Appendix E

Responses to Comments

December 3, 2008

Part I:	Staff responses to written comments submitted in response to February 8, 2008 Staff Report and proposed Basin Plan amendment
Part II:	Staff responses to issues raised at April 9, 2008 testimony hearing before the Water Board
Part III:	Staff responses to written comments submitted in response to September 05, 2008 staff-initiated revisions to the February 08, 2008 documents
Part IV.	Staff responses to peer review comments on Project Report and Basin Plan amendment draft dated November 16, 2007
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References

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PART I: STAFF RESPONSES TO WRITTEN COMMENTS ON THE FEBRUARY 08, 2008 STAFF REPORT AND PROPOSED BASIN PLAN AMENDMENT

Comment Letter no. 1: U.S. Environmental Protection Agency, Peter Kozelka, EPA Region 9 TMDL Coordinator, March 21, 2008

U.S. EPA submitted a summary of comments, and an attachment with detailed comments and questions.

Summary Comments

EPA summary comment 1: "Please clarify the TMDL and express it as a mass per unit of time. A percentage of natural load can be used….EPA recommends that TMDLs include a discussion of the total maximum daily load that must be achieved to attain water quality standards."

The Sonoma Creek sediment TMDL is 65,400 tons per year, and is set by calculating a rate above the natural load that would still result in attainment of water quality standards. We have revised Staff Report Sections (1.4 TMDL Process) and 7.3 (Establishing the TMDL), to provide the requested additional clarification. As discussed in the revised section 7.3, as well as Staff Report Section 7.6 (Seasonal Variation and Critical Conditions), sediment supply is in part a natural process that is dependent upon factors such as rainfall patterns, which vary on seasonal, annual, and longer timeframes. Therefore, the TMDL is more appropriately expressed as an average annual load (averaged over five to ten years), as well as a percentage of natural background. In order to express the TMDL as an average daily load (tons/day), the annual load can be divided by 365 days. This is consistent with the approach described in the *Mad River Total Maximum Daily Loads for Sediment and Turbidity* approved by U.S. EPA in 2007.

EPA summary comment 2: "Please clarify the problem statement, in particular, the roles played by various sediment sources, and the linkages between the problem statement, numeric targets, source analysis and the TMDL and allocations. While the TMDL appears to emphasize fine sediment, the Report does not appear to support the notion that fine sediment is problematic in the watershed; rather it appears that channel incision is a more important issue, which could reflect a sediment-starved system."

In response to the comment, we have revised Staff Report Sections 3.1 (Problem Statement- Summary) and 3.4 (Limiting Factors Analysis) to clarify the problem statement and the linkages between the problem statement, numeric target, source analysis, and the TMDL and allocations. In revised Section 3.4, we provide clarification on the link between the problem statement and sediment sources. We have also added Table 2 (Rationale to Support Finding of Fine Sedimentation Impairment) to present our

weight-of-evidence approach in concluding that elevated fine sedimentation is a factor in the steelhead population decline.

EPA summary comment 3: "Please clarify why the numeric targets were chosen as the best indicators of success. For example, it appears that the permeability target may be duplicative of the bulk sampling targets. Additionally, the analysis appears to suggest that the permeability target may not be achieved by the TMDL; targets should be set at a level that, when attained, reflect attainment of the water quality standards."

Adapted from the approach of Bauer and Ralph (2001), we considered five criteria in choosing the numeric targets to measure attainment of water quality objectives for sediment and settleable material. These criteria are:

a) Responsiveness to changes in sediment supply

b) Relevance to the biological requirements of salmonids, and/or other aquatic species

c) Measurement reliability

d) Necessary effort to obtain a representative sample

e) Availability of baseline data

Although spawning gravel permeability and substrate composition-percent fines both provide an index of the suitability of potential spawning sites with regard to fine sediment deposition, each of these targets has a possible limitation that is addressed by the other.

Percent fine sediment in the streambed is a direct measure of the level of fine sedimentation and its significance. However, the primary limitation of this parameter is that a very large mass of streambed material must be sampled and measured at each site in order to achieve desired level of accuracy, and therefore, necessary effort per sample also is very high (about one person-day per site). Also, to address sampling variance, in each major tributary, approximately at least ten sites would need to be sampled. Therefore, to accurately estimate percent fines in the streambed in eight Sonoma Creek tributaries and two mainstem reaches would likely require 100 person-days or more.

In contrast, estimating spawning gravel permeability at the same 100 sites would only require about 20 person-days. This attribute and its direct biological significance make permeability an attractive parameter. However, an important potential limitation of permeability in estimating fine sediment concentration is that it reflects both the influence of fine sediment concentration and overall packing of the streambed.

Based on the above considerations, we selected both parameters as numeric targets. In practice, we think it may be possible to establish a good correlation (e.g., $r^2 \geq 0.7$)

between reach median value for permeability and reach mean values for percent fines, as was done for the Trinity River in northwestern California (Matthews and Associates, 2001). If so, we will be able to estimate fine sediment concentration at a large number of potential spawning sites based on permeability measurements alone. This would allow us to develop a spatially extensive dataset for sedimentation given a reasonable amount of sampling effort. If we are not successful in establishing a strong correlation between permeability and percent fines, we would then rely primarily on the percent fines together with pool filling data in evaluating attainment of water quality objectives for sediment and settleable material. Also, because we have established a strong correlation between permeability and sediment supply scaled for stream power, we would not recommend discontinuing permeability monitoring altogether absent development of a similarly strong correlation to percent fines, pool filling, and/or another parameter.

Finally, we note in considering the uncertainty in measuring both rates of sediment supply to channels and spawning gravel permeability, we have cautioned against using the empirical regression we developed in the Napa River watershed, as a basis for estimating the *absolute* magnitude of permeability increase in response to decrease in sediment supply (Water Board, 2007; p.66). To clarify our opinion on this issue, we revised Staff Report Section 7.3 (Establishing the TMDL). The revised Section 7.3 describes the approach taken to predict the permeability value when the sediment load is set equal to the TMDL, at Agua Caliente, and states our conclusion that the predicted value (5,800 cm/hr) and the target value (7,000 cm/hr) are quite close when we take into account the uncertainties in estimating permeability and sediment supply rate. Although it is not possible to calculate an absolute permeability value at the TMDL sediment load, this analysis and the closeness between the predicted and target values indicates that the permeability target can be met at the TMDL sediment loading rate. Similarly, at a permeability value of 5,800 cm/hr, we predict that approximately 47 percent of salmon eggs will survive from spawning to emergence, versus 50 percent at the numeric target.

The TMDL targets are streambed permeability, pool filling, and substrate composition-percent fines. They are watershed-specific interpretations of the narrative water quality objectives for sediment, settleable material, and population and community ecology. Attainment of these targets (determined by a weight of evidence approach) constitutes attainment of water quality standards.

EPA summary comment 4: "Please explain why the water quality indicators in the Habitat Enhancement Plan are different than the numeric targets in the TMDL; please explain how they relate to each other."

The water quality indicators are intended solely to evaluate attainment of the water quality objective for population and community ecology in relation to impacts of channel incision on habitat complexity and functions. Because channel incision is by

definition a form of pollution (e.g., a human caused alteration to the physical integrity of a water body), and not a pollutant like sediment, these are not numeric targets. Therefore, the proposed water quality indicators will not have a direct bearing on determination of sediment impairment. Instead, the indicators are proposed to track progress in relation to stream-riparian enhancement actions that need to be undertaken to reverse in part the impacts of incision on habitat complexity and connectivity.

To provide additional clarification, we have revised the Staff Report Chapter 8 and added Table 7 (Key Components of the Sonoma Creek Watershed TMDL and Habitat Enhancement Plan). Table 7 summarizes the measures of progress for both the Sediment TMDL and the Habitat Enhancement Plan. We have also revised Staff Report Section 8.6 (Habitat Enhancement Plan-subsection Water Quality Indicators) to clarify the intended use of the water quality indicators.

EPA summary comment 5: "Please clarify the relationship between the sediment TMDL and allocations with the various sections of the TMDL analysis and the various portions of the Implementation Plan." We suggest distinguishing between sediment-related and non-sediment related issues, to ensure that support for the sediment-related portions of the TMDL are not overshadowed or confused by the more holistic and general approaches contained within the Habitat Enhancement Plan and other components of the document.

To clarify these issues, we have added the following introductory remarks to Staff Report Section 8.4 (Implementation Strategy):

> Within the implementation plan, we propose three categories of actions as needed to achieve all of the goals of Basin Plan amendment including actions to control:
>
> 1) *Upslope Sediment Discharges* directly associated with current and/or historical land-use activities including development, agriculture, and roads;
>
> 2) *Channel Incision Sediment Discharges and Consequent Impacts on Habitat Complexity* that result from direct disturbance of channels and/or indirect watershed disturbances (e.g., more intensive storm runoff), that are historical and/or ongoing in nature; and
>
> 3) *Other Impacts of Human Actions on Habitat Conditions* including baseflow persistence, fish passage, and large woody debris loading and functions.
>
> Actions to control upslope and channel-incision sediment discharges are needed to achieve the sediment TMDL and related water quality objectives for sediment and settleable material. Actions to control sediment discharges resulting from incision also must reverse, at least in part, the adverse effects of incision on habitat complexity and functions in order to achieve the water quality objective for population and community ecology. Actions to treat other human impacts on proper habitat function including baseflow persistence, fish passage, and large woody debris, also are needed in order to conserve the steelhead population and enhance the overall health of the native fish community.

EPA summary comment 6: "Please clarify and revise the Draft Staff Report as necessary, the Source Analysis, TMDL, Linkage Analysis, Load Allocations, and Implementation Plan to ensure consistency concerning the descriptions of and values for source categories."

Staff Report Chapter 6 (Source Analysis) has been revised for clarification and consistency. Please also see our responses to EPA-15a through EPA-15d, below.

EPA summary comment 7: "Please clarify the differences between the Implementation Plan, Habitat Enhancement Plan, the 'Habitat Enhancement Plan within the Implementation Plan,' and 'restoration priorities.' We suggest strengthening the connections between the TMDL and allocations with the Implementation Plan."

Please see our response above to "EPA Summary Comment 5," which addresses this comment in part. Within Staff Report Chapter 8 (Implementation Plan), we have added Table 7 to summarize the key components (including differences) of the Sediment TMDL and Habitat Enhancement Plan. The Implementation Plan consists of the Sediment TMDL (or Sediment Control Actions) and the Habitat Enhancement Plan. We have revised Section 8.5 (Sediment Control Actions) to further clarify the actions needed, and the regulatory actions proposed, to control sediment discharges. The revised Section 8.5 also describes our approach (which is both regulatory and collaborative) to address channel incision. Actions to address other impacts of human actions on habitat conditions are described in the Habitat Enhancement Plan (Section 8.6 of the *Implementation plan)*. Actions described in Section 8.6 do not directly relate to attainment of the TMDL, although channel restoration actions that reverse the effects of channel incision are complementary to sediment control actions.

Detailed Comments and Questions

EPA-1a: "On p. 6 [of the Staff Report], we would like you to correct the following statement: "A total maximum daily load (TMDL) is a water body-specific cleanup or restoration plan that targets the pollutant causing impairment (in this case sediment)." …A TMDL is more correctly described as a "total maximum daily load," and it is more accurate to state that the Sonoma Creek TMDL defines the allowable load of sediment (expressed as a mass) that can be discharged into Sonoma Creek while ensuring attainment of water quality standards.

EPA-1b: "Moreover, it is misleading to state that the TMDL is "a percentage of the natural background sediment delivery rate," (p. 6). However, it is appropriate to describe the determination of the loading capacity and TMDL to include a process of determining a natural background delivery rate, and to set the TMDL by calculating a

rate over that natural load that would still result in attainment of water quality standards."

We have revised Staff Report Section 1.4 (TMDL Process) in response to this comment. We have clarified that the Sonoma Creek Sediment TMDL defines the allowable amount of sediment that can be discharged into Sonoma Creek while ensuring attainment of water quality standards. The TMDL is expressed as an allowable mass of sediment per unit of time, as well as a percentage of natural background sediment delivery rate. We also include a discussion of the allowable daily load in section 7.3 (Establishing the TMDL).

EPA-2: "We believe the TMDL could be greatly strengthened by ensuring that the issues related to the sediment impairment are clarified and highlighted, and are distinct from other issues that could confuse the issues of sediment as a pollutant (and as the subject of the TMDL). Throughout the document, it is sometimes unclear whether this is a sediment TMDL or a fish habitat enhancement plan that also describes sediment loads. Accordingly, it is important, throughout the document, to ensure that the reasoning for the elements of the sediment TMDL is highlighted and clarified.

The scope of the Basin Plan amendment is broader than attainment of the sediment TMDL and related water quality objectives for sediment and settleable material. We have revised the Staff Report Section 1.1 to clarify the goals and scope of the Basin Plan amendment. Please see our responses above to "EPA Summary comments 2, 5, and 7" where we provide clarifications regarding:

a) The scope of the Basin Plan amendment;

b) Sediment-related impairment versus impacts of other stressors (e.g., fish passage, large woody debris, and baseflow persistence) on habitat conditions; and

c) Which control actions are needed to achieve the sediment TMDL, and which are proposed to address the other stressors.

EPA-3: (In Staff Report Chapter 3) "It may be helpful to strengthen the descriptions of relationships between sediment, which is the identified pollutant, and the identified sediment-related problems….In some cases it is unclear which habitat problems are clearly related to sediment as a pollutant.

Please see our response above to "EPA Summary comment 2."

EPA-4: "We would also appreciate a little more information to support the problem statement; it appears that the problem is primarily related to a full range of historic land uses, and development of ditches in the 1800s, both of these described in a few short sentences. It is not very clear how you concluded that fine sediment contributes to the sediment problem, and it is only somewhat clearer how you concluded that channel incision contributed to the sediment problem."

Please see our response above to EPA Summary comment 2.

EPA-5: EPA suggested updated information on listed species in the Sonoma Creek watershed be added to the Staff Report.

We have endeavored to provide the most current and complete information regarding the status of all listed fish and aquatic wildlife species (as well as other native fishes that are not listed) that are known to occur within the freshwater channel reaches of the mainstem of Sonoma Creek and/or its tributaries (e.g., the stream reaches covered under the sedimentation listing). This information is provided in Staff Report Chapter 3. It is our understanding that the listed species that occur in the freshwater reaches of Sonoma Creek and/or its tributaries are: steelhead trout and California freshwater shrimp.

In describing the status of these species, we have relied primarily on the excellent summary publication for Bay Area native fishes that was prepared by Leidy (2007), the Recovery Plan that the US Fish and Wildlife Service prepared for California Freshwater Shrimp (USFWS, 1998), and the specific studies that have been conducted by the Sonoma Ecology Center and/or its partners to provide a qualitative picture of status and trends of the steelhead population in the watershed. As indicated in Leidy (2007), evidence as to whether Coho salmon were native to Sonoma Creek (and if so, are now extirpated) is inconclusive, so we did not discuss this species in any detail within the report. Also, Sonoma Creek watershed has not been included by NOAA Fisheries within its critical habitat designation for Central California Coast Coho Salmon. One additional species, the Sacramento Splittail is not listed currently, although its status is under review.

EPA-6: "Given that you are focusing on steelhead, it will be very useful to explain why this focus will serve to achieve water quality standards. Please clarify if steelhead is the most sensitive species."

Please see our response above to "EPA Summary comment 2," and the revised Section 3.4 (Limiting Factors Analysis) of the Staff Report, which provides a discussion of why steelhead was selected as the primary index species.

EPA-7: "[Staff Report] Section 3.3, discussing salmonid life cycle and water quality requirements, could be strengthened by clarifying the problem statements. For example, the adult migration section states that water depth may be inadequate, but it is unclear, given the earlier statements that tributaries were not historically connected to the mainstem, whether this reflects natural conditions or disturbed conditions."

Please see our response to "EPA Summary comment 2."

As discussed in Staff Report Section 3.4, "The cause of the observed low summer base flows is not known for certain. Low summer flows are likely the result of multiple factors including a Mediterranean climate, geology, groundwater withdrawals, and watershed disturbances leading to incision and a lowering of the water table. While some dry reaches may be naturally occurring, historical maps and accounts dating from the 1820's show evidence that the valley used to be significantly wetter, with summer surface pending (indicative of a high water table) and abundant springs flowing at the base of the Maya camas and foothills of Sonoma Mountain…"

EPA-8a: "Please clarify the references to sediment as a pollutant in the limiting factors analysis section [of the Staff Report]. For example, three limiting factors are cited: deposition of excess sediment in the stream bed and changes in habitat structure resulting from bed and bank erosion; stressful water temperatures due to lack of shade, loss of deep pools and low base flow; and migration barriers and low summer flows. It is not clear whether this is a different set of issues than that included in the original problem statement (low steelhead population, channel incision/widening, and excessive fine sediment in spawning/rearing sites)."

We have addressed these specific comments as part of our response above to "EPA Summary comment 2."

EPA-8b: "It is not clear whether fine sediment deposition and low permeability, is at issue, except for the comparison with data from the Napa River. Clarifying the sediment issues should include resolving the apparent contradiction in stating that channel incision is problematic, while at the same time pool filling, (apparently) due to fine sediment, is problematic."

We have augmented the problem statement (Chapter 3 of the Staff Report) to address this comment. Please see our response to "EPA Summary comment 2" which describes revisions to the problem statement to address this and other comments received.

EPA-8c: "Clarifying the findings of the limiting factors analysis related to sediment, drawing from the sediment source analysis, and including more of the more information to support statements will assist with clarifying the problem statement."

Please see our response above to "EPA Summary comment 2."

EPA-9: "The text states that narrative water quality objectives for sediment, settleable material and population and community ecology are not attained, and that the narrative objectives for turbidity or suspended sediment are not violated. However, Table 3 implies that only the objective for "suspended material" are [sic] violated: the note below the table states that "italicized bold text indicates water quality objective is violated," and only "suspended material" is bold and italicized."

To address these comments, the Staff Report, Table 3 (Water Quality Objectives and Sediment-Related Beneficial Uses) has been corrected, so that Sediment, Settleable material, and Population and community ecology are shown in ***italicized bold text***. Turbidity and Suspended material are shown in normal text.

EPA-10: "There are four numeric targets identified: streambed permeability greater than or equal to 7,000 cm/hour at potential spawning sites, decreasing trend in the volume of fine sediment deposited in pools, sediment smaller than 0.85 mm diameter comprising less than 14 percent of total bulk core samples, and sediment smaller than 6.4 mm diameter comprising less than or equal to (or less than—it is stated both ways) 30 percent of total bulk core samples. None of these appears to address the problem of channel incision/widening"

Please see our response above to "EPA Summary comment 4" where we discuss the issue of channel incision within the context of the Clean Water Act definitions for pollutant and pollution.

The substrate composition-percent fines targets are: 1) percent of fine sediment less than 0.85 mm in diameter is less than or equal to 14 percent of the total bulk core sample ($\leq$14% fines <0.85 mm); and 2) percent of fine sediment less than 6.40 mm in diameter is less than or equal to 30 percent of the total bulk core sample ($\leq$30% fines <6.40 mm). We revised Staff Report Table 4 to consistently state these substrate composition-percent fines targets.

EPA-11: "The use of fine sediment bulk samples has been adopted in many recent sediment TMDLs. However, the only information presented (Staff Report p. 34) suggests that these targets are already being obtained at spawning sites, and that these values correspond with a survival-to-emergence rate of 50 percent. This information seems to contraindicate the need for reduced fine sediment in spawning areas. Please clarify."

In response, we have provided the following clarifying edits to Section 5.3 (Substrate Composition-Percent Fines):

> The targets (for percent fines in the substrate) complement the proposed streambed permeability target because they provide a direct measure of the fine sediments affecting streambed permeability. ~~These targets are attainable because they are met at several sites where recent spawning had been observed—Sonoma Ecology Center measured fine sediment content at eight known spawning sites (gravels) and the results indicate the proposed percent fines targets are met at these locations (SEC, 2001).~~ It is encouraging to note that these target values may already be achieved in more favorable potential spawning sites within the watershed as suggested by the result of a pilot study to evaluate suitability of substrate conditions at known sites of spawning and subsequent juvenile rearing (SEC, 2001)[16].
>
> [16]The results of ~~a~~ this preliminary study ~~of the suitability of spawning gravel~~ (summarized in Appendix G of SEC et al., 2006) indicate that both of the proposed targets for percent fines were attained at ~~known sites of spawning, where successful incubation also was inferred based on subsequent presence of juvenile salmonids in the same reaches~~ the eight sites that were sampled. However, the site selection criteria, known locations of spawning and subsequent juvenile presence, may have inadvertently biased the sample toward the more favorable potential spawning sites within the watershed ~~Because only known spawning sites with inferred successful incubation were sampled, we do not think the preliminary provides a basis for inferring whether or not spawning substrate quality is suitable in general at potential spawning sites throughout the watershed.~~

We also have added Table 2 to the problem statement, in Section 3.4 of the Staff Report, where we present all of the available data for evaluation of fine sedimentation impairment (see response above to "EPA Summary comment 2") including the following information that relates to this specific comment:

> Spawning gravel quality: A pilot study was conducted in 1998 to evaluate suitability of streambed grain sizes at steelhead and salmon spawning sites (see Appendix G in SEC et al., 2006a). At the eight sites sampled, gravels were found to be within the suitable size range, and fine sediment concentration was relatively low. However, only known sites of spawning and subsequent juvenile presence were sampled, which may have inadvertently biased the sample toward the more favorable sites?

EPA-12: "It is unclear why the permeability target is chosen, other than its use in the Napa River (Staff Report p. 29), and to serve as an additional indicator of fine sediment, which may be adequately covered by bulk sample monitoring, without the additional expense of duplicative monitoring. The explanation discusses survival of incubating salmonid eggs and larvae; although the limiting factors discussion in Chapter 1 highlights the juvenile rearing stage as limiting (it does not mention the incubation stage as limiting). Permeability at 18 potential spawning sites was estimated to correlate to a survival-to-emergence rate of 30 percent or greater, which may suggest mild, though not severe, impairment….The desired permeability target is related to a 50 percent or 60 percent survival-to-emergence rate (it is stated both ways, p. 30), which would indicate good conditions for survival-to-emergence; however, given that suitable spawning habitat itself is apparently limited (e.g., discussion on p. 30), and given the likelihood that this target evidently would be attained easily if the bulk sample targets are attained (Figure 3 indicates that 14

percent fines may correlate to a permeability value of less than 50 cm/ min, or less than 3,000 cm/hour), it is not clear whether this target will add value."

Please see our response above to "EPA Summary comment 3" where we present our rationale for target selection, and why we conclude that permeability is useful to measure and provides information above that which we could discern from measuring fine sediment concentration in the streambed alone.

Please also see our response above to "EPA Summary comment 2" and specifically our revisions to Section 3.4 (Limiting Factors Analysis). In these edits to Section 3.4, we present our rationale to support the finding that elevated levels of fine sedimentation causes or contributes to reduced rates of growth and survival in one or more freshwater life stages, and as such, reducing fine sedimentation is a necessary element of an effective plan to conserve the steelhead population within the watershed.

With regard to interpretation of Figure 3, please note that this is only presented to support the conclusion that permeability can be explained in part by fine sediment concentration. As we state elsewhere in the report, permeability also is a function in part of the sizes and packing of the framework gravels. The data in the graph are for a few streams in Alaska, and the specific relationship between percent fines and permeability only should be applied to these streams, and/or other streams with similar substrate attributes and sediment transport capacity. We are not aware of a universal relationship between permeability and percent fines. As such, at this time we are not able to extrapolate percent fines from permeability measurement (although we would like to try to develop such a relationship for channels in the Sonoma Creek watershed, as we discuss in our response to "EPA Summary comment 3").

EPA-13: "Moreover, the third rationale for choosing this target, that it may be attained if the TMDL is 125 percent of natural background sediment, is neither explained (here or in the Linkage Analysis), nor is it believable. The TMDL/Allocations section, in fact, indicates that the permeability target will not be attained."

Please see our response above to "EPA Summary comment 3" where we address these comments.

EPA-14: "The discussion of the pool filling target states that fine sediment deposition 'does not cause a biologically significant reduction in pool volume' but 'blankets most of the pool bottoms,' and that the 'mean value for pool filling in the Sonoma Creek watershed (8.5 percent) is within the range [for] other watersheds underlain by bedrock types that do not produce abundance sand and granules.' These statements seem to contradict earlier statements that fine sediment, or pool filling, or channel incision, is problematic. Please clarify these statements."

Please see our response above to "EPA Summary comment 2."

EPA-15a: "[Staff Report] Table 5 shows the 'current condition' for sediment delivery; Table 5b shows 'urban runoff' values, apparently related to NPDES permits; and Table 6 shows current conditions and allocations for the TMDL. These tables should be consistent and clearly show the connections. However, the list of sources, degree of rounding, and in some cases, the total numbers vary somewhat, resulting in additional confusion."

We have revised the following tables in the Staff Report: Table 5 *Sediment Delivery to Sonoma Creek* (same as Table 2 of the Basin Plan amendment); Table 5b *Sediment Delivery from Urban Stormwater Runoff*; and Table 6 Sonoma *Creek Sediment Load and Wasteload Allocations (*same as Table 3 of the Basin Plan amendment). These revisions were made to provide clarity, as well as to incorporate changes made in response to CalTrans' request that our estimate of its sediment load be adjusted to reflect a more accurate acreage of Caltrans facilities in the Sonoma Creek watershed. Our initial estimate of the acreage of CalTrans' facilities was 1,400 acres (based on watershed-scale geographical information system (GIS) data); while CalTrans' analysis of aerial photographs indicates the acreage is actually 284 acres. This adjustment in acreage has the effect of changing the estimated sediment load from CalTrans from 500 tons/year to 100 tons/year. In addition, all numbers displayed in tables are now rounded to the nearest hundred, to provide consistency in the degree of rounding. In Tables 2 and 3 of the Basin Plan amendment, the sources are now listed in descending order. In Table 3, we've added an "estimated reduction needed" column to clarify the relationship between current loads and allocations. The Staff Report tables have also been revised accordingly.

We have revised the Sources section of the Basin Plan Amendment as follows:

> **Sources**
>
> Field assessments and sediment load modeling provide credible estimates of average rates of sediment delivery to Sonoma Creek. As shown in Table 2, the average annual sediment load to the freshwater reach of Sonoma Creek is estimated to be ~~118~~117,000 tons per year, or 360 tons per $km^{2\ per}$ year. The natural background sediment delivery rate to Sonoma Creek is 52,000 tons per year, or 160 tons per $km^{2\ per}$ year. Therefore, the current sediment delivery rate is estimated to be 225 percent of the natural background rate.

Revised Table 2 of the Basin Plan amendment (identical to Table 5 of the Staff Report) is shown below:

Table 2. Sediment Delivery to Sonoma Creek (tons/year)

	Annual Sediment Load (tons/year)[a]
Natural Processes	
• Channel Erosion, Incision	25,000
• Landslides	4,000
• Soil Creep	17,000
• Surface Erosion	6,000
Total- Natural Processes	**52,000**
Human Actions	
• Channel Erosion, Incision	43,000
• Landslides	1,000
• Surface Erosion from Vineyards, Other Row Crops, and Grazing Lands:	9,000
• Urban Stormwater	1,000
• Roads and Stream Crossings	11,000
Total- Human Actions	**66,000**
TOTAL	**118,000**
[a]Sediment loads are rounded to the nearest thousand.	

Table 2. Average Annual Sediment Delivery to Sonoma Creek (tons/year)[a]

Source Categories		Estimated Rate[c] (tons/year)
Natural Processes	Channel Erosion, Incision[b]	25,400
	Colluvial Bank Erosion (Soil Creep)	16,600
	Surface Erosion[b]	6,200
	Landslides[b]	4,100
	Total- Natural Processes	52,300
Human Actions	Channel Incision and Gully Erosion[b]	43,300
	Roads and Stream Crossings	11,200
	Surface Erosion[b] from vineyards, other row crops, and rangelands	8,600
	Urban Stormwater Runoff	1,100
	Landslides[b]	900
	Total- Human Actions	65,100
GRAND TOTAL		117,400

[a]Sediment delivery rates are rounded to the nearest hundred.

[b]Channel erosion and incision, surface erosion, and landslides occur **due to** both natural processes and human actions. For these sources, each component (natural processes vs. human actions) is displayed separately.

[C] The timeframe associated with the average annual rate varies from long-term average rates which were estimated for landslides, channel incision, and gully erosion to those for urban stormwater, surface erosion, and road-related erosion, which are estimated based on current/contemporary conditions.

Revised Table 3 of the Basin Plan amendment (identical to Table 6 of the Staff Report) is shown below:

Table 3. Sonoma Creek Sediment Load and Wasteload Allocations (tons/year)

Source Category	Current Condition	Allocation	
		Tons/year	Percent Natural Background
LOAD ALLOCATIONS			
Natural Processes			
• Channel Erosion, Incision	25,400	25,400	49
• Landslides	4,100	4,100	8
• Soil Creep	16,600	16,600	32
• Surface Erosion	6,200	6,200	12
Total - Natural Processes	52,300	52,300	100
Human Actions			
• Channel Erosion, Incision	43,300	7,800	15
• Landslides	900	200	0.4
• Surface Erosion, including Vineyards, Grazed Lands, Unmanaged Areas, and Minor Agriculture	8,600	1,600	3
• Roads and Stream crossings	11,200	2,000	4
Total - Human Actions (Load Allocations)	64,000	11,600	22
Total - Load Allocations		63,900	122
WASTELOAD ALLOCATIONS			
Construction Stormwater - NPDES Permit No. CAS000002	300	300	0.6
Municipal Stormwater - NPDES Permit No. CAS000004	600	600	1
Industrial Stormwater - NPDES Permit No. CAS000001	100	100	0.2
Caltrans Stormwater - NPDES Permit No. CAS000003	500	500	1
Total - Wasteload Allocations		1,500	3
TOTAL ALLOCATIONS = TMDL		65,400	125
[a]Allocations are rounded to the nearest hundred.			

Table 3. Sonoma Creek Sediment Load and Wasteload Allocations (tons/year)[a]

	Source Category	Current Load[b] (2005)	Estimated Reductions Needed (Percentage)	Allocation	
				tons/year	Percent Natural Background
Load Allocations	Natural Processes				
	• Channel Erosion, Incision	25,400	0	25,400	49
	• Colluvial Bank Erosion (Soil Creep)	16,600	0	16,600	32
	• Surface Erosion	6,200	0	6,200	12
	• Landslides	4,100	0	4,100	8
	Human Actions				
	• Channel Erosion, Incision	43,300	81	8,100	15
	• Roads and Stream Crossings	11,200	81	2,100	4
	• Surface Erosion, including vineyards, grazed lands, unmanaged areas, and minor agriculture	8,600	81	1,600	3
	• Landslides	900	81	200	0.4
	TOTAL	116,300		64,300	123
Wasteload Allocations[c]	Municipal Stormwater - NPDES Permit No. CAS000004	600	0	600	1
	Construction Stormwater - NPDES Permit No. CAS000002	300	0	300	0.6
	Industrial Stormwater – NPDES Permit No. CAS000001	100	0	100	0.2
	Caltrans Stormwater – NPDES Permit No. CAS000003	100	0	100	0.2
	TOTAL	**1,100**		**1,100**	**2**
TOTAL ALLOCATIONS = TMDL = 125 % of Natural Background				**65,400**	**125**

[a]Sediment loads and allocations are rounded to the nearest hundred. Some totals may not appear to add up due to rounding.
[b]Table 5 also displays the estimated current (2005) sediment loads. Total current (2005) estimated sediment load = 117,400 tons/year.
[c]Source categories included in the wasteload allocations (e.g., municipal stormwater) are described as "urban stormwater" in Table 5. The term "urban stormwater" in Table 5 incorporates municipal, construction, industrial, and Caltrans stormwater.

We have revised Table 5b of the Staff Report as follows:

Table 5b. Sediment Delivery from Urban Stormwater Runoff

Point Source Category	Assumptions/Data	Estimated Mean Annual Delivery Rate (tons/yr)[a]
Construction Stormwater	Ground disturbance: 50 acres Sediment delivery rate: 50% Average soil erosion rate: 10 tons/acre	300
Municipal Stormwater	Acreage of urban land use: 12,195 acres[b] Runoff coefficient: 0.2 (typical urban coefficient is 0.35 (BASMAA, 1996; however Sonoma Creek watershed is highly vegetated with low directly-connected impervious area) Average rainfall: 30 inches/yr. TSS concentration: 100 mg/L[c] Sediment delivery rate: 50%[d]	600
Industrial Stormwater	Acreage of industrial land use: 250 acres[b] Average rainfall: 30 inches/yr. TSS concentration: 100 mg/L (EPA benchmark) Runoff coefficent: 1	100
Caltrans	Acreage of Caltrans roads: ~~1400~~ 284 acres[~~b~~e] TSS concentration: 100 mg/L[~~e~~ f] Runoff coefficient: 1 Average Rainfall: 30 inches/yr.	~~500~~100

[a]Rounded to nearest hundred.

[b]Source: Land cover data provided by Sonoma Ecology Center.

[c]WEF Manual of Practice No. 23/ASCE Manual No. 87, assumes median urban site (WEF and ASCE 1998)

[d]Assumes half of sediment is retained on land or removed via culverts, detention basins, etc.

[e] Information provided by Caltrans (Caltrans, 2008). Acreage includes highways, a maintenance station, and a park and ride facility

[~~e~~Approximation[f]Approximation based on *Storm Water Monitoring & Data Management Discharge Characterization Study Report* (California Department of Transportation, 2003)

EPA-15b: "Urban stormwater runoff in Table 5 totals 1,000 tons/year, but 1,500 tons/year in Table 5b; wasteload allocations, based on NPDES permits, totals 1,500 tons/year in Table 6….[Staff Report] Section 6.4 discusses "channel incision, gully erosion and landslides," and concludes, for example, that sediment from channel bed incision, bank erosion and gullies is 69,000 tons /year. We are not able to reconcile this with the summary in the table. Thus, clarifications and simplifications of the information could be presented."

Please see response to comment EPA-15a above. Regarding reconciliation of sediment loading numbers displayed in tables to the text discussion, as stated in footnote b of Table 2 in the Basin Plan amendment (shown in response to EPA-15a), several sediment sources occur both naturally and due to human actions. The *total (*naturally occurring plus human-caused) sediment load from channel bed incision, bank erosion, and gullies is estimated at approximately 68,700 (rounded to 69,000) tons/year—the naturally occurring component is estimated to be 25,400 tons/year and the human-caused component is estimated to be 43,300 tons/year.

EPA-15c: "How is sediment delivery from natural processes estimated from 1800 (p. 38)? Is this the period reflected in Table 5? How is this reconciled with, for example, a period of 1935 (or 1937, on p. 53) -2005 for landslides, based on aerial photographs? The discussion cites periods from 1850-2005 (55 years), or "during the past 70 years," as well, so it would be helpful to clarify which time period was used."

The timeframe associated with the average annual rate varies from long-term average rates which were estimated for landslides, channel incision, and gully erosion; to those for urban stormwater, surface erosion, and road-related erosion, which are estimated based on current/contemporary conditions. The timeframes associated with estimated sediment delivery rates from channel incision, gully erosion, and landslides are discussed in Staff Report Section 6.4 (Channel Incision, Gully Erosion, and Landslides). The methods associated with estimating sediment delivery rate from surface erosion and roads are discussed in Staff Report Sections 6.5 (Surface Erosion) and 6.6 (Roads and Stream Crossings). To clarify, we have added a footnote to Table 5 of the Staff Report (which corresponds to Table 2 of the proposed Basin Plan Amendment) and the revised table is shown in our response to EPA comment 15-a, above.

We also note that Section 6.7 (Accuracy of Sediment Delivery Rates) also discusses the effect of the timeframe for estimates in attempting to determine current rates. We also revised Section 6.2 (Watershed Changes Affecting Sediment Delivery) to further clarify our methods for estimating sediment delivery from surface erosion, and our approach for estimating natural sediment sources.

EPA-15d: "In addition, it is not clear what the 'current conditions' period is based upon….If [it is] based on a much longer (historical) time period, it might be helpful to have some way to estimate whether the more recent rates are substantially different; if recent sediment delivery rates are much lower than during the longer historic period, then perhaps current (i.e., recent) conditions are closer to the allocations already, and implementation actions could be more flexible.

Please see our response immediately above to EPA-15c.

EPA-16: "The discussion of surface erosion, roads and stream crossings, and model assumptions is a little confusing ([Staff Report] pp. 47 ff), and difficult to reconcile with the results that are presented in Tables 5 and 6. For example, it is possible that the decimal points of some of the surface erosion cover factors may have been misplaced (e.g., is it possible that average cover values of 0.037 and 0.015 for vineyards and grazing areas is intended, rather than 0.37 and 0.15, respectively?)." This would better explain why the value of 0.02 was chosen (earlier stated as 0.2). Further in the discussion, average sediment delivery ratios are similarly confusing (5 percent? Or 0.50, which would imply 50 percent?). Road mileages, stream crossings, and total values of sediment contributed seem out of synch with the summaries in the table, and some of the assumptions that were made were difficult to follow. It may be clarified by emphasizing the conclusions to the analysis, then explaining why other assumptions were discarded (rather than including the draft results, which are much different than the results in Tables 5 and 6)."

It appears that the commenter may have misread the passage. We stated that the cover factor for vineyards should be adjusted from 0.37 to 0.20, and that the cover factor for grazing areas should be adjusted from 0.15 to 0.02. Similarly, with regard to adjustment of sediment delivery ratios, we provided a rationale for adjusting a watershed-wide estimate of 5 percent irrespective of land-use category or management practices to average values of 25 percent for vineyards and 50 percent for grazing areas.

Please see our response to EPA comment 15-a, where we present revised tables summarizing sediment delivery rates. We believe Staff Report Chapter 6 (Source Analysis), with the revisions described in our response to EPA comments 15-a, 15-b, and 15-c, clearly present the methodology, assumptions, and conclusions of our source analysis.

EPA-17: "It is acceptable to calculate the TMDL by considering natural loading rates. However, [Staff Report] Section 7.2 proposes to express the TMDL as a percentage of the natural background rate. EPA recommends that TMDLs be expressed as a total maximum *daily* load. Any uncertainty in the determination of the TMDL can be discussed in the Margin of Safety; if needed, the TMDL can be revised in the future if

new information demands it. Please express the TMDL as a total maximum daily load. You may also additionally express it as an annual average load."

We address this comment in our response to EPA summary comment 1.

EPA-18: "The document generally, and the TMDL section specifically, emphasizes reduction of fine sediment, suspended sediment and turbidity…[but] information provided in earlier sections suggested that water quality standards for suspended material and turbidity were not violated. Please clarify."

As stated in Staff Report Chapter 4 (Water Quality Standards), we do not conclude that the narrative objectives for turbidity or suspended sediment are violated. In response to EPA-9, we have corrected Table 3 of the Staff Report to indicate that the water quality objectives for turbidity and suspended material are not violated. As stated in Chapter 1 (Introduction) of the Staff Report, we use the term fine sediment to refer primarily to sand and fine gravel deposited in or on the streambed in fish bearing reaches of gravel or cobble-bedded channels. High concentrations of fine sediment in the streambed are associated with: a) poor rates of survival for salmonid eggs from spawning to emergence; b) diminished growth and survival of juvenile salmonids during the dry season; and/or c) low rates of juvenile steelhead during the wet season.

We expect that implementation measures to reduce sediment delivery will also reduce suspended material and turbidity.

EPA-19: "Although it is possible that the permeability target is not needed, the TMDL discussion reveals that setting the TMDL at 125% of natural background is not expected to meet the target (5,800 cm/hr is expected, and the target is 7,000 cm/hr). Please reconcile this difference."

Please see our response above to "EPA Summary comment 3."

EPA-20: Re: Margin of Safety, Seasonal Variation and Critical Conditions, "The discussion of uncertainty that is included in the Sediment Source Analysis could potentially assist in the discussion in these sections. It is not clear from the text whether conservative assumptions were used, and whether uncertainty is accounted for in the development of the TMDL (see notes in the Source Analysis sections)."

In response to this comment, we have revised Staff Report Section 7.5 (Margin of Safety) to further describe the conservative assumptions used in setting targets for substrate composition and spawning gravel permeability, as well as the implicit margin of safety provided by implementation of habitat enhancement actions.

EPA-21: "We are confused about the role of the Habitat Enhancement Plan vis-à-vis the Implementation Plan, and we believe it will be helpful to clarify the differences throughout the document.."..For example, significant problems, apparently, are channel incision/widening/bank erosion, and inadequate water depth. The Habitat Enhancement Plan appears to suggest that the ideal channel form would be wider and shallower. Please clarify/reconcile these apparent contradictions.

Please see our responses above to EPA Summary comments 5 and 7.

EPA-22: Staff Report "Section 8.4, Implementation Strategy, states that the TMDL and Habitat Enhancement Plan "will include implementation measures." Do you mean that it *does* include these measures?"

Yes.

EPA-23: "Please clarify the role of Tables 7-10, *vis-à-vis* the Implementation plan text."

These tables (which have been renumbered to Tables 8-11) provide a summary of the permit programs and control actions associated with implementation, as discussed in Staff Report Chapter 8.

EPA-24: [Staff Report] "Section 8.5 is titled 'Sediment Reduction and Control/New Regulatory Programs,' but it appears that all the programs that are discussed are pre-existing, and the new programs do not appear to be regulatory. Please clarify."

The Basin Plan amendment calls for new regulatory programs or expansion/revision of existing regulatory programs to control and reduce sediment. As shown in the Basin Plan amendment Tables 4.1-4.4 (corresponding to Staff Report Tables 8-11), new regulatory programs are proposed to control sediment from roads, gullies, and surface erosion on: vineyards, rural lands, and public lands. Expansion of the municipal stormwater program, to require attenuation of peak flows and durations to MEP (Maximum Extent Practicable) standards, is also called for in the Basin Plan amendment. No changes are proposed for the existing Industrial and State Highways Stormwater programs.

The recommended actions to enhance habitat conditions are not regulatory, but will instead rely on cooperative partnerships, technical assistance, and grant funding.

EPA-25: "In general, it might be helpful if the relationships between the Source Analysis, the TMDL/Allocations, and the Implementation Plan are clarified. For example…it is not clear what activities will be classified as avoiding direct impacts, nor how that strategy will ultimately result in large sediment reductions that are needed."

This comment is addressed above in our response to "EPA Summary comment 5.

EPA-26a: "Roads and stream crossings constitute the second greatest quantity of sediment. The text states that Sonoma County does not have written policies on road construction, maintenance or stream crossings. Development of programs to reduce sediment discharges from roads is needed, and this need appears to be under-represented in the implementation plan."

To address this comment, we have revised and expanded Staff Report Section 8.5 (Sediment Control Actions- subsection Roads and Stream Crossings). In the revised section, we point out that the Basin Plan amendment specifies performance standards for sediment delivery to channels from road-related erosion that applies to all public and private roads. We also discuss approaches, such as sediment-control cooperatives, to address road-related sediment delivery.

EPA-26b: "Note that the text at p. 70 states that the "performance standard" is to reduce sediment to 6 tons per road mile per year, but this figure appears to be at odds with the allocations in Table 6; and Table 7 states that the current estimate is 34 tons per mile per year. Also, the number of road miles totals 972 (p. 79), including either 454 or 519 miles (p. 53) of unpaved roads. Please reconcile these figures with those in the Source Analysis."

These performance standards have been revised, and are now in narrative form. Please also see our response to SEC-2. Please also note that the correct number for the estimated number of miles that are unpaved is 519. Section 8.5 (Sediment Control Actions– subsection Roads and Stream Crossings) has been corrected accordingly.

EPA-27: "Surface erosion from vineyards, grazing and other agricultural sources together make up the next largest category of sediment discharge. Given the apparent success of the Fish Friendly Farming Program in the Napa River watershed, the erosion ordinance applicable to new vineyards (and given the lack of attention to road sources), the proposed regulatory program suggested for existing vineyards alone seems burdensome."

Vineyards may include a suite of potentially significant source categories including surface erosion within the vineyard footprint, road-related erosion, gully erosion and/or

shallow landslides (where vineyard development causes or contributes to an increase in storm runoff), and channel incision. Sonoma County regulations only apply to hillside vineyards that have been developed after adoption of the ordinance, and in these cases, only to on-site erosion control within the footprint of the vineyard and/or stream setbacks for pollutant filtration. Please also note that only a few vineyards within Sonoma Valley are enrolled and certified by the Fish Friendly Farming Program. Also, existing voluntary programs for vineyard soil conservation developed by the Southern Sonoma RCD have focused on control of on-site erosion within the vineyard footprint.

Based on these points, and consistent with the State Nonpoint Pollution Control Policy, we respectfully differ, and have concluded that a WDR waiver program (the least intrusive form of regulation by the Water Board) should be implemented to regulate pollutant discharge from vineyards. The waiver program will recognize the Fish Friendly Farming program and other qualified third-party certification programs, so that landowners participating in such a program would not have to duplicate efforts. The waiver program would also regulate and provide coverage for those landowners who are not enrolled in a qualified third-party certification program.

EPA-28: "It is not clear whether the proposed requirements on p. 71 are in addition to those anticipated on pp. 72 ff….Please clarify if Water Board anticipates including standard BMPs as part of conditions for Waste Discharge Requirements (WDRs)." It may be helpful to emphasize that compliance with the conditional waivers of the WDRs that may be adopted by the Water Board (Table 7) will assist in clarifying that every landowner will not necessarily be required to report extensively. Perhaps identifying potential standard BMPs, if they are proposed, which would ease the inventory burdens for smaller vineyard and ranching operations, could be included. A sample sediment inventory or Ranch Water Quality Plan could also be developed in the future, to further encourage the collaborative efforts that have gone into the development of this TMDL and the Habitat Enhancement Plan."

In describing new regulatory programs in the Staff Report, we first discuss existing efforts and then discuss building upon these efforts to create new regulatory programs to address gaps or inadequacies. We assume the commenter is asking whether actions under the existing Sonoma County Vineyard Erosion and Sediment Control Ordinance (SCVESCO) would be required in addition to the WDR waiver program that will be developed for vineyards (discussed on pages 71 and 72 of the public review draft of the Staff Report). The SCVESCO is a county ordinance, enforced and administered by the Sonoma County Agricultural Commissioner. The Water Board will look for opportunities to build upon the county's ordinance; however the conditional WDR waiver program will be a separate program, developed by the Water Board, in large part to address the goals of this TMDL.

Our conditional waiver programs will have conditions that dischargers (e.g., vineyard or grazing land operators) must comply with. However, the discharger will have the flexibility to choose the BMPs that are most effective and cost-efficient for their land. The commenter's specific suggestions regarding the conditional WDR waiver programs will be considered during development of the public review draft of the WDR waiver program.

EPA-29: "Please clarify how the Habitat Enhancement Plan, Section 8.6, fits in to the TMDL and implementation plan, and its relationship to the sediment load reductions identified in the TMDL….For example, the water quality indicators are completely different than those in the TMDL, and appears to suggest that more flooding should occur throughout the Sonoma Creek floodplain and valley, and that the channel needs to be wider and shallower."

Please see our response above to EPA Summary comments 4, 5 and 7.

EPA-30: Tables 7-9 appear to be similar, and include similar requirements. The proposed requirements could be simplified, and potential conditional waivers for WDRs could be included, if that is a potential alternative to the extensive reporting suggested in the tables. Does Table 11 essentially suggest that no change is proposed over current NPDES permit limits?

No change is proposed over current NPDES permit effluent limits. We propose to develop general WDR waivers for each of these source categories. We believe the amount of reporting is appropriate given the potential water quality threats. With regard to NPDES stormwater pollution control permits, as these are reissued, we have recommended that (where this is not already the case) these include performance standards and conditions to effectively control potentially significant increases in storm runoff peak rate and duration (see also our response to SFEI-4, ahead).

EPA-31: "The document could be strengthened by ensuring that the correct references are cited. For example, the limiting factors analysis section cites SEC 2004, which is the *draft* limiting factors analysis, while a later reference listed in that section but not, apparently, used is the *final* analysis. If nothing changed substantively between the draft and the final, it may be more accurate (and more reassuring to the reader) to refer to the final report."

We have carefully checked all citations for accuracy and have made the few required changes.

Comment letter no. 2: California Department of Parks and Recreation, Marla S. Hastings, March 18, 2008

The Department of Parks and Recreation expressed concurrence with the goals, approach, and scientific basis, and proposed implementation plan of the sediment TMDL and Habitat Enhancement Plan for the Sonoma Creek watershed. Water Board staff appreciate the Department's support and look forward to working together to improve water quality in the watershed and restore a healthy fishery.

Comment letter no. 3: California Department of Transportation (CalTrans), Joyce Brenner, March 21, 2008

CalTrans expressed support for the Water Board's efforts to protect human health and achieve the best water quality possible. Ms. Brenner made the following comments and requests:

CalTrans-1: "Table 5b of the Staff Report states that the acreage of Department roads in the Sonoma Creek watershed is 1,400 acres….Our estimates indicate that the Department right-of-way covers 284 acres….We request that the Regional Board please make a correction for total land use area and identify specific types of roads and land uses that were included in [the] calculation."

We have revised the estimated sediment load from Caltrans to reflect the acreage information provided by CalTrans. As shown in the revised Table 5b of the Staff Report, the acreage used to calculate the estimated sediment load from CalTrans facilities has been adjusted from 1,400 to 284 acres. This acreage (284) includes all Caltrans facilities (i.e., highways, a maintenance facility, and a park-and-ride facility) in the Sonoma Creek watershed. This change in the acreage of CalTrans facilities has the effect of lowering the estimated sediment load from CalTrans facilities from 500 tons/year to 100 tons/year. Please see our response to EPA-15a, which shows the tables and text that have been revised as a result of this change. The Staff Report has also been revised accordingly.

CalTrans-2: Regarding implementation requirements for compliance with performance standards with which CalTrans believes it is already in compliance, "the Department would like to have clarification for the requirements discussed in Table [11] of the Staff Report and Table 4.4. of the Basin Plan amendment, which lists performance standards and actions….We request that the Board please clarify if any additional actions [by CalTrans] will be needed to achieve performance standards in addition to compliance with statewide NPDES Permit."

CalTrans is responsible for control of runoff from state highways and associated construction activities, and is permitted under the Caltrans statewide NPDES storm water permit (NPDES Permit No. CAS000003). The sediment wasteload allocation for

CalTrans is equal to the estimated current sediment load (both are 100 tons/year). The sediment load and wasteload allocation assume that erosion and sediment controls are implemented as required by the existing permit. Continued compliance with the existing permit is expected to achieve the wasteload allocation. We do not expect that additional actions will be needed by CalTrans to achieve the wasteload allocations or performance standards specified by this TMDL.

Please note that the State Water Resources Control Board is undergoing the reissuance process for the CalTrans statewide stormwater permit- that is a separate matter and we cannot comment here on the potential additional actions the new permit may require.

Caltrans-3: "We encourage Regional Board staff to coordinate the compliance schedule for this TMDL to be compatible with other upcoming TMDLs in the region. This would help the Department, as well as, other dischargers, with effective planning of resources and implementation of controls to meet the requirements of both TMDLs."

We agree that coordinating compliance schedules of related TMDLs would be helpful in resource planning, and will make an effort to do so. However, the timing of TMDLs and their associated implementation schedules depends upon staff resources, our public participation process, stakeholder input, and on administrative process timelines. We encourage CalTrans and other dischargers to be proactive in planning resources and implementation of controls, and to seek opportunities to coordinate complimentary pollutant control actions. We will share information about upcoming TMDLs, as it is available, to assist dischargers in planning resources.

Comment letter 4: San Francisco Estuary Institute, Kat Ridolfi, March 24, 2008

SFEI-1: "Rural lands are defined [in the Staff Report] as parcels greater than 10 acres (Table 4.3 in Proposed Basin Plan Amendment). However, smaller parcels, and the subdivision of those parcels for homes, wineries, or other structures, can still contribute significant sediment through erosional forces and/or runoff from impervious surfaces. Increases in drainage connectivity exacerbate existing bank erosion and bed incision, and will be excluded from oversight under the current definition of lands required to submit a report of waste discharge. Instead of an acreage threshold for rural lands, I suggest basing the condition for waste discharge requirements on a '% disturbance factor,' which would include total impervious surfaces plus other un-vegetated areas such as dirt roads and paths which may contribute to increased drainage connectivity and represent effective means for routing fine sediment to receiving waters."

We agree that it is possible that parcels smaller than 10 acres may contribute sediment through erosive forces or sediment-laden runoff. However, we believe that a 10-acre threshold allows for the most efficient use of resources and would address the vast majority of sediment discharges from rural lands. According to available parcel data, there are approximately 20,400 parcels in the Sonoma Creek watershed. Of these, approximately 5,800 are larger than 10 acres, comprising 97 percent of the total unincorporated land area. The majority of the parcels smaller than 10 acres are located in urban areas (e.g., City of Sonoma), which are regulated by the Small MS4 (Phase II) Stormwater Permit. In addition, parcels smaller than 10 acres but that are identified by Water Board staff as posing a threat to water quality, will also be regulated even if they are outside the Small MS4 Stormwater Permit area. To clarify this point, we have made the following change to footnote 1 of Table 4.3 of the Basin Plan amendment (similar to Table 10 of the Staff Report):

Table 4.3 Required TMDL Implementation Measures for Sediment Discharges Associated with Rural Lands[1,]

Sources and Performance Standards	**Actions**	**Implementing Parties**	Completion Dates
Roads:~~Road-related sediment delivery to channels ≤ 120 tons per road mile per 20-year period[4,5]~~ Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels ; **and** **Gullies and/or shallow landslides**: Promote natural recovery, and minimize human caused increases in sediment delivery from unstable areas.	Submit a Report of Waste Discharge[2] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures.	Landowners	June 2014
	Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs.	Landowners	As specified in applicable WDRs or waiver of WDRs
	Report progress on implementation of-site specific erosion control measures.[3]	Landowners	As specified in applicable WDRs or waiver of WDRs

[1]Rural lands include: non-farmed and non-grazing portions of parcels >10 acres that contain one or more residences, and/or a winery; vacant residential parcels >10 acres; and/or portions of 10-acres or larger parcels with secondary vineyard, orchard, and/or grazing. Parcels smaller than 10 acres, but that are identified by Water Board staff as posing a threat to water quality, may also be required to implement the specified actions.

[2] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board

[3] These reports may be prepared individually or jointly or through a recognized third party.

~~[4]To achieve 82 percent reduction, from current estimate of 34 tons per mile per year, as needed to meet the sediment load allocation for road-related sediment delivery.~~

~~[5]Performance standard for road-related sediment delivery of 120 tons per mile per 20-year period, is equivalent to a 20-year average rate of 6 tons per mile per year.~~

Parcels within the permit area of the Small Municipal Separate Storm Sewer Systems (Small MS4s) would be subject to the requirements of the statewide General Permit for the Discharge of Storm Water from Small MS4s. Minimum parcel size and/or sediment discharge thresholds that would trigger the requirement to obtain a permit or waiver for the discharge of sediment and other pollutants will be further evaluated during the process of developing waiver programs. We appreciate Ms. Ridolfi's suggestion of the use of a percent disturbance factor as a threshold for regulatory requirements, and will consider it further as we develop conditional waivers of waste discharge requirements.

SFEI-2: "The proposed [method] of requiring implementation of vineyard BMPs at a certain slope and tracking such implementation is insufficient. The current draft of the TMDL bases sediment reduction on vineyards and grazing lands on the Sonoma County Vineyard Erosion Control Ordinance. However, a threshold of 20 percent slope to *begin* to require erosion and sediment control plans for new or re-plantings is inadequate. Napa County regulations require erosion control plans for any plantings on greater than 5 percent slope which takes into account a larger percentage of the watershed. Given the current sedimentation issues in the watershed, the current ordinance is not working as written, so we recommend a provision written into any waivers which goes above and beyond the current county requirements."

The TMDL and Basin Plan amendment does not base sediment reduction on vineyards and grazing lands on the Sonoma County Vineyard Erosion Control Ordinance, nor do we propose a 20 percent threshold to begin requiring erosion and control plans. The regulatory program we propose for vineyards is described in Staff Report Section 8.5 Sediment Reduction and Control/New Regulatory Programs, subsection Vineyards. We discuss the Sonoma County Vineyard Erosion and Sediment Control Ordinance in order to provide background on existing regulations related to vineyard erosion control, identify gaps, and discuss opportunities to build upon existing efforts. The TMDL does indeed call for a regulatory program that is more protective than the current Sonoma County Erosion and Sediment Control Ordinance. As shown below, we have revised a header in Staff Report Section 8.5, to clarify that we propose building upon, not duplicating, existing efforts with regard to vineyard erosion and sediment control.

> ~~*Anticipated Water Board Regulation of Vineyards*~~ *Building Upon Existing and Local Efforts*
>
> Existing vineyards not undergoing replanting are not currently regulated. Additional measures that may achieve needed sediment reductions include expanding or creating regulatory programs to address existing vineyards, and incorporating performance measures such as controlling runoff so as not to increase peak flow rates and durations in streams…

SFEI-3: "A careful spatial tracking (in GIS format) of these BMPs is necessary to prioritize reaches or subwatersheds for future stabilization and restoration projects (a recommended action in Table 5.1 of the Basin Plan amendment). Without an accounting of the type and coverage of BMPs, there is no way to determine if the practices that are implemented are effective or if technical assistance is needed to recommend better practices to reach the goals of the TMDL. A model for this effort of spatial tracking of BMPs is the wavier for irrigated agricultural lands for the entire central coast, administered by the Central Coast RWQCB. The waiver program there has combined requirements of water quality monitoring, continuing education, and tracking of BMP implementation to help in future decision-making by the RWQCB and landowners. We highly recommend this type of program be implemented in the Sonoma Creek watershed. We have developed an initial BMP classification system, including examples of practices, for the Napa River watershed…that is applicable for sediment reduction. It might serve as a useful template for the Sonoma Creek watershed as well."

We appreciate the suggestion to incorporate spatial tracking of BMPs into the conditional waivers of waste discharge requirements, and will further consider the suggestion during development of conditional waivers of waste discharge requirements. We agree that there must be a mechanism to track the implementation and effectiveness of BMPs, and this is required for any nonpoint source pollution control implementation program, per the State's *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* (NPS Enforcement Policy) (State Board, 2004). A nonpoint source pollution control implementation program is defined in the NPS Enforcement Policy as a program developed to comply with SWRCB or RWQCB Waste Discharge Requirements (WDRs), waivers of WDRs, or basin plan prohibitions. The NPS Enforcement Policy states that a nonpoint source implementation must include "sufficient feedback mechanisms so that the RWCB, dischargers, and the public can determine whether the program is achieving its stated purpose(s), or whether additional or different MPs [Management Practices] or other actions are needed." As we develop waiver programs, we will evaluate (with stakeholder input) which types of monitoring are most appropriate, useful, and cost-effective.

SFEI-4: "The TMDL does not seem to directly or adequately address the issue of hydromodification which causes the bed and bank erosion responsible for a majority of the sedimentation of the watershed. This was a major recommendation that came out of the Sediment Source Analysis (referred to as 'hosing of the creek,' p. 49). Hydromodification will be addressed in the forthcoming Muncipal Regional Permit (MRP); however, [this] watershed is currently not covered under that permit. You may want to consider applying [MRP] Provision C.3.b. to those covered by a TMDL implementation plan (Draft MRP language: 'Permittees shall require [certain] projects…to implement Low Impact Development (LID) management techniques (per

Provision C.3.c) and design and install stormwater treatment systems that will reduce the discharge of pollutants in stormwater runoff from Regulated Projects to the maximum extent practicable.'). This provision is especially important because it bases requirements for implementation of stormwater management techniques based on the new or redeveloped impervious area of projects (similar to my recommendation for rural lands addressed in comment #1 of this letter).

The TMDL implementation plan does address the issue of hydromodification. Hydromodification, or increases in peak runoff flow rates and durations, is discussed in Staff Report Section 8.5 (Sediment Control Actions). As discussed in Section 8.5, hydromodification is one of the causes of channel incision, and we propose regulatory programs to attenuate runoff flows and durations. The proposed Basin Plan amendment, Table 4.5 includes the following performance standard for municipal stormwater runoff: "Attenuate peak flows and durations from new and redevelopment project to MEP standards." The Staff Report then defines what MEP standards are: "We consider MEP to be those standards specified in the Phase I Municipal Regional Stormwater Permit Tentative Order (NPDES Permit No. CAS612008, provision C.3)." The Basin Plan amendment does, in fact, call for the MRP C.3 provisions to be applied to the urban areas/clusters within the watershed. To clarify this point, we have added a table note to the Basin Plan amendment Table 4.5, as shown below:

Table 4.5 Required TMDL Implementation Measures for Sediment Discharges associated with Urban Land Uses

Source	Performance Standards	Actions	Implementing Parties	Completion Dates
Construction Stormwater Runoff	Control and minimize sediment and erosion from construction sites through appropriate use of Best Management Practices.	Comply with the requirements of the *General Permit for Discharges of Storm Water Associated with Construction Activity* (NPDES Permit No. CAS000002) or updated versions of the Construction General Permit. Develop, maintain, and implement a Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs to be used to control erosion and sedimentation. Develop and implement a sediment monitoring plan if the construction site discharges directly to Sonoma Creek or its tributaries.	Owners or Operators of Sites under Construction	As specified in the Construction General Permit (NPDES Permit No. CAS000002)
Industrial Stormwater Runoff	Control discharges from industrial facilities to the standard of "best available technology economically achievable" and the "best conventional pollutant control technology."	Comply with the requirements of the General Permit for Discharges of Stormwater Associated with Industrial Activities ~~*Industrial Stormwater General Permit*~~ (NPDES Permit No. CAS000001). Develop a SWPPP and monitoring plan to identify sources of pollutants (including sediment) and the means to control them to reduce	Owners or Operators of Industrial Facility Sites	As specified in the Industrial Stormwater General Permit (NPDES Permit No. CAS000001)

Source	Performance Standards	Actions	Implementing Parties	Completion Dates
		stormwater pollution.		
Municipal Stormwater Runoff	Reduce discharge of pollutants, including sediment, to the maximum extent practicable (MEP)[1]	Comply with approved stormwater management plans. Comply with Municipal Stormwater Permit (NPDES Permit No. CAS000004).	Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other designated entities	As specified in approved stormwater management plan and in applicable NPDES permit (NPDES Permit No. CAS000004).
	Attenuate peak flows and durations from new and redevelopment projects to MEP standards.	Amend and implement stormwater management plans to control peak flow rates and durations	Sonoma County Water Agency, County of Sonoma, City of Sonoma, Sonoma Developmental Center, and any other designated entities	No later than June 2014
State Highways Stormwater Runoff	Control runoff from state highways and associated construction activities.	Comply with the Caltrans *Statewide Stormwater Permit* (NPDES Permit No. CAS000003).	California Department of Transportation (Caltrans)	As specified in applicable NPDES permit (NPDES Permit No. CAS000003).

[1] MEP is the performance standard specified in Section 402(p) of the Clean Water Act. What constitutes MEP evolves with technology and feasibility, and therefore may change in the future. As of 2008, we consider MEP to be those standards specified in the Phase I Municipal Regional Stormwater Permit Revised Tentative Order (NPDES Permit No. CAS612008, provision C.3).

SFEI-5: "Components of the MRP, which base effectiveness of management practices on change in pre-project flows should also be implemented as part of this TMDL or as part of future NPDES permits for both the unincorporated areas of the Valley of the Moon and the City of Sonoma."

Please see response to SFEI-4. We assume Ms. Ridolfi is referring to Sonoma Valley by the term "Valley of the Moon." The City of Sonoma and the urban areas/clusters of the Sonoma Valley are currently regulated by the Small MS4 Stormwater Permit.

Comment letter 5: Sonoma Ecology Center, Richard Dale, March 18, 2008

Mr. Dale explained his view that "the implementation tables, with their focus on reducing surface erosion, do not adequately address the water management issues at the heart of the chief sediment source. Water runoff management must be top priority of the implementation tables." He requested the following changes to the tables and Staff Report.

SEC-1: "Require all land uses to adhere to a no-net-gain rule for runoff and sediment. The allocation of a mere 1,500 tons/yr for all stormwater-related wasteloads does not hold urban and residential development sufficiently accountable for the increase in runoff and peak flows resulting from increases in impermeable surfaces and subsurface drainages emptying to ditches and channels (see bottom of Table 3)….A no-net-gain rule must be supported by City, County, State, and Federal ordinances to be successful in attaining the 80 percent sediment delivery reduction in Table 12. Its presence in the Basin Plan amendment is critical."

We agree that attenuating runoff and peak flows is vital to attaining the required sediment delivery reduction. Please see our response to SFEI-4. The Basin Plan amendment specifies a performance standard, for the source category Municipal Stormwater Runoff, of "Attenuate peak flows and durations from new and redevelopment projects to MEP standards." Maximum Extent Practicable (MEP) is the technology-based standard specified in Section 402(p) of the Clean Water Act, which evolves with technology. Staff Report Section 8.5 then defines what currently constitutes MEP, which are the standards specified in the Phase I Municipal Regional Stormwater Permit Tentative Order (NPDES Permit No. CAS612008, provision C.3.). The standard is excerpted below:

> *Stormwater discharges from (new and redevelopment projects of one acre or more impervious surface) shall not cause an increase in the erosion potential[29] of the receiving stream over the pre-project (existing) condition. Increases in runoff flow and volume shall be managed so that post-project runoff shall not exceed estimated pre-project rates and durations, where such increased flow and/or volume is likely to cause increased potential for erosion of creek beds and banks, silt pollution generation, or other adverse impacts on beneficial uses due to increased erosive force.*

[29] *The erosion potential (Ep) of increased flows and durations of flows from new/redevelopment projects indicates the impact of these flows on stream stability. Ep is expressed as the ratio of post-project to pre-project "work done" on the stream by the increased flows and durations of flows. Using the Ep index as a point of reference, the management objective is: Stormwater discharges from new/redevelopment projects shall not cause an increase in the erosion potential of the receiving stream over the pre-project (existing) condition, i.e., an Ep of up to 1.0 will be maintained for all stream segments downstream of the project discharge point.~~all of the project discharge point.~~*

In addition, the performance standards for vineyards (Basin Plan amendment, Table 4.1) have been revised in the publicly circulated draft dated September 5, 2008 to specify the following performance standard: "Effectively attenuate significant increases in storm runoff: Runoff from vineyards shall not cause or contribute to downstream increases in rates of bank or bed erosion." Table 4.1 is shown in the response to SEC-2, below. The statewide Construction General Permit is presently in the reissuance process, and is moving strongly in the direction of no net increase in peak runoff. Because the other sediment source categories are not expected to significantly increase the amount of impervious surface in the watershed, we expect that the performance standards specified in the Basin Plan amendment, and the (to be) reissued Construction General permit, will be effective in attenuating increases in runoff peaks and durations.

SEC-2: "Tailor the implementation tables to the results published in the…Staff Report. In Tables 7 through 10, road reductions are the only ones with numeric targets. We question why the 80 or 82 percent reduction is not made for land uses across the board. In lieu of consistency in the implementation tables, wouldn't the road reductions best be written as "Reduce road-related sediment delivery to channels through road restoration protocols as part of WDR waiver conditions"?

We have revised the performance standard for roads to "Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels." This change is reflected in the Staff Report, Tables 8 through 11 (which were previously numbered 7 through 10), and in the corresponding Tables 4.1 through 4.4 in the Basin Plan amendment. The revised Basin Plan amendment Table 4.3 is shown in the response to SFEI-1; Tables 4.1, 4.2, and 4.4 are shown below:

Changes shown in double underline/~~strikethrough~~ in Table 4.1 display revisions that were publicly noticed in the September 05, 2008 version.

Table 4.1 Required and Trackable TMDL Implementation Measures for Sediment Discharges Associated with Vineyards[1]

~~Sources and~~ **Performance Standards**	**Actions**	**Implementing Parties**	Completion Dates
Surface Erosion associated with vineyards: Comply with the Sonoma County Vineyard Erosion and Sediment Control Ordinance (Sonoma County Code, Chapter 30, Article V) and minimize erosion from existing vineyards; **and** **Roads**: ~~Road-related sediment delivery to channels ≤ 120 tons per road mile per 20-year period~~[3,4,5] Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and** **Gullies and/or shallow landslides:** Promote natural recovery and minimize human-caused increases in sediment delivery from unstable areas; ~~**or**~~ **and** **Effectively attenuate significant increases in storm runoff.** Runoff from vineyards shall not cause or contribute to downstream increases in rates of bank or bed erosion. ~~Implement farm plan certified under Fish Friendly Farming Environmental Certification Program or other farm plan certification program approved as part of~~	Submit a Report of Waste Discharge[2,3] to the Water Board that provides, at a minimum, the following: a description of the vineyard; identification of site-specific erosion control measures needed to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures. OR Implement farm plan certified under Fish Friendly Farming Environmental Certification Program or other farm plan certification program approved as part of a WDR waiver policy. All dischargers applying for coverage under a WDRs waiver policy also will be required to file a notice of intent (NOI) for coverage, and to comply with all conditions of the WDR waiver policy [6,4].	Vineyard owner and/or operator	June 2014

~~WDRs waiver conditions.~~	Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs.	Vineyard owner and/or operator	As specified in applicable WDRs or waiver of WDRs
	Report progress on implementation of site specific erosion control measures.[2~~3~~]	Vineyard owner and/or operator	As specified in applicable WDRs or waiver of WDRs

[1] As needed to achieve TMDL allocations and consistent with the *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* .~~(State Board, 2004)~~

[~~1~~2] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.

[~~2~~3] Reports may be submitted individually or jointly through a recognized third party.

[~~3~~] ~~To~~ [~~4~~] ~~To achieve 82 percent reduction, from current estimate of 34 tons per mile per year, as needed to meet the sediment load allocation for road-related sediment delivery.~~

[~~4~~] ~~Performance~~ [~~5~~] ~~Performance~~ ~~standard for road-related sediment delivery of 120 tons per mile per 20-year period, is equivalent to a 20-year average rate of 6 tons per mile per year.~~

[~~6~~] ~~This.~~ [~~4~~] This Basin Plan amendment recognizes farm plans certified under the Fish Friendly Farming Environmental Certification Program as effective with regard to control of pollutant discharges associated with vineyards. Additional conditions will be required under a General WDR and/or waiver program consistent with ~~State Board (2004),~~ State Board's *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* and/or as needed to avoid potentially significant environmental impacts.

Table 4.2 Required TMDL Implementation Measures for Sediment Discharges Associated with Grazing

Source(s) and Performance Standard(s)	Actions	Implementing Parties	Completion Dates
Surface erosion associated with livestock grazing: Attain or exceed minimal residual dry matter values consistent with University of California Division of Agriculture and Natural Resources guidelines; **and** **Roads**: ~~Road-related sediment delivery to channels ≤ 120 tons per road mile per 20-year period[3,4]~~ Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and** **Gullies and/or shallow landslides**: Promote natural recovery and minimize human-caused increases in sediment delivery from unstable areas	Submit a Report of Waste Discharge[1] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified erosion control measures.	Landowner and/or ranch operator	June 2014
	Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs.	Landowner and/or ranch operator	As specified in applicable WDRs or waiver of WDRs
	Report progress on implementation of site specific erosion control measures.[2]	Landowner and/or ranch operator	As specified in applicable WDRs or waiver of WDRs

[1] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[2] These reports may be prepared individually or jointly or through a recognized third party.
~~[3] To achieve 82 percent reduction, from current estimate of 34 tons per mile per year, as needed to meet the sediment load allocation for road-related sediment delivery.~~
~~[4] Performance standard for road-related sediment delivery of 120 tons per mile per 20-year period, is equivalent to a 20-year average rate of 6 tons per mile per year.~~

Table 4.4 Required TMDL Implementation Measures for Sediment Discharges associated with Parks and Open Space, and/or Municipal Public Works

Landowner Type	Sources and Performance Standards	Actions	Implementing Parties	Completion Dates
Parks and Open Space and Public Works	**Roads**: ~~Road-related sediment delivery to channels ≤ 120 tons per road mile per 20-year period[3,4]~~ Design, construct, and maintain rural roads to minimize road-related sediment delivery to stream channels; **and** **Gullies and/or shallow landslides**: Promote natural recovery, and minimize human caused increases in sediment delivery from unstable areas.	Submit a Report of Waste Discharge[1] to Water Board 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 this table; and a schedule for implementation of identified control measures. For paved roads, erosion and sediment control actions could primarily focus on road crossings to meet the performance standard. Adopt and implement best management practices for maintenance of unimproved (dirt/gravel) roads, and conduct a survey of stream-crossings associated with paved public roadways, and develop a prioritized implementation plan for repair and/or replacement of high priority crossings/culverts to reduce road-related erosion and protect stream-riparian habitat conditions.	Sonoma County Stormwater Management Program (SWMP) State of California, Department of Parks and Recreation State of California, Department of Transportation County of Sonoma Transportation and Public Works	June 2014
		Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs.	Landowners	As specified in applicable WDRs or waiver of WDRs, and/or the SWMP

Landowner Type	**Sources and Performance Standards**	**Actions**	**Implementing Parties**	Completion Dates
		Report progress on development and implementation of best management practices to control road-related erosion.[2]	Landowners	As specified in applicable WDRs or waiver of WDRs, and/or SWMP

[1] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[2]These reports may be prepared individually or jointly or through a recognized third party.
~~[3]To achieve 82 percent reduction, from current estimate of 34 tons per mile per year, as needed to meet the sediment load allocation for road-related sediment delivery.~~
~~[4]Performance standard for road-related sediment delivery of 120 tons per mile per 20-year period is equivalent to a 20-year average rate of 6 tons per mile per year.~~

SEC-3: "Name funding sources that support on-the-ground work for the TMDL. Help prevent on-paper-only Basin [Plan] amendment by naming funding sources for prioritizing sediment sources for treatment, naming funding sources that will support the required work, and identifying what incentives will be given when treatments are implemented."

Staff Report Section 9.7 discusses sources of funding, and we have updated this section to reflect current information.

Comment letter 6: Upper Kenwood Stewardship, Keith M. Hanover, February 16, 2008

Kenwood-1: "I…find that the importance of the marshes that have been drained throughout the Sonoma Valley watershed are not being addressed in a manner befitting their importance….Sediment may be reduced by spreading the high flows around the valley's many roads with the addition of indigenous marsh plantings to strain the turbid waters the way the valley did a century ago….This will also slow the waters down and allow the sediment to drop higher up the valley where it belongs. Reconnecting the Sonoma Creek to the Kenwood marsh and adding new micro marshes around vineyards and down the many roads throughout the valley would increase recharge, reduce the high damage flow in the main channel during heavy rains, and correct many of the problems created over the last century. I wish that this important portion of a balanced watershed be placed higher on the project lists and studies to be conducted…."

We appreciate the comment and have revised Staff Report Chapter 2 to discuss the importance of the freshwater marshes and the impact of the loss of the Kenwood Marsh complex on sediment transport and creek flows.

Restoration of freshwater marshes in the watershed is being studied by the Critical Coastal Areas program—the Sonoma Creek watershed is a Critical Coastal Area, selected for a pilot study to identify and prioritize actions that will improve watershed health. The pilot study identified several Wetland Restoration Opportunity Areas, including protecting and restoring wetlands within the former Kenwood Marsh area. The identification of restoration opportunities will guide stakeholders in developing an action plan to help restore natural watershed function.

Comment letter 7: Southern Sonoma Resource Conservation District, Leandra Swent, March 20, 2008

RCD-1: "The TMDL Draft Report and accompanying Draft Amendment links the solution to fish recovery and water quality attainment directly with the reduction of

distal, fine sediment as the chief priority in a spatially extensive regulatory program. However, the [Limiting Factors Analysis (LFA)] clearly identifies the primary lifecycle bottleneck as the degradation and/or loss of winter and summer rearing habitat for 12-24 month old fish. Furthermore, a comprehensive approach prioritizing the restoration of winter and summer rearing habitat for juvenile fish emerges [in the LFA] as the recommended approach to population recovery with sediment listed as a lower priority. These findings and priority rankings for steelhead recovery are not mentioned anywhere in the Draft Staff Report or the Draft Basin Plan Amendment. We request that this disconnect between the data and recommendations in the LFA be addressed, thoroughly discussed and substantiated in the Draft Report, and reflected in the Draft Amendment as necessary."

To meet the goals of the Sediment TMDL and Habitat Enhancement Plan, upslope sediment discharges must be reduced. We estimate that 20,000 of 64,000 tons per year of total anthropogenic input to channels within the watershed are associated with upland surface erosion and roads, or about 30 percent of the anthropogenic total delivery to channels. From the standpoint of steelhead habitat, which is primarily in confined tributary reaches, upstream of incision reaches, this contribution represents about 40 percent of the total delivery to upland channels. When gullies are added in, the anthropogenic proportion exceeds 50 percent. These contributions are even more significant when we take into account that roads and surface erosion are chronic sources and that they typically are much richer in percent fine sediment than natural process sources. In addition, the cobble-boulder clusters that may provide a primary winter refuge habitat for steelhead, and hence, may exert a significant influence of total smolt production, are degraded by increases in fine bed material. Considering all of the above, we find that upland sediment control is a necessary ingredient of a conservation and recovery plan for steelhead in the Sonoma Creek watershed.

At the same time, channel restoration projects that enhance habitat and reduce sediment delivery due to channel instability are also a necessary ingredient to achieve the goals and support fishery recovery. The fact that habitat enhancement actions are recommended, rather than required, does not diminish their importance. These actions are recommended (rather than required) because there are substantial scientific and socio-political challenges that need to be resolved. More importantly, the responsibility is broadly distributed in space and time for the channel instability problems.

We agree that complimentary/supplemental efforts in the watershed should be integrated and look forward to working towards this goal during the implementation phase. The Water Board has participated in watershed efforts in this watershed for decades, providing technical assistance and funding for projects that improve water quality and enhance habitat. A key goal of the habitat enhancement plan is to provide a framework that supports regional and local programs that enhance aquatic habitat. The inclusion of the habitat enhancement plan in the Basin Plan amendment provides formal

recognition of the Water Board's resolve to allocate staff resources and funding to support habitat enhancement efforts.

Finally, we do not find any "disconnect" between the Basin Plan amendment and Staff Report, and the Limiting Factors Analysis. The Basin Plan amendment and Staff Report include and address all priority recommendations of the Limiting Factors Analysis. The Limiting Factors recommended restoration measures and categorized them into three priority levels:

1) Category 1: Remove barriers to fish passage, install fish habitat structures and revegate stream banks, augment in-stream cobble and boulder cover, and enhance summer baseflow

2) Category 2: Refine linkages between fine sediment and spawning success, which includes remediating upland sources and increasing stream bed and bank stability

3) Category 3: Chemical water quality and temperature remediation

Category 1 recommended actions are included in the Habitat Enhancement Plan, are fully discussed in the Staff Report (Chapters 3, 5 and 8), and are captured in the Basin Plan amendment as Tables 5.1-5.3. Category 2 actions are captured in the TMDL itself, which includes an implementation plan to reduce upland sediment sources and increase bed and bank stability. Category 3 actions are recommended, per the Limiting Factors Analysis, only after Category 1 and 2 actions are completed and proved insufficient to resolve habitat quality issues. We do not have any indication that chemical water quality is a factor limiting the success of the fishery, and we expect that temperature remediation (achieving cooler water temperatures) will result from Category 1 and 2 actions such as enhancing habitat complexity and baseflow.

RCD-2: "The RWQCB Board must consider the monumental challenge of altering the dynamics of this extremely complex system which clearly requires a holistic approach, and a carefully balanced allocation of resources and responsibility….The staggering costs to the agricultural community for reducing fine sediment delivery by 80 percent represents a skewed methodology and misplaced commitment of resources. The Draft Basin Plan Amendment recommends public funding be sourced to cover 75 percent of the Agricultural Water Quality Control Program with agricultural businesses picking up the tab for the estimated $6,000,000 to $12,000,000 of funding required to reduce sediment supply and enhance habitat….Given the extreme fragility of agriculture in the Sonoma Creek Watershed, the implementation of your proposed sediment management measures puts the agricultural community and the resources they care for at serious risk. The focus of the TMDL regulatory program and attendant resources should be directed toward the channel which is the main source of fine sediment."

Enhancing, restoring, and preserving habitat in the Sonoma Creek watershed is a significant challenge for both landowners and state, regional, and local government. The majority of the costs for habitat enhancement projects would come from public funding. As discussed in Staff Report Section 9.5 (Economic Considerations), over the 20 year implementation period of the TMDL, we project the costs to agriculture is likely to be between $300,000 and $600,000 per year—shared among all of the agricultural interests in the watershed. We do not have reason to conclude that this cost, the purpose of which is to improve habitat and reduce erosion on agricultural land, will compromise Sonoma County's agricultural economy. We also note that management practices to reduce sediment discharge and improve riparian areas largely overlap with good land stewardship practices, and would also provide cost savings in reduced road maintenance and topsoil loss (savings which were not included in the cost estimates).

RCD-3: "We urge the RWQCB Board to consider seamless integration of the goals of the TMDL with formidable, existing efforts in the Sonoma Valley Watershed."

Water Board staff's belief that the sediment TMDL will be achieved, and that salmonid habitat restored and protected, is based in no small part on the commitment and dedication of many groups and individuals in the watershed. We look forward to working closely with the RCD on the Watershed Enhancement Plan when it is updated in 2009. The goals of the TMDL are consistent and integrated with many existing efforts in the watershed, including the Limiting Factors Analysis, Critical Coastal Areas program, the Watershed Enhancement Plan, and the Bay Area Integrated Regional Water Management Plan (IRWMP). We anticipate further opportunities for integration during the implementation of the Sediment TMDL and Habitat Enhancement Plan, in areas such as technical assistance, monitoring, and funding.

The RCD attached comments on the Preliminary Project Report (dated July 19, 2007), which John Guardino submitted on November 16, 2007. We respond to those early comments below, noting changes made in response and incorporated into the February 8, 2008 Staff Report and proposed Basin Plan amendment.

RCD2007-1: "The Steering Committee is concerned about the fundamental approach of this Basin Plan amendment and the attainability of the proposed objectives for sediment reduction using a traditional regulatory approach….If we proceed under a regulatory approach, significant resources and effort will be directed towards reducing anthropogenic, upland sediment discharge which accounts for a small minority of the total in physical locations which are least responsible for input. The

Steering Committee feels that this approach is highly flawed and will render the TMDL targets completely unattainable within any reasonable time frame….If over 70 percent of the total sediment source is a result of channel erosion and incision, then clearly that is where our immediate attention should be focused if we hope to successfully meet the proposed targets…. High impact restoration projects in the channel should be judiciously balanced with reducing low level, chronic surface erosion inputs. These efforts must also be fully integrated with supplementary efforts in the watershed to solve other critical issues including ground and surface water management, flood control, and other non-point source pollution problems."

Please see our response to RCD-1

RCD2007-2: The RCD appealed to the Water Board to coordinate TMDL development and implementation with the Bay Area Integrated Water Management Plan, the Sonoma Creek Enhancement Plan (currently being updated, with a revised document scheduled for release in 2009), and other "existing work in the watershed."

Please also see our response to RCD-3.

The Bay Area Integrated Water Management Plan (IRWMP) is a multi-stakeholder, nine-county effort to coordinate a strategic approach to regional water resources management (Bay Area IRWMP, 2006). The plan was adopted by agencies and groups who signed a Letter of Mutual Understanding, and builds upon water resources needs and planning strategies identified throughout the Bay Area. We believe the Sediment TMDL and Habitat Enhancement and the Bay Area IRWMP are appropriately coordinated and integrated. The Bay Area IRWMP is founded upon local planning documents, and on Statewide Priorities which include implementation of TMDLs that are established or under development. In addition to being a regional planning document, the Bay Area IRWMP also facilitates funding under Proposition 50, which sets aside $380 million for IRWMP related projects. The Sonoma Creek Sediment TMDL and Habitat Enhancement Plan identified actions needed to address water quality and improve habitat conditions for native fisheries and other aquatic species. The Bay Area IRWMP includes a methodology for assessing potential projects, which includes evaluating whether projects address statewide priorities (such as TMDL implementation). Several projects that would implement the TMDL and Habitat Enhancement Plan have already been assessed and identified as Bay Area IRWMP projects, including: Annadel State Park Erosion Control (California State Parks) and the Nathanson Creek Preserve Restoration Project (Sonoma Ecology Center). The Bay Area IRWMP includes a methodology where future projects (that implement the TMDL) can also be assessed. Therefore, by design, the Bay Area IRWMP is coordinated with the TMDL, and there will be additional opportunities for further integration during implementation of the TMDL and Habitat Enhancement Plan.

RCD2007-3: "The Steering Committee is unclear how or if the Sonoma Creek TMDL will adapt to climate change and emerging trends over the next 10-20 years. We are also concerned about how the TMDL will adapt over time and continue to address sediment issues in an integrated fashion with other efforts in the watershed."

The February 08, 2008 Public Notice version of the Staff Report and Basin Plan amendment include Sections 8.7 (Evaluation and Monitoring) and 8.8 (Adaptive Implementation) that address this comment. As part of the adaptive implementation program, the TMDL and implementation plan will be revised and updated based on new information, research, or monitoring results. In the course of adaptive implementation, we will consider several key questions, including how climate change will affect hydrology, sediment transport, habitat for the watershed's aquatic species, and the outcome of required and recommended measures.

Comment letter 8: La Prenda Vineyards Management Inc., Ned Hill, March 21, 2008

La Prenda-1: "I…strongly recommend that the BMP's suggested by the Sonoma Valley Vintners and Growers Alliance be included in the Actions for Agriculture."

We assume that Mr. Hill is referring to the best management practices (BMPs) discussed in the Sonoma Valley Vintners and Growers Alliance's (SVVGA) *Interview Report on Best Management Practices in Sonoma Valley*, which is a compilation of interviews on Best Management Practices used by Grape Growers in Sonoma Valley. We appreciate and acknowledge the work that the SVVGA and the Southern Sonoma RCD have done in researching and implementing effective BMPs in the Sonoma Valley. We believe the information and guidance provided by these and other local groups will be vital to achieving widespread and consistent implementation of BMPs on vineyards and other agricultural land. We encourage the appropriate use of the BMPs discussed and suggested by the SVVGA, but we are prohibited from specifying the manner of compliance. Therefore, the BMPs suggested by the SVVGA are not included in the Basin Plan amendment, Table 4.1 (Required and Trackable Implementation Measures for Sediment Discharges Associated with Vineyards).

La Prenda-2: In addition to Fish Friendly Farming, "there should also be mention of programs such as the California Association of Winegrape Growers 'Sustainable Farming' and mention of the work that the Sonoma Valley Vintners and Growers Alliance has done with its members in researching the best erosion control BMP's for our area."

We have revised Staff Report Section 8.5 Sediment Control Actions- subsection Vineyards) to acknowledge the work that the California Association of Winegrape Growers and the Sonoma Valley Vintners and Growers Alliance has done to research and encourage implementation of BMPs.

We discuss the Fish Friendly Farming Program (FFFP) because we are familiar with it, having certified (along with NOAA Fisheries and the Agricultural Commissioner) over 6,000 acres of vineyards in the adjoining Napa Valley. We feel the FFFP is an effective nonpoint source pollution control program that contains the key elements specified in the NPS Enforcement Policy. As discussed in the revised Section 8.5, we are open to recognizing other effective third-party programs that meet the key elements specified in the NPS Enforcement Policy.

La Prenda-3: Speaking for himself and the Sonoma Valley Vintners and Growers Alliance, Mr. Hill offered to "come up with standards for Vineyard BMP's in the Sonoma Valley that would work for our area and would lead to a reduced sediment flow into Sonoma Creek during the rainy season."

We appreciate Mr. Hill's offer to assist with development of performance stands for vineyard BMPs and look forward to working with him and the Sonoma Valley Vintners and Growers Alliance during the development of the conditional waiver program for grape growers.

La Prenda-4: "Unfortunately an 82 percent reduction [in sediment from causes related to human activity] is not a reasonable goal, and setting standards that are too high and having a jumble of paperwork required for landowners only works against the process by leading people to try and skirt the rules rather than follow them."

The best available information (i.e., the sediment source analysis, information on maximum load of sediment allowable for a healthy fishery, limiting factors analysis) indicates that an approximately 80 percent reduction in human-caused sediment delivery is needed. However (as stated in the proposed Basin Plan amendment in the Implementation Plan section) the allocations in the TMDL are not directly enforceable. To demonstrate attainment of applicable allocations, dischargers must demonstrate that they are in compliance with the required implementation actions and any applicable waste discharge requirements, waiver conditions, or NPDES permits.

The Water Board will make every reasonable effort to minimize paperwork, while at the same time ensuring that effective NPS pollution control programs are implemented per the NPS Enforcement Policy. As stated in that policy, "all current and proposed NPS discharges must be regulated under Waste Discharge Requirements (WDRs), waivers of WDRs, or a basin plan prohibition, or some combinations of these administrative tools."

Of the three available permitting options, conditional waivers are the most flexible option. By definition they are "regulatory-based incentives for [implementation of] best management practices." In large part to reduce the administrative burden and to provide flexibility, the Water Board intends to develop conditional waivers of WDRs for the sources of sediment identified in Tables 4.1-4.4, including vineyards and grazing lands.

La Prenda-5: "Certain implementation measures are required for surface erosion however only recommended for the stream channels. The data presented in your own tables clearly states that stream channels contribute a significant amount of sediment, however actions listed for stream channels are only 'recommended.'"

We infer that Mr. Hill is referring to channel incision by "…stream channels contribute a significant amount of sediment…" As discussed in the revised Staff Report sections 8.5 and 8.6, channel incision is the progressive lowering over time of streambed elevation as a result of erosion, and typically results from some combination of: a) a significant increase in peak runoff flow rates and durations; b) a significant decrease in the supply of coarse sediment; and c) direct disturbances that reduce resistance to erosion or focus energy along the banks or bed. To address the many causes of channel incision, we rely on multiple approaches including regulatory programs to protect stream corridors and require effective attenuation of runoff peaks and durations, and cooperative partnerships to undertake habitat restoration projects. Please see our response to RCD-1.

La Prenda-6: Citing "united criticism of the Plan by the entire TMDL Steering Committee," Mr. Hill stated that "community members have met for the past 8 years and, working under the header of a 'Community-Based Plan,' we have come up with a plan that we are finally happy with. It is a shame to now have the groups equally concerned by the Regional Water Quality Control Board's interpretation of and 'taking over' of the process/plan."

Water Board staff have been working in the Sonoma Creek watershed on sediment issues for over five years, and continue to engage with many stakeholders and groups, including the TMDL Steering Committee. Ultimately, it is the Water Board's responsibility to develop a TMDL that resolves the impairment recognized under section 303(d) of the federal Clean Water Act, and is consistent with state policies including the NPS Enforcement Policy.

We are not aware of a "Community-Based Plan" endorsed by all members of the TMDL Steering Committee (including the Water Board) that is designed to address Sonoma Creek's sediment impairment. We infer that the "Community-Based Plan" Mr. Hill refers to is the Watershed Enhancement Plan, which is currently being revised by stakeholders under the leadership of the RCD. Water Board staff support the habitat

enhancement goals of the Watershed Enhancement Plan and look forward to integrating efforts as we implement the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan.

We have received supportive comments for the TMDL and Habitat Enhancement Plan, along with suggestions for improvement, from the Sonoma Ecology Center and the Southern Sonoma Resource Conservation District, both members of the Steering Committee. We look forward to continuing to work towards common goals with members of the Steering Committee.

We have endeavored to write a Basin Plan amendment that gives dischargers flexibility to choose from a menu of BMPs. We continue to consider the requests and suggestions of community members, for the goal of resolving the sediment issue and restoring the local fishery.

La Prenda-7: "I am uncomfortable with the singling out of 'Vineyards,' 'Grazing Land' and 'Rural Homeowner over 10 acres' in the plan, however not mentioning the rural homeowner living on smaller lots. Visual observation shows me that horses over the winter on a 3 acre lot expose a lot more bare ground to erosion than my 40 acre vineyard put to bed for the winter does."

We appreciate Mr. Hill's observation that horses over the winter on a 3-acre lot can discharge significant amounts of sediment. We have revised the Basin Plan amendment and Staff Report to clarify that parcels smaller than 10 acres will also be regulated if they are identified by Water Board staff as posing a threat to water quality. Please see our response to SFEI-1.

Comment letter 9: North Bay Agriculture Alliance, Mike Morris, March 20, 2008

NBAA-1 "We ask your Board not to adopt the proposed Basin Plan Amendment as we find it untenable. The proposed requirements upon us lack scientific justifications, political fairness, and economic reasonableness as well as any assurance of worthwhile ecological benefit in return."

We assert that the Basin Plan amendment, which has undergone scientific peer review, addresses the Sonoma Creek watershed's sediment impairment, and thereby moves us toward compliance with the federal Clean Water Act. Please see Staff Report chapters 3, 6, and 8 for the scientific rationale behind the requirements proposed in the Basin Plan amendment. We respectfully disagree with the commenter's view of the proposed requirements. The proposed Basin Plan amendment requires sediment control actions, as required by the NPS Enforcement Policy, and provides flexibility for dischargers to choose cost-effective best management practices.

Please also see our response to comment RCD-1 where we discuss the need for control of upland sediment sources, as well as habitat enhancement actions.

NBAA-2 "What is needed is a thorough review of the process…including a critical re-examination of the listing of Sonoma Creek as sediment-impaired."

Sonoma Creek has been listed as impaired by sediment since 1996; the U.S. Environmental Protection Agency (U.S. EPA) has approved the list of impaired waters several times since the original listing. The Water Board is required by the Clean Water Act to address all listings.

"Impairment," is related to specific "beneficial uses" of the watershed, which are identified in the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan). Sonoma Creek watershed supports the following beneficial uses: cold freshwater habitat (COLD), warm freshwater habitat (WARM), water contact recreation (REC-1), noncontact water recreation (REC-2), fish spawning (SPWN) and migration (MIGR), wildlife habitat (WILD), and preservation of rare and endangered species (RARE), specifically steelhead trout, Chinook salmon, and California freshwater shrimp. "De-listing" must be based on scientific evidence that none of these uses is impaired by excess sediment. Based on scientific studies, we find that water quality objectives for sediment, settleable material, and population and community ecology are not attained, and excess sediment is impairing several beneficial uses, including COLD, WARM, RARE, SPWN, MIGR, and WILD. Therefore, we do not find it necessary to re-examine the listing.

NBAA-3 "In short, the adopted approach is to mitigate the basic scientific weakness [of the Draft Staff Report and implementation plan] by overburdening the agricultural community and expanding your work beyond TMDL proper….We must recognize the limits of the TMDL and RWQCB. Neither a TMDL project nor the RWQCB can, or even should, solve all the fish recovery problems or assure the whole ecological wellbeing of a stream. There are many other agencies, entities, people, and programs, which are better equipped to address different aspects of these issues."

We respectfully disagree with the commenter's view regarding the appropriate scope of the Basin Plan amendment. Please see Staff Report Chapter 3, where we explain the rationale for developing the *Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan.* We do agree that there are other agencies, entities, people, and programs with resources and expertise in fish recovery issues. That is why we propose to partner with and support local and ongoing programs to support fish recovery. As described in Staff Report Section 8.6, the Habitat Enhancement Plan provides a framework that supports and integrates local restoration efforts by watershed groups,

landowners, and other agencies to address key factors impacting salmonid species in the watershed.

Comment letter 10: Sonoma County Farm Bureau, Doug Beretta, March 23, 2008

Farm Bureau-1: "We request that you hold adoption of the proposed Basin Plan Amendment and direct your staff to revise the implementation plan so that it may gain the support from the stakeholders. The implementation plan as detailed in the Draft Staff Report dated February 8, 2008, cannot be accepted by the agricultural stakeholders we represent….We have concerns that warrant further exploration and science based evaluation."

Water Board staff have been meeting with stakeholders in the Sonoma Creek watershed regarding sediment and habitat issues for more than five years. The TMDL Staff Report and Basin Plan amendment have undergone scientific peer-review, and been revised in response to peer review comments. The scientific studies that informed the TMDL and Basin Plan amendment, the Limiting Factors Analysis and the Sediment Source Analysis, have also undergone extensive scientific review. We assert that our current knowledge warrants the actions specified in the implementation plan. However, adoption of the amendment by the Water Board is not the end of our participation process with stakeholders. There will also be public participation processes for development of all conditional waiver programs including those for vineyards, grazing lands, and rural lands. Also, "further exploration and science based evaluation" will continue as part of the adaptive management and monitoring program that allows us to adjust the TMDL or implementation plan as new information becomes available. This adaptive approach allows for regular and substantive progress, as we continue to gain information.

Farm Bureau-2: "We seriously doubt if the high cost of compliance can be justified….Whatever the true cost may be, it is highly unlikely that it will result in substantial recovery of the fish population in Sonoma Creek, particularly considering increased awareness of the Pacific Oceans conditions which are negatively affecting salmonid habitat."

Ocean conditions likely have an effect on the state of the salmonid fisheries. However, there are documented stressors on the fish in the freshwater habitat that state and federal laws require us to address. The Limiting Factors analysis documented several stressors impacting the salmonids' freshwater lifestage, including impacts to rearing and spawning habitat, as well as migration. Our current knowledge indicates significant increases in the salmonid population in Sonoma Creek can be achieved through protection and enhancement of the freshwater habitat. From a conservation standpoint,

it is necessary to address stressors affecting the freshwater habitat, in order for the population to be resilient to natural and anthropogenic disturbances in both its freshwater and ocean habitats.

Finally, we do not agree that the "high cost of compliance" is not "justified," given the value of the resources we are protecting. In addition, the implementation plan provides landowners flexibility to choose management practices that are most cost-effective for their site conditions, as well as to develop a reasonable schedule to implement the management practices (i.e., the costs may be spread out over time).

Farm Bureau-3: "[The] agricultural community in Sonoma County is highly conscious of the environmental value of our streams. We have been supporting the [Sonoma County Vineyard Erosion and Sediment Control Ordinance] and have reduced the sediment inflow substantially."

We recognize the Sonoma County Vineyard Erosion and Sediment Control Ordinance as a good start toward reducing sediment in the watershed. Landowners who are in compliance with the ordinance will be familiar with the actions in the TMDL implementation plan, and likely have a lot less to do (in terms of new efforts) to comply with the conditions of the future waiver.

Farm Bureau-4: "In order for us to remain good stewards of land, however, agricultural economy has to be sustainable first. In revising the Implementation Plan, Report, and proposed Basin Plan Amendment, your staff should focus more narrowly on TMDL-sediment and devise a program of cost-effective actions that the stakeholders can willingly support."

Please see our response to comment RCD-2. In addition, we note that our menu of implementation actions is designed to give landowners in the watershed flexibility to choose effective actions that are appropriate to local conditions—as well as cost-effective.

Farm Bureau-5: The Report should also clarify under what circumstances Sonoma Creek will be de-listed of sediment-impairment.

When the TMDL targets are met, the listing will be resolved.

It is not necessary to revise the Staff Report to lay out the state's delisting policy. That policy is described in the *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List*, available at http://www.waterboards.ca.gov/tmdl/docs/ffed_303d_listingpolicy093004.pdf. As the policy states, "Any interested party may request an existing listing be reassessed under

the delisting factors of this policy. In requesting the reevaluation, the interested party must…provide the data and information necessary to enable the [regional and state Water Boards] to conduct the review." The prescribed delisting process, like the listing process, is based on a weight-of-evidence approach.

Comment letter 11: Western United Dairymen, Paul E. Martin, March 20, 2008

WUD-1: "A key element in the plan is the assumptions used to determine the natural background level [of sediment,] in order to establish a measure of habitat impairment in the region. It appears that many of the assumptions used to establish this level were not valid or scientifically based. Realizing the importance of this element as a basis for regulations, we believe that it is imperative that a model based on sound assumptions be used."

We assert that the scientific basis of the Basin Plan amendment is sound. The Staff Report and Basin Plan amendment have undergone scientific peer review. The peer reviewers supported the methods used in the sediment source analysis, which was used to estimate the natural background sediment loading.

WUD-2: Mr. Martin notes that the number of dairies in Sonoma County has declined from 118 in 1990 to 71 in 2007. "The remaining dairies have been able to continue in business by adapting to a changing environment and increased regulatory requirements. There has been considerable improvement in grazing land management, and producers need to get credit for what they have already done."

We appreciate the Western United Dairymen's interest in and cooperation with the regulatory programs in place to protect the environment in Sonoma County. As explained in the implementation plan, those already implementing actions that effectively reduce sediment to local waters will receive "credit" for their actions, because they will have less to do to be in compliance with grazing lands waiver of WDRs, compared with a landowner who has not implemented any best management practices.

WUD-3: Referencing the discussion of new regulatory programs for grazing lands in Staff Report Section 8.5, Mr. Martin suggests that "instead of developing a new program, Western United Dairymen…encourage coordination with the Tomales Bay Grazing Waiver Program. Dairymen are already complying with the Regional Board's Confined Animal Facility Waiver of Waste Discharge Requirements, and when a grazing waiver is available, we suggest that the two be combined to reduce paperwork."

We expect that the grazing waiver program to be developed for the Sonoma Creek watershed will be very similar to the Tomales Bay grazing waiver program, with watershed-specific refinements.

We intend to integrate the grazing waiver conditions and requirements into the Confined Animal Facilities Waiver of WDRs program, when the Confined Animal Facilities Waiver of WDRs comes up for renewal.

WUD-4: "On [Staff Report] page 75 (Section 8.5), the term "exclusion fencing" must be replaced with "control fencing." Riparian pasture systems, where cattle are used to graze riparian areas, have been proven to be one of the best strategies to manage the health of a riparian system. The reasons are varied, but the end result is that in order to maintain a healthy root system for soil stabilization that comes with fresh new grass growth, the thatch from the previous year's growth must be removed, preferably by grazing, to stimulate successful seedling establishment in the coming year. The intent should be to recognize proven grazing conservation practices by utilizing fencing to control grazing, not completely exclude it."

We have revised Staff Report Section 8.5 to replace the term "exclusion fencing" with "control fencing."

We do not have enough information to concur with the comment regarding riparian pasture systems as a strategy to manage the health of the riparian system. We expect that issue will be further studied during development of the conditional waiver for grazing lands.

Comment letter 12: Ad Hoc Committee, Ann Maurice, March 24, 2008

Ms. Maurice re-submitted comments she sent following the CEQA scoping meeting on October 3, 2007 (Ad Hoc2007); and attached a new list of suggestions dated March 24, 2008.

Ad Hoc2007-1: "Shouldn't you change your headings to distinguish between "sediment" (like urban pavement runoff) and "topsoil"! Where is it all going? Why hasn't it filled up Sonoma Creek?"

Sediment is a pollutant that impairs Sonoma Creek. Not all sediment is topsoil. Fine sediment washes into the creek from eroding creek banks, for example. Sediment transport, and where the sediment is deposited, is a complex process that depends upon the size of the sediment and the water flow. Larger/heavier sediment would be likely to deposit in the stream, close to the sediment source. Fine sediment can cause significant problems for fish spawning and habitat in the creek, as it clogs the gravels in the creek bed where salmonids spawn, reducing the available oxygen eggs and juvenile fish need

to survive. Much of the sediment load likely deposits in the lower watershed, in the marsh plains.

Ad Hoc2007-2: "Your proposal is to reduce human caused sediment by 75 percent….How do you propose to accomplish this?"

Please see Staff Report Chapter 8, Implementation Plan. (The full report was released after Ms. Maurice prepared her comments and questions.)

Ad Hoc2007-3: "You appear to be advocating non-specific "voluntary" compliance with plans that are either on-going or not yet developed by other parties. We need the Regional Board to set the standard and make strong requirements."

Many of the actions called for in the Basin Plan amendment are not "voluntary" and will be required via the Water Board's regulatory authorities. Please see our response to EPA-24.

While the Regional Water Board's regulatory mandate is limited by law, we have several effective mechanisms for encouraging compliance with the Habitat Enhancement Plan for Sonoma Creek. We work closely with other state agencies that have jurisdiction where we do not, and share our water quality and habitat goals. We have a long track record of working with stakeholders in the watershed, and we are determined to continue our collaborative efforts to implement the Habitat Enhancement Plan included in our Basin Plan amendment and coordinate with the Southern Sonoma Resource Conservation District's Watershed Enhancement Plan. We have commented on the Sonoma County General Plan and we will continue to provide input and guidance to the County as they move forward in their process.

Finally, the California Environmental Quality Act (CEQA) provides significant protection for the environment, as it requires public participation and facilitates public input in regulatory and permitting actions by all government agencies. Working together with Sonoma Creek's many experienced environmental advocates, we intend to realize our goals of enhancing, restoring, and protecting the Sonoma Creek watershed.

Ad Hoc2007-4: "As to on-going policies of other agencies, since we've got a sediment problem, we assume the existing policies aren't adequate!...How would continuing to comply with existing standards achieve a different result?"

Our implementation plan includes building upon existing efforts and new regulatory programs, as well as collaborative watershed efforts. Please see Staff Report Chapter 8 (Implementation), as well as responses to EPA -24 and SFEI-2.

Ad Hoc2007-5: "Regarding bank erosion and channel incision, you advocate 'stabilizing the banks.' But erosion is what 'naturally' adds woody debris into the creek. Bank erosion undermines trees and drops them into the water slowing the flow, creating swirls and deep pools that you agree are the very things needed for fish rearing. Streams change their course and create new channels. Bank erosion is how they do it, the "natural" process. Mightn't bank stabilization make the flow cut the channel deeper, the opposite of what you are trying to accomplish?"

Some erosion is indeed "natural," feeding a stream and associated floodplain, and contributing to natural realignment gradually over time. During a large storm event large woody debris may indeed lodge in the creek, adding habitat value. However, human activity such as roadbuilding or earthwork near the creek bank can greatly accelerate the natural process. In a big storm, human-caused erosion can combine with high flows to create a scouring effect that incises the banks, deepens the channel, and washes out the gravels and riffles that fish need to span and rear.

We intend "streambank stabilization" to mean contouring and maintaining a gradually sloping bank, planted with riparian vegetation, which provides natural riparian functions including bank stability and habitat complexity. We strongly discourage artificial armoring of banks, which would indeed contribute to channel incision. Streambank restoration (sometimes called stabilization) is essential in some severely incised areas. It does not halt all natural erosion. Please keep in mind that the TMDL is 125 percent of natural sedimentation – not zero.

Please see Table 13 in the Staff Report and Table 5.1 in the proposed Basin Plan amendment.

Ad Hoc2007-6: "Many of Sonoma Creek's tributaries dry up in the summer, resulting in long reaches of dry stream and direct mortality to fish as pools dry up. Stranding due to low flows (or no flow) has created the greatest source of fish mortality directly observed in the course of habitat surveys, with surveyors observing thousands of dead fry in dry pools. Lack of water is the biggest problem. How do you propose to correct it?"

California's native fish species are well adapted to intermittent streams. High temperatures and depleted oxygen supply, exacerbated by human activities and climate change, stack the deck against the fish. Restoration of healthy stream reaches with ample riparian vegetation should help to address excess fish mortality due to stranding, by adding deep pools and shade that keeps water cool in summer. In addition, we support local sustainable groundwater management actions that help preserve baseflows.

Ad-Hoc2007-7: "Are you promoting use of recycled water?"

We support sustainable and appropriate management of groundwater resources, for the purpose of enhancing summer flows in Sonoma Creek. In general, the Water Board supports water recycling efforts where appropriate, consistent with State Water Resources Control Board's Resolution 2008-0030 *Requiring Sustainable Water Resource Management*.

Ad-Hoc2007-8: Ms. Maurice raises questions about water supply and water use to irrigate vineyards, and water "exports" in the form of bottled wine from Sonoma Creek watershed wineries.

We share the commenter's concern about long-term water supply in northern California, but water supply issues are outside the purview of the sediment TMDL and Habitat Enhancement Plan. The Sonoma County Water Agency and the State Water Resources Control Board's Division of Water Rights can better address her concerns.

Ad-Hoc2007-9: "Do you allow electroshock for monitoring or other data collection? Does your Board grant permits for electrofishing in any streams in your jurisdiction?...Have you studied sub-lethal impacts like broken backs, impaired fertility, neurological distress, navigational problems?"

We do not disallow electrofishing ("electroshock") activities that are authorized by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), which reviews proposed electrofishing activities in the context of the Endangered Species Act. NOAA Fisheries has evaluated the impacts of electrofishing, and has developed guidelines for electrofishing in waters containing salmonids (NOAA Fisheries, 2000). NOAA Fisheries can better address her concerns regarding electrofishing.

Ad-Hoc2007-10: "Is anyone using Roundup in Sonoma Creek to kill *Arundo donax*?"

Roundup® is a commercial formulation of glyphosate, and is an herbicide. It is not registered by the U.S. EPA for use in waterways. We are not aware of any use of Roundup® in Sonoma Creek to kill *Arundo donax*. *Arundo donax* (also known as giant reed) is a tall bamboo-like weed that is highly invasive and threatens riparian ecosystems by crowding out native plants and animals. It spreads very easily, can cause flooding, and is highly flammable.

The Sonoma Ecology Center coordinates *Arundo donax* eradication efforts throughout the Sonoma Creek watershed, and participates in the Team Arundo Del Norte Arundo Eradication and Coordination Program. Team Arundo del Norte is a partnership of

local, state, and federal organizations working to control *Arundo donax* where it threatens rivers, creek, and wetlands in Central and Northern California. To control infestations of *Arundo donax*, the Sonoma Ecology Center sometimes uses Rodeo®, an aquatic formulation of glyphosate that is registered by the U.S. EPA for use in and near waterways. Use of aquatic pesticides is regulated by the Department of Pesticide Regulations, U.S. EPA, and the State Water Resources Control Board.

Ad Hoc2008-1: Create an easement along the Sonoma Creek corridor limiting human activity within it but allowing the natural erosive processes to occur… Could the Sonoma County Open Space District be involved to purchase "Best Management Easements [?]."

Land use decisions, such as uses within the riparian corridor are the purview of the Sonoma County and are defined in the County's General Plan. Water Board staff have commented on drafts of the County's General Plan. We suggest that Ms. Maurice also comment on the County's General Plan, which establishes allowable uses in the riparian zone. The Open Space District can better address Ms. Maurice's question about their involvement in purchasing "Best Management Easements."

Ad Hoc2008-2: Determine why the Creek is now disconnected from valley tributaries. If they are, does that mean that those tributaries are filling with or depositing sediments which create a barrier to flow into Sonoma Creek?...Why not establish incentives for some kind of a Valley Floor Aquifer Recharge Zone (near Kenwood) to encourage landowners to allow local overflow and infiltration for community benefit?

Actually, many valley tributaries are now connected to mainstem Sonoma Creek, whereas historically the tributaries discharged onto alluvial fans and were not directly connected to the mainstem. Please see (newly added) Box 1 (Conceptual Model of Causes of Incision of Sonoma Creek and its Tributaries) in Chapter 3 of the Staff Report. We do not have indications that tributaries are filling in or depositing sediments which create flow barriers.

We support the actions of the *Sonoma Valley Groundwater Management Plan* (adopted by the Sonoma County Water Agency) to evaluate and implement projects to recharge groundwater.

Ad Hoc2008-3: "Since you say the channel is too deep and woody debris and tree trunks are needed to trap gravel, create swirls and eddies, slow the flow and provide habitat for fish breeding, then you need to trap sediment to raise the bottom of the

bank and make the channel shallower…Don't try to control and manipulate the natural process, adapt to it!"

The Sonoma Creek watershed Sediment TMDL and Habitat Enhancement Plan aims to restore (as much as possible given current land use, political, and economic constraints) a balanced sediment budget and riparian habitat complexity. Increasing large woody debris is one element of the habitat enhancement plan, as discussed in Chapter 8 of the Staff Report.

Comment letter 13: Acorn Growers Association, Ellen Faulkner, March 24, 2008

Acorn-1: Your research indicates that the main problem with Sonoma Creek is lack of water. The solution is simple: Stop the diversions. Let the vineyards go to dry farming…in time to save anadromous fish runs.

Our research does not indicate that the main problem with Sonoma Creek is the lack of water. As described in Staff Report Chapter 3 (Problem Statement), native fish in Sonoma Creek are affected by a suite of stressors including a scarcity of good quality rearing and spawning habitat, excessive sediment, habitat simplification, passage barriers, and summer low-flow conditions. As discussed in Section 8.6 Habitat Enhancement Plan, we propose to enhance summer base flows by supporting local efforts to implement a groundwater management plan and to increase groundwater recharge.

Water diversions are overseen by the State Water Board's Division of Water Rights, which is in the process of adopting the North Coast Instream Flow Policy (SWRCB-Division of Water Rights, 2008) http://www.waterrights.ca.gov/HTML/instreamflow_nccs.html , which would establish guidelines to maintain instream flow to protect fishery resources. Water Board staff has participated in coordination meetings to inform development of this policy. In our agency's comment letter, we recommend that the policy establish whether existing levels of instream flow are protective of anadromous salmonids, and if not, the actions that should be taken to achieve protective instream flows (Water Board, 2008).

Acorn-2: It appears that the bank stabilization program only maintains the channelization and continuing downcutting of the creek, further separating the creek from its floodplain. Stop the bank stabilization program. The creek should be allowed to cut its own meanders, and to receive the resultant sediments to fill in its current deep ditch configuration.

Please see our response to comment Ad Hoc2007-5, above.

Acorn-3: "300-foot setbacks are absolutely necessary to save Sonoma Creek."

We appreciate the comment. We suggest that Ms. Faulkner comment on the Sonoma County General Plan and the various Specific Plans, which establish setbacks.

PART II: STAFF RESPONSES TO COMMENTS AND QUESTIONS RAISED AT THE APRIL 9, 2008 TESTIMONY HEARING BEFORE THE WATER BOARD

A. COMMENTS FROM MEMBERS OF THE PUBLIC

Sonoma Ecology Center, Rebecca Lawton

Many of the Ms. Lawton's comments at the Board meeting restate comments in the Sonoma Ecology Center's written comments. We repeat them here to the extent that they illuminate comments by members of the Water Board.

"We support the adoption of the sediment TMDL by the Board, but we urge that changes be made to the implementation tables to strengthen their connection to the findings of the studies and to the…main body of the staff report. Stream channel erosion and incision account for 65 percent of human-caused sediment delivery to Sonoma Creek as shown in table two of the [draft Basin Plan] amendment. Table three shows waste load allocations distributed among the human actions that contributes sediment to our waterways. Of the 11,600 tons per year allowed human actions, 7,800 tons per year are allocated to channel erosion and incision….The amendment implementation tables with their emphasis on reducing surface erosion should more strongly address the water management issues at the heart of the chief sediment source: channel erosion and incision."

Please see our response to SFEI-4 and SEC-1 in Part I.

"…We recommend the following actions and changes to the implementation tables: Number one, we ask that all land uses adhere to a no-net-gain rule for runoff and sediment when development occurs."

Please see our response to SEC-1 in Part I.

"We ask that the implementation tables be tailored to the results published in the staff report, which is based on the sediment source analysis and limiting factors analysis, and it did an excellent job of summarizing the findings. So we ask that staff work to eliminate any templating from previous TMDLs done and that show up in the implementation tables, and we've talked to staff about that and hope to see that occur."

Please see our response to SEC-2 and RCD-1 (Part I). In addition, we assert that the implementation tables in the Basin Plan amendment and the Staff Report reflect the findings of the sediment sources analysis and the limiting factors analysis, as well as the requirements of the State Water Board's *Policy for Implementation and Enforcement of the*

Nonpoint Source Pollution Control Program ("NPS Enforcement Policy"; SWRCB, 2004). We also point out that the supporting staff report is the appropriate document (rather than solely the implementation tables) to summarize the scientific studies and other rationale behind the Basin Plan amendment, and should be consulted for questions regarding background, scientific information, or rationale.

"We also think that the stormwater permit isn't able to get at the less-than-one-acre size parcels that in aggregate contribute quite a bit toward [the] problem [of incision]."

Please see our response to SFEI-1 and SEC-1 (Part I). Please note that neither the county, City of Sonoma, nor the Water Board is limited to enforcement activities only on sites larger than 1-acre. Smaller sites that pose a water quality problem can also be regulated by the Water Board.

"A vineyard going in…may be required to do some tile drains, or some surface drainage that actually helps worsen the peak flow problem, so that's a concern….We have developments going in in city limits that…have been able to increase impermeable surface [area] without regard to peak storm runoff. Really it's a water management issue, our sediment problem."

The Basin Plan amendment now includes a performance standard for vineyards that requires vineyard owners or operators to "effectively attenuate significant increases in stormwater runoff" such that "runoff from vineyards shall not cause or contribute to downstream increases in rates of bank or bed erosion." This performance standard was included in the September 5, 2008 draft revisions, which were circulated for public comment. Please also see our response to SEC-1 in Part I.

Norm Yenni, hay and grain farmer in southern Sonoma Creek watershed

"The proposed implementation plan does not reflect the things we had talked about at great length, and really it doesn't reflect the process."

"Erosion from tilled and pastured lands…is a small percentage of the problem, but it receives a lot of attention in the document…. Why…are we not focusing our efforts on the paved and roofed areas with 100 percent runoff? That's what really is the source of the problem or a good source of the problem as I see it. Charts in the document just arbitrarily list vineyards and pastures first, but the results of development, depending on what chart you're looking at, it's either incision erosion or sometimes they're all grouped together into one simple word, that being stormwater. And…depending on what part of the document you're reading through, you can get different flavors of it."

Water Board staff have been working in the Sonoma Creek watershed for decades, and specifically on sediment and fishery conservation issues for over five years. Ultimately, it is the Water Board's responsibility and authority to develop a TMDL that resolves the impairment listed under section 303(d) of the federal Clean Water Act, and is consistent with state policies including the NPS Enforcement Policy.

Please see our response to RCD-1 where we explain that control of upland sediment sources (such as from vineyards and grazed lands) is a necessary ingredient of a conservation plan for steelhead in the Sonoma Creek watershed. There are indeed many sources of sediment, and causes of incision. Urban stormwater is both a source of sediment and increased peak flows, and the Basin Plan amendment calls for control of urban stormwater to the Maximum Extent Practicable. Please see our response to SFEI-4 for a detailed discussion on the Basin Plan amendments requirement regarding urban stormwater.

For clarity, we have revised the sediment source tables so that sources are listed in descending order, based on their estimated sediment contribution. The revised tables are shown in response to EPA-15a (Part I), and in the response to Board member McGrath, below.

Mr. Yenni commented on attendance numbers at the public workshop and CEQA scoping meeting held at the Sonoma Community Center on October 3, 2007. He felt that out of 25–30 people at the meeting, "roughly five people of the public at large" (i.e., people who have not regularly participated in the public process associated with this TMDL), was insufficient. Further, he stated that "the material presented at the meeting…was vague and focused more on process than…implementation. The document under consideration today is hard for the layman to read and can be interpreted in different ways….Today's hearing…isn't being held in the watershed so you're not getting a lot of the actual landowners or the people that will be directly affected by this, speaking to you….I don't think we've involved the public, as I was lead to believe we would or as I believe should be done."

Mr. Yenni's comments go to the Water Board's public participation process in the watershed, and our compliance with the California Water Quality Act's (CEQA) in regards to involving the public. Since 2002, Water Board staff have held and attended numerous meetings in the Sonoma Creek watershed, and worked closely with the Sonoma Ecology Center, the Resource Conservation District, other government agencies, and members of the agricultural community to gain information that informs this Basin Plan amendment. The input and participation of these stakeholders has been invaluable during the development of the TMDL and Habitat Enhancement Plan.

The meeting Mr. Yenni describes was a scoping meeting conducted and noticed according to requirements of CEQA, held at the Sonoma Community Center, which is in the heart of the Sonoma Creek watershed. To notify the public and to encourage

attendance and participation at the CEQA scoping meeting, we placed a display advertisement in the Press Democrat before the scoping meeting. We provided notification (via e-mail or U.S. mail) to all interested parties that we were aware of. Some of the materials staff presented at the meeting were preliminary because the purpose of the meeting was to receive comments from the public about possible adverse environmental impacts of the project *before* the project was thoroughly defined and the project documents were released for the 45-day public comment period (also duly noticed), which extended from February 8, 2008 to March 24, 2008.

We encourage stakeholders who are concerned about policy under development to inform other potentially concerned citizens about the importance of participating in the public process. We also welcome suggestions on how to further encourage public participation.

Regarding the shallow depth of the mouth of Sonoma Creek in the lowlands where the creek flows into San Pablo Bay, Mr. Yenni said, "I'm not convinced that sediment is the only problem" blocking fish passage into the creek from the bay.

We welcome additional science-based information about conditions in the lower watershed.

"Once the objectives of the TMDL have been reached, it would stand to reason that we should have a healthy watershed from [the] perspective [of sediment], and I think the de-listing should take place at that time if we've reached our goal, but there are no such plans and I don't know why not."

De-listing is the Water Board's goal for all of the impaired waterbodies in our region. The Water Board's adaptive management approach to implementation provides for review of the TMDL's progress over time, adjustment of our strategy if necessary, and delisting when possible. Achievement of water quality standards, including the numeric targets specified in the TMDL, will result in de-listing. In considering de-listing of Sonoma Creek as impaired by sediment, we will follow the methodology set forth in the State Board's *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (State Board, 2004), which specifies the policies and requirements for de-listing.

Mr. Yenni suggested that a "quicker permit process" for retention of woody debris and alteration of the streambed from agencies such as the California Department of Fish and Game would make more landowners likely to cooperate with the implementation goals of the TMDL.

For stream restoration or habitat enhancement projects, we support streamlining the permitting process. Within the Water Board's Clean Water Action Section 401 Water Quality Certification program, which regulates fill of streams and wetlands, we will continue to look for opportunities to permit restoration activities on a program basis, rather than having separate permits for individual (yet related) projects. We do not have control over the permitting processes of other agencies such as the California Department of Fish and Game, however we will continue to work collaboratively with other agencies to coordinate project reviews.

John Guardino, Southern Sonoma County Resource Conservation District

Mr. Guardino concurred with Ms. Lawton's comments for the Sonoma Ecology Center.

"We would like to see seamless integration of the TMDL action plan with the Sonoma Creek Enhancement Plan" now under development.

We share this goal. Please see our response to RCD-3 and RCD2007-2 (Part I).

He requested that the 20-year timeframe for achievement of the TMDL, along with "a reasonable approach…tailored to individual needs and resources of the landowners over that timeframe" be "in writing within the amendment and/or the staff report."

We believe that the Staff Report Chapter 8 and our responses to the RCD and Farm Bureau, clearly indicate that the implementation plan provides flexibility for landowners to choose those management practices that are cost-effective and work for their land. In addition, the implementation tables in the Basin Plan amendment clearly state that landowners are to propose a schedule for implementing their selected management practices. The Basin Plan amendment provides flexibility, but requires regular and substantive progress. We believe this is the appropriate balance.

He also told the Board that the RCD wishes to continue to be involved in the development of the agricultural waiver program.

We welcome the RCD's continued involvement in the development of waiver of WDR programs affecting agriculture.

"A watershed-wide scale issue is hydromodification. We'd like to see that addressed in more detail in this report….Obviously we can't go back in time, but if there are ways to restore floodplain function and natural detention, that's going to go a long

way to helping to solve the incision problem that we've heard about today, and that seems to be really where this issue of incision is coming from.

We agree that addressing hydromodification, restoring floodplain function and natural detention will greatly contribution to solving the incision problem. The Basin Plan amendment proposes a multi-pronged strategy for achieving these goals: Regulatory programs are proposed to attenuation peaks flows and durations, from vineyards and urban areas; and the Habitat Enhancement Plan (Staff Report Section 8.6) proposes actions to restore habitat complexity, floodplain function, and natural retention. Hydromodification is discussed in detail in section 8.5 of the Staff Report. Please also see our responses to SFEI-4 and SEC-1 (Part I).

"Equitability is another issue I want to touch on….How are we going to handle…urban populations and rural residential properties and ranchettes of ten acres and under, with regard to their potential impact and cumulative impacts on sediment and hydromodification? I'd like to see it more thoroughly addressed."

Please see our response to SFEI-1, where we explain that it is most efficient to regulate parcels greater than 10 acres, but we are not limited to acting only on parcels greater than 10 acres. Parcels smaller than 10 acres will be regulated if Water Board staff determines they pose a threat to water quality.

Regarding the Limiting Factors Analysis, "we'd like to see…the report and the amendment…address the findings and the priority rankings for steelhead recovery in the creek. The priority…finding…was summer and winter rearing habitat for juvenile [steelhead]. Sediment was much lower on the list….We are still not convinced [of the relative importance of sediment]and would like to continue to work with staff to get some additional explanation…because we see the habitat restoration piece being really front and center."

Please see our response to RCD-1 (Part I).

B. COMMENTS FROM MEMBERS OF THE WATER BOARD

Questions raised by members of the Board and answered by staff at the Testimony Hearing may be found in the hearing transcript (Appendix G of the Staff Summary Report).

Water Board Member James McGrath

"I'd like to see some clarification in Table 5 [of the Staff Report]. As I read it and look at it, I'm not sure that the lower part of it is the totals or the increases according to the

anthropogenic effects. Specifically, I'm chewing over the question of surface erosion and I see 6,000 at the top and 9,000 at the bottom. And if it's a 50 percent increase, that's one thing. If it's a 150 percent increase, according to development, that's another thing, so I'm just not clear on that."

To provide clarification, we have revised Table 5 of the Staff Report to more clearly present the sediment sources, their magnitude, and their anthropogenic component. Please see our response to EPA-15a (Part I) for a discussion on changes to this table made in response to U.S. EPA's comment.

With regard to sediment loading from surface erosion, the estimated natural component is 6,200 tons/year, the human-caused component is 8,600 tons/year, and the total is 14,800 tons/year (6,200 plus 8,600). Therefore, the percent increase is calculated as follows: increase = human-caused component ÷ natural component = 8,600 ÷ 6,200 = 139%, or approximately 140 percent. Surface erosion due to human activities, as well as due to roads, has resulted in significant increases in the fine sediment delivery to Sonoma Creek. That is why we propose regulatory programs, such as waivers of waste discharge requirements, to reduce these controllable sources.

Please note: the sediment loads in the previous version were rounded to the nearest thousand; the revised table displays sediment loads rounded to the nearest hundred. The revised Table 5 (we deleted the previous table) is shown below.

Table 5. Average Annual Sediment Delivery to Sonoma Creek (tons/year)[a]

Source Categories		Estimated Rate[c] (tons/year)
Natural Processes	Channel erosion, Incision[b]	25,400
	Colluvial Bank Erosion (Soil Creep)	16,600
	Surface erosion[b]	6,200
	Landslides[b]	4,100
	Total- Natural Processes	52,300
Human Actions	Channel Incision and Gully Erosion[b]	43,300
	Roads and stream crossings	11,200
	Surface erosion[b] from vineyards, other row crops, and rangelands	8,600
	Urban Stormwater runoff	1,100
	Landslides[b]	900
	Total- Human Actions	65,100
GRAND TOTAL		117,400

Source Categories	Estimated Rate[c] (tons/year)
[a]Sediment delivery rates are rounded to the nearest hundred. [b]Channel erosion and incision, surface erosion, and landslides are occur due to both Natural Processes and Human Actions. For these sources, each component (natural processes vs. human actions) is displayed separately. [C] The timeframe associated with the average annual rate varies from long-term average rates which were estimated for landslides, channel incision, and gully erosion to those for urban stormwater, surface erosion, and road-related erosion, which are estimated based on current/contemporary conditions.	

"Given that people seem to be comfortable with the number that says hydromodification to the stream is a problem, I'd like to see some underlying hydrology for what you think is the source problem and what's going on."

Regarding "tools" to achieve the TMDL, Board Member McGrath stressed the need to consider the entire stream and "a bigger hydrologic picture" when prescribing solutions. "Retaining flows, if it's a dam, can be a fish passage barrier and counterproductive. If it's a big pool, [which] only slows water by the size of the pool, it can be part of a hydrologic solution that also provides rearing habitat….Looking at the stream like that would convince me one way or the other….I want to see a picture of the stream in terms of slowing the water down but not causing flood control problems, and doing it with mechanisms that add debris to the stream."

We have added Box 1: Conceptual Model of Causes for Incision of Sonoma Creek and its Tributaries (shown on next page), to Chapter 3 of the Staff Report, to describe the historical and ongoing activities that contribute to incision in Sonoma Creek and its tributaries. This addition provides a hydrologic picture of what has occurred, and continues to occur, that has caused hydrologic changes in the watershed.

We agree that appropriately adding large woody debris to Sonoma Creek and its tributaries can benefit the riparian system by slowing water down and creating more habitat complexity. We propose to add large woody debris to the stream using a comprehensive approach where the riparian corridor is protected using our Clean Water Act Section 401 authorities, as well as a collaborative approach as described in the Habitat Enhancement Plan. These approaches will increase large woody debris by encouraging natural recruitment, and by implementing well-conceived restoration projects where woody debris structures are carefully installed. A healthy, intact riparian corridor will allow for natural recruitment of large woody debris as tree and plant material naturally fall into the stream. The Habitat Enhancement Plan (Staff Report Section 8.6) recommends installing large woody debris structures, as an immediate means of improving pool habitat and increasing retention of gravels and cobbles, in a manner that does not cause flood control problems.

We propose a similarly comprehensive approach to slowing the water down. We propose to control increases in peak runoff rates from urban land uses and from vineyards using regulatory measures, while the Habitat Enhancement Plan calls for actions to increase habitat complexity and encourage groundwater recharge. These measures are expected to slow the water down.

Box 1: Conceptual Model of Causes for Incision of Sonoma Creek and its Tributaries

A wide array of historical and ongoing land-use activities have resulted in direct disturbances to channels, and/or watershed disturbances that could cause or contribute to incision of Sonoma Creek and/or its tributaries along the valley floor. SEC et al. (2006) has documented one or more episodes of channel incision (depending upon location) that occurred along Sonoma Creek and the lower alluvial reaches of its tributaries approximately between the 1880s and 1950s. Historical land-uses that may have caused or contributed to incision include the following (**inferred mechanism for incision in bold)**:

1. *Connection of naturally disconnected tributaries channels*. Approximately 20 percent of tributary channels were historically disconnected from the mainstem in normal water years. Water from the tributaries flowed onto alluvial fans and infiltrated into groundwater. European settlers connected these tributaries to the mainstem, and these areas are now discreetly channelized. These changes **increased peak flow** and sediment supply to mainstem Sonoma Creek.
2. *Straightening of the mainstem and tributary reaches along the valley floor.* These changes likely **increased streambed slope** locally, and therefore, increased energy available to erode the bed and banks.
3. *Draining of several hundred acres of floodplain wetlands.* The primary geomorphic effect of these changes on the mainstem channel is **increased peak flow**.
4. *Logging of redwood forests and intensive livestock grazing*. These disturbances likely caused significant **increases in peak flows and their durations** during storm events**.**

Other land use activities may be contributing factors. Gravel mining and dredging were conducted on a large scale by the early twentieth century. More recently, an extensive urban storm drainage network was constructed in Sonoma, and a large number of box culverts have been installed at road crossings on tributaries[1]. Levees and bank revetments are widespread along urban and rural channel reaches throughout the valley. Hillside development, including vineyards and roads, may also be causing significant increases in storm runoff. Intensive removal of large woody debris from channels likely is a common and ongoing practice after large floods. These more recent and ongoing disturbances may cause significant increases in peak flow, increase the energy exerted on channel beds and banks during a typical flood, and/or create local discontinuities in slope and sediment supply that would facilitate incision,or destabilze banks.

Although significant shifts in precipitation or large tectonic events also have the potential to initiate channel downcutting, these natural disturbances did not occur in the watershed in the historical period. Therefore, we conclude that historical land-use disturbances appear to be primary causes for multiple episodes of incision on Sonoma Creek and in the lower alluvial reaches of its tributaries.

[1]Urban development appears to be the primary cause for documented incision and instability in the Schell Creek drainage.

Water Board Member Terry Young

"In terms of…what are we going to do:…Clearly the problems with in-stream incision are problems that we don't have a really attractive solution for yet. The hydromodification programs that are now in this draft deal with improvements to new things that are going to be built, but they don't deal with the problems that we're

having already. I didn't see a solution to the problem jumping out at us today, so we all have to…think about that a little bit more I think."

In-stream incision is a complex problem, and is the aggregate result of many different watershed disturbances. We propose to address this problem using, from a program standpoint, two approaches: *regulatory* programs to prevent increases in peak flows and duration and *collaborative* programs to reverse the impacts of channel incision. The regulatory programs are described in Staff Report Section 8.5, Sediment Control Actions) and the collaborative approach falls under the Habitat Enhancement Plan Staff Report Section 8.6. We have added Table 7 (shown below), to the staff report to summarize the key components of the Sediment TMDL and Habitat Enhancement Plan. We propose a collaborative approach to "deal with the problems we're having already." We envision reach-based collaborative partnerships forming to plan, design, and implement reach-scale restoration projects to stabilize heavily incised reaches and increase habitat complexity. We believe there are mechanisms in place that encourage these efforts.

The Sonoma Creek watershed is also a Critical Coastal Area (coastal watershed in critical need of protection from nonpoint source runoff pollution, as determined by a multi-agency committee), as well as an impaired waterbody with a TMDL nearing completion. These factors make projects in Sonoma Creek highly competitive for funding, including funding set aside for Integrated Regional Water Management Plan (IRWMP) projects. Water Board staff and stakeholders are in regular communication regarding mechanisms for selecting and funding high priority projects. At the same time, regulatory programs will be in effect to prevent additional increases in peak flows and durations, as well as disturbance to the riparian corridor.

Table 7. Key Components of the Sonoma Creek Watershed TMDL and Habitat Enhancement Plan

Sediment TMDL (Proposed) Required Actions[1]	**Habitat Enhancement Plan Recommended Actions[2]**
• *Control upslope sediment discharges* from roads and stream crossings, surface erosion from vineyards and grazing lands, and gullies and shallow landslides	• *Support habitat enhancement actions* (other than upslope sediment control) recommended in the Limiting Factors Analysis o Increase habitat complexity (e.g., install and encourage large woody debris and riparian vegetation) o Enhance summer base flows o Address fish barriers
• *Reduce Sediment Discharge from Channel Incision* by requiring actions to attenuate or prevent significant increases in storm runoff peaks and durations, and avoiding impacts to the stream and riparian corridor associated with land use activities	• *Reverse adverse impacts of channel incision* on habitat complexity and complexity, and make progress towards a balanced sediment budget, through stream restoration projects
Measures of Progress	
• *Sediment TMDL Numeric Targets* o Streambed permeability o Pool filling o Substrate composision	• *Water Quality Indicators for Habitat Complexity* o Bankful channel width-to-depth ratio o Spacing between gravel bars o Shear stress on channel o Floodplain width o Riffle size and frequency o Hardened or leveed channel length (decreasing trend)
• Numeric targets are used assess attainment of Sediment TMDL	• Water quality indicators used to assess progress towards increasing habitat complexity and achievement of a balanced sediment budget
Implementation Mechanism	
• Regulatory and permitting authorities including NPDES permits, CWA Section 401 water quality certifications, WDRs, and conditional waivers	• Collaborative partnerships with stakeholders, watershed groups, and agencies • Grant funding • Technical assistance

[1]Proposed required actions are shown on tables 8 through 12.
[2]Recommended actions are shown on tables 13 through 15.

"I don't see a tie-in between what we're doing [in the sediment TMDL, to reduce sediment in the creek] and the watershed enhancement plan other than a lot of good

intentions….Could [we] be a little bit more specific about creating incentives to get the watershed enhancement plan done in our TMDL?"

The greatest incentives the Water Board can provide are funding and technical assistance. By including the Habitat Enhancement Plan in the Basin Plan amendment, and by consequently adopting the Basin Plan amendment, the Water Board is formally stating its commitment to achieving the goals of the Sonoma Creek Watershed TMDL and Habitat Enhancement Plan. This formal commitment translates into allocation of staff resources, and into increased funding opportunities for the actions recommended in the Habitat Enhancement Plan. Allocation of staff resources, in turn, allows staff to continue to work with stakeholders to prioritize projects, help develop projects with measurable outcomes, and strategize funding.

There are many possible paths to bridge the gap from "good intentions" to on-the-ground projects: one path is a watershed technical advisory committee that reviews, prioritizes and recommends projects for funding, then pulls resources together to fund and implement the project; another path is through the methodology put forth in the Bay Area IRWMP, where a project applies to be included and is assessed using a set of criteria. Many projects that implement the Habitat Enhancement Plan are included in the Bay Area IRWMP.

Waivers of WDRs for specific activities (e.g., vineyards, grazing lands) may also require specific evaluation of impacts on habitat (e.g., riparian vegetation) and corrective BMPs where impacts occur. Such provisions were included in the recent waiver for grazing in the Tomales Bay watershed.

Regarding mechanisms for compliance: The way this is written for vineyards and for ranchers, the compliance is via a BMP-type program, and that's fine. But it would be nice also if we could create a mechanism where an alternative compliance path could be simply to demonstrate that that particular landowner isn't making the problem worse: [that] there really isn't an erosion problem or a sedimentation problem coming off that piece of property, and here's why. That might save a particular landowner from having to do a lot of activities that just don't make sense on his piece of ground."

Our goal for a regulatory program for vineyards is to ensure that appropriate management practices are implemented to control sediment discharges and prevent erosive forces from runoff. We recognize that many vineyard owners are effectively controlling sediment and managing runoff to avoid increases in peak flows and durations, and certainly want to encourage efficient use of resources. We agree that having landowners doing activities that don't make sense on their specific properties is counterproductive and a poor use of resources. As described in the Staff Report Section 8.5 Sediment Control Actions, assessment of sediment sources and effectiveness of best management practices are key components of the regulatory program we recommend.

This inventory and assessment of sediment sources and effectiveness of best management practices allows the landowner to document that his property is not causing a sediment discharge, if that is the case. For the landowner whose property is not causing a sediment or incision problem, his responsibilities would essentially end with the assessment and documentation. It is only for those properties where additional or more effective best management practices are needed, that the following steps of developing and implementing an effective control plan would be required. For properties where sediment and runoff are effectively controlled, fewer required actions would apply and the "path to compliance" would be shorter.

"The list of the potential third party programs, I think, is a lot longer than is in the draft. That was pointed out by a couple of commenters and I noticed a couple of holes, too. The workbook for the sustainable wine grape growing is an obvious example of something that is out there that we could piggyback on…I'm thinking that if a landowner has already qualified for an existing program and we have decided that that program is good enough, that level of certification is good enough, then that landowner is done…We always have to at the Board obviously maintain the ability to spot check what's going on for enforcement purposes…If the landowners are already really doing everything we want them to do and they have proved it to somebody else already, then I'd like them to be done."

We agree that if a landowner is already doing everything needed to address water quality and endangered species conservation and protection, and has adequately demonstrated these actions, then that landowner is "done". That is what is happening with the Fish Friendly Farming Program, which has certified over 6,000 acres of vineyards in the Napa River watershed. Vineyards that have been certified by the Fish Friendly Farming Program would not have additional requirements and would essentially be "done."

We recognize the substantial work that the California Association of Winegrape Growers and the Sonoma Valley Vintners and Growers Alliance in researching and encouraging implementation of best management practices. Please see our response to La Prenda-2 (Part I).

We support the development of third-party programs and recognize their potential benefits, including the efficient use of resources, and the ability to educate and reach individual dischargers. Earlier this year, we wrote a letter of support for the Southern Sonoma RCD's Conservation Innovation Grant (CIG) proposal to develop a ranch and farm planning program to address water quality requirements (Water Board, 2008; Southern Sonoma RCD, 2008). We have also met with the Wine Institute to discuss the Code of Sustainable Winegrowing Practices and what would be needed to qualify for a waiver.

The State's *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program* ("NPS Enforcement Policy"; SWRCB, 2004) provides guidance regarding development of third party programs and the key elements of an acceptable program to control nonpoint source pollution:

> *Prior to developing an NPS control implementation program or recognizing an implementation program developed by dischargers of third-parties as sufficient to meet RWQCB obligation to protect water quality, a RWQCB shall ensure that the program meets the requirements of the key structural elements described below….*
>
> > *Key Element 1: An NPS control implementation program's ultimate purpose shall be explicitly stated. Implementation programs must, at a minimum, address NPS pollution in a manner that achieves and maintains water quality objectives and beneficial uses, including any applicable antidegradation requirements…*
> >
> > *Key Element 2: An NPS control implementation program shall include a description of the MPs and other program elements that are expected to be implemented to ensure attainment of the implementation program's stated purpose(s), the process to be used to select or develop MPs, and the process to be used to ensure and verify proper MP implementation…*
> >
> > *Key Element 3: Where a RWQCB determines it is necessary to allow time to achieve water quality requirements, the NPS control implementation program shall include a specific time schedule, and corresponding quantifiable milestones designed toward reaching the specified requirements…*
> >
> > *Key Element 4: An NPS control implementation program shall include sufficient feedback mechanisms so that the RWQCB, dischargers, and the public can determine whether the program is achieving its stated purpose(s), or whether additional or different MPs or other actions are required…*
> >
> > *Key Element 5: Each RWQCB shall make clear, in advance, the potential consequences for failure to achieve an NPS control implementation program's stated purposes…*

We are open to recognizing effective third party programs that meet all of the Key Elements described above, and expect that further work to develop third party programs will take place during the development of conditional waivers of waste discharge requirements for grape growers and grazing lands.

"If the landowners are already really doing everything we want them to do and they have…been certified through a third party program, then I don't think we need a separate reporting document specific to the Regional Board. We should be able to

use…the reporting that they have already done. It would be great if they could check a postcard and say, 'Put my waiver under this guy's program.' They sign the page and they send a postcard back….It's not clear in this draft that we are gong to try to really streamline the reporting process for those people who have qualified under a third party program, and I would like to see that…more explicit."

The Water Board will make every reasonable effort to minimize paperwork, while at the same time ensuring that effective NPS pollution control programs are implemented per the NPS Enforcement Policy (outlined on our response to the comment above). Please note that Key Element 4, outlined above, states that a NPS pollution control program must "include sufficient feedback mechanisms so that the RWQCB, dischargers and the public can determine whether the program is achieving its stated purpose(s), or whether additional or different MPs or other actions are required…" Please also our response to La-Prenda-4, where we discuss our intention to regulate nonpoint sediment sources under conditional waivers, which are the most flexible and least administratively burdensome options available.

PART III: STAFF RESPONSES TO WRITTEN COMMENTS ON THE SEPTEMBER 5, 2008 STAFF REPORT AND PROPOSED BASIN PLAN AMENDMENT

Comment Letter no. 1: San Francisco Bay Conservation and Development Commission (BCDC), Sara Polgar, Coastal Planner, October 21, 2008

BCDC-1: "BCDC Staff is excited to see the efforts and progress your agency has made in developing this and other TMDLs for Bay region watersheds."

We appreciate BCDC staff's support of the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan and of other TMDLs for SF Bay Region watersheds.

BCDC-2: BCDC staff discusses the extent of BCDC's jurisdiction in the watershed and states that "Sonoma Creek from its mouth to the confluence with Second Napa Slough is considered a 'certain waterway' and BCDC jurisdiction includes all areas that are subject to tidal action including submerged tidelands and marshlands up to five feet above sea level on this waterway. BCDC also has certain waterway jurisdiction in Tolay Creek to the northerly line of Sears Point Road (State Highway 37)."

We note the extent of BCDC's jurisdiction in the watershed and will coordinate with them on all projects within their jurisdiction.

BCDC-3: "The proposed Implementation Plan does not appear to include management activities within BCDC jurisdiction. However, to the extent that management activities will affect long-term sediment supply to San Francisco Bay, the Implementation Plan could affect the Commission's ability to fulfill its role in conservation of Bay resources such as tidal marshes and tidal flats.

Sea Level Rise and Tidal Marshes and Tidal Flats. *San Francisco Bay Plan* findings on Tidal Marshes and Tidal Flats state, in part, that:

> **Sedimentation is an essential factor in the creation, maintenance and growth of tidal marsh and tidal flat habitat. However, scientists studying the Bay estimate that sedimentation will not be able to keep pace with accelerating sea level rise, due largely to declines in sediment entering the Bay from the Sacramento and San Joaquin delta, thus potentially exacerbating shoreline erosion and adversely affecting the sustainability of future wetland restoration projects.**

Successful implementation of the proposed TMDL and Implementation Plan for Sonoma Creek Watershed would significantly reduce fine sediment loading to the

watershed, and provide important habitat benefits to native fish populations. It is not clear how the TMDL reductions in sediment loading to watershed would affect sediment discharge (relative to current levels) from Sonoma Creek to the Bay. With the critical importance of sediment supply to the maintenance of Bay tidal marshes and tidal flats, an important part of the monitoring for and adaptive implementation of this TMDL will be to assess long-term impacts on sediment output from Sonoma Creek. A broader consideration of sediment needs will facilitate adaptive management of sediment supply in the watershed to benefit both the native fish populations as well as Bay tidal habitats."

Sediment supply and transport is in part a natural process, and the TMDL implementation actions do not disrupt natural sediment processes. The Sonoma Creek Watershed Sediment TMDL is set at 125 percent of natural background, not zero. Human activities have increased the sediment supply to Sonoma Creek, and have caused the supply to be richer in fine sediment. It is these human-caused increases in sediment supply (e.g., erosion from inadequately managed lands and roads, and human-caused channel incision) that the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan propose to control and reduce. There is no indication that restoring the sediment supply rate to a rate that is closer to the natural background rate would adversely affect Bay tidal habitats. We do have evidence however, as discussed in Staff Report Chapter 3, that the current sediment supply rate (over twice the natural rate) is adversely affecting freshwater habitat for steelhead and other native aquatic species. If, in the future, there is evidence that TMDL implementation actions are adversely affecting Bay tidal habitats, the Water Board will consider changes to the TMDL or the implementation plan as part of our adaptive management process. In response to this comment, we have added the following question to the Adaptive Implementation plan, in both the Staff Report and Basin Plan amendment:

- What effect will climate change have on hydrology, sediment transport, and habitat for the watershed's aquatic species? Is there evidence that TMDL implementation actions, together with climate change, may affect Bay tidal habitats? How will climate change effect the outcome of required and recommended measures, and how should these measured be adjusted in response?

BCDC-4: "With the recent passage of AB 2094, the Commission has been directed to develop, in coordination other local governments, agencies and interested parties, regional adaptation strategies for addressing the impacts of climate change on San Francisco Bay and its shoreline. As BCDC Staff move forward with developing these strategies, we see an excellent opportunity for further coordination with the Regional Board in development of TMDLs and implementation plans for local watersheds. By engaging more in your TMDL development process, we would be better able to incorporate watershed-level goals and planning into our climate change adaptation

planning, and to ensure that regionwide adaptation considerations feed into the development of TMDLs and implementation plans."

We welcome BCDC staff's participation in our TMDL development process. Climate change is both a regional and local issue. Potential watershed-level effects of climate change on Sonoma Creek include altered rainfall patterns and resulting altered hydrology in the Creek. Altered hydrology in Sonoma Creek could have a very significant impact on sediment transport (e.g., more storms resulting in sediment-moving events) and fishery habitats (e.g., higher temperatures could mean lower summer base flows). We look forward to coordinating with BCDC staff on watershed-level and regional water quality and aquatic habitat goals.

Comment Letter no. 2: Sonoma Creek Sediment TMDL Steering Committee, October 21, 2008

Committee members are: Southern Sonoma County Resource Conservation District (RCD), Sonoma Ecology Center, North Bay Agricultural Alliance, and Sonoma Valley Vintners and Growers Alliance

Committee-1: "After submitting numerous comment letters over the past year and providing public testimony at your April 2008 Board Meeting, we were expecting to see the majority of those comments addressed in this most recent [September 5, 2008] version of the Staff Report and Basin Plan Amendment. The…comments you received in March 2008…should have resulted in substantial changes and revisions to the Report and BPA. Regional Board staff recently…discussed [changes]…with members of the Steering Committee. Unfortunately, the final report and Basin Plan Amendment will be released only ten days before the final adoption hearing on December 10th…We respectfully request that you reschedule the adoption hearing for at least 45 days after the release of the final report so that the Steering Committee and the public will have ample time to review it before adoption."

The Water Board's public notice dated September 5, 2008, announcing the availability of documents for review and the date of the Water Board hearing, clearly stated the scope and content of the revisions being circulated for public comment. In addition, prior to the release of the public notice, Water Board staff communicated to several members of the Steering Committee (including representatives of the Sonoma Ecology Center and the Southern Sonoma County RCD) that the September 5, 2008 documents would not incorporate responses to comments previously received. As communicated to the Steering Committee members, the Water Board was only soliciting comments on the limited set of revisions (those pertaining to a vineyard performance standard and to the Regulatory Analysis), and therefore only those revisions would be released for public comment. Previously submitted comments have been considered, are part of the administrative record, and are addressed in the final documents and in this Responses to Comments document (Appendix E).

The Water Board's public comment process allows adequate time for public review. Public review periods for this Basin Plan amendment included a 30-day CEQA comment period, a 45-day period in February/March 2008 to review draft documents, a second 45-day comment period to review a limited set of revisions (to vineyard performance standards and to the Regulatory Analysis), and a minimum 7-day period to review revisions to the documents and staff's responses to comments before the Water Board's adoption hearing. In addition, as the commenter noted, Water Board staff discussed the (then draft) revisions with several members of the steering committee. To facilitate review of the final documents, staff discussed draft responses and revisions to the staff report and Basin Plan amendment with committee members during telephone calls and in-person meetings held in August and October 2008.

The revisions made in response to comments received are mainly clarifying in nature, and are not legally substantive. Therefore there is no legal requirement to have a 45-day review period. All changes are clearly identified by strike-through/underline formatting, and explained in the responses to comments document, which should be easily reviewed in the time between release of the final draft TMDL and the Board meeting. It is not necessary to delay the adoption hearing until 45 days after the release of the final documents.

Committee-2: "The science underpinning the TMDL in Sonoma Creek suggests that the measures the Board can mandate will not solve the problems. We ask that the Basin Plan Amendment list the many other processes that are also addressing hydromodification in the watershed, state that the efforts of other processes in addition to the TMDL will be necessary to restore beneficial uses to Sonoma Creek, and that in order to avoid duplication and extra burden, TMDL implementation will refer and work with these processes to the extent possible. Specifically, for example, the waiver program should make use of data collected in the watershed to limit its activity to surfaces that contribute to the sediment problem. The waiver program could also make use of data from the Sonoma Valley Groundwater Management Plan to identify and rank substantial projects with mutual benefit." The commenter requests inter-agency collaboration and lists the following projects occurring in the watershed: The Sonoma Creek and Tributaries Feasibility Study (for flood reduction), Sonoma Valley Groundwater Management Plan, Sonoma Creek Watershed Enhancement Plan update, San Francisco Bay Area Integrated Regional Water Management Plan (IRWMP), North San Pablo Bay Restoration and Reuse Project, and Sonoma Valley Recycled Water Project."

Please see our response to RCD-1 in Part I of this document, where we discuss the importance of habitat enhancement actions in achieving the goals of reducing sediment and supporting fishery recovery.

We agree that the best approach is to build upon existing efforts in the watershed, and that is the strategy we propose for every element in the implementation plan. As stated in Staff Report Chapter 8, the proposed sediment control actions build upon existing local knowledge, programs and guidance materials (such as the *Vineyard Manual* published by the RCD); the habitat enhancement plan (section 8.6) "provides a framework that supports and integrates local restoration efforts (by watershed groups, landowners, and local agencies) to address key factors impacting salmonid species in the Sonoma Creek watershed." In the Strategy subsection of section 8.6 of the Staff Report, we state that "we expect that watershed-based collaborative efforts, supported by incentive and funding programs, will accomplish many of the habitat enhancement actions needed to restore a healthy fishery" and specifically discuss support for the goals of the Sonoma Creek Watershed Enhancement Plan. Section 8.6 of the Staff Report and Table 5.2 of the Basin Plan amendment also discuss Sonoma Valley Groundwater Management plan actions as implementation measures to enhance baseflows in Sonoma Creek.

Please also see our response to RCD-3 and RCD2007-2 (in Part I of this document), where we address the comment of integration with existing efforts in the watershed, including the San Francisco Bay Area IRWMP.

The waiver programs will consider available data in determining the appropriate requirements. We welcome data that will assist in this effort.

Committee-3: "[In Table 4.1 of the proposed Basin Plan amendment,] under the 'Actions' column, the Board recommends that landowners qualify for the Waiver Program by implementing a farm plan certified under Fish Friendly Farming (FFF) program. Currently, there are a number of free or low cost programs that directly meet or can be adapted to the requirements. FFF is a copyrighted program delivered through a private consulting firm and has not garnered strong support and community buy-in. We request that you remove all references to the FFF certification in the Staff Report and BPA."

The Basin Plan amendment, Table 4.1 states that vineyard owners/operators are required to:

- Submit a Report of Waste Discharge that provides, at a minimum: a description of the vineyard, identification of site-specific erosion control measures needed to achieve performance standard(s) specified in the Basin Plan amendment, and a schedule of implementation of identified erosion control measures.

OR

- Implement farm plan certified under Fish Friendly Farming (FFF) Environmental Certification program or other farm plan certification program approved as part of a WDR waiver policy. All dischargers applying for coverage under a WDR waiver policy will be required to file a notice of intent (NOI), and to comply with all conditions of the WDR policy.

AND

- Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs
- Report progress on implementation of site specific erosion control measures.

Landowners are not required to participate in the FFF certification program—they also have the option of submitting a report of waste discharge with the required information, or participating in another certification program approved as part of a WDR waiver policy.

Water Board staff has discussed with representatives of the RCD and the Wine Institute the changes and additions to their respective industry programs that would be needed to qualify them as third-party certification programs under the waiver policy. Furthermore, we recently wrote a letter of support for the RCD's Conservation Innovation Grant proposal to develop a ranch and farm planning program to address water quality requirements. We have revised the Staff Report, section 8.5, subsection *Vineyards,* to further clarify that the Water Board encourages other third-party certification programs that are protective of water quality and fish habitat, and meet the key elements of the state's Nonpoint Source Enforcement Policy.

The Basin Plan amendment specifically recognizes the FFF certification program because from a technical perspective we are very confident that farms certified under FFF are operating in a manner that is protective of water quality. Water Board staff has participated in the FFF certification process for the past five years, having certified over 6,000 acres of vineyards in the adjoining Napa Valley (along with NOAA Fisheries and the Agricultural Commissioner). The FFF certification has also been successful in Sonoma County (particularly in the Russian River watershed) and in Mendocino County. In the Sonoma Creek watershed, three vineyards totaling over 1,500 acres have been certified under FFF. The Fish Friendly Farming name and logo are copyrighted to ensure that use of the name and logo is limited to those who have in fact been enrolled and certified. We intend to formally recognize Fish Friendly Farming as an approved third-party certification program in the upcoming waiver program. Therefore, it is appropriate to include Fish Friendly Farming in the Staff Report and Basin Plan amendment. Furthermore, discussion of the FFF program is informative to the public because it provides an example of a program that is qualified to be recognized as a third-party certification program.

Committee-4: "The Steering Committee appreciates that RWQCB staff has asked us to help identify high value restoration projects in the watershed…Reliable analytical tools are desperately needed to effectively prioritize [potential projects] based on value…Funds have yet to be encumbered to further this important work [of developing tools]. Having these tools in place is a missing piece…required to

effectively implement the TMDL and attain the water quality targets efficiently and in a reasonable amount of time. Furthermore, additional projects could be identified if the RWQCB collaborates with the Sonoma Valley Groundwater Management Plan process and other aforementioned plans and projects in the watershed."

We agree that effectively prioritizing projects is important to achieving the goals of the Sediment TMDL and Habitat Enhancement Plan. We support funding well-conceived grant proposals for projects that effectively reduce sediment and enhance fishery habitat. We have revised the Staff Report, section 8.6, to clarify that we support effective prioritization of restoration projects, to achieve the most benefit and to make the best use of grant funding. We look forward to participating in effective and productive collaborations with watershed partners to achieve common goals of water quality and aquatic habitat enhancement.

Committee-5: "The Committee feels that requiring every applicable landowner complete a sediment survey by June 2014 is unnecessarily burdensome and not consistent with relevant scientific findings….The Sediment Source Analysis surveys identify surfaces that are priorities for sediment control….As the waiver program is developed, we request that Staff work with the Sonoma Ecology Center to develop a list of areas that fall under the critical threshold for possible waiver exemptions. The waiver program should be limited only to locations that are most likely to contribute significant amounts of sediment. We request that language be inserted into the Staff Report and BPA to establish ranking and prioritization and promote the development of these and other required ranking tools as critical first steps in implementing the TMDL….The Committee requests that it be directly involved, to the extent possible, in the development of the waiver program…"

The proposed Basin Plan amendment allows landowners approximately five years to assess their property for sediment sources, identify erosion control measures necessary to control those sediment sources, and develop a schedule to implement the landowner-selected erosion control measures. Five years is a reasonable and adequate timeframe to meet these requirements. In fact, according to comments from stakeholders (including members of the Steering Committee) many landowners have already implemented effective erosion control measures.

Control of upland sediment sources is consistent with the findings of the sediment source analysis (described in the Staff Report Chapter 6). Please see our response to RCD-1 in Part I of this document, where we explain that upland surface erosion and roads contribute up to 50 percent of the human-caused sediment delivery to roads and cause adverse impacts to steelhead habitat. To date we have not received sufficient data to justify exempting "a list of areas" from the requirement to adequately control human-caused erosion and hydromodification. The purpose of the required site assessment is to evaluate whether the property discharges (or has the potential to discharge) sediment.

Consistent with the Water Board's waiver development practices, appropriate thresholds or criteria for waiver applicability will be determined during the waiver development process. We have revised the Staff Report, section 8.5, to provide this clarification. We encourage stakeholder participation in the waiver development process.

Control of sediment discharges is necessary to achieve the TMDL and conserve the steelhead fishery, whether the source is upland surface erosion, roads, or channel instability. Therefore, we do not find it vital to develop tools to rank control of sediment sources. We considered that the commenter may be suggesting ranking tools to prioritize by geographic area. Our implementation plan allows landowners, who operate independently, the flexibility to choose the management practices that are best suited to their land, and to prioritize the implementation of the practices by proposing a schedule. We encourage landowners to use whatever ranking tools are helpful in prioritizing implementation measures on their land.

Committee-6: "Based on the conclusions and recommendations in the Limiting Factors and Sediment Source Analysis, the goals of the TMDL cannot be attained by implementing only the required actions. We request that the Staff Report state that the TMDL water quality targets and salmonid recovery cannot be attained without the recommended actions in the habitat enhancement plan."

The goals of the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan (as stated in Section 1.3 of the Staff Report) are to:

- Conserve the steelhead trout population
- Restore water quality to meet water quality standards, including attaining beneficial uses
- Enhance the overall health of the native fish community
- Protect and enhance habitat for native aquatic species
- Enhance the aesthetic and recreational values of the river and its tributaries

We agree that implementation of the Habitat Enhancement Plan is necessary to meet the goals of the Sediment TMDL and Habitat Enhancement Plan-—that is why it is incorporated into the Basin Plan amendment. Please see the revised Section 1.3 of the Staff Report, where we state that actions to reduce fine sediment supply and reduce discharges from channel incision alone are not sufficient to recover native fish and aquatic wildlife populations in the Sonoma Creek watershed. In addition, we find that habitat enhancement actions will greatly facilitate attainment of the water quality targets in a faster timeframe, and in a manner that provides much greater ecological benefit than sediment control actions alone.

Please also see our response to RCD-1(in Part I of this document), where we further discuss the importance of the Habitat Enhancement Plan.

Comment Letter no. 3: Sonoma Ecology Center, Rebecca Lawton, Geologist, Director of Programs, October 21, 2008

In this October 2008 comment letter, Sonoma Ecology Center echoes many of the same comments as those in their March 2008 letter, as well as the comments of the Sonoma Creek Sediment Steering Committee (above).

SECset2-1: "We understand that Regional Board staff have incorporated as many tools into the BPA as they feel are available to address the hydromodification that research indicates is the basis of Sonoma Creek's sediment impairment. We feel that BPA would be strengthened by shifting focus as much as possible to channel complexity and streambed and bank erosion, to be more successful in addressing fishery and water-quality programs."

Please see our responses to SFEI-4 and SEC-2 (Part 1) where we discuss the multiple regulatory approaches that are called for in the Basin Plan amendment to address hydromodification and resulting channel incision.

Please also see our response to RCD-1 (Part I) where we re-iterate the importance of implementing both sediment reduction actions as well as habitat enhancement actions, such as improving channel complexity, to succeed in addressing fishery and water-quality programs.

SECset2-2: "Mandating a waiver program for all agricultural and rural land uses is not consistent with the scientific finding underpinning this process. To apply the program to every parcel places an undue burden on landowners. Existing sediment source analysis data can be used to apply the waiver program to areas above a critical threshold of concern for estimated watershed sediment contributions. We would like to see language in Tables 4.2 through 4.4 that says that the program will be limited to locations that are most likely to contribute significant amounts of sediment. Because the waiver program presently under development appears to be the process where specific requirements will be developed that will affect private landowners, we recommend involving stakeholders in its development as soon as possible."

Please see our response to Committee-5.

SECset2-3: "…[T]he BPA should make clear that many recommended non-regulatory actions are judged necessary to solve the problem. Adding language to this effect will upgrade the importance of the Habitat Enhancement Plan. We ask that this statement,

or one equally definitive, be included in the BPA: 'It is not possible to achieve targets without implementing both recommended and required actions.'"

Please see our response to Committee-6.

SECset2-4: "Funding for TMDL implementation should be aimed at the most effective projects in terms of cost per unit sediment reduction. This prioritization of projects needs to compare estimates of the volume of sediment kept out of the streams per dollar, for individual projects. The BPA should state that a critical first step to supporting TMDL implementation is to use existing sediment source analysis data to prioritize specific on-the-ground sediment reduction projects."

Please see our response to Committee-4.

SECset2-5: "Language should be incorporated that assures that the monitoring plan for the TMDL will be implemented. Additionally, because a primary basis of listing Sonoma Creek for sediment was the decline in the salmonid population, TMDL implementation should include monitoring the salmonid population, and the BPA should reflect this recommendation. "

The monitoring plan is included in the Basin Plan amendment, which when adopted and approved will become part of the Water Quality Control Plan for the San Francisco Bay Basin(Basin Plan), our master planning document for water quality in our region. Inclusion in the Basin Plan provides assurance the monitoring plan will be implemented. Additional language is not needed for this assurance.

Monitoring the salmonid population would indeed provide essential information about the status of steelhead in the watershed. This information could also be used to make decisions regarding restoration and management practices and priorities. We support salmonid population monitoring in the watershed, and will assist to the extent we are able, in providing technical expertise, collaboration, or grant funding for this effort.

We will consider any available information on salmonid populations in the watershed in our adaptive management process, and have revised the Basin Plan and Staff Report (Adaptive Implementation section, "Key Questions to be considered") to clarify this, as follows:

- What is the population status of steelhead in the watershed? Do we see an increase in the number or percentage of steelhead that survive past the juvenile rearing life stage as sediment reduction and habitat enhancement measures are implemented? An improved understanding of the current status of steelhead populations in the Sonoma Creek watershed is essential for guiding adaptive updates to the management actions recognized in this plan. Two types of monitoring data may be needed to evaluate the current population status in the watershed: 1) "smolt" production and sizes, and 2)

> adult spawning run-size. Smolt refers to the life stage when juvenile salmonids migrate from freshwater to the ocean. These two types of monitoring would provide a basis for assessing the influences of ocean and freshwater rearing habitat on steelhead run-size.

However, we do not believe it is possible to establish a good correlation between sediment reduction actions/water quality targets and salmonid population data. This is because salmonids spend a large part of their life cycle in the ocean, and ocean conditions affect their population. There are many factors beyond sediment that affect salmonid population. Therefore, we do not propose salmonid population monitoring as part of the monitoring plan for the Sediment TMDL, but it is certainly something we support and encourage as part of improving our understanding of the overall health of our waters.

SECset2-6: "…[I}n Tables 4.1 – 4.5, we recommend consistency in performance standards across land uses. These include "surface erosion," "roads," "gullies and/or shallow landslides," and the recommendation to "effectively attenuate significant increases in storm runoff." Furthermore, these standards should be applied to parcels much smaller than 10 acres…"

Please see our response to SEC-1 and SEC-2 (in Part I of this document) where we explain revisions to performance standards, and SFEI-1 where we explain the rationale of having a 10-acre threshold for rural lands and the revisions made to clarify that smaller parcels posing water quality threats will also be regulated.

SECset2-7: "In Table 4.1, Fish Friendly Farming should not be called out by name. It is a copyrighted program developed with public funding, a situation that may be illegal…Instead, please name or list the criteria that an acceptable program must meet.

The Sonoma County Vineyard Erosion and Sediment Control Ordinance referred to in Table 4.1 is about to be combined with the County of Sonoma's grading ordinance and will soon have a new name. We recommend that the Board work with the county to integrate TMDL requirements with the upgraded ordinance, such that a streamlined process may be established to avoid stakeholders needing to fulfill multiple regulatory requirements aimed at the same goal: soil and water conservation.

Please see our response to Committee-3, which addresses the comment related to Fish Friendly Farming.

We appreciate the information about the current status of Sonoma County's ordinances related to sediment and erosion control. We share the commenter's goal of streamlined processes and will consider the County's ordinances during development of our waiver programs.

SECset2-8: "Our understanding is that there may only be ten days between the release of the next BPA version (including the first formal response to earlier comments), and that there will be no opportunity to formally comment on the revised draft—a process critical to the Board's assessment of how well revisions have addressed stakeholder concerns. We request that a longer comment period be established to allow the Board to receive measured feedback on the effectiveness of proposed revisions prior to the formal Board hearing. "

Please see our response to Committee-1. Also note that the Water Board's process does allow formal comment on the revised draft final documents—commenters may attend the adoption hearing and present their comments to the Board before the vote.

SECset2-9: "The March 21, 2008, comment letter from EPA echoes several of our comments to this and past drafts of the BPA. Given the confluence of the comments, we ask that the BPA be revised to reflect EPA's comments."

The Staff Report and BPA have been revised in response to EPA's comments. Please see our responses to EPA's comments in Part I of this document.

PART IV: STAFF RESPONSES TO PEER REVIEW COMMENTS ON THE SONOMA CREEK WATERSHED SEDIMENT TMDL AND HABITAT ENHANCEMENT PLAN

The scientific basis for the Sonoma Creek Watershed TMDL and Habitat Enhancement Plan has undergone external scientific peer review, pursuant to §57004 of the Health and Safety Code. We provided a November 16, 2007 project report to the peer reviewers (Prof. Susan Bolton of the University of Washington and Prof. Peter Goodwin of the University of Idaho) for their review and comment. We revised our documents in response to their comments. These revisions, shown below in underline/~~strike-through~~, were incorporated in the publicly noticed Staff Report and Basin Plan amendment, both dated February 8, 2008. Further changes to the Staff Report and Basin Plan amendment, made in response to public and Water Board comments, are shown in Parts I-III of this Responses to Comments document and incorporated in the final Staff Report and proposed Basin Plan amendment dated December 3, 2008.

I. Staff Responses to Comments from Prof. Susan Bolton

Dr. Bolton expressed concurrence with many components of the underlying science of the Sonoma Creek Watershed Sediment TMDL and Habitat Enhancement Plan, and made the following supporting comments:

Areas of Agreement

- **"The studies that provided the background for the sediment TMDL report for the Sonoma Creek watershed have for the most part used standard methods that are in common use across the country."**
- **"The Sediment Source reports are very well documented and clearly acknowledge uncertainties and assumptions."**
- **"It is clear that habitat conditions in the Sonoma Creek watershed have been altered since the 1880s and that the population of steelhead…has declined. Most of these changes are from controllable water quality factors."**
- **"The suggestion of reducing sediment inputs to 125 percent of background is a valid and scientifically supported goal compared to a fixed target of mass per unit time."**

We note and appreciate these supportive comments. We provide responses to Dr. Bolton's specific comments below, organized by topic area as outlined in Dr. Bolton's comment letter.

Water Quality

Bolton Comment 1: Dr. Bolton comments that the TMDL report starts by stating that it is necessary to know the salmonid life cycle as well as the habitat and water quality requirements of the watershed's aquatic species, but that the report then states "that the focus will be entirely on steelhead and ignores all other aquatic species under the assumption that what is good for steelhead is good for everything else." She further states that "Data and literature exist on the other species of note in the watershed, especially the federally listed endangered freshwater shrimp and other fishes such as lampreys and sculpins. Single species restoration plans can be counterproductive to a properly functioning ecological system that consists of many different, interacting and biological components….The Limiting Factors [Analysis] report states that it will address only the physical factors, primarily sediment, on steelhead, Chinook and freshwater shrimp but goes on to only address issues related to steelhead on the assumption that steelhead are an excellent indicator of overall aquatic ecological health. This statement is not based on generally agreed upon scientific knowledge as any animal that spends an extensive amount of time away from the habitat in question does not meet criteria for a good indicator. The freshwater shrimp, which are listed as endangered and spend their entire life in Sonoma Creek and would be a much better indicator than steelhead. Mebone (2001) indicates that selected sculpin species may be good indicators also."

We acknowledge that the Limiting Factors Analysis focused on steelhead trout under the assumption that it is an excellent indicator of overall aquatic health. However, the TMDL and Habitat Enhancement Plan calls for actions to restore sediment delivery rates to those closer (than current rates) to natural background rates, and to reverse the adverse changes to the complexity, functions, and connectivity of Sonoma Creek's stream, riparian, and floodplain habitats. These actions would likely benefit all native aquatic species in the watershed, including the California freshwater shrimp. To clarify our intent and approach, we have revised the Staff Report, Section 3 Problem Statement, second bullet as follows:

- ~~Changes in physical habitat structure that appear to be caused by erosion of bed~~ Incision and ~~banks (incision) in~~ <u>widening of</u> Sonoma Creek and its

> tributaries are resulting in causing significant adverse changes to ~~steelhead habitat~~ the complexity, function, and connectivity of its stream, riparian, and flood plan habitats (SEC et al., 2004).

We reviewed the *California Freshwater Shrimp Recovery Plan*, as suggested by Dr. Bolton, and added the following to the Staff Report, Section 3.2 Habitat Conditions, to clarify the habitat needs of California freshwater shrimp in the watershed:

> In addition to native fish populations, Sonoma Creek and its tributary Yulupa Creek support the California freshwater shrimp (*Syncaris pacifica* Holmes 1895). California freshwater shrimp are found in low elevation (less than 380 ft.) and low gradient (generally less than 1 percent) streams where banks are structurally diverse with undercut banks, exposed roots, overhanging woody debris, or overhanging vegetation Many of the land use activities that affect steelhead populations also threaten the California freshwater shrimp (U.S. Fish and Wildlife Service, 1998).

The *California Freshwater Shrimp Recovery Plan* also indicates that the threats to the freshwater shrimp population are similar to threats to steelhead, and that the recommended recovery actions for freshwater shrimp are consistent with actions recommended by the TMDL and Habitat Enhancement Plan. We have revised the Staff Report, Section 3.3 Salmonid Life Cycle and Water Quality Requirements, as follows:

> **3.3 Salmonid Life Cycle and Water Quality Requirements**
>
> Protecting the beneficial uses of Sonoma Creek and its tributaries requires us to understand the salmonid life cycle as well as the habitat and water quality requirements of the watershed's aquatic species. The sediment TMDL and Habitat Enhancement Plan focus on the recovery of salmonid species (particularly steelhead trout) with the intention that efforts to restore and protect this species will benefit all native aquatic species in the watershed, including the California freshwater shrimp[4](see also Section 5.4 Potential Responses of Other Aquatic Species).
>
> Footnote:
>
> [4]According to the California Freshwater Shrimp Recovery Plan (U.S. Fish and Wildlife Service), threats to shrimp population include increased soil erosion, loss of riparian vegetation, adverse bank and channel changes, and modification of the stream bottom due to sedimentation. These are many of the factors that affect steelhead trout. The recommended recovery actions for freshwater shrimp include reducing unnatural rates of deposition in streams. Therefore, the actions set forth and recommended in this sediment TMDL and Habitat Enhancement plan will likely benefit the endangered freshwater shrimp, as well as salmonids.

We also examined the expected effect the TMDL and Habitat Enhancement Plan actions on other native species in the watershed, and added Section 5.4:

5.4 Potential Responses of Other Aquatic Species

Expected responses of other fish and aquatic wildlife species to actions to reduce fine sediment supply and enhance habitat complexity are as follows:

Species	Expected change in relative abundance	Hypothesized mechanism(s)
Riffle Sculpin	Small to Moderate Increase	Increase in riffle area and frequency; decrease in embeddedness; increase in large woody debris
Sacramento Pikeminnow	Neutral to Moderate Increase	Increase in floodplain habitat and large woody debris contributing to higher rates of over-winter survival; decrease in deep-pool run habitat leading to less competition with largemouth bass for prey
Sacramento Sucker	Neutral to Small Increase	Increase in area of shallow/slow backwater habitat and large woody debris leading to increases in survival during early fry rearing stages
California Freshwater Shrimp	Neutral to Small Increase	Increase in relative abundance is dependent upon an increase in proportion of channel length where channel is free to form its own bed and banks, and specifically at outside bends to form deep pools with undercut banks and overhanging roots
Largemouth Bass, Bluegill, and Green Sunfish	Small Decrease	Decrease in deep-pool run habitat area may reduce relative abundance of these introduced predators

Expected fish species responses summarized above are predicated on large scale implementation of stream and riparian habitat enhancement projects (e.g., similar in scale to those being considered along the mainstem and tributaries of the Napa River; see Section 6.5 of Water Board, 2007 for additional discussion), and life history requirements for above fish species as described in Moyle (2002). For California freshwater shrimp, expected response is based primarily on association of freshwater shrimp with deep pools with undercut banks and overhanging roots, and a review of its life history and ecology as described in the *Recovery Plan for California Freshwater Shrimp* (USFWS, 1998).

Bolton Comment 2: "The Limiting Factors report hypothesizes that a bottleneck exists between 0+ and 1+ age steelhead juveniles. This is based on a single snapshot of a nonrandom sample of juvenile fish in the upper

watershed above Glen Ellen (less than 4% of total watershed blue-line streams….There is a large amount of uncertainty in this estimate…as the 1+ fish typically use more complex habitat which makes them difficult to count and expected survival from 0+ to 1+ is usually <20%...and it is quite possible that the error in the population estimate is within the expected survival range….Recommending that efforts of enhancement focus on a life stage that normally has a very high mortality due to a variety of interacting factors, such as temperature, predation, food limitations and discharge variability…creates a very challenging goal for the enhancement effort."

The Limiting Factors Analysis (Sonoma Ecology Center et al., 2004) acknowledges the uncertainties involved in the total steelhead population estimates, and suggests future work to fill in information gaps. The hypothesis that there is a bottleneck between 0+ and 1+ age steelhead juveniles is based on habitat surveys indicating that summer and winter rearing habitat for age 1+ juvenile fish is very limited in Sonoma Creek, as well as the results of the steelhead population study. While the hypothesis provides a valuable tool for understanding steelhead population dynamics and habitat needs in Sonoma Creek, the TMDL and Habitat Enhancement Plan takes a precautionary approaching by addressing all life stages: The numeric targets for spawning gravel permeability and substrate composition describe desirable conditions for spawning and egg incubation/fry emergence; and the Habitat Enhancement Plan recommends actions to remove fish passage barriers (to improve success during migration) and enhance baseflow, which would be beneficial during all life stages.

Bolton Comment 3: Dr. Bolton expresses concerns that "the bottleneck concept addresses only capacity and not productivity and …can lead to excessive focus on one life stage when success at all stages is necessary in fish with complex life histories such as salmon."

Please see our responses to Bolton Comments 1 and 2.

Bolton Comment 4: "Literature exists (e.g., California shrimp recovery plan 1988) that could be used to include requirements of other species such as shrimp and lampreys into the analysis to increase the certainty that the proposed actions will improve the entire aquatic community….The focus on a single species and life stage is inconsistent with current restoration theory that restoring processes, where possible, or at least creating changes in processes

that moves them towards "natural" rates is the best way to recover habitat and populations."

We agree that creating changes in processes that move them towards natural rates is the best way to restore habitat. The objective of the TMDL is to reduce sediment delivery so that it is closer to natural sediment loading rates. In addition, a main goal of the habitat enhancement plan is to restore stream conditions that are closer to those found in natural, un-impacted systems. Please also see our response to Bolton Comments 1 and 2.

Sediment-related impairment

Bolton Comment 5: Dr. Bolton makes a general comment that "some errors seem to have been made in transferring finding[s] from the Limiting Factors report to the TMDL report."

We have revised the Staff Report, Section 3.4 Limiting Factors Analysis, to clarify our interpretation of the Limiting Factors Analysis, as shown below:

> ***3.~~5~~4 Limiting Factors Analysis***
>
> To improve our understanding of current fish habitat conditions and the significance of sediment pollution relative to other factors (such as temperature, migration barriers, and low summer base-flows) that may be limiting populations of steelhead and salmon, the Water Board provided funding to the Sonoma Ecology Center, in conjunction with Stillwater Sciences and UC Berkeley, to support development of the Sonoma Creek Limiting Factors Analysis. The goal of the limiting factors analysis was to determine the physical, chemical and biological factors adversely affecting fish and aquatic wildlife populations at all freshwater life stages. Due to limited resources, the limiting factors analysis excluded from consideration limiting factors that affect estuarine and ocean life phases, as well as predation and food-web interactions.
>
> ~~Three~~At the onset of the study, three aquatic species of concern were ~~evaluated~~identified: steelhead trout, Chinook salmon, and California freshwater shrimp. ~~The~~ Ultimately, the study focused on the physical factors influencing population dynamics of steelhead trout, the most common of the three species in the Sonoma Creek watershed and an excellent indicator of overall aquatic ecological health.[5] The focused studies surveyed Sonoma Creek and its tributaries above the tidally influenced reach (north of Schellville).
>
> The limiting factors analysis included several focused studies, including a steelhead census performed in late summer/fall of 2002 (SEC et al., 2004, Appendix B). The steelhead census estimated a total population of 17,000 steelhead trout within the watershed, using snorkel, electrofishing, and extrapolation methods. The size of the measured fish indicate that approximately 90 percent of the population are age 0+ (0-12 months), while only 10 percent are aged 1+ or older. This indicates a "bottleneck" in the local steelhead population during the juvenile rearing stage. The surveys revealed large numbers of age 0+ fish in most pools selected for sampling, but only a few pools held larger (greater than 4.3-inch) age 1+ fish (classified as between 12 and 24 months of age).
>
> The limiting factors analysis estimates that only 10 percent of the age 0+ fish are surviving to the 1+ life stage. ~~Both~~It is possible that the low percentage of age 1+

fish found during the steelhead census may be due to difficulties in finding and counting the fish in complex habitat structures, or due to natural predation. However, both summer- and winter-rearing habitat for age 1+ fish is very limited in Sonoma Creek due to well-documented changes in creek hydrology and geomorphology. Therefore, increasing the survival of fish ages 12-24 months (age 1+) has the potential to increase the total steelhead population by enhancing ~~rates of smolt out-migration~~ the number and fitness of smolts that migrate to the ocean and ensuring that enough ~~fish reach adulthood~~ adult fish spawn, as needed to maintain a sustainable fishery. ~~Though~~Taking a precautionary approach, this TMDL will address water quality and habitat pressures on all steelhead life stages, ~~it will focus~~while focusing on improving habitat and survival for age 1+ juveniles.

Potential limiting factors adversely affecting fish populations are presented in Table 2. Factors found to be adversely affecting ~~fish~~ steelhead populations in the Sonoma Creek watershed are discussed below:

- Sediment-related impairment, which includes impacts resulting from deposition of excess sediment in the stream bed as well as changes in physical habitat structure as a result of bed and bank erosion
- ~~Elevated~~Stressful water temperatures in the lower reaches of mainstem Sonoma Creek and of Nathanson Creek, likely due to lack of shade, loss of deep pools, and low base flow
- Migration barriers and low summer flows

~~Due to limited resources, the limiting factors analysis excluded from consideration limiting factors that affect estuarine and ocean life phases, as well as predation and food web interactions.~~

Table 2 Potential Limiting Factors by Salmonid Life Stage

Life Stage	Limiting Factor
Upstream migration	Physical barriers to passage Insufficient flows Migration corridor hazards
Spawning and egg incubation	Spawning gravel mobility Low spawning gravel permeability Redd de-watering High water temperatures Poor water chemistry
Juvenile rearing	Insufficient summer rearing habitat Insufficient winter rearing habitat Poor pool habitat availability Poor pool habitat quality Insufficient in-stream shelter Stranding by low flows Inadequate riparian cover High water temperatures Suspended sediment concentrations Poor water chemistry Low food availability Predation

Life Stage	Limiting Factor
	Competition from native species Competition from introduced species
Out-migration	Corridor hazards Inadequate flows High water temperatures Poor water chemistry Predation

Sediment-Related Impairment

Sediment-related impairment includes impacts resulting from excessive amounts of fine sediment deposited in the streambed at potential steelhead spawning and rearing sites. These conditions result in low gravel permeability, which can cause poor incubation for fish eggs and high mortality prior to emergence.

In addition to reducing spawning habitat, excess sediment can impact in-stream shelter by filling pools, eliminating deep pool habitat where fish rest and feed. Fine sediment fills the spaces between cobbles and boulders needed for winter rearing habitat. Low-quality shelter for juvenile fish ~~has~~may have resulted in increased predation rates and population reductions among of 1+ fish[6], a critical bottleneck in the steelhead population in Sonoma Creek. Numeric targets will be proposed to reduce impacts of fine sediment.

Some of the most important sediment-related impacts result from changes in sediment transport processes that determine the shape, complexity, and hydrology of stream habitats. Both the direct and indirect effects of human activities adversely affect pool/riffle morphology, channel width, channel bank slopes , and in-stream and riparian vegetation.

Low Gravel Permeability and Pool Filling

Low gravel permeability is a significant adverse effect of excess sediment. Using a simple linear regression relationship, gravel permeability can be used to predict survival-to-emergence. With an average gravel permeability of approximately 2000 cm/hr, fine sediment in Sonoma Creek's spawning gravels causes, on average, 70 percent mortality (30 percent survival) of incubating eggs. (SEC et al., 2004; McCuddin 1977; Taggart 1976; Stillwater Sciences and Dietrich, 2002). This mortality rate is higher than in the neighboring Napa River watershed, where egg mortality is estimated to be 60 percent.

The limiting factors analysis also documented pool-filling by fine sediment, with a watershed average of 8.5 percent (meaning that 8.5 percent of pool volume has been lost due to in-filling by sediment). ~~This watershed-wide average is approximately four times that measured in~~At the ~~Napa River~~documented levels of pool filling, fine sediment blankets much of the pool bottoms, compromising the quality of pools as rearing habitat for juvenile salmonids (SEC et al., 2004). Sediment deposition is also reducing winter rearing habitat by filling cobble-boulder bed interstices.

Physical Habitat Structure

Stream channel incision has resulted in sediment/flow relationships that promote the creation of deeper and narrower channels. Many stream channels have scoured down to local bedrock, which in some locations consists of weak sedimentary rocks that are easily eroded and yield large amounts of fine sediment. The result is shallower pools, fine sediment deposition from eroding streambeds and destabilized banks, less access to water and soil support for

riparian trees, and less in-stream retention of large woody debris and coarse sediments (gravels, cobbles, and boulder for spawning and rearing habitat). Analysis of in-stream shelter in Sonoma Creek yielded ratings ranging from 8 to 86 out of a maximum of 300, using a standard in-shelter index developed by the California Department of Fish and Game. The average watershed-wide score was 38, which is 13 percent of the maximum score. This indicates low quality of shelter for juvenile steelhead (SEC, et al., 2004), as a minimum in-stream shelter score of 80 is recommended for salmonids (CDFG, 1998). Changes in physical habitat structure in Sonoma Creek have caused a decrease in available habitat for fish to hide and rest, particularly during high flows. This can significantly reduce survival of age 1+ fish, as well as total steelhead population numbers.

Suspended Sediment

Within a certain range, high suspended sediment concentrations during storm peaks is a natural phenomena that fish are adapted to handle. In unimpaired streams within the California Coast Range, even in cases where natural rate of sediment delivery to channels is very high, we would expect streams to clear up within a few days after a storm event. During high flows, native fishes seek shelter to reduce energy expenditure, and to avoid entrainment and exposure to high suspended sediment concentrations, which may cause short- to long-term physiological damage (e.g., gill abrasion) and/or mortality. Once the peak has passed, fish may leave shelter habitats and begin to forage. If streams usually remain cloudy (e.g., turbidity $\geq$ 20 NTU), for several days after a storm however, then these extended elevated levels of turbidity would result in loss of feeding opportunities, with the potential to cause significant adverse ~~affects~~effects on growth and survival. Alternatively, land-use related increases in sediment supply may also increase the magnitude, frequency, and/or duration of peak suspended sediment concentrations during high flows, and consequently the severity of physiological stress to fish, if they are unable to locate habitats where they are protected.

The Sonoma Ecology Center has collected and published suspended sediment concentration and turbidity monitoring data for Sonoma Creek in water years ~~2004~~2002 through 2004 (SEC et al., 2006). The Sonoma Creek monitoring data suggest that the magnitude and duration of suspended sediment concentrations in the water column may at times be severe enough to cause major physiological stress on salmonids including impaired respiration and feeding. Overall, suspended sediment and turbidity were monitored in Sonoma Creek in thirty-seven storms. Based on approach of Newcombe and Jensen (1996), it appears that in four of the thirty-seven storms, documented suspended sediment concentrations could have caused significant physiological stress to juvenile salmonids. Conditions severe enough to cause direct mortality to juvenile salmonids were not documented during monitored storms.

~~Elevated~~ Stressful Water Temperatures

During the late summer, cool streamflows are a precious resource for aquatic species. ~~Elevated~~Stressful temperatures can cause chronic stress in fish and reduce growth rates if food supply cannot keep pace with elevated metabolic rates.

Temperature monitoring indicates that although summer stream temperatures stay relatively cool in upper elevation tributaries, temperatures on lower reaches of the mainstem and ~~on~~lower Nathanson Creek (located in the southern portion of the valley) can become warm enough—for very short periods—to kill fish (SEC et al., 2004). Increasing riparian cover, pool depths, and groundwater recharge

rates in these reaches could help keep temperatures lower to increase likelihood of successful fish rearing.

Low Flows and Migration Barriers

Impacts related to low summer base-flow and migration barriers have a significant ~~affect~~effect on steelhead population size.

Summer Low-flow Conditions

Low flow conditions cause significant direct mortality to juvenile fish as rearing pools dry out. Low summer flows significantly affect fish age 1+ (12–24 months), and are a key factor limiting the total steelhead population in Sonoma Creek. Many of Sonoma Creek's tributaries begin to dry up as early as June. Dry reaches may extend as long as five miles by the end of the summer.

The majority of streams affected by seasonal drying cut through alluvial fan deposits. (The largest alluvial fans are found in foothills of the Mayacamas and at the base of the Carriger Creek subwatershed.) In these areas stream beds are surrounded by permeable coarse sediments, and low flows tend to become subsurface flows.

The cause of the observed low summer base flows in not known for certain. Low summer flows are likely the result of multiple factors including a Mediterranean climate, geology, groundwater withdrawals, and watershed disturbances leading to incision and a lowering of the water table. While some dry reaches may be naturally occurring, historical maps and accounts dating from the 1820's show evidence that the valley used to be significantly wetter, with summer surface ponding (indicative of a high water table) and abundant springs flowing at the base of the Mayacamas and foothills of Sonoma Mountain (SEC et al, 2004; SEC, 2002).

Perennial flows are more common in primarily bedrock stream reaches, such as the mainstem of Sonoma Creek between Glen Ellen and Kenwood, and higher elevation reaches on many tributaries, such as Bear Creek in Sugarloaf Ridge State Park, Calabazas and Hooker creeks, and upper Carriger Creek (SEC et al., 2004).

Barriers to Fish Passage

~~Man-made barriers to fish passage cut off available spawning and rearing habitat to approximately 25 percent of stream reaches in the Sonoma Creek watershed.~~ Barriers significantly reduce the amount of habitat available to ~~age~~age 1+ fish and are important factors limiting the total steelhead population in Sonoma Creek. Most barriers in the watershed are due to road crossings (e.g., culvert placed too high to allow fish to jump and pass through, or culvert concentrates flows such that fish cannot overcome the current to pass through). In addition to preventing migration passage, barriers can also restrict the ability of rearing juveniles and resident adults to move about in the system to feed, or seek shelter and other resources. Although the impacts of some barriers depend upon flow conditions, species, and life-stage of fish, the Limiting Factors Analysis focused on identifying full barriers (i.e., barriers that prevent even the strongest swimming species presumed present from passing, at all flow conditions) (SEC et al, 2004, Appendix J). Man-made barriers to fish passage cut off available spawning and rearing habitat to approximately 25 percent of stream reaches in the Sonoma Creek watershed (i.e., full barriers cut off 25 percent of stream reaches in the watershed).

Data collected for the limiting factors analysis provide a basis for prioritizing barriers for removal based on upstream habitat (SEC et al., 2004). Restoration

goals for in-channel barrier remediation and habitat enhancement features are outlined in the implementation plan.

Footnotes to this section:

[5]The limiting factor approach is intended to identify the most important constraint (e.g., the bottleneck life stage and key stressor(s)) that controls carrying capacity under current conditions. However, considering the diversity of life history strategies employed by steelhead, climatic variability, and that many stressors interact in a synergistic fashion, such an approach simplifies actual interactions and outcomes. From a conservation standpoint, for a small population like steelhead in Sonoma Creek, it seems essential to address all stressors that contribute to elevated levels of mortality in any life stage in order for the population to persist over the long-term. Harvey et al (2007) and Mobrand et al. (1997) provide additional insights regarding the challenges associated with modeling salmonid population dynamics.

[6]Although predation and food-web studies were not conducted due to limited resources, we infer that the lack of good quality rearing habitat (indicated by the low in-stream shelter scores) has contributed to increased predation and lower success for juvenile steelhead.

Bolton Comment 6: "The TMDL report states that the loss of shelter for juvenile fish has resulted in increased mortality but there is no indication that any predation studies were undertaken."

We acknowledge that predation studies were not undertaken. Due to limited resources, the Limiting Factors Analysis excluded from consideration predation and food-web interactions. We infer that the scarcity of good quality rearing habitat (indicated by low in-stream shelter scores) has contributed to lower success for juvenile steelhead. The Staff Report, Section 3.4 Limiting Factors Analysis has been revised (see response to Bolton Comment 5) to provide this clarification.

Permeability and pool filling

Bolton Comment 7: "Chapman is cited as the source for information on survival and permeability. However, close reading of Chapman (1988) discovers an article by Coble (1961 cited in Chapman 1988) that indicates that velocity (a measure of permeability) is not related to survival of steelhead embryos when normalized for a dissolved oxygen level of 6 mg/l…. In other words, survival is only related indirectly to velocity in so far as velocities are related to DO. Chapman (1988) also says that one cannot predict egg survival quantitatively or with any accuracy based solely on physical factors such as fines and permeability because the process of redd formation creates a different condition around the eggs creates a different condition around the eggs than exists in non-redd gravels."

Where oxygen-rich groundwater discharges into the surface streamflow, the relationship between dissolved oxygen concentration and permeability may be poorly correlated. However, steelhead and salmon typically select spawning sites where streambed topography is convergent vertically and horizontally. At these sites, the infiltration and/or seepage rate of surface streamflow is intensified, and there is a very strong correlation between permeability and dissolved oxygen content, and between both of these parameters and fine sediment concentration (Tagart, 1976). We selected permeability, as opposed to dissolved oxygen content, as our metric because it is much more time efficient to measure, and because a large proportion of potential spawning sites are associated with convergent streambed topography. At such sites, a high concentration of fine sediment will significantly reduce permeability and dissolved oxygen concentration, and therefore cause high rates of egg and/or embryo mortality.

We also made the following revisions to the Staff Report, Section 5.1 Permeability, to provide further clarification, as shown below:

Background and Rationale

Streambed permeability, or the flow rate of water through the streambed, is a key factor influencing the survival of incubating salmonid eggs and larvae. Streambed permeability is significantly and positively correlated with survival to emergence (Chapman, 1988). Cool, clean water flowing through the streambed is needed to provide and replenish dissolved oxygen and to remove metabolic wastes. Streambed permeability is a function of the size distribution and packing of coarse sediment (gravels) and finer sediment contained in the streambed. Streambed permeability is inversely related to fine sediment concentration, primarily sand grains with diameters ≤ 1 mm that are deposited in the streambed (McNeil and Ahnell, 1964). ~~See figure~~ Figure 3 shows this relationship.

There also is a strong positive correlation between permeability and dissolved oxygen content where the topography of the streambed converges vertically and horizontally, such as at the boundary between the tail of a pool and the head of a riffle (or where bars and/or large woody debris create the same conditions); this topography causes a portion of the streamflow to discharge into the streambed (Tagart, 1976). Steelhead and salmon typically choose these types of sites for spawning. When a large amount of fine sediment is deposited in the streambed, permeability can be reduced by a substantial amount with consequent adverse impacts to the survival of incubating salmon and trout eggs and larvae.

In 2004, the Sonoma Ecology Center measured streambed permeability at eighteen potential spawning sites for steelhead located in mainstem Sonoma Creek and its tributaries and reported a median value of approximately 1800 cm/hr, which corresponds to a predicted value for survival ~~rate~~ of approximately ~~29~~30 percent ~~for eggs and larvae~~or greater for salmonid embryos from spawning-to-emergence (SEC~~Limiting Factors Analysis~~ et al., 2004). The Sonoma Ecology Center also prepared a sediment source analysis to quantify rates of sediment delivery to channels in the Sonoma Creek watershed, and to distinguish natural and human causation. Based on this work, they conclude that human actions have caused an approximate doubling of the sediment supply to Sonoma Creek within the historical period (SEC~~Sediment Source Analysis~~ et al., 2006).

Furthermore, many management related sources (e.g., road-related sources, vineyard erosion, construction) are richer in fine sediments (sand, silt, and clay) than most natural sources and are chronically delivered[7], which may further exacerbate the amount of fine sediment (e.g., sand) that remains stored in the channel.

~~In~~ Recent research by Cover et al. (2006) demonstrates that sediment supply and streambed sedimentation levels are strongly correlated when supply is scaled to account for stream power. Consistent with the results of Cover et al. (2006), in the Napa River watershed ~~we~~ Water Board staff found a strong negative correlation between streambed permeability and sediment supply scaled for stream power[8] (SFBRWQCB Board, 2007; see Figure 7). The data used to develop ~~this~~the Napa River watershed relationship span a wide range of values for sediment supply rate, permeability, and stream power including the typical ranges for these parameters in stream reaches in the Sonoma Creek watershed that provide potential habitat for salmonids. Based on the relationship between permeability, sediment supply, and stream power (developed in the Napa River watershed), the results of Cover et al. (2006), and the work of McNeil and Ahnell (1964), we conclude that:

- Low permeability values at potential spawning sites in Sonoma Creek and in its tributaries are explained, at least in part, by a high concentration of fine sediment (primarily sands) in the streambed.
- Current values for permeability at potential spawning sites for steelhead and salmon in the Sonoma Creek watershed are lower than natural background values as a result of increases in sediment supply that are related to land use activities.

We propose a numeric target ≥ 7000 cm per hour as the reach-median value for streambed permeability at all potential spawning sites for salmon and steelhead in the mainstem of Sonoma Creek and its tributaries. We predict that this value corresponds to approximately 50 percent or greater survival of incubating salmon and steelhead eggs and larvae between spawning and emergence[9]. We conclude that the proposed target value is protective and attainable based on the following rationale:…

Footnotes to this section:

[7]Chronic refers to repeated sediment delivery every year regardless of whether there is a large storm event or above average precipitation, versus a discrete source, as in the case of most shallow landslides (e.g., debris avalanches), where the bulk of the sediment delivery occurs once at the time of the failure (e.g., during a large storm event) or soon thereafter.

[8]Stream power is defined as the rate of energy expenditure by water, as it flows through a channel. Stream power is directly proportional to the product of streamflow discharge multiplied by water surface slope. In our analysis, we use drainage area as a surrogate for streamflow discharge. Only a fraction of total stream power is available to transport sediment. This is because energy is also expended through internal friction within the fluid, and friction along the channel boundaries caused by grain roughness, large obstructions (like debris jams, bedrock outcrops, bridge piers, etc.), and/or other changes in channel width, depth, and direction of flow encountered along the length of the channel. In reaches where we measured permeability, channel form and substrate sizes varied substantially. Therefore our estimates of total stream power only provide a relative estimate of the fraction of stream power that is available to transport sediment.

> [9]The egg survival-to-emergence index is developed from data relating gravel permeability to survival of coho and/or Chinook salmon eggs. Based on review of Coble (1961), Barnard and McBain (1994), and Rubin and Glimsater (1996), we conclude that steelhead egg survival-to-emergence is 60 percent or greater at a permeability value of 7,000 cm/hr.

Bolton Comment 8: "Data on the effects of sediment size on fry emergence are also quite varied. Reported sizes of sediment that negatively affect emergence range from <0.84 mm to 8 mm. The TMDL report defines fine sediment in section 1.4 as anything <11.2 mm…other definitions…use 2 mm as upper limit of fine sediments."

The Staff Report (Section 1.3 Project Definition and Objectives and Section 5.3 Substrate Composition- Percent Fines) has been revised to clarify the use of the term "fine sediment" as follows:

> ~~1 Fine sediment consists of fine gravels (granular size, or approximately 2 mm-11.2 mm in diameter), sand, silt, and clay. In the Sonoma Creek watershed, most impacts due to fine sediment are from sand-sized particles, with some impacts likely from fine gravels.~~ [2]In this report, unless otherwise noted, we use the term fine sediment to refer primarily to sand and fine gravel (e.g., ≤ 10 mm in diameter) deposited in or on the streambed in fish bearing reaches of gravel- or cobble-bedded channels. High concentrations of fine sediment in the streambed are associated with: a) poor rates of survival of salmonid eggs from spawning-to-emergence; b) diminished growth and survival of juvenile salmonids during the dry season; and/or c) low rates of survival of juvenile steelhead during the wet season.

Bolton Comment 9: "The TMDL report states that elevated water temperatures due to lack of shade, loss of deep pools and low base flows is an adverse factor for fish populations but the Limiting Factor report states that summer water temperature is a critical factor only in localized areas…"

Temperature monitoring, conducted as part of the Limiting Factors Analysis, indicates temperatures may be stressful on lower reaches of mainstem Sonoma Creek and on lower Nathanson Creek. The Staff Report, Section 3.4 Limiting Factors Analysis (subsection Stressful Water Temperatures) has been revised (as shown in the response to Bolton Comment 5) to clarify the locations of stressful water temperatures.

Bolton Comment 10: Dr. Bolton comments that low summer base flows are reported, but that it is unclear whether it is historical.

We have added the following text to the Staff Report, Section 3.4 Limiting Factors Analysis (subsection Low Flows and Migration Barriers):

The cause of the observed low summer base flows is not known for certain. Low summer flows are likely the result of multiple factors including a Mediterranean climate, geology, groundwater withdrawals, and watershed disturbances leading to incision and a lowering of the water table. While some dry reaches may be naturally occurring, historical maps and accounts dating from the 1820's show evidence that the valley used to be significantly wetter, with summer surface ponding (indicative of a high water table) and abundant springs flowing at the base of the Mayacamas and foothills of Sonoma Mountain (SEC et al, 2004; SEC, 2002).

Bolton Comment 11: "[T]he report focuses solely on adult upstream migration and does not take into account the movement of juvenile fishes, both upstream and downstream. Ensuring that barriers are removed or passable to both adults and juveniles is important for population recovery."

We agree that ensuring that barriers are removed or passable to both adults and juveniles is important for population recovery. In the Staff Report, Section 8.6 Habitat Enhancement Plan (subsection Address Fish Barriers), we recommend retrofitting or replacing problem structures (road crossings) to allow fish passage in general, not solely for adult upstream migration. We have revised the Staff Report, Section 3.4 Limiting Factors Analysis (shown in response to Bolton Comment 5), subsection Barriers to Fish Passage, to clarify that barriers can also (in addition to prevent migration) restrict the ability of rearing juveniles and resident adults to move about in the stream to feed, or seek shelter and other resources. In addition, we have revised the Basin Plan Amendment, Table 5.3 Recommended Actions to Restore Fish Passage (now also included in the Staff Report as Table 14), as follows:

Table 5.3 Recommended Actions to Restore Fish Passage

Recommended Action	Management Objective(s)	Action(s)	Implementing Parties	Schedule/ Notes
Address Fish Passage Barriers	No significant structural impediments to salmonid migration or passage in mainstem or key tributaries Reduce the number of	3.1 Design, replace or retrofit road crossings to allow fish passage according to fish-friendly guidance such as those developed by FishNet 4C , Department of Fish and Game, or other appropriate entity with expertise in salmonid habitat restoration.	Local public agencies, watershed groups and landowners	

	stream miles inaccessible to fish	3.2. Develop, prioritize, and implement plans to remove identified barriers to fish passage	Local public agencies, watershed groups, and landowners	

Bolton Comment 12: "The coincident factors of excessive fines and channel incision are odd. Channel incision usually results from scour and transport of sediment out of the channel and substrate coarsening of remaining sediment. The energy required to scour and incise is typically sufficient to transport fine sediments downstream. Deposition of excessive fines usually leads to channel filling and aggradation which is the opposite of incision. A clarification of these two factors would be useful. The ditching and channelization of old alluvial plains would increase drainage density and tend to increase storm discharge and energy for flushing out fines."

The co-occurrence of active incision and streambed fining may be the result of a variety of causes. To describe these causes, we have added the following discussion to Section 6.4 Channel Incision, Gully Erosion, and Landslides (subsection Discussion of Channel-based sediment delivery), of the Staff Report:

> Following incision, the mainstem and lower alluvial tributary reaches of Sonoma Creek have continued to adjust. Local experts who have evaluated substrate conditions and channel dynamics along the mainstem of Sonoma Creek, and Schell and Nathanson creeks have observed high concentrations of fine sediment (sand and finer-sized particles) in the streambed at potential spawning sites for salmonids in reaches that are hypothesized to be actively incising and/or widening (Collins, 2008; Micheli, 2008). Co-occurrence of active incision and streambed fining may result from a variety of causes including:
>
> a) During flows above bankfull stage, high rates of bank erosion on banks with abundant fine sediment and/or stream bed incision (that occurs within fine-particle-sized bedrock formations that are exposed or become exposed) provide a chronic supply of fine sediment that is subsequently deposited at flows below bankfull stage on the falling limb of the hydrograph (Micheli, 2008; Collins, 2008).
>
> b) In the lower gravel-bedded reaches of Sonoma and Shell creeks, fine sediment deposition can be associated with backwater flooding caused by the coincidence of high tides and large flood events (Collins, 2008).
>
> Other causes also may explain co-occurrence of active incision and elevated fine sedimentation. This topic represents a key data gap that should be filled through additional monitoring and analysis, to aid channel management and habitat enhancement efforts.

Bolton Comment 13: "Incision is rightly noted as a negative factor but very little is mentioned about how to minimize it or control it."

Channel incision is caused by many factors, and is an aggregate impact of all of the changes in the watershed that have altered flow patterns or directly disturbed the riparian area. Our plan proposes to minimize future channel incision and reverse some of the impacts of existing incision by requiring stormwater management (i.e., attenuating peak flows and durations) and by supporting channel restoration. We have revised the Staff Report, Section 8.5 Sediment Reduction and Control/New Regulatory Programs (subsection Channel Incision); and Section 8.6 Habitat Enhancement Plan, to clarify our approach to minimizing channel incision.

Section 8.5 Sediment Reduction and Control/New Regulatory Programs (subsection Channel Incision) has been revised as follows:

> ***Channel Incision***
>
> ~~There are a number of ways to address channel incision. Maintaining intact riparian corridors (via setback requirements, if necessary) accelerates natural recovery. Reach-based channel restoration projects can restore habitat locally and help with downstream recovery as well. To address channel incision in Sonoma Creek and its tributaries, we will rely on multiple approaches, including regulatory programs to prevent increases in stream peak flow and avoid direct impacts to the stream corridor, and collaborative stream restoration and habitat enhancement projects (see the Habitat Enhancement Plan section of this report).~~
>
> We use the term channel incision to refer to the progressive lowering over time of streambed elevation as a result of net erosion[23]. Channel incision typically results from some combination of: a) a significant increase in peak runoff flow rates and durations (e.g., energy available to erode the bed and banks is greater than the ability of the channel to resist erosion); b) a significant decrease in the supply of coarse sediment (e.g., incision occurs because capacity to transport sediment is greater than supply); and c) direct disturbances that reduce resistance to erosion or focus energy along the banks or bed. There are a number of ways to address the causes of channel incision, including attenuating increases in peak runoff rates and durations associated with new and re-development of structural and agricultural projects; maintaining/restoring riparian corridors; and limiting direct disturbances to channels may accelerate natural recovery. Active and direct interventions, such as reach-based channel restoration projects may also be effective provided that the causes for channel instability and habitat simplification are addressed. To address channel incision in Sonoma Creek and its tributaries, we will rely on multiple approaches, including regulatory programs to: a) attenuate runoff flows and durations, and b) avoid direct impacts[24] to the stream corridor. Also, we will rely on collaborative/non-regulatory efforts including stream restoration and habitat enhancement projects (see the Habitat Enhancement Plan section of this report) to reverse some of the adverse impacts of channel incision on water quality and habitat integrity.
>
> ***Attenuation of Peak Flow Rates and Durations/ Hydromodification Management***

The Water Board considers increases in runoff flow rates and durations a form of pollution, in that the increased energy from these flows can cause erosion of stream bed and banks, resulting in the loss of beneficial uses in the receiving water body. In urban areas of the San Francisco Bay Area, NPDES Phase I Municipal Stormwater Permits require permittees to control increases in runoff associated with new and redevelopment.

Attenuation of peak flow rates and durations from new and redevelopment projects, to the maximum extent practicable (MEP), is essential to the success of the TMDL, in order to avoid new sources of channel incision-related sediment supply as future development projects increase the amount of impervious surface across the Sonoma Creek watershed.

We consider MEP to be those standards specified in the Phase I Municipal Regional Stormwater Permit Tentative Order (NPDES Permit No. CAS612008, provision C.3) (SFBRWQCB, 2007b), excerpted below:

> *Stormwater discharges from (new and redevelopment projects of one acre or more impervious surface) shall not cause an increase in the erosion potential[25] of the receiving stream over the pre-project (existing) condition. Increases in runoff flow and volume shall be managed so that post-project runoff shall not exceed estimated pre-project rates and durations, where such increased flow and/or volume is likely to cause increased potential for erosion of creek beds and banks, silt pollution generation, or other adverse impacts on beneficial uses due to increased erosive force.*

The Tentative Order further specifies the elements required for the demonstration that post-project stormwater runoff does not exceed estimated pre-project runoff rates and durations.

Sonoma County and its municipalities are regulated by NPDES Phase II Municipal Stormwater requirements of the Clean Water Act, under the General Permit for the Discharge of Storm Water from Small MS4s (Small MS4 Stormwater Permit) (WQ Order No. 2003-0005-DWQ). As with Phase I, the Small MS4 Stormwater Permit contains requirements related to treating runoff from new and redevelopment projects. However, the current Small MS4 Stormwater Permit does not require attenuation of runoff peak flows and durations (such requirements are being considered for a future reissuance of the Small MS4 Stormwater Permit. Because increased runoff rates and durations caused by new impervious surfaces will exacerbate the known water body impairment caused by sediment in the Sonoma Creek watershed, the Water Board will use one (or more) of the following mechanisms to implement attenuation of peak flow rates and durations from new and redevelopment projects in the Sonoma Creek watershed:

1. The statewide Small MS4 Stormwater Permit (the reissued permit may include requirements for attenuation of peak flow rates and durations)
2. The regionwide Municipal Regional Stormwater Permit (MRP) (the Water Board could expand it to include Sonoma Creek watershed municipalities)
3. An individual stormwater permit for Sonoma Creek watershed municipalities
4. The statewide Construction General Permit, which is currently in the reissuance process (the reissued permit is anticipated to include

requirements for post-construction control of increased stormwater runoff flows and durations.

Protection of Stream Corridors

The Stream Protection Policy now under development by the Water Board is intended to further clarify Water Board authorities and to provide regulatory and non-regulatory incentives for landowners and local government agencies to protect and restore stream and riparian habitats. In channel reaches that are actively incising and/or widening, projects that are intended to stabilize a stream bank (but are only evaluated locally at an erosion site and do not consider the primary causes for instability that may be related to reach- or watershed-scale phenomena) are often ineffective, or may transfer erosion problems to other sites. Similarly, many of the disturbances that are causing channel instability are also contributing factors to the chronic flooding and habitat degradation along the mainstem and lower tributary reaches of Sonoma Creek. Therefore, projects undertaken at the reach-scale to address multiple objectives including flood management, habitat restoration, and channel stability have a much greater potential to be effective in achieving all of these goals. This topic is discussed in further detail below in Section 8.6.

Channel Incision Impacts

Sediment produced by channel incision will be the TMDL's highest priority for source reduction and control because this sediment is produced adjacent to the streambed, and is likely to have a greater effect on fine sediment deposition at spawning and rearing sites in Sonoma Creek than more remote sources of sediment delivery. In addition to being a significant sediment source, channel incision devastates the physical habitat structure of the creek by disconnecting the creek from its floodplain, destabilizing streambanks and riparian vegetation, and eliminating pools, riffles, and in-stream shelter. Channel incision problems along Sonoma Creek and its tributaries result from multiple historic and ongoing disturbances, some of which are local and/or direct, and others that are indirect and farther away.

Footnotes to this portion of Section 8.5:

[23]Incision is distinguished from "streambed scour." Streambed scour is local in space and/or time and balanced by fill, provided there is a balance between channel sediment transport capacity and supply.

[24]Example projects that may cause significant direct disturbances to channel stability include building and/or agricultural development within channels or riparian corridors, road crossings, outfalls, bank stabilization projects, flood control structures, vegetation and/or woody debris maintenance activities.

[25]The erosion potential (Ep) of increased flows and durations of flows from new/redevelopment projects indicates the impact of these flows on stream stability. Ep is expressed as the ratio of post-project to pre-project "work done" on the stream by the increased flows and durations of flows. Using the Ep index as a point of reference, the management objective is: [Stormwater discharges from new/redevelopment projects shall not cause an increase in the erosion potential of the receiving stream over the pre-project (existing) condition, i.e., an Ep of up to 1.0 will be maintained for all stream segments downstream of the project discharge point]

Section 8.6 Habitat Enhancement Plan has been revised as follows:

8.6 Habitat Enhancement Plan

In Sonoma Creek, as well as in many Bay Area watersheds, ~~controlling~~ reducing the rate of fine sediment ~~will not be enough~~delivery to ~~restore~~ channels is a necessary action to support conservation and ~~protect~~ recovery of the steelhead fishery. In addition to reducing fine sediment supply, specific actions ~~are~~ (including but not necessarily limited to the following) also are needed to:

- Prevent and reduce channel incision
- Enhance the physical habitat structure of mainstem Sonoma Creek and its tributaries by: a) increasing in-stream shelter, pools, and large woody debris; and b) by reversing the adverse impacts of channel incision on habitat complexity and connectivity
- Enhance summer baseflows
- Address fish barriers

The Habitat Enhancement Plan provides a framework that supports and integrates local restoration efforts (by watershed groups, landowners, and local agencies) to address key factors impacting salmonid species in the Sonoma Creek watershed. The Limiting Factors Analysis (SEC et al., 2006) and other information relevant to conservation and recovery of native fish and aquatic wildlife species in the watershed (USFWS, 1998) provide more detailed guidance on restoration measures and priorities.

Key goals of the Habitat Enhancement Plan are to increase habitat complexity and make progress towards a balanced sediment budget in Sonoma Creek and its tributaries. The water quality indicators we propose to measure progress towards these goals are described below.

Habitat Complexity

Water Quality Indicators

We propose the following water quality indicators that correspond to an improving trend in habitat complexity, and progress toward achievement of a balanced sediment budget (e.g., the amount of fine and coarse sediment input to a given channel reach is equal to the amount that is transported downstream). There should be an increasing trend through time in the percent of the length of mainstem of Sonoma Creek, and in the lower alluvial reaches of its tributaries, that attain the following conditions:

1. The bankfull channel width-to-depth ratio is ≥12:1, as needed to support formation of alluvial gravel bars (Jaeggi, 1984).
2. The average spacing between alluvial and/or forced gravel bars within the active channel is ≤7 times the width of the bankfull channel (Leopold, Wolman, and Miller, 1964).
3. Available shear stress at bankfull does not exceed the amount required to initiate motion of the streambed by more than approximately 20 percent; consistent with values in natural, stable gravel-bedded channel with low bedload sediment supply (Andrews, 1984).
4. Floodplain width is ≥4 times bankfull channel width, as defined above, consistent with the requirement for freely formed bed and banks for a sinuous wandering gravel-bed channel

Also, there should be:

1. An increasing trend through time in the mean area and frequency of riffles and gravel bars within the mainstem channel; and
2. A decreasing trend through time in the percent of the length of the mainstem of Sonoma Creek and in the lower alluvial reaches of its tributaries, where banks or bed are hardened, and/or where constructed levees contribute to channel instability.

Background and Rationale

Accelerated rates of bed and bank erosion, as a consequence of channel incision, are the dominant human-caused sources of sediment that are delivered to Sonoma Creek (SEC~~*Sediment Source Analysis*~~ et al., 2006), and the primary agent for habitat simplification of mainstem Sonoma Creek and in the lower alluvial reaches of its major tributaries (SEC~~*Limiting Factors Analysis*~~ et al., 2004). As a consequence of incision, the frequency and area of riffles and gravel bars has been greatly diminished, and the mainstem has been decoupled from its floodplain and side channels.[~~26~~27] These changes greatly diminish the suitability of stream-riparian habitats for native fish and aquatic wildlife species. Also, such changes may cause substantial damage to streamside property, and present a significant risk of damage to key public works and streamside buildings, as the channel attempts to re-establish stability.

Although it may be possible to achieve a substantial reduction in bed and bank erosion rates through an engineering approach relying on structures to harden banks and control bed elevation (e.g., grade control), such an approach would present a significant risk of further damage to habitat complexity. Also, it is unclear whether such an approach ultimately would be effective in reducing erosion rates, and it would be quite costly to construct and maintain. Furthermore, such an approach has the potential to contribute to the persistence of chronic downstream flooding within the estuarine reach[~~27~~28].

In contrast, using a geomorphic approach to reduce bed and bank erosion rates has the potential to be effective both in reducing erosion rates and in partially reversing some of the impacts to habitat complexity that have occurred as a result of incision. However, adopting a geomorphic approach to restore channel stability probably also would have a greater impact on the land uses that could occur near the channel, and as such, potentially significant social, political, and economic constraints may influence feasibility.

Considering the degree to which habitat has been simplified by incision, from the standpoint of the attainment of water standards[~~28~~29] the only feasible approach for reducing bed and bank erosion, is to adopt an approach that results in at least partial reversal of the adverse changes to habitat.

Strategy

We expect that watershed-based collaborative efforts, supported by incentive and funding programs, will accomplish many of the habitat enhancement actions needed to restore a healthy fishery. ~~Sonoma Valley has a history of land stewardship, as evidenced by the fact that the watershed is still highly vegetated and forested.~~ Groups and agencies such as the Sonoma Ecology Center, Parks Departments (State and County), RCD, and Sonoma County Water Agency have strong interest and history in implementing stream restoration, habitat enhancement, and landowner stewardship/education programs. The Sonoma Ecology Center and RCD are working collaboratively with an advisory committee to update the Sonoma Creek Watershed Enhancement Plan (WEP), which was

first completed in 1997. Covering a wide range of watershed issues, the WEP identifies natural resource issues concerning residents, recommends a course of action to address those issues, and identifies information needs. The WEP shares common goals with the Habitat Enhancement Plan, including conserving and improving stream habitat. While the WEP update is currently in progress (anticipated to be completed in late 2009), we expect that it will incorporate the goals and implementation measures of the TMDL and Habitat Enhancement Plan. Such an updated and comprehensive WEP could provide a planning tool to develop and implement specific habitat enhancement projects.

The limiting factors analysis and habitat surveys identify several restoration priorities and potential projects, and these recommendations provide a good foundation for further developing restoration and habitat enhancement projects. In addition, habitat enhancement holds many benefits beyond restoring a healthy fishery, including easing long-standing flooding problems and enhancing recreational values and tourism.

Water Board staff are interested in working together with local stakeholders and agency partners in the Sonoma Creek watershed to explore the potential to plan and implement projects that will lead to a healthier creek. There are several grant programs administered by the Water Board that could provide partial funding to support stakeholder involvement, planning, research, and construction of channel enhancement projects. The next opportunity should be the Agricultural Water Quality Grant Program. We expect the State Board to release a request for proposals for the Agricultural Water Quality Grant Program in the spring of 2008.

Preventing and Reducing Channel Incision

At this time we do not intend to propose a regulatory permitting program to require channel restoration and resolve the many adverse ecological and water quality impacts of channel incision. However, channel incision supplies more than half of the sediment load to Sonoma Creek, and much of the load is fine sediment. ~~To~~Therefore, to achieve the TMDL, progress must be made in reducing sediment loads from channel incision.

Channel incision is a complex process, and solutions will require multiple approaches. We expect that existing and future permitting programs will help prevent additional incision as they require practices that will accelerate natural recovery (such as maintaining setbacks and preserving riparian corridors).

Existing channel incision must be addressed in a holistic way, on a reach basis, rather than property-by-property in most cases. Because stream processes work to balance energy, flow, and sediment, incision repair work on one bank or in one isolated section of a creek can have unintended and negative impacts on adjacent, crossbank, or downstream areas. Channel restoration must be done in a coordinated fashion, and it will be important to bring together all available technical expertise. Two reach-based landowner groups have formed recently in the adjacent Napa River watershed that are examining opportunities to enhance channel stability, water quality, and habitat conditions throughout approximately 12.5 miles of the mainstem of the Napa River. The first phase of project construction in the 4.5-mile long Rutherford reach is projected for the summer of 2009. Scientific studies and outreach to landowners and public agencies are underway in the 8-mile long Oakville-to-Oak Knoll reach to develop a conceptual plan for channel enhancement that will be completed before the end of this year. Although Napa River and Sonoma Creek differ in some important aspects, these

projects may provide insights that could be applied to channel enhancement efforts in Sonoma Valley.

To control channel incision in a way that enhances habitat for fish and aquatic species, we recommend and support cooperative and coordinated actions by multiple landowners, planned and executed over significant distances along the river. To make efficient use of resources, projects should be planned and designed to provide multiple benefits, such as floodwater retention (by restoring floodplains), enhancing habitat (by encouraging pool formation), and bank stabilization. By creating stable banks, large-scale channel restoration project can also stabilize landslide areas and reduce sediment loads from landslides. Such large-scale, multi-benefit projects ~~will~~ should be ~~more~~very competitive for grant funding as well as easier to manage.

The geomorphic analysis performed as part of the Sediment Source Analysis (SEC et al., 2006, Appendix C~~), should be used to guide channel restoration priorities~~provides useful information regarding the degree of channel incision and the amount of fine sediment exposed in stream banks. This analysis includes a map showing areas of high incision in the watershed, and estimates of percent fines in specific locations. This information could help to identify top priority sites for channel restoration.

Footnotes to this section:

~~26~~27Most of the valley floor was an active floodplain prior to incision during the historical period. The floodplain was inundated on an annual basis or more frequently. Side channels conveyed a large portion of the runoff and sediment supply to Sonoma Creek. Many of these side channels are now filled or perched above the mainstem, and therefore under current conditions, are no longer significant conduits for runoff or sediment transport.

~~27~~28Loss of floodplains, simplification of channel form, and/or persistence of accelerated rates of bed and/or bank erosion, all may contribute to exacerbation of downstream flooding through less detention and/or faster routing of runoff and increased sediment load which has the potential to fill channels, and thereby reduce flood conveyance capacity.

~~28~~29These include attainment of the water quality objective for population and community ecology, and the rare and cold freshwater habitat beneficial uses.

Numeric Targets

Bolton Comment 14: "Focusing on process rates, such as sediment delivery, large woody debris delivery, channel shading and water delivery minimizes the potential of accidentally improving a particular segment of a population at the expense of the overall aquatic community of other life stages. The targets expressed in the TMDL report are the symptoms of what is wrong. More focus on the processes that create these symptoms and have they changed over time is recommended."

We agree that looking at process rates is important in tracking how the stream system is responding to management practices or restoration activities, as well as how the system is adjusting to past disturbances. As described in the Staff Report, Section 8.6 Habitat Enhancement Plan; and in the Basin Plan

Amendment, Monitoring and Evaluation Section, we propose water quality indicators that correspond to an improving trend in habitat complexity and progress toward achievement of a balanced sediment budget (i.e., the amount of fine and coarse sediment input to a given channel reach is equal to the amount that is transported downstream). These water quality indicators (bankfull channel width-to-depth ratio, average spacing between gravel bards, available sheer stress, floodplain width, riffle size and frequency, length of hardened banks) will help to measure progress towards the goals of the Sediment TMDL and Habitat Enhancement Plan.

For numeric targets in the Sediment TMDL, we selected targets based on the following criteria: a) relevance to biological requirements of salmonids; b) responsiveness to changes in sediment supply; c) degree of measurement reliability; d) amount of effort necessary to obtain a representative sample; and c) availability of baseline data.

The Evaluation and Monitoring Plan proposes to monitor for water quality indicators as well as numeric targets, to measure progress towards attaining the Sediment TMDL as well as progress towards attaining habitat complexity and a balanced sediment budget.

Bolton Comment 15: Dr. Bolton comments that the proposed targets for substrate composition are already met, according to the data presented in the Limiting Factors report.

As discussed in more detail in the revised Staff Report, Section 5.3 Substrate Composition-Percent Fines, we do not believe the preliminary study of spawning suitability (conducted as part of the Limiting Factors Analysis) provides a basis for inferring whether or not spawning substrate quality is suitable in general at potential spawning sites throughout the watershed:

> **5.3 Substrate Composition-Percent Fines**
>
> ~~Substrate composition~~ Grain size distribution of ~~a watercourse~~the streambed is a common measure of salmonid spawning habitat quality because fine sediment ~~particles~~grains, called fines, have the potential to impact embryo development and block passage of fry (NCRQCB, 2006). We propose two targets for percent fines in the substrate (% ~~Fines <~~streambed particle sizes < 0.85 mm and % ~~Fines~~streambed particle sizes < 6.40mm~~) because the size of fine sediment particles likely to fill the interstices of redds sufficient enough to block passage of fry (preventing emergence) is larger~~). In general, particles finer than ~~the sediment size likely to suffocate embryos~~about 1 mm exert a primary influence on incubation success (McNeil, 1964). Particles ranging from 1 mm to 10 mm in size can block fry emergence while still allowing enough water flow through the redds to support embryo development (Kondolf, 2000; NCRWCB, 2006). As such, unless otherwise noted, we use the term fine sediment to refer primarily to

sand and fine gravel (e.g., ≤ 10 mm in diameter) deposited in/on the streambed in fish bearing reaches of gravel- or cobble-bedded channels. Fine sediment that impacts embryo development has been defined as particles that pass through a 0.85 sieve (NWQCB, 2006).[10] A high percentage of sand or fine gravel in the streambed also can adversely affect the frequency of streambed scour, biomass of vulnerable prey species in the streambed, and/or suitability in general of summer and winter rearing habitat for salmonids. These issues are summarized in Water Board (2007, p. 8-9)

Targets

The target value for percent fines ~~less than~~< 0.85 mm is a substrate composition, where the mean value for percent fines < 0.85 mm as estimated from a representative sample of ~~fine sediment less than 0.85 mm in diameter~~potential spawning sites is ~~less than or equal to~~< 14 percent of the total weight of the bulk core sample~~(i.e. <14% fines < 0.85 mm).~~ The target value for percent fines ~~less than~~< 6.4~~0~~ mm is a substrate composition, where the mean value for percent ~~of fine sediment less than 6.40 mm in diameter is less than or equal to 30 percent of the total bulk core sample (i.e., < 30%~~ fines < 6.4~~0~~ mm~~).~~ as estimated from a representative sample of potential spawning sites is < 30 percent of the total weight of the bulk core sample. These targets are applicable to potential spawning sites for anadromous salmonids in wadeable[11] streams and rivers with gradient less than 3 percent. Potential spawning sites for anadromous salmonids in the Sonoma Creek watershed can be identified based on occurrence of the following attributes: l) dominant substrate size in the streambed surface layer is between 8 and 128 mm; 2) a minimum surface area of gravel deposit of 0.2 m^2 in tributaries and 1.0 m^2 within the mainstem Sonoma Creek; and 3) location at a riffle head, pool tail, and/or pool margin where streambed slope ≤ 0.03, or where the streambed slope is > 0.03, in pool tails, backwater pools, and/or in gravel deposits associated with flow obstructions (e.g., woody debris, boulders, banks, etc.).

Background and Rationale

Much research has been conducted to relate salmonid survival to emergence with the size of the substrate. Two targets for substrate composition are needed because the size of particles that impact embryo development (0.85 mm in diameter) is smaller than the size of particles impacting emergence from the redd (1 mm to 10 mm). Based on extensive literature review, the North Coast Regional Water Board determined that the salmonid freshwater habitat desired conditions for substrate composition are: a) percent of fine sediment less than 0.85 mm in diameter is less than or equal to 14 percent of the total bulk core sample, and b) percent of fine sediment less than 6.40 mm in diameter is ~~les~~less than or equal to 30 percent of the total bulk core sample (NCRWCB, 2006). As detailed in the North Coast Water Board's Desired Salmonid Freshwater Habitat Conditions for Sediment-Related Indices (NCRWCB, 2006), these targets correspond to a survival-to-emergence rate of 50 percent. Some of the studies evaluated for the desired condition were conducted in salmonid streams, while others were conducted in an experimental setting where the substrate was manipulated to study the effect of substrate size on survival-to-emergence.

The targets (for percent fines in the substrate) ~~compliment~~complement the proposed streambed permeability target because they provide a direct measure of the fine sediments affecting streambed permeability. These targets are attainable because they are met at several sites where recent spawning had been observed—Sonoma Ecology Center measured fine sediment content at eight known spawning sites (gravels) and the results indicate the proposed

percent fines targets are met at these locations (SEC, 2001~~).~~)[12]. A monitoring program that ~~included~~includes a larger number of sampling sites and a stratified random site selection scheme ~~may reveal many locations where these percent fines targets are currently not met~~is needed to reach conclusion with regard to the suitability in general of the full population of potential spawning sites within the watershed.

As with the streambed permeability target, we hypothesize that the reductions in chronic sources of fine bed-material associated with land-use activities needed to attain numeric targets for substrate composition-percent fines will also contribute to enhancement of summer and winter rearing habitat for steelhead.

Footnotes to Section 5.3

[10]The specific reference sizes, 0.85 and 6.4 mm (as opposed to 1 and 6 mm), result from the fact that the earliest researchers used US Standard Sieve mesh sizes (e.g., the sieves are machined in English units). They subsequently reported their research results in scientific journals, which use metric units. For comparison purposes, most subsequent researchers have used these same reference sizes.

[11]A wadeable stream is one which an average human can safely cross on foot during the summer, low flow season while wearing chest waders.

[12]The results of a preliminary study of the suitability of spawning gravel (summarized in Appendix G of SEC et al., 2006) indicate that both of the proposed targets for percent fines were attained at known sites of spawning, where successful incubation also was inferred based on subsequent presence of juvenile salmonids in the same reaches. Because only known spawning sites with inferred successful incubation were sampled, we do not think the preliminary provides a basis for inferring whether or not spawning substrate quality is suitable in general at potential spawning sites throughout the watershed.

Bolton Comment 16: "Clarification as to where in the system these targets are to be applied and whether for spawning gravels or pools substrate would be useful."

The streambed permeability and substrate composition-percent fines targets apply at potential spawning sites. As described in the revised Staff Report, Section 5.3 Substrate Composition-Percent Fines (shown in response to Bolton Comment 15), potential spawning sites for anadromous salmonids in the Sonoma Creek watershed can be identified based on occurrence of the following attributes: l) dominant substrate size in the streambed surface layer is between 8 and 128 mm; 2) a minimum surface area of gravel deposit of 0.2 m2 in tributaries and 1.0 m2 within the mainstem Sonoma Creek; and 3) location at a riffle head, pool tail, and/or pool margin where streambed slope ≤ 0.03, or where the streambed slope is > 0.03, in pool tails, backwater pools, and/or in gravel deposits associated with flow obstructions (e.g., woody debris, boulders, banks, etc.).

The pool filling target is to be applied at pools in channel reaches where the slope of the streambed is ≤ 5 percent, as shown in the revised Staff Report, Section 5.2 Pool Filling (see below);

5.2 Pool Filling

Target

There should be a decreasing trend through time in the mean volume of fine sediment ~~(sand and granules)~~ deposited in pools in channel reaches where the slope of the streambed is ≤ 5 percent.

Background and Rationale

The Sonoma Ecology Center has documented the amount of fine sediment deposition in pools in Sonoma Creek and its tributaries (e.g., mean value of pool filling = 8.5 percent), and noted that although fine sediment deposition does not cause a biologically significant reduction in pool volume, at the documented levels, fine sediment blankets most of the pool bottoms, thereby compromising the quality of pools as rearing habitat for juvenile salmonids (SEC, ~~Limiting Factors Analysis~~2006). The above observations are consistent with findings of Suttle et al. (2004), who manipulated concentrations of fine sediment in pools within a natural river bed to evaluate effects on growth and survival of juvenile steelhead, and concluded that:

- There is a strong negative relationship between juvenile growth and substrate embeddedness (e.g., the depth to which gravel and larger rocks are buried by adjacent finer bed-material) in pools.
- Even at very low levels of fine sediment deposition, growth and survival of juvenile salmonids is significantly diminished.
- "[T]here is no threshold below which exacerbation of fine sediment delivery and storage in gravel-bed rivers will be harmless."

Suttle et al. (2004) further documented mechanisms to explain decreased growth and survival rates with increasing levels of fine sediment deposition including: a) substantial reduction in the biomass of vulnerable prey species; b) increase in the activity level of individual fish (e.g., amount of time spent swimming); and c) increase in the number of aggressive interactions between fish sharing the same pool.

~~Although the mean value for pool filling in the Sonoma Creek watershed (mean value = 8.5 percent) is within the range~~ Adverse effects on growth and survival of ~~published~~ juvenile steelhead were most pronounced when the amount of fine sediment deposited in (experimentally manipulated) pools corresponded to substrate embeddedness values ~~for other watersheds underlain by bedrock types that do not produce a high percentage of sand or granules (3 to 15 percent; Lisle and Hilton, 1999; p. 1294~~≥ 60 percent. Based on observation of Figure 1 in Suttle et al. (2004), we ~~conclude that because human actions have increased total~~ would estimate that at 80 percent embeddedness, the corresponding level of pool filling would be much less than 10 percent.

Mean value for pool filling in Sonoma Creek watershed (8.5 percent) is within the range for other watersheds underlain by bedrock types that do not produce abundant sand and granules (e.g., 3-to-15 percent; Lisle and Hilton, 1999; p. 1294). However, the sediment delivery rate to channels in the Sonoma Creek watershed has increased by a factor of two-or-more as a result of land use activities (SEC~~, Sediment Source Analysis), fine sediment deposition in pools within the Sonoma Creek watershed~~ et al., 2006). Therefore, we conclude that fine sedimentation in pools is elevated above the natural background level. This conclusion is supported further by the results of Cover et al. (2006) and the relationship between sediment supply and permeability presented in the staff report for the Napa River sediment TMDL (SFBRWQCB, 2007a; Figure 14) which confirm that there is a strong correlation between sediment supply and sedimentation level.

We also hypothesize that because Sonoma Creek has a Mediterranean climate and active tectonic setting, natural sediment loads are highly variable and native biota are adapted to large infrequent sediment inputs associated with natural disturbances (e.g., large storm events, wildfires, and major earthquakes). Native biota are not adapted however to chronic increases in fine sediment load caused by land-use activities that disturb vegetation cover and/or infiltration capacity of soil (e.g., road-related erosion, agriculture, construction, timber harvest, livestock grazing, etc.). Under the natural sediment input regime, fine sediment input would be very low in most years, and the amount of fine sediment stored in the channel would be reduced rapidly following a large natural disturbance event, back to levels favorable for fish spawning and rearing. By this same rationale, significant reductions in the amount of chronic fine sediment input from land- use activities will facilitate a significant reduction in mean values of pool filling. We propose a target for decreasing trend through time in the mean volume of fine sediment stored in pools (expressed as a fraction of the total volume of the pool; see Hilton and Lisle, 1993) as needed to enhance food supply and summer growth and survival of juvenile salmonids and other native fish species.

Bolton Comment 17: Dr. Bolton comments that the Limiting Factors Analysis concludes there is a moderate level of certainty about the issue of pool filling and a low to moderate impact of pool filling on fish, in contrast to the "strong statements in the TMDL report on the negative effects of fine sediment….Suttle et al. shows little effect of embeddedness on fish growth until the embeddedness level reaches 60% and substantial change in mortality events did not appear until embeddedness reached 80%. It is important to remember that pool sediment is typically smaller than elsewhere in the river system as velocities are by definition slower in pools and smaller particles will settle. The questions is 'is there too much' or is the problem with the size of the fines. The TMDL report does not make use of many of the data that exist in the Limiting Factors report that could be used to back up the conclusions."

We have revised the Staff Report, Section 5.2 Pool Filling (shown in response to Bolton Comment 16) to address this comment.

Bolton Comment 18: "The proposed target is based on data which have some limitations as expressed in the Limiting factors report: only year of data, no data on tolerances of Sonoma Creek and a sample that included areas with very different slopes and areas."

We infer that Dr. Bolton is referring to the streambed permeability target, which was not based on (but rather was evaluated with) data collected as part of the Limiting Factors Analysis. The background and rationale for the streambed permeability target is discussed in the revised Staff Report, Section 5.1 Streambed Permeability Target (shown in the response to Bolton Comment 7). The limitations of the streambed permeability data collected in the Sonoma Creek Watershed are acknowledged.

Source Analysis

Bolton Comment 19: "RUSLE (Revised Universal Soil Loss Equation) and SEDMODL are commonly used and accepted practice for slopes and road, respectively…Uncertainty in model outputs is acknowledged and discussed. Many assumptions needed to be made but they are detailed and supported in the text."

We note and appreciate Dr. Bolton's confirmation that accepted practices were used in modeling sediment delivery from surface erosion and roads.

TMDL and Allocations

Bolton Comment 20: Dr. Bolton comments that a sediment TMDL expressed as a percentage of natural background is "sensible, facilitates looking at processes and sources instead of symptoms and implicitly accounts for temporal and spatial variability in load."

We note and appreciate the confirmation that the TMDL is sensible.

Bolton Comment 21: "[T]here are no size categories given for the TMDL. If land cover/land use and processes delivering sediment and the sizes of sediment have changed over natural background rates, simply lowering total sediment load may not achieve the desired decrease in fines." Dr. Bolton also states that "Unenforceable allocations of TMDLs are unlikely to achieve success in steelhead recovery or habitat conditions."

We expect that implementation actions will favor reduction in fine sediment (as opposed to coarse sediment). The implementation actions target chronic anthropogenic sources of sediment delivery (e.g., surface erosion and road-related erosion), which are typically much richer in percent fine sediment than natural process sources.

While the allocations themselves are not enforceable, the implementation actions are required and enforceable. If the required implementation actions do not achieve the allocations, the implementation actions will be adjusted as part of the adaptive management process, as needed to achieve the TMDL.

Bolton Comment 22: "Having the primary goal being the recovery of native salmon[id] populations may negatively affect more critically endangered species."

As discussed in our responses to Bolton Comments 1 and 2, the TMDL seeks to restore sediment input to Sonoma Creek to rates that are closer to natural background. We have added a section to the Staff Report (shown in response to Bolton Comment 1) that discusses the expected response of other native aquatic species to actions to reduce fine sediment. These actions are not expected to negatively affect native or endangered species.

Bolton Comment 23: "It is unclear what stream power index is used to arrive at the predicted permeability rates as the delivery rate varies with drainage area and by tributary features."

A TMDL of 125 percent of natural background equates to an annual sediment supply of 180 metric tons per km^2 . We used this sediment supply and the stream power index estimated for the Sonoma Creek at Agua Caliente to arrive at the predicted permeability rate. The stream power index at Agua Caliente was calculated as follows:

Stream power index at Agua Caliente = Drainage Area x Slope =

151 km^2 x 0.005 = 0.756

Bolton Comment 24: "Looking at modeled sediment delivery by sub-basin and presumed particle size may allow a much more efficient and effective approach to decreasing fine sediment delivery given the different geological layers and land use in various basins. This information could be used to

prioritize which basins are not in the worst conditions but also where enhancement efforts are most likely to be successful."

We agree available information and tools, such as those described in the Sediment Source Analysis, should be consulted when prioritizing sediment delivery reduction efforts.

Bolton Comment 25: Dr. Bolton notes that "the most effective method of decreasing the delivery of fine sediment is through storm water management."

Stormwater management is indeed an effective method of decreasing the delivery of fine sediment. Please see our response to Bolton Comment 13. In addition, the implementation plan (Section 8.5) requires sediment sources (e.g., livestock grazing, vineyards, urban stormwater, roads and stream crossings) be reduced in part through stormwater management.

Bolton Comment 26: Dr. Bolton suggests using available information to focus extra effort in particularly problematic areas.

We agree that available information should be consulted in selecting and prioritizing implementation of sediment reduction and habitat enhancement efforts.

Bolton Comment 27: "In various places in the TMDL plan reduction of sediment from human and land use activities is reported at 80% and 85%. The final document should have a consistent desired percentage reduction."

To achieve the TMDL, human-caused sediment delivery needs to be reduced by 82 percent. The Staff Report has been corrected throughout.

Big Picture Issues

Bolton Comment 28: "[T]he report then becomes focused on a single species and a limiting factor that has only a moderate certainty based on the Limiting Factors report. I recognize that this is a sediment TMDL report and assume that other reports are in progress that will address the high certainty, high impact findings from the Limiting Factors report and seek to take a more process and sub-basin prioritization approach in order to achieve the protection and enhancement of all native aquatic species."

As discussed in the revised Staff Report, Section 8.6 Habitat Enhancement Plan (see response to Bolton Comment 13), the Habitat Enhancement Plan provides a framework that supports and integrates local restoration efforts. Within this framework, we anticipate that more focused and detailed studies will continue to be undertaken to address the high impact/high certainty factors identified in the Limiting Factors Analysis.

Bolton Comment 29: "The alteration of hydrologic processes from land development, ditching, draining and roads may have led to a severely altered flow pattern that has contributed significantly to stream habitat degradation. Restoring habitat complexity and connectivity may be a higher priority tha[n] asking landowners to voluntarily meet standards that exist in terms of current BMPs that have resulted in the current situation in Sonoma Creek watershed. Most actions listed in the Water Quality Attainment chapter indicate that success will be achieved by compliance with existing standards (Tables 4.1 thru 4.5). Success is very unlikely if 'business as usual' continues."

The proposed implementation plan does not propose to achieve success by continuing "business as usual". Rather, (as stated in both the Staff Report, Chapter 8 Implementation Plan; and the proposed Basin Plan Amendment, Implementation section) the implementation plan calls for regulatory programs to require all significant dischargers (except natural processes) to control surface erosion and manage runoff, in order to reduce sediment delivery and achieve the TMDL. Specifically, the implementation plan calls for new regulatory programs to reduce sediment delivery from roads, livestock grazing lands, vineyards; and strongly recommends more stringent stormwater controls (see response to Bolton Comment 13) for construction projects and urban areas.

Our approach to the implementation plan is to build upon existing, local efforts and technical knowledge. That is why we discuss and recognize existing ordinances and guidance materials. We recognize that many landowners in the watershed have already taken advantage of the available resources (e.g., technical assistance from the local Resource Conservation District, handbooks for vineyard planting and management, guidance on fish-friendly road design and maintenance) and are implementing best management practices to reduce sediment delivery. Dr. Bolton's comment indicates she may have interpreted our recognition of existing, local efforts to mean that we are proposing "business as usual"- we are not. While many landowners practice good land stewardship, a significant portion of the watershed does not have effective management practices in place to control erosion, sedimentation, and prevent channel incision.

The intent of the implementation plan is to hold all significant sediment dischargers accountable to achieve trackable progress towards implementing sediment reduction management practices.

We infer that Dr. Bolton suggests that restoring habitat complexity and connectivity may be a higher priority than having landowners implement best management practices to control sediment. Restoring habitat complexity and connectivity is indeed needed to restore the native fishery, and that is why we have included the Habitat Enhancement Plan. However, control of upland sediment sources is also a necessary ingredient to reduce fine sediment delivery and support fish conservation goals.

Bolton Comment 30: "If samples are from the upper watershed and that is where the fish are, why is the TMDL being assessed at the lower end of the watershed?"

Progress towards achieving the TMDL will be assessed throughout the watershed. The TMDL is the *total* allowable sediment load to the freshwater portion of Sonoma Creek. To asses the *total* sediment load, we need to assess the TMDL at the lower end of the watershed. However, the TMDL is calculated at 125% of natural background to take into account natural processes and seasonal variation. This percentage-based TMDL of 125 percent of natural background applies throughout the watershed (as stated in the proposed Basin Plan amendment). Therefore, the TMDL will in fact be assessed throughout the watershed.

Bolton Comment 31: "I do not believe that the TMDL plan if implemented as indicated will achieve a high level of success in meeting [the stated goals], but it is a start. Focusing on the high certainty, high impact elements of the limiting factor[s] report is the quickest way to jump start recovery of the watershed …. The adaptive management portion of the report needs substantial improvement also if real changes are to be made based on updated conditions and data."

With this Basin Plan amendment (which includes a TMDL and Habitat Enhancement Plan), we are setting in motion a plan to reduce sediment and enhancement stream habitat. There is inherent uncertainty about the best solutions to the complex issues of sediment and habitat enhancement in this watershed. The implementation plan allows for flexibility and provides a

framework for further studies and actions that will achieve a high level of success.

We agree that an important part of implementation is to adaptively manage and adjust as updated information becomes available. We have revised the adaptive implementation section of the Staff Report and proposed Basin Plan amendment as shown below:

> ***8.8 Adaptive Implementation***
>
> In concert with the monitoring program, described above, the Sonoma Creek Sediment Reduction and Habitat Enhancement Plan and TMDL will be regularly updated. Results of in-progress or anticipated studies that enhance understanding of the population status of steelhead trout in the Sonoma Creek watershed, and/or factors controlling those populations, may also trigger changes to the plan and TMDL. At a minimum, data in response to the following questions will be considered to guide research and monitoring efforts and focus each subsequent update of the TMDL.
>
> ***Key Questions to be considered in the course of Adaptive Implementation:***
>
> - What is the population status of steelhead in the watershed? Do we see an increase in the number or percentage of steelhead that survive past the juvenile rearing life stage as sediment reduction and habitat enhancement measures are implemented?
> - Are Sonoma Creek and its tributaries progressing toward TMDL targets as expected? If there has not been adequate progress, how might the implementation actions, targets or allocations be modified?
> - What are expected benefits of various actions to enhance habitat for steelhead? Which actions, and in which locations, would enhancement measures have the most benefit and be the most cost-effective?
> - Are the specified sediment reduction measures and recommended habitat enhancement measures resulting in an improving trend in channel stability?
> - <u>What affect will climate change have on hydrology, sediment transport, and habitat for the watershed's aquatic species? How will climate change effect the outcome of required and recommended measures, and how should these measured be adjusted in response?</u>
> - <u>Are there new data or information available that warrants revision of water quality targets, allocations, or implementation measures?</u>

II. Staff Responses to Comments from Prof. Peter Goodwin

We are pleased to note that Dr. Goodwin stated that "the TMDL has clearly benefited from an active non-profit (Sonoma Ecology Center) and several well

respected external scientists that have supported agency activities and Board staff for several years prior to the development of the TMDL… Overall the document is exceptionally well-written and certainly compatible with the consistent high quality of other reports developed by the RWQCB [Water Board] in recent years and is consistent or above the level used in many other regions."

Dr. Goodwin explains that "the comments are divided into two sections, the first addresses typographical errors and the type of questions that may be raised in future meetings. The second part responds to specific questions asked by Board staff and focuses primarily on performance assessment and reducing the uncertainty in assumptions." Our responses will follow the format of Dr. Goodwin's comment letter.

Comments on Text of the Report

This group of comments "addresses typographical errors and the type of questions that may be raised in future meetings." We thank Dr. Goodwin for this thorough review, and have corrected the typographical errors he noted. Where information is currently available, we provide responses below.

Goodwin Comment 1: "Is it possible that some of the tributaries would have had defined ephemeral channels across the floodplain?"

It is possible, although we are not aware of accounts in the historical record that document tributaries having defined ephemeral channels across the floodplain. Maps of Sonoma Valley drawn before 1875 consistently show tributaries which seem to end on the valley floor before reaching the mainstem of Sonoma Creek. It is likely that many tributaries ended in alluvial fans, with their flows sinking below the surface. Under winter conditions with saturated soils, the water from these tributaries spread out over the valley via sheet flows. Other tributaries did join the mainstem, often flowing closely parallel before joining the mainstem.

Goodwin Comment 2: "The deposition of fines within spawning gravels is of course very important. However, this is part of the problem. Loss of instream geomorphic diversity can compound this problem. Local hydrodynamics can reduce the deposition of fines in certain areas and the pool-riffle morphology is critical for causing the differential head that drives the hyporheic flows. Thus the loss of pronounced morphology can also have a detrimental affect."

"Certainly the evidence presented shows that fine sediment is a systemic problem. Over time as the fine sediment is reduced, how much of this problem

can be alleviated through the local hydrodynamics? Redds may occur in local higher velocity areas which will be 'flushed' despite the high fine sediment loading of the river system. This is not a substitute for reducing the overall fine sediment loading but could help some degraded reaches be more productive faster as the fine sediment influx is gradually reduced system-wide."

We agree that enhancing local hydrodynamics may accelerate recovery of channel bed conditions as fine sediment input is reduced. Specifically, well conceived additions of large wood have the potential to accelerate natural recovery of substrate conditions. We have revised the Staff Report, Section 8.6 Habitat Enhancement Plan, subsection *Projects Designed to Enhance Physical Habitat Structure*, as follows:

> *Projects designed to Enhance Physical Habitat Structure*
>
> A high priority for restoring the steelhead fishery in Sonoma Creek is enhancing physical habitat structure, which would greatly increase the success of the juvenile rearing stage. (The need for enhancing physical habitat structure is also discussed in the Problem Statement section.) Enhancing physical habitat structure includes increasing: (1) riparian canopy; (2) large woody debris (both volume and frequency); and (3) frequency and depth of pools.
>
> Increasing riparian canopy, in addition to providing shelter and food, would also help maintain suitable water temperatures by providing shade. Large woody debris (LWD) plays an important role in channel morphology by forming habitat such as pools, by storing sediment and organic matter, and by providing shelter. Habitat inventories performed in 1996, 2001-2002 and 2004-2006 document low amounts of large woody debris watershed-wide. These habitat inventories also document low frequency and quality of pool habitat.
>
> In the limiting factors analysis, SEC et al. (2006), identify installation of large woody debris structures and enhancement natural riparian vegetation along stream corridors as priority restoration measures. Installation of large woody debris structure is a more immediate means of improving pool habitat and increasing retention of gravels and cobbles, while stream revegetation constitutes a longer-term strategy for large woody debris recruitment and channel complexity. These measures are proposed because: a) recent surveys indicate a paucity of large wood in channels, low frequency of pools, and poor quality (depth and cover); and b) the very low amount of large woody debris documented in the habitat surveys is inferred to be substantially below natural reference values[20].
>
> With regard to the restoration priorities identified in limiting factors analysis, it appears that large woody debris structures may be most effective in reaches where wood would be an effective agent for pool and bar formation under natural conditions, and where channel attributes are otherwise favorable for rearing steelhead. Therefore, a logical focus might be to enhance the homogeneous and simple habitat found in plane-bed channel reaches where flow is perennial and riparian canopy cover is good. Well-designed debris jams installed in plane-bed reaches should be effective in enhancing pool frequency and quality (e.g., pool depths are larger and more variable in wood-formed pools), and for enhancing retention of gravel by forcing a complimentary bar or backwater deposit (Buffington et al., 2002). Engineered debris jams also may be effective in pool-

riffle reaches where they can increase frequency and quality of pools and sediment storage in bars. Although it is possible to design structures that could remain stable in deeply incised channels, such sites present several additional challenges.

The above discussion regarding the positive effects of adding wood with regard to increasing average pool volume and frequency also implies that adding wood may reduce the mean fraction of pool volume filled by fine sediment (Lisle and Napolitano, 1998). Or in other words by adding wood, the effects of fine sediment deposition in pools may be ameliorated. Similarly, adding wood as described above would increase retention of gravel, and therefore increase quantity of spawning habitat. It is difficult to evaluate how adding wood may influence the concentration of fine sediment in the streambed at potential spawning sites. However, by increasing the number of potential spawning sites, there should be more sites where substrate conditions are favorable. In summary, well-conceived additions of large wood also may have the potential to accelerate natural recovery of substrate conditions.

We are confident that physical habitat enhancement can be successfully planned and implemented through collaborative stakeholder efforts, because of the accomplishments already achieved. There is already a complete habitat inventory of Sonoma Creek, as a result of the work of Sonoma Ecology Center, Southern Sonoma RCD, and the California Department of Fish and Game. The results of the habitat surveys have been analyzed to identify top restoration priorities. Queries have been performed on the habitat survey data to identify potential restoration sites for increasing riparian canopy, increasing scour depth and shelter in pools, and increasing pool connectivity (SEC, 2003; SEC, 2007).

We recommend that interested landowners, groups, and agencies—such as the Water Board, Parks departments, DFG, Sonoma Ecology Center, and the RCD work together to take the existing data and develop a prioritized restoration plan to address the physical habitat-related factors limiting the steelhead population. Interested groups could pull their resources together to provide technical expertise, assist with landowner education, and seek or provide funding.

Footnote to this portion of Section 8.6

[20]In central California stream channels, where riparian corridors are dominated by hardwoods, the amount of large woody debris in channels on public lands is on average is twice as high as the amount in channels on private lands (Opperman, 2007). In comparing frequency of wood documented in Sonoma Creek watershed habitat surveys to average values for similar channels surveyed by Opperman, we conclude there is a substantial deficit of woody debris in the Sonoma Creek watershed. Much lower amounts of woody debris in channels on private land surveyed by Opperman was explained by intensive efforts by landowners to cut or remove large debris from the channel, as it is perceived to cause bank erosion and flooding problems. Although these problems can occur in some locations, the larger scale effect of more natural rates of woody debris storage in channels are to enhance channel stability and habitat complexity (Montgomery et al., 2003). Considering the potential significance of management decisions by private landowners, an effective public outreach and education program, together with technical assistance should be considered as part of the longer-term effort to restore wood loading and functions in the Sonoma Creek watershed.

Goodwin Comment 3: "The text states that steelhead age 1+ infrequently migrate to the ocean. Secondly very few age 1+ steelhead are observed in the river and estuary. Is there evidence for this mortality or is it possible that these smaller fish are being missed in the outmigration surveys? The text might be expanded to pre-empt this question."

It is possible that juvenile steelhead were missed in the surveys. However, we infer that the scarcity of good quality rearing habitat has decreased the success of juvenile steelhead. Please see our response to Bolton Comments 2, 5 and 6.

Goodwin Comment 4: "As the main channel has incised has this resulted in gravel barriers where tributaries join the mainstem [?]. This could reduce the period of connectivity between tributaries and main channel."

"[H]as the incision of the main channel occurred at a faster rate than the tributaries? In areas where the tributaries are depositing gravels, a greater barrier (in terms of height and period of disconnectivity) than with no incision."

Distinct knick-points have been identified in the lower reaches of some tributaries to Sonoma Creek however, we are not aware of any field surveys to evaluate fish passage conditions at these sites. In the adjacent Napa River watershed, where extensive field surveys have been conducted to evaluate fish passage conditions, road crossings on tributaries often provide local grade controls that delineate the boundary between incised and non-incised reaches. In many cases, the abrupt vertical drop immediately downstream of the crossing, which has occurred primarily as a result of head-ward migration of a knick-point along the tributary in response to mainstem incision, constitutes an impediment to adult steelhead passage (and in a few cases complete barriers).

Goodwin Comment 5: "Perhaps add that the altered hydraulics at culverts can also be a barrier – not just the physical jump. Sometimes the fish can jump, but they do not have the sustained burst speed to make it through the culvert."

We agree that altered hydraulics at culverts can also be a barrier. As discussed in our response to Bolton Comment 11, and shown in our response to Bolton Comment 5, we have revised the Staff Report and Basin Plan amendment to include the impacts that barriers have to movement within the system as well as migration.

Goodwin Comment 6: "Is the loss of pools just by infilling or are other factors such as past grazing along channel banks, bank stabilization or reduction of large woody debris also responsible for loss of pool habitat. A qualifier could be included that since past practices such as rip-rap along channel banks, livestock breaking down banks and removal of woody debris by landowners are no longer conducted, pool infilling is regarded as the primary indicator of instream habitat sustainability."

The reduction in large woody debris loading appears to be the primary cause for lower frequency and poorer quality of pools. In confined tributary reaches, reduced woody debris loading in stream channels is explained by active efforts to remove log jams from channels (Opperman, 2007), and/or by land uses that reduce the potential for recruitment of large woody debris from the riparian corridor (e.g., agricultural cultivation, timber harvesting, residential development, etcetera). Along most of the mainstem and lower alluvial reaches of tributaries, incision also further contributes to a reduction in large woody debris loading because available shear stress during the annual flood and larger events has been greatly increased, and incised channel form also reduces the potential for fallen trees to get into the channel.

Goodwin Comment 7: "The targets do not account for any spatial variability. For example, the streambed permeability sets a target of 7000cm/hr as the reach-median value. Consideration might be given to defining the reach. Is it several pool-riffle sequences or at a larger scale? Since this is quantifiable target it would be worth linking the target to the goal and how it will be monitored. For example should the measurement be taken in areas of the channel bed where steelhead are most like to make redds. The targets also do not propose criteria for the spatial distribution or frequency of pools. Are there reaches of the stream which historically were widely used but are now significantly degraded?"

We have revised the Staff Report, Sections 5.1 Streambed Permeability Target, 5.2 Pool Filling and 5.3 Substrate Composition- Percent Fines, to clarify where the targets apply. Please see our responses to Bolton Comments 7, 15, and 16.

Goodwin Comment 8: "These two criteria [for substrate composition –percent fines] make a lot of sense. However, from the perspective of assessment monitoring and the benefits to the ecosystem where would this be measured? Is it for all stream beds where S<3% or in certain microhabitat features such as

pool tail-outs and runs? Refining the stream feature where measurements might be made could help link monitoring to the target."

We have revised the Staff Report, Section 5.3 Substrate Composition-Percent Fines to clarify that the substrate composition targets are applicable to potential spawning sites for anadromous salmonids in streams with gradient less than 3 percent. The attributes of potential spawning sites are described in the revised Section 5.3. Please see our responses to Bolton Comments 7, 15, and 16.

Goodwin Comment 9: "[In Section 6.1 Source Analysis, third bullet], channel incision is mentioned but not channel widening. The sediment analysis (page 40) considered both channel widening and channel incision. With bedrock control or grade control due to structures, anthropogenically-induced channel widening could occur."

We agree. Widening is one mode of channel adjustment that is occurring along Sonoma Creek. We have revised the Staff Report, Section 3.1 Problem Statement Summary, second bullet, as follows:

> ~~Changes in physical habitat structure that appear to be caused by erosion of bed~~ Incision and ~~banks (incision) in~~ widening of Sonoma Creek and its tributaries are ~~resulting in~~causing significant adverse changes to ~~steelhead habitat~~ the complexity, function, and connectivity of its stream, riparian, and flood plan habitats (SEC et al., 2004).

Goodwin Comment 10: "Was wildfire an issue in this watershed naturally?"

Although Native American land management practices in the watershed included periodic burning to clear land to increase hunting opportunities and increase encourage germination of plants, we don't have information to conclude these practices (or any other factors) altered natural wildfire patterns.

Goodwin Comment 11: "Reference to best professional judgement [in estimate sediment input from construction sites]. Obviously there is much experience from the RWQCB – but are there some additional documents to reference (ABAG manuals, other RWQCB documents?)."

We estimate the sediment input from construction sites assuming: a typical sediment delivery ratio of 50 percent, ground disturbance associated with construction activity is 50 acres per year, and the average soil erosion rate from a site with best management practices is 10 tons per acre. Our estimate of the acreage of ground disturbance is based on staff's field observations of the

amount of construction in the watershed. The average soil erosion rate was also used in the Napa River Sediment TMDL.

Goodwin Comment 12: "On these relatively short rivers cited, is the longitudinal gradient of sediment particle sizes negligible? Are processes such as different tributary sources, differential transport and abrasion insignificant?"

Available information regarding streambed particle size distributions along the mainstem of Sonoma creek is insufficient to answer this question.

Goodwin Comment 13: "The number of anthropogenically induced landslides is only about 20% of the total. The reviewer has no knowledge of this watershed but it seems low compared with forested watersheds where roads can contribute a far higher percentage. It may be worth checking with the experts consulted in the scientific studies to ensure consensus."

We believe that the estimate of percent human caused sediment delivery (including landslides) represents a minimum number. As discussed in the Staff Report, Section 6.7 Accuracy of Sediment Delivery Rates, human causation for channel incision, gully erosion, and landslides was only inferred at sites where human made structures and/or land uses were documented as overlapping in space/time with observed erosion, and the activity/structure provided a plausible mechanism for the observed erosion.

Goodwin Comment 14: "In addition to repairing landslides, should the strategy also be to prevent future landslides (particularly related to any new roads)[?]"

Yes, preventing future landslides is part of the strategy. In the Staff Report, Section 8.4 Implementation Strategy, subsection Roads and Stream Crossings, we recommend use of existing guidance such as FishNet 4C's *Guidelines for Protecting Aquatic Habitat and Salmon Fisheries for County Road Maintenance* (FishNet 4C, el al., 2004) when designing or maintaining roads. In order to meet the performance standards specified for road-related erosion (in Tables 7-10 of the Staff Report and Tables 4.1-4.4), we expect that new roads will be designed such that they disperse runoff so as to not create new landslides.

Considerations to guide future monitoring and information gathering

Goodwin Comment 15: Dr. Goodwin posed several questions that "may be raised in future meetings" for our consideration.

We also appreciate and will consider the following questions, posed by Dr. Goodwin, which may be raised in the future, to help guide future studies and implementation:

- **"Thermal refugia. For example, undercut banks with little lateral mixing can also be critical refuge habitat (not only the effects of shading). Secondly, the importance of cold groundwater contributions is mentioned here but not discussed elsewhere. If shallow groundwater pumping is prevalent on the floodplains, could this potentially remove an important source of both streamflow and cooler water in the summer months? Many of the possible measures for the sediment TMDL could also help address the temperature concerns."**
- **"Juvenile rearing. Is there evidence that the changes in land use have altered the hydrographs such that refuge areas are less effective. Examples might include: (1) increased hydrograph peaks and steeper recession limbs resulting in increased potential for stranding, and (2) since the channels have incised, greater discharges can be transported before interacting with the floodplain. This will result in greater shear stresses and altered eddy structures that could reduce refuge areas during high flows"**
- **"Elevated Water Temperatures…Is there evidence of reduction in groundwater contributions due to stream incision and groundwater withdrawals. If there are 2 or more gaging stations on Sonoma Creek, a simple way of seeing if this is significant would be to plot the difference in annual monthly mean flows between the stations over time (particularly the low flow months of August, September and October)."**
- **"The conclusion that suspended sediment or turbidity is not an issue seems reasonable. Periodic longitudinal surveys of turbidity may be helpful in identifying if there are any local problems."**
- **"The seasonal variation. It is unclear if there is an accumulation of fines in a particular season that gradually clears out before the steelhead spawning season (such as is observed on systems such as the Payette river). The proposed monitoring program should evaluate whether this is the case on Sonoma Creek. In addition, the effects of large floods (such as FY2006) or future significant events should be assessed. If a major flood is found to deposit large quantities of fines, monitoring will detect this and other**

measures can be accelerated. Conversely if the major flood flushes fine sediments and improve habitat conditions, this knowledge will also benefit stake-holders."

-

Uncertainty

Goodwin Comment 16: "To avoid undue criticism, the authors may wish to consider starting with the Napa estimate (which are used anyway and probably the most defensible if the Napa results have been verified). Perhaps the various sediment delivery components could be tabulated with the assumptions and potential uncertainty. This uncertainty could then be linked to the monitoring program and periodically refined or adjusted if necessary to achieve the Targets."

We infer that Dr. Goodwin is suggesting starting with the Napa estimate (from the Napa River Sediment TMDL) for sediment delivery from roads and surface erosion, which are the two estimates based largely on modeling. Because detailed, watershed-specific work was conducted to develop the models (as described in the Sediment Source Analysis), we used the model results as a starting point and then adjusted the results based on the estimates developed for the Napa Sediment TMDL. We provide an explanation of the refinements made to the modeled results, and a qualitative discussion of the uncertainties associated with the methods and assumptions in Section 6.5 *Surface Erosion*, Section 6.6 *Roads and Stream Crossings* and Section 6.7 *Accuracy of Sediment Delivery Rates.*

Goodwin Comment 17: Several of Dr. Goodwin's comments "focus primarily on performance assessment and reducing the uncertainty in assumptions." These comments include:

- **"There is considerable uncertainty in any sediment TMDL and this report has done good job in acknowledging the various assumptions and describing how numeric targets are derived. The reviewers primary suggestion is to quantify this uncertainty in a systematic way that can be reduced in coming years through the monitoring program. Secondly, the objectives of the monitoring program should include:**
    1. **Reducing the uncertainties in the derivation of the numeric targets. Over time it can be determined if the rules are appropriate, too stringent or inadequate.**

2. **Quantify the performance of individual actions within the proposed rule in the recovery of steelhead populations.**
3. **Ensure the overall intent of the TMDL is achieved.**
4. **Facilitate the implementation of adaptive management."**

- **"This uncertainty [in estimation of sediment delivery components] could then be linked to the monitoring program and periodically refined or adjusted if necessary to achieve the targets."**
- **'[In the implementation plan,] no time-frame is presented. It is recommended to consider milestones or reassessments to focus stake-holder involvement while there is still time to ensure fish population recovery."**
- **"In future the emergence of new technologies such as green LiDAR may allow channel changes and substrate characterization to be quantified with a high degree of accuracy over large spatial scales (McKean and Wright, USFS and NASA). However, this technology is still in the research phases and consideration should be given to how the monitoring will be conducted, the statistical accuracy of the surveys quantified and how the progress toward targets might be measured. Should the monitoring select a few representative microhabitat areas within the watershed that are surveyed to a high degree of accuracy, or a less intense but more uniform monitoring across the entire watershed or a combination of both? It is also suggested in the TMDL report that the frequency of monitoring should be every 2-3 years. Given the interest of stake-holders and current status of the steelhead population, perhaps annual monitoring at a coarse spatial level to quantify the detectable changes in channel condition, coupled with less frequent but more intense monitoring of representative pool sequences might be considered. In addition, detailed monitoring following major geomorphically-significant flood events should be undertaken. The ultimate goal of this monitoring should be to quantify the effectiveness of the TMDL in achieving the four goals described in Section 8.1"**
- **"The periodic review as described in the report is essential so that the best estimates and understanding described in the TMDL report (November 2007) can be refined as new scientific knowledge becomes available. An adaptive approach is also recommended but for this to be implemented, adequate monitoring must be done. Too often 'adaptive management' is used as an excuse for not getting it right the first time. If this approach is to be effective and defensible, a funding source for monitoring should be identified and made an absolute priority. Adequate monitoring will also**

help to prioritize restoration actions in the watershed and ultimately result in cost savings."

- **"The assumption used throughout the analysis is that suspended sediment is 70% of the total sediment load. Although several sources are cited it seems that ultimate source is the general 'rule-of-thumb' given by Leopold, Wolman and Miller (1964 although this was reprinted in 2000). Bedload measurements for the purpose of verifying this ratio and to evaluate the variation over a range of discharges should be incorporated into the proposed monitoring program. This basic information will also be useful for future restoration planning and obtaining an improved understanding of the gravel bed dynamics."**
- **"If the TMDL is based on percent reduction from current values the importance of pre-implementation monitoring becomes extremely important and allows statistical methods such as BACI to be used. The monitoring program should be designed to statistically defensible."**

We appreciate Dr. Goodwin's suggestions on assessing performance and reducing uncertainty as we move forward to implementation, monitoring, and evaluation. We have revised Section 8.7 Evaluation and Monitoring of the Staff Report, as shown below:

> ***8.7 Evaluation and Monitoring***
>
> In collaboration with stakeholders[32] in the watershed, Water Board staff will develop a detailed monitoring ~~plan~~program to assess progress of TMDL attainment and provide a basis for reviewing and revising TMDL elements or implementation actions. ~~The~~As an initial milestone, by fall 2011, the Water Board and watershed partners will complete monitoring ~~plan will be designed~~ plans to evaluate: a) attainment of water quality targets; and b) suspended sediment and turbidity conditions. Initial data collection, based on the protocols established in these monitoring plans may begin in the winter of 2011-2012.
>
> As a whole, the objectives of the monitoring program are to:
>
> 1. *Assess channel response and progress towards achieving water quality targets*. In-channel effectiveness monitoring[33] will be conducted to evaluate: a) progress toward achieving water quality targets, and b) channel response to management measures and natural processes. Parameters that will be monitored to assess progress toward achieving water quality targets are streambed permeability, pool filling, and percent fines composition of the substrate. The number of sites to be monitored will be selected based on availability/presence of the applicable habitat feature (i.e. spawning gravels and pools), as well as the number of samples needed to have a high degree of statistical confidence in estimated values. Frequency of monitoring should be once every five years, at a minimum, for streambed permeability and pool filling. If resources are available, desired monitoring frequency for all TMDL target parameters is once every two to three years. Pool filling should be monitored every two to three years to allow a trend analysis. The Water

Board may propose alternative water quality parameters and/or numeric target values at a future date as part of the adaptive implementation process, when/if information becomes available to conclude with a high degree of confidence that one or more alternative parameters or target values provide a superior basis for determining attainment of water quality objectives for sediment, and the protection of fisheries-related beneficial uses.

~~2.~~ *Further evaluate potential impacts of suspended sediment and related turbidity*. To further study potential impacts of suspended sediment and related turbidity, monitoring of turbidity should continue. The Sonoma Ecology Center maintains a continuous and automated monitoring station at the Sonoma Valley Watershed Station in Eldridge, CA. Monitoring of suspended sediment should continue to further understanding of turbidity and suspended sediment concentrations in ambient conditions, and during and after storms. Turbidity/suspended sediment data should be analyzed to determine the length of time it takes for turbidity levels to drop to pre-storm levels (or 20 NTU or below) after a storm event. We would then compare Sonoma Creek's clearing times to what we would expect in an unimpaired stream, which is that streams clear to pre-storm levels, approximately 20 NTU, within a day or two. In addition, turbidity/suspended sediment data should be analyzed using the Newcombe and Jensen severity index method, which relates exposure to various suspended sediment concentrations to impact on fish (Newcombe and Jensen, 1996). ~~A significant number of storm events ranking an 8 on the Newcombe and Jensen severity index would be an indication of significant impact to fish.~~

We expect that as sediment reduction and habitat enhancement measures (including reducing channel incision) are undertaken, suspended sediment concentrations and turbidity levels will decrease. This expectation should be confirmed with continued turbidity monitoring. In addition, turbidity monitoring can provide information regarding the effectiveness of sediment reduction measures because it is a sensitive measure of the effects of land use on streams (NCRWQCB, 2006).

3. *Assess whether required sediment reduction measures are undertaken.* Implementation monitoring[34] will be conducted by landowners or designated agents, per the compliance monitoring and reporting provisions of applicable waivers of Waste Discharge Requirements, Waste Discharge Requirements, and NPDES permits.

4. *Evaluate effectiveness of selected sediment reduction measures (both structural and management-related.* The Water Board will conduct upslope effectiveness monitoring to evaluate sediment delivery to channels from land use activities and natural processes. The first sediment source analysis update will occur by 2020, when sediment delivery associated with human activities may be reduced by 25 percent or more. A subsequent update may occur, assuming the water quality targets for sediment are not already achieved, by 2025, when sediment supply associated with human activities may be reduced by ~~37~~40 percent or more. An additional goal for future updates of the source analysis is to reduce uncertainty associated with estimates of sediment delivery rates. We hope to develop estimates of sediment delivery rates for all sources identified in Table 2, except for urban stormwater, to a level of accuracy such that estimated sediment delivery rates are within a factor of two or less of actual values.

5. *Evaluate effectiveness of recommended habitat enhancement measures and assess progress towards goals of the Habitat Enhancement Plan.* The Water Board and local partners should monitor habitat complexity-related water quality indicators to assess progress towards achievement of a balanced sediment budget (where the amount of fine and course sediment input to a given channel reach is equal to the amount that is transported downstream).

Monitoring should occur to determine whether there is an increasing trend in the percent of the length of mainstem of Sonoma Creek, and in the lower alluvial reaches of its tributaries, that attain the following conditions:

a) The bankfull channel width-to depth ratio is $\geq$ 12:1.

b) The average spacing between alluvial and/or forced gravel bars within the active channel is $\leq$ times the width of the bankfull channel.

c) Available shear stress at bankfull flow does not exceed the amount required to initiate motion of the streambed by more than approximately 20 percent.

d) Floodplain width is $\geq$ 4 times bankfull channel width.

Monitoring should also assess whether there is:

e) An increasing trend through time in the mean area and frequency of riffles and gravel bars within the mainstem channel; and

f) A decreasing trend through time in the percent of the length of the mainstem of Sonoma Creek, and in the lower alluvial reach of its tributaries, where banks or bed are hardened, and/or where constructed levees contribute to channel instability.

Rationale for these water quality indicators and conditions is found in Section 8.6 Habitat Enhancement Plan.

Footnotes to Section 8.7

[32]Ideally, the monitoring plan would be developed in partnership with: a) local experts (e.g., Sonoma Ecology Center, Southern Sonoma RCD) who have familiarity with watershed conditions, monitoring expertise, and cooperative relationships with landowners; and b) other public agencies whose policies and actions may be affected by the results of the TMDL monitoring program (e.g., County of Sonoma, California Department of Fish and Game, and National Marines Fisheries Service)

[33]Effectivness monitoring is used to assess whether the sediment control measures had the desired effect.

[34]Implementation monitoring ensures that identified management actions (such as BMPs) are undertaken, and provides information on whether BMPs are being installed or implemented as intended.

We have also revised the Evaluation and Monitoring section of the proposed Basin Plan amendment accordingly. In addition, Dr. Goodwin's suggestions will continue to be considered as the Water Board and watershed partners develop detailed monitoring plans. We have also revised the Adaptive Implementation Section, as shown in the response to Bolton Comment 31.

Numeric Targets

Most of Dr. Goodwin's comments regarding numeric targets are addressed previously in this document, and not repeated here.

Goodwin Comment 18: "The three numeric targets are measureable and capture multiple processes."

We appreciated Dr. Goodwin's concurrence that the targets are measureable and capture multiple processes.

Source Analysis

Goodwin Comment 19: "The Source Analysis and TMDL does not appear to provide a clear and referenced definition of suspended and bedload transport. The reviewer may have overlooked this – but is the standard USGS definition used? Is washload included in the suspended sediment? Does total sediment load imply total bed material load? Perhaps a definition and sketch could be provided so that there is no ambiguity."

The standard USGS definitions of suspended- and bed-load were used. Suspended-load includes the wash load and the bed material suspended load (e.g., primarily sand sized material that may be transported is suspension, settle along the streambed, and/or be transported as bedload). In the source analysis, and our summary in the TMDL report, "total sediment load" refers to the product of suspended- and bed-load. Suspended-load is estimated from field sampling of transport rates. Bed-load is assumed to equal a constant fraction of the suspended-load.

Goodwin Comment 20: "The significant difference between sediment yield from roads in Sonoma Creek watershed and Napa River is a cause for concern. Napa estimates were developed from a detailed field campaign (Dietrich, 2000) and considerable confidence might be expected in these results. Although some differences are expected between Sonoma Creek and Napa, a factor of 4 between the two watersheds is large and could significantly affect the overall estimated sediment budget (from about 8% to 20%). The more explicit description of cumulative uncertainty described above would allow the sensitivity of the final result to the various assumptions to be seen."

As discussed in Section 6.6 Road Crossings in the Refinement of Initial Estimate, the estimate of sediment delivery from road-related erosion is quite sensitive to

the resolution/accuracy of road and channel mapping. For the analysis, the USGS 1:24,000-scale blue-line streams layer was used to approximate the complete channel network. Also 1:24,000 digital ortho-photographs were interpreted to extend the network. Considering the scale and resolution of the ortho-photographs, it is highly likely that most headwater channels are not included in the network. This is significant because headwater channels typically represent two-thirds or more of the total channel network. Because the complete channel network mapping was not available at the time of the analysis, we conclude that the actual proximity of most road segments to channels is closer than modeled, and therefore the actual sediment delivery is higher than modeled. As described in the Staff Report, we conclude that the model may have underestimated sediment delivery from roads by a factor of 2 or more. Considering all the uncertainties in the estimate, we conclude the estimate is accurate within a factor of four, which may account for the difference between the Sonoma and Napa watersheds.

We agree that the sensitivity and uncertainty associated with the current estimate of sediment delivery from roads has a significant effect on the overall sediment budget. In the next sediment source analysis, we hope to increase the accuracy to within a factor of two (see the revised Evaluation and Monitoring Plan, shown in response to Goodwin Comment 16.

Sediment TMDL and Allocations

Goodwin Comment 20: "The proposed TMDL of 125% of the estimated natural background is justified (subject to a clearer state of the uncertainty described above). The approach of proposing allocations based on percent reduction from current values is achievable and has the added advantage of being quantifiable."

We appreciate Dr. Goodwin's concurrence that the TMDL is justified, as well as his support of the allocation approach.

Overarching Questions and Comments

Dr. Goodwin's suggestions regarding quantifying uncertainty in a way that can be reduced in coming years, and the objectives of the monitoring plan are addressed in our response to Goodwin Comment 16.

We note and appreciate Dr. Goodwin's supportive comments about the TMDL overall:

- **"The scientific portion of the proposed rule has been developed carefully and with consultation with external scientific expertise. The use of steelhead as an indicator species of the overall health of Sonoma Creek ecosystem makes sense provided actions do not have a detrimental effect on other species of concern. Sediment TMDLs are difficult to develop and there is no magic formula or standard methodology to follow. The rule appears to be a good-faith effort to bring the best available knowledge to protect beneficial uses in a fair manner."**
- **"[T]he authors in the sequence of reports *Limiting Factors Analysis, Sediment Source Analysis* and *Sonoma Creek Watershed TMDL and Habitat Enhancement Plan* have done an excellent job in integrating current scientific knowledge about the watershed and clearly articulating the methodology. A more complete description of the monitoring plan and adaptive management approach will ensure knowledge continues to be gathered and used to ensure the TMDL achieves the stated objectives."**

PART V: STAFF-INITIATED CHANGES

V. 1. We have made minor, non-substantive revisions to the proposed Basin Plan amendment to improve clarity, and to correct typographical and grammatical errors. All changes are shown in strikethrough/underline format in Appendix B.

V.2. We have made minor revisions to the Staff Report's references section and text citations, and corrected typographical and grammatical errors. Some changes were also made to improve clarity. All changes are shown in strikethrough/underline format in Appendix C.

References

Citation in text	Reference
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