIA; only 130.3 acres (44.5%) qualify as TIA, as shown in Table 3-2 of the Existing Conditions Report.

As with the Single Family Residential land use, roads are also included in the TIA estimates of other land use categories (e.g., commercial, institutional, etc.). Therefore, Table 3-2 of the Existing Conditions Report appears to underestimate total paved road TIA if one only looks at the Road land use category. Thus, Table 3-2 of the Existing Conditions Report does not present TIA data for San Geronimo Valley in a way that is clear and easily understood. As stated above, a new table has been added to the Final SEIR to clarify the breakdown of TIA by type and remove any unnecessary reference to land-use classifications; Table 2-4 Estimated TIA by Type in San Geronimo Valley in the Final SEIR shows that of the total 301.7 acres of TIA for the San Geronimo Valley watershed, 220.5 acres (73%) of TIA is associated with roads, driveways, and sidewalks. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

The following statement in the Existing Conditions Report (Stillwater Sciences 2009c) has also proven to be confusing: “Of the total length of roads (i.e., paved, gravel, and other) in the existing GIS layer (251.2 road miles [401.9 km]), 13% included a field-surveyed width attribute while 87% did not.” Although stated in the context of other information regarding San Geronimo Valley, the “251.2 road miles” refers to road miles throughout Marin County, not just within the valley. The statement was initially used to characterize the proportion of field-surveyed width attributes in as large a dataset as possible for Marin County; however, the statement should have made this clear and provided a justification for using the broader dataset. The correct San Geronimo Valley-specific statement is “Of the total length of roads (i.e., paved, gravel, and other) in the existing GIS layer (52.9 road miles [85.1 km]), 30% included a field-surveyed width attribute while 70% did not.” The 52.9-mile estimate was used in all TIA calculations for both the Existing Conditions Report and the Draft SEIR (i.e., the 251.2-mile estimate was
not used in TIA calculations for either the Existing Conditions Report or the Draft SEIR).

**Master Response 5. Approach to Analyzing Impacts to Salmonids**

Several commenters requested additional information to clarify the rationale behind the impact analysis approach, the choice of salmonid life stages analyzed, and whether the analysis uses a life cycle approach. Commenters also requested additional information and explanation to justify the conclusions regarding impacts related to salmonid summer rearing success.

The impact analysis in the SEIR describes and relies on quantitative data and results when available. In many cases, however, a quantitative analysis was not possible and the analysis results are based on a qualitative evaluation using the best available data. The SEIR uses a conservative analysis approach (i.e., likely overestimating impacts), which is commonly considered appropriate when evaluating potential effects to listed species and other sensitive resources in circumstances where comprehensive data are lacking and conclusions cannot be made with certainty (Persson 2016, Jalava et al. 2013, Tickner 2003).

**5.1. Salmonid Life Stages Analyzed in the SEIR**

The Draft SEIR describes current conditions and stressors for each salmonid life stage based on the best available data, including the Recovery Plan for CCC Coho Salmon (NMFS 2012), the Salmonid Enhancement Plan (PCI 2010), the Lagunitas Limiting Factors Analysis (Stillwater Sciences 2008), and salmonid population and habitat data collected and reported by MMWD. This information was used to identify the salmonid life stages at which stressors would be most likely to limit production of smolts from the San Geronimo Creek watershed and those most susceptible to cumulative impacts caused by future development: incubating eggs and juveniles rearing during winter and summer. The Draft SEIR thus analyzes the potential impacts of the Proposed Project at a program level using estimates and assumptions of the potential Project impacts on habitat required by each of these salmonid life stages.

Summer juvenile salmonid monitoring data and smolt outmigration data, collected by MMWD and provided in its annual reports, was reviewed and incorporated into the impact analysis. The data and analyses in the MMWD annual reports and other existing reports (see Section 3.6) indicate that survival of coho salmon in the San Geronimo Creek watershed reflects the cumulative influence of factors acting on the egg, fry, and juvenile life stages. Together with
evidence of winter habitat limitations in the watershed (Stillwater Sciences 2008), this information provides substantial justification for the multi-life stage approach used for the impact analysis in the SEIR.

A full “life cycle approach,” which was suggested by commenters as a preferred approach to analyzing salmonid impacts, can be described as a systematic evaluation of stressors and impacts on each salmonid life stage and the resulting effects on subsequent life stages and the persistence of the population. It is a valuable and appropriate approach in a variety of analytical contexts where sufficient data are available and impact mechanisms can be adequately predicted or hypothesized. The feasibility of this approach as a means of evaluating program-level environmental impacts depends on the availability of sufficient data to describe not only the stressors acting on each life stage (as in the Recovery Plan for CCC Coho Salmon [NMFS 2012] and the Salmonid Enhancement Plan [PCI 2010]) but also how Project implementation will influence or cause stressors at each stage of the life cycle and at the population level. The SEIR analyzes impacts on life stages for which sufficient data are available from previous studies or from new analyses (e.g., the Lagunitas Fine Sediment Reduction and Habitat Enhancement Plan [SFBRWCQB 2014]; TIA projections in the SEIR) but does not attempt to extend this analysis to life stages (e.g., adult or juvenile migration) or ecological interactions (e.g., competition between salmonid species) for which data are insufficient to establish a credible link between Project effects and life stage stressors or impacts.

The SEIR (Section 5.1) acknowledges the difficulty in linking development-related effects to impacts on salmonids and their habitat, and also explains that incremental effects that could result from the Proposed Project are difficult or impossible to discern at the population level. Consequently, the SEIR adopts a more stringent and conservative impact analysis approach focused on impacts that would prevent salmonids from completing essential behaviors. The impact analysis approach used in the SEIR is more conservative than a population-level impact analysis because an effect that prevents completion of an essential behavior could be considered significant and adverse, even if that effect would be unlikely to have a population-level impact. This is an accepted approach to environmental impact analysis for salmonids that has been used in program EIRs and other CEQA compliance documents for a variety of projects throughout California (e.g., SJRRP 2012, AECOM 2015, USBR and DWR 2017).

Evaluating Project impacts using population viability as a significance criterion, as suggested by commenters, would require a comprehensive population viability
analysis relying on detailed quantitative data describing Project effects on each of the four viable salmonid population (VSP) criteria: abundance, diversity, productivity, and spatial structure (McElhany et al. 2000). The VSP criteria are based on population characteristics that reasonably predict extinction risk during a 100-year period (Bjorkstedt et al. 2005). This type of analysis would require a multi-faceted quantitative analysis including habitat capacity estimates and salmonid population modeling to predict abundance and productivity, coupled with population genetics modeling to predict diversity and an unidentified approach potentially using modeling or estimates to predict changes in the population’s spatial structure. To be scientifically defensible and avoid unduly speculative conclusions, such an analysis would require the ability to explicitly and quantitatively link Project effects to changes in each of the four VSP criteria using tested analytical approaches shown to produce results with uncertainty estimates within a generally acceptable range (i.e., 5–10%). Based on the current state of the scientific knowledge, this approach is neither feasible nor appropriate for a program-level cumulative impact analysis conducted for purposes of CEQA compliance.

To clarify the analysis approach used, which can be characterized as a modified life cycle approach, additional explanation has been added in Section 5.1 of the Final SEIR. The updated text describes in more detail how the life stages selected for analysis were chosen and how the level of analysis appropriate for each salmonid life stage was determined. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

5.2. Analysis of Impacts Related to Summer Rearing Success

The impact analysis in the Draft SEIR incorporated the most recent available salmonid summer habitat data for San Geronimo Creek, collected by MMWD in 2011 (Ettlinger et al. 2013) and by Stillwater Sciences in 2015 (Appendix A). The analysis also considered the results of salmonid juvenile and smolt monitoring in the watershed (e.g., Ettlinger et al. 2015b, c), which were not cited in the Draft SEIR. More recent juvenile salmonid population and summer habitat data, collected by MMWD in 2015 and 2016, became available after completion of the Draft SEIR and have been incorporated into the Final SEIR. Consistent with the findings of the Lagunitas Limiting Factors Analysis (Stillwater Sciences 2008), the data support the hypothesis that summer rearing habitat does not currently limit production of juvenile coho salmon from the San Geronimo Creek watershed. This hypothesis forms the basis for the SEIR’s analysis of impacts on summer rearing success (Potential Impact 5.3).
For example, despite low flows and warm stream temperatures in summer 2015, Ettlinger et al. (2016b) found little evidence that environmental conditions were limiting coho growth or physiological condition. The following spring, the estimated abundance of coho smolts outmigrating from San Geronimo Creek (1,097 smolts) was above average compared with recent years and represented 11% of the estimated coho salmon smolt production from the entire Lagunitas Creek watershed (Ettlinger et al. 2017a). These data are consistent with previous data and studies in that they provide no clear indication that summer rearing habitat is limiting coho salmon or steelhead populations in the watershed. Ettlinger et al. (2015c, 2016b, 2017b) hypothesize that adult coho salmon abundance, poor winter rearing habitat, and stream flows during incubation and fry emergence exert a stronger influence on juvenile coho salmon densities than habitat conditions during the summer rearing period. Accordingly, we find no evidence that the assumptions or conclusions of Potential Impact 5.3 should be revised based on these recent data.

The SEIR analysis, including the analysis of impacts to summer rearing success, takes into account past, present, and reasonably foreseeable future impacts, as required by CEQA and the Court’s opinion. The summer rearing analysis considers two potential impact mechanisms that could result from the Proposed Project: (1) reduced summer baseflow, and (2) reduced habitat complexity. While it is possible that additional degradation of summer rearing habitat in the San Geronimo Creek watershed could make a considerable contribution to existing significant cumulative impacts, a credible analysis of the potential effects of future groundwater pumping and surface water diversions is not possible due to a lack of data. Likewise, there is no information to support the conclusion that Project-related reductions in summer habitat complexity would be sufficient to substantially or measurably reduce the ability of juvenile salmonids to forage or find shelter during the summer rearing period.

Available data are insufficient to determine the likely number and location of future groundwater wells, if any. Establishment of and pumping from new groundwater wells, if it occurs in the future, would be subject to County permitting and would be extremely limited, thus unlikely to contribute to effects on salmonid summer habitat conditions. This is based on the County’s reasonable assumption that the vast majority, and very likely all, of the parcels that would be developed in the future under the Marin CWP (2007) would have municipal water supply and would not require groundwater wells or surface water diversions (see also Section 2.6.2 and Potential Impact 5.3). Surface water diversions are not subject
to County regulations and permitting. However, any new surface water diversions would be subject to state policies including those designed to maintain instream flows in northern California coastal streams (SWRCB 2013), water rights permitting requirements, lake and streambed alteration permitting requirements, CEQA compliance requirements, and potentially state and federal take prohibitions for listed salmonids. As a result, new permits for surface water diversion in the San Geronimo Valley would be extremely unlikely and thus effects of any such diversions on salmonid summer rearing habitat are also unlikely.

Master Response 6. Adequacy of Mitigation Measure 5.1-1 Expanded SCA Ordinance

Several commenters expressed concern with the clarity and adequacy of Mitigation Measure 5.1-1 Expanded SCA Ordinance in the SEIR, including: whether the Expanded SCA Ordinance would be similar to the Interim SCA Ordinance; the level of detail necessary to ensure effective implementation of this measure; the timing of implementation; how this measure would impact gardening (i.e., vegetation clearing and planting); how this measure would impact septic system repair and replacement; who would undertake site assessments required for discretionary permits; what information would be included in standard management practices; and permitting requirements for low impact development. Responses to these comments are provided in Sections 6.1 through 6.6 below.

6.1. Status of Interim SCA Ordinance

The Interim Stream Conservation Area Ordinance (Interim SCA Ordinance) was adopted by the Board of Supervisors on October 29, 2013, and was scheduled to take effect on December 28, 2013; however, the Interim SCA Ordinance was never implemented because of litigation filed by SPAWN and the Center for Biological Diversity on November 18, 2012. Further information relating to the Interim SCA Ordinance can be found here: https://www.marincounty.org/depts/cd/divisions/planning/stream-conservation-area-ordinance. Consideration maybe given to the Interim SCA Ordinance in developing an Expanded SCA Ordinance; however, the 2013 Interim SCA Ordinance was never implemented and does not set a precedent or requirement that would be required to be necessarily carried forward.
Level of Detail

Mitigation Measure 5.1-1 reinforces the existing commitment of Marin County to implement a permanent Expanded SCA Ordinance for San Geronimo Valley. Adoption of an Expanded SCA Ordinance was already included in general terms under the Proposed Project as Policy BIO-4.1 Restrict Land Use in Stream Conservation Areas, and Implementing Program BIO-4.a Adopt Expanded SCA Ordinance for Parcels Traversed by or Adjacent to a Mapped Anadromous Fish Stream and Tributary, where the Marin CWP (2007) provides an appropriate level of detail for a long-range planning document. Rather than being vague, inclusion of the Expanded SCA Ordinance in the SEIR as CEQA mitigation to address identified significant impacts of future development in San Geronimo Valley commits Marin County to specific planning mechanisms for reducing impacts, namely removing important ambiguities and/or inadequacies of the Marin County Development Code. For example, as stated in Mitigation Measure 5.1-1, the set of development activities that require a permit would be expanded to the specific list provided in the measure, and consistent permit requirements would be enacted across planned and conventional zoning districts in recognition that land use impacts across all zoning districts potentially impact salmonid health. The Expanded SCA Ordinance would involve additions and amendments to the Development Code to accomplish the objectives of Mitigation Measure 5.1-1. For instance, proposed development within the SCA that has potential to adversely impact salmonids would require site plan review.

All zones established in Chapter 22.06 of the Development Code (Agricultural and Resource-Related Districts, Residential Districts, Commercial and Industrial Districts, Special Purpose and Combining Districts) are either “Conventional” or “Planned”; therefore, implementation of the second provision of Mitigation Measure 5.1-1 means that the Expanded SCA Ordinance captures all zoned land within San Geronimo Valley—no zones are excluded. This means that non-residential zones within San Geronimo Valley, including zones within which agricultural, equestrian, commercial, and other non-residential activities occur, are captured by Mitigation Measure 5.1-1 Expanded SCA Ordinance. Additionally, the Expanded SCA Ordinance in the Final SEIR applies to all land uses and activities that involve vegetation clearing, increase impermeable area, increase surface runoff, expose soil, or alter the bed, bank, or channel of any stream, regardless of whether they are residential in nature or otherwise. This would include the development of roads and culverts, and agricultural activities that have these impacts, for example.
As is standard practice for local municipalities and counties, the specific and detailed standards that govern development projects must be set forth in an ordinance. Inclusion of a complete Expanded SCA Ordinance as mitigation for future development under the Marin CWP (2007) is impractical because the latter requires a separate legislative process from the SEIR. The Court explicitly did not direct the County to prepare an SCA Ordinance as part of the SEIR. Instead, the Court determined that it remains at the discretion of the County to determine when to enact the SCA Ordinance. Accordingly, Mitigation Measure 5.1-1 recognizes and places the SEIR within the proper administrative and legal trajectory for adoption of development standards for San Geronimo Valley.

Subsequent implementation is expected to take up to five years from the date that the current or threatened litigation is resolved. To address public comments and consistent with State CEQA Guidelines Section 15126.4(a)(1)(B), Mitigation Measure 5.1-1 includes updated language that clarifies and amplifies provisions of the Expanded SCA Ordinance, consistent with the Draft SEIR, as follows in Sections 6.2 through 6.6. Please also refer to the Final SEIR for these updates to Mitigation Measure 5.1-1. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

### 6.2. Introduction and Timeline

Commenters expressed concern regarding the timeline for implementing Mitigation Measure 5.1-1 Expanded SCA Ordinance. As aforementioned in Section 6.1, the Court opinion adhered to reasoning that it is within the discretion of Marin County to determine when to enact the required SCA Ordinance. Furthermore, it is standard practice for the Marin County Board of Supervisors to meet regularly to affirm progress towards adopting an Expanded SCA Ordinance, and Marin County will continue to support this process. The goal is to adopt the Expanded SCA Ordinance within five years from certification of the Final SEIR, barring unforeseen schedule delays. Accordingly, the introduction to Mitigation Measure 5.1-1 has been clarified and amplified from the Draft SEIR, and incorporated into the Final SEIR as follows:

The County shall adopt an Expanded SCA Ordinance consistent with Goal BIO-4 and associated Implementing Programs under the Proposed Project. The County shall commence with development of the Expanded SCA Ordinance following certification of the Final SEIR and, barring unforeseen delays caused by continuing, new, or threatened litigation related to the SEIR process and/or the ordinance, shall complete the Expanded SCA Ordinance within five years of Final
SEIR certification. The County shall report on progress toward completing the Expanded SCA Ordinance to the County Board of Supervisors no less than twice annually, and shall provide public noticing of the forthcoming Board of Supervisors meeting within 10 days prior to the meeting.

In developing the Expanded SCA Ordinance, the County will incorporate provisions that would:

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

6.3. Clarification Regarding Stream Alterations, Tree and Vegetation Trimming and Removal, and Repairs or Replacements of Septic Systems (Provision 1)

Several comments requested clarification regarding whether trees and vegetation can be trimmed and removed, and whether this requires a permit (see Master Response 18). Commenters also stated that Marin County did not consider sewage disposal systems in the Draft SEIR; permits should not be made more onerous than the status quo; and incentives rather than disincentives should be offered for maintaining and upgrading septic tanks (see Master Response 15). Albeit the separate process for the Expanded SCA Ordinance moving forward (described in 6.1 above), Marin County has updated Mitigation Measure 5.1-1 to provide additional clarification and detail in order to alleviate concerns expressed by commenters. Marin County has previously committed to introduce more rigorous riparian management to benefit anadromous fish via the Marin CWP (2007), and to protect natural source areas for future wood recruitment within riparian areas via the Memorandum of Understanding for Woody Debris Management in Riparian Areas of the Lagunitas Creek Watershed (MMWD et al., 2007). Clarification updates to the first provision of Mitigation Measure 5.1-1 in the Final SEIR attempt to balance concerns raised, primarily by property owners and residents, with the need to, and previous commitments to, protect and enhance salmonid habitat (CDFG 2004, PCI 2010, SFRBWQCB 2014a). Specifically, Marin County has clarified and amplified this section with the following exemptions to the first provision (note that the footnote numbering is different in the final mitigation measure):

- Expand the set of development activities that require a discretionary permit and site assessment to include any activities within the SCA that requires vegetation clearing, increases impermeable area, alters increases surface
runoff, results in exposed soil, or alters the bed, bank, or channel of any stream, with the following exemptions:

Exemption 1: Dead, invasive, or exotic vegetation, including leaf-litter, may be removed without a permit. Consistent with Policy BIO-4.4 of the Marin CWP (2007) and the San Geronimo Valley Salmon Enhancement Plan (SEP)\(^\text{13}\), woody debris located below the streamside top of bank is not exempt. Prior to removal of such woody debris, consultation is required with Marin County\(^\text{14}\), the California Department of Fish and Wildlife (CDFW), and/or Marin Municipal Water District (MMWD) to determine its potential to induce erosion or threaten health and safety (including fire safety), and thus whether a permit is needed to remove it. Top of bank shall be determined through a site inspection.

Exemption 2: Removal or trimming of pyrophytic\(^\text{15}\) combustible live trees and/or vegetation consistent with Marin County Ordinance No. 3550 would not require a permit.

Exemption 3: Planting of non-pyrophytic native vegetation is exempt.

Exemption 4: Repairs or replacements of septic systems\(^\text{16}\) that incorporate applicable Marin County Stormwater Pollution Prevention Program (MCSTOPPP) minimum erosion control, sediment control, and good housekeeping BMPs\(^\text{17}\) are exempt.

Exemption 5: Landowners who partner with the Marin Resource Conservation District to voluntarily restore creeks on their property shall not be required to obtain a discretionary permit for work within the SCA, or a

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\(^{13}\) Diameters and lengths defined in Table 1 (pp. 11) of PCI (2010).

\(^{14}\) The current contact for woody debris consultation is Sarah Phillips – Marin Resource Conservation District Urban Streams Coordinator: mailto:sarah@marinrcd.org; phone: (415) 663-1170. For fire-related health and safety, contact the Marin County Fire Department Fire Marshall, Scott Alber: (415) 473-6566 or Fire Safe Marin: (415) 570-4FSM (4376).

\(^{15}\) For the purposes of Exemption 2, pyrophytic combustible trees and/or vegetation are defined as fire-prone plants listed on the FIRESafe MARIN website: [http://www.firesafemarin.org/plants/fire-prone](http://www.firesafemarin.org/plants/fire-prone). The hardwood and coniferous riparian species Tanoak, California Bay Laurel, and Douglas-fir are considered to be pyrophytic combustible trees and thus are included in this exemption.

\(^{16}\) Septic system is defined as an on-site sewage disposal system consisting of a septic tank, and a soil infiltration leach field, evapotranspiration mound, or other approved disposal facility. This captures all individual sewage disposal systems as defined in Title 18 of the Marin County Municipal Code of Ordinances.

\(^{17}\) For information regarding MCSTOPPP, please see: [https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp](https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp)
Creek Permit\(^{18}\) for work below the streamside top of bank, providing that the proposed work is consistent with and authorized under the Marin Resource Conservation District’s Permit Coordination Program (http://www.marinrcd.org/pcp/) and the Resource Conservation District takes full responsibility for the work. Top of bank shall be determined through a site inspection.

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

6.4. Site Assessments (Provision 3)

Site assessments are necessary so that the potential impacts of proposed activities can be effectively and consistently evaluated for appropriate permit requirements. In response to comments received, the third provision under Mitigation Measure 5.1-1 has been slightly modified to omit CDFW and the National Marine Fisheries Service (NMFS) training and certification obligations, as follows:

- Require site assessments to be conducted by a qualified professional with at least five years of field experience who has received training and certification by CDFW or NMFS in assessing potential impacts to stream ecology, riparian ecology, and hydrology in coastal California, and the potential for impacts to anadromous salmonids from changes to these processes and conditions.

- Training and certification by NMFS and/or CDFW would be consistent with Action Step 22.2.1.2. from the Central California Coast coho salmon recovery plan (NMFS 2012) (“Provide technical and staff support to counties to encourage general plan updates to include measures to protect coho salmon [CDFG 2004])” and the California Department of Fish and Game (CDFG) (2004) Recovery Strategy for California Coho Salmon.

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

\(^{18}\) For information regarding Creek Permits, please see: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/creek-permit-checklist
6.5. Standard Management Practices (Provision 4)

Some commenters queried what the Standard Management Practices (SMPs) in the fourth provision. To provide greater clarity and minimum performance requirements, additional detail has been added to the provision in the Final SEIR as follows:

- Require Standard Management Practices (SMPs) to be incorporated into all projects development activities within the SCA, as defined in Provision 1, for the protection of hydrologic processes, stream and riparian habitat, and water quality within SCAs. SMPs shall be reviewed and approved by CDFW or NMFS to ensure the SMPs are adequate to avoid or minimize impacts to salmonids.

The SMPs will include, at a minimum, the following information:

For Riparian Vegetation and Habitat:

- Identification (common names, scientific names, and images) of riparian vegetation important for salmonids;

- Requirements for replacement of riparian trees removed in association with development activities, including:
  - Riparian trees removed shall be replaced with non-pyrophytic native riparian trees on-site at a 2:1 ratio or, if on-site mitigation is not feasible, shall be replaced off-site at a 3:1 ratio in a functionally equivalent riparian area of San Geronimo Creek or its major tributaries (North Fork San Geronimo Creek, Woodacre Creek, Montezuma Creek, Arroyo/Barranca/El Cerrito Complex, Larsen Creek) within reaches accessible to anadromous salmonids.
  - Allowable woody riparian tree species (primarily non-pyrophytic) for replanting in riparian areas include:
    - Broadleaf – Bigleaf Maple (*Acer macrophyllum*), California Buckeye (*Aesculus californica*), White Alder (*Alnus rhombifolia*), Oregon Ash (*Fraxinus latifolia*), Coastal Live Oak (*Quercus agrifolia*), and Arroyo Willow (*Salix lasiolepis*).
    - Coniferous – Redwood (*Sequoia sempervirens*), Douglas-fir (*Pseudotsuga menziesii)*.

* Douglas-fir is a California native species and is considered to be a fire-prone plant, as listed on the FIRESafe MARIN website [http://www.firesafemarin.org/plants/fire-prone](http://www.firesafemarin.org/plants/fire-prone). Where planted, Douglas-fir should be set back from structures in compliance with Title 16 of the Marin County Municipal Code and the California
Public Resources Code. Additionally, its potential to contribute to wildfire may be reduced through appropriate trimming, thinning, and removal of branches and shoots to reduce the density of woody plant material in the understory. While tanoak is also a native riparian and understory species in the San Geronimo Valley, tanoak is highly vulnerable to Sudden Oak Death and therefore can increase the amount of dead and dry plant material (i.e., fuel) and the potential for wildfire (Forrestel et al. 2015). The native riparian tree California Bay Laurel is currently considered to be a vector for Sudden Oak Death and is thus not included on the list of allowable woody riparian tree species for replanting in the SCA.

− Replacement trees should be of the same category as the tree being removed:
  − Broadleaf trees should be replaced by broadleaf trees using a #5 container.
  − Coniferous trees should be replaced by coniferous trees using a #15 container.
  − Willow trees should be replaced by willow trees using a 1-inch diameter, 4-foot length cutting.
− Replacement trees shall be irrigated as needed and monitored to ensure survival for a minimum of two years.
− Trees that do not survive for a minimum of two years shall be replaced according to the above requirements. Replacements shall be irrigated as needed, and monitored to ensure survival for a minimum of two years.

• Allowable vegetation removal and replacement techniques; and
• Allowable seasonal timing for vegetation removal.

**For Water Quality and Hydraulic Capacity:**

• Consistent with the BASMAA Post-Construction Manual (BASMAA 2014) and Provision 5 of this mitigation measure:
  − Drainage requirements for new or replaced impervious areas;
  − Runoff dispersal requirements from new or replaced impervious areas;
  − Bioretention facility design standards; and
  − Bioretention facility underdrain and overflow requirements.

**For Pollution Prevention during Construction Phase:**
• Erosion and sediment control requirements, such as MCSTOPPP “Minimum Erosion and Sediment Control Measures for Small Construction Projects” (2015); and
• Seasonal restrictions for construction activities.

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

6.6. Low Impact Development Practices and Designs (Provision 5)

Confusion was expressed by commenters with regard to the permitting implications of the fifth provision under Mitigation Measure 5.1-1. Marin County agrees with the assertion by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) that downstream impacts of altered hydrology are cumulative and integrated in lower downstream reaches of other sub-watersheds, such that for low impact development (LID) standards to be effective they must be implemented throughout the watershed, rather than restricted to priority reaches in the SCA. Marin County also recognizes that the cumulative impact of development, including small (<2,500 ft²) increases of impervious area, may incrementally contribute to adverse impacts on salmonids in San Geronimo Valley by increasing surface runoff, contributing to a more peaked hydrograph, and increasing sediment erosion.

Requiring some degree of LID for stormwater management for all new development, regardless of location, is the current standard of practice in municipalities throughout the Pacific Northwest and in California Region 3 (Central Coast). The current standard for the cities and towns in Contra Costa, Santa Clara, San Mateo Counties, and Vallejo and Fairfield-Suisun requires retention of the 85th percentile 24-hour storm volume. The difference in performance between the 85th percentile 24-hour storm and the 95th percentile 24-hour storm (which was proposed as mitigation in the Draft SEIR) can be quantified relative to one another. The purpose of such an evaluation is to determine the reduction in retained volume that would result from using a more widely adopted standard (the 85th percentile storm) in place of the more protective one (the 95th percentile storm), and then to explore whether other measures could adequately compensate for the net effects on the flow regime. Making use of the daily rainfall record from the rain gage station closest to the San Geronimo Valley, Lagunitas Forest Knolls (station US1CAMR0031), the available daily average data from November 2014 through February 2018 was analyzed using the standard method of USEPA (2009). From these data the 85th
percentile storm is 1.79 inches, which includes 59% of the total annual rainfall volume, and the 95th percentile storm is 3.12 inches, which includes 83% of the annual volume. Thus, about 40% more runoff would remain un-detained under the less restrictive standard, which necessitates additional measure(s) to achieve an equivalent outcome.

An effective “additional measure” would be a reduction in the threshold of new or replacement impervious area that would trigger drainage controls. At present, that threshold is 2,500 ft² for single-family homes and small projects (BASMAA 2014)—any project that adds less than this amount of new or replacement impervious area is exempt from drainage controls, and so any such runoff is undetained before being released to the surrounding drainage network. For the period 2000–2017, nearly half of all new single-family home permits in the valley (48%) created under 2,500 ft² of new or replacement impervious area, which accounts for about one-third of the total “new-house imperviousness” added to the valley during this period. Lowering the threshold of drainage controls to 500 ft² would capture every such project, which in turn would increase by one-half the area whose runoff would now be treated. Considering other, non-full-house additions and ancillary structures would only improve the magnitude of managed impervious area (since 2/3 of the impervious area from new additions 2000–2017 was added by projects between 500 and 2,500 ft², and none from projects larger than 2,500 ft²).

Based on these evaluations, Marin County concludes that reducing the retention requirements in the Draft SEIR (from the 95th percentile to the 85th percentile 24-hour storm) is compensated by lowering the threshold of imperviousness requiring drainage controls (from 2,500 to 500 ft²). The 40% of annual rainfall that would not be treated by reducing the retention requirements from the 95th to the 85th percentile storms is closely matched by the greater area of (previously exempted) imperviousness that would now be subject to flow control. We conclude, assuming equivalent effectiveness of treatments, that reducing the storm-size requirement but increasing the net area of treated imperviousness will yield equivalent results in net runoff.

Additional specificity, and an increase in some sizing factors, would be required in Appendix C and Appendix D of the Bay Area Stormwater Management Agencies Association (BASMAA) Post-Construction Manual (BASMAA 2014) if these documents are used to design sufficiently sized facilities to meet the objective of 59% of annual rainfall retained (i.e., up to the 85th percentile storm volume).

Accordingly, Marin County has clarified and amplified the fifth provision under Mitigation Measure 5.1-1 in the Final SEIR, as follows:
• Require discretionary permits for projects in priority stream reaches (the reaches most heavily impacted and potentially most important for salmonid winter rearing) to include low impact development (LID) practices and designs that are demonstrated to prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event and approved by a qualified professional. Priority reaches are currently considered to be Woodacre Creek, upper San Geronimo Creek, lower San Geronimo Creek, and Montezuma Creek but may be modified based on the results of future studies and monitoring by MMWD and others.

• Require that discretionary permits for development projects within the SCA include low impact development (LID) practices and designs that are demonstrated to prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event. Specifically:
  - Small projects, including single-family homes and driveways, that create or replace 500 ft² or more of impervious surface shall be required to complete a stormwater control plan (SCP) that achieves retention of the 85th percentile, 24-hour design storm for the newly created or replaced impervious surface, or for an equivalent area of previously unretained impervious surface on the same site. For San Geronimo Valley the SCP cannot rely upon the existing runoff reduction measures as described in Appendix C of the Bay Area Stormwater Management Agencies Association (BASMAA) Post-Construction Manual (BASMAA 2014) to retain the 85th percentile, 24-hour design storm standard.
  - Regulated projects shall be required to complete a stormwater control plan (SCP) that achieves retention of the 85th percentile, 24-hour design storm for the newly created or replaced impervious surface, or for an equivalent area of previously unretained impervious surface on the same site. For San Geronimo Valley the SCP cannot rely upon the bioretention sizing factor (0.04) described in Appendix D of the BASMAA Post-Construction Manual (BASMAA 2014) to retain the 85th percentile, 24-hour design storm standard.
  - New roads (paved and unpaved) shall be required to meet the following design criteria:
    ▪ Surface drainage:

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19 Includes paper streets (Marin County Municipal Code 24.04.627) and/or improvements to existing unpaved roads.
• Road surfaces and ditches are hydrologically "disconnected" from streams and stream crossing culverts, with a maximum allowable hydrologic connectivity of 25% of the total new road surface and compacted shoulder area (paved and unpaved). To be considered disconnected, road surface runoff is dispersed, rather than collected and concentrated, and does not return to a connected ditch farther downstream.

• Fine sediment contributions from roads, cutbanks and ditches are minimized by utilizing seasonal closures and installing a variety of surface drainage techniques including berm removal, road surface shaping (i.e., outsloping, insloping, crowning), rolling dips, ditch relief culverts, waterbars and other measures to disperse road surface runoff and reduce or eliminate sediment delivery to the stream.

  ▪ Stream crossings:

  • Stream crossings have a drainage structure designed to pass the 100-year flood flow including appropriate sizing and configuration to accommodate predicted loads of woody debris and sediment.

  • Stream crossings have no diversion potential (e.g., functional critical dips are in place).

  • Culvert inlets have low plug potential (trash barriers or deflectors installed where needed).

  • Approaching road surfaces and ditches are disconnected from streams and stream crossing culverts to the extent feasible, with a maximum allowable hydrologic connectivity of 25% of the total new road surface and compacted shoulder area, using road shaping and road drainage structures.

  • Class I (fish-bearing) stream crossings meet California Department of Fish and Wildlife and National Marine Fisheries Service fish passage criteria.

  ▪ Road fills:

  • Unstable and potentially unstable road fills that could deliver sediment to a stream are excavated (removed) or structurally stabilized.
• Excavated spoil is placed in locations where eroded material will not enter a stream.
• Excavated spoil is placed where it will not cause a slope failure or landslide.

- Off-site retrofits
  • If on-site avoidance or minimization of surface runoff and sediment erosion is not feasible using the above Provision 5 criteria, off-site retrofit of existing impaired sites (e.g., stream crossings currently diverted or with diversion potential, culverts likely to plug or undersized culverts), would occur at a 2:1 ratio for total runoff area in a functionally equivalent riparian area of San Geronimo Creek or its major tributaries (North Fork San Geronimo Creek, Woodacre Creek, Montezuma Creek, Arroyo/Barranca/El Cerrito Complex, Larsen Creek) within reaches accessible to anadromous salmonids. If functionally equivalent off-site mitigation opportunities cannot be identified within these locations, then opportunities can be selected elsewhere in San Geronimo Valley and/or in the downstream Lagunitas Creek watershed using existing site-specific sediment source assessments (e.g., San Geronimo Valley Non-County Maintained Roads Erosion Assessment and Implementation, Marin County, California, 2010; Lagunitas Creek Watershed Unpaved Roads Sediment Source Site Assessment, 2013).

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Master Response 7. Adequacy of Mitigation Measure 5.1-2: Salmonid Habitat Enhancement Projects

To mitigate reduced winter rearing habitat quality due to future development under the Marin CWP (2007), Marin County proposed to provide funding to a third party to facilitate habitat enhancement within San Geronimo Valley in the Draft SEIR. Several public comments stated that Mitigation Measure 5.1-2 was too vague and requested additional details about the proposed salmonid enhancement projects, including methods to quantify their success and permanence. Some commenters stated that habitat enhancement mitigation should be provided for future development, rather than for the existing baseline, and that mitigation should not be based on existing policies and programs.
Others commented that habitat enhancement projects might adversely impact their properties, including their ability to install bank erosion and flood protection. Two commenters requested additional information describing the level of mitigation or enhancement (such as the amount of instream habitat enhancement) required to compensate for specific development impacts (i.e., the mitigation ratio). In response to these comments, Mitigation Measure 5.1-1 has been clarified and amplified as described in Master Response 6 above, and Mitigation Measure 5.1-2 has been refocused to mitigate adverse impacts on salmonids due to bank stabilization projects. Consistent with Section 15068.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Regarding introducing a mitigation ratio, due to uncertainties related to the exact location, size, and characteristics of individual future development projects in San Geronimo Valley, it is not possible to determine the exact location and amount of salmonid habitat that could be affected under the Proposed Project. Thus, the County has determined that it is infeasible to quantify a standard “mitigation ratio” that characterizes the relationship between the area of salmonid habitat that would be affected by a development project and the area of salmonid habitat enhancement that would be required to avoid or minimize potential impacts. Because a reasonable mitigation ratio cannot be feasibly quantified at this time, Marin County shall require, as alternative measures, that biotechnical techniques and salmonid habitat enhancement elements be included for all permitted bank stabilization projects (revised Mitigation Measure 5.1-2) and that on-site or off-site replacement of riparian trees be required for those that are removed (revised Mitigation Measure 5.1-1 Provision 4) and thus can no longer provide current or future ecosystem functions beneficial to salmonids (e.g., shading, large woody debris recruitment, nutrient and macroinvertebrate input).

By maintaining and enhancing riparian function (stream shading, large woody debris recruitment, nutrient and macroinvertebrate input), reducing bank erosion and sediment inputs, avoiding additional bank hardening and flow constriction, and improving stream habitat complexity, these two measures would help achieve the instream shelter targets (channel bed form) for overwintering and summer rearing habitat and the riparian canopy and water temperature targets (water quality) for summer rearing habitat (Tables 3-3 and 3-4) established by the Salmonid Enhancement Plan (PCI 2010). Specific criteria, design specifications, and guidelines for individual bank stabilization and instream habitat enhancement projects shall be developed in coordination with and approved by CDFW, with input from agencies such as NMFS and other willing participants, as appropriate.
for project permitting. Combined, requirements for biotechnical techniques and salmonid habitat enhancement elements for all permitted bank stabilization projects, and on-site or off-site replacement of riparian trees for those that are removed, would avoid Project-related impacts to anadromous salmonids in the San Geronimo Creek watershed or minimize the impacts to a level that is less than significant and would not make a cumulatively considerable contribution to an existing significant adverse impact.

Revisions to Mitigation Measure 5.1-2 maintain the goals, purpose, and efficacy of the mitigation measure, while eliminating reliance on third-party funding of habitat enhancement projects by the County since, for example, the availability of general funds for this purpose cannot be guaranteed in the future. This change in no way represents a lack of support for programs that facilitate and/or incentivize restoration projects on private land. Marin County is supportive of the Marin Resource Conservation District’s Marin Coastal Watersheds Permit Coordination Program (http://www.marinrcd.org/pcp/) for landowners who partner with the Resource Conservation District to voluntarily restore creeks on their property. Accordingly, the County maintains the purpose and standards of this mitigation measure by shifting this exemption into Mitigation Measure 5.1-1 which does not require an additional County Creek Permit for work that is authorized and is consistent with the Permit Coordination Program where the Resource Conservation District takes full responsibility for the work (see Exemption 5 of Mitigation Measure 5.1-1.

Lastly, clarifications and amplifications to Mitigation Measure 5.1-2 also eliminate targets, performance standards, and timelines specified in the Basin Plan Amendment (SFBRWQCB 2014b), as requested in comments.

In accordance with the above, Mitigation Measure 5.1-2 has been clarified and amplified as follows:

**Mitigation Measure 5.1-2: Require Biotechnical Techniques and Salmonid Habitat Enhancement Elements for All Bank Stabilization Projects**

Marin County shall require that biotechnical techniques and salmonid habitat enhancement elements be included for all permitted bank stabilization projects. Biotechnical techniques provide structural and surface erosion protection through the use of vegetation and wood to reproduce elements of the natural system, thus providing beneficial ecosystem functions and habitat features (Wells 2002, WDFW 2003). Specific criteria, design specifications, and guidelines for individual bank stabilization and instream habitat enhancement projects shall be
developed in coordination with and approved by CDFW, with input from agencies such as NMFS and other willing participants, as appropriate for project permitting.

Bank stabilization projects shall adhere to the following provisions:

- All stream bank stabilization work shall include biotechnical techniques, such as those described in Appendix H of the Salmonid Enhancement Plan (PCI 2010) and the Creek Bank Restoration and Repair Guidance available at: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/mcstoppp/general-public/creeks-and-watersheds

- Stream bank stabilization structures that involve riprap, rock, or other structural components used to prevent localized stream erosion, sediment transport, or movement shall be used only in unusual circumstances and shall require justification in order to receive a permit. However, rock used to facilitate natural stream processes and dynamics with the purpose of achieving stream equilibrium between erosional and depositional processes shall be allowed, providing the proposed design is justified and approved by the appropriate resource agencies.

- All stream bank stabilization work shall also incorporate salmonid habitat enhancement elements such as anchored tree or branch bundles, overhanging woody vegetation, cobble/boulder substrate, or other features that improve the shelter complexity rating of each affected stream habitat unit by at least 20% or by a percentage equal to half the affected percentage of the bank length of each habitat unit, whichever is greater. Habitat units and instream shelter complexity ratings shall be identified and determined before initiation of bank stabilization work and after completion of the work, and shall be identified and determined by a qualified professional according to the protocols described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2010, or most recent edition). The qualified professional conducting the identification of habitat units and instream shelter complexity ratings will possess field experience assessing potential impacts to stream ecology, riparian ecology, and hydrology in coastal California, and the potential for impacts to anadromous salmonids from changes to these processes and conditions.

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20 For example, a bank stabilization project that affects 60% of the bank length of a given stream habitat unit (e.g., a pool, riffle, or run) must provide instream habitat enhancement that increases the shelter complexity rating of the affected habitat unit by 30% (i.e., half of 60%). A project that affects 25% of the bank length of a given habitat unit must provide instream habitat enhancement that increases the shelter complexity rating of the affected habitat unit by 20%.
• Habitat enhancement elements incorporated into bank stabilization projects must be stable (non-mobile) in the channel and provide instream shelter for salmonids at summer baseflow and bankfull flow, as determined by a qualified professional (see above) using protocols described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2010, or most recent edition).

Projects shall be designed to enhance floodplain/winter habitat for coho salmon and other anadromous salmonids in the San Geronimo Valley and be consistent with guidelines and requirements included in Action Steps LaC-CCC-3.1.4 and LaC-CCC-4.2.2.1 from the Central California Coast coho salmon recovery plan (NMFS 2012) and TMDL implementation actions recommended by the SFBRWQCB to attain water quality objectives and ecological objectives for improving populations of coho salmon and steelhead (SFBRWQCB 2014a). Specific criteria, design specifications, and guidelines for habitat enhancement projects shall be developed in coordination with and approved by CDFW and/or NMFS.

Habitat enhancement projects shall be focused in priority stream reaches (the reaches most heavily impacted and potentially most important for salmonid winter rearing), which are currently considered to be Woodacre Creek, Lower San Geronimo Creek, and Montezuma Creek but may be modified based on the results of future studies and monitoring by MMWD and others.

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

**Master Response 8. Adequacy of Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams**

Comments received on Mitigation Measure 5.2-1 indicated that performance standards put forth by the San Francisco Bay Regional Water Quality Control Board to reduce fine sediment delivery under the fine sediment TMDL established by the Basin Plan Amendment (SFBRWQCB 2014b) were developed for existing conditions and are not adequate or appropriate to mitigate impacts related to fine sediment delivery under future development conditions. Mitigation Measure 5.2-1 has been updated to remove reference to the Basin Plan Amendment’s performance standards and to incorporate performance standards for LID practices specified in Mitigation Measure 5.1-1 to be applied within the SCA and additional measures outside the SCA, as follows:
Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams

The provisions of the Expanded SCA Ordinance described under Mitigation Measure 5.1-1 shall avoid or minimize the hydrologic effects and stream sedimentation associated with future additional development in the SCA watershed, helping reduce the potential for redd scour and degradation of salmonid winter rearing habitat.

In addition, the County shall adopt changes to existing stormwater, LID, erosion and sediment control requirements within the San Geronimo watershed and outside of the SCA consistent with the following:

- Development projects requiring a permit shall be required to adhere to LID practices and designs specified in Mitigation Measure 5.1-1.
- Projects subject to a grading permit (Marin County Municipal Code 23.08.025, 23.08.026) shall not be conducted during the rainy season (October 15–April 15). No exceptions to this requirement shall be given by the Director of Marin DPW or by other parties except in cases of imminent threat to life or property.
- New roads (paved and unpaved) shall be required to adhere to design criteria specified in Mitigation Measure 5.1-1.

These actions would occur in addition to ongoing implementation of measures to control and reduce production and delivery of fine sediment to streams from existing development, including applicable waste discharge requirements (WDRs) or waiver of WDRs, in keeping with the requirements of the Basin Plan Amendment (SFBRWQCB 2014b) which establishes the TMDL for fine sediment in the Lagunitas Creek watershed.

In addition, Marin County DPW shall continue to develop and implement measures and guidelines to control and reduce production and delivery of fine sediment to streams and minimize its effects on redd scour and other components of salmonid habitat, in keeping with the requirements of the Basin Plan Amendment (SFBRWQCB 2014b). These actions, many of which are underway or substantially complete, include measures that will achieve the following performance standards within 20 years of Basin Plan amendment adoption:

- Achieve and maintain the target for road-related sediment delivery to channels of ≤ 350 cubic yards per mile per 20-year period; and
• Minimize delivery of sediment to channels from unstable or potentially unstable areas by managing existing roads and other infrastructure to prevent additional erosion of legacy sediment delivery sites, and/or delivery from other potentially unstable areas.

To this end, Marin County DPW shall submit, by 2019, a Report of Waste Discharge to the SFBRWQCB that provides, at a minimum, the following:

• Description of the road network and/or segments;
• Identification of erosion and sediment control measures to achieve performance standard(s) specified in Table 4.2 of the Basin Plan Amendment;
• A schedule for implementation of identified control measures; and
• Development and implementation of guidelines for road maintenance, as needed to protect water quality, stream-riparian habitat, and salmonid fisheries.

The Marin County DPW shall also comply with applicable waste-discharge requirements (WDRs) or waiver of WDRs, and report progress on development and implementation of best management practices to control road-related erosion.

Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Master Response 9. Adequacy of Mitigation Measure 5.2-2: Stream Habitat Enhancement Projects

In response to comments, and following updates to Mitigation Measure 5.1-2, Mitigation Measure 5.2-2 was no longer required as a separate mitigation measure to mitigate impacts to salmonid spawning success. Accordingly, Mitigation Measure 5.2-2 has been deleted as a separate mitigation measure in the Final SEIR. With clarification and amplification, Mitigation Measure 5.1-2 now covers all activities that were or would be included in Mitigation Measure 5.2-2. Mitigation Measure 5.1-2 will avoid impacts to salmonid spawning success, or reduce the impacts to a level that is less than significant and would not make a considerable contribution to existing significant cumulative impacts. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Mitigation Measure 5.2-2: Stream Habitat Enhancement Projects
Marin County, or nonprofits in partnership with reach-based landowner stewardships, shall develop and implement projects to enhance stream habitat complexity and connectivity, enhance riparian function and LWD loading/recruitment, increase natural hydraulic sediment sorting and gravel retention, and reduce development-related erosion in the watershed. The objectives of these enhancement projects will be to:

- Support self-sustaining populations of coho salmon and steelhead and to enhance the overall health of the native fish community; and
- Reduce rates of sediment delivery to channels (associated with incision and accelerated bank erosion) by 67% in San Geronimo Creek.

If approved by the SFBRWQCB, these enhancement projects may include the floodplain/winter habitat enhancement projects described above under Mitigation Measure 5.1-2. As specified in the Basin Plan Amendment (SFRWQCB 2014b), specific actions shall include the following:

- Within 10 years of Basin Plan Amendment adoption, develop and implement plans to enhance LWD loading and restore natural rates of recruitment to channels, as needed to achieve numeric targets for LWD loading (≥ 300 m³/ha in Redwood Channels and ≥ 100 m³/ha in Hardwood Channels) and to achieve load allocations for sediment (Basin Plan Amendment Tables 3a and 3b). These plans will include a survey to quantify baseline values for LWD loading.
- Within five years of Basin Plan Amendment adoption, develop detailed technical studies to characterize reach-specific opportunities and priorities for floodplain restoration.

To help meet targets for salmonid spawning habitat quality, the actions described above shall be consistent with the following salmonid habitat enhancement goals, as described in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010):

- Protect and enhance the riparian corridor to create healthy, self-sustaining habitat (Recommendation #2);
- Promote increased watershed-wide stormwater retention and disconnection (Recommendation #12); and
- Reduce fine sediment delivery from roads and upland erosion (Recommendation #15).

Specific criteria, design specifications, and guidelines for habitat enhancement projects shall be developed in coordination with and approved by CDFW and/or NMFS.
Master Response 10. Confusion Regarding the Stream Conservation Area (SCA) 100-ft buffer Requirement

Commenters indicated that they do not understand the 100-ft buffer referenced in the SEIR, or the logic inherent to the 100-ft buffer. Commenters expressed confusion between the 100-ft buffer required by the Marin CWP (2007) and minimum 35-ft buffer guideline contained in the San Geronimo Valley Salmon Enhancement Plan (2010); indicated their feeling that the 35-ft buffer is adequate; and expressed confusion about the definition of riparian vegetation and how to measure 50 ft landward from the outer edge of woody riparian vegetation.

As discussed in the SEIR sections 2.4.1 and 2.6.1, Stream Conservation Areas (SCAs) are incorporated into biological goals in the Marin CWP (2007). The purpose of the SCA is established in BIO 4-1:

“SCA is established to protect the active channel, water quality and flood control functions, and associated fish and wildlife habitat values along streams. Development shall be set back to protect the stream and provide and upland buffer, which is important to protect the significant resources that may be present and provides a transitional zone. Best management practices (BMPs) shall be adhered to in all designated SCAs and strongly encouraged in ephemeral streams not defined as SCAs.”

Within the Inland Rural Corridor (an environmental region where San Geronimo Valley is situated), the SCA is the greater of either:

(a) 50 feet landward from the outer edge of woody riparian vegetation associated with the stream, or

(b) 100 feet landward from the top of bank.

(see also page 2.4-24 of the Marin CWP [2007]).

This definition of the SCA has already been adopted as part of the Marin CWP (2007) for all areas designated Inland Rural Corridor, Coastal Corridor, and Baylands Corridor throughout Marin County. The SCA is generalized as the “100-ft buffer” in discussions throughout this SEIR, but could extend beyond 100 feet in streamside locations with more than 50 feet of woody riparian vegetation. The
outer edge of woody riparian vegetation\textsuperscript{21} would be determined by a biologist at the time of consultation for land uses that may require permits. As per page 2.4-23 and page 5-50 of the Marin CWP (2007), woody riparian vegetation is defined as follows:

“Woody riparian vegetation includes plants that have tough, fibrous stems; vines; and branches covered with bark and composed largely of cellulose and lignin. Characteristic woody riparian species include willow, alder, box elder, big-leaf maple, cottonwood, dogwood, elderberry, elk clover, thimbleberry, and California blackberry, among others.”

The 35-ft buffer distance is not a policy of the Marin CWP (2007), but rather it is a guideline in the San Geronimo Valley Salmon Enhancement Plan (2010), which states:

“A \textbf{minimum} 35-foot buffer is recommended to guide enhancement on parcels that are already developed and to guide enhancement of riparian habitat on parcels proposed for new or re-development. On larger parcels, a wider buffer may be needed to protect the existing riparian forest…To support a naturally regenerating riparian forest and a sustainable source of large woody debris \textbf{100 feet or more is recommended} by the scientific literature and by many other local and state governments \textbf{for the conifer and hardwood riparian forests that naturally occur in San Geronimo Valley.”}

Therefore, the 35-ft buffer is not considered sufficient for riparian ecosystem sustainability in San Geronimo Valley, and the wider 100-ft buffer has been adopted as policy in the Marin CWP (2007) (i.e., the Proposed Project). Scientific rationale for the 100-ft buffer, considering channel morphology, biological communities, and water quality is summarized in Appendix E to the San Geronimo Valley Salmon Enhancement Plan (2010), available at the following websites:

http://www.marinwatersheds.org/documents/SEPFINAL.pdf
http://www.marinwatersheds.org/documents/SEPAAppendices.pdf

\textsuperscript{21} “Riparian Vegetation. Vegetation associated with a watercourse and relying on the higher level of water provided by the watercourse. Riparian vegetation can include trees, shrubs, and/or herbaceous plants. Woody riparian vegetation includes plants that have tough, fibrous stems and branches covered with bark and composed largely of cellulose and lignin. Herbaceous riparian vegetation includes grasses, sedges, rushes and forbs — broad-leaved plants that lack a woody skeleton.” (Marin CWP 2007).
Master Response 11. Invasive Species

The County agrees that aquatic and riparian invasive species can alter ecological function and food web structure and adversely impact salmonids through predation, competition, or other mechanisms. Most introductions of non-native fishes and other aquatic vertebrates, however, occurred during the early Anglo-European colonization and population growth periods of the 19th and early 20th centuries (Dill and Cordone 1997) and contemporary urbanization—especially on a small scale as in San Geronimo Valley—is unlikely to increase the number or abundance of non-native fish species and other aquatic or semi-aquatic vertebrates that compete with or prey upon salmonids. Urbanization may contribute to the introduction and spread of non-native aquatic invertebrates and aquatic plants, but these invaders are not typically associated with adverse impacts to salmonids in coldwater streams. Effects of the Proposed Project related to invasive aquatic species are therefore not considered in the analysis of cumulative impacts in the SEIR.

While future development under the Proposed Project is not expected to contribute to increases in aquatic invasive species, development in San Geronimo Valley has previously been associated with displacement of native riparian vegetation by invasive and ornamental plants (Stillwater Sciences 2009a). If this trend continues under the Proposed Project, the resulting loss of riparian function could result in indirect impacts to salmonids. This impact was addressed in the Draft SEIR.

The Final SEIR has been clarified in Section 5.1 to distinguish the potential impacts of invasive aquatic and riparian species on salmonids and the rationale underlying the impact analysis. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.


Numerous comments were received highlighting the monetary, cultural and intrinsic value of homes for current homeowners and their heirs, and seeking clarifying information regarding how these values will be balanced when protecting salmonids. Concerns were raised about socioeconomic impacts to homeowners being overlooked for the sake of protecting salmon from biophysical impacts. Many commenters felt that the Draft SEIR should have considered resident and homeowner needs in tandem with the needs of salmon, rather than
excluding socioeconomic impacts from the assessment. One commenter suggested that if residents are better acknowledged and their needs accommodated that they would be more likely to participate in local conservation. Another commenter suggested that too many permitting restrictions for conservation would force the middle class out of San Geronimo Valley in favor of upper class vacation rentals.

Master Response 3 explains that economic or social effects shall not be treated as significant effects on the environment under CEQA; therefore, socioeconomic concerns raised by residents and homeowners do not constitute an environmental impact per se. Accordingly, Master Response 12 does not discuss the adequacy of the impact assessment from the perspective of CEQA. Instead, the below information clarifies the scope of the Proposed Project and the SEIR, as related to the balance between conservation and homeowner needs.

The Marin CWP (2007) contains multiple guiding principles, including the following principles most relevant to balancing conservation and homeowner needs in the context of this SEIR:

“1. Link equity, economy, and the environment locally, regionally, and globally.
We will improve the vitality of our community, economy, and environment. We will seek innovations that provide multiple benefits.”

“5. Preserve our natural assets.
We will continue to protect and restore open space, wilderness, and damaged ecosystems, and enhance habitats for biodiversity.”

“8. Supply housing affordable to the full range of our members of the workforce and diverse community.
We will provide and maintain well-designed, energy efficient, diverse housing close to job centers, shopping, and transportation links. We will pursue innovative opportunities to finance senior, workforce, and special needs housing, promote infill development, and reuse and redevelop underused sites.”

We will live in healthy, safe communities and provide equal access to amenities and services. We will particularly protect and nurture our children, our elders, and the more vulnerable members of our community.”
The Marin CWP (2007) is broken into three elements: Natural Systems and Agriculture, Built Environment, and Socioeconomic. The Marin CWP (2007) strives to achieve a balance between these elements of the environment. The introductory sentence is: “Marin County has long maintained a tradition of environmental planning balanced with the recognition of the essential linkages between land use, transportation, and the need for affordable housing.” Balancing goals, policies, and programs for wide-ranging aspects of the environment provided the foundation for the Marin CWP (2007).

While the Marin CWP (2007) achieves a balance between natural and built environments through its planning history and documents, the SEIR deliberately has a narrow focus. The SEIR is a supplementary assessment focusing wholly on the potential cumulative impacts, and the range of potential consequences, on salmonids in San Geronimo Valley resulting from future theoretical buildout in the watershed; and, a description of mitigation measures relevant to salmonids in San Geronimo Valley. Both were directed by the Court of Appeal of the State of California First Appellate District Division Three (see also Sections 1.1 and 1.2).

**Master Response 13. Responsibilities of County Versus Property Owners with Respect to Development Requirements**

Several commenters requested clarification regarding the responsibilities of Marin County versus homeowners with respect to development requirements. These comments were focused on policy issues rather than the physical environmental impacts of the Proposed Project, where the latter is the purpose of a CEQA analysis. As stated previously, public comments on the Draft SEIR expressing concern about the potential social and economic implications of the proposed mitigation measures will be considered by the Marin County Board of Supervisors as the process moves forward.

Governmental agencies play an important role in guiding sustainable development and conserving biological diversity, where the latter has been determined to be intrinsically valuable, and of ecological, genetic, social, economic, scientific, educational, cultural, recreational, and aesthetic value (Convention on Biological Diversity 1992).

The County of Marin Board of Supervisors has adopted the following mission statement:
“The mission of the County of Marin is to provide excellent services that support healthy, safe and sustainable communities; preserve Marin's unique environmental heritage; and encourage meaningful participation in the governance of the County by all.”

Under this mission, one of Marin County’s goals is to create a sustainable future (https://www.marincounty.org/depts/bs/boards-and-commissions/member-handbook/marin-county-mission-statement-and-defining-values).

The Marin CWP (2007) references the San Geronimo Valley Community Plan (Plan) (1997), which defines land-use and conservation guidelines for planning decisions. The Plan (1997) is adopted as part of the Marin CWP (2007), and is underpinned by ten goals; the following goals are most pertinent to the SEIR:

“Preserve and enhance the valley’s natural resources and rural setting.”

“Assure that the type and amount of growth will be consistent with maintaining the valley's rural character and promoting a balance of environmental quality with sustainable community services and facilities.

“Enable a healthy lifestyle that promotes the well-being of people and the physical safety of people and property.”

“Retain the existing village character and heritage of the valley and preserve the valley's social and economic diversity.”

“Promote a sustainable local economy which will benefit present and future generations without detrimentally affecting resources or biological systems and which will result in balanced communities where residents have opportunities to enjoy the components of a high quality of life; employment, affordable housing, transportation, services, and a healthy physical environment.”

The Plan strives to provide for the community’s growth and economy, without detrimental effects to the natural setting and its biological systems.

The Planning Division of the Marin County Community Development Agency promotes sustainability by regulating land use and real estate development. One of the guiding principles in the Marin CWP (2007) is to preserve natural assets, including restoration of open space, wilderness, and ecosystems, and enhancement of habitats for biological diversity. Marin County uses a
combination of regulatory-based and project-based planning approaches to achieve this preservation principle. The Expanded SCA Ordinance proposed under Mitigation Measure 5.1-1 is a regulatory-based response to an identified need to preserve habitat for salmon in San Geronimo Valley.

With regard to implementing more rigorous planning provisions, all land use activities Marin County undertakes are subject to thorough and transparent planning and building processes, achieving an equivalent or greater level of scrutiny as private land use development. Marin County is required to meet State and Federal mandates, as well as achieving consistency with the Marin CWP (2007). Marin County also is required to meet standards set by the San Francisco Bay Regional Water Quality Control Plan (Basin Plan) (SFBRWQCB 2007), including the TMDL for fine sediment in the Lagunitas Creek Watershed established by the 2014 Basin Plan Amendment (SFBRWQCB 2014b). Marin County also must meet the same standards as any member of the public for maintenance of its structures and other land use activities.

In addition to achieving regulatory requirements, Marin County undertakes small- and medium-scale projects to protect and enhance salmonid habitats. Since 2002, Marin County has completed nine fish passage projects in San Geronimo Valley and developed designs for additional projects. Please refer to Section 3.6.1 of the Draft SEIR, under the sub-heading “Observed Salmonid Spawning Activity”, for details of the fish passage projects. Marin County has also collaborated with MMWD on sediment reduction and management treatments for roads and other sediment sources, including repairs of sediment source sites in San Geronimo Valley, programs and policies for unpaved roads and woody debris, stream flow monitoring, and aquatic invasive species management (MMWD 2011).

More recently (2015–2017), Marin County has undertaken efforts to reduce road-related fine sediment delivery to stream channels in the San Geronimo Valley, as was described under Impact 5.2 in the Draft SEIR (see page 5-16). As a result of the SEIR analysis, Marin County has also committed to the following: incorporation of biotechnical techniques and salmonid habitat enhancement in all bank stabilization projects under Mitigation Measure 5.1-2; fine sediment control measures under proposed Mitigation Measure 5.2-1; and a future groundwater study under Mitigation Measure 5.3-1.

Although the County plays an important role in guiding sustainable development and habitat conservation, and must also meet regulatory requirements and
development standards, the financial burden of seeking discretionary permits and facilitating site assessments under the proposed mitigation for potential salmonid impacts falls on those who benefit directly from development activities within San Geronimo Valley.

**Master Response 14. Need to Support Affordable Housing**

Comments were received expressing concern for availability of affordable housing, including housing the elderly in San Geronimo Valley via home additions, and preventing desirable areas becoming overrun with short-term vacation rentals. These comments were focused on policy issues rather than the physical environmental impacts of the Proposed Project, where the latter is the purpose of a CEQA analysis. As stated previously, public comments on the Draft SEIR expressing concern about the potential social and economic implications of the proposed mitigation measures will be considered by the Marin County Board of Supervisors as the process moves forward.

**Affordable Housing Provisions in the Marin CWP (2007)**

One of Marin County’s priority Countywide Goals is to support more affordable housing. Provision for affordable housing is embedded in goals and policies of the Marin CWP (2007), especially in the Community Development and Housing sections. Policies and implementation programs under Goal CD-2 (Balanced Communities) promote affordable housing through policies aiming to increase supply, provide fee exemptions, provide for the analysis of affordable housing preferences, expedite processing of affordable housing projects, revise affordable housing regulations, convert market rate units into affordable housing, and identify affordable housing sites in Community Plans. Additionally, the Marin County Housing Element 2015–2023, adopted in 2014, incorporates the following policies specific to affordable housing:

> **Policy 1.3 Development Certainty.** Promote development certainty and minimize discretionary review for affordable and special needs housing through amendments to the Development Code.”

> **Policy 2.3 Incentives for Affordable Housing.** Continue to provide a range of incentives and flexible standards for affordable housing in order to ensure development certainty and cost savings for affordable housing providers.”
“**Policy 2.4 Protect Existing Housing** Protect and enhance the housing we have and ensure that existing affordable housing will remain affordable.”

Consistent with the provisions of the Marin CWP (2007), Marin County has established affordable housing regulations in Chapter 22.22 of the Development Code, as well as affordable housing incentives, such as density bonuses consistent with State law, for projects with a net increase of at least 5 dwelling units in Chapter 22.24 of the Development Code. Chapter 22.22 requires that all new lots and multi-family housing with a subdivision map provide affordable housing, and that single-family dwellings, multi-family rental housing, and non-residential developments pay affordable housing fees to be used towards developing and preserving affordable housing for income qualifying households. There are some exemptions to the affordable housing provisions, and the exemption of residential second units is relevant to homeowners in San Geronimo Valley (i.e. development of residential second units does not require affordable housing fees). Residential second units include:

“Second Unit. A self-contained living unit, either attached to or detached from, and in addition to, the primary residential unit on a single lot. Sometimes called a granny flat or in-law unit.”

**Permitting Implications for Affordable Housing of Mitigation Proposed in the Draft SEIR**

Without amendments to existing permitting standards (i.e., via the Expanded SCA Ordinance), new residences, additions, and other construction activities in conventionally zoned districts that meet all conventional standards (e.g., setback to property line, floor area ratio, height limits) do not trigger discretionary permit requirements. Implementation of Mitigation Measure 5.1-1 would necessitate a discretionary permit and site assessment for any activity within the SCA that increases impermeable area, requires vegetation clearing, increases surface runoff, results in exposed soil, or alters the bed, bank, or channel or any stream. It would also enact consistent permit and site assessment requirements for development in Planned Zoning Districts and Conventional Zoning Districts, and would require LID practices and designs for a variety of projects within the SCA. Some new residences and additions (i.e., second units) that did not require discretionary permits previously would be required to obtain one. To reduce sediment production and delivery and minimize hydrologic alteration, Mitigation Measure 5.2-1 would require LID practices and designs, including erosion control measures and improved stormwater routing, for a variety of projects outside of
the SCA and would limit projects that require a grading permit to the dry season. The purpose of the more rigorous permitting requirements is to protect salmonids from additional land disturbance, increased TIA and storm runoff, and modification of stream banks and riparian habitat. The discretionary permit process would include environmental review under CEQA, and would consider whether the proposed activity would adversely alter hydraulic capacity, cause a net loss in habitat acreage, value, or function, or degrade water quality, consistent with Policy BIO-4.2.

Mitigation Measure 5.1-1 would not alter the affordable housing policies or development clauses, and second units would remain exempt from paying affordable housing fees pursuant to section 22.22.020 of the Marin Development Code.

**Master Response 15. Impacts of and Fixes for Failing Septic Systems/Sewage Disposal Systems**

Some commenters were concerned that septic systems in San Geronimo Valley are in disrepair and are causing adverse water quality and potential health impacts. Many commenters requested a streamlined process to allow for repairs and replacements of septic systems. Some commenters requested that the potential impacts on water quality of increased septic system leachate and discharge associated with future development be assessed in the SEIR, including an analysis of chemicals used in the treatment process. One commenter expressed concern that insecticides, including methoprene, are still being used in septic systems in San Geronimo Valley.

Marin County recognizes that potential water contamination from sewage disposal systems is San Geronimo Valley is a pressing community concern. Master Response 6 addresses the need for an exemption from the SCA discretionary permit and site assessment in order to accommodate improvements to septic systems in San Geronimo Valley. Additionally, Sections 3.4 and 5.1 of the Draft SEIR have been clarified and amplified to provide additional information regarding the potential impacts on salmonids of elevated coliform and nutrient levels in San Geronimo Creek due to septic tank leakage. Section 5.1 has also been clarified and amplified to indicate that development of a community sewer system (e.g., Woodacre/San Geronimo Flats Wastewater Recycling Project) is included amongst the set of current and reasonably foreseeable future projects already aligned with stated goals, policies, and/or implementing programs in the Marin CWP (2007). Consistent with Section
15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered.

The below responses focus on policy-related comments rather than the physical environmental impacts of the Proposed Project, where the latter is the purpose of a CEQA analysis. As stated previously, public comments on the Draft SEIR expressing concern about the potential social and economic implications of the proposed mitigation measures will be considered by the Marin County Board of Supervisors as the process moves forward.

**Permitting Requirements for Sewage Disposal Systems**

Map 2-8 of the Marin CWP (2007) shows that San Geronimo Valley uses septic systems. There are four kinds of permits that may apply to sewage disposal systems in San Geronimo Valley (listed in Master Response 18 below), including Title 18 – Sewers, sewer permits.

The Marin County Department of Environmental Health Services (EHS) regulates sewage disposal systems (also known as onsite wastewater treatment systems (OWTS) or septic systems) to protect ground and surface waters from contamination. Title 18 of the Marin County Municipal Code sets standards for sewage disposal permits, and Chapter 18.06 provides for individual sewage disposal systems. Pursuant to section 18.06.040 and 18.07.040 of Title 18, construction, alteration, repair or replacement of an individual sewage disposal system and/or a complex graywater system or a component thereof, or relocation of an alternative sewage disposal system, requires a permit from the health officer of EHS. Permits are not required to pump (i.e., empty) septic tanks, and pumping is generally recommended every three to five years.

There are separate code requirements for standard sewage disposal systems and alternative sewage disposal systems. Standard sewage disposal systems

22 “The term “individual sewage disposal system” means and includes any system of piping, treatment devices or other facilities (excluding chemical toilets) that store, convey, treat or dispose of sewage which is discharged anywhere other than into a public sewer system.”

23 A standard sewage disposal system is: “A sewage disposal system which includes a septic tank (with or without the use of sump chamber and pump) by which method subsurface effluent is disposed of through leach lines.”

24 An alternative sewage disposal system is: “Any individual sewage disposal system which may or may not include a standard septic tank for treatment, or does not include standard leaching trenches for effluent disposal, which has been demonstrated to function in such a manner as to protect water quality and preclude health hazards and nuisance conditions.”
typically include a septic tank that is connected to a leachfield or disposal trench via leach lines. Many of these standard systems were installed in San Geronimo Valley over 50 years ago. Alternative sewage disposal systems may include, but are not limited to, septic tanks with above ground mounds and drip irrigation systems, or pressure distribution dispersal fields, and are more likely to be tailored to the site to avoid contamination risks. Pursuant to section 18.07.120 of Title 18, alternative sewage disposal systems are required to obtain and uphold operating permits from EHS. EHS health officers inspect alternative sewage disposal systems in San Geronimo Valley biannually or annually, and may require repairs or changes to ensure public health and safety. Please visit https://www.marincounty.org/depts/cd/divisions/environmental-health-services/septic-systems for further details about sewage disposal system permits.

Sewer permits from EHS (Title 18 of the Marin County Municipal Code) are separate to building permits from the Building and Safety sector of the Community Development Agency of Marin County (Title 19 of the Marin County Municipal Code). Electrical and plumbing building permits may be required for individual sewage disposal systems (such as for pumped systems), in addition to Title 18 sewer permits. Also note that pursuant to section 18.06.055 of Title 18, building permits are not issued for any building not connected to an approved sewage disposal system, without approval of the health officer.

At present, septic tanks not exceeding 18 inches above grade do not require a County land use permit under Title 22 (Development Code) regardless of the zoning district in San Geronimo Valley25. Construction for the purposes of installing, replacing, or servicing septic tanks may, therefore, result in land disturbance, and/or modification of stream banks and riparian habitat that adversely effects salmonids, with environmental assessments for sewer permits limited to only ground and surface water contamination.

Under the Draft SEIR, the Expanded SCA Ordinance proposed in Mitigation Measure 5.1-1 would mean that all activities requiring vegetation removal, soil exposure, alteration of surface runoff, increased impermeable areas (including sewage disposal systems), or bed, bank, or channel alterations, would require a discretionary permit and an associated site assessment. However, Marin County recognizes concerns raised by commenters that contamination from property owners failing to repair or replace individual sewage disposal systems can also

25 Note that in the coastal zones of Marin County, septic systems may require a land use permit.

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have an adverse, indirect impact on salmonids. Therefore, an exemption is proposed in Mitigation Measure 5.1-1 to allow for repair and replacement of septic systems without the requirement for a land use permit, as shown in Master Response 6.3 above.

For clarification, construction of new sewage disposal/septic systems on currently developed or undeveloped lots that are not replacing an existing degraded system would require land use permits upon implementation of the Expanded SCA Ordinance under Mitigation Measure 5.1-1 to protect salmonids from adverse land disturbance and land use change impacts. Any construction, alteration, repair, or replacement of a sewage disposal system would remain subject to the status quo sewer permit requirements from EHS, and building permit requirements, which are separate from and additional to any required land use permits (note that sewer permits are always required for these activities).

**Potential Health Hazards from Insecticides used in Septic Systems**

The Marin/Sonoma Mosquito Control District (District) regulates the use of insecticides, including methoprene. All products used by the District are registered by the USEPA as public health pesticides labeled for mosquito control. Methoprene (Altosid) is a substance that can be used within the District subject to label requirements and limitations. Methoprene is a biochemical pesticide—preventing target pests from reaching maturity or reproducing, rather killing them directly via toxicity (USEPA 2001). Methoprene does not persist in soils and is unlikely to contaminate groundwater (USEPA 2001). Oral, dermal, or inhalation exposure over an extended period is not likely to cause adverse health effects in humans, and is practically non-toxic to terrestrial species including ducks and quail (USEPA 2001). In aqueous solutions exposed to natural sunlight, complete degradation of methoprene into other compounds referred to as ‘photolysis products’ usually occurs within days, and degradation also occurs by microbial metabolism. Methoprene residues can accumulate at low concentrations in edible tissues of fish, and impacts may occur to non-target freshwater invertebrates. However, methoprene is classified as having minimal acute and chronic risk to freshwater fish (McAllister et al. 1985, Suprenant 1985, Cohle et al. 1993), freshwater invertebrates (Suprenant 1985), and estuarine species (Machado 1992, Sousa 1996, Sleight 1972, Sleight 1973).

**Potential Health Hazards from Failing Sewage Disposal Systems**

Concerns were raised regarding the current state of septic tanks in San Geronimo Valley, including health and environmental issues from failing septic tanks.
tanks, with indication that septic tanks in the valley flats are regularly underwater in winter. Section 18.06.040 of Title 18 provides that this is a prohibited act for standard sewage disposal systems:

“It is unlawful for any person to do any of the following:

(c) Construct, use, or maintain any privy, cesspool, septic tank, sewage treatment works, graywater system, chemical toilet, composting toilet, sewer pipes or conduits, or system(s) components in a manner where sewage, graywater, impure water or any other matter or substance will discharge upon the surface of the ground, become injurious or dangerous to health or will empty, flow, seep, or drain into or affect any river, stream, creek, spring, lake, pond, reservoir, swamp, ocean, bay, water supply, water system, groundwater, culvert, or drainage within the County of Marin.

(d) …

(e) Any individual sewage disposal system or graywater system constructed, operated or maintained in violation of this chapter is hereby declared to be a public nuisance and may be abated according to provisions of the law.”

Section 18.07.040 of Title 18 similarly prohibits alternative sewage disposal systems from threatening public health:

“It is unlawful for any person to do any of the following:

Construct, use, or maintain any alternative sewage disposal system in such a manner as to threaten public health or water quality or overflow onto public or private land or affect any river, stream, creek, spring, lake, pond, reservoir, swamp, ocean, bay, water supply or water system.”

Section 18.06.150 states penalties for violations of Title 18 standard sewage disposal system requirements:

“Any person violating any of the provisions of this chapter is guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not more than one thousand dollars, or by imprisonment in the county jail for not more than six months, or by both such fine and imprisonment. Such person is guilty of a separate offense for each and every day during any portion of which a violation of this chapter is committed, or permitted by such person.”
Section 18.07.180 similarly states penalties for violations of alternative sewage disposal system requirements:

“All persons violating any of the provisions of this chapter is guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not more than one thousand dollars, or by imprisonment. Such person is guilty of a separate offense for each and every day during any portion of which a violation of this chapter is committed, or permitted by such person.”

The county health officer enforces provisions for individual sewer systems, and any concerns regarding defective systems should be directed to the Marin County Department of Environmental Health Services (EHS):

Environmental Health Services General Mailbox
3501 Civic Center Drive, Suite 236
San Rafael, CA 94903
Phone: (415) 473-6907
Fax: (415) 473-4120
Hours: 8:00 AM until 4:00 PM, Monday through Friday

Master Response 16. Fire Hazard Implications: Riparian Clearing for Maintaining Defensible Space

Commenters raised concern that Mitigation Measure 5.1-1 Expanded SCA Ordinance would deter or inhibit vegetation management for fire safety, and sought exemptions. One commenter stated that Marin County Ordinance 3550 requires owners of land adjacent to structures to maintain a fuel break of 30-150 feet. One commenter suggested exempting any vegetation clearing or tree branch laddering that is required by state law, a fire agency, or an insurance company that provides fire insurance to the property owner.

Management of fire hazards is an instrumental part of the Marin CWP (2007) and Development Code. San Geronimo Valley falls within the Urban-Wildland Interface Zone (Map 2-13 of the CWP), State Responsibility Area (SRA) for fire protection (Map 2-14 of the CWP), and within areas of very high fire risk or high fire risk (Map 2-15 of the CWP). Goal EH-4 of the Marin CWP (2007), and associated policies and implementation programs, provide for fire safety. The following policies and implementation programs are particularly relevant:
Policies:

“**EH-4.1 Limit Risks to Structures.** Ensure that adequate fire protection is provided in new development and when modifications are made to existing structures.”

“**EH-4.2 Remove Hazardous Vegetation.** Abate the buildup of vegetation around existing structures or on vacant properties that could help fuel fires. (See also Natural Systems and Agriculture Element, BIO-1.4, Support Vegetation and Wildlife Disease Management Programs).”

“**EH-4.5 Regulate Land Uses to Protect from Wildland Fires.** Use land use regulations, including but not limited to subdivision approvals and denials, as means of protecting people and property from hazards associated with wildland fires.”

Implementation Programs:

“**EH-4.c Require Compliance with Fire Department Conditions.** Continue to refer land development and building permit applications to the County Fire Department or local fire district for review, and incorporate their recommendations as conditions of approval as necessary to ensure public safety. Continue to require compliance with all provisions of the most recently adopted version of the California Fire Code (with local amendments).”

“**EH-4.d Review Applications for Fire Safety.** Require applicants to identify defensible space and compliance with fire safety standards, and continue to work with local and State fire agencies to ensure that California Fire Code (with local amendments), County Development Code, and State standards for construction are applied uniformly countywide.”

“**EH-4.g Develop and Maintain Fuel Breaks and Access Routes.** Work with public agencies and private landowners to construct and maintain fuel breaks and emergency access routes to facilitate effective fire suppression.”

“**EH-4.h Require Adequate Clearance.** Require standards for clearance of vegetation on vacant lots, and around structures, and landscaped areas to ensure timely and adequate removal of potential fire fuel on both public and private property.”
Additional to the Marin CWP (2007), the California Public Resources Code (PRC), California Fire Code and International Fire Code set the direction for fire management within Marin County. With regard to the former, Section 429126 of Chapter 3 Mountainous, Forest-, Brush-, and Grass-Covered Lands of the California PRC is a state-wide standard requiring 100 feet of defensible space from each side and from the front and rear of structures, but not beyond the property line. With regards to the latter, Marin County Ordinance No. 3550 provided for updates to the California Fire Code and International Fire Code, which have been included in Title 16 Fire of the Marin County Municipal Code since 2010. Pertinently, Section 16.16.040 of Title 16 requires the following setbacks, consistent with Marin County Ordinance No. 3550:


The 2016 California Fire Code and the 2015 International Fire Code is amended and changed in the following respects:

Section 4907.2 is hereby added to Chapter 49 and shall read as follows:

Section 4907.2. Fire Hazard Reduction. Any person who owns, leases, controls or maintains any building or structure and/or lands within specific Wildland Urban Interface areas of the jurisdiction of the Marin County Fire Department shall comply with the following: Cut and remove all combustible vegetation within 30 feet of structures, up to 150 feet when topographic or combustible vegetative types necessitate removal as determined by the Fire Code Official. Remove piles of accumulated dead vegetation on the property. Cut and remove tree limbs that overhang wood decks and roofs. Remove that portion of any tree which extends within 10 feet of any chimney or stovepipe. Clean any leaves and needles from roof and gutters. Cut and remove growth less than 3 inches in diameter, from the ground up to a maximum height of 10 feet, provided that no crown shall be raised to a point so as to remove branches from more than the lower one-third of the tree’s total height. Vegetation clearance requirements for new construction and substantial remodels in Wildland-Urban Interface Areas shall be in accordance with

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26http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=4291.&lawCode=PRC
the 2003 International Wildland-Urban Interface Code, as amended by the county of Marin.

Exception 1: When approved by the Fire Code Official, single specimens of trees, ornamental shrubbery or similar plants used as ground covers, provided that they do not form a means of rapidly transmitting fire from the native growth to any structure.

Exception 2: When approved by the Fire Code Official, grass and other vegetation located more than 30 feet (9144 mm) from buildings or structures less than 18 inches (457 mm) in height above the ground need not be removed where necessary to stabilize soil, and prevent erosion.

Marin County agrees that fire safety is imperative. Accordingly, the exemptions listed out in Master Response 6, as clarified and amplified, allow for suitable vegetation management while simultaneously supporting long-term enhancement of riparian function (i.e., recruitment of large woody debris that provides important winter shelter habitat for rearing salmonids) (see also Impact 5.1). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Master Response 17. Flood Hazard Implications

Concerns were raised with regard to flooding, including the safety of homes on the creek, and reinforcement of banks to prevent erosion and protect homes. One commenter stated that they filed multiple Federal Emergency Management Agency (FEMA) flood insurance claims since 2006 due to San Geronimo Creek flooding. Commenters are concerned that San Geronimo Creek is not included in flood protection programs and monitoring. Commenters are also concerned that homes are located within a short distance (e.g., 6 feet) of the creek, but the banks do not have reinforcement.

The below response focuses on policy-related comments rather than the physical environmental impacts of the Proposed Project, where the latter is the purpose of a CEQA analysis. As stated previously, public comments on the Draft SEIR expressing concern about the potential social and economic implications of the proposed mitigation measures will be considered by the Marin County Board of Supervisors as the process moves forward.
One of the primary purposes of restricting land use in the existing SCA is to protect flood control functions (Policy BIO-4.1 of the Marin CWP (2007)). Expansion of the SCA Ordinance under Mitigation Measure 5.1-1 has been proposed for protecting salmonids, including reductions in runoff and flood flashiness within San Geronimo Valley by minimizing increases of impermeable areas, retaining vegetation, avoiding soil exposure, and retaining established surface runoff pathways (see Section 3.2 for a discussion of hydrology and flood flashiness under existing conditions, as well as Impact 5.1 for a discussion of the potential impacts to hydrology under the Proposed Project). Vegetation buffers are especially important, serving the dual-benefits of protecting salmonid habitat and reducing flood risk (Prunuske Chatham and 2010).

With regard to FEMA, part of San Geronimo Valley (westward from Railroad Avenue in Woodacre) is within Flood Hazard Zone A, which is a 100 yr probability flood zone. Because Marin County is part of the Community Rating System (CRS), residents with properties partly or wholly within FEMA Flood Hazard Zone A qualify for a discount on their flood insurance premiums. More information on the CRS program can be found here: https://www.marincounty.org/depts/pw/divisions/creeks-bay-and-flood/fema-flood-information

Marin County implements flood management practices throughout the county, including within San Geronimo Valley. The Marin County Sheriff’s Office provides the Alert Marin service, through which residents can receive alerts straight to their phone about current emergencies. To register for the Alert Marin service, please follow the information on this webpage: https://www.marinsheriff.org/services/emergency-services/alert-marin

No properties within San Geronimo Valley are zoned F-1 or F-2 under the Development Code, as these zonings are reserved for properties with significant value for flood control (i.e., floodways). San Geronimo Valley is also not within a Floodplain Zone, but the western fringe of San Geronimo Valley (Lower San Geronimo Creek) is within a Dam Inundation Area27, because of dams in Lagunitas Creek.

Standard 24.04.560 of the Development Code sets a drainage setback: “All structures shall be set back from creeks, channels or other major waterways at least twenty feet from the top of bank or twenty feet plus twice the channel depth measured from the toe of the near embankment, whichever is greater.”

27 As shown on Map 2-12 of the Marin CWP (2007).
This applies throughout the County, including San Geronimo Valley, and means that land use permits are required for structures to stabilize or reinforce stream banks (i.e., mitigation proposed in the Draft SEIR does not introduce a new permitting requirement for stream bank reinforcement).

Although the general information above should be helpful for commenters to better understand the existing status of flood management practices, the relevant assessment is whether the mitigation proposed to protect salmonids in the SEIR would have adverse flood hazard implications. As aforementioned, the Expanded SCA Ordinance proposed under Mitigation 5.1-1 would be beneficial for reducing runoff and flood flashiness. The proposed mitigation has been assessed against the pertinent flood hazard goals, policies, and programs contained within the Marin CWP (2007). These include policies BIO-4.7, BIO-4.9, BIO 4-10 assessed in Table 2.1 of the Draft SEIR, and policy WR-1.3 assessed in Table 2-2 of the Draft SEIR. Additionally, Environmental Hazards Goal EH-3 provides for safety of people and property from flooding and inundation, and the following policies and programs:

**Policies:**

*“EH-3.1 Follow a Regulatory Approach. Utilize regulations instead of flood control projects whenever possible to minimize losses in areas where flooding is inevitable.”*

*“EH-3.2 Retain Natural Conditions. Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.”*

**Implementation Programs:**

*“EH-3.d Alert Property Owners. Notify owners of property in areas with inundation or flooding potential regarding those hazards when they seek development review or other related County services.”*

*“EH-3.f Require Hydrologic Studies. Continue to require submission of detailed hydrologic and geologic studies for any proposed development that could increase sedimentation of a watercourse or alter natural drainage patterns. Amend the Development Code to include findings to continue to regulate development in flood prone areas to ensure public*
health and safety and to preserve the hydraulic and geomorphic integrity of the stream system and associated habitat.”

“EH-3.j Review and Inspect Dams. Maintain permit authority over and continue to oversee construction of dams too small to be regulated by the State or federal government.”

“EH-3.m Maintain Flood Controls. Continue to implement adopted flood control programs, including limitations on land use activities in flood hazard areas and through repair and maintenance of necessary flood control structures.”

“EH-3.p Assess the Cumulative Impacts of Development in Watersheds on Flood Prone Areas. Consider the effects of upstream development, including impervious surfaces, alteration of drainage patterns, reduction of vegetation, increased sedimentation, and others, on the potential for flooding in low-lying areas. Consider watershed studies to gather detailed information.”

The SEIR, including proposed mitigation, is wholly consistent with these policies and implementation programs.

Master Response 18. Frequently Asked Questions Regarding Permits and Other Development Activities

Please find responses to frequently asked questions and requests by commenters set out below:

- Can I leave existing structures within 100 feet of the creek, without need for a new permit?

  Yes, if a structure was legally constructed, it would be classified as a nonconforming structure pursuant to the Development Code:

  “Nonconforming Structure. A structure that was legally constructed, but does not conform with this Development Code because amendments to this Development Code or the previous Marin County Zoning Ordinance made the structure nonconforming in its size, location on its site, separation from other structures, number of parking spaces provided, or other features.”

  As provided for by Section 22.112.020 C and D of the Development Code:
“Nonconforming structures. A nonconforming structure may be allowed to continue being used unless the structure is demolished. However, if the nonconforming structure is demolished as a result of a natural disaster its reconstruction shall be allowed as provided for in section 22.112.020.E (Reconstruction after damage or destruction).

Conforming additions. Additions to a nonconforming structure may be made as long as the additions are in conformance with this Development Code.”

“Nonconforming use of a conforming structure. The nonconforming use of a structure may be continued, transferred, and sold, but not changed, increased, expanded, or intensified (e.g., longer hours of operation, more employees, etc.) Modifications to the nonconforming use of a structure may only occur as follows:

1. Expansion of use. The nonconforming use of a portion of a structure may be extended throughout the structure if it does not increase, expand, or intensify the nonconforming use.

2. Substitution of use. The nonconforming use of a structure may be changed to a use of the same or more restricted nature if the change does not result in an increase, expansion, or intensification of the nonconforming use as determined by the Director.

3. Relocation of use. The nonconforming use of a structure may not be relocated to another location on the parcel, or moved from the inside to an outside location, unless such relocation eliminates or substantially reduces the degree of nonconformity as determined by the Director.”

- Can I rebuild in the event of natural disaster?

Natural disaster is defined in the Development Code as follows:

“Natural Disaster. Any situation in which the force or forces which destroyed a structure were beyond the control of the owner, including fire, flood, storm, explosion, landslide, earthquake, or other similar conditions.”

Yes, rebuild is allowed under Section 2.112.020 E of the Development Code:

“Reconstruction after damage or destruction. The reconstruction of a nonconforming structure damaged or destroyed by fire, flood, earthquake or other natural disaster or as the result of an emergency may be allowed, provided that the following requirements are satisfied:
1. There is adequate information available regarding the pre-existing placement, height, bulk, and floor area of the structure to be reconstructed.

2. The extent of the nonconformity is not increased.

3. The structure shall be reconstructed on the same location on the lot (have the same structure footprint).

4. The structure shall be reconstructed with no greater height, bulk, or floor area than the original structure.

5. Reconstruction shall be vested within 24 months of the date of the damage, unless extended by the Director to respond to circumstances outside the property owner’s control.”

- What small-scale building projects do I need a permit for and how much will it cost?

   Depending on the project, various types of permits are required, which may include, but are not limited to:

   • Building permits (Title 19 of the Marin County Municipal Code), which are obtained from the Building and Safety sector of the Community Development Agency of Marin County.

   • Land use permits (Title 22 of the Marin County Municipal Code (i.e., the Development Code)), which are obtained from the Planning Division of the Community Development Agency of Marin County.

   • Creek, Encroachment, and Grading permits (Title 24 Development Standards), which are obtained from the Department of Public Works of Marin County.

   • Sewer (i.e., septic system) permits (Title 18 of the Marin County Municipal Code), which are obtained from the Environmental Health Services (EHS) sector of the Community Development Agency of Marin County.

   The Expanded SCA Ordinance under Mitigation Measure 5.1-1 would only change requirements for land use permits. In addition to existing land use permit requirements under the Development Code, discretionary land use permits and associated site assessments would be required for all new activities within the SCA that requires vegetation clearing, increases impermeable area, increases surface runoff, or results in exposed soil, in both planned and conventionally zoned districts, unless specific
exemptions included in the Final SEIR are achieved (see also Master Responses 8 and 18 regarding exemptions).

Further information on land use permits and associated fees can be found on the Marin County website: https://www.marincounty.org/depts/cd/divisions/planning/planning-applications-and-permits

- Will I need reports or permits to empty my septic tank?
  No permits are required for pumping (i.e., emptying) septic tanks at present, and permits for pumping are not proposed via the Draft or Final SEIR. Please refer to Master Response 6, Section 6.3 with regard to repairing, replacing, or constructing septic tanks.

- What activities within the SCA do not require a site assessment?
  Any activity that complies with all provisions of the Development Code without requiring a discretionary permit, and that also does not trigger any of the performance standards introduced by the Expanded SCA Ordinance under Mitigation Measure 5.1-1 would not require a site assessment for activities within the SCA (see also Master Response 6).

- The requirement for CDFW and NMFS review of all projects is too stringent. Homeowners should be allowed to hire their own expert if they wish.
  The requirement for site assessments is embedded in the Marin CWP (2007):

  “BIO-2.a Require Site Assessments. Require site assessment by a qualified professional for development applications that may adversely affect sensitive biological or wetland resources, including jurisdictional wetlands, occurrences of special-status species, occurrences of sensitive natural communities, and important wildlife nursery areas and movement corridors. The assessment should determine the presence or absence of any sensitive resources that could be affected by development, evaluate the potential impacts, and identify measures for protecting the resource and surrounding habitat.

  Require the assessment to be conducted by a qualified professional paid for by the applicant. Unless waived, the qualified professional should be hired directly by Marin County.”
Without site assessments, the impacts of activities to be permitted cannot be adequately assessed. In response to comments received from CDFW and others, the third bullet-point under Mitigation Measure 5.1-1 has been slightly modified as shown in Master Response 6 above. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

- **Do I need a permit for gardening and how much will it cost?**
  Marin County agrees to exemptions allowing certain vegetation trimming and removal under the first provision of Mitigation Measure 5.1-1, as stated in Master Response 6 above.

- **Can I remove storm debris from my property without a permit?**
  Marin County agrees to exemptions allowing certain vegetation trimming and removal under the first provision of Mitigation Measure 5.1-1, as stated in Master Response 8 above.

- **Will the SCA interfere with property insurance?**
  Property insurance rates are established independently by insurance companies, and depend on both the company and the plan. Marin County cannot comment on property insurance premiums or other insurance matters, and property owners should consult with their insurance providers for all insurance-related queries.

  Generally, Marin County strives to achieve special permit exemptions for activities to reduce risks to life and property, including fire hazard, in the Marin County Code. This is reflected in the response to “What activities within the SCA do not require a site assessment?” above.

- **Establish an Ombudsman position to intercede on homeowners’ behalf when County regulations and enforcement become excessive, contradictory, or counter-productive.**
  As established in Master Response 7 above, Sarah Phillips is currently in a position similar to an Ombudsman. Sarah is the Urban Streams Coordinator for the Marin Resource Conservation District, and is contactable for San Geronimo Creek conservation matters: mailto:sarah@marinrcd.org; phone: (415) 663-1170.
Complaints regarding government agencies and services fall under the watch of the Marin County Civil Grand Jury:
Response to Letters
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7.1 STATE AGENCY LETTERS
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Letter 1a—State Clearinghouse
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Rachel Reid
Marin County Community Development Agency
350 Civic Center Drive, #300E
San Rafael, CA 94903

Subject: 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to
Salmonids in San Geronimo Valley
SCHP: 2004022376

Dear Rachel Reid:

The State Clearinghouse submitted the above named Draft EIR to selected state agencies for review. The
review period closed on June 14, 2017, and no state agencies submitted comments by that date. This letter
acknowledges that you have complied with the State Clearinghouse review requirements for draft
environmental documents, pursuant to the California Environmental Quality Act.

Please call the State Clearinghouse at (916) 445-0613 if you have any questions regarding the
environmental review process. If you have a question about the above-named project, please refer to the
ten-digit State Clearinghouse number when contacting this office.

Sincerely,

Scott Mergan
Director, State Clearinghouse
### Document Details Report

**State Clearinghouse Data Base**

<table>
<thead>
<tr>
<th>SCHS</th>
<th>2004022976</th>
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<tr>
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<td>2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley</td>
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<tr>
<td>Lead Agency</td>
<td>Marin County</td>
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<td><strong>Type</strong></td>
<td>EIR Draft EIR</td>
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<tr>
<td><strong>Description</strong></td>
<td>Marin County Draft 2005 Countywide Plan Update</td>
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### Lead Agency Contact

| **Name** | Rachel Reid |
| **Agency** | Marin County Community Development Agency |
| **Phone** | 415-473-4863 |
| **Email** |  |
| **Address** | 3901 Civic Center Drive, #308, San Rafael, CA, 94903 |

### Project Location

| **County** | Marin |
| **City** |  |
| **Region** |  |
| **Lat/Long** |  |
| **Cross Streets** |  |
| **Parcel No.** |  |
| **Township** |  |
| **Range** |  |
| **Section** |  |
| **Base** |  |

### Proximity to:

- Highways
- Airports
- Railways
- Waterways
- Schools
- Land Use: 2007 Marin Countywide Plan

### Project Issues:

- Biological Resources; Wetland/Riparian; Growth Inducing; Landuse; Cumulative Effects

### Reviewing Agencies

- Resources Agency; California Coastal Commission; Department of Fish and Wildlife, Region 3; Department of Fish and Wildlife, Marine Region; Department of Parks and Recreation, San Francisco Bay Conservation and Development Commission; Department of Water Resources; California Highway Patrol; Caltrans, District 4; Office of Emergency Services, California; Native American Heritage Commission; State Lands Commission; Regional Water Quality Control Board, Region 2; State Water Resources Control Board; Division of Drinking Water

### Date Received

| 05/01/2017 | Start of Review | 05/01/2017 | End of Review | 06/14/2017 |

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**Note:** Blanks in data fields result from insufficient information provided by lead agency.
1a Comment noted.
Letter 1b—California Department of Fish and Wildlife
July 27, 2017

Ms. Rachel Reid, Environmental Planning Manager  
Marin County Redevelopment Agency  
3501 Civic Center Drive, Suite 308  
San Rafael, CA 94903

Dear Ms. Reid:

Subject: Comments to 2007 Marin Countywide Plan, Supplemental Environmental Impact Report, Marin County

The California Department of Fish and Wildlife (CDFW) reviewed the draft Supplemental Environmental Impact Report (SEIR) provided for the 2007 Marin Countywide Plan (2007 CWP).

The draft SEIR was received in our office in April 2017, and CDFW was given an extension via email until July 29, 2017 to respond.

CDFW is a Trustee Agency with responsibility under the California Environmental Quality Act (CEQA) §15386 for commenting on projects that could impact fish, plant and wildlife resources. CDFW is also considered a Responsible Agency if a project would require discretionary approval, such as the California Endangered Species Act (CESA) Permit, the Native Plant Protection Act, the Lake and Streambed Alteration Agreement (LSAA) and other provisions of the Fish and Game Code that afford protection to the State’s fish and wildlife trust resources. Pursuant to our jurisdiction, CDFW has the following concerns, comments, and recommendations regarding the Project.

PROJECT DESCRIPTION AND LOCATION

The Project includes future land use development specific to San Geronimo Valley. San Geronimo Valley is located in western Marin County, California, and is a subwatershed of the larger Lagunitas Creek watershed that drains to Tomales Bay. The Final Environmental Impact Report (EIR) for the Marin CWP (2007) was certified by the Marin County Board of Supervisors in November 2007 and the Marin CWP (2007) was adopted. Following the County’s certification of the Final EIR, the Salmon Protection and Watershed Network (SPAWN) filed a lawsuit challenging the adequacy of the EIR. SPAWN’s challenge was limited to the application of the Marin CWP and EIR to the San Geronimo Valley. On appeal, SPAWN’s challenge was further narrowed to two primary contentions: that the EIR failed to properly analyze the cumulative impacts on threatened salmonids of future development in the San Geronimo Valley watershed as contemplated by the Marin CWP (2007), and that the EIR relied on inadequate mitigation measures to reduce the impacts of development to a less-than-significant level. This supplemental analysis under CEQA has been mandated by the California Court of Appeal in a March 2014 opinion (Court order).

The CEQA document should identify reasonably foreseeable future projects in the Project vicinity, disclose any cumulative impacts associated with these projects, determine the significance of each cumulative impact, and assess the significance of the Project’s contribution.
Ms. Rachel Reid
July 27, 2017
Page 2

To the impact (CEQA Guidelines, §15355). Although a project’s impacts may be insignificant individually, its contributions to a cumulative impact may be considerable; a contribution to a significant cumulative impact – e.g., reduction of available habitat for a listed species – should be considered cumulatively considerable without mitigation to minimize or avoid the impact.

The CEQA Guidelines (§§15124 and 15378) require that the draft SEIR incorporate a full project description, including reasonably foreseeable future phases of the Project, and that contains sufficient information to evaluate and review the Project’s environmental impact. Please include a complete description of the following project components in the project description:

1b-c Under Section 2.4.1 Natural Systems and Agricultural Element, the draft SEIR should analyze the cumulative impact of invasive species on salmonid survival and the potential increase in the spreading of invasive species from the proposed development.

1b-d ENVIRONMENTAL SETTING
Sufficient information regarding the environmental setting is necessary to understand the project’s, and its alternative’s (if applicable), significant impacts on the environment (CEQA Guidelines, §§15125 and 15360). Please revise to include additional clarification for the following sections of the Environmental Setting:

II-d Section 3.1 Special-Status Anadromous Fish Species states that the San Geronimo Valley (SGV) has the most stable coho salmon population south of the Noyo River. Please address the on-going destabilization of the SGV population due in part to disturbance of salmonid habitat from development.

II-e Section 3.1.1 Life History and Habitat Requirements states that coho salmon spend one year in the Pacific Ocean. Please update to clarify that coho salmon spend two years in the Pacific Ocean.

II-f Section 3.6.3 Summer Rearing Habitat states that few studies or monitoring efforts have been conducted (with reference to summer rearing habitats). CDFW recommends doing an updated literature search on the subject regarding the number of juvenile rescue efforts during summer months; for example, please see the Marin Municipal Water District’s (MMWD) Salmonid Habitat Report regarding summer rearing habitat.

II-g Table 3-3 includes critical habitat elements for San Geronimo main stem. Please update to include critical habitat elements for San Geronimo Creek tributaries as they serve as essential habitat as well.

II-h CDFW recommends that the CEQA document prepared for the Project provide baseline habitat assessments for special-status plant, fish and wildlife species located and potentially located within the Project area and surrounding lands, including all rare, threatened, or endangered species (CEQA Guidelines, §15380). Fully protected, threatened or endangered, candidate, and other special-status species that are known to occur, or have the potential to occur in or near the Project site, include, but are not limited to:
1b-i

CDFW recommends that prior to project implementation surveys be conducted for special-status species with potential to occur, following recommended survey protocols if available. Survey and monitoring protocols and guidelines are available at: https://www.wildlife.ca.gov/Conservation/Survey-Protocol.

Botanical surveys for special-status plant species, including those listed by the California Native Plant Society (http://www.cnps.org/opus/rareplants/inventory/), must be conducted during the blooming period for all sensitive plant species potentially occurring within the Project area and requiring the identification of reference populations. Please refer to CDFW protocols for surveying and evaluating impacts to rare plants available at: https://www.wildlife.ca.gov/Conservation/Plants.

1b-j

CUMULATIVE IMPACT ANALYSIS AND MITIGATION MEASURES

The CEQA Guidelines (§15152.2) necessitate that the draft SEIR discuss all direct and indirect impacts (temporary and permanent) that may occur with implementation of the Project. This includes evaluating and describing impacts such as:

Section 5.1 Introduction and Approach to Impact Analyses

Section 5.1 Introduction and Approach to Impact Analyses states that impacts evaluated herein are considered indirect because they affect habitat conditions but do not directly impact individual fish. This area includes both federally and state listed threatened and endangered fish species. CDFW recommends updating this section to include a discussion of direct impacts from reduced water flow, food supply, increased water temperature, low dissolved oxygen, and reduced shelter resulting in higher predation to both listed species and other aquatic organisms.

Section 5.2 Impact Analyses

Mitigation Measure 5.1-1 Expand SCA Ordinance states that it would expand the set of development activities that require a permit and site assessment; please update this section to clarify and list the specific development activities included under this ordinance and effective date of the expansion. Mitigation Measure 5.1-1 also states that a qualified professional who has received training and certification from CDFW or National marine Fisheries Service (NMFS).
Ms. Rachel Reid  
July 27, 2017  
Page 4

1b-l will conduct assessments. CDFW is unable to train and certify individuals. CDFW recommends outlining minimum requirements for the proposed training program along with who, outside of CDFW, will conduct the training. CDFW, and potentially NMFS and the San Francisco Regional Water Quality Control Board (SPRW/QCB), may want to review and accept the Standard Management Practices (SMPs). Mitigation Measure 5.1-1 also states that discretionary permits will be required for projects in priority stream reaches. CDFW recommends outlining in this section when a discretionary permit by the County would be required, and CDFW recommends outlining how cumulative impacts will be assessed and analyzed for projects within a stream zone.

1b-m CDFW will require an LSAA, pursuant to Fish and Game Code §§ 1600 et. seq. for Project-related activities within any 1800-jurisdictional waters within the proposed Project area. Notification is required for any activity that will substantially divert or obstruct the natural flow; change or use material from the bed, channel, or banks including associated riparian or wetland resources; or deposit or dispose of material where it may pass into a river, lake or stream. Work within ephemeral streams, washes, watercourses with a subsurface flow, and floodplains are subject to notification requirements. CDFW, as a Responsible Agency under CEQA, will consider the CEQA document for the Project. CDFW may not execute the final LSAA until it has complied with CEQA (Public Resources Code § 21000 et seq.) as the responsible agency.

1b-o Floodplains provide important habitat for fish and other aquatic organisms; therefore, please add in Mitigation measure 5.1-2 Winter Habitat Enhancement Projects the goal of “reconnecting floodplain where possible” as recommended in the Salmonid Enhancement Plan.

1b-p Mitigation Measure 5.1-2 addresses the application of new drainage controls. Please update to address impacts from development to the bed, bank, and channel. These impacts may include altering on-site hydrology and geomorphology. Mitigation Measure 5.1-2 states that habitat improvements would increase habitat complexity and provide crucial high-flow refuge. CDFW recommends outlining how these habitat improvements would be quantified based on area impacted from development. Mitigation Measure 5.1-2 states that with the proposed mitigation measures, the impacts of the proposed projects on salmonid winter rearing habitat would be unlikely to contribute to the existing cumulative effects that limit survival and production in the watershed. CDFW recommends outlining how mitigation would be quantified and evaluated to assure avoidance of significant impacts to salmonids and other aquatic species.

Impact 5.2 Reduced Salmonid Spawning Success Due to Increased High Flow Frequency and Magnitude and Elevated Sediment Delivery

1b-q Impact 5.2 states that the proposed project is not capable of substantially avoiding or eliminating all impacts associated with future development. CDFW recommends that the draft EIR outline the impacts and the resulting mitigation and avoidance measures from these impacts. Proposed mitigation should directly benefit anadromous salmonids and their habitat in the most critical reaches.

1b-r Increasing total impervious areas (TIAs) impacts hydrology, storm water runoff, and increases the likelihood of channel incision. This has a direct impact on fish displacement and possibly reduces winter survival. CDFW recommends revising impact 5.2 to address these impacts.
Mitigation Measure 5.2.2 Stream habitat Enhancement Projects states that large woody debris (LWD) loading would occur within 10 years of a Basin Plan Amendment (BPA) and that floodplain restoration would occur within 5 years of BPA adoption. CDFW recommends implementation of mitigation prior to impacts, not based on the adoption of the BPA. A delay in mitigation would result in an increased temporal impact from the proposed developments. CDFW recommends that the County, with the help of their partners, develop assessments, opportunities and priorities for floodplain restoration. Specific criteria, design specifications, and guidelines for habitat enhancement projects should be developed in coordination with and approved by CDFW, and possibly with NMFS and SFRWQCB as well.

Mitigation Measure 5.2.2 also states that the proposed Project would have a less-than-significant impact, both individually and cumulatively on spawning success of coho salmon and steelhead in the San Geronimo Creek watershed. CDFW believes that past impacts have been significant to this watershed, and thus, any future impacts would be significant.

Impact 5.3. Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature.

Impact 5.3 states that summer baseflow conditions are noted by NMFS as “fair” in Lagunitas Creek. CDFW recommends that the draft SEIR only include the project area within the San Geronimo Creek (SGC) watershed in this assessment. SGC main stem and tributaries are disconnected in the summer rearing months and base flows are rated by CDFW as “poor.” Impact 5.3 also states that summer rearing is believed to be of lesser importance than winter rearing; the Limiting Factors Analysis model was conducted over a decade ago. The recent 2011-2016 drought has shown that summer rearing in SGC continues to be a key limiting factor especially where there is significant residential development and in the face of climate change. Please reassess this impact to include more recent data.

Impact 5.3 also states that, regarding increases in development, their incremental contribution to reduced habitat complexity would be relatively minor. Due to past and present impacts, CDFW believes that any minor impact would be significant. CDFW recommends this section to quantify what “minor” means and reassess any change as significant.

Finally, Impact 5.3 states that the proposed Project would have less-than-significant cumulative impacts on the ability of juvenile salmonids to successfully rear and grow. CDFW believes that due to significant past and present impacts, any added impact would contribute to the extirpation of salmonids in this watershed. CDFW recommends that this draft SEIR take into account, past and present impacts, as outlined in CEQA and the Court order.
Ms. Rachel Reid
July 27, 2017
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General Comments

1b-ad This draft SEIR should incorporate greater site specificity. Mitigation Measures should address critical migration, spawning, rearing reaches, and what types of projects would be implemented in these reaches. This should include assessing both the impact these areas and mitigation for deleterious impacts to salmonids. Per the Court’s order and requirements under CEQA, provide the kind of specific, concrete and enforceable mitigation measures necessary to reduce the impacts of significant impacts identified in the draft SEIR. The draft SEIR should evaluate past, present and future projects to inform the cumulative impacts analysis as required under Guidelines § 15160.

1b-ae The draft SEIR states that “an expanded SCA Ordinance consistent with Goal BIO-4 is a principal measure to mitigate the significant impacts of future development.” CDFW recommends that the draft SEIR include specific and enforceable timelines for completion and adoption of the expanded ordinance and performance standards.

1b-ag Based on the comprehensive analysis of the direct, indirect, and cumulative impacts of the Project, the CEQA Guidelines (§§ 15021, 15063, 15071, 15126.2, 15126.4 and 15370) direct the lead agency to consider and describe all feasible mitigation measures to avoid potentially significant impacts in the draft SEIR, and/or mitigate significant impacts of the Project on the environment. This includes a discussion of take avoidance and minimization measures for special-status species, which are recommended to be developed in early consultation with the U.S. Fish and Wildlife Service, NMFS and CDFW. These measures can then be incorporated as enforceable project conditions to reduce potential impacts to biological resources to less-than-significant levels.

Fully protected species may not be taken or possessed at any time (Fish and Game Code § 3511). Therefore, the draft SEIR is advised to include measures to ensure complete take avoidance of these fully protected species.

REGULATORY REQUIREMENTS

California Endangered Species Act

1b-ah Please be advised that a CESA permit must be obtained if the project has the potential to result in “take” of plants or animals listed under CESA, either during construction or over the life of the project. Issuance of a CESA Permit is subject to CEQA documentation; the CEQA document must specify impacts, mitigation measures, and a mitigation monitoring and reporting program. If the Project will impact CESA listed species, early consultation is encouraged, as significant modification to the Project and mitigation measures may be required in order to obtain a CESA Permit.

1b-ai CEQA requires a Mandatory Finding of Significance if a project is likely to substantially impact threatened or endangered species (CEQA §§ 21001(c), 21083, & CEQA Guidelines §§ 15380, 15064, 15065). Impacts must be avoided or mitigated to less-than-significant levels unless the CEQA Lead Agency makes and supports Findings of Overriding Consideration (FOC). The CEQA Lead Agency’s FOC does not eliminate the project proponent’s obligation to comply with Fish and Game Code § 2060.
FILING FEES
CDFW anticipates that the Project will have an impact on fish and/or wildlife, and assessment of filing fees is necessary (Fish and Game Code, § 711.4; Pub. Resources Code, § 21088). Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW.

If you have any questions, please contact Mr. James Hansen, Environmental Scientist, at (707) 576-2869 or James.Hansen@wildlife.ca.gov; or Ms. Karen Weiss, Senior Environmental Scientist (Supervisory), at (707) 944-5525.

Sincerely,

Scott Wilson
Regional Manager
Bay Delta Region


1b-a Comment noted.
1b-b Comment noted.
1b-c Please refer to Master Response 11.
1b-d As described in Section 3.2 of the SEIR, threats to salmonids from urbanization in the Lagunitas Creek watershed were rated very high for coho salmon (NMFS 2012) and high for steelhead (NMFS 2015). However, we found no data or analyses in published or unpublished sources specifically linking development in the San Geronimo Valley to destabilization of the coho salmon population.

1b-e The text in Section 3.1.1 has been revised to clarify that coho salmon typically spend one winter in fresh water and one winter in the ocean before returning to spawn in their 3rd year. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

1b-f The SEIR summarizes the most recent available information on salmonid summer habitat quantity and quality in San Geronimo Creek. Results of MMWD’s 2016 salmonid habitat survey in San Geronimo Creek (Ettlinger 2017), received in January 2018, have been incorporated into Sections 3 and 5 of the Final SEIR and in responses to comments. An additional literature search, conducted in January 2018 in response to this comment, found one account describing a juvenile salmonid rescue conducted in San Geronimo Creek during early July 2015 (Turtle Island Restoration Network 2015) but no additional monitoring data or analyses of summer habitat quantity or quality. A summary of the fish rescue, including the result of a dissolved oxygen measurement taken during the rescue, has been added in Section 3.6.3 of the SEIR.

1b-g The summer rearing habitat targets in Table 3-4 (previously Table 3-3) are based on values cited in the scientific literature and summarized in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010). The targets describe coho salmon and steelhead habitat suitability parameters and are not specific to the mainstem of San Geronimo Creek nor to any specific stream or watershed. The current conditions summarized in the table for each habitat target reflect the most recent available data for the San Geronimo Creek watershed, including tributaries where available.

1b-h A complete description of the environmental setting for biological resources, including special-status species with the potential to be
present in the Project area and affected by the Proposed Project, is included in the Final Environmental Impact Report (EIR) for the Marin CWP (2007). Additional information on special-status species is outside the required scope of this SEIR (see page vii).

1b-i Annual surveys for salmonid adults, juveniles, and smolts are conducted in San Geronimo Creek by MMWD and applicable results are summarized in the SEIR. Data from 2016 salmonid surveys in San Geronimo Creek, which became available after completion of the Draft SEIR, have been added to the Final SEIR. Low-flow habitat surveys of San Geronimo Creek were conducted in 2015 and are appended to the Draft SEIR as Appendix A.

1b-j Many habitat conditions and other factors, including those listed in the comment, can contribute to increased predation on juvenile salmonids. These effects are discussed in Section 5 and elsewhere in the SEIR and for analysis purposes are considered indirect effects because the potential for mortality by predation or other mechanisms would be an indirect, rather than direct, result of changes in these habitat factors.

1b-k Please refer to Master Responses 6.2 through 6.4.

1b-l Comment noted. Mitigation Measure 5.1-1 has been slightly modified in the Final SEIR to remove the reference to training and certification by CDFW and to outline qualification requirements for those conducting assessments. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.5.

1b-m A discretionary permit would be required for the land uses and activities listed in the first bullet point under Mitigation Measure 5.1-1, as well as for land uses and activities currently requiring a discretionary permit under the Development Code, in both the planned and conventional zoned districts. Please refer to Master Response 6.7.

1b-n Comment noted. Marin County obtains necessary federal and state authorizations, and undertakes consultation as required, for all County projects.
Although reconnecting floodplains where possible is stated as a goal in the San Geronimo Valley Salmonid Enhancement Plan (PCI 2010), the County has determined that reconnecting or restoring floodplains in the reaches of San Geronimo Creek and tributaries accessible to anadromous salmonids is not a feasible mitigation measure because there are few suitable locations due to encroachment by development and infrastructure, and because the participation of willing landowners, which would be a requirement, cannot be guaranteed.

We assume the commenter was referring to Mitigation Measure 5.1-1, which specifies requirements for low impact development (LID) measures including drainage controls. In response to this comment, Mitigation Measure 5.1-1 has been clarified and amplified to further expand the set of development activities that require a permit and site assessment to include activities that alter the stream bed, bank, or channel. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. For activities within the SCA, discretionary permits would be required to include LID practices and designs. Please refer to Master Response 6.7.

Further, Mitigation Measure 5.2-1 has been revised to require LID practices and designs for projects located outside the SCA. Please refer to Master Response 8.

The Proposed Project is the future land use and development specific to the San Geronimo Valley, consistent with the goals, policies, and programs of the Marin CWP (2007) that serve to avoid or minimize adverse impacts on biological and wetland resources in the County. The paragraph contained within Impact 5.2 referred to by the commenter is stating that the current exemptions and allowances of the Marin CWP (2007) and Development Code (i.e., without the mitigation proposed in the Draft SEIR) mean that the Proposed Project is not capable of substantially avoiding or eliminating all impacts to hydrology and sediment delivery associated with future development. The commenter appears to have been confused by the statement and/or taken the statement out of context. The Draft SEIR does cover cumulative impacts and mitigation in Section 5.

The analysis of potential impacts on redd scour (Impact 5.2) addresses increased storm flow magnitude and frequency, sediment
delivery, and streambed scour that would likely result from the expected increases in TIA under the Proposed Project. Because there is no direct correlation between TIA and these impacts that can be quantified using available data, the projected frequency of wet season flow reversals was used to evaluate impacts based on likely changes in hydrologic response. Please also refer to Master Response 4.2.

1b-u The statement referred to by the commenter explains that without the mitigation proposed in the Draft SEIR (i.e., without expanding the SCA to include the conventionally zoned district), 79% of parcels within San Geronimo Valley are exempt from complying with existing SCA provisions. The cumulative impact of the current situation, with exempt areas, is assessed in the Draft SEIR. The assessment concludes that expanding SCA provisions to conventional zoning districts would help avoid or minimize impacts and Measure 5.1-1 therefore requires this.

1b-v The cumulative impact of the exemptions described by the commenter is assessed in the SEIR and mitigation has been determined necessary to avoid or minimize significant cumulative impacts.

1b-w Please refer to Master Response 7.

1b-x Mitigation Measure 5.2-2 has been deleted as a separate mitigation measure in the Final SEIR. With clarification and amplification, Mitigation Measure 5.1-2 now covers all activities that were or would be included in Mitigation Measure 5.2-2 (see Master Response 9). Mitigation Measure 5.1-2 also has been clarified and amplified to eliminate reliance on targets, performance standards, and timelines specified in the Basin Plan Amendment (SFBRWQCB 2014b) (see Master Response 7). See Individual Response 1b-o regarding floodplain restoration.

1b-y We agree that past impacts on salmonid spawning success in the San Geronimo Valley have been significant and adverse. However, with mitigation the impacts of the Proposed Project would be less than significant on their own and would be unlikely to contribute considerably to the existing significant adverse impacts.

1b-z The NMFS habitat condition ratings are available only for the Lagunitas Creek watershed as a whole. While these ratings include available data for San Geronimo Creek, we found no summer salmonid habitat condition ratings specific to San Geronimo Creek and CDFW has not provided a source or citation for the “poor” rating stated in the comment.
The impact analysis incorporates the most recent available habitat data for San Geronimo Creek, including data on summer habitat collected by MMWD in 2011 (Ettlinger et al. 2013). More recent juvenile salmonid population data, collected in 2015 and 2016 and not evaluated for the Draft SEIR (but subsequently evaluated and incorporated into the Final SEIR), provide no clear indication that summer rearing habitat is limiting coho salmon or steelhead populations in the watershed. Despite low flows and warm stream temperatures in summer 2015, Ettlinger et al. (2016b) found little evidence that environmental conditions were limiting coho growth or physiological condition. The following spring, the estimated abundance of coho smolts outmigrating from San Geronimo Creek (1,097 smolts) was above average compared with recent years and represented 11% of the estimated coho salmon smolt production from the entire Lagunitas Creek watershed (Ettlinger et al. 2017a). Ettlinger et al. (2015c, 2016b, 2017b) hypothesize that adult coho salmon abundance, poor winter rearing habitat, and stream flows during incubation and fry emergence exert a stronger influence on juvenile coho salmon densities than habitat conditions during the summer rearing period. Accordingly, we find no evidence that the assumptions or conclusions of Potential Impact 5.3 should be revised based on these recent data. Please also refer to Master Response 5.

For purposes of the SEIR analysis, a minor impact in the context of salmonid ecology is one that would prevent salmonids in the San Geronimo Creek watershed from completing essential behaviors (migrating, reproducing, feeding, and sheltering) or substantially interfere with their ability to do so. In the context of CEQA and particularly with regard to the analysis of cumulative impacts, a minor impact is one that would make a less than considerable contribution to an existing significant adverse impact. Given the necessarily predictive nature of the impact analysis and the limitations of the available data, it is not possible to justifiably quantify a minor impact.

The SEIR analysis, including the analysis of impacts to summer rearing success, considers past and present impacts, as well as reasonably foreseeable future impacts that could occur with implementation of the Proposed Project, as required by CEQA and the Court’s opinion. The summer rearing analysis considers two potential impact mechanisms that could result from the Proposed Project: (1) reduced summer baseflow, and (2) reduced habitat complexity. While it is possible that, as stated in the comment, any additional impact to
summer rearing habitat in the San Geronimo Creek watershed could contribute to the extirpation of salmonids, available data are insufficient to: (1) establish a link between the Proposed Project and summer baseflow reductions, and (2) support the conclusion that Project-related reductions in summer habitat complexity would be sufficient to substantially or measurably reduce the ability of juvenile salmonids to forage or find shelter during the summer rearing period. As a result, impacts to summer rearing success are considered less than significant and would not make a considerable contribution to the existing significant adverse impact. Please also refer to Master Responses 2 and 5.

The SEIR identifies the most important reaches for each of the salmonid life stages analyzed and describes which reaches are and would be the most heavily impacted, based on available information. As described in Master Responses 6, 7, and 8, clarifications and amplifications have been made to Mitigation Measures 5.1-1, 5.1-2, and 5.2-1 to include additional specificity and revised implementation schedules. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered.

Clarifications and amplifications have been made to Mitigation Measures 5.1-1, 5.1-2, and 5.2-1 to include additional specificity and revised implementation schedules. Please also refer to Master Response 2 regarding impacts of actions not part of the Proposed Project, and Master Responses 6, 7, and 8 regarding mitigation measures. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered.

Please refer to Master Responses 6.2 and 6.3.

Please refer to Master Response 3

The SEIR is consistent with the State CEQA Guidelines sections referenced by the commenter, which require an analysis of potential impacts, identification of significant impacts, and mitigation to reduce or minimize significant impacts. Analysis of take avoidance is not a requirement of CEQA. As specified in the Court’s opinion, the principal action considered in the SEIR is adoption and implementation of the Marin CWP (2007) with respect to the San Geronimo Valley and the potential for effects on salmonids. In doing so, and consistent with
State CEQA Guidelines Section 15021, Marin County has considered environmental, economic, and social factors during development of all mitigation measures included in the SEIR. Please also refer to Master Response 3.

1b-ah Comment noted. The Proposed Project is not expected to result in take of any species listed under CESA and therefore a CESA permit would not be required.

1b-ai Comment noted. Please also refer to Master Response 3.

1b-aj Comment noted.
7.2 REGIONAL AGENCY LETTERS
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Letter 2—SF Bay Regional Water Quality Control Board
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Dear Ms. Ried:

Attached are Water Board comments on the SGVD SEIR.

Regards,
Xavier Fernandez
Senior Environmental Scientist
SF Bay Regional Water Quality Control Board
June 15, 2017

Marin County Community Development Agency
Planning Division
3501 Civic Center, Suite 308
San Rafael, CA 94903
Attn.: Rachel Reid
Email: envplanning@marincounty.org

Subject: Comments on the draft 2007 Marin Countywide Plan Supplemental EIR (SEIR) with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley, dated April 2017.

Dear Ms. Reid:

Thank you for the opportunity to comment on the draft 2007 Marin Countywide Plan Supplemental EIR (SEIR) with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley, dated April 2017. We have reviewed the document and have the following comments:

**Comment 1: Cumulative Impacts**

The analytical framework for identifying impacts to salmonid population viability, habitat and watershed processes critical to supporting salmonid life stages is not clearly identified. This SEIR appears to use a life cycle model approach by evaluating migration, spawning success, and winter rearing and summer rearing. However, this framework for analysis, if it is being used, is not clearly stated or explained. National Marine Fisheries Service (NMFS) uses a life cycle approach to identifying significant impacts on coho salmon population viability in the Final Recovery Plan for Central California Coast coho salmon ESU (Recovery Plan) (2012). Marin County also uses this approach in the San Geronimo Valley Salmon Enhancement Plan (SGVSEP) (2010). A life cycle model approach, in which impacts are identified and assessed at each life stage, is used for these plans because this model identifies and evaluates impacts that affect the short, medium and long-term viability of salmonid populations. Other models, such as a Limiting Factors Analysis (LFA), are very important and should additionally be used. However, LFA are most appropriate for determining the highest priority actions in the short- and medium-term timeframes. For an analysis such as this SEIR cumulative impacts analysis for permanent and short, medium and long-term impacts of development projects, it is essential to evaluate the impacts from a life cycle model approach.
Chapter 5.1, Introduction and Approach to Impact Analysis (pg. 5-2), states "the analysis evaluates the potential for cumulative impacts on the salmonid life stages that are most likely to be affected by future development in the watershed: incubating eggs, and juveniles rearing in during winter and summer." It is not clearly stated why these life stages are the most sensitive life stages to cumulative development impacts, or that the other life stages and their habitat requirements have been fully evaluated and determined to not merit further evaluation. Our review of data presented in the SCVSEF indicates that additional vulnerable life stages, and their associated essential behaviors or habitat requirements would include: a) Spawning: adequate quantity and spatial variability of spawning gravel; b) Migration/movement: adult, juvenile and smolt migration and movement during winter, spring, summer and fall (related to potential baseflow changes); and c) Juvenile rearing: all seasons of juvenile rearing, including winter, spring, summer and fall rearing conditions.

The discussion on pgs. 5-2 and 5-3 identifies significance criteria as “preventing salmonids in SGV watershed from completing essential behaviors (migrating, reproducing, feeding and sheltering)). We concur this is an essential analysis, however, other standard factors affecting population viability should be considered including potential Project impacts on: salmonid densities and abundance, genetic diversity, growth/health, age structure (steelhead), and population spatial structure. Data is available to inform quantitative assessments of some of these parameters such as density, growth and age structure. Other factors would require a more qualitative analysis.

Comment 2. Significance Criteria (Chapter 4, pgs 4-1, 4-2)

Page 4-2 identifies 3 specific criteria for determining if the proposed Project will have a significantly cumulative impact. In each case, the criteria incorporate qualifying factors as follows: 1) where populations have already been significantly adversely impacted; 2) where habitat has already been significantly adversely impacted; and 3) where migration patterns have already been significantly adversely impacted.

It is not clear why this qualifying criteria is used. We assume that if impacts have a significant cumulative impact on any life stage or critical habitat/watershed process, that it would be considered a significant adverse impact, regardless of whether it was previously impacted. For instance, if baseflow quantity or persistence is not currently significantly adversely impacted, but future development would have a significant cumulative impact, then this should be included as a potentially significant cumulative impact.

Additionally, the first significance criteria (pg 4-2) which states: “Have a cumulatively considerable adverse effect, either directly or through habitat modifications or impacts to critical watershed processes, on coho salmon, steelhead, or Chinook salmon where populations have already been significantly adversely impacted”, should be amended to include as indicated above with italics “impacts to critical watershed processes”.

Page 2 of 7
Comment 3. Impact Analysis and Mitigation Measures

Impacts 5.1 and 5.2
We concur with the findings in Section 5.1 that there will be significant cumulative impacts to reduced survival of fry and juveniles due to reduced winter rearing habitat quality. However, this finding should be modified to also incorporate the adverse changes in watershed processes that affect winter habitat (e.g., watershed hydrology). We further concur with impact 5.2 finding of “reduced salmonid spawning success due to increased high flow frequency and magnitude and elevated sediment delivery.”

Impact 5.3 Reduced Salmonid Summer Rearing Success Due to degraded Habitat conditions including reduced habitat complexity, reduced streamflow and increased water temperature.

The SEIR finds that the cumulative impacts will have “less than significant cumulative impact.” The above analysis does not include low dissolved oxygen levels and this should be considered. The analysis concludes that the overall incremental impacts will be small and the “incremental contribution to reduced habitat complexity would be relatively minor.” This statement is not supported by an analysis of the data on any basic factors such as Project impacts on abundance, density and growth, or more complex factors such as spatial structure, life history, or competition between salmonid species (steelhead and coho). Data analysis from the Lagunitas Creek Limiting Factors Analysis indicates that there is relatively low survival in a number of years from egg to late summer ranging from 0.67 – 4.52%. While these life stages are not identified as the limiting factor, this data indicates that there is significant mortality at some life stage(s) between spawning and fall rearing that has not yet been identified. This poor survival cannot be assumed to be solely due to egg incubation or redd scour effects, because this poor survival was observed in many different water years. The available data could be carefully evaluated to determine more closely which factors are affecting survival, but this has not been done. MMWD data related to coho and steelhead summer survival, growth and potential competition between species for habitat should be analyzed. In the absence of this evaluation, we assume that poor survival is the cumulative effect of impacts at each life stage from incubation to fall rearing.

Further supporting the need for additional analysis of the potential cumulative impacts of the Project on summer rearing, are analyses which were done as part of the NMFS Coho Recovery Plan (NMFS 2012) identifying that commercial/urban development impacts are a high risk to summer rearing. This viability analysis indicates high levels of impairment in summer rearing habitat resulting in a rating of “poor” for: LWD frequency; pool/riffle ratio; shelter; and riparian vegetation (tree diameter). Overall summer juvenile viability was given a “poor rating”.

San Geronimo Creek and Tributary Baseflows: The NMFS Coho Recovery Plan was written prior to the recent drought and did not take into account drought conditions in its rating of summer baseflows as “fair”. The recent summer analysis (SEIR Appendix B) indicated that most tributaries were dry, which would have likely led to a ‘poor rating’ in...
the coho Recovery Plan. Additionally, water quality during summer months does not meet the standards cited in the SEIR.

Many factors that are directly influenced by dry season baseflows affect juvenile summer and fall growth and survival. Growth in the summer is important, as winter survival is correlated to juvenile size (See Population and survival Indicators). A reduction in groundwater discharge to San Geronimo and its tributaries from new development hydrologic impacts could potentially lead to higher water temperatures, lower D.O., higher fish densities, and less growth, potentially resulting in reduced summer and winter survival. Protecting and enhancing base flow is critical and should be given a high priority. Protection of stream base flow cannot be deferred to a later date while a study is being conducted, as indicated under "voluntary mitigation measures" pg 5-26. Rather, protective measures should be incorporated at this time and modified as per study results. Specific potential impacts include the following:

- Stream temperature and dissolved oxygen (DO): Currently water temperatures in the summer exceed optimal temperatures and DO levels can be less than optimal for juvenile salmonids. Therefore degradation of water quality cannot be permitted and long-term improvement is necessary. Higher baseflows originating from cold groundwater recharge, in a Mediterranean climate such as San Geronimo, would have a positive effect on fish growth by reducing stream temperature and increasing DO. Protecting baseflows includes insuring that groundwater recharge is not reduced by Project development that increases impervious surfaces or increases road related surface runoff (see LID/road comment).

- Continuous flow; continuous flow with adequate flow depth through perennial stream reaches is a critical component for allowing juvenile fish to move between habitat units to forage, escape predators, or relocate from unsuitable conditions; and to provide a continuous source of food to pools from riffles (where the majority of summer drift insects are located). During fall and spring, it is essential for juveniles and smolts to have adequate flow to readjust their location in the watershed for better winter survival or for outmigration (smolts). Low spring or fall baseflows, or a change in the timing of baseflow increases/persistence, may inhibit this movement.

- Reducing impacts from high salmonid densities (density dependent interactions): Salmonids are territorial and when densities become too high there is an increase in antagonistic interactions for food and space, and increased mortality, lower growth and loss of fitness. When emigration is possible salmonids will frequently move into habitats with lower densities, if this habitat is available.
Comment 4. Chapter 5 Mitigation Measures

General Concerns

A. We cannot evaluate the adequacy of many of the mitigation measures such as those that will be included in a future ordinance or included in permit requirements or Standard Management Practices because there is little, if any, detail on the specifics of those requirements.

B. Avoidance: The SGVSEP recommends that high quality areas in the watershed should be preserved such as Arroyo. These high quality areas are not mentioned in the SEIR, and avoidance measure such as conservation easements or land purchase are not included as potential mitigation measures for preserving high quality habitat.

C. Mitigation (avoidance, minimization, rectifying etc). We have previously commented during the development of the SGVSEP that in order to successfully mitigate for future development impacts in the SGV watershed, the County should develop a watershed-wide restoration plan that achieves the following:
   - Reach-scale detail that analyzes the opportunities and constraints for in-stream and riparian zone restoration, and
   - Identifies high quality areas for preservation.

D. Several mitigation measures rely on reviews, approvals or trainings by CDF&W and NOAA. It is unclear that these agencies have established programs to review and approve these plans, or staffing capabilities. The measures indicated in Recovery Plan are voluntary measures.

E. Timelines and performance standards; there are no timeframes or measurable performance indicators for mitigation measures. For instream values such as pool frequency, shelter ratings, canopy cover- suggest using Recovery Plan criteria. Suggest LID performance criteria as indicated below (see LID).

F. Sediment TMDL: the San Francisco Bay Regional Water Quality Control Board (Regional Board) Lagunitas Creek fine Sediment Reduction and Habitat Enhancement Plan (Enhancement Plan), developed as part of the Lagunitas Creek Sediment TMDL, incorporates measures to reduce sediment discharges into Lagunitas Creek and its tributaries. The sediment reduction measures required of Marin County and other implementing parties are regulatory requirements under the Clean Water Act (e.g. to achieve a performance standard for roads of * < 350 cubic yards per mile per 20 year period). However, the elements of the Enhancement Plan related to habitat enhancement and LWD addition are voluntary measures (see Table 4.3 of Enhancement Plan).
Additionally, the TMDL was written prior to the development of this cumulative impacts analysis. It was assumed in developing the TMDL that the cumulative impacts from development in SGV, would be addressed specifically through additional mitigation identified in the SGV SEIR for cumulative impacts to salmonids. The TMDL does not include an analysis of future sediment discharges, but rather conducts an analysis of existing sediment discharges and required reductions in these discharges. The TMDL does not provide for any increases in sediment discharges in the watershed, but rather reductions for all identified sources including roads, channel incision and bank erosion, gullies, landslides and stormwater/construction development impacts. The evaluation of existing paved roads and road maintenance practices and related sediment reduction measures, as required by TMDL, should reduce overall current sediment loading to San Geronimo Creek. However, additional measures related to new infrastructure (i.e. private roads and driveways, new county roads, and culverts) and impervious surfaces (see Section xx below) should be specifically identified and incorporated into SEIR mitigation measures, rather than relying on TMDL measures.

Further, TMDL timelines for sediment reduction and habitat enhancement are not suitable as timelines to mitigate impacts from Project impacts. For the TMDL, the TMDL performance standards have a 20 year timeframe for achievement.

Comment 5. Mitigation Impacts for Changes in Watershed Hydrologic Processes

New development and redevelopment within the SGV Watershed will increase winter storm flow magnitude and frequency as a result of additional stormwater runoff from new or replaced impervious surfaces. The Lagunitas Creek watershed and its tributaries (SGV watershed) are currently listed as impaired by sediment due, in part from increased runoff caused by increases in impervious surfaces related to development and its associated infrastructure (e.g. roads). We appreciate inclusion of mitigation measures to reduce significant effects from increased flows that incorporate measures in the Lagunitas Creek TMDL and requirements in the small municipal stormwater permit. Specifically, the addition of large woody debris (TMDL) and LID requirements (small municipal stormwater permit). These mitigation measures alone, however, will be insufficient to prevent significant impacts from increased flows caused by new and replaced impervious surfaces because: 1) the TMDL measures do not address new impervious surfaces from additional development; 2) new public or private road hydromodification impacts are not addressed; and 3) the small municipal stormwater permit includes exceptions or reduced requirements for single family homes, new roads that create less than 5,000 square feet of continuous impervious surfaces, and structures ancillary to existing roads.

Further, the LID mitigation measures recommended in the SEIR are required for specific sub-watersheds rather than all sub-watersheds. While a change in hydrology in a specific sub-watershed may be small relative to the sub-watershed’s overall...
hydrology, the downstream impacts are cumulative and integrated in lower downstream reaches of other sub-watersheds. An example of this is the lower San Geronimo sub-watershed which receives all of the flow from watersheds upstream and has critical spawning and rearing habitat. Therefore, we recommend that the mitigation measures include LID requirements for all development projects, in all sub-watersheds, throughout the watershed (in or out of SCA). In addition, we recommend that the LID requirements in the mitigation measures be sized to ensure that post-project stormwater discharge rates and durations match pre-project discharge rates and durations from 10 percent of the pre-project 2-year peak flow up to the pre-project 10-year peak flow. It is unclear whether the SEIR requirement to prevent offsite discharges for up to the 95th percentile 24-hour rainfall event meets this standard. Further we recommend considering sub-watershed and watershed regional measures to address increases in flow resulting from future development within the watershed. Additionally, specific standards for paved and dirt roads (private and public) should be included in mitigation measures.

Comment 6. Miscellaneous Comments

- Sewage, nutrients and other pollutants: the SEIR does not consider the impacts of sewage, nutrients, and stormwater pollutants on water quality.

If you have any questions concerning this letter, please contact Nicole Fairley of my staff at (510) 622-2424 or nicole.fairley@waterboards.ca.gov.

Sincerely,

Xavier Fernandez
North Bay Section Leader
Watershed Division
2a Please refer to Master Response 5.

2b Please refer to Master Response 5.

2c Pursuant to the State CEQA Guidelines and the Court’s opinion, the analysis in the SEIR is focused specifically on cumulative impacts and thus the criteria defining an impact’s significance are likewise specific to cumulative impacts. Accordingly, the significance criteria used in the analysis have been modified from the criteria found in Appendix G of the Guidelines to add clarifying qualifications. For an impact to be considered significant in the SEIR it must be determined to be significant and adverse, and must make a cumulatively considerable contribution to an already significant adverse impact.

2d The phrase, “critical watershed processes” has been added to the first significance criterion in Section 4, as requested.

2e The analysis and conclusions of Impact 5.1 are based largely on predicted adverse modifications to watershed hydrology that would result from increased TIA under the Proposed Project and the resulting adverse impacts on winter habitat for fry and juvenile salmonids. This approach is described in Sections 5.1 and 5.2 and changes to the SEIR to further explain or emphasize this approach is considered unnecessary.

2f Dissolved oxygen is considered and discussed, either directly or in terms of its inverse relationship to water temperature, in the analysis of existing conditions and potential impacts of the Proposed Project on summer rearing habitat (Potential Impact 5.3). Because there is insufficient evidence linking future development to reduced dissolved oxygen levels or its causes, dissolved oxygen is not and cannot be specifically implicated as a cause of adverse impacts under Potential Impact 5.3. Additional summary information regarding available dissolved oxygen data has been added to Section 3.4 of the SEIR.

2g Please refer to Master Response 5.

2h Please refer to Master Response 5.

2i We agree that summer baseflow and suitable water temperature and dissolved oxygen are important for juvenile salmonid growth, rearing success, and survival and that baseflow should be protected. Mitigation Measure 5.2-1 has been clarified and amplified to include specificity regarding measures that will reduce hydrologic alteration related to development and roads. These measures will help protect summer baseflows by minimizing increases in surface runoff and promoting
groundwater recharge. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 5.

2j Comment noted. Please also refer to Individual Response 2i.

2k Comment noted. We agree with the importance of continuous flow for salmonids and the potential impacts described in the comment.

2l Comment noted. We agree with the potential for density-dependent impacts described in the comment.

2m Please refer to Master Responses 6 (including 6.6 for SMPs), 7, 8, and 9.

2n Please refer to Master Response 7.

2o Please refer to Master Response 7.

2p Mitigation Measure 5.1-1 has been slightly modified in the Final SEIR to remove the reference to training and certification by CDFW and outline qualification requirements for those conducting assessments. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.5.

2q Please refer to Master Responses 3, 6, and 7.

2r Mitigation Measure 5.2-1 has been clarified and amplified in the Final SEIR to eliminate reliance on targets, performance standards, and timelines specified in the 2014 Basin Plan Amendment. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 8.

2s With respect to new public or private roads, a new table (Table 2-4) has been added to the SEIR to present assumptions regarding future conditions for TIA types, including roads. The County does not plan to build any new public roads in San Geronimo Valley, although individual private development projects could apply for a permit that includes development of a “paper street”, or a recorded undeveloped street that appears on County maps. Accordingly, Mitigation Measure 5.1-1 Provision 5 and Mitigation Measure 5.2-1 have been clarified and amplified to provide clarity regarding LID criteria for both paved and unpaved new road surfaces, both inside and outside the SCA. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Responses 6.6 and 8.
Requiring some degree of low impact development (LID) for stormwater management for all new development, regardless of location, is the current standard of practice in municipalities throughout the Pacific Northwest and in California Region 3 (Central Coast). It is a common concern that more recently adopted retention requirements fail to meet the standards for runoff first developed in the 1980’s.

Several related standards have been developed and applied across California and the United States to improve stormwater management practices and outcomes. For example, Public Law 110-140, Section 438 (passed into US law in December 2007) states “The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 ft² shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow” (note the 5,000 square foot threshold here, also). The US Department of Defense has subsequently interpreted “maximum extent technically feasible” as requiring retention of the 95th percentile 24-hour storm, which provides empirical evidence that this requirement is (1) feasible and (2) effective.

Demonstration of this effectiveness of this approach is available. In the course of Region 3 adopting an equivalent requirement for post-construction stormwater management, the Water Board commissioned a study by Northwest Hydraulic Consultants to present a comparison between this approach and more traditional discharge-based requirements (*Case Study of the Hydrologic Benefits of On-Site Retention in the Central Coast Region*, dated July 23, 2012). A representative graph from their model outputs is shown below:
Although this example covers only a single condition (SCS type “C” soils, single-family residential development) and a slightly narrower range of discharges than queried by the comment letter, the full range of presented results indicate that this provides equivalent level of protection from the perspective of flow durations for most combinations of soils and development types…and a dramatically greater level of protection when considering the full suite of potential impacts from hydromodification. Indeed, there’s really no comparison, which is why so many updated stormwater management regulations are now embracing this (post-1980’s) approach to flow control.

A slightly less rigorous, but even more widely applied standard (including, for example, the cities and towns in Contra Costa, Santa Clara, San Mateo Counties, and Vallejo and Fairfield-Suisun) requires retention of the 85th percentile 24-hour storm volume. No quantitative evaluation of the difference in performance between these two approaches is available, but the performance of these two standards (i.e., 85th vs. 95th percentile 24-hour storm volumes) can be quantified relative to one another. The purpose of such an evaluation is to determine the reduction in retained volume that would result from using a more widely adopted standard (the 85th percentile storm) in place of the more protective one (the 95th percentile storm), and then to explore whether other measures
could adequately compensate for the net effects on the flow regime. Making use of the daily rainfall record from the rain gage station closest to the San Geronimo Valley, Lagunitas Forest Knolls (station US1CAMR0031), the available daily average data from November 2014 through February 2018 was analyzed using the standard method of USEPA (2009). From these data the 85th percentile storm is 1.79 inches, which includes 59% of the total annual rainfall volume, and the 95th percentile storm is 3.12 inches, which includes 83% of the annual volume. Thus, about 40% more runoff would remain un-detained under the less restrictive standard, which necessitates additional measure(s) to achieve an equivalent outcome.

An effective “additional measure” would be a reduction in the threshold of new or replacement impervious area that would trigger drainage controls. At present, that threshold is 2,500 ft\(^2\) for single-family homes and small projects (BASMAA 2014)—any project that adds less than this amount of new or replacement impervious area is exempt from drainage controls, and so any such runoff is un-detained before being released to the surrounding drainage network. For the period 2000–2017, nearly half of all new single-family home permits in the valley (48%) created under 2,500 ft\(^2\) of new or replacement impervious area, which accounts for about one-third of the total “new-house imperviousness” added to the valley during this period. Lowering the threshold of drainage controls to 500 ft\(^2\) would capture every such project, which in turn would increase by one-half the area whose runoff would now be treated. Considering other, non-full-house additions and ancillary structures would only improve the magnitude of managed impervious area (since 2/3 of the impervious area from new additions 2000–2017 was added by projects between 500 and 2,500 ft\(^2\), and none from projects larger than 2,500 ft\(^2\)).

Based on these evaluations, Marin County concludes that reducing the retention requirements in the Draft SEIR (from the 95th percentile to the 85th percentile 24-hour storm) is compensated by lowering the threshold of imperviousness requiring drainage controls (from 2,500 to 500 ft\(^2\)). The 40% of annual rainfall that would not be treated by reducing the retention requirements from the 95th to the 85th percentile storms is closely matched by the greater area of (previously exempted) imperviousness that would now be subject to flow control. We conclude, assuming equivalent effectiveness of treatments, that reducing the storm-size requirement but increasing the net area of treated imperviousness will yield equivalent results in net runoff.

July 2018
Additional specificity, and an increase in some sizing factors, would be required in Appendix C and Appendix D of the Bay Area Stormwater Management Agencies Association (BASMAA) Post-Construction Manual (BASMAA 2014) if these documents are used to design sufficiently sized facilities to meet the objective of 59% of annual rainfall retained (i.e., up to the 85th percentile storm volume).

Accordingly, Mitigation Measure 5.1-1 Provision 5 and Mitigation Measure 5.2-1 have been updated to provide clarity regarding additional LID requirements both inside and outside the SCA for small projects including single-family homes and driveways creating 500 ft² or more of impervious surface. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Responses 6.6 and 8.

Regarding the concept of “regional measures” referenced in the comment, regional facilities are common (and, historically, primary) approaches to stormwater management. They echo end-of-pipe treatment approaches for water quality, under the assumption that a more centralized facility will minimize net cost and long-term maintenance. This is an understandable but typically misguided belief—large capital facilities can be difficult to site and permit, they provide no benefit for upstream watercourses, and they rarely achieve any recovery of the underlying watershed processes whose impairment led to problems in the first place. Retrofitting may be necessary in some subwatersheds, but the most productive approach in such situations will likely be distributed projects (e.g., “green streets”) rather than centralized ones (e.g., a detention pond). Given the generally rural character of San Geronimo Valley, the predominant form of stormwater conveyance is grassy swales/unpaved roadside ditches leading to a stream channel, such that the requirement for distributed projects is already met and retrofits of existing swales would not offer much, if any, benefit.

Dirt roads are more challenging—they can function hydrologically as close approximations of paved roads and can generate substantially more sediment, but they are often unpermitted in their construction and/or use. Mitigation Measure 5.1-1 Provision 5 and Mitigation Measure 5.2-1 have been clarified and amplified to provide clarity regarding LID criteria for both paved and unpaved new road surfaces, both inside and outside the SCA. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and
recirculation is not triggered. Please also refer to Master Responses 6.6 and 8.

Please refer to Master Response 15 (sewage) and Master Responses 6.6, 6.7, and 8 (stormwater). Please also refer to Individual Responses 15k, 15l, 15ad, 15ae, and 15af regarding water quality impacts.
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Letter 3—Marin Municipal Water District
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Taylor, Tammy

From: Gregory Andrew <gandrew@marinwater.org>
Sent: Thursday, June 15, 2017 11:45 AM
To: EnvPlanning
Cc: Taylor, Tammy; Crystal Yezman; Mike Swezy; Dain Anderson; Eric Ettlinger; Nicholas Salcedo; Gregory Andrew
Subject: MMWD comments on Marin Countywide Plan SDEIR for San Geronimo Valley

Hello Marin County Environmental Planning,

The Marin Municipal Water District is preparing comments on the Draft 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmoinds in San Geronimo Valley.

We have reviewed the SDEIR but need a few more days of internal review and senior management approval on the comments before submitting them. It is our understanding that it will be ok to submit our comments next week, which will be enough time for us to prepare our comments. Please look for our comment letter before the end of next week.

Thank you for this consideration,
Greg

Gregory Andrew
Fishery Program Manager

Follow us on the Web, Twitter, Facebook and our Blog.
3 Comment noted. Please see the responses to Letter 4 below.
Letter 4—Marin Municipal Water District
Rachel Reid  
Marin County Community Development Agency  
3501 Civic Center Drive, Suite 308  
San Rafael, CA 94903

Re: Marin Countywide Plan Draft Supplemental EIR (DSEIR) - Focus on San Geronimo Valley

Dear Ms. Reid:

Marin Municipal Water District (MMWD) staff has reviewed the Marin Countywide Plan Draft Supplemental EIR (DSEIR) - Focus on San Geronimo Valley and offer the following comments:

Page 3-20, Table 3-1: It appears that the DSEIR utilizes only 2 data points to characterize a trend with regard to fine sediment deposition in San Geronimo Creek. Normally, trend projections involve considerably more data points than two to avoid single or even short-term data anomalies or unique events. For example, Figure 11 of the Lagunitas Creek Salmonid Habitat Report (Ettlinger et al. 2013) shows an increase in gravel and a decrease in fine sediments between 2006 and 2011 in lower San Geronimo Creek, but a worsening trend since 2003 and no change since 1998. Changes between the most recent two surveys do not appear to support an improving trend in streambed quality in lower San Geronimo Creek. [Ettlinger, Eric, B. Schleifer, and G. Andrew. 2013. Lagunitas Creek Salmonid Habitat 2011. Marin Municipal Water District.]

Page 3-25, Table 3-2: Ettlinger et al. (2013) should be cited as the source of data on wood and pool frequencies.

Page 3-29, Table 3-3: Fish shelter increased modestly in lower San Geronimo Creek between 2006 and 2011, but was far below what was observed in 2003 and 1998. This does not support an increasing trend in shelter as suggested in the DSEIR. An increase in fish shelter in upper San Geronimo Creek is supported by the available data (Ettlinger et al. 2013).

Page B-3, Table 2. The minimum depth criterion for coho salmon cited in the DSEIR may not be the optimum, based on review of published literature that suggests the species prefers a minimum depth of 1.0 foot (Listelie 2007). [Listelie, L. 2007. Coho Salmon (Oncorhynchus kisutch) Life History Patterns in the Pacific Northwest and California. Final Report Prepared for the U.S. Bureau of Reclamation, Klamath Area Office, Klamath Falls, Oregon].

LETTER # 4
If you would like to discuss this further, please contact Dain Anderson, Environmental Services Coordinator, at 415-945-1586.

Sincerely,

Crystal Yezman
Manager of Facilities and Watershed
LAGUNITAS CREEK SALMONID HABITAT 2011

Prepared by:

Eric Etlinger, Aquatic Ecologist
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Marin Municipal Water District
220 Nellen Avenue
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May 2013
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EXECUTIVE SUMMARY

During the fall of 2011, Marin Municipal Water District staff conducted a habitat typing survey of Lagunitas Creek and two of its tributaries, San Geronimo Creek and Devil’s Gulch. These surveys quantified aquatic habitat for coho salmon (Oncorhynchus kisutch) and steelhead trout (O. mykiss). This report analyzes the data collected during that survey and compares them with data collected during habitat typing surveys between 1992 and 2006.

Many factors could be responsible for the changes in habitat observed between 2006 and 2011, but a driving factor is likely the rebound in habitat conditions following the major flood in December, 2005. Some of the logs that were recruited to upper Lagunitas Creek during that storm appear to have migrated downstream, and as they did so, pools became less frequent in the upstream reaches and more frequent downstream. Bank vegetation increased and some of this vegetation provided additional cover over pools. Banks and slopes that were destabilized by the “New Year’s Flood” of 2005-06 may have increased the sediment supply while moderate flows in the intervening years limited sediment transport. As a result, the distribution of substrates became increasingly bimodal, with cobbles and fines increasing and gravel-dominated habitats decreasing. As fine sediments increased, spawning areas became more embedded.

The longer-term trends since 1997 vary between reaches and for different habitat parameters. On the positive side, wood loading has increased or remained stable in all reaches. Pool cover has increased in Devil’s Gulch. Bank vegetation appears to be increasing, but this parameter is highly subjective and the trend is difficult to interpret. Likewise, our observed increases in canopy cover were rendered unreliable due to methodological errors. On the downside, pool frequency has declined in upper San Geronimo Creek and Devil’s Gulch. Cover in pools has declined in most of Lagunitas and lower San Geronimo Creeks. Pool depths, substrate conditions, and embeddedness don’t show strong positive or negative trends. Overall, an increase in wood in the wetted channel has been the only measurably positive habitat trend in the study area. Decreases in pool frequency and total pool cover are worrisome negative trends in salmonid habitat over the last 14 years.
1.0 INTRODUCTION

Lagunitas Creek originates on the north slope of Mount Tamalpais and flows through a series of four water supply reservoirs, the downstream-most being Kent Lake. From there the creek flows northwestward for 12 miles where it discharges into Tomales Bay (Figure 1). The Lagunitas Creek watershed supports both coho salmon (Oncorhynchus kisutch) and steelhead trout (Oncorhynchus mykiss), as well as California freshwater shrimp (Palaemonetes pacificus). San Geronimo Creek, Devil’s Gulch, Nicasio Creek, and Olema Creek are the major tributaries to Lagunitas Creek. Devil’s Gulch, which flows through National Park and State Park land before entering Lagunitas Creek, is the smallest of these tributaries but it has perennial surface flows in addition to good habitat characteristics that make it an important salmonid stream. The San Geronimo Creek watershed, in contrast to Devil’s Gulch, is a mixture of private and public lands, and is the most developed part of the Lagunitas Creek watershed.

Much of the land within the Lagunitas Creek watershed is publicly owned by the Marin Municipal Water District (MMWD), California Department of Parks and Recreation (DPR), and the National Park Service (NPS). The San Geronimo Creek watershed is a mix of private land and county-owned lands of the Marin County Open Space District. Many agencies, organizations and individuals are working to improve the habitat for salmonids and other species in the watershed.

As part of its efforts to improve salmonid habitat, MMWD began habitat typing surveys of Lagunitas Creek in 1992. In 1995 the State Water Resource Control Board (SWRCB) mandated MMWD to monitor populations of salmonids and freshwater shrimp in Lagunitas Creek, as part of SWRCB Order WR95-17. In response to the Order, MMWD developed the Aquatic Resources Monitoring Workplan for the Lagunitas Creek Drainage (Trihey 1996), which was recently updated as part of the Lagunitas Creek Stewardship Plan (MMWD 2011). Both the workplan and the Stewardship Plan stipulate that habitat typing is to be conducted at least every five years, or more frequently if unusually high flow events alter the riparian zone and stream channel (Trihey 1996, MMWD 1997). Habitat typing enables MMWD to:

- Assess salmonid habitat composition and quality,
- Extrapolate fish densities at survey sites to similar habitats throughout the watershed, and
- Evaluate the success of habitat enhancement efforts.

Habitat typing was previously conducted in the Lagunitas Creek watershed in 1992, 1995, 1997, 1998 (completed in 1999), 2003, and 2006. The 2011 survey was conducted as scheduled since no channel-forming flows occurred in the previous five years.

2.0 METHODS

2.1 Habitat Typing

The Lagunitas Creek survey began in Point Reyes Station and ended at Peters Dam, approximately 12 miles upstream (Figure 1). The habitat survey for Devil’s Gulch began at its confluence with Lagunitas Creek and continued upstream for approximately two miles. San Geronimo Creek was surveyed from its confluence with Lagunitas Creek at Shaft Bridge, upstream
approximately five miles to the Dickson Weir in Woodacre, a grade control structure that is impassable to coho salmon.

Habitat typing protocols and methodology followed guidelines from the California Salmonid Stream Habitat Restoration Manual (Flossi et al. 2010). A “Level II” survey, which classifies habitats as either “pool,” “riffle,” or “flatwater,” was performed with two modifications. Throughout the survey, “flatwater” habitats were distinguished as either “run” or “glide”; and “riffle” habitats were identified as either “riffle” or “cascade.” Habitat unit classifications used in this survey were, therefore, identified as either “pool,” “run,” “riffle,” “glide” or “cascade.” Units encountered that did not definitively fall into one of these classifications were classified as “other” and measurements were taken where possible.

The habitat survey was conducted between late August and early October, prior to any significant rainfall or scheduled increase in stream flows. Flows in the mainstem of Lagunitas Creek are regulated and are typically between eight and ten cubic feet per second (cfs) at this time of year, in each year since the 1995 State Water Board Order. This consistency allows for comparisons between surveys conducted since 1995, without having any variations in flow conditions.

Surveys were conducted by walking upstream to a designated landmark. Parameters collected for each habitat are presented in Table 1. Habitats shorter than the stream width (typically short riffles) were lumped with the upstream unit and not identified as separate habitat units. Measurements were taken using a measuring tape and measuring rod. Data collection and rating criteria followed guidelines set forth by the California Salmonid Stream Habitat Restoration Manual (Flossi et al. 2002), using the “ten percent methodology.” This protocol requires that data be collected on all parameters for all pools and for 10% of other habitats. Habitat dimensions and a count of large woody pieces were collected for every habitat unit. Substrates, bank vegetation, bank composition and in-stream shelter were quantified for one in ten randomly selected habitats. Habitats were randomly selected by using the last digit of the most recent GPS coordinate reading. GPS coordinates as well as air and water temperatures (in degrees centigrade) were recorded at the start of every tenth habitat or new dataset.

2.2 Analysis of Parameters

Habitat typing data collected in 2011 were compared to data collected in 1992, 1995, 1997 and 1998 (data from Lagunitas Creek below Nicasio Creek were collected in 1999), 2003 and 2006. For all years, data from side channel habitats were not analyzed. Habitat composition was determined by totaling the lengths of each habitat type (pool, riffle, run, etc.) and dividing by the total length of stream. Most other habitat comparisons are based on habitat surface area, but habitat composition is calculated by length in order to compare with past surveys when only habitat lengths were collected. Mean pool depths were calculated by totaling the pool volumes (mean length x mean width x mean depth) and dividing by the total pool surface area. Average maximum pool depths were determined by averaging the maximum depths of individual pools. Mean creek widths were calculated by dividing the total surface area of all habitats in a reach by the length of that reach.

Surveys since 2003 recorded fish cover in the field as the percentage of the habitat covered, plus an estimate of the contribution of each cover type (woody debris, terrestrial vegetation, etc.).
earlier years, shelter ratings were assigned to each cover type, which corresponded to a general level of contribution (16-25%, for example). To compare years, earlier shelter ratings were converted to a percentage using the midpoint of the contribution range while ensuring that the total of all cover types equaled 100%. An area was then calculated for each cover type for each habitat, and the total area of all cover types was always equal to the area of cover estimated in the field.

Since 2003 substrates were recorded as either dominant or sub-dominant, as opposed to estimating the contribution of each substrate type, as was done in 1997 and 1998-99. Comparing these datasets meant only comparing the areas dominated by each substrate. Sub-dominant substrates were not analyzed due to the uncertainty of their contribution in each habitat. Habitats were grouped by their most-abundant substrates and their surface areas were totaled. These totals were compared with the total surface area of each reach and with data from other years. Substrate data were collected for every pool and for 10% of other habitat types (as part of the 10% methodology), which overrepresented pool substrates in the dataset. To analyze these data, the area of pool substrates was multiplied by 10% before totaling the areas of dominant substrates. Sand was identified separately from silt/clay in 2003, but was lumped in all other surveys. Large cobble was identified separately from small cobble since 2003, but lumped in earlier surveys.

Bank vegetation data were collected similarly in all years, with the exception that since 2003 data from the right and left banks were recorded separately. The dominant vegetation type was recorded along with the percentage of the banks vegetated, between the water and 20 feet upslope. "Vegetated" banks included not just ground covered by plants, but areas stabilized by roots, which often required a subjective assessment of root extent. The proportions of banks covered by each vegetation type were calculated by multiplying habitat lengths by two (two banks), and then by the percentage of the banks vegetated by each type. When multiple vegetation types were recorded for a single habitat they were assumed to be equally abundant. Total lengths of vegetated bank were divided by reach lengths to produce the proportion of the reach vegetated by each vegetation type.

3.0 RESULTS

3.1 Habitat Composition and Dimensions

The overall habitat composition for Lagunitas Creek in 2011 was 44% pool, 23% run, 21% glide, and 12% riffle (Figure 2). The frequency of pools in 2011 was similar to that observed in previous years in all reaches of Lagunitas Creek, except for upstream of Shafer Bridge. Pools were least frequent between Devil's Gulch and Shafer Bridge and most frequent between Nicasio Creek and Tocaloma. Mean pool depths were the greatest yet observed downstream of Devil's Gulch but farther upstream pool depths were close to average (Figure 3). Pools were shorter than previously documented upstream of Tocaloma, and were less than half the length observed in 1997 (Figure 4).

Glide habitats were more abundant in Lagunitas Creek than had been previously documented. Upstream of Tocaloma, glides accounted for 26% of the creek, which is the most identified in
those reaches. The abundance of all other habitat types fell within the ranges documented in previous surveys.

In San Geronimo Creek, habitat proportions were similar to those documented in 2003 and 2006. Fewer pools were seen in the upper half of the creek than have ever been documented, while pools were more abundant than average downstream. Pool depths and lengths in both reach were similar to those documented in previous surveys.

In Devil's Gulch, riffle habitats were less common than previously documented while glide habitats made a significant contribution for the first time. Cascades made up 6% of the creek, which was the most documented in any creek for any survey. The number of pools, their depths and their lengths were similar to what was documented in 2003 and 2006.

The wetted channel of Lagunitas Creek between Devil's Gulch and Shafer Bridge became wider in 2011 than previously measured, and was nearly as wide as the channel downstream of Nicasio Creek (Figure 5). The narrowest reach of Lagunitas Creek was between Nicasio Creek and Tocaloma, where the creek becomes increasingly incised as it approaches the confluence with Nicasio Creek. San Geronimo Creek and Devil's Gulch were found to be wider, on average, than previously documented. Devil's Gulch has been steadily widening since 1999, expanding from eight feet to 11 feet wide.

3.2 Fish Cover

Pool cover was more abundant throughout Lagunitas Creek than in 2006 (Figure 6). The reasons for the increase differed between reaches, with terrestrial vegetation cover increasing most between Nicasio Creek and Tocaloma and between Devil's Gulch and Shafer Bridge. Root mass and large woody debris were largely responsible for the increased cover between Tocaloma and Devil's Gulch and upstream of Shafer Bridge, respectively.

Cover also increased in San Geronimo Creek, particularly in the upstream half (Figure 7). On average, 24% of pools in upper San Geronimo Creek were covered, which was the largest amount of cover ever recorded in this stream. Terrestrial vegetation was responsible for most of the increase in cover.

In Devil's Gulch, pool cover averaged 28%, nearly doubling from 2006. Nearly all cover types increased, and the largest increases were seen in terrestrial vegetation, woody debris, and undercut bank. In fact, these cover types were more abundant than during any previous survey.

Fewer large logs were found in Lagunitas Creek pools, both in the wetted and bankfull channels, compared to 2006. Logs were less abundant in upstream reaches but more abundant between Nicasio Creek and Tocaloma. Logs were more abundant overall, however, than in either 1998 or 2003. Large woody debris covered 3.5% of pools in 2011, on average, which was less than in 2006 but more than in 1998 or 2003. Despite the reduction in logs between 2006 and 2011, the percentage of pools with at least one large log increased in most reaches of Lagunitas Creek.
In San Geronimo Creek, the number of logs in the wetted channel was essentially unchanged from 2006 and 1998. The low log count in 2003 is unreliable. Cover provided by large woody debris was also very similar between 2011, 2006 and 1998.

In Devil’s Gulch, slightly fewer large logs were seen in the wetted channel but more were seen in the bankful channel. Large woody debris provided more cover, however, than was seen in previous surveys.

3.3 Bank Vegetation

Bank vegetation along Lagunitas Creek increased in extent throughout Lagunitas Creek, and returned to levels similar to what was documented in 1998-99 (Figure 8). However, the proportions of vegetation types differed substantially from previous surveys in most survey reaches. Evergreen tree cover (e.g., redwood and bay) was far more abundant upstream of Tocaloma than has been documented previously, while herbaceous vegetation and shrubs were rarely dominant. Farther downstream, deciduous trees (willow, alder and ash) were dominant over roughly 80% of the banks.

Along San Geronimo Creek, bank vegetation increased from 2003 and 2006, due to substantial increases in evergreen and deciduous trees (Figure 9). Approximately 70% of the banks were vegetated in lower San Geronimo Creek and 80% in the upper half. In Devil’s Gulch, evergreen trees were observed to be the dominant vegetation over nearly half the banks, and total vegetation cover rose sharply to 80%.

Canopy cover in Lagunitas Creek was observed to be between 83% and 94% upstream of Nicolas Creek, and evergreen trees comprised the greatest proportion of the canopy yet observed. Methodological problems associated with measuring canopy cover will be addressed in the Discussion.

3.4 Substrates

The largest change to the streambed of Lagunitas Creek between 2006 and 2011 was the decrease in gravel-dominated habitats (Figure 10). In the primary coho spawning reaches, upstream of Tocaloma, gravel-dominated habitats were less abundant than previously recorded and only half as abundant as in 2006. This decrease was accompanied by an increase in cobble and boulder-dominated habitats. Habitats dominated by fine substrates were less common between Tocaloma and Devil’s Gulch but more prevalent elsewhere. For the first time, a significant proportion of habitats were dominated by fine sediment upstream of Shafter Bridge.

Substrate conditions changed very little in the lower half of San Geronimo Creek since 2006, but in the upper half gravel-dominated habitats declined dramatically. Only a single pool was described as having gravel as the dominant substrate, while one third of the streambed was characterized as cobble-dominated. Fine sediment was dominant in 65% of the streambed; more than in 2006 but similar to what was observed in 1998 (Figure 11).

Devil’s Gulch substrate conditions changed the most of any reach in the study area. Fine sediments went from a minor component of the streambed to the dominant substrate in over half of
the creek. Gravel declined by a similar margin. The substrate size distribution is bimodal, with 80% of the streambed being dominated by either fines, cobbles or boulders.

Pool tail embeddedness increased in most survey reaches since 2006 but fell within the range of past estimates in all reaches except for Devil’s Gulch (Figure 12). Embeddedness in Devil’s Gulch was estimated at 41%, which was higher than previously estimated and higher than in any other reach other than upper San Geronimo Creek. In 2006 Devil’s Gulch embeddedness was the lowest of any reach. Since 1997 these estimates have been highly variable in the tributaries and between Nicasio Creek and Tocaloma, but relatively stable elsewhere in Lagunitas Creek.

4.0 DISCUSSION

Salmonid habitat in Lagunitas Creek and its surveyed tributaries showed both improvement and degradation between 2006 and 2011. Pools were generally more frequent, had more cover, and were by and large as deep or deeper than in 2006. Bank vegetation also appeared to increase in all reaches. On the other hand, pool area decreased overall, gravel became less abundant in the streambed, and both coarser material and fines were more frequently dominant. Related to the increase in fine sediments, pool tail embeddedness increased in most reaches, particularly in the tributaries.

Glide habitat in Lagunitas Creek was more abundant than ever recorded, contributing 23% of the creek length upstream of Nicasio Creek. In 2006 glides comprised 16% of the creek, and in 2003 less than 2% of the creek. While most of the glides identified in 2011 clearly met the definition of glide habitat, it appears that some glides would likely have been classified as shallow pools in previous years. Between 2003 and 2011, the maximum depth of glides upstream of Nicasio Creek increased from an average of 1.6 feet to 2.2 feet. At the same time, the ratio of the glides’ maximum depths to their mean depths (i.e., the heterogeneity of their depths) increased from 1.5 to 1.8. Deeper, more heterogeneous habitats (more like pools) appear to have been called glides in 2011 than in 2003. To improve consistency between surveys, a more stringent definition of glide habitat will be implemented prior to the next habitat survey.

Glide habitats were also more abundant in San Geronimo Creek and Devil’s Gulch than previously observed. In both streams the increase in glide habitat was associated with a decrease in run habitat. The proportion of pool habitat increased slightly in both creeks. In San Geronimo Creek, the small increase in glide habitat may have been related to lower flows in 2011. Flows in San Geronimo Creek were 0.34-0.52 cfs during the habitat survey, while flows were slightly higher (0.52-0.56 cfs) in 2006. In Devil’s Gulch, the large increase in fine substrates may have resulted in more uniform channel morphology and a large increase in glides.

Pool frequency (e.g. pools/mile) has been positively correlated with salmonid habitat quality (NMFS 1996), as has the ratio of pool to riffle habitat (Nichelson et al 1992). Pools were more frequent between Nicasio Creek and Devil’s Gulch than has been previously observed and were also longer. In fact, between Nicasio Creek and Tocaloma the high frequency of pools met the standard for a “properly functioning” stream for the first time (Figure 13). There were fewer pools upstream of Devil’s Gulch than have been documented since 1999, but the large increase in pools between Nicasio Creek and Tocaloma raised the total number of pools found in Lagunitas Creek to the highest yet observed. In lower San Geronimo Creek, pools became shorter and
more frequent. Changes in pool frequency appear to be related to wood loading, so that an increase in logs tended to coincide with an increase in pools (Figure 14). Changes in wood loading explain nearly half of the observed changes in pool frequency.

The number of large logs observed throughout the watershed decreased between 2006 and 2011, both in the wetted and bankfull channels. In both Lagunitas Creek and San Geronimo Creek, logs decreased upstream and increased downstream, suggesting a downstream movement of logs without adequate recruitment of additional logs in the upstream reaches (Figure 15). The proportion of pools containing at least one log remained relatively stable or increased in all reaches. This supports the hypothesis that pool frequencies are related to wood loading, with pool frequencies declining in reaches with reduced wood loading, and the proportion of pools with at least one log remaining relatively stable.

In the stream reaches that saw large increases in pool cover (Nicasio to Tocaloma, upper San Geronimo Creek, and Devil’s Gulch), terrestrial vegetation played the largest role in the increase. In each of these reaches, terrestrial vegetation provided more cover than had previously been observed. Bank vegetation may have been recovering from the large flood in 2006, when many mature trees were toppled. We’ve observed that these trees were often replaced by new, bushier growth that extended over the water. Winter stream flows between 2006 and 2011 were not high enough to prune this new growth back.

Bank growth could help explain the large increases in bank vegetation observed in 2011, although most of that increase was in evergreen vegetation (redwood and bay), which would not be expected to expand as quickly as herbaceous vegetation, shrubs or even alders. A more likely explanation may be the inherent bias associated with estimating the proportion of a bank stabilized by vegetation. The purpose of estimating bank vegetation is to assess bank stability, so tree roots are generally included in the vegetation estimate. Estimating vegetation cover on a redwood-dominated bank, for example, is difficult because while little vegetation may be growing between trees trunks, the bank may be highly stable. Thus, surveyor bias is introduced when estimating how much of an otherwise bare bank is being stabilized by tree roots. In 2011 surveys may have overestimated the extent of tree roots within otherwise bare banks.

Canopy cover in 2011 was greater than previously recorded in every stream reach. Not only were the mean estimates of canopy cover unusually high, but in many reaches the distribution of estimates were heavily skewed towards total canopy cover. As an example, in 2011 more than half of Lagunitas Creek habitats were observed to have at least 85% canopy cover. In 2006 only 3% of habitats had that much cover. This discrepancy appears to be largely a result of surveyor error. The most significant source of error was likely the locations at which canopy cover was measured. According to the California Salmonid Stream Habitat Restoration Manual (Flossel et al., 2010), canopy cover should be measured at the center of the stream habitat, and this is how canopy was measured in 2003 and 2006. In 2011, surveys recorded canopy cover at the upstream end of each habitat. The upstream ends of most habitats, particularly pools, are narrower than at the centers, so have denser canopies. Canopy cover estimates for 2011 are included in Figure 16 to provide a comprehensive summary, but these data are unreliable.

The large increase in fine sediments between 2006 and 2011 may have been a delayed effect of the 2006 flood. Uplift areas and banks destabilized in 2006 may have contributed a higher load
of fines in the intervening years. Winter stream flows were most likely inadequate to flush these sediments out of the creek. The decrease in gravels in most reaches, coupled with an increase in cobbles and boulders, is more difficult to explain. Stream flows since 2006 were inadequate to deliver cobbles and boulders, so these substrates were likely uncovered, but it's unclear how these larger substrates were uncovered given the low winter flows. This question warrants further investigation by a geomorphologist, and should be placed into the context of longer-term sediment dynamics in the Lagunitas Creek watershed.

Long-term habitat trends vary greatly among streams and for individual parameters. Since 1997, Lagunitas Creek has maintained a relatively stable number of pools while pool frequency appears to be declining in San Geronimo Creek and Devil's Gulch. Pool depths show no significant trends in any of the streams. The number of logs has increased or at least not declined in all streams. Cover in pools, which includes woody debris, has declined in Lagunitas and San Geronimo Creeks, but has increased in Devil's Gulch. Bank vegetation has been highly variable, with some indication of an overall increase throughout the study area. However, as described above, this apparent trend may be the result of surveyor bias. Substrate conditions and embeddedness have been highly variable and don't show strong trends. Overall, an increase in wood in the wetted channel has been the only measurably positive habitat trend in the study area, and that improvement may be offset by decreases in pool frequency and total pool cover.

5.0 CONCLUSIONS

The overall story of habitat changes between the previous habitat survey in 2006 and 2011 could be told as a recovery following a significant flood. A large volume of wood was recruited into the creek in 2005-06, and some of these logs may have have migrated downstream in the intervening years. As logs decreased between Devil's Gulch and Peters Dam, so did pools, while both logs and pools increased downstream. Bank vegetation recovered from the scouring that occurred in 2005-06, and some of this vegetation provided increased fish cover over pools. Slopes and banks destabilized by the flood increased the sediment supply in the intervening years, while moderate winter flows limited sediment transport.

The impact of these changes on coho is difficult to assess. Shorter, more frequent, and well-covered pools are beneficial for coho. However, pool habitat decreased in the primary spawning areas upstream of Devil's Gulch and in upper San Geronimo Creek. Pool depths were generally stable, despite an increase in fine sediments, but these sediments increased embeddedness, which is detrimental to incubating coho eggs.

The picture was also mixed for steelhead, which are more impacted by changes to the streambed than are coho (Sheppard and Johnson, 1985). The increase in cobble-dominated substrates may have provided more cover for steelhead fry, possibly ameliorating the incubation impacts of increased fine sediments. Steelhead rely less on wood and vegetative cover than coho, so are less impacted by changes in these habitat parameters. In summary, the habitat changes observed between 2006 and 2011 would not be expected to cause significant negative impacts to the Lagunitas Creek steelhead population.
6.0 REFERENCES


Table 1. Parameters recorded during habitat typing surveys

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Note: The 1995 Devil's Gulch survey covered only 1.4 miles. The 1992 survey did not cover Lagunitas Creek upstream of Shafter Bridge.

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Coho Salmon (*Oncorhynchus kisutch*) Life History Patterns in the Pacific Northwest and California

Final Report

March 2007

Prepared for
U.S. Bureau of Reclamation
Klamath Area Office

Prepared by
Lawrence C. Lestelle

Biostream
environmental

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Executive Summary

In 1997 coho salmon (Oncorhynchus kisutch) in the Klamath River basin, as part of the Southern Oregon Northern California Coasts evolutionary significant unit (SONCC Coho ESU), were listed as threatened under the Endangered Species Act (ESA). The National Marine Fisheries Service (NMFS) cited water management, water quality, loss of habitat, overfishing, and other factors as causing a serious decline of the species within this ESU.

In the Klamath basin, the roles of different habitats to the performance of coho salmon have been a subject of much debate and controversy. Of particular concern is the use and importance of the mainstem Klamath River relative to the tributaries. This issue has a significant bearing on how flows are to be regulated in the mainstem river for the protection and restoration of the species. It also bears on how managers perceive the relative importance of different habitats in formulating an overall recovery plan for coho salmon in this basin.

The purpose of this report is to review coho life history patterns and associated life stage specific survivals. The report is a stand-alone document that synthesizes a large body of scientific information on life histories of the species over most of their range in North America. Emphasis is given to the Pacific Northwest (Southeast Alaska, British Columbia, Washington, and Oregon) and California. The report describes patterns of life history evident across this range and variations from common patterns. It describes how coho salmon utilize different types of habitat, including various sizes of streams and rivers, as part of their repertoire of life history tactics.

This report also serves as a background reference for an analysis of coho performance in the Klamath River basin being prepared by Cramer Fish Sciences (CFS). Their analysis summarizes and synthesizes extensive data collected in the Klamath basin and includes the formulation of a life cycle model designed to help assess coho performance in the basin.

This report aims to describe the central themes of coho salmon life histories as well as the types and extent of variation documented in the Pacific Northwest and California. Two underlying questions are considered throughout the report. How similar are coho life history patterns across the species' range? And what kinds and extent of variation occur with respect to these patterns, particularly as variation might relate to the SONCC Coho ESU and Klamath River coho?

Life History Overview

Distribution Patterns

Coho salmon inhabit very small coastal streams as well as the largest rivers in western North America. Within larger river systems, coho salmon spawning is typically distributed in tributaries to mainstem rivers. This pattern for spawning principally in smaller streams has given coho salmon a reputation of being primarily associated with small rivers and streams.

In the ocean, coho salmon generally do not migrate as far as the other species of Pacific salmon and steelhead trout. Coho originating in rivers of California, Oregon, and Washington tend to feed along the Continental Shelf associated with the region of origin.

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Life Cycle Overview and Unique Characteristics

Most coho salmon across the species' geographic range have a three-year life cycle, divided about equally between time spent in fresh and salt water. The basic life history begins in natal streams when spawners mate and deposit eggs into nests dug in the stream substrate. Spawning typically occurs between mid autumn and early winter in small tributaries to larger rivers, though timing can occur much later for some populations.

Returning adults in populations at the southern end of the range (both California and southern Oregon) are sometimes stalled in their river entry due to a lack of rainfall and sufficient stream flow for upstream migration, delaying spawning, sometimes even pushing it into March. This suggests that southern coho populations may have greater flexibility in adjusting their maturation timing than more northern populations; maturation would appear to be controlled partially by entry into fresh water. Factors controlling variability in maturation timing of coho salmon are not well known.

After spawning, the adults die. Following egg incubation, surviving fry emerge from the substrate in late winter and spring and begin their free swimming life.

The emergent fry move quickly to slow velocity, quiescent waters, usually along the stream's margins or into backwaters where velocities are minimal, a consistent behavior across the species range. This affinity for slow velocity areas remains characteristic of juvenile coho throughout their freshwater life, unlike most other salmonid species.

Juvenile coho typically spend one year rearing in fresh water, during which time they may remain close to their natal sites or they may move considerable distances to find suitable summer and/or overwintering habitat. Dispersal by some fry to areas downstream shortly following fry emergence is a pattern seen throughout the geographic range of the species. In fall another movement pattern often occurs with juveniles in some areas of the river system redistributing to habitats more favorable for overwinter survival, particularly to off-channel habitats.

At approximately 18 months of age, coho juveniles undergo smoltification during spring and enter the marine environment, where they experience very rapid growth. Their smolt to adult survival rate can be strongly affected by exposure to large estuarine complexes like Puget Sound or the Strait of Georgia. In contrast, wild smolts entering the Pacific Ocean from the rivers along the outer coasts of Washington, Oregon, and California typically survive at 1/4 to 1/3 of rates for fish moving through large estuarine complexes. This difference gives populations originating inside the Strait of Juan de Fuca a tremendous boost in productivity compared to those along the outer coasts and makes them naturally more resilient to habitat perturbations.

Adult coho begin arriving at the entrances to their home rivers in late summer, but more typically in early autumn. Fish arrive earliest back to their home river in northernmost rivers and latest in populations further south. This pattern is related to the timing of fall and winter rains and increases in stream flow—flows typically rise later moving from north to south.

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Within the basic life history, variations exist in age structure, generally following patterns associated with latitude. One variation occurs because some juveniles spend an additional year rearing in fresh water and emigrate seaward at approximately 30 months of age; these return and spawn at four years of age. This life history pattern primarily occurs in more northern populations, particularly in Alaska. One notable occurrence of age 2 smolts has been found in Prairie Creek, tributary to Redwood Creek, in Northern California.

A central theme in the freshwater life history of juvenile coho is their close association with slow velocity habitats. Body morphology and fin sizes of juvenile coho salmon are particularly adapted to slow velocity habitats. Most coho juveniles have a laterally compressed body with long dorsal and anal fins, thought to be adaptations for life in slow water. In contrast, steelhead fry have cylindrical bodies in cross section with short dorsal and anal fins, adapted to higher velocity habitats than used by juvenile coho. Juvenile Chinook have a body form and fin sizes intermediate between coho and steelhead.

These differences in body shape and fin sizes are consistent with water velocity and depth preferences reported for these three species. Coho prefer much slower velocities than either steelhead or Chinook; Chinook preferences are intermediate between coho and steelhead. It is logical to expect that selection of habitat types by these species would reflect their adaptation to water velocity and depth.

Variation has been found to exist between regions both with respect to body morphology and swimming performance. Two morphological forms have been identified based on differences in body shape and fin size: a “coastal” form, characterized by large dorsal and anal fins and a deep robust body, and an “interior” form with smaller fins and a more streamlined body shape. These two forms have been found to have different swimming performance characteristics. The interior form has a body form and swimming performance that would generally favor long distance in-river migrations, such as occurs in the Fraser River. It is not known whether both morphological forms exist in the Klamath River, where both interior and coastal ecotypes occur. Differences have also been found in the body morphology between juveniles that inhabit lakes and those in streams.

Another aspect of life history that may differ between regions is foraging behavior. Foraging behaviors can vary between individuals of the same population or even of the same family. Four foraging behaviors have been identified in Northern California as distinct phenotypes, referred to as *floatvell* (the stereotypical coho foraging type), *margin-backswater*, *estuarine*, and *early emerging*. Juveniles typically do not switch to other foraging phenotypes once they begin to display a certain type. Three of the phenotypes are known to exist in other regions. One type (early emerging) may be unique to the southern portion of the species’ range (i.e., California). These phenotypes utilize habitats differently. The early emerging type has been characterized as being more trout-like than is common among juvenile coho. During summer this type forages only at dawn and dusk on drifting invertebrates. During the day, they seek refuge in undercut banks, often associated with cold seeps along terrace cutbanks. It has been suggested that this phenotype represents a pattern of adaptation significant to coho salmon in the southern portion of their range.
Freshwater Habitat Utilization

Spawning Migration

Adult coho salmon use the main channel of mainstream rivers and tributaries for migrating to spawning sites. They utilize all habitat types within the main stream and can generally be found holding to rest during the migration in deep water areas, particularly pools.

Survival during the freshwater migration is assumed to be high in streams of the Pacific Northwest. In short rivers where natural predators are not abundant, survival exclusive of any harvest impact is likely very high – it may approach 100% in many cases.

Spawning

Coho salmon tend to spawn in small streams or in side channels to larger rivers. They also sometimes spawn along the river margins of larger streams, but normally not in large numbers.

Coho salmon spawn heavily in groundwater channels where these habitats exist along the floodplains of rivers, often in relatively high densities.

Egg and Alevin Incubation

Survival from egg deposition to fry emergence can vary significantly between streams depending on stream characteristics and local conditions. Changes in stream conditions due to land use can severely reduce survival to emergence.

Average survival to emergence for coho in streams that might be considered typical in the Pacific Northwest is much less than occurs under optimal conditions in nature. In streams with no or relatively moderate and recent land use, survival to emergence averages approximately 30%, as seen in studies in Oregon, Washington, and British Columbia.

Two factors are most often cited as affecting the survival to emergence of coho salmon: fine sediment loading and bed scour. Following extensive and prolonged land use practices in a watershed, survival to emergence can be reduced by half or more. Survival in spring fed streams with upwelling groundwater is often much higher than in runoff streams.

Fry Colonization

Upon emergence coho fry move quickly to slow velocity habitats, typically along the channel margin, or they continue to move downstream. They have a strong affinity for very slow velocity water and generally move there as rapidly as possible. Fish that emerge during high flows can be swept downstream, moving them to less suitable habitats, increasing blooenergetic costs, and increasing predation exposure. Large rivers typically provide little suitable habitat for young coho fry.
Young coho fry that move to larger rivers can subsequently move into off-channel habitats as a result of their need for calm, slow velocity water.

Survival during the fry colonization stage is mostly density-independent because of the short time period involved. Estimated survival rates for Deer Creek in the Alsea watershed study (Oregon Coast) show a modest density-dependent effect. An estimate of the density-independent component of survival for Deer Creek is 81% during a period prior to logging and recently completed logging.

**Subyearling Summer Rearing**

Juvenile coho are found residing in a wide variety of stream types and sizes during summer. They are typically found in highest densities within their natal streams since the majority of fry usually do not migrate large distances from spawning sites.

The need for slow velocity water by juvenile coho remains strong during this life stage. Juvenile Chinook and steelhead will often be found feeding near velocity shears within main channels, while coho remain more closely associated with the shoreline or dense cover of woody debris. This pattern indicates a much stronger affinity for slow velocity by coho salmon than the other species during this life stage.

Juvenile coho are most often found in pools. The highest densities of juvenile coho during this life stage are usually found in the smallest streams. The large differences seen between densities of small and large streams likely occurs because a smaller proportion of the total cross-section in large streams provides depths and velocities preferred by juvenile coho salmon.

The influence of wood on rearing densities during summer is not the same across all stream types and sizes. Evidence exists that the affinity of juvenile coho salmon for wood accumulations increases through the summer with growth. In mainstream rivers during summer the presence of large wood is much more important than in small streams for juvenile coho salmon.

In large rivers, secondary channels (i.e., side channels and off-channel habitats) provide important rearing areas for juvenile coho. Groundwater channels are usually utilized almost exclusively by coho salmon and can be very productive for the species.

High water temperatures during summer can be an important factor affecting the distribution, growth, and survival of juvenile coho salmon. High water temperatures can trigger movement of juvenile coho salmon during summer, when little movement typically occurs. Movement occurs as fish seek refuge from high temperatures. One foraging behavior that has only been described in Northern California streams may be particularly adapted to use of thermal refugia.

Survival of juvenile coho salmon during summer can be strongly density-dependent in smaller streams. Competition for shrinking space—due to declining flows in late summer—and limited food results in reduced survival at higher juvenile abundance.
An estimate of the density-independent component of survival for Deer Creek (Alsea watershed, Oregon) is 80% during a period prior to logging and recently completed logging.

**Fall Redistribution and Overwintering**

In many streams, some juvenile coho salmon move from their summer rearing locations in fall, triggered by increased flows associated with autumn rainfall. This movement is another demonstration of the affinity that these fish have for slow velocity water. Water velocities increase in main stream habitats with rising flow, either dislodging juveniles from summer rearing sites or stimulating them to move to find more favorable habitats prior to the coming of larger, more frequent winter storms.

During this period of redistribution, some juvenile coho salmon immigrate into off-channel habitats. These habitats provide refuge from high flow velocities. This movement of juvenile coho salmon from mainstem streams during fall and winter appears to be due to fish leaving unfavorable areas in search of improved survival conditions. Within mainstem streams, they evacuate sites with high exposure to high velocities. Large wood accumulations are especially important as velocity refuge sites during winter, particularly in large streams. Juvenile coho have been found to rarely use cobble substrate as overwinter cover.

Overwinter survival of juvenile coho is approximately 2-6 times greater in off-channel habitats than within main channel habitats. This difference in survival rates between in-channel and off-channel habitats is especially important in watersheds that have undergone significant changes due to land use. Coho populations subject to high overwinter mortality—as experienced within main channel habitats—have much reduced life cycle productivity compared to populations with good overwinter habitat.

**Smolt Migration**

Smoltification and the corresponding smolt migration begins earlier in the southerly part of the species’ geographic range, being somewhat later in northern streams. The timing pattern is very similar in California, Oregon, Washington, and southern British Columbia.

A wide range of smolt outmigration patterns can exist within the overall critical time window in a single watershed. Both migration timing and rate of migration can be affected by smolt size, location in the watershed at the start of the migration, migration distance, and stream flow. This overview is focused primarily on free-flowing rivers.

Larger salmonid smolts, for several species including coho salmon, generally begin their migration earlier than smaller ones, presumably because smaller ones require additional time to gain size necessary for smoltification and for improved marine survival.

In streams on the Washington Coast, the coho smolt migration typically begins first for fish emigrating from off channel sites, followed by fish from runoff tributaries. Smolts emigrating from off channel sites are consistently larger than those coming from runoff tributaries.

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Early migrants tend to migrate downstream more slowly than late timed fish, a pattern that occurs for salmonid species in general.

Smolts that begin their migration far from the estuary generally travel downstream much faster than those that begin closer.

Flow can affect migration timing and migration rate, which has been well described in the Columbia River system. The effects of flow on migration rate is most evident through the extensive reservoir system of the Columbia and Snake rivers.

Factors that can affect the survival rates of migrant smolts in fresh water have been extensively studied in the Columbia and Snake rivers—and intensely debated. Much of the debate has focused on the relationship between mainstem flow and outmigrant survival. It is well known that predation can be high on juvenile salmonids as they outmigrate through impounded systems such as the Columbia River. The Columbia system has large populations of northern pikeminnow and exotic predatory fishes. It has often been assumed in these cases that the travel rate of smolts, affected by flow, determines predation rates by regulating the amount of time that juvenile migrants are exposed to the predators. More recent research, however, indicates that while migration rate is affected by flow, survival of yearling and older smolts appears to be largely a function of migration distance and not travel rate.

Within the mainstem Columbia River hydrosystem, another factor shown to be important to the survival of outmigrant yearling smolts is water temperature. It is thought the effect of temperature on yearling smolt survival operates mainly by affecting the activity of predatory fishes (pikeminnow and exotics)—as water temperatures increase, their feeding rate increases.

The effect of migration distance on yearling smolt survival has also been demonstrated for free-flowing streams upstream of Lower Granite Dam on the Snake River. A strong inverse relationship exists between survival and migration distance for hatchery spring Chinook smolts released at various hatchery sites in the Snake River system. In this case, it appears that water temperature during the period of migration does not help explain mortality within the free-flowing tributaries to the Snake River, suggesting that temperature has a stronger role in the prey-predator dynamics within the extensive reservoir system downstream.

Studies conducted in free-flowing rivers without pikeminnow and abundant exotics present suggest that smolt survival during their outmigration is typically very high.

Studies of wild coho smolts show that their migration is not continuous but interspersed by periods of holding. In many cases, it is not rapid once it has been initiated, apparently progressing as if in stages. Smolts generally use slow velocity habitats during periods of holding and resting.

**Discussion and Conclusions**

Two underlying questions are considered throughout this report as they relate to how coho salmon utilize physical habitats within a watershed. How similar are coho life history patterns...
across the species’ range? And what kinds and extent of variation occur with respect to these patterns, particularly as variation might relate to the SONCC Coho ESU and Klamath River coho?

These questions relate to Moyle’s statements about coho salmon in his book “Inland Fishes of California”:

“...evolutionary forces keep coho salmon (and other salmon) surprisingly uniform in morphology and life history throughout their range, while producing runs that show strong, genetically based adaptations to local or regional environments. In California coho populations are the southernmost for the species, and they have adapted to the extreme conditions (for the species) of many coastal streams.”

On its surface, Moyle’s statement may seem contradictory. He concludes that coho salmon show a high degree of uniformity (or similarity) in life history patterns across their range, yet he asserts there is also significant variation and local adaptation. In context, Moyle is saying that coho salmon—like other salmonid species—exhibit significant variation in life histories, but the range of variation remains within what he sees as unifying life history themes for the species. The central themes of life history similarity are morphology, age structure, spatial distribution within a watershed, general timing patterns of migrations and other movements, development and growth patterns, foraging patterns, effects of environmental stressors, and habitat use patterns—among others. But significant variations exists within these unifying themes, enabling considerable adaptation to local conditions.

One unifying theme in the freshwater life history of juvenile coho is their affinity for low velocity habitats in all life stages. Body morphology and fin sizes appear to be generally adapted to life in these habitats—withstanding variations that exist between coastal and interior forms (discussed further below). Their affinity for slow water is evident across the species’ range—in both northern and southern regions and coastal and interior regions. Juveniles in all life stages—though to a lesser extent during the smolt stage—primarily rear and seek refuge in slow velocities associated with pools, channel margins, backwaters, and off-channel sites (alooves, ponds, and groundwater channels). Their affinity for low velocity water is strongest during the fry (very young fry) and overwintering life stages.

This association with low velocity habitats tends to result in several patterns of distribution within a watershed. Juvenile rearing—particularly in summer—occurs to a large extent within the natal streams. Emergent fry generally remain relatively close to their natal areas, though some dispersal downstream typically occurs. The maximum extent that dispersal occurs downstream is not known. Spawning which occurs in higher gradient streams appears to result in a greater downstream dispersal of fry. In that case, the young move—or are displaced by high velocity flows—to low velocity habitats in reaches of lower gradient.

Another related distribution pattern is the association that juvenile coho have for physical cover. Cover types within the water column or overhead are preferred (wood, rooted macrophytes, roots, overhead structure), as opposed to substrate cover provided by cobbles or turbulence cover associated with velocity shears. In smaller streams, cover is not a strong determinant of habitat.
selection in summer, though association with it grows by summer's end. Physical cover appears to be a much greater determinant of habitat selection in large rivers, probably due to the likelihood for higher water velocities and more predators.

The affinity for low velocity habitats is particularly strong during winter. This season often brings rapidly changing, adverse conditions within a stream—both in coastal and interior regions—whether due to flow fluctuations or extreme cold and iceing. Survival appears to be strongly related to how successful juvenile coho are in locating suitable refuge from harsh conditions. Movement seems to be voluntional, or when flows are high, due to displacement. In dynamic rivers, redistribution to overwintering sites can be quite dramatic in terms of distances traveled and numbers of fish that move.

Off channel sites (aloves, ponds, groundwater channels) are particularly desirable overwintering habitats throughout the Pacific Northwest and California. These provide the highest survival rates compared to other habitats. Low velocity locations within main stream channels having undercut banks with exposed root mazes or sites of large wood accumulations also provide refuge habitat. Side channels with low velocities and some form of cover are also used. Juvenile coho rarely use cobble substrate for overwintering cover, as commonly occurs for juvenile steelhead.

Variations on the central themes of coho life history exist and several types could affect habitat utilization patterns. Juvenile coho in the southern part of the range can exhibit a summer movement pattern different from what is seen further north. This movement pattern appears to be a redistribution to find thermal refugia. There is no evidence that fish in the southern region have a higher thermal tolerance than fish further north, though some greater tolerance may exist. While the fate of fish that move in search of thermal refugia has not been determined, some do successfully arrive at cooler water sites. It is unknown what level of mortality or loss in other performance measures might occur while moving to refugia or the distance that fish can travel. The early emerging foraging phenotype, having some adaptation to warm conditions, may be suited for movement during early to mid summer to seek out refugia. Their larger size than other foraging phenotypes would be advantageous for such movement. Habitat utilization in warm water streams will reflect overlapping areas of tolerable temperatures and water velocities.

Another life history variation is seen in differences in body morphology and fin sizes between coastal and interior populations and associated swimming performances. It is not known how far south such a coastal-interior distinction might extend. Do both forms exist within the Klamath River basin? There is no evidence that these morphological forms have different habitat requirements, i.e., does the interior form, which has greater swimming stamina, have less of an affinity for slow water habitats than the coastal form? Or do cover type preferences differ between the forms? Evidence shows that both forms exhibit the same selection for slow water habitat types and cover types. Researchers have suggested that the adaptive benefit of these variations to interior coho (more streamlined body, smaller fins, greater swimming stamina) is in their ability to negotiate long in-river migrations, both as smolts and adults. An interior-type body form would presumably aid upper Klamath River coho in their movements (including summer and fall redistribution movements) within the mainstem Klamath River, if this body form occurs there.

Coho Salmon Life History Patterns
Perhaps the most obvious variation in life history patterns seen in southern coho populations is their ability to delay river entry timing during periods of drought or late arriving rainfall. In the extreme, river entry can apparently be stalled several months. This would thereby delay spawning and would presumably have cascading effects on emergence timing and subsequent growth and habitat use patterns.

Coho salmon exhibit a wide variety of life history patterns in large, diverse watersheds. These patterns are phenotypic expressions of the interaction of genotype and environmental factors. Among others, these factors include flow characteristics, gradient, water temperature, and habitat structure. Diverse phenotypic expressions enable the species to utilize a wide variety of physical habitats across a range of gradients, habitat sizes, and qualities—but within limits set by the species’ genetic blueprint. To understand the performance of a species in any watershed requires a life history perspective, seen across the full cycle.
Coho Salmon (*Oncorhynchus kisutch*) Life History Patterns in the Pacific Northwest and California

1.0 Introduction

In 1997 coho salmon (*Oncorhynchus kisutch*) in the Klamath River basin, as part of the Southern Oregon Northern California Coast evolutionary significant unit (SONCC Coho ESU), were listed as threatened under the Endangered Species Act (ESA). The National Marine Fisheries Service (NMFS) cited water management, water quality, loss of habitat, overfishing, and other factors as causing a serious decline of the species within this ESU. The SONCC Coho ESU is composed of populations produced between Cape Blanco in Southern Oregon (just north of the Rogue River) to Punta Gorda in Northern California (includes the Mattole River). The geographic setting of the SONCC Coho ESU includes three large basins, which include Klamath basin, and numerous smaller basins across diverse landscapes (Williams et al. 2006). The large basins encompass both interior and coastal type landscapes.

In the Klamath basin, the roles of different habitats to the performance of coho salmon have been a subject of much debate and controversy (Hardy and Addley 2001; Vogel 2003; NRC 2004). Of particular concern is the use and importance of the mainstem Klamath River relative to the tributaries. This issue has a significant bearing on how flows are to be regulated in the mainstem river for the protection and restoration of the species. It also bears on how managers perceive the relative importance of different habitats in formulating an overall recovery plan for coho salmon in this basin. Complicating this issue is the fact that habitats, including associated flow patterns, have been altered in both the mainstem and tributaries due to land use, flow regulation, and irrigation withdrawals.

The purpose of this report is to review coho life history patterns and associated life stage specific survivals. The report is a stand-alone document that synthesizes a large body of scientific information on life histories of the species over most of their range in North America. Emphasis is given to the Pacific Northwest (Southeast Alaska, British Columbia, Washington, and Oregon) and California. The report describes patterns of life history evident across this range and variations from common patterns. It describes how coho salmon utilize different types of habitat, including various sizes of streams and rivers, as part of their repertoire of life history tactics. Uncertainties are identified where evident.

This report is intended to serve as a background reference for an analysis of coho performance in the Klamath River basin being prepared by Cramer Fish Sciences (CFS). Their analysis summarizes and synthesizes extensive data collected in the Klamath basin and includes the formulation of a life cycle model designed to help assess coho performance in the basin. The CFS analysis is intended to assess the effects of flow regulation within the Klamath river relative to other survival factors in the basin. That analysis focuses on characteristics of habitat and populations within the Klamath basin. Therefore, the report presented here makes no attempt to synthesize various data sets from the Klamath watershed, nor to draw conclusions about specific
factors affecting coho population performance in that basin. The focus here is broader, though information from the Klamath basin is incorporated as part of the coastwide perspective. Some commentary is given to address specific situations in the Klamath basin to aid the reader in considering how Klamath population characteristics might differ or align with those in other basins.

This report is not redundant of the many other documents that summarize life history patterns of coho salmon (e.g., Shapovalov and Taft 1954; Laufle et al. 1986; Hassler 1987; Sandereock 1991; Pearey 1992; Behnke 2002; CDFG 2002; Moyle 2002; Quinn 2005). Those documents are used as the basis for some of the material presented here. A more in-depth presentation is provided here of habitat utilization patterns exhibited by the species and some of the factors believed to shape those patterns. To the extent that information is available, variations from common patterns are described. Survival rates associated with particular life history strategies are described where possible.

Life histories lie at the heart of the biology of a species (Stearns 1992). Life history traits are directly related to survival and reproduction—they are phenotypic expressions of the interaction of genotypic and environment. Individuals of a population that express different life history traits vary in fitness within a set of environmental conditions. This drives natural selection. Habitats are the templates that organize life history traits (Southwood 1977). The range of life history diversity within a species is the result of evolutionary trade-offs of costs versus benefits in the process of adaptation to habitats.

Each salmon species has a characteristic general life history pattern with unique attributes that separate it from the other species (Lichatowich 1999). Among these attributes are age structure, length of freshwater residence, and their spawning and rearing distributions within a watershed. These generalized life histories are central themes around which populations express life history variation in response to local habitat conditions (Lichatowich 1999). Moyle’s (2002) description of this dynamic is useful here:

“Coho salmon have thousands of semi-isolated populations in coastal streams over a wide range. At the same time, fish from different regions mix at sea, and individuals may ‘stray’ into nonnatal streams for spawning. These two opposing and dynamic evolutionary forces keep coho salmon (and other salmon) surprisingly uniform in morphology and life history throughout their range, while producing runs that show strong, genetically based adaptations to local or regional environments. In California coho populations are the southernmost for the species, and they have adapted to the extreme conditions (for the species) of many coastal streams.”

This report aims to describe the central themes of coho salmon life histories as related to habitat use as well as the types and extent of variation documented in the Pacific Northwest and California. Two underlying questions are considered throughout the report. How similar are coho life history patterns across the species’ range? And what kinds and extent of variation occur with respect to these patterns, particularly as variation might relate to the SONCC Coho ESU and Klamath River coho?
The report is organized into four sections:
1. Introduction
2. Life history overview
3. Freshwater habitat utilization
4. Discussion and conclusions

Section 2 provides an overview of the distribution and major life history characteristics of coho salmon. These topics are well covered elsewhere (e.g., Sandercock 1991) and the intention here is not to duplicate this material. Coverage here highlights recurring patterns and issues seen to be particularly applicable to the life history and performance of Klamath coho salmon as related to habitat utilization and survival.

Section 3 describes patterns and rates of utilization of different freshwater habitats by coho salmon as seen in various areas of western North America. Variations from and within these patterns are identified together with causal factors. Life stage specific survival rates are summarized.

Section 4 provides discussion and conclusions regarding the two central questions being examined: 1) how similar are life history patterns across the species’ range that relate to habitat utilization; and 2) what kind of variations are expressed by the species as they might relate to Klamath River coho?

2.0 Life History Overview

This section provides an overview of the major patterns and characteristics of coho life history in Western North America. Variations to life history themes are described, particularly as they might provide insight about variations in California coho life histories. Life history characteristics that can affect habitat utilization patterns are emphasized here.

2.1 Distribution Patterns

Populations of spawning coho salmon are distributed along the coasts of both the Asian and North American coasts of the North Pacific Ocean. In North America, they currently populate streams from Monterey Bay (Waddell and Scott creeks) in Central California (south of San Francisco Bay) to Point Hope on the northwest corner of Alaska (Sandercock 1991; Brown et al. 1994). They are much less common in both the northern and southern fringes of their distribution and most abundant across the mid section of their ranges (Sandercock 1991). Naturally produced coho in California, both in the SONCC ESU and Central California Coast Coho ESU (CCC Coho ESU), are believed to be alive in a general state of decline; the number of streams supporting the species is substantially reduced from historic distribution (Brown and Moyle 1991; CDFG 2002). This is particularly true on the extreme southern fringe of their distribution—within the CCC ESU.

Coho salmon inhabit very small coastal streams as well as the largest rivers in Western North America—including connected lakes within these stream systems. Within the largest rivers, their upstream migrations are longest in more northerly rivers, being approximately 1,400 miles on the...
Yukon River, 425 miles in the Fraser system, and currently about 300 miles in the Columbia system (Sandercock 1991). Historically, they inhabited streams in the Columbia River Basin 500 miles from the ocean (Muilen 1894). In the Klamath River, they are believed to have historically ascended to the vicinity of Spencer Creek, approximately 230 miles from the river mouth (Hamilton et al. 2005). In the Sacramento River, Behnke (2002) states that coho salmon were always extremely rare and says it is unclear why conditions are so ill-fitted for this species. Brown et al. (1994), however, suggests that coho may not have been entirely rare in the system historically. Moyle (2002), citing Leidy (1984), states that coho were never common in the Sacramento basin but small numbers probably once spawned in the McCloud and upper Sacramento rivers, in excess of 300 miles from the marine environment.

Within larger river systems, coho salmon spawning is typically distributed in tributaries to mainstem rivers. In smaller streams that empty directly to the marine environment, they will spawn over the stream’s length, from just above tide water to headwater reaches. This pattern of spawning principally in smaller streams has given coho salmon a reputation of being primarily associated with small rivers and streams (Behnke 2002). In contrast, Chinook (O. tshawytscha), chum (O. keta), and pink (O. gorbuscha) salmon often spawn in large mainstem rivers, although each of these also spawn in small streams. Coho also spawn on beaches of some Alaskan lakes (Ruggerone and Rogers 1992). Sandercock (1991) described the typical spawning distribution of coho salmon as follows:

“Their success as a species may be partly attributed to their utilization of a myriad of small coastal streams and to their aggressiveness and apparent determination to reach the small headwater creeks and tributaries of larger rivers to spawn. In many cases, they overcome difficult obstructions to reach areas inaccessible to other salmon and then share these locations with only resident cutthroat trout. These small headwater streams generally provide cool, clear, well-oxygenated water, with stable flows that are ideal for incubation and subsequent rearing.”

Lichatowich (1999) illustrated differences in typical patterns of spawning distribution for salmon species in a hypothetical watershed (Figure 1), showing that coho salmon normally spawn higher in river systems relative to other species. In large rivers (e.g., Columbia, Snake, and Fraser rivers), Chinook salmon ascend the mainstem river further than coho.

A representative example of this pattern is seen in the Clearwater River on the Olympic Peninsula (Washington Coast). Edie (1975) delineated three zones within the river system as utilized by anadromous salmonids (Figure 2): Chinook zone, coho zone, and cutthroat (O. clarki) zone. These distributions are related to the physical and hydrological characteristics of the stream system, not to differences in water quality variables such as temperature. Water temperature remains within safe limits for these species in this river. Flow in the mainstem river during spawning months is typically in the range of 800-3,000 cfs. Edie (1975) described the Chinook zone as being the main river and the lower reaches of larger tributaries (see Figure 43 top for a picture of the Clearwater River). This zone is mostly used by Chinook salmon and steelhead (O. mykiss) trout and to a much lesser degree by coho salmon. Stream gradient is mostly less than about 1%. The coho zone, immediately upstream of the Chinook zone, encompasses the middle reaches of larger tributaries, the downstream portion of smaller tributaries, and the very upper
portion of the mainstem river. Gradients in this zone are moderate, mostly 1-2% but can be as high as 4%. This zone is primarily used by coho salmon and steelhead trout but significant cutthroat utilization can also occur. The upper zone, the cutthroat zone, is the domain of cutthroat trout. Streams are steep (2-6% but can be higher) and small (1-10 ft in width). This zone can be used by sea run cutthroat trout as well as small resident fish. While spawning by different salmonid species overlaps across zones, the pattern is instructive regarding general species usage.¹

![Diagram of spawning distribution](image)

Figure 1. The spawning distribution of Pacific salmon in a hypothetical watershed. Typical distribution of chum (a), pink (b), coho (c), Chinook (d), and sockeye (e). From Lichatowich (1999).

In the ocean, coho salmon generally do not migrate as far as the other species of Pacific salmon and steelhead trout (Behnke 2002). Coho originating in rivers of California, Oregon, and Washington tend to feed along the Continental Shelf associated with the region of origin (Sandercock 1991; Peary 1992; Moyle 2002)(Figure 3). However, coho stocks originating farther north are found farther offshore (Quinn and Myers 2005).

¹ One reviewer of this report raised a question regarding how habitat alterations due to land use might have influenced the pattern observed by Edie (1975). In the view of this author, whose research on the Clearwater began in 1971, when major areas of the watershed were still unroaded and unlegged, the pattern depicted by Edie is representative of the pristine state.

*Coho Salmon Life History Patterns*
Figure 2. Coho salmon life history patterns. Distribution patterns in this river reflect those that commonly occur for these species in the Pacific Northwest and California.
2.2 Life Cycle Overview and Unique Characteristics

Most coho salmon across the species’ geographic range have a three year life cycle, divided about equally between time spent in fresh and salt water (Sanderson 1991). The basic life history begins in natal streams when spawners mate and deposit eggs into nests dug in the stream substrate. Spawning typically occurs between mid autumn and early winter in small tributaries to larger rivers, though timing can occur much later for some populations.
Returning adults in populations at the southern end of the range (both California and southern Oregon) are sometimes stalled in their river entry due to a lack of rainfall and sufficient stream flow for upstream migration, delaying spawning, sometimes even pushing it into March (Shapovalov and Taft 1954; Moyle 2002). This suggests that southern coho populations may have greater flexibility in adjusting their maturation timing than more northern populations; maturation would appear to be controlled partially by entry into fresh water. Factors controlling variability in maturation timing of coho salmon are not well known.

After spawning, the adults die. Following egg incubation, surviving fry emerge from the substrate in late winter and spring and begin their free swimming life.

The emergent fry move quickly to slow velocity, quiescent waters, usually along the stream’s margins or into backwaters where velocities are minimal, a consistent behavior across the species range (Sandercocck 1991; Nickelson et al. 1992; Hampton 1988; Nielsen 1994; CDFG 2002). An affinity for slow velocity areas remains characteristic of juvenile coho throughout their freshwater life, unlike most other salmonid species.

Juvenile coho typically spend one year rearing in fresh water, during which time they may remain close to their natal sites or they may move considerable distances to find suitable summer and/or overwintering habitat. Their movements can disperse them to streams of all sizes—from tiny rivulets to large rivers and all sorts of connected water bodies, including lakes, ponds, springbrooks, flooded wetlands, and estuarine areas.

Figure 4, based on extensive studies in the Clearwater River (Olympic Peninsula, Washington), illustrates a variety of life history patterns within the same river system (Lestelle et al. 1995a). Most spawning in this river occurs in tributaries, in both low (<1.5%) and high (>1.5%) gradient streams, and in the upper portion of the mainstem where it narrows and steepens. The low gradient tributaries typify streams considered by many biologists to be highly productive for coho salmon—small low velocity streams with abundant pool habitat interspersed with woody debris. While the steeper streams support good numbers of spawners, emergent fry appear to largely disperse downstream from them into more suitable summer habitat.

Dispersal by some fry from natal reaches to areas downstream shortly following fry emergence is a pattern seen throughout the geographic range of the species (Figure 5)(Lister and Genoe 1970; Aar 1972; Hartman et al. 1982; Murphy et al. 1984; Nielsen 1994). Downstream movement by young fry can result from intraspecific competition with other fry (Chapman 1962), displacement during high flows (Hartman et al. 1982), or not finding suitable colonization habitat (Aar 1972). Some fry emigrants arrive at the stream mouth estuary (not shown in Figure 4) where they rear successfully in brackish water conditions. They apparently utilize the freshwater surface water

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2 Pink and chinook salmon can reach sexual maturation while still in saltwater (Groot and Margolis 1991), while some species like sockeye salmon seem to need to mature in freshwater (Hodgson and Quinn 2002). This author has found that fall Chinook salmon returning to rivers on the Olympic Peninsula (Washington Coast) appear to have very little flexibility in adjusting maturation based on their river entry timing. These populations enter the rivers from the ocean mostly during freshwater periods. In years of severe drought, they delay entry until just before or at the time of flushing, when they swim into large numbers over shallow riffles in the lower river. They tend to spawn in the lower reaches of the river during such years. Their maturation timing appears to be little different, even unchanged, from years during normal river entry patterns.
lens to some extent, a rearing strategy observed in California (Nichens 1994), Oregon (Miller and Sadro 2003), Washington (Beamer et al. 2004), British Columbia (Tschaplinski 1988), and Alaska (Murphy et al. 1984).

Figure 4. Utilization pattern by coho salmon of different areas of the Clearwater River (Olympic Peninsula, Washington) by life stage. Circle size reflects the relative amounts of production attributed to each area. Dashed lines show movement of fish from one area (dot) to another area (arrow). From Lestelle et al. (1993a). The chart illustrates the extent that coho juveniles can move during freshwater life to locate suitable habitats.

Freshwater rearing during summer typically occurs without extensive movement where flow and temperature conditions do not reach extreme conditions for survival (Figure 5)(Au 1972; Lindsay 1974; Kahler et al. 2001). However, more limited movement appears to be the norm in at least some streams. Kahler et al. (2001) observed that small-scale movement (i.e., several habitat units) and especially upstream movement was common for juvenile coho in three study streams in Western Washington. The researchers concluded that habitat quality rather than social dominance was the primary factor affecting movement.

More extensive summer movement, perhaps over relatively long distances, can be triggered by excessively high water temperatures or severely diminished flows, as documented in some Northern California and coastal Oregon streams (Figure 6)(Kruzie 1998; Chesney and Yokel 2003). Direction of movement in these cases has been observed to be downstream as seen in screw trap catches, though it should be noted that the sampling gear could only detect downstream movement. Juvenile coho have been found to move out of mainstem rivers during periods of high water temperature and into cool water tributaries. This behavior has been
described in the Kamath River, where juvenile coho have been found moving upstream in excess of 3,000 ft from the mainstem in cool water tributaries (Toz Soto, Karuk Department of Natural Resources personal communications).³

![Graph](image)

**Figure 5.** Representative pattern of movement and migration of juvenile coho salmon seen in many streams across the species geographic range. Created from data in Au (1972) for Deer Creek, Aben River system (Oregon Coast).

![Graph](image)

**Figure 6.** Movement of juvenile coho salmon past trap site in the South Fork Umpqua River (Oregon Coast) during spring and summer. Pattern is stylized from data in Kruzie (1998). Movement of juveniles during summer is believed due to high water temperatures.

In fall another movement pattern often occurs with some juveniles redistributing from oversummering sites to habitats more favorable for overwinter survival (Figure 4; Skeensick 1970; Bustard and Narver 1975; Peterson 1982a; Cederholm and Scarlett 1982; Swales et al. 1986; Brown 2002). Harsh winter conditions for survival exist in many streams of the Pacific.

³Stream-type juvenile Chinook exhibit the same behavior to escape high water temperatures in mainstem rivers. Lindsay et al. (1986) reported juvenile Chinook to move up to 7.5 miles upstream in some cool water tributaries from the mainstem John Day River (Central Oregon) during periods of high water temperature.
Northwest and Northern California, due either to frequent high flows in western regions or prolonged cold temperatures in eastern regions (Brown 2002). Limited winter habitat is believed to be a major constraint on coho populations in many Pacific Northwest watersheds (Mason 1976a; Hartman et al. 1998; Solazzi et al. 2000; Brown 2002). Moyle (2002), in referring to the importance of overwintering habitat for juvenile coho in California, concluded:

"Availability of overwintering habitat is one of the most important and least appreciated factors influencing the survival of juvenile coho in streams."

A redistribution in fall at the onset of high flows or cold temperatures is an adaptation that many salmonids exhibit, particularly coho salmon. The question arises as to how far juvenile coho will move during this fall redistribution. In the Clearwater River, juvenile coho have been found to move up to 20 miles downstream from summer rearing sites to overwintering habitat (Peterson 1982a; Cederholm and Scarlett 1982). This distance was nearly the maximum that could possibly have been observed in that river due to its size and how the study was designed. In the Vedder-Chilliwack River (tributary to the lower Fraser River), Fedorenko and Cook (1982) found some juvenile coho to redistribute downstream from summer rearing sites nearly 40 miles to overwintering sites. In this case, juveniles had been captured and tagged in Chilliwack Lake in fall, then were recaptured the following spring emigrating from tributaries to the lower river—downstream of the lake up to 40 miles. These lower tributaries are only a short distance from the mainstem Fraser River, thus it is possible that some fall migrants had gone even further downstream to overwinter. But how far will juvenile coho travel to find suitable overwintering sites in large river systems, such as the Klamath River?

Inquiry was made of Richard Bailey\(^4\) of Fisheries and Oceans Canada on what is known about redistributions of juvenile coho in the Fraser River system. Bailey reported that his agency is currently pursuing the answer to this very question. It has been hypothesized that juvenile coho move downstream from the upper Thompson River (upstream of the city of Kamloops) in fall to the Fraser River, and continue to move until they arrive in the lower Fraser River valley where abundant overwintering habitat exists, a distance of over 250 miles. In summer of 2006, Bailey's agency initiated a study to investigate this matter. The Thompson River is in the interior region of the Fraser Basin.

The Fraser River study highlights the level of importance that biologists in that region associate with the potential role of overwintering habitats to coho salmon. Such a view is consistent with Moyle's perspective of an equally important role to California coho, quoted above.

Figure 4 illustrates the effect of how movements during the freshwater life history can result in a significant rearrangement of where smolts are produced compared to where spawning takes place. Movements, though mostly directed downstream, can also occur in upstream directions. The pattern seen in Figure 4 is considered representative of many coho populations in the Pacific Northwest (Fedorenko and Cook 1982; Hartman et al. 1998; Brown 2002). It is reasonable to conclude that multiple life history patterns that incorporate some form of redistribution within a

\(^4\) Richard Bailey, based in Kamloops, British Columbia, is assigned to assess the performance of Thompson River coho, a population that has experienced significant decline in recent years. It is a stock of concern in planning fisheries off the coasts of the Pacific Northwest by the Pacific Fishery Management Council.

Coho Salmon Life History Patterns
watershed are common to the species. It is believed that coho return to their natal sites, regardless
of redistributions that occur during freshwater residence (Lesteller et al. 1993a).

Moyle (2002) described the importance of redistributions of juvenile coho to California
populations as follows:

“Juveniles show pronounced shifts in habitat with season, especially in California
streams. In spring, when stream flows are moderate and fish are small, they are widely
distributed in riffles, runs, and pools. As stream flows diminish in summer, they
increasingly concentrate in pools or deeper runs. During winter, before emigration, they
seek refuges from high velocity flows generated by winter storms. Especially important
are large off-channel pools with complex cover or small spring-fed tributary streams.”

The utilization pattern illustrated in Figure 4 can be viewed as being representative of a river
system with one or more connected lakes having access to coho. Lakes provide a significant
component of coho production in some watersheds in coastal Oregon (Zhou 2000), Western
Washington (Burarnski 1989; Lesteller et al. 1993b), British Columbia (Holtby et al. 1993), and
Alaska (Ruggerone and Rogers 1992; Ruggerone and Harvey 1994). Lakes can be important
rearing areas during summer (Swain and Holtby 1989) and/or winter (Quinn and Peterson 1996).
Lakes would tend to function in the same way as off-channel ponds.

At approximately 18-19 months of age (from egg fertilization), coho juveniles undergo
smoltification during spring and enter the marine environment, where they experience very rapid
growth. Their smolt to adult survival rate can be strongly affected by exposure to large estuarine
complexes like Puget Sound or the Strait of Georgia (Spence 1995; Coronado and Hilborn 1998;
Pinnix 1999; Beamish et al. 2000). For example, wild coho smolts that enter Puget Sound
survive at rates that average nearly 20% (survival to recruitment to fisheries) during favorable
regimes of the Pacific Decadal Oscillation (PDO) (Lesteller et al. 1993b). In contrast, wild smolts
entering the Pacific Ocean from the rivers along the Washington north coast, which have no or
limited extended estuarine habitat, typically survive at 1/6 to 1/3 that rate (Figure 7) (Sharma et
al. 2006; Volchardt et al. 2007; Quinault Department of Natural Resources unpublished). This
difference gives populations originating inside the Strait of Juan de Fuca a tremendous boost in
productivity compared to those along the outer coasts and makes them naturally more resilient to
habitat perturbations. Spence (1995) suggested that coho smolts originating in rivers on the
outer coast of Washington, Oregon, and California are affected by ocean upwelling conditions,
which influences prey abundance, more immediately and directly than smolts passing through
extensive estuarine areas. Hence, marine survival of smolts produced on the outer coasts are
more strongly affected by interannual variability in intensity and timing of ocean upwelling
events.
Marine survival for populations along the south to central coast of California typically are the lowest of North American coho (Coronado and Hilborn 1998). Those in Northern California (e.g., Klamath) are higher but still below average when compared to other states and provinces (Coronado and Hilborn 1998). Survival rates for Oregon coho are higher yet but tend to also be less than in regions farther north. This latitudinal pattern in survival is correlated with certain factors as reported by Pearce (1992). He indicated that protected bays, inlets, and shallow littoral areas that favor survival of juveniles are rarer to the south, especially off California and Oregon. In addition, oceanographic variability, resulting from interannual fluctuations in the intensity of upwelling or El Niño events, appears to be greater in the southern part of the species’ range.

Recently reported marine survivals for wild fish (brood years 1996-2001) in the West Fork Smith River (Umpqua Basin, Oregon Coast) (Miller 2005) range between 1.3 to 21.7% (mean of 10.2% over 6 yrs) and illustrate the tremendous variation that has occurred over the past decade. A regime shift in ocean conditions is believed to have occurred in 1998-1999, positively affecting many salmon populations in the southern half of their range (Beamish et al. 2009). However, marine survival for some populations within this part of their range was extremely poor in return year 2006 and is forecasted to again be low for 2007 (Volkhardt et al. 2007).

The ocean migration of coho salmon occurs mainly along the coastal waters of the continental shelf in the southern part of the species’ range (Quinn and Myers 2004). Northern populations migrate farther offshore (averaging four times as far from tag recovery work). In the southern region, waters are warmer farther offshore, less productive, and dominated by other fishes (Pearcy 1992).

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Footnote:

3/ The mean for these years reported for West Fork Smith River is much higher than would be expected over a much longer period because it is skewed high by exceptionally high survivals in several years since the regime shift of 1998. Such high survivals also occurred in areas farther north, as seen for some populations on the Washington Coast. This apparently was not the case for Bingham Creek coho shown in Figure xx.
After roughly 16-17 months in the sea, adult coho return to their home rivers. They begin arriving at the entrances to their home rivers in late summer, but more typically in early autumn. Sandercoc (1991) noted that fish arrive earliest back to their home river in northernmost rivers and latest to rivers farther south. This pattern is generally correlated with the timing of fall and winter rains and increases in stream flow—flows typically rise later moving from north to south. Many smaller streams in Oregon and California are blocked to upstream migration until elevated flows open sand bars formed across their mouths during summer. In larger rivers whose mouths remain open to the ocean, low flows that extend into early or mid fall keep riffles shallow and can slow upstream migration of adult salmon. Major runs within British Columbia and Washington enter their home rivers primarily during September through November (Sandercoc 1991). Moyles (2002) described river entry timing for Klamath River coho as between September and late December, peaking in October and November. He noted that river entry in the Eel River, located further south, is approximately 4-6 weeks later. Shapovalov and Taft (1954) reported entry timing for several Central California streams as being primarily between mid October and end of January. A similar latitudinal pattern of river entry timing also exists for fall-run Chinook in many short coastal rivers (Nicholas and Hankin 1988; Healey 1991), presumably due to effects of flow timing and in-river thermal patterns regulating spawning timing.

To this author’s knowledge, an effect of stream temperature on the upstream migration timing of adult coho has not been described in the scientific literature. Water temperatures are typically cooling when adult coho begin their freshwater migration. Quinn (2005) concluded that variation in river entry and migration timing seems to be fundamentally controlled by accessibility to spawning grounds and spawning date. As shown earlier in this section, however, coho in the southern extent of their range appear to be able to postpone spawning if access is significantly delayed. Much remains unknown about factors affecting both migration and spawning timing, including the connection between flow and thermal regimes (Quinn 2005).

River entry across an entire run of fish often occurs in pulses—coinciding with storm events—over a period of three months or more (Shapovalov and Taft 1954; Sandercoc 1991), though it can be shorter in small coastal systems. River entry can be continuous when flows are sustained by frequent storms (Holby et al. 1984). Shapovalov and Taft (1954) reported that run entry in Waddell Creek at the southern end of the geographic range extended over about three months.

Typically moving during high flows, coho salmon return to their natal streams—usually with a high degree of fidelity—to complete their life cycle at spawning. Time of spawning is typically later than that of other species and more protracted such that instantaneous spawner density is often low.

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7/ Prolonged low flows in fall can slow the upstream migration rate of adult coho even when the river mouth remains open to the ocean, as seen by the author in major rivers on the Olympic Peninsulas in Washington when rains are significantly delayed. This same effect has been noted in the early part of the run on the Klamath River when flows are exceptionally low (CDFG 2004).

7/ Water temperatures in the lower reaches of rivers in the southern part of the range are often still elevated in September when the earliest run component of coho can begin entering freshwater. Elevated temperatures at this time can contribute to mortality rate on migrating coho, as documented in at least one case on the Klamath River (CDFG 2004).
Within the basic life history, variations exist in age structure, generally following patterns associated with latitude. While the majority of coho are age 3 at spawning, some males mature precociously at age 2 as "jacks", after spending approximately six months at sea (Sandercocock, 1991). Druecker (1972) suggested that the percentage of jacks in the population decreases from south to north. This life history is virtually absent in the northern end of the range. Precocity, while having some genetic basis, is related to freshwater growth rate and smolt size, both of which decrease with latitude. In the southern half of the range, percentage of jacks in a population is related to quality and productivity of habitat (Young 1999). High quality habitats produce faster growth and larger smolts, resulting in greater precocity—though the percentage of jacks in a population can vary significantly between years (Shapovalov and Tuft 1954; Young 1999). Young (1999) suggested that jacks could be critically important in maintaining genetic structure of coho populations because they provide the only gene flow between otherwise isolated brood years for the species.

Another deviation from a three year life cycle occurs because some juveniles spend an additional year rearing in fresh water and emigrate seaward at approximately 30 months of age; these return and spawn at four years of age. This pattern occurs primarily in more northern populations, particularly in Alaska (Sandercocock 1991), and is due to growth rates being slower in colder streams, requiring an additional year for fish to attain a size necessary for smoltification. South of British Columbia, very few juveniles typically smolt at 30 months of age (Sandercocock 1991), though exceptions exist.

One notable occurrence of age 2 smolts has been found in Prairie Creek, tributary to Redwood Creek, in Northern California by Bell (2001). Twenty eight percent of the smolt yield was reported to be age 2 (approximately 30 months old) in a single year of study. Bell noted that age 2 coho smolts had not been previously documented in California and that they are a small component of smolt yield on the Oregon Coast (citing Moring and Lantz, 1975). Walt Duffy (Humboldt State University, personal communications) indicates that such a high percentage of age 2 smolts does not occur every year in Prairie Creek, but small numbers likely do, as well as in other Northern California streams. Bell attributed the occurrence of age 2 smolts in Prairie Creek to poor winter and spring growth rates. Duffy (personal communications) believes that high rearing densities associated with cool summer temperatures in this stream may be responsible. Nielsen (1992a) observed that one foraging phenotype in some Northern California streams produced exceptionally small yearling migrants (< 70 mm) without smolt like characteristics. Nielsen's observations may provide insights into the occurrence of age 2 smolts in Prairie Creek and other California streams; this is discussed further later in this section.

A central theme in the freshwater life history of juvenile coho is their close association with slow velocity habitats. Body morphology and fin sizes of juvenile coho salmon are particularly adapted to slow velocity habitats. Most coho juveniles have a laterally compressed body with long dorsal and anal fins, thought to be adaptations for life in slow water (Blaisson et al., 1988b)(Figures 8-10). Figures 9-10 are from Stein et al. (1972) from observations made on coho and Chinook salmon in the Siskiyou River (Oregon Coast). Note the significant differences in fin sizes between Chinook and coho juveniles at around 60 mm body length in Figure 9. In contrast

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* The Siskiyou River in Southern Oregon is the first river immediately north of the northern boundary of the Southern Oregon Northern California Coasts Coho ESU.
to coho fry, steelhead fry have cylindrical bodies in cross section with short dorsal and anal fins, adapted to higher velocity habitats than used by juvenile coho (Bisson et al. 1988b). Juvenile Chinook have a body form and fin sizes intermediate between coho and steelhead (Figures 8 and 9). These morphological differences between juvenile coho and other salmonid species appear to favor coho in interspecific interactions in habitats most favored by coho (Stein et al. 1972; Hartman 1965; Glova 1986; Young 2001). Coho generally dominate in competitive interactions within slow water habitats with Chinook, steelhead, and cutthroat. Fin morphology is believed to be important in social interactions of salmonids (Keenleyside and Yamamoto 1962; Stein et al. 1972).

These differences in body shape and fin sizes between species are also consistent with water velocity and depth preferences reported for these species (Figure 11). Data in Figure 11 come from a study in the Trinity River in the Klamath River basin (Northern California) (Hampton 1988). Almost identical depth and velocity preferences are reported for juvenile coho salmon in rivers of Western Washington (Figure 12) (Beecher et al. 2002). Coho prefer much slower velocities than either steelhead or Chinook; Chinook preferences are intermediate between coho and steelhead. It is noteworthy that preferred water velocities of juvenile coho salmon change little between fry (<50 mm) and parr (>50 mm), whereas a significant change occurs for juvenile Chinook salmon. Juvenile coho are typically 60-70 mm in size by the end of their first summer of life. It is logical to expect that selection of habitat types by these species would reflect their adaptation to water velocity and depth.
Figure 8. Juvenile coho salmon (top), Chinook salmon (middle), and steelhead trout (bottom) illustrating differences in fin size and body morphology. Photos courtesy of Roger Tabor, U.S. Fish and Wildlife Service, Lacey, Washington. Note that the dorsal and anal fins of the coho are easily recognized by their white leading edges.
Figure 9. Diagrammatic sketches of the dorsal and anal fins of recently emerged and 2-week-old coho and fall Chinook salmon in Sixes River (Oregon Coast). From Stein et al. (1972). Note that differences in size of fins between species increase as fish grow (see Figure 10) and appear to be greatest at lengths of about 60 mm, which for coho would typically occur between mid to late summer.

Juvenile coho can adjust their velocity preferences to a limited extent depending on food availability. Based on controlled experiments, Rosenfeld et al. (2005) reported that increased food abundance resulted in greater growth of both dominant and subdominant juvenile coho and a shift to higher average focal velocities. Increased food permits juvenile coho to exploit higher velocity microhabitats that might otherwise be bioenergetically unsuitable with less available food. The authors observed that average focal velocities shifted from 6.5 cm/s to 8.4 cm/s, with maximum growth occurring in the range of 10-12 cm/s. Still, the shift reported by these authors was small, with velocities remaining within the strongly preferred range shown in Figure 12.
Figure 10. Differences in dorsal and anal fin sizes between juvenile coho and Chinook salmon. From Stehn et al. (1977).

Variation has been found to exist between regions both with respect to body morphology and swimming performance. Taylor and McPhail (1985a) identified two morphological forms based on differences in body shape and fin size: a “coastal” form, characterized by large dorsal and anal fins and a deep robust body, and an “interior” form with smaller fins and a more streamlined body shape. Figures 8-10 illustrate characteristics of what those authors called the coastal form. The study was based on a comparison of samples collected in the Thompson River subbasin (interior Fraser basin), lower Fraser River tributaries, and Vancouver Island streams. In addition, the authors performed breeding experiments to determine if these morphological differences are inherited. Further, to see if morphological differences between interior and coastal populations
found in these areas exist in other regions, they sampled preserved juvenile coho (from fish museums) from the upper Columbia system and from creeks in north coastal British Columbia and Alaska. They concluded that the coastal-interior stock differences in morphology is part of a coastwide pattern and that the differences are at least partially inherited. The authors also reported that adult coho sampled in the same areas showed some of the same morphological differences displayed by the juveniles.

Figure 11. Water depth and velocity preferences of coho salmon, Chinook salmon, and steelhead trout fry (≤50 mm) and parr (≥50 mm), as observed in the Trinity River in the Klamath River basin (Northern California). Water velocities are mean column values. Adapted from Hampton (1988).

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These two morphological phenotypes differ in swimming performance (Taylor and McPhail 1985b). Coastal juveniles were found to have greater burst velocities (fast start) than the more streamlined interior form. In contrast, the interior form was found to have significantly greater swimming stamina, on average four to five times the prolonged swimming performance of coastal juveniles. Taylor and McPhail (1985b) concluded that differences in swimming performance were related to body and fin morphology. They noted that variations in swimming performance are probably adaptive and related to differences in the energetic demands of their freshwater migrations (smolt and adult) and perhaps to levels of predation experienced by coastal and interior forms. Burst speed would favor fish exposed to abundant predators under conditions where swimming stamina is not as important. In contrast, swimming stamina would favor smolts and returning adults that migrate long distances in swift, turbulent rivers, such as the Fraser and Thompson rivers.  

\[ \text{Swimming stamina would also favor long distance movements of pre-smolts, as has been hypothesized for a fall redistribution of Thompson River coho described earlier.} \]
The findings of Taylor and McPhail (1985a and 1985b) raise a question about whether both morphological forms exist in the Klamath River where interior and coastal ecoregions occur. Within the interior portion of this basin, some coho are currently produced in excess of 200 miles from the ocean. Their migrations in the mainstem Klamath River traverse many turbulent, swift reaches, not unlike the Fraser River but on a smaller scale. Implications of this question are discussed later in this document.

Variation in morphological forms—similar to that described above—has also been found at a much smaller scale than that of ecoregions. Swain and Holtho (1989) reported distinct differences in body morphology between life history forms associated with different habitat use patterns in a single river system. Certain morphological characteristics of juvenile coho rearing in a small lake within the Cowichan River system (Vancouver Island) were significantly different than those of stream-rearing coho in the lake’s inlet stream. Lake rearing fish had more posteriorly placed pectoral fins, shallower bodies and smaller, less brightly colored dorsal and anal fins than did stream rearing fish. The dorsal and anal fins of stream fish were larger and more falcate than lake fish. Lake rearing fish were schooling and non-territorial, unlike the highly territorial stream fish, which displayed frequent aggressive behavior. These characteristics, both morphological and behavioral, were maintained when both forms were placed within a common laboratory environment for two months.

The researchers concluded that differences between forms may be genetically based, or environmentally induced and fixed early in life. They inferred that the differences between forms are adaptive, with fin size, body shape, coloration, and behavior of each form more suited to survival within their respective rearing environments. While they proposed a plausible mechanism for genetic differentiation, phenotypic plasticity seemed just as likely. Their findings showed that either through genetic divergence or phenotypic plasticity, coho within a relatively small—yet diverse—river system can adapt to exploit contrasting habitats, thereby reducing intraspecific competition and increasing overall utilization of the system. More recent research suggests that the findings of Swain and Holtho (1989) were due to phenotypic plasticity—not genetic differentiation—as fin size and body morphology of juvenile salmonids has been found to be shaped by water velocity (Pakkeasras and Pirronen 2001). It should be noted that species-specific responses to water velocity differs between species, likely due to different energetics and cost reduction strategies.

Another aspect of life history that may differ between regions is foraging behavior. Foraging behaviors can vary between individuals of the same population or even of the same family. Nielsen (1992a; 1992b; 1994) identified four foraging behaviors of juvenile coho—she considered them distinct phenotypes. She suggested that one of the four types may be unique to the southern portion of the species' range (i.e., California); see also Moyle (2002). Nielsen’s findings were based on studies conducted in one Puget Sound stream over two years of study (Nielsen 1992b) and in ten Northern California streams over four years (Nielsen 1992a and 1994). In the California work, Nielsen (1992a and 1994) monitored foraging behaviors of individual fish from fry emergence until outmigration as yearlings. Fry were trapped and marked as they emerged from distinct redds sites, their subsequent movements and feeding patterns were observed, they were remarked at larger sizes (still knowing their origin) so they could continue to be followed and observed through summer and winter. Drought conditions in California during

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the years of study allowed observations to continue throughout winter. Each foraging phenotype was found to utilize habitat features differently (Table 1). All four phenotypes were consistently found in the Northern California streams. Fish rarely changed their foraging behavior once they had been associated with a phenotype. Nielsen concluded (Nielsen 1994; Jennifer Nielsen, U.S. Geological Survey, personal communications) that the phenotypes are not genetically distinct but are the result of population responses to different environmental conditions.\[10\]

In her earlier work, Nielsen identified two of the four foraging phenotypes in a Puget Sound stream (Nielsen 1992b), the *thalweg hierarchy* and *margin-backwater* types. The *thalweg hierarchy* type is the most common foraging behavior of juvenile coho found in the Pacific Northwest and California during summer. It is the stereotypical coho foraging pattern, used by the largest proportion of a population (Table 1). The primary habitat used by this type is main channel pool, i.e., pools associated with the channel thalweg. Fish that employ this foraging pattern are grouped in partial dominance hierarchies, with dominant and subdominant individuals. They feed predominantly on invertebrate drift and grow throughout the summer, attaining sizes of 60–85 mm by winter (Figure 13), when growth typically slows. A surge in growth occurs in spring, when they reach sizes of 90–105 mm in California streams. They smolt and emigrate to sea between March to June. This foraging pattern occurs in other regions.

The second phenotype found both in Washington and California is the *margin-backwater* type, called “floaters” in Nielsen (1992a) (see also Puckett and Dill 1985). This type is composed of fish that move to slack water habitats at or near the channel margin immediately following emergence and do not subsequently move to deeper water as they grow. They do not form dominance hierarchies but instead roam relatively large forage areas feeding opportunistically on food of terrestrial and aquatic origin. Forage arenas are characterized by extremely low velocity flow along the channel margin or in backwater pools. Growth rates of these fish are low compared to other foraging phenotypes (Figure 13). Margin-backwater fish remain small throughout summer, fall, and winter (Nielsen 1992a and b).

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\[10\] Nielsen (1994) gives details on the numbers of families and individuals that were monitored by marking wild fish for broad years 1990 and 1991. Newly emerged fry were captured by trapping 16 distinct redds in five of the study streams. Fry were marked using a broadcast spray of fluorescent pigment, with different colors used on fish from adjacent redds. Fish were released at the redd sites following marking and allowed to disperse naturally. After several weeks, marked fish were recaptured (at approximately 45 mm in size), then re-marked as individuals using a Pan Jet inoculation with acrylic paint. Surviving marked individuals were observed over the course of the study. A total of 105 individuals were observed at the time of smolt migration and an additional 40 fish were sacrificed for analysis at 6-16 months following marking with the Pan Jet. Nielsen did not identify how many other marked fish were observed at various times during the study.
Table 1. Characteristics used to depict wild coho phenotypes in 10 streams in Mendocino County, Northern California 1989-1992. Recreated from Nielsen (1994). Sample sizes were not reported for each phenotype in the original papers—see footnote in text regarding overall numbers of marked fish observed in some years of the study.

<table>
<thead>
<tr>
<th>Coho characteristic</th>
<th>Thalweg</th>
<th>Margin</th>
<th>Estuarine</th>
<th>Early emerging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary habitat</td>
<td>thalweg flows</td>
<td>margin/backwater</td>
<td>estuary tidal prism</td>
<td>cutbank/rootwad</td>
</tr>
<tr>
<td>Social system</td>
<td>large groups (17-38)</td>
<td>isolated roving individuals</td>
<td>individuals found in widely dispersed large groups (14-23)</td>
<td>small integrated groups of 2-4 fish, no obvious hierarchy</td>
</tr>
<tr>
<td>Emergence timing</td>
<td>February – April</td>
<td>February – April</td>
<td>February – March</td>
<td>January – February</td>
</tr>
<tr>
<td>Foraging behavior</td>
<td>forage stations</td>
<td>forage stations</td>
<td>opportunistic</td>
<td>forage stations</td>
</tr>
<tr>
<td>Forage timing</td>
<td>diurnal</td>
<td>diurnal</td>
<td>diurnal</td>
<td>crepuscular</td>
</tr>
<tr>
<td>Primary diet source</td>
<td>aquatic invertebrates</td>
<td>terrestrial invertebrates</td>
<td>aquatic invertebrates</td>
<td>terrestrial invertebrates</td>
</tr>
<tr>
<td>Mean diet caloric content (season)</td>
<td>low (all year)</td>
<td>empty to high (seasonally mixed)</td>
<td>highly variable (all year)</td>
<td>high (all year)</td>
</tr>
<tr>
<td>Intraspecific agonistic behavior</td>
<td>highly competitive</td>
<td>little interaction</td>
<td>highly competitive</td>
<td>little interaction</td>
</tr>
<tr>
<td>General growth pattern – spring</td>
<td>dominant = fast</td>
<td>slow</td>
<td>slow</td>
<td>fast</td>
</tr>
<tr>
<td></td>
<td>subdominant = average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General growth pattern – summer</td>
<td>dominant = average</td>
<td>slow</td>
<td>average</td>
<td>slow</td>
</tr>
<tr>
<td></td>
<td>subdominant = slow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General growth pattern – fall/winter</td>
<td>dominant = fast</td>
<td>slow</td>
<td>slow</td>
<td>fast</td>
</tr>
<tr>
<td></td>
<td>subdominant = fast</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size-at-age</td>
<td>dominant = large</td>
<td>small</td>
<td>average</td>
<td>large</td>
</tr>
<tr>
<td></td>
<td>subdominant = average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% emerging population</td>
<td>67%</td>
<td>17%</td>
<td>13%</td>
<td>3%</td>
</tr>
</tbody>
</table>

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In Northern California streams, Nielsen (1992a) reported that margin-backwater juveniles moved to the estuary in spring as small yearlings (<70 mm) without smolt characteristics, their fate being uncertain. Fish of this size should tend to remain in fresh water for another year and smolt as two year olds. This would explain Bell's finding of a large number of age 2 smolts in Prairie Creek in one year. Nielsen (1994), however, noted that no evidence was ever found for age 2 smolts in the ten populations studied in Northern California (from scale analysis). Perhaps all of the conditions that would cause fish of this phenotype to remain in fresh water for an added year occurs infrequently in this region. The question arises as to the adaptive benefit of a foraging strategy that produces such small yearling migrants, whose survival appears questionable. They may experience rapid growth in the stream mouth estuary and move into the open ocean at a
much larger size (Figure 13). Alternatively, if fry exhibiting this phenotype move from natal tributaries following emergence into larger mainstream rivers, when present (see Figure 4), and find greater food supplies there, growth could be much faster during summer. Growth rates during summer in mainstream rivers, where water temperatures are suitable\textsuperscript{11}, normally exceed those in small natal streams (Cederholm and Scarlett 1982). Fish displaying this foraging behavior may also be those found to move into riverine ponds or alcoves soon after emergence, residing there through summer and winter (discussed later in this document). Fish that do so would be expected to attain a size necessary for smoltification, assuming suitable water temperatures exist in summer. Thus, the contribution of this foraging type to population sustainability may depend on availability of certain habitat types and adequate food resources.

The third phenotype is the estuarine type (Table 1; Figure 13). Although not observed by Nielsen in Washington (due to the location of the study), this foraging behavior occurs across the species' range, as described earlier in this document. In California, Nielsen (1994) described fish exhibiting this phenotype as moving up and down the stream mouth estuary\textsuperscript{12} during spring and summer within the freshwater surface layer. The juvenile coho foraged opportunistically on whatever was found in the water column, as well as picking up food items along the substrate. They fed on items of both freshwater and marine origin. In an Alaskan stream, Murphy et al. (1984) found young of the year coho to grow more quickly in the stream mouth estuary than in freshwater reaches upstream. Similarly, Tschaplinski (1988) found juvenile coho within a stream mouth estuary in British Columbia to significantly outgrow those rearing upstream; by fall the estuarine fish were longer by 16-18 mm.

Nielsen was unable to follow the estuarine fish through winter—she noted that their distributions during winter and the following spring remained unknown (Nielsen 1992a). Murphy et al. (1984) found in an Alaskan stream that most juvenile coho evacuated the stream mouth estuary prior to winter; the authors presumed—but could not confirm—that fish moved upstream to more favorable freshwater sites. In British Columbia, Tschaplinski (1988) reported that juvenile coho left the stream mouth estuary between late September and November—no overwintering occurred in the estuary. Moreover, Tschaplinski found only a small number of juveniles to move back upstream into fresh water to overwinter. He inferred that the majority of estuarine juveniles moved into Barkley Sound. Based on lab studies, he concluded that juveniles that reared in the stream mouth estuary during summer, gradually being acclimated to brackish water, were able to physiologically tolerate brackish to moderately high salinity of the nearshore, surface waters of Barkley Sound. However, the lab studies showed that the estuarine reared juveniles could not fully acclimate in 30% sea water at the time of their departure despite their size being comparable to yearling smolts. Miller and Sadro (2003) conducted extensive marking and ultrasonic tag tracking studies to investigate seasonal movements of juvenile coho within portions of the relatively large Coos Bay estuary in Southern Oregon. They found no evidence that juveniles moved beyond the upper estuary into the strongly marine environment during fall. They concluded that similarities in life history patterns between southern and northern regions of

\textsuperscript{11} Suitability of various temperatures to growth and survival is discussed later in this report.

\textsuperscript{12} The estuarine zone immediately associated with its principal freshwater source is referred to in this document as a stream mouth estuary. Estuaries can be very large and can include a continuum of conditions from areas having no salinity (at the upper end of tidal influence) to those with near fully marine characteristics. Puget Sound is technically considered an estuary.

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the species’ range include downstream movement to the stream mouth estuary at age 0 during both spring and fall, use of the upper estuarine zone for months, and upstream movements during fall to overwinter in fresh water. They stated that regional differences likely exist in how estuaries are used by juvenile coho given the profound differences in nearshore oceanographic conditions between regions.

Nielsen (1992a, 1994) called the fourth foraging phenotype the early emerging or early pulse type (Table 1). This phenotype has only been described in Northern California. It is comprised mainly of early emerging fry from individual redds. Nielsen found that a small proportion of the fry in a redd emerged much later than the majority of fry; approximately 3% emerged during January and February. These fish demonstrated an unusually fast growth pulse immediately after emergence. They attained lengths of 65 to 78 mm by late May or early June (Figure 13). Growth then shut down during summer, followed by another growth pulse in early fall. By late September they could be 105 mm in size and by spring they tended to resemble two year olds.

The foraging behavior of early emerging fish was found to be distinctly different than the behaviors of the other phenotypes. Upon emerging, the fry fed initially in groups of 3 to 5 fish on drifting aquatic invertebrates at the margins of pools. Few agonistic interactions occurred within the small groups. As they grew, these fish occasionally left their positions at the margins and fed briefly on drift aquatic invertebrates in deeper water (March to April). By summer their foraging behavior was characterized as being more trout-like than is common among juvenile coho. They foraged only at dawn and dusk on drifting invertebrates in the water column. During the day, they sought refuge in undercut banks, often associated with cold-seeps along terrace cutbanks.

Nielsen (1992a) stated that only this fourth phenotype was found to be in close proximity to cold-seeps along terrace cutbanks. She reported that this phenotypic expression was dominant in streams subject to drying during the drought that was then underway at the time of the study. She concluded that this behavior is “the one most likely to survive to smolification in freshwater stream habitats” subject to extreme drought conditions. Thus, she suggested that the phenotype represents a pattern of adaptation significant to coho salmon in the southern portion of their range.

Limitations of Nielsen’s descriptions of foraging phenotypes should be recognized. The descriptions did not identify how fish moved longitudinally within a stream system upstream of the estuary, as depicted in Figure 4. It is not known whether one or more type is more likely to move longitudinally along the stream system during spring, summer, or fall. A further limitation is that the observations were made during drought conditions. It is uncertain how the types might

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13 It is noteworthy that Koski (1966) found that the earliest emerging coho fry from individual redds in Oregon coastal streams were consistently the largest of all fry produced from the redd. Fry length typically would steadily diminish for later emerging fish. The size differential between the early and late emerging fry was nearly 3 mm on average (28 mm vs 33 mm). The average number of days over which fry emerged from an individual redd was about 35 days.

14 It is uncertain to this author whether or to what extent juvenile coho might switch from the fall/spring phenotype to an early pulse type phenotype under severe drought or high water temperature conditions. Nielsen’s work suggests that switching would generally not occur, that is, fry that emerge during the peak of emergence would not display the foraging behavior of the early emerging fry.
differ during wet cycle years with regard to phenotype composition, foraging and growth patterns, and migrant sizes. It is also unknown how the patterns might differ with stream size.

3.0 Freshwater Habitat Utilization

This section describes the relative utilization—or importance—of various physical habitats to coho salmon and associated survivals within the freshwater environment. It is necessary for clarity to begin with a short description of the various riverine habitats utilized by salmonids. In fresh water, coho primarily utilize stream habitats, though they also rear in lakes where present within the accessible stream network of a watershed (Sandercock 1991). Emphasis is given in this report to describing use of stream habitats with some limited coverage on lake utilization.

3.1 Description of Channel and Habitat Types

Riverine habitat types refer to physical features of the aquatic system defined by channel and valley morphology and flow characteristics—they can be defined at multiple scales (Frisell et al. 1986; Burnett 2002). In this document they are defined either by geomorphic (channel) unit type, edge unit type, or channel type (Figure 14).13

Geomorphic units (or channel units) are distinct physical features of the channel that have relatively homogenous characteristics of depth, velocity, and substrate (Bisson et al. 1983; Montgomery and Buffington 1998). There are many classification schemes in use to distinguish geomorphic units (e.g., Hawkins et al. 1993)—the units shown here capture the main ones referred to often in salmonid ecology studies. In studies of coho salmon, pools are often further delineated as being either scour pools or dammed pools (such as beaver ponds) (Level II from Hawkins et al. 1993) or even further into other pool types as often done on the Oregon Coast (e.g., Nickelson et al. 1992).14 It suffices here to keep the delineation fairly broad but reference to Nickelson’s classification is also used in this document.

Delineation of channel edge habitats is based on Murphy et al. (1989), Beechie et al. (2005), and Schwartz and Herricks (2005). Three types of edge units are recognized, consistent with Beechie et al. (2005): backwater pools, bank edges, and bar edges (Figure 15). These habitats can be particularly important as velocity refugia to small fish as flows increase. Backwater units (or backwaters) are partially enclosed, low velocity areas separated from the main river channel (Figures 16). They often form at the mouths of remnant channels or small tributaries. Expansion eddy units, as defined by Schwartz and Herricks (2005), are considered backwater units here. Bank and bar edges are localized hydraulic dead zones formed at the channel margins associated either with vegetated banks or gravel bars. As flows increase above baseflow, vegetation along bank edges can be wadded and inundated (Figure 17). Another aspect of the channel form, sometimes used to distinguish habitat types is channel type, such as main channel, side channel,

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13 Habit type delineation in this document is drawn from Lentelle et al. (2005).
14 The classification scheme applied to pool types in Oregon coastal streams refers to one type as an allee, which is actually an off-channel habitat type. Along mainland rivers, this habitat type is often called an off-channel pond, as commonly done in Washington State and British Columbia. Hence, in this report alcoves and off-channel ponds are synonymous. Elsewhere in Oregon State, such as along the Willamette River, the term "alley" is sometimes used to refer to backwater pool units (Landers et al. 2002—discussed in Lentelle et al. 2005).
or wall-base channel (Peterson and Reid 1984; Stanford et al. 2002). Identification of channel type is particularly important in addressing habitat issues in large mainstem rivers where geomorphic channel units do not adequately describe all of the features utilized by salmonids. In this document, channel types are grouped according to Lestelle et al. (2005).

All channels other than the primary (or largest) channel of the main river—including off-channel—are called secondary channels. Numerous terms have been applied to the continuum of secondary channels that exist in various river types—often without clear definitions of distinguishing characteristics. Types are grouped here to facilitate recognition of various habitats referred to in the scientific literature and as a way to simplify a wide variety of terms that have been used. (It is recognized that classifying channel types presents difficulties, however, because there is actually a continuum of channel conditions that change with flow level. Some channels are mixtures of different types and some are transitional between types.)

![Habitat type diagram](image)

**Figure 14.** Riverine habitat types utilized by salmonid species. From Lestelle et al. (2005) with revision to use of the term “above” — see text. In channel mesohabitats occur in the main channel, side channels, and braids.

Riverine habitat types can be grouped according to their location with respect to the main stream channel as being either in-channel or off-channel. The distinction here is made consistent with Peterson and Reid’s (1984) classification (Figure 18), which closely resembled the more recent classification of riverine channels by Toomre et al. (1998), Ward et al. (1999), and Zabl et al. (2000). The relative importance of main river versus off-channel habitats can vary widely.

11/Toomre et al. (1998) and Ward et al. (1999) identified six channels based on surface hydrological connectivity with the main channel and source of water: (1) main channel, (2) side channels, (3) intermittently-connected side channels, (4) mixed channels, (5) groundwater channels, and (6) tributaries. They also provided a subdivision of groundwater channels. They did not address braids. Mixed channels were those that had a mixture of flow sources. Zabl et al. (2000) subdivided groundwater channels into (a) alluvial groundwater channel and (b) lateral groundwater channel, comparable to Peterson and Reid’s percolation and wall-base channels.
between salmonid species and life stages. The need to recognize off-channel habitats is particularly relevant to coho salmon.

Figure 15. Illustration from Beechie et al. (2005) showing example of locations of habitat units delineated on the Skagit River (Washington). Note the very large backwater unit. Backwater units were most commonly located where off-channels or side channels joined the main river. See Figure 16 for photograph of the backwater shown in this figure.
Figure 16. Backwater habitat unit on the Skagit River illustrated in Figure 15. Photograph provided by Eric Beamer of the Skagit River System Cooperative.

Figure 17. Bank edge habitat unit along the Klamath River during spring runoff.

Although Peterson and Reid's (1984) classification of channels is often cited in the scientific literature, some of these references are inconsistent with Peterson and Reid in that they classify side channels as being off-channel habitats (e.g., Sedell et al. 1984; Landers et al. 2002; Sald-Caromile et al. 2004). The term “off-channel” as applied here is reserved to those habitats without direct openings at their upstream end to the main river, except when flows overtop the...
floodplain, consistent with Peterson and Reid (1984). Flow source and fish behavior, such as how fish move into a habitat, differ markedly between off-channel habitats as defined here and those located in main river channels.

![Diagram of river habitat types](image)

Figure 18. Main river and off-channel channel types from Peterson and Reid (1984).

Within the category of main river habitat, the distinction between braids and side channels is important. A braided channel reach is one that typically has numerous branches, separated by exposed alluvial bars. The bars tend to be transient, unvegetated and submerged at bankfull flow (Knighton 1988). Braided channels generally have high bed load, erodible banks, and relatively high stream power—hence they are unstable and prone to shift. Braided reaches occur naturally, particularly in glacial valleys, but they can also result from riparian destabilization caused by vegetation removal (Buffington et al. 2003). From an ecological perspective, they are hostile environments because of their dynamic nature (Lockner et al. in press). A side channel is an active channel separated from the main river by a vegetated or otherwise stable island (Knighton 1988) and carries surface flow at flows less than bankfull. Islands tend to be large relative to the size of the channels. While side channels can occur in almost any type of river, they frequently occur in anastomosing rivers—those characterized by having extensive multiple channels with relatively stable islands. This river type is normally associated with unconfined channels with relatively wide floodplains. Historically such rivers in the Pacific Northwest often carried high wood loads, which acted to create and stabilize islands and frequency of channel avulsions (i.e., shifts). These features served to "meter" flow into many small side channels, providing very stable conditions for small fish year-round (Sedell and Froglatt 1984; Collins et al. 2003).

*Coho Salmon Life History Patterns* 32
Off-channel habitat types are those not fed by surface water from the main river when flows are less than bankfull. They are fed by floodwaters, groundwater (or hyporheic flow), and in some cases, by water sources from higher terraces. They occur on a stream’s floodplain, sometimes on the higher elevations of the extremities of the floodplain (Figure 19). Peterson and Reid (1984) identified three types of off-channel habitats: overflow channels, percolation channels, and wall-base channels. Tockner et al. (1999) combined percolation channels and some forms of wall-base channels and called them groundwater channels, which is done here. Salditch-Caromile et al. (2004) separated floodplain ponds from wall-base channels, also done here. None of these authors included seasonally flooded wetlands as a distinct channel type but they are increasingly recognized as being an important habitat feature in some rivers (Sommer et al. 2001; Lastelle et al. 2005).

For some salmonid species, groundwater channels, ponds/alcoves, and seasonally flooded wetlands can be especially important in their life history. Groundwater channels are usually relic river or overflow channels fed largely by subsurface flow, though surface flow from higher terraces can also contribute. They can be small features with little base flow (Sedell et al. 1984) or much more extensive where former river channels receive substantial subsurface flow (Figure 20). They usually have little flow velocity, clear water, and temperatures colder in summer and warmer in winter than in the main river. Stanford and Ward (1993) referred to them as “hotspots” of production for some aquatic species. Groundwater channels often can be recognized by the presence of abundant aquatic vegetation, indicating stable flow and substrate (Figure 21).

Floodplain ponds and alcoves are water-filled depressions, partially or entirely filled with water year-round (Dykstra 2000). Floodplain ponds are often cut-off oxbows with small egress channels to the main river (Figure 19). Ponds in meandering valley segments are vulnerable to high water temperatures and low dissolved oxygen during summer, depending on their water source, but these often provide high quality habitat during winter. Where present along tributaries to larger rivers, floodplain ponds are often small features and called alcoves within some classification schemes (as commonly done on Oregon coastal and Northern California streams). Alcoves along small streams can be very small features (Figure 20). In Prairie Creek in Northern California, some alcoves are as small as 3 ft across or smaller (Walt Duffy, Humboldt State University, personal communications).

Seasonally flooded wetlands occur on the floodplains of large rivers and are the remnants of ancient ponds and relict channels (Dykstra 2000). These areas are typically flooded during fall–winter or spring, depending on a river’s runoff pattern (Figure 21). They can be relatively small...
in size or very expansive, as occurred historically along many large rivers in the Pacific Northwest and California (Sommer et al. 2001; Lestelle et al. 2005).

Figure 19. Up-valley oblique view of meandering river and associated floodplain, showing examples of well-bate channels—a subtype of groundwater channel—and a riverine floodplain pond. From Peterson and Reid (1986) and Cederholm et al. (1997a).

Figure 20. Groundwater channel contained within a relict channel of the Yakima River (Eastern Washington) supplied by hyporheic water. The mouth of the groundwater channel is shown (where individual is standing). The flowing river channel is shown in the immediate foreground.

Coho Salmon Life History Patterns
Figure 21. Groundwater channels often contain abundant aquatic vegetation, indicating stable, low velocity flows and stable substrate conditions, seen here in a groundwater channel along the Queets River within Olympic National Park (Olympic Peninsula, Washington). Abundant newly emerged coho fry were actively feeding amongst the vegetation when this picture was taken.

Figure 22. Four acre floodplain pond formed within an ancient channel of the Chehalis River (Western Washington). Pond drains to the main river through a small egress channel seen on left side of pond.
All of these off-channel types can provide critical habitats in some life stages to salmonids—particularly for coho salmon. These habitats provide refuge from high velocity flow, as well as thermal refugia during some times of the year.

### 3.2 Life Stage-Specific Habitat Utilization and Survival

Utilization patterns by coho salmon of different habitat types in each life stage are described below, together with reported survival rates. Variations from common patterns are described where they have been found. Only freshwater life stages are covered.

#### 3.2.1 Spawning Migration

Adult coho salmon use the main channel of mainstem rivers and tributaries for migrating to spawning sites. They utilize all habitat types within the main stream and can generally be found holding to rest during the migration in deep water areas, particularly pools.

As described earlier, river entry of adult coho is primarily keyed to storm events in autumn. Their migration into tributary natal streams often occurs during high flows (Koski 1966).

Because arrival time to rivers generally coincides with the onset of fall rains, water temperature usually poses no problems for migration success. Fish that enter the river at the beginning of a run may encounter elevated water temperatures, as reported in some years in the Klamath River—in which case, mortality can result (CDFG 2004).

Survival during the freshwater migration is assumed to be generally high in streams of the Pacific Northwest. In short rivers where natural predators are not abundant, survival exclusive of any harvest impact is likely very high, perhaps approaching 100% in many cases. Predation by sea lions and seals can occur in the lower reaches of rivers and estuaries, potentially preventing...
recovery of listed coho populations under some circumstances (Meyler 2002). Hillemeier (1999) determined that pilchards preyed primarily on Chinook salmon in the lower Klamath River, consuming over 8% of the returning run in 1997. The predation rate on returning coho salmon was much less, roughly estimated at 2% of the run. Williamson and Hillemeier (2001) found a similar pattern of relative impacts on Chinook and coho salmon in that river in 1999 with estimated losses of 2.3% and 1.3% of the returning run sizes.

Figure 24. (Top) Oxbow-wetland within the floodplain of the Chehalis River (Western Washington) during a flood event in March 2003. The site is flooded from its lower end where it drains to the main river, located at the far end of the photo. No river water enters at the top end of the ponded area. (Bottom) Water levels receding at the same site in April 2003. Water is draining toward the main river, located in the far end of photo. Water drains through a swale in a natural levee. Structure in picture is the fyke net and a migrant trap located in the distance. Both Chinook and coho juveniles were captured by fyke net and migrant trap. The site was dry by late spring. From Honning (2004).

In drought years in Southern Oregon and California when sand bars blocking stream mouths persist, it is reasonable to assume that some adults may be prevented from spawning. Walt Duffy (Humboldt State University, personal communications) has observed late timed adult coho

Coho Salmon Life History Patterns
struggling to swim over barely inundated sand bars blocking Stone Lagoon, a lagoon about 2 miles south of Redwood Creek (Northern California).

Coho production from some streams is correlated with streamflow during the migration and spawning life stages (Lestelle et al. 1993b; Volkhardt et al. 2007). In years of high flow during these life stages, penetration by migrating adults into a river system is believed to be increased, thereby increasing the total miles of habitat able to be used by the population, resulting in increased production (Bradford et al. 1997). Seacomeca (1981) found that the annual catch of coho off the Oregon Coast from 1942 to 1962 was correlated with total streamflow during the corresponding years of freshwater life. He suggested that one likely explanation was that years of high flow would have allowed greater access by spawners to streams in the upper areas of river systems.

3.2.2 Spawning

Coho salmon spawn mainly in small streams or in side channels to larger rivers, a pattern seen across the species range (Burner 1951; Sandercock 1991; Moyle 2002). They sometimes spawn along the river margins of larger streams, but normally not in large numbers (author’s personal observations). Under unusually dry weather conditions when access into smaller spawning tributaries may be blocked, they will spawn in larger numbers in mainstem rivers. Such behavior has been observed in the Thompson River in the Fraser River interior region; survival of eggs and fry is thought to be reduced in such cases due to relatively poor quality of habitat for incubation (Richard Bailey, Fisheries and Oceans Canada, personal communications). Coho have also been observed to spawn in significant numbers in mainstem rivers where hatcheries are located in close proximity to the river downstream of a dam. This has been observed in the mainstem Rogue River (Southern Oregon) (McPherson and Cramer 1981) and the Klamath River (Brown and Moyle 1994; NRC 2004) and in rivers farther north.

Coho salmon spawn on pool tailouts and along margins of riffles in main channel habitats, often close to or under cover. They generally spawn in small gravels (Burner 1951).

They spawn heavily in groundwater channels where these habitats exist along the floodplains of rivers, often in relatively high densities (author’s personal observations). These channels often have fine substrates with high amounts of fine or sand sized particles. These areas, despite their high sediment load, produce high egg survival because of upwelling that occurs there (Bjornn and Reiser 1991; Waters 1995).

They also spawn within the littoral areas of some lakes in Alaska, such as Chignik Lake (Ruggerone and Rogers 1992).

High water temperature is generally not an issue to spawning success of coho salmon in the Pacific Northwest and California. Spawning begins in late fall after streams have had significant cooling.

Survival from the onset of nest digging to the completion of spawning in rivers of the Pacific Northwest is assumed to be very high under normal conditions.

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3.2.3 Egg and Alevin Incubation

Egg and alevin incubation habitat is the same as that described above for spawning. Nest sites are selected by spawners, eggs are deposited, and except for some relatively small amount of lateral movement by pre-emergent fry, eggs and fry remain within or very near the original nest sites.

Survival from egg deposition to fry emergence can vary significantly between streams depending on stream characteristics and local conditions. Changes in stream conditions due to land use can severely reduce survival to emergence.

Under the most optimal conditions occurring in nature survival to emergence can reach approximately 80%. Quinn (2005), referring to salmon species in general, states that “If scours do not occur and the size of gravel is ideal, up to 80% of the eggs may survive to produce free-swimming fry. This typically only takes place in artificial spawning channels where pre-sorted gravel and regulated flows provide nearly ideal conditions.” Morling and Lantz (1975) reported that the maximum observed survival to emergence in a study of three streams in the Abra watershed (Oregon Coast) for coho salmon was 82% (of 94 redds trapped). The eight year study included years prior to and following logging. Taggart (1984) reported a maximum observed survival to emergence of 77% for coho salmon in tributaries to the Clearwater River (Olympic Peninsula, Washington) (of 19 redds trapped over two years). The EDT model31 applies a 60% survival from egg deposition to emergence to represent the average survival expected over some period of years (e.g., 10 years) in stream reaches that contain the best conditions that occur in nature (Lentelle et al. 2004). The single highest observed survivals in studies like those conducted by Koski and Taggart would not be expected to occur for groups of redds in an optimal stream reach averaged over a period of years. The average survival in this case is lower than maximum observed values.

Average survival to emergence for coho in streams that might be considered typical in the Pacific Northwest and California is much less than occurs under optimal conditions in nature. Morling and Lantz (1975) summarized survival to emergence in three small Oregon coastal streams over eight years (Table 2). In redds where some fry emergence occurred, the average survival across all years and streams was 32.7%. Including redds with no successful emergence, average survival was 28%. Zero emergence occurred in 14.5% of the redds. Koski (1966), who reported on the first year of study, included redds with zero emergence to compute an average survival to emergence. He discounted the possibility of false redds because of the intensive observations he made on spawners and redds. Koski concluded that redds with zero emergence resulted from gravel scours. Logging occurred in the Deer Creek and Needle Branch watersheds approximately half way through the eight year study. Flynn Creek remained unlogged. There was no significant shift in survival rates in the two logged watersheds following logging.

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31. The Ecosystem Diagnosis and Treatment (EDT) model is used throughout the Pacific Northwest to help assess the performance of salmon populations in relation to habitat condition. http://www.mbrbrd.com/MBR/edt.html

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Table 2. Summary of survival from egg deposition to fry emergence for coho salmon in the Alsua River (Oregon Coast) study streams averaged over eight years (Morin and Lantz 1975).

<table>
<thead>
<tr>
<th>Measure</th>
<th>Deer Cr.</th>
<th>Flynn Cr.</th>
<th>Needle Br.</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of redds trapped</td>
<td>32</td>
<td>30</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>% survival for successful</td>
<td>37.9%</td>
<td>25.7%</td>
<td>34.6%</td>
<td>32.7%</td>
</tr>
<tr>
<td>emergence only</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% survival including zero</td>
<td>33.5%</td>
<td>20.8%</td>
<td>29.8%</td>
<td>28.0%</td>
</tr>
<tr>
<td>emergence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Taggart (1984) assessed survival from redds in tributaries to the Clearwater River (Olympic Peninsula, Washington) during a period of active logging in the watershed. Most of the logging in his study streams had occurred within a period of 1-10 years prior to his study. Over two years, he monitored survival in 19 redds. The average survival for all redds monitored was 29.8% (arithmetic mean). Taggart reported a geometric mean of 22.1%. Taggart cautioned, however, that redds were selected in the study on the basis of how he felt they would aid in developing a relationship between intergravel sediment load and survival. Redds were not selected randomly to assess mean survival to emergence in the river system. Moreover, he specifically excluded redds for trapping that were determined to be subject to scour. Jeff Cederholm’s (personal communications, cited in WDF and Quinault Treaty Tribes [1982]) reviewed Taggart’s study and concluded that Taggart’s arithmetic mean of 29.8% was a reasonable estimate of average survival in the river system at that time, including redds with no successful emergence.

Prior to logging, the average estimated survival to emergence for coho salmon in Carnation Creek (Vancouver Island) was 29.1% (Scrivener and Brownlee 1989), a value nearly identical to the estimates for Clearwater and Alsua tributaries. It should be noted that Carnation Creek and all of the study streams in the Clearwater and Alsua watersheds are small streams, characteristic of many coho spawning streams.

Sandercock (1991) stated that Briggs (1953) reported in a California study that “average egg-to-fry survival was 74.3%” based on 22 coho redds sampled. However, Sandercock failed to identify that Briggs had not estimated survival to emergence. Briggs employed egg and alevin pumping to obtain estimates of the ratio of live to live plus dead at the time of pumping. The estimates did not take into account dead eggs that had disintegrated nor the loss that would have occurred from that time until emergence. Koski (1966) suggested that much of the mortality that occurs in redds is due to pre-emergent fry being prevented from emerging successfully from the redd. Thus, it appears that Briggs’ estimates do not reflect survival to emergence comparable to the other studies cited above.

**Coho Salmon Life History Patterns**
Data collected in the Alsea watershed study streams (Oregon Coast) suggest that survival to emergence of coho salmon generally lacks a density-dependent effect. Relationships between the numbers of emigrant fry trapped in the lower end of the three study streams and numbers of female spawners are linear across the range of spawners seen during the eight year study period (Figure 25). Linearity in these relationships indicates that survival to emergence is density-independent in these streams. This means that over the range of spawners seen that the availability of spawning area was sufficient to minimize any effect of competition for redd sites and redd superimposition.

Two factors are most often cited as affecting the survival to emergence of coho salmon: fine sediment loading and bed scour. A third factor, presence of an egg-eating oligochaete worm, has also been found to have significant effects on survival to emergence in some areas of Northern California. A brief summary of the magnitude of these effects is useful here.

![Graphs showing relationships between female coho salmon spawners and emigrant fry captured in traps at the downstream ends of study streams.](image)

*Figure 25. Relationships between female coho salmon spawners and emigrant fry captured in traps at the downstream ends of study streams in the Alsea watershed (Oregon Coast). Emigrant fry data from Au (1972). Spawner abundance data from Knight (1980).*

*Coho Salmon Life History Patterns*
Following logging, the estimated average survival to emergence of coho salmon in Carnation Creek was approximately half that prior to logging. Average survival was estimated to have declined from 29.1% to 16.4% (Scrivener and Brownlee 1989). This was attributed primarily to sediment loading. Mortality likely occurred both as a result of reduced oxygenation associated with increased fine sediment and to increased bed scour associated with the greater sediment load. Scrivener and Tripp (1998) provided updated estimates of survival for Carnation Creek. They listed 25% as the unlogged average and 19% as the logged average in the absence of mass wasting. With mass wasting, they estimated survival to emergence to be 15%. Cause of mortality was listing as being both reduced oxygenation and increased bed scour.

Taggart (1984) characterized the relationship between fine sediment and survival to emergence for coho salmon as curvilinear across the range of fines examined (Figure 26). Relatively small increases in fine sediment within the intermediate range of values produced a steep decline in survival. At higher levels of fines, the rate of decline in survival slowed substantially, suggesting that egg pocket structure affords some protection against further degradation as fines within the surrounding redd environment increase to higher levels. Chapman (1988) predicted that egg pocket structure within natural redds would afford such protection.

Koski (1986) characterized the relationship between sand sized particles and survival to emergence for coho salmon within the Alsea watershed study streams (Oregon Coast) as being linear (Figure 27). Variability in survival increased at higher levels of sand concentrations.

![Figure 26](image.png)

Figure 26. Relationship between percent of substrate <0.85 mm in size and percent survival to emergence of coho salmon in the Clearwater River (Olympic Peninsula, Washington). From Taggart (1984).

The relationships between fines/sand and survival shown in Figures 26-27 apply where flow through the redd is downwelling. Tributaries in the Clearwater River watershed are little affected
by spring sources and flow through salmon redds is downwelling (i.e., water flow moves from the surface flow down through the redds).

In streams fed largely by springs, salmonid spawning can occur at sites with upwelling due to the groundwater influx occurring through a reach (Figure 28). When spawning occurs in upwelling groundwater, the adverse effects of sediment on eggs and emerging fry are largely negated, resulting in high survival, provided the groundwater is not low in dissolved oxygen (Bjornn and Reiser 1991; Waters 1995; Garrett et al. 1998). Spawning areas at these locations can be very high in fines. This explains why salmonids can have very high rates of reproduction in some streams despite excessive deposits of fine sediment. Coho salmon will spawn heavily in groundwater channels if available (personal observations of author).

![Graph showing relationship between percent of substrate < 1.33 mm in size and percent survival to emergence of coho salmon in the Alsea River study streams (Oregon Coast). From Kossik (1966).](image)

**Figure 27.** Relationship between percent of substrate < 1.33 mm in size and percent survival to emergence of coho salmon in the Alsea River study streams (Oregon Coast). From Kossik (1966).

Bed scour can have very high adverse effects on incubating salmon eggs. On the Queen Charlotte Islands, Tripp and Poulin (1986) cite bed scour as being a significant factor affecting survival to emergence of coho salmon. It is most damaging to egg survival in relatively high gradient streams having little large woody debris. It is made worse following logging that leads to mass wastage. If the loss of eggs to scouring is assumed to be directly related to depth of the incubating eggs, mortality due to scouring alone could be greater than 70% for coho salmon in many streams on the Queen Charlotte Islands (Srivastava and Tripp 1998).

Montgomery et al. (1996) found that even minor increases in depth of bed scour due to land use practices can significantly reduce salmon embryo survival. Scour and fill of gravel beds is a normal physical process that occurs during high flow events, but watershed development can change their rates and associated equilibria. Schuett-Hames and Adams (2003) reported that the
depth of bed scour in salmonid spawning tributaries of the upper White River (Western Washington) is a function of peak flow (Figure 29). They projected significant egg losses for spring Chinook due to bed scour. Channel simplification and loss of stable large woody debris (LWD) appears to have increased the extent of bed scour at flow in those streams. Peak flows also appear to have increased as a result of timber harvest and road building.

Figure 28. Salmonid redd construction in relation to sites of downwelling (A) and upwelling (B). From Waters (1995).
Rates of scour and fill within a stream segment can be highly variable due to widely differing site specific conditions (Montgomery et al. 1999; Remie and Millar 2000). For example, side channels provide much greater bed stability than found in the main channel. Stable LWD can also provide favorable spawning sites, protected from high velocities in exposed areas during flood conditions. Shellberg (2002) reported that in streams having high flows during fall and winter that bull trout redds were scour and in stream reaches lacking features that protect from instability (e.g., side channels and stable LWD). He concluded that loss of LWD and channel simplification had increased the probability for redd scour in some streams.

Montgomery et al. (1996) studied bed scour and chum salmon egg pocket depths in two streams, one located in Puget Sound (Kenedy Creek). They concluded that close correspondence found between egg burial depths and scour depths implies a finely tuned adaptation to long-term rates of sediment transport. Further, they said that changes in gravel transport rates, as can occur with land use, can dramatically affect egg survival because egg pockets tend to be just below the usual depth of scour in pristine streams. They reported that egg pocket depths averaged about 22 cm for chum salmon (median = 20 cm), although the range between the shallowest and the deepest was quite large (10 to 49 cm). Egg pocket depths reported are the distances from the level of stream bed to the ceiling of the egg pocket. Their results demonstrated that relatively small increases in scour depth would jeopardize the majority of egg pockets (Figure 30). Depths of egg pockets for coho salmon are very similar to those of chum salmon (DeVries 1997).

Montgomery et al. (1999) examined the spawning distributions of Chinook and coho salmon and trout species in several rivers of Washington and Oregon to assess the role of geomorphic factors on distribution. They concluded that the spawning distributions of all fall spawning salmon species in rain-dominated stream systems are strongly affected by channel gradient and valley floor width. Bed scour generally increases with channel gradient and the degree of channel confinement. In rain dominated systems, these authors concluded that coho salmon would infrequently spawn in streams with gradients greater than 3% or in highly confined channels because bed scour would usually be prohibitively high to sustain the population.
Figure 3b. Potential egg loss (as a percent of egg deposition) for chum salmon in Kennedy Creek (Puget Sound region, Washington). From Montgomery et al. (1996). Egg pocket depths of coho salmon are similar to those of chum salmon (Devries 1997).

Another mortality factor found to significantly affect coho survival to emergence in some streams in Northern California, is an oligochaete worm (Briggs 1953; Sparkman 2003). The worm, *Haplotaxis ichtyosphaga*, can kill eggs with copious mucous secretions, although Sparkman (2003) found evidence that the worms also consume portions of live eggs. When worms are present survival to emergence can be reduced to 0%. Sparkman reported that two factors best explained survival to emergence in natural redds within the Prairie Creek watershed in Northern California—amount of fine sediment and presence/absence of the oligochaete worm. In artificially constructed redds, egg survival averaged 9% and 78% when worms were present and not present, respectively. The distribution of this worm species outside Prairie Creek is unknown. Egg mortality associated with the worm has not been reported outside of Northern California (Sparkman 2003).

3.2.4 Fry Colonization

Upon emergence coho fry move quickly to slow velocity habitats, typically along the channel margin, or they continue to move downstream. They have a strong affinity for very slow velocity water (Figure 11) and generally move there as rapidly as possible. Fry emergence can be very protracted, which can help facilitate dispersal (Mason 1976b).

Fish that emerge during high flows can be swept downstream (Chapman and Bjornn 1969; Hartman and Holby 1982; Holby 1988; Shirvell 1990; Fausch 1993), in some situations moving them to less suitable habitats, increasing bioenergetic costs, and increasing predation exposure. In rivers with abundant floodplain habitat, emergence during high flows (i.e., spring runoff) can be beneficial if fry gain access to those habitats, then subsequently return to the main river without being stranded (Sommer et al. 2001; Henning 2004; Lestelle et al. 2005). Backwaters and bank edges along vegetated shorelines during spring runoff are also important refuge sites for emergent fry. However, in streams lacking suitable velocity refugia, fry survival is likely diminished if emergence occurs during periods of prolonged high flow (Shirvell 1990; Smith 2000; Fausch et al. 2001; Lestelle et al. 2006).
Young fry are most often found in shallow, slackwater along stream margins and often associated with some form of bank cover—particularly back eddies, or behind fallen trees, undercut tree roots, and other well-protected areas (Mundie 1969; Lister and Genoe 1970).

Nickelson et al. (1992) reported that coho fry densities in small streams on the Oregon Coast were by far highest in backwater pool units (Figure 31) compared to other habitat types, although they could be found along the margins of virtually all types. They were not present in off-channel habitats (alcover) as fry, presumably because these habitats were not well connected to the stream during time of emergence. Of the habitat types inhabited, backwater units had the slowest water velocities.

Mundie (1969) reported that newly emerged coho fry were relatively scarce in large mainstream rivers like the Stamp River on Vancouver Island (Figure 32). He stated: “Contrary to appearances large coastal rivers like this one are not important feeding areas for coho. The food produced in them is sparse, and the recently emerged fry are confined to marginal slack water out of reach of the main stream drift.” Mundie’s observations suggest that low velocity refugia are limited in this river.

Following emergence, some fry move longer distances than others (Au 1972), partly as a result of emigration due to intraspecific competition (Chapman 1962). This effect can result in moving some fish into larger streams and lakes downstream of natal tributaries. In some cases, emergent fry may move upstream into a lake if spawning occurs in the lake’s outlet stream (Swain and Holby 1989).

In cases where spawning is not distant from the sea, some fry can move into stream mouth estuary (Tschaplinski 1988; Nielsen 1994), as described earlier in this report. These movements are typical of coho fry and serve as a dispersal mechanism. However, large numbers of fry sometimes captured at stream trapping facilities, usually assumed to be fry emigrants (Au 1972), are apparently often merely moving a short distance downstream of the trapping site (Lindsay 1974). In such cases, emergence sites are likely not far upstream of trapping sites. This suggests that the distance traveled from natal sites as fry is typically not extensive for coho salmon.

Young coho fry that move to larger rivers can subsequently move into off-channel habitats as a result of their need for calm, slow velocity water. Peterson and Reid (1984) reported trapping small fry moving into off-channel ponds via low velocity egress channels connected to the outlets of the ponds. This movement is the likely source of juvenile coho found in many off-channel habitats during summer—both in coastal regions (e.g., Sedell et al. 1984; Coe 2001) and interior regions (Brown 2002).

Water temperature is generally not an issue to young coho fry in the Pacific Northwest and California because of their emergence timing during spring.
Figure 31. Mean density (± SE) of juvenile coho salmon by habitat type during spring, summer, and winter reported for Oregon coastal streams. AL = alcove; BW = backwater pool; DM = dammed pool; SC = scour pool; PL = plunge pool; TR = trench pool; GL = glide; RI = riffle; RA = rapid. Adapted from Nickelson et al. (1992).

Survival during the fry colonization stage is likely mostly density-independent because of the short time period involved. Estimated survival rates for Deer Creek in the Alsea watershed study (Oregon Coast) show a modest density-dependent effect (Figure 33 - derived from data in Au 1972). An estimate of the density-independent component of survival can be obtained from Figure 33 by simply extending the regression line to the Y-axis (zero density), giving a value of 81%. This represents the average survival rate for the fry colonization phase for Deer Creek—a small coho stream—absent any effect of fry density.
Figure 32. Stamp River, Vancouver Island. Mundie (1969) reported that this river is of a size that keeps it from being an important nursery area for coho salmon fry. Fry in rivers like this one must remain confined to marginal, slow velocity water, which is generally limited in amount and distribution.

Figure 33. Relationship between the number of newly emerged, resident coho fry (total emergent fry minus fry emigrates) and survival to June 1 in Deer Creek, Abesia watershed (Oregon Coast). Survival shown is for the fry colonization phase for resident fry. Derived from data in As (1972). Estimated density-independent survival is the point where the regression line would cross the Y-axis (0.81). The open square symbol was assumed to be an outlier and was not used in the regression.

3.2.5 Subyearling Summer Rearing

Juvenile coho reside in a wide variety of stream types and sizes during summer, in addition to connected lakes where present. They are typically found in highest densities within their natal streams since the majority of fry usually do not migrate long distances from spawning sites.
(Lindsay 1974), unless the natal stream has a high gradient promoting longer distance movement (Lesch et al. 1993a).

The need for slow velocity water by juvenile coho remains strong during this life stage (Figure 11). In larger streams, juvenile Chinook and steelhead are more frequently associated with some surface water turbulence than coho salmon, as seen in a study of velocity-depth preferences in the Trinity River in the Klamath basin (Hampton 1988a, Figure 34). Juvenile Chinook and steelhead are often found feeding near velocity shears within main channels, while coho remain more closely associated with the shoreline or dense cover of woody debris. This pattern—seen across the species’ range—indicates a much stronger affinity for slow velocity by coho salmon than the other species during this life stage. All of the swimming phenotypes described by Nielsen (1992a, 1992b, 1994) are closely associated with habitat types having slow water velocities.

![Frequency of association with surface turbulence](image)

*Figure 34. Percent of observations of fry (<50 mm) and juvenile (≥50 mm) Chinook, coho, and steelhead found occurring with surface turbulence in the Trinity River in the Klamath River basin (Northern California). Reprinted from Hampton (1988).*

Juvenile coho are most often found in pools as shown in data for the Oregon Coast (Figure 23)(Nickelson et al. 1992). In smaller streams, they are found in highest densities in all pool types, intermediate densities in glides, and lowest densities in riffles and cascades. It is important to note that these densities occur where fry recruitment is high (i.e., high spawning escapements) and habitat quality is not degraded. This pattern of habitat selection occurs throughout their range (Hartman 1985; Bisson et al. 1988b; Schwartz 1991; Las 1994; Sharma and Hilborn 2001; Brakensiek 2002). The densities reported by Nickelson et al. (1992) are very consistent with those predicted for key habitats (pools) using relationships developed for coho salmon in British Columbia (Pottermyr 1993). Those relationships show, however, that density can be strongly affected by stream productivity, i.e., by the amount of food it produces to support salmonids. Highly productive streams can support higher juvenile coho densities than less productive ones (Mason 1976a; Pottermyr 1993; Ward et al. 2005).

The highest densities of juvenile coho during this life stage are usually found in the smallest streams (Rosenfeld et al. 2000). Although utilization patterns have not been well defined for all habitat types in large streams, qualitative descriptions indicate that densities drop sharply in large

The most extensive data set comparing densities between low and high order streams (i.e., small versus large streams) occurs in Jepsen and Rodgers (2004) and Jepsen (2006). This study, the Western Oregon Rearing Project, provides a quantitative comparison based on an exceptionally large number of pools sampled by snorkeling in late summer in watersheds spread across the Oregon coast (Table 3; Figure 35). Spawning escapements for brood years that produced these data were high compared to earlier years (PFMC 2006). The large differences seen between densities of small and large streams occurs because a smaller proportion of the total cross-section in large streams affords depths and velocities preferred by juvenile coho salmon, though other factors are also operative. This largely explains why average coho smolt production for different sizes of watersheds between Southeast Alaska and California has been found to be linearly correlated with the total utilized stream length in a watershed (Bradford 1997; Bockting and Peacock 2004).

Within the SONCC Coho ESU, extensive sampling for juvenile salmonids occurred annually in the mainstem Rogue River between 1974-1983 to evaluate the effects of Lost Creek Dam on salmonids. Sites were sampled between the dam site (RM 157) and the river mouth throughout spring, summer, and fall. Prior to the return of hatchery coho to Cole Rivers Hatchery, few subyearling coho were captured each year in the mainstem river, suggesting that this species was rearing almost entirely within the tributaries (Cramer and Martin 1978; Cramer and Martin 1979; McPherson and Cramer 1981; Cramer et al. 1985). Following the return of adult hatchery to Cole Rivers Hatchery near the dam, more juvenile coho than in previous years—though still small numbers—were captured in the upper part of the mainstem (within approximately 25 miles of the dam) (McPherson and Cramer 1983). The researchers believed that this was due to stray hatchery adults spawning in the mainstem river below the dam (Cramer et al. 1985).

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23 / The linear relationship suggests that, on average, the same number of smolts is produced in a mile of a large river as in a mile of a small tributary to that river. Substantial variability is evident about the relationship, indicating effects of stream type, geomorphology, climate, habitat quality, nutrients, etc. For example, in stream systems with substantial ponds or lakes, smolts produced per mile of stream may be linearly correlated with the percentage of total wetted surface area in the system comprised of ponds or lakes (Baranski 1989; Leitelle et al. 1993b). It should be noted that within large watersheds, the large majority of stream miles utilized are found in tributaries to the mainstem river.

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Table 3. Densities (fish/m² pool) and SE of means of juvenile coho salmon in two size groups of streams on the Oregon Coast: 1st-3rd order (small streams) and 4th-5th order (large streams). Data were collected by snorkeling in late summer. Ratios of density for small streams to large streams, maximum and minimum observed densities, number of reaches sampled, and number of pools sampled are also shown. Only sites where coho were found are included in statistics. Data from Jepsen and Rodgers (2004) and Jepsen (2006).

<table>
<thead>
<tr>
<th>Year</th>
<th>Measure</th>
<th>1st-3rd</th>
<th>4th-5th</th>
<th>Ratio</th>
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<tr>
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<td>Ave density (fish/m²)</td>
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<td></td>
<td>Standard error</td>
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<td></td>
<td>No. reaches sampled</td>
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<td>44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. pools sampled</td>
<td>4000</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>Ave density (fish/m²)</td>
<td>0.48</td>
<td>0.08</td>
<td>0.164</td>
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<td>0.041</td>
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</tr>
<tr>
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<td>Range</td>
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<td>0.00-1.78</td>
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</tr>
<tr>
<td></td>
<td>No. reaches sampled</td>
<td>251</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. pools sampled</td>
<td>4008</td>
<td>409</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>Ave density (fish/m²)</td>
<td>0.31</td>
<td>0.03</td>
<td>0.104</td>
</tr>
<tr>
<td></td>
<td>Standard error</td>
<td>0.032</td>
<td>0.012</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>No. reaches sampled</td>
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<td></td>
</tr>
<tr>
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<td>No. pools sampled</td>
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</tr>
<tr>
<td>Mean</td>
<td>Overall ave density</td>
<td>0.49</td>
<td>0.05</td>
<td>0.100</td>
</tr>
</tbody>
</table>

Juvenile coho that rear in mainstem rivers usually remain in close association with the shoreline (Mur tile 1969; Marshall and Britton 1980; Beecie et al. 2005). Beecie et al. (2005) assessed the relative utilization by juvenile salmonids, including coho, of mainstem habitat units in the Skagit River (Western Washington). The researchers concluded that juvenile coho were largely using edge habitats with very little use of mid channel habitats. This pattern was evident during both summer and winter. Among the three edge unit types, juvenile coho were found primarily in bank and backwater units during both summer and winter, with little use of bar edges in either season (Figure 36A). During summer, they were almost always closely associated with cover comprised of wood or aquatic plants—little use was made of cobble cover (Figure 36C). In winter, only wood appeared to provide suitable cover. Banks had the most abundant wood cover, whereas backwaters contained aquatic plants and wood cover. Bars contained mainly cobble-boulder cover. Among edge units, bars and banks tended to have similar velocity distributions, with backwaters comprised exclusively of low velocity points. While juvenile coho were found

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associated with both low and medium velocity classes in summer (Figure 36B), they were almost always found within the low velocity class in winter.

![Graph: Juvenile coho density by stream order]

Figure 35. Densities (fish/m² pool +/− SE) of juvenile coho salmon in two size groups of streams on the Oregon Coast: 1st-3rd order (small streams) and 4th-5th order (large streams). Data from Jepsen and Rodgers (2004) and Jepsen (2006).

In large rivers, secondary channels (i.e., side channels and off-channel habitats) provide important rearing areas for juvenile coho. Murphy et al. (1999) determined utilization rates of various channel and habitat types in the lower Yukon River, Alaska during mid to late summer. Within the main river, they sampled channel edges, backwater pools, braids, and side channels (called sloughs by the authors). On the valley floor off the main river (i.e., off-channel habitat), they sampled terrace tributaries (type of groundwater channel), tributary mouths, upland sloughs (type of groundwater channel), and off-channel beaver complexes. Within the main river (including side channels), habitats beyond the channel edge were too swift to sample and were assumed to not hold rearing juveniles because of fast current. Coho and Chinook generally occupied different habitats. Juvenile Chinook were more abundant in main river channel and habitat types than coho salmon, whereas the latter were more abundant in off-channel habitats (Figures 37 and 38). Coho salmon occupied significantly slower current than Chinook. Coho densities were highest in still or slow water (~10 cm/s), whereas Chinook density was highest in slow-to-moderate current (1-20 cm/s). Both species were virtually absent from areas with currents > 30 cm/s. Coho almost exclusively occupied off-channel habitats and were consistently scarce in river habitats, even those with slow water.

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Although this assumption could not be verified through actual observation in the river, it is extremely unlikely that coho juveniles were rearing in this large, swift mainstream river.

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Figure 36. Relative fish density (fish per point standardized by year) by species-age class and (A) edge unit type, (B) water velocity class, and (C—continued to next page) cover type in the Skagit River (Western Washington). Asterisk indicates statistically significant difference among unit types ($p = 0.05$). Numbers below x-axis indicate the proportion of points at which fish of that species were captured. Bars below x-axis indicate results of multiple comparisons (bars at similar elevation indicate that differences are not significant). See Figure 15 for edge unit types. Velocity classes defined as high ($>45$ cm/s), medium (15 - 45 cm/s), and low ($<15$ cm/s). Relative densities are not comparable between species. From Beechle et al. (2005).
The importance of side channels and groundwater channels of large rivers to juvenile coho during summer has been described in several studies in Washington State. Juvenile coho are often found in small side channels to mainstem rivers (Sedell et al. 1984; Rot 2003; Pess et al. 2005), together with juvenile Chinook and steelhead trout. Juvenile coho can occur in especially high densities (0.8 fish/m² total area) in stable side channels, i.e., those protected at their head end by large blocking log jams (Sedell et al. 1984). In groundwater channels, juvenile coho are frequently found in larger numbers than in surface water fed side channels. Groundwater channels are usually utilized almost exclusively by coho salmon, rarely by juvenile Chinook or steelhead trout (Sedell et al. 1984; Rot 2003; Pess et al. 2005). Both of these channel types can be major rearing areas for juvenile coho during summer in some parts of large river systems (Sedell et al. 1984). Both types, particularly groundwater channels, provide low velocity rearing habitat. In addition, groundwater channels normally have cooler water temperatures in summer than occur in mainstem rivers and their side channels. Stanford and Ward (1993) described groundwater channels as being exceptionally productive for some salmonid species—as seen by this author for juvenile coho in this channel type along the mainstem Queets River (Olympic Peninsula, Washington). In rivers of Western Washington, coho salmon utilize groundwater channels more than any other species.
Figure 37. Wetted area (hectares) of different channel and habitat types in the lower Taku River (Alaska) (top) and corresponding mean densities (mid to later summer) of juvenile coho and Chinook (adapted from Murphy et al. (1989). Channel and habitat types are: mid channel of main river channel and side channels (Mid main, channel edge of main river and side channels (Chan edge), braid (Braid), slough (Slough), backwater (Backw), terrace tributary (Ter trib), tributary mouth (Trib mouth), upland slough (Up slough), and beaver pond (Bear pond)).
The influence of wood on coho rearing densities during summer is not the same across all stream types and sizes and its role in this life stage is not altogether clear (Giannico and Healey 1999).

Some studies have reported that juvenile coho densities in smaller streams during summer are positively correlated with quantity of large woody debris (Hartman and Scrivener 1990; Koski 1992; Roni and Quinn 2001) (Figure 39) while others have found strong association (Gretle 1985; Bugert et al. 1991; Fransen et al. 1993; Spalding et al. 1995; Cederholm et al. 1997b). Part of the discrepancy appears to be due to whether authors distinguish the role that wood has in pool formation from its role as cover. Greater amounts of large wood often equate to more frequent and larger pools (as seen in the study of Roni and Quinn 2001), which in turn, results in a greater number of juvenile coho per channel length (reported by Roni and Quinn 2001).Cover in small streams can be provided by other stream components besides large wood, such as undercut banks, overhanging riparian vegetation, macrophytes—these items may dilute the role of large wood as cover in some streams during summer (Gretle 1985; Bugert et al. 1991). There is also evidence that the affinity of juvenile coho salmon for wood accumulations increases through the summer with growth (Hartman 1965; Dolloff and Reeves 1990; Fransen et al. 1993; Peters 1996)(Figure 40). Therefore, differences between studies may be partly due to within season variation.

![Figure 39. Density of juvenile coho salmon during summer in streams in Southeast Alaska, expressed as number of fish per square meter of total wetted channel area in relation to volume of large woody debris (LWD). Recreated from Koski (1992).](image-url)
In mainstream rivers during summer the presence of large wood appears to be much more important than in small streams for juvenile coho salmon. Peters (1996)—in the most extensive study of mainstream coho utilization known to this author—found that juvenile coho rearing in the mainstem Clearwater River (Washington) was strongly associated with large wood (Figure 41). Highest juvenile coho densities were associated with the most complex wood matrices sampled. Areas containing sparse wood had few juvenile coho present. John McMillan with the Center for Wild Salmon in Washington State has conducted extensive snorkeling surveys of several rivers on the Olympic Peninsula (Washington). His findings (personal communications) are comparable to those of Peters (1996). Areas of no or little wood have few juvenile coho relative to sites with dense large wood. Hartman (1965) reported very similar findings for the mainstream Chilliwack River (British Columbia); association with wood increased as juveniles grew and by late summer and fall juveniles were almost always associated with log jams.
Figure 41. Mean (+/- 2 SE) coho salmon abundance (% debris accumulation) at natural and introduced woody debris (combined) accumulations of different density during 1990 and 1993 and natural (N) and introduced (I) debris accumulations during 1992 in the mainstream Clearwater River (Washington). Recreated from Peters (1996). (* = no stations classified as sparse) Wood is classified by its relative accumulation as dense, medium, or sparse.

Peters (1996) concluded that the reason why juvenile coho were so tightly associated with wood in the mainstream river during summer was not simply to avoid higher water velocities. Many debris accumulations were located in sites with current velocities well below those preferred by juvenile coho (10 cm/s in Murphy et al., 1989; 20 cm/s in Dolloff and Reeves 1990). In most cases wood was located such that water velocities were not appreciably different within wood matrices than outside them. Peters hypothesized that the attraction of wood during summer in mainstream rivers is due to its providing refuge cover from predators and not primarily as water velocity refuge. In his study, the attraction of wood increased as coho grew larger, i.e., wood association was greater later in the season—identical to the findings of Hartman (1965) cited above. (As noted earlier, this same pattern is also evident in streams smaller than the Clearwater River – see Figure 40). Peters concluded that as juvenile coho grow they become more wary of predators, seeking greater association with dense wood. He stated:

"This is supported by the observation that juvenile coho salmon are less willing than other Pacific salmon to take risks during feeding (Abrahams and Healey 1993), which results in reduced attack distance to food following the presentation of model predators (Dill and Fraser 1984)."

This suggests that not only are juvenile coho poor swimmers in swift water, they are much less daring than other salmonid species in their willingness to move away from cover to feed. In larger and swifter rivers than the one studied by Peters (1996), large wood is also likely important as velocity refuge, suggested in other aspects of Hartman’s (1965) study (described below for the overwintering life stage).
High water temperatures during summer can be an important factor affecting the distribution, growth, and survival of juvenile coho salmon.\textsuperscript{26} Preferred temperatures in this life stage are 12-14°C (Brett 1952) with optimum temperatures for growth at about 14-18°C (Sullivan et al. 2000). Food availability is an important determinant in how well juvenile salmon can cope with elevated temperatures (Brett et al. 1982; McCullough et al. 2001). As food abundance increases, they are better able function (e.g., grow) with higher temperatures, but within limits. The maximum temperature that juvenile coho can tolerate without mortality is less clear because of the many ways that temperature can affect performance (McCullough 1999; Sullivan et al. 2000).

Eaton et al. (1995) used an extensive database of stream temperatures and species presence to estimate the weekly mean temperatures (daily maximum) that species can tolerate. For coho salmon, the value was estimated to be 23.4°C but it was not made clear what level of mortality could be expected above that point. This value is below laboratory-determined lethal temperature limits. Although it is clear that juvenile coho can tolerate higher temperatures under some natural conditions, it is evident that performance is usually adversely affected. Adverse effects have also been described at lower temperatures in various field investigations. Welsh et al. (2001) concluded that the findings of Eaton et al. (1995) for coho salmon were skewed by data representing large (and presumably diverse) river reaches and by use of less sensitive life stages. In a field investigation relating water temperature to juvenile coho distribution in the Mattole River (Northern California), the authors found that temperatures in the warmest tributaries containing juvenile coho salmon were 18°C or less (maximum weekly maximum temperature or MWMT). The study suggests that MWMT greater than 18°C would preclude coho presence. Madej et al. (2006) reported that the coho distribution in Redwood Creek (Northern California) is currently limited to the lowermost 12 miles of the stream, a point downstream of where the MWMT ranges between 23° to 27°C; historically coho migrated upstream another 45 miles. Frissell (1992) found juvenile coho salmon to be absent or rare in stream segments where temperatures exceeded 21°C in Sixes River (Southern Oregon).

In stark contrast to the findings of Welsh et al. (2001) and Frissell (1992), Bisson et al. (1988a) reported that juvenile coho showed no evidence of mortality or lethargy when temperatures exceeded 24.5°C during extended periods in streams near Mount St. Helens (Washington). In that case, water temperatures peaked at 29.5°C. Bisson et al. (1988a) hypothesized that an unusually high abundance of food may have enabled the juvenile coho to survive. However, these streams had extreme diurnal fluctuations in temperature (Martin et al. 1986) that likely afforded some measure of relief. The authors did not attempt to identify potential thermal refuge sites as described by Nielsen (1992a) or Ebersole et al. (2003a).

High water temperatures apparently can trigger movement of juvenile coho salmon during summer, when little movement typically occurs, as reported on the South Fork Umpqua River (Oregon Coast) (Figure 6; Kreuzie 1998). It is not clear from the study results what the sole effect of elevated temperatures was on juvenile movement (compared to flow and initial fry dispersal) but it is strongly evident that a temperature effect was occurring. Temperatures when movement

\textsuperscript{26} A separate report addressing coho salmon performance in the Klamath River authored by Cramer Fish Sciences (in preparation) provides a thorough review of the effects of water temperature on coho salmon. This issue is dealt with only briefly in this report.

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occurred ranged between 15-23°C. High temperature also appears to trigger downstream movement of juvenile coho in the Klamath River basin (Chesney and Yokel 2003).

One way that juvenile salmonids cope with high temperatures is to find thermal refuge sites. Groundwater channels described earlier can provide such refuge. Ebersole et al. (2003a) described four cold water patch types in streams of the Grande Ronde basin (Northeast Oregon): cold alcoves, floodplain springbrooks (type of groundwater channel), cold side channels, and lateral seeps. All of these tended to be small. Ebersole et al. (2003b) reported that the abundances of juvenile Chinook and rainbow trout abundance were affected by the frequency of occurrence of coldwater patches. Higher frequency of occurrence of patches increased abundance, suggesting that survival is related to the probability that juveniles can successfully find patches. Ebersole et al. (2001) reported that patches appeared to be able to accommodate limited number of juvenile rainbow trout, suggesting that patch size may limit how many juveniles will survive even if patches can be readily located. Ebersole et al. (2003b) found no evidence that patch size affected abundance of juvenile Chinook salmon.

Juvenile coho have been found to use thermal refuge sites in Northern California streams. Nielsen (1999a) reported that juvenile coho used cool water pools at confluences with cool tributaries and coldwater seeps along hillshores where some groundwater influence exists. One coho foraging phenotype, called “early emerging” (see Table 1), exhibited a unique feeding behavior that relied on cold water seeps for refuge during hours of high temperature.

Juvenile coho are found to be restricted to thermal refugia in the mainstream Klamath River during extended periods of the summer (Belchik 1997; Sutton et al. 2002; Deas and Tanaka 2006). Deas and Tanaka (2006) provided detailed observations on how subyearling coho, in addition to juvenile Chinook and steelhead, were distributed in several thermal refuge sites in the mainstream river in relation to water temperature. Figure 42 shows juvenile salmonid counts made by snorkeling within a thermal refuge site (Beaver Creek confluence) on the mainstream Klamath River at RM 162, showing fish numbers of each species within a sampling grid. The figure also shows temperature patterns at the time of the fish counts, made on July 28, 2005 at 7 pm. More examples are provided in the Deas and Tanaka report. Figure 43 is a photograph of the site taken on December 19, 2005, showing the backwater pool seen mapped in Figure 42 in relation to other channel and related flow features (flows are much higher in the December photo). Figure 42 shows that the distributions of the three species appear to be related to the thermal pattern. It also appears, in consideration of flow features seen in Figure 43, that the distributions were affected by flow velocities. Note that the juvenile coho show little association with where the velocity shear line would be expected to be (along the outer edge of the thermal refuge), in contrast to the other species. The authors noted that the juvenile coho were closely associated with an “algae mat” on the backwater pool (remnant of the mat is visible in Figure 43); the pool also contained abundant small woody debris on the substrate as well as rooted aquatic vegetation. No large wood pieces are present at the site. The composition of cover types in this backwater unit is comparable to that described earlier for backwaters in the Skagit River.

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Figure 42. Fish counts by species at a thermal refuge site in the mainstem Klamath River (Northern California) on July 28, 2005 at 7:00 pm. Beaver Creek enters the mainstem river at upper left, shown as a cool water plume. Cool water also emerges along the gravel bar downstream of the mouth of Beaver Creek. A backwater pool is located in the bottom of the figure. Water temperatures are shown by the color scale. From Dres and Tamaka (2006). See Figure 43 for photograph of site.
Survival of juvenile coho salmon during summer can be strongly density-dependent (Au 1972; Marshall and Britton 1980; Fransen et al. 1993; Quinn 2005). Competition for shrinking space due to declining flows in late summer—and limited food results in reduced survival at higher juvenile abundance (Figure 44). Thus, the amount of suitable living space during summer can limit the size of a coho population in a watershed. Such limitations can be plainly evident in smaller watersheds where the population does not exhibit extensive redistributions between life stages. This is readily seen in the relationship between summer low flow and smolt yield in the following spring in some streams in the Puget Sound region (Figure 45). Relationships like this one are found in streams that have an abundance of overwintering habitat (Lestelle et al. 1993b). In streams with little overwintering habitat, smolt yield is often controlled by winter conditions, thereby obscuring the effects of summer low flow on abundance.

Figure 43. Beaver Creek thermal refuge site in the Klamath River illustrated in Figure 42. Photograph taken on December 19, 2005. Backwater pool unit is plainly evident in lower left quadrant; remnant algae mat covers the inner part of the pool.

Figure 44, derived from data for Deer Creek in the Alsea watershed study (Au 1972), provides an estimate of the density-independent component of survival for the stream by extending the regression line to the Y-axis (zero density), giving a value of 86%. This represents the average survival rate for the summer rearing phase for Deer Creek between June 1 and October 15 absent any effect of juvenile density. The Deer Creek watershed was partly logged approximately halfway during the study. Combined with the density-independent rate reported earlier in this document for the fry colonization phase the overall rate absent density effects for this stream would be 70% (multiplying 0.81 times 0.86).

In streams that lack abundant overwintering habitat, such as occurs for many streams on the Oregon Coast (Solaini et al. 1999), coho production from streams is not correlated with summer low flow (Sassafrass 1981). A lack of correlation is also evident in Washington streams where overwintering habitat is not abundant (Lestelle et al. 1993b).

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Figure 44. Relationship between the number of resident coho fry present on June 1 and survival to October 15 in Deer Creek, Alaska watershed (Oregon Coast). Survival shown is for the summer life stage for resident juveniles. Derived from data in Au (1972). Estimated density-independent survival is the point where the regression line would cross the Y-axis (0.86).

Figure 45. Relationship between the 45-day average lowest summer flow and coho smolt yield the following spring in Big Beef Creek (Western Washington). From Lestelle et al. (1992b).
3.2.6 Fall Redistribution and Overwintering

In many streams, some juvenile coho salmon move from their summer rearing locations in fall, triggered by increased flows associated with autumn rainfall. This movement is another demonstration of the affinity that these fish have for slow velocity water. Water velocities increase in main stream habitats with rising flow, either dislodging juveniles from summer rearing sites or stimulating them to move to find more favorable habitats prior to the coming of larger, more frequent winter storms (Tschaplinski and Hartman 1983). Moyle (2002) suggests that the availability of overwintering habitat is one of the most important and least appreciated factors influencing the survival of juvenile coho in streams.

This pattern of downstream movement in fall associated with rising flow has been reported in the Klamath River (USFWS 1998; Toz Soto, Karok Department of Natural Resources personal communications), Oregon coastal streams (Rodgers et al. 1987) (Figure 46); Western Washington streams (Allee 1974; Peterson 1982), and British Columbia streams (Tschaplinski and Hartman 1983; Brown 2002). In some cases, juveniles captured at the head of tidal influence (Rodgers et al. 1987; Allee 1974; IMWSOC 2006) have been found to continue moving into estuarine habitat (Miller and Sadro 2003). It is evident, however, that these fish have not undergone amelioration and are not prepared for survival in full strength seawater (Rodgers et al. 1987). Miller and Sadro (2003) found them to reside into winter in the extensive upper parts of the Coos Bay estuary (i.e., within the estuary-freshwater ecotone) (Oregon Coast). In rivers that have minimal estuarine habitat, such as rivers on the Washington North Coast (e.g., Queets River), juvenile coho swept into the ocean during fall freshets likely perish.\footnote{\textit{Some uncertainty remains regarding the fate of fall emigrants that move into the marine environment. This author believes that probability of survival is related to whether the juveniles can find low salinity habitats along the nearshore environment or whether they can locate and enter nearby streams to overwinter. This topic is being researched in streams along the western portion of the Strait of Juan de Fuca (see IMWSOC 2006)—a significant downstream emigration of juvenile coho past a trap site immediately above tide water has been found in East Twin River between mid October and mid December. East Twin River and other streams in the immediate vicinity have very small stream mouth estuaries—the streams discharge directly into the outer coast of Strait of Juan de Fuca. Data on East Twin River is being analyzed as part of a Master’s Thesis by Todd Bennett (University of Washington).}}

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During this period of redistribution, some juvenile coho salmon immigrate into off-channel habitats. These habitats provide refuge from high flow velocities. Peterson (1982a) and Peterson and Reid (1984) described extensive movements of juvenile coho out of the mainstem Clearwater River (Washington Coast) into off-channel ponds (Figure 47). Thousands of juvenile coho salmon can move upstream through a tiny ogress channel into a single pond within a short period of time—showing this to be a very striking pattern of migration for this species. Juvenile Chinook and steelhead trout do not generally exhibit such a movement into these habitats (Brown 2002; Lestelle et al. 2005). Once coho juveniles have moved into these sites, few move back out into the main stream during the winter—the large majority stay for the duration and emigrate in the spring as smolts. Their overwinter survival in these sites is typically high (approximately 70%) although it can apparently be less in very shallow ponds (Peterson 1982b; Peterson and Reid 1984). Similar movements occur by juvenile coho into off-channel alcoves along small streams (Nickelson et al. 1992; Bell et al. 2001). Bell et al. (2001) reported very high fidelity of overwintering coho to alcoves in Prairie Creek (Northern California), a finding comparable to the lack of movement out of riverine ponds until smolt emigration. Winker et al. (1995) suggested that stable residency within a habitat type is indicative of high quality habitat.
Figure 47. Pattern of trap catches of juvenile coho salmon moving into an off-channel pond along the Clearwater River (Washington) in relation to stream discharge in the mainstem river. From Peterson (1982a).

To aid the reader in visualizing the differences in the quality of different habitats for overwintering coho, three reference photos are provided here. Figure 48-top shows the Clearwater River (the river where Peterson conducted his studies) during moderately low winter flow—the reach shown is typical of the river. Figure 48-middle shows the Smith River in Oregon, comparable in size to the Clearwater River in a flow event exceeding bankfull. Figure 48-bottom shows a riverine pond habitat on the Clearwater River—conditions shown exist throughout the winter. These pictures illustrate the extreme differences in conditions between in-channel and off-channel habitats during winter.
Figure 48. Winter habitat conditions in rivers used by juvenile coho salmon. (Top) Clearwater River (Washington) during moderately low winter flow. (Middle) Lower Smith River (Oregon Coast) during flood event—this river is comparable in size to the Clearwater River. (Bottom) Riverine pond adjacent to the Clearwater River. Smith River photo is courtesy of Ron Rasmussen, U.S. Forest Service.

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The same type of movement observed by Peterson is also found into groundwater channels (or small spring-fed floodplain tributaries) (Skeelsick 1970; Giammico and Hinch 2003). Skeelsick (1970) summarized the results of monitoring the movements of juvenile coho out of the mainstem Wilson River (Oregon Coast) into a small spring-fed floodplain tributary over a period of ten years. Immigrants were marked at the time of their capture in fall so that overwinter survival could be assessed; surviving smolts were enumerated in late winter and spring at the time of their emigration as smolts. Overwinter survival for the ten year period ranged between 46% to 91% and averaged 72%.

Bustard and Narver (1975) and Tschapinski and Hartman (1983) monitored coho juveniles moving out of the mainstem Carnation Creek (Vancouver Island) into a series of small beaver ponds on the stream's floodplain. As found by Peterson (1982a), once fish moved into the site they generally did not leave again until late winter and spring. Tschapinski and Hartman (1983) estimated the average overwinter survival over a six year period to be either 67% or 72% (using two methods of estimation).

Overwinter survival in off-channel habitats has been found to be improved if cover in the form of wood is added (Giammico and Hinch 2003), although the effect is not as evident in relatively warm groundwater channels. Apparently fish remain more active in warmer groundwater channels and may be more effective at evading predation. Juvenile coho have a greater cover-seeking response in very low temperatures (Bustard and Narver 1975; Taylor 1988).

Besides moving into off-channel habitats, juvenile coho salmon will also move from large streams (mainstem rivers) into small tributaries during this period of redistribution (Cederholm and Scarlett 1982; Scarlett and Cederholm 1984; Bramblett et al. 2002). In the Clearwater River (Washington), Cederholm and Scarlett monitored the movements of juvenile coho from the mainstem river into small tributaries. These streams are not spring fed—they are perennial runoff tributaries (1-1.5% channel gradients) that respond rapidly to rainfall events. Fish were found to move up to 1,100 meters upstream of the mainstem Clearwater River into these streams. The pattern of residency appeared to be different than reported for ponds by Peterson (1982a) and Tschapinski and Hartman (1983). In the runoff tributaries, fish exhibited a greater amount of movement through the winter—fish appeared to be arriving and departing more often than seen in the ponds. This suggests that fish were leaving the mainstem in an effort to find improved conditions, then continued that search to other areas during the course of winter. This may reflect an urgency to leave the large mainstem river when conditions are particularly harsh, followed later by more movement to escape conditions found unfavorable for continued residency. It suggests a transient residency pattern of fish that have not found high quality overwintering sites.

This movement of juvenile coho salmon from mainstem streams during fall and winter appears to be due to fish leaving unfavorable areas in search of improved survival conditions. Within mainstem streams, they evacuate sites with high exposure to high velocities. In Carnation Creek (Vancouver Island), sites within the main channel jumbled with logs, undercut banks, and deep pools filled with upturned tree roots and other forest debris contained almost all of the juvenile coho remaining in the main stream during the winter (Tschapinski and Hartman 1983). The large reductions in the main stream population in fall coincided with the largest movement of juvenile coho into the off-channel sites. No coho were found in midstream locations within the
stream and they did not inhabit areas under banks unless the sites contained tree roots or other
lodged debris (Figure 49), consistent with the findings of Beechie et al. (2005) in the Skagit
River described above (Figure 36C). Bustard and Narver (1975) reported the same pattern for
cover use in Carnation Creek in earlier work than that of Tschapilinski and Hartman as seen in
Figure 50, which nicely contrasts species differences in cover type preferences. Juvenile
steelhead, in addition to also overwintering in wood accumulations (yearling and older fish),
utilize cobble substrates. Young of the year steelhead predominantly utilize cobble or boulder
substrates for overwintering, which coho rarely use (Ruggles 1966; USFWS 1988; McMahon
and Hartman 1989).

Grette (1985) reported similar results for small streams on the Olympic Peninsula (Washington),
stating:

“During winter, coho were observed to be closely associated with instream cover,
especially debris-related instream cover. Often, the majority of the coho population in a
particular pool would be found near debris cover along a slow velocity stream margin.
Although cover appeared to be important, the single most important factor determining
distribution of coho during winter appeared to be velocity. A slow velocity pool with
instream cover (often even a very small area of cover) was likely to have coho present,
while a high velocity habitat with abundant instream cover often had no coho.”

Figure 49. Relationship between instream wood volume and numbers of juvenile coho salmon overwintering
at sites in Carnation Creek (Vancouver Island). From Tschapilinski and Hartman (1983).
The USFWS (1988) investigated habitat types used by overwintering juvenile coho and steelhead in the Trinity River within the Klamath River basin. Juvenile coho were found overwintering in side channels in “still water with aquatic vegetation or woody debris as the main cover type.” Juvenile coho were rarely observed holding underneath cobbles as was the common behavior for juvenile steelhead. The researchers noted that “use of large woody debris by juvenile coho salmon would have probably been greater had this type of cover been available in greater quantities within the study sites or the Trinity River in general.”

The association between juvenile coho and cover increases as water temperature drops. Distance between individual juvenile coho and nearest cover diminishes with falling temperature, as seen in Carnation Creek. (Figure 51). At temperatures $< 3^\circ C$, virtually all individuals were found tight within cover. Toz Soto (Karuk Department of Natural Resources personal communications) has observed a similar pattern in snorkeling surveys in tributaries to the Klamath River. Juvenile coho, like several salmonid species, are nocturnal at low temperatures during winter months (McMahon and Hartman 1989; Roos and Faryam 2000).

Hartman (1965) described the importance of large, stable instream wood to juvenile coho overwintering in main stream habitats in British Columbia (Hartman 1965). The Chilliwack River, the focus study stream, at the time contained numerous large wood accumulations. Hartman’s study is particularly notable in how he performed his sampling within this mainstem

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river—he used “Prima Cord” explosives to sample small fish at various sites within the river. This proved to be an effective way to sample under log jams. Sampling was conducted in all seasons, including winter. To this author’s knowledge, it is the only study to conduct such a rigorous sampling of log jam sites. Hartman reported that the large majority of juvenile coho found at sampling sites in the mainstem river during fall were located in close association with log jam cover. During winter, nearly all coho juveniles were associated with log jams.

![Graph]

Figure 51. Mean distance to cover of juvenile coho and steelhead in relation to water temperature during winter in Carnation Creek (Vancouver Island). From Bustard and Narver (1975). Sample size is indicated by the associated numbers. Regression lines were derived from N observations.

The importance of large wood to overwintering coho salmon has also been documented in Porter Creek, tributary to the Chehalis River (Washington) (Cederholm et al. 1997b). This study looked at the effect of wood enhancement on numbers of coho and juvenile steelhead produced in this medium sized creek. Although wood enhancement also increased pool quantity in the stream, smolt numbers were much more responsive to wood than merely to changes in pool quantity (Figure 52).

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It bears noting that the size and density of large, stable wood in stream channels varies greatly by channel size, channel type, and available wood sources (Abbe and Montgomery 1996; Bilby and Bisson 1998; Montgomery et al. 2003). Small channels retain wood much more readily than large channels (Figures 53-54). Wood is much more easily transported in large channels.

Channel type (i.e., extent of confinement) also influences how much wood is retained in a channel—confined channels with boulder or bedrock substrate contain about half or less number of pieces of wood found in similarly sized, unconfined reaches with small substrate (Bilby and Wasserman 1989; Bilby and Bisson 1998). The amount and sizes of wood that are recruited into a stream channel also greatly affects the extent of wood retained within a channel (Hyatt and Naiman 2001). Where riparian forests have been reduced by development or where they are composed of small trees, stream channels contain much less wood compared to heavily forested areas with large trees (Montgomery et al. 2003). Large wood jams are still abundant on a few large rivers of the Pacific Northwest, as seen on the Queets River within the Olympic National Park (Washington) (Figure 55)—a river subject to extreme flood conditions associated with high precipitation but still able to retain large wood volumes within its channel.
In smaller mainstream streams on the Oregon Coast, Nickelson et al. (1992) reported that juvenile coho predominantly overwinter in pools—particularly dammed pools and backwater pools—and in alcoves (Figure 31), all having low velocities. Densities are highest in alcoves. Nickelson et al. (1992) reported that riffle habitats hold virtually no coho juveniles during winter.

Researchers on the Oregon Coast concluded on the basis of various analyses (e.g., Reeves et al. 1989) that coho salmon in Oregon coastal streams were largely limited by the amount of suitable overwintering habitat compared to available summer habitat. This entire region has been subject to extensive logging in the past; habitats have been altered and wood loads are far below historic levels. A project was initiated in several streams to add winter habitat, primarily by increasing the amount of alcoves and dammed pools (Solaaz et al. 2000). The well designed study monitored two reference streams and two treatment streams over a period of eight years. A key response variable considered was overwinter survival of juvenile coho salmon. Overwinter survival was increased significantly in both treatment streams as a result of habitat modifications. This study provides some of the best evidence that overwinter survival is related to the availability of low velocity habitat. Prior to treatment and including the reference streams, average survival in these streams was in the range of 10-20%. Average overwinter survival in the two treatment streams following habitat modification was 39%. These post-treatment survivals are similar to overwinter survivals estimated in Prairie Creek (Northern California, a nearly pristine stream within old growth redwood forest) of 45% (Brackenridge 2003) and in Carnation Creek prior to logging of 35% (Bustard and Narver 1975).
The role of winter conditions to the performance of Oregon coastal coho has also been demonstrated in an analysis of winter flows and smolt yields. Knight (1980) found smolt yields in the three Alsea River study streams to be significantly correlated to the level of high flow during the overwintering period (Figure 56). These results provide further evidence that the quantity and quality of winter habitats limit coho production on the Oregon Coast. At high flows, the distinction between pools and riffles can be obscured. Gordon et al. (2004), in their excellent book on stream hydrology, describe it as follows:

“As kayakers are well aware, the water surface slope, depth of flow and speed of the current become more uniform over the stream reach at high flows. At these times, it becomes questionable whether the terms ‘pool’ and ‘riffle’ are even applicable. As discharge increases, velocity and depth rise more rapidly in pools than in riffles, and energy loss becomes more uniform. The shear stress in pools can eventually exceed that in riffles.”

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Figure 55. Abundant log jams still exist on some rivers in the Pacific Northwest as seen in the Queets River within Olympic National Park (Washington). Dense accumulations of wood, built on large key pieces, provide cover and velocity refuge for small salmonids. Note the young alder trees growing from a large key piece (middle picture), indicating a degree of interannual stability of jams, despite extreme flow fluctuations within this river due to high precipitation.

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This suggests that the effective size of pools shrinks—from the perspective of the coho—as winter flows increase; hence Figure 56 suggests that smolt yields in effect decline as pools become less effective as velocity refuge sites. Grette (1985), in describing the role of pools for overwintering coho, reported that some habitats classified as pools during summer were recognized as ripples during winter flows for the reasons described by Gordon et al. (2004). This dynamic of how velocities change in main channel pools also highlights the importance of off-channel habitats to coho that need low velocity habitats. Moreover, it emphasizes the importance of large, stable wood for fish residing in the main channel during winter.

Figures 57 and 58 and Table 4 summarize estimates made of overwinter survival for juvenile coho salmon in streams of the Pacific Northwest and California. The estimates are presented corresponding to the major channel type (main stream or off-channel) utilized by coho in each study. There is a clear pattern showing much higher survivals for off-channel sites. Figure 58 separates the estimates further into altered main stream channels (by land use practices), pristine main channel habitat, and several types of off-channel habitats.

Another factor that can affect overwinter survival of juvenile coho is fish size in fall, just prior to the redistribution movement. Overwinter survival can be higher for larger fish at the end of the summer rearing period (Holby 1988; Quinn and Peterson 1996). In a small Puget Sound stream, Quinn and Peterson (1996) reported that juvenile coho in larger size-classes had significantly higher overwinter survival rates than smaller fish in the winter of 1990-1991 but not in 1991-1992—though a pattern for increasing survival with size was still evident in the second year (Figure 59). Maximum daily flows during the winter of 1990-1991 were almost twice as high as those in 1991-1992, suggesting that the benefit of fish size is greatest during winters with high peak flows. This further suggests that the effect of fish size is demonstrated most in runoff-type streams as opposed to within off-channel habitats where velocity effects are minimal. Moreover, juvenile coho that rear during summer in mainstem rivers are usually larger than those rearing in small tributaries (Marshall and Britton 1980; Scarlett and Cederholm 1984; Peterson and Reid 1984), except when mainstem temperatures are extremely high, which limits growth. Hence, where juvenile coho find favorable conditions in mainstem rivers for summer growth and remain there overwinter, their larger size may compensate to some degree for harsher winter conditions that often exist there compared to smaller tributaries. Quinn and Peterson (1996) suggested that the superior survival of larger fish during winter may be explained by some combination of size-related predation and resistance to displacement by floods.
Figure 56. Relationships between coho smolt yields and mean January discharge during the overwintering life stage in Deer Creek, Flynn Creek, and Needle Branch within the Alsea River system (Oregon Coast). Data labels indicate smolt year. The three streams were subject to different levels of logging. The Needle Branch watershed was clearcut in 1966, leaving no buffer strip along the stream. The Deer Creek watershed was patchcut (three patches) with 25% of the area being logged in 1966. Partial buffer strips were left. Flynn Creek was not logged and served as a control watershed during the study period. From Knight (1989).
Figure 57. Comparison of overwinter survival estimates for juvenile coho in main stream habitats and off-channel habitats. See Table 3 for a list of studies used to create the chart.

Figure 58. Comparison of overwinter survival estimates for juvenile coho in altered main stream habitats (MC-Al), enhanced main stream habitats (MC-Enh), pristine main stream habitats (MC-Pra), off-channel ponds (Off-Pd), off-channel beaver complexes (Off-Bv), and off-channel spring sites (Off-Sp). See Table 1 for a list of studies used to create the chart.
Table 4. Summary of estimated overwinter survival rates for juvenile coho salmon in streams of Alaska, British Columbia, Washington, Oregon, and California.

<table>
<thead>
<tr>
<th>Channel type</th>
<th>Basin</th>
<th>Status</th>
<th>Region</th>
<th>Survival</th>
<th>Source</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>In channel</td>
<td>Alicea R.</td>
<td>Previously logged; pre-treatment</td>
<td>Oregon Coast</td>
<td>0.13</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
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<td>Alicea R.</td>
<td>Previously logged; reference-pre-treatment</td>
<td>Oregon Coast</td>
<td>0.17</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
<td>In channel</td>
<td>Alicea R.</td>
<td>Previously logged; post-treatment</td>
<td>Oregon Coast</td>
<td>0.38</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
<td>In channel</td>
<td>Nestucca R.</td>
<td>Previously logged; pre-treatment</td>
<td>Oregon Coast</td>
<td>0.20</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
<td>In channel</td>
<td>Nestucca R.</td>
<td>Previously logged; reference-pre-treatment</td>
<td>Oregon Coast</td>
<td>0.11</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
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<tr>
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<td>Previously logged; post-treatment</td>
<td>Oregon Coast</td>
<td>0.19</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
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<tr>
<td>In channel</td>
<td>WF Smith R.</td>
<td>Previously logged; post-treatment</td>
<td>Oregon Coast</td>
<td>0.39</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
<td>In channel</td>
<td>Big Beef Cr.</td>
<td>Previously logged</td>
<td>Hood Canal</td>
<td>0.10</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
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<td>Big Beef Cr.</td>
<td>Previously logged</td>
<td>Hood Canal</td>
<td>0.10</td>
<td>Solazzi et al. (2000)</td>
<td>Two year mean</td>
</tr>
<tr>
<td>In channel</td>
<td>Siskiyou Cr.</td>
<td>Pristive</td>
<td>SE Alaska</td>
<td>0.20</td>
<td>J. Elersick personal communications</td>
<td>Survival rates from 9 locations: High flow winter</td>
</tr>
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<td>In channel</td>
<td>Carmanitan Cr.</td>
<td>Pristive</td>
<td>Vancouver Is.</td>
<td>0.25</td>
<td>Quinn and Peterson (1996)</td>
<td>Moderate flow winter</td>
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<tr>
<td>In channel</td>
<td>Prarie Cr.</td>
<td>Pristive</td>
<td>North CA</td>
<td>0.25</td>
<td>Quinn and Peterson (1996)</td>
<td>Three year mean</td>
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*Mean survival rate: 0.20*
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<th>Stream</th>
<th>Survival</th>
<th>Source</th>
<th>Comment</th>
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<td></td>
</tr>
<tr>
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<td>Off-channel - pool</td>
<td>Colosseum R.</td>
<td>Not known</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
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<td>Off-channel - pool</td>
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<td>Not known</td>
<td>0.66</td>
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</tr>
<tr>
<td>Off-channel - pool</td>
<td>Off-channel - pool</td>
<td>Colosseum R.</td>
<td>Not known</td>
<td>0.66</td>
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<tr>
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<td>Off-channel - pool</td>
<td>Colosseum R.</td>
<td>Not known</td>
<td>0.66</td>
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<tr>
<td>Off-channel - pool</td>
<td>Off-channel - pool</td>
<td>Colosseum R.</td>
<td>Not known</td>
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</tr>
<tr>
<td>Off-channel - pool</td>
<td>Off-channel - pool</td>
<td>Colosseum R.</td>
<td>Not known</td>
<td>0.66</td>
<td></td>
</tr>
</tbody>
</table>
Figure 59. Overwinter survival of juvenile coho of different sizes tagged at the end of summer in Big Beef Creek (Western Washington) in 1990 and 1991. From Quinn and Peterson (1996).

Figure 60 summarizes in graphic form effects of environmental factors on the overwinter survival of juvenile coho salmon. Most of these factors relate to how easily juvenile coho can find low velocity habitats during winter.

![Environmental Factors Affecting Overwintering Survival of Juvenile Coho](image)

Figure 60. Summary of factors that affect overwinter survival of juvenile coho salmon.
3.2.7 Smolt Migration

Juvenile coho salmon that attain a certain size by late winter or spring undergo smoltification—the physiological transformation necessary for surviving at sea. Minimum fork length needed during this time period to facilitate the transformation appears to be 75-80 mm based on studies cited by Sandercock (1991). Fish that do not reach this size within the critical time window delay their outmigrating until the next year. As noted earlier in this document, the fate of especially small yearling migrants associated with the margin-backwater foraging type described by Nielsen (1994) remains unknown. The large majority of coho smolts in California, Oregon, and Washington are yearlings.

Smoltification and the corresponding smolt migration begins earlier in the southerly part of the species’ geographic range (Sandercock 1991; Spence 1995). Shapovalov and Taft (1954) reported that in California the outmigration of smolts begins as early as mid March, peaking in mid May. Similar timing patterns exist in Oregon and Washington streams (Au 1972; Seiler et al. 2004). In contrast, in the Resurrection Bay area of Alaska, the mid point of the outmigration can occur in mid June (Sandercock 1991 citing McHenry 1981). Spence (1995) suggests that one reason for the relationship between smolt timing and latitude is that ocean upwelling and seasonal increase in productivity occurs progressively later with increasing latitude. Also, migrations of northern populations tend to be of short duration (majority migrating over a 5-10 day period), while 50% of the fish from southern populations migrate over a 2-5 wk period. Spence (1995) suggests that the migration of southern populations spans a greater time period because greater variation occurs in the timing of increased spring-time ocean productivity in the southern end of the species’ range. While positive relationships between smolt timing and latitude are strong, considerable variation in timing has been observed among populations at any given latitude (Spence 1995). This variation may be partly the result of the type of streams where data has been collected within the data set that Spence used in his analysis.

Of particular interest for this review is the wide range of smolt outmigration patterns that can occur in a single watershed within the overall critical time window for smoltification. While the onset and duration of smoltification are largely controlled by day length and water temperature (Hoar 1976), both migration timing and rate of migration can be affected by smolt size, location in the watershed at the start of the migration, migration distance, and stream flow (Quinn 2005). This overview is focused primarily on free-flowing rivers. It is beyond the scope in this report to consider factors affecting migration timing and travel rates through reservoirs, such as in the Columbia system, though some information from that system is included here where useful.

Larger salmonid smolts, for several species including coho salmon, generally begin their migration earlier than smaller ones, presumably because smaller ones require additional time to gain size necessary for smoltification and for improved marine survival (Irwin and Ward 1989; Seiler et al. 2004; Quinn 2005). This pattern is seen in the Queets River system on the Washington coast (the Cedarwater River seen in Figure 2 is a major tributary to the Queets River). Studies have been underway in this river system since 1981 to annually assess natural coho smolt yields from various tributaries and from the watershed as a whole. The studies provide a means to assess outmigrating timing, rates of migration, and production of wild smolts.

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originating in various habitats around the basin (Lestelle and Curtwright 1988; Lestelle et al. 1993a).

The coho smolt migration in the Queets system typically begins first for fish emigrating from riverine ponds, followed by fish from runoff tributaries (Figure 61). Smolts coming from off-channel ponds are consistently larger than fish that overwinter and emigrate from runoff tributaries and small groundwater channels (Figure 62). Consequently, the emigration from overwintering ponds occurs earliest and ends well before it is completed in runoff streams. While emigration timing from ponds is earlier than runoff streams, considerable variability can exist between ponds (Figure 63). Differences in timing seen in Figure 63 are not due to variation in smolt size because both the earliest and latest patterns shown consisted of exceptionally large fish of comparable size.

![Graphs showing cumulative percent of coho smolts emigrating from different types of habitats in 1987 and 1988.](image)

Figure 61. Timing of coho smolt emigration from three channel types in the Queets River system in 1987 and 1988: a riverine pond (Morrison Pond), a runoff stream (Seabagish River), and a groundwater fed stream (North Creek). Data from Lestelle and Curtwright (1988) and ODFW (1989a).

Another pattern usually seen with Queets coho smolts shows that early emigrants, though large, move downstream more slowly than fish that emigrate late in the migration. Figure 64 illustrates this pattern, comparing the timing of wild fish marked when they departed either a pond or a runoff tributary with their recapture timing at a seining site near the head of tidewater. The pond and runoff tributary trap sites where marking occurred were 6.8 and 27.6 miles upstream of the

*Coho Salmon Life History Patterns*
seining site, respectively. Travel rates computed using the median dates when smolts were marked and released, then recaptured near the head of tidewater were 0.6 and 5.5 miles per day for pond and runoff tributary fish respectively (1.0 and 8.9 km/day). A different depiction of this pattern is seen by comparing the release timing of all marked fish to their recapture timing at a scoop trap near the mouth of the Clearwater River (Figure 65). Smolts departing tributary streams and ponds later in the season migrated more quickly to the scoop trap than earlier migrants. It bears noting that more rapid migration of later-timed fish in this river occurs during a receding hydrograph—the flow regime is rainfall dominated with winter peak flows.

![Average small length by channel type](image)

**Figure 62.** Average lengths of coho smolts emigrating from ponds, runoff streams, and small groundwater channels in the Queets River system in 1987, 1988, 1989, and 1991. Data for 1990 in the sequence of years shown were not used here due to experimental supplementation fish present that year. Multiple trapping sites for each channel type are included. Data from Lestelle and Curtwright (1988) and QDNR (1989a, 1989b, 1992).

![Cumulative percent](image)

**Figure 63.** Timing of coho smolt emigration from four riverine ponds along the Clearwater River (Queets River system) in 1988: Pond 2, Morrison Pond, Dashers Pond, and Coppermine Bottom Pond (CMB). Data from QDNR (1989a).

_Coho Salmon Life History Patterns_
Figure 64. Emigration timing patterns of marked coho smolts from a riverine pond (Morrison Pond) and a runoff tributary (Snahapish River) in the Clearwater watershed and recapture patterns of the same marked smolts at the Queets River spawning site near the head of tidewater in 1987. Computed average migration rates associated with the times of 50% of marks released and marks recaptured are shown in miles traveled per day. The trap sites where smolts were marked are located 6.8 and 27.6 miles upstream of the spawning site respectively. Adapted from Leestee and Curtwright (1988).

This pattern of early migrating smolts moving more slowly downstream than later migrants has been documented elsewhere and it appears to occur for salmonid species in general (Quinn 2005). Dawley et al. (1986) documented the pattern for hatchery coho salmon released at Iee Harbor Dam on the Snake River. Fish released later in the season migrated more quickly than those released earlier (Figure 66). Similar results were reported by Giorgi et al. (1997) for hatchery and wild yearling Chinook smolts and steelhead smolts in the Columbia River and by Pyper and Smith (2003) for spring Chinook yearling and coho smolts in the Yakima River.

Another factor that can affect migration rate of salmonid smolts is migration distance to the river mouth (Quinn 2005). Smolts that begin their migration far from the estuary generally travel downstream much faster than those that begin closer. A multiple regression analysis of coho smolt release data in Dawley et al. (1986) Table 18 in that report excluding releases prior to March 15 and after June 15 for the Columbia River shows significant effects (P<0.05) of both date released (Julian day) and distance between release site and the recovery point on travel time. Similarly, data presented here in Table 6 show the same type of effects for wild coho smolts in the Clearwater River—though the scale in distance being traveled by smolts is much less in this case. Multiple regression analysis between release date (Julian day) and distance to the recapture site as independent variables and travel time (dependent variable) shows significant effects (P<0.05) for both independent variables in combination (R^2 = 0.73). This effect of distance on travel time is intriguing—Quinn (2005) states that it raises the question of whether there is a genetic adaptation in travel time to the distance that a population has to migrate.
Figure 65. Emigration timing patterns of marked coho smolts released at all tributary trap sites combined and at a scoop trap near the Clearwater River mouth in 1987. Adapted from Lestelle and Curtwright (1988).

Figure 66. Travel rate of coho salmon smolts released at Ice Harbor Dam on the Snake river and captured at Jones Beach on the lower Columbia River (463 km downstream—288 miles). Data from Dawley et al. (1986); figure re-created from Quinn (2005).

Flow is another factor that can affect migration timing and migration rate (Fast et al. 1991; Berggren and Filardo 1993; Williams et al. 2005; Quinn 2005). The effect of flow on smolt migration patterns through the reservoir system of the Columbia is reasonably well established—river flow has been demonstrated to make the greatest contribution to explaining smolt travel time among various factors examined (Berggren and Filardo 1993). Williams et al. (2005) summarized available information relating flow level to smolt migration rates of yearling

Coho Salmon Life History Patterns
Chinook under pre-dam and post-dam conditions on the Columbia and Snake rivers (Figure 67). Flow levels are shown as affecting travel time between Lewiston, Idaho and Bonneville Dam (317 miles) under both pre-impoundment and post-impoundment conditions. Travel time over this distance prior to dams during high flow conditions was estimated to be approximately half the time required during low flow conditions (based on Raymond 1979).

Factors that can affect the survival rates of migrant smolts in fresh water have been extensively studied in the Columbia and Snake rivers—and intensely debated. Much of the debate has focused on the relationship between mainstream flow and outmigrant survival. It is well known that predation can be high on juvenile salmonids as they outmigrate through impounded systems such as the Columbia River (Beamesderfer et al. 1996) and in systems with multiple water diversions with fish bypasses like the Yakima River (Fast et al. 1991). These rivers have large populations of northern pikeminnow (Ptychocheilus oregonensis) and exotic predatory fishes. It has often been assumed in these cases that the travel rate of smolts, affected by flow, determines predation rates by regulating the amount of time that juvenile migrants are exposed to the predators. More recent research, however, indicates that while migration rate is affected by flow, survival appears to be largely a function of migration distance and not travel rate (Muir et al. 2001; Smith et al. 2002; Williams et al. 2005). This is particularly the case for yearling and older smolts (as reported for yearling Chinook and yearling and older steelhead)(Anderson 2003a; Williams et al. 2005).

Anderson (2003b) explains that the effect of predatory fishes on yearling and older smolts acts essentially through a gauntlet effect: "observations on migrating prey (juvenile salmon) through a field of predators (pisivors) reveals that mortality depends mostly on distance traveled and only weakly on travel time...At the other extreme, if prey and predators move randomly within an enclosed habitat, mortality is time dependent." The latter case could be applied to the effect of predators on subyearling Chinook as they move slowly seaward through a large river like the Columbia River, consistent with conclusions of Anderson (2003a).

Within the mainstream Columbia River hydrosystem, another factor shown to be important to the survival of outmigrant yearling smolts is water temperature (Anderson 2003a; Conner et al. 2003; Smith et al. 2003). Anderson (2003a) suggests that for yearling spring Chinook smolts that temperature operates mainly by affecting the activity of predatory fishes. As water temperatures rise, feeding rates of predatory fishes typically increase (within temperature limits tolerable to the species).
The effect of migration distance on yearling smolt survival has also been demonstrated for free-flowing streams upstream of Lower Granite Dam on the Snake River. A strong inverse relationship exists between survival and migration distance for hatchery spring Chinook smolts released at various hatchery sites in the Snake River system (Figure 68) (Williams et al. 2005). The fish experienced only free-flowing river conditions from their points of release until they arrived at the top end of the Lower Granite Dam reservoir—they were assessed for survival just below the dam. Williams et al. (2005) also reported survival rates for PIT-tagged wild and hatchery yearling Chinook released at two sites upstream of Lower Granite Dam (Table 5). It is important to note that the free-flowing section of the Snake River below the tributaries where these releases were made, the lower ends of the tributaries, and the Lower Granite reservoir contain northern pikeminnow and other exotic predatory fish species. Anderson (2003b) concluded that water temperature during the period of migration did not help explain mortality within the free-flowing tributaries to the Snake River, suggesting that temperature has a stronger role in the prey-predator dynamics within the extensive reservoir system downstream. Anderson (2003b) determined that only migration distance affected smolt survival to Lower Granite Dam.
Table 5. Summary of average survivals for wild and hatchery yearling Chinook smolts released at two sites upstream of Lower Granite Dam (LGD) on the Snake River, 1993-2003. Fish released at the Salmon River trap experienced free-flowing river conditions until they arrived at the Lower Granite reservoir. Fish released at the Snake River trap at the head of the reservoir experienced impounded water conditions to the point of tag detection at the dam. Data from Williams et al. (2005).

<table>
<thead>
<tr>
<th>Release site</th>
<th>Distance to LGD (km)</th>
<th>Survival to LGD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hatchery</td>
</tr>
<tr>
<td>Salmon River (White Bird) trap</td>
<td>233</td>
<td>77.7%</td>
</tr>
<tr>
<td>Snake River trap – head of LG reservoir</td>
<td>52</td>
<td>92.9%</td>
</tr>
</tbody>
</table>

Less data exists on predation rates on free-flowing rivers in the Pacific Northwest where pikeminnow and exotic predators are not present. One example is for streams on Vancouver Island where mergansers are the primary predator on migrant smolts. Wood (1987) reported maximum estimates of mortality rate due to adult mergansers to be less than 2% for hatchery coho salmon during their seaward migration in the Big Quilicum River.

Lestolle and Curtwright (1988) evaluated survival of wild coho smolts during their migration downstream from traps within the Clearwater River system on the Olympic Peninsula. This river, like those reported on by Wood (1987), is used extensively by mergansers. Groups of wild coho smolts captured in tributary traps were uniquely branded to identify recaptured fish at a scoop trap located near the mouth of the river. A total of 18 mark groups in nine pairs were released to learn whether survival was affected by release time (day or night) or release site (distance traveled)(Table 6). No significant differences in recapture rates were found between release sites or between day and night releases. The results suggested that little or no mortality occurred between release and recapture for all groups. The closest release site was 1.3 miles upstream of the scoop trap, while the most distant site was 22.6 miles upstream. It is noteworthy that this river, as the name implies, is a clear water river and generally has very low turbidity through much of the smolt migration. It is a rainfall-dominated stream and is moderately confined over much of its length. During the smolt migration, the river has virtually no flooded shorelines containing grasses and willows that might provide cover. It also has a relatively low wood load, unlike the Queets River, which it joins.

Taken together, the studies described above for free-flowing rivers suggest that smolt survival during their outmigration is typically very high. The data reported in Table 5 for the Snake River, combined with results in Table 6, are construed to mean that most or all of the mortality on fish released at the head of the Lower Granite Dam was due to the presence of pikeminnow and exotic fishes inhabiting the impoundment. This suggests that survival with distance is much higher in the absence of pikeminnow and for entirely free-flowing reaches than seen in Table 5.
The results of the marking experiments in the Clearwater River (Table 6) show another pattern worth noting. Smolts emigrating from an individual tributary on any given date exhibited wide ranges in the number of days that it took to arrive at the river mouth. For example, smolts trapped and released on May 14 at the mouth of Miller Creek, 11 miles above the downstream scap trap, took between 1 to 28 days with a median of 13 days to travel that distance. For all groups combined, the range in days required to migrate to the scap trap was 1 to 37 days. These results show that smolts tended not to travel rapidly between the tributary of origin and the point of departure from the mainstream river. These findings are consistent with patterns of wild coho smolt migrations seen elsewhere.

In Carnation Creek (Vancouver Island), McMahon and Holby (1992) reported that coho smoltification and associated downstream emigration occurs progressively within a stream system, even small ones as Carnation Creek. Fish emigrating from tributaries moved progressively—as if in stages—downstream as smoltification developed. Smolts were typically segregated in groups >5 fish, with aggregation size increasing significantly over the course of the smolt run. Smolts exhibited few agonistic interactions. The groups exhibited a high degree of cohesiveness. Typically, fish were quite secretive, milling about in dark, low velocity areas under cover with occasional forays to the edge of cover to feed on invertebrate drift. The most common used cover type was large woody debris associated with pools. Movement downstream in this short stream required several weeks once movement had been initiated. These findings indicate that smolt emigration by individual fish is not rapid once initiated, but occurs progressively with fish continuing to forage and use in-stream cover during periods of rest and short-term residency at stop-over sites. McMahon and Holby stated that shelter from high velocities during spring freshets is likely important to prevent premature displacement.
Table 6. Summary results of mark-recapture experiments with wild coho smolts captured in ommigrant traps in tributaries to the Clearwater River in 1982. All groups were marked with unique brands. Fish were released within 24 hrs of their capture at the tributary traps to test for differences in recapture rates between day and night release. Recaptures were made at a scoop trap near the mouth of the river. Table is created from Leff and Curtwright (1988). No significant (P>0.05) differences in recapture rate were found between any release site.

<table>
<thead>
<tr>
<th>Release site</th>
<th>mi from</th>
<th>Release group</th>
<th>No. released</th>
<th>Recapture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>scoop</td>
<td>Pair no.</td>
<td>Date</td>
<td>Time</td>
</tr>
<tr>
<td></td>
<td>trap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurst Cr.</td>
<td>1.3</td>
<td>1</td>
<td>14-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>15-May</td>
<td>night</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>23-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>26-May</td>
<td>night</td>
</tr>
<tr>
<td>Miller Cr.</td>
<td>11.0</td>
<td>3</td>
<td>14-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>15-May</td>
<td>night</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>25-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>26-May</td>
<td>night</td>
</tr>
<tr>
<td>Christmas Cr.</td>
<td>12.5</td>
<td>5</td>
<td>15-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>15-May</td>
<td>night</td>
</tr>
<tr>
<td>Bull Cr.</td>
<td>18.5</td>
<td>6</td>
<td>15-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>15-May</td>
<td>night</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>14-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>15-May</td>
<td>night</td>
</tr>
<tr>
<td>Sokalak R.</td>
<td>22.6</td>
<td>8</td>
<td>25-May</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>25-May</td>
<td>night</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>3-Jun</td>
<td>day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>3-Jun</td>
<td>night</td>
</tr>
</tbody>
</table>

| Total day releases | 1,829 | 456 | 24.9% |
| Total night releases | 1,403 | 331 | 23.0% |
| Grand total releases | 3,233 | 787 | 24.4% |

Coho Salmon Life History Patterns
Quinn (2005) described the downstream migration of coho smolts as not continuous but interspersed by periods of holding. Radio tracking of wild coho smolts in the Chehalis River (Western Washington) suggested that migrants spent about 40% of the time moving and 60% holding during their outmigration (Moser et al. 1991). Smolts rested in back eddies and even in off-channel habitats, consistent with observations of McMahon and Holtby (1992).

A multi-year study is being conducted in the Klamath River by the U.S. Fish and Wildlife Service to investigate coho smolt emigration patterns and associated survivals using radiotelemetry. First year results (Sturzer et al. 2006) have shown an outmigration pattern similar to those described above where wild smolts display periods of holding interspersed with downstream movement. While smolts were found to hold in a variety of habitat types, they appeared to prefer those with low water velocities. Unlike juvenile coho at younger life stages, however, fish were frequently found to be occupying velocity shear zones. Moreover, unlike the observations of McMahon and Holtby (1992) in Carnation Creek where fish were found in close association with shelter, smolts in the mainstem Klamath River were more removed from margin cover when holding. Holding smolts were generally still associated with shoreline habitats, 75% of habitat use was within 20 ft of the shoreline. The migration rate of smolts was also found to accelerate as fish moved further down the river.

McMahon and Holtby (1992) described the progressive downstream movement pattern of smolts as one of transitioning to a behavior adapted to open-water life (i.e., away from cover)—a pattern seen in the Klamath River observations. It is logical to expect that as smolts leave small streams (such as the size of Carnation Creek) and emigrate down large rivers, their association with instream cover would diminish.

**4.0 Discussion and Conclusions**

Two underlying questions have been considered throughout this report as they relate to how coho salmon utilize physical habitats within a watershed. How similar are coho life history patterns across the species' range? And what kinds and extent of variation occur with respect to these patterns, particularly as variation might relate to the SONCC Coho ESU and Klamath River coho?

These questions relate to Moyle's statements about coho salmon in his book "Inland Fishes of California":

"...evolutionary forces keep coho salmon (and other salmon) surprisingly uniform in morphology and life history throughout their range, while producing runs that show strong, genetically based adaptations to local or regional environments. In California coho populations are the southernmost for the species, and they have adapted to the extreme conditions (for the species) of many coastal streams."

The extensive coverage of coho life histories in Sandercock (1991), augmented by the works of Moyle (2002) and Quinn (2005), provide much material that addresses the two questions of primary interest here. This report provides additional information, mostly as it pertains to how
physical habitat is used and associated survival rates. Variations in life history traits that relate to habitat use have been described here to the extent that information is available.

On its surface, Moyle’s statement may seem contradictory. He concludes that coho salmon show a high degree of uniformity (or similarity) in life history patterns across their range, yet he asserts there is also significant variation and local adaptation. In context, Moyle is saying that coho salmon—like other salmonid species—exhibit significant variation in life histories, but the range of variation remains within what he sees as unifying life history themes for the species. The central themes of life history similarity are morphology, age structure, spatial distribution within a watershed, general timing patterns of migrations and other movements, development and growth patterns, foraging patterns, effects of environmental stressors, and habitat use patterns—among others. But significant variations exist within these unifying themes, enabling considerable adaptation to local conditions.

One unifying theme in the freshwater life history of juvenile coho is their affinity for slow velocity habitats in all life stages. Body morphology, fin sizes, and behavior are generally adapted to life in these habitats—withstanding variations that exist between stream-type and lake-type fish and coastal and interior forms (discussed further below). Their affinity for slow water is evident across the species’ range—in both northern and southern regions and coastal and interior regions. Juveniles in all life stages—though to a lesser extent during the smolt stage—primarily rear and seek refuge in slow velocities associated with pools, channel margins, backwaters, and off-channel sites (aloves, ponds, and groundwater channels). This tends to segregate them to some degree from juvenile Chinook and steelhead, though overlaps in space occur. Their affinity for low velocity water is strongest during the fry (very young fry) and overwintering life stages.

This association with low velocity habitats tends to result in several patterns of distribution within a watershed. Juvenile rearing—particularly in summer—occurs to a large extent within the natal streams. These streams usually tend to be relatively small and low in gradient, thus they often have a substantial amount of low velocity habitat. Emergent fry generally remain relatively close to their natal areas, though some dispersal downstream typically occurs. The maximum extent that dispersal occurs downstream is not known. Spawning which occurs in higher gradient streams appears to result in a greater downstream dispersal of fry. In that case, the young move—or are displaced by high velocity flows—to low velocity habitats in reaches of lower gradient.

Another related distribution pattern is the association that juvenile coho have for physical cover. Cover types within the water column or overhead are preferred (wood, rooted macrophytes, roots, overhead structure), as opposed to substrate cover provided by cobbles or turbulence cover associated with velocity shears. Preferred cover types provide shelter from high water velocities and predators, and match feeding behaviors keyed to aquatic drift and terrestrial organisms on the water surface (instead of benthos feeding). In smaller streams, cover is not a strong determinant of habitat selection in summer, though association with it grows by summer’s end. Physical cover appears to be a much greater determinant of habitat selection in large rivers, probably due to the likelihood for higher water velocities and more predators.

Coho Salmon Life History Patterns.
The affinity for low velocity habitats is particularly strong during winter. This season often brings rapidly changing, adverse conditions within a stream—both in coastal and interior regions—whether due to flow fluctuations or extreme cold and icing. Survival appears to be strongly related to how successful juvenile coho are in locating suitable refuge from harsh conditions. One characteristic of coho seen throughout their range is for some individuals within the population to move during fall to sites that offer some degree of refuge. The number of fish that move, and the extent of their movement, appears to be related to the suitability of their locations to provide shelter from high velocities. Movement seems to be volitional, or when flows are high, due to displacement. In dynamic rivers, redistribution to overwintering sites can be quite dramatic in terms of distances traveled and numbers of fish that move. Off-channel sites (alcoves, pools, groundwater channels) are particularly desirable overwintering habitats throughout the Pacific Northwest and California. These provide the highest survival rates compared to other habitats. Low velocity locations within main stream channels having undercut banks with exposed root masses or sites of large wood accumulations also provide refuge habitat. Side channels with low velocities and some form of cover are also used. Juvenile coho rarely use cobble substrate for overwintering cover, as commonly occurs for juvenile steelhead.

Listeck et al. (2005) considered how these patterns of distribution would be manifested in a large river system, one with a fairly extensive floodplain along the mainstem river. For the sake of illustration, they compared the expected distribution pattern of coho salmon to one that could be expected for ocean-type Chinook (i.e., fall Chinook). The patterns, shown in Figures 69 and 70, are based on a summary of habitat use patterns given in that paper. The patterns are those that would be expected in a largely unaltered watershed. They are consistent with the conclusions being presented here.

Another set of utilization patterns showing how species use a stream system has been derived using the Intrinsic Potential Method (Agrawal et al. 2005). The method assumes that three indicators of landform and hydrology—channel gradient, valley width (degree of confinement), and mean annual discharge—constrain channel morphology and hence the potential of a reach to express habitat characteristics favorable for specific salmonid species and life stages. The method was originally developed for coho and steelhead in watersheds draining the Coast Range of Oregon (Burnett 2001; Burnett et al. 2003). Burnett’s (2001) study was conducted in the Elk River (Southern Oregon), which is encompassed by the SONCC Coho ESU. Figure 71 displays suitability of stream reaches to support coho, Chinook, and steelhead using this method. If these patterns were to be repeated in the form of Figures 69 and 70, they would yield similar patterns as seen in those figures.
Figure 69. Summary of expected habitat utilization patterns for coho salmon in a generally unaltered large river system. A moderate to high spring run-off is assumed. It is assumed that the mainstem river is flowing across a wide floodplain. Circle size reflects relative amounts of production attributed to each area. Dashed lines show movements of fish from one area (box) to another area (arrow). From Lestelle et al. (2005).

Variations on the central themes of coho life history exist and several types could affect habitat utilization patterns. Juvenile coho in the southern part of the range can exhibit a summer movement pattern different from what is seen further north. This movement pattern appears to be a redistribution to find thermal refugia. There is no evidence that fish in the southern region have a higher thermal tolerance than fish further north, though some greater tolerance may exist. Little or no movement by juveniles in mid summer is typically seen in more northern populations, but temperatures are less severe. Trapping in some streams in California and Oregon show that substantial numbers of fish can move in early to mid summer during periods of increasing temperature. While the fate of these fish has not been determined, some do successfully arrive at cooler water sites. It is unknown what level of mortality or loss in other performance measures might occur while moving to refugia or the distance that fish can travel. Nielsen (1992a, 1996) described a foraging phenotype (termed “early-emerging”) in Northern California that appears to provide some measure of adaptation to high temperature. These fish display no obvious dominance hierarchy and have a crepuscular (i.e., associated with dawn or twilight) foraging pattern, where they move out from refuges to feed then return. Nielsen (1992a) concluded that this foraging phenotype is the dominant one during periods of drought, when streams are
particularly warm with limited flow. Perhaps this phenotype is suited for movement during early to mid summer to seek out refugia. Their larger size than other foraging phenotypes would be advantageous for such movement. Habitat utilization in warm water streams will reflect overlapping areas of tolerable temperatures and water velocities.

**Figure 70. Summary of expected habitat utilization pattern for ocean type Chinook salmon in a generally unaltered large river system.** A moderate to high spring runoff is assumed. It is assumed that the mainstem river is flowing across a wide floodplain. Circle size reflects relative amounts of production attributed to each area. Dashed lines show movements of fish from one area (dot) to another area (arrow). From Lestelle et al. (2005).

Another life history variation is seen in differences in body morphology and fin sizes between coastal and interior populations and associated swimming performances (see Taylor 1985a and b). It is not known how far south such a coastal-interior distinction might extend. Do both forms exist within the Klamath River basin? There is no evidence that these morphological forms have different habitat requirements, i.e., does the interior form, which has greater swimming stamina, have less of an affinity for slow water habitats than the coastal form? Or do cover type preferences differ between the forms? Evidence shows that both forms exhibit the same selection for slow water habitat types and cover types (e.g., Brunt 1999). Taylor and McPhail (1985a and b) suggest that the adaptive benefit of these variations to interior coho (more streamlined body, smaller fins, greater swimming stamina) is in their ability to negotiate long in-river migrations, both as smolts and adults. Richard Bailey’s (Fisheries and Oceans Canada, personal communication) hypothesis that Thompson River juvenile coho travel from the upper Thompson River to the lower Fraser River to overwinter recognizes that these fish may be
adapted for a fall redistribution on such a scale. An interior-type body form would presumably aid upper Klamath River coho in their movements within the mainstream Klamath River, if this body form occurs there. This author, on seeing the nature of the mainstream Klamath River downstream of the Scott River, wondered whether juveniles could successfully negotiate the distance and turbulent water conditions to travel to the very lower parts of the river to overwinter. In light of what Thompson River fish would encounter during a fall redistribution of the scale mentioned, the Klamath scenario would be much more feasible. A multi-year study was initiated in fall 2006 to investigate the fall redistribution and overwintering patterns of juvenile coho in the lower Klamath River and the lower reaches of its small tributaries.  

![Graphs of Coho, Steelhead, and Chinook](image)

Figure 71: Suitability curves for each of the three components of the Intrinsic Potential Method (gradient, valley constraint, and discharge) for coho, steelhead, and Chinook juveniles. Recreated from Agrawal et al. (2005).

29 / The study is being conducted by the technical staffs of the Yurok and Karuk tribes and is funded by the Bureau of Reclamation.

Coho Salmon Life History Patterns
Perhaps the most obvious variation in life history patterns seen in southern coho populations is their ability to delay river entry timing during periods of drought or late arriving rainfall, particularly when sand bars are formed that block entry. In the extreme, river entry can apparently be stalled several months. This would thereby delay spawning and would presumably have cascading effects on emergence timing and subsequent growth and habitat use patterns. This may be a factor in variation of freshwater age structure seen in Prairie Creek (see Bell et al., 2001). Sandbars can often block entry to smaller streams in Northern California but on occasion also form on large rivers in that region such as the Klamath River. While these features may only rarely delay entry timing into rivers like the Klamath (Walt Duffy, Humboldt State University personal communications), it is noteworthy that delayed rainfall can affect the ability of adult coho to enter spawning tributaries in such large rivers. In such cases, delayed rainfall can force adults to spawn to a greater extent in the mainstem; spawning maturation would likely not be delayed.\textsuperscript{30}

Coho salmon exhibit a wide variety of life history patterns in large, diverse watersheds. These patterns are phenotypic expressions of the interaction of genotype and environmental factors. Among others, these factors include flow characteristics, gradient, water temperature, and habitat structure. Diverse phenotypic expressions enable the species to utilize a wide variety of physical habitats across a range of gradients, habitat sizes, and qualities—but within limits set by the species’ genetic blueprint. To understand the performance of a species in any watershed requires a life history perspective, seen across the full cycle (Lichatowich et al., 1995).

\textsuperscript{30} Once adult coho enter freshwater, maturation would probably develop on a normal schedule (see Hodgson and Quinn, 2002).
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Bailey, Richard.  Fisheries and Oceans Canada, Kamloops, British Columbia.

Cederholm, Jeff C.  Washington State Department of Natural Resources, Olympia, Washington.

Duffy, Walt G.  Humboldt State University, Arcata, California.

Ebersole, Joseph L.  U.S. Environmental Protection Agency, Corvallis, Oregon.


Soto, Toz.  Department of Natural Resources, Karuk Tribe, Orleans, California.
4a  The commenter appears to be referring to the number of survey years over which substrate change was compared in the Draft SEIR, not to the number of data points. The Draft SEIR included data from 1998, 2003, 2006, and 2011, as provided in Ettlinger et al. (2013). The Final SEIR has been clarified and amplified to include data on stream substrate and other habitat conditions through 2016, based on Ettlinger (2017). The updated information provided in Section 3.6.1 and in Table 3-2 (previously Table 3-1) notes the lack of clear trends in the proportions of gravel and fine sediment, concluding that the data are insufficient to determine whether spawning habitat targets for sediment size and the percentage of fine sediment are being met in the lower or upper mainstem of San Geronimo Creek. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

4b  The Final SEIR, including Section 3.6.2 and Table 3-3 (previously Table 3-2), has been clarified and amplified to include data on stream habitat conditions in 2016, based on Ettlinger (2017). Appropriate citations for the information sources are included. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

4c  Available data through 2016 (Ettlinger 2017) indicate an overall decline in fish cover in pools in both lower and upper San Geronimo Creek since at least 1998. Sections 3.6.2 and 3.6.3 and Tables 3-3 and 3-4 (previously Tables 3-2 and 3-3) have been updated in the Final SEIR.

4d  We agree that 1 ft is an appropriate minimum depth criterion for juvenile coho salmon (age 0+). However, the age 0+ depth criterion used for the summer low-flow habitat survey and shown in Appendix A (Table 2) was a multi-species criterion selected to best represent minimum depth requirements for both coho salmon and steelhead juveniles.
7.3 LOCAL GROUPS LETTERS
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Letter 5—Turtle Island Restoration Network
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David Zaltsman  
Marin County Counsel  
3501 Civic Center Drive  
San Rafael, CA  

April 20, 2016  

Dear David,

Since it appears that Marin County will not be formally taking public comment on the scoping for the recirculated EIR (REIR) analyzing the cumulative impacts of development within the San Geronimo valley on coho salmon habitat, we are submitting our comments regarding the appropriate scope of the analysis. As you know, on April 2, 2015, Judge Haakenson of the Marin County Superior Court ordered the County to conduct an environmental review “In conformity with CEQA Guidelines section 15126.4 and the opinion of the Court of Appeal.” On September 8, 2015 you sent us a scope of work developed by Stillwater Sciences for the “supplemental” EIR for the Board, which was presumably approved by the Board. We note that the original Supplemental EIR proposal by Stillwater Sciences, dated August 28, 2015 proposed a full Notice of Preparation and public comment period. Furthermore, in our subsequent meetings we were first informed of an opportunity to comment on the scope of the “Supplemental” EIR and public meeting, but at our most recent meetings we were informed that there would be no formal Notice of Preparation or public scoping meeting. In light of recent developments indicating the scoping process may not move forward, we are submitting these comments.

First, we wish to confirm that we are in agreement that the appropriate scope of the cumulative impacts analysis is of the cumulative impacts of all development within the San
San Geronimo Valley

As laid out by Stillwater Sciences in their proposal, the Court of Appeal faulted the original EIR for failing to “provide the information ...necessary to make informed judgments about the advisability, so far as the San Geronimo Valley watershed is concerned, of adopting the countywide plan” and the trial court ordered a return to the writ of an analysis of the impacts of development in the San Geronimo Watershed on salmonids consistent with that opinion. In light of that principle, we wish to raise issues regarding the geographic scope and the scope of the impacts of development considered.

Geographic Scope

As a threshold question, we emphasize that the EIR must evaluate all development within the San Geronimo watershed and not merely within the Stream Conservation Area. Although the SCA is an important regulatory tool, the best available science (as cited for example in the Salmon Enhancement Plan) demonstrates that activities throughout the watershed have potential and likely impacts on salmonid habitat. Furthermore, both the Court of Appeal’s opinion and the order from the trial court emphasize that the San Geronimo watershed is the appropriate scope of analysis and not merely the SCA.

Furthermore, it is critical that the analysis incorporate analyses not just of the impacts on the main stem and tributaries, but also impacts on all seasonal and ephemeral streams within the watershed. Although small individually, these streams cumulatively contribute significant delivery of water, pollutants, sediment, and thermal load to the main stem salmonid habitat.

Cumulative impacts of past, present and future actions

Please bear in mind that CEQA Guidelines section 15130(b)(1) requires an analysis of the impacts of past, present and probable future projects. As we have noted elsewhere, the analysis of cumulative impacts involves a two-step analysis. First, we look to see if the cumulative impacts from past, present and future impacts reach the threshold of significance. Second, we analyze the contribution of the project to those cumulative

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impacts to determine if that contribution is cumulatively considerable. As defined in the CEQA Guidelines (regulations),

“Cumulative impacts” refers to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. ... The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.²

That is, a cumulative impacts analysis looks at the impacts from related projects together, and then assesses whether the contribution of the project is “significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects”³ As the California Court of Appeal has described the importance of this analysis, “[o]ne of the most important environmental lessons evident from past experience is that environmental damage occurs incrementally from a variety of small sources. These sources appear insignificant, assuming threatening dimensions only when considered in light of the other sources with which they interact.”⁴

As described repeatedly in the CEQA Guidelines, the impact from a project may “appear insignificant”⁵ but can contribute to damage caused by many sources, even if the contribution of any single impact may be “individually minor”⁶ or “individually limited”⁷ in large part because the severity of past impacts can elevate the significance of even a minor additional impact where catastrophic results could occur with even modest worsening of environmental conditions. Since the cumulative impacts analysis considers the joint

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² 14 Cal. Code Regs. § 15355.
⁵ Ibid.
Impact of a proposed project with past, present and future projects, "the greater the existing environmental problems are, the lower the threshold should be for treating a contribution to cumulative impacts as significant." As summarized by two leading CEQA practitioners, "[w]hen [the cumulative impacts analysis] is done properly, the [analysis] may find that the scope of the environmental problem is so severe that even a minuscule incremental change would be cumulatively considerable and thus significant."

**Past impacts:**

Here, CEQA requires that the EIR analyze past impacts that have degraded coho habitat up to the present day as a threshold matter. Given the direct state of the coho salmon and the serious degradation of these past impacts, even small incremental changes would constitute cumulatively considerable significant impacts.

**Probable future impacts:**

Naturally, in light of the court order, the focus of the analysis of probable future impacts will properly be on evaluating all impacts of a range of development trajectories within the San Geronimo watershed. To date, the County has in several instances assumed only a modest rate of development or buildout on individual projects. Here, however, the Court has made clear that the analysis must include at least three different scenarios: "the maximum potential impact, the range of potential impacts, or the likely net impact if the policies and implementation programs described." Thus, to satisfy the opinion of the Court of the Appeal, the REIR should evaluate full buildout of every allowed parcel to the maximum extent allowable by law. In addition, the REIR should also include two other scenarios to capture the range of possible development scenarios: First, the REIR should include a relatively slow buildout scenario and second, the REIR must develop a most likely prediction buildout pace scenario, including the accelerating development pressures in Marin County.

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As nearly all in Marin are keenly aware, we are facing steeply accelerating pressures to build more and larger houses throughout the County, and San Geronimo Valley is far from exempt from this trend. A perusal of development and remodeling proposals and home listing demonstrates a growing number of multi-million dollar homes of a large scale being developed even in San Geronimo Valley. Therefore, this last category must include an analysis of a rate of buildout substantially greater than what the valley has seen historically, both in terms of the number of projects and the ever increasing scales of single family homes and expansions.

As you know, a complete environmental analysis of CEQA requires an analysis of the likely impacts including not just according to what is permissible under the prevailing regulatory scheme, but also as they actually physically occur. Thus, in light of the uneven and spotty enforcement by state and county authorities in the watershed, each impact must be assessed in terms of the current baseline conditions, the role of past impacts in creating those conditions, and, according to the Court of Appeal, the maximal impacts which should include frequent and widespread violations of regulation and law.

The County has stated publicly and in private meetings that there is a large amount of illegal development that occurs without permits. We are aware that the County only investigates illegal development when a complaint is filed. We are also aware that currently only two of the County’s four inspector positions are filled, and that even four is woefully inadequate to cover the 200,000+ parcels in the County. We expect the required analysis to determine both the amount of legal AND the amount of illegal development under current existing conditions and under various build-out scenarios. There are a number of ways to derive estimates, including the use of Google map tools to compare development over time.

In addition, given the importance of both water flows and drought in the viability of the populations of the California Coho, all impacts must be analyzed in combination with much stronger peak storm flows and deeper droughts than are represented in the historical record because climate change is resulting and will result in unprecedented severe conditions. Thus, the maximal conditions ordered analyzed by the Court of Appeal must incorporate the impacts of development under increasingly severe climactic conditions.
In addition, the impacts from development include various impacts to salmonids, including increases in temperature from increased water exposure throughout the watershed, increased sedimentation from development and vegetation clearing, loss of forest habitat, stream channel simplification through incision and entrenchment, increased storm water runoff and pollution from impervious surfaces and vehicle traffic, hydrological flow impacts, and reductions in food resources, among others. The cumulative impacts from all of the below activities on each of these areas must be included.

Finally, we remind the county that “[a] lead agency shall find that a project may have a significant effect on the environment... where ... [t]he project has the potential to: substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; [or] threaten to eliminate a plant or animal community.” Unfortunately, given the dire status of the California Coho in San Geronimo Valley any marked degradation in the habitat is likely to cause the population to drop below self-sustaining levels or threaten to eliminate the animal community dependent on the salmon. We expect the significance thresholds applied to reflect this mandatory duty.

**Full scope of development impacts**

As we have discussed in some detail, development includes a wide range of impacts beyond the increase in built area. It is critical that the REIR include also all of the attendant development impacts, including the inevitable loss of vegetated habitat areas and clearing of woody and herbaceous vegetation associated with such development, changes in the hydrology from landscaping, paving and clearing, impacts from increases presence of cars and attendant automotive runoff, increased rate of vehicle accidents and subsequent fluid spills, increases in road development, increases in the potential use of toxic chemicals, such as herbicides and pesticides, increases in the septic load in downstream waters both from failing systems and new systems, the likelihood of informal unauthorized withdrawals of water, the likelihood of increase bank armoring to protect development, channel simplification and incision, increased noise and light pollution, increased household pet predation on salmonids, nutrient loading from animal waste, increased cases of unauthorized recreational fishing, increased stream waste and garbage,
among other impacts. Again, we expect the analysis to provide current baseline conditions and scenarios under build-out.

**Development surfaces** As we know, building homes is one key impact of development, but the construction of homes brings a host of attendant impacts that must also be analyzed. Thus, the REIR must analyze not only the increase in impervious cover related to homes, but also both the increases in impervious structure from required parking spaces and driveways, decks, patios, driveways and other surfaces. The process of construction brings increased threats to salmonids including fine sediment runoff, construction vehicle traffic, fluids, and airborne particles, noise pollution, and construction material waste.

**Vegetation clearing** Development also invariably involves increased clearing of vegetation, cutting of trees, and damage to riparian habitat or preclusion of restoration. Some of this vegetation clearing is legally required, such as mandatory clearing for defensible spaces, so please include information on this currently and expected in the future, clearing around new roadways, clearing around new utility infrastructure and the like. In addition, increased development invariably entails additional vegetation clearing from voluntary activities, such as the installation of landscaping and other attendant development, such as play structures, sandboxes, installation of “temporary” structures such as storage boxes and sheds, and tree cutting. Thus, the REIR’s analysis of development should include not just the increases in pervious and impervious cover, but also the scale of the loss of habitat.

Please provide baseline information on current tree cover and what would be allowed under Marin’s current Tree Ordinance. While the tree ordinance only relates to certain species and trees of certain size, please provide information on other/smaller trees and native vegetation.

In particular, there are noted non-linear effects of such impacts, as increased clearing results in increased habitat fragmentation and loss of woody cover above certain thresholds are associated with qualitative changes in instream characteristics, such as peak flow and temperature, insect food availability, and predation. In many ways the attendant
Vegetation clearing is both more extensive and more destructive than the structures themselves.

Invasives - Beyond the impacts of clearing, development greatly increases the introduction of invasives, including plants from landscaping, cats and dogs, and also aquatic invasives such as freshwater mussels. Because these are clearly foreseeable impacts of development, these impacts much also be accounted for in the REIR.

Automotive runoff and chemical pollutants - Recent studies have demonstrated that runoff of from cars can have strong effects on salmonid health even at remarkably low doses. Increased development inevitably involves increased presence of cars within the watershed and increased load of automotive toxins, including oil, gasoline, brake fluid, coolant, and copper and other toxic metals from brake pad wear. In addition to the residential vehicle use, several locations are used for commercial vehicle and construction equipment storage, and the impacts of such sites must be included in the analysis. Construction and commercial vehicles emit diesel exhaust that produces airborne particulates that enter waterways through impervious surface runoff. Thus, the analysis of development should assess the increases in toxicity loads at all development scenarios and the impact of increased toxicity.

Roads - The EIR should assess the level of increase in roads associated with full buildout, including paving of currently unpaved roads, widening of existing roads, construction of new roads and driveways, and the increased impact on hydrology from new road drainage features such as ditches and culverts. Not only do such roads involve increases in impervious surface and changes in sedimentation, but they also implicate increases in automotive runoff as described above. The increased road construction intended to handle greater vehicle traffic will result in inevitable vehicle collisions which often release contained vehicle fluids onto the road surfaces and adjacent lands and waterways. These fluids include radiator coolant, gasoline, engine oil, AC coolant, and more. Often vehicles will be driven off road surfaces and fall into creeks and waterways, often releasing vehicle fluids directly into the water and sometimes requiring the use of fire retardants in the stream. The REIR must appropriately investigate and address the myriad impacts to
salmonids habitat and water quality from road construction, vehicle miles, road expansion, drainage manipulation, and traffic collisions.

**Chemical applications** - In addition, development also typically involves increases in the application of various toxic chemicals, such as herbicides and pesticides in gardens, for termite treatment, or to reduce the presence of insects. Furthermore, development brings both increased levels of fire retardants from construction and utilities, but also the increased risk of fire brings a likelihood of the use of foams and other chemicals. In fact, in 2007, the National Marine Service release a jeopardy biological opinion regarding the use of fire retardants around salmonid streams that must be reviewed and incorporated. Although this might seem remote, in fact Marin County Fire has released large quantities of chemicals and retardants into San Geronimo Creek, so the likelihood must be assessed and this impact added to the cumulative impact to the watershed. Since the introduction of such toxins within the environment are also associated with increased housing the impacts of the increased toxin loads in salmonid streams must also be analyzed.

**Water quality and septic tanks** - Given the current sanitation options within San Geronimo Valley, increased development necessitates increased use of septic systems. There is extensive evidence of pharmaceuticals and other chemical agents in waste water and impacts of these on fish\(^{10}\) as well as documented use of pesticides such as methoprene within septic systems in San Geronimo Valley. Since septic systems do not filter these pollutants adequately, there is a significant potential for increases in the presence of these chemicals at bioactive levels within downstream waters. Given the lack of the ability of the County to enforce and clean up severe septic issues, we expect the analysis to provide baseline data on the release of nutrients, pathogens and potential salmon-harming chemicals. In addition, this analysis must include both impacts from new septic systems as well as increased discharges from newly failed systems as aged systems fail throughout the valley. As a result, the REIR must appropriately analyze the maximum amount of increased black and grey water released into the riparian system, including additions of human and other fecal coliform bacteria, pharmaceuticals, detergents, bleach, and all other increased

pollution resulting from increases in the number of failed system in the valley. Furthermore, these additions come in the context of the listing as an impaired waterway for San Geronimo Creek, which means that the threshold for significance of these impacts cumulative with past impacts is extremely low. Therefore, the REIR must account for the attendant impacts of development from increased septic systems on water quality within the San Geronimo watershed.

**Water withdrawals** – Unfortunately, in times of drought and increased water rates, increased development and landscaping has driven and will likely drive unauthorized pumping from waterways, either directly from instream pumps that can trap salmonid fry or through wells. Thus, the REIR should assess the potential for current and increased water withdrawals, especially from wells and especially during low water periods when removal of water can eliminate critical over summering habitat in stream pools.

**Bank Armoring** – Past development too close to streams has resulted in bank armoring to protect such structures, and allowing additional development within the area in which streams are likely to move will trigger more bank armoring as well. Naturally, increased development along streams is likely to increase both the presence of structures and attendant development, such as patios, shed, play structures and the like. Thus, buildout is going to increase pressures for bank armoring that may occur informally, illegally and under “emergency” permits that bypass normal permitting procedures. Thus, it is imperative that the REIR assess the scope of past armoring and the potential for future armoring and its relationship to increased impacts within salmonid streams, especially with respect to critical thresholds of hydrological and instream flow behaviors as armoring levels increase. Typical bank armoring includes rock rip rap, gabion walls, concrete abutments, stacked logs, rock and wood retaining walls, and more. These impacts of all of these features leads to channel incision, habitat simplification, greater discharge velocities, and increased flood stage and property damage downstream. The impacts of armoring will worsen the instream flow characteristics and eliminate overwintering habitat for salmonids. Furthermore, by eliminating natural banks, armoring disrupts riparian ecology by reducing vegetated streambanks with concrete and stone, reducing prey availability and disrupting nutrient cycling with surrounding forest. We expect analysis of current levels of
armoring, expecting increased need for armoring under current climate change scenarios, as well as impacts from additional development allowed under the CWP.

In addition, similar emergency regulations appear to allow removal of large woody debris from streams, and increased development increases the likelihood of illegal or unpermitted removal of large woody debris. Given the lack of enforcement of any relevant regulation of activities in the streams, these impacts are likely to increase with increased development and must similarly be analyzed.

*Noise and light* - Increased development entails increased noise and light pollution, which may affect behavioral ecology of salmonids and other wildlife within the San Geronimo Valley watershed. For example, construction activities, such as pile driving or other ground disturbance, can have severe physiological effects on salmonids and survival. Frequent ground vibrations from large vehicles and adjacent home construction can cause stress to salmonids, limiting nesting sites for adults and rearing habitats for juveniles. Noise from streamside homes and garages including utilities (gas, electrical boxes, air conditioning, septic, etc.) can cause increased disturbances and stresses to all life stages of salmonids. Noise from people too close to streams as a result of patios, decks, and the like can cause disturbance to spawning and rearing fish. Light pollution from houses, garages, decks, emergency lighting, street lights, and vehicles that shoot glare and spotlighting on streams can disrupt spawning, juvenile rearing, and the ability for salmonids to migrate. These impacts have the potential to disrupt important ecological functions within the watershed.

*Domestic animals* - In addition, the increases in development will bring greater impacts from additional livestock, dogs, domestic cats and feral cats, in particular. In addition to damage to waterways and increased fecal matter from other animals, feral cats in particular can pose threats to fish. Both feral and domestic cats have been observed fishing for and killing juvenile salmonids in Larsen Creek. Unleashed dogs are often seen chasing spawning salmonids off redds, walking over eggs when incubating in gravel, stirring sediment in pools where juvenile salmonids seek refuge, and leave fecal remnants near open waterways that add nutrients to streams.
Confined animal livestock enclosures in the San Geronimo Valley contribute pathogens from feces, sediment and dust from paddocks, and pharmaceuticals administered to livestock. The REIR must fully evaluate the effects of domestic animals and confined animal facilities on the creek habitats and water quality. The REIR must evaluate the full impacts of domestic animals on habitat and watershed processes that coincide with development buildout scenarios.

Given the wide variety of known impacts from development on salmonids and the broad scope of the Court of Appeal’s order, it is imperative that the REIR analyze the full set of such impacts on salmonid populations. Although individually such impact may be relatively minor, a series of minor insults from automotive runoff, pesticides, sediment, thermal load and the like can add up to catastrophic consequences for a population that is on the verge of extinction. As noted above, CEQA requires that the significance threshold for cumulative impacts be commensurately lower as the background impacts increase. Here, the past impacts on the salmonid habitat have pushed the population first to threatened status in 1996 (meaning the population had the potential to approach the edge of extinction) and then in 2012 to come to the verge of extinction when listed as endangered. That endangered status by its very legal definition means that essentially any additional impact that reduces the viability of the population is significant and runs a grave risk of the loss of the largest population remaining in the California Coastal Coho salmon population.

We appreciate the opportunity to raise these issues earlier in the process to allow the draft recirculated EIR to have an adequate and full accounting for environmental impacts, rather than waiting for substantial revisions to the draft before becoming final or having to resolve these issues before the Court.

Please let us know if you have further comments or questions as part of this dialogue.

Respectfully submitted,

Doug Karpa, J.D., Ph.D.
Legal Program Co-Director and Science Policy Director
5a Comment noted.

5b Comment noted.

5c The SEIR analyzes impacts related to development throughout the San Geronimo Creek watershed, including but not limited to the SCA.

5d The SEIR analyzes impacts on habitat and processes occurring in streams throughout the watershed for which data are available or information is sufficient to form the basis for reasonable assumptions.

5e Please refer to Master Response 3.

5f Please refer to Master Response 3.

5g The SEIR characterizes existing conditions, including the current status of anadromous salmonids and their habitat in the San Geronimo Creek watershed, and it discusses the likely causes of habitat degradation and population decline. The impact analysis in the SEIR evaluates the potential for incremental changes to make a cumulatively considerable contribution to existing significant adverse impacts.

5h Please refer to Master Response 4.1.

5i Please refer to Master Response 4.1.

5j Please refer to Master Response 3.

5k The County requires permits for a variety of development activities including, but not limited to, building permits, grading permits, planning permits, and septic permits. The submitter is correct that unpermitted, illegal developments are investigated when complaints are filed. This is part of the Marin County Community Development Agency’s code enforcement program, to ensure compliance with the County’s laws and regulations for land use, zoning, building, housing, and environmental health. Information on the code enforcement program and how to file a complaint is available here: https://www.marincounty.org/depts/cd/divisions/code-enforcement. Marin County maintains four environmental complaint inspectors and replaces vacant positions through recruitment as needed. Additionally, the Environmental Protection Unit prosecutes civil and criminal violations of California’s environmental protection laws, including cases related to: water pollution, illegal waste discharges, unpermitted underground storage of hazardous materials, and unlawful disposal of hazardous waste. Information of filing a complaint with the Environmental Protection Unit is available here: https://www.marincounty.org/depts/da/consumer-proection-unit/environmental-protection.
Historical unpermitted development of sufficient size to make a meaningful contribution to TIA appears in the aerial images used for digitizing existing conditions (see also Master Response 4.2) and thus is inherently considered as part of existing conditions TIA. The types of structures cited by the comment (e.g., small sheds, chicken coops, small structures, areas of pavement) located close to the stream channel may not appear in aerial images because they may be hidden beneath riparian canopy or too small to be reasonably and/or reliably digitized. While such small structures do have the potential to contribute to TIA-related impacts on salmonids, particularly when they are located in the SCA, explicitly accounting for them in TIA estimates requires a buffering approach, because a parcel-by-parcel analysis of the TIA contributions of numerous small, individual existing structures is infeasible using aerial imagery. As noted in Master Response 4.2, the conservative road width buffer of 36 feet accounts for a variety of hard surfaces that are not sidewalks but are visible in the aerial photos of San Geronimo Valley and not rigorously captured by the digitization process, including the full extent of intersection shoulders, driveway shoulders, swimming pool (hardscape) patios, paved paths between parking lots and building entrances, small sheds, and domestic animal-related features (e.g., chicken coops, dog runs), which are located both inside and outside of the SCA.

However, as an example, assuming 500 ft² of unpermitted development exists entirely within the SCA on every existing improved parcel located either completely (n=93) or partially (n=648) within the SCA (see Final SEIR Table 2-13, previously Table 2-11) would result in less than 1% TIA for the total area of SCA (1,186.2 acres, see Final SEIR Table 2-15) in San Geronimo Valley. Expanding this estimate to the valley as a whole would result in 0.1% TIA under existing conditions. Both of these estimates are within the general uncertainty of the TIA analysis (approximately 1%) and would not alter the impact analyses, significance determinations, or mitigation measures put forth in the SEIR. Future unpermitted development at this scale would result in far less of an increase in TIA (0.03% in the SCA and 0.1% TIA for the entire watershed), since the number of future improved parcels located completely (n=25) or partially (n=119) is lower. Further, as stated in SEIR Section 6.2, the relatively low number of San Geronimo Valley building permits issued by Marin County in recent years (e.g., 2016) indicates that the number of additional improved parcels and developed units anticipated under the Proposed Project is likely to be an
overestimate. Therefore, any estimate assuming future development of all available parcels completely or partially within the SCA, where such development is entirely within the SCA, is very likely to be an overestimate of future conditions TIA. Overall, given the general uncertainty of the TIA analysis (approximately 1%) and the acknowledged use of conservative buffers on paved roads (within or outside of the SCA) to account for hard surfaces that are not reliably captured by the standard TIA methodology, we see no basis to assume any systematic over- or under-representation of TIA for existing or future conditions for the SEIR. More importantly, as stated in reference to effective impervious area in SEIR Section 2.6.1 and as generally applicable to TIA, imperviousness is a coarse, albeit powerful, predictor of stream conditions and there is little to be gained by continued efforts to more precisely delineate TIA in San Geronimo Valley.

5l Please refer to Master Response 2.

5m The SEIR analyzes the potential for impacts related to each of the impact mechanisms listed in the comment.

5n The significance thresholds used in the SEIR are consistent with those referenced in the comment.

5o Please refer to Master Responses 6 and 15.

5p Please refer to Master Response 4.2.

5q The SEIR's impact analysis includes the potential for loss of riparian habitat (e.g., vegetation) and riparian function that can accompany development.

5r Sections 3.5 and 3.6 of the SEIR summarize available information on riparian vegetation and tree cover in San Geronimo Valley. Additionally, the Native Tree Preservation and Protection Ordinance 3291 was subsumed into Development Code Chapters 22.27 – Native Tree Protection and Preservation, 22.62 – Tree Removal Permits, and Section 22.130.030 (definitions of “Protected Tree” and “Heritage Tree”), which establish the regulations governing removal of native and heritage trees under the Marin County Municipal Code.

5s The SEIR's impact analysis includes the potential for loss of riparian habitat (e.g., vegetation) and riparian function that can accompany development.

5t Please refer to Master Response 11.

5u We acknowledge that highly concentrated toxins in highway runoff and other sources in highly urbanized watersheds such as those draining to
Puget Sound (e.g., Scholz et al. 2011, Spromberg and Scholz 2011) have adversely impacted adult salmonids, including coho salmon. However, the levels of urbanization and road use intensity associated with water quality impairment and coho salmon mortality in these areas far exceed current levels in the San Geronimo Valley and levels that can be reasonably expected under the Proposed Project. A related study found that a mixture of metals and petroleum hydrocarbons intended to mimic polluted urban stormwater runoff resulted in no discernable adverse effects on coho salmon spawners (Spromberg et al. 2016), suggesting that additional substances or combinations of substances found in undiluted runoff from an intensely used interstate highway but not in the tested mixture are responsible for the observed coho salmon mortality. Section 3.4 of the Final SEIR has been clarified and amplified to include additional water quality data available for the San Geronimo Valley. However, existing information does not include data on toxins in road runoff or other vehicle-derived substances. The Final SEIR has also been clarified and amplified at Section 5.1 to discuss the potential for adverse impacts on salmonids related to these water quality constituents and clarify the impact analysis approach. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered.

5v Please refer to Master Responses 4.2, 6.2, and 6.7 regarding roads, impervious surfaces, and hydromodification. Please refer to the responses to Comment 15k regarding impacts of road runoff on salmonids and Comment 15m regarding impacts related to fire retardant chemicals.

5w Please refer to the responses to Comment 15k regarding impacts of road runoff on salmonids and Comment 15m regarding impacts related to fire retardant chemicals.

5x Please refer to Master Response 15 and the responses to Comments 15k, 15l, and 15ae.

5y Please refer to Master Response 5.2.

5z The current condition of stream and riparian habitat structure and function are summarized in Sections 3.5 and 3.6 of the SEIR. Although it is not possible to predict the likely location or characteristics of bank armoring associated with future development, the impact analysis
addresses the potential degradation of stream and riparian structure and function that could occur under the Proposed Project.

5aa Illegal, unpermitted, or emergency removal of large woody debris from streams is not a predictable or quantifiable effect of the Proposed Project and is not analyzed in the SEIR.

5ab Potential impacts related to light and noise (vibration) are not predictable or quantifiable effects of the Proposed Project and are not analyzed in the SEIR.

5ac Potential impacts of livestock and pets on salmonids are not specifically analyzed in the SEIR because the potential for effects and the effect mechanisms cannot be reliably linked to development under the Proposed Project. However, some effects that can be associated with livestock, such as increased erosion and sedimentation, are analyzed in the SEIR.

5ad Comment noted.
Letter 6—San Geronimo Valley Stewards
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To: Marin County Planning Commissioner’s; Christina Desser; Margaret Curran; Dan Dickerson; Davis Paoli; Marga Biebl; John Eder; and Peter Terram

From: The San Geronimo Valley Stewards

Re: San Geronimo Valley Stewards’ Comments on the Adequacy of the Draft “2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley”

1. Potential Impacts Uncertain and Development Overestimated without Alternatives

Evaluation: Page 5-2 of the SEIR states, “the cumulative impact analysis implicitly acknowledges the difficulties of showing direct links between land-use activities and in-stream conditions, and so the predictions of impacts are of necessity qualitative and conservative (i.e., potentially overestimated).” Page 2-29 states, “Under the Proposed Project, there is potential for an increased number of improved parcels within the watershed as a whole, as well as an increased number of developed units. Despite this, remaining parcels zoned for future development tend to have significant environmental constraints, which either substantially increase construction costs or preclude development altogether (e.g. inadequate percolation for on-site septic systems, lack of access via paved roads, steep topography necessitating engineered foundation designs).” Furthermore, page 2-30 of the SEIR acknowledges “that the number of additional improved parcels and developed units anticipated under the Proposed Project is likely to be a conservative estimate (i.e., an overestimate).”

Section 15126.6 of the CEQA Guidelines call for an EIR to evaluate reasoned alternatives that could feasibly attain most of the basic objectives of the Project, and that would avoid or substantially lessen any of the significant effects. However, the Draft SEIR is considering only a full build-out Project, while at the same time acknowledging both the difficulty of linking potential impacts to planned development, as well as admitting the estimates of future development are overstated. Essentially, the SEIR has concluded that the full build-out scenario is exaggerated and improbable.

2. Projections of Development Ignores Existing Building Restrictions: The SEIR analysis not only admits overestimating of buildable parcels and units, but also ignores existing building restrictions (lot size, ridge line building, setbacks, septic suitability), and assumes all potentially buildable parcels will receive maximum number of units and added impervious area.

3. Vegetation Clearing Requirements for Fire Hazard Conflicts with Proposed SCA Ordinance:

A. Residents of the SGV are currently being denied home insurance if extensive tree cutting and vegetation removal around existing homes is not performed. If an insurance company is requiring a homeowner to clear vegetation 50-feet or more from an existing structure, will
that insurance policy requirement override an SCA setback requirement to maintain riparian vegetation?

7. If a fire or other catastrophe destroys an existing home in the SCA setback, the footprint and location of the structure should be "grandfathered" in to allow rebuilding in the same location, and in the same footprint, and not force the structure to be re-sited on the parcel due to SCA requirements.

C. The Draft SEIR inadequately addresses the conflicts between codes and practices for vegetation control related to fire hazard on the one hand, and SCA requirements to maintain riparian vegetation on the other.

4. Projected Development Impacts Related to Sediment Ignores ~80% of SGV Watershed Lands: The Draft SEIR identifies known conditions that impact salmon in SGV streams, such as sediment contributions associated with runoff. Mitigation Measure 5.1.1 calls for an Expanded Stream Conservation Area Ordinance that will impose extensive new regulatory requirements on privately held parcels which comprise only about 20% of the SGV watershed, while the remaining 80% (made up of public open space, utility, agriculture, and especially zoned lands) will not be subject to an SCA ordinance. The SEIR should evaluate current and projected future contributions of sediment to SGV streams from County, public utility, and agricultural lands, (i.e., unpaved roads) as balanced against existing and projected development, and appropriately allocate the regulatory burden of proposed new SCA Ordinance mitigation measure across all landholders.

5. Estimates of Total Impervious Area are Exaggerated: The SEIR acknowledges that the development-related estimated increase in Total Impervious Area is based on "maximum allowable buildout in the Marin CWP (2007)" - and that the result is a conservative overestimation of added TIA (page 2-31). Estimates of additional TIA related to development should be more accurately analyzed due to admitted site constraints that will limit the actual number of developable parcels, sizes of new units, and the amount of projected TIA within the SCA setback should be delineated to assess probable quantity of new impermeable development that will be subject to SCA setback regulations.

6. Stream Conservation Area Ordinance 100-foot setback disregards small or constrained parcels: the 2010 San Geronimo Valley Salmon Enhancement Plan (SEP) by Prunuske Chatham, Inc. and Stillwater Sciences, determined that a 35-foot stream setback was sufficient for "areas constrained by development or small vacant lots" (page 221, SEP, 2010). Why does the SEIR ignore this recommendation from a 2010 report done by the same consultant (Stillwater Sciences)?

7. SEIR should address the potential impact of an Expanded SCA Ordinance on the County's goals for affordable housing. An expanded SCA Ordinance as being proposed by Mitigation Measure 5.1.1, will implement significant financial and regulatory burdens that may deter or prevent homeowners from adding a modest addition for an aging parent, or as an affordable rental unit.
6a Please refer to Master Response 4.1.
6b Please refer to Master Responses 3 and 4.1.
6c Please refer to Master Response 4.1.
6d Please refer to Master Response 4.1.
6e Please refer to Master Responses 16 and 18.
6f Please refer to Master Response 18.
6g Please refer to Master Responses 6.4 and 16.
6h Section 5–Impacts 5.1 and 5.2 of the SEIR analyze the potential for impacts related to erosion and sedimentation resulting from future development throughout the watershed, regardless of land use or ownership. Please refer to Master Responses 6.1 and 13.
6i Please refer to Master Response 4.2.
6j Please refer to Master Response 10.
6k Please refer to Master Response 14.
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Letter 7—San Geronimo Valley Stewards
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Ms. Rachael Reid,

Attached are the San Geronimo Valley Stewards' comments regarding the County of Marin's Draft SEIR pertaining to the San Geronimo Valley.

A hard copy of our comments has also been mailed.

Respectfully submitted,

Denis Poggio

San Geronimo Valley Stewards Protect Families and Fish
From:
San Geronimo Valley Stewards
- Koa Pickering, President
- Denis Poggi
- Peggy Sheneman

By US Mail To:
Rachel Reid
Environmental Planning Manager
Marin Community Development Agency
3501 Civic Center Drive, Suite #308
San Rafael CA 94903

By Email: enplanning@marincounty.org

Hard Copies Mailed To County Of Marin Officials Listed On Page 14

RE: Comments from the San Geronimo Valley Stewards
County of Marin - Draft April 2017 Supplemental EIR

San Geronimo Valley Stewards thanks the Marin Community Development Agency and Marin County Counsel for their diligent and professional work on the SEIR draft. We appreciate the research of Stillwater Sciences in this difficult assignment.

Our comments are made with the intent of improving the SEIR and providing more information, so the County can move forward with a 2018 Countywide Plan and a new stream ordinance. Mitigation steps which require taxpayer dollars should be informed by data to make the projects effective.

SG Valley Stewards supported adoption of the 2013 Marin County Interim Stream Conservation Area Ordinance. The 2013 Ordinance was also supported by Marin Conservation League, Marin Audubon Society, and other responsible conservation groups. Unfortunately, it never took effect in San Geronimo Valley because Spawn sued to stop it, which triggered the "poison pill" clause. The 2013 Ordinance governed the other unincorporated areas of Marin, until sunset by its own terms in April 2016.

Why the SEIR is Important to 800 Families Living in Existing Homes Near the Creeks.

The draft SEIR evaluates only one development scenario—a full build out of 358 new units. (SEIR pages 2-25 to 2-45.) The SEIR recommends mitigating the impact of full
build out by adopting a new stream ordinance, with strict adherence to 100-foot setbacks, discretionary design review, and hiring expensive experts for every activity within the stream conservation area. (SEIR pages 5-12 to 5-22.) The SEIR recommendations are similar to the Tier 3 stream permit required for large new house construction under Marin's 2013 interim stream ordinance.

The SEIR makes no mention of exceptions or exemptions for small improvements to existing homes, most of which were built in before 1980 on small lots within 100 feet of streams. In suggesting a mitigation ordinance, the SEIR should acknowledge the precedent of the 2013 ordinance Tier 1 and Tier 2 permits for small projects. Consider for an existing home a handicap ramp, children's play structure, garbage can enclosure, vegetable garden, or driveway paving. Do these small projects justify discretionary design review, Planning Commission hearings, and appeal to the Board of Supervisors?

Since the 2007 Countywide Plan, Marin County has recognized the crises in affordable housing, especially in West Marin. Second units and junior second units are the least expensive and fastest way to add housing, privately financed, without taxpayer dollars. A 350 square foot addition to an existing house can create a new bathroom and studio/bedroom. This would provide caregiver housing for a senior, or enable a homeowner to rent space for workforce housing.

Marin Community Development Agency has recommended that a stream ordinance should follow guidelines for "CASE": The ordinance should be Clear, Affordable, Simple and Enforceable.

**SUMMARY:**
SGV Stewards respectfully request the following corrections and additions be made to the Draft SEIR before it is approved by the Board of Supervisors:

- **A.** Amend the SEIR to also evaluate two reasonably probable developments with lesser impact on habitat; Building 108 new houses, and /or permitting small improvements to existing homes. Calibrate the new stream ordinance (suggested as a mitigation measure) to the lesser impacts of these projects.

- **B.** Recognize and accommodate geographic constraints, by studying the impact of a 35-foot setback for existing homes on small lots near the creeks.

- **C.** Do not place regulatory obstacles to fire prevention. Vegetation and tree management is dictated by state law, our fire insurance policies, and the Marin Fire Department. Fire conflagration would be a disaster for the San Geronimo salmon species.

- **D.** Provide more information and hard data on: How TIA is measured under existing conditions, impervious area caused by roads and paved surfaces, current and historic water flows, sediment impact on watershed lands owned by exempt parties (government agencies and agriculture), and effect of septic effluent on groundwater.
1. Development is Over-Estimated and Link to Potential Impacts is Uncertain.

SEIR at page 5-2 states, "The cumulative impact analysis implicitly acknowledges the difficulties of showing direct links between land-use activities and in stream conditions, and so the predictions of impacts are of necessity qualitative and conservative (i.e., potentially over-estimated), except where sufficient quantitative information is readily available."

Even under the 358 unit full build out scenario, SEIR finds Total Impervious Area (TIA) might increase by only 5%. That is, 14.1 additional acres of TIA might be added to existing conditions of 301 acres of TIA. This could result in percentage increase of less than three-tenths of one percent (0.3%), (SEIR pages 2-30 and 2-31.)

SEIR admits the number and scale of 358 additional units may be over-estimated, but fails to evaluate the more realistic scenario of about 100 vacant lots that may be potentially buildable. SEIR page 2-29 states: "...remaining parcels zoned for future development tend to have significant environmental constraints, which either substantially increase construction costs or preclude development altogether (e.g., inadequate percolations for on-site septic systems, lack of access via paved roads, steep topography necessitating engineered foundation designs."

Planning Commissioner Desser correctly asked on May 22, 2017 why the SEIR could not research and estimate the vacant lots that are actually buildable? She suggests many lots appearing on the Assessor Parcel Maps may be tiny "paper streets" and pocket parks left over from pre-1920 subdivisions that were never completed. Could many of the 358 paper lots be eliminated by simply looking at their size and configuration?

The 2010 Salmon Enhancement Plan (SEP) states that Assessor Maps show 203 unimproved single family residential parcels partially or fully within the SCA. Of those, 108 lots cannot contain 3,000 square feet of development outside the SCA.


There may be about 108 residential parcels that, if developed, would require construction within the SCA zone.

2. CEQA Requires SEIR Evaluate Reasoned Alternatives.

July 2018
Section 15126.6 of the CEQA Guidelines call for an EIR to evaluate reasoned alternatives that could feasibly attain most of the basic objectives of the Project, and that would avoid or substantially lessen any of the significant effects. However, the draft SEIR considers only a full build out of 358 new units, while admitting this estimate is over-stated and acknowledging the difficulty of linking this development to potential impacts on salmon. The full build out scenario is exaggerated and improbable. The SEIR draft is of little help to inform the County officials and residents how best to structure a new Countywide Plan and a new stream ordinance as mitigation.

Only 19 permits were issued for improvements on existing homes in 2016 for the SG valley. This compares to 1200 permits for the County as a whole. More importantly, all of the 19 permits were for remodels, new decks, or retaining walls. No permits were issued for construction of a new home on a vacant lot. (SEIR page 2-28.) These facts support the CDA estimate of 15 small project permit applications filed each year. (CDA Staff Report Oct. 29, 2013.)

Alternative development scenarios that represent more probable and less extensive future development in the SG Valley should be included in the final draft SEIR. The SEIR recommends a new stream ordinance as mitigation, and it should be appropriately calibrated to reflect realistic alternatives that will have less impact on our treasured salmon.

Planning Commission Staff report, May 22, 2017 states: “The analysis in this program SEIR is considered the first tier of environmental review, creating the foundation upon which future project-specific CEQA can build...” It is important this first step foundation be complete by evaluating reasonable alternatives, as well as the “full build out” scenario of the 2007 Countywide Plan.

It would also be most efficient for the County and individual homeowners for the draft SEIR to include now the more likely development scenarios. “A program SEIR can be incorporated by reference into subsequently prepared CEQA documents...This draft SEIR will help make the environmental review process for individual development applications more efficient...” Id. CEQA Guidelines recommend this tiered approach to eliminate repetitive discussion, and focus later reports on actual issues ripe for decision on particular projects. Id.

3. SEIR Should Evaluate Two Other Reasonably Probable Development Projects.

We request SEIR be amended to evaluate two other development scenarios that present more probable and less extensive future development in the SG Valley:

Scenario #2: About 108 new residences are built on vacant lots, with construction of about 3,000 sq feet of impervious area per lot, within the SCA zone. This could increase total Valley TIA by about 324,000 square feet (7.4 acres) --which is half of the estimated increase under SEIR Scenario #1 (358 new units). The Scenario #2
evaluation should consider County restrictions on septic, steep grade, ridge line protection, etc. as well as road access and MMWD water availability.

Scenario #3: Existing homes are permitted to add up to 350 square feet. If the 800 family homes now existing in the SCA zone are permitted to add up to 350 square feet (cumulative maximum over the life of the home). That could result in 280,000 square feet increase in TIA (6.4 acres).

It is probable that Scenario #3 would over-estimate development, because not all 800 families will make additions to their homes or will increase effective impervious area. If the County models a new stream ordinance similar to the 2013 ordinance, Tier 1 and Tier 2 permits for small projects would require best management practices to control sediment, and use pervious materials where possible.

An important difference from new building construction on a vacant lot, is that improvements to an existing home can be netted against removal of old impervious areas. For example, tear out the old hot tub; resurface the driveway with pervious drainage stones, etc. The result can be a net equality (or even a decrease) in effective impervious area. See SEIR page 2-28 (surface water drains into filtration runoff).

SEIR Table 2-12, page 2-41 posits there are 884 existing "units" which are partially or fully within the SCA. "Units" includes horse sheds, roads, schools, etc. SEIR page 2-29. Is it fair to assume 800 "units" might be single family homes?

The 2009 ECR report shows 1,371 single family residences in the entire valley, with median home size of 1,544 feet. 1995 Assessor's report shows 1,596 "living units" in the valley (which includes multi-family buildings).

4. SEIR Should Evaluate 35 foot Setbacks for Small Lots.

We recognize the SEIR is constrained by the stream setbacks in the 2007 Countywide Plan, which are 100 feet from top of stream bank for the Inland Rural Corridor, including the SG Valley. However, the SEIR should also look forward to the new 2018 Countywide Plan, by evaluating the cumulative impact of establishing a 35-foot setback for small already-developed lots in the SG Valley.

A 35-foot buffer is recommended by 2010 SEP report: "A minimum 35-foot buffer is recommended to guide enhancement on parcels that are already developed and to guide enhancement of riparian habitat on parcels proposed for new or re-development." SEP page 2-21. "In areas constrained by existing development or on small vacant lots, a minimum 35-foot buffer from the active channel to new construction can ensure the protection or enhancement of riparian vegetation or function. The buffer can make a crucial contribution to filtering sediment and sediment attached pollutants, while also providing shade and natural bank stabilization." SEP pages 2-21 to 2-22. On San Geronimo Creek and major tributaries, a 35-foot buffer would allow construction of a 3:1 slope for stream stabilization and restoration projects. Id.
SEP states that a 35-foot setback "would also allow natural erosion processes as the stream adjusts to changes in the watershed and runoff patterns without jeopardizing structures, gardens, or other infrastructure. In areas where people are already living, this zone is the key area to focus riparian enhancement activities." SEP page 2-22.

Other cities and counties use less than 100 feet as stream buffer: The town of Fairfax in Marin County calls for a 20 foot setback from the top of the creek bank, or twice the depth of the creek. http://www.town-of-fairfax.org/html/tc_overview.html.

Santa Cruz County uses a Riparian Corridor Setbacks of:
- 50 feet from each side of a Perennial stream;
- 30 feet from an Intermittent stream;
- 10 feet from Ephemerals; and
- 50 feet from Riparian woodlands.

See: www.codepublishing.com/Portals/2/County/Planning/env/Riparian
- Corridors and Required Setbacks.pdf

Marin CDA surveyed the average lot size and home size on the East side of SG Valley. On October 2, 2013, Marin CDA published a "Valley Home Size" chart to assist in consideration of a proposed community waste water project.

<table>
<thead>
<tr>
<th>Location</th>
<th>Size</th>
<th>Home Size SQ. FT.</th>
<th>Lot Size SQ. FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Woodacre Flats</td>
<td>Median</td>
<td>1,371</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>1,439</td>
<td>12,609</td>
</tr>
<tr>
<td>Upper Woodacre Flats</td>
<td>Median</td>
<td>1,604</td>
<td>13,282</td>
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<tr>
<td></td>
<td>Average</td>
<td>1,727</td>
<td>15,918</td>
</tr>
<tr>
<td>San Geronimo</td>
<td>Median</td>
<td>1,790</td>
<td>18,800</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>1,790</td>
<td>18,810</td>
</tr>
</tbody>
</table>

The homeowner cannot fit a 100-foot setback on a 10,000 square foot lot (100 feet by 100 feet). Even on a 15,000 square foot lot, the 100 foot setback would leave the homeowner with only a 50 foot wide strip to fit his house, garage and septic.

Most homes along the main stems and major tributaries of creeks on the Valley floor would be rendered valueless and lose all meaningful use, if a 100 foot setback were to be enforced.

5. Who Performs and Pays for the Site Assessment?

SEIR recommends, as mitigation for a full 358-unit project, a new stream ordinance that requires permit and site assessments to be conducted by a qualified professional who is trained and certified. We have no objection to this requirement, but ask for clarification.
Would the homeowner on a small project (Tier 1 or Tier 2) be required to hire an expert and pay for the site assessment? Might there be a sliding scale of fees so that small projects are not burdened with costs that outweigh benefits?

Training and certifying a few CDA staff for this role may be cost effective. Another alternative is the County maintaining a list of qualified and certified experts, so the homeowner does not search the internet for a name. The homeowner should be allowed (if he requests) to hire his own expert.


SEIR recommends the new stream ordinance require a stream permit and site assessment for "any activity within the SCA that requires vegetation clearing ..." SEIR page 5-12.

People are afraid: At the Stewards public meeting on May 16, 2017, we learned that insurance companies have and are canceling home fire policies, or threatening not to renew, because of the high fire risk in the SG Valley.

What assurances can the Board of Supervisors give to SG Valley homeowners that a New Stream Ordinance will not interfere with the homeowner's duty to comply with insurance demands that homeowners remove flammable brush and clear space around their homes?

The SEIR should be amended to exempt from stream permit/site assessment any vegetation clearing or tree branch laddering that is required by state law, a fire agency, or an insurance company that provides fire insurance to the property owner. Maintaining a 100-foot defensible space around each residence is required by California Resources Code section 4291.

A stream ordinance that would require the extra step of a stream permit and site assessment would discourage homeowners from taking the inexpensive vegetation management practices recommended by Fire Safe Marin. We are supposed to remove ladder fuels (low level vegetation) and cut grasses down to 4 inches, in the 100 foot defensible space around our homes. (See, "Ready, Set, Go" published by Marin Fire Chiefs.) Covered fire breaks, which maintain forest canopy and shrubs for stream bank stabilization, can be an attainable goal.

The SEIR should be described to state the disastrous environmental consequences of fire in the SG Valley. An intense burn could scour out the entire drainage system, and could be the tipping point that makes salmon recovery impossible. A fire hot enough to burn mineral soil changes the chemistry of the stream water, and chemicals from burned buildings and cars can sterilize the creeks killing off all aquatic life.
SG Valley faces an enormous risk of wild fire, similar to the conflagration that recently destroyed Lake County. We live in the Urban-Wildland Interface zone, which is recognized in the 2007 Countywide Plan.

The County adopted a strict tree ordinance in 2011. We don't need to duplicate regulations in a stream ordinance.

SEIR page 3-29 relies on a 1996 study of riparian tree canopy. This should be updated by the more recent MMWD surveys showing 80% shade tree canopy over the major fish-bearing streams. Clear cutting of trees or massive removal of brush simply does not occur. We experienced one incident in the past decade of someone cutting 5 redwood trees. The violators were caught and punished.

7. Home Re-Building to Existing Footprint Should be Permitted After Fire, Earthquake or Flood.

People are worried: If homes are destroyed by fire, flood, or earthquake, Would the SEIR require a new stream permit, or require new location siting on the parcel, or prohibit a family from rebuilding their home?

SEIR Mitigation Measure 5.1-1 (Expanded SCA Ordinance) should exempt from the stream permit requirements activity within the SCA zone for rebuilding a residence after destruction or damage by fire, flood, earthquake, or natural disaster, provided that best management practices are followed in construction (per CDA guidelines), and provided the "unit footprint" within the SCA is the same square footage as the destroyed or damaged structure.

The purpose of the Mitigation Measure is to prevent an increase in TIA. This is not a problem if the TIA of new construction has no net increase, compared to the destroyed or damaged the building it replaces.

8. SEIR Should Address Sediment Impacts Caused by Public Agency Watershed.

SEIR correctly identifies sediment from run off as impacting salmon. But SEIR places all the regulatory burden for sediment on private homeowners who control less than 25% of the SG watershed. Sediment caused by the other 75% of the watershed must be evaluated, in order to measure the effectiveness of mitigation measures (such as a new ordinance or taxpayer funded projects). We need to know the "before" and "after" of sediment measurements.

Stewards' review of Assessor Parcel Maps indicates that Marin County Open Space District owns 27% of the land in the SCA zone, and MMWD owns 12%. Lagunitas School District is also a large land holder. Agricultural land (ranch and two equestrian

In April 2016, San Geronimo Valley Stewards (Steve Tognini) sent a letter to Marin County Counsel (David Zaltsman) requesting the SEIR correct the impervious area calculations found in the 2009 Existing Conditions Report prepared by Stillwater Sciences. Mr. Zaltsman kindly replied he would pass on the information. Can the County please confirm the 2009 ECR data gaps and errors did not find their way into the 2017 SEIR?

9 - A: SEIR page 2-28 states 90% of impervious area in San Geronimo watershed is attributed to roads (paved, gravel, other), sidewalks, parking lots, and driveways. Based on total 301 acres TIA, that would mean there are about 271 acres of road-type impervious areas? (SEIR page 2-30.) Stewards request sources, information, and how 271 acres of road/driveway/parking lots-related TIA was calculated?

Please note this 90% figure seems to greatly exceed the road-associated TIA reported by Tilley & Slonecker study (2007) where roads made up 28.2% of TIA in the SG Valley.

9 - B: There are only 36 miles of paved roads in San Geronimo Valley. (Cal RWQC Board 2014, page 158, Fine Sediment Reduction Plan.) The Jan 2009 Existing Conditions Report by Stillwater Sciences mistakenly assumed 251 miles of roads. Does the SEIR correct this error?

9 - C: The SEIR estimates how many square feet or how many acres of roads? SEIR page 2-24 describes "road density" as 7.4 miles/mi2. (That excludes dirt unpaved roads under the USGS definition of impervious roads. SEIR Page 2-29.) Does the SEIR account for narrow width of our paved roads (less than the standard 36 feet wide)?

9 - D: The SG Valley has less than 3,000 feet of sidewalks. Does the SEIR correct the 2005 ECR error of assuming miles of sidewalks alongside our roads?

9 - E: SEIR page 2-29 describes 2005 existing conditions of 1,099 feet or road per "average building unit footprint" of impervious area. How is this calculated?
9. Are roads, driveways, and paved infrastructure included in SEIR Table 2-12 page 2-41, calculating the increase in "improved units" from existing conditions to the proposed project (full build out of 358 units)?

10. What data supports the SEIR assumption there are 301 acres of TIA in SG Valley? How much TIA is attributable to existing family homes?

So much of the SEIR evaluation relies on estimates of impervious area, and many of its recommended mitigation steps focus on reducing impervious area, that attention should be focused on one key figure: 301 acres of Total Impervious Area under existing conditions.

This figure seems to appear only once, in Table 2-5 page 2-30: “TIA (ac) 301.4” in the column “Existing Conditions (2005)”.

Footnote 1 page 2-30 lists as the source: “Data provided by Marin County CDA in 2005.” It assumes no substantial development in the Valley since 2005 and therefore no change to the number of improved parcels, units or TIA. (All building and development was stopped for 37 months from Feb 2008 to October 2013, by moratoriums and injunctions demanded by SPAWN.)

The Stewards respectfully request access to the CDA data supporting 301 acres of TIA. We don’t wish to cause substantial delay or create unnecessary paperwork, but this 301 acre estimate is key to the entire SEIR report.

Also, our review of the 2009 ECR report revealed major errors and inconsistencies in describing TIA caused by infrastructure and private development. For example, some Parcel Maps still show the east side of Flanders Ranch as “institutional” because it was once zoned for a future high school. It is cow pasture.

The County deserves a second look at the factual basis for this 301 acre assumption of TIA. Would it be informative to test the estimate of 301 acres TIA against the 2013 LiDAR map, which blue-lined the stream conservation area? Perhaps check with the geophysicist in the Community Development Agency?

Stewards estimate 150 to 200 acres of TIA for the SG Valley, some portions of which are not located within 100 feet of any stream. We request supporting data and welcome corrections:

A. 36 miles of paved roads. 15 miles (SF Drake Blvd and SGV Drive) are about 36 feet wide. The remaining 21 miles are about 22 feet wide.

B. 3000 feet of sidewalks around the Lagunitas School, the SGV Community Center, and the Golf Club.
C. 20 non-residential buildings or institutions (10 of which * will be exempt from any stream ordinance, as government-owned or agriculture):
*One ranch
*Two equestrian centers
*Four U.S. post offices (2000 SQ feet each)
*MMWD Water Treatment Plant
*Marin County Fire Dept
*Lagunitas Elementary & Middle Schools
*SG Valley Community Center
*SG Valley Golf Course, club house and parking lot
*Two churches (including one Child Care Center)
*Spirit Rock Retreat
*Woodacre Improvement Club
*Lagunitas (one store and one small commercial building)
*Forest Knolls (four stores)
*Woodacre (one store)
*San Geronimo (one store)

D. 1371 single family residences, with median home size of 1544 square feet, were described in the 2009 ECR. (This figure should be checked with County Assessor.) Please note the smallest homes are those built decades ago, close to the fish-bearing main channels of creeks. After allowing for driveways and decks, we estimate all the TIA for existing family homes does not exceed 50 acres, after allowing for driveways and decks.

The 2009 ECR states the SG Valley watershed is 6,000 acres. Does SEIR agree with the ECR on this fact?

It appears that TIA attributable to existing family homes is **LESS THAN ONE PER CENT** “in numbers 0.83%” of total acreage in the SG watershed, under existing conditions.


The SEIR repeatedly cites high velocity and force of water flows as impacting salmon. (See SEIR pages 5-15 to 5-16, for example.) SEIR concludes that landowner activity increasing total impervious area will exacerbate high velocity water flows.

Yet the SEIR does not describe or measure what are the water flows, especially in winter. SEIR pages 3-24 to 3-26 describes current conditions on water quality and flow as “unknown” or “data inconclusive”.

This information should be readily available from MMWD, which has measured since 1980 water flows in San Geronimo Creek at the Lagunitas Bridge. USGS agency also measures creek flows in S.P. Taylor State Park.
Is water flow information available for the smaller tributaries such as Montezuma Creek and Woodacre Creek? Can the information flow statistics be matched against drought years? Can the report highlight years of natural floods?


Stewards appreciate the County's decision to undertake a voluntary study of groundwater pumping (wells) and surface water diversions. (SEIR page 5-26, Voluntary Mitigation Measure 5.3-1.)

We recommend the groundwater study also consider the effluent discharge from home and institutional septic systems, as well as landscape irrigation. The average household places about 150 gallons per day of water into the ground.

Conclusion

We recognize the SEIR was commissioned as the result of litigation. SG Valley Stewards ask that the SEIR be corrected and improved, so it can serve the practical function of guiding future decisions on the 2018 Countywide Plan, a new stream ordinance, CDA guidelines for homeowners, and effective projects for habitat. The SEIR is the first tier foundation in a series of impact reports. Let's make it complete.

The U.S. Supreme Court has ruled unanimously that government conditions on use and enjoyment of private land must have a nexus and a rough proportionality to the actual impacts of the proposed development. Koontz v. St. Johns River Water management District, 570 U.S. 2588 (2013).

THANK YOU FOR YOUR ATTENTION TO OUR COMMENTS AND CONCERNS.
San Geronimo Valley Stewards Protect Families and Fish

We are a non-profit whose mission is to protect families and fish in the San Geronimo Valley. We have over 400 members, donors, and supporters, who live in about 800 homes near Valley streams.

We are all volunteers; we have no paid staff, and we are not funded by taxpayer dollars.

SG Valley Stewards collaborate with County agencies and Marin Resource Conservation District to sponsor educational programs and events for healthy creeks. We host public programs on fire prevention, woody debris in creeks, removal of invasive species, and legislative actions to protect aquatic habitat. Stewards’ annual litter removal squad regularly clears trash out of creeks and from roadways.
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Tarisha Bai, Marin County Counsel
   • TBai@marincounty.org
7a Comment noted. No issues related to the adequacy of the Draft SEIR are raised in this comment.

7b Please refer to Master Response 6.1.

7c Please refer to Master Response 4 with respect to the conservative analysis of future development, and to Master Response 10 for information on the 100-ft buffer. Updates have been made to Mitigation Measure 5.1-1 to provide additional clarity in terms of what activities are allowable within the SCA (see Master Responses 6, 7, and 8). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 18 for additional clarification regarding existing land uses and structures with the SCA, and allowable future activities.

7d As stated in Master Response 6, the Interim SCA Ordinance does not set a precedent that will be upheld for the Expanded SCA Ordinance. With regard to improvements to existing homes, please refer to Master Response 18, which includes a list of activities that do not require a discretionary permit and site assessment.

7e Please refer to Master Response 16 regarding affordable housing fee exemptions. As per Master Response 18, external work that requires extension of the building footprint would likely result in vegetation clearing, increase impermeable area, increase surface runoff, and/or result in exposed soil; therefore, would require a discretionary permit and site assessment to ensure adverse effects on salmonids are avoided or mitigated.

7f Comment noted. No issues related to the adequacy of the Draft SEIR are raised in this comment, thus it is not further addressed.

7g Please refer to Master Response 4.

7h Please refer to Master Response 10.

7i Please refer to Master Response 15, and related Master Response 8.

7j Please refer to Master Response 4.2 (TIA), Master Response 2, and Master Response 15 (septic systems). With regard to sediment impacts on lands owned by exempt parties (government agencies and agricultural lands), please refer to Master Response 13. Please refer to the response to 7ae below regarding water flows.
The comment mixes references to future improved parcels and future developed units. SEIR metrics referenced by the commenter on pages 2-29 through 2-31 of the Draft SEIR (e.g., 358 additional developed units) are associated with the watershed as a whole. The analysis of units and parcels within the SCA is discussed in Draft SEIR Section 2.6.4 (pages 2-35 through 2-45). As shown in Table 2-13 of the Final SEIR (previously Table 2-11 of the Draft SEIR), the number of additional improved parcels under future conditions is estimated as 22 completely within the SCA and 119 partially within the SCA, for a total of 141 parcels. The 141 parcels include single family residential and multi-family residential, along with other land use classifications. The commenter asserts that there may be 108 residential parcels that, if developed, would require construction within the SCA but does not include consideration of other land use classifications or provide specific assumptions associated with this number in the comment. As stated in the Draft SEIR on page 2-30, it is not possible to quantitatively reduce the estimate of improved parcels under the Proposed Project without a parcel-by-parcel analysis that assumes specific design attributes for future development. The SEIR is a programmatic analysis of future development under the Marin CWP (2007), which by definition, does not require a parcel-by-parcel analysis of potential development constraints. See also Master Response 4.1.

The SEIR states that the number of additional improved parcels and developed units anticipated under the Proposed Project is likely to be an overestimate for the reasons described in Section 6.2. See also Comment Response 7l.

Alternatives to the Proposed Project were assessed in the Final Environmental Impact Report (EIR) for the 2007 Marin Countywide Plan (Final EIR) that was certified and adopted by the Marin County Board of Supervisors in November 2007. Consistent with State CEQA Guidelines Section 15163 (b) a supplement to an EIR need contain only the information necessary to make the previous EIR adequate for the project as revised. As stated in SEIR Section 1.1.2, the Court directed Marin County to set aside its approval of the Marin CWP (2007) and certification of the EIR pending preparation of a supplemental EIR that analyzes cumulative impacts in conformity with State California Environmental Quality Act (CEQA) Guidelines.
section 15130, subdivision (b) and the Court’s opinion, and that describes mitigation measures in conformity with State CEQA Guidelines section 15126.4 and the Court’s opinion or make other findings in conformity with State CEQA Guidelines section 15091. See also Master Response 4.1.

7n In contrast to Comment 7l, Comment 7n appears to be focusing on 108 future units rather than parcels. For Scenario #2, the commenter appears to be comparing the SEIR’s total number of additional developed units (n=358) for the entire watershed to their assertion that 108 units could reasonably be constructed within the SCA. This is not a relevant comparison because not all the 358 additional developed units would be in the SCA. SEIR Table 2-14 (previously Table 2-12) indicates that the number of additional improved units under future conditions is estimated as 26 completely within the SCA and 140 partially within the SCA, for a total of 166 units. As shown in a footnote to Table 2-14, the assignment of additional improved units relative to the SCA under the Proposed Project follows that of improved parcels (i.e., if the improved parcel is completely within the SCA, then the improved unit would be completely within the SCA; if the improved parcel is partially within the SCA, then the improved unit would be practically within the SCA). Following this approach, the amount of additional TIA within the SCA for the watershed (since the TIA calculations are cumulative, the estimate for Lower San Geronimo Creek is the same as that of San Geronimo Valley as whole) would be 1.9 acres (see Table 2-15, previously Table 2-13) which is considerably less than the 7.4 acres proposed by the commenter. Please also refer to Master Response 4.1.

For Scenario #3, please see responses to comments 42d-f with respect to discussions regarding additions to existing homes. The County agrees that improvements to existing homes can result in a net decrease in effective impervious area, particularly given Mitigation Measures 5.1-1 and 5.2-1.

7o Please refer to Master Response 10.

7p Please refer to Master Response 6.5 (site assessments) and Master Response 18 (regulatory and financial burden).

7q Please refer to Master Responses 6.4 and 16.

7r Comment noted. Please refer to Master Response 16.

7s Riparian canopy conditions reported in Table 3-3 of the Draft SEIR were not from 1996, but rather from 2008, as described in the
Existing Conditions Report (Stillwater Sciences 2009a). An error in the footnote of Table 3-3 (which now appears as Table 3-4 in the Final SEIR) caused confusion and has been corrected. This and other habitat information in Sections 3.6.1, 3.6.2, and 3.6.3 has been updated to include the most recent available data.

7t Please refer to Master Response 18.

7u Previous studies have evaluated sediment sources in San Geronimo Valley (see Stillwater Sciences 2010; and SFBRWQCB 2014a), and mitigation in the SEIR is consistent with these. With regards to the responsibilities of the County versus property owners and the regulatory and financial burden on homeowners, please refer to Master Responses 13 and 18, respectively.

7v Comment noted. Agricultural land is not exempt from Mitigation Measure 5.1-1 Expanded SCA Ordinance, as clarified in Master Response 6.2. With respect to the comment regarding other projects to include as part of the cumulative impact analysis, please refer to Master Response 2.

7w Please refer to Master Response 4.

7x The referenced statement on page 2-28 of the SEIR includes the area of buildings, along with roads (paved, gravel, other), parking lots, driveways, and sidewalks, in the TIA estimate. As stated in the SEIR, all these features together (which, importantly, includes buildings) should characterize more than 90% of the impervious areas found in the San Geronimo Valley watershed. Based on a total of 301.7 acres of TIA for the San Geronimo Valley watershed, 220.5 acres (73%) of TIA is associated with roads, driveways, and sidewalks, as shown in the new Table 2-4 Estimated TIA by Type in San Geronimo Valley, which has been added to the SEIR to clarify this potential misunderstanding. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

The County agrees that the proportion of road-related TIA for San Geronimo Valley is considerably higher than the average value for roads reported in Tilley and Slonecker (2007) (where roads made up 28.2% of TIA). These two values cannot be directly compared, however. Tilley and Slonecker (2007) break up the individual elements of “road-related TIA” into “roads,” “driveways,” “parking lots,” and “sidewalks,” whereas the SEIR combines them into the single category of “road-related.” Both approaches are common in
the technical literature; neither is “wrong,” but they are not entirely equivalent. Note that the combination of the 4 road-related TIA categories of Tilley and Slonecker (2007) yields a value of 65% when averaged across their six study watersheds.

Secondly, not all the Tilley and Slonecker (2007) study watersheds are equivalent in character to that of the San Geronimo Valley (indeed, none of them are ideal analogs). As they note, “as the watershed becomes more and more developed, the contribution of roads tends to decline” (p. 22). If we consider only the least urbanized of their watersheds (Tuscarora Creek, the most similar to San Geronimo), the road-related contribution to the watershed TIA is about 75%.

Although the Existing Conditions Report (Stillwater Sciences 2009) found that road-related TIA is an even more dominant form of TIA under current conditions in the San Geronimo Valley than in the semi-rural East Coast watersheds of Tilley and Slonecker (2007), we do not find the disparity in precise values particularly surprising, given substantial differences in neighborhood character. The methods used to estimate TIA in San Geronimo Valley, which are quite consistent with those of both Tilley and Slonecker (2007) and other published studies, are described in detail Section 2.4.3.1 of the Existing Conditions Report (Stillwater Sciences 2009).

The comment appears to reference the San Francisco Bay Regional Water Quality Control Board Staff Report (Staff Report) entitled “Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Plan” (SFBRWQCB 2014a), which states the following on page 156: “There are about 116 kilometers (72 miles) of roads in the San Geronimo Creek [watershed], about half are paved, and half are dirt or gravel-surfaced (Lynx Technologies, 2007).” There does not appear to be an explicit reference to 36 miles of paved roads in the Staff Report or the Lynx Technology (2007) report.

That said, the following statement in the Existing Conditions Report (Stillwater Sciences 2009) is admittedly confusing: “Of the total length of roads (i.e., paved, gravel, and other) in the existing GIS layer (251.2 road miles [401.9 km]), 13% included a field-surveyed width attribute while 87% did not.” While stated in the context of other information regarding San Geronimo Valley, the stated 251.2 road miles refers to road miles throughout Marin County. The statement was initially used to characterize the proportion of field-
surveyed width attributes in as large a dataset as possible for Marin County; however, the statement should have made this clear and provided a justification for application of the broader dataset. The correct San Geronimo Valley-specific statement is “Of the total length of roads (i.e., paved, gravel, and other) in the existing GIS layer (52.9 road miles [85.1 km]), 30% included a field-surveyed width attribute while 70% did not.” The 52.9-mile estimate was used in all TIA calculations for both the Existing Conditions Report and the SEIR (i.e., the 251.2-mile estimate was not used in TIA calculations for either the Existing Conditions Report or the SEIR).

The 52.9-mile estimate breaks down as 49.2 miles of paved roads, 3.6 miles of gravel roads, and 0.1 miles of other (i.e., paved bridges). The difference between the 36-mile paved road estimate used in the Staff Report and the Lynx Technology (2007) report, and the 49.2-mile paved road estimate used in the Existing Conditions Report (Stillwater Sciences 2009) and the SEIR, is likely due to the use of different watershed boundaries for the studies. The Existing Conditions Report (Stillwater Sciences 2009) and the SEIR use the California Department of Water Resources Calwater 2.2.1 watershed boundary (https://catalog.data.gov/dataset/calwater). It is not clear from the Lynx Technology (2007) report what watershed boundary is used to delineate San Geronimo Valley.

7z

The SEIR cites information provided in the San Francisco Bay Regional Water Quality Control Board Staff Report entitled “Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Plan” (SFRWQCB 2014a), which states the following on page 79: “Not including trails and driveways, the density of roads in the San Geronimo Creek watershed is 7.4 mi/mi², about half is paved and about half are unpaved (dirt or gravel) [(Lynx Technologies, 2007, unpublished data)].” While the Regional Board’s statement regarding San Geronimo Valley road density (7.4 mi/m²) does include unpaved roads, the TIA estimates used in the SEIR for the salmonid impact analysis do not include unpaved (dirt) roads, because, as the commenter correctly points out, dirt roads do not conform to the standard USGS definition of impervious roads (Draft SEIR page 2-29, and Stillwater Sciences 2009). Table 2-6 Paved and Unpaved (Dirt) Roads in San Geronimo Valley has been added to the SEIR to provide the requested information. The SEIR reference to road density has been changed to 9.3 mi/mi² (i.e., 86.7 mi total road length divided by 9.4 mi² total watershed area) to be
consistent with the total road length used elsewhere in the Existing Conditions Report (Stillwater Sciences 2009) and the SEIR. This change does not alter the impact analyses, significance determinations, or mitigation measures put forth in the SEIR.

For calculating TIA, a standard average width of 36 feet was applied to San Geronimo Valley paved roads (Stillwater Sciences 2009). The 36-foot average road width implicitly accounts for sidewalks, which occur along some paved roads in the San Geronimo Creek watershed (but not all) and were not included in the original Marin County road dataset. Assuming more narrowly paved roads (e.g., 15 miles at 36 feet wide and the remaining 34.2 miles at 22 feet wide) would result in a small (<1%) difference in the total TIA estimate, which is within the uncertainty of the overall TIA analysis and would not alter the impact analyses, significance determinations, or mitigation measures put forth in the SEIR. Further, using a slightly wider average road width buffer in our analysis also accounts for a variety of hard surfaces that are not sidewalks but are visible in the aerial photos of San Geronimo Valley and not rigorously captured by the digitization process. This includes the full extent of intersection shoulders, driveway shoulders, swimming pool (hardscape) patios, paved paths between parking lots and building entrances, small sheds, and domestic animal-related features (e.g., chicken coops, dog runs), which are located both inside and outside of the SCA.

7aa Roads and Parking Lots are discussed in Section 2.6.1 of the Final SEIR (see page 2-33). The commenter does not provide additional information explaining how their 3,000-foot sidewalk estimate was derived. However, as discussed in Comment Response 7z, assuming more narrowly paved roads and only 3,000 feet (0.57 mi) of sidewalks would result in a small (<1%) difference in the total TIA estimate, which is within the uncertainty of the overall TIA analysis and would not alter the impact analyses, significance determinations, or mitigation measures put forth in the SEIR. Further, using a slightly wider average road width buffer also accounts for a variety of hard surfaces that are not sidewalks but are visible in the aerial photos of San Geronimo Valley and not rigorously captured by the digitization process, including the full extent of intersection shoulders, driveway shoulders, swimming pool (hardscape) patios, paved paths between parking lots and building entrances, small sheds, and domestic animal-related features (e.g., chicken coops, dog runs), which are located both inside and outside of the SCA.
7ab  The 1,099 ft$^2$ value presented in SEIR Table 2-4 *Average Building (Unit) Footprint by Land Use Category* (now Table 2-5) was originally presented in the Existing Conditions Report (Stillwater Sciences 2009) and refers to the area that is assigned to the “Road” land use category by Marin County. The “Road” land use category includes not only all roads but also a variety of other features such as easements along roads and areas between other land use categories (e.g., areas between parcels that are not otherwise assigned a land use category). Less than half of this “Road” land use category is also considered to be impervious, as shown in Table 3-2 of the Existing Conditions Report (Stillwater Sciences 2009). In any case, unlike the other land use categories shown in SEIR Table 2-4 (now Table 2-5), the “Road” category (and hence the 1,099 ft$^2$ metric) is not used in the calculation of future potential TIA for buildings (units). It was originally presented in SEIR Table 2-4 for the sake of completeness, but since it has proven to be confusing it has been deleted.

7ac  As defined in the SEIR on page 2-25, “developed units” include the commercial or residential buildings or structures erected according to applicable building codes, using unit designation as assigned by the Marin County Assessor’s Office. The units summarized in Table 2-14 (previously Table 2-12) include just the building or structure, and so they do not include associated roads, driveways, or paved infrastructure. The definition of developed units has been added as a footnote to Table 2-10 (previously Table 2-8) and Table 2-14 (previously Table 2-12).

7ad  With respect to the methodology for estimating the 301.7 acres of TIA under existing conditions, please see Master Response 4.2. We agree that this is a key parameter.

With respect to development since 2005, Section 2.6.1 of the SEIR has been revised to clarify that existing conditions for this SEIR are defined as conditions at the time that Marin County published the revised Notice of Preparation (NOP) for the Final EIR, which was 2005. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

A. With respect to the road buffer, please refer to Comment Response 7z.
B. With respect to the sidewalk estimate, please refer to Comment Response 7z and 7aa.

C. The comment lists several buildings in San Geronimo Valley that would be included in a land use category other than residential (e.g., agricultural, commercial, institutional, or utility). As shown in SEIR Table 2-5 (previously Table 2-4), multiple land use categories were considered in the development of future conditions TIA estimates (i.e., not just residential).

D. The Existing Conditions Report (Stillwater Sciences 2009) states the following on pages 3-13 and 3-14 “…visual surveys of available data indicate that most homes in the San Geronimo Creek watershed are located within 100 feet (30.5 m) of the top of bank, or within the SCA. The majority of this development consists of single family residential homes (n=790) ranging in size from 309 ft² (28.7 m²) to 7,285 ft² (676.8 m²). Currently, the median home size in San Geronimo Valley (1,544 ft² [143.4 m²]) is smaller than the median home in Marin County (1,890 ft² [175.6 m²]).” The aforementioned information is provided in the Existing Conditions Report as summary information; the median home size and number of single family residential homes are not used to calculate TIA for single family homes as a subset of all building types. Rather, as described in Master Response 4.2, the SEIR relies upon digitized aerial photos to estimate existing conditions total TIA for all buildings in San Geronimo Valley.

The SEIR uses a total watershed area of 6,001.0 acres, which is based on the full parcel dataset. The Existing Conditions Report uses a total watershed area of approximately 5,970 acres (Stillwater Sciences 2009), which includes all parcels inside the 10-meter DEM watershed boundary.

The SEIR does not report total TIA attributable to single family homes under existing conditions because distinguishing between building types with respect to existing conditions TIA is not useful to the impact analysis. In contrast, the SEIR does apply an average building footprint by land use category (including single family residential land use) as a way to estimate future potential TIA (Table 2-5 [previously Table 2-4] of the SEIR).

Table 3-2 of the Draft SEIR and surrounding text does not state that water velocity and discharge are unknown, but that morphological parameters, including the residual pool depths and floodplain
connectivity are unknown. Table 3-2 has been slightly modified to include recent data on pool/riffle ratio and other habitat targets. Section 3.3 of the Draft SEIR describes the hydrology of the San Geronimo Creek watershed, including specific reference to water flow (i.e., discharge (cfs)) data available from the MMWD stream gage on Lagunitas Road Bridge. High water velocities and associated hydraulic energy, as well as fine sediment delivery to San Geronimo Creek, are drivers of redd scour. As explained in Impact 5.2, development drives both more rapid and higher peak water flow and increased sediment delivery due to land use change and altered hydrological processes. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

7af Comment noted. Voluntary Mitigation Measure 5.3-1 Groundwater Study has been revised to note that septic systems and landscape irrigation are examples of development-related effects that could be included in the study.

7ag Comment noted.
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Letter 8—Marin Conservation League
Rachel Reid, Environmental Planning Manager
Marin County Civic Center
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903
Email: envplanning@marincounty.org

Dear Ms. Reid:

Re: 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley

Marin Conservation League appreciates that the County has prepared a Draft Supplemental EIR to the 2007 Countywide Plan (Plan) EIR that analyzes cumulative impacts of potential future development in the San Geronimo Valley on endangered and threatened salmon and steelhead species. Continued construction, expansion, and remodeling of buildings and infrastructure can potentially worsen the already dire condition of salmonid habitat and populations in the San Geronimo and Lagunitas watersheds; thus the need for thoughtful policies and programs to guide future development in this area. Specific comments follow.

The Draft EIR is both adequate and inadequate. We considered adequacy of the SEIR from three perspectives: 1) The Court’s direction to provide information that allows decision-makers and general public to understand the likely consequences, or at least the range of potential consequences, of build-out within the San Geronimo Creek watershed on threatened fish species; 2) Identification and analysis of significant cumulative impacts of build-out in conformance with CEQA Guidelines section 15130 (b); and 3) Identification of mitigation measures conforming with CEQA Guidelines section 15126.4 and requirements for preparation of a Program EIR.

Court Direction. On the first point, MCL believes that the SEIR is generally adequate. The SEIR provides an excellent account of salmonid life cycle, especially spawning and rearing needs, and the past, present, and likely future threats to the species’ success in the San Geronimo Valley.
Cumulative Analysis and Significant Impacts. The analysis thoroughly describes the cumulative effects of historic activities that reduced salmon and steelhead populations while recognizing that residential and infrastructure development is only one of many factors that have contributed to this decline. However, it is the only impact that is directly related to the Plan; thus, the SEIR’s focus on examining how development allowed under the Plan could continue to change the watershed’s hydrology and riparian habitats on which these fish depend.

The SEIR (p.5-2) premises its analysis by acknowledging the “difficulties of showing direct links between land use activities and instream conditions, and so the predictions of impacts are of necessity qualitative and conservative (i.e., potentially overestimated.” SEIR estimates of how the Proposed Project – i.e., potential development based on Plan policies – could constitute full build-out is thorough and includes parcels that due to economic or physical constraints are highly unlikely to be built upon.

The one deficiency is the analysis is limited to impacts on major perennial and intermittent creeks and tributaries without consideration of impacts on ephemeral waterways. The network of ephemeral creeks, although not inhabited by fish, transports sediments and nutrients and therefore plays a major cumulative role in maintaining the health of the intermittent and perennial stream. Even with this shortcoming, MCL believes that the SEIR sufficiently identifies the significant impacts that are cumulatively considerable.

Mitigation Measures. Measures put forth in the SEIR are not sufficiently detailed regarding timing, enforcement, and performance standards to support a finding of less-than-significant impact, and therefore are not adequate. Our principal concern is that the proposed mitigations largely reiterate policies and programs stated in the Plan that have remained unimplemented and unenforced in the ten-year interim. Other implied mitigations include projects recommended in the San Geronimo Valley Salmon Enhancement Plan (2010), a Department of Public Works sediment control program, and programs to meet water quality and ecological objectives in the Basin Plan mandated by another agency – the SFRWQC.5.

Mitigation Measure 5.1-1 recommends adoption of an expanded Stream Conservation Area (SCA) ordinance based on Plan goals, with some additional provisions:

- Bullet #1. We are concerned that requiring a site assessment and permit for any vegetation clearing within the SCA that increases impermeable area, alters surface runoff, or results in exposed soil, unless qualified, is an unrealistic expectation. It would be virtually impossible to monitor all such activities that property owners would undertake without application to the County and, thus, would be unenforceable.

- Bullet #2 and #3. Establishing permit and assessment requirements that are consistent for all zoning districts, would be constructive and contribute to achieving Plan goals. The SEIR does not elaborate on whether this obligation would be imposed on property owners or a service provided by the County, but it would only be successfully implemented if it did not create an undue financial burden on property owners. In addition, very clear project thresholds for assessment and permit requirements must be provided so property owners understand what is asked.

- Bullet #4. There are no performance standards proposed for BMPs.

- Bullet #4 and #5. Project thresholds should be clarified, presumably to be done in the ordinance.

Mitigation Measure 5.1-2 elaborates on existing programs, such as suggested in Bio-4. It is not clear if it refers to the Urban Steams program contracted to the RCD following the failure to implement the 2014 ordinance. The proposed mitigation may envision an expanded version of this program and, if so, this might be stated. As the components of MM
5.1-2 seem to be entirely feasible and do not rely on adoption of an SCA ordinance there is no reason for them to be deferred. The SEIR should indicate timing and performance standards.

Mitigation Measure 5.2-1 also relies on enacting a net-yet-defined SCA ordinance, along with implementing measures to achieve performance standards described in the Basin Plan, and reporting on the County’s existing programs to the San Francisco Bay Regional Water Quality Control Board (SPBRWQCB).

CEQA guidelines state that “Formulation of mitigation measures should not be deferred until some future time unless the EIR specifies performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way.” (CEQA Guidelines, § 15126.4, subd. (a)(1)(B).) “Impermissible deferral of mitigation measures occurs when an EIR fails to set standards or demonstrate how the impact can be mitigated in the manner described in the EIR.” At the May 22 Planning Commission meeting on the SEIR, when it was noted that the expanded SCA ordinance will not be written before certification of the Final SEIR, the County’s Environmental Coordinator confirmed that specific mitigation measures can be deferred until a later time if the SEIR contains performance standards and criteria.

This explains the lack of a deadline for SCA ordinance adoption. But we have not found performance standards in the Draft SEIR that could be met by one or more mitigation measures, with the exception of the overriding but hard to measure Countywide Plan BIO-2.1: “No net loss of sensitive habitat acreage, value, and function.”

With the understanding that no single factor is wholly responsible for mitigating impacts on habitat, several metrics could be included in the SEIR to serve as performance standards and criteria for developing individual parcels. Examples include a limit to total land cleared of vegetation, or percent of unvegetated land; Impervious area as a percent of land acreage; no net change to peak flow hydrograph; number and size of riparian trees. For instream habitat, performance standards could be developed for structural complexity, such as large woody debris in cubic meters per stream length; pool frequency; gravel embeddedness; or composition of macroinvertebrate community. For hydrology, standards could be established for decreasing wet-season flow reversals.

Many of these metrics are discussed in the SEIR. Some could apply as standards to individual parcels, others would have to be established for stream reaches, to be met by a combination of mitigation measures, including other restoration projects or acquisition of undeveloped land.

Requests to Include Additional Information/Tables. The FEIR should briefly describe jurisdictions with administrative oversight for waterways in the San Geronimo Valley. Although Marin Municipal Water District and the park services are not subject to the Plan, an overview would aid in public understanding of the problems that must be addressed.

Improved maps should be provided. Figure 2.2 is crowded and hard to read – enlarging it might help. Figure 2.7 is difficult to interpret. We suggest including maps with the following: all waterways, including perennial, intermittent, and ephemeral streams, active wells, leachfields, and ponds, indicating distances from waterways.

Although it appears the analysis does not extend to ephemeral streams, this is not clear. The FEIR should describe what waterways are covered in its discussion. A legend to accompany Figure 2-7 would also help the public to understand if the boundaries shown include only major creeks or if they also encompass intermittent and ephemeral creeks.
General Comments. Numerous sources have identified major factors limiting salmonid success, and which could be affected by County regulatory actions. These include decreased oxygen levels in water, incised creek banks which are easily undercut by high flows that also diminish large woody debris (LWD) structures, excessive sediment, and insufficient vegetation, including overhanging trees, along creek banks and in setbacks along the creeks.

Improving this situation will require the participation and cooperation of creekside landowners, the County, other jurisdictions, agencies, and community organizations. There have abundant credible recommendations for improvement of salmonid habitat, such as a provision in the SCA, which was suggested by MCL during the prior SCA process, to require a net benefit to the SCA in exchange for permission to build within it. A broad public process to update Plan creek policies will bring about still more suggestions for strategies that can be evaluated. MCL urges the County to make every effort to begin as soon as possible to update relevant 2007 Plan policies, and the SCA ordinance which is the cornerstone for improving salmonid rearing and spawning habitat conditions.

Thank you for this opportunity to comment.

Kate Powers
President

Marin Conservation League
175 N. Redwood Dr. Suite 135
San Rafael, CA 94903
415-485-6257

Attachment: adv_wwt_SanGeronomo_SalmonidSEIR_2017.06.13.pdf
8a Comment noted. Marin County concurs that thoughtful policies and programs are needed to guide future development in San Geronimo Valley to protect salmonid habitat.

8b Marin County appreciates that comments have been divided into three topical areas.

8c Marin County concurs that the Draft SEIR adequately addresses the Court’s direction to provide information to foster an understanding of the potential range of consequences of build-out within the San Geronimo Creek watershed on threatened fish species.

8d Marin County concurs that the cumulative effects analysis in the Draft SEIR is thorough. SCA is defined as: “A setback from the bank of a natural watercourse, which is intended to protect the active channel, water quality, and flood control functions and associated fish and wildlife habitat values along streams” (Marin CWP (2007)). SCA policies, including typical setbacks shown in Figure 2-2 of the Marin CWP (2007), do apply to ephemeral streams if the stream “(a) supports riparian vegetation for a length of 100 feet or more, and/or (b) supports special-status species and/or a sensitive natural community type, such as native grasslands, regardless of the extent of riparian vegetation associated with the stream” (pp. 2.4-23 of the Marin CWP (2007)). For ephemeral streams that do not meet these criteria, a minimum 20-ft development setback is required (pp. 2.4-26 of the Marin CWP (2007)).

8e Following feedback received from commenters, Marin County has updated the mitigation measures in the Draft SEIR to clarify and amplify their intent and implementation, as outlined in Master Responses 6, 7, 8, 9, and the Final SEIR. Mitigation measures have also been updated so that they do not fall back on existing policies or programs. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered. With regard to the adequacy of Mitigation Measure 5.1-1 and its timelines for implementation, please refer to Master Response 6.

8f Please refer to Master Responses 6 and 7.

8g Please refer to Master Response 6.

8h Please refer to Master Responses 6, 13, and 18.

8i Please refer to Master Response 8.

8j Mitigation Measure 5.1-2 has been clarified and amplified to eliminate reliance on existing programs and include timing and performance standards. Please also refer to Master Response 7. Consistent with
Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

8k Mitigation Measure 5.2-1 has been updated to eliminate reliance on existing programs and certain performance standards described in the 2014 Basin Plan Amendment. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 8.

8l Please refer to Master Response 10.

8m Please refer to Master Response 6.

8n Please refer to Master Response 6.

8o Various local, state, and federal government agencies are responsible for administrative and regulatory oversight of waterways in San Geronimo Valley. The SEIR describes only those agencies and responsibilities that are relevant to the analysis of impacts on anadromous salmonids.

8p Figure 2-2 of the Draft SEIR is an excerpt from the Marin CWP (2007); therefore, it is not appropriate to modify this figure as part of the Final SEIR, other than to improve image quality. The caption of Figure 2-7 has been updated in the Final SEIR so that it is easier to interpret. Please note that Figure 2-3 shows the major tributaries to San Geronimo Creek.

8q Please refer to Individual Response 8d with regard to ephemeral streams. Please refer to Individual Response 8p with regard to updates to Figure 2-7.

8r Marin County believes that Mitigation Measure 5.1-1 Expanded SCA Ordinance will significantly benefit salmonids within San Geronimo Creek, resulting in an overall net positive effect. In terms of the timeline for the Expanded SCA Ordinance, please refer to Master Response 6.
Letter 9—Environmental Action Committee (EAC) of West Marin
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Dear Ms. Reid,

Please find attached our comments regarding the 2007 Marin Countywide Plan Draft Supplemental Environmental Impact Report.

Sincerely,
Ashley Eagle-Gibbs

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Ashley Eagle-Gibbs, Esq. | Conservation Director
Environmental Action Committee of West Marin (EAC)
PO Box 699, Point Reyes Station, CA | 94956
(651) 663-9312.
ashley@eacmarin.org

Protecting Wild West Marin Since 1971

Website | Facebook | Twitter | Instagram

July 2018
First, the Draft SEIR is deficient in that it identifies a Stream Conservation Ordinance (Ordinance) as the primary mitigation measure for identified significant impacts, but it does not specify any standards that the Ordinance should contain. Nor does the Draft SEIR indicate any timeframe for enacting the Ordinance. Without standards and a timeframe, the Ordinance is merely a placeholder for some imagined future mitigation, not a mitigation measure itself.

Second, the Draft SEIR should state unequivocally, as the 2010 Salmon Enhancement Plan (SEP) does, that the scientific evidence supports a stream buffer of 100 feet or more. "To support a naturally regenerating riparian forest and a sustainable source of large woody debris 100 feet or more is recommended by the scientific literature..." [Page 2-21]. Some members of the public, and at times Marin County itself, have promoted the misleading idea that the SEP calls for a 35-foot Stream Conservation Area. In fact, the SEP states that, "In areas constrained by existing development or on small vacant lots, a minimum 35-foot buffer from the active channel to new construction can ensure the protection or enhancement of riparian vegetation or function." [Page 2-21] The SEP goes on to say that, "An undisturbed buffer is most critical along perennial and intermittent streams in the Valley." [Page 2-22] It is clear from the SEP’s complete discussion of

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1 Available at: http://www.marincounty.org/-/media/files/departments/cd/planning/sca/sepfinal.pdf
EAC Letter to Marin County re. Draft SEIR
June 15, 2017

the issue that 35 feet of undisturbed riparian area is the minimum width of an ecologically functional buffer, not an acceptable width for a Stream Conservation Area.

Thank you for the opportunity to comment.

Respectfully,

[Signature]
Ashley Eagle-Gibbs
Conservation Director
9a Please refer to Master Responses 6, 7, and 8 which clarify and amplify Mitigation Measure 5.1-1 Expanded SCA Ordinance to provide more clarity regarding standards for attainment. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 6 for the timeframe for implementation of this mitigation measure.

9b Please refer to Master Response 10. Marin County concurs that the 100-ft buffer is supported by scientific evidence for San Geronimo Creek.
Letter 10—Marin Audubon Society
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Taylor, Tammy

From: Barbara Saizman <bsaizman@att.net>
Sent: Thursday, June 15, 2017 11:33 AM
To: EnvPlanning
Subject: San Geronimo DSEIR comments
Attachments: San Geronimo DSEIR comments.pdf

Attached please find Marin Audubon Society comment letter on the San Geronimo Salmonid DSEIR
June 15, 2017

Via Email
Rachael Reid, Environmental Coordinator
Community Development Department
County of Marin
3501 Civic Center Drive
San Rafael, CA 94903

RE: COMMENTS ON MARIN COUNTYWIDE PLAN SUPPLEMENTAL EIR WITH FOCUS ON POTENTIAL CUMULATIVE IMPACTS ON SALMONIDS IN SAN GERONIMO VALLEY

Dear Ms. Reid:

Thank you for the opportunity to comment on the Draft Supplemental Environmental Impact Report (DSER) for the Salmon in San Geronimo Valley. The SEIR provides important information about the endangered salmonid species of concern and adverse impacts. As discussed below, however, we recommend that another significant impact be included as a mitigation measure. Many of the proposed mitigations are vague, the proposed ordinance is poorly defined, and the party responsible for implementing the measures and when the mitigations would be completed are unclear. These and other deficiencies reflect uncertainty about the mitigations effectiveness, likelihood for success and, for some, whether they would be implemented at all.

Impact Identification
The presence of spawning habitat is essential to begin the life cycle and to maintain the populations of all species of concern. If suitable gravel substrate for spawning habitat is not available, there will be no salmonid populations, there will be no redds, fry and juvenile salmonids to need the rearing and out-migration habitats. Many of the conditions identified as limiting habitat functions in wintering habitat, and reducing summer rearing success, also adversely affect the availability of spawning habitat. Factors that could impact the availability of spawning gravels include: reduced connectivity, increased sediment deposition that buries gravel spawning substrate, increased magnitude and frequency of winter storm flows, high flows from culverts all of which cause streambed scour and wash away gravel spawning habitat. We note that storm intensity and frequency is anticipated to increase with climate change. For the above reasons, we recommend that reduced spawning habitat be added to the list of significant impacts and impacts that contribute to cumulative impacts.

Discussion of Identified Impacts
Impact 5.1 Reduced Survival of Fry and Juvenile Salmonids due to Reduced Winter Rearing habitat Quality

The current conventional zoning of 79% of the parcels in the watershed means that the vast majority of parcels are not subject to SCA policies and do not need permits for projects. These allowances are incompatible with protection of salmonids. Mandatory requirements are needed to prevent increased
runoff and sediment deposition, reduced riparian habitat, modification of stream banks and beds, and prevent potentially destructive activities in SCA’s.

The County’s sediment reduction program pursuant to Basin Plan Amendment 2014b is cited. Describe the Basin Plan Amendment requirements that ensure adverse impacts would be avoided. The discussion states “delivery of sediments to streams would be minimized. “Even if sediment delivery is minimized, that does not warrant the conclusion “that adverse impacts on stream habitat and function are not expected.” Minimizing a bad situation would still result in a bad situation. The impacts would still be significant.

Cumulative, a contribution of even small losses - adding degradation to an already-adversely impacted salmonid habitat - would be considerable - particularly if the changed conditions are unmitigated. The primary mitigation measure considered should be avoidance.

Mitigation Measure 5.1 -1 Expanded SCA Ordinance
First and Second Bullets: We agree that the county must change zoning requirements to ensure all development activities that could adversely impact endangered species require consistent site assessments and permits. The discussion, however, includes no recommendations for what should be included in the expanded ordinance. Requirements and standards for protection of special status species habitat should be mandatory for all properties, and standards for what should be in the ordinance should be recommended in this DEIR.

Permits should be required for activities in all stream reaches. Activities that should be addressed in the ordinance should at least include decks that would cover ground, block light and eliminate vegetation; driveways; erosion control structures, new residences or other structures in the SCA, i.e. any activity that would destroy stream related vegetation and increase flows.

Bullet 3: Training and certification by NMFS as a requirement for any biologist preparing assessments or in any way advising on special status species habitats is needed mitigation. Too many consultants operate without standards or commitment to protecting resources. The list of approved consultants should be available to the public.

Bullet 4 calls for standard BMPs. The DEIR should list the standard BMPs that would ensure hydrologic processes, stream and riparian habitat protection and water quality within SCAs, so they can be reviewed by the public as part of this environmental review process. If BMPs are not listed, the public has no way evaluating their adequacy.

Bullet 5 - While stream reaches that have the most potential for degradation should have the highest priority, it should be recommended that development in all stream reaches should be subject to the standards that protect the resources.

MIT 5.1 -2 Winter Habitat Enhancement Projects
This mitigation addresses small projects to promote habitat enhancement projects. What constitutes a small project? Why would enhancement projects be limited to small projects?

It is recommended that the enhancement project be consistent with the Salmonid Enhancement Plan. Why should the projects be limited to those recommendations? We suggest that enhancement goals of the Enhancement Plan be considered the minimum enhancement, because they could be expanded...
and/or improved upon. For example, why shouldn’t the goal for Recommendation #10 be to reduce and eliminate armoring and for Recommendation #15, to reduce or eliminate whenever possible, fine sediment delivery. Also, shouldn’t Reuse 4 read to promote stormwater retention and reduce or eliminate disconnection?

Permanence of the enhancement improvements should be addressed. Folks should not be allowed to take public money to implement a habitat enhancement project without an assurance that the enhancements would be in place for a substantial length of time to ensure that species benefit the species. Our preference would be that the improvements be required to be maintained permanently.

The recommendation calls for specific criteria, guidelines, and design specifications to be developed in coordination with and approved by the CDFAW and NMFS. We recommend that they also be developed in coordination with the Lassen TAG. The relevant action steps from the CoHo Salmon Recovery Plan and TMDL implementation action recommendations should be stated in this DSEIR so the public can be consider them in their review.

The Community Development Agency (CDA) should administer policies and permit programs, and ensure consistency. More rigorous permitting by the CDA (as discussed on page 5-14) should be clearly included as part of MM 5.1.1, not just discussed under “Significance after Mitigation.” There have been instances, less frequent in recent years, where permit conditions have varied with different staff persons. Consistent requirements for site assessments, consistent application of policies and ordinances, and implementation of the permit program, are essential to protect the endangered resources.

Inconsistent interpretation is also unfair to the public. Staff should receive adequate training and supervision to better ensure consistency.

The discussion of “drainage controls” (page 5-14) speaks to a requirement specified at MM 5.1.1 UD drainage control practices. This section simply recommends including “low impact development (LID) the practices and designs that are demonstrated to prevent or limit discharge...” in order to evaluate the effectiveness of those practices and designs, we need to know what they are. Please describe the referenced practices and designs.

Consistency with action steps is recommended in the Central California Coast Coho Salmon Recovery Plan and these are reference on pages 5-12 and 5-13 and again on 5.14 and 5.31. We ask that the relevant sections of the Recovery Plan be stated in the DSEIR to facilitate public review. We request the same for TMDL implementation Action recommended by the SFRWQCB.

Impact 5.2 Reduced Salmonid Spawning Success Due to Increased High Flow Frequency and Magnitude and Deviated Sediment Delivery.

This impact is focused on reduced spawning success after eggs are laid, due to increased scour of gravels containing incubating eggs” from the force of flowing water.

Urban uses increase the force and quantity of storm runoff and sediment flows into streams, and urban uses include vegetation removal. The discussion should address the value of native vegetation for stream habitats and species, including bank stabilization and insect production. Also described should be activities that are known to cause vegetation to be removed, such as bank armoring and culverts. Measures to mitigate, preferably by avoidance, further loss of streambank vegetation, including avoidance, should be recommended for inclusion in the ordinance.
While the impacts of individual developments might be small, the cumulative impacts of scour and on-stream hydrology would be significant. Development projects exacerbate the current degraded habitat conditions that are already significant. Measures to avoid the adverse effects on spawning habitat and red scour should be included in an ordinance.

**Mitigation Measure 5.2.1 Control and Reduce Production and Delivery of Fine Sediments**  
To comply with BIO 2.1, adverse impacts on habitat must be avoided—not minimized—as provided in this mitigation. BIO 2.1 calls for achieving "no net loss of sensitive habitat acreage, values and function." This mitigation does not appear to comply with BIO 2.2: "Restrict or modify proposed development in areas that contain essential habitat for special status species...as necessary to ensure continued health and survival of these species and sensitive areas."

This mitigation relies on a Basin Plan Amendment adopted in 2014. The Basin Plan Amendment specifies a schedule for implementation of identified control measures and guidelines for road maintenance. What is the schedule for and status of this implementation? A status report on the efforts to reduce sediments and meeting the target for road-related sediment delivery should be provided. What has been accomplished or worked on in last three years? A 20 year time frame is too long. Requiring DPW to submit a report by 2019 is a long time to wait; practically when the amendment was adopted three years ago.

**Mitigation Measure 5.2.2 Stream Habitat Enhancement Projects**  
For this mitigation Marin County or non-profits would develop and implement enhancement projects. This mitigation is vague. It is unclear who or what Marin County agency would be responsible to implement it and the timeline (five years) line for studies is too long. We recommend that targets for constructing projects be recommended. DPW should be identified as the responsible entity. If opportunities can be found for partnerships with non-profits arise or can be worked out, DPW can delegate responsibility to implement a given project, but overall responsibility must remain with the county agency.

To avoid increases in peak flow frequency and magnitude that can scour spawning gravels and cause mortality of incubating eggs, future development that would cause these impacts should be avoided, not just minimize. Although important, the ability of enhancement projects alone to improve spawning habitat quantity and quality is uncertain due to uncertainty about whether projects would be effective or even implemented. It is not clear this would reduce impact to less than significant.

**Impact 5.3 Reduced Summer Rearing Success Due to Degraded Habitat Conditions**  
Increased sediment from roads, grazing, forest clearing, development affecting instream shelter, reduced pool habitat, habitat connectivity, diversity, production and delivery of invertebrate prey, and reduced water quality including high temperatures and high sediment loads, ground and surface water withdrawals and reduced streamside vegetation, would all result from the project, and all would reduce summer rearing habitat. Mitigation for this impact relies on mitigations for previous impacts and on voluntary mitigations. Again, an ordinance that includes measures to address the above impacts is needed to provide assurance these impacts would be avoided.

We disagree with the explanation that this impact is less than significant because development projects will not contribute considerably to the existing rearing habitat degradation. Without permit restrictions,
future development could divert surface water and pump ground water as well as contribute to all of the other impacts listed in the above paragraph.

Mitigations for this impact should be mandatory. There are six appropriative water rights that should be investigated as well as other possible diversions. In order to determine the significance of water diversions, the mitigation should require that CDM or DPW attempt to identify the quantity of water is being diverted or that could be diverted by the appropriative water rights holders. Also, unauthorized water diversions should be investigated and action taken to ensure these destructive diversions are terminated. Monitoring is needed and enforcement may be needed to ensure appropriative right holders stay within their limits and no unauthorized diversions occur.

A peak stormwater runoff and detention program is proposed. It is claimed that aquifer recharge areas would increase opportunities for groundwater recharge and potential increased summer flows. More information should be provided to enable the reviewer to evaluate the feasibility and potential effectiveness of this proposal. Where would these detention basins be located, how effective would they be and what impacts could they cause to existing natural resources?

Establishing a Groundwater Monitoring Program for unincorporated Marin is recommended. The Program would require monitoring of water levels and water quality measurements and producing an annual report. This information is useful but it must be followed with investigations to identify the causes of the water quality and water level problems and with enforcement actions to address problems that are identified. To whom would the reports be made and who would hold the responsibility for carrying out and enforcing the program? Enforcement follow-up for this impact should be part of an enforcement program.

We disagree with the justification that this impact being less than significant. As discussed above, development projects can contribute considerably to the existing rearing habitat degradation.

Mitigation 5.8 Voluntary Mitigation Summer Habitat Enhancement Projects

Mitigation measures should not be voluntary because they would be too easily allowed to lapse. A measure being voluntary measures increases uncertainty about whether it would be implemented at all. An agency responsible for summer habitat enhancement projects should be identified and there should be a schedule and annual targets for progress implementing summer habitat enhancement projects.

Designs for specific projects should also be developed in coordination with Lagunitas TAC which has broad membership of agency staff and interested parties.

Additional Mitigation Measure Needed:

Enforcement. People implement permitted activities in ways inconsistent with permit conditions and also undertake activities without permits at all. A missing and essential mitigation of all of the other adopted mitigations. This mitigation should include a requirement that an enforcement program be developed and implemented in order to ensure that salmonid protection measures are actually implemented and implemented as required. The responsible agency should be identified.

Summary

In summary, the DSEIR identifies considerable number of adverse impacts that are caused by urban development and suggests mitigations to address these impacts. In order to evaluate the potential effectiveness of the mitigations and for this DSEIR to be adequate, the discussion, particularly on the
most inclusive and important mitigation - adoption of an ordinance to regulate development in the watershed - should recommend standards for what the ordinance should achieve and measures that would assure those standards are accomplished. Descriptions of mitigation measures should be more comprehensive and specific in terms of content, timing and responsibility and all mitigation measures should be mandatory. Also, we suggest additional measures that will better ensure impacts are actually avoided or otherwise mitigated.

Thank you for addressing our concerns.

Sincerely,

Barbara Salzman, Co-chair
Conservation Committee

Phil Peterson, Co-chair
Conservation Committee
The impact analysis in the SEIR evaluates the potential for the Proposed Project to increase sediment delivery to streams and increase high flow frequency and intensity. These effects have the potential to degrade spawning habitat, scour incubating eggs from redds, and reduce salmonid spawning success, as described in Impact 5.2. The SEIR also describes the potential for these impacts to be exacerbated by climate change. There is no evidence, however, that the quantity of spawning gravel is currently limiting salmonid production or would become limiting in the future as a result of development under the Proposed Project. Despite an apparent downward trend in the amount of gravel substrate in San Geronimo Creek since 1998 (Ettlinger 2017), surveys during the 2015–2016 spawning season documented 68 coho redds in mainstem San Geronimo Creek and 28 coho redds in tributaries, the largest totals in the last 9–10 years (Ettlinger et al. 2016a).

Mitigation Measure 5.1-1 expands the set of development activities in the SCA that require a permit and enacts consistent permit requirements across planned and conventional zoning districts. Please also refer to Master Response 8, which describes measures to reduce sediment delivery and avoid adverse impacts or reduce them to a less-than-significant level.

Please refer to Master Response 8.

Please refer to Master Response 8.

Please refer to Master Response 8.

Please refer to Master Response 8.

Mitigation Measure 5.1-2 has been clarified and amplified in the Final SEIR to include alternative habitat enhancement measures. The term “small” has been deleted from Mitigation Measure 5.1-2. Please refer to Master Response 7. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

Habitat enhancements required under Mitigation Measure 5.1-2, as clarified and amplified in the Final SEIR, will be consistent with goals and critical habitat targets included in the Salmonid Enhancement Plan (PCI 2010). The goal of promoting increased watershed-wide stormwater retention and disconnection (Recommendation #12 from the Salmonid Enhancement Plan) includes disconnection of the stormwater system (e.g., storm drains, ditches, culverts) from stream channels, which is desirable because it reduces potential adverse
impacts on salmonid habitat that can result from increased stormwater runoff. The LID and stormwater measures included in Mitigation Measure 5.1-1, as clarified and amplified, will help achieve this goal. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also see Master Response 7.

10i As described in Master Response 7, habitat enhancements included in bank stabilization projects under Mitigation Measure 5.1-2, as clarified and amplified, would be required to be stable (non-mobile) in the stream channel. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

10j Participation by the Lagunitas TAC is not a requirement of habitat enhancements required under Mitigation Measure 5.1-2, as clarified and amplified, but is not precluded. References to action steps from the Central California Coast coho salmon recovery plan (NMFS 2012) are no longer included in the mitigation measures in the Final SEIR. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

10k Comment noted.

10l Please refer to Master Response 6.

10m As noted in Individual Response 10j, references to action steps from the Central California Coast coho salmon recovery plan (NMFS 2012) are no longer included in the SEIR's mitigation measures. Actions and recommendations included in the Basin Plan Amendment (SFRWQCB 2014b) have also been removed from the mitigation measures in the Final SEIR.

10n The potential effects of urbanization on streambank erosion and riparian function, including the role of riparian vegetation in providing invertebrate prey for salmonids, are discussed in Sections 3.2, 3.4, 3.6, and 5.1, and in Impact 5.2 of the SEIR. The Marin CWP (2007) includes goals, policies, and implementing programs including, but not limited to, Policy BIO-4.7 (Protect Riparian Vegetation), that are intended to avoid or minimize loss of riparian vegetation (see Tables 2-1 and 2-2). Additional measures to mitigate unavoidable impacts to riparian function are included in Mitigation Measure 5.1-1: Expanded SCA Ordinance. Please also refer to Master Response 6.2.
Measures to avoid and minimize adverse effects on spawning habitat (i.e., redd scour) that could result from altered watershed hydrology and increased sediment input are included in Mitigation Measures 5.2-1. Please also refer to Master Response 6.

Mitigation Measure 5.2-1 has been clarified and amplified in the Final SEIR to remove reference to the performance standards and timelines in the Basin Plan Amendment. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 8.

The Final SEIR has been updated to remove Mitigation Measure 5.2-2 as explained in Individual Response 1b-x. Mitigation Measure 5.1-2 has been clarified and amplified to require biotechnical techniques and stream habitat enhancements for bank stabilization projects. Please refer to Master Responses 7 and 9. Mitigation Measure 5.1-1 also has been clarified and amplified to include additional LID and stormwater control requirements that will avoid or minimize increases in peak flow magnitude and frequency. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.7.

While the Proposed Project may result in impacts to salmonid summer rearing habitat, the analysis in the SEIR has determined that the impacts would be less than significant and therefore do not require mitigation. The Marin CWP (2007) includes goals, policies, and implementing programs intended to limit development impacts (Policy BIO-2.2), preserve riparian ecotones (Policy BIO-2.3), restrict land use in the SCA (Policy BIO-4.1), promote natural stream channel function (Policy BIO-4.4), protect riparian vegetation (Policy BIO-4.7), and avoid erosion and sedimentation (Policy WR-2.3) (see Tables 2-1 and 2-2). The Expanded SCA Ordinance proposed as Mitigation Measure 5.1-1 includes additional measures to minimize sediment delivery to streams, reduce hydrologic alteration, and avoid adverse impacts to riparian function. Please also refer to Master Responses 2 and 6.2.

Please refer to Master Response 5.2.

The analysis in the SEIR has determined that Potential Impact 5.3 would be less than significant and therefore mitigation is not required. The Groundwater Study proposed as Voluntary Mitigation Measure 5.3-1 would determine the potential impacts of groundwater pumping and
surface water diversions on summer baseflow and aquatic habitat conditions. Surface water diversions are not subject to County regulations and permitting; thus, the County is not the appropriate entity to conduct enforcement actions.

10u The peak stormwater runoff and detention and aquifer recharge programs described under Potential Impact 5.3 are existing policies under the Marin CWP (2007) (Policies BIO-4.20 and WR-1.1, respectively) rather than proposals for new programs. Implementation of these policies would be consistent with the Marin CWP (2007), and would require detailed planning subject to applicable County requirements.

10v The Groundwater Study proposed as Voluntary Mitigation Measure 5.3-1 would include periodic water level measurement and water quality sampling (i.e., monitoring) with annual reporting, as suggested by the commenter. The County would be responsible for implementing the study. Voluntary Mitigation Measure 5.3-1 has been slightly modified to indicate that study results would be made available to the public and that the results of the study would be used to evaluate whether the existing well siting, yield, and storage requirements for pumped and gravity source wells are adequate to protect summer baseflows in San Geronimo Creek and perennial tributaries. An enforcement program is not included as part of this voluntary measure. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

10w The County has determined that Voluntary Mitigation Measure 5.3-2 cannot be feasibly implemented, and this measure has therefore been removed from the Final SEIR. Summer habitat enhancements to benefit rearing salmonids have been included in the updated Mitigation Measure 5.1-2. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 7.

10x Marin County is responsible for ensuring compliance with all required mitigation measures included in the Final SEIR. Enforcement of laws, regulations, and permit conditions is the responsibility of the agency or entity charged with the required authority.

10y Please refer to Master Responses 6, 7, and 8.
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Letter 11—Watershed Alliance of Marin
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Taylor, Tammy

From: Laura Chariton <laurachariton@comcast.net>
Sent: Thursday, June 15, 2017 1:21 PM
To: EnvPlanning
Cc: BOS; Rodoni, Dennis; Arnold, Judy; Sears, Kathrin; Rice, Katie; clasbonconnelly@marincounty.org
Subject: WAMDSERSanGeronimo Final.pdf; PastedGraphic-Stiff

Marin County Development Agency
Attn: Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Re: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR (“Draft SEIR”)

Dear Ms. Reid,

Please find attached our comment letter regarding the Draft Supplemental EIR for the 2007 Countywide Plan for the San Geronimo Valley.

Sincerely,

Laura Chariton, President, Watershed Alliance of Marin a 501(c)(3)
watermarin.org
446 Panoramic Hwy.
Mill Valley, CA 94941
415 234-9007
415 855-5630 Cell

July 2018

7-377
June 15, 2017

Marin County Development Agency
Attn: Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Via email - To: ENVPlanning@marincounty.org, Attn: Rachel Reid

Re: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR ("Draft SEIR")

Dear Ms. Reid:

Watershed Alliance of Marin (WAM) is a non-profit 501(c)(3) corporation which works with community groups, private citizens, and other non-profit organizations to preserve and protect Marin County watersheds, through education, on-site reviews, citizen science creek surveys and public advocacy.

WAM was not part of the litigation which resulted in the present Draft Supplemental Environmental Impact Report (DSEIR). We have however followed the decade long hiatus on the failure of Marin County to enact an SCA ordinance which would reflect the federal and state laws on protection of watercourses of the United States, and would comply with the NEPA and CEQA standards for protection of endangered species.

As such, we welcome the scrutiny by the Court in evaluating the Countywide Plan of 2007 (CWP), exposure of its limitations, vagueness and failure to exact standards for compliance. The Court provided an excellent guide for all of us. The DSEIR failed to execute this mandate.

Watershed Alliance of Marin
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Watermarin.org
I. What is the Project

Forget the usual description of a ‘project’. Here the Court determined what it is, i.e., the cumulative effects of future development, and inadequate mitigation measures. There is an insistence in the DSEIR to follow supplemental EIR guidelines for “program EIR” and therefore fails to implement the Court’s mandate. Whereas here, there has been adequate fact-finding to give the Court a basis for its specific instructions, those instructions must be followed. Failing to do so will put enormous fiscal burdens on the County in further litigation, and more importantly, accelerate the extinction of the salmonids for which the lawsuit was brought.

II. What are the standards

This is our question, and we do not agree with the DSEIR, which moved the goalposts from saving from extinction, to a baseline which appears to be “It’s already too late.” The DSEIR provides no meaningful standard of either action or time to save the salmon, to rectify past mistakes, and to motivate the County to act with deliberate speed.

III. Mitigations

The Court seeks quantification of the geographic and environmental parameters of development, stating: “Evaluate in meaningful terms” and “Estimate the impact” if policies are applied. This was not accomplished and we must wonder why the DSEIR did not include all information the County has, with an index of the information needed to follow the Court’s mandate. The County’s environmental consultant has been looking at this watershed for decades, and has a track record of fact-finding, analysis and conclusions, all part of the public record which should have been included here. It is therefore a mystery to us why those reports were not used to inform the existing conditions report, e.g., why dirt roads were not included in its compendium of Total Impervious Area (TIA), nor in its determinants of pollution. We concur with Salmon Protection and Watershed Network of the Turtle Island Restoration Network on the inability of the expanded stream ordinance to affect mitigation because of a plethora of concerns such as:

“Further, as discussed in more detail below, this Section [Future Development 2.8] fails to consider the parameters for development that may be allowed by the Proposed Ordinance, which will not only establish measures to mitigate the impacts of development within the San Geronimo Creek sub-watershed, but may also include provisions that will determine the amount of permissible additional development on already developed parcels.” (Page 11, Turtle Island Restoration Network Comments to Draft 2007 Marin Countywide Plan Supplemental EIR ("Draft SEIR"))
IV. Continuing the Watershed Approach

Not only did the DSEIR fail to address the real TIA, but also failed to factor in the deleterious effect of hillside development, debris, slides, leading to erosion and incision, and compounding the killing effects of human inflicted impact. To mitigate, as the DSEIR proposes, there should be deference to the riparian corridor ecology including the fostering of big trees for woody debris, and riparian vegetation to control erosion, and encourage recovery for the damage done.

V. CWP 2007

Repeating the CWP of 2007 does nothing to advance the purpose here, to find how to save these fish, which was the sine qua non (an essential condition) of the lawsuit. CWP 2007 is obsolete. In the past decade, climate change has accelerated, sea levels have risen (SCV is at sea level), coho are on the verge of extinction and steelhead are now listed on federal and state special species lists. As such, to “supplement” this CWP with an attendant SEIR to that document, fails to comply with the Court Order.

VI. Conclusion

To comply with the Court’s Order, in this Draft SEIR has failed to recommend real mitigation in the form of an SCA ordinance that is a riparian corridor ordinance. That ordinance needs to be pursuant to a decision-making process informed by science, historical facts, and include all the BIO sections from the 2007 Countywide Plan for animal, creeks, plants, wetlands, streams, etc. It should have included the repertoire of previous relevant studies. The ‘enhanced’ SCA ordinance requires far more than what this well-informed consultant has given us. From the SPAWN/TIRN comments letter:

“There is no doubt that an increase in TIA from increased development under the 2007 CWP and not mitigated by the Proposed Ordinance will adversely impact the riparian habitat and be detrimental to the survival and recovery of salmonids.”

(Page 20, Turtle Island Restoration Network Comments to Draft 2007 Marin Countywide Plan Supplemental EIR (“Draft SEIR”))

The DSEIR as a bare minimum should set forth a model SCA ordinance to cover all of the abuses both present and past, which means restoration for the damage done and incorporation of the goals of watershed management. We realize that solutions will not be easy but every effort must be made to protect and restore the federally listed endangered fish in this and other watersheds throughout the County. This is needed both to comply with law and the greater Marin environmental ethic of species protection.

No one thinks their individual actions will lead to species extinction; but each action that

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reduces stream capacity, creates erosion and impervious surfaces that destroys flood plains is another link in the chain of cumulative impacts towards species destruction. It is imperative that the County take the highest and broadest view possible in creating an ordinance that will protect Marin's riparian corridors and mitigate any past or future damage in the strongest possible way. We look forward to the response to our comments and questions and a thorough response to SPAWN's comments.

Sincerely,

Laura Charlton

Laura Charlton, President Watershed Alliance of Marin

CC: Marin County Board of Supervisors
    Supervisor Arnold, Board President
    Supervisor Sears
    Supervisor Rice
    Supervisor Connolly
    Supervisor Rodoni

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11a Marin County is following actions required by the Court, in full compliance with the Court’s opinion. Please refer to: Section 1.1 of the Draft SEIR which discusses the Court’s opinion, Section 1.2 of the Draft SEIR which discusses compliance with CEQA, Master Response 3 regarding general compliance with CEQA and requirements for an economic analysis, as well as Master Response 6.1 (status of Interim SCA Ordinance) and Master Response 6.3 (introduction and timeline for the Expanded SCA Ordinance). With regard to the Project history, Marin County has worked diligently to engage SPAWN and the San Geronimo Valley community in relation to salmonid protection. Marin County facilitated the following actions:

- Marin County conducted public meetings prior to the acceptance of the San Geronimo Valley Salmon Enhancement Plan in 2010 with the Existing Conditions Report;
- Marin County hosted four community workshops in 2010 to discuss strategies to protect salmon habitat in the San Geronimo Valley;
- Marin County held community meetings and public hearings in conjunction with the proposed Native Tree Preservation and Protection Ordinance 3291 in 2010 and the interim expanded SCA Ordinance in 2013;
- Since 2014, Marin County has partnered with the Marin Resource Conservation District to fund the Urban Streams Coordination program to support educational, restoration, and stewardship opportunities;
- Marin County met with SPAWN on October 25, 2017 to discuss SPAWN’s comments on the public Draft SEIR; and,
- Marin County has incorporated suggestions from comments received on the Draft SEIR into the Final SEIR, where practicable and scientifically sound.

11b The Proposed Project is defined as land use and development specific to the San Geronimo Valley under the goals, policies and programs of the Marin CWP (2007) (see Sections 1.2 and 2 of the SEIR).

11c Please refer to Master Responses 6, 7, and 8, which describe how Mitigation Measures 5.1-1, 5.1-2, and 5.2-1 have been slightly modified in the Final SEIR in part to include additional specificity on the actions and timeframes required for implementation of these measures to avoid, minimize, or mitigate the impacts of the Proposed Project to a less-than-significant level. While these measures, in addition to those
included in the Marin CWP (2007), are expected to provide substantial protections and enhancements for anadromous salmonids and their habitat in the San Geronimo Valley, the purpose and requirements of the SEIR do not include saving the salmon from extinction, rectifying past mistakes, or motivating the County. The County disagrees with the commenter’s statement that characterizes the Draft SEIR’s baseline as “it’s already too late” to save the salmon from extinction.

11d With regard to the public record and related background information that ultimately led to the current litigation, please refer to Individual Response 11a.

11e Please refer to Master Responses 4.1 and 6.

11f Please refer to Master Responses 4.2 (TIA), 6, 7, 8, and 9. Protection of the riparian corridor is a major part of the proposed mitigation, with vegetation clearing requiring a discretionary permit in all zones under the Expanded SCA Ordinance (see Master Response 6.4).

11g Please refer to Master Response 2. Contrary to the commenter’s claim, the Draft SEIR responded directly to, and in compliance with, the Court’s opinion.

11h Please refer to the response to 11g above. Contrary to the commenter’s claim, the Draft SEIR is supported by relevant science, historical facts, and information from published scientific literature and unpublished scientific reports. The relevant BIO sections of the Marin CWP (2007) are described in Section 2.4 of the SEIR and referenced multiple times throughout the Impact Analyses (Section 5.2). Please refer to Master Response 6 for Mitigation Measure 5.1-1 (Expanded SCA Ordinance) clarifications and amplifications that have been incorporated into the Final SEIR.

11i Please refer to the responses to comment letter 15 and Master Response 4.2.

11j Please refer to Master Response 6.

11k Marin County concurs that cumulative impacts leading to species extinctions should be avoided through mitigation and remediation measures. Please refer to Master Response 6.
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Letter 12—Sierra Club Marin Group
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June 15, 2017

Marin County Development Agency

Attn: Rachel Reid, Environmental Planning Manager

3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Via email: ENVPlanning@marincounty.org, Attn: Rachel Reid

Re: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR ("Draft SEIR") and SCA Ordinance

Dear Ms. Reid,

Please find attached the comments to the Draft Supplemental EIR on the 2007 Countywide Plan regarding San Geronimo Valley with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley and SCA Ordinance.

Sincerely,

Laura Charlton, Vice Chair, Sierra Club Marin Group Executive Committee

LETTER #12
June 15, 2017

Marin County Development Agency
Attn: Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Via email: ENVPlanning@marincounty.org, Attn: Rachel Reid

Re: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR (“Draft SEIR”) and SCA Ordinance

Dear Ms. Reid:

Please find below our comments in response to the Draft Supplemental Environmental Impact Statement (DSEIR) on the “2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley.”

The Sierra Club urges the County to make the following improvements to the DSEIR:

1) Incorporate robust performance standards for the Stream Conservation Area (SCA) Ordinance, such that the analysis of this mitigation can be meaningful and effective.
2) Update the projected increases in Total Impervious Area (TIA) to include not just new development, but also allowed expansions to existing developments, including any bonus potential expansions contemplated as part of any Woodacre community sewage treatment facility as a reasonable foreseeable project within the context of the cumulative impacts analysis.
3) Update the projected increases in TIA to reflect the average house size built in Marin over the last five years, rather than the average house size of the existing stock in San Geronimo Valley.
4) Develop an analysis of impacts from pollution in streams, including pesticides and herbicide runoff, leasage from septic systems (e.g., as applied by the Mosquito Vector Control and Abatement District), automotive runoff, nutrient loads, and other pollutants, and incorporate mitigation measures to control such runoff.
5) Develop an analysis of the impacts to streams and water quality of the currently allowable agricultural operations and non-residential uses in San Geronimo Valley.

Stream Conservation Ordinance

The Sierra Club reiterates its strong support for moving forward promptly with a community process to develop a robust Stream Conservation Area Ordinance (SCA Ordinance) that will be adequate to protect critical salmonid habitat throughout the County. The SCA Ordinance is the centerpiece mitigation measures in this DSEIR, and it is critical that the SCA Ordinance meet specific performance standards in order for it to function effectively. If the SCA Ordinance is to be included...
in the DSEIR as effective mitigation, the DSEIR must analyze the impacts of the 2007 Countywide Plan (CWP) based on specified performance standards.

We note that without such performance standards, the SCA Ordinance cannot be relied upon as mitigation here, and this DSEIR cannot be used as CEQA analysis of any SCA. (See, e.g., Center for Sierra Nevada Conservation v. City of El Dorado (2012) 202 Cal. App. 4th 1156, 1181.) The Sierra Club reiterates its position that the County should commit to the following performance standards in this DSEIR before such an ordinance can be considered adequate mitigation. We recommend that the SCA Ordinance be based on strong ordinances such as the Santa Cruz County ordinance. The best ordinance is only as good as the level of enforcement, and the County absolutely must take stronger steps to ensure that illegal development does not occur and the measure is abated.

The SCA Ordinance must meet the following standards at minimum or stricter standards and be analyzed accordingly:

1. The SCA Ordinance must incorporate a Net Restoration standard, where impacts are offset at a 2:1 ratio or greater on an area and individual basis for all projects and additional restoration is incentivized to reverse the damage from over a century of degradation.

2. The SCA Ordinance should take a watershed-based approach with scientifically-grounded protection based on local stream order (e.g., ephemeral, secondary, main stem), slope, and riparian vegetation integrity.

3. The SCA Ordinance must include or be accompanied by a program to protect and restore ephemeral streams and include all hydrologically contributing streams, regardless of the condition of the vegetation along such streams.

4. The SCA Ordinance must prohibit all ground disturbance to ensure habitat restoration and maintain the integrity of hydrologic function within a minimum of 50 feet of streams.

5. The SCA Ordinance must include a level of impact review and permitting for all structures, including fences, sheds, patios, decks, etc. within the SCA and within floodplains to ensure compliance with best practices and to abate harmful unpermitted structures.

6. The SCA Ordinance must allow for additional discretionary review where warranted by site and environmental conditions.

7. The SCA Ordinance must incorporate best stormwater management practices to slow, spread and sink runoff, including mandatory bioswales, raingardens, other vegetated zones, or other appropriate methods of water retention between any impervious surface and any ephemeral, seasonal, or permanent stream.

8. The SCA Ordinance must provide for retreat from creek banks and riparian zones, meeting or exceeding setback standards where structures are replaced or substantially remodeled.

9. The SCA Ordinance must ensure that all building employ permeable materials where possible, and otherwise any expansion of impervious surfaces where allowed is minimized by incentivizing expansions within existing footprints first or, alternatively only into areas upland of existing structures not within the SCA.

10. The SCA Ordinance must apply to both vegetated and severely damaged habitat alike. Grandfathering disturbed habitat as “non-habitat” simply incentivizes the fastest removal of vegetation possible and is not consistent with a “no net loss of habitat” standard established in the CWP.

11. The SCA Ordinance should discourage the use of pesticides within 100 feet of streams and encourage the use of pesticide free vegetation management.
12s 12) The SCA Ordinance must apply equally to County projects and workers as it does to residents.

12t 13) Critical habitat features must receive heightened protection through more stringent standards. Other applicable exemptions to SCA protections should not apply.

12u 14) Standard Management Practices must be applied to all projects involving vegetation clearing, increases in impervious area, altering surface runoff, exposing soil, or generating greater transport of automotive and other pollutants into the stream regardless of zoning.

12v 15) Standard Management Practices should be reviewed and approved by National Marine Fisheries Service (NMFS) and California Department of Fish and Wildlife (CDFW) to ensure avoidance of impacts to salmonids.

12w 16) The SCA Ordinance shall require accurate mapping of all streams in relation to all submitted project plans.

12x 17) The SCA Ordinance should account for slope, geology, erosion potential, and hillside stability when determining a setback.

12y We recognize that some of these concepts are incorporated into Mitigation Measure 5.1-1, but the parameters of the Expanded SCA Ordinance are nonetheless too vague to allow proper evaluation of the impacts. For example, we strongly support “expand[ing] the set of development activities that require a permit and site assessment to include any activity within the SCA that requires vegetation clearing, increases impervious area, alters surface runoff, or results in exposed soil.” (DSEIR, at 5-12).

12z Without greater specificity of the Standard Management Practices, and benchmarks for current and ongoing conditions, it would be impossible to assess the effectiveness of these measures. We commend the County for specifying that these measures be reviewed by NMFS and CDFW, but without clear minimum standards (e.g., how much vegetation would be protected, how runoff would be prevented, how much impervious area would be allowed, what building materials could be used), this measure cannot be fully evaluated. Such review is a requisite step toward assuring protection of salmonids but, as currently stated, it may constitute impermissible deferred mitigation and deferred analysis. We urge the County to provide greater specificity and minimum standards to avoid these legal concerns.

12z We commend the County for its continued support of voluntary restoration efforts throughout the County through public funding and the Urban Streams Coordinator position. We commend the County for adopting objectives for the CWP of “preserv[ing] and restore[ing] the natural environment” and “reduc[ing] the ecological footprint” of Marin’s communities.

12z Project description and impact analyses must incorporate all sources of new impervious surface

The Sierra Club notes that the Court of Appeals specifically directed the County in its March 2014 decision to make the fullest accounting of the maximum impacts from the CWP. The language of that opinion laid out three distinct analyses of “the maximum potential impact, the range of potential impacts, or the likely net impact if the policies and implementation programs described in the Marin CWP (2007) …” (Salmon Protection and Watershed Network v. County of Marin (2014) A137062 (March 5, 2014)). We commend the County for engaging in an analysis of the complete build out allowable under the CWP on every lot. However, we note that this estimate is an undercount in three respects.
First, a significant source of increased TIA will come from renovations and expansions rather than new development. Yet, the DSEIR analysis addresses only new development on undeveloped lots, not allowable expansions and remodeling which will significantly impact natural resources and wildlife in coming years. As we are all aware, there is a steadily increasing demand for high-end housing across the County resulting in the renovation and expansion of existing housing stock.

One example under consideration in San Geronimo Valley is to allow up to 500-square-feet of expansion for up to 500 homes as part of a proposal to develop a community sewage treatment plant for Woodacre. This proposal alone could account for some 6 additional acres of TIA, while similar expansion of all 1,600 units in San Geronimo Valley could contribute an additional 18 acres of TIA. Taken together these two factors could nearly triple the total acreage of TIA.

This issue highlights the critical nature of the performance standards of any SCA Ordinance. A strong Ordinance could greatly reduce the expansion of TIA by limiting expansions to less than 500 feet or requiring expansions only within existing footprints, and can greatly reduce the effective impervious area by requiring that expansions of footprints be upland of existing structures. Thus, the specifics of any proposed development rules have substantial consequences for the impacts of the CWP.

Second, assessment of the increase from TIA from permitted structures alone fails to incorporate the attendant impervious area from driveways, patios, decks, landscaping and the like that are often appurtenant to new development. Again, the specifics of applicable building standards and permitting regimes are critical to assessing the impacts and scale of such appurtenant development.

As emphasized previously, the impacts can be greatly ameliorated through advanced approaches to dealing with stormwater runoff using mandatory best management practices, such as bioswales and rain gardens between impervious surfaces and waterways; use of pervious pavers where possible; and revegetation of all waterways feeding into salmonid habitats as part of best practices for mitigations of impacts. Given the critical role that such environmentally friendly best management practices play in mitigating impacts from urbanized areas, the DSEIR must establish some minimum set of enforceable standards to reduce these impacts—and enforce them.

Third, the analysis makes a poorly founded assumption that build out would entail new structures built on the same scale as the existing housing stock. However, since new construction in Marin is almost entirely for the high-end market, new units are likely to be substantially larger than the average existing housing. Therefore, the Sierra Club would urge that the DSEIR to use the average house size as built in Marin or San Geronimo Valley over the last five years, rather than using an historical average that does not reflect current trends in construction.

Finally, we commend the County for assessing these impacts at the watershed, sub-basin and SCA levels, as impacts at any of these levels would be significant. Failing to evaluate impacts, particularly at the SCA level within each sub-basin, risks missing critical impacts by including too large an area in the denominator for any percent coverage calculations.

Agriculture policies must be evaluated

Given the potential for large impacts from nutrient and sediment loading from agricultural uses, the Sierra Club opposes the approach taken here that “The Environmental Hazards, Atmosphere and Climate, Open Space, and Agriculture and Food topics of the Marin CWP (2007) are not considered
further in this document.” (DSEIR, at 2-4) There are significant examples of large-scale ground moving at the ranches in the area, especially north of Sir Francis Drake in Woodacre. Furthermore, the equestrian facilities in Woodacre maintain large denuded areas that potentially account for major sources for both nutrient and fine particulate matter (sediment). The CWP largely fails to address such sources, though their impacts should be fully accounted for. Thus, failing to even examine the impacts of agricultural policies would leave decision makers and the public at a loss to assess whether there are impacts that require mitigation. The effect is to undermine the key goals of CEQA.

Impacts of pollution must be evaluated

12ah
The Sierra Club has frequently noted our concerns regarding automotive runoff, pesticides, herbicides and sewage in salmonid streams, including those in San Geronimo Valley. We note that urbanized streams, including in Corte Madera Creek in Ross Valley are impaired from high diazinon levels, highlighting the potential threat of pesticides to salmonid streams. Furthermore, our understanding is that herbicides are still used in septic systems in San Geronimo Valley, including methoprene. These pose threats to salmon directly and to their food sources, as well as to threats to the listed endangered California Freshwater Shrimp in Lagunitas Creek. Thus, the complete absence of any assessment of these potential impacts, and more importantly, consideration of effective mitigation measures, is a highly consequential oversight.

12af
We commend the County for finally developing a long-awaited DSEIR to assess these impacts and we welcome the many positive steps included in this document. We look forward to participating in a community process going forward to resolve all outstanding SCA issues Countywide.

Respectfully submitted,

Laura Charlton
Vice Chair, Marin Group Executive Committee, Sierra Club

CC: Marin County Board of Supervisors
President, Judy Arnold
Damon Connolly
Kate Rice
Dennis Rodoni
Kathryn Sears
Please refer to Master Responses 6.2, 6.4, 6.5, 6.6, and 6.7.

Please refer to Master Response 2.

The analysis has been updated to reflect that mean house size in San Geronimo Valley increased over time from approximately 1,400 ft² in 1920 to approximately 2,675 ft² for the period 2000–2017 (data provided by Marin County [2017]). The longer-term San Geronimo Valley trend mirrors that of the broader U.S. over a shorter period, where mean house size increased from approximately 1,650 ft² in 1975 to approximately 2,700 ft² in 2015 (U.S. Department of Commerce 2015).

Section 3.4 of the Draft SEIR has been updated in this Final version to include additional water quality data available for the San Geronimo Valley. The additional information does not change the analysis approach or any significance determinations. Section 5.1 of the Draft SEIR has also been updated at Section 5.1 to discuss the potential for adverse impacts to salmonids related to these water quality constituents and clarify the impact analysis approach. Please also refer to Individual Response 15k. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. With regard to leakage from septic systems specifically, please refer to Master Response 15.

The SEIR describes existing salmonid habitat conditions that have resulted from past and ongoing land and water uses in the San Geronimo Creek watershed, including agricultural and non-residential uses. The SEIR also analyzes impacts that could be caused by future development under the Marin CWP (2007), which regulates residential and non-residential development. Furthermore, mitigation proposed in the SEIR applies to all land in the San Geronimo Creek watershed, regardless of the zoning or land use classification (see Master Response 6.2).

Please refer to Master Response 6, especially 6.3.

The Expanded SCA Ordinance provisions under Mitigation Measure 5.1-1 have been clarified and amplified from the Draft SEIR, including clarifications regarding performance standards and timelines. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.
Please also refer to Individual Response 5k regarding illegal development.

12h The requirements for discretionary permits within the SCA, which include a site inspection, will determine mitigation required on a project-by-project basis. Standard Management Practices (SMPs) will ensure consistent minimum mitigation standards for developments, including riparian tree removal mitigation ratios (see Master Response 6.6).

12i The Expanded SCA Ordinance will only relate to land designated as SCA. Perennial and ephemeral streams have been considered in the analysis—please refer to Individual Response 8d. Please refer to Master Response 8, which describes the watershed-wide approach to controlling and reducing production and delivery of fine sediment to streams required under Mitigation Measure 5.2-1. Mitigation measures proposed as part of the Expanded SCA Ordinance (Mitigation Measure 5.1-1) applies to all land designated as SCA throughout the watershed, regardless of stream order, slope, or riparian vegetation integrity. Adding such detailed elements may complicate implementation of the provisions to the extent that it impedes effective planning to protect salmonids, rather than enhancing protection as desired.

12j Please refer to Individual Response 8d and Master Response 6.4. Per Goal BIO-4 of the Marin CWP (2007), best management practices (BMPs) are strongly encouraged in ephemeral streams not defined as SCAs.

12k The Expanded SCA Ordinance does not prohibit any activities altogether, but requires discretionary permits, so that development can be assessed on a case-by-case basis and consistently achieve mitigation to protect salmonids. Please refer to Master Response 6.

12l Permitting required under the Expanded SCA Ordinance relates to activities that may impact salmonids, including vegetation clearing, increases of impermeable area, alterations of surface runoff, soil exposure, and alterations to the bed, bank, or channel of any stream, rather than to land uses and structures themselves. Please refer to Master Responses 6 and 18.

As of June 30, 2015, development projects that create or replace 2,500 ft² or more of impervious surface (roofs or pavement) must incorporate specified measures to reduce runoff, and projects creating or replacing less than 2,500 ft² of impervious surface can opt to do this (BASMAA 2014). Small projects that create or replace 2,500 ft² to 5,000 ft² of impervious surface, and single-family homes that create or replace 2,500 ft² or more of impervious surface, are required to complete a simple Stormwater Control Plan (SCP) that includes a completed data form, site plan or sketch, and completed checklist for each runoff reduction measure selected. For these projects, runoff reduction measures should include one or more of the following: dispersal of runoff to vegetated areas; pervious pavement; cisterns or rain barrels; and a bioretention facility or planter box, with each measure selected in compliance with design specifications and requirements (BASMAA 2014). Rain gardens (free-form bioretention facilities) and bioswales (linear bioretention facilities) are among the acceptable types of bioretention facilities. Runoff reduction measures for regulated projects that create 5,000 ft² or more of impervious surface, excluding detached single-family homes, require a more comprehensive SCP (BASMAA 2014), which must provide information on bioretention facility design among several other stormwater control elements. Mitigation Measures 5.1-1 and 5.2-1 have been clarified and amplified to include more rigorous requirements for erosion control and LID practices and designs in the SCA and watershed-wide, respectively, in the Final SEIR. Updates to Mitigation Measure 5.1-1 also include lower thresholds for impervious area that trigger the LID and stormwater control requirements. Consistent with Section 15088.5 of the State CEQA Guidelines, these revision do not constitute significant new information and recirculation is not triggered. Please refer to Master Responses 6.6, 6.7, and 8.

Although provisions for nonconforming structures allow rebuild in the event of natural disaster (see Master Response 18), any rebuilds that increase the footprint, height, bulk, or floor area are not covered by this provision, and would likely require land use permits. During associated review processes, setbacks from stream banks would be considered.

Comment noted. Provisions for the use of permeable materials will be considered during development of the Expanded SCA Ordinance, and upon review of discretionary permit applications. Please refer to Master Responses 6.
12q Please refer to the response to 12j above.

12r Comment noted. Provisions for limiting pesticides will be considered during development of the Expanded SCA Ordinance.

12s Please refer to Master Response 13.

12t Marin County concurs that critical habitat features for salmonids should be protected. Exemptions to discretionary permit requirements for development within the SCA, as proposed under Mitigation Measure 5.1-1, are described in Master Response 6.4.

12u Standard Management Practices (SMPs) are proposed to apply to all projects within the SCA. Please refer to Master Response 6.6.

12v Please refer to Master Response 6.6.

12w The SCA Ordinance applies to perennial and ephemeral streams, and any required clarification can be obtained during site assessments. Furthermore, hydrological features, including Blue Line Streams, Watersheds, Wetlands, and FEMA flood information, are layers in the MarinMap Map Viewer, available digitally here: http://www.marinmap.org/dnn/.

12x Requiring the Expanded SCA Ordinance to account for slope, geology, erosion potential, and hillslope stability would likely complicate implementation to the extent that it impedes effective planning to protect salmonids, rather than enhancing protection as desired. Please also refer to Master Response 10.

12y Please refer to Master Response 6.4.

12z Mitigation Measure 5.1-1 has been clarified and amplified from the Draft SEIR, including clarifications regarding performance standards for the Final SEIR. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.

12aa Comment noted.

12ab Comment noted.

12ac Estimating future units and TIA from development expansions on currently developed parcels would be speculative, and may not exceed the margin of error for the TIA analysis. Even if a speculative analysis were undertaken, it would be unlikely to change the mitigation proposed, which already captures development expansions—please refer to Master Responses 4.2 and 18.
12ad Please refer to Master Response 4.2. Please also refer to the response to 12n above.

12ae The average single-family home footprint for the period including 2011 and 2014-2017 (based on available information, no homes were built in 2012 and 2013) is approximately 2,400 ft\(^2\), compared to the 1,190 ft\(^2\) average used in the Draft SEIR TIA estimates. Conservatively assuming that all 358 future potential units under the Proposed Project would be developed with an additional 1,210 ft\(^2\) of TIA (2,400 ft\(^2\) \(−\) 1,190 ft\(^2\)) would result in an additional 10 acres of TIA for the watershed as a whole, or 0.2% additional TIA. This small (< 1%) difference in the total TIA estimate is within the uncertainty of the overall TIA analysis and would not alter the impact analyses, significance determinations, or mitigation measures put forth in the SEIR. See also Individual Response 42d.

12af Comment noted.

12ag With regard to atmosphere and climate, please refer to Master Response 2. With regard to agricultural impacts and compliance with CEQA, please refer to Master Responses 6.2 and 3, respectively.

Further to Master Response 6.2, on the fringe of Woodacre the Dickson Ranch – Equestrian is zoned Agricultural, Residential Planned (ARP) and adjoining land north of Sir Francis Drake Blvd is also Zoned ARP. The Creekside Equestrian Center is located to the south of Sir Francis Drake Blvd and is zoned Residential, Single-Family Planned (RSP) (MarinMap Map Viewer). Mitigation Measure 5.1-1 Expanded SCA Ordinance applies to all zoned land within San Geronimo Valley, meaning these ranches and equestrian centers would be subject to the same Expanded SCA Ordinance as residential land uses. The Draft SEIR’s analysis of the impacts associated with implementation of the Marin CWP (2007) is consistent with the scope of the Court’s direction, which focuses on built development. In response to comments received on the Draft SEIR, the relevant Marin CWP (2007) Environmental Hazards provisions have been assessed in Master Responses 16 and 17 of this Final SEIR.

12ah Please refer to Individual Response 12d above.

12ai Comment noted.
Letter 13—Save our Seashore
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Taylor, Tammy

From: gbatmuirb@aol.com
Sent: Thursday, June 15, 2017 2:48 PM
To: EnvPlanning
Subject: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR ("Draft SEIR")
Save Our Seashore

A 501(c)(3) Charitable Organization (EIN 94-3221625)
Founded in 1985 to Protect Marin County's Ocean, Dunes, Bluffs, Waterfronts and Creeks
40 Sunnyvale Dr, Inverness, CA 94937  ghsmarin@sbcglobal.net  415-661-1188

June 15, 2017

Comments to Draft 2007 Marin Countywide Plan Supplemental EIR (“Draft SEIR”)

13a There is good news in this SEIR, which recognizes that an enhanced Streamsides Conservation Area (SCA) Ordinance could be the mitigation needed to balance development with protection of endangered salmon in San Geronimo Valley (SGV) watershed.

13b Nevertheless there appear to be significant holes in the SEIR that need to be filled:

- The proposed SCA Ordinance appears to lack any performance standards as well as any timetable for development/implementation. This dispute has gone on far too long. These salmon will not survive on a “wing and a prayer” and property owners deserve more certainty in their planning. Thus the completion and passage of an enhanced SCA Ordinance should be a necessary component of the final SEIR, rather than a hoped-for subsequent action.

- The SEIR also appears to ignore the substantial existing un-permitted development in establishing its baseline. This position contradicts that taken by the County’s CEQA lawyer and approved by the Planning Commission in the 2005 Lawsons Landing case, in which the CEQA baseline was “existing physical conditions.” Thus the additional amount of new development that the SEIR estimates of could be allowed without impacting salmon might actually have been already taken place in the form of existing un-permitted development. The SEIR should review LIDAR and other data to develop a reasonable estimate of unpermitted development. The SEIR should then reduce the amount of development proposed to be authorized by the amount of unpermitted development already existing.

- Similarly, the proposed SCA+ Ordinance appears to exempt approximately 80% of SGV parcels that are “conventionally zoned.” If so, then it is not clear how the SEIR analysis of “cumulative” development and appropriate mitigations can be accurate. While it is likely true that many SGV parcels are outside the proposed boundary of the SCA, development even outside the SCA can impact the SCA and its salmon.

- The SEIR appears to assume as mitigation for its proposed level of additional development a number of mitigations for the existing level of development planned. If so, then it is not clear to what extent, if any, these existing mitigations can or should be considered as CEQA mitigations in the SEIR.

- Similarly, the SEIR proposes mitigations additional to those already existing, but at least some of those “existing” mitigations do not meet the CEQA criteria of quantifiable and enforceable. For example, the SEIR proposes to enhance Large Woody Debris (LWD) beyond programs already existing. However, the Water Board’s Basin Plan Amendment Appendix A notes that the existing LWD program is a voluntary effort, not a regulatory requirement. Thus even without quantifiable and enforceable mitigation, the SEIR adds value to a voluntary baseline generates an outcome that is un-quantifiable and un-enforceable.

13g Save Our Seashore is happy to play a constructive role (as we have done in the Lagunitas Technical Advisory Committee) in any working group established to resolve these issues.

Sincerely, Gordon Bennett, SOS President
13a  Comment noted.

13b  Please refer to Master Response 6, especially Master Responses 6.2 and 6.3.

13c  Please refer to Individual Response 5k above.

13d  Mitigation Measure 5.1-1 Expanded SCA Ordinance does not exempt conventionally zoned parcels. Please refer to Master Response 6.2. Mitigation for impacts originating outside the SCA is provided in Mitigation Measure 5.2-1, which includes measures to control erosion and reduce delivery of fine sediment to streams.

13e  Mitigation Measures 5.1-2 and 5.2-1 have been slightly modified to eliminate reliance on existing programs and certain performance standards described in the 2014 Basin Plan Amendment. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Responses 7 and 8.

13f  Please refer to Master Response 8.

13g  Comment noted.
Letter 14—San Geronimo Valley Planning Group
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From: Jeanberens@comcast.net [mailto:Jeanberens@comcast.net]
Sent: Wednesday, June 14, 2017 10:54 PM
To: Reed, Michelle
Cc: Rodoni, Dennis; Cordova, Lorenzo; Kutser, Rhonda
Subject: SGV Planning Group comments to SEIR

Dear Ms. Reed,

Attached are the Comments of the San Geronimo Valley Planning Group on letterhead. Below is the letter in text form.

Yours Truly,
Brian Stailey
Chair, San Geronimo Valley Planning Group

June 14, 2017
Marin County Redevelopment Agency
Rachel Reid
3501 Civic Center Dr. Suite 308
San Rafael, CA 94903

SUBJECT: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR (Draft SEIR)

Dear Ms. Reid:

The following comments are submitted by the San Geronimo Valley Planning Group in response to the request for comments by Marin County under section 15087 of the California Environmental Quality Act. The San Geronimo Valley Planning Group, founded in 1972, is the oldest environmental/community organization representing residents within the San Geronimo Valley.

The issue of how development within the Streamside Conservation Area (SCA) affects salmonid habitat has been ongoing for many years, and as you know the County has attempted to resolve the issue on several occasions. This latest attempt to define the way development may proceed within the SCA only reflects the complexity of the issue and the community’s inability to determine how these proposed regulations may help the salmonid habitat.

We do not believe the current proposals are presented in such a manner as to be coherent in everyday language or succinct in scientific documentation. We therefore request an additional 45-day review period (preferably longer) during which time County representatives hold a public meeting at a time and place convenient for San Geronimo Valley residents. Given the gravity of the issues before the community holding a meeting at the Civic Center on a Monday afternoon, does not meet the spirit of community engagement and dialogue.

Input from many of our 216 members indicates there is considerable confusion as to:

LETTER # 14
the worthiness of the proposals to improve habitat.

- how the proposed new regulations will impact homeowner’s property and property rights.
- concerns about a baseline that already ignores unpermitted development.
- what appears to be “exceptions” that will impact salmon restoration and sustainability.

The Planning Group is an active member of MMWD’s Technical Advisory Committee (TAC). The short review period makes it impossible for TAC’s local reps and professional members to comment.

Based upon this input we believe that further discussion is warranted.

Along with the Draft SEIR in its entirety, specifically, the following issues need further community vetting:

Impact 5.1 Reduced Survival of Fry and Juvenile Salmonid Life Stages Due to Reduced Winter Rearing Habitat Quality – It is unclear what is the current contribution of private property developments as compared to potential private property developments to this problem. It is also unclear what is the contribution of public properties, to this problem as well. We believe a thorough understanding of how to maximize winter water penetration into the soil and minimize surface run off should be the goal of any County regulation. However, the regulations proposed seem to take a cookie cutter approach to developing a solution. The community deserves an opportunity to understand how their existing property improvements degrade habitat, how potential property developments can be designed in such a manner as to minimize any increase in these winter water flows, and what the County will implement on public properties to achieve the common goal. The community also needs to understand the anticipated thresholds that will be used to evaluate success or failure. At this point, none of these issues have been made known to the community and as such public comments have not been sufficient as required by CEQA.

In addition, why cannot the County establish a low interest loan program to allow property owners willing to improve SCA habitat an opportunity to do so at little or no cost to the County?

Impact 5.2 Reduced Salmonid Spawning Success Due to Increased High Flow Frequency and Magnitude and Elevated Sediment Delivery – Much like Impact 5.1 understanding how we all contribute to this issue is paramount to achieving success in the community. As this point, the community has done their best to understand the Draft SEIR, but given the relatively short review period (45-days), another scoping EIR (Woodacre/San Geronimo Flats Wastewater Recycling Project and Environmental Impact Report) requiring the San Geronimo Valley community to respond during the same period, and the complexity of this issue the community has not had the resources to make a coherent and thoughtful response to this SEIR.

Impact 5.3 Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature – In this case, the Draft SEIR seems to take a less than thorough look at how the community could improve riparian habitat quality and does not account for the proposed loss of aquifer recharge via diverted septic system abandonments in Woodacre and San Geronimo. Lowering summer water temperatures through riparian plantings as a condition for development is a sound and cost effective way to improve the quality of the SCA habitat at little or no public investment.

The issue of how development is regulated within the San Geronimo Valley SCA is not a new issue. Why cannot the County engage the community in a thoughtful and thorough process that results in a reasonable timetable for development and/or implementation? At this point, the County has not sponsored any community meetings within the Valley, has not conducted any meaningful outreach beyond the minimum requirements under CEQA. This subject demands more from County Officials than the minimum requirements under CEQA. The problem has existed for over fifty years and has been recognized as a contributor for reduced salmonid populations for over a decade. Why is the County minimizing the ability for the community to understand the solutions set forth and offer comments?

The San Geronimo Valley Planning Group requests the Marin County Redevelopment Agency extend the SEIR comment period for another 45-days, preferably longer, and during that time host a meaningful public meeting in the Valley to discuss the proposed regulations, their enforcement as well as performance standards to evaluate if the regulations are deemed successful or not.

Finally, we believe our new Supervisor has the skills and knowledge to meet with SPAWN and come to an agreement on a SCA ordinance and hope that process is underway. The Planning Group looks forward to participating in a worthy resolution that benefits the salmon, our oldest Valley residents, as well as creekside property owners who are gifted with the salmon’s proximity but must also assume some responsibility for their protection.
Respectfully,
Brian Staley
Chair, San Geronimo Valley Planning Group

PO Box 57  Forest Knolls, CA 94933

cc Supervisor Rodoni; Aides Lorenzo Cordova and Rhonda Kutter
Marin County Redevelopment Agency
Rachel Reid
3501 Civic Center Dr. Suite 308
San Rafael, CA 94903

SUBJECT: Comments to Draft 2007 Marin countywide Plan Supplemental EIR (Draft SEIR)

Dear Ms. Reid:

The following comments are submitted by the San Geronimo Valley Planning Group in response to the request for comments by Marin County under section 15087 of the California Environmental Quality Act. The San Geronimo Valley Planning Group, founded in 1972, is the oldest environmental/community organization representing residents within the San Geronimo Valley.

The issue of how development within the Streamside Conservation Area (SCA) affects salmonid habitat has been ongoing for many years, and as you know the County has attempted to resolve the issue on several occasions. This latest attempt to define the way development may proceed within the SCA only reflects the complexity of the issue and the community’s inability to determine how these proposed regulations may help the salmonid habitats.

We do not believe the current proposals are presented in such a manner as to be coherent in everyday language or succinct in scientific documentation. We therefore request an additional 45-day review period (preferably longer) during which time County representatives hold a public meeting at a time and place convenient for San Geronimo Valley residents. Given the gravity of the issues before the community holding a meeting at the Civic Center on a Monday afternoon, does not meet the spirit of community engagement and dialogue.

Input from many of our 216 members indicates there is considerable confusion as to:

• the worthiness of the proposals to improve habitat.
• how the proposed new regulations will impact homeowner’s property and property rights.
• concerns about a baseline that already ignores unpermitted development.
• what appears to be “exemptions” that will impact salmon restoration efforts and sustainability.
• the Planning Group is an active member of MMWD’s Technical Advisory Committee (TAC). The short review period makes it impossible for TAC’s local reps and professional members to comment.

Based upon this input we believe that further discussion is warranted.

Along with the Draft SEIR in its entirety, specifically, the following issues need further community vetting:

Impact 5.1 Reduced Survival of Fry and Juvenile Salmonid Life Stages Due to Reduced Winter Rearing Habitat Quality – It is unclear what is the current contribution of private property developments as compared to potential private property developments to this problem. It is also unclear what is the contribution of public properties to this problem as well. We believe a thorough understanding of how to maximize winter water penetration into the soil and minimize surface runoff should be the goal of any
County regulation. However, the regulations proposed seem to take a cookie cutter approach to developing a solution. The community deserves an opportunity to understand how their existing property improvements degrade habitat, how potential property developments can be designed in such a manner as to minimize any increase in these winter water flows, and what the County will implement on public properties to achieve the common goal. The community also needs to understand the anticipated thresholds that will be used to evaluate success or failure. At this point, none of these issues have been made known to the community and as such public comments have not been sufficient as required by CEQA.

In addition, why cannot the County establish a low interest loan program to allow property owners willing to improve SCA habitat an opportunity to do so at little or no cost to the County?

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Impact 5.3 Reduced Salmonid Summer Rearing Success Due to Degraded Habitat Conditions Including Reduced Habitat Complexity, Reduced Streamflow, and Increased Water Temperature – In this case, the Draft SEIR seems to take a less than thorough look at how the community could improve riparian habitat quality and does not account for the proposed loss of aquifer recharge via diverted septic system abandonment in Woodacre and San Geronimo. Lowering summer water temperatures through riparian plantings as a condition for development is a sound and cost effective way to improve the quality of the SCA habitat at little or no public investment.

The issue of how development is regulated within the San Geronimo Valley SCA is not a new issue. Why cannot the County engage the community in a thoughtful and thorough process that results in a reasonable timetable for development and/or implementation? At this point, the County has not sponsored any community meetings within the Valley, has not conducted any meaningful outreach beyond the minimum requirements under CEQA. This subject demands more from County Officials than the minimum requirements under CEQA. The problem has existed for over fifty years and has been recognized as a contributor for reduced salmonid populations for over a decade. Why is the County minimizing the ability for the community to understand the solutions set forth and offer comments?

The San Geronimo Valley Planning Group requests the Marin County Redevelopment Agency extend the SEIR comment period for another 45-days, preferably longer, and during that time host a meaningful public meeting in the Valley to discuss the proposed regulations, their enforcement as well as performance standards to evaluate if the regulations are deemed successful or not.

Finally, we believe our new Supervisor has the skills and knowledge to move with SPAWN and come to an agreement on a SCA ordinance and hope that process is underway. The Planning Group looks forward to participating in a worthy resolution that benefits the salmon, our oldest Valley residents, as well as creek side property owners who are gifted with the salmon’s proximity but must also assume some responsibility for their protection.

Respectfully,
Brian Staley
Chair, San Geronimo Valley Planning Group

PO Box 57  Forest Knolls, CA 94933

cc Supervisor Rodoni; Aídes Lorenzo Cordova and Rhonda Kanner
14a Comment noted. Marin County concurs that analyzing cumulative impacts on salmonid habitat in San Geronimo Valley and developing measures to avoid or minimize impacts to a less than significant level while maintaining the rights of property owners is a complex issue.

14b The County has endeavored to prepare the SEIR using clear, succinct, and non-technical language while providing scientific justification and documentation for the analyses and conclusions. The public comment period was a full 45-days in length, closing on June 15, 2017 at 4:00 pm. This is considered adequate time for agencies and members of the public to review and comment on the Draft SEIR, in accordance with Section 15203 of the State CEQA Guidelines. As stated in Section 1.4, there will be an additional 21-day public review and comment period following release of the Final SEIR, providing an opportunity to comment again.

14c Please refer to Master Response 7.

14d Please refer to Master Response 18.

14e Please refer to Master Response 4.1. Additionally, the Marin County Community Development Agency has established a code enforcement program to ensure compliance with the County's laws and regulations for land use, zoning, building, housing, and environmental health. Information on how to file a complaint can be found here: https://www.marincounty.org/depts/cd/divisions/code-enforcement. The same enforcement program would apply to the provisions of the Expanded SCA Ordinance.

14f Some exemptions are necessary to ensure that separate regulatory processes are not in conflict, to protect public health and safety, and ensure provisions are not ineffectively onerous. Please refer to Master Responses 6.2 and 6.4.

14g See Individual Response 14b with respect to opportunities to comment on the Draft and Final versions of the SEIR. Please also refer to Master Response 6.2, which explains that the Expanded SCA Ordinance will proceed with the appropriate administrative and legal trajectory, meaning that there should be opportunities to comment further on detailed provisions that relate to the SCA in the future.
With regard to public property developments compared to private property developments, please refer to Master Response 6.2, which explains that all zones are captured by provisions for the Expanded SCA Ordinance, as mitigation for Impact 5.1. This means that residential zones, where private development predominantly occurs, and non-residential zones, which include private and public property developments, are subject to the same measures to avoid or reduce cumulative impacts to a less than significant level. This is because surface runoff, and other impacts to salmonids, are influenced by watershed-wide land and water use, regardless of whether the land is public or private, or what the zoning is. The County does not consider this a cookie cutter approach. Measures to control erosion, reduce hydrologic modification, and minimize delivery of fine sediment to streams are included in Mitigation Measures 5.1-1 and 5.2-1. Please refer to Master Responses 6 and 8.

Marin County concurs that the community should understand how their existing property improvements degrade habitat, and how potential property developments can be designed in a manner to minimize any increase in potential water flows. As aforementioned in Section 1.2, this document includes clarifying information to help members of the public understand cumulative salmonid impacts and mitigation discussed in the Draft SEIR, to describe how mitigation has been clarified and amplified in the Final SEIR, and what this means for property development. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. With regard to what the County will implement on public properties towards achieving the common goal of mitigating cumulative impacts to salmonids in San Geronimo Valley, please refer to Master Response 13.

With regard to anticipated thresholds to evaluate success or failure, we recognize two basic approaches to evaluating the effectiveness of the development restrictions included in Mitigation Measure 5.1-1 (and Mitigation Measure 5.2-1) on achieving their desired endpoint, namely the improvement in fish populations. The first approach is to simply apply the restrictions and then measure their outcomes in the stream directly. This approach is intuitive, but it cannot demonstrate success (or failure) over any useful time frame. This is because year-to-year variability in rainfall means that any systematic response of streamflow to development mitigation must be great enough to rise above that variability. A recent study looking at urbanization effects in the Pacific
Northwest and southern California (Booth and Konrad 2017) found that a decade or more is the minimum period necessary to identify any such trends, and even then, with only the most rapid rates of watershed urbanization found in the study regions. Furthermore, even if streamflow benefits could be demonstrated, their influence on fish populations could only be inferred: a variety of factors, including but not limited to the impacts of watershed and riparian-zone urban development, affect the numbers of anadromous fish in a stream. These factors include ocean conditions, harvest rates, and weather. So although fish counts might show a (negative) correlation with the rate of urban development, that would not “prove” that development had caused the decline; conversely, stable or improving fish numbers would not demonstrate that the restrictions had been the sole (or even the primary) cause of the improvement.

The second approach to evaluating the effectiveness of these restrictions is to evaluate the best available science regarding the relationship between the many factors that affect fish populations, which include (but are not limited to) the impacts of unmitigated TIA on aquatic systems, and to craft restrictions that conform with that guidance. That is the approach taken in this SEIR. Monitoring could be useful to confirm that these measures are actually being implemented as anticipated (e.g., riparian vegetation remains intact; drainage facilities are being constructed as designed); but including a monitoring strategy to determine whether mitigation for future development under the Marin CWP (2007) has resulted in the anticipated benefits to fish populations, or to certain fish species, would be speculative.

Lastly, Marin County considers the SEIR to be in compliance with CEQA for the reasons set out in Master Response 3.

14i Please refer to Master Response 18.
14j Please refer to Master Responses 8 and 9.
14k Marin County is considering a community sewer system (i.e., Woodacre/San Geronimo Flats Wastewater Recycling Project) for San Geronimo Valley. Information on the Woodacre/San Geronimo Flats Wastewater Recycling Project can be found on the Marin County website: https://www.marincounty.org/depts/cd/divisions/environmental-health-services/woodacre-san-geronimo-wastewater. The Draft Woodacre – San Geronimo Wastewater Recycling Study (which considers an area including 360 developed land parcels) is currently on hold, and requires revisions to reflect change of ownership of the San
Geronimo Golf Course that was part of the original water recycling feasibility proposal if the wastewater recycling project is to move forward. Because details of this project are currently unknown, an assessment of potential cumulative impacts to salmonids within the context of future development under the Marin CWP (2007) would be speculative at this time. While implementation of a community sewer system may be beneficial to salmonids by improving overall water quality (e.g., increasing summer time dissolved oxygen, reducing nutrients) in San Geronimo Creek, the degree to which these benefits may occur cannot reasonably be assessed given existing information. The potential for reduction of summer baseflow in San Geronimo Creek due to collection and processing of wastewater at a centralized facility rather than in individual septic systems that allow for shallow groundwater flow through leach fields also cannot be assessed given existing information. These considerations could be included in planning efforts for the community sewer system, should the project move forward.

14l Please refer to Master Response 3.
14m Please refer to Individual Response 14g above.
14n Comment noted.
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Letter 15—Turtle Island Restoration Network
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June 15, 2017

Marin County Redevelopment Agency
Attn: Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Re: Comments to Draft 2007 Marin Countywide Plan Supplemental EIR ("Draft SEIR")

Dear Ms. Reid:

These Comments to the Draft SEIR are submitted by Turtle Island Restoration Network, a California public benefit corporation, and Salmon Protection and Watershed Network, a conservation project of Turtle Island Restoration Network, (collectively "Turtle Island/SPAWN"), in response to the Notice of Availability dated May 1, 2017 by the County of Marin ("County") as required under Section 15087 of the California Environmental Quality Act, Cal. Pub. Res. Code § 21000 et seq. ("CEQA").

As noted in the Draft SEIR, this supplemental analysis under CEQA has been mandated by the California Court of Appeal in a March 2014 opinion¹ which required the County to set aside its approval of the 2007 Marin Countywide Plan Update (2007 CWP) pending preparation of a supplemental SEIR that analyzes the cumulative impacts of such project, and describes mitigation measures to address such impacts, in conformity with the CEQA Guidelines. 14 Cal. Code Reg. § 15000 et seq. ("Guidelines"). The County is presently subject to Peremptory Writ of Mandate issued by the Marin County Superior Court issued on December 5, 2014 following remand by the Court of Appeal to prepare and certify a final Supplemental EIR.² Until the Writ is returned to the Superior Court, the 2007 CWP

² Salmon Protection and Watershed Network v. County of Marin, Marin County Superior Court

TURTLE ISLAND RESTORATION NETWORK
P.O. Box 370
Forest Knolls, CA 94933

LETTER # 16
Turtle Island/SPAWN Comments to Draft SEIR
June 15, 2017
Page 2

is not in effect in the San Geronimo Valley watershed, and development applications are reviewed under the 1994 Countywide Plan.

These Comments are informed by and rely upon the information sources referenced in the Draft SEIR Sec. 1.3 and the sources identified in the attached List of Additional References that are incorporated by reference. Where possible, specific comments are referenced to the Section number in the Draft SEIR Section in brackets (e.g. [1.1]) and/or by page number (e.g. "at 2-1"), to which the specific comment pertains. Unless noted otherwise, all defined terms, acronyms and abbreviations in these Comments have the same meaning as specified in the Draft SEIR. (Draft SEIR at v – vi.)

Summary of Comments

15b
* In the analysis of cumulative effects, the Draft SEIR fails to identify and analyze all prospective development allowable under the 2007 CWP, understates the extent of prospective development and other future known and likely projects, and fails to consider the additional development likely to be allowed under the “Expanded SCA Ordinance.” (“Proposed Ordinance”)

15c
* The Draft SEIR provides an incomplete and inadequate description of the environmental baseline of the project area, specifically including the riparian and in-stream habitats, and status of salmonid species listed as endangered or threatened under Federal and California laws.

15d
* The Draft SEIR provides an incomplete and flawed analysis of potential and cumulative impacts from prospective development allowed under the 2007 CWP, including direct and indirect impacts to water quality, riparian habitat, spawning, nursery and rearing habitats, and to endangered and threatened salmonid species.

15e
* The Draft SEIR provides inadequate mitigation for the significant impacts on spawning and rearing salmonid habitat from future development allowable under the 2007 CWP in that the Proposed Ordinance is vague, unenforceable, and lacks any timeline or deadline for the formulation and adoption of the Proposed Ordinance.

15f
* The Draft SEIR is deficient in failing to provide any analysis of the Proposed Ordinance under CEQA, or adequate performance standards by which the future formulation of the Proposed Ordinance may be
analyzed under CEQA, or providing any explanation of the process or
deadlines for analysis of the Proposed Ordinance under CEQA.

- The other measures provided by the Draft SEIR to mitigate the
  significant impacts on spawning, rearing and Summer salmonid
  habitat from future development allowable under the 2007 CWP are
  inadequate in that such measures are vague, unenforceable, lack
  performance standards, and lack any timeline or deadline for their
  development and/or implementation.

To satisfy the requirements of CEQA, the Draft SEIR cannot be finalized
and certified without the concurrent formulation and adoption of an SCA
Ordinance that addresses the specific significant impacts to salmonid species and
their habitat from the prospective development allowable under the 2007 CWP.

Compliance with CEQA Process

Preliminarily, the County has failed to adequately explain its plan for future
steps in the CEQA process necessary for the 2007 CWP to be fully implemented.
The Draft SEIR [1.2.1] states that it is a “program EIR” as defined in Section
15168 of the Guidelines, which may be prepared on a “series of actions” that are
related or connected and the basis for future “tiered” environmental analyses of
such future actions. Specifically, the Draft SEIR states, “This analysis does not
examine the effects of site-specific projects (…)” and “The analysis in this
program SEIR is considered the first tier of environmental review, creating the
foundation upon which future, project-specific CEQA documents can build.” Draft
SEIR at I-6 [emphasis added].

However, merely designating the Draft SEIR as a program EIR does not
relieve the County of its obligation to conduct a complete and thorough analysis of
the environmental impacts, or sidestep necessary analysis by asserting it will be
addressed in future analyses. In this case, the Draft SEIR contemplates future
tiered environmental analyses for the full implementation of the 2007 CWP, but

3 Friends of Mammoth v. Town of Mammoth Lakes Redevelopment Agency, 82 Cal. App. 4th
511, 534, 534, 98 Cal. Rptr. 2d 334, 348 (2000), as modified on denial of reh’g (Aug. 21, 2000). ([A]
program EIR is designed for analyzing program-wide effects, broad policy alternatives and
mitigation measures, cumulative impacts and basic policy considerations, as opposed to specific
projects within the program. (Guidelines, § 15168, subd. (b)). However, the Guidelines also state
a program EIR “will be most helpful in dealing with subsequent activities if it deals with the
effects of the program as specifically and comprehensively as possible.” [emphasis added]).
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notably absent is any discussion of future environmental analyses is any mention of a CEQA-compliant process for the Proposed Ordinance that, once enacted, will be the principal mitigation measure for two significant impacts (Draft SEIR at 5-12, 5-19.)

A CEQA-compliant environmental analysis is required for an action requiring legislative approval that is relied upon for mitigation in an EIR.⁴ As discussed in more detail below, the description and discussion of the Proposed Ordinance in the Draft SEIR⁵ is inadequate to satisfy CEQA without further analysis. (See “Expanded SCA Ordinance,” below.) However, the Draft SEIR neither commits to such further analysis, nor does it provide any guidance when such analysis will be made and available for comment.⁶ Further, the Draft SEIR also fails to specify whether or not implementation of the 2007 CWP will be contingent upon the enactment and implementation of the Proposed Ordinance.

Accordingly, to prevent future controversy and to clarify the need for a complete and thorough analysis of the Proposed Ordinance in the Draft SEIR, the County must either specify that the Proposed Ordinance will be the subject of a future CEQA-compliant environmental analysis or that the County considers the analysis of the Proposed Ordinance contained in the Draft SEIR to be adequate to satisfy CEQA. In either event, the County must provide a timeline and deadline for the development, environmental analysis and implementation of the Proposed Ordinance before it is relied upon for mitigation of significant impacts from future development.

Draft SEIR Analysis of Cumulative Impacts

As mandated by the Court of Appeal and the Writ, in the Draft SEIR the County must provide an analysis of potential cumulative impacts, and the range of potential consequences, on salmonids in the San Geronimo Valley in conformity with Guidelines § 15130 and the Court of Appeal opinion. (Draft SEIR at vii.) As discussed below, the Draft SEIR analysis of cumulative impacts is incomplete and

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⁵ Draft SEIR Mitigation Measure § 5.1-1 at 5-12.
⁶ At the Draft SEIR public comment hearing held by Marin County Planning Commission on April 22, 2017, Planning Commission staff represented that the Proposed Ordinance would be subject to a separate CEQA analysis as part of the next Countywide Plan update/amendment process, which would occur in approximately four years.
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flawed in its failure to identify and fully analyze all the potential and cumulative impacts of the proposed allowable development in the 2007 Countywide Plan (CWP).7

Project Description [2]

An over-arching concern with the project description arises out of the vagueness of the Proposed Ordinance description that relies on reference to the aspirational provisions of Goal BIO-4 of the 2007 CWP and broadly-stated provisions. (See Draft SEIR at 5-12 – 5-13, Table 2-1 at 2-8 – 2-10.) The description of the Proposed Ordinance in the Draft SEIR is relevant to the project description in that the Proposed Ordinance description fails to include (or expressly exclude) certain exemptions and exclusions included in Goal BIO-4.a and in prior versions of an Ordinance, including an exemption for parcels located in conventionally-zoned districts (almost 80% of potential development parcels) and a "by right" exclusion for additional development up to 500 sq.ft. of additional footprint within the SCA. The inclusion of such exemptions and exclusions to the Proposed Ordinance would allow additional future development not considered in the cumulative effects analysis in the Draft SEIR.8 In addition, as discussed below, such exemptions and exclusions would also result in an ineffective mitigation measure to reduce those key significant impacts from the 2007 CWP both identified in the Draft SEIR and described in these Comments.9

Natural Systems and Agriculture Element [2.4.1]

The Draft SEIR states, "The Environmental Hazards, Atmosphere and Climate, Open Space, and Agriculture and Food topics of the Marin CWP (2007) are not considered further in this document." (Draft SEIR at 2-4.) This is a serious flaw in determining the impacts of continued development in the San Geronimo Valley, as discussed below.

7 See Monohaen, C., Ltr. to Marin Cty. Planning Comm. et al., re 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley (Jun. 12, 2017) ("The Draft SEIR analysis of future development is incomplete and flawed in its failure to identify and fully analyze all the potential and cumulative impacts of the proposed allowable development in the 2007 Countywide Plan (CWP).").
8 See Future Development [2.6], below.
9 See Expanded SCA Ordinance [5.1-1, 5-2.1]; Vagueness, below.
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(1) Increased Toxins from Increased Development and Sewage Disposal.

Based upon available studies and information, an increase in development within the Lagunitas Creek watershed will result in increased stream pollution from toxins, sewage and pharmaceutical contaminations. Specifically, The environmental baseline described in the Draft SEIR completely fails to address existing levels of toxicity from all sources including road runoff, pharmaceuticals in wastewater\textsuperscript{10} and pesticide use. The Draft SEIR further fails to analyze or discuss the likelihood of future levels, the impacts to the stream and riparian habitats from increased levels of toxins, or discuss the direct impacts on salmonid health and survival.

Recent studies indicate that spawning salmon in streams subject to impacts on water quality from toxins in storm runoff and other sources are negatively impacted by decreased water quality.\textsuperscript{1} More specifically, daily surveys of a representative urban stream revealed premature spawner mortality rates that ranged from 60-100\% of each fall run compared to a of <1\% rate in a non-urban stream. The authors concluded that the weight of evidence suggests that freshwater-transitional coho are particularly vulnerable to toxic contaminant (or contaminant mixture) in urban runoff. Stormwater may therefore place important constraints on efforts to conserve and recover coho populations in urban and urbanizing watersheds throughout the western United States.\textsuperscript{12}

An increase in development will necessarily result in increased pollution from oil and other toxins from road run-off.\textsuperscript{13} Increased automobile traffic


\textsuperscript{13} See Sholtz, N. L. et al. (2011).
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associated with residential and commercial development will increase these known
toxins to salmonids, and no specific mitigation for this hazard is provided.

Sewage disposal for all housing and businesses located in the San Geronimo
Valley occurs within the Lagunitas Creek watershed, whether through individual or
community septic systems or planned centralized wastewater treatment plants. (See
Approach to Impact Analysis [5.1 - 5.2], below.) Sewage disposal technology does
not remove pharmaceuticals from wastewater causing known impacts to salmon
species.14

Finally, pesticides from agricultural and other sources are known causes of
increased toxicity and impacts to salmonids.15 The Draft SEIR fails to discuss or
analyze this important impact on water quality, and no specific mitigation for this
hazard is provided.

(2) Increase in Toxic Metals

The Draft SEIR omits any discussion of toxic metals in the Lagunitas Creek
watershed and the impacts of such toxins on salmonids and their food sources.
Specifically, in 2009 the San Geronimo Valley Salmon Enhancement Plan Existing
Conditions report16 stated:

Although a number of metal species have been measured in San Geronimo
Creek and a few of its major tributaries (Table 3-8), none were measured at
water column concentrations of concern (Piovarcsik and Andrew 2008,
SFRBWQCB 2007, TBWC 2006). However, sediment concentrations in San
Geronimo Creek were high for chromium and nickel (> probable effects
concentration [PEC], as well as arsenic, copper, and mercury (> threshold


16 San Geronimo Valley Salmon Enhancement Plan Existing Conditions (Stillwater Sciences Jan. 2009) § 3.5.5 at 3-24.
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Effects concentrations [TECs]) (Table 3-9). The observed sediment metals concentrations were high enough to support possible acute toxicity to infaunal invertebrates (SFBRWQCB 2007, MacDonald et al. 2000). Additionally, tissues of clams deployed near the Creamery Creek confluence with mainstem San Geronimo (referred to as Creamery Gulch in SFBRWQCB [2007]) as part of the toxicity testing were among the highest mercury concentrations measured anywhere in the Bay Area at 0.03 ug/g. Copper concentrations were also high at 7.68 ug/g. While the tissue results reflect elevated sediment chemistry measurements, the bioavailability and toxicity of sediment metals to salmonids and other local biota is currently uncertain in the San Geronimo Creek watershed. The observed concentrations may be more representative of increased erosion in the watershed than of anthropogenic sources of toxicants (SFBRWQCB 2007), and assessing fish tissue levels would be required to determine possible health effects.

The Draft SEIR’s failure to incorporate this available information in its discussion and of baseline environmental conditions and the analysis of cumulative impacts renders such analysis incomplete and inadequate.

(3) Increase in Fires

The Draft SEIR fails to consider or analyze the impacts on salmonid habitat from wildfires and fire control activities, stochastic events that become more likely with increased levels of development. As stated by NOAA:

Control of wildland fires may include the removal or modification of vegetation due to the construction of firebreaks or setting of backfires to control the spread of fire. This removal of vegetation can trigger post-fire landslides as well as chronic sediment erosion that can negatively affect downstream coho habitat. Also, the use of fire retardants may adversely affect salmonid habitat if used in a manner that does not sufficiently protect streams causing the potential for coho to be exposed to lethal amounts of the retardant. This exposure is most likely to affect summer rearing juvenile coho. Fire retardant has impacted salmon in the San Geronimo

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subwatershed creeks in the past resulting in mortality and harm to salmonids.18

(4) Increase in Invasive Species

The Draft SEIR fails to identify or analyze the impacts from an increase in invasive species associated with increased levels of development. Invasive species (both plant and animal) impact salmon streams.19 Research indicates that increased development opens new niches for invasive species20 that often thrive in newly disturbed habitat.21 The problem is compounded by the introduction of additional invasive species through development activities.

(6) Climate Change

Although not an impact of the Proposed Project, the likely impacts from changes in temperature, precipitation, the frequency and intensity weather events, and other conditions from a changing climate are part of a dynamic environmental baseline that will change over the course of the Proposed Project. Accordingly, consideration of the likely direct and indirect impacts on salmonid species and habitat from climate change should be considered as part of the cumulative effects analysis to the same extent as the effects of known and likely future development.


The impacts of climate change on salmon have already been identified and discussed, including impacts from increases in temperature, rainfall variability, storm frequency, climatic water deficit, and fire frequency, and an increase in non-native species that prey on salmon.

Future Development [2.6]

This Section, which establishes parameters for the projection and discussion of impacts from future development in the San Geronimo Valley from the 2007 CWP, contains notable flaws regarding several parameters. Specifically, the "Average Building (Unit) Footprint" [Table 2-4] and "Development Metrics for the San Geronimo Valley" [Table 2-5] are based on 2005 data provided by the Community Development Agency (CDA), with the footnote that "no substantial development in the San Geronimo Valley since 2005 and therefore no change" in the estimated TIA or the number of improved parcels. However, there is no indication that the data presented in these two tables includes any information, estimates or allowances for illegal and/or unpermitted development within the San Geronimo Valley. Historical and current unpermitted development within the San Geronimo Valley, including development within the SCA, is an acknowledged

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significant problem. Failing to acknowledge these existing conditions, and factor them into the development metrics for the number of developed units and the TIA within the watershed, provides an inaccurate basis for the cumulative effects analysis in the Draft SEIR.

Further, this Section fails to use accurate parameters for development that may be allowed by the Proposed Ordinance, which will not only establish measures to regulate future development and mitigate the resulting impacts within the San Geronimo Creek sub-watershed, but are likely to include provisions that will determine the amount of permissible additional development on already-developed parcels. For example, an exception provided in Goal BIO-4. a. and included in a previous proposed SCA Ordinance provided for by-right “modest additions” to existing residences within the SCA up to 500 sq. ft. that met certain conditions, which could result in a total of almost 500,000 sq. ft. of new residential development within riparian habit in the San Geronimo Valley. Further, the County has not indicated whether the 500 sq. ft. exception would also be eventually allowed on the 474 currently undeveloped parcels in the future after they are developed, could allow an additional 237,000 square feet of future development that which is not considered in the Draft SEIR.

The following Sections contain additional significant incorrect assumptions, misstatements or mischaracterizations of available data:

Watershed Scale Discussion [2.6.2].

(1) Stating that 19 building permits is a “relatively low number” mischaracterizes the data, in that 19 permits relative to the SGV’s population is substantially greater when compared to 1,200 permits relative to the County’s

See, e.g., San Geronimo Valley Salmon Enhancement Plan (Feb. 9, 2010) at 2-33 (“Small sheds, chicken coops, other small structures, and areas of pavement in close proximity to stream channels are common in San Geronimo Valley. Most of these were likely built before the enactment of stream setbacks; some were constructed illegally.”).

See Note 64, below.

See DRAFT Marin Stream Conservation Area Ordinance Revised per Board of Supervisors Hearing, October 29, 2013.

See Monohan (2013) (“The current draft ordinance, will allow 500 sq ft additions to existing structures. In just San Geronimo Valley, which currently has 955 developed parcels, this could result in 477,500 sq ft. (955 X 500) of loss of current or potential riparian habitat.”).

See Draft SEIR § 2.6.2 Table 2-5 at 2-30.
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(2) Using the gross number of building permits as the basis for the “overestimated” number of anticipated additional improved parcels and developed units does not include any historical or future unpermitted development discussed above. Accordingly, there is no basis to conclude that the forecast levels of future development are an “overestimate.” Further, there is no basis to conclude that the number of additional improved parcels and units is an overestimate based upon economic conditions or physical limitations of specific parcels. Unless parcels are permanently “removed” by the County as being eligible for possible development, any reduction based upon economic or physical factors is speculative and inappropriate.

(3) The conclusion that it is “unlikely” no new development will use groundwater wells and that the number of wells will remain approximately equal to the existing number of wells is based upon an unsupported assumption that “all new improved parcels would possess municipal water supply.” (Draft SEIR at 2-31, 2-34). The conclusion also ignores the likelihood of new wells drilled for agricultural, animal husbandry or other purposes, which should be considered as either foreseeable future development accessory to existing uses, or as an indirect result of permitted development under the 2007 CWP. (e.g. a large garden or horse stable accessory to a new rural residence).

Subbasin/Reach Scale [2.6.3].

(1) As noted above for the watershed scale, there is no basis to conclude that the number of improved parcels or units anticipated from implementation of the 2007 CWP is “overestimated.” (Draft SEIR at 2-32.)

32 2010 census Marin County: 1200 permits/252409 pop. = .00475; cf. San Geronimo Valley: 19 permits/3613 pop. = .00526
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(2) The parsing of data by subbasins and reaches is of questionable utility unless the analysis includes allowances for the quantity and quality of stream and riparian habitat available in such subbasin or reach. For example, characterizing the effect of increase in improved parcels and units in the Lower San Geronimo/Woodacre Creek reaches as “moderate” based upon the lower “relative increase” fails to account for the effect on habitat provided in such subbasin/reach. (Draft SEIR at 2-32.) The same comment applies to the analysis of TIA in each subbasin/reach. (Draft SEIR at 2-33.)

(3) There is also ample evidence that pumping directly from creeks within the Lagunitas Creek watershed occurs that is likely to increase with greater development without regulatory controls. This issue has been discussed at the Lagunitas Creek Technical Advisory Committee on which the County holds a seat and informed of this issue, and it is discussed in the federal Coho Recovery Plan.3)

SCA Scale [2.6.4].

(1) No data or other support is provided for the assertion that “relatively few parcels small enough to lack significant flexibility in development placement (0-0.5 ac) [are] located completely within the SCA.” (Draft SEIR at 2-35.)

(2) The basis for characterizing the effects of developing parcels within the Lower San Geronimo/Woodacre Creek SCA as “moderate” is a purely qualitative analysis based upon a “relative increase,” which masks the actual effect on the stream and riparian habitat. (Draft SEIR at 2-35 – 2-26.)

(3) The discussion concerning the 79% of SCA parcels within conventional zoning districts that would not be subject to design or other discretionary review highlights the significant flaws in using Goal BIO-4 as the basis for the Ordinance. (Draft SEIR at 2-36.) In addition, notwithstanding the acknowledgment of this flaw, no meaningful analysis is made of the increased effects from development of new parcels and units not subject to design or other discretionary review.

Environmental Setting [3]

The discussion of the fish species’ and habitat condition in this Section require additional review and clarification to be accurate for the purpose of the analysis and findings made in the Draft SEIR.

3) Final Recovery Plan for Central California Coast coho salmon ESU (NMFS 2012) § 3.6.2 at 48.
Special-Status Anadromous Fish Species [3.1]

The coho salmon that spawn in the Lagunitas Creek watershed are part of the Central California Coast Evolutionary Significant Unit (ESU) that is listed as “endangered” under the federal Endangered Species Act (ESA).[34,35] This coho salmon population segment is also listed as endangered under the California Endangered Species Act (CESA).[36]

The historical and continuing decline in coho salmon abundance in the Lagunitas Creek watershed is well-documented and includes data that extend well beyond the limited numerical data referenced in the Draft SEIR at 3-1. The statement that recent years’ counts “suggest modest improvements” in coho population is misleading in that the years to which this comment applies are not specified and, given the much-longer trend of declining populations, a few or several years’ increase is biologically insignificant. Further, noting that the coho salmon population in the Lagunitas Creek watershed is the “largest and most stable population south of the Noyo River in Mendocino County” may be technically accurate, but given the severely depressed abundance of the California Central Coast Evolutionary Significant Unit (CCC ESU) it is irrelevant to the Draft SEIR’s analysis and does indicate the importance of protecting the coho salmon which spawn and rear in the Lagunitas Creek watershed to the recovery of the CCC ESU.

More specifically, coho salmon and steelhead trout populations have experienced significant historical population declines in the Lagunitas Creek watershed approaching 90% since the mid 20th Century, precipitating listings as “endangered” (coho salmon) and “threatened” (Chinook salmon and steelhead trout) under the ESA, as well as listings under the CESA. Annual coho spawning


[35] Section 3 of the ESA defines the term “endangered species” to mean “any species [or ESU] which is in danger of extinction throughout all or a significant portion of its range.” 16 U.S.C. 1532(7).

numbers in the watershed have dropped from thousands to hundreds, and some recent years have seen the numbers drop as low as 26 nests ("rodds").  

Recent data unequivocally indicates that the coho salmon remain in danger of imminent extinction. The coho salmon in this ESU have been described by NOAA as "gravely close to extinction" and, more recently, as "critical concern" with "current threats expected to push species to extinction in the wild within 10 – 15 generations."  

The greatest contemporary threat to the continued survival of the coho salmon and steelhead in the greater Lagunitas watershed is the continued impacts from residential and commercial development. (Draft SEIR at 3–8 – 3–9, citing NMFS (2012), NMFS (2015).) Although the Lagunitas Creek watershed has historically been significantly impacted by dams that directly caused spawning and rearing habitat loss and from forest removal, the impacts from continuing development present the greater current threat. (Draft SEIR 3.2 at 3–8, citing NMFS (2012).) Specifically, the Draft SEIR states, "Studies in the Pacific Northwest have shown that coho salmon abundance is significantly lower in rural, urban, and agricultural areas, and areas with high road density, than in watersheds with fewer human land uses (Sharma and Hilborn 2001, Pess et al. 2002). Of 14 potential threats to coho salmon in the greater Lagunitas Creek watershed evaluated by NMFS (2012), residential and commercial development was ranked as the greatest overall threat ("very high") to the viability of the coho salmon population. The impacts from development and urbanization include loss of riparian habitat, increased stream velocities from impervious surfaces and

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38 Final Recovery Plan for Central California Coast coho salmon ESU (NMFS 2012) § 3.1 at 3.11.
40 Final Recovery Plan for Central California Coast coho salmon ESU (NMFS 2012) § 3.6.1 at 3.6, § 3.6.4 at 3.12, Table 3-5 at 3.12.
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vegetation removal, increased pollution inputs and additional armoring and simplification of stream channels to protect housing structures.\footnote{41}

The coho salmon in the Lagunitas Creek watershed is a designated “focus population” for the recovery of the CCC ESU.\footnote{42} Given the historical and future impacts from development within the Lagunitas Creek watershed, to stabilize and recover the endangered coho salmon the County must adopt a strategy of both minimizing and mitigating impacts from both future development and reducing current impacts from historical development as proposed by NMFS and referred to as “managed retreat.”\footnote{43} Unfortunately, the Draft SEIR fails to recognize or adopt both aspects of this strategy.

Water Quality [3-4]

The Draft SEIR states that “reported water temperatures in mainstream San Geronimo Creek and at least two of its major tributaries (i.e., Woodacre Creek, Montezuma Creek) have consistently been below the maximum thresholds for salmonids upper incipient lethal temperature (26.6°C, Brett 1952) and the critical thermal maxima (24.6°C; McGeer et al. 1991), although they have been observed to exceed optimal ranges for coho, steelhead, and Chinook salmon during summer low-flow periods (Stillwater Sciences 2009a).” (Draft SEIR at 3-15.) Notwithstanding the concern that summer water temperatures exceed optimal ranges for salmonids, the Draft SEIR does not address what effects additional development in the stream conservation area would have on water temperatures.

In the discussion of water quality conditions, it is important to emphasize that Lagunitas Creek, which includes San Geronimo Creek, is listed under Clean Water Act § 303(d) as an “impaired waterbody due to increases in the amount of fine sediment (primarily sand) that is being deposited in the streambed.”\footnote{44} Accordingly, a TMDL and load allocation has been established for Lagunitas

\footnote{41} Id. § 3.6.10 at 3.19.
\footnote{42} Id.
\footnote{43} See Final Recovery Plan for Central California Coast coho salmon ESU (NMFS 2012); Coastal multispecies recovery plan Vol. IV, Central California Coast Steelhead (NMFS 2015).
\footnote{44} See Basin Plan Amendment (SFRWQCB 2014b) \footnote{45}; See also Lagunitas Creek Watershed Fine Sediment Reduction and Habitat Enhancement Plan Staff Report (SFRWQCB 6-2014) at 14 (“Lagunitas Creek and its tributaries have a greatly diminished capacity to sort, store, and meter sediment because of floodplain disconnection and a significant reduction in large woody debris loading.”).
Creek upstream of Devils Gulch that requires a 50% reduction in sediment delivery from all sources from the historical load period 1983 – 2008. From this determination, it is evident that regarding fine sediment the water quality of San Geronimo Creek is significantly impaired, which must be considered as both an important part of the environmental baseline in analyzing the cumulative impacts from future development, and in considering the standards for adequate mitigation measures to address such impacts.

Regarding the impaired status of Tomales Bay for pathogens, and the presence of elevated levels of coliform bacteria and nitrate levels in the San Geronimo Creek and Woodacre Creek, a significant tributary, the Draft SEIR states “While high coliform levels are not expected to affect salmonids, excessive algal growth from high nutrient levels may decrease dissolved oxygen levels in the creek (Stillwater Sciences 2009a).” (Draft SEIR 3-15 – 3-16.) However, although the Draft SEIR states that high coliform and nitrate levels are “not expected” to affect salmonids, the presence of fecal coliform has been identified as a cause of the decrease in aquatic insect diversity and biomass in freshwater streams where fecal coliform bacteria exceed daily load standards according to section 303(d) of the Federal Clean Water Act. Because aquatic invertebrates are a major food source for rearing salmonids and that the effects of invertebrate biomass and diversity are negatively impacted by coliform bacteria, the Draft SEIR fails to adequately address the impact of coliform bacteria on salmonids.

Basic Water Quality [3.1.2]

In the discussion of “water quality,” the Draft SEIR states that the analysis focuses on “water temperature and dissolved oxygen which the water quality parameters previously identified as most likely to limit salmonid populations in San Geronimo Creek and most likely to be affected by the Proposed Project.” Draft SEIR at 3-6 [emphasis added]. However, this focus excludes other parameters that can have a significant adverse effects on water quality and adversely limit salmonid populations, even if not the “most likely.” Such parameters include items that are commonly associated with increasing urbanization of rural areas, including

43 Basin Plan Amendment (SFBRWQCB 2014b) Exhibit A at 6.

The importance of the riparian zone to the preservation and recovery of salmonids is central to the cumulative effects analysis. Unfortunately, the Draft SEIR is deficient in its discussion and analysis of the current conditions and the effects from increased development in the riparian from the 2007 CWP, and the direct and indirect impacts on salmonids. These deficiencies are discussed below:

(1) In the discussion of vegetation coverage, the Draft SEIR states, “Data summarized by Ettlinger et al. (2013) from 1998, 2003, 2006, and 2011 indicate a decline in vegetation covering the stream banks (bank cover) from 1998 to 2006, followed by an increase from 2006 (53% bank cover) to 2011 (>70% bank cover).” (Draft SEIR at 3-16.) Unfortunately, this data is only for the mainstem of San Geronimo Creek and provides no data on the majority of the stream length of San Geronimo Creek which occurs on the many tributary streams. In fact these tributaries provide 25-35% of annual spawning habitat for coho salmon. These tributary streams also provide the majority of current and future development parcels and thus are likely to have significantly less vegetation cover.

The San Geronimo Valley Existing Conditions report, which this data is derived, actually states, “General trends in dominant bank vegetation, percent of bank vegetated, percent total canopy, and percent deciduous and evergreen trees are apparent from 1998, 2003, and 2006 data, including a consistent dominance of deciduous trees and shrubs along the banks, and an overall decline in bank cover from 75% in 1998 to 53% in 2006 (Ettlinger 2008).”

While the Draft SEIR suggests an improvement the original Existing Conditions Report suggests a decline, and even when the new data is considered through 2011 (“followed by an increase from 2006 (53% bank cover) to 2011 (>70% bank cover)”) vegetation cover remains below the 75% level recorded in 1998.

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6 San Geronimo Valley Salmon Enhancement Plan Existing Conditions (Stillwater Sciences Jan. 2009) § 3.6 at 3-26.
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(2) In the discussion of vegetation coverage, the methodology of the referenced data further inaccurately portrays the overall amount and trend of coverage in the riparian zone. Draft SEIR at 3-16 – 3-17. Specifically, the data collected and summarize by Ettinger et al. and Stillwater Sciences indicating an increase in coverage in the two most recent surveys only measures the coverage over the stream, and does not account for the width of the forested zone, and is not a conclusive indicator of increasing riparian health. While shade is important, this is one only one function of riparian habitat that is critical to salmonid survival and recovery. This conclusion is buttressed by the noted lack of large DBH trees as a future supply of LWD, and by the contra-indicator of concentrated TIA within the riparian zone of San Geronimo Creek.

As stated in the San Geronimo Valley Salmon Enhancement Plan (2009):
A dense riparian forest strip adjacent to the stream that transitions to shrubs and herbaceous vegetation is a vital feature in most, but not all, riparian zones. Intact riparian zones provide filtration of sediment and other pollutants, streambank stabilization, shade for temperature regulation, shelter, and food sources for a range of fauna. Riparian zones also hold water in winter to recharge in-stream flows in summer months. Another important function of the riparian zone in salmon-bearing streams such as San Geronimo is delivery of both large and small downed wood. Large woody debris (LWD) is essential in these stream systems to create pools, trap coarse sediment, generate channel complexity, and provide shelter from high velocities and predators. Without significant amounts of LWD, channel beds become simplified and unstable, prone to incision. Small wood also provides intricate shelter components during summer low-flow conditions, and its incorporation into large-wood structures improves their functioning during high flow events.48

48 San Geronimo Valley Salmon Enhancement Plan (Feb. 9, 2010) at 4-102; Id. ("The riparian zone is an area adjacent to the streams that supports or has the potential to support plant and animal species adapted to living near water. The riparian zone provides important ecological services including filtration and storage of water, temperature control, wood production, and wildlife refugia habitat. It can encompass homes and other infrastructure. A riparian corridor is the linear extent of intact riparian habitat, often providing linkage between other distinct habitat patches. A riparian buffer is an undisturbed area immediately adjacent to a stream. Its purpose is to protect the stream from human land uses, and human infrastructure from erosion and flooding.")
The Plan further states, (Table 7) that the science-based goal is “100 feet or more, depending on location,” though it sets an unexplained “target” of 35 feet.49 The mitigation measures proposed in the Draft SEIR fail to note how even the “target” goal of 35 feet will be met.

(3) The discussion of vegetation coverage fails to accurately describe and document the current conditions, specifically including the amount of vegetation destroyed by past development activities, disease (e.g. Sudden Oak Death Syndrome) and other causes and amount remaining, the levels of patchiness and continuous coverages with discussion of the impacts of these differences, and a discussion of the amount of coverage necessary to foster self-sustaining recruitment.

(4) The discussion of vegetation coverage also fails to accurately describe and analyze the effects of projected development from the 2007 CWP, including a projection of the types and extent of coverage loss from development within the SCA, a similar projection for loss from other activities outside of the SCA (e.g. increased run-off from expanded TIA), a similar projection for loss from fire protection activities, a similar projection for loss from disease (e.g. SODS) either caused or spread by development and for loss from removal of diseased vegetation for public safety reasons.

There is no doubt that an increase in TIA from increased development under the 2007 CWP and not mitigated by the Proposed Ordinance will adversely impact the riparian habitat and be detrimental to the survival and recovery of salmonids.50 The Draft SEIR does indicate that TIA within 100 foot riparian zone already exceeds the 5% threshold in all reaches of San Geronimo Creek. (Draft SEIR at 3-18 (Fig. 3-4).) Yet, TIA only measures reduction of riparian vegetation replaced by impervious surfaces such as houses/roads/driveways, but fails to measure development impacts that would also include dirt roads, lawns, wooden decks, sheds not requiring permits, grassy parking areas and the general living areas surrounding homes. Since most parcels are small, the majority of riparian habitat has been removed from most parcels.

49 Id. at 4:104 (Table 7).
50 Monahan (2013) (“In my opinion, the potential loss of habitat and increase in impervious area resulting from actions permitted by the draft ordinance are incompatible with the conservation objectives and will be detrimental to the long term survival of salmon within the watershed.”).
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(5) The discussion further fails to consider the projected losses from inadequate regulatory protections for riparian zone vegetation in the face of increased development from the 2007 CWP, including the lack of a comprehensive tree ordinance and lack of a comprehensive vegetation ordinance.

(6) The discussion further fails to consider the direct and indirect impacts on salmonids from the effects of changes in riparian zone (e.g. decreased or loss of vegetation coverage, lack of source material for LWD), including impacts to food resources and changes in species composition. As summarized by Monoham (2013), “In my opinion, further development in areas that have a patchwork of riparian habitat due to development within the 100-ft buffer along streams (areas without contiguous riparian buffer strips) can lead to cumulative impacts that can decimate salmonid populations.”

(7) The discussion further fails to analyze the economic costs of decreased biological services from a functionally-impaired riparian zone, including decreased water quality.

Spawning Habitat [3.6.1]

The discussion of spawning habitat in San Geronimo Creek highlights the significant challenges of addressing and mitigating the significant adverse impacts from increased development forecast under the 2007 CWP. Draft SEIR at 3-19 – 3-22. Of particular note is the current state of degraded spawning habitat that is “below targets” in much of San Geronimo Creek due to fine sedimentation and low dissolved oxygen levels. (Draft SEIR Table 3-1.) Significant impacts from red scouring are also noted. (Draft SEIR at 3-21.) These conditions highlight the challenges of mitigating additional impacts from implementation of the 2007 CWP.

Regarding barriers to fish passage, the discussion of existing barriers is incomplete and understates the actual number and extent of such barriers. In addition, the statement “spawning activity in Woodacre Creek and other tributaries to San Geronimo Creek since the 2007-2008 spawning season has been negligible” is misleading if intended to unplay the importance of these historically important tributaries. Biological significance can only be determined over a statistically

31 See e.g., San Geronimo Valley Salmon Enhancement Plan Existing Conditions (Stillwater Sciences Jan. 2009) § 3.9.1.1 at 3-54 – 3-55.
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significant period, as may be suggested by the recent reversal in the “negligible”
spawning activity in these tributaries.

The discussion of available large DBH trees in lower Montezuma Creek as
the source of future LWD highlights the importance of mitigation measures that
address protection of large DBH trees to preserve and maintain quality riparian
habitat. (Draft SEIR at 3-27.)

Analysis of Significant Impacts [5.1 – 5.2]

As noted in the Draft SEIR’s discussion of “Significance Criteria” [4.1],
“cumulatively considerable” means that the incremental effects of the of proposed
project when viewed in connection with the effects of past projects, the effects of
other current projects and the effects of probably future projects. While the Draft
SEIR notes that its analysis of significance complies with the Guidelines and the
Court of Appeal Order, the analysis is limited to the evaluation of the cumulative
effects from the adoption and implementation of the 2007 CWP in the San
Geronimo Valley. Draft SEIR at 4-1.

However, notably absent from either the description of the San Geronimo
Valley environment and potentially affected resources, or the future development
projected to result from implementation of the 2007 CWP, is consideration of
“other current projects and the effects of probably future projects.” No list of
“past, present and probably future projects” is provided in the Draft SEIR to
inform the cumulative impacts analysis as required under the Guidelines.52 One
example of a known current project that is in the CEQA planning stage is the
proposal for a Woodacre – San Geronimo Wastewater Recycling facility, for
which the County commissioned a Draft Project Report prepared for the County
dated March 2017.53 This facility, which will potentially be located within the SCA
of San Geronimo Creek, is currently proceeding to the draft EIR stage of

52 Guidelines § 15130(b) (“The following elements are necessary to an adequate discussion of
significant cumulative impacts: (1) Either: (A) A list of past, present, and probable future
projects producing related or cumulative impacts, including, if necessary, those projects outside
the control of the agency, or (B) A summary of projections contained in an adopted local,
regional or statewide plan, or related planning document, that describes or evaluates conditions
contributing to the cumulative effect. ( . . . )”).

53 Draft Project Report Woodacre – San Geronimo Wastewater Recycling Study (Querst
Engineering Corporation Mar. 2017), available at
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environmental review under CEQA, and raises significant issues regarding
total impacts to San Geronimo Creek. A second example of the failure to
cover the impacts of other current and probably future projects is omission of
the proposed development under the Spirit Rock Meditation Center – Master Plan
Amendment (Sept. 2010), which was approved by the Marin County Board of
Supervisors on July 19, 2011. The failure to include the potential impacts of this
and other current and likely future projects in the planning and proposed project
stages and lack of analysis as part of the cumulative impacts discussion renders the
Draft SEIR deficient under applicable CEQA Guidelines.

In addition to the deficiencies discussed above, the approach to impact
analysis states that the “predictions of impacts are of necessity qualitative and
conservative (i.e. potentially overestimated) except where quantitative information
is readily available” and that adverse impacts can result from conditions that are
not a “direct consequence” of the 2007 CWP. Draft SEIR at 5-2. These limitations
on the validity of the cumulative impacts analysis, without greater explanation as
to their application (e.g. all qualitative cumulative effect or just specific effects), or
providing a confidence range for effects, undermines the integrity of the impacts
analysis. If “overestimation” is being used to reduce uncertainty as to any or all
effects, then it should be noted that such use of the precautionary principal is
commonly considered appropriate, and often mandated, when dealing with
potential effects to ESA-listed species.

54 See e.g. SFBRWQCB (2017) at 3 (“Location of pressurized collection system and treatment
system: The systems are located close to the creek in many locations. This leads to higher risk of
impact to the creek if there is a failure in the system.”); Id. at 3 – 4 (“Preventing the discharge of
treated wastewater to the tributaries and creek is essential to protect the health of endangered and
threatened aquatic species and creek water quality. In addition to the previously mentioned
endangered and threatened coho, steelhead and Freshwater shrimp, California red-legged frog
may also be present on the golf course property. The EIR should evaluate and identify measures
that will prevent discharge of treated wastewater to the creek and its tributary channels, including
golf course drainage channels.”).

55 See Community Development Agency, County of Marin, Spirit Rock Meditation Center
Master Plan Amendment, available at
https://www.marincounty.org/depts/cd/divisions/environmental-review/archived-eir-
projects/spirit-rock.

56 See, Guidelines § 15130(b); § 15064(b)(1); § 15065(a)(3).
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Also with regard to the impacts analysis, the Draft SEIR states that “because incremental changes in the salmonid populations that utilize San Geronimo Creek during their freshwater life stages may not be discernable at the scale of the population (e.g., coho salmon in the Lagunitas Creek watershed) or ESU (e.g., Central California Coast coho salmon”) that the analysis will, in essence, disregard such population changes in its analysis of incremental effects. Draft SEIR at 5-2.  
While focusing the effects analysis on those biological features, functions and processes that impact the life cycle stages of salmonids, the purported inability to note “discernable” changes in populations from incremental changes is insufficient basis to ignore decades of data reflecting trends in population abundance at least at the watershed level where populations are most likely to be directly impacted.  
Such data is the clearest evidence available that documents the adverse effect on salmonid populations from the effects of development, and failing to factor it into the analysis of continued and increased development on the populations is a clear failure to use readily available and relevant scientific information and data.  
As described above, the Draft SEIR provides an incomplete and flawed analysis of potential and cumulative impacts from prospective development allowed under the 2007 CWP, and the analysis of the significance of such impacts is incomplete and fails to comply with CEQA. 57

Proposed Measures to Mitigate Significant Impacts

As mandated by the Court of Appeal and the Writ, in the Draft SEIR the County must provide a description of mitigation measures relevant to salmonids in the San Geronimo Valley in conformity with Guidelines § 15126.4 and the Court of Appeal opinion. Draft SEIR at vii. Guidelines § 15126.4(a)(1)(B) specifically requires that the discussion of mitigation measures shall identify measures for each significant environmental effect identified in the Draft SEIR.  
As described above, the mandatory mitigation measures described in the Draft SEIR are inadequate to satisfy the Court of Appeal’s order and the requirements of CEQA. 58 As such, the Draft SEIR fails to remedy the inadequacies of the 2007 CWP Final EIR 59 to provide the kind of specific, concrete, and

57 See Guidelines § 15064(d), §15064(h)(1).
58 See Guidelines § 15126.4(a).
enforceable mitigation measures necessary to reduce the impacts of significant
impacts identified in the Draft SEIR and as described in these Comments. Accordingly, based on the information and analysis provided in the Draft
SEIR, it is not possible to reach a conclusion that the significant impacts identified in the Draft SEIR will be mitigated to “less than significant” for the reasons discussed below.45

Expanded SCA Ordinance [5.1-1, 5.2-1]

As the principal measure to mitigate the significant impacts of additional development allowable under the 2007 CWP on winter rearing habitat [5.1-1] and spawning habitat [5.2-1], the Draft SEIR proposes adoption of an “Expanded SCA Ordinance consistent with Goal BIO-4 and associated implementing programs under the Proposed Project.” (Draft SEIR at 5-12, 5-19.) The Draft SIR’s reliance on the Proposed Ordinance “fails to satisfy CEQA’s requirements for an adequate measure to mitigate significant impacts in a variety of ways, including vagueness, lack of enforceability, the lack of any deadline or timeline for formulation and adoption of the Ordinance, and the lack of any discussion tying specific proposed mitigation provisions to measurable performance standards.” Each of these shortcomings is discussed below.

1. Vagueness. Although vaguely described in the Draft SEIR, no draft of the Proposed Ordinance or sufficient detail regarding its provisions is provided upon which to base any meaningful analysis of its effectiveness to address each of the significant impacts from additional development allowable under the 2007 CWP that the County asserts will be mitigated with enactment of the Proposed Ordinance. The Draft SEIR’s reliance on the unformulated and unaugmented

45 SPAWN v. Cty. of Marin, 2014 WL 845416 at *9 (“Mitigation Measure 4.6-1 simply defers the formulation of meaningful mitigation measures to abate this significant impact and fails to comply with the mandates of CEQA.”).

46 See Monoham (2017).

47 Monoham (2017) (“The Draft SEIR relies on mitigating those significant impacts that it does identify and analyze to “less than significant” primarily through an Expanded Stream Conservation Area (SCA) Ordinance, which is only vaguely described by reference to broadly stated goals and a general description of provisions that are not tied to any specific standards necessary to address and mitigate specific significant impacts.”).
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Ordinance as a measure to mitigate the significant impacts from additional development renders the Draft SEIR inadequate under CEQA.63

The Draft SEIR if also misleading in its description of the Proposed Ordinance by reference to Goal BIO-4 Riparian Conservation but excluding key provisions in Goal BIO-4 that would affect the Proposed Ordinance’s efficacy to address and mitigate the significant impacts. (See Draft SEIR at 2-4 – 2-5, 5-12.) Specifically, Goal BIO-4 provides for exceptions to its application to development within the SCA, including by-right “modest additions” up to 500 sq. ft. that meet certain conditions,64 which would allow the average existing single family residence to increase its existing footprint by over 40%.65 Such a broad exception could result in development of over 500,000 sq. ft. of riparian habitat.66 Other notable exceptions to the Proposed Ordinance coverage include exemption of almost 80% of potential development parcels in conventionally-zoned districts that would impact the SCA which would require the County to “enact consistent permit and site assessment requirements for development in planned zoning districts and conventional zoning districts. (Draft SEIR at 5-12.) The Draft SCA fails to identify

63 Pres. Wild San’tee v. City of Santee, 210 Cal. App. 4th 260, 281, 148 Cal. Rptr. 3d 310, 325 (2012) ("An EIR is inadequate if [the]... may largely depend upon management plans that have not yet been formulated, and have not been subject to analysis and review within the EIR.").
65 BIO-4.a states: “Adopt Expanded SCA Ordinance. Make a new SCA ordinance that would implement the SCA standards for parcels traversed by or adjacent to a mapped anadromous fish stream and tributary. Such an ordinance could, by way of example, require compliance with the incorporation of best management practices into the proposed project and could consider modest additions to existing buildings that would not result in a significant impact to riparian resources, such as additions that do not exceed 500 square feet of total floor area and that do not increase the existing horizontal encroachment into the SCA, provided a site assessment first confirms the absence of adverse impacts to riparian habitats. As part of the new ordinance, consider including additional incentives, such as reduced fees or other similar incentives, to reduce the extent of existing development within an SCA or improve conditions that may be impacting sensitive resources.”
66 See Draft SEIR § 2.6.1 Table 2-4 at 2-29.
67 See Note 28, above. Using data provided in the Draft SEIR, approximately 370,000 sq. ft. could be added to improved parcels located wholly or partially within the San Geronimo SCA. See Draft SEIR Table 2-11 at 2-38 (741 parcels X 500 sq. ft. = 370,550 sq. ft.).
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these and any other possible exceptions to the Ordinance or discuss the effects of these exceptions to the Ordinance’s effectiveness to mitigate Impact 5.1 and 5.2.

(2) Performance Standards. Guidelines § 15126(a)(1)(B) provide that “mitigation measures should not be deferred until some future time.” An EIR is deficient under CEQA if it relies on an undeveloped and unapproved mitigation measure that is not subject to analysis and review in the EIR. 58 However, under certain circumstances, mitigation measures may be subject to future development and analysis; specifically, if mitigation is “feasible but impractical” at the time of a general plan amendment, then if the EIR articulates “specific performance criteria” and makes further approvals contingent on meeting such criteria. 69

The Draft SEIR relies upon the adoption of the Proposed Ordinance as the principal mitigation measure to address significant impacts to salmonid habitat. (Draft SEIR at 5-12, 5-19.) The Proposed Ordinance has not been formulated, and it has not been analyzed or reviewed in the Draft SEIR. Further, the County has not asserted that it is impracticable to develop the Proposed Ordinance. However, even if the formulation of the Ordinance is not practicable at the time the Draft SEIR was prepared, the Draft SEIR is deficient in that it fails to provide adequate “performance standards” for the Proposed Ordinance to satisfy if and when it is formulated.

As noted, the Draft SEIR describes the proposed Ordinance to be “consistent with” Goal BIO-4 and implementing programs. (Draft SEIR at 5-12.) However, neither BIO-4.a nor the general description provided in BIO-4.1 [See Table 2.1 at 2-8] provides sufficient performance standards by which to measure the effectiveness of the Ordinance, or to provide adequate criteria upon which to base

58 Communities for a Better Environment v. City of Richmond (2010) 184 Cal.App.4th 70, 92, 108 Cal.Rptr.3d 478, quoting San Joaquin Raptor Rescue Center v. County of Merced (2007) 149 Cal.App.4th 645, 670, 57 Cal.Rptr.3d 663 (“An EIR is inadequate if ‘[i]t's success or failure of mitigation efforts ... may largely depend upon management plans that have not yet been formulated, and have not been subject to analysis and review within the EIR.””).

69 Endangered Habitats League Inc. v. County of Orange (2005) 131 Cal.App.4th 777, 793, 32 Cal.Rptr.3d 177 (“[F]or mitigation is feasible but impractical at the time of a general plan or zoning amendment, it is sufficient to articulate specific performance criteria and make further approvals contingent on finding a way to meet them.” [Citation.]); Guidelines § 15126(a)(1)(B) (“[M]easures may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way.”)).
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the future development of the Ordinance as an effective mitigation measure.\textsuperscript{11} For example, “Development shall be set back to protect the stream and provide and [sic] upland buffer, which is important to protect the significant resources that may be present and provides a transitional zone.” does not provide any measurable performance standard criteria. Nor do the implementing programs provide more than a series of steps to implement the provisions of the Ordinance after adoption.

The lack of performance standards in Goal BIO-4 is not remedied by the generalized and conflicting additional “provisions” discussed in the Draft SEIR. For example, “Expand the set of development activities that require a permit and site assessment to include any activity that requires vegetation clearing, increases impermeable area, alters surface runoff, or results in exposed soil.” (Draft SEIR at 5-12.) This broadly-stated provision encompasses a range of activities that are contemplated as possible exceptions under Goal BIO-4.a, and likely includes activities that are in conflict with activities required under other County rules and ordinances, such as the clearing of brush adjacent to structures for fire mitigation. In the same vein, the requirement for Standard Management Practices to be incorporated into all projects lacks specificity as to the scope of such practices and standards to be met to “ensure that the SMPs are adequate to avoid or minimize impacts to salmonids.” (Id.)

In addition, the Proposed Ordinance fails to provide any performance standard necessary to comply with the “no net loss” standard for sensitive habitat under Goal BIO-2.1 of the 2007 CWP.\textsuperscript{12} Although Goal BIO-2.1 provides that the “no net loss” standard of “sensitive habitat acreage, values and function” will be achieved, in part, by the adoption of an SCA ordinance, the qualitative description of the Proposed Ordinance in the Draft SEIR adds nothing to Goal BIO-4 in providing a performance standard to achieve this standard.

(3) Proposed Ordinance Enforcement. As noted previously, unpermitted or unauthorized development is a known problem in the San Geronimo Valley, as is the lack of enforcement of building and development permit programs and

\textsuperscript{11} See also 2007 CWP at 2.4-30 – 2.4-33.
\textsuperscript{12} 2007 CWP at 2.4-13 (“Require adequate mitigation measures for ensuring the protection of any sensitive resources and achieving “no net loss” of sensitive habitat acreage, values, and function.”).
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ordinances. In addition to failing to address the problem of unpermitted development under existing programs and ordinances, the Draft SEIR is silent as to the importance of robust and effective enforcement of the Proposed Ordinance to be an effective mitigation measure for Impacts 5.1 and 5.2, and fails to offer any plan for the effective enforcement of its provisions. The Draft SEIR also does not offer any analysis of the Proposed Ordinance’s effectiveness as a mitigation measure if it is not fully enforced and the resulting effect on cumulative impacts. Given the past history of lax enforcement of County regulations regarding building and development in the San Geronimo Valley, the complete failure to acknowledge this problem and its effect on the Draft SEIR’s analysis renders it deficient as a mitigation measure.

(4) Enforceability of Mitigation Measure. Guidelines § 15126.4(a)(2) provides that, in the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation, or project design. However, although reliance on the Proposed Ordinance to provide mitigation is provided for in CEQA, the Draft SEIR fails to provide the required that the Ordinance will be enacted.

First, the Draft SEIR does not provide a deadline or even a timeline for the adoption of the Proposed Ordinance and implementation of its provisions to mitigate the significant impacts from future development under the 2007 CWP. A deadline or timeline is required when future mitigation depends on the adoption of a plan, policy or regulation that will contain specific mitigation measures.

Second, the Draft SEIR fails to specify a monitoring program for the Proposed Ordinance that incorporated as a mitigation measure for the significant impacts from future development under the 2007 CWP. The purpose of the

73 See Final Recovery Plan for Central California Coast coho salmon ESU (NMFS 2012) Recovery Action ID LaC-C-CCC 22.2 (“Enforce existing building permit programs to minimize unpermitted construction.”).
75 Cal. Pub. Res. Code § 21081.6(a)(1); Sierra Club v. Cty. of San Diego, 231 Cal. App. 4th 1152, 1165, 180 Cal. Rptr. 3d 154, 164–65 (2014) (“If the agency finds that mitigation measures have been incorporated into the project to mitigate or avoid a project’s significant effects, a ‘public agency shall adopt a reporting or monitoring program for the changes made to the project or conditions of project approval, adopted in order to mitigate or avoid significant effects on the
monitoring requirements is to ensure that mitigation measures will be actually implemented and not merely adopted and then disregarded. 76

Finally, the Draft SEIR fails to specify that implementation of the 2007 CWP is conditioned upon the enactment and implementation of the Proposed Ordinance. However, the County cannot implement the 2007 CWP prior to adopting the Proposed Ordinance to mitigate its significant effects. 77

As demonstrated by the ongoing litigation between Turtle Island/SPAWN and the County, the Peremptory Writ of Mandate process is inadequate to enforce the requirements of CEQA on the County. The over two-year passage of time from issuance of the Writ and the County’s release of the Draft SEIR evidences the County’s ability to delay and forestall compliance with the CEQA process, and the lack of meaningful options to compel its compliance. The County’s actions to date provide no assurance that the development and adoption of the Proposed Ordinance would proceed in a timely manner, effectively making the proposed mitigation unenforceable.

Winter Enhancement Projects [5-1-2]

To further mitigate the significant impact of additional development allowable under the 2007 CWP on coho winter rearing success by mitigating adverse impacts to salmonid habitat, the Draft SEIR provides that the County will provide funding to third parties to facilitate “small enhancement projects on private property” to achieve “targets” set forth in the Salmon Enhancement Plan and Table 3.2 in the Draft SEIR, that are also consistent with four specific “goals” from such Plan (Draft SEIR at 5-13). The Draft SEIR’s reliance on the facilitation of habitat enhancement projects on private property fails to satisfy CEQA’s requirements for an adequate measure to mitigate significant impacts in a variety of ways as follows:

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(1) There are no enforceable targets or standards in the measure as to the amount or timing of the funding to facilitate the enhancement projects, nor is there any deadline or timeline for the implementation of such projects.

(2) The Draft SEIR fails to specify a monitoring program for this mitigation measure to ensure its implementation.

(3) The potential effectiveness of the proposed enhancement projects is limited by vague restrictions to "small projects" on private property.

(4) Although the mitigation measure references some qualitative and quantitative goals and targets, such goals and targets describe the desired conditions relative to the existing baseline conditions, and do not describe specific measures designed to address the significant impacts from future development allowed under the 2007 CWP or provide performance standards for such measures.

(5) The Draft SEIR fails to address if and how these enhancements will be maintained, preserved and not reversed when private properties are sold to new owners.

Control and Reduction of Fine Sediment Delivery [5.2-1]

To mitigate the significant impacts from the delivery of fine sediment to streams, the Draft SEIR states that "the Expanded SCA Ordinance described under Mitigation Measure 5.1-1 shall avoid or minimize the hydrologic effects and stream sedimentation associated with additional development in the watershed (. . .)." (Draft SEIR at 5-19.) The Draft SEIR goes on to state that, "Marin County DPW shall continue to develop and implement measures and guidelines to control and reduce production and delivery of fine sediment to streams and minimize its effects on redd scour and other components of salmonid habitat, in keeping with the requirements of the Basin Plan Amendment (SFRWQCB 2014b)." (Id.) However, even though the Basin Plan Amendment describes certain actions and guidelines, this mitigation measure is inadequate to address the significant impact of fine sediment deliveries as follows:

(1) The Proposed Ordinance fails to satisfy the requirements for a mitigation measure required by CEQA as discussed above.

(2) The Draft SEIR relies on actions and guidelines described in the Basin Plan Amendment; however, no analysis or explanation is provided that the targets and actions outlined in such document are adequate to achieve mitigation of impacts from future development under the 2007 CWP. Rather, the targets and
actions described in the Amendment are necessary to achieve reduction from historical mean annual sediment deliveries to targeted TMDLs, and does not provide measures to address impacts from future development. For example, regarding sediment delivery from roads the Plan Amendment requires a 50% reduction from the 1983 – 2008 historical delivery level to achieve the targeted load allocation.\textsuperscript{79} The required reduction does not address what further reductions will be required to address sediment deliveries from new or expanded roads that will result from additional development allowable under the 2007 CWP.

(3) The referenced standard of “≤350 cubic yards per mile per 20-year period” is too long-range to provide a meaningful performance standard for mitigation and fails to provide measurable interim goals necessary to address the impacts of likely development during such period under the 2007 CWP and as described in these Comments.

(4) The proposed mitigation measure relying on the Basin Plan Amendment lacks time parameters for implementation. Even though developing a “Report of Waste Discharge” by 2019 is provided in the Plan Amendment, such report is inadequate as a mitigation measure by failing to provide the interim objectives and measures necessary for adequate performance standards. Reliance on a future report for implementation fails to provide a mitigation measure that addresses the impacts from cumulative future development allowed under the 2007 CWP.

(5) The Draft SEIR fails to specify a monitoring program to ensure implementation of this mitigation measure.

Stream Habitat Enhancement Projects [5.2-2]

The Draft SEIR provides as a mitigation measure for “projects to enhance stream habitat complexity and connectivity, enhance riparian function and LWD loading/recruitment, increase natural hydraulic sediment sorting and gravel retention, and reduce development-related erosion in the watershed.” (Draft SEIR at 5-20.) This mitigation measure is inadequate in a variety aspects vague, lacks performance standards, is not enforceable in failing to identify the parties responsible for implementation, the nature of the projects intended to achieve the stated mitigation of identified significant impacts, and the fails to specify a monitoring program to ensure implementation of this mitigation measure. Further, the proposed mitigation is contingent upon the approval of projects by the

\textsuperscript{79} See Basin Plan Amendment (SFBRWQCB 2014b) Table 3a at 6.
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SFBRWQCB as being compatible with the Basin Plan Amendment, and relies on the development of future studies and plans for the mitigation to proceed.

Degraded Summer Habitat Conditions [5.3-1, 5.3-2]

The Draft SEIR asserts “While the Proposed Project is not capable of fully avoiding or eliminating impacts to hydrology, sediment delivery, and instream habitat complexity associated with future development, planned development impacts are not expected to contribute considerably to the existing degradation of salmonid summer rearing habitat or measurably reduce coho salmon and steelhead summer rearing success in the watershed.” (Draft SEIR at 5-25.) Based on such assertion, the Draft SEIR concludes that “the Proposed Project would have a less than significant cumulative impact on summer rearing success by juvenile coho salmon ( . . ).” [emphasis in original]). (Id.)

However, the assertion that the impacts of development allowable under the 2007 CWP are “not expected” to degrade the existing impaired Summer habitat conditions—an assertion that is wholly lacking adequate scientific support and runs counter to the preceding discussion of degraded Summer habitat conditions and adverse impacts on salmonids rearing success and survival—the conclusion ignores the principal that incremental impacts, even if individually minor, can be “significant” in the cumulative effects analysis of impacts from all other past, current and projects.” Viewed in this light, the Draft SEIR’s conclusion of “less than significant cumulative impact” on Summer rearing coho salmon is flawed and deficient. As such, the “voluntary mitigation measures” set forth in the Draft SEIR fail are inadequate to satisfy the requirements under CEQA for enforceable mitigation measures to minimize significant impacts.

Proposed Actions and Conclusion

Although the Draft SEIR does an adequate job of discussing a number of the threats to coho salmon and steelhead trout survival and recovery (subject to some important omissions as discussed in these Comments), it falls short in its analysis of the impacts from additional development allowable under the 2007 CWP and its failure to explain how the proposed mitigations will reduce these impacts to “less than significance.” The Draft SEIR highlights the critical importance of mitigation.


2. Guidelines § 15126.4(a)(2).
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However, the Proposed Ordinance and other measures described in the Draft SEIR to mitigate the significant impacts for the increase in development allowed under the 2007 CWP are largely vague and aspirational, and fail to provide measurable standards to evaluate if they will be effective to mitigate such significant impacts. The Draft SEIR relies on an amorphous process with no schedule or deadlines for the development and adoption of the Proposed Ordinance which, like the other mitigation measures, lack monitoring programs to ensure implementation. As a result, if the Draft SEIR were to be finalized and certified in its current form, development under the 2007 CWP in the San Geronimo Valley would proceed without the existence of enforceable mitigation measures as required under the CEQA.

In addition to informing decision-making, the CEQA must be interpreted “to afford the fullest possible protection to the environment.” Given the crucial role of the Proposed Ordinance and other mitigation measures to the protection of federally and state-protected salmonid species and their habitat, and to provide regulatory certainty to all stakeholders in the San Geronimo Valley, it is imperative that the preparation and adoption of the Proposed Ordinance must take place concurrently with—not after—the finalization and certification of the Draft SEIR. There is simply no basis to argue that the CEQA process for the 2007 CWP can be completed without the finalization of the Proposed Ordinance. Turtle Island/SPAWN is ready to participate as one of the stakeholder parties in the process necessary to complete this last step of the CEQA process.

82 Friends of Mammoth v. Board of Supervisors (1972) 8 Cal.3d 247, 259, 104 Cal.Rptr. 761, 502 P.2d 1049.
Turtle Island/SPAWN looks forward to the County’s due consideration of, and responses to, these comments within the requirements of CEQA.\(^3\)

Respectfully submitted,

Andrew G. Ogden
Senior Attorney, Turtle Island Restoration Network

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\(^3\) Guidelines § 15088(a), (c).
List of Additional References
Scoping Comments to Draft SEIR


TURTLE ISLAND RESTORATION NETWORK
P.O. Box 370
Forest Knolls, CA 94933
Dear Marin County Board of Supervisors,

Please find an attached letter of my comments for the Stream Conservation Area Ordinance.

Best Regards,
Carrie Monohan

Carrie Monohan, Ph.D.
Science Director

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To the Marin County Board of Supervisors,

RE: Proposed Stream Conservation Ordinance for the San Geronimo Valley inadequate protection of salmonid habitat and riparian buffer function

My name is Carrie Mouchlan. I am a forest hydrologist with a PhD in Forest Resources and Hydrology. My dissertation was on riparian buffer function and habitat for salmon from the University of Washington as part of the Center for Streamside Studies. I completed my dissertation in 2004 and have 10 years of professional experience in the field of watershed hydrology and water quality. I am currently working as the Science Director for a non-profit in the Sierra Nevada, called The Sierra Fund, I am also Adjunct Professor at Chico State University since 2010 and am the chair committee member for 6 master student thesis that relate to watershed ecology, hydrology, and water quality.

I am writing about proposed Stream Conservation Ordinance for the San Geronimo Valley, part of the Lagunitas Creek watershed, home to the largest wild population of Endangered Central California Coast (CCC) coho salmon and the second largest population of Threatened CCC Steelhead. I have reviewed the Marin County draft ordinance, as well as the Stillwater Sciences (2009) report, San Geronimo Valley Existing Conditions Report, commissioned by Marin County Public Works and created as part of Marin County’s Salmon Enhancement Plan [SEP] (2010).

According to the Marine County adopted Salmon Enhancement Plan [SEP], “(h) ealthy riparian habitat is fundamental to well-functioning streams. It keeps water cool and clear, protects streambanks from erosion, moderates flood flows, and provides roots and wood that are vital to creating the diverse habitat that salmonids and many other aquatic creatures need. The SEP states that “(p)rotecting what works is the most effective and efficient conservation tool. In San Geronimo Valley, this includes keeping existing riparian habitats intact, maintaining streamflows, preventing fine sediments from degrading spawning areas, and protecting areas that provide excellent habitat or opportunities for significant restoration.” Yet at the same time, the SEP acknowledges that “(t) he San Geronimo Valley, riparian habitat has been impacted by many years of development. The ECR identified an insufficient number of trees over 12 inches in diameter to supply woody debris and complex root structures for in-stream habitat, declining density and continuity of riparian vegetation, and the displacement of native vegetation with invasive and ornamental plants.” It therefore follows that priority actions should include those that both protect existing habitat and restore degraded habitat in order to achieve recovery goals.

The SEP recommends the protection and enhancement of riparian habitat as a high priority, critically urgent action that would have a strong effect on salmon populations within the
watershed. “Riparian habitat with dense, native, mature vegetation is vital to creating and maintaining high quality habitat for salmonids in San Geronimo Valley. Shade helps to maintain the cool water temperatures that salmon and steelhead need to thrive. Cooler water holds more oxygen. Leaves dropping into the streams are a major food source for the aquatic insects that in turn feed fish. Large wood, in the form of downed dead or live trees, traps and sorts gravel and sand for spawning, redirects flows to form deeper pools, and provides shelter. During high winter storm flows, densely vegetated banks and floodplains dissipate energy and provide safe havens for fish by creating low-velocity areas.

Although this Plan is focused on steelhead and salmon, riparian habitat is critical for many other wildlife species. It connects upland habitats to water sources and provides travel corridors, cover, and food. Many species spend much of their lives in or close to riparian habitat. Over 135 species of California birds and 90 species of mammals, reptiles, invertebrates, and amphibians either completely depend upon riparian habitats or use them preferentially at some stage of their life history (RIHV 2009).

Healthy riparian habitat also provides many benefits for people. Grasses, other herbaceous plants, and low shrubs filter fine sediment, nutrients, and other pollutants from runoff before it enters streams. Trees, with their extensive, deep root structures hold banks in place to protect property from erosion. Vegetated banks slow and hold water to reduce flooding and increase recharge into the stream during the summer months.”

1) I agree with the conclusions of the Marin County Salmon Enhancement Plan [SEP] regarding the importance of intact, unfragmented riparian habitat to salmonids. Vegetated buffers along streams are a necessary part of healthy streams. These zones are important natural biofilters, protecting aquatic environments from polluted surface runoff, excessive sedimentation, and erosion. They supply shelter and food for many aquatic animals, including endangered coho salmon, threatened steelhead trout, and their prey species and shade that is an important part of stream temperature regulation. Both coho salmon and steelhead trout require cold water and a few degrees of warming can have sublethal and lethal impacts on both species. When riparian zones are damaged by construction, agriculture or silviculture, biological restoration can take place, usually by human intervention in erosion control and revegetation. The SEP states that “to support a naturally regenerating riparian forest and a sustainable source of large woody debris 100 feet or more is recommended by the scientific literature and by many other local and state governments for the conifer and hardwood riparian forests that naturally occur in San Geronimo Valley.” The view taken by the SEP is consistent with similar studies throughout the country.

Current studies indicate that parcels that are in the 100-foot buffer along streams in the San Geronimo Valley have already lost a significant amount of riparian habitat and thus provide limited ecological functions necessary for coho salmon survival and recovery. In environments that have a patchwork of habitat, or refugia, stream systems are at risk of reaching a “tipping point” in terms of loss of habitat such that the stream no longer supports sustainable populations of salmonids and successful regeneration of fry.
2) In my opinion, further development in areas that have a patchwork of riparian habitat due to development within the 100-ft buffer along streams (areas without contiguous riparian buffer strips) can lead to cumulative impacts that can decimate salmonid populations.

The current Stream Conservation Ordinance does not consider cumulative impacts of areas that are in danger of reaching a critical tipping point for salmonid protection because the current ordinance does not require mitigation for 500 sq ft additions to existing structures, allows new development on 205 parcels in the San Geronimo Valley located inside the 100-ft streamside buffer area, and allows accessory structures (sheds) up to 120 sq. ft to be constructed without mitigation.

- The current draft ordinance, will allow 500 sq ft additions to existing structures. In just San Geronimo Valley, which currently has 955 developed parcels, this could result in 477,500 sq ft (955 x 500) of loss of current or potential riparian habitat.
- Further, the ordinance allows new development on 205 parcels in the San Geronimo Valley located inside the 100-ft streamside buffer area. Using the average home size in Marin, the structures alone would result in a loss of current or potential riparian habitat of over 1,000,000 square feet (205 x 2800 sq. ft). This figure is a conservative estimate, since it does NOT include all the additional lost habitat associated with building a home (driveways, walkways, patios, sheds, required defensible fire break space, etc.).
- This ordinance allows accessory structures (sheds) up to 120 sq. ft to be constructed without mitigation. Just in the San Geronimo Valley, these structures alone would result in the loss of current or potential riparian habitat of 139,200 square feet (1160 x 120). This also does not include the additional loss of habitat necessary for a required defensible fire break space around structures.

The SEP highlighted the threat of increase in impervious area. “Total impervious area (TIA) in the SCA ranges from 7.3% along the North Fork of San Geronimo Creek to 20.8% along Montezuma Creek in representative study reaches (ECR Section 3.3.1). This measurement of impervious area estimates the amount of riparian habitat that has been replaced by hard, impervious structures, such as buildings and driveways, and is an indicator of development impacts to riparian zone health and functioning. However, TIA underestimates the amount of riparian habitat lost because lawns, landscaping, vegetable gardens, and outbuildings are not included in the TIA analysis, yet they all can have significant impacts on the riparian zone.

A recent analysis was conducted by Marin County to supplement the ECR riparian vegetation survey with quantitative data on land use and cover within the SCA (ECR Appendix G). The study was limited to 29 parcels where landowners gave permission for access. The parcels included equestrian centers, the Marin Municipal Water District (MMWD) pump station, large residential and undeveloped property. Even in this sample of parcels with less development than typical in the San Geronimo SCA, 12% of the SCA area surveyed was covered with buildings,
disks, pools, driveways, and other impervious structures—above the 10% percent imperviousness associated with decline in stream habitat quality (Center for Watershed Protection 1998). Another 25% of the SCA area was in lawn, bare earth, and nonnative vegetation. The average riparian canopy width was 44 feet, and, in most cases, it ended abruptly with not even isolated riparian trees in the remaining width of the SCA, well below the proposed target of an 80-150 ft wide woody riparian zone with 75% cover."

3) In my opinion, the potential loss of habitat and increase in impervious area resulting from actions permitted by the draft ordinance are incompatible with the conservation objectives and will be detrimental to the long term survival of salmon within the watershed.

The mitigation required in the current draft SCA ordinance is inadequate to prevent additional loss of habitat for the following reasons:

1. Riparian vegetation is very narrowly defined in the ordinance so that it only includes species dependant on a high water table. According to the Stillwater Sciences Existing Conditions Report, most of the vegetation it identified as occurring in the riparian zone do not meet this narrow definition and thus will not require mitigation if it is removed. Two common species not protected for example, California bay laurel and redwood trees, both common in the SCA.

2. Mitigation is not required if it is determined the area is already disturbed. According to the Stillwater Sciences Existing Conditions Report, most of the 100 foot buffer area in the San Geronimo Valley meets this criterion, thus no mitigation will be required for new development, seriously impacting the already diminished functions that the existing patchwork of streamside buffers provide.

4) The ordinance is not protective of riparian buffers around ephemeral streams. The draft ordinance only provides for the 100-foot setback if 100 feet of riparian vegetation is present. Based on my experience, this will exempt a significant portion of ephemeral stream habitat which may have intermittent riparian habitat, yet still provide great benefits to salmonids. As such, this is inadequate for the continued protection of these listed species.

Ephemeral streams can be defined as those channels with a distinct stream bed and bank that carry water only for a short period of time during and briefly after storms (Roy et al 2009). That is, their channels lie above the water table and depend directly on precipitation rather than on snow melt, springs or other sources (U.S. Geological Survey). However, even when ephemeral streams do not have visible flow, they may continue to flow below the surface. This area (the hyporheic zone) between the stream channel and the alluvial groundwater is important to the physical, chemical, and biological integrity of the above-ground portion of the stream. A stream reach that lacks water at all times on the surface may continue to have a thriving hyporheic zone (Levick et al 2008).

Ephemeral streams perform similar ecological and hydrological functions as perennial streams
by moving water, nutrients and sediment throughout the watershed. They may carry juvenile salmonids when they flow, and can provide important temporary rearing habitat and refugia for juvenile salmonids (Reid & Zimmer 1994). Juvenile salmonids can move into ephemeral streams when they flow, releasing density dependence and stored nutrients, at the same time creating more rearing habitat. For example, 10% of juvenile coho salmon rearing in main channel of Carnation Creek during summer, moved into intermittent tributaries and ephemeral swamps in autumn 1983 (Brown & Hartman 1988).

Ephemeral streams play a key role in the ecology of their respective watersheds and in the growth and survival of juvenile salmonids.

- Ephemeral streams deliver nutrients, detrital material and invertebrates downstream to perennial salmonid rearing locations.
- They are sources of large woody debris — the critical rearing habitat for many juvenile salmonids.
- The biogeochemical functions of ephemeral streams include cycling of elements and compounds, removal of imported elements and compounds, particulate detention, and organic matter transport. These functions influence water quality, sediment deposition, nutrient availability, and biotic functions, all of which are affected directly and indirectly by land-use and land-cover change (Levick et al 2005).
- Stream energy dissipation is important for the prevention of channel erosion and increased sediment loads that can degrade water quality. High midwinter discharges in association with unstable debris can dislocate juvenile coho salmon overwintering in the main channel (Tschaplinski & Hartman 1983). By providing channel and stream bank roughness through standing or downed material, vegetation can influence flow velocities, flow depths, bank and flood plain erosion, and sediment transport and deposition, and can be a major factor contributing both to channel stability and to channel instability (e.g. Heede 1985). Vegetation along the stream bank stabilizes the soil through the reinforcing nature of their roots.
- Ephemeral stream vegetation also provides leaf litter, and food and cover for wildlife. In some cases, vegetation can intercept rainfall, preventing it from infiltrating into the soil, and influencing the local water balance and ecosystem processes (Owens et al. 2006, Miller 2005).
- The existence of off-channel winter habitat may reduce variation in coho salmon smolt production and reduce the effect of single catastrophic events such as debris torrents within the main channel (Brown & Hartman 1988).

Small stream and headwater habitats, including ephemeral streams, are vital parts of the biological integrity of U.S. waterways. The disturbance or loss of ephemeral streams has dramatic physical, biological, and chemical impacts, which are evident from the uplands to the riparian areas and stream courses of the watershed (Levick et al 2008).
In general, an increase in impermeable surface area and channelization can:

- lead to high discharges through ephemeral streams after storm events, which in turn can contribute to wash out juvenile salmon rearing in the mainstem (and may also erode suitable rearing habitat [and urban property] further downstream).
- alter channel characteristics (e.g., channel shape and depth) and organic matter input which can affect the ability of streams to cycle materials. Because small streams have high surface-area to volume ratios, they are often able to take up and process nutrients at higher rates than larger perennial streams (Pinay et al. 2002) and are important for maintaining downstream water quality.
- lead to increased sediment loading from loss of natural stabilizing riparian habitat along ephemeral stream banks which can lead to fish mortality, but also reduce habitat quality and availability of invertebrate food sources Clinnick (1985).
- lead to contamination from septic tanks and other sources of organic pollutants and heavy metals which can be transported downstream and into groundwater, and lead to eutrophication, presence of harmful pathogens, and massive fish die offs.
- Lead to loss of source areas for large woody debris which contributes to essential rearing habitat for juvenile salmonids along perennial reaches.

Riparian buffers are useful management tools to protect stream habitat from anthropogenic threats. Yet to be most effective, buffers must extend along all streams, including intermittent and ephemeral channels (Wenger & Fowler 2000). The effectiveness of a network of buffers is directly related to its extent; governments that do not apply buffers to certain classes of streams should be aware that such exemptions reduce benefits substantially (Wenger 1999).

In summary, I do not agree with the conclusions of the County that this ordinance will adequately protect salmonids in San Geronimo or in Marin County. The County must reconsider critical aspects of the ordinance to more adequately protect against the incremental loss of habitat from development in the stream conservation area. In my opinion, development without protection of remaining riparian areas could cause a decline in salmonid populations, particularly if it reduces the overall habitat in the watershed below the levels necessary for salmonids to survive. I am not aware that the County has considered the cumulative effects of the proposed ordinance.

Yours sincerely,

Carrie Monohan, Ph.D.
Adjunct Professor at Chico State
Department of Geologic and Environmental Sciences and
Science Director
The Sierra Fund
June 12, 2017

To: Marin County Planning Commission and Board of Supervisors

RE: 2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley (Draft SEIR)

My name is Carrie Monohan, I am a forest hydrologist with a PhD in Forest Resources and Hydrology. My dissertation was on riparian buffer function and habitat for salmon from the University of Washington as part of the Center for Streamside Studies. I completed my dissertation in 2004 and have 15 years of professional experience in the field of watershed hydrology and water quality, I am currently working as the Science Director for The Sierra Fund, a non-profit organization located in the Sierra Nevada mountains. I am also Adjunct Professor at Chico State University in the Geological and Environmental Science Department since 2010, and I am the currently the chair committee member for 6 master student theses that relate to watershed ecology, hydrology, and water quality. I have finished 13 masters students since 2010.

I have reviewed the Draft SEIR and, in my professional opinion, based on the information and analysis provided in the Draft SEIR it is not possible to reach a conclusion that the significant impacts identified in the Draft SEIR will be mitigated to “less than significant” for two principal reasons:

1. The Draft SEIR analysis of future development is incomplete and flawed in its failure to identify and fully analyze all the potential and cumulative impacts of the proposed allowable development in the 2007 Countywide Plan (CWF), and

2. The Draft SEIR relies on mitigating those significant impacts that it does identify and analyze to “less than significant” primarily through an Expanded Stream Conservation Area (SCA) Ordinance, which is only vaguely described by reference to broadly stated goals and a general description of provisions that are not tied to any specific standards necessary to address and mitigate specific significant impacts.
Introduction

Coho salmon and steelhead trout populations have experienced significant population declines in the Lagunitas Watershed approaching 90% resulting in listings under the Federal Endangered Species Act and the California Endangered Species Act. Dams built and operated by the Marin Municipal Water District on Lagunitas and Nicasio Creeks, Peter’s Dam and Seager Dam respectively, restrict the area of summer and winter habitat for salmonids in the watershed by 50%. The dams block access to important headwater streams where spawning and juvenile rearing occur. The San Geronimo Valley however, is the only undammed headwaters remaining, allowing for 20%-35% of total spawning and up to 33% of the rearing to occur. Therefore, the San Geronimo Valley and its network of perennial and ephemeral streams are critically important for the survival of endangered salmonids in the entire Lagunitas Creek Watershed. Additionally, the Lagunitas Creek Watershed supports up to 20% of the total population of wild Central California Coast (CCC) coho salmon, and is the southernmost wild persistent run of coho in the western hemisphere. Annual coho salmon spawning numbers in the Lagunitas Creek Watershed have dropped from thousands to hundreds, and in some recent years, the Marin Municipal Water District, National Park Service, and SPAWN have seen the numbers drop as low as 26 nests (called redds). The National Marine Fisheries Service has reaffirmed that the Central California Coast coho and steelhead populations are likely to become extinct in the foreseeable future unless current threats are mitigated.

While historical declines in the Lagunitas Creek Watershed can be tied to direct spawning and rearing habitat loss behind dams, the primary impact to survival and protection today results from continued impacts from residential and commercial development that include: loss of riparian habitat, riparian habitat degradation, channel incision, increased stream velocities from impervious surfaces, increased temperatures, increased pollution inputs and fine sediment delivery, and additional bank armoring and simplification of stream channels to protect structures. The SEIR states, “Studies in the Pacific Northwest have shown that coho salmon abundance is significantly lower in rural, urban, and agricultural areas, and areas with high road density, than in watersheds with fewer human land uses (Sharma and Hillborn 2001, Pess et al. 2002). Of 14 potential threats to coho salmon in the greater Lagunitas Creek watershed evaluated by NOAA Fisheries (2012), residential and commercial development was ranked “very high” – the highest ranking given to any threats identified for this population.

Coho salmon are currently considered critically endangered and declining, thus if Marin County is serious about stabilizing and recovering this endangered population, it must enact regulations of not only ensuring no additional threats from development, but actually embark on a program of reducing existing impacts, proposed by the NOAA Fisheries in the 2012 Final Recovery Plan for CCC Coho as “managed retreat.”

1. The cumulative impacts analysis in the Draft SEIR is incomplete and flawed in failing to consider all the potential impacts of the proposed allowable development in the 2007 CWP.

The Supplemental Environmental Impact Report (SEIR) required for the Marin Countywide Plan (CPW) attempts to document the threats that development within the stream conservation area (SCA, 100 ft buffer) has on native salmonids, but several omissions to the documented threats are concerning. Additionally, the impacts stated in section 5 of the SEIR are incomplete in terms of determining total and cumulative impacts the proposed mitigation measures.
In section 5.1 the SEIR does indicate that total impervious area (TIA) within 100 ft riparian zone already exceeds the 5% threshold in all reaches of San Geronimo Creeks, according to the 2009 SEP, particularly in subbasin reaches of Woodacre Creek exceeding 10% TIA. Yet, when determining proposed development the SEIR only measures reduction TIA to include houses, roads, and driveways, and fails to measure TIA that would also include lawns, patios, decks, gardens, sheds not requiring permits, grassy parking areas, vehicle staging areas, and the general areas surrounding homes. These areas must be considered as TIA since they are not riparian vegetation. Since most parcels are small, the majority of riparian habitat has been removed from most parcels and what remains are these surfaces, which are not included in the TIA estimate. These levels of unaccounted for TIA contribute to greater flow flashiness, channel incision, habitat simplification, and greater need for bank armor than what the Draft SEIR accounts for.

In addition, section 5 states that nearly 79% percent of parcels in conventionally-zoned districts would be largely exempt from the proposed mitigation protections, which would allow development within the SCA but provides no mechanism to ensure “no net loss” of habitat at these parcels, as required in the 2007 CWP, which I believe is necessary to ensure “less than significant impacts.” Section 5 also states that effects of increased development and TIA would have unknown effects on the winter survival of steelhead, despite the understanding that steelhead spawn and rear in the same reaches as coho in the San Geronimo Creek and subbasins (SPAWN 2014, Ettlinger et al 2015), and therefore would also be subject to the same hydrologic and riparian conditions as coho during these life stages.

In section 5.2, the SEIR determined that impacts to spawning success of coho, steelhead, and Chinook would be “potentially significant”, which I believe is underestimating the impact given that the SEIR also states that “approximately 32% of [spawning gravels in San Geronimo Creek] currently exceeds the targets of <25% gravel embeddedness recommended in the [SEP]”. Additionally, since 25%-35% of the salmonid spawning occurs in the San Geronimo Valley and its tributaries, any increase in fine sediment delivery that would increase the riffle embeddedness above the current 32% would certainly be detrimental to spawning success. Since the Lagunitas Creek Watershed is listed as impaired for fine sediment delivery under the Lagunitas Creek Sediment Total Maximum Daily Load (TMDL), any increase in fine sediment delivery from development would be in direct conflict with the ruling of the TMDL and would be in violation of the RWQCB authority to regulate fine sediment delivery in the watershed. Therefore any increase in fine sediment delivery will likely be detrimental and significant, and I believe the SEIR determination that continued sediment delivery will be “potentially significant” is grossly inadequate.

In section 5.2-1, the mitigation measures proposed for the control of fine sediment delivery to creeks are vague and arbitrary. For example, the SEIR states, to “Achieve and maintain the target for road-related sediment delivery to channels by ≤350 cubic yards per mile per 20-year period”. Despite this proposed mitigation measure intends to limit fine sediment delivery, this measure contrasts with the Lagunitas Creek Sediment Total Maximum Daily Load (TMDL) Implementation Plan administered by the San Francisco Regional Water Quality Control Board (RWQC). The TMDL identifies fine sediment delivery from development in the San Geronimo Valley alone to be equal to 11,500 metric tons per year and targets a minimum of 50% reduction of the fine sediment delivery from these sources annually. The TMDL implementation plan calls for a reduction of 6,100 metric tons of sediment from San Geronimo Creek and its tributaries annually. The TMDL has identified sediment sources from development to include roads, bank erosion and channel incision. Therefore, the TMDL calls for an annual reduction in 6,100 metric...
tons of sediment annually from San Geronimo Creek Watershed, yet the SEIR calls for a reduction of just ≤350 cubic yards per mile per 20-year period, which falls far below the sediment reduction targets in the TMDL and is inadequate and seemingly arbitrary.

In section 5.3 regarding the reduced summer rearing habitat, the SEIR states that summer rearing habitat is “not considered to be limiting the production of coho salmon or steelhead in the watershed”, despite that it goes on to say that “degraded summer habitat contributes to overall adverse conditions for juvenile coho salmon and steelhead in the San Geronimo Creek watershed and may reduce summer rearing success”. Furthermore, the SEIR states that under degraded summer habitat conditions “carrying capacity is reduced, fish growth may be reduced or cease, and fish become more susceptible to predation, competition, and physiological stressors”. Additionally, summer rearing habitat is likely affected by warm water temperatures and decreased dissolved oxygen. The SEIR states that “In San Geronimo Creek, dissolved oxygen levels do not consistently meet the generally accepted requirement of 7 mg/L for salmonid rearing (and spawning) habitats and water temperature does not meet the target of <15°C (M1WAT) in all locations.”

The Draft SEIR states in section 3.6 regarding summer habitat that “water temperature and dissolved oxygen which the water quality parameters previously identified as most likely to limit salmonid populations in San Geronimo Creek and most likely to be affected by the Proposed Project.”. This statement is in conflict with the assumptions presented in the impacts analysis of section 3.5, that downplays the significance of degraded summer habitat on the salmonid populations. Despite the conflict, this water quality analysis excludes other parameters that can have significant adverse effects on water quality and adversely limit salmonid populations, even if not the “most likely.” Such parameters include items that are commonly associated with increasing urbanization of rural areas, including oil, vehicle fluids, and other toxins from roadway runoff, pesticides and herbicides, and elevated nitrate levels from sewage which are currently documented in San Geronimo Creek and part of the water quality baseline (See Draft SEIR at 3-15). These additional stressors on water quality must also be considered in the water quality analysis of the effects from implementation of the 2007 CWP.

Additionally, the SEIR states that the 36 “groundwater wells in the SCA are likely to affect creek flow and salmonid habitat under existing conditions, particularly during summer low-flow periods, additional information would be required to ascertain the hydrologic and biological effects of groundwater pumping”. Despite this lack of understanding that the groundwater pumping would have of summer and winter habitat for salmonids and the associated effects on water quality, the SEIR assumes that planned development increases are “unlikely to have adverse impacts on the ability of juvenile salmonids to successfully rear and grow...[and] would have a less than significant cumulative impact”.

This finding underestimates the impact that increased development would have on summer rearing habitat given that water temperatures and dissolved oxygen already consistently do not meet targets for salmonid viability and that impacts from groundwater pumping from wells within the SCA are currently not understood but are “likely to affect creek flow and salmonid habitat under existing conditions, particularly during summer low-flow periods”. This finding that summer rearing habitat will see a “less than significant impact” from increased development, despite the known existing water quality impacts on salmonids and the unknown effects of groundwater withdrawal on the ecosystem, is inaccurate and lacks evidence of existing impacts and ignores groundwater as a significant driver of summer habitat conditions.
In section 2.4.1 of the Draft SEIR, Natural Systems and Agriculture Element, the SEIR states “The Environmental Hazards, Atmosphere and Climate, Open Space, and Agriculture and Food topics of the Marin CWP (2007) are not considered further in this document.”

This is a serious and concerning flaw in determining the impacts of continued development in the San Geronimo Valley. Specifically regarding the impacts to Natural Systems, the SEIR does not evaluate the effects of increased development on riparian ecosystems, increased toxins and sewage pollution, risk of wildfires, and impacts of domestic animals, invasive species, and climate change on native salmonids or overall natural systems.

A) Riparian Ecosystems

The SEIR fails to adequately describe current riparian conditions and what impacts additional loss of riparian habitat will be to endangered salmonids. Destruction and alteration of riparian habitat is likely the most serious impact development will have on salmonids in the San Geronimo Valley.

The SEIR states, “Data summarized by Bittinger et al. (2013) from 1998, 2003, 2006, and 2011 indicate a decline in vegetation covering the stream banks (bank cover) from 1998 to 2006, followed by an increase from 2006 (53% bank cover) to 2011 (> 70% bank cover).” Yet, these data are only for the mainstem of SG Creek, and provides no data on the majority of stream lengths within the San Geronimo Valley, including the many tributary streams where 25-35% of total annual coho spawning occurs. These tributary streams also provide the majority of current and future development parcels and thus are likely to have significantly less vegetation cover than what is reported for the main stem of San Geronimo Creek.

The SOV Existing Conditions report, which these data are derived from says, “General trends in dominant bank vegetation, percent of bank vegetated, percent total canopy, and percent deciduous and evergreen trees are apparent from 1998, 2003, and 2006 data, including a consistent dominance of deciduous trees and shrubs along the banks, and an overall decline in bank cover from 75% in 1998 to 53% in 2006 (Bittinger 2008).”

While the SEIR suggests an improvement, the original report suggests a decline, and even when the new data are considered through 2011 (“followed by an increase from 2006 (53% bank cover) to 2011 (> 70% bank cover),” it still remains below the 75% level recorded recorded in 1998.

More importantly, these data only measure vegetation that directly covers (shades) the stream bank, but fails to indicate the width, species composition, health and function of that riparian zone. While shade is important, this is one only one function of riparian habitat that is critical to salmonid survival and recovery.

I agree with the findings of Marin County’s San Geronimo Valley Salmon Enhancement Plan (SEP) (2009) which states the importance of a streamside riparian buffer as, “a dense riparian forest strip adjacent to the stream that transitions to shrubs and herbaceous vegetation is a vital feature in most, but not all, riparian zones. Intact riparian zones provide filtration of sediment and other pollutants, streambank stabilization, shade for temperature regulation, shelter, and food sources for a range of fauna. Riparian zones also hold water in winter to recharge in-stream
flows in summer months. Another important function of the riparian zone in salmon-bearing streams such as San Geronimo is delivery of both large and small downed wood. Large woody debris (LWD) is essential in these stream systems to create pools, trap coarse sediment, generate channel complexity, and provide shelter from high velocities and predators. Without significant amounts of LWD, channel beds become simplified and unstable, prone to incision. Small wood also provides intricate shelter components during summer low-flow conditions, and its incorporation into large-wood structures improves their functioning during high flow events.

The SEP states, “The riparian zone is an area adjacent to the stream that supports or has the potential to support plant and animal species adapted to living near water. The riparian zone provides important ecological services including filtration and storage of water, temperature control, wood production, and wildlife refugia habitat. It can encompass homes and other infrastructure.

A riparian corridor is the linear extent of intact riparian habitat, often providing linkage between other distinct habitat patches.

A riparian buffer is an undisturbed area immediately adjacent to a stream. Its purpose is to protect the stream from human land uses, and human infrastructure from erosion and flooding.”

The SEIR fails to specifically define the terms of riparian zone, riparian corridor, and riparian buffer.

The SEIR fails to document current conditions of riparian habitat within the SCA- including the amount of riparian buffer remaining; the health and function of what remains; the amount destroyed by previous development and other activities such as parking and vehicle staging; the level of habitat fragmentation that prevents self-sustaining recruitment; the amount of vegetation removed for fire protection; and the presence of forest disease and pests such as sudden oak death (SOD).

The SEIR also fails to analyze the amount of riparian vegetation within the SCA lost through current lack of adequate tree ordinance; the amount lost through current lack of adequate vegetation ordinance; the impact of riparian habitat loss to food resources for salmonids and other wildlife; the function of existing riparian zone to mitigate for impaired water quality; the economic value of functional riparian zone to mitigate for impaired water quality; and the impact of change in riparian species composition.

B) Toxins and Sewage

The SEIR fails to address current sources from road runoff, pharmaceuticals in wastewater, and pesticide use associated with development, nor does it account for anticipated levels of these toxins with increases in development and the effects on salmonids or natural systems.

An increase in development will necessarily result in increased stream pollution. Sewage disposal for all housing and businesses the San Geronimo Valley utilize septic systems. This sewage disposal technology does not remove pharmaceuticals from wastewater and this is a known impact to salmon species and aquatic invertebrates, yet no specific mitigation for this hazard is provided. Road run-off from increased automobile trips associated with increased
housing will increase these known vehicle toxins to salmonids. No specific mitigation for these hazards is provided.

The San Geronimo Valley Existing Conditions report states in sect. 3.5.5 “Although a number of metal species have been measured in San Geronimo Creek and a few of its major tributaries (Table 3-8), none were measured at water column concentrations of concern (Piovarcisk and Andrew 2008, SFBRWQCB 2007, TBWC 2006). However, sediment concentrations in San Geronimo Creek were high for chromium and nickel (> probable effects concentration [PEC], as well as arsenic, copper, and mercury (> threshold effects concentrations [TECs]) (Table 3-9). The observed sediment metals concentrations were high enough to support possible acute toxicity to infaunal invertebrates (SFBRWQCB 2007, MacDonald et al. 2000). Additionally, tissues of clams deployed near the Creamery Creek confluence with mainstem San Geronimo (referred to as Creamery Gulch in SFBRWQCB [2007]) as part of the toxicity testing were among the highest mercury concentrations measured anywhere in the Bay Area at 0.03 ug/g. Copper concentrations were also high at 7.68 ug/g. While the tissue results reflect elevated sediment chemistry measurements, the bioavailability and toxicity of sediment metals to salmonids and other local biota is currently uncertain in the San Geronimo Creek watershed. The observed concentrations may be more representative of increased erosion in the watershed than of anthropogenic sources of toxicants (SFBRWQCB 2007), and assessing fish tissue levels would be required to determine possible health effects.” Despite this knowledge of heavy metals and carcinogens found in the San Geronimo Creek watershed, the SEIR fails to address the impacts that development will have on the water quality toxicity, and programs and actions necessary to affectively mitigate as for these toxins.

C) Wildfire

The SEIR fails to address impacts that additional development would have on the threat to wildfires or the risk that wildfires have on the salmonid populations and natural systems. Specifically, the risk to wildfires needs to be address regarding changes to riparian vegetation, forest cover, and flammable infrastructure associated with increases in development. The risk of wildfire should be evaluated with increases in development and the level of wildfire severity and intensity should be explored regarding the impact of fire on salmonid habitat and viability. The SEIR makes no mention of the impact development will have on wildfire or the risk that wildfire will have on salmonids or natural systems. The SEIR should provide adequate mitigations measures for wildfire and provide measurable targets and objectives to meet those requirements.

D) Invasive Species

Disturbance caused by development provides a fertile environment for invasive species which are often introduced by new residents who want to bring a part of their past with them.

The SEIR fails to consider increases in terrestrial and aquatic invasive species associated with development. An increase in non-native vegetation, gardens, weeds, and invasive plant species negatively affects the function of riparian habitats that support salmonids. The impact of invasive plant species associated with increased development needs to be evaluated and addressed regarding the impact to native salmonids and natural systems.
The presence of aquatic invasive species that persist in San Geronimo Creek such as largemouth bass and bluegill, known predators of salmonids, and likely competitors for resources with salmonids also thrive in modified and simplified habitats that development brings.

Protective measures and programs need to be developed in order to adequately mitigate for the impacts that increased invasive species have on salmonid populations and natural systems.

E) Climate Change

The SEIR fails to address the anticipated impacts of climate change, including increased number and severity of storm events. While the degraded and already destroyed winter habitat is identified as a likely significant impact in the SEIR, this report fails to evaluate scientifically accepted climate change models that predict an increased storm magnitude and frequency, increased frequency of drought, and increases in water temperature, the SEIR fails to address the impacts that climate change will have on salmonids when considering additional development. These will impact both summer and winter habitat.

While the SEIR documents many threats to coho and steelhead survival and recovery with several important omissions however, it fails to show how the proposed mitigations reduce these impacts to less than significant levels. The SEIR recommends a riparian streamside protection ordinance as mitigation for development within the SCA, but fails to provide specific details on the proposed ordinance.

2. It is not possible to reach a conclusion of impacts being mitigated to “less than significant” based on the enactment of a proposed Expanded SCA Ordinance that is vaguely described by reference to broadly stated goals and a general description of provisions that are not tied to any standards necessary to address and mitigate specific significant impacts.

The SEIR states, under Goal Bio-4, that riparian conservation is one of the most important for protection of salmonid habitat. The 2009 Marin County Salmon Enhancement Plan states, “a riparian corridor is the linear extent of intact riparian habitat, often providing linkage between other distinct habitat patches. A riparian buffer is an undisturbed area immediately adjacent to a stream. Its purpose is to protect the stream from human land uses, and human infrastructure from erosion and flooding.” Goal Bio-4 in the SEIR includes policies that define the SCA, including a development setback of at least 100 ft from the top of the bank in the inland rural corridor (including San Geronimo Valley) with certain exceptions, including driveways if no other location is feasible, utility crossings, and the repair or retrofit of existing permitted or legal non-conforming structures or improvements within the existing footprint”. The Goal Bio-4 states that "exceptions may be allowed if the parcel falls entirely within the SCA, or development outside SCA is either infeasible or would have greater impacts, provided that development does not adversely alter hydraulic capacity; cause a net loss in habitat acreage, value, or function; or degrade water quality”.

The SEIR states that “the science-based goal is “100 feet or more, depending on location,” though it sets a “target of 35 feet.” Despite the language in the 2009 SEP discussing the
importance of riparian buffers and the vague goals for mitigation, the current mitigations of an SCA development ordinance described in the SEIR fail to note how the “target” goal will be implemented. Despite the language in the SEIR that states general policy goals, the SEIR does not include methods for how the goals and targets will be met, evaluated, measured, enforced, and maintained. In my opinion these mitigations, most of which are aspirational and vague, do not provide measurable standards to adequately determine if they can mitigate for the increases in development allowed under the plan.

It is completely possible that an Expanded SCA Ordinance could “mitigate impacts of future development”, but that would completely depend on the specific provisions of that ordinance, of which the specific provisions are not included in the Draft SEIR. The necessity for a mitigation measure with specific provisions and standards to address specific significant impacts is illustrated by similar ordinances proposed by the County of Marin in the past which have failed to be enacted, or have included so many exceptions and exemptions to have “swallowed the rule” or, in the case of the current tree ordinance, to have failed to adequately protect the riparian zone. Because of the exceptions and exemptions, the past proposed ordinances would be ineffective at protecting stream habitat and dependent endangered species.

In summary, it is my professional opinion that, based on the information and analysis provided in the Draft SEIR, it is not possible to reach a conclusion that the significant impacts identified in the Draft SEIR will be mitigated to “less than significant” for two principal reasons:

1. The Draft SEIR analysis of future development is incomplete and flawed in its failure to identify and fully analyze all the potential cumulative impacts of the proposed allowable development in the 2007 CWP; and

2. The Draft SEIR relies on mitigating those significant impacts that it does identify and analyze to “less than significant” primarily through the enactment of an Expanded SCA Ordinance that is vaguely described by reference to broadly stated goals and a general description of provisions that are not tied to any specific standards necessary to address and mitigate specific significant impacts.

Sincerely,

[Signature]

Crris Mrofkan, PhD.

Date: 6/13/17
May 1, 2017
CIWQS Place Number: 782305

Marin County Community Development Agency
Attention: Ms. Rachel Reid, Environmental Planning Manager
3501 Civic Center Drive, Suite 308
San Rafael, CA 94903

Subject: Comments on Notice of Preparation for Woodacre / San Geronimo Flats Wastewater Recycling Project Environmental Impact Report

Dear Ms. Reid:

The Regional Water Board has reviewed the Notice of Preparation circulated by Marin County for the subject Environmental Impact Report (EIR), and offers the below comments.

Generally, the project is to provide community-scale wastewater service, to replace existing individual Onsite Wastewater Treatment Systems (OWTS) that are currently serving the individual homes in the community. The NOP states that many of these onsite system are old, failing, or not operating at current standards for wastewater treatment and disposal, and that the propose wastewater recycling system will include abandonment of these substandard septic systems. The NOP states that the project area encompasses approximately 360 developed properties.

1. Setting and Scope of Project.

The EIR needs to clearly describe which wastewater systems and properties are part of the planned constructed project and which are not. The use of the term ‘project area’ is unclear. Water Board understanding is that there are on the order of 600 or more developed properties in the watershed area of the proposed project. The NOP indicates the project will encompass 360 developed parcels. This appears to leave some existing OWTS unserved by the proposed project. The EIR also needs to clearly describe what measures will be taken to address inadequate OWTS in the area that will not be served by the project.
2. System Reliability.

For all Alternatives:
System reliability consists of many elements: adequate siting and design of treatment facilities; proper construction; malfunction alarms; operations and maintenance (O&M), and monitoring. Adequate design includes system redundancy so that system elements can be taken off-line for maintenance and repair as needed. These elements should be considered for each alternative and in alternative costs.

For Tertiary Treatment with Spray Irrigation alternative:
The County needs to create a program to ensure adequate O&M (programmatic framework, staffing, and financing). The O&M of a pressured collection system and a tertiary treatment system that includes disinfection, solids handling, and spray irrigation for disposal, will require a significant O&M program including: financing for short- and long-term maintenance; 24-hour telemetry alarms and alarm responders (staff); and monitoring. At this time, the County does not appear to have a program, staffing, or financing to support such a program. The County can contract with certified operators or companies that provide such services; however, they must provide oversight of these services and they will maintain liability for proper O&M. These elements must be planned for and financed and should be included in an EIR evaluation. O&M will require system operation by a certified operator, incorporating routine inspections of the collection, treatment, disinfection and spray irrigation system. System influent and effluent monitoring will be required routinely through State Water Board or Regional Water Board permitting programs. A system incorporating disinfection and spray disposal in locations of potential public contact and in close proximity to San Geronimo Creek (creek), a critical stream for endangered coho, freshwater shrimp, and threatened steelhead, will require significantly more oversight and management than the system at Marshall, which discharges to a leach field.

3. Permits.
It is unclear at this time what permits will apply to the regulation of the proposed alternatives. However, due to the potential for significant impacts to the creek of a community wastewater system, the Regional Water Board will consider all permitting options for these proposed systems, including Waste Discharge Requirements. The EIR should note the requirement to obtain appropriate approvals from the Water Board, potentially including Waste Discharge Requirements, as part of the project.

Aside from the OWTS to be served by the proposed project, there are many other OWTS in the area. The Water Board has concerns about the adequacy and proper operation and management of all OWTS in the vicinity. Sewering for all may not be appropriate. However, some form of area-wide management for all OWTS is appropriate. Options to encompass all OWTS in the watershed or subsections should be discussed. The alternatives do not appear to include a mixture of combined alternatives, each designed to be most appropriate for the sub-watershed. For instance, could there be an overall watershed-wide solution incorporating a combination of the following practices: individual leachfield repair, community leachfield(s), and tertiary treatment?
Specific Concerns for the tertiary wastewater treatment and disposal system include:

A. Location of pressurized collection system and treatment system: The systems are located close to the creek in many locations. This leads to higher risk of impact to the creek if there is a failure in the system. Alternative locations should be considered.

B. Storage:
   Storage of untreated wastewater: The adequacy of the size of the untreated wastewater storage system and its location should be evaluated to ensure there will be no discharges of untreated wastewater in violation of Discharge Prohibitions in the San Francisco Bay Basin Water Quality Control Plan.

   Storage of tertiary treated wastewater in ponds: Storage must be provided during all times that spray irrigation cannot occur. During rainy years, this constitutes the majority of the rainy season. In addition to evaluating storage capacity for the 100-year rainfall event, the storage needed for a rainy season such as the 2016-2017 rainy season, should be evaluated. This would include the storage needed for multiple rain events with no spray irrigation between events due to ground saturation. Discharges of untreated or treated sewage to the creek or hydraulically connected waterbodies to the creek, would be considered a violation of permit conditions (WDR or Reclamation permits).

   Depth to groundwater: Groundwater depth and impacts on pond location and storage capacity must be adequately considered. The high ground table throughout the watershed is a significant factor in septic system failure and could profoundly affect storage system performance. Depth to groundwater should be identified as soon as possible to capture the groundwater table depth during this 2016-2017 rainy season. Its impact on storage pond performance should be evaluated.

   Flood protection: Ponds must be designed to maintain structural integrity and not be overtopped by creek or tributary floods.

C. Treatment: System must be sited and designed to reliably treat the assigned wastewater flows and provide redundancy for routine and non-routine O&M. The reliability of any proposed disinfection system must be closely evaluated to ensure that there are no public health or environmental impacts. In the event chlorine disinfection is used, all aspects of chlorination (e.g., chlorine storage, the application system, and dechlorination) will require close evaluation to ensure no chlorine is discharged to waterways.

D. Wastewater disposal:
   a. Spray Irrigation: Wastewater spray irrigation systems are not permitted to discharge treated wastewater to waters of the State. Preventing such a discharge to the creek and its tributaries may present a significant challenge due to the extensive drainage network running throughout the golf course. Preventing the discharge of treated wastewater to the tributaries and creek is essential to protect the health of endangered and threatened aquatic species and creek water quality. In addition to the previously mentioned endangered and threatened coho, steelhead and freshwater shrimp, California red-legged frog may also be present on the golf course property. The EIR should evaluate and identify measures that will prevent discharge of treated wastewater.
wastewater to the creek and its tributary channels, including golf course drainage channels.

b. **Existing Leachfields:** Potential use of French Ranch or other existing large leachfield system during winter: there may be numerous issues related to use of these systems for winter wastewater application. The EIR should carefully evaluate the necessary details, including, but not limited to, depth to groundwater, loading rates, etc. to ensure there are no impacts to groundwater or surface water.

If you have any questions or comments about this matter, please contact Blair Allen, Water Resource Control Engineer, via email to Blair.Allen@waterboards.ca.gov or at (510) 622-2305.

Sincerely,

Digitally signed by
Keith H. Lichten,
Division Chief
Date: 2017.05.01
19:26:12 -07'00'

Keith H. Lichten, Chief
Watershed Management Division
15a Comment noted.

15b Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15c Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15d Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15e Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15f Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15g Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15h Please refer to Master Response 6.

15i Please refer to Master Response 3 and Master Response 6.3.

15j The expanded SCA Ordinance proposed as part of Mitigation Measure 5.1-1 includes a provision for enacting consistent permit and site assessment requirements for development in planned zoning districts and conventional zoning districts, thus eliminating current exemptions for development in conventional zoning districts. Additionally, Mitigation Measure 5.1-1 has been clarified and amplified from the Draft SEIR to indicate allowable exemptions and exceptions in this Final SEIR (see Master Response 6). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. The impacts of future development, including any remaining exemptions or exclusions after enactment of the expanded SCA Ordinance, are included in the SEIR’s impact analysis.

15k We acknowledge the adverse impacts on adult salmonids, including coho salmon, from highly concentrated toxins in highway runoff and other sources in highly urbanized watersheds such as those draining to Puget Sound (e.g., Scholz et al. 2011, Spromberg and Scholz 2011) but we note that the levels of urbanization and road use intensity associated with water quality impairment and coho salmon mortality in these areas far exceed current levels in the San Geronimo Valley and levels that can be reasonably expected under the Proposed Project or any future development scenario. A related laboratory study found that a mixture of metals and petroleum hydrocarbons intended to mimic
polluted urban stormwater runoff resulted in no discernable adverse effects on coho salmon spawners (Spromberg et al. 2016), suggesting that additional substances or combinations of substances found in undiluted runoff from an intensely used interstate highway but not in the lab-tested mixture are responsible for the observed coho salmon mortality. While high concentrations of pharmaceuticals and other personal care products have been found in juvenile salmon collected from urbanized estuaries (Meador et al. 2016), available information is insufficient to determine whether these contaminants have adverse effects on salmon. Despite evidence that the synergistic effects of common pesticides can cause neurotoxicity in salmon (Laetz et al. 2009), Scholz et al. (2011) determined that common pesticides were not responsible for observed mortality of coho salmon spawners in urbanized Puget Sound watersheds. The Draft SEIR has been updated at Section 3.4 to include additional water quality data available for the San Geronimo Valley in this Final SEIR. The additional data do not change the analysis approach or any significance determinations. Note that existing information does not include data on toxins in road runoff, pharmaceuticals in wastewater, or pesticides. The SEIR has also been updated at Section 5.1 to discuss the potential for adverse impacts on salmonids related to these water quality constituents and clarify the impact analysis approach. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

We agree with the potential for adverse effects on salmonids related to wildland fire control activities, including the use of flame retardant chemicals. However, we find no basis to conclude that future development would contribute to increased risk of wildland fire or adverse impacts on salmonids and their habitat. The original Marin
CWP (2007) EIR analyzed risk of wildland fire hazard and determined that the policies and requirements of the Marin CWP (2007) would reduce exposure of people and structures to loss, injury, or death from wildland fire hazard. This reduced risk would result from reduced likelihood of wildland fire spreading from structure fires and vice versa. With the improved policies and requirements in the Marin CWP (2007), it is likely that the risk of wildland fire and any associated salmonid impacts would be reduced under the Proposed Project. This impact is therefore not analyzed in the SEIR.

15n Please refer to Master Response 11.

15o Climate change and its likely effects on salmonids and their habitat is one of the impact mechanisms described in the SEIR and considered in the analysis of cumulative impacts.

15p Please refer to Individual Response 5k.

15q Please refer to Master Response 4.

15r Please refer to Master Response 4.

15s Please refer to Master Response 4.

15t Please refer to Master Response 5.

15u The SEIR uses several metrics to characterize existing conditions as well as future development under the Proposed Project, where the metrics were selected based upon available data and potential relationship to habitat conditions for salmonids (see Section 2.6). The metrics used in the SEIR are neither speculative nor inappropriate. Please refer to Master Response 4.

15v The impact analysis describes the potential salmonid habitat impacts for specific sub-basins and reaches, based on the level of likely future development and the importance of these areas for salmonid ecology and their relative vulnerability due to existing and likely future stressors.

15w Unregulated pumping from creeks in the Lagunitas Creek watershed is not part of the Proposed Project and its future occurrence in the San Geronimo Creek watershed cannot be predicted without undue speculation. As such, this impact has not been analyzed in the SEIR. Please also refer to Master Response 5.

15x As stated in a footnote to Table 2-14 (previously Table 2-12), the assignment of additional improved units relative to the SCA under the Proposed Project follows that of improved parcels (i.e., if the improved parcel is completely within the SCA, then the improved unit would be
completely within the SCA; if the improved parcel is partially within the SCA, then the improved unit would be partially within the SCA).

15y The potential impacts related to future development within the SCA under the Proposed Project are analyzed in Section 5. The descriptions of likely future development in Section 2.6 do not provide an analysis of environmental impacts. Please also refer to Master Response 4.1.

15z The SEIR’s impact analysis considers and describes the potential effects of development of new parcels and units not subject to design or other discretionary review. Please also refer to Master Response 6 for clarifications and amplifications to Mitigation Measure 5.1-1 in the Final SEIR.

15aa We agree with the commenter’s assessment that coho salmon in the Lagunitas Creek watershed, including those in San Geronimo Creek, are at risk of extinction. The description of anadromous salmonid populations in the SEIR is based on the most recent available data. The information presented in the SEIR is technically accurate and appropriately characterizes the population’s legal designation, abundance, trends, and other characteristics.

15ab Pursuant to CEQA, the County is required to minimize or mitigate any significant impacts that would occur in the future as a result of the Proposed Project, in order to render the impacts less than significant. The County’s responsibilities as part of the SEIR for the Proposed Project do not include mitigating or otherwise compensating for past impacts. As a cumulative impact analysis, the analysis is based on the potential impacts to salmonids and their habitat of future development in the San Geronimo Creek watershed, in combination with the impacts that have resulted or could result from other past, present, and reasonably foreseeable future influences on these species and their habitat. Please refer to Master Response 2.

15ac The analysis in the SEIR (e.g., Potential Impact 5.3) considers the impacts of loss or degradation of riparian function associated with development in the SCA, including potential effects on stream water temperature.

15ad The Draft SEIR has been updated at Section 3.4 to clarify and provide additional detail on the 303(d) listing of the Lagunitas Creek watershed, and to provide additional baseline water quality data in this Final SEIR. The additional data do not change the analysis approach or any significance determinations. Existing fine sediment impairment
and the potential for Project-related impacts on salmonid habitat related to sediment are important aspects of the SEIR impact analysis, and measures have been proposed to mitigate the potential impacts. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

15ae The SEIR has been modified at Section 3.4 to include additional information on coliform, nutrients, metals, and other water quality contaminants in San Geronimo Creek, referencing the 303(d) listings for several of these constituents in the Lagunitas Creek watershed. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Although elevated fecal coliform levels have been documented in San Geronimo Creek, high coliform levels are not expected to directly affect salmonids, and there is no conclusive evidence in the scientific literature linking elevated levels of coliform bacteria to the diversity or abundance of benthic macroinvertebrates, including those that serve as food for juvenile salmonids (Mulders 2015) (see also Final SEIR Sections 3.4.7 and 3.6.3). Further, there is no evidence that salmonid food (BMI) availability in San Geronimo Creek is limiting (i.e., low salmonid growth), and thus no basis for presuming an existing or future adverse impact on salmonids. Despite evidence of reduced BMI diversity and biomass in Woodacre Creek and the mainstem near the water treatment plant, which could result in reduced salmonid food availability in these locations, Ettlinger et al. (2015b) notes that winter growth of juveniles in San Geronimo Creek and Devil's Gulch is typically higher than in mainstem Lagunitas Creek which suggests adequate food to support good salmonid growth in the watershed.

15af Please refer to Individual Response 15k, above regarding potential salmonid impacts related to water quality impairment from storm runoff, pharmaceuticals, and pesticides. Regarding nutrients such as nitrate, potential effects on salmonids are either undocumented in the San Geronimo Creek watershed (increased algal growth) or addressed separately (reduced dissolved oxygen levels) in the SEIR.

15ag The Draft SEIR accurately characterized the available data and trends in riparian vegetation along San Geronimo Creek. Riparian vegetation trend data are not available for tributaries of San Geronimo Creek. The Draft SEIR has been updated to include riparian vegetation data collected in 2016, which show that the increased riparian tree canopy
coverage observed in San Geronimo Creek from 2003 to 2011 remained relatively unchanged from 2011 to 2016 (Ettlinger 2017). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. A similar pattern is seen in the data for stream bank coverage by all vegetation types, with very little change from 2011 to 2016 in the bank vegetation coverage.

15ah We agree that the width of the riparian forest and its function as a source of future LWD recruitment are important aspects of the riparian zone. While data on the width of the riparian zone are not available, data on the number and density of large riparian trees that would provide LWD recruitment were collected in 2008 (Stillwater Sciences 2009c) and are summarized in the SEIR. Mitigation measures in the SEIR do not seek to attain targets for riparian zone width, but rather to protect and enhance riparian and floodplain function by other means.

15ai The SEIR summarizes the best and most recent available data on riparian vegetation along San Geronimo Creek and its tributaries and evaluates potential changes to existing conditions and riparian function that could result from implementation of the Proposed Project. The SEIR references established targets for riparian function (Table 3-4 of the Final SEIR; previously Table 3-3 of the Draft SEIR) and elements of the Marin CWP (2007) designed to protect riparian forest structure, composition, and function, and proposes mitigation measures to avoid, minimize, or compensate for impacts to these characteristics and functions.

15aj A projection of the types and extent of riparian vegetation affected by future development and associated activities is not possible given the uncertainty regarding the exact location, size, and characteristics of future development that could occur within the SCA and the specific effects that development would have on vegetation coverage.

15ak While the commenter is correct that TIA only measures impervious surfaces such as roads, driveways, and houses, the SEIR includes mitigation measures to avoid significant adverse impacts to watershed processes and riparian functions or minimize them to a less-than-significant level. The SEIR concludes that with mitigation future development under the Proposed Project would not make a considerable contribution to the existing adverse impacts on anadromous salmonids in the San Geronimo Valley.
15ai The SEIR’s impact analysis considers the potential effects on anadromous salmonids and their habitat that could result from implementation of the Proposed Project, including effects on riparian vegetation and riparian function. The analysis considers the Marin CWP (2007)’s protections for riparian vegetation, which include policies under goals BIO-1 (e.g., BIO-1.3, Protect Woodlands, Forests, and Tree Resources), BIO-2 (e.g., BIO-2.2, Limit Development Impacts), and BIO-4 (e.g., BIO-4.7, Protect Riparian Vegetation). These policies which would protect large native trees and forest (including riparian) habitat, restrict or modify proposed development in riparian areas, and retain riparian vegetation to protect riparian functions.

15am See Individual Response 15ai, above.
15an  The SEIR does not analyze economic costs associated with changes in biological services. In keeping with State CEQA Guidelines, Section 15163 for supplemental EIRs, and the Court’s opinion, the SEIR contains only the information necessary to make the previous EIR adequate for the Project as revised (i.e., an analysis of potential cumulative impacts on anadromous salmonids in the San Geronimo Valley and measures to adequately mitigate significant impacts).

15ao  The characterization of existing conditions regarding fish passage barriers and spawning activity in each subbasin reflects the best and most recent available information and is not meant to downplay the ecological importance of any area for salmonids. Contrary to the assertion in the comment, the Woodacre Creek subbasin is identified in the SEIR (Section 5.2) as among the locations in which salmonid spawning and rearing are concentrated (Section 3.6.1) and future development and/or its effects on hydrologic and other watershed processes would be greatest (Section 2.6.3)."

15ap  Comment noted.

15aq  The SEIR is a programmatic analysis of future development under the Marin CWP (2007). Please refer to Master Response 2.

15ar  Please refer to Master Response 5. The County does not agree with the commenter’s statement that the analysis approach used in the SEIR undermines the integrity of the analysis.

15as  The SEIR’s characterization of existing conditions and impact analysis describe and incorporate the best and most recent available data on salmonid populations and their habitat in the San Geronimo Valley. The County does not agree with the commenter’s statement that the SEIR fails to use readily available and relevant scientific information and data, nor do we agree that the impact analysis is flawed, incomplete, and fails to comply with CEQA. Please also refer to Master Response 5.

15at  Mitigation measures in the Draft SEIR have been clarified and amplified to provide the specificity requested by the comment and to improve their enforceability. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Responses 6, 7, 8, and 9.

15au  Mitigation Measure 5.1-1 Expanded SCA Ordinance has been clarified and amplified in the Final SEIR to provide additional specificity and timelines. Consistent with Section 15088.5 of the State CEQA
Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 6.

15av Please refer to Master Response 3 and 6.

15aw Please also refer to Master Response 6. The Marin County Community Development Agency has established a code enforcement program to ensure compliance with the County's laws and regulations for land use, zoning, building, housing, and environmental health. Information on how to file a complaint can be found here: https://www.marincounty.org/depts/cd/divisions/code-enforcement. The same enforcement program would apply to the provisions of the Expanded SCA Ordinance.

15ax First, regarding the timeline for adopting the Ordinance, please refer to Master Response 6.2. Second, regarding the requested monitoring program, the Court opinion specifies that an EIR may not defer the formulation of mitigation measures to a future time, but mitigation measures may specify performance standards which would mitigate significant effects in one or more specified ways. Mitigation measures discussed in the SEIR and Master Responses 6 through 9 incorporate such performance standards, which will ensure that adopted measures are not disregarded. Third, regarding implementation of the Marin CWP (2007), Marin County has continuously acknowledged its duty to implement an SCA Ordinance, as also specified in the Court opinion. Please also refer to Master Responses 6.1 and 3.

Please also refer to Master Responses 3, 6.1, 6.2, and 6.3.

15ay Please refer to Master Response 7.

15az Please refer to Master Response 8.

15ba Please refer to Master Response 7.

15bb Please refer to Master Response 5. We disagree with the commenter's assertion that the conclusion of a less than significant cumulative impact on summer rearing success by juvenile coho salmon and steelhead is flawed and deficient.

15bc Comment noted. Please see response(s) to individual comments herein, as appropriate, including references to applicable master responses.

15bd Please refer to Master Responses 6, 7, and 8.

15be Comment noted. Please also refer to Master Response 6.4 regarding the timeline for adopting an Expanded SCA Ordinance.
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7.4 NATIVE AMERICAN INDIAN TRIBE LETTERS
Letter 16—Federated Indians of Graton Rancheria
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Taylor, Tammy

From: THPO@gratonrancheria.com
Sent: Monday, June 19, 2017 12:18 PM
To: EnvPlanning
Subject: FW: Salmonids in San Geronimo Valley

From: THPO@gratonrancheria.com
Sent: Monday, June 19, 2017 12:08 PM
To: Rachel Reid (rreid@marincounty.org) <rreid@marincounty.org>
Subject: Salmonids in San Geronimo Valley

Dear Rachel Reid,

The Tribe has received the project notification letter requesting interest and input regarding the project at Salmonids in San Geronimo Valley. We appreciate your effort to contact the Tribe. The Tribal Heritage Preservation Office staff has reviewed the project information. Based on the project details, the Tribe does not have any comments to provide at this time. Should the project be modified the Tribe respectfully requests project notification and the opportunity to review the project. Thank you for contacting the Tribe with this notice and the opportunity to provide comment.

Sincerely,
Buffy McQuillen
Tribal Heritage Preservation Officer (THPO)
Native American Graves Protection and Repatriation Act (NAGPRA)
Office: 707.566.2288; ext. 137
Cell: 707.318.0485
FAX: 707.566.2291

Antonette Tomic
THPO Administrative Assistant
Federated Indians of Graton Rancheria
6400 Redwood Drive, Suite 300
Rohnert Park, CA 94928
Office: 707.566.2288, ext. 143
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atomic@gratonrancheria.com

Please consider our environment before printing this email.

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LETTER # 16

July 2018

7-489
Comment noted. As for other submitters, you will have the opportunity to comment on the revisions to the Draft SEIR, which have been incorporated into the Final SEIR, during a 21-day review period.
7.5 INDIVIDUAL LETTERS
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Letter 17—Denis J Poggio
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Today's meeting is to receive testimony on the "adequacy" of the Draft SEIR that is proposed at this time.

The Oxford Living Dictionary defines "adequacy" as, "The state or quality of being adequate".

The Oxford Living Dictionary lists acceptability, reasonableness, passableness, satisfactoriness, fairness, capability, competence, competency, ability, aptitude, skill, skillfulness, adeptness as synonyms for "adequacy".

I believe today's meeting should be rephrased to "receive testimony on the fairness on the Draft SEIR that is proposed at this time."

The Draft SEIR that is being proposed today is lacking "fairness" because the document:

- Lacks clarity and fairness to a San Geronimo Valley Property Owner who is required to obtain a permit from the Community Development Agency for maintaining their property within the Stream Conservation Area.
  - 5.5-1: Expanded SCA Ordinance (page116):
    - Expand the set of development activities that "require a permit" and site assessment to include any activity with the SCA that requires vegetation clearing, increases imperable area, alters surface run off, or results in exposed soil.
    - Require site assessment to be conducted by a qualified professional who has received training and certification California Department of Fish and Wildlife or National Marine Fisheries Service in assessing potential impacts to stream ecology, riparian ecology and hydrology and the potential impacts to salmonids from changes to these processes and conditions.
- Requires an over-reaching financial burden on a San Geronimo Valley Property Owner to hire a "qualified professional" to assess potential impacts on maintaining their property within the SCA.
  - Adding wood chips to the property which could affect the altering the surface run off.
  - Cutting tree limbs or removing hazards trees or large shrubs for reducing fire loads.
- Places the undue burden on the San Geronimo Valley Property Owners to reduce siltation in the creeks and tributaries when in fact the County of Marin and Marin Municipal Water District has over 215 miles of dirt roads that contribute significantly in the rainy season to the siltation of our creeks and tributaries while there is 36 miles of paved roads.
- 85% of the San Geronimo Valley property is owned by public agencies while 15% of San Geronimo property is owned by single family property owners as per 2014 Regional Water Quality Board meeting on Fine Sediment Reduction Plan on page 158.

- This document does not adequately address solutions that will reduce the constant follow of silt from these 215 miles of unpaved roads into our creeks and tributaries that are maintained by the County of Marin and Marin Municipal Water District.

- There is no scientific statement in the SEIR quantifying that any of the proposed elements from the Expanded Stream Conservation Ordinance will in fact result in future significant salmonids populations.
  - Where's the cost/benefit analysis for the proposed elements from the Expanded Stream Conservation Ordinance upon the San Geronimo Valley Property Owners or the County of Marin?

- On page 100 of the SEIR, Stillwater Science has referred to Marin Municipal Water District's water treatment plant as a wastewater treatment plant.
- That is not the case.
- This is type of error is unacceptable when Stillwater has been working for the County of Marin for over a decade; they should be familiar with such large public and private elements that are part of the San Geronimo Valley.
17a Marin County does not consider permitting requirements to be unfair. Please refer to Master Response 6.4 with regard to exemptions provided to the Expanded SCA Ordinance, and to Master Response 13 regarding the shared responsibilities for protecting salmonids.

17b The site assessment requirements have been revised following public agency comments. Please refer to Master Response 6.5.

17c As for comment 17b, please refer to Master Response 6.5.

17d Please refer to Master Response 6.

17e Please refer to Master Response 16.

7f Mitigation for reducing production and delivery of fine sediment to streams is discussed in Master Response 8. There is not an undue burden on San Geronimo Valley property owners, as explained in Master Response 13.

17g Please refer to Master Responses 6.7 and 8, which explain mitigation related to cumulative impacts on salmonids from unpaved roads in San Geronimo Valley.

17h The analyses in the Draft SEIR are supported by available data and scientific literature. A cost-benefit analysis was not required by the Court, and is not required under CEQA (see Master Response 3).

17i Minor errors in the Draft SEIR have been fixed in the Final SEIR. Please refer to Master Response 1.
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Letter 18—John Baldwin
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Taylor, Tammy

From: john baldwin <jbroofing@comcast.net>

Sent: Monday, May 29, 2017 9:27 AM

To: Reid, Rachel

Attachments: Letter to Rachel Reed 4-8-17.docx

Please see attached regarding Supplemental Environmental Impact Report / Expanded Stream Conservation Ordinance.
I am writing you regarding the SEIR released by the County on May 1 and particularly about the Expanded Stream Conservation Ordinance. I am opposed to the new “Stream Conservation Area” setbacks. I have lived in San Geronimo for over 40 years and watch the salmon spawn in the creek right behind my house. This SCA 100 foot setback covers most of my backyard. I grow vegetables, fruit trees and ornamental landscaping. My wife has a small art studio here in the back yard. I don’t think any of this has any negative impact on the salmon or steelhead. We have tried to be good stewards. I don’t need SPAWN or the County meddling in my backyard. If I want to plant an apple tree instead of a pear tree do I need to buy a permit and hire a “qualified biologist” to perform site assessment work to tell me where or how or if I can even plant a fruit tree! Or permits and assessments just to install a hot tub! Give me a break.

I think it is basically unfair to single out private property owners like the SCA does. Only 20% of San Geronimo Valley land is singled out while 80% of County Open Space, Agriculture, Specially Zoned, MMWD and County DPW are exempt from the ordinance requirements. I would think that the horse ranches, golf course, all the traffic on Sir Francis Drake, not to mention global warming, over fishing, dams, would have way more impact on the environment than my little spot. I think that all of us would be better off without new SCA restrictions and just have the County and SPAWN help the property owners who need help upon their requests. Don’t penalize the rest of us.

I wander out to the creek on my property all the time because I never know what I might see there. Lots of bird life, hawks, heron, egrets, deer, squirrels, steelhead, crawdads, even a cornman once. And yes salmon. The worst I have seen in regards to the fish life is when the river otters come up the creek. I’ve seen them there many times and they basically clean the creek out of anything living in the water. They’ll just look up at me and go about their business eating everything they can. They eat it all. I may as well be a rock for all they care. I hope the County isn’t going to look at us creek dwellers the same way. I own land here and have property rights. Those rights should be respected. These properties represent our dreams and our nest eggs. I hope this means something to you...... Don’t let SPAWN intimidate you because of their abusive behavior.

I hope the County will oppose SPAWN and their lawsuits. I would hope that SPAWN receive absolutely no public financing.

Sincerely

John and Janice Baldwin
18a  Comment noted. Please refer to Master Response 6.4 for regulatory exemptions relating to vegetation, and Master Response 6.4 for minor modifications to site assessment requirements.

18b  Please refer to Master Responses 2, 6.2, and 13. With regard to horse ranches, please refer to Individual Response 12ag above. The San Geronimo National Golf Course is zoned Resort and Commercial Recreation (RCR), and would also be subject to Mitigation Measure 5.1-1 Expanded SCA Ordinance.

18c  Comment noted. Please refer to Master Response 12.
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Letter 19—Michael Howe
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This memorandum represents our comments and concerns regarding the Draft 2017 Marin County Supplementary Environmental Impact Report.

A bit of background about the two of us: We both are retired and have lived in the Valley since 1976, having purchased and resided here since that date. We raised our two children – Raine and Aaron, have 3 grandchildren and 2 Great Grandchildren.

Linda was a Foundation Program Executive for 35 years at the Zellerbach Family Foundation leading the Foundation’s Community Arts program.

Michael was a tenured faculty member and Dean at the University of San Francisco; Dean of Faculty at the College of Marin, Senior Program and Evaluation Officer at the Marin Community Foundation; President of the East Bay Community Foundation; Chair, National Task Force on Community Leadership, John Gardner Center, Stanford University; and is President of Howe and Associates.

Both of us are and have been members of a broad range governmental commissions and committees, and of non-profit organizations. For example, Michael served and was Chair of the Marin County Parks, Open Space Fair Commission; and was on the Board of Greenbelt Alliance, along with other boards and commissions in Alameda, Contra Costa County, Marin and San Francisco counties, many of which are environmentally focused.

Our home is located on San Geronimo Creek and we have a seasonal stream that runs along the eastern side of our property. We recall the day we moved in to our unfinished home the summer of 1976. That winter and for the next two decades heavy rainfall that began to diminish around the turn of the century resulted in us becoming more and more concerned about the environmental health of the SG Valley. We have always been careful to observe and care for the Creek as well as the salmon and steelhead running up the San Geronimo Creek adjacent to our home. Over the past 10-12 years the drop in the numbers of fish spawning has been of great concern to us. We have always been careful to make sure that our property is welcoming to all flora and fauna with the goal of protecting the natural environment.
Our view, and that of many of our neighbors, is that the SEIR is attempting to mitigate a problem that is most assuredly not altogether caused by the human population of the SGV. The problems began with global climate change—warming, and over-fishing of the oceans across the globe. Within the region and prior to our moving to SGV the construction of Kent Lake along with the rapid reduction of rainfall over the last 2 decades, except for the winter of '16-'17, dramatically reduced the capacity of the San Geronimo Creek habitat to support spawning fish. Living on the Creek has provided us with the opportunity to observe first hand the diminution of the water flow in the Creek and stream year by year. Like the others, this fact is something the people living in the SGV cannot change.

As to the SEIR, after having downloaded and read the SEIR, it is concerning to both of us that the report provides little evidence that any of the mitigation measures proposed in the report would provide a significant impact cumulatively. Words such as “potential”, “cumulatively considerable” and “could” that are used repeatedly in sections 4, 5 and 6 seem to us to lack the level of specificity and scientific evidence that one would expect when recommending regulations that would cause residents to feel assured that once regulations are implemented the problem would be solved.

For example, section 5, page 2 first sentence in paragraph two “The cumulative impact analysis implicitly acknowledges the difficulties of showing the direct links between land-use activities and in-stream conditions, and to the predictions of impacts are of necessity qualitative and conservative (i.e., potentially overestimated), except where sufficient quantitative information is available” provide little assurance to us that the SEIR provides direction that the homeowner can feel assured that additional financial investments on our part in support of the recommendations will result in any significant change. Frankly, the SEIR is written in a way that folks not trained in the fields of stream function, hydrology, water quality, riparian zones and habitat find it difficult to read and draw conclusions from. For us sections 5.1, 5.2 and 5.3 left more questions than provided answers. Section 5.1 seems to suggest that future development of 358 lots should be controlled. But the paragraph on page 5-6 is so confusing and the map that is included in the report provides no sense as to whether or not these lots are buildable, if they are on the market or planned for sale. For us, the SEIR should in fact provide that information. The last paragraph of 5-8 makes a wild leap—not simply conservative—about future development. Again, we need hard data here. The section then uses the SEIR’s “qualitative and conservative” recommendations to suggest that they have a potentially significant cumulative impact. The logic here is reminiscent of the arguments that climate change deniers use.

Likewise, trying to interpret the SEIR is frustrating to say the least. For example, in 5-13 under Mitigation Measure 5.1-2 there are recommendations referred to that are located Table 3-2, however, we were unable to find the recommendations nor descriptions as to what the recommendations were. Without an ability to follow the logic model there is no way for us to make an assessment of the recommendations. This leaves us in a quandary, do we just accept what is being presented on faith? Sorry, we don’t and believe that the County not make decisions that way.

We want to emphasize that the concerns expressed above are not the only ones that we have identified with the report. Therefore it is important to state here that we want it noted that the report does not provide us with the level of assurance that the recommendations should be implemented, as they do not provide sufficient factual and compelling information that provides clear direction for action. The SEIR needs to be revised as well as rewritten so that those of us who must be guided by any new regulations understand and hopefully agree with them.

Finally, we want to emphasize that we have other major concerns associated with the report. First, we have not found any scientific evidence advanced in the report that 100-foot setbacks work. Further, the report is silent as to whether or not current homeowners and their heirs will be subject to new regulations that ultimately result. Know that this issue must be addressed as the process moves forward. We want to do what we can in support of mitigations that have sufficient evidence backing them up that provide a reasonable chance for...
success. The Report does not provide us that assurance at this point. Revise it so that we along with other homeowners are provided with a document that we can understand as well as backed up with data that provide reasonable recommendations for us to work with the County to improve the stream function, hydrology, water quality, riparian zones and habitat along the San Geronimo Creek.
19a For information on ephemeral (seasonal) streams please see Individual Response 8d. With regard to climate change, overfishing, and damming/lake construction, please refer to Master Response 2.

19b The proposed mitigation measures are intended to reduce cumulative impacts of development on salmonids in San Geronimo Valley, at least to a level where the impact is less than significant compared with existing conditions. Please refer to Master Responses 6, 7, 8, and 9 for clarifications and amplifications to mitigation measures following public submissions on the Draft SEIR. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

19c One of the most challenging aspects of environmental law is the inherent requisite to make judgments regarding future effects, often termed “risk” (which considers both probability and consequence). This challenge is entrenched in scientific and technical evidence that is presented to courts considering environmental cases. Words like ‘potential’ and ‘could’ reflect the inherent challenge of forecasting future effects, which cannot usually be made quantitatively or qualitatively with complete scientific certainty.

When considering cumulative impacts, the assessment needs to consider numerous, incremental future effects simultaneously, presenting an even greater challenge. The term ‘cumulatively considerable’ stems from CEQA. Under CEQA, cumulative impacts are two or more individual effects that when considered together are considerable or increase other environmental impacts (State CEQA Guidelines, CCR Section 15355). While cumulative impacts are inherently difficult to forecast, conclusions regarding cumulatively considerable impacts on salmonids, or lack thereof, in the Draft SEIR were supported by compelling scientific evidence and literature. Following public submissions, new evidence has been considered in the Final SEIR.

19d Numerous studies have demonstrated that stream ecosystem health is influenced by a complex interplay of factors related to development (see Sections 3.2 and 5.1). Despite this, there are inherent challenges in conducting a fully quantitative cumulative analysis of potential future impacts to salmonids and their habitat; the Draft SEIR explicitly and transparently acknowledges these challenges while still meeting the requirements of the Court’s opinion to conduct a meaningful assessment. Where quantitative information is unavailable, making
conservative, qualitative assessments of impacts is common practice in environmental analysis. Assessments need to be conservative to ensure uncertainty in the qualitative assessments does not mean that mitigation is inadequate (i.e., mitigation needed to protect salmonids is not underestimated).

19e Please refer to Master Response 4.1 for information regarding how the future numbers of improved parcels have been analyzed.

19f The last paragraph on page 5-8 of the Draft SEIR relates to projected future development and TIA. The assessment of a potentially significant cumulative impact on winter survival of juvenile coho salmon is on page 5-11 of the Draft SEIR. For information on assessments of projected future development and TIA, please refer to Master Responses 4.1 and 4.2. For information on the assessment of a potentially significant cumulative impact on winter survival of juvenile coho salmon, please refer to Section 5.1 above.

The language used in the Draft SEIR (and Final SEIR) had all due regard to scientific evidence and is wholly compliant with CEQA (see Master Response 2).

19g Targets for Critical Habitat Elements of Salmonid Overwintering Habitat to Support Emergent Fry Survival and Juvenile Survival to Smolting, sourced from PCI (2010), are incorporated in the Final SEIR as Table 3-3 (previously Table 3-2). Please refer to Master Response 7 for further information regarding the adequacy of Mitigation Measure 5.1-2.

19h Updates to the Draft SEIR are incorporated throughout this Final SEIR to provide the requested clarifications. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered. Marin County considers that the quantitative and qualitative information provided is compelling, and supports conclusions drawn and mitigation proposed in the Final SEIR.

19i Please refer to Master Response 10.

19j As described in Master Response 6.2, no land uses or zones within San Geronimo Valley are excluded from the Expanded SCA Ordinance. Please also refer to Master Responses 12 and 18 regarding regulations for homeowners.
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Letter 20—Joe Downey
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Taylor, Tammy

From: Joe Downey <joesdowney@comcast.net>
Sent: Thursday, June 08, 2017 6:11 PM
To: Reid, Rachel; Bal, Tarisha
Cc: Rodoni, Dennis
Subject: SEIR Citizen Comments and Concerns

To: Rachel Reid, Takisha Bal, County Counsel
Cc: Supervisor Denis Rodoni
From: Joe and Kendra Downey, 372 Meadow Way/PO Box 220, San Geronimo, CA
Subject: Draft 2017 Marin County Supplementary Environmental Impact Report
Date: June 8, 2017

Kendra and I are residents of San Geronimo who bought our property on Meadow Way in 1977 and built our family home here in 1979. We live on the North side of Meadow way and are on the stream. We raised our two children in this home and host our grandchildren here often. I am a retired teacher from the Tamalpais Union High School District and a former general contractor. I am currently a Board member of the San Geronimo Valley Affordable Housing Association. Kendra is a retired OB/GYN Nurse Practitioner who worked for Planned Parenthood for 25 years. We are both native Californians; Kendra is a 3rd generation Bay Area native. We care deeply for our valley and all the flora and fauna that live here.

Who built the Kent Lake Dam? Who built the Nicasio Lake Dam? These two events killed the salmon and steelhead breeding/birthing grounds for many, many miles of habitat. Yes- it was us-the Citizens of Marin County who voted "yes" to get more water so more people could live in Marin. Why not just dam up the San Geronimo Valley in the name of water- get the residents of Marin to vote "yes", and be done with it!

There are so many unknown elements to these stream conservation issues that conjecture/guessing is almost useless. Yes, our care of the stream side habitat is part of the picture. But much larger issues as global climate change- warming and over fishing and depletion of ocean habitat for the fish are having a very significant impact also. Oh, yes, and rainfall reduction over the past four decades (Last winter being an exception) has had a very significant effect in reducing the fish population here.

The build-out potential and the ensuing potential cumulative impact of building development that is sited in the report is speculative. As a builder, I have looked at many of the lots that are sited as "buildable"; many of these sites. Each would require such Herculean, very expensive, measures that it would be unbuildable. Our "on site septic disposal systems" are antiquated, at best, and will be replaced with some other, much less ecologically impactful systems-- composting toilets, greywater recycling systems are available now. Who knows? Technology is moving so quickly that some sort of drone vacuum, or...? will be available soon!

The SEIR does not provide enough sufficient factual and compelling information that provides clear direction for action. The winds of change are all about us- please proceed with caution- our family homes are greatly affected by your decisions.

Sincerely,

Joe and Kendra Downey
Sent from my iPad

LETTER # 20
20a Please refer to Master Response 2, which explains that historical damming activities are beyond the scope of this environmental analysis. If you seek information regarding historical damming, MMWD (2011, pp. 12) is a good source, and states that: “Peters Dam forms Kent Lake and is MMWD’s largest reservoir. The dam was built without a fish ladder and marks the upstream limit of anadromous fish migration in the main-stem of Lagunitas Creek. Nicasio Reservoir, formed by Seeger Dam, is situated on Nicasio Creek, the largest tributary to Lagunitas Creek. Peters Dam and Seeger Dam block anadromous salmonid fish passage to about 50% of their historically available habitat. Upstream of Kent Lake are Alpine Dam, Bon Tempe Dam, and Lagunitas Dam which actually blocked fish passage prior to Kent Lake”.

20b Please refer to Master Response 2.

20c Please refer to Master Responses 4.1 and 15.

20d Marin County contends that the Draft SEIR does provide factual and compelling information.
Letter 21—Nicola Mielke
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Taylor, Tammy

From: Mielke, Nicola <NSpoors@levi.com>
Sent: Friday, June 09, 2017 5:28 PM
To: Rodoni, Dennis; Reid, Rachel; Bel, Tarisha
Cc: Mielke Matt; Mielke, Nicola
Subject: SEIR REPORT
Attachments: SEIR Questions2.docx

So here is my draft. Ask the girls if they want to add or send there own letter.

Dear Sir/Madam

I am writing to you as a concerned home owner of a property 100FT from the creek in Woodacre. 

Firstly I believe in protecting the fish but not at the expense of families.

Best Success throughout the world in environmental impact is when communities work together. So I would urge the county to think of how good behavior can be rewarded rather than coming from an approach to punish. People won’t get permits, environmental reports etc if the county doesn’t make them accessible.

I also worry the county is doing this to get SPAWN off their back, now the individual homeowners will become targets of SPAWN. We will all be sued individually.

I have three girls and we moved to the Valley because our family loves nature, we are also vegan as we are aware of how humans though over fishing and poor farming standards has played a major effect on the environment. So I understand some of SPAWN’s concerns. However I don’t see that the SIER acknowledges Global Warming.

Nor does it take into effect the dams beginning built.

However I do not understand the 100FT set back agreement in SIER at all. In fact the SIER actually states that its hard to predict and make direct links to development and stream conditions.

I believe if the county is not sympathetic to make the permits and environmental reports affordable many people including ourselves will be left with no choice to do work to our homes under the radar.

Which will be disappointing, as then the fish go unprotected.

When I bought my property my dream was to create the most sustainable off grid living experience for my children. Raise them aware of what human actions have on environment. I do not nor ever had a plan to expand our home, but I do and will continue to want to grow veggies in my garden, have chicken’s for my waste and create a full circle eco system.

I want to return my garden back to native eco system that birds and bees can enjoy. I want to restore my creek bank, remove all blackberries however where is the county to help support me with this. We wanted to connect our garden from one side of the creek to the other, but now that dream will be gone, along with the playhouse we wanted to build for our daughters. Even though the county has a bridge very close to where we would want ours.

When we moved into property first thing we did was have a energy audit done on our home so we could eventually become off grid. I am happy to share this with you, it would cost 30,000. County of Marin gives the least grants to do this. The Energy Auditor that works all over the bay area was shocked at how little this county gave. Our home is one of the worst he has seen for loss of energy which means we as a family our having a terrible effect on environment.

Yet the county holds themselves in high regards to protecting environment, but yet takes a stance not to offer Grants and support the community but rather punish and enforce permits. Our dream of ever converting our home to be solar powered will never happen.
I bought my home in 2013, there was no documentation given to me about a CWP that I now understand had begun in 2007. If I had known about this I would not have brought my children to live in our current home. As this is making me feel stressed and unsure that I will ever have a home worth anything to leave for my children.

I would like to see the county come up with a plan to buy worried homeowners out of there homes at the current market value. As our home, will no longer be desirable to anyone. County can use these homes to create housing for low income families and can then manage there own permits. My insurance company may not insure our home etc.

I have attached all my questions in an above attachment. Please open it and I would like a reply to my questions.

In the mean time I am contacting a lawyer to see where I can be protected for my rights, how I can be compensated, for the stress I feel.

We need the county to help us live sustainably and productively for the benefit of the salmon AND the people who love them. Such action is long overdue we have wasted to much time and money in courts fighting SPAWN. We have to find a way as a community to all work together.

Regards,

Nicola Mielke, Matt Mielke, Edith Mielke, Grace Hazel and Rose Hazel and all our pets!!

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Questions I would like to put to county to be answered:

**The SEIR document:**

- Has a SEIR been done anywhere else, if so has success been seen?
- Where did the logic for 100FT come from?
- Why is the whole county not held responsible for the enviornmental impact. Creating dams has had an effect on Salmon, over fishing and farming, why should people within 100 Ft of the creek be held accountable?
- Why is 80% of the Valley land that's public exempt?
- The SEIR calls out that the buildable parcels has been over estimated, what is the county going to do about this over estimation?
- The document also admits that its hard to predict and make direct links to impact from development to stream current conditions, therefore what will the county do about this, will further investigation not be needed?
- Why when the MMWD states the creek has the highest return of fish are we still believing we need the 100FT set back?
  
* duplicate - See 21n above*

**Permits:**

- How much will it cost to have environmental reports, will it be a sliding scale?
- Will I have to get permits for planting in my garden my whole property is within 100FT of creek? If so how much will they be? I’m worried a modest project like planting a tree, adding gravel to back yard or adding a hot tub could become unaffordable.
- How will clear-ments’, required by the Fire department and Insurance companies be handled?
- If I get a down tree or if there is lots of debris from upstream due to storms that ends next to my property the SEIR and SPAWN tells me I should leave it because its great for the salmon, will I need an environmental report or permit?
- Can the county not offer Grants rather than impose fines, to allow us to plant the sides of the creek to stop low scale erosion?
• My insurance company may decide to uninsure my home due to the new changes directed by the SEIR what will county do about this?

• Also should the cost for these permits not be spread across the county?

• Will I be asked to re-home my chickern's, as their within 100FT of the creek?

• Will we be made to remove structures already within 100ft of the creek that have not had enviromental impact reports done or permits? Or will these be grandfathered.

• Will I need enviromental reports to empty my septic?

Compensation:

• Will the county offer some homeowners within 100Ft of the creek a buy out for their properties?

• How will the county protect homeowners from beginning SUED by Spawn?

• Will the county reduce peoples property tax that have had their homes re-zoned to balance lack of freedom, permit cost's ?(As my property price will be lowered and it will be hard to re-sell my home. Any modest projects could become unaffordable.

• Why in 2013 was I not made aware of the SEIR when I bought my home?

• Will the county offer homeowners within 100FT of the creek grants to update septic's, upgrade homes to solar, add low flush toilets, collect rainwater, re-move concrete so that we can become truly as sustainable as possible and empower us to live at one with the fish?

• Can or will the county introduce a Community Land Trust so that outstanding parcels can be bought for a fair price that can never be built on similar to MALT.

Insurance:

• If my home gets flattened due to earthquake or fire will I be allowed to re-build?

• If Fire department and insurance company requires clearment beyond the SEIR advises for healthy creek what will be the out come? (I think that SEIR should be amended to have exceptions made for this.)
duplicate • How will the county protect families from beginning sued in future from SPAWN?
21a Comment noted. Marin County is working diligently to bring the current litigation process with SPAWN to fruition.

21b Comment noted. Please refer to Master Response 2.

21c Please refer to Master Response 10.

21d The cost of permits is not proposed to be modified as part of the Draft SEIR (or Final SEIR). However, permitting requirements for homeowners and others in San Geronimo Valley will be more rigorous to ensure salmonids are protected. To ensure permitting requirements are not unnecessarily or ineffectively onerous, Marin County has proposed specific exemptions to the Expanded SCA Ordinance in the Final SEIR (see Master Response 6.4). Exemptions may be developed further through the separate legislative process for developing and implementing the Expanded SCA Ordinance (see Master Response 6.2).

21e Please refer to Master Responses 6.4 and 18.

21f Comment noted. Energy audits and costs to be off-grid are beyond the scope of actions associated with this litigation process. For your information, energy financing information and contact information can be found here: https://www.marincounty.org/depts/cd/divisions/sustainability/energy-financing.

21g The Marin CWP (2007) was a comprehensive update to the previously existing 1994 Marin Countywide Plan (updated in 2004 and 2005); therefore, the concept of, and existence of, a policy document for the County was not new in 2007. The Board of Supervisors approved the Marin CWP (2007) with adopted mitigation on November 6, 2007, well before your property purchase in 2013. The current litigation process for San Geronimo Valley is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is legally obligated to follow actions required by the Court.

21h Regulatory changes to protect salmonids, as required by litigation, do not warrant property purchases by Marin County throughout San Geronimo Valley. Please refer to Master Response 18 regarding regulatory requirements for homeowners and insurance.
Supplemental Environmental Impact Reports (SEIRs) are not uncommon to address additional analyses required by the Court, and a multitude of SEIRs have been prepared for other projects, which are irrelevant to the specific information on cumulative impacts to salmonids and mitigation required by the Court in this case.

See also Master Response 6.1 regarding the 2013 Interim SCA Ordinance for San Geronimo Valley.

Please refer to Master Response 10.

Please refer to Master Responses 2 (impacts beyond the scope), 10 (100-ft buffer), and 13 (responsibilities of the County versus property owners).

No land within San Geronimo Valley is exempt from the Expanded SCA Ordinance. Please refer to Master Response 6.2.

Please refer to Master Response 4.1.

Please refer to the responses to comments 19c and 19d above.

Please refer to Master Response 10.

Please refer to Master Response 18. Site assessments and permits are paid for by the individual(s) or agency(ies) seeking to undertake land use activities. There is no sliding-scale or county-wide distribution.

Please refer to Master Responses 6.4 and 18. Please also refer to Individual Response 17d above.

Please refer to Master Responses 16 (fire hazards) and 18 (insurance).

If you have no plans to remove downed trees or debris you do not require a permit to leave them on your property. If you seek to remove downed trees or debris from your property, you may require a permit. Please refer to Master Response 6.4 for further details regarding vegetation removal.

Providing that there is no conflict with fire management, planting native species in the SCA is generally supportive of salmonid habitat.

Please refer to Master Response 18.

A watershed-wide approach, as well as an SCA-scale approach, has been taken to protecting salmonids from development impacts in the Final SEIR. Please see the response to 21p above regarding fees.

Please refer to Master Response 18.
21x Please refer to Master Response 18.

21y Please refer to Master Responses 15 and 18.

21z Please refer to the response to 21h above.

21aa Marin County cannot offer protection for individuals from lawsuits. Everyone is required to abide by the law and uphold legal requirements.

21ab Regulatory changes to protect salmonids, as required by litigation, do not warrant reductions of property tax. While property tax reductions are not a consideration, nor are property tax increases. To curtail local jurisdictions from establishing burdensome property taxes, Proposition 13 capped ad valorem property tax rates at one percent of full cash value at the time of acquisition; therefore, Marin County cannot independently establish new ad valorem property taxes, or change property taxes to reflect property values at times other than acquisition. Proposition 13 also introduced a requirement for local “special” taxes to be approved by two-thirds of the voters, thus requiring a political process for any ad valorem property tax increases.

21ac Individuals are responsible for obtaining property information prior to acquisition. Please also refer to the response to 11a.

21ad Marin County does not plan to offer grants for activities the submitter has described; however, regulatory requirements have been revised to make it easier to upgrade and replace septic systems (see Master Response 15).

21ae Marin County has no plans to establish a Community Land Trust.

21af Please refer to Master Response 18.

21ag Please refer to Master Response 16.
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Taylor, Tammy

From: Zuni Picarelli <zunipic@icloud.com>
Sent: Monday, June 12, 2017 4:15 PM
To: Reid, Rachel
Cc: Bal, Tarisha; Rodoni, Dennis; DOPATTERSON@marincounty.org
Subject: SGV issues

To whom it may concern.

My name is Susan Picarelli. I have lived in this wonderful valley for almost 40 years in my home. I had been off and on in this area since 1966 when I married a boy from Forest Knolls.

My current home is an old cabin across the street from a small creek that flows into the Papernill creek about 1/2 miles away. We don’t have salmon in our creek. It is almost dry in the summer ... a slight water flow.

I have a small Business . I live with a few people who help me maintain my property.

When you live in these old homes in this area you are in complete contact with the nature around you. Winds and rain... when we have a strong rainy season. Trees constantly falling down due to beetle infestation in droughts and knocked over by winds later . We are a very conscious community. We live out here because we do like nature . We are not suburban dwellers . The fact that we are put under this microscope of scrutiny about the salmon seems absolutely a waste of MY TAX DOLLARS . I am a voter and a tax payer .

I am completely offended to see Marin County in court because of SPAWN and their law suits. I know of no one who lives where we live that does not care about our valley and our forests. This is why we live here. We want to continue to be in an area that is virtually unchanged since 1966. The exception being the development by the golf course.

I am not sure what I am even supposed to say to you. I am just speaking my mind. I really love Marin and especially West Marin. I am tired of all the political mess that seems to corrode the community.

Thank you
Susan picarelli

Sent from my iPhone
22 Comment noted. The current litigation process for the San Geronimo Valley component of the Marin CWP (2007) is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is following actions required by the Court. Please refer to Individual Response 8d for information on ephemeral (seasonal) streams. Please also refer to the response comment 21ab for information on property taxes.
Letter 23—Richard Seramin
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Taylor, Tammy

From: Richard Seramin <raseramin@icloud.com>
Sent: Monday, June 12, 2017 10:50 AM
To: Reid, Rachel
Cc: Bal, Tarisha; Rodoni, Dennis
Subject: Comments on SEIR Report

MR. RICHARD A. SERAMIN
P.O. BOX 84
SAN GERONIMO, CA. 94963

June 12, 2017

Rachel Reid
Marin County Community Development Agency

Tarisha Bal
Office of Marin County Counsel

Dear Ms. Reid and Ms. Bal,

My Family has lived in San Geronimo Valley for close to forty years, we have raised our two boys in our
home that was built in 1961, with the San Geronimo Creek flowing through both sides of our property, well within the SCA 100 foot set
back. A set back that was established over ten years after our house was built.

We have been and will remain Stewards of not only our property protecting the
wildlife and salmon that migrate up and through our creek spawning along the way, but also, Stewards taking
care of other area’s within the valley, by participating in creek clean ups, roads clean ups, and helping neighbors
maintain this wonderful place we call home.

I advise the board that the SEIR’s report is not accurate, it is misleading, and doesn’t present a true picture of
what if any development would take place in the San Geronimo Valley. The following are concerns that must
be looked into and challenge for their accuracy before a decision can be on how the SEIR’s report affects the
homeowners
of the San Geronimo Valley.

1. Why is there a 100 foot SCA set back affecting homes that were build prior to that 100 foot setback
requirement made in early 1970’s? If the SEP report ($300,000.00 County Paid Report) recommends a
“Minimum 35-foot buffer is recommended to guide enhancement on parcels that are already
developed and to guide enhancement of riparian habitat on parcels proposed for new or re-development.
On larger parcels, a wider buffer may be needed to protect the existing riparian forest. This buffer is
measured from the edge of the creek bed or active channel and provides the following benefits “
• protects water quality,
• preserves riparian vegetation,
• allows for restoration where riparian vegetation is patchy or non-existent,
• allow natural stream adjustments and protects property from erosion,
• supports stormwater infiltration

LETTER # 23

July 2018

7-533
2. If the SEIR’s report recommends that vegetation not be cleared unless a permit is issued at an extreme cost to the homeowner, but the fire dept. states that all homes in the valley should have vegetation removed or controlled within 30ft. of the property, who do we follow, and how does this affects our ability to obtain fire insurance to protect our homes? If one of these homes is destroyed by fire, will the property owner be allowed to replace the home within the same footprint within the SCA. If not, won’t this be consider as a “taking”?

3. The claim by SPAWN that major development is posed to happen in the San Geronimo Valley is erroneous, of the 358 lots that the SEIR claims are buildable, the majority of them are either not within the SCA, or not buildable due to steep slopes, or too small to build on, or unable to perk for septic tanks.

4. Approximately a total of 20% of the San Geronimo Valley is built out, with mostly modest private homes, within that 20% is golf course, the French Ranch development, a couple of churches, restaurants, and grocery stores. The 80% left is controlled by open space, MMWD, County property etc. that will not fall into the same guide lines that will be required by the private property owners. Don’t be mislead by false claims that Major development is just around the corner, if there is no land available than this can’t happen.

We all agree that protecting the environment is the #1 responsibility of all Valley residents, but not by handcuffing the residents and taking away their rights to live and have control of their property. Are you willing to put the same restrictions on all the other residents that live in other parts of the County? If not, then don’t single out just the San Geronimo Residents. IT’S JUST NOT FAIR!

Don’t allow yourself to be held hostage by an NGO that is using the County as their “CASH COW”. Stand up for our rights!

Sincerely,

Mr. Richard A. Serumin
23a Comment noted.
23b Marin County does not agree that the Draft SEIR is misleading for the reasons set out in numerous Master Responses.
23c Please refer to Master Response 10.
23d Please refer to Master Response 16.
23e Please refer to Master Response 18.
23f Please refer to Master Response 4.1.
23g Please refer to Master Response 6.2 regarding the application of the Expanded SCA Ordinance to all zones and relevant activities, and 13 regarding the responsibilities of Marin County and private property owners.
23h Comment noted. Marin County recognizes that surface runoff, and other impacts to salmonids, are the outcome of incremental watershed-wide land use developments. Accordingly, Marin County has taken a watershed-wide approach to managing fine sediment production and delivery to streams in San Geronimo Valley in the Final SEIR (see Master Response 8).
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Letter 24—Jim Rawlinson
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Taylor, Tammy

From: JIM <jimrawlinson@comcast.net>
Sent: Monday, June 12, 2017 7:37 AM
To: Reid, Rachel; Bal, Tarisha
Cc: Reedon, Dennis
Subject: Draft SEIR to the 2007 Marin Countywide Plan Final EIR

Dear Ms. Reid and Ms. Bal,

Failing septic systems in Marin are both a serious health issue and a extreme danger to the environment. The draft SEIR should have provisions for current and future up grades and repairs. This Draft should provide for development of onsite systems as well as a community wastewater system. Home owners must be encouraged to maintain their systems. The creeks are contaminated now, and action must be taken now.

Thank you for your consideration of this opportunity you have.

Jim Rawlinson
24 Please refer to Master Response 15.
Letter 25—Ernesto DiBenedetto
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Taylor, Tammy

From: ernesto <edirettos@comcast.net>
Sent: Monday, June 12, 2017 10:23 PM
To: Reid, Rachel; Ball, Tarisha
Cc: DRodini@Marincounty.org
Subject: SEIR report comments
Attachments: county seir ltr pdf

Attached find a summary review letter for your review.....thank you for taking the time to read it...

Ernesto
To: Rachel Reid, Taishu Bal  
CC: Supervisor Dennis Rodini  

From: Debra and Ernest DiBenedetto  

Subject: Draft 2017 SEIR Marin County  

Date: June 12, 2017  

This correspondence contains our comments and concerns regarding the Draft 2017 Marin County SEIR.  

Debra and I have lived in San Geronimo since 1980. Currently, Debra is an elementary school teacher in the Dixie School District in San Rafael. Debra also is the creator of the Dixie Outdoor Classroom, a creek restoration project, and has served the county in her teaching capacity for 22 years. Debra was an active member and volunteer at the Lagunitas School District when our children were growing up. She is due to retire in two to four years.  

Ernest has been a business professional. He was the Chief Operating Officer of a restaurant chain in the state of Connecticut for 13 years before coming to California and creating/owning his own sales organization, The ToySellers Group for 17 years, followed by creation of DirettO Consulting a sales and marketing firm working mainly with startups in the Specialty Toy Industry for five years. His latest venture was being a co-owner of the Woodacre Market and Dell, which was completely refurbished in 2003 and resold in 2008. Mr. DiBenedetto is now retired.  

As homeowners at 444 Meadow Way, San Geronimo we have participated in a creek side restoration project via the San Geronimo Valley Landowner Assistance Program (2011), in conjunction with MMWD, County of Marin, S.G. Valley Planning Group, Stewards and Spawn to enhance the San Geronimo Creek and habitat on our property for the community and of course our treasured salmon. It is this type of attitude and cooperation with homeowners that in our opinion would be one of the positive steps towards creating the enhanced habitat that would actually benefit our streams and salmon.  

When we first moved into the wonderful San Geronimo Valley the abundance of salmon was quite obvious even to a layman. Over time this of course has changed. Have we personally seen overgrowth and overbuilding along with negative impact by creek side homeowners to our habitat?? NO, WE HAVE NOT! If anything the community has stepped forward to enhance, not destroy our beloved streams.  

We have of course read the latest SEIR and trying to interpret it is quite frustrating in itself. How it can be determined that considerable overgrowth will take place on the present available properties is well beyond our comprehension. We have lived here since 1980 and development most certainly has been minimal over the last 36
years even with the inclusion of French Ranch. With today’s County guidelines and standards we find it hard to comprehend that the actual build-out calculations used to validate the report is a position the consultant will be able to defend in the future.

Finally, scientists, educators, consultants, and others were used in the construction of the SEIR. The real facts of climate change, dam construction which has had major impact on our streams along with overfishing of our oceans for some reason are not discussed.

Let us not take the easy way out and choose to impact Valley Creek side Homeowners for what is a global and regional problem. Instead if Government along with funded environmental agencies concentrated their financial funding to provide actual needed enhancement and improvement of our cherished habitat instead of spending there funding on lawyers, consultants, and lawsuits, just maybe there would be real improvement to hang our hats on.

In conclusion we can only say that the possiblility of an additional financial burden created by County Government that would greatly impact us personally in this phase of our life seems quite unfair. To expect a small group of individuals to solve a global problem seems a bit surreal in our opinion.

We have always been good partners for our community and environment.
25a  Comment noted.

25b  The nature of incremental cumulative impacts is that they may occur relatively slowly over long time periods, making them more difficult to discern and measure than other impacts, and also more difficult to predict; thus, the need for a comprehensive cumulative salmonid impact analysis, as required by the Court. Please refer to Master Response 4.1.

25c  Please refer to Master Response 4.1.

25d  Please refer to Master Response 2.

25e  The current litigation process for San Geronimo Valley is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is legally obligated to follow actions required by the Court. With regard to your reference to a global and regional problem, please refer to Master Response 2.

25f  Please refer to Master Responses 2 and 13. Cumulative development impacts on salmonids in San Geronimo Valley is not a global problem, but a watershed-wide problem, with more severe impacts resulting from land use activities proximal to streams. In recognition of this, Marin County has taken an SCA-scale (100-foot streamside buffer) approach (see Master Response 6), and a watershed-wide approach to managing fine sediment production and delivery to streams in San Geronimo Valley in the Final SEIR (see Master Response 8).
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Taylor, Tammy

From: Ann Linder <whitetara9@gmail.com>
Sent: Tuesday, June 13, 2017 5:50 PM
To: Reidon, Dennis; Reid, Rachel; Bal, Tarisha
Subject: SEIR SGV

Hello,

I'm retired and a 22 year resident of Woodacre living on Elm Avenue in a 1,500 square-foot house built in 1950 next to a small creek on a lot just under half an acre in size. The creek drops to a very very low flow in the summer and has no fish of any kind living in it.

My entire lot would fall under the 100' setback. If the SEIR is adopted a small number of Valley homeowners could have the normal use of their property severely restricted and also be required to pay for expensive permits and site assessments. We homeowners will be shouldering an unfairly large bureaucratic and financial burden without evidence of benefit to the water quality. The 100' setback is unreasonable.

I agree with all of the questions, requests and suggested changes put forward by the San Geronimo Valley Stewards.

Thank you,
Ann Linder
25 Elm Ave.
PO Box 413
Woodacre, CA 94973
26a Comment noted. Please refer to Individual Response 8d above with regard to ephemeral (seasonal) and perennial streams.

26b Please refer to Master Response 10 for reasoning related to the 100-foot buffer. Please also refer to Master Response 18 for your ability to continue existing property land uses, Master Response 13 regarding the responsibilities of property owners for protecting salmonids, and Master Response 6.4 for exemptions that will be incorporated into the Expanded SCA Ordinance to ensure it is not unnecessarily onerous for property owners.

26c Please refer to the responses to comment letters 6 and 7 above.
Letter 27—Dennis J Poggio
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Rachel Reed  
Environmental Planning Manager  
Marin Community Development Agency  
3501 Civic Center Drive - Suite 300  
San Rafael CA 94903  

June 13, 2017  

Re: Denis J Poggio - 44 Montezuma, Forest Knolls - Since 1982  

Comments Draft SEIR  

Additional attention and analysis to be included when amending the Draft SEIR in the following areas:  

27a • A deficiency of clarity and fairness to a property owners who are required to obtain a permit from the Community Development Agency for maintaining their property within the Stream Conservation Area.  

27b • A financial burden on a property owner to hire a "qualified professional" to assess potential impacts on maintaining their property within the SCA.  

27c • There is a disproportionate responsibility on the property owners which drive on 36 miles of paved roads to reduce creek and tributaries siltation when in fact over 215 miles of dirt roads owned by County of Marin and Marin Municipal Water District are the siltation culprits during the rainy season.  

27d • More detailed analysis how the County of Marin and Marin Municipal Water District will be required to mediate their polluting siltation dirt roads in the immediate future.  

27e • Analysis of the existing and future increase of stream pollution due to substandard and failing septic systems especially in the Woodacre and San Geronimo Creeks.  

27f • Acknowledge and support the repair of failing and polluting septic systems.  

27g • Development of a community wastewater system to address the failing existing septic systems which are polluting the Woodacre and San Geronimo Creeks.  

duplicate: • Understanding the present and future impacts of polluting septic systems especially in the Woodacre and San Geronimo Creeks if those failing septic systems are not repaired or replaced in a timely manner.  

27h • Future environmental impacts for existing properties in the Stream Conservation Area relative to the implementation of the Marin County’s Local Area Management Plan.  

27i • Removal of requirements and barriers presented in the Draft SEIR which are a disincentive for repairing polluting septic systems.  

Thank you for your consideration to include my concerns are considered when in amending the Draft SEIR before it is presented to the Board of Supervisors for consideration, final approval and then adoption.  

Respectfully,  

Denis J Poggio  
44 Montezuma  
Forest Knolls CA 94933  
415-486-9549
27a Please also refer to Master Response 18 for your ability to continue existing property land uses, Master Response 13 regarding the responsibilities of property owners for protecting salmonids, and Master Response 6.4 for exemptions that will be incorporated into the Expanded SCA Ordinance to ensure it is not unnecessarily onerous for property owners.

27b Please refer to Master Response 6.5.

27c Please refer to: Master Responses 6.6 for relevant standard management practices will be incorporated into the Expanded SCA Ordinance; 6.7 for low impact development practices; 8 for watershed-wide mitigation to control and reduce fine sediment production and delivery to streams; and 13 for the shared responsibilities of Marin County and property owners.

27d Please refer to Master Responses 8 and 13.

27e Please refer to Master Response 15.

27f Please refer to Master Response 15.

27g Please refer to Master Response 15.

27h The Local Area Management Plan (LAMP) (2016) relating to the oversite of Onsite Wastewater Treatment Systems within Marin County has been considered in preparation of the Final SEIR. There is no conflict with the LAMP.

27i Marin County concurs that unnecessary barriers to repairing septic systems should be removed in the Final SEIR. Please refer to Master Response 15.
Letter 28—Lisa Lukianoff and Chris Raney
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Dear Marin County Board of Supervisors, et. al.:

We purchased our home at 6713 SFDB, in Forest Knolls in 2006. Our home is located 6' from the creek in the back of the property.

Also in 2006, I obtained permits with the County of Marin to fully upgrade and renovate the original home, not adding any square footage. This was a significant financial investment of approximately $200,000.00. We installed new windows, electrical, plumbing, flooring, inset lighting, and heating. Currently, our home is valued at approximately $800,000.00. (see Zillow link: https://www.zillow.com/savedhomes/for_sale/19286799_zpid/1_prd/38.024312,-122.67025,38.006121,-122.669562_rect/14_zm/1_rs/1_fr?view=public

I am a Consulting Psychologist and my husband is a Real Estate Developer and we both moved here from Southern Marin.

As homeowners and community members we are extremely concerned about how the Supplemental Environmental Impact Report will affect us on the following issues:

1. Flooding & Safety: We have filed 4-FEMA flood insurance claims since 2006 due to the SG creek flooding. The most recent in December 2016. We are concerned that nothing is being done to protect existing homes on the creek.

On March 10, 2017, I wrote to the County of Marin, Anthony Williams, Principal Civil Engineer, and Felix Meneau, P.E., Zone Engineer, at the Marin County Flood Control (https://www.marincounty.org/depts/pw/divisions/flood-control) to demonstrate the absence of San Geronimo Creek in their current flood protection programs and monitors.
CURRENT PROGRAMS & MONITORS

Ross Valley Flood Protection and Watersheds Program website includes Corte Madera Creek Flood Risk Management Project information and San Anselmo flood project information (http://www.marinwatersheds.org/rossvalleywatersh/index.html) but does not include any information on San Geronimo Creek flood issues. If you follow the link specifically for San Geronimo Valley, there is no mention of any flood protection projects (http://www.marinwatersheds.org/san_geronimo_valley.html).

Ross Valley Fire Department Creek level alert website which currently monitors Fairfax, Sleepy Hollow, San Anselmo, and Ross Creeks. Although these are excellent resources they do NOT include the San Geronimo Creek. (http://www.rossvalleyfire.org/services/creek-levels-weather)

FEMA has handled numerous flood reports along the San Geronimo Creek.

I respectfully asked the County of Marin to include the San Geronimo Valley residents, approximately 3,600, in all flood alert and protection systems, similar to Fairfax and other towns. These websites are great resources for residents to monitor flood issues. It's only logical that San Geronimo Creek is included in a flood alert system.

I received an email back from Mr. Williams, who took the time to explain the comprehensive process involved and provided relevant information:

"Thank you for your inquiry. The 11 existing flood control zones within the County were established by resolution of the Board of Supervisors. The older flood zones (dating back to the 1960's) are funded through ad valorem property taxes but the newer zones, like Ross Valley (Zone 9), were created via a tax ballot measure. Because of current ad valorem tax allocations for other programs, the only way to create a new flood zone in the San Geronimo area would be through a tax measure. Obviously, there needs to be a majority of interest from the community for such a measure to be successful and recent efforts in other established zones (Stinson Beach and Santa Venetia) were not successful. A flood control zone in your area could support creek gaging and alarming systems as well as other flood risk reduction measures. This is how the current network of gages are paid for – installation and subsequent operations and maintenance is budgeted within existing flood control zones. If the primary interest is focused on an emergency alert system, it is possible that the County Office of Emergency Services (OES) could be engaged to provide something."
2. **Stabilization and reinforcement** of our home located within 6' of the San Geronimo Creek. We have visited Marin County Building offices to inquire about the reinforcement of the creek bank, to no avail. There were no options for our home on the creek.

We are hopeful the board of supervisors and staff will incorporate measures to help homeowners protect their existing homes (and assets) from erosion and flooding. And that there will be consideration given to issues involving the flooding creek.

Thank you for taking the time to read this.

Sincerely,

Lisa Lukianoff & Chris Raney.

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https://twitter.com/dr_lukianoff

This email correspondence and any documents which may accompany it, contain professional information from Lisa Lukianoff, Psy.D., and which is intended exclusively for the use of the individual or entity to which it is addressed, and which may contain information that is privileged, confidential, and/or otherwise exempt from disclosure under applicable law.

If the reader of this message is not the intended recipient or the employee or the agent responsible for delivering the message and any documents to the intended recipient, any disclosure, dissemination, distribution, copying, or other use of this communication or its substance is prohibited. If you have received this communication in error, please call collect to arrange for the destruction of the communication or its return to us at my expense. Thank you.
Photo of SG creek adjacent to our home, 5' distance on the west end and 6' distance on the east end.

Lisa Lukianoff
Sent from my iPhone, please pardon any misspelled words.
6713 Sir Francis Drake Blvd, Forest Knolls, CA 94933

2 beds • 2 baths • 1,548 sqft

OFF MARKET
Zestimate®: $829,513
Rent Zestimate®: $3,800/mo

Est. Refi Payment:
$3,152/mo
Note: This property is not currently for sale or for rent. The description below may be from a previous listing.

Located In West Marin’s San Geronimo Valley, surrounded by protected land preserves. This 1940’s (summer) cottage home was completely upgraded & remodeled into an open-space modern cottage home. Nestled in San Geronimo Valley surrounded by protected open space preserves. French Ranch Open Space Preserve, Roy’s Redwoods Preserve, Gary Giacomini Open Space Preserve and Samuel P. Taylor State Park. Just 9-miles to Point Reyes National Seashore.

Design Theme: Indoor-outdoor living.
The design themes focus was an integration of indoor-outdoor living with an emphasis on environmentally sustainable and natural elements while retaining the quintessential feel of the original home. Natural woods (bamboo) and stone tiles were used to integrate and enhance the surrounding nature into the interior.

Previously a summer home, steeped in nature and surrounded by trees with a creek at the back of the property, this home was transformed into a modern living space with clean lines, a blended open-space living room, kitchen and dining area. Master bedroom and bathroom, guest bedroom and mud room are located on the second level, adjacent to private outdoor spaces.

Color consulting was done by: http://www.keatinhally.com/

NEW UPGRADES:
? Bamboo flooring was installed throughout the upstairs
? Natural maple wood cabinets in the kitchen
? Granite countertops
? Soaking tub in master bath
? Pietra Italian stone tiles throughout the downstairs mud-room and master-bath
? Wool carpet installed in the stairwell and both bedrooms
? Recycled blue-jean cotton insulation was installed throughout
? Full-spectrum natural lighting installed in inset lighting fixtures
? Double-pane windows with non-mildew frames
? Low VOC paint used both in the interior and exterior
? Rinnai tankless water heater
? New electrical and plumbing
? Redwood treated exterior siding

WHAT I LOVE ABOUT THE HOME
Privacy, surrounded by nature and the beauty of a creek in the back of the property, in the heat of the summertime a few trees provide shaded areas.

Facts and Features

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additional to letter 28

Bedrooms
Beds: 2

July 2018
**Final SEIR San Geronimo Valley**

**Home Value**

**Zestimate**

$829,513

**Zestimate Range**

$771,000 - $896,000

**Last 30 Day Change**

+ $4,550 (0.6%)

**One Year Forecast**

$833,744 (+0.5%)

**Improve Your Home Value**

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**Price / Tax History**

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**Neighborhood: 94933**

*additional to letter 28*

July 2018
Nearby Schools in San Geronimo

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<td>10</td>
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<td>9-12</td>
<td>7.3 mi</td>
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<tr>
<td>NR</td>
<td>San Geronimo Valley Elementary</td>
<td>K-6</td>
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<tr>
<td>7</td>
<td>Lagunitas Elementary</td>
<td>K-8</td>
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Data by GreatSchools.org

Disclaimer: School attendance zone boundaries are provided by a third party and subject to change. Check with the applicable school district prior to making a decision based on these boundaries.

About the ratings: GreatSchools ratings are based on a comparison of test results for all schools in the state. It is designed to be a starting point to help parents make baseline comparisons, not the only factor in selecting the right school for your family.
### Similar Homes for Sale

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<th>Baths</th>
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### Nearby Similar Sales

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<td>1</td>
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</table>
28a Please refer to Master Responses 17 and 18.

Additionally, for the general information of the commenter, there are two politically separate County-level agencies with regard to flood management: Marin County Flood Control and Water Conservation District (District), and Marin County under which the proposed SCA Ordinance would apply. The District’s mission only relates to flood control zones, which have been implemented in response to identified needs, such as historical flood events, since the District was first established in the 1950s. San Geronimo Valley is not within a flood control zone pursuant to management by the District; therefore, the policies and management practices of the District are not applicable. For San Geronimo Valley, or any area of Marin County not already within a flood control zone, to be reclassified as a flood control zone and subject to management by the District, a multi-step political process would be required, including a tax ballot measure with majority community interest (pers. comm. Tony Williams - District Civil Engineer, 20 January 2018). This is because Proposition 13 capped ad valorem property tax rates at one percent of full cash value at the time of acquisition, such that local jurisdictions, including Marin County, cannot independently establish ad valorem property taxes. Proposition 13 also introduced a requirement for local “special” taxes to be approved by two-thirds of the voters. If community members or groups wish to pursue a flood control zone within San Geronimo Valley, first a grass-roots campaign would need to gather signatures and/or other forms of support for consideration of the County and Flood District Board of Supervisors, and second funding would need to be obtained from the County General Fund or otherwise to bring the tax ballot to fruition. Given recent attempts to establish flood zones in other areas have failed to obtain a two-thirds vote, a tax ballot would likely only be facilitated with a compelling grass-roots community campaign.

28b Please refer to Master Responses 7, 17, and 18.
Letter 29—Lisa Lukianoff and Chris Raney
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Taylor, Tammy

From: Lisa Lukianoff <lukianoff.lisa@gmail.com>
Sent: Wednesday, June 14, 2017 5:48 PM
To: EnvPlanning; Rodoni; Dennis; Bai; Tarisha; Reid; Rachet; Taylor; Tammy
Cc: Chris Raney
Subject: Re: Suppl Environ Impact Report: CONCERNS by homeowners on the creek @ 6713 SFDB, Forest Knolls
Attachments: 6713 Sir Francis Drake Blvd, Forest Knolls, CA 94933 _ Zillow.pdf

In case the Zillow link (below) doesn't work for you, I've attached a PDF of the Zillow Estimate.

On Wed, Jun 14, 2017 at 5:09 PM, Lisa Lukianoff <lukianoff.lisa@gmail.com> wrote:

Dear Marin County Board of Supervisors, et. al.:

We purchased our home at 6713 SFDB, in Forest Knolls in 2006. Our home is located 6' from the creek in the back of the property.

Also in 2006, I obtained permits with the County of Marin to fully upgrade and renovate the original home, not adding any square footage. This was a significant financial investment of approximately $200,000.00. We installed new windows, electrical, plumbing, flooring, inset lighting, and heating. Currently, our home is valued at approximately: $800,000.00. (see Zillow link: https://www.zillow.com/savedhomesfor_sale/19286780_zpid/1_pnd/38.024312,-122.67026,38.082121,-122.690562_rect/14_zm/1_rs/1_fr?view=public.

I am a Consulting Psychologist and my husband is a Real Estate Developer and we both moved here from Southern Marin.

As homeowners and community members we are extremely concerned about how the Supplemental Environmental Impact Report will affect us on the following issues:

1. Flooding & Safety: We have filed 4-FEMA flood insurance claims since 2006 due to the SG creek flooding. The most recent in December 2016. We are concerned that nothing is being done to protect existing homes on the creek.
On March 10, 2017, I wrote to the County of Marin, Anthony Williams, Principal Civil Engineer, and Felix Meneau, P.E., Zone Engineer, at the Marin County Flood Control (https://www.marincounty.org/depts/pw/divisions/flood-control) to demonstrate the absence of San Geronimo Creek in their current flood protection programs and monitors.

CURRENT PROGRAMS & MONITORS

Ross Valley Flood Protection and Watersheds Program website includes Corte Madera Creek Flood Risk Management Project information and San Anselmo flood project information (http://www.marinwatersheds.org/rossvalleywatershed/index.html) but does not include any information on San Geronimo Creek flood issues. If you follow the link specifically for San Geronimo Valley, there is no mention of any flood protection projects (http://www.marinwatersheds.org/san_geronimo_valley.html)

Ross Valley Fire Department Creek level alert website which currently monitors Fairfax, Sleepy Hollow, San Anselmo, and Ross Creeks. Although these are excellent resources they do NOT include the San Geronimo Creek. (http://www.rossvalleyfire.org/services/creek-levels-weather)

FEMA has handled numerous flood reports along the San Geronimo Creek.

I respectfully asked the County of Marin to include the San Geronimo Valley residents, approximately 3,600, in all flood alert and protection systems, similar to Fairfax and other towns. These websites are great resources for residents to monitor flood issues. It’s only logical that San Geronimo Creek is included in a flood alert system.

I received an email back from Mr. Williams, who took the time to explain the comprehensive process involved and provided relevant information:

"Thank you for your inquiry. The 11 existing flood control zones within the County were established by resolution of the Board of Supervisors. The older flood zones (dating back to the 1980's) are funded through ad valorem property taxes but the newer zones, like Ross Valley (Zone 9), were created via a tax ballot measure. Because of current ad valorem tax allocations for other programs, the only way to create a new flood zone in the San Geronimo area would be through a tax measure. Obviously, there needs to be a majority of interest from the community for such a measure to be successful and recent efforts in other established zones (Stinson Beach and Santa Venetia) were not successful. A flood control zone in your area could support creek gaging and alerting systems as well as other flood risk reduction measures. This is how the current network of gages are paid for – installation and subsequent operations and maintenance is budgeted within existing flood control zones. If the
primary interest is focused on an emergency alert system, it is possible that the County Office of Emergency Services (OES) could be engaged to provide something."

2. **Stabilization and reinforcement** of our home located within 6' of the San Geronimo Creek. We have visited Marin County Building offices to inquire about the reinforcement of the creek bank, to no avail. There were no options for our home on the creek.

We are hopeful the board of supervisors and staff will incorporate measures to help homeowners protect their existing homes (and assets) from erosion and flooding. And that there will be consideration given to issues involving the flooding creek.

Thank you for taking the time to read this.

Sincerely,

Lisa Lukianoff & Chris Raney.

---

https://twitter.com/dr_lukianoff

This email correspondence and any documents which may accompany it, contain professional information from Lisa Lukianoff, Psy.D., and which is intended exclusively for the use of the individual or entity to which it is addressed, and which may contain information that is privileged, confidential, and/or otherwise exempt from disclosure under applicable law.

If the reader of this message is not the intended recipient or the employee or the agent responsible for delivering the message and any documents to the intended recipient, any disclosure, dissemination, distribution, copying, or other use of this communication or its substance is prohibited. If you have received this communication in error, please call collect to arrange for the destruction of the communication or its return to us at my expense. Thank you.
29  Duplicate of Letter 28.
Letter 30—Michael Snyder and Carol Stranger
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We have read thru the SEIR. Our problems with it fall into four categories.

1. The map: The map does not take into consideration existing building restrictions. Such as, lot size, septic perk, ridge line building, or MALT (if applicable), etc.

2. Supposition: The SEIR goes much too far into the "what if" category without a basis in reality. We have numerous laws and restrictions on building that Stillwater chose to ignore. This expediency on their part gives the impression that their are hundreds of buildable lots in San Geronimo Valley. This will be a field day for SPAWN and their claim of a "Wal-Mart" sized build out.

3. TIA and EIA: Once again there is a huge supposition on potential building plus faulty estimates of TIA and EIA. The report estimates are based on an assumption of maximum build out for the maximum number of units on all parcels. Stillwater's report states: "Determining existing TIA for each unit in a given parcel, parcels with existing units, determining the average TIA of a single unit by parcel and land use type, multiplying the average by the number of additional units allowable for that parcel, and adding it to the existing TIA". The established assumption is inaccurate in light of existing rules and regulations.

4. CEQA has an economic impact requirement which the SEIR does not take into account. CEQA has two components: First - protection of the environment; Second - the economic cost to homeowner that accompanies the first component (protection of the environment). CEQA is mentioned numerous times but the potential impact on the cost to homeowners, the second component of CEQA, is ignored. Ignoring the economic impact on homeowners will lead to multiple lawsuits against the County.

Support for Item #1 & 2 above by section and page.
2-30 last paragraph.
2-32 section 2.6.3
4-1 first paragraph
5-37 second paragraph first sentence

Support for Item #3 above by section and page.
Section 2-28 Item #1 and # 2.

Support for Item #4 above by section and page.
2-7 BIO-2.1, BIO 2.3
2-8 BIO- 4.1

To sum it up my biggest problem is "guilty before the crime" (assumed build out of all parcels to the maximum), ignoring existing rules and regulations regarding building in this valley, very faulty TIA and EIA estimates, and disregarding the second component of CEQA when the economic component of CEQA favors the homeowners.

Michael Snyder
Carol Stanger
30a The comment does not reference a specific map in the SEIR. There are three maps in the SEIR, each presenting different information, as described in the caption:

- Figure 2-2 San Geronimo Valley Land Use Policy Map (Marin CWP (2007))
- Figure 2-3 Area of Analysis
- Figure 2-7 Map of parcels within San Geronimo Valley with additional potential development units and number of units under the Proposed Project. The SCA boundaries are shown for reference.

If the commenter is referring to Figure 2-7, the commenter is encouraged to note the word “potential” in the figure caption. The corresponding text in SEIR Section 6.4, as well as text in Sections 6.2 and 2.6.3, indicates that the number of additional improved parcels and developed units anticipated under the Proposed Project represents a conservative estimate due to a number of environmental constraints that are likely to significantly reduce the total number of buildable parcels (e.g., inadequate percolation for on-site septic systems, lack of access via paved roads, steep topography necessitating engineered foundation designs). While it is not possible to quantitatively reduce the estimate of improved parcels under the Proposed Project without a parcel-by-parcel analysis that assumes specific design attributes for future development, the relatively low number of San Geronimo Valley building permits issued by Marin County in recent years (e.g., 2016) indicates that the number of additional improved parcels and developed units anticipated under the Proposed Project is likely to be an overestimate. Within the SCA in particular, additional policies (BIO-4.1 to BIO-4.20, see SEIR Table 2-1) would further limit development activities, with Policy BIO-4.2 Comply with SCA Regulations requiring individual projects to undergo a discretionary permit process that involves design review for development within the SCA.

30b Existing building restrictions were not ignored as part of the SEIR analysis. Please refer to the responses to comments 30a and 42d.

30c The commenter does not provide a rationale for why the referenced TIA methodology assumption is inaccurate in light of established rules and regulations. Please refer to Master Response 4.2 and Comment Response 42d-f.

30d Please refer to Master Response 3.
30e Please refer to Master Response 4.2 and Individual Responses 30a-d and 42d-f.
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Letter 31—Peggy Sheneman
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Taylor, Tammy

From: Peggy Sheneman <peggycreeks@comcast.net>
Sent: Wednesday, June 14, 2017 2:33 PM
To: EnvPlanning: Reid, Rachel; Bai, Tarisha; Rodoni, Dennis; Mosher, Ana; Hilda
Subject: San Geronimo SEIR Should Comply With Scoping Request

From: Peggy Sheneman 415-488-4426
P O Box 814, woodacre CA 94973

To: Rachel Reid, Marin Community Development Agency
eniplanning@marincounty.org, RReid@marincounty.org

Tarisha Bai, Marin county Counsel
TBai@marincounty.org

Supervisor Dennis Rodoni, DRodoni@marincounty.org

Marin Planning Commission, AMosher@marincounty.org

Re: Has Stillwater Sciences completed the tasks assigned under the SEIR Scoping documents?

I have lived in Woodacre since 1982, and own a house on land with a blue-line mapped stream.

31a Has Stillwater Sciences completed the tasks assigned under the 2015 scoping documents, or should more information be provided before the Marin County pays them?

31b I refer to the San Geronimo SEIR Scoping Request, August 28, 2015, from Stillwater Sciences to David Zaitsman, Marin County Counsel (2015 Scoping request). Page 5, section 2.4, calls for reviewing the "2013 Expanded SCA Ordinance" and the "Standard Management Practices (SMPs) developed for the SCA".

31c The April 2017 draft SEIR pages 5-12 to 5-20 recommends a new stream ordinance, but does not explain how this SEIR mitigation measure differs in any respect from the Interim SCA Ordinance adopted by Marin County Oct. 29, 2013. (I publicly supported the 2013 ordinance.)

31d Is the SEIR stating that the 2013 ordinance is or is not a good model for effective mitigation? Would the 2013 ordinance requirements for exemptions and Tier 1 Permits (small improvements on existing homes) adequately mitigate significant impacts? Are the SMPs adequate or should they be improved?

31e The 2013 ordinance was in effect in the rest of Marin County for 30 months, until April 2016. What was the result for stream habitat in those areas? How did the 2013 ordinance work for homeowners?

31f The 2017 supplemental impact report was spawned in litigation, and we should not assume there will be no future lawsuits. A judge looking at the SEIR would search for answers to these questions, but not find them in the SEIR.

LETTER # 31
Thank you for your attention and diligence.
31a Tasks under the 2015 scoping documents have been completed.

31b Task 2 of the Scope of Work involved updating information on existing conditions related to salmonids in San Geronimo Valley, prior to developing the Draft SEIR. Both the 2013 Expanded SCA Ordinance and Standard Management Practices were included in the information gathered. Please refer to Master Response 6.1 (Interim SCA Ordinance) and Master Response 6.6 (Standard Management Practices) for information on how this information was used towards developing the Final SEIR.

31c Please refer to Master Response 6.1 regarding the Interim SCA Ordinance, which does not set a precedent for the Expanded SCA Ordinance. The Expanded SCA Ordinance will be subject to a separate legislative process, as described in Master Response 6.2.

31d Please refer to Individual Response 31c above (and Master Responses 6.1 and 6.6). Whether similar provisions to the Interim SCA Ordinance, or otherwise, will be included in the Expanded SCA Ordinance, will be decided during the legislative process for the Expanded SCA Ordinance.

31e Please refer to Master Response 6.1, which states that the Interim SCA Ordinance was never implemented because of litigation; therefore, there is no measure of its effectiveness. As also stated in Master Response 6.1, the Interim SCA Ordinance does not set a precedent that will be carried forward into the Expanded SCA Ordinance, which will be subject to its own legislative process.

31f The Draft SEIR was prepared in accordance with the directive of the Court, and in compliance with CEQA (see Master Response 3). Marin County has worked diligently address public comments on the Draft EIR, while complying with CEQA.
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Taylor, Tammy

From: Christin Anderson <sgvchristin@gmail.com>
Sent: Wednesday, June 14, 2017 9:37 AM
To: Reid, Rachel; Bai, Tarisha
Cc: Rodoni, Dennis; Jackson, Lorene
Subject: SEIR San Geronimo Valley

Dear Ms. Reid and Ms. Bai, My family and I have now been living in the San Geronimo Valley for 33 years. We have been aware of the fragility of our streams and our part in protecting them. As residents who live on the Valley floor of Woodacre, we have been very active and interested in seeing a way to mitigate the pollution in the creeks from sub-standard and failing septic systems. The document as I read it, does not address this long standing problem. I recommend that the document include this elephant in the creek, addressing existing and potential future pollution with the support of the County to support onsite repair or development of a community wastewater system to serve existing homes.

The Tomales Bay TMDL, the SGV Salmon Enhancement Protection Plan, the Regional Water Board, MMWD, and the Environmental Health Services Division have all recognized and supported future mitigation of this issues. The Local Area Management Plan will also be addressing this issue with stronger regulations very soon. So far I have not seen this issue even mentioned with regard to new development.

I recommend that the SEIR include this issue and language to address potential solutions or regulations. In addition, the SEIR should offer incentives not disincentives to the home owners to solve their own problems or at least perform some kind of maintenance. Many residents don't even know where their tank is located or has never had it pumped, mostly out of fear of opening a big can of worms that the County may come down on. I believe that most of the home owners want to do the right thing. A Septic System Education Program would serve all of us well and get all of us working together. Please be advocates for better Wastewater Management rather than adversaries.

Thank you for your support,
Christin Anderson
Resident and SGV Wastewater Project Leader/volunteer
32 Please refer to the responses to comments 27h and 27i above, and to Master Response 15.
Letter 33—Donnell Peters
Taylor, Tammy

From: Donell Peters <donell.peters@comcast.net>
Sent: Wednesday, June 14, 2017 12:25 PM
To: Reid, Rachel
Subject: Comments regarding MARIN-DRAFT 2017 SUPPLEMENTAL EIR

To: Rachel Reid -- County Counsel

Please accept my comments regarding the Marin-Draft 2017 Supplemental EIR. I fully agree with all of the comments that you received from the San Geronimo Valley Stewards. Please count my feedback in full support for all of their proposals and requests for clarification. The Stewards are a really great group with smart, dedicated volunteers who are making a positive difference here in the valley.

About me:

I own a home along the San Geronimo Creek in San Geronimo and have been here for 23 years. Prior to living here I was in Inverness and Lagunitas, so I am officially a long time West Marin Resident. I live here alone with my dog so together we have a very light impact on the land. I work in Software Development, and Program Management. I can usually work from home a day or two a week and other days take the Larkspur Ferry to SF.

So far, I have not had any trouble with my Fire Insurance, which is issued by State Farm, but have been seeing recent emails on NextDoor that other companies are canceling their local policies. There was a very scary wildfire directly across the street a year ago, when the hill behind the school caught fire. That was my first direct experience with fire with planes and helicopters flying low overhead. I do not think there is sufficient enforcement of fire safety standards by our local Fire Department. A friend recently visited from Mendocino County where they are very fire conscious and was shocked to see the amount of overgrowth in the San Geronimo neighborhoods. That’s why the Steward’s question about how the County will react to rebuilding requests after a natural disaster needs to be answered. As we all know, Spawn would just love to see any requests to rebuild after a major disaster declined.

The majority of my property and house are within the 100ft setback zone. As a result I am adversely impacted by these streamside proposals. The house was built in the early 1970’s, approx. 2500 square feet.

I am an avid environmentalist but I am not an extremist who believes that nature needs to be preserved in a state that does not include Humans. I believe that Man and Nature can consciously co-exist. I a master gardener and only use organic gardening methods. I don’t go down the creek bank into the creek because I do not want to disturb the fish. Over the years I have observed salmon, steelhead and even eels spawning. I’ve seen river otters eating the salmon carcasses and watched Blue Herons eat the salmon fry as they hatched. I am a close observer of nature and read a lot about how the lack of upwelling restricted the amount of food available for the young fish, impacting the survival rates while they were in the ocean. The recent population decline had nothing to do with the proximity of houses to the creek. Fish populations have also been impacted by large storms that washed away their nests. These were nature based occurrences and had nothing to do with homeowners.

Thanks for considering my feedback,

- Donell Peters
33a Comment noted. Please refer to the responses to comment letters 6 and 7.

33b Please refer to Master Responses 16 and 18.

33c Please refer to Master Responses 10 and 18.

33d The nature of incremental cumulative impacts to salmonids from development, including housing developments near creek banks, is that they may occur relatively slowly over long time periods, making them more difficult to discern and measure than other impacts, and also more difficult to predict; thus, the need for a comprehensive cumulative impact analysis, as required by the Court. Please refer to Master Responses 2 and 17, which provide information in relation to climate change and flooding-related impacts.
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Taylor, Tammy

<table>
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<tr>
<th>From:</th>
<th>George Peterson <a href="mailto:gecpete@yahoo.com">gecpete@yahoo.com</a></th>
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<td>EnvPlanning: <a href="mailto:TTAYLOR2@MARINCOUNTY.ORG">TTAYLOR2@MARINCOUNTY.ORG</a></td>
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</tbody>
</table>

George Peterson, P.E.

20 Sanchez Road Suite P
Forest Knolls, CA 94933
Ofc: 415-488-4835
Cell: 415-233-3542
June 12, 2017

Count of Marin
RReid@marincounty.org; TBal@marincounty.org
DRodoni@marincounty.org
CC: info@vgstewards.org

Re: Supplemental Environmental Impact Report (SEIR)

Background

I have owned my home at 20 Sanchez Road in Forest Knolls since 1998. The house is near the top of a hill bounded by Forest, Juarez and Sanchez. My property extents from Juarez, a County road, to Sanchez, a non-County road. At the lower Juarez end the property is about 100 feet from Paper Mill Creek – an all year waterway. At the farthest, the property is about 250 feet distant from the creek.

Overview

Overall, the County appears to be doing a good conscientious job of protecting the salmon and their habitat from degradation and even making significant improvements.

The County seems to be having much more difficulty in protecting the residents of the valley, especially protecting the residents from the County.

The Supplemental Environmental Impact Report (SEIR) does a good job of identifying and suggesting solutions to adverse impacts that might happen to the salmon. However, it is nearly silent on how to protect residents.

There are a number of ways that regulations can be written and enforced such that salmon are fully protected and simultaneously the potential negative impact on residents in the valley is minimized. Indeed, if the residents are considered as well as the salmon, the greater resident participation is likely to enhance all efforts rather than detract.

Zones

Create zones within the impact area. Very often activities that are nearer the creek will have more impact. This should be recognized. Unnecessarily restricting activities that are small and distant form the creek does nothing to protect the salmon, but can have large negative impacts on residents.

Even if there are initially no designated differences between two Zones; the fact that different Zones exist will make it much, much easier to designate a difference if one is found to be warranted in the future.

For instance, suppose some activity is found to have a significant impact on water temperature if performed within 10 ft of the stream, but no effect at all if further than 35 ft. Without zones, this activity would need to be prohibited even at 99 ft. The designation of zones allows for future flexibility as the knowledge and science advances.

Recommendation:
Suggested zones:
- 0-15 ft
34c  NOT Extended SCA
The proposed Stream Conservation Area (SCA) is the GREATER of either “50-feet landward from the outer edge of woody riparian vegetation associated with the stream” or “100-feet landward from the top of stream bank.” In an wooded area such as I live in; this wording could be interpreted as extending the SCA almost indefinitely. If woody riparian vegetation extends 200-feet, that makes the SCA 250-feet wide. A huge increase unjustified by any data that such a large area is necessary. The exact definition of woody riparian vegetation would also be problematic and open to varying interpretations.

Recommendation:
The maximum SCA is 100-feet landward from the top of the stream bank. Stream bank tops are fairly definite, and such a distance is more than sufficient for protection. In fact, 35-feet was previously suggested.

34d  Expedited Review Process
My experience is that the County is not good at modifying procedures to fit the individual circumstances of the residents. This experience comes from a lot line adjustment that is nearing completion.

When my neighbors and I bought our properties neither of us knew exactly where the lot line was between us. After many years we gradually began to have a better idea. It was obviously too close to my house. When they decided to sell their property they offered to sell me some of the land adjacent to mine. Thereupon a surveyor was contracted and the existing lot line was found. It passed through my car deck and electrical panel, cut through part of my septic system, contained my propane tank, and intersected most of my retaining wall. It was also very distant from their house and septic and passed through some virtually impenetrable steep hillside; and no “conforming” issues would be changed. This was obviously a simple straightforward lot line adjustment wanting to happen.

It is necessary for the County to ensure that no additional issues are created by a lot line adjustment. For instance, the county shouldn’t approve a new lot line that would go the neighboring property’s house or septic or even impinges on the setbacks. It this case that was so obvious that a visual inspection with surveyor stacks in place could have easily done the job. But the procedure required was that the surveyor determine by survey and map out my neighbor’s house and septic fields in within a 0.1” and draw them on a highly detailed map. Yep; no issues. However, that complex procedure cost perhaps $10,000+ more than necessary.

A one size fits all must be the most restrictive expensive onerous detailed size. In the majority of cases, it is the wrong size; in a few, it is necessary. Yes, necessary for cases of disputed ownership or tight quarters as happened down at the end of my block. However, unnecessarily expensive for my situation. The County would do a great service to its community by making some efforts to distinguish between simple & modest, and extreme situations and to create procedures adapted accordingly.

The County needs to protect the residents from the County.
Recommendation
Recognize three levels of review.
- Expedited: Fairly obvious that no impacts will be created. Permits granted within the existing procedures. No additional requirements. For example; a homeowner wants to add an additional story onto an existing structure. Would not change impermeable areas etc.; such construction should be automatically exempt from salmon review procedures.
- Simplified: Fits into a set of parameters that are designed to ensure no credible impact potential exists. For example, adding a hot tub at some distance to the stream with sufficient remediation (a French drain to mitigate water flows).
- Full Review: Necessary to fully review the application because one or more critical design/impact issues might exist.

Cumulative Impact
The analysis is based on preventing adverse effects from the maximum cumulative impact of future development. It does not address a far more important question: determining the modest level of development that can be allowed now without adverse impacts.

Why is this question more important?
1) The "maximum" future development is extremely unlikely to ever happen. Many included parcels are unbuildable due to site conditions: slope, lack of perk, site, economics, etc. To restrict all development based on a maximum that isn’t possible is needlessly restrictive.
2) Small increments of development that would have no impact on valley conditions, can have major benefits to the homeowner involved. For example, if one and only one family in the valley were to cover over 100 sq ft of land to install a hot tub; that would have no impact on stream conditions. However, it could greater increase that families enjoyed lifestyle. If the hot tub installation was further remediated with some extra features to capture and slow runoff to previous rates, that would be even better.
3) Small projects could be allowed on existing sites to certain limits. The valley conditions are continuously monitored and that slow development could be stopped if it is ever determined to have adverse impacts.
4) On-going larger enhancement projects are most likely to improve overall valley conditions faster than small project degrade it, especially since properly done, these small project are unlikely to degrade conditions anyhow.

Recommendation
Create a Potential Impact Parameter (PIP) based on three factors:
- Size
- Distance to stream
- Remediation
A 1.2 sq ft newly paved over space within 5 ft of the stream and without any remediation would be 100 units. A 1.2 sq ft newly paved space at 30 feet from the stream with fully effective remediation would be 10; i.e., even at most distance and remediation can only reduce calculated impact by 90%.

Over an 8 year period or until better data is determined the County would approve 8,000 units of development on existing developed sites in the valley by expeditious process. This would greatly benefit valley residents with no possibility of harming fish conditions.

**MMWD**

A salmon ladder on Peters Dam that forms Kent Lake would open a huge area of ancestral salmon habitat. The area behind Peters Dam is already protected from development. The dam is relatively low and seems an ideal candidate for a salmon ladder. The blocking of this MMWD area seems to be the primary reason the remaining streambed has to be so diligently protected.

Whereas almost the whole county benefits from the MMWH water supply, and whereas it is the dam which make this water supply possible that are the primary cause of the reduction of salmon habitat, therefore, the beneficiaries of MMWD water should financially participate in the remediation efforts.

**Recommendation**

The financial responsibility of protecting salmon should not fall solely on residents of the valley. Establish a fund to pay for increased regulatory cost of residents paid for by all stakeholders who benefit.

**Conflicting Regulations**

Each year I receive a reminder from the Marin County Fire Department “Wildfire is Coming, Are You Ready?” It states: “100 feet of defensible space is required by law.” “Marin County Ordinance 3550 states in part that owners of land adjacent to structures are required to maintain a fuel break 30-150 feet from structures, depending on topographic and condition of vegetation.”

I live on a fairly steep hill, so the larger fuel break is more responsible. Last summer a fire started right across the stream from my house. The flames where easily visible. While the fire department successfully put out the fire, it was an important reminder of the hazards of living on a wooded hillside.

It appears that the County of Marin will simultaneously require homeowners in the valley to clear and not-clear their properties. Since the regulations may be enforced by different departments; “Damned if you do; damned if you don’t.”

The County should put in place a mechanism to protect the residents from the County.

**Recommendation:**

Establish an Ombudsman position to intercede on homeowners’ behalf when County regulations and enforcement become excessive, contradictory, or counter-productive.

Thank you for your consideration of this matter.

George Peterson
As described in Section 7.2 above, updates to the Final SEIR respond to comments seeking clarification regarding the types of development activities that would require new permits and site assessments, as well as further detail regarding the analyses conducted for the SEIR. Clarifications and amplifications, including exemptions, to Mitigation Measure 5.1-1 Expanded SCA Ordinance attempt to balance concerns raised primarily by homeowners and residents with the need to, and previous commitments to, protect and enhance salmonid habitat (CDFG 2004, PCI 2010, SFBRWQCB 2014a). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Responses 6, 7, 8, and 9 for modifications to mitigation measures that address homeowner concerns.

The 100-ft SCA is a streamside buffer zone to protect salmonids based on scientific evidence, discussed further in Master Response 10. Beyond the 100-ft buffer, watershed-wide impacts resulting from sediment delivery to streams have also been addressed (see Master Response 8). Marin County has noted your comment, but there is not currently compelling scientific evidence to support sub-zones within 100 feet of streams. Even if such evidence came to light, creating streamside sub-zones would likely result in unnecessarily complex planning provisions that are difficult to implement on the ground. Marin County does not consider that additional sub-zones would make development planning easier for property owners and residents of San Geronimo Valley, nor would they enhance salmonid protection compared to the 100-ft buffer approach.

Individual property boundary adjustments are beyond the scope of the SEIR. In response to comments received on the Draft SEIR, Marin County has included minimum exemptions to the Expanded SCA Ordinance permitting and site assessment requirements in Master Response 6.4. Additional exemptions may be included as the Expanded SCA Ordinance is developed in full (see Master Response 6.2). As stated in Master Response 18, internal remodeling of existing structures within the SCA that does not extend the building footprint, as well as external repair of existing structures within the SCA, provided repair does not require vegetation clearing, increase impermeable area, increase surface runoff, or result in exposed soil, and provided compliance with all other relevant land use provisions of the Development Code, would not require a discretionary land use permit.
Adding an additional story to an existing structure may, therefore, not require a discretionary land use permit.

34e The nature of incremental cumulative impacts is that they may occur relatively slowly over long time periods, making them more difficult to discern and measure than other impacts, and also more difficult to predict; thus, the need for a comprehensive cumulative salmonid impact analysis, as required by the Court. The Draft SEIR found that the incremental cumulative impacts of development on salmonids in San Geronimo Valley would be significant without mitigation. Mitigation includes both SCA and watershed-wide development management (Master Responses 6 and 8) and habitat enhancement (Master Response 7), and does not prohibit development. Please refer to: Individual Response 34a above; minimum exemptions in Master Response 6.4, which ensure the Expanded SCA Ordinance is not unnecessarily onerous to property owners and residents; and Master Response 18, which describes projects that would not require discretionary land use permits under the Expanded SCA Ordinance. The scale (or size) of a project, its distance to the stream, potential remediation and habitat enhancement, as well as the number of parcels and units that will potentially be developed, have all been considered in the SEIR.

34f Peters Dam forms Kent Lake and is MMWD's largest reservoir. The dam was built without a fish ladder and it marks the upstream limit of anadromous fish migration in the main stem of Lagunitas Creek (PCI 2010). Please refer to Master Response 2 with regard to historic damming activities. While a salmon ladder on Peters Dam may benefit salmon by providing access to upstream habitat, the dam and its effects are not affected by the Proposed Project and have not been analyzed in the SEIR.

34g Please refer to Master Response 13 with regard to shared responsibilities of protecting salmonids. The financial burden of seeking discretionary permits and facilitating site assessments under the proposed mitigation for salmonids falls on those who benefit directly from development activities within San Geronimo Valley. No property tax increases are proposed.

34h Please refer to Master Response 16.

34i Please refer to Master Response 18.
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Letter 35—Ann Seramin
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Dear County Representatives,

Thank you for the opportunity to comment on the DRAFT SEIR to the 2007 Countywide Plan Final EIR. It has now been 10 years of litigation paid by taxpayers.

My name is Ann Serramin and I have lived in the San Geronimo Valley since 1978 with my husband. We have raised our two boy’s here, who are ages 26 and 30. I am active community member: a church member at St. Cecilia’s in Lagunitas; I am on the San Geronimo Valley Stewards board; and am a committee member on the Woodacre/San Geronimo Flats Wastewater Project.

A little history: My grandparents’ had a summer home in Lagunitas on Spring Lane in the 20’s and 30’s. My father had fond memories of summer’s here in the 1930’s. My grandmother stayed all summer here with my father and siblings, while my grandfather worked during the week, then would take the ferry from SF to Tiburon, then the train out to the valley on the weekends. When my sister and I moved out here, (she came in 1974) with our husbands, my grandparents’ felt that they had come full circle. When they visited us, they could not believe that the valley hadn’t changed at all, in their eyes, since they had sold the family summer house here in the late 30’s. They felt that time had stood still out here.

That being said, I feel that living conditions here in the valley still have not changed much, and I have grave concerns with this latest forced additional court ordered SEIR report for the San Geronimo Valley.

I feel that the **100 foot set back** regulation for existing homes on the creek is unrealistic. The SEIR doesn’t even touch on that. Our history shows that residents have been diligent stewards in preserving the beauty and land that we have here. We have a home on the creek that is within a 100 foot set back. It was built in 1963. None of the reports that the county has paid for has proved accurate science, with no exceptions or exemptions for homes within a hundred foot set back that need to maintain their structure, add a handicap ramp, or build a child’s play structure, enclose garbage cans, or add a small unit for senior care, or affordable housing. I feel a 35 foot set back is adequate for the new 2018 County wide plan by evaluating homes in a Tier system that makes it clear, simple, affordable, and enforceable, as suggested in the 2013 ordinance. Where was this kind of alternative in the SEIR? Other counties such as Santa Cruz, Saratoga, & Napa have collaboratively ordinances where the counties work with homeowner’s on creeks to better improve their riparian area’s. Why didn’t Stillwater analyze that? Our valley could be as prestige as Santa Cruz, Saratoga, and Napa riparian area’s.

My other major concerns with the SEIR report are:

**FIRE** - Homeowners would need a permit to clear our vegetation? We are required to clear our vegetation by the County and State Fire Agencies, and insurance companies. I walk the hills and ridges everyday and see so much overgrown vegetation around homes, and in open space. It scares me that someone could light a match and the whole valley will be gone...people, houses and fish...There would be no environment...chemicals from the burn will kill all aquatic life. **This Valley’s VEGETATION is Fuel for Fire, and the residents are less than 20% of the SGV Watershed. Look what happened in the Lake County Fire.** Why didn’t the
SEIR ADDRESS THIS? It needs to be stated in the SEIR Report the consequences of fire in the San Geronimo Valley. Insurance companies are not renewing home policies when residents are calling to inquire about cost, changes, or deletions or additions to their policies. I had a resident tell me at the Stewards May 15th meeting, that she called her insurance to take her daughter off her car insurance policy, and the next day they cancelled her home insurance. (Allstate) We had at least 10 people tells us that this has happened to them. Questions and changes to home and car policies are triggering cancellations.

ALSO, IF A HOME IS DESTROYED AFTER FIRE, EARTHQUAKE, OR FIRE, THE HOMEOWNER MUST BE PERMITTED TO RE-BUILD ON THE EXISTING FOOTPRINT PROVIDED WITH BEST MANAGEMENT PRACTICES AND SAME SQUARE FOOTAGE AS THE DESTROYED HOUSE. Otherwise it is a TAKING.

SANITATION - I would like to recommend that the SEIR include science that addresses ongoing and future failing septic systems and the impact it has on the salmonid. This is a health issue! They need to address the need to repair septic, and or recommend construction of a community wastewater system to the lower flats of the Valley as successfully accomplished in Marshall, (Valley Waste Water Project has been in progress the last eight years.) There is a need to get this valley out from under it’s major problem. It is the “elephant in the room” that is preventing any progress towards improving life in the valley and living in the 21st Century. The winters’ are deplorable in the valley with heavy rain, and septic systems in the flats of the valley are floating under water, preventing toilets to be flushed, shower’s to be taken, or laundry to be washed.

AFFORDABLE HOUSING - SEIR should address the impact of an expanded SCA Ordinance on the needs for affordable housing in the SGV. The population here is getting older, and there is a need for full time caregivers. A 350 square addition would provide for workforce housing, or senior caregiver housing that could be privately financed without taxpayer’s money.

In conclusion, we need to get out of the dark ages here in the Valley, and work as a community to help with improving these dire issues, and eater no longer to SPAWN. THEY HAVEN’T COME TO THE TABLE. The County, MMWD, Department of Fish and Wildlife, and the The federal Government has spent over 35 million in trying to save the Coho. Let us not be held hostage any longer. Our Taxpayer money has been ill spent with all the lawsuits, and it is time that these environmental analysis’s from companies such as Stillwater encompass all the community issues that effect taxpayer’s, so that we may all work collaboratively to achieve the best together for the beautiful Valley we live in.

Thank you.

Ann Seramin
20 Meadow Way
P.O. Box 84
San Geronimo, CA 94963
email: ascramin@comcast.net
phone: (415)468-6775

July 2018
35a Please refer to Master Response 10. Please also refer to Master Response 18, where you can find information of activities that would not require a discretionary land use permit under the Expanded SCA Ordinance, as well as contact information for the Urban Streams Coordinator for the Marin Resource Conservation District.

35b As explained in Master Response 6.2, the Expanded SCA Ordinance will be subject to a separate legislative process, during which representatives of agencies and the community will have the opportunity to provide input. This is additional to the opportunities for public comment on the Draft and Final SEIR, in compliance with CEQA. As a supplemental EIR prepared in response to the direction of the Court, analysis of alternatives to the Proposed Project is not required. Per State CEQA Guidelines Section 15163, the SEIR need contain only the information necessary to make the previous EIR adequate for the Project as revised. Feedback regarding effecting streamside ordinances that are operative in other counties has been noted, and Marin County is open to reviewing these during development of the Expanded SCA Ordinance.

35c Please refer to Master Responses 6.4 and 16.

35d Please refer to Master Responses 16 and 18.

35e Yes, please refer to Master Response 18.

35f Please refer to Master Response 15.

35g Please refer to Master Response 14.

35h The current litigation process for San Geronimo Valley is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is legally obligated to follow actions required by the Court, which requires allocation of funds towards environmental analysis and legal fees.
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Letter 36—John Beckerley
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Dear All with my deepest respect,

These are a few of my thoughts on the SEIR report:

| 36a | You're number one priority with regards to the stream ordinance is that you must protect us from fire. I am a San Francisco Firefighter who responded to the Oakland fire and saw firsthand what an out of control wildfire can do to all of us, above all you must protect our lives and properties. |
| 36b | I think that the 35 foot setback is reasonable as hundred feet is probably too much. Over the past years I have not been able to understand how the county can allow themselves to be taken hostage by Todd Steiner and Spawn, our valuable tax dollars are being wasted by him suing the county and the county paying his legal fees. It's an unbelievable predicament and this individual has got to be reigned in. I trust that you will all use your best judgement but remember our lives and property come before the Salmon. We all love the salmon and want them to prosper but this whole suit has become ridiculous. This winter water was running everywhere through our properties, that means the whole Valley lives near or on the so called ephemeral streams. Have we as property owners have no rights? Sincerely, John Beckerley, San Geronimo |

Sent from my iPad
36a Please refer to Master Response 16.
36b Please refer to Master Response 10.
36c Please refer to Individual Response 35h above.
36d Please refer to Individual Response 8d in relation to defining ephemeral streams. Please also refer to Master Response 17 in relation to flooding, Master Response 12 in relation to the implications of the SEIR for homeowners, and Master Response 18 for information on the regulatory and financial burden of the SEIR on homeowners.
Letter 37—Bruce Lafranchi
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This draft report involves the Marin County Planning Department is such critical issues as a family planting a new tree, growing vegetables, building a handicap ramp, or parking their car in a different area, etc. all in the name of preserving fish. And yet there is little or no likelihood that any of these measures will in any way affect the spawning and survival of any fish.

Further, the stream setbacks are excessive and essentially amount to a government taking of property with no compensation and for no discernible benefit. 25ft would be more than adequate and provide virtually all of the same benefits as the proposed setbacks.

It conflicts with responsible fire management practices and seems to require government permitted for normal daily activities such as trimming brush. Is that really necessary or even practical?

The impervious area restrictions should be re-evaluated given that well in excess of 98% of the valley are not impervious and will remain that way. This includes home size restrictions.

People need to be able to build, re-build, renovate and expand or Marin county should condemn and purchase their property.

George Orwell: There are some ideas so absurd that only an intellectual could believe them.
37a As discussed in Sections 3.2 and 5 of the SEIR, numerous studies have demonstrated that stream ecosystem health is influenced by a complex interplay of factors related to development. The SEIR describes a cumulative impact assessment of future development for the watershed as a whole, rather than assessing the impacts of individual development activities, such as the examples referenced by the commenter. Formulation of the mitigation measures was based on a combination of available data regarding salmon health in San Geronimo Valley and Marin County permitting and development requirements. Please refer to Master Response 6.4 (Clarification Regarding Tree and Vegetation Trimming and Removal), Master Response 12 (Implications of the SEIR for Homeowners and Balancing Conservation with Homeowner Needs), and Master Response 18 (Regulatory and Financial Burden on Homeowners) for further information.

37b Please refer to Master Response 10.

37c Please refer to Master Responses 6.4 and 16.

37d The commenter does not provide a rationale or citation for the statement that well in excess of 99% of the valley is not impervious and will remain that way. Please refer to Master Response 4.2.

37e Regulatory changes to protect salmonids, as required by litigation, do not warrant property purchases by Marin County throughout San Geronimo Valley. Please refer to Master Response 18 regarding regulatory requirements for homeowners and insurance.
Letter 38—Andrew Davis
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Taylor, Tammy

From: Andrew Davis <andrew.davis511@gmail.com>
Sent: Wednesday, June 14, 2017 6:44 PM
To: Rodoni, Dennis; Bal, Tarisha; Reid, Rachel; EnvPlanning
Subject: Supplemental EIR comments

Ms Reid & Marin County Planning,

I am a homeowner in Forest Knolls, and am writing to express my concerns and questions about items in the "2007 Marin Countywide Plan Supplemental EIR with a Focus on Potential Cumulative Impacts to Salmonids in San Geronimo Valley," as follows:

Executive Summary, "SEIR Requirement" (2): A clear consequence of the SEIR's consideration of the impacts of "buildout" on salmonids in San Geronimo Valley is the impact on the (human) residents of the valley, yet the SEIR does not substantially address these issues. For example, Section 2.4.2 "Built Environment Element" provides general "community development" topics but does not provide any in-depth study of the topics. My concern is that when the impact on salmonids is the metric to guide development - and the impact on people is not given equal consideration - "community development" will decline for many reasons.

- At what point in the process are the impacts on residents considered?
- How/when does the County address the impacts of the proposed Expanded SCA Ordinance outlined in Mitigation Measure 5.1-1 (page 5-12)?

2.6.4 Scale of the Stream Conservation Area (SCA), page 2-36 states "the number of additional improved parcels and developed units anticipated under the Proposed Project represents a conservative estimate due to a number of environmental constraints that are likely to significantly reduce the number of total parcels."

- What form of investigation of properties (both developed and undeveloped) has the author made to substantiate this claim?
- Can the report author provide a list of APN for parcels they consider have the potential for development, as well parcels which are considered not able to be developed due to "environmental constraints"?
- While I expect "constraints" identified in this section to include proximity to streams and hillside restrictions, what are the constraints considered by the author? Are factors like setbacks, and the ability to construct approving on-site wastewater disposal systems, and site access also considered?

Stream Conservation Area is defined on page 2-26 as "a development setback on each side of the streamside top of bank that is the greater of either (a) 50 ft landward from the outer edge of woody riparian vegetation associated with the stream, or (b) 100 ft landward from the top of bank." While I assume the "top of bank" can be identified by a land surveyor, I have not found a clear definition of riparian vegetation in the report, and/or by what process the boundary of such vegetation would be defined. Much of the valley is covered by vegetation which is continuous - and without boundary - so I am concerned about this definition and the possibility of what appears to be an open-ended definition from preventing any and all forms of development.

- What is the definition of "the outer edge of riparian vegetation?"
A CDFW or NMFS-trained professional is identified on page 5-12 as determining such a boundary - please confirm.

Approximately what does a CDFW or NMFS professional cost, e.g., to determine the riparian boundary?

Mitigation measure 5.1-1: Expanded SCA Ordinance page 5-12: The list of activities that would require "site assessment" is so broad its hard to imagine what activities would *not* require site assessment. I'm concerned that something like a modest addition to a single family home - which increases "impermeable area" - will automatically require site assessments, and this will slow development in the Valley which is already impaired.

- This provision in is overbroad and too far-reaching, and seems like it should be addressed in the development of the SCA Ordinance. Can this be removed from the draft SEIR?

The second bullet-point in this section asks for consistent permit and site assessment requirements for conventional zoned districts as well as planned zoning districts. Section 2.6.4/page 2-6 provides background that planned districts require discretionary review (due to lack of controls), compared to conventionally zoned districts which are have development controls provided in the Municipal code. Based on the conservatism that pervades the report, the implication of the this bullet-point is that conventionally zoned parcels undergo automatic design review, imposing a harmful economic burden to modest projects.

- This provision in is overbroad and too far-reaching, and seems like it should be addressed in the development of the SCA Ordinance. Can this be removed from the draft SEIR?

The third bullet-point in this section requires mandatory CDFW or NMFS review of *all* projects.

- This provision in is overbroad and too far-reaching, and should be addressed in the development of the SCA Ordinance. Can this be removed from the draft SEIR?

The fourth bullet-point requires discretionary permits for any project in a priority stream reach, lists the stream reaches that would be categorically included for this level of review, and then concludes that the requirement "may be modified based on the results of future studies." This approach effectively shifts the burden of salmonid habitat repair on a minority group of homeowners in the San Geronimo Valley. The low level of building permits issued for construction in the Valley is a clear indication that development is already impaired due to the complex regulations already in place, and the proposed measure is directly counter to Project Objectives such as "more affordable housing" (provided in section 2.3, page 2-3).

- The difference between the SCA defined for the Inland Rural Corridor and for the rest of the County is unfair and burdensome. Homeowners on small stream reaches in the Valley should not be burdened with fixing an issue that is at least in part predicated on a reservoir and dam system that benefits the entire County, unless the County can offset the added cost which will be imposed by the ordinance measures outlined in the report. Can this bullet point be removed from the SEIR due to the economic discrimination it imposes on residents of stream reaches? Alternately, can additional measures be added to the report (such as a water tax on other parts of the County) to mitigate the economic hardships proposed in measures in the SEIR?
Thank you,

Andrew Davis  
375 Montezuma Avenue  
Forest Knolls, CA 94933  
cell 415.250.1855  
mailing address PO Box 167, 94933
The SEIR has been prepared in accordance with the direction of the Court, which requires: (1) analysis of potential cumulative impacts, and the range of potential consequences, on salmonids in San Geronimo Valley resulting from future theoretical buildout in the watershed under the Proposed Project, and (2) a description of mitigation measures relevant to salmonids. These specific requirements notwithstanding, Marin County has considered the impact of the SEIR on residents of San Geronimo Valley, and clarifications and amplifications have been made to the Final SEIR to reflect resident and property owner concerns. The Final SEIR attempts to balance these concerns with the need to, and previous commitments to, protect and enhance salmonid habitat. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Responses 6.4, 13, and 18.

38b Please refer to the response to 38a above, and Master Response 6.
38c Please refer to Master Response 4.1.
38d Please refer to Master Response 10.
38e Please refer to Master Response 6.5.
38f Please refer to Master Response 18.
38g Please refer to Master Responses 6.4, 6.5, and 18.
38h Please refer to Master Response 6.2, which explains that implementation of the second provision of Mitigation Measure 5.1-1 means that the Expanded SCA Ordinance captures all zoned land within San Geronimo Valley—no zones are excluded. This does not mean that all parcels within San Geronimo Valley undergo design review, but that development proposals that require vegetation clearing, increase impermeable area, increase surface runoff, result in exposed soil, or alter the bed, bank, or channel of any stream, and does not achieve relevant exemptions, would require a discretionary land use permit including design review under the Expanded SCA Ordinance (see Master Response 6.2). Note that development activities may require discretionary land use permits and design review under other existing provisions of the Development Code unrelated to the Draft SEIR and Expanded SCA Ordinance.

38i As explained in Individual Response 38h above, the Draft SEIR did not require design review for all projects. The requirement for review to be
undertaken by CDFW or NMFS has been slightly modified in the Final SEIR in response to comments received. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 6.5.

38j The submitter appears to be referring to the fifth provision of the Draft SEIR (not the fourth). Please refer to Master Response 6.7, which clarifies and amplifies the fifth provision (relating to low impact development in the SCA) in the Final SEIR. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 14 in relation to affordable housing.

38k Please refer to Master Response 2 in relation to dams and reservoirs. Please also refer to Individual Response 38j above (and Master Response 6.7).
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Letter 39—Tona Wheeler
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Dear County Officials,

Thank you for the time, effort and attempts at fairness that you are devoting to this issue.

Our family moved to SG Valley 40 years ago, into one of the first houses built for year-round use. It is 103 years old now! We gratefully raised our 4 children here and have enjoyed being part of the Valley community. Our house is located 300 feet from a stream that often has had fish - salmon and steelhead - spawning in it. At one time in the not-to-distant past, 300 feet was the suggested set-back for additional regulation of construction; therefore, we feel compelled to write this letter.

Our children are grown and on their own now but we would like to remain in our home as long as possible. Since the bedrooms and full bathroom are all upstairs, that will soon entail some creative solutions for mobility issues. We both have jobs involving children - education and remediation - and do a lot of work from our home offices.

In this semi-rural setting, we have experienced floods, droughts, wind-storms, and many months of beautiful weather. In emergencies, our community pulls together, works together, and solves our problems. We work out our differences and act with what we feel is best for the whole community. We definitely look to the County for support and appreciate assistance, but there is a strong sense of self-reliance here in the Valley.

We do not feel very protected by the County from the "tunnel-vision" goals of SPAWN and its' questionable ethics and intentions. We look for an equitable balance for wildlife, including fish, and people. San Geronimo Valley has been singled out in onerous restrictions that are not applied to other county areas of similar geography. The difficulty of obtaining permits and the high cost of inspections results in residents side-stepping the legalities and relying on their own ingenuity. Compliance with rules is better achieved if the rules are within an achievable range.

We ask that you consider very seriously the suggestions made by the SGV Stewards and make changes in accordance with their points as you move forward with the SEIR.

Sincerely,

David and Tona Wheeler  
7 Crescent Drive  
Woodacre, Ca. 94973
39a  Comment noted. Please refer to Master Response 2 (climate change), Master Response 10 (setbacks), Master Response 16 (drought and fire), and Master Response 17 (flooding).

39b  Comment noted. The current litigation process for the San Geronimo Valley component of the Marin CWP (2007) is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is following actions required by the Court. Please also refer to Master Response 13, which explains that Marin County strives to achieve the balance you mention between socioeconomic development and environmental protection.

39c  All mitigation measures are considered user-friendly to implement and achieve (see Master Responses 6, 7, and 8). Please also refer to the response to 5k, which describes complaints procedures for unpermitted development.

39d  Please refer to the responses to comment letters 6 and 7.
Letter 40—Suzanne and Griffe Griffiths
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Good afternoon,

Please see the attached letter regarding the May 1st Supplemental Environmental Impact Report for the San Geronimo Valley.

We would like to add our voice to the rolls of residents that could be negatively impacted by unreasonable restrictions to maintenance, improvements and construction within 100 feet of the San Geronimo Creek. We would like to thank you in advance for your time.

Sincerely,
Suzanne and Griffie Griffiths
226 Railroad Avenue, PO Box 608
Woodacre, CA 94973

LETTER # 40
June 14, 2017

To whom it may concern;

My husband Griffe and I are long term residents of the San Geronimo Valley. We reside at 226 Railroad Avenue in Woodacre on the San Geronimo Creek. Griffe purchased the home in 1980 and raised our children there. I have been there since 1995 and have fallen in love with this place, just as he did 37 years ago.

My husband is a craftsman and works there in our home studio. He keeps a watchful eye over the creek all though the year. I am a County of Marin employee since 2009, currently working in the Human Resources Department. We both enjoy our work and feel very fortunate to live in this beautiful place.

Our home is approximately 75 years old, we are on a lot that is 100’ x 100’. We have lovingly restored it over the years and it is the heart and soul of our family. We have always cared for the flora and fauna and protect our creek. We have made a point of leaving it undisturbed to preserve the habitat which we love.

Over the years we have watched the creek rise and fall with the seasonal rains and realized the terrible impact the droughts have had on the ecosystem. This past winter was such a huge relief to all of us on the creek, gratefully knowing that it would improve the salmon spawning season.

Most of our neighbors and friends that reside on the creek feel the same as we do. They respect and preserve the land along the creek and not one of us would want to do anything to harm or destroy any part of it.

We were very supportive of SPAWN when they first arrived in the valley, thinking that we had a common goal in preserving the environment. Over the years they have become hostile toward the residents of the valley. Often blaming, wanting to punish or limit the rights of the homeowners and taxpayers for the diminishing salmon population. The irony of SPAWN being a 'non-profit' environmental group that specializes in litigious actions against the residents and county government of a very enlightened and conscientious county such as Marin stuns us and we are infuriated by their posture. There truly could have been a better way to do this, with the residents and county in concert to find a better and mutually beneficial solution.

We are grateful for a more reasonable voice representing our rights as residents of the valley from the San Geronimo Valley Stewards and support their efforts toward providing more information for a 2018 Countywide Plan and new stream ordinances that will provide fair exceptions for the existing homes on the creek.
We are very concerned for the property owner rights of residents located on the creek, and hopeful that we will actually have a voice and equal consideration from the officials that are addressing the Environmental Impact Report for the San Geronimo Valley.

I recently attended the CLAM event in San Geronimo regarding the program designed to relieve the housing crisis. My husband and I are pursuing the possibility of adding a second unit to rent in order to create the independent income we need to remain in the County of Marin after retirement. I now wonder what the impact of the SEIR will be in our hopes of pursuing this project. Will we be hobbled by restrictions to our established and long term home, unable to maintain and upgrade it because of red tape, expensive permits and restriction and limitations in what we are allowed to do?

Please take the time to listen to the residents of the creek that will be impacted by this Ordinance. Not to belabor the obvious but we have voices, we pay taxes and we vote for our representatives. Can we please count on you to represent our protection and interest in these negotiations?

Respectfully yours,

Suzanne and Griffiths Griffiths

Suzanne and Griffiths Griffiths
226 Railroad Avenue (PO Box 608)
Woodacre, CA 94973
Ph: 415-488-0284
Email: suszannegriffiths6@gmail.com
griffemetal@comcast.net
40a Comment noted.

40b Comment noted. The current litigation process for the San Geronimo Valley component of the Marin CWP (2007) is because SPAWN filed a lawsuit, as described in Section 7.2 above. Marin County is following actions required by the Court.

40c Comment noted. Please refer to the responses to comment letters 6 and 7 above.

40d Please refer to Master Responses 12 and 18.

40e Please refer to Master Responses 14 and 18.

40f Numerous changes have been incorporated in the Final SEIR to address the concerns expressed by residents and property owners. Please refer to Master Response 12 with regard to balancing conservation and homeowner needs.
Letter 41—Alan Weiler
Taylor, Tammy

From: Alan Weier <alan@kallisto.com>
Sent: Thursday, June 15, 2017 8:48 PM
To: NVPLANNING@MARINCOUNTY.ORG; Taylor, Tammy; Rodoni, Dennis;
    BAL@MARINCOUNTY.ORG; Reid, Rachel; enplanning@marincounty.org
Subject: County of Marin - Draft April 2017 Supplemental EIR

Hello Marin County Supervisors and Planning teams,

I am home owner in Lagunitas and full time resident for 23 years. I recognize that the County must weigh the needs of competing human and environmental interests and that the long term choices facing the county are not simple ones. As you weigh the alternatives, I urge you to consider the points raised by the Valley Stewards.

I believe that most people who live in West Marin want to maintain the best balance possible, recognizing that some compromises have to be made.

People need a reasonable process for maintaining and upgrading their homes to maintain value and provide for the evolving needs of their families. On top of that, people in this area want to provide affordable housing, both to keep the middle class flavor of the area and to get some additional income. You don’t have look very far to see the consequences of no action. Communities in desirable places become enclaves of the wealthy and short-term vacation rentals. This is inevitable unless active measures are taken to give people a fair and reasonable path forward.

People moved here in the first place because they love the area and want to enjoy and protect it. But part of that protection is maintaining the built environment along with the natural environment and being able to evolve with the times. I urge you to chart a course forward that protects both the natural and built environment. It can be done, and Marin county can lead the way.

Thank you for your consideration,

Alan Weier
Lagunitas, CA
41a Please refer to Master Response 12 (balancing conservation with homeowner needs), Master Response 14 (affordable housing), and Master Response 18 (regulatory and financial burden). Please also refer to the responses to Individual Responses 6 and 7.

41b Comment noted. Please refer to Master Response 12.
Letter 42—Mark Daley
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Hi Tammy,

Thank you very much for your message. If it's no trouble for you at this point, could I ask that you use a revised version (attached below). I found some mistakes, typos etc. in the one I sent you yesterday!

Thanks again.

Mark Daley

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On Jun 21, 2017, at 9:18 AM, Taylor, Tammy <TTaylor@marincounty.org> wrote:

Hi Mark,

Yes, I've received your comments. Thank you for submitting them, and yes they will be included and responded to in the Final SEIR.

Thank you,

Tammy Taylor
PLANNER

County of Marin
Community Development Agency
2501 Civic Center Drive, Suite 308
San Rafael, CA 94903
415 473 7873 T
415 473 7880 F
CRS Dial 711
TTaylor@marincounty.org

-----Original Message-----
From: Mark's Professional Email [mailto:mdaley@att.net]
Sent: Tuesday, June 20, 2017 4:03 PM
To: EnvPlanning
Cc: Taylor, Tammy
Subject: Comments on Draft SEIR

Dear Marin County CDA/Environmental Planning Dept.:

My comments on the Draft SEIR are attached. Please confirm that you have received them.

Thank you very much for your help, and for the opportunity to comment on the Draft SEIR.
> Sincerely,
> Mark Daley

> Email Disclaimer: http://www.marinsecurity.org/main/disclaimers
Rachel Reid  
Environmental Planning Manager  
Marin Community Development Agency  
3901 Civic Center Drive, Suite #308  
San Rafael CA 94903  
June 20, 2017

Dear Ms. Reid:

Thank you for the opportunity to comment on the Draft SEIR. I appreciate the time and effort that you, your staff, the County Counsel’s Office, and Stillwater Sciences have put into its preparation.

On its own, the SEIR that the County is required by the Court to provide can’t do much to meet the needs of either the fish or us humans in Marin County. The fish arguably need better habitat than what they have now; the SEIR at most will help prevent their existing habitat from getting worse under the 2007 CWP. We humans need a sustained conversation by which to get a lot closer, collectively, about how much we are going to do for the fish—and about how much it even makes sense to do for them; and also about who should be burdened by, and who should pay for, whatever we do decide to do for them. The public comment process of the SEIR can’t be that conversation, even if it helps that conversation get started.

Despite these things that the SEIR can’t be, it is still important that it do its own job well. The SEIR needs to make a very strong case for its claims, if only to spare the County the hassle and expense of dealing with future litigation. Therefore the SEIR needs to face the strongest possible challenges during the Draft stage, even from non-lawyer, non-scientist, members of the public like myself, with no particular axe to grind against the County. If people like ourselves can find weakness or weirdness in the SEIR’s arguments—particularly of a sort that suggests the SEIR hasn’t met the requirements of the Court order—then imagine what a motivated opponent with a sharp legal team could do. It is far better that these issues be hashed out and understood now, during this public comment period, than later on in a courtroom. I have accordingly done my best to present every strong challenge that occurred to me in reading through the SEIR. Some of these challenges seem to derive from a broadly “pro-fish” outlook; others come across as more “pro-homeowner.” I offer them all in a spirit of collegiality and constructive criticism.

The NMFS Coho Recovery Plan estimates that the project of restoring the coho population and habitat will take fifty years. During that time, much of the housing stock in the San Geronimo Valley will have worn out and will need to be replaced. Thus our salmon issues are not going to go away anytime soon, and we had better get started now on a plan for the long term. Hopefully as we turn to this task, we can shift the mood of the public discourse on this topic from accusation to cooperation, and embrace our shared responsibility for the solutions we need to create.

Thank you very much for your dedication to Marin County and to this issue. I look forward to reading the County’s response to my public comments.

Sincerely,

Mark Daley
Comments on Section 2: Project Description

Please clarify the SEIR's use of "future potential TIA" discussed in Section 2.6.1, and explain how the quantities calculated using this method are useful in making planning decisions for the watershed. Please address the arguments offered below, and consider renaming the numbers again for this part of the SEIR's analysis, this time aiming to supply two estimates of future TIA: a fully conservative estimate and a fully (or more fully) realistic estimate.

The SEIR estimates the quantity it calls "future potential TIA for buildings (units)" by:

1) Determining existing TIA for each unit in a given parcel; parcels with existing units, determining the average TIA of a single unit by parcel and land use type, multiplying the average by the number of additional units allowable for that parcel, and adding it to the existing TIA.

2) For parcels without existing units, applying the average unit size for the associated land use category (based on the parcel land use).

(SEIR pp. 2-26 - 2-29)

By means of this method the SEIR generates the values labeled "TIA" and "Percent TIA" in Tables 2-5, 2-9 and 2-13.

Two sorts of concern arise about this method:

(a) Because its reliance on historical average footprint is neither conservative nor realistic, the method's results are of questionable usefulness in making planning decisions. The method is not conservative because the historical average footprint is less than the maximum allowable footprint. The SEIR attempts to be conservative in its other estimates, such as the number of buildable lots, but because it does not take a similar approach here with TIA—the specific quantity that it claims is linked to salmonid habitat impacts—its results don't describe the worst case scenario, which is important in making rational plans and which CEQA requires for this reason. A realistic estimate would be an acceptable alternative to a conservative one, but unfortunately the method probably does not yield a realistic estimate of future TIA either, since there is good prima facie reason to think that the future average footprint will exceed the historical average. There appears to be a strong and widespread trend both in California (including at least some parts of Marin) and across the country towards building larger homes, and in the absence of a good explanation of why this trend would not be seen in the SGV, there is every reason to expect vacant lots to be built out with larger homes than typically used to be built in the past, and existing small homes to be either enlarged, or torn down and replaced with something larger.

(b) Because the method determines TIA indirectly, as a function of allowable additional units instead of tallying up allowable footprint directly, its accuracy as an approximation of either realistic or conservative future buildout is uncertain. An important source of additional TIA that the SEIR's analysis should capture is the additional square footage that could be added onto existing units. The SEIR analysis does attempt to capture this, but it does so indirectly, by computing future potential TIA as a function of additional allowable units. This indirectness introduces an element of uncertainty into the results. If there are many developed parcels which are not allowed to have additional units, but which are allowed to enlarge their existing single units, then this increase in TIA will not be captured by the method. Of course, the method compensates for such omissions by over- attributing TIA to parcels that are allowed more than one additional unit, but the overall accuracy of this compensation depends on how many of these latter parcels there are, compared to the former. Unfortunately, the SEIR does not say how many parcels of each kind there are.
A more direct and intuitive—and also more conservative—method of approximating the maximum potential TIA under full buildout, might be to start with the maximum allowable square footage of living space that is allowable for each parcel, given its size and all applicable setbacks, assume that all necessary septic and other requirements are met (regardless of cost), and then suppose that the developed unit spreads the allowable living space over a single story to the maximum extent possible. Then add estimates of the TIA of driveway and other impervious surfaces installed in the yard. The result of this computation would yield the maximum potential TIA for this parcel. The maximum potential TIA for each scale (watershed, reach, and SCA) would be found by adding up the maximum potential TIA of all the parcels contained within it. By subtracting the existing TIA for each scale, one would arrive at the potential increase in TIA under the 2007 GWP, for each scale. It would be a clear, intuitive picture of what maximum buildout under the Proposed Project looks like, in terms of TIA.

In sum, the questions or information requests for the consultants pertaining to this point area: Why couldn’t, or didn’t, the SEIR analyze TIA along something like these lines? (E.g., Are there pitfalls in this approach that make the approach actually used in the SEIR preferable by comparison?) And given that the choice was made to analyze TIA in terms of the number of allowable additional units on a parcel, please explain the relationship between this number and the total allowable footprint of all units on that parcel, in order to provide some way of gauging the reliability of the SEIR’s method.

Please include more information about how many "infeasible” exemptions there might be and how much TIA might be added under the Proposed Project overall, using this exception.

In its opinion, the appeals court asked specifically:

While the Marin GWP (2007) provides that noncompliance with Stream Conservation Area (SCA) standards may be permitted if a parcel falls entirely within an SCA or development on the parcel entirely outside the SCA is either infeasible or would have greater impacts than development within the SCA, how many and what size of lots are estimated to fall within this exception and what is the significance of such exceptions?

(P. 15 of the Appeals Court’s opinion)

The SEIR does present estimates of the extent of development and TIA that will occur on parcels falling entirely within the SCA, but it doesn’t clearly estimate those quantities for parcels on which development entirely outside the SCA is either infeasible or would have greater impacts than development within the SCA. The closest it comes is to approach this question indirectly by means of a discussion of “distribution of parcel sizes and location relative to the SCA” (p. 2-35), where it claims that

... relatively few parcels [would be] small enough to lack significant flexibility in development placement (0–0.5 ac) located completely within the SCA (Figure 2–6a,b). The majority of smaller parcels would be located only partially within the SCA, such that development within the SCA itself could be avoided, or they would be located outside the SCA (Figure 2–6a,b).

This is a good start, but the SEIR should give more detail about the number of parcels partially contained within the SCA on which development within the SCA cannot be avoided, since this determination would come closer to characterizing the class of lots on which development outside the SCA is infeasible. It should be noted, however, that unavoidability and infeasibility are not the same thing, and therefore the SEIR’s authors should also explain as precisely as possible the relationship in their thinking between these two concepts. Unfortunately "infeasible" was never defined in the GWP itself and can be interpreted...
In more than one way, this fact has suggested to some parties (including SPAWN, who made it a part of their lawsuit) the existence of a loophole to be exploited. Precisely for this reason, then, a discussion of this term in the SEIR would be a helpful step towards hammering out an interpretation that allays such concerns.

Comments on Section 5: Cumulative Impacts and Mitigation Measures

Impact 5.3

In its discussion of Impact 5.3, the SEIR concludes that the impacts of the Proposed Project on the summer rearing success of salmonids will be less than significant. It concludes this partly on the basis of the following claims which I paraphrase as follows:

1. Summer rearing success is currently impacted by past and present development in the watershed in three primary ways: (i) by reductions in the quantity and quality of instream habitat (via channel incision due to altered watershed hydrolology, increased sediment delivery, and the reduced frequency and recruitment potential of LWD) brought about by increased development and TIA; (ii) by increased water temperature and decreased oxygen levels brought about in part by tree and vegetation clearing; and (iii) by reduced habitat area and connectivity resulting from low summer base flows, which can be aggravated by groundwater pumping and surface water diversions.

2. Projected development under 2007 CWP will not make a considerable contribution to any of (i), (ii) or (iii), because:

   a. Although one significant cause of (i) is past and existing development and TIA in the watershed, the projected future increases in these quantities are probably too small to contribute considerably to making salmonid summer rearing conditions [specifically, summer instream habitat conditions] worse than they already are. [Because the projected increases will not reduce the availability of summer instream habitat—LWD and such—by very much.]

   b. Projected cutout under the 2007 CWP will not contribute considerably to (ii) making water quality (specifically, water temperature) worse than it already is, because SCA setback policies (Figure 2-7) and riparian conservation policies (Table 2-1, Table 2-2) under the Proposed Project offer some protections for riparian trees and other bank vegetation, as well as riparian function and instream habitat.

   c. The contribution of future SGV groundwater pumping and surface water diversions to (iii) is not considerable, because we don’t know how much water is, or will be, pumped and/or diverted, or how much these water uses affect the hydrology and biology of the watershed.

If this paraphrase accurately represents this part of the SEIR’s argument, then the conclusion rests on shaky ground, since (2a), (2b) and (2c) each appear highly questionable. My request of the consultants is that they respond to the challenges below, which I offer in the spirit of “Please show me why I’m wrong…”

Concerning (a): The kinds of instream conditions that the SEIR describes as constituting impaired winter habitat are pretty much the same as, or very similar to, the ones that constitute impaired summer habitat: channelization, insufficient LWD, too much sediment, and so on. According to the SEIR (Impact 5.1), the Proposed Project contributes considerably to bringing about these conditions by altering the watershed’s
It makes sense to suppose that although the physical changes that development causes take place primarily during the winter—because their primary mechanism is the force of flowing stormwater—the toll they take on the salmonid population may come at different times of year, winter or summer, depending on weather patterns. In years when favorable spring and summer rearing conditions are followed by powerful winter storms, insufficient high flow refuge might limit a juvenile population that had been doing well up to that point; whereas in drought times of dry summers followed by milder winter flows, food shortages and predation over the summer might trim their numbers down to something considerably less than the carrying capacity of the available winter habitat, so that the summer survivors make it through the winter as well.

If this story or something reasonably close to it is true, then the habitat simplification caused by the Proposed Project should either have a significant impact on both summer and winter rearing success, or on neither. If the Proposed Project’s "incremental contribution to reduced habitat complexity would be relatively minor and likely too small to substantially or measurably reduce the ability of juvenile salmonids to forage or find shelter during the summer rearing period" (p. 5-24), it is hard to see why this contribution would be any more substantial or measurable when it comes to juvenile salmonids’ reduced ability to find shelter from storm flows during the winter. Yet the SEIR attributes this latter situation to a chain of causes and effects set in motion in a cumulatively considerable way by the Proposed Project. This apparent inconsistency needs to be cleared up.

Now possibly there’s a further difference between the winter and the summer scenarios that explains the difference in the significance of the impacts. The effect of altered hydrology in winter, it might be argued, is not only to reduce the amount of available storm flow refuge, but also to increase the force of the storm flows themselves. In other words, in winter the Proposed Project does a double whammy on the fish. But in the summer its effect is merely to reduce the amount of predator refuge: still a whammy, but just a single one. Perhaps this shows why the Proposed Project’s impact is significant in the one case but not the other.

It would show this, however, only if there were no other summertime environmental changes, also caused by the Proposed Project, that in combination with habitat simplification added up to significant impact overall. Increased water temperature due to tree cutting and reduced base flows due to groundwater pumping and surface water diversions could very well be changes of this sort; therefore their potential role needs to be studied and discussed carefully and in detail. The SEIR needs to give them much fuller treatment than it has done thus far, before it can claim to have shown that the Proposed Project would have a less than significant cumulative impact on summer rearing success. Some suggestions about what is needed are given below.

Concerning (b): That various CWP policies “offer some protections” (p. 5-24) against tree-cutting near the creek does not show that the complete buildout under the Proposed Plan won’t contribute considerably to a significant water temperature impact due to future tree-cutting. The SEIR’s analysis here needs to be at least as detailed as its analysis of TIA impacts. For example, it should probably start by defining one or more metrics that could be used to estimate how much shade the creek would lose under maximum buildout (or under a range of buildout scenarios), and then do some explicit figuring using those definitions.

Homeowners groups have been expressing the concern to the County for years now that the precautions necessary to safeguard homes from wildfire require cutting more trees than fish-friendly SCA policies are likely to allow. This potential conflict is additional evidence (at least prima facie) that future tree-cutting under maximum buildout could be a significant impact. Homeowners cut trees for the same reason that
they armor banks and remove LWD: to protect their homes. How much tree-cutting would happen under the Proposed Project, and what would that do to water temperatures? Perhaps a lot, or perhaps not; still, the point is that it needs to be studied.

Concerning (ii): It doesn’t follow from our not knowing the extent of future pumping/diverting and its effects, that these activities won’t contribute considerably to a significant impact under the 2007 CWP. It’s part of the SEIR’s job to know the extent of these activities and their effects, or at least to try to know. The whole reason why CEQA exists in the first place is to keep governments from harming the environment without first attempting to find out whether they were going to do that. So it is quite odd, and even alarming, to see the SEIR argue, in effect, “we don’t know what the impacts are because we haven’t studied them, so probably there’s nothing to worry about.” The SEIR’s proposal to study some of these potential impacts later, after the adoption of the 2007 CWP, by means of Voluntary Mitigation Measure 5.5-1 (Groundwater Study), is even more alarming. Potential impacts need to be studied before the adoption of a Proposed Project, so that the studies can inform the decision whether to adopt it. The groundwater study, and any other necessary studies, should be done now, and the results incorporated into the SEIR. This point follows not only from common sense but arguably from the requirements of CEQA also, and moreover it appears to be one of SPAWN’s points from its lawsuit with which the Court of Appeals agreed:

... Further, SPAWN asserts, the EIR fails to provide a baseline against which to analyze the impact of future development.... The supplemental studies prepared or planned to be prepared after certification of the EIR, SPAWN contends, “proposed to do the very analysis that should have been completed in the EIR.” [See the Court of Appeal’s Opinion, p. 12]

......

Whatever else the county may be doing (or may have done subsequent to the approval of the EIR) to study and respond to these issues, the program EIR that is now before us fails to provide the information—if no more than rationally-based estimates—necessary to make informed judgments about the advisability, so far as the San Geronimo Valley watershed is concerned, of adopting the countywide plan. In approving the EIR despite its failure to provide this critical information, the county prejudicially abused its discretion by failing to proceed in the manner required by CEQA. [Opinion, p. 16].

The SEIR is an enormous improvement over the EIR in supplying information necessary to make informed judgments, but in regard to the issue of summertime base flows it appears vulnerable to the same, or a very similar, legal challenge as last time. This vulnerability should stand out to the County as an especially bright red flag.

1 See also the following excerpt from the Court of Appeal’s citation of Stanford Linear Accelerator Project v. County of Santa Clara (1988) 48 Cal.App.4th 183, which it used to support its endorsement of SPAWN’s point:

“No matter what subsequent environmental review might take place, and no matter what additional mitigation measures might be adopted to ameliorate adverse environmental impacts on each of the four ‘phases’ of planned development,” stationing the analysis of the impacts of supplying water until after approval of the development plan “would appear to be pulling the cart before the horse.”
Mitigation Measures: General Concerns

Articulate reasoning more fully. The SEIR’s discussion of mitigation measures needs fuller articulation to show that the proposed measures really will reduce or alleged significant impact to the less-than-significant level. This concern follows both from common sense and from the Court of Appeal’s remarks about the EIR’s need to specify performance standards (See the Opinion, pp. 18-19.) Since the determinations about impact significance are quantitative (or quasi-quantitative) in nature, so should be the determinations about what it takes to mitigate these impacts. By approximately how much, for example, does one average-sized mitigating installation (e.g., LWD, LID, floodplain restoration, etc.) alleviate deficiencies in habitat quantity/quality? Approximately how many such installations are needed to do the job of mitigating the incremental habitat impacts of the Proposed Project, and approximately how many of this needed number are able/likely to be installed, both in the watershed overall and in each of the subbasins or reaches? All these questions must be answered to substantiate the SEIR’s claims about the effectiveness of the mitigations.

Performance standards for mitigations should be based on realistic assumptions about buildout, not conservative ones. In projecting development impacts, the SEIR endeavors to reason, at least partly, from conservative assumptions about the extent of buildout under the 2007 CWP. In order to characterize the upper limit of the environmental damage the Proposed Project might cause. This is fundamentally a rational strategy, but it has to be used carefully. Sometimes considering the impacts of maximum potential buildout (i.e., “every parcel is buildable and will be built”) can give a quick “yes” answer to the question of whether to go ahead with a project. If the impacts of this “worst case” scenario are less than significant, then presumably so are those of all other scenarios, and thus the project should be cleared for takeoff. Metter et al. are more complicated: if the impacts of the worst case are significant, however, Such a finding, by itself, would not show that the project should be abandoned, or that mitigations should be required, because maximum potential buildout may be a very unlikely scenario and the more likely buildout scenarios may, for all we know, have less-than-significant impacts requiring no mitigation. In order to really know how much mitigation will be needed if we do go ahead with the project, we need to determine as best we can the impacts of the likely buildout scenarios. If we fail to make this additional determination, and instead simply approve the project together with a mitigation program designed to address the impacts of complete buildout, we may be over-mitigating to a considerable degree. And insofar as these mitigations take the form of permit requirements imposed on property owners and enhancement projects paid for by taxpayers, the over-mitigation will impose unfair burdens on these parties. For this reason, the SEIR needs to discuss the impacts of both the complete buildout scenario and more realistic buildout scenarios, and also show that its mitigation targets are calibrated to the latter rather than the former. It doesn’t appear to do this currently.

1 I am reasoning here from common sense: I don’t know what CESA or other laws require.
Mitigations: Special Concerns

Special concerns arise concerning each of the following proposed mitigations:

Mitigation Measure 5.1-1: Expanded SCA Ordinance

The new permit requirements proposed under Mitigation 5.1-1 might need to be made somewhat more strict in the following two respects, in order that the Mitigation address the impact adequately:

Regulate runoff and sediment input originating outside the SCA.
Mitigation 5.1-1 calls for new permit requirements for "any activity within the SCA that requires vegetation clearing, increases impermeable area, alters surface runoff, or results in exposed soil" (p. 5-12). This is a sensible approach, but logically, considering the mechanisms by which Impact 5.1 is created, some of these activities—specifically, those that increase impermeable area or exposed soil—should require permits outside the SCA as well. This is because the TIA and other development that will be added outside the SCA under the Proposed Project will generate a substantial amount of additional damaging runoff and fine sediment, and shoot it into the creek through the storm drains. It is implausible that the total impacts of all the additional runoff and sediment generated both within and outside the SCA can be mitigated by regulating SCA development alone. Moreover—although this may be a side issue to the ones raised by the Court of Appeal—it seems unfair to SCA homeowners to require them to apply for TIA and exposed soil permits that are not required of their neighbors who live farther from the creek, even though the neighbors’ TIA and exposed soil is just as damaging.

Require LID in all stream reaches, but clarify how much LID work homeowners must do.
Mitigation 5.1-1 calls for
discretionary permits for projects in priority stream reaches (the reaches most heavily impacted and potentially most important for salmonid winter rearing) to include low impact development (LID) practices and designs that are demonstrated to prevent excessive discharge from events up to the 95th percentile 24-hour rainfall event and approved by a qualified professional. Priority reaches are currently considered to be Woodacre Creek, upper San Geronimo Creek, lower San Geronimo Creek, and Montezuma Creek but may be modified based on the results of future studies and monitoring by MMWD and others. [pp. 5-12 - 5-13]

Two issues arise here. First, requiring LID only in priority stream reaches may lead to the degradation of other reaches, and the usual regulatory mechanisms may have trouble keeping up. If LID is not required in non-priority stream reaches, those reaches will presumably continue to deteriorate at a faster rate than the now-protected ones, until they become as heavily impacted as those others. But by the time their worsened condition is discovered and duly studied, and they are redesignated as priority reaches, the damage will already have been done. Requiring LID in all reaches would appear to be more effective in protecting against this incremental damage.

Second, the SEIR should clarify how much LID work individual homeowners would be required to do under this Mitigation. What does CEQA (or CEQA together with any other state regulations) demand of the County in this regard? For example, if a homeowner in the SCA of a priority reach wanted to add 500 square feet of TIA to an existing home with a TIA of 2,000 square feet, would the mandated LID mitigation have to treat the entire 2,500-square-foot total, or just the 500-square-foot addition?

These questions lead into broader issues of how much TIA remediation should be undertaken overall, by whom and at whose expense, which—despite being tangential to the issues raised by
Mitigation Measure 5.1-2: Winter Habitat Enhancement Projects

Mitigation Measure 5.1-2 specifies that

The County shall provide funding to a third party, such as the Marin County Resource Conservation District, to facilitate small enhancement projects on private property that are designed to help achieve targets set forth in the San Geronimo Valley Salmonid Enhancement Plan. [p. 5-13]

While the installation of small exotic enhancements on private property would probably benefit the salmon, there are a couple of reasons why Mitigation Measure 5.1-2 as stated here in the Draft might not meet the requirements set out by CEQA.

First, there is the above-mentioned general issue of the SEIR needing to provide a reasoned estimate of approximately how much benefit a single enhancement project is likely to provide to the watershed, and of approximately how many such projects are likely to be installed, in order to provide substantial evidence for its claim that this Mitigation would contribute to making Impact 5.1 less than significant.

Second, the SEIR is unclear here as to whether these proposed enhancements on private property would be mandatory or optional for the property owners. If they are mandatory, then the Marin County Resource District, which is a non-regulatory agency, might be unable to assist in implementing this Mitigation. If they are optional, then this part of the SEIR might fail to meet the CEQA requirement that mitigations be "fully enforceable through permit conditions, agreements, or other legally-binding instruments." (Guidelines § 15128.4, subd. (a)(2).) While the County's establishment of the enhancement program might be a legally-binding obligation for the County, the property owners' participation in this program wouldn't be a legally-binding obligation for them, and this lack in the chain of obligation might be enough to show that the mitigation isn't "fully enforceable." I am not a lawyer and so cannot speak authoritatively on this point, but it strikes me as a vulnerability in the SEIR that could end up involving the County in further litigation.

Mitigation Measure 5.2-1: Control and Reduce Production and Delivery of Fine Sediment to Streams

Mitigation 5.2-1 (see p. 5-19) specifies that

Marin County DPW shall continue to develop and implement measures and guidelines to control and reduce production and delivery of fine sediment to streams and minimize its effects on rood courses and other components of salmonid habitat, in keeping with the requirements of the Basin Plan Amendment (SFRWQCB 2014b). These actions, many of which are underway or substantially complete, include measures that will achieve the following performance standards within 20 years of Basin Plan amendment adoption:

- Achieve and maintain the target for road-related sediment delivery to channels of ≤ 350 cubic yards per mile per 20-year period; and
- Minimize delivery of sediment to channels from unstable or potentially unstable areas by managing existing roads and other infrastructure to prevent additional erosion of legacy sediment delivery sites, and/or delivery from other potentially unstable areas.
Although this Mitigation does specify a partial performance standard in the form of the target amount of road-related sediment delivery, the SEIR also needs to provide supporting reasoning that shows approximately how much of the redd occur impact of the Proposed Project is likely to be reduced by hitting this target. It needs to do this, both because (as noted above) a fully articulated argument is good form, and also because there are a couple grounds for concern whether the County's continuation of its sediment reduction work will be sufficient to mitigate Impact 5.2 of the Proposed Project.

First, the Basin Plan Amendment appears concerned with reducing sediment inputs from existing dirt roads, and, as such, its performance standards are presumably set where they are in order to achieve that end. The SEIR, on the other hand, is ostensibly concerned with minimizing sediment inputs from future development under the 2007 CWP, including inputs not only from future dirt roads but also from other future activities. The SEIR does not estimate how much sediment would be generated by this future development. So it is unclear whether achieving the Basin Plan Amendment's targets would be enough both to clean up the previous impacts and to mitigate the future impacts.

Second, the Basin Plan Amendment's scope is the entire Laguna Creek watershed, whereas the location of the Proposed Project is the San Geronimo Valley only. It is unclear how much of the Basin Plan Amendment work that the County would commit itself to continuing is located in the San Geronimo Valley subwatershed. So it's unclear how much of the County's sediment reduction work would count towards mitigating impacts of the Proposed Project.

Mitigation Measure 5.2-2: Stream Habitat Enhancement Projects

- The stream habitat enhancements envisioned under Mitigation Measure 5.2-2 include (potentially) the installation of LWD in the San Geronimo Valley. As noted earlier in regard to some of the other mitigations, the SEIR needs to provide some approximations about how many such installations—and of what size—are needed to do their job, how many can be installed, and how many will be installed. There is a particular concern about LWD installations in the SGV that they will cause flooding and endanger the closely-packed creekside homes. It's not primarily the runoff from SGV houses that reduces the availability of LWD; it's the people living in them who need to keep their homes safe. This concern is reasonable. It's far from obvious that there are enough suitable locations for installations in each of the various reaches for this program to serve as an effective mitigation; therefore the SEIR should include some preliminary assessment of the number of suitable sites.

Voluntary Mitigation Measure 5.3-1: Groundwater Study

- The groundwater study, and any other necessary studies pertaining to base flows, should be done now, as research supporting the SEIR's conclusions about base flows and published as an appendix to the SEIR, instead of later, as supplemental research after the certification of the CWP. (See p. 6 of this letter, above.)
Miscellaneous Requests and Corrections:

1. Please include as an appendix to the SEIR the data that were used to calculate the various tables and figures. Please describe how calculations and claims were arrived at. (Please "show your work," as math teachers say, to allow the public to review and double-check your calculations.)

2. Error in Table 2-5: The percent change in unimproved parcels is 68%, not 22% as claimed.

3. Possible errors in Tables 2-8 and 2-12 and Figure 5-2: These should be titled "Number of Developed Units..." instead of "Number of Improved Units...". "Improved Units" is not one of the metrics defined in the SEIR.

4. Table 2-12 is hard to understand, because of Footnote 2 (p. 2-41) which says:

   The assignment of additional improved units relative to the SCA under the Proposed Project follows that of improved parcels (i.e., if the improved parcel is completely within the SCA, then the improved unit would be completely within the SCA; if the improved parcel is partially within the SCA, then the improved unit would be partially within the SCA).

   What does "practically" mean here? Did the authors mean to say "partially"?

5. Typos: the document should be spell-checked.
42a Marin County considers that the SEIR can contribute substantially to the protection of salmonids from cumulative development impacts in San Geronimo Valley, while avoiding unnecessarily onerous provisions for property owners and residents. Please refer to the Final SEIR and Master Response 12 in relation to balancing conservation with homeowner needs. Please also refer to Individual Response 11a.

42b Marin County is following actions required by the Court, in full compliance with the Court’s opinion. Please refer to Section 1.1 of the Draft SEIR which discusses the Court’s opinion, Section 1.2 of the Draft SEIR which discusses compliance with CEQA, and Master Response 3 regarding compliance with CEQA.

42c Comment noted. With regard to shared responsibilities for conservation, please refer to Master Response 13. Please also refer to Master Response 4.1 for information on how numbers of improved parcels and developed units were assessed within the context of future theoretical buildout in San Geronimo Valley.

42d CEQA does not require the analysis of a worst-case scenario, regardless of how potentially informative such an analysis might be. Analysis of the maximum allowable footprint for individual parcels would require a parcel-scale analysis and consideration of a host of potential design attributes and permitting requirements for each parcel depending on the type of project, which is not within the scope of a programmatic SEIR analysis (see also Section 1.2.2). However, more importantly, assuming development of the maximum allowable footprint for 358 future developed units (Table 2-7), as well as the maximum allowable footprint for additions for 1,598 existing units (Table 2-7), would not provide an analysis of reasonably foreseeable impacts because existing information does not suggest a rapid progression towards development footprints in San Geronimo Valley that maximize impervious area.

That said, mean house size in San Geronimo Valley increased over time from approximately 1,400 ft² in 1920 to approximately 2,675 ft² for the period 2000–2017. The longer-term San Geronimo Valley trend mirrors that of the broader U.S. over a shorter period, where mean house size increased from approximately 1,650 ft² in 1975 to approximately 2,700 ft² in 2015 (U.S. Department of Commerce 2015). Data characterizing the size of additions to already existing units over time are not available for San Geronimo Valley; however, for the period 2015-2017 there were a total of 17 building permit applications...
that involved additions, with proposed footprints ranging 22–1,000 ft\(^2\) with an average of approximately 400 ft\(^2\) per addition (Marin County unpublished data 2018). Doubling the mean house size for San Geronimo Valley for the period 2000–2017 to 5,350 ft\(^2\) for all 358 future potential units (which would vastly exceed the current trend of slowly increasing house size), and doubling the average size of unit additions to 800 ft\(^2\) for all 1,598 existing units (which is not based on a trend analysis since data are lacking, but is nonetheless a large average increase), would result in approximately 73 additional acres of cumulative TIA, or a 1.2% increase in total TIA for the watershed as a whole (not including increases in road or parking lot TIA). Cumulative TIA under current conditions is approximately 5%, such that future projected total cumulative TIA would be 6.4% (including increases in road and parking lot TIA shown in Table 2-4 of the Final SEIR). Within the uncertainty of the TIA analysis for San Geronimo Valley, and the general coarseness of TIA as a metric for urbanization effects on stream habitat, this 1–1.5% increase in the estimate of future TIA due to a hypothetical doubling of mean house size and house additions would not change the significance of projected impacts to salmonids in San Geronimo Valley.

We believe that even this relatively modest increase in estimated future TIA, based on its assumption of a doubling of development footprints rather than a slow decadal increase as evidenced by the available data, must be considered outside the bounds of ‘reasonably foreseeable.’ We therefore judge that our findings of potential future increases in TIA to be well-founded and insensitive to any unavoidable, credible uncertainties in their estimating. Therefore, any analysis of the maximum allowable footprint for future developed units and additions to existing units would be unlikely to qualify as a reasonable assumption under CEQA.

42e The SEIR is a programmatic analysis of future development under the Marin CWP (2007), which by definition includes reasonably foreseeable development projects based on existing information. It is not a parcel-by-parcel analysis of potential future development constraints that necessarily assumes specific design attributes for a host of different Project possibilities to arrive at the number of parcels partially contained within the SCA on which development within the SCA cannot be avoided. As stated in the comment, the SEIR notes that the distribution of parcel sizes and location relative to the SCA would vary by subbasin and/or reach, with relatively few parcels small
enough to lack significant flexibility in development placement (0–0.5 ac) located completely within the SCA.

42f The commenter’s summary of the existing salmonid summer rearing habitat conditions in San Geronimo Creek, and the likely impact mechanisms responsible for those conditions, is largely accurate. However, the commenter’s summary fails to note that summer rearing habitat has not been identified as a limiting factor for salmonids in the San Geronimo Creek watershed. Juvenile salmonid population data, collected in 2015 and 2016 and summarized in the Final SEIR, provide no clear indication that summer rearing habitat is limiting coho salmon or steelhead populations in the watershed. Despite low flows and warm stream temperatures in summer 2015, Ettlinger et al. (2016b) found little evidence that environmental conditions were limiting coho growth or physiological condition. The following spring, the estimated abundance of coho smolts outmigrating from San Geronimo Creek (1,097 smolts) was above average compared with recent years and represented 11% of the estimated coho salmon smolt production from the entire Lagunitas Creek watershed (Ettlinger et al. 2017a). Ettlinger et al. (2015c, 2016b, 2017b) hypothesize that adult coho salmon abundance, poor winter rearing habitat, and stream flows during incubation and fry emergence exert a stronger influence on juvenile coho salmon densities than habitat conditions during the summer rearing period.

42g The commenter’s summary is accurate but incomplete. In addition to the impact mechanisms described in the commenter’s summary, the rationale for concluding that impacts on summer rearing success would be less than significant includes the evidence (summarized in Individual Response 42f, above) that incremental changes to summer rearing habitat complexity under the Proposed Project would likely be too small to substantially or measurably reduce the ability of juvenile salmonids to forage or find shelter during the summer rearing period. As a result, reduced smolt production and population-level effects are unlikely.

42h The commenter’s summary is largely accurate but incomplete. An important additional reason that future theoretical buildout under the Marin CWP (2007) would be unlikely to make a considerable contribution to the currently degraded condition of summer water temperature and dissolved oxygen in San Geronimo Creek is that clearing of riparian vegetation is only one of multiple factors that could affect these water quality parameters. For example, water temperature
and dissolved oxygen can be affected by warmer air temperatures and reduced precipitation (causing reduced summer baseflow), both of which may be exacerbated by climate change.

42i The commenter’s summary is inaccurate because it paraphrases the Draft SEIR as stating that the effects of future groundwater pumping and surface water diversions would not be considerable. Rather, the SEIR concludes that the potential effects of future groundwater pumping and surface water diversions cannot be credibly analyzed due to a lack of data. Available data are insufficient to determine the likely number and location of future groundwater wells, if any. Establishment of and pumping from new wells, if it occurs in the future, would be subject to County permitting and would be extremely limited, thus unlikely to contribute to effects on salmonid summer habitat conditions. This is based on the County’s reasoned assumption that the vast majority, and very likely all, of the parcels that would be developed in the future under the Marin CWP (2007) would have municipal water supply and would not require groundwater wells or surface water diversions (see also Section 2.6.2 and Potential Impact 5.3). Surface water diversions are not subject to County regulations and permitting. However, any new surface water diversions would be subject to state policies including those designed to maintain instream flows in northern California coastal streams (SWRCB 2013), water rights permitting requirements, lake and streambed alteration permitting requirements, CEQA compliance requirements, and potentially state and federal take prohibitions for listed salmonids. As a result, new permits for surface water diversion in the San Geronimo Valley would be extremely unlikely and thus effects of any such diversions on salmonid summer rearing habitat are also unlikely.

42j For the reasons described in the responses to Comments 42f through 42i, the County does not agree with the commenter’s statement that the arguments in the SEIR are questionable nor that the conclusion of Potential Impact 5.3 is unsupported.

42k The comment fails to note that: (1) degraded winter rearing conditions (i.e., reduced high flow refuge habitat) have also resulted from loss and disconnection of floodplains and other off-channel habitat in the San Geronimo Valley, and (2) impacts to salmonid winter rearing success would result from increased frequency and magnitude of winter stream flows due in part to altered watershed hydrology under the Proposed Project. Importantly, the latter impact mechanism would not occur during the salmonid summer rearing period and thus Project-
related impacts on winter and summer rearing success would not be equal.

42l The commenter’s hypothesis is consistent with available information and hypotheses that suggest winter rearing habitat in the Lagunitas Creek watershed (including San Geronimo Creek) is likely the primary factor limiting coho salmon production, and that summer habitat conditions do not appear to be limiting the population. However, the commenter’s hypothesis that summer food shortages and predation would be likely to reduce rearing densities below the winter carrying capacity is not supported by available evidence.

42m For the reasons described in Individual Response 42k, the County does not agree with the Commenter’s assertion that impacts of the Proposed Project on summer and winter rearing success should be equal.

42n Please refer to responses to Comments 42h, 42i, and 42k.

42o A projection of the types and extent of riparian vegetation affected by future development and activities associated with development is not possible given the uncertainty regarding the exact location, size, and characteristics of future development that could occur within the SCA and the specific effects that development would have on vegetation coverage. As a result, estimating water temperature changes resulting from riparian vegetation loss would not be feasible. The Marin CWP (2007) includes policies and programs to protect riparian vegetation, preserve riparian function, and achieve “no net loss” of sensitive habitat acreage, values, and function. These include Policy BIO-2.1 (Include Resource Preservation in Environmental Review), Policy BIO-4.7 (Protect Riparian Vegetation), and Implementing Program BIO-4.i (Replace Vegetation in SCAs) – see Table 2-1.

42p Please refer to Individual Response 42o above, as well as Master Response 16 (fire hazards), and Master Response 6.4 (clarification regarding tree and vegetation trimming and removal).

42q Please refer to Individual Response 42i regarding future groundwater pumping and surface water diversions, and to Master Response 3 regarding compliance with CEQA. The analysis in the SEIR has determined that Potential Impact 5.3 would be less than significant and therefore mitigation is not required. The Groundwater Study proposed as Voluntary Mitigation Measure 5.3-1 would determine the potential impacts of groundwater pumping and surface water diversions on summer baseflow and aquatic habitat conditions, but this information
is not necessary to analyze impacts to salmonid summer rearing success.

42r Comment noted.

42s Marin County has clarified and amplified the mitigation measures in the Draft SEIR that incorporate performance standards in compliance with CEQA (see Master Responses 6, 7, 8, and 9). Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please refer to Master Response 7 regarding mitigation ratios.

42t Please refer to Master Response 4.1.

42u Marin County concurs that cumulative impacts to salmonids stem from development and other activities occurring both within and beyond the SCA. Clarifications and amplifications to the Final SEIR include additional stormwater, LID, erosion and sediment control requirements outside the SCA in Mitigation Measure 5.2-1. Consistent with Section 15088.5 of the State CEQA Guidelines, these revisions do not constitute significant new information and recirculation is not triggered. Please refer to Master Response 8. However, because streamside activities have greater potential for impacts (see Master Response 10), Mitigation Measure 5.1-1 includes more detailed measures to avoid and minimize impacts originating from within the SCA.

42v Please refer to Master Response 6.7.

42w Please refer to Master Response 6.7.

42x Please refer to Master Response 4.2 relating to the TIA methodology, and 8 relating to TIA-associated sediment delivery impacts on salmonids.

42y Please refer to Master Response 7.

42z As the commenter correctly points out, the enforceable aspect of Mitigation Measure 5.1-2 in the Draft SEIR would have been provision of funds to facilitate small habitat enhancement projects on private property, should there be a willing landowner. The County cannot require landowners to participate in habitat enhancement projects on their land. Please refer to Master Responses 5 and 7.

42aa Please refer to Master Response 8, which describes clarifications and amplifications to Mitigation 5.2-1 to adopt performance standards for LID practices specified in Mitigation Measure 5.1-1. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.
The effect of the proposed LID practices and sediment control measures on reducing redd scour cannot be quantified because the amount by which fine sediment delivery would be reduced is unknown. In addition, while research has identified linkages between sediment input and the risk of redd scour in the San Geronimo Creek watershed (e.g., Cover 2012), relationships are not sufficiently known to identify quantitative reductions in redd scour that would be likely to result from a reduction of sediment inputs.

42ab Mitigation Measure 5.2-1 has been clarified and amplified to remove reference to the Basin Plan Amendment performance standards and to incorporate performance standards for LID practices specified in Mitigation Measure 5.1-1. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered. Please also refer to Master Response 8.

42ac Please refer to Individual Response 42ab and to Master Response 8.

42ad Please refer to Master Response 7 in relation to mitigation ratios and Master Response 17 with regard to flood hazards.

42ae Please refer to Individual Response 42i.

42af Marin County has provided a geodatabase containing all feature classes for the watershed boundary, subwatershed/subreach designations, SCA boundary, TIA, parcels, units, and groundwater wells under existing and future conditions used in the SEIR analysis. The geodatabase can be accessed at:

The general user can interact with the geodatabase files in QGIS, which is a free, open source software package:
https://www.qgis.org/en/site/

42ag Minor modifications have been made to Table 2-5 of the Draft SEIR (Table 2-7 in the Final SEIR), as appropriate. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.

42ah Minor modifications have been made to table and figure titles, as appropriate. Consistent with Section 15088.5 of the State CEQA Guidelines, this revision does not constitute significant new information and recirculation is not triggered.
42ai A typo in the footnote of Table 2-12 of the Draft SEIR (Table 2-14 in the Final SEIR) has been corrected, as appropriate.

42aj Comment noted.
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Taylor, Tammy

From: Cia Donahue <cpdonahue@comcast.net>
Sent: Tuesday, June 13, 2017 4:20 PM
To: Reid, Rachel; Bal, Tarisha; Rodoni, Dennis; Patterson, Diane
Subject: Draft SEIR for San Geronimo Valley

Dear Friends in County Government,

My husband and I have lived in Woodacre since February of 1968. Though we are both retired, we have been, and continue to be active and supportive members of our local school, our church and our community! Our home was built in the 1950’s and continues to serve our needs and our visiting family members. We have done our best to maintain our property by pruning our trees regularly and maintaining a defensible space around our home. We are concerned about some of the drastic proposals set forth in the 2017 Supplemental EIR. Our concerns include:

1. There should be some exemption for clearing defensible spaces around our homes, even though they may be near a creek. If a wildfire were to take hold in the San Geronimo Valley (or anywhere in Marin) there will be no vegetation left to protect fish or homes.

2. There should be some exemptions allowing for in-filling for affordable housing the SG Valley.

3. There should be a reduction in the Streamside Conservation Area. It is unrealistic to expect that all homes will be required to have a setback of 100 feet. With careful planting and landscaping, a 35-foot setback requirement seems quite adequate.

We all want to protect the salmon and habitat for all wildlife. We also want to provide reasonably comfortable homes for we human beings. We hope that energy and resources are directed toward meeting the needs of ALL species that live here.

Sincerely,
Cecelia Donahue
43a Please refer to Master Response 16.
43b Please refer to Master Response 14.
43c Please refer to Master Response 10.
43d Comment noted.
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As a resident of the San Geronimo Valley for more than sixty years and an Aerial Firefighter for more than thirty years I have grave concerns about ordinances, however well-intentioned, that could set the stage for disaster for all of Marin County. One aspect of the "riparian" zone not discussed in the SEIR is its susceptibility to wildland fire. Great emphasis is placed on preserving the riparian canopy to keep water temperatures within the range that promotes spawning and survival of fry until they are mature enough to return to the ocean. Measures taken to preserve the riparian canopy and woody riparian vegetation that create a suitable habitat would be to no avail if those measures did not include fuel modification, where required, to reduce the fire hazard. A fire during an intense burn period that scours out an entire drainage system would negate years of effort in one day.

Our riparian zones are populated by conifers, laurels (bay trees) and other pyrophytes species. Any plan to manage the riparian zone should include an inventory of the diverse types of vegetation, areas of abnormally high density, volatility and corrective action required. Over 100 years of successful fire suppression have created conditions of an abnormally high fuel load throughout the great expanses of our wildlands. Before human activity seasonal fires would have cleared out the understory many times over the same period greatly reducing the possibility of a fire storm. It will now require human activity to bring our wildland fuel load back toward a balance. If we wait for mother nature to do it for us it might just wipe the slate clean and start over.

The use of covered fire breaks where forest canopy, shrubbery required for stream bank stabilization, large woody debris are all preserved to the extent necessary to provide a healthy habitat should be an attainable goal.

The San Geronimo Valley is a wildland urban interface environment where the burn down of 100 homes and businesses, their contents, the cars in the driveways would precipitate not only a human but an environmental catastrophe. For any species on the verge of an extinction vortex such an event could be the tipping point where any recovery may be impossible. Fire history shows that where fire is hot enough to burn to mineral soil changes the chemistry of water in creeks and streams sterilizes them to the point that no aquatic biota can survive for indefinite periods of time.

Extreme ordinances to prohibit any removal of vegetation to provide for defensive space derived from studies such as the one under consideration was responsible for the loss of an entire community in South Shore Lake Tahoe. The Angora fire provides a glaring example. Well intentioned regulation intended to preserve habitat and wild lands proved to be a main reason that the fire could not be stopped even with a massive air assault with fire retardant chemicals. There was no defensible space to protect homes from the fire and the wild land from fully involved structures that ignited new fires everywhere in the drainage.
What happens in our valley won’t necessarily stay in our valley. There is an uninterrupted fuel bed in Marin County that spans the entire county. In 1945, a fire that started in the riparian zone at the paper mill below the confluence of the Little Carson and Big Carson creeks burned from where Kent Lake Dam is today to the base of Mt. Tam. The wind driven fire was so intense that embers were reported to be falling on Market Street in San Francisco. The only reason the fire did not spread into the San Geronimo Valley was because an old WW1 Veteran and valley resident, Skinny Ferrell, backfired it at the top of Green Hill. Depending on the wind and burn conditions a fire that starts in the San Geronimo Valley could burn through the populated hills and towns of Central and Southern Marin. Defensive space is not only designed to protect homes from wildland fires, it is also to defend the wildlands and other homes from house fires.

A fire that started in the 30s in Ignacio burned through Woodacre destroying over 30 homes. Photos a few years after that time show no riparian canopy over most of the Woodacre Creek.

This will mark my 35th year in Aerial Firefighting and during that time I have witnessed the destruction of many communities from small hamlets to settlements much larger than the San Geronimo Valley. Those where situations where all the firefighting apparatus that could be mustered could not stop the fire. The only way a community can survive such a fire is to inventory the threat and take corrective action before a fire starts.

One way real solutions can be found is to establish working groups that consist of all stakeholders in the region, necessary experts, modeled after the work of Dr. Elenore Ostrom on Governing the Commons. (The Evolution of Institutions for Collective Action). Planning as a response to the assertions of one focus group that looks at the world through a narrow lens inevitably leads to a host of unintended consequences.

Sincerely,

James M. Barnes
44a Marin County agrees that the riparian canopy should be protected from wildlife. Please refer to Master Response 16.


44c Comment noted. Please refer to Master Response 16.

44d Comment noted. Please refer to Master Response 16.

44e Comment noted. Please refer to Master Response 16.

44f Please see the response to 11a above.
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July 2018


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APPENDIX A

San Geronimo Creek 2015 Low-flow Habitat Survey
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1 INTRODUCTION

Available summer rearing habitat for juvenile coho salmon and steelhead (O. mykiss) in the San Geronimo Creek watershed was evaluated in October and early November 2015 to document existing habitat conditions. Available summer rearing habitat is generally most limiting during the late summer and fall period, particularly for age-1 and older steelhead, since flow is typically lower during this period than the remainder of the year. 2015 was the third consecutive year of drought in the region, resulting in lower than average flow conditions for the period.

Available rearing habitat was documented at a variety of locations selected to represent a range of habitat conditions in San Geronimo Creek and its major tributaries. Summer rearing habitat availability was quantified using a field mapping approach based on life-stage-specific habitat criteria. Habitat conditions were documented, but not mapped, at locations that were dry at the time of the survey, or had no suitable habitat based on the criteria.

2 METHODS

2.1 Field Observations

Locations for conducting field observations (survey reaches) were identified in mainstem San Geronimo Creek and its major tributaries to characterize flow and habitat conditions at a range of locations throughout the watershed. Seven sampling areas were identified in the San Geronimo Creek watershed including two mainstem reaches (upper and lower) and five major tributary basins (Arroyo/Barranca/El Cerrito, Montezuma, Larsen, Woodacre, and North Fork San Geronimo creeks). Reaches within these sampling areas were selected based on the following considerations:

- Fish distribution
- Channel gradient
- Access
- Contributing drainage area (and/or flow)
- Site length

Survey reaches within the seven sampling areas were generally selected to be within documented fish distribution (Chinook salmon, coho salmon, and steelhead), and downstream of permanent natural barriers to migration. Survey
reaches were also identified for each of the major gradient classes present within each sampling area. The length and distribution of channel gradient categories (0–1%, 1–2%, 2–4%, 4–8%) were determined using GIS, and used a guidance for site selection. Channels within the different gradient categories are expected to be controlled by different geomorphological processes, which directly influence channel bed morphology and aquatic habitat conditions. Survey reach characteristics are presented in Table 1. Multiple reaches were surveyed (or observations made) within most of the sampling areas.

Table 1. Survey reach characteristics.

<table>
<thead>
<tr>
<th>Sampling Area</th>
<th># of Survey Reaches or Observations</th>
<th>Gradient Class</th>
<th>Fish Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower mainstem San Geronimo Creek (downstream of Roy’s Pools)</td>
<td>3</td>
<td>0–1%</td>
<td>Coho/steelhead/Chinook</td>
</tr>
<tr>
<td>Upper mainstem San Geronimo Creek (upstream of Roy’s Pools)</td>
<td>2</td>
<td>0–1%</td>
<td>Coho/steelhead/Chinook</td>
</tr>
<tr>
<td>Arroyo/Barranca/El Cerrito creeks</td>
<td>2</td>
<td>1–2%, 2–4%</td>
<td>Coho/steelhead</td>
</tr>
<tr>
<td>Montezuma Creek</td>
<td>1</td>
<td>2–4%</td>
<td>Coho/steelhead</td>
</tr>
<tr>
<td>Larsen Creek</td>
<td>1</td>
<td>1–2%</td>
<td>Coho/steelhead</td>
</tr>
<tr>
<td>Woodacre Creek</td>
<td>4</td>
<td>1–2%, 2–4%</td>
<td>Coho/steelhead</td>
</tr>
<tr>
<td>North Fork San Geronimo Creek (upstream of Woodacre Creek)</td>
<td>2</td>
<td>1–2%, 2–4%</td>
<td>Coho/steelhead</td>
</tr>
</tbody>
</table>

2.2 Habitat Mapping

Summer rearing habitat availability was quantified in locations with suitable rearing habitat and surface flow using a habitat criteria mapping approach. Suitable habitat was mapped in the field based on life stage specific habitat criteria. The criteria included depth and velocity thresholds used to define suitable habitat based on habitat preferences reported in the scientific literature (Table 2).
Table 2. Habitat criteria values for mapping coho salmon and steelhead habitat in San Geronimo Creek.

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Species</th>
<th>Velocity</th>
<th>Depth</th>
<th>Supporting Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min (ft/s)</td>
<td>Max (ft/s)</td>
<td>Min (ft)</td>
</tr>
<tr>
<td>Age-0+ summer rearing</td>
<td>Coho salmon &amp; Steelhead</td>
<td>none</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Age-1+ summer rearing</td>
<td>Steelhead</td>
<td>0.25</td>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Riffle production a</td>
<td>Benthic macro-invertebrates</td>
<td>1.0</td>
<td>3.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*a Depth and velocity criteria for flow required to inundate substrate d50 in coarse gravel or cobble riffles.

A to-scale sketch map of the active channel bank, water’s edge, and polygons delineating suitable rearing habitat based on the criteria presented in Table 2 was developed for sites with suitable habitat. Field mapping sites were generally 20–40 active channel widths in length in order to capture a variety of habitats and multiple pool-riffle sequences. A measuring tape and stadia rod were used to measure distances in the field to guide sketch mapping within a scaled grid. The measuring tape was run in a straight line lengthwise along the channel, and the stadia rod was sequentially placed perpendicular to the tape allowing the accurate measurement of relative distances within the grid. The grid scale used was determined by the size of the channel to maximize detail within the sketch map grid, where narrow channels were sketched at a larger scale than wider channels. Sketch maps were digitized and areas of suitable habitat calculated using GIS. Mapping area results were used to estimate available rearing habitat per unit length (ft²/ft) of stream.

3 RESULTS

Field sites in San Geronimo Creek were visited on October 7–8 and November 11, 2015. Observations of summer rearing habitat conditions are summarized below for the two mainstem reaches and five major tributary subbasins surveyed.
3.1 Lower Mainstem San Geronimo Creek

Streamflow in lower mainstem San Geronimo Creek was intermittent, but with visible surface flow in certain sections; especially those areas with bedrock control. Measured flow at the locations surveyed ranged from 0.0 to 0.03 cfs. Flow at the gage near the downstream end of the reach averaged 0.05 on the date of the survey (10/7/2015). Pool habitats, some relatively large, were separated by riffles that were mostly dry, restricting the possibility of fish migration or movement between habitats. Potential for macroinvertebrate production and drift from riffles to pools was low in these intermittent reaches. Gravel/cobble substrates were relatively abundant and within a size range suitable for spawning. Water quality appeared to be marginal and approaching stagnant in some isolated pools, evidenced by black sediment and a scum/sheen on the water surface. Fish were observed in multiple pools including small cyprinids (possibly California Roach) and one young lamprey. Salmonid presence was not confirmed during our low-flow habitat mapping surveys, however, late summer electrofishing surveys performed by MMWD documented juvenile steelhead (age-0+ and age-1+) and coho in lower mainstem San Geronimo Creek in 2015 (E. Ettlinger, pers comm., 2015).

Based on habitat mapping Age-0 rearing habitat was relatively abundant and ranged from 3.1 to 9.5 ft²/ft and averaged 6.7 ft²/ft. No suitable habitat for age-1 steelhead rearing or benthic macroinvertebrate production was documented based on the mapping criteria (Table 2). Larger pools were sufficiently deep for age-1 rearing (>1.0 ft), although flow was too low to meet or exceed the minimum velocity criteria threshold (0.25 ft/s). Similarly, flow was too low to meet the minimum velocity criteria threshold for productive benthic macroinvertebrate habitat (1.0 ft/s), suggesting that food availability was likely lacking. Habitat complexity was low overall. Observed large woody debris (LWD) frequency and volume was low, although where present, LWD created local scour and contributed to habitat complexity.

MMWD survey data for 2015 indicated that juvenile steelhead and coho abundance was near average at the two regular monitoring sites (SG1 and SG2) in lower San Geronimo Creek, with the exception of age 0+ steelhead abundance at one site (SG2) where abundance was the lowest observed in 16 years of sampling. The MMWD survey data suggest that juvenile fish were able to use the limited habitat available, and survive in the isolated pools that remained in the late summer and fall, despite drought conditions and low streamflow.
Habitat availability in lower mainstem San Geronimo Creek is sensitive to small changes in flow, particularly when flow is reduced to 0.0 cfs and conditions become intermittent. Under these intermittent conditions fish can persist, but food resources are limited, and growth is expected to be reduced.

### 3.2 Upper Mainstem San Geronimo Creek

Streamflow in upper mainstem San Geronimo Creek was generally intermittent with isolated pools separated by dry riffles with visible flow only in relatively small sections at the upstream and/or downstream ends of riffles. Measured flow at surveyed locations ranged from 0.0 to 0.025 cfs. Flow at the gage near the downstream end of the lower mainstem reach averaged 0.05 cfs on the date of the surveys (10/7 and 10/8/2015). Pools in the upper mainstem reach were generally relatively large and separated by dry riffles, restricting the possibility of fish migration or movement between habitats. Potential for macroinvertebrate production and drift from riffles to pools was extremely low in these intermittent reaches. Gravel/cobble substrates were relatively abundant and within a size range suitable for spawning, although potentially suitable spawning substrates were generally highly embedded. Water quality appeared to be marginal and approaching stagnant in some isolated pools. Fish including small cyprinids (possibly California Roach) and young salmonids (thought to be *O. mykiss*) were observed in multiple pools.

Age-0 rearing habitat based on habitat mapping was abundant and ranged from 2.7 to 5.4 ft²/ft and averaged 4.0 ft²/ft. No suitable habitat for age-1 steelhead rearing or macroinvertebrate production was documented based on the mapping criteria (Table 2). Larger pools were sufficiently deep for age-1 rearing (>1.0 ft), although flow was too low to meet or exceed the minimum velocity criteria threshold (0.25 ft/s). Similarly, flow was too low to meet the velocity criteria for productive benthic macroinvertebrate habitat (1.0 ft/s), suggesting that potential food availability was low. Habitat complexity was moderate overall, and created by LWD and boulders (rip rap).

MMWD survey data for 2015 indicated that age-0 steelhead and coho abundance was near average at the two regular monitoring sites (SG3 and SG4) in upper San Geronimo Creek. Age-1 steelhead abundance was below average, but within the range observed in previous years. The MMWD survey data suggest that juvenile fish were able to use the limited habitat available, and survive in the isolated pools that remained in the late summer and fall, despite drought conditions and low streamflow.
Habitat availability in upper mainstem San Geronimo Creek is sensitive to small changes in flow, particularly where flow is reduced to 0.0 cfs, and conditions become intermittent. Similar to conditions observed in the lower mainstem reach, under intermittent conditions, fish can persist, but food resources are limited and growth is likely reduced.

See description of Woodacre Creek for discussion of the uppermost subreaches of upper mainstem San Geronimo Creek influenced by flow from Woodacre Creek.

### 3.3 Arroyo/Barranca/El Cerrito creeks

Flow conditions were generally dry throughout Arroyo, Barranca, and El Cerrito creeks, with the exception of a few small areas with very shallow (<1 in) standing water in the middle mainstem of Arroyo Creek. No surface flow was observed. Habitat criteria mapping was not performed due to the lack of water and mostly dry conditions. No fish habitat was present.

Habitat availability in Arroyo, Barranca, and El Cerrito creeks may be sensitive to small changes in flow during some (wetter) years. However, during dry conditions such as those observed during 2015, these streams provided no fish habitat, and low-flow summer rearing habitat availability would not be sensitive to further reductions in flow.

### 3.4 Montezuma Creek

Flow conditions were dry throughout Montezuma Creek. No fish habitat was present during the survey and habitat criteria mapping was not performed due to the absence of water.

Habitat availability in Montezuma Creek may be sensitive to small changes in flow during some (wetter) years. However, during dry conditions such as those observed during 2015, Montezuma Creek was dry and provided no aquatic habitat. Low-flow summer rearing habitat availability in Montezuma Creek would not be sensitive to further reductions in flow.
3.5 Larsen Creek

Flow conditions were dry throughout Larsen Creek. No fish habitat was present during the survey and habitat criteria mapping was not performed due to the absence of water.

Habitat availability in Larsen Creek may be sensitive to small changes in flow during some (wetter) years. However, during dry conditions such as those observed during 2015, Larsen Creek was dry provided no aquatic habitat, and low-flow summer rearing habitat availability would not be sensitive to further reductions in flow.

3.6 Woodacre Creek

Flow conditions were generally dry throughout the upper Woodacre Creek basin, including East Woodacre and West Woodacre creeks. Small pockets of standing water were observed in the middle mainstem reaches of Woodacre Creek. Surface flow was observed in the lower reaches of Woodacre Creek with flow increasing downstream toward the confluence with mainstem San Geronimo Creek. Measured flow in Woodacre Creek near the confluence with North Fork San Geronimo Creek was estimated at approximately 0.009 cfs. Water quality appeared to be good (i.e., clear, flowing, not stagnant). North Fork San Geronimo Creek was dry upstream of Woodacre Creek, and flow from Woodacre Creek extended downstream into upper mainstem San Geronimo Creek.

Fish, including age-0 salmonids, were observed in lower Woodacre Creek and upper mainstem San Geronimo Creek immediately below the confluence with Woodacre Creek. Habitat criteria mapping was not performed due to landowner access limitations.

Habitat availability in lower Woodacre Creek (and upper mainstem San Geronimo Creek) would be sensitive to small changes in flow during dry conditions such as those observed during 2015. Further reductions in flow would be expected to reduce habitat availability, food resources, and growth.

Habitat availability in upper Woodacre Creek may be sensitive to small changes in flow during some (wetter) years. However, during dry conditions such as those observed during 2015, upper Woodacre Creek was dry, and provided no aquatic habitat.
4 CONCLUSIONS

Locations surveyed that were dry during 2015 including North Fork San Geronimo, Arroyo/Barranca/El Cerrito, Montezuma, and Larsen creeks, did not provide suitable summer rearing habitat for salmonids. These reaches are not expected to be sensitive to reduced flow during dry conditions such as those observed during 2015; however, these reaches could be sensitive to small changes in flow during some (wetter) years.

Upper and lower mainstem reaches of San Geronimo Creek were largely intermittent with pool and run habitats separated by dry riffles. Age-0 rearing habitat was relatively abundant with greater habitat area per unit length in the lower mainstem compared with the upper mainstem. Age-1 habitat was not documented in the mainstem reaches (or major tributaries surveyed), and was primarily limited by low water velocity (less than 0.25 ft/sec). MMWD juvenile salmonid surveys in 2015 indicated that juvenile coho (age-0) and steelhead (age-0 and age-1) were able to persist in mainstem reaches throughout the summer. Water quality conditions appeared to be marginal where surface flow was intermittent, although water quality parameters were not measured during the surveys. Habitat availability in these mainstem reaches is sensitive to small changes in flow. Reduced flow would be expected to reduce suitable habitat area, food availability, and growth.

Reaches of lower Woodacre Creek and the upper mainstem reaches of San Geronimo Creek immediately downstream of the confluence with Woodacre Creek had connected surface flow, and the best summer rearing habitat conditions observed in the San Geronimo Creek basin during our surveys. Flow in this area appeared to be near the lower limit of suitability for age-0 rearing, and is likely extremely sensitive to small changes in flow, since further reduction could change flow conditions from having continuous surface flow to being intermittent.

Based on the habitat criteria presented in Table 2, no productive BMI habitat was identified in San Geronimo Creek during the summer rearing habitat surveys.

5 REFERENCES


Shirvell, C. S. 1990. Role of instream rootwads as juvenile coho salmon (Oncorhynchus kisutch) and steelhead trout (O. mykiss) cover habitat under varying streamflows. Canadian Journal of Fisheries and Aquatic Sciences 47: 852–861.

