State of California
Department of Fish and Game

Memorandum

Date: December 10, 2009

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Subject: Comments on October 2009 Draft EIR for the El Sur Ranch Water Right Application No. 30166.

The following are my comments on the October 2009 Draft Environmental Impact Report (DEIR) for El Sur Ranch's water right application no. 30166 that is pending before the California State Water Resources Control Board (SWRCB). The proposed project of this DEIR is the diversion of water from a subterranean stream using two existing production wells owned by El Sur Ranch that are located in Andrew Molera State Park on the flood plain at the mouth of the Big Sur River. Pumped water is applied through a series of irrigation pipes to pastures uphill and northwest of the wells. Pumping from the older well, called the Old Well, is said to have occurred since 1949. Pumping from the more recent well, called the New Well, has occurred since 1984. The DEIR provides an assessment of the potential impacts from pumping these two wells at a rate that exceeds the historic water use.

The environmental setting and analysis presented in this DEIR are complex in part because of the hydrogeologic setting and because of the complexity of the proposed diversion limitations and proposed mitigation measures. The hydrogeologic setting for the diversion is a subterranean stream at the mouth of the Big Sur River. The dynamic character of the river channel, the presence of a lagoon, periodic closure of the river's outlet by a sand bar, and periodic occurrence of high tidal fluctuations all combine to create a dynamic hydrologic setting.

The complexity of the physical setting is overlain by the water right application's proposed six diversion limits, four measured in acre-feet (ac-ft) and two in cubic feet per second (cfs). The DEIR proposes a 23-element mitigation measure for bypass flows needed to protect public trust resources at the point of diversion. It uses two or more sets of flow criteria for each month based on historic monthly low percentile flows, except for June and November, which have only one percentile bypass flow criterion. These bypass flows are not set based on impact to fish passage or habitat, but based on low river flows during past periods pumping. The DEIR also proposes, as a mitigation measure the future development of at least two plans to manage applied water: an Irrigation Water Management Plan, and Erosion Control and Operations Management Plan. A potential third future plan is a feasibility study and design of a seasonal instream aeration system to raise dissolved oxygen levels in the lower river during periods of low flow and high water temperature. The El Sur Ranch pastures may also be subject to Central Coast Regional Water Quality Control Board's (CCRWQCB) waste discharge waiver for irrigated lands under Order R3-2009-0050 and MRP 2004-0117, which requires development and implementation of a Farm Water Quality Management Plan with its own Monitoring and Reporting Program. The DEIR doesn't indicate whether these future management plans will be made available for public review and comment prior to approval of the water rights permit through the CEQA process, incorporated into the water rights permit, or through the approval of the another permit or order by the SWRCB.

Finally, the DEIR appears to propose a modification of the SWRCB's Decision 1639 four-part physical test for determination of a subterranean stream flowing through a known and definite channel with the addition of the quantification how much of the water diverted through the pumping of wells comes from surface flows of the river versus how much from the ground water aquifer. This modification to the physical characteristics required for designating a subterranean stream adds additional complexity and would require additional monitoring measures to verify compliance with permit bypass flow requirements necessary to protect public trust resources.

This document is divided into three sections. The first section presents the recommendations of my general comments. In the second section I provide my general comments and recommendations in a detailed discussion of issues that are either not discussed in the DEIR or inadequately discussed. In this general comments section, I have highlighted in bold type the recommendations of each topic so that they can be more easily identified. The third section provides specific comments on sections and tables in the DEIR.

Summary of General Comments and Recommendations

1) The DEIR should acknowledge the requirements of SWRCB's Decision 1639 that defines four physical conditions needed for a subterranean stream flowing through a known and definite channel. The DEIR should then demonstrate that these conditions are met at the point of diversion of the El Sur Ranch wells. The SWRCB should as part of the CEQA and/or water rights permit process make a finding that the El Sur Ranch wells divert ground water from a subterranean stream flowing through a known and definite channel.

2) Clarification is needed about whether these riparian lands are included in the request for an appropriative water right. The DEIR should discuss separately the riparian and non-riparian land impacts and requested diversions. I've measured the area of the point of use, the irrigated pastures, using ArcMap software and found that the total irrigated area is approximately 248 acres, not the 267 acres stated in the DEIR. When the 25-acres of riparian land is subtracted from my 248 acres, the result 223 acres is the total for irrigated pastures subject to the appropriative water right. The NRCE analysis of water demand appears to include the Swiss Canyon area, but the DEIR does not consider it part of the irrigated lands. I recommend that the actual area of the irrigated pastures be measured

and documented by a licensed land surveyor. Once the actual area is measures, the DEIR should be revised based on this updated and more accurate information.

3) The engineering calculations that convert electrical consumptions to pumped volume and rate used in establishing historic and baseline water usage and well pumping capacity should be provided in the DEIR along with the input data, pump efficiency test results, sources and magnitude of potential error, and any other assumptions used to make the diversion and pump capacity estimates.

   The DEIR should provide as part of the mitigation measures a discussion of how the monitoring of the various diversion volumes and pumping rates would be accomplished using the power usage rather than direct measurement with a flow meter. The mitigation monitoring should include specific data collection requirements, such as frequency and type of measurements that are needed to document compliance with the water right permit. Specifically, how often must electrical power usage be collected, monthly, daily or hourly? Should power usage be linked with the pasture(s) being irrigated? How often will water diversions be reported, particularly during periods of low river flow? Will the frequency of monitoring and/or reporting vary with the season and river flow? The DEIR should also discuss as a mitigation measure the use of calibrated flow meters on the discharge pipes that measure both the instantaneous rate of discharge and the cumulative total discharge. The mitigation should also address the issue of monitoring the time and duration of pumping for each well so that the instantaneous total diversion can be monitored.

4) a) <u>1,615 acre-feet maximum calendar year total diversion:</u> Table 2-3 of the DEIR should be updated to show the estimate of diversion requirements based on the more recent 2007 estimates and the DEIR re-written to reflect this updated information. The DEIR doesn't present a comparison, for similar periods, between the El Sur Ranch's historic water use and the historic regional water use documented by DWR or others such as the various Monterey County water agencies. It should be noted that the requested maximum diversion is based on year of maximum historic use, 1977, which is not within the 1984 to 2004 CEQA baseline period of the DEIR. The DEIR should clarify that the pastures are considered un-cultivated cropland. According to the USDA, the permanent pasture land at the El Sur Ranch would likely be considered uncultivated lands and subject to the 2-1/2 acre-feet per acre beneficial use required by the Water Code Section 1004.

   b) <u>1,200 acre-feet running 20-year average maximum annual total diversion</u>: The 1,200 acre-feet running average diversion limit doesn't have much effect on reducing the number of years that the maximum annual volume can be diverted if the next 10 year's diversions can be at the maximum of 1,615 acre-feet. The request for an average annual diversion limit that is 40 percent above the historic baseline average seems excessive and suggest unreasonable use.

   c) <u>735 acre-feet July 1 to October 1 seasonal maximum total diversion</u>: The proposed July to October total seasonal limit for total diversion is set just below the maximum one-year historic diversion and exceeds the calculated estimate of the optimal diversion requirement for a year with no precipitation. In addition, the requested diversion limit of 735 acre-feet is 11% greater than the historic diversion of the year with the lowest flows on record (1977), which doesn't seem to offer much protection to the public trust resources, nor have the effects of such a diversion, in fact, been analyzed. The DEIR should provide an analysis of the relationship between historic diversion and the percentile flows in the river at the time of diversion, along with an opinion on whether historic seasonal diversions might have affected public trust resources. The DEIR should also provide an evaluation to justify the flow percentiles used in the mitigation measures as additional limits on the diversions. Consideration should be given to adding an additional mitigation measure that would further restrict diversion during periods of drought, such as eliminating the additional 10-percent diversion desired for annual leaching of salts during periods of drought.

d) <u>230 acre-feet July 1 to October 1 monthly maximum diversion:</u> The 230 acre-foot maximum monthly limit from July to October is approximately 51 percent above the baseline average diversion for July, the month used in setting the limit. This limit allows for maximum diversion during the period of lowest flows, which conflicts with the goal of protecting public trust resources. The month of June has the highest average historic diversion of June through November, the months with the lowest historic flows. The DEIR should be revised to provide a discussion of the applicant's reasons for the requested 37 acre-foot "cushion" and the impacts on public trust resource that result from using the month with the second highest average diversion for establishing the dry season diversion limit.

e) <u>5.84 cfs maximum instantaneous pumping rate:</u> The DEIR should document the reasoning behind selecting the maximum instantaneous diversion rate of 5.84 cfs. This documentation should demonstrate why the El Sur Ranch lands fit the conditions specified in CCR Title 23 Section 697(a)(1) for 1 cfs per 50 acres, use the actual acres being irrigated in the calculation, and then compare the requested instantaneous rate to the baseline condition.

f) <u>5.34 cfs maximum 30-day average pumping rate:</u> The DEIR should document the reasoning behind selecting the maximum 30-day running average limit of 5.34 cfs. This documentation should demonstrate why the El Sur Ranch lands fit the conditions specified in CCR Title 23 Section 697(a)(1) for one cfs per 50 acres, use the actual acres being irrigated in the calculation, compare the requested 30-day average rate to the baseline condition, and then discuss the reasoning for distinguishing between and setting different diversion limits for monthly and 30-day running averages.

5) The DEIR's assumption that the conditions of the river in the ZOI during the 2004 to 2007 study period will continue and remain constant, and that ground water will always discharge into the river in the ZOI from Creamery Meadow isn't justified. The DEIR should be modified to document the dynamic nature of the lower portion of the Big Sur River, evaluate the impacts of a change in channel position on the environmental impact analysis, discuss the impacts of changing channel location on the gains and losses to the river, and provide mitigation monitoring measures needed to document and measure the changes in river flow during pumping of the wells whenever the channel migrates or the character of the channel bed material changes.

6) a) The assumption that the river losses are constant at approximately 24 percent of the pumping rate, 0.74 cfs at 3.09 cfs pumping and 1.28 cfs at 5.34 cfs pumping (page 4.2-66), and that this rate of loss will occur in perpetuity is invalid.

b) The duration of pumping impacts extends beyond the time listed in the DEIR tables because of the recovery of the cone of depression. This should be accounted for in the environmental impact analysis and the diversion limits.

The bypass flow limitations for the water rights permit should require the cessation of pumping whenever river flow drops below a specified rate(s) as measured at an appropriate river gage. The bypass flow should be set based on specific impacts to public trust resources not historic flow percentiles. This type of bypass flow limit requires at least daily measurement and reporting of the instantaneous rate of flow at the river gage and rate of diversion at the wells in order to know when the limit is reached. Without instantaneous flow measurements there would be no way of knowing that a violation has occurred because long-term averaging doesn't measure or report peak discharge rates. While the USGS gages can provide instantaneous provisional data, the present lack of flow metering at the wells is precludes achieving this standard.

c) The DEIR should be revised to address how the impacts of diversions from the separate sources, surface water and ground water, will be monitored to ensure that the assumptions about the conditions in the ZOI made in the environmental analysis remain valid.

d) The complexity of the proposed system of six water right limits will be difficult enough to monitor, report and enforce, but if the permit assumes that something other than the full rate of diversion impacts the flows in the river, then a bypass flow limitation(s) is a moving target.

e) The DEIR should discuss the requirements of SWRCB's Decision 1639 and how they are relevant to the El Sur Ranch well diversions. It appears that the DEIR's proposal to apportion the source of the water being diverted at the wells into surface water and subterranean stream ground water directly conflicts with Decision 1639. This conflict with the Decision 1639 is an addition to other technical issues that are being raised in this memorandum as a result of the proposal to separate the sources of water being pumped.

f) The DEIR should analyze the environmental impacts of the El Sur Ranch diversions with the assumption that all of the pumped water is diverted from the Big Sur River. The El Sur Ranch well water rights permit limitations and conditions, as well as the bypass flow requirements should be written assuming that all of the flow being pumped by the wells is diverted from and causes potential impacts to the surface water flow in the river. This would be consistent with other water rights permits issued for subterranean stream diversions and would make the establishing and enforcing of diversion limitations and bypass flow requirements consistent with other permits.

7) Based on the information in my Table 3, I would recommend that at a minimum, loss in instantaneous flow of 5 cfs be assumed downstream of the USGS Big Sur gage when calculating bypass flow requirements. With a more through investigation and analysis, the validity of the 8.9 cfs loss may be determined.

The DEIR should provide analysis of the losses or gains that are likely to occur in the 7 miles between the USGS Big Sur gage and the point of diversion, and determine what value(s) should be used to correct the USGS Big Sur gage reading in setting bypass flow requirements. This analysis should document and evaluate natural and anthropogenic gains and losses in the river below the USGS gage and any potential future riparian diversions. As an alternative, the DEIR should evaluate whether another gage should be installed lower in the river that is closer to the point of diversion. CDFG staff has submitted a proposal to its management and is awaiting word on funding approval for the USGS to establish a gage on the Big Sur River in the Andrew Molera State Park area to aid in the current study of the river. Unfortunately, long-term funding for maintaining this gage may not be available.

8) My updated percentile calculation shown in my Table 4 and those in Table 2 of the 2006 3rd Amendment to the water rights application are in fairly close agreement, but differ significantly from those used in the DEIR, Table 4.2-1. I recommend that an evaluation be done as to why the DEIR flow percentiles differ. Following that evaluation, the correct table of historic daily flow frequency percentiles should be provided.

9) The bypass flow limitations for the water rights permit should require the cessation of pumping whenever river flow drops below a specified rate(s) as measured at an appropriate river gage. The bypass flow should be set based on specific impacts to public trust resources at the point of diversion, not historic flow percentiles. Monitoring of bypass flow limit requires at least daily measurement and reporting of the instantaneous rate of flow at the river gage, and rate and time of diversion for each well in order to know when the bypass limit is reached. Without instantaneous flow measurements there would be no way of knowing that a violation has occurred because long-term averaging doesn't capture peak discharge rates. While the USGS gages can provide instantaneous provisional data, the current lack of flow metering at the wells precludes achieving meaningful monitoring of diversions.

   The maximum instantaneous rate of diversion of 5.84 cfs being sought by the application should be used in setting a bypass flow requirement. An interim bypass flow as measured at the USGS gage of 40 cfs between June 1 and November 30 would be appropriate given the lack of actual instream information on the flows necessary for fish passage, the distance from between the point of diversion and the USGS Big Sur gage, variability in the changes in flow below the USGS gage, and the need to consider that the entire diversion has the potential to impact river flow. An interim bypass flow of 132 cfs should be used between December 1 and May 31. Additional site-specific instream studies are needed to finalize these flow recommendations. The DEIR should be revised to incorporate interim bypass flow requirements of 40 cfs from June 1 to November 30 and a 132 cfs from December 1 to May 31.

   The interim bypass flows of 40 cfs and 132 cfs significantly alters the environmental impact analysis, conclusions and mitigation measures of the DEIR. I have drawn on my Table 4 a bold line at approximately 40 cfs and 132 cfs for the appropriate months. My Table 4 shows that the percentile flow limitation criterion proposed in the DEIR mitigation measures and Table A do not appear to be protective of public trust resources. This suggests that past historic diversions by the El Sur Ranch wells likely had an impact on fish passage and habitat. Therefore, the DEIR should provide an analysis the potential past impacts from the CEQA baseline diversions.

10) a) Because the area that this sediment discharges to is critical habitat, a technical study is needed on the areas of erosion along the walls of Swiss Canyon to identify the level of stability and the causes of any instability and to provide mitigation measures for stabilizing the slopes and preventing further erosion. The DEIR should provide the results of this study and include any recommendations as mitigation measures.
    b) The DEIR should evaluate whether leakage from an irrigation pipe(s) is discharging into

Swiss Canyon. In addition, the DEIR should evaluate the potential impact from irrigation pipe maintenance activities within Swiss Canyon and the need for permits along with the recommended permit conditions.

11) The DEIR should evaluate whether the existing baseline irrigation practices of the El Sur Ranch fall under the requirements of Order R3-2009-0050 and MRP R3-2004-0117. If they do, then the DEIR should provide a copy of the management checklist/self assessment, the Farm Water Quality Management Plan, copies of the completed practices implementation checklists, and copies of the annual monitoring reports. The results of any monitoring under this Order should be incorporated into the DEIR's environmental analysis and mitigation measures developed. as necessary.

The DEIR should evaluate whether the proposed project irrigation practices fall under the requirements of Order R3-2009-0050 and MRP R3-2004-0117. If the baseline conditions do not fall under the Order, indicate whether the Notice of Intent will be filed for the proposed project and when the required management checklist/self assessment form and the Farm Water Quality Management Plan along with implementation of the monitoring and reporting program will be developed and implemented. The lack of water quality data on the tailwater pond waters and other waters that discharge from the irrigated pastures as required by the Order suggests that the current operations either do not fall under Order R3-2009-0050 or may not be not in full compliance with the requirements from the Order. In addition, several of the future reports required by the mitigation measures, 4.2-2 – an Irrigation Water Management Plan and 4.2-4 – an Erosion Control and Operations Management Plan, appear to be similar to the Farm Water Quality Management Plan requirement of the Order. If the project operations fall under the Order, then the DEIR should discuss how the mitigation management plan identified in the DEIR will integrate with the requirements of the Order.

The DEIR should evaluate and provide mitigation measures for any potential impacts from irrigating the pastures based in part on the results of any previous water quality monitoring, particularly the project's practice of leaching out the salts that results from applying additional irrigation water. What impact does this leaching have on the quality of ground water or surface water? What monitoring and reporting will be done to evaluate potential impacts from leaching of salts?

12) The DEIR should expand on the discussion of the potential impacts from applying higher salinity water regardless of whether the saltwater intrusion is caused by high tides or pumping or a combination. The impacts from irrigating with higher salinity water and the impacts of discharging the salts leached from the pasture soils may cause a significant environmental impact. A mitigation measure is needed for impact 4.2-7 that requires the wells, Old and New wells, be shut off whenever the salinity levels reach 1,000 μ/cm and followed up with sampling and testing of chloride concentration, and that the shutoff time, date and water quality measurements be documented and reported.

13) a) Seepage at the cliff face and resultant sapping erosion can be expected to increase with an increase in water applied to the adjacent pastures from the baseline of approximately 3 feet to the application's 6 to 6.5 feet. This is particularly significant during periods where the leaching of salts is undertaken because that requires applying more water

than needed for vegetation growth in order to flush the salts downward. This flushing water will likely perch on the clay subsoil rather than penetrate it, and eventually flow towards the cliff face, increasing the volume and duration of seepage along the bluff.

b) The addition of more irrigation water to the adjacent pastures from the baseline of approximately 3 feet to the application's 6 to 6.5 feet will likely add to the perched ground water on top of the clay subsoil. This perched water will eventually seep out at the cliff face and may increase the areas of saturation along with an increase in unstable areas. The DEIR should evaluate the source of the ground water seepage along the coastal bluff adjacent to the El Sur Ranch pastures and provide mitigation measures to ensure that irrigation practices do not cause or accelerate coastal bluff instability or erosion.

General Comments and Recommendations

1) El Sur Ranch is seeking an appropriative water right for diverting water from a subterranean stream using two existing production wells that are located in Andrew Molera State Park on the flood plain at the mouth of the Big Sur River. The pumped water is applied to pastures that are both within and outside the watershed of the Big Sur River. Irrigation of the land that lies within the river's watershed can be done under a claim of riparian right. Irrigation of land that does not lie within the river's watershed using water from these wells requires an appropriative water right. The reason that this appropriative water right can be sought for a diversion using these two wells is because they are pumping water from a subterranean stream flowing through a known and definite channel (Water Code Section 1200). The DEIR states on page 2-13 that a determination that the ground water being diverted by the two wells is from a subterranean stream is based on the technical information provided in the April 1999 Jones and Stokes hydrologic investigation report, which confirmed an earlier April 1992 SWRCB staff inspection report. However, the DEIR doesn't acknowledge the fact that the SWRCB has established a test for subterranean stream flow with its Garrapata Decision (Decision 1639) issued in September 1999 after the Jones and Stokes report.

Apparently, the first determination that the ground water being pumped by the El Sur Ranch wells is from a subterranean stream was made in the April 12, 1992 SWRCB staff inspection report prepared by Mr. Lewis Moeller, Water Resource Control Engineer. Mr. Moeller found that the two wells are pumping from underflow of the Big Sur River and not from percolating ground water. Mr. Moeller's findings that the water being pumped is underflow of the Big Sur River and the fact that the wells need to be located on the river deposits of the Big Sur River appear to be the only reasons to conclude that the pumped water is taken from a subterranean stream. Mr. Moeller reached a conclusion that 90 acres of the El Sur Ranch's pastures can be irrigated under a valid claim of riparian right, but that the remaining acreage was not riparian to the Big Sur River. Thus, an appropriative water right is needed to divert the underflow from the river for the purpose of irrigating non-riparian pastures.

At the time of Mr. Moeller's inspection report, the finding that the El Sur Ranch wells pumped underflow may have been sufficient evidence to reach a conclusion that the water being pumped was taken from a subterranean stream. In September 1999 the SWRCB's issued Decision 1639 which gives the requirements for defining a subterranean stream.

This decision supercedes both Mr. Moeller's inspection report and the Jones and Stokes April 1999. Decision 1639 established a four-part physical test for ground water to be classified as a subterranean stream flowing through a known and definite channel. The four physical conditions that must exist are:

- A subsurface channel must be present;
- The channel must have relatively impermeable bed and banks;
- The course of the channel must be known or capable of being determined by reasonable inference, and
- Groundwater must be flowing in the channel.

While there appears to be sufficient hydrogeologic information in the DEIR and its referenced reports to demonstrate that the SWRCB's four physical conditions of a subterranean stream can be met at the point of diversion of El Sur Ranch wells, the DEIR doesn't compile or present the information in a organized manner that allows for this finding. For example, DEIR Figures 4.2-1, 4.2-2a, 4.2-2b, and 4.2-3 provide sufficient information to define the location of the subterranean stream. The DEIR discusses the nature of the alluvial aquifer from page 4.2-17 to page 4.2-22 providing information that ground water is stored and is flowing in the subterranean stream, and that its hydraulic conductivity ranges from 3,567 to 3,679 feet per day. The discussions in The Source Group, Inc.'s (SGI) 2005 report on the Franciscan Formation, Section 3.2.1, the terrace deposits, Section 3.2.2, and the alluvial aquifer, Section 3.2, provide sufficient data to define the nature and hydrogeologic character of the subterranean stream aquifer and the bed and bank materials. Section 3.3.4 of the 2005 SGI report indicates that the terrace deposits that compose part of the bed and bank have a maximum hydraulic conductivity of 100 feet per day. Although the hydraulic conductivity of the underlying Franciscan Formation isn't stated, the discussion of the bedrock unit in Section 3.2.1 states that it grades from dark grey clay to a weathered micro-greywacke beneath the El Sur Ranch wells. The hydraulic conductivity of the underlying grey clay and weathered bedrock would likely be no greater than the younger less weathered terrace deposits. With this information, the hydraulic conductivity ratio of the subterranean stream to the bed and bank materials can be calculated at approximately 35 times (3,567 ft/day divided by 100 ft/day = 35.67). Thus, the subterranean stream's hydraulic conductivity is greater than the bed and bank by more than 1 order of magnitude (order a magnitude = 10 times greater), a general standard that the SWRCB has used in the past for determining bed and bank.

The DEIR should acknowledge the requirements of SWRCB's Decision 1639 that defines four physical conditions needed for a subterranean stream flowing through a known and definite channel. The DEIR should then demonstrate that these conditions are met at the point of diversion of the El Sur Ranch wells. The SWRCB should as part of the CEQA and/or water rights permit process make a finding that the El Sur Ranch wells divert ground water from a subterranean stream flowing through a known and definite channel.

2) The proposed project is the issuance of water rights permit to appropriate water from the Big Sur River to irrigate pasture-lands of the El Sur Ranch. The irrigated pastures include lands that are considered riparian to the river. The DEIR and the 3rd Amendment to the water rights application information about the riparian lands that seems to be in conflict. Clarification is needed about whether these riparian lands are included in the request for an appropriative water right. The DEIR should discuss separately the riparian and non-riparian land impacts and requested diversions.

The DEIR states on page 2-5 that the total project area is 292 acres of which 25 acres are dunes, tailwater pond, outfall, access roads, or irrigation canals. The remaining area, 267 acres, is irrigated pasture, which is the place of use (POU) for the water right application no. 30166. The DEIR states that an existing riparian right serves the 25 acres of these 267 acres of irrigated pasture. Therefore, the appropriative water right is being sought for the remaining 242 acres. This POU acreage appears to differ from the 267-acre POU area given Table 1 on page 3 of the memorandum accompanying the October 17, 2006 3rd Amendment to the water rights application no. 30116 (3rd Amendment). The 3rd Amendment states that the POU is a total of 267 acres and then lists separately the 25 acres of riparian lands. The 3rd Application states that the applicant is claiming a right to use a portion of the diverted water under a riparian right, but it's unclear if the applicant is requesting an appropriative right for water used on riparian lands.

I measured the irrigated pasture areas using ArcMap software with the USGS digital orthoquadrangle image (DOQQ o36121c7sw.tiff) as a base map and placed a geo-referenced overlay of a scan of DEIR Figure 2-3 to define the project boundaries. My measurements of Figure 2-3 found that the total irrigated pasture area is approximately 248 acres not the 267 acres stated in the 3rd Amendment and DEIR. I assumed that the 25 acres of riparian lands is an accurate measure of this area. The 25 acres of riparian lands are included in my 248 acres. Thus, the area that an appropriative water right is needed is 223 acres not the 242 acres given in the DEIR. While this 19-acre difference in total POU area may be small, it does impact the amount of water being applied per acre. The maximum annual diversion of 1,615 ac-ft being requested in the water right application when applied uniformly over the POU changes from approximately 6 feet per year to 6.5 feet per year (1,615 ac-ft over 267 acres versus 1,615 ac-ft over 248 acres). If the 267-acre POU area is used throughout the DEIR is changed to 248 acres, it will affect the analysis in a number of chapters as well as the water rights application. I haven't attempted to assess the impact on 2005 and 2007 Natural Resource Consulting Engineers, Inc.'s (NRCE) analyses of water use, but it's likely to have an impact.

The technical documents supporting the DEIR provide some confusion as to whether the Swiss Canyon area is part of the lands The 3rd Amendment's Table 1 on page 3 appears to indicate that the Swiss Canyon area is included in the POU area even though Figure 2-2 of the DEIR shows that it is not part of the POU. The DEIR also states that Swiss Canyon is not within the POU and is not part of the irrigated area under existing or proposed conditions (page 2-6). The 267-acre POU area is derived in the 3rd Amendment by removing the 25 acres of riparian from the 292-acre total project area. The Swiss Canyon area is not mentioned in the DEIR as part of the 25-acres of non-irrigated lands. The 2005 NRCE report on page 6-11 and the 2007 report on page 7-15 state that Swiss Canyon is "likely irrigated by seepage water from the irrigated pasture fields above," that the grasses in the canyon derive a beneficial use from this seepage, and that the cattle graze on the grass in the canyon. Therefore, they included the canyon in their irrigated area. NRCE didn't indicate how much water from the irrigated pastures drains into Swiss Canyon, but the inclusion of the canyon area in their calculations and the water right application apparently assumes that the requested 6 feet per year or a total of approximately 150 acre-feet area will run off or seep into the approximate 25 acres of canyon.

Clarification is needed about whether these riparian lands are included in the request for an appropriative water right. The DEIR should discuss separately the riparian and non-riparian land impacts and requested diversions. I've measured the area of the point of use, the irrigated pastures, using ArcMap software and found that the total irrigated area is approximately 248 acres, not the 267 acres stated in the DEIR. When the 25-acres of riparian land is subtracted from my 248 acres, the result 223 acres is the total for irrigated pastures subject to the appropriative water right. The NRCE analysis of water demand appears to include the Swiss Canyon area, but the DEIR does not consider it part of the irrigated. I recommend that the actual area of the irrigated pastures be measured and documented by a licensed land surveyor. Once the actual area is measures, the DEIR should be revised based on this updated and more accurate information.

3) The DEIR indicates that the amount of baseline and current water diverted is calculated using electrical power usage and pump efficiency tests results (page 2-14). The 2005 NRCE report states that pump efficiency tests were conducted in 1967, 1992 and 2004 (page 6-17). NRCE provides the results of the 2004 pump efficiency tests giving the kilowatt-hour to acre-feet conversion rates in Table 6-12. Historic water diversions based on the electrical usage conversion are presented in the DEIR in Table 2-1, which covers a period from 1975 to 2004. The DEIR doesn't provide any information on water use prior to 1975, or after 2004. Neither the DEIR, nor the NRCE report provides information on the actual electricity usage or the actual pump efficiency tests. From DEIR Table 2-1, it is clear that an accurate estimate of the water diverted is a complex engineering calculation that requires knowledge of what pasture(s) is/are being irrigated, what the duration of pumping is for each well associated with each pasture and the change in pump efficiency with time. The 2005 NRCE report states that daily records of pump operations were available from 1989 to 2000 (page 6-17). Apparently, daily records of pump operations are not available before 1989 or after the year 2000.

The calculation of water diversion is fundamental to the establishment of baseline water diversion and the subsequent DEIR analysis of impacts. The maximum pumping rate of each well is apparently calculated by the pump efficiency tests rather than direct measure with a flow meter. The lack of actual data on electricity consumption and the well efficiency tests prevents review of the accuracy of the historic water use and the pumping capacity of the wells.

The engineering calculations that convert electrical consumptions to pumped volume and rate used in establishing historic and baseline water usage and well pumping capacity should be provided in the DEIR along with the input data, pump efficiency test results, sources and magnitude of potential error, and any other assumptions used to make the diversion and pump capacity estimates.

The DEIR should provide as part of the mitigation measures a discussion of how the monitoring of the various diversion volumes and pumping rates would be accomplished using the power usage rather than direct measurement with a flow meter. The mitigation monitoring should include specific data collection requirements, such as frequency and type of measurements that are needed to document compliance with the water right permit. Specifically, how often must electrical power usage be collected, monthly, daily or hourly? Should power usage be linked with the pasture(s) being irrigated? How often will water diversions be reported, particularly during periods of low river flow? Will the frequency of monitoring and/or reporting vary with the season and river flow? The DEIR should also discuss as a mitigation measure the use of calibrated flow meters on the discharge pipes that measure both the instantaneous rate of discharge and the cumulative total discharge. The mitigation should also address the issue of monitoring the time and duration of pumping for each well so that the instantaneous total diversion can be monitored.

4) The 3rd Amendment to water rights application no. 30166 proposes six diversion limits. The proposed period of diversion and use is year-round. Four of the limits are based on the volume of diversion, while two set limits on the rate of diversion. These six diversion limits sometimes overlap making monitoring, reporting, determination of compliance, and enforcement very complex. The volume and rates of diversion sought in the water rights application are based on estimates of historic use and an estimate of optimum irrigation requirements. The estimate of required optimal irrigation was derived using an irrigation efficiency of 65% and an additional 10% for leaching salts. The estimated irrigation requirements appear to be an overestimation of actual historic use by approximately 32% for the 30-year median of 962 acre-feet (312 ac-ft / 962 ac-ft = 0.31), and approximately 42% for the median of the baseline period (377 ac-ft / 898 ac-ft) (see my Table 1). The requested water allocation for an annual maximum diversion of 1,615 acre-feet and a 20-year average are approximately 68% and 25%, respectively, above the 30-year median of actual water use.

The application seeks to have an annual diversion that is an additional 10 percent above the optimal irrigation requirement for leaching of salts that might build up as a result of irrigating with higher salt content water. The need for leaching could be lessened through irrigation management, pumping less from the Old Well, and close monitoring of irrigation water salinity. The maximum annual diversion limit is based on optimal irrigation during a year that would be similar to the drought of 1977, a period of lowest flows on record for the Big Sur River. The DEIR's justification of historic diversions as baseline does not consider whether these past diversions might have had an impact on public trust resources, such as fisheries. The six water diversion limitations are given in DEIR Table 2-4 and will be discussed in the order listed below:

- 1,615 acre-feet maximum calendar year total diversion;
- 1,200 acre-feet running 20-year average maximum annual total diversion;
- 735 acre-feet July 1 to October 1 seasonal maximum total diversion;
- 230 acre-feet July 1 to October 1 monthly maximum diversion;
- 5.84 cubic feet per second maximum instantaneous pumping rate; and
- 5.34 cubic feet per second maximum 30-day average pumping rate.

a) <u>1,615 acre-feet maximum calendar year total diversion</u>

The maximum 1,615 acre-feet per calendar year diversion will provide for the average application of approximately 6.5 acre-feet per acre (or just feet) of water across the 248 acres of pasture, or 6 feet if the DEIR's 267 acres (that includes the 25-acres of riparian lands) is used. This water is in addition to the 26.41 inches of annual precipitation stated in the 3rd Amendment, or the 27.26 inches of annual precipitation given in Table 7-14 by NRCE in their 2007 report, or the 30.63 inches of annual precipitation given in Table 1 of Appendix B of NRCE's 2007 report. The water right application request for a maximum annual 1,615 acre-feet of diversion is based on an estimated historic high diversion of 1,611 acre-feet in 1977 and 1,737 acre-feet in 1984 (page 4.1-5 and Table 2-1). Water year 1977 had the lowest average annual flow on record, 10 cfs, for the Big Sur gage; water year 1984 had a near median annual average flow of 80.6 cfs (USGS web site for gage #11143000). During 1984 the diversion was highest because the New Well was brought on-line, and apparently the pumping wasn't based on and far exceeded what was needed. The DEIR notes that the amount pumped in 1984 was not normal, but still uses it in the justification of maximum annual diversion. The DEIR also notes on page 2-24 that calculations show that the amount of water pumped in 1977 exceeded the 1,430 acre-feet that were calculated as necessary (Table 2-3). It should also be noted that the year being used to set the maximum historic use, 1977, is not within the 1985 to 2004 CEQA baseline period of the DEIR. Table 2-1 shows that the highest annual diversion during the baseline period was 1,136 acre-feet in 2004.

The DEIR indicates in the footnote of Table 2-3 that the source of the irrigation diversion requirements listed in the table is from the 2006 3rd Amendment to the water rights application. However, there is a conflict between the amended water rights application's Table 5 and the tables in the supporting technical reports. The 2006 3rd Amendment states on page 4 that the annual amount of water needed for optimal crop production would have been 1,440 acre-feet for 1977, while Table 5 on page 8 of the Attachment A of the 3rd Amendment, which was the source for DEIR Table 2-3, shows 1,430 acre-feet. The source for Table 5 in the 2006 3rd Amendment to the application is unknown because it disagrees with the monthly irrigation diversion requirements table given in Appendix B of the 2005 NRCE water use report, the document cited in the 3rd Amendment. It even disagrees with the monthly irrigation requirement given in the table in Appendix C of the updated 2007 NRCE report. The 2005 NRCE report shows irrigation diversion requirements for 1977 were 1,321 acre-feet, but the analysis was based on an irrigation area of 290 acres, with 55 percent efficiency and 11 percent leaching. The 2007 NRCE report shows irrigation diversion requirements for 1977 were 1,303 acre-feet, but the analysis is based on 267 acres, with 65 percent efficiency and 10 percent leaching. Given that the updated 2007 NRCE report followed the 2006 3rd Amendment to the water right application, the conflict is understandable. However, the 2007 NRCE addendum report was accessible yet an outdated table on irrigation diversion requirements was still used in the DEIR. **Table 2-3 of the DEIR should be updated to show the estimate of diversion requirements based on the more recent 2007 estimates and the DEIR re-written to reflect this updated information.** The water rights application may also need to be updated.

The updated 2007 NRCE analysis attempts to justify the argument in the application for the 1,615 acre-feet annual maximum based on the need for optimal pasture growth and a need for leaching of built up salts. The fact is that the application is for a maximum annual diversion that is based on a non-baseline year with the worst flows on record, plus approximately 24 percent ((1615 ac-ft-1303 ac-ft) / 1303 ac-ft = 0.239), which includes the extra 10-percent for leaching. I'm not certain what the limit of beneficial use of applied water is, but appropriating annually 24 percent more water than is needed to satisfy optimal pasture growth during the worst drought on record, seems to be excessive.

The proposed application of 6-plus feet of water to a pasture greatly exceeds the irrigation requirement that others have either measured in the Monterey County area for pastures or cited as being considered not wasteful. The California Department of Water Resources (DWR) web site has spreadsheets that tabulate agricultural land and water use throughout California for 1998 through 2001 (http://www.water.ca.gov/landwateruse/anlwuest.cfm). El Sur Ranch is located in the Detailed Analysis unit 057-Santa Lucia Range, Planning Area 301-Northern Central Coast, and the Central Coast hydrologic region. DWR lists a range of applied water for pasture in these study areas for the years 1998 through 2001 of 2.17 to 3.5 acre-feet per acre (or feet). Mr. Moeller in his April 12, 1992 SWRCB staff inspection report stated that a typical application rate for pasture land is 3 acre-feet per acre (3 feet).

In fact, the 2007 NRCE report states that the average historic January to December irrigation application on the El Sur Ranch is 3.43 feet, which is close to the DWR regional March to October estimate that ranges from 3.3 to 3.5 feet. A review of DEIR Table 2-1 shows that the applicant's historic irrigation occurred mostly during March to October. **The DEIR doesn't present a comparison, for similar periods, between the El Sur Ranch's historic water use and the historic regional water use documented by DWR or others such as the various Monterey County water agencies. It should be noted that the year being used to set the maximum historic use, 1977, is not within the 1984 to 2004 CEQA baseline period of the DEIR.**

Finally, the Water Code in Section 1004 states that "'useful or beneficial purposes' shall not be construed to mean the use in any one year of more than 2-1/2 acre-feet of water per acre in the irrigation of uncultivated areas of land not devoted to cultivated crops."

The Water Code doesn't indicate whether an irrigated pasture is considered a cultivated or uncultivated crop. The USDA does, however, define the difference between a cultivated and uncultivated crop for its National Resource Inventory Program. Footnote 5 in a 2006 USDA publication, Environmental Effects of Agricultural Land-Use Changes by Lubowski and others, (http://www.ers.usda.gov/publications/err25/) provides the following distinction:

> *"[5]Cultivated cropland includes land identified as being in row or close crops, summer fallow, aquaculture, in crop rotation, or other cropland not planted. Cultivated cropland includes cropland in short-term set-aside programs; double-cropped horticulture; and land in either hay or pasture which had at least one of the three previous years in row or close-grown*

crops. The NRI definition of uncultivated crops includes land in hay with no rotation and single-cropped horticulture."

The DEIR should clarify that the pastures are considered un-cultivated croplands. According to the USDA definition, the permanent pasture land at the El Sur Ranch would likely be considered uncultivated lands and subject to the 2-1/2 acre-feet-per-acre beneficial use required by Water Code Section 1004.

b) <u>1,200 acre-feet running 20-year average maximum annual total diversion</u>

The second proposed diversion limit is a 20-year running average maximum annual total of 1,200 acre-feet. Application of this criterion requires calculating next year's maximum diversion by averaging it with the previous 19 years of annual diversion data. The date that this forward calculation needs to be done isn't specified in either the DEIR or the 3rd Amendment, but presumably it would be done at the first of each year because a calendar year is the stated period of use, January 1 to December 31. Table 2-1 of the DEIR shows that the 20-year rolling average for the baseline period of 1985 to 2004 was 857 acre-feet. Thus, the requested 1,200 acre-foot 20-year rolling average is approximately 40 percent above the baseline average ((1,200 ac-ft -857 ac-ft) / 857 ac-ft = 0.40). The DEIR doesn't provide water use information for years after 2004. Therefore, whenever the water rights permit is approved, there will be a for water use data after 2004 in order to calculate the 20-year average. I made a spreadsheet with 19 years of baseline water use data (1986-2004) to calculate how many years the 1,615 acre-foot maximum annual diversion can occur before the 1,200 acre-foot average is reached. Without the last 5 years of water use data (2005-2009), this calculation has to use, beginning with the year 2005, the maximum annual diversion of 1,615 acre-feet. According to the calculation, the 1,200 acre-feet limit would be exceeded in 2014. **The 1,200 acre-foot running average diversion limit doesn't have much effect on reducing the number of years that the maximum annual volume can be diverted if the next 10 year's diversions can be at the maximum of 1,615 acre-feet. The request for an average annual diversion limit that is 40 percent above the historic baseline average seems excessive and suggest unreasonable use.**

c) <u>735 acre-feet July 1 to October 1 seasonal maximum total diversion</u>

The DEIR states on page 2-25 that two out of the 30 years of historic record exceeded the 735 acre-foot seasonal limit. Based on DEIR Table 2-1, those two years were 1979 and 1984. As discussed above and hinted at in the DEIR, pumping in 1984 was related to the development of the New Well and exceeded what was necessary for beneficial use. The estimated actual pumping in 1979 exceeded the requested 735 acre-foot seasonal limit by 9 acre-feet. The water year 1979 was an average water year with an average annual flow of 97.9 cfs (USGS web site). It should also be noted that 1979 is outside the DEIR baseline period. The historic seasonal diversion for 1977, the water year with the lowest flows on record, was only 661 acre-feet. Additionally, DEIR Table 2-3 shows the calculated estimate of diversion required for this four-month irrigation season in a year with no precipitation is 690 acre-feet.

I've attached my Table 1 which compares the historical and the calculated optimal diversions shown in DEIR Tables 2-1 and 2-3, respectively. Based on DEIR Table 2-3 and my Table 1, the estimated optimal irrigation diversion requirements during the baseline period for the July 1 to October 31 irrigation season reached a maximum of 735 acre-feet once, in calendar year 1993, and the difference between actual diversion and calculated irrigation requirement for that year is 81 acre-feet (735 ac-ft – 654 ac-ft = 81 ac-ft). The difference between the median of the actual diversion and the median of the optimal irrigation season for the baseline period is 98 acre-feet (653 ac-ft – 508 ac-ft = 98 ac-ft). The difference between the actual and optimal irrigation for the 30-year record is 53 acre-feet (651 ac-ft – 599 ac-ft = 53 ac-ft) These are differences of approximately 19% (98/508 = 0.19) and 9% (53/599 = 0.088) above the median, respectively.

As with the annual maximum diversion limit, the water right application is requesting an appropriation for the summer irrigation season that is at the maximum of historic use and estimated optimal diversion requirement. The requested 735 acre-foot seasonal diversion is 45 acre-feet greater (735-690 = 45) than the calculated irrigation requirement for a year with no precipitation and 74 acre-feet greater than the historic diversion during 1977 (735-661 = 74), the year of lowest flows on record. The 3rd Amendment states that this seasonal diversion limit is intended to regulate pumping during the months of lowest flows. The DEIR doesn't provide any information on the relationship between the historic diversions and the flows in the river at the time of these diversions with reference to the current knowledge about flows necessary for fish passage. Thus, there is no assessment in the DEIR of whether the historic seasonal diversions might have affected fish passage. Given that the requested diversion is 11% greater than the historic diversion of the year with the lowest flows on record (74/661 = 0.11), it doesn't seem to offer much protection to the public trust resources. The DEIR should also show that the flow percentiles used in the mitigation measures as additional limit on the seasonal diversion are protective of fish passage and other public trust resources.

The proposed July to October total seasonal limit for total diversion is set just below the maximum one-year historic diversion and exceeds the calculated estimate of the optimal diversion requirement for a year with no precipitation. In addition, the requested diversion limit of 735 acre-feet is 11% greater than the historic diversion of the year with the lowest flows on record (1977), which doesn't seem to offer much protection to the public trust resources, nor have the effects of of such a diversion, in fact, been analyzed. The DEIR should provide an analysis of the relationship between historic diversion and the percentile flows in the river at the time of diversion, along with an opinion on whether historic seasonal diversions might have affected public trust resources. The DEIR should also provide an evaluation to justify the flow percentiles used in the mitigation measures as additional limits on the diversions. Consideration should be given to adding an additional mitigation measure that would further restrict diversion during periods of drought, such as eliminating the additional 10-percent diversion desired for annual leaching of salts during periods of drought.

d) <u>230 acre-feet July 1 to October 1 monthly maximum diversion</u>

The fourth limitation addresses the monthly volume of diversion during the irrigation season running from July1 to October 31. The 2006 3rd Amendment states that this diversion limit is approximately the calculated maximum irrigation requirement for optimal forage in July. The DEIR states on page 2-25 that "[t]his volume is the calculated maximum irrigation diversion requirement for optimal forage production in July, and is based on an average pumping rate not-to-exceed 5.34 cfs for the period July through October." However, a pumping rate of 5.34 cfs results in a total monthly diversion of approximately 318 acre-feet. The DEIR in Table 2-3 lists the estimated July requirements and has a maximum of 222 acre-feet for the baseline years, but gives no average for any month. The equivalent table in Appendix C of the NCRE 2007 report shows a July maximum of 220 acre-feet. The 2006 3rd Amendment indicates that the 230 acre-foot monthly maximum diversion includes a "cushion" of 37 acre-feet above the average diversion requirement to allow for unanticipated variations in need. Back calculating by subtracting the 37 acre-feet cushion from the 230 acre-feet gives an average July diversion requirement of 193 acre-feet. Table 2-1 of the DEIR shows that the average historic baseline diversion in July was 152 acre-feet. Thus the requested 230-acre-foot maximum monthly limit from July to October is approximately 51 percent higher than the baseline average use ((230 ac-ft -152 ac-ft) / 152 ac-ft = 0.513). This 51 percent above the baseline average during the period of lowest flows exceeds the diversion requested for the 20-year rolling average, which is 40 percent above the baseline average. The July monthly average diversion is the highest of the July to October months for both the 30-year historic use and 30-year calculated optimal irrigation requirement. It should be noted that DEIR Table 2-1 shows that June has the highest average historic rate of baseline diversion, while the DEIR focuses most of the impact assessment on the months of September and October.

The 230 acre-foot maximum monthly limit from July to October is approximately 51 percent above the baseline average diversion for July, the month used in setting the limit. This limit allows for maximum diversion during the period of lowest flows, which conflicts with the goal of protecting public trust resources. The month of June has the highest average historic diversion of June through November, the months with the lowest historic flows. The DEIR should be revised to provide a discussion of the applicant's reasons for the requested 37 acre-foot "cushion" and the impacts on public trust resource that result from using the month with the second highest average diversion for establishing the dry season diversion limit.

e) <u>5.84 cfs maximum instantaneous pumping rate</u>

The water right application requests a maximum instantaneous diversion rate of 5.84 cfs based on an application rate of 1 cfs for each 50 acres assuming a total irrigated acreage of 292 acres (see Table 1 on page 3 of the memorandum accompanying the 3rd Amendment). The DEIR is based on irrigating 267 acres, and as noted above, I measured the actual number to be approximately 248 irrigated acres. The DEIR doesn't give any discussion or reasoning at to why the maximum diversion is set at 5.84 cfs beyond stating that it is below the historic high pumping rates that periodically exceeded 6 cfs (page 4.2-59). The DEIR in Table 4.1-1 lists the 5.84 cfs rate as a "[m]aximum monthly rate" not an instantaneous rate. This conflicts with the 2006 3rd Amendment that requests "a flow rate not to exceed 5.84 cfs at any time."

The standard of one cubic foot per second per 50 acres apparently comes from California Code of Regulations (CCR) Title 23, Section 697(a)(1), which discusses reasonable use of water appropriated by direct diversion. According to the CCR Title 23, Section 697(a)(1), the 1 cfs per 50 acres rate of use, or duty, applies when there is an abundance of water and a heavy transportation loss, or for irrigating porous, sandy or gravelly soils in the Central Valley of California or elsewhere in the State where similar conditions prevail. For other than porous, sandy or gravelly soils in the Central Valley or area with similar conditions the, CCR Title 23, Section 697(a)(1) considers a duty of 1 cfs per 80 acres to be reasonable use. In areas where water supply is less abundant and conditions are favorable to a more economical use, a duty of 1 cfs for 150 acres is considered reasonable use. The conditions that the CCR Title 23, Section 697(a)(1) applies to the diversion rate of 1 cfs for 50 acres are not fully met at El Sur Ranch and therefore the reasonableness of the proposed 5.84 cfs maximum diversion may not be consistent with the CCR Title 23, Section 697(a)(1).

First, the climatic conditions at the El Sur Ranch along the Central Coast of California adjacent to Big Sur are not similar to the central valley of California. Second, the majority of the soils being irrigated (86 percent) are a Santa Ynez fine sandy loam and likely don't fit the porous, sandy or gravelly criteria of the CCR Title 23, Section 697(a)(1). Water available for appropriation is not abundant throughout the year, especially during summer months. Transportation losses are minimal because water is delivered to the pastures by pipe. Finally, the area of irrigation is not 292 acres as stated in the application, but closer to 248 acres, as discussed above. Therefore the reasoning used in the water rights application and the DEIR to justify the one cfs per 50 acres as a reasonable use doesn't seem to apply.

A reasonable diversion rate of 3.1 cfs is calculated from CCR Title 23 Section 697(a)(1) with a duty of 1 cfs per 80 acres, along with an irrigated area of 248 acres (248 acres * (1 cfs / 80 acres) = 3.1 cfs). This value assumes that the El Sur Ranch lands being irrigated have a climate similar to the Central Valley of California. Table 4.2-6 of the DEIR lists the baseline mean flow diversions by month and shows that the historic maximum diversion in June was 2.89 cfs, which is comparable to the 3.1 cfs calculated above.

The DEIR should document the reasoning behind selecting the maximum instantaneous diversion rate of 5.84 cfs. This documentation would demonstrate why the El Sur Ranch lands fit the conditions specified in CCR Title 23 Section 697(a)(1) for 1 cfs per 50 acres, use the actual acres being irrigated in the calculation, and then compare the requested instantaneous rate to the baseline condition.

f) <u>5.34 cfs maximum 30-day average pumping rate</u>

The sixth water right diversion limit is the 5.34 cfs 30-day average diversion rate for any time of the year. As with the maximum instantaneous diversion rate, the DEIR does not provide the reasoning behind the selection of this 30-day running average diversion limit, but some reasoning is provided in 2006 3rd Amendment. This limit was added in the 2005 amendment, based on the ratio of 50 acres per cubic foot per second, similar to the maximum instantaneous rate, only this time 267 acres was used as the number of irrigated acres. In addition there is a statement in the DEIR on page 2-26 that the 230 acre-feet July to October monthly limit is based on the average pumping rate not-to-exceed 5.34 cfs. However, the maximum monthly diversion from continuous pumping at a rate of 5.34 cfs is approximately 318 acre-feet. Elsewhere, the 3rd Amendment on page 8 of the accompanying memorandum states that, based on the 230 acre-foot monthly maximum diversion limit, the monthly pumping rates should not normally exceed 3.87 cfs in "any calendar month," but that the 5.84 cfs pumping rate is retained because it is close to the combined capacity of the two wells and is needed on occasion. However, the 230 acre-foot monthly limit is only for the months of July to October. In addition, the combined pumping capacity of the two wells is 7.93 cfs, 4.45 cfs for the Old Well and 3.48 cfs for the New Well (page 4.2-48).

As discussed above, the rational for this reasonable use standard apparently comes from CCR Title 23 Section 697(a)(1) and, as noted above, the reasonable use diversion of 1 cfs per 50 acre doesn't seem to apply to the El Sur Ranch pastures. The maximum pumping rate of 3.1 cfs based on a duty of 1 cfs per 80 acres still applies. If this diversion limit were applied during the July 1 to October 31 irrigation season, then a 30-day running average maximum total diversion of approximately 184 acre-feet would result. It should be noted that 184 acre-feet is the value used in the DEIR in Table 4.2-6 for both the project's 20-year average and the maximum diversion for the months of July to October, rather than the maximum limit of 230 acre-feet in any month requested in the 3rd Amendment.

The DEIR presents other information related to this 30-day average maximum diversion rate that appears to conflict. Table 4.1-1 lists a 30-day average rate (5.34 cfs) as a baseline of 234 acre-feet for August and September 1997. However, Table 2-1 lists the historic diversions during August and September 1997 as 97 and 121 acre-feet, respectively, and 94 and 98 acre-feet for July and October 1997, respectively. Table 4.1-1 then lists the proposed project's 20-year running 30-day average as 318 acre-feet. But the 3rd Amendment doesn't link the 30-day average maximum limit to the 20-year running average limit.

The water rights application makes a significant distinction between calendar months and the period of 30 days for diversion limits, 230 acre-feet per month and a 5.34 cfs 30-day average maximum. Table 4.2-6 compares the baseline to the proposed project diversion and gives another average rate of 3.09 cfs for the months of July to October, apparently based on the monthly maximum diversion of 184 acre-feet, which is less than the 230 acre-feet limit specified in the water rights application. The reasoning for the 184 acre-feet and 3.09 cfs project maximums given in Table 4.2-6 is unknown, other than it is the 4 month average of the 735 acre-foot seasonal limit, but a 184 acre-foot per month limit in July through October is not required in the application. Another example of the conflict between 30-day and monthly averaging would occur when pumping is continuous during the July 1 to October 31 season at an average rate of

5.84 cfs (the maximum instantaneous any time rate) for 19 consecutive days in a calendar month with no pumping for the remainder of the month (10 or 11 days depending on the month). This would divert approximately 220 acre-feet and would not exceed either the 230 acre-foot monthly limit or the 30-day average maximum of 5.34 cfs. Nevertheless, this 19-day period of pumping would affect the flow of the Big Sur River by the continuous diversion of 5.84 cfs, which would greatly exceed the impact by the 3.87 cfs diversion assumed by the maximum monthly total diversion of 230 acre-feet, and would have a slightly greater impact than would the maximum 30-day average diversion rate of 5.34 cfs. The overlapping complexity of the various diversion rates, such as the any time maximum 30-day average of 5.34 cfs, the seasonal monthly total of 230 acre-feet, and the any time instantaneous average of 5.84 cfs, is another example of complexity that these overlapping diversion limits create, which raises the question of how the diversions will be monitored and reported, and the limits enforced.

The DEIR should document the reasoning behind selecting the 30-day running average limit of 5.34 cfs. This documentation would demonstrate why the El Sur Ranch lands fit the conditions specified in CCR Title 23 Section 697(a)(1) for one cfs per 50 acres, use the actual acres being irrigated in the calculation, compare the requested 30-day average rate to the baseline condition, and then discuss the reasoning for distinguishing between and setting different diversion limits for monthly and 30-day running averages.

5) Estimates of the impact on river flows from pumping the El Sur Ranch wells is highly dependent on the location and condition of the Big Sur River as it flows through the pumping zone of influence (ZOI) of the wells. The impacts from a pumping well(s) on a nearby stream are controlled by the distance between the well(s) and the river, the rate and duration of pumping, and the hydraulic conductivity and storage coefficient of the aquifer and any low permeability layer that lines the channel. A great deal of effort by the applicant has been directed to the study of how much and at what location surface water is gained or lost during periods of pumping and non-pumping within the ZOI of the El Sur Ranch wells. While these studies were being conducted, from 1997 to 2007, the lower section of the Big Sur River made a sharp bend towards the southwest (see DEIR Figure 2-2), flowing almost transverse to the axis of Creamery Meadow, and then bent northwest into the lagoon area before bending again southwest to discharge into the ocean.

The southwestern transverse flow of the river within the ZOI is a critical factor in gains or losses to the river during pumping because it cuts across the regional direction of ground water flow. The applicant previously described the discharge of ground water in the ZOI as upwelling either due to a constriction in the bedrock at the mouth of the river that reduced the volume of ground water discharge or the result of salt-water intrusion during high tides. My June 28, 2006 memo that’s included in Appendix B of the DEIR discusses in detail why the constriction hypothesis is not likely the cause of ground water upwelling and why the effect of the salt-water intrusion has not been adequately quantified.

In summary, while the aquifer width and cross-sectional area are reduced at the mouth of the river, but the ability of the aquifer to transmit ground water is not because the hydraulic conductivity increases with depth, which increases the aquifer transmissivity. Thus, the product of the transmissivity times the aquifer width is equal to or greater at notch as further upgradient under Creamery Meadow. If the hydraulic gradients at the notch and Creamery Meadow are considered the same, then the quantity of flow is the same using Darcy's Law (Q = k*i*A). The upwelling that might be caused by salt-water intrusion hasn't been quantified and, given the daily and seasonal variation in sea level from tides and storms, and impacts of pumping of the wells on salt-water intrusion, it hasn't been shown that any upwelling due to salt-water intrusion is consistent long enough to have made a sustained impact. The likely cause of the ground water discharging to the river in the ZOI is not due to upwelling from a constriction or salt-water intrusion, but rather to a difference in head between the river and the adjacent water table, which is strongly affected by the orientation of the river relative to the direction of ground water flow.

The orientation of the river transverse to the direction of ground water flow allows for the discharge of ground water into the river on the upgradient riverbank, a gain in flow, whenever the surface water elevation of the river is lower than the water table elevation under the adjacent aquifer beneath Creamery Meadow. The amount of water gained by the river is controlled by the hydraulic conductivity of the aquifer and riverbed, the area of river bed exposed, and the hydraulic gradient, in other words, Darcy's Law. Because the river flows transverse to the direction of ground water flow the gradient between the river and ground water table is at a maximum. When the river is oriented less than perpendicular to the ground water gradient, then the hydraulic gradient between the river and water table is less than maximum and rate of flow between them is reduced. In fact, the conditions where the river flows nearly parallel to the flow of ground water occurs just upstream of the ZOI. Measurements of river flow taken between velocity transect no. 1, VT1, and the ZOI show that this reach of river changes back and forth from a gaining to a losing stream several times. I've attached my Table 2, which shows the changes during July through October of 2004 between upgradient VT1 and study year 2004 velocity transect no. 2, VT2, which is located near the edge of the ZOI (see SGI, 2005, Figure 1-3). This table shows that this section of the river that is outside the ZOI changes from a losing to gaining reach and back again during these 4 summer months. The causes of these changes were not determined. However, the DEIR on page 4.2-62 notes that during the 2007 study for a distance of up to 600 feet upstream from the ZOI the groundwater gradient become more negative, greater river loss, when both wells were pumping. This suggests that the changes from gaining to losing in Table 2 might in part be due to pumping.

The change in the rate and direction of ground water discharge to the river based on the orientation of the river is an important factor in the consideration of the impacts on the Big Sur River from pumping the El Sur Ranch wells. The DEIR places a lot of emphasis on the gains in river flow that occur in the transverse section of the ZOI. The DEIR balances these gains against the losses that occur in the river due to pumping. The problem however is that these gains are in part dependent on the orientation and location of the river and require that the river stay in its current location and in the current condition for the gains measured during the period of study to remain valid. Unfortunately, the river's location during the 1997 to 2008 period of study is significantly different from its historic location at least in the lower section adjacent to the El Sur Ranch wells. This suggests that the river is very dynamic in the lower section and likely to meander to other locations as a result of high flow events. In fact, the 5,000 cfs peak flow during the recent October 13, 2009 storm event appears to have created a second flowing channel according to

CDFG staff that conducted recent field surveys following this storm. This change in the impact on the gains or losses to the river flows, from shifting of the channel location and/or a bifurcation of flow in the ZOI, is not evaluated in the DEIR. The fact that the channel recently changed means that the DEIR is based on channel conditions that apparently no longer exist.

The dynamic nature of the lower section of the Big Sur River is apparent when the historic aerial photos of the lower river are reviewed. Several historic aerial photos either were submitted with the applicant's reports or are readily available over the Internet. The Rogers E. Johnson and Associates's (REJA) 2007 report on El Sur Ranch coastal cliff erosion has eight aerial photos taken from 1942 to 2003 that show portions of the lower section of the Big Sur River. The 2005 NRCE report on reasonable beneficial use has a 1929 image of the river adjacent to the southern portion of the project area. A digital orthophoto quadrangle developed by the USGS from May 1994 imagery (NAPP 6920 12) is available over the Internet as a digital tiff file (o36121c7sw.tiff). This imagery can be found at: http://atlas.ca.gov/download.html, and a portion that encompasses the project area is attached as my Figure 1. Oblique coastal aerial photos of the mouth of the Big Sur River are available on-line from the Coastal Records Project. The Andrew Molera State Park web site links to these Coastal Records Project images. Attached Figure 2 shows the mouth of the Big Sur River in its historic straighter course on April 30, 1979. Flows at the USGS gage on this day were approximately the mean annual average at 99 cfs. This image also gives an indication in Creamery Meadow of the course the river would take sometime after May 1994.

The historic location of the channel was much closer to the El Sur Ranch wells than its location during the 1997 to 2008 period of study. In fact, the 1992 SWRCB water rights staff report indicated that the river was approximately 160 feet from the New Well. The channel shifted southwestward, apparently in response to high flows sometime after May 1994 when the USGS orthophoto imagery was taken and prior to the 1997 field studies of Jones and Stokes (Jones and Stokes, 1999). A close inspection of attached Figure 2 finds that the future course the river can be seen as a shallow, arcuate depression to the right of the active channel in what was then a grass covered section of Creamery Meadow. This shallow depressed area aligns well with the edge of overbank flow pattern visible on Figure 6 in the REJA 2007 report, a May 1956 aerial photo of the project area.

The river was apparently still migrating following the 1997 Jones and Stokes field work as evidenced by the destruction of their JSA-5 monitoring well they installed across the river within Creamery Meadow. A plot of the previous location of this monitoring well on more recent imagery would give an indication of the amount of channel migration. As noted above, the recent October 13, 2009 storm flows have apparently changed the channel again and appear to have created a second flowing channel. The historic migration of the river during high flow events indicates that the channel can shift course at any time. This dynamic geomorphic characteristic should be considered when assessing the impacts of diversions from wells in the area.

Given the historic migration of the Big Sur River channel within the lower reach as evidenced in the recent channel changes, it is likely that the section of the river adjacent to the El Sur Ranch wells will always be susceptible to a change in shape and location.

Reliance on the channel remaining in one location is not warranted. Thus, the analysis of the relationship between the river, ground water table and the pumping wells can be expected to periodically change and that change may be significant. When the river flows nearly parallel to the axis of the alluvial valley, gains and losses from the river to ground water will likely follow the pattern seen in the reach upstream of the ZOI, that is, vary from a gaining to losing reach naturally throughout the year, and in response to changes in pumping rate and duration. Combined with the periods of drought that reduce the amount of ground water flowing beneath Creamery Meadow, the amounts of ground water gained or lost to the river will the likely vary significantly over time.

The DEIR's assumption that the conditions of the river in the ZOI during the 2004 to 2007 study period will continue and remain constant, and that ground water will always discharge into the river in the ZOI from Creamery Meadow isn't justified. The DEIR should be modified to document the dynamic nature of the lower portion of the Big Sur River, evaluate the impacts of a change in channel position on the environmental impact analysis, discuss the impacts of changing channel location on the gains and losses to the river, and provide mitigation monitoring measures needed to document and measure the changes in river flow during pumping of the wells whenever the channel migrates or the character of the channel bed material changes.

6) The DEIR assesses the environmental impacts from the El Sur Ranch wells with the assumption that the water pumped comes from two separate sources, water stored in the ground water aquifer and water lost from the river during periods of pumping. The DEIR also assumes that the amount of water loss from the river during periods of pumping is a relatively constant percentage of the total water pumped and that the maximum amount is constant at 24 percent of pumping (page 4.2-65). The assumption that the source of water pumped by a well can be both the groundwater aquifer and a nearby river is valid and well documented in technical literature. However, there are several significant issues, both technical and legal, that complicate the DEIR's approach of having two distinct sources for the water being diverted through pumping wells. Those issues include the following:

a) The DEIR's determination of how much water is lost from the river due to pumping of the El Sur Ranch wells ignores the likelihood that the channel location and conditions will change and thereby alter the hydrogeologic setting which determines the amount of water lost from the river. **Thus, the assumption that the river losses are constant at a approximately 24 percent of the pumping rate, 0.74 cfs at 3.09 cfs pumping and 1.28 cfs at 5.34 cfs pumping (page 4.2-66), and that this rate of loss will occur in perpetuity is invalid.** It should be noted that the loss rate is not given for the maximum instantaneous pumping rates of 5.84 cfs, which would be 1.4 cfs, if this linear relationship is accurate. The issue of channel migration was discussed in more detail above in item no. 5.

b) The DEIR's analysis of pumping impacts ignored the fact that the river continues to lose flow after the pump is turned off. When a well pumps ground water it creates a cone of depression around it and this drop in water table or piezometric surface has to be backfilled once the pumping stops. The DEIR acknowledges that it takes approximately 4 days for ground water levels to recover after pumping stops, but fails to understand what this means to flows in the river (page 4.2-59). The rise in the level of ground water during this recovery period is similar, but inverse to the drop during pumping. In fact, well recovery analysis commonly assumes that the rise in water level during recovery can be calculated by assuming the pump drawdown curve continues, but at the moment the pumping stops the drawdown pumping curve beginning at time zero is inverted and the recovering water level is the sum of the two curves.

The period of recovery can be almost as long as the period of pumping. The continued loss of water from the river following cessation of pumping was not accounted for in the DEIR analysis of impacts or the mitigation measures. This failure to account for river losses during well recovery becomes important because the DEIR proposes to split the source of water pumped and because some of the water right application diversion limits are based on specific periods of time, such as monthly and 30-day averages. Although water is not diverted to the pastures when the pumps stop, water is still being diverted from the river and the impacts of that diversion continue until the water table recovers. This is analogous to diverting surface water through a gate that doesn't completely closed. **The duration of pumping impacts extends beyond the time listed in the DEIR tables because of the recovery of the cone of depression. This should be accounted for in the environmental impact analysis and the diversion limits.**

c) The DEIR assumption that water is being diverted from two sources, surface water and subterranean channel ground water, requires that the monitoring of diversion include measurements of both surface water and ground water hydraulic and hydrogeologic conditions across the ZOI rather than at one local point of interest. The DEIR assumes that the changes in surface water flow due to pumping can be averaged across the ZOI. However, this averaging does not account for local impacts such as restriction of fish passage at a riffle. Averaging flows across the ZOI isn't valid when the impacts are local. For example, the failure to maintain fish passage at passage transects 10 and 11 near the upstream limit of the ZOI can't be mitigated by having more flow at the downstream passage transect 4. The DEIR mitigation measures lack ongoing monitoring of conditions in the river channel within the ZOI to measure whether the assumptions about the rate of diversion from each source, the effectiveness of flow averaging within the ZOI, and the stability of the channel location continue to maintaining adequate fish passage and habitat during periods of diversion.

   The DEIR should be revised to address how the impacts of diversions from the separate sources, surface water and ground water, will be monitored to ensure that the assumptions about the conditions in the ZOI made in the environmental analysis remain valid.

d) The proposal to separate the sources of pumped water into surface water and ground water will require that the monitoring program for the water right permit take into account not only the river flows at a surface water gage, but also the condition and location of the channel, the ground water levels in and adjacent to the ZOI and the changes in the level of the surface water in the ZOI due to variations in upstream flow and temporal changes caused by tidal fluctuation and/or the closing off of the lagoon.

As I've discussed above, the assumption that the amount of water lost during pumping is known and can be calculated based on a long-term consistent linear relationship between pumping and river loss is invalid. If the water right permit assumes that only a portion of the rate of diversion is derived from the river, that this proportion is constant throughout time, and then uses this relationship in establishing bypass flow requirements, then the bypass flows requirements will likely become invalid whenever the channel changes location or characteristics. As noted above, this may have already occurred as a result of the October 13, 2009 storm event, rendering the calculations presented in the DEIR outdated.

The water rights permit needs to have conditions that limit diversion that are easily monitored and accurately measurable, otherwise the permit conditions are unenforceable. The DEIR states that approximately 24% of the diverted flow comes from the river, but, as I've pointed out, river losses continue for some time after diversion stops and in time the percentage of river loss will vary as that channel shifts.

The complexity of the proposed system of six water right limits will be difficult enough to monitor, report and enforce, but if the permit assumes that something other than the full rate of diversion impacts the flows in the river, then a bypass flow limitation(s) is a moving target.

e) The separation of diverted water into different sources raises an interesting legal issue regarding the nature of a subterranean stream. The proposal in the DEIR to account for the different sources of water being diverted by the El Sur Ranch wells appears to add a new condition to the legal definition of subterranean stream that directly conflicts with the SWRCB's Decision 1639.

SWRCB's Decision 1639 states on pages 6 and 7 that a subterranean stream need not be interconnected with a surface stream and any evidence concerning the interconnection of the ground water in the aquifer (alluvium) with surface flow is immaterial to the legal classification of the ground water. The decision goes on to discuss the meaning of underflow noting that it is a subset of a subterranean stream. The decision further notes that it is not necessary for ground water to be underflow to establish the existence of a subterranean stream. This issue of underflow is relevant because that is how Mr. Moeller described the conditions at the El Sur Ranch wells in his April 12, 1992 inspection report and it appears to be the basis for his stating that the underflow (ground water) of the Big Sur River is not from percolating groundwater and its use on other than riparian lands requires an appropriative right. In other words, Mr. Moeller determined that the ground water being pumped required an appropriative water right permit because it was coming from a subterranean stream flowing through a known and definite channel (Water Code Section 1200).

As discussed above, the DEIR was developed based on the assumption that the ground water being pumped by the El Sur Ranch wells comes from a subterranean stream flowing through a known and definite channel which, based on Decision 1639, doesn't require a linkage to surface water. Nevertheless, the DEIR attempts to quantify in somewhat confusing detail the linkage between the surface water flow in the Big Sur River, the nature of the ground water, and the different sources of the water being diverted through pumping of the El Sur Ranch wells. If the linkage between surface water and ground water is immaterial in determining that the ground water is in a subterranean stream, then why is it relevant in the granting an appropriative right to divert water being pumped from that subterranean stream?

The DEIR should discuss the requirements of SWRCB's Decision 1639 and how they are relevant to the El Sur Ranch well diversions. It appears that the DEIR's proposal to apportion the source of the water being diverted at the wells into surface water and subterranean stream ground water directly conflicts with Decision 1639. This conflict with Decision 1639 is an addition to other technical issues that are being raised in this memorandum as a result of the proposal to separate the sources of water being pumped.

f) The issues discussed in this section show that the DEIR's proposal to separate the water pumped by the El Sur Ranch wells into two sources, surface water and ground water in a subterranean stream, has a significant impact on the ability to monitor the diversion, and enforce CEQA mitigation measures, the water rights permit diversion limits and conditions, and any minimum bypass flow requirements that are necessary to protect public trust resources. In addition, the separation of water sources may significantly change the SWRCB's Decision 1639 requirements for establishing the existence of a subterranean stream flowing through a known and definite channel by requiring that additional evidence regarding where the water being diverted comes from and in what proportion. If one of the sources is surface water, then additional information may be necessary on the other types of surface water, such as springs, or irrigation return flow, and perhaps other elements of the hydrological cycle, such as direct precipitation runoff, the path of source water flow, or the age, etc.

The DEIR should analyze the environmental impacts of the El Sur Ranch diversions with the assumption that all of the pumped water is diverted from the Big Sur River. The El Sur Ranch well water rights permit limitations and conditions, as well as the bypass flow requirements should be written assuming that all of the flow being pumped by the wells is diverted from and causes potential impacts to the surface water flow in the river. This would be consistent with other water rights permits issued for subterranean stream diversions and would make the establishing and enforcing of diversion limitations and bypass flow requirements consistent with other permits.

7) The DEIR analysis utilizes the historic flow records for the Big Sur gage, USGS #11134000, located approximately 7 miles upstream from the point of diversion, the El Sur Ranch wells (page 4.2-4). The DEIR's was written with the assumption that this gage will be used in the water rights permit to measure flows at the point of diversion, determine compliance with water rights permit and bypass flow limits, and to monitor impacts from the pumping of the wells. Use of this gage requires that the gains and losses between the gage and the point of diversion be identified and accounted for when measuring the environmental impacts, and when establishing, implementing and monitoring minimum bypass flows needed to protect public trust resources.

The DEIR attempts to document the diversions between the USGS gage and the point of diversion, but doesn't provide any information on the gains or losses between the gage and the point of diversion that can be used in establishing minimum bypass flow requirements. The DEIR Table 5-1 is a listing of existing and potential water rights within the Big Sur watershed, but provides information on only the annual diversions, nothing on the seasonal diversions or instantaneous rates of diversions. In addition, Table 5-1 doesn't indicate whether these diversions are above or below the USGS gage and doesn't provide a map of their locations. The DEIR doesn't discuss or quantify the impacts from existing riparian diversion below the USGS gage or evaluate whether there is a potential for additional riparian diversions with future development. Elsewhere in the DEIR, under the discussion of surface water hydrology, some information on the changes in flow below the USGS gage is provided, but the information is incomplete and conflicting. For example, the text on page 4.2-25 states that the lower Big Sur River downstream of the USGS gage is a losing reach, but the information presented in Table 4.2-4 shows that the river is always gaining, even during summer months.

On page 4.2-31 of the DEIR states that flow losses measured from the USGS gage to a point approximately 4,000 feet upstream from the point of diversion, near velocity transect VT1, ranged from 1.93 to 8.9 cfs as measured from 1997 to 2005. The discussion however doesn't provide any insight on what rate of flow loss should be used in setting bypass flow requirements for the water rights permit. I have attached my Table 3 that provides four tables that list changes in flow between the USGS gage and a point approximately 4,000 feet upstream from the point of diversion, S1 in 1997 and 1998, and VT1 in 2004, 2006 and 2007. Information for these tables was taken from the Jones and Stokes (1999) and SGI reports (2005, 2007 and 2008). These four tables show the variation in the losses and gains in flow over this 7 miles of river at different times. While the August 1997 loss of 8.9 cfs is much higher than the others, losses in the range of 4 to 5 cfs are common during dryer periods. It should be noted that none of the studies evaluated what caused the measured losses, and thus can't provide any data on how to calculate the natural and anthropogenic losses below the USGS gage. This lack of information is likely due to the fact that the DEIR mitigation measures propose bypass flow requirements based on flow percentiles from historic gage measurements, not river flows necessary for fish passage.

The DEIR text also discusses the changes in flow between the USGS gage and Zones 2 to 4 in the ZOI during the 2007 study. The discussion cites Figure 3-28 of the 2008 SGI report as showing a losing stream between velocity transect VT1, located about 4,000 feet upstream of the ZOI, and VT3 midway in the ZOI. Unfortunately, the 2007 and 2008 SGI studies placed the upstream ZOI velocity transect, VT3, near the center of the zone, rather than at the upstream perimeter as the 2004 SGI study did with station VT2 (see Figure 1-3 in the 2005 SGI report). Flow losses between VT1 and VT3 measured in September 2007 shown in Figure 3-28 ranged from approximately 1.5 to 4.7 cfs. Because VT3 is within the ZOI and not at its upstream edge, the natural river losses can't be separated from those induced by pumping. I provided addition information of the gains and losses between VT1 and the ZOI above in general comment no. 5 with my Table 2 of flows measured from July to October 2004. The range of the losses shown in my Table 2 is similar to those of Figure 3-28, although there are periods where the river actually gains flow.

Therefore, the DEIR doesn't address the issue of gains or losses in the Big Sur River over the 7 miles between the USGS gage and the El Sur Ranch point of diversion with sufficient information to allow for determination of an appropriate value for adjusting USGS gage readings in the calculating of bypass flow requirements**. Based on the information in my Table 3, I would recommend that at a minimum, loss in instantaneous flow of 5 cfs be assumed downstream of the USGS Big Sur gage when calculating bypass flow requirements. With a more through investigation and analysis, the validity of the 8.9 cfs loss may be determined.**

The DEIR should provide analysis of the losses or gains that are likely to occur in the 7 miles between the USGS Big Sur gage and the point of diversion, and determine what value(s) should be used to correct the USGS Big Sur gage reading in setting bypass flow requirements. This analysis should document and evaluate natural and anthropogenic gains and losses in the river below the USGS gage and any potential future riparian diversions. As an alternative, the DEIR should evaluate whether another gage should be installed lower in the river that is closer to the point of diversion. CDFG staff has submitted a proposal to its management and is awaiting word on funding approval for the USGS to establish a gage on the Big Sur River in the Andrew Molera State Park area to aid in the current study of the river. Unfortunately, long-term funding for maintaining this gage may not be available.

8) The DEIR is written with the assumption that public trust resources can be protected using diversion limits set at flows for derived from specific threshold percentiles based historic daily river flows at the Big Sur USGS gage. Historic daily flows from April 1, 1950 to August 18, 2008 are listed by percentile in DEIR Table 4.2-1. Table 2 of the 2006 3rd Amendment also provides historic flow percentiles between 1950 and 2006, but these two tables don't give similar values. I've also prepared a historic flow percentile table using daily average flow data for the USGS Big Sur gage #11143000 that I recently downloaded from the USGS web site and processed in an Excel spreadsheet using the PERCENTILE() function. My attached Table 3 lists historic flow by percentile and by type of flow condition, wet, above average, normal, dry and critically dry. My Table 4 uses historic gage flow data from April 1, 1950 through August 30, 2009, the latest information available at the time of this memorandum. My percentile calculations are close to those in Table 2 of the 2006 3rd Amendment to the water rights application, which lacks the most recent three years of record because it was prepared in October 2006. **My updated percentile calculation shown in my Table 4 and those in Table 2 of the 2006 3rd amendment to the water rights application are in fairly close agreement, but differ significantly from those used in the DEIR, Table 4.2-1. I recommend that an evaluation be done as to why the DEIR flow percentiles differ. Following that evaluation, the correct table of historic daily flow frequency percentiles should be provided.**

9) The DEIR is written based on the premise that baseline pumping as listed in Table A on page 4.2-69 should be allowed year-round, subject to limitations established in a future monitoring program that will become part of a future Irrigation Water Management Plan (IWMP) as described in mitigation measure 4.2-2. In addition, mitigation measures 4.3-1 and 4.3-2 have flow limitation criteria, but the inclusion of these criteria in the IWMP isn't required. Pumping diversions above the baseline condition are allowed throughout the

year, based on the month and various non- exceedence flow criteria derived from the USGS Big Sur gage. I have attached my Table 5, which lists the monthly non-exceedence flow criteria taken from mitigation measures 4.2-2, 4.3-1, 4.3-2 and 4.3-4 as stated in DEIR Table 3-1 giving flow percentile cutoffs for when baseline and greater-than-baseline diversions can occur. The other mitigation measures listed below each of the three main mitigations are also subject to the same flow limitations. These criteria trigger only during either extreme critical dry and/or critical dry conditions. The term extreme critical dry is a term defined for this DEIR on page 4.2-68 as flows less than the 10th percentile. My Table 5 shows that there are typically two percentile triggers for each month, except June and November, each of which has only one. I've also added in parentheses the actual flow associated with each percentile, which is taken from my Table 4. Mitigation measure 4.3-4 for dissolved oxygen is listed at the bottom of my Table 5 because it is uniform throughout the year with fixed flow and temperature thresholds. These mitigation measures seem to overlap and present an unusual set of 23 bypass flow requirements.

For example, most of the 4.2-2 mitigation measures require that the flows at the USGS Big Sur gage drop below the 5th or 10th percentile before a cut back to baseline pumping is triggered. Once triggered, baseline pumping has to be maintained until flows rise above the 10th or 20th percentile, respectively. Regardless of flows, pumping can continue at the baseline rate unless no-diversions flow thresholds are specified in the yet-to-be-developed monitoring and operations plan for streamflow in ZOI Zones 2 through 4, which will be incorporated into the future IWMP. In addition, part (b) of the 4.3-1 and of the 4.3-2 mitigation measures require, in the future, development of possibly another monitoring and operations plan along with specific flow thresholds that will apparently be established in the Final EIR. Apparently, there is insufficient information at this time to develop the monitoring and operations plan or the specific flow thresholds needed to protect public trust resource. The lack of this information in the DEIR prevents government agencies and the public from having an opportunity to review and comment on these critical flow thresholds. Also, the DEIR doesn't set any specific standards for resource protection in these future plans other than general statements that flows in Zone 2 through 4 are not to be reduced such that the project has an effect on steelhead movement, that critical passage and dissolved oxygen conditions are not violated, real-time monitoring, recordkeeping, with an adaptive management feedback system, etc.

A review of my Table 5 suggests that mitigation measures 4.3-1 and 4.3-2 invalidate the lower trigger criteria of mitigation measure 4.2-2. For example, mitigation 4.2-2 allows pumping above baseline in January when flows are between the 10th (25.9 cfs) and 5th (24.4 cfs) percentiles, but upon reaching the 5th percentile, pumping is reduced to baseline. However, 4.3-1 requires that pumping be reduced to baseline below the 10th percentile flow condition. Why not restate 4.2-2 to be consistent with mitigations 4.3-1 and 4.3-2 and require that, whenever flows are below either the 20th or 10th percentile, pumping only at baseline levels is allowed, subject to future flow thresholds?

The DEIR states that CEQA guidance is followed in establishing baseline pumping rates, baseline environmental impacts, and mitigation measures for protection of public trust resources. The baseline pumping and environmental impacts used in this DEIR are given without an assessment or review of past impacts caused by this level of pumping. Even though the DEIR generally dismisses the prior impacts from pumping with justification of the project's baseline, there are statements on pages 4.3-37 and 4.3-42 that acknowledge that significant impacts may have occurred during past diversions.

> *"It should also be noted that the proposed incremental increases in pumping rates are relatively slight compared to baseline pumping rates. Baseline pumping has historically had a substantially larger effect on surface flow elevation than would be caused by the anticipated incremental increase in pumping that would occur as part of the proposed project. While baseline pumping conditions, by definition, do not require mitigation under CEQA, the effect of baseline pumping on fish passage in critically dry conditions, serves to magnify any adverse cumulative effect of project pumping on aquatic resources." (page 4.3-37)*

> *"Further, while only a slight, yet potentially significant, increase in the incidence of critical flow conditions could result from the proposed incremental increase above baseline pumping conditions, it is important to note that baseline pumping rates have historically had a substantially larger effect on the incidence of critical flow conditions than would be caused by the anticipated incremental increase in pumping that would occur as part of the proposed project. As noted above, baseline pumping conditions, by definition, do not require mitigation under CEQA, but the effect of baseline pumping on stream hydrology, water quality, and, particularly, fish passage in critically dry conditions, serves to magnify any adverse cumulative effect of project pumping on aquatic resources." (page 4.3-42)*

The DEIR is effectively "grandfathering" or "vesting" the environmental impacts from baseline diversions without providing any analysis of what environmental impacts might have occurred during past diversions. Although the DEIR does briefly mention, on page 2-2, *National Audubon Society v. Superior Court* (1983) (33 Cal.3d 419 [189 Cal.Rptr. 346]), it ignores the conclusions of that decision. One particularly relevant part of this ruling addresses the issue of whether past impacts have to be evaluated and considered in a decision to issue an appropriative water right:

> *"In exercising its sovereign power to allocate water resources in the public interest, the state is not confined by past allocation decisions which may be incorrect in light of current knowledge or inconsistent with current needs."*

Though the *National Audubon* case addressed the issue of existing appropriative water rights and flow requirements below an existing dam, one would hope that the ruling would also apply to establishing diversion limits on a free flowing river during the process of issuing an appropriative water rights permit.

Rather than rely on a complex set of bypass flows based on historic flow percentiles that haven't been shown to be protective of public trust resources, the water rights permits should use a more standard approach for bypass requirements that use actual instream flows established through instream studies at the point of diversion. The technical studies done for the El Sur Ranch application haven't provided sufficient information to develop protective instream bypass flow limits. CDFG staff are now conducting field studies to obtain this information, but the results of these efforts aren't available at this time.

Therefore, interim bypass flow limits are needed to facilitate the evaluation of potential environmental impacts. The water rights permit should require cessation of diversion whenever the flows drop below the bypass requirement. The DEIR's approach of allowing continued diversion at the baseline rate regardless of flow conditions isn't justified because no information has been provided to show that the past baseline diversions were not detrimental to the public trust resources.

Use of an actual rate of bypass flow would eliminate the multiple, overlapping percentile flow limits presented in Table A and my Table 5. Several statements in the DEIR, data in the technical reports, and preliminary results of recent CDFG staff instream flow investigations on the lower Big Sur River would allow a limited assessment of possible impacts from past diversions and allow a preliminary or interim estimate of minimum bypass rates of flow needed to protect fish habitat and passage. The DEIR on page 4.3-40 states that flows in 2007 at passage transects 4, 10 and 11 didn't meet juvenile steelhead passage criteria. There is also additional information from the 2006 study that shows that passage criteria were not met several times at passage transects 10 and 11 (see Tables 3-11 and 3-12 of Hanson, 2007a). Information in the 2006 study is important information because the flows were higher during that year and passage was still not achieved. The flows listed in the two 2006 Hanson study tables were measured approximately 4,000 feet upstream from the ZOI, at station VT-1 (see Table 3-1 of Hanson, 2007a). The highest daily average flow where passage was not achieved in a transect in the ZOI occurred on September 6, 2006 at approximately 22 cfs. For the other days in the study, changes in flow between the USGS gage and VT1 varied from a gain of approximately 1 cfs to a loss of 3.6 cfs (see Hanson's Table 3-1 in my Table 3). Changes in flow between VT1 and the passage transects were not measured. While these passage transect measurements don't provide information on what rate of flow is actually needed for passage, they do provide a lower limit for development of an interim bypass flow rate during the low flow months, June through November. See my Table 3 for calculations of flow losses/gains between the USGS gage and VT-1 on the study days in September and October 2006. Note that there were no measurements of the actual flow at the passage transects so the loss or gain in flow between the USGS gage and the passage transects can't be calculated.

An interim bypass flow for low flow months, June through November, can be estimated from the flow measured on September 6, 2006 at Hanson's passage transect no. 11, which didn't meet fish passage criteria, and from estimates of the losses in flow downstream from the USGS gage using previous measurements (my Table 3). Adding to the no-passage flow of 22 cfs for passage transect 11, a loss below the USGS gage of 5 to 9 cfs results in a flow of 27 to 31 cfs, which still doesn't allow for fish passage. When the full instantaneous diversion rate of 5.84 cfs is added, a rounded flow of 33 cfs to 37 cfs results, which still doesn't allow for fish passage. It should be noted that the maximum combined pumping rate of the two El Sur Ranch wells is 7.93 cfs (page 4.2-48), which exceeds the requested maximum instantaneous diversion rate of 5.84 cfs. Flow rounding is warranted because the USGS often report stream flow in whole numbers.

Preliminary analysis from studies conducted in October and November of 2009 on the lower Big Sur River by CDFG staff appear to confirm that flows in the ZOI need to be greater than 30 cfs for consistent fish passage. Determination of a final value will have to wait until additional studies are conducted and analyzed.

Although the information developed by the applicant doesn't allow for determination of the flows necessary for fish passage in the ZOI, there is sufficient data to estimate an interim bypass flow for low flow months. An interim bypass flow of 40 cfs for the months of June through November is warranted given that flows greater than 30 cfs appear to be required for fish passage in the ZOI, and adding the typical losses below the USGS gage of 5 cfs to 9 cfs, and the maximum requested instantaneous diversion rate of 5.84 cfs, with the knowledge that the maximum pumping rate is 7.93 cfs.

The DEIR and supporting technical studies don't provide any information on flows needed for maintaining public trust resources during high flow months, December to May. An interim high flow bypass requirement can be estimated using the procedures in the December 2007 Draft SWRCB's *Policy for Maintaining Instream Flows in Northern California Coastal Streams,* updated March 14, 2008 (2007 SWRCB Instream Flow Policy). Even though this policy is specific to coastal streams north of Marin County, and application of its methodology to a dryer central coast stream may not be adequately protective, it does provide an accepted method for establishing a bypass flow. A bypass flow estimated from the 2007 SWRCB Instream Flow Policy can also be compared to procedures given in the joint CDFG/NMFS's June 17, 2002 *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams* (2002 CDFG/NMFS Instream Flow Guidelines).

The 2007 SWRCB Instream Flow Policy recommends, for watersheds less than 290 square miles in area, that equation 1 on page 4 be used to establish a minimum bypass flow. The area of the watershed above the point of diversion is 58.9 square miles (DEIR page 4.2-3), and the mean annual unimpaired flow at the USGS gage is 99.2 cfs (from USGS web site). When these parameters are used in equation 1, a minimum bypass flow of 132 cfs is derived. This flow is lower than the February median flow of 186 cfs that is recommended as a minimum bypass flow by the 2002 CDFG/NMFS Instream Flow Guidelines (see my Table 4). Note that the 132 cfs December to May bypass flow doesn't include any gains/losses below the USGS gage or the diversions. My Table 4 has a bold line drawn across each month, which defines these two interim minimum bypass flows needed to protect fisheries resources. This bold line is drawn between percentile values during months of December through May at 132 cfs, and for June through November at 40 cfs. Whenever instantaneous flows are above the bold line no diversion can occur.

The bypass flow limitations for the water rights permit should require the cessation of pumping whenever river flow drops below a specified rate(s) as measured at an appropriate river gage. The bypass flow should be set based on specific impacts to public trust resources at the point of diversion, not historic flow percentiles. Monitoring of bypass flow limits requires at least daily measurement and reporting of the instantaneous rate of flow at the river gage, and rate and time of diversion for each well in order to know when the bypass limit is reached. Without instantaneous flow measurements there would be no way of knowing that a violation has occurred because long-term averaging doesn't capture peak discharge rates. While the USGS gages can provide instantaneous provisional data, the current lack of flow metering at the wells precludes achieving meaningful

monitoring of diversions.

The maximum instantaneous rate of diversion of 5.84 cfs being sought by the application should be used as a minimum in setting a bypass flow requirement provided measures are in place to prevent the maximum pumping rate of 7.93 cfs. An interim bypass flow as measured at the USGS gage of 40 cfs between June 1 and November 30 would be appropriate given the lack of actual instream information on the flows necessary for fish passage, the distance from between the point of diversion and the USGS Big Sur gage, variability in the changes in flow below the USGS gage, and the need to consider that the entire diversion has the potential to impact river flow. An interim bypass flow of 132 cfs should be used between December 1 and May 31. Additional site-specific instream studies are needed to finalize these flow recommendations. The DEIR should be revised to incorporate interim bypass flow requirements of 40 cfs from June 1 to November 30 and a 132 cfs from December 1 to May 31.

The interim bypass flows of 40 cfs and 132 cfs significantly alters the environmental impact analysis, conclusions and mitigation measures of the DEIR. I have drawn on my Table 4 a bold line at approximately 40 cfs and 132 cfs for the appropriate months. My Table 4 shows that the percentile flow limitation criterion proposed in the DEIR mitigation measures and Table A do not appear to be protective of public trust resources. This suggests that past historic diversions by the El Sur Ranch wells likely had an impact on fish passage and habitat. Therefore, the DEIR should provide an analyze the potential past impacts from the CEQA baseline diversions.

10) The Swiss Canyon runs between the two El Sur Ranch irrigated pastures that are the POU for the appropriated water right and the riparian diversion. There is potential for irrigation water to run into the canyon from overland flow or subsurface seepage. The DERI states that the Swiss Canyon area is not within the POU and is not part of the irrigated area (page 2-6). However, as I discussed above, under general comment no. 2, the canyon area appears to be included in the 267-acre POU, which seems to contradict the DEIR's statement. The DEIR states that studies of the historic erosion of Swiss Canyon, the POU and the coastal bluffs found no evidence of increased erosion during the past 50 years (page 4.2-33). The DEIR attributes this lack of increased erosion in part due to filling of pre-existing gullies, control of surface runoff and vegetative cover. The DEIR also stated that riparian vegetation in Swiss Canyon increased from 1942 to 2003 and that although some erosion and slumping was evident along the banks, the amount and extent was less than identified in the early 1940s prior to pasture irrigation (page 4.2-33). The following is a discussion of two issues related to erosion and runoff into Swiss Canyon that need additional discussion in the DEIR.

a) The 2007 REJA report provides a set of historic aerial photos of the pastures and Swiss Canyon from 1942 to 2003. The 1942 image, REJA Figure 3, shows a number of arcuate slumps and eroded areas of slope failure along the walls of Swiss Canyon. The REJA report states that these failures were filled in between 1956 and 1967. The REJA report doesn't discuss how these fills were placed, but I think it can be assumed that it was not placed as engineered compacted fill and that the slope face of some of these filled areas is at or near the angle of repose. This fill material is likely less dense and has less strength than the native soils or terrace deposits. However, this assumption should be evaluated with laboratory testing of in-situ samples. If this fill was placed without engineering design and control, then the stability of these fill slopes is unknown. The REJA report notes that there is still some erosion, but less than before the fill was placed. The REJA report doesn't address how much erosion is occurring, whether mitigation measures, such as additional drainage control or fill stabilization, should be taken to prevent future erosion and what measures are needed to monitor and document erosion. **Because the area that this sediment discharges to is critical habitat, a technical study is needed on the areas of erosion along the walls of Swiss Canyon to identify the level of stability and the causes of any instability and provide mitigation measures for stabilizing the slopes and preventing further erosion. The DEIR should provide the results of this study and include any recommendations as mitigation measures.**

b) The DEIR states in several places that there is "upwelling" or a spring of ground water in Swiss Canyon near the boundary of pastures 2 and 7 (page 4.2-17) about 0.1 miles upstream from biological monitoring station 1 (page 4.3-45). The 2008 Hanson report concludes that there is no evidence to suggest that El Sur Ranch irrigation practices were an important factor affecting habitat or surface waters within Swiss Canyon in 2007. It should be noted that Hanson commented in the 2007 report (2007b) that there was standing water within the creek bed in the vicinity of irrigation pipe repair and testing downstream of Station 2 between fields 2 and 3 (page 6). DEIR Figure 2-3 shows the boundaries of the irrigation pastures and the piping. The figure shows that there is an irrigation pipe running across Swiss Canyon aligned with the boundaries between pastures 2 and 7, and pastures 3 and 6.

I've attached as my Figure 3, an image that was taken from a USGS digital orthophoto quadrangle (DOQQ o36121c7sw.tiff) that shows Swiss Canyon on May 12, 1994. Of particular interest is the unvegetated area in the lower third of the canyon between pastures 2 and 7 and pastures 3 and 6. This image shows a linear feature cutting through this patch of bare ground in line with the pipe is shown on DEIR Figure 2-3. The 2001 and 2003 aerial photos, Figures 9 and 10, provided in the REJA 2007 report still show a variation in vegetation density in the area of this disturbance. The change in vegetation density is apparent in a comparison of the May 1978 image in the REJA report, Figure 8, to my the attached Figure 3, and comparison of oblique aerial photos taken in April 1979m my Figure 4, and September 2008, my Figure 5.

Given the presence of an irrigation pipe running beneath Swiss Canyon between pastures 2 and 7 and pastures 3 and 6, and perhaps elsewhere, and the observation that a repair of the pipe was taking place in 2006, the DEIR should evaluate whether the "upwelling" of ground water in the area between pastures 2 and 7 might be caused by a leak in an irrigation pipe. The DEIR should also address the environmental issues associated with the maintenance of any pipes that transect Swiss Canyon, particularly when there is a need to excavate and otherwise disturb the bottom of the canyon to facilitate repairs. The DEIR should provide a mitigation measure that requires periodic testing of the integrity of the irrigation pipes that cross Swiss Canyon, such as conducting a pressure test of the section of pipe that traverses the canyon. The DEIR should address whether additional permits are necessary when performing pipe maintenance activities, permits such as a Fish and Game Streambed Alteration Agreement and other Federal Permits.

The DEIR should evaluate whether leakage from an irrigation pipe(s) is discharging into Swiss Canyon. In addition, the DEIR should evaluate the potential impact from irrigation pipe maintenance activities within Swiss Canyon and the need for permits along with the recommended permit conditions.

11) The DEIR discusses on page 4.2-42 that the irrigated pastures are subject to the requirements of the Central Coast Regional Water Quality Control Board's (CCRWQCB) *Conditional Waiver of Waste Discharge Requirements for Discharges From Irrigated Lands*, Order R3-2004-0117. The CCRWQCB has recently replaced that order with Order R3-2009-0050 (Order), which requires that the Monitoring and Reporting Plan (MRP) No. R3-2004-0117 continue under this new order. The DEIR states elsewhere that there are no specific best management practices or discharge limitations under this order (page 4.2-74). My reading of Order R3-2009-0050 differs with the statements in the DEIR that there are not discharge limitations or required management practices.

Order R3-2009-0050 has a number of General Conditions that require compliance with water quality standards. The Order also has a list of documents that need to be submitted along with the Notice of Intent during the Enrollment Process. Among these is a completed management practice checklist/self assessment form, and a statement of completion of a Farm Water Quality Management Plan. Depending on which of the two tiers the irrigated lands belong, the Farm Water Quality Management Plan needs to be completed immediately for Tier 1 lands, or within 3 years of enrollment date for Tier 2 lands. Filing of the NOI was required by January 1, 2005. Full region-wide monitoring in accordance with MRP R3-2004-0117 (MRP) was to be implemented by January 1, 2006. The MRP requires that the discharger participate in a cooperative monitoring program or monitor individually. Because there are no other irrigated-land dischargers in the area of El Sur Ranch's pastures, I'm assuming that they would undertake individual monitoring for this conditional waiver. The MRP requires monitoring of any discharges to surface or ground water, including discharges to streams, tailwater ponds, and stormwater runoff. The MRP provides three tables of specific water quality parameters that need to be monitored along with the frequency of sampling. Monitoring data are to be submitted electronically to the Regional Board at least quarterly with hard copy reports annually.

The DEIR should evaluate whether the existing baseline irrigation practices of the El Sur Ranch fall under the requirements of Order R3-2009-0050 and MRP R3-2004-0117. If they do, then the DEIR should provide a copy of the management checklist/self assessment, the Farm Water Quality Management Plan, copies of the completed practices implementation checklists, and copies of the annual monitoring reports. The results of any monitoring under this Order should be incorporated into the DEIR's environmental analysis and mitigation measures developed. as necessary.

The DEIR should evaluate whether the proposed project irrigation practices fall under the requirements of Order R3-2009-0050 and MRP R3-2004-0117. If the baseline conditions do not fall under the Order, indicate whether the Notice of Intent will be filed for the proposed project and when the required management checklist/self assessment form and the Farm Water Quality Management Plan along with implementation of the monitoring and reporting program will be developed and implemented. The lack of water quality data on the tailwater pond waters and other waters that discharge from the irrigated pastures as required by the Order suggests that the current operations either do not fall under Order R3-2009-0050 or may not be in full compliance with the requirements from the Order. In addition, several of the future reports required by the mitigation measures, 4.2-2 – an Irrigation Water Management Plan and 4.2-4 – an Erosion Control and Operations Management Plan, appear to be similar to the Farm Water Quality Management Plan requirements of the Order. If the project operations fall under the Order, then the DEIR should discuss how the mitigation management plans identified in the DEIR will integrate with the requirements of the Order.

The DEIR should evaluate and provide mitigation measures for any potential impacts from irrigating the pastures based in part on the results of any previous water quality monitoring, particularly the project's practice of leaching out the salts that results from applying additional irrigation water. What impact does this leaching have on the quality of ground water or surface water? What monitoring and reporting will be done to evaluate potential impacts from leaching of salts?

12) The DEIR discussion of seawater intrusion on page 4.2-24 suggests that the high spring tides cause the saline wedge to migrate into the subterranean alluvial channel towards the Old Well. The DEIR states on page 5-10 of the cumulative effects section that "[c]onsidering that current wave action can result in high salinity at the Old Well, a 2-foot increase in mean sea level, coupled with high tides and wave actions, could substantially increase the potential for salt water intrusion." Thus, there is a potential for the wells to pump saline water whether the condition is "natural" or the result of pumping. The DEIR notes that irrigation operations of the Old Well "require" shutoff whenever the salinity levels reach 1,000 μ/cm (page 4.2-75). However, the DEIR states on pages 2-11 and 2-12 that according to the 3rd Amendment this salinity shut off is voluntary and that following the shut off the chloride concentration is measures. The DEIR then notes that "[i]n the event that the chloride concentration exceeds 250 ppm, the California Department of Parks and Recreation (DPR) may require the Ranch to terminate pumping until the chloride concentration in the well is reduced."

The salinity shutoff is not a requirement of the water rights permit application or included as a CEQA mitigation measure because the DEIR concludes that the impact is less than significant (see mitigation measure 4.2-7). This seems to conflict with the need to shut off of the Old Well due to salinity during the 2005 to 2007 studies and the need for 10 percent additional diversion to leach out salts caused by irrigation with high salinity waters. As discussed in my general comment no. 11, the impacts from leaching of salts from the pasture soils is still an outstanding environmental issue that likely requires monitoring under CCRWQCB Order R3-2009-0050. For reasons discussed above in my general comment no. 9, the fact that water with higher salinity has been applied to the pastures for the past 50 years and is considered the baseline condition, doesn't justify in the potential environmental impact. The CCRWQCB Order R3-2009-0050 requires compliance with the SWRCB's Anti-Degradation Policy of Resolution No. 68-16 and states that the conditional waiver doesn't create a vested right to discharge. Thus, the DEIR assumption that the environmental impacts from the baseline irrigation practices are "grandfathered in" or 'vested" doesn't appear to be valid.

The DEIR should expand on the discussion of the potential impacts from applying higher salinity water regardless of whether the saltwater intrusion is caused by high tides, pumping or a combination. The impacts from irrigating with higher salinity water and the impacts of discharging the salts leached from the pasture soils may cause a significant environmental impact. A mitigation measure is needed for impact 4.2-7 that requires the wells, Old and New wells, be shut off whenever the salinity levels reach 1,000 μ/cm and followed up with sampling and testing of chloride concentration, and that the shutoff time, date and water quality measurements be documented and reported.

13) The DEIR discusses the potential erosion of the sea cliffs due to irrigation of the pastures and concludes that there isn't any evidence of accelerated erosion from irrigation and there shouldn't be any additional erosion from an increase in application rate. The DEIR states on page 4.2-33 that:

"The REJA study (2007) found no evidence of increased erosional activity during the past 50 years (through 2003, the last date of stereo aerial photographs) or erosion resistant bedrock either along the bluff tops, on the banks of Swiss Canyon, or within the POU. In fact, gulley formation and slumping decreased from 1949 through 2003, primarily because of filling in of pre-existing gullies, the control of surface runoff, and vegetative cover. Additionally, from 1942 to 2003, riparian vegetation in Swiss Canyon increased, and although some erosion and slumping was evident along the banks, the amount and extent was less than that identified in the early 1940s prior to irrigated pasture use."

"Overall, there was no evidence of increased erosional activity during the past 50 years, either along the blufftops or on the banks of Swiss Canyon. In fact, gullying and slumping has decreased within this time frame, primarily because of filling of pre-existing gullies and control of surface runoff."

The DEIR conclusions are apparently based on the finding of the 2007 REJA report and possibly the 2007 Hanson and Associates report (2007c) included in the May 2007 Volume II of technical reports submitted by the applicant. The REJA report concluded that:

"Surf erosion is the primary agent affecting bluff retreat; if surf erosion ceased, the coastal bluffs would soon reach a stable angle of repose regardless of whether or not the land adjacent to the bluffs is irrigated."

Hanson and Associates (Hanson) reported the results of the twice weekly inspections they made during September and October of 2006 of five locations on the coastal bluff adjacent to El Sur Ranch pastures 7 and 8. Hanson include in the report a series of photos taken at the five stations throughout the study period. The inspection report concluded that:

> *"Twice weekly onsite inspections and analysis of photographic documentations of fixed monitoring points showed no changes to the bluff within the context of surface irrigations excess overflow or rainfall infiltration excess runoff."*

The REJA 2007 study focused on large changes in the sea cliffs that might have occurred over the last 50 years, while the Hanson study was almost an instantaneous look at the stability of the sea cliff over a brief two-month period. I've discussed above in my general comment no. 10a the inadequacy of the slope stability studies in Swiss Canyon and made recommendations for further investigation and analysis. In the analysis of the long-term stability of the sea cliffs, the REJA and Hanson studies may not have adequately evaluated the impacts of irrigation or identified the existing indicators of unstable slope conditions.

The aerial photo study by REJA documented that the coastal bluffs along the El Sur Ranch pastures have retreated an average of 1.8 to 2 feet per year and attributed this retreat to normal sea wave induced erosion (DEIR page 4.2-33). REJA noted seepage from the face of the bluff inside and outside of the irrigated pasture area and slumping along segments of bluff adjacent to irrigated and non-irrigated pasture. Unfortunately, the REJA report doesn't provide any site-specific mapping of the locations of the noted seepage and slumping, so I can't compare their observations to mine. The REJA report also didn't provide any discussion of the potential sources of the observed ground water seepage or the failure mechanisms and factors that caused the slumping, other than being sea wave induced. The lack of information on the source(s) of the seepage and the specific failure mechanisms of the slumps leaves a significant data gap in evaluating the stability of the slopes adjacent to the pastures.

In addition to the aerial photos provided in the REJA 2007 report, I have reviewed a series of oblique aerial photos obtained through the Andrew Molera State Park web site that were taken periodically since the 1970s by the Coastal Records Project. I have attached as Figures 4 through 15 portions of these Coastal Records Project images that show the sea cliff adjacent to pasture 7 in April 1979, January 1989, September 2002, October 2005 and September 2008. My interpretation of these images is as follows:

a) Figures 4 through 10 show the section of the bluffs adjacent to pasture 7 and Swiss Canyon. This area lies approximately between the bluff survey points #1 and #2 in Hanson's 2006 (2007c) monitoring study. Unfortunately, the older images are not a clear as the more recent ones, but I think that the two larger arcuate gully head scarps can be seen in the 1979 and 1989 image as well as a bluff that appears to have a shallower slope than in the later images. In the 2005 and 2008 images, Figure 7 through 10, the bluff shows a distinctive set of scalloped or "theater-headed" scarps at the head of a number of gullies. The number and density of these scalloped shaped gullies appears to have increased significantly between 1989 and 2005. The bluff erosion continued between 2005 and 2008, but because of the shorter period of time the change is less apparent.

The causes of these scallop shapes is discussed in some detail in USGS Professonal Paper 1693 by Hampton and others (2004). They discuss the role of ground-water seepage on ocean cliff stability and note that when downward percolation of ground water is retarded by an impermeable horizon causing seepage along the cliff face it creates erosion. This ground-water seepage erosion is also called “sapping” which they note can resemble wave erosion, but the cause and remediations are different (page 20). The scalloped or “theater-headed” shapes at the head of the gullies are created by the concentration of ground-water flow. Hampton and others describe the erosion process as:

> *“[a] feedback mechanism then begins, whereby sapping leads to valley formation, which in turn leads to further concentration of ground-water flow, which leads to accelerated erosion of the valley.”*

Hampton and others also cite publications by Higgins and Osterkamp (1990) and Laity and Malin (1985) for more detailed treatment of the mechanisms of sapping in forming cliffs and theater-headed valley formation.

The occurrence and apparent increase in the number and density of these scallop shaped gullies suggests that groundwater sapping is occurring along this section of the coastal bluff. The soil underlying the adjacent pasture is Santa Ynez sandy loam, which has a low permeability zone caused by a 25-inch thick clay subsoil at a depth from 16 to 36 inches (page 4-1 of NRCE, 2005). When the water applied to the adjacent pasture exceeds the evapotranspiration demand of the pasture vegetation, it either runs off as surface flow or likely infiltrates and eventually becomes perched on the clay subsoil. Because the slope of the land is towards the ocean, perched ground water likely flows towards the cliff face. There the ground water seeps out the cliff face and entraps and transports grains of soil, eventually undermining the slope through the process known as sapping (Higgins and others, 1990). This process develops scalloped heads on the resulting gullies. These gullies erode from the top down, not the bottom up. They aren’t created by sea waves eroding the toe of the cliff and migrating upwards.

Seepage at the cliff face and resultant sapping erosion can be expected to increase with an increase in water applied to the adjacent pastures from the baseline of approximately 3 feet to the application’s 6 to 6.5 feet. This is particularly significant during periods where the leaching of salts is undertaken because that requires applying more water than needed for vegetation growth in order to flush the salts downward. This flushing water will likely perch on the clay subsoil rather than penetrate it, and eventually flow towards the cliff face, increasing the volume and duration of seepage along the bluff.

b) A second area of sea cliff instability occurs to the northeast between Hanson’s 2006 bluff survey points #3 and #4. My attached Figures 11 through 15 show the area in 1989, 2002, 2005 and 2008. In the 2002 and 2005 images, several darkened areas of groundwater seepage can be clearly seen on the face of the bluff in Figures 12 and 13. In addition, the 2005 and 2008 images in Figures 13 and 14 show numerous clumps of non-native pampas grass in the area of seepage. Pampas grass thrives where there is ample moisture (http://wric.ucdavis.edu/information/pampasgrass/pampasgrass5.html). Figure 15 is a closeup of this cliff in 2005 and shows the density of the pampas grass with the darken slope areas. The series of images taken at bluff survey point #4 by Hanson in September and October 2006 show the some of the pampas grass in that area. It should be noted that the density of the pampas grass appears to increase from 2002 to 2008, suggesting continued seepage with possibly an increase. Figure 16 is a photo from Hampton and others (2004) that shows a similar image of a seepage darkened bluff failure in northern Monterey Bay with the growth of pampas grass.

The mechanism of slope failure in this area differs from the scalloped gully area to the southeast. Here the failures look like slumps that slip out from seepage areas. The increase in moisture has a significant impact of slope stability. Increasing soil moisture causes additional weight adding to the forces driving instability. When moisture is sufficient to saturate soil and develop hydrostatic pressure, slope stability rapidly decreases. The seepage along the coastal bluff adjacent to the El Sur Ranch pastures is likely there for the same reasons as further the southeast. Infiltrated irrigation water perches on top of a clay subsoil whenever it is over applied and then flows towards the cliff face.

The addition of more irrigation water to the adjacent pastures from the baseline of approximately 3 feet to the application's 6 to 6.5 feet will likely add to the perched ground water on top of the clay subsoil. This perched water will eventually seep out at the cliff face and may increase the areas of saturation along with an increase in unstable areas. The DEIR should evaluate the source of the ground water seepage along the coastal bluff adjacent to the El Sur Ranch pastures and provide mitigation measures to ensure that irrigation practices do not cause or accelerate coastal bluff instability or erosion.

Comments on Specific Sections of the DEIR

This section of comments is specific to the text in the DEIR document. These comments are given in sequence by DEIR page number. Specific comments will also refer to the general comments when additional discussion is needed.

14) Page 1-5: The final paragraph of the section on EIR certification at the top of the page states that the approval of the Final EIR will include a mitigation monitoring and reporting program (MMRP) and that this will "likely" be included in the conditions of the water rights permit. The DEIR shouldn't consider the inclusion of mitigation measures in the water rights permit that will protect public trust resources as a "likely" event. Rather, it should be a considered a "requirement" that they be part of the water rights permit. Several of the mitigation measures proposed in the DEIR to protect public trust resources, 4.2-2, 4.3-1 and 4.3-2, include the requirement to develop at some unspecified time in the future several management plans. For example, the IWMP, ECOMP, and detailed flow monitoring and operations plans of mitigation measures 4.3-1 and 4.3-2. The mitigation measures in these plans are critical to reducing the impacts from the project's diversions

to less than significant. The description of the DEIR mitigation measures 4.3-1 and 4.3-2 require consultation with NMFS and CDFG in the development of the detailed flow monitoring and operations plans. On page 2-28 the DEIR states that:

> "*There are no other permits or approvals that are anticipated. The SWRCB has consulted with other trustee agencies as required by CEQA. These agencies, through consultations during the DEIR and water rights process, will provide input related to appropriate areas of responsibility and any proposed mitigations and/or conditions on the water rights permit.*

While it is probably incorrect that no other permits or approvals are needed (see my general comments nos. 10 and 11), this statement appears to indicate that mitigation measures and/or conditions proposed by CDFG as a responsible agency **will** be part of any proposed mitigations and/or conditions on the water rights permit. If this is not the intent of the SWRCB, then the DEIR needs to expand on the method(s) they will employ to ensure that the diversions approved in the El Sur Ranch's water rights permit are protective of public trust resources.

15) Page 2-1: The project description states that El Sur Ranch has diverted water from groundwater wells for irrigation purposes since 1949. Pages 1-1 and 4.2-32 state that the Old Well has been operational since 1949, so it's assumed that this is the first well used to divert water in 1949. On page 2-17 the DEIR states that the first year of riparian land irrigation was not later than 1951. However, the April 12, 1992 memorandum by Mr. Moeller that reports on his investigation of the El Sur Ranch wells following a complaint to the Division of Water Rights states that the El Sur Well (Old Well in DEIR) was used to irrigate lands on the El Sur Ranch since 1955. Why is there a discrepancy on the beginning of the use of the Old Well between the SWRCB's complaint report and the DEIR? What specific information is available to document actual diversions in 1949? Are there records of electrical usage?

16) Page 2-1: The proposed project is the issuance of a water rights permit. The DEIR doesn't discuss until page 2-13 in the Project Description that the SWRCB staff found back in 1992 that the irrigation of non-riparian lands required an appropriative water right. The DEIR's discussion on pages 2-13 and 2-14 that describes the Mr. Moeller's recommendations in the El Sur Ranch complaint report doesn't give an accurate picture of the alternatives given in 1992. Mr. Moeller's recommendation was that El Sur Ranch should be directed to cease diversions from underflow of the Big Sur River in accordance with Water Code 1052. Water Code 1052 states that the diversion or use of water subject to Water Code Division 2 other than when authorized in Division 2 is a trespass and prescribes civil fines that the SWRCB can impose for the trespass. Mr. Moeller's 1992 report recommends that if El Sur Ranch wishes to irrigate non-riparian lands from wells taking underflow of the Big Sur River, an appropriative water right permit should be obtained from the SWRCB. The DEIR's language on page 2-14 seems to imply that Mr. Moeller gave a recommendation that applying for a water rights permit was an alternative to the immediate cessation of the unauthorized diversion. I don't think that was the intent of Mr. Moeller's recommendation when he said that an appropriative water right should be obtained. He didn't say that applying for an appropriate water right permit is sufficient to continue the unauthorized diversion. The DEIR should clearly represent the legal status

under Water Code 1052 of the diversion of water by the El Sur Ranch wells since April 12, 1992 to irrigate non-riparian lands. To do otherwise, gives the reader of this **DEIR prepared for the SWRCB** an impression that the continued diversion of all but 270 acre-feet per year, or 75 acre-feet per year if the riparian acreage is reduced to 25 acres, is not considered a trespass by the SWRCB, in effect Water Code 1052 doesn't apply.

17) Page 2-5: The project description notes that Swiss Canyon, which bisects the project site, specifically El Sur Ranch's irrigated pastures, is "fed indirectly by seepage from the Ranch,… and that the canyon is accessible to cattle for grazing." In my general comment no. 10, I discuss the issue of groundwater upwelling within Swiss Canyon and suggest that its source may be the buried irrigation pipe running beneath the canyon between the two irrigated pasture areas.

18) Page 2-5: The discussion of the 267-acre area as the place of use indicates that 25 of these acres are considered riparian to the Big Sur River. On page 2-17 the DEIR states that only 23 of the 25 riparian acres are currently irrigated. So the statement that the water rights application is requesting diversion to irrigate the remaining 242 acres is not accurate, the value would be 244 acres. The DEIR apparently evaluates the environmental impacts of the diversions for both the riparian and appropriative water rights. The 3rd Amendment doesn't make it clear whether the riparian area is part of the appropriative water right, but it appears that the requested diversion limits include water necessary to irrigate the riparian lands (see application Table 1). The fact is that the appropriative water right is only needed for irrigation of 242 (244) acres of non-riparian lands. The question arises as to whether a riparian water right can be issue an appropriative water permit? If so, does this appropriation then allow the place of use of water allocated to riparian lands be used to irrigate outside the watershed of the riparian lands? The DEIR and the water rights application discusses diverting water to irrigate both riparian and non-riparian lands from a single point of diversion, in this case two wells whose flows aren't separated, without specifying what portion is dedicated to each type of right appears to create a situation of "commingling of accounts," along with all of the associated problems. In addition, my general comment no. 2 discusses my opinion that the total irrigated pasture area is approximately 248 acres, not the 267 acres. Thus, by my measurement, the non-riparian area would be 223 acres not 242 acres.

19) Page 2-6: The discussion of the capacity of the two wells gives their instantaneous pumping rates in gallons per minute (gpm) without a conversion to cubic feet per second (cfs). The 3rd Amendment to the water rights application uses units of cubic feet per second for the requested instantaneous maximum and 30-day average rate of diversion limits. This section of the DEIR should also give the pumping rates in cfs to be consistent with the water rights application. For the Old Well the pumping rate is said to range from 1,145 gpm (2.55 cfs) and 2,000 gpm (4.46 cfs) and for the New Well the pumping rates are 963 gpm (2.15 cfs) and 1,567 gpm (3.49 cfs). Elsewhere in the DEIR the estimated maximum pumping rate for the Old Well is said to be 4.45 cfs and for the New Well a maximum rate of 3.48. However, in the cumulative effects section on page 5-12 the maximum production capacity of the Old Well is said to be 1,145 gpm or 2.55 cfs, and 1,562 gpm or 3.49 cfs for the New Well. As I've discussed above in my general comment no. 4(f), the issue of the maximum combined pumping rate becomes a part of the justification for the 30-day average pumping rate of 5.34 cfs, which is said to be near the

maximum combined pumping rate of the two wells. If the combined pumping rate is actually 7.95 cfs (4.46 cfs + 3.49 cfs = 7.95 cfs) as the DEIR infers then there is an additional problem with ensuring that the pumping doesn't greatly exceed the diversion limits imposed in a water right permit.

20) Page 2-11: The project description states that the El Sur Ranch varies the number of cattle on the pastures from an average of approximately 400 to a maximum of 700 head. The DEIR doesn't discuss how much water will be appropriated for each head of cattle. If the maximum 1,615 acre-feet per year is appropriated, then the water dedicated to each head of cattle ranges from approximately 4 acre-feet to 2.3 acre-feet. To put this in perspective, the average residential household uses approximately 127,000 gallons or 0.4 acre-feet per year (American Water Works Association Drinktap.org web site). Thus the water being requested for appropriation for each head of cattle would support from 5.75 to 10 average households. If the 1,200 acre-feet 20-year running average appropriation is used instead, then the water being irrigated would support from 4.25 to 7.5 average households. Perhaps the DEIR should provide some discussion of these types of statistics in the evaluation of beneficial use and the need for appropriating water for optimal production of pasture grasses.

21) Page 2-12: The discussion of the requirement to cease pumping when the electrical conductivity of the pumped water reaches 1.0 micromhos per centimeter needs additional clarification. Elsewhere in the DEIR the equivalent term uS/cm is used (page 4.2-24) where it is said that the pumping halts at 1,000 uS/cm. The DEIR should note that these two units of measure are equivalent. The discussion also indicates that the California Department of Parks and Recreation (CDPR) has some discretionary authority on this matter. El Sur Ranch is apparently required to test the chloride concentration whenever the electrical conductivity reaches 1,000 uS/cm. If the chloride exceeds 250 parts per million, DPR may require that the well stop pumping. The DEIR states on the previous page that cessation of pumping is voluntary on the part of El Sur Ranch. If testing for chloride content must be performed whenever a specific trigger is reached and DPR has the authority to require the cessation of pumping, what part is voluntary on the part of El Sur Ranch? The DEIR should expand on the specifics of this voluntary requirement, along with the contractual or legal requirement(s) for testing the salinity of the pumped water and the authority of DPR to require the cessation of pumping. This discussion should be very specific, such that the SWRCB can properly refer to or adopt as a condition in the water rights permit this requirement for salinity testing, reporting and the cessation of pumping trigger.

22) Page 2-18: A Water Availability Analysis (WAA) that was done in support of the water rights application and included in Appendix D of the DEIR. The WAA states that the analysis was done using the procedures given in Appendix A of the June 17, 2002 *Guidelines for Maintaining Instream Flows to Protect Fisheries Resources Downstream of Water Diversions in Mid-California Coastal Streams*, prepared by the California Department of Fish and Game and the National Marine Fisheries Service (Guidelines). These Guidelines were written for analysis of the high flows of the winter season, from December 15 to March 31. However, the WAA appears to have calculated the Cumulative Flow Impairment Index (CFII) using parameters that significantly differ from the Guidelines. For example, the WAA period of study was April 1 to October 31 El Sur

Ranch's permit "diversion season," a dry season, even though the permit is for year-round diversions. Therefore, the WAA violates the basic premise for the Guidelines, the use for high winter flows only, and ignores the year-round period of diversion, so the analysis is of questionable validity.

The WAA also makes several assumptions that don't seem to add up correctly. First, the calculation of upstream demand is based on taking the existing water rights, totaling 177.6 acre-feet per year, and dividing the demand evenly across 365 days and then calculating the use for the 213-day "diversion season." By my calculation, 213 days is approximately 58.4% of the year. Thus, the total upstream demand should be approximately 103.7 acre-feet not the 49.9 acre-feet listed (177.6 ac-ft/yr x 0.584 = 103.7 ac-ft/yr). Then the WAA proportions the applicant's water use evenly throughout the 213-day "diversion season" even though the water right being sought allows otherwise. The application allows for diversion of 735 acre-feet from July to October, with a monthly maximum of 230 acre-feet. The application also allows outside the July-October irrigation season a maximum average 30-day diversion of 5.34 cfs, or 318 acre-feet. If the 30-day rate of 5.34 cfs or 318 acre-feet is applied for the months of April, May and June, a diversion of approximately 951 acre feet would be permitted. The combination of the maximum diversions of the April to June and July to October periods exceeds the annual 1,615 total acre-feet being sought. Thus, the correct value for the WAA calculation would be the maximum annual diversion of 1,615 acre-feet. If this value were used and then added to the 103.7 acre-feet of upstream diversions for the April to October "diversion season," then the total demand would be 1,718.7 acre-feet or a CFII of 9% of the average seasonal flow volume of 19,012 acre-feet (1,718.7 ac-ft /19,012 ac-ft = 0.09), which exceeds the 5% Guideline cutoff for impact to fisheries. Note that this cumulative flow calculation doesn't appear to include the potential riparian diversions upstream from the point of use. When all potential riparian diversions are added in, the upstream riparian demand increases the CFII percentage. Therefore, the WAA conclusion that the CFII doesn't exceed the recommended 5% cutoff is incorrect because of the misapplication of the Guidelines and the incorrect calculation of existing and application demands.

23) Page 2-19: The discussion of the proposed place of use states that the land to be irrigated includes 25 acres of riparian. As noted above in my comment no. 18, the DEIR states elsewhere (page 2-17) that only 23 of these acres are currently being irrigated.

24) Page 2-20: The introduction to the section on diversion and rate limits assumptions states that the chapter doesn't reflect the SWRCB's determination or judgement as to whether the proposed diversion and use of water are reasonable and beneficial. Granted, the SWRCB as a deliberating body has the right to reach an independent decision regarding the appropriateness of the requested water rights application. But this is still a curious statement given that this DEIR is a SWRCB document developed to evaluate the environmental impacts of a discretionary permit that they alone have the authority to approve. Ultimately the SWRCB will have to certify the Final EIR and in doing so make "one or more written findings for each of those significant effects, accompanied by a brief explanation of the rationale for each finding" (CEQA Guidelines section 15090). It would seem that the time for the SWRCB to put forth their best effort at presenting the rationale for their eventual findings would be in this DEIR.

25) Pages 2-21 through 2-26: This section of the project description presents water use and diversion limitations of the project. I have provided in my general comment no. 4(a) through 4(f) discussions of each of the diversion limits along with the inconsistencies. In particular, Table 2-3 that lists the estimated irrigation diversion requirements doesn't seem to agree with the technical support documents. See my general comment no. 4(a) for additional discussion.

26) Pages 2-26 through 2-28: This section discusses the operational practices of the El Sur Ranch in irrigating the pastures. Several of the mitigation measures require that different operation management plans be developed, and there is a possibility of additional requirements that CCRWQCB's Order R3-2009-0050 requires for irrigated lands. These management plans are a critical component of the mitigation measure to ensure the protection of public trust resources. The operating practices listed in this section appear to be the beginnings of these required operation management plans, but a list of general goals and practices isn't specific enough to be an enforceable operations plan. The DEIR should provide specific mitigation measures, operation practices and procedures so that these practices that are critically important for reducing the project's impacts to a level of less than significant can be reviewed and commented on by government agencies and the public, and clearly demonstrate to the SWRCB that the impacts can be mitigated.

27) Page 2-28: See my comment no. 14 for discussion on the statement that the DEIR was developed with the assumption that no other permits are required and the issue of whether responsible agency mitigation measures or conditions will be part of the water rights permit.

28) Page 3-1: See my comment no. 15 for discussion of inconsistencies about when the Old Well began pumping. See my general comment no. 1 for the discussion of determination of whether the El Sur Ranch well has been found to be pumping from a subterranean stream as defined by SWRCB Decision 1639.

29) Table 3-1: The summaries in this table of the mitigation measure are very complex. I've attached my Table 5, my attempt to list by month the flow limitations of mitigation measures 4.2-2, 4.3-1 and 4.3-2. However, my Table 5 doesn't begin to explain the decision tree, linkages, and alternatives to the mitigation measure being proposed. For example, mitigation 4.2-4 requires in the future that a ECOMP be prepared and on approval by the SWRCB incorporated into the IWMP as required by mitigation 4.2-2. But the IWMP has to be approved by the SWRCB only when it is modified; the original plan apparently requires no review or approval. Likewise, monitoring to ensure compliance with the IWMP is required only if it is modified, but apparently the original plan has no monitoring requirements. These complex conditions and links among the mitigation measures creates problems in understanding the mitigation requirements, administering the mitigation measures, monitoring and reporting, ensuring compliance, and enforcement. The DEIR needs a graphic that shows the decision tree and the linkage among the mitigation measures as well as a table that presents a matrix of the flow limitations, the times and duration that they apply, and the timing of monitoring and reporting to ensure compliance with the mitigations. If these mitigations are acceptable to the SWRCB, or something like them, then these graphics and tables should become part of the water right permit

The DEIR mitigations 4.2-2, 4.2-6, 4.2-10, 4.2-11, 4.3-1, 4.3-2, 4.3-9, 4.3-10, 4.3-12, and 5-4 only restriction continuous baseline diversion based on protocols and operation management procedures to be developed in the future in the IWMP. The IWMP is supposed to have protocols and operator training to ensure that the project diversions do not cause or contribute to extremely critical dry flows (< 10th percentile) or critical dry flows (< 20th percentile) greater than baseline. Thus mitigation measures apparently allow for unrestricted year-round diversions at baseline rates. The IWMP apparently doesn't have to be developed during the CEQA process although mitigations 4.3-1(b) and 4.3-2(b) imply that flow thresholds established in the Final EIR will be part of a "flow monitoring and operations plan" that will be at some undetermined future time approved by the SWRCB and incorporated into the IWMP. Interestingly, mitigation measure 4.3-4 that deals with dissolved oxygen levels in the river does not require the instream aeration system to be part of the IWMP or an evaluation of its feasibility and efficacy during the CEQA process. I will provide additional discussion as needed on each mitigation measure in my comments on DEIR Section 4.

30) Page 4.2-1: See my general comment no. 2 for a discussion on why the irrigated acreage is approximately 248 acres not 267 acres. The DEIR states that the applicable issues are only the impacts during critical dry periods. See my general comments nos. 5, 6, 7, 8, and 9 for discussions on why this assumption is incorrect and potentially significant impacts may occur in normal, above normal and even wet years (see my Table 4).

31) Page 4.2-4: See my general comment no. 8 for a discussion on the flows listed in Table 4.2-1 and the inconsistency with a similar table in the 3rd Amendment to the water rights application and my calculation of flow percentiles.

32) 4.2-8: Table 3-3 of The SGI's 2005 report presents estimates of the quantity of flow out of the terrace deposits along with the hydraulic conductivity of 100 feet/day, which they indicate is a high estimate. The use of hydrogeologic information from the 1999 Jones and Stokes report raises an issue of professional practice and what license is required to practice hydrogeology. This issue was raised in an October 4, 2001 review by staff of the California Geological Survey (formerly Division of Mines and Geology). This review was included as Attachment 2 in the June 30, 2006 memorandum to Ms. Victoria Whitney, Chief of the Division of Water Rights on the Notice of Preparation from Mr. Robert W. Floerke, Regional Manager of CDFG's Yountville Office. This memorandum is attached in Appendix B of the DEIR. The DEIR should use hydrogeologic or geologic information presented in the 1999 Jones and Stokes report only when an SGI or other licensed geologist and/or civil engineers have accepted responsibility for the work. In the case of the terrace hydraulic conductivity, SGI has used the value in their calculations and therefore becomes responsible for the data. The SGI 2005 report should also be cited as the source for the terrace deposit hydraulic conductivity and elsewhere in the DEIR where Jones and Stokes hydrogeologic data and conclusions are use, provided that SGI accepts responsibility for the work.

33) Pages 4.2-7 through 4.2-15: This section discusses the geology of the project area. The DEIR includes several geologic cross-sections prepared by SGI (2005), but doesn't provide much discussion on the hydrogeologic significance of these sections. Instead,

the DEIR substitutes the finding of a geophysical study for the hydrogeologic setting and presents a rather detailed discussion of the geophysical layers identified by their differing resistivity. The DEIR however, doesn't discuss how these resistivity layers relate to the physical aquifer conditions. The DEIR needs a better explanation of why this geophysical data is important and how it will be used in assessing the project's impacts.

34) Page 4.2-16: The discussion of the soils in the POU doesn't provide much information on the distribution of the soils or the subsurface characteristics. The 2005 and 2007 NRCE reports provide information on the soils, their permeability and water holding capacity, as well as a map showing their distribution. Of particular interest is the description of the clayey subsoil of the Santa Ynez fine sandy loam that has a permeability rate of less than 0.06 inches per hour. The permeability rate of this clayey subsoil is approximately an order of magnitude lower than the surface layer with a permeability ranging from 0.6 to 2.0 inches per hour. This clayey subsoil will inhibit downward drainage of applied water, which raises the issue of where the water applied to leach the salts out of the soils will go and what additional impacts result from the discharge of this high salt content water. See my general comment no. 13 for further discussion on the importance of this clayey subsoil and seepage of ground water on the coastal bluffs. The DEIR should provide more information on the soils in the POU, provide the soils map of NRCE reports and discuss where the water that leaches the salts from the pastures will discharge and the impacts of that discharge on water quality and beneficial uses.

35) Pages 4.2-17: See my general comment no. 1 on the need to determine that the point of diversion is a subterranean stream as defined by SWRCB Decision 1639. The 169 cfs listed as normal winter flows should be stated as average of normal daily flow. The "normal" for peak flows during winter months is much higher. Also see my general comment no. 8 on the problem with the flows listed in Table 4.2-1. The discussion of alluvial aquifer characteristics should include information on the hydraulic conductivity of the different alluvial layers. This will be important in the later discussion on page 4.2-21 of the impact of the Franciscan bedrock constriction on naturally forcing ground water to seep into the river or "upwelling" in the ZOI.

36) Pages 4.2-18: As discussed in my comment no. 32, the use of Jones and Stokes hydrogeologic opinions and data is questionable because they did not have the required professional licenses to make these opinions or reports. The DEIR should only use hydrogeologic data and opinions where SGI has accepted responsibility. The statement that the depth of the notch in the bedrock at the mouth of the river is unknown conflicts with DEIR Figure 4.2-3, which has contours showing the base of the gravels, and supposedly the top of the bedrock, all the way to the ocean. These contours suggest that the depth of the notch is approximately 90 to 95 feet below sea level.

37) Page 4.2-21: The discussion of the bedrock constriction naturally forcing ground water to seep into the lower-most reach of the river as the path of least resistance is incorrect. Refer to my June 28, 2006 memorandum in Appendix B that comments on the Notice of Preparation and Initial Study for this DEIR for a discussion on the theory that the bedrock constriction causes natural upwelling of ground water into the river. Specifically, I estimated that the transmissivity of the aquifer at the bedrock constriction isn't reduced because of the high hydraulic conductivity of the material in the "notch." Because the flow

of ground water is determined by the transmissivity, aquifer width and the gradient not just the cross-sectional area and gradient, the theory of constant upwelling ground isn't valid. See my general comment no. 5 for a discussion of the likely cause of the groundwater seepage in the ZOI and its dependence on the orientation of the channel and the elevation of ground water.

38) Page 4.2-23: See my general comment no. 5 on the issue of the stability of the channel location and the impact on the loss of river flow during pumping. Also see my general comment no. 3 for a discussion of the engineering analysis of electrical use and pump efficiency tests needed to document the historic pumping diversions shown in Tables 2-1 and 4.2-2.

39) Page 4.2-24: The discussion on the halting of pumping when the electrical conductivity reaches 1,000 uS/cm needs to indicate that this is a voluntary cutoff. See my general comment no. 12 for discussion of the salinity cutoff, the potential impacts from applying salty water and why there should be a mitigation measure in the DEIR and a condition in the water rights permit that require cessation of pumping when this conductivity is reached.

40) Page 4.2-25 and 26: The section states that the Big Sur River is a losing reach below the USGS gage and references Table 4.2-4, which gives monthly average annual flows at the gage and Andrew Molera State Park. Table 4.2-4 shows that the river always gains flow between the gage and Andrew Molera State Park, which contradicts the statement that it's a losing reach. In addition, the average flows listed in Table 4.2-4 don't match either the median flows or fall between the 40 and 60 percentiles listed in Table 4.2-1, except for July, August and September. This suggests that the data are skewed and the mean (average) and median (50^{th} percentile) are very different. The DEIR should point this out and discuss why the average is the most appropriate value instead of the median, given that the mitigation measures are based on percentile flows. The discussion of the velocity transects used in the 2004, 2006 and 2007 SGI studies fails to point out that in the 2004 study VT2 was at the upper end of the ZOI and in a different location in the 2006 and 2007 studies. The changing of the velocity stations locations between studies creates confusion.

41) Page 4.2-31: The discussion of the estimate of flow losses below the USGS gage can be expanded to include more data. See my general comment no. 7 and my Table 3 for more information on the flow losses between the USGS gage and the point of diversion.

42) Page 4.2-32 and 33: See my general comment no. 13 for discussion of evidence of irrigation impacts on stability of coastal bluffs.

43) Page 4.2-34: The first paragraph gives total diversion rates for water users in the Big Sur River watershed. What is the source of this data? This section also considers that the total 5.84 cfs diversion being requested by El Sur Ranch is part of the total river flow diversion. See my general comment no. 9 for discussion of why the 5.84 cfs total diversion should be used in calculating bypass flow requirements. Table 6-1 is said to provide a list the appropriative water rights, but this table lists the water use for the project alternative. It is likely that the table to be reference is Table 5-1 in Chapter 5.

44) Page 4.2-36: The discussion of the lack of water quality data for the tailwater pond or for any other runoff from the pastures suggests that El Sur Ranch has not confirmed that natural degradation is occurring in the pond. See my general comment no. 11 for a discussion of the requirement for following the CCRWQCB's Order R3-2009-0050 and MRP R3-2004-0117.

45) Page 4.2-37: The discussion of groundwater quality leaves out the potential impacts from the leaching of the salts that build up in the pastures. Where does this leached water discharge and what is the impact on the receiving waters? See my general comment nos. 11, 12 and 13 for a discussion of the potential impacts from the leaching of salts and the monitoring requirements.

46) Page 4.2-39: The discussion of beneficial uses of waters seems to miss the significance of SWRCB Resolution 68-16, the Anti-Degradation Policy. This policy provides protection for water bodies even when there is no specific numerical standard listed in the Basin Plan. On the next page, the DEIR discusses the role of the Anti-Degradation Policy for protection of all waters of the State without citing the resolution number. The DEIR give the impression that this policy doesn't apply to surface waters. The DEIR should be written to reflect the requirements of the Anti-Degradation Policy.

47) Page 4.2-42: See my general comment no. 11 for discussion of the conditional waiver of waste discharge requirements for discharges from irrigate land.

48) Page 4.2-45: Table 4.2-6 lists the baseline and proposed project diversion rates, both the 20-year running average and the project maximum. Several of the diversion rates listed in this table don't match the diversion limits being requested in the water right application. For example, the monthly diversion rates listed for July through October show 184 acre-feet per month, but the requested limit is a maximum of 230 acre-feet per month. The monthly diversion rate of 184 acre-feet isn't a requirement of the water right limits and uniform diversion during these months isn't required. In fact, as I've discussed in my general comment 4(f), pumping at the maximum rate of 5.84 cfs for 19 days per month wouldn't violate any of the other diversion limitations. The anytime maximum instantaneous diversion rate of 5.84 cfs isn't listed on this table, yet pumping can go that high at any time. The sum of the acre-feet for the project's 20-year average totals is 1,557 acre-feet not the 1,200 acre-feet of the 20-year average. The sum of the average baseline historic diversions for November through April (Table 2-1) is 52 acre-feet, but Table 4.2-6 shows 7 acre-feet. The baseline seasonal maximum monthly average is given as 269 acre-feet, but this is a one-time monthly maximum from September 1990 (Table 2-1). The greatest monthly baseline July to October season average is for July at 168 acre-feet. Note that the highest monthly average is June at 172 acre-feet. The DEIR should be written to reflect the actual diversion rates being requested in the 3rd Amendment to the water rights application. The complexity of the six diversion limits makes describing the maximum permitted diversion and associated impacts difficult, but that is what is being requested and the DEIR should address the potential maximum impact

49) Page 4.2-46 through 48: The discussion of the SGI studies provides a section on the many limitations of these technical studies. These technical studies have more limitations

than presented on in this section that are discussed elsewhere in the DEIR. The impact of these limitations on the environmental analysis of this DEIR is significant. In particular, how accurate is the proportioning of the diverted water into surface water and ground water sources, and can this ratio be assumed to continue unvaried in perpetuity? See my general comments nos. 5, 6, 7 and 9 for additional discussion on the splitting of the sources of water diverted by the two El Sur Ranch wells. The following are some of the additional technical limitations in the DEIR that are found outside of the Study Limitations section:

4.2-48 & 49: *"No natural groundwater flow information in the terrace area underlying the POU was measured for initial conditions but it was measured after pumping tests as 0.019 ft/ft…"*

4.2-49: *"However, these tests do not include data from groundwater wells located out side of the ZOI and/or within the Creamery Meadow. Consequently, for this impacts analysis, although the ZOI will be often used to refer to the New Well ZOI radius, but the actual ZOI may extend farther."*

4.2-49: *"The shallow piezometer essentially measures surface water elevations and the deeper one measures the local groundwater hydraulic potential. However, as with surface water quality, flow, and water depth measurements, these measurements were also affected by the ambient changes in lagoon conditions, tides, and rain events. During the 2006 and 2007 studies, there was no attempt to reconcile potential groundwater elevations and local tidal conditions and no monitoring was conducted within the south side alluvial aquifer (underlying the Creamery Meadow)."*

4.2-50: *"However, because of external factors that can influence results and limited data available for analysis, characterization of incremental effects remains qualitative."*

"Additionally, changes in gradients at each location can be used to identify impacts at each location caused by pumping, but differences between locations cannot necessarily be used to identify impacts from pumping because both locations may be affected by pumping (e.g., see VT3 and VT2 on Figure 4.2-5)."

4.2-54: *"Instantaneous measurements are insufficient to capture the potential effects of pumping on changes in flow characteristics because potential confounding factors such as lagoon closure, tidal action, precipitation, or changes in upstream inflows could affect the data and the measurements may not occur at a high enough frequency such that the stabilized condition or the immediate effects may be missed."*

4.2-54: *"Consequently, data where the lagoon changes state from open to closed or closed to open cannot be reliably used to evaluate potential flow effects. Additionally, because both VT2 and VT3 were within the zone of influence, pumping would effect flow and water surface elevation at both locations; therefore, proposed project differences between the two locations would not reflect the total gain/loss from the Big Sur River within Zones 4 through Zone 2."*

4.2-55: *"As with all other measurements, tidal action, lagoon status, and precipitation all* *affect the measurements. However, despite limitations in the data, these changes in hydraulic gradient and groundwater inflow/outflow were used to qualitatively evaluate the effects of incremental increases in diversion rates during the July to October irrigation season on flow within the Lower Big Sur River adjacent to the area of diversions."*

4.2-58: *"No measurements within the Creamery Meadow underlying aquifer were taken to accurately identify the ZOI extending within the Creamery Meadow during the ZOI tests (SGI 2007)."*

4.2-61: *"However, because the unaffected gradient was not measured closer to the same time period as the pumping-affected gradients, the effect of pumping on the overall groundwater gradient in the area of diversions cannot be determined from the 2004 study…No information is available regarding the groundwater gradient in the aquifer underlying the Creamery Meadow."*

4.2-63: *"Only one monitoring station was located within the Big Sur River along the curve where it begins to flow southwestwardly. This station was located within the area expected to be affected by the New Well, but not the Old Well. However, no hydraulic gradient (difference between shallow water versus groundwater potentiometric surface) was measured at this station, regardless of extraction scenario (Figure 3-6 SGI 2008). The lack of any measureable differences at this station indicates that this station may have been compromised and proposed project effects on surface water to groundwater gradients in this area cannot be determined."*

4.2-64: *"When only the Old Well or New Well was operating, there was likely still an effect on river flow; however, because of confounding external factors (e.g., lagoon closing and opening, low flow above the project area, rainfall events, tidal actions), these relationships cannot be reasonably identified."*

4.2-70: *"However, no measurements have been made to identify specific conditions on the POU and verify the accuracy of these calculations; calculations are based on average values for the types of soils within the POU and not any actual measurements of infiltration, uptake, and evapotranspiration. Consequently, the use of additional irrigation water that calculations indicate could be effectively used may not, in reality, be effectively used."*

4.2-77: *"Because of data variability, no conclusions regarding pumping effects on DO can be made."*

4.2-78: *"Because values are instantaneous and several events may artifact the data (e.g., lagoon opening and closing, precipitation, tidal processes, and alterations in flow and water quality because of Labor Day weekend additional water demands/diversions and increased septic seepage from greater recreational activities in the [Pfeiffer]-Big Sur State Park) effects of diversions cannot be identified."*

4.3-2: *"Timing of field visits by PBS&J biologists was established by project and landowner schedules. All visits were reconnaissance-level surveys and not intended to* *be comprehensive surveys for specific resources."*

4.3-31: *"A passage transect study was conducted in 2007, which indicated that the shallow water depths at the upstream transects "were independent of irrigation well operations" (Hanson 2008: pg 26). No analysis, however, was provided to support this conclusion. There were several other factors which limit the usefulness of this study when assessing the potential for the project to impact the ability of fish to move through the study area. These factors include:*

- *Tidal influences drive the changes in depth observed at passage transects 2 and 3 at the downstream end of the study area.*
- *It is unknown how far upstream the area of tidal influence extends.*
- *The 2007 study did not include a discussion of the stage-discharge relationship for different passage transects making it difficult to predict passage conditions for different levels of streamflow.*
- *All passage transects have different geometries, which influence their depths at different flows and make comparisons between riffles impossible.*
- *The lagoon was closed between September 3 and 12 influencing results as water collected in the lower river.*
- *There were substantial rainfall events on September 21 and October 10 which could have influenced streamflows and therefore passage conditions."*

4.3-41: *"The Hanson (2008) passage tables indicate that only the New Well was operating during this period. However, the SGI (2008) report indicates that between August 31 and September 2, both wells were operating and pumped 5.02 cfs (SGI 2008); this condition is assumed to be accurate…Passage data and the precise relationship between pumping attributable to the project and reductions in water surface elevations are both somewhat limited."*

50) Page 4.2-50: See my general comment no. 12 for a discussion of the need to expand the assessment of impacts from pumping saline water.

51) Page 4.2-51: The ZOI lines on Figure 4.2-6 should be drawn on Figures 4.2-4 and 4.2-5 so that the relationship between the monitoring station and the ZOI is clear. In several places within section 4.3, Biological Resources, there is some confusion as to whether passage transects 10 and 11 are within the ZOI. Placement of the radius of the ZOI on the figures with the monitoring stations would show that they clearly are within the ZOI.

52) Page 4.2-53: Table 4.2-7 compiles the monthly average flows for the study period at the USGS gage. Are the values listed the mean or median? The DEIR is written around flow percentiles, so I would think that the values given are the 50th percentile or the median because the mean of a skewed data set doesn't have to fall into a consistent percentile. See my general comment no. 8 for a discussion of the discrepancy in the percentile tables in the DEIR, the water right application and my Table 4.

53) Page 4.2-55 and 56: The discussion of bankfull flow should refer the reader to Table 6-3, which has a tabulation of flood flows and return periods. The flows listed in Table 6-3 appear to be low for return periods listed. Bankfull flow as well as other flood events are

calculated based on the annual peak flow events not the daily flows (Dunne and Leopold, 1978). Therefore the values listed for the flood flow return periods in Table 6-3 will likely be significantly higher. My estimate of the 1.5 and 2.0 year return period flood flows using a simple Weibull plotting position method finds the flow range to be approximately 1,600 cfs to 2,200 cfs.

54) Page 4.2-57: See my general comment no. 13 on the evidence for coastal bluff erosion and instability from groundwater seepage and the relationship to irrigation of pastures.

55) Page 4.2-58: The text states that the ZOI extends 1,100 feet from the New Well and refers the reader to Figure 4.2-6. However, the annotation on this figure says that the radius of influence of the New Well is 1,000 feet. Also, the radius of influence lines should be put on the other figures that show the monitoring stations and zones. The DEIR should note that the radius of influence of the Old Well is estimated at 1,120 feet (Figure 3-7 of 2007 SGI report), but the 720 feet shown on Figure 4.2-6 is from the New Well. The DEIR should also note that the combined effect of both wells pumping at the same time may extend the radius of influence (see my comment no. 57).

56) Page 4.2-59: This section discusses the potential impact on ground water levels and aquifer supply and concludes that the project pumping will not permanently lower the level of ground water. Elsewhere in the DEIR, on page 4.2-21, the storage capacity of the aquifer, presumably the one beneath the entire Creamery Meadow, is stated as 765 acre-feet [cubic-feet]. The proposed maximum annual diversion is 1,615 acre-feet and the 20-year running average is 1,200 acre-feet. Thus, the annual diversion can be greater than the volume of the water in storage, by approximately 50 to 100 percent. The aquifer is being recharged mostly from upgradient underflow and surface flows. An extended period of low precipitation (dry and critical dry years) would reduce the volume of recharge. The DEIR is written such that during periods of low precipitation the volume of pumping would be at a maximum in order to provide optimal forage. These two conditions, low precipitation with maximum pumping, could result in a lowering of the water table well below normal conditions. As I've discussed in my general comment no. 5, the rate of groundwater discharge to the river is in part dependent on the difference in elevation between the water table and the river. A sustained drop in the water table from a lack of recharge would result in a reduction in the rate that ground water discharges to the river and may even reverse the direction of flow, *e.g.* the river flows to the ground water. While the statement that ground water would not be permanently lowered, it may be lowered for a period of time sufficient to cause a potentially significant impact to river flows and thereby public trust resources.

57) Page 4.2-62: The discussion of the hydraulic gradient between surface water and ground water in the river states that during the 2007 SGI study, a critical dry irrigation season, when both wells were pumping, the gradient became more negative for a distance of 600 feet upstream of the ZOI. In other words, the river lost flow to the groundwater aquifer for a distance that was greater than the radius of influences calculated by the pumping well tests when both wells were pumping. The DEIR goes on to say that the groundwater gradient could change as much as 16% when diversions are above 5.0 cfs. What information is there that this loss only occurs when pumpng is above 5.0 cfs? The change in volume of river flow lost when both wells are pumping is not calculated, but

should be provided for comparison with losses/gains in the ZOI. First, this is an interesting statement that the pumping impacts extend up to 600 feet upstream of the ZOI when both wells pump. Perhaps the ZOI is larger when both wells pump, perhaps because their pumping impacts are additive. Second, there is some question whether passage transects 10 and 11 are within the ZOI (see page 4.3-37), but this statement that pumping influences extend 600 feet beyond the designated ZOI would clearly find that these transects are affected when both wells pump and well within the ZOI.

58) Page 4.2-63: The discussion of the impacts to the river in the ZOI when both wells are pumping describes differences between the river zones. The difference in the gains or losses throughout the ZOI is important because the pumping impacts are local and can't be averaged. For example, Zone 2 is apparently a losing reach even without pumping, and with pumping river losses increase. This contrasts with Zones 3 and 4 that are said to be gaining reaches and pumping reduces the water gained. This DEIR states that the losses to the river during pumping are approximately 26%, but the fact that the river varies from a gaining to losing reach within the ZOI means that the impacts may vary within the ZOI. This fact isn't emphasized in the DEIR, but is critically important because the issue of acceptable fisheries habitat and passage is local and can't be average over a long section of river. Note that elsewhere in the DEIR the river losses during pumping are stated as 16% and 30% (see my comment no. 74).

59) Page 4.2-64: The DEIR should note that during the 2004 SGI study VT2 was not in the same location as it was during the 2006 and 2007 SGI studies. In 2004, Station VT2 was located near the upper stream end of the ZOI near passage transect 10, see Figure 1-3 in SGI's 2005 report. Velocity transect VT3 also changes location in the 2004 study. This change in station locations needs to be made clear.

60) Pages 4.2-64 and 65: The last paragraph discusses the loss of river flow during pumping of a single well. The loss of flow in the river during baseline July to October diversion is stated to be approximately 16% of the total diversion of 2.21 cfs. The discussion compares baseline losses to the increase in losses from increased rate of diversion. The term "average irrigation season condition," is used for this, but the actual diversion rate isn't given. DEIR Table 4.2-6 gives a listing of the baseline and proposed diversions and shows baseline flows in September as high as 2.60 cfs. The DEIR's averaging of irrigation season flow causes the assessment of the potential impact to be understated. The math in this paragraph is hard to follow. In fact, the sentence at the top of page 4.2-65 states that the increase in overall loss of river flow would be 0.06 cfs more than baseline for the average July through October season, but 0.05 cfs less than baseline at the maximum monthly July through October diversion rate. What does an "increase in overall loss" "less than baseline" mean? How can the loss from pumping be greater during average conditions than during maximum condition? Also, I've discussed elsewhere that the maximum pumping rate during the months of July to October can be 5.84 cfs, the instantaneous maximum diversion rate at anytime, provided the duration of pumping is 19 or less consecutive days every 30 days and every per month.

61) Page 4.2-65: See my comment 53 for discussion of how bankfull flow should be calculated. DEIR Table 4.2-8 should be revised to reflect the proper calculated flood flows.

62) Page 4.2-66: The discussion of loss of river flow has several errors. The sustained maximum diversion rate is 5.84 cfs not 5.34 cfs. As I've discussed before, that a pumping rate of 5.84 cfs can occur for 19 consecutive days resulting in a diversion of a total volume of approximately 220 acre-feet without violating the 30-day average or monthly average limits or 5.34 cfs and 230 acre-feet, respectively. The statement that no minimum has been established for flows that are necessary to maintain aquatic habitat, which presumably includes fish passage, is incorrect. The lack of establishing a minimum flows is due to the failure of the technical studies done to support the water rights application. While these report fail to provide the necessary minimum flows, they do contain sufficient information to establish an interim minimum bypass flow for periods of low flow. See my general comment no. 9 where I document that the minimum bypass flow of 40 cfs during June through November is needed for fish passage and 132 cfs during December to May. Therefore, this analysis that assumed a minimum flow needed is only 1 cfs is inadequate. DEIR Table 4.2-9 should be revised using 40 cfs and 132 cfs as a minimum flows necessary for protection of public trust resources. This table should also be expanded to include each month since the flow percentiles change with month. See my Table 4 with a bold line drawn along the 40 cfs and 132 cfs boundary between flow percentiles.

63) Page 4.2-67: This section states that sustained 30-days of pumping at 5.34 cfs can occur at any time from November to June, but Table 4.2-6 shows a maximum pumping rate of 0.68 cfs in November to April. I've discussed before the need to assume that the maximum diversion rate of 5.84 cfs can occur at any time.

The "average" baseline flow for November is stated as 29.8 cfs and over 100 cfs for all other winter months. However, the DEIR Table 4.2-1 lists the November median at 19 cfs and the other winter months range from 36 to 120 cfs, with only January and February exceeding 100 cfs. Again, the issue is the use of mean (average) or median. Because DEIR is written around percentile flows and the mean changes with the skew of the data, I suggest that the median, 50^{th} percentile, is the better statistic.

The discussion on Swiss Canyon states that the point of upwelling between pastures 2 and 7 may be natural groundwater seepage or percolation of irrigation water. See my comment no. 10(b) for a discussion of why the source of this water might be a leak in the irrigation pipe that runs beneath Swiss Canyon in this area.

64) Pages 4.2-68 and 69: Mitigation measure 4.2.2 requires the applicant "immediately" develop and implement an Irrigation Water Management Plan (IWMP). Will this document be developed as part of the CEQA process? Will it be approved by any or all regulatory agencies that have jurisdiction over the project's impacts? What permit(s) other than a water right permit will be required for implementation of the IWMP? Finally, why is it that the only time the SWRCB has to approve the IWMP is when there are modifications, but not the original plan? What is the regulatory procedure for SWRCB approval? Will the approval be done under CEQA or an equivalent regulatory process? Does the IWMP approval conflict with the CCRWQCB's authority under Order R3-2009-0050, or CDFG's authority?

Table A lists baseline diversion rates and the proposed limits on diversion using baseline flows at the specified percentiles. The baseline diversion in Table A don't seem to match the baseline diversions given in Table 4.2-6. For example, in Table 4.2-6 the November to April baseline mean diversion is listed as 0.02 cfs, whereas the baseline diversions in these months in Table A range from 0.0 to 0.42 cfs with a mean of of 0.113 cfs.

The bypass flow requirements listed for this mitigation measure are based on seasonal percentile flows as measured at the USGS gage. See my general comments nos. 5, 6, 7, 8, and 9 for discussions on why the proper bypass flow requirements should be based on actual flows in the river that allow for fish passage and habitat protection and why the minimum bypass flows should be 40 cfs from June through November and 132 cfs from December to May. See my Table 5 for my interpretation of the monthly limitations stated in mitigation measure 4.2.2. See my Table 4 for the monthly percentiles that achieve my recommended 40 cfs and 132 cfs bypass flow requirement.

65) Pages 4.2-71 and 72: The excess irrigation in the northern pasture is said to discharge, presumably off site, through a flow control structure. DEIR Figure 2-2 and 2-3 show a single outlet draining over the coastal bluff from northern pasture 7. See my general comment no. 13 for a discussion of areas along the coastal bluff of the northern pasture 7 where groundwater seepage is creating erosion and instability. Also, no study or evaluation has been done on the potential for runoff from the pastures in to the natural drainage north of the irrigated pastures.

The discussion of Swiss Canyon notes the "upwelling" of ground water near pastures 2 and 7, and that riparian vegetation in the canyon reduces the potential for bed and bank erosion. See my general comment no. 10 for a discussion of the erosion in the canyon, vegetation disturbance, and possibility that the source of the "upwelling" ground water is a leak in the irrigation pipe that runs beneath Swiss Canyon.

The discussion of mitigation measures for Impact 4.2-3 requires that an Erosion Control and Operations Management Plan (ECOMP) be submitted to the SWRCB for approval. The mitigation measures require monthly inspection and repairs during the "irrigation season," a term that has been used elsewhere in the DEIR to mean July through October. The ECOMP will become part of the IWMP, which apparently doesn't have to be approved by the SWRCB until it is modified. The mitigation adds a requirement to the IWMP of mitigation measure 4.2-2 that it have management practices to avoid bare soil conditions and limit grazing above pre-project levels on land with less than 50 percent cover. The mitigation requires that erosion and sediment transport BMPs be implemented. However, on page 4.2-74 the DEIR states that under the CCRWQCB's irrigated land discharge waiver, there currently are no required BMPs or discharge limitations.

Is the ECOMP a modification the IWMP? When does the ECOMP have to be submitted to the SWRCB for approval? Is the approval by the SWRCB a CEQA process or some other equivalent permit process? Will erosion control management occur throughout the year given that the requested diversion is year round? Is the project proposing to increase the grazing intensity above the pre-project level, and if so, what is the pre-project level and what is the expected increase? How does the ECOMP compare to the Farm

Management Plan required by CCRWQCB's Order R3-2009-0050? What BMPs will be implemented given the DEIR's apparent decision that the CCRWQCB doesn't require specific practices be implemented? See my general comments nos. 11 and 13 for discussion of erosion control and water quality permit issues.

66) Page 4.2-73: The discussion of Impact 4.2-6 states that the proposed project would be subject to CCRWQCB Order No. R3-2004-0117. This order has been replaced on July 10, 2009 by Order No. R3-2009-0050, but the monitoring and reporting plan from Order No. R3-2004-0117 remains in place and was adopted by Order No. R3-2009-0050. See my general comment no. 11 for a discussion of this CCRWQCB order and its applicability to the El Sur Ranch pastures.

67) Pages 4.2-74 and 75: The discussion of Impact 4.2-7 says that the pumps are periodically shut down in response to high salinity levels. The discussion says that the Old Well is "required" to shut off when salinity levels reach 1,000 uS/cm. Elsewhere in the DEIR the salinity shut off for the Old Well is said to be voluntary. The statement is again made that the maximum allowed rate of sustained pumping is 5.34 cfs. I've noted before that the requested maximum year-round water right limit is 5.84 cfs, and that this level of pumping could be sustained for 19 consecutive days every 30 days and/or month without violating any of the other diversion limits. See my general comments nos. 4 and 12 for discussion of the diversion limits and the issues related to applying higher salt content irrigation water.

68) Page 4.2-76: The statements that the maximum average diversion during July through October is 3.67 cfs and the maximum average throughout the rest of the year is 5.34 cfs are incorrect because of the presumption that pumping has to take place for longer than 30-days and for reasons given above in several of my other comments. In addition, compare these values with those in DEIR Table 4.2-6 to see additional discrepancies in the presentation of the maximum allowed pumping rates. See my general comments nos. 5 and 6 for discussion of potential impacts from changes in the channel location, and needed monitoring requirements to document channel conditions. Also, see my June 28, 2006 memorandum on the 2006 Notice of Preparation and Initial Study for a discussion on temperature data from the 2004 study.

69) Page 4.2-78: The mitigation measure for Impact 4.2-8 has as an alternative mitigation measure an instream aeration system to increase the level of dissolved oxygen. This alternative mitigation doesn't have even a preliminarily design, or any evaluation of feasibility or effectiveness, yet the DEIR concludes that it would result in a less than significant impact over baseline. However, the statement on the previous page says, " …no conclusions regarding pumping effects on DO can be made." If the studies to date can't provide any conclusion on pumping impacts, so how can a conclusion be reached that instream aeration system would mitigate these effects to less than significant? In addition, this alternative mitigation doesn't address what permits would be required to implement it, and the fact that several of the permits would have to come from other than the SWRCB, namely CDFG and possibly CDPR. There is also the fact that the applicant doesn't own the land and would have to have approval from CDPR to install and operate such a system. If this alternative is to be considered feasible, more information is needed on the design, efficacy, and implementation and permit requirements. In addition, letters

are needed from the agencies that might have approval and/or permit authority concurring that the project is feasible. Will the project's approval be carried out under a CEQA or another equivalent process? Finally, who will be the lead agency, SWRCB, or whom? At this point in time, it doesn't appear that the planning effort for the instream aeration system alternative has been adequate to consider it a feasible mitigation measure.

70) Pages 4.2-79 and 80: The discussion on cumulative impacts states that the unpermitted historic maximum diversion is approximately 1,412 acre-feet and that the total cumulative maximum diversion being sought by water rights application no. 30116 is 1,891 acre-feet. DEIR Table 5-1 lists the maximum historic total annual diversion during baseline as 1,136 acre-feet. The 3rd Amendment to the water rights application discusses a theoretical requirement for optimal production of 1,440 acre-feet, and a historic maximum annual diversion of 1,611 and 1,737 acre-feet as shown in DEIR Table 2-1. While the DEIR baseline from 1985 to 2004 has a maximum annual diversion of 1,136 acre-feet in 2004. The 3rd Amendment to the water rights application is requesting an annual maximum of 1,615 acre-feet. Why does the DEIR use different numbers to evaluate impacts of the maximum diversion requested in the permit?

The discussion of Impact 4.2-9 states that the current total water diversions in the Big Sur River are 6.85 cfs, which apparently include 5.84 cfs diverted by El Sur Ranch (see page 4.2-34). As I questioned in my comment no. 43, where does this number come from? On page 4.2-34 the reader is referred to Table 6-1 for a detailed list of the appropriative water rights, but this table is a list of CEQA alternatives. Table 5-1 lists the existing and potential water rights within the Big Sur watershed, but only by acre-feet per year not cfs. The analysis also neglects to account for other riparian users in the watershed. El Sur Ranch's riparian diversion is included in the 5.84 cfs. The cumulative impacts discussion needs to account for the riparian uses in the watershed. See my general comment no. 7 for a discussion of flow losses below the USGS gage and the need to include riparian users in the assessment of water availability.

The statement that diversions of the proposed project would not substantially draw the aquifer down has been discussed in my comment no. 56. For the proposed annual diversion of approximately 50 to 100 percent more than the ground water stored in the aquifer stores to not have an impact requires that the recharge rate be continuously at or greater than the diversion rate. The DEIR hasn't established this as a fact. If the flow of ground water from upgradient of Creamery Meadow isn't adequate to replenish the diversion, then losses from the river flows will have to make up the difference, if that is at all possible. The DEIR should calculate the amount of underflow coming through the narrow aquifer in the bedrock section of the river upgradient from Creamery Meadow and document the groundwater mass balance among all of the gains, losses, and diversions including losses to the ocean.

71) Page 4.2-81: See my comment no. 53 for discussion of the issue of calculating bankfull and flood flows.

The statement that irrigation runoff from the project site doesn't enter the Big Sur River seems to ignore the riparian irrigation. The water rights application apparently includes 25 acres of riparian lands. See my general comment no. 2 for a discussion of the lands included in the application. In fact, the 3rd Amendment to the water rights application has a statement that the applicant reserves the right to contend that additional lands are riparian to the Big Sur River. It seems that, by definition, lands that are riparian to a river drain towards that river, which contradicts the DEIR's statement. The mitigation measure for the riparian portion of Impact 4.2-11 should include irrigation practices and erosion control measures and monitoring.

72) Pages 4.3-36 and 37: The discussion of the potential reduction in river water depth from project pumping states that the stream flows lists in Table 4.3-7 are the mean daily exceedence flows at the USGS gage from December through May. The listing of flows as "exceedence" percentiles differs from the previous tables in the DEIR, which list percentiles as "non-exceedence." To avoid confusion, I recommend that the DEIR use either exceedence or non-exceedence percentiles, but not both. Note that the 3rd Amendment to the water rights application uses exceedence flows in Table 2. Also, compare DEIR Table 4.2-1 and 4.3-7 for differences in flow values with the same percentile when exceedence to non-exceedence conversion is made.

The discussion of the passage studies indicates that there is a question whether passage-transects 10 and 11 are within the ZOI. Elsewhere in the DEIR these passage-transects are said to be within the ZOI (page 4.3-40). As I discussed in comment 55, the radius of influence lines on DEIR Figure 4.2-6 should be put on Figure 4.2-5 to clearly show that passage transects 10 and 11 are within the ZOI. In addition, on page 4.2-62, it's stated that during the 2007 SGI study, during a critical dry irrigation season when both wells pumped, the groundwater gradient became more negative as far as 600 feet upstream from the ZOI. In other words, the river lost more flow to the groundwater aquifer (see my comment no. 57). This suggests that the pumping influence may extend further upstream than the theoretical radius of ZOI.

The mitigation measure for Impact 4.3-1 uses flow percentiles to establish flow limits and requires development, in the future, of a detailed flow monitoring and operations plan approved by the SWRCB that will eventually be incorporated into the IWMP. As I discussed above, a table similar to my Table 5 is needed that clearly lists these flow limits. This future monitoring and operations plan will use flow thresholds established in the Final EIR that will be developed in consultation with NMFS and CDFG. It's not clear whether these consultations will occur before or after the development of flow threshold for the Final EIR. If these consultations are to occur before, why haven't they happened prior to the submission for this DEIR? What is the timeline for approval of this flow monitoring and operations plan? Apparently sometime after the Final EIR because the FEIR thresholds are needed to develop the plan? Will the SWRCB's approval process be done under CEQA or some other board equivalent process? What other permits will be needed to implement this flow monitoring plan and how will the SWRCB incorporate the requirements of other permits? In addition, see my general comment no. 9 for a discussion on a minimum bypass flows from June to November of 40 cfs and December to May of 132 cfs.

The issues of Table A have been previously discussed in my general comment no. 9 and comment 64. Specifically, that the listed percentile flows don't agree with Table 2 of the 3rd Amendment to the water rights application or my Table 4. My comment no. 64

discusses the disagreement between Table A baseline diversion rates and those in Table 4.2-6. In addition, the baseline diversion rates seem to be opposite the availability of water supply. Winter diversions are lowest, while summer's are the highest. Although this is the historic pattern of un-permitted diversion, it conflicts with the amount of water available for diversion.

73) Pages 4.3-39 through 42: The discussion of juvenile steelhead passage impairment is provided in Table 4.3-8, which lists the mean monthly flows at the USGS gage for June to October during the 2004, 2006 and 2007 study years. This table is linked to Table 4.3-9, which shows the flows by percentile. As with the other sections that use flow percentiles, there is an exceedence versus non-exceedence issue, and the disagreement between DEIR percentile flows and those of the the 3rd Amendment to the water rights application and my Table 4. There also appears to be another issue with the disagreement between flows listed (Table 4.3-9 and Table 4.2-1) when the exceedence to non-exceedence issue is corrected. For example, the 50th percentile in Table 4.3-9 for October is given as 22 cfs, while the median (50th percentile) in Table 4.2-1 is given as 15 cfs. There are other discrepancies between the table.

The last paragraph on page 4.3-40 says that the analysis focuses on passage transect 4 because it is located in the area subject to the greatest amount of drawdown. Other passage transects are equally important. In particular, passage transects 10 and 11 frequently failed to have sufficient flows for passage during several of the studies. The section closes with a statement that the passage data and relationship between project pumping and reductions in surface water elevations are "somewhat" limited. Are they limited sufficiently that the statements about changes in flow and depth given sometimes to two decimal places are only rough estimates? This statement seems to invalidate much of the DEIR analysis of impacts to river flow by pumping.

The mitigation measures for Impact 4.3-2 are similar to those for Impact 4.3-1 in the use of flow percentiles to establish flow limits along with the requirement to develop, in the future, a detailed flow monitoring and operations plan to be approved by the SWRCB that will eventually be incorporated into the IWMP. As I discussed above, a table similar to my Table 5 is needed that clearly lists these flow limits. The monitoring plan will use flow thresholds established in the Final EIR that will be developed in consultation with NMFS and CDFG. It's not clear whether these consultations will occur before or after the development of flow thresholds for the Final EIR. If these consultations are to occur before, why didn't' they happen before submission of this DEIR? What is the deadline for approval of the flow monitoring plan? Apparently sometime after the Final EIR because the FEIR flow thresholds are needed for development of the plan? Will the SWRCB's approval process be done under CEQA or some other board equivalent process? What other permits will be needed to implement this flow monitoring plan and how will the SWRCB incorporate the requirements of other permits? In additon, see my general comment no. 9 for a discussion on minimum bypass flow of 40 cfs from June to November.

74) Pages 4.3-43 through 45: The discussion of the changes in inflow to ground water from pumping states that there is a reduction of 0.30 cfs for every 1 cfs pumped, a 30% reduction. Elsewhere in the DEIR, values of 24% are use for losses to the river flows

from pumping. Elsewhere on page 4.2-64 the "loss of flow gain plus flow loss to groundwater" is said to be 16%. The DEIR apparently has a range for the loss in river flow during pumping from 16% to 30% without a clear explanation of the conditions causing the difference.

The statement that the maximum diversion rate attributed to the project is 1.4 cfs apparently comes from back calculating the numbers in DEIR Table 4.1-1. A project difference between baseline and 318 acre-feet for the average 30-day average rate of 5.34 cfs is 84 acre-feet. As discussed above, the maximum pumping rate is 5.84 cfs. Pumping for 27 days at 5.84 cfs produces 312 acre-feet, which is less than the 318 acre-feet 30-day average maximum. The DEIR's approach of averaging doesn't agree with the water right permit limits. The DEIR should include an analysis of the impact from the maximum rate of pumping, not a time average of the pumping. Fish are a biological resource; pumping impacts to fish today can't be mitigated with future periods of non-pumping.

The statement that the increases in project pumping are relatively slight compared to baseline pumping raises the issue of whether the past un-permitted diversions can establish a environmental impact baseline. See my general comment no. 9 for a discussion of why this un-permitted baseline is inappropriate.

The flow limit in mitigation measures for Impact 4.3-4 differs from the other mitigation measures in that it sets a trigger based on one specific flow, 10 cfs. The percentile of a 10 cfs flow varies each month. See my Table 4 for the changes in monthly exceedence percentage for 10 cfs. In addition, the 10 cfs flow is less than the June through November 40 cfs bypass flow and December through May 132 cfs bypass flow I've recommended in my general comment no. 9. The alternative mitigation measure of installing a seasonal aeration system is based on the feasibility as determined with a future study and design, along with future permit approval. The mitigation incorrectly infers that approval of the instream aeration system lies only with the SWRCB. This system will require a Streambed Alteration Agreement with CDFG and likely permits or agreements with DPR, the land owner. What permit process will be used by the SWRCB to approve the instream aeration system? Will the approval be one under the CEQA process or some other board equivalent process? At this point in time, it doesn't appear that the planning effort for the instream aeration system alternative has been adequate to consider it a feasible mitigation measure.

75) Pages 4.3-45 through 49: See my general comment no. 10 for a discussion on the possible source of the spring in Swiss Canyon and the likely need for additional permits.

76) Page 5-3: Table 5-1 should also include the cubic-feet-per-second diversion rates because these values are needed to determine the loss in flow downstream from the USGS gage and aid in establishing bypass flow requirements. The table or another table should also include riparian diversions, existing and potential.

77) Page 6-2: The no project alternative states that without approval of the appropriative water right all future diversions would be limited to the existing riparian water right. The existing riparian water right is said to be for 25 acres. However, the 3rd Amendment to the

water rights application states that the applicant reserves the right to contend that additional lands are riparian to the Big Sur River. The April 12, 1992 memorandum by Mr. Moeller stated that the riparian acreage was 90 acres and the total annual diversion would be 270 acres, or 3 feet. Are the 90 acres and 270 acre-feet per year the numbers the applicant wants to use for the no-project alternative, or is there another set of numbers?

The statement that the maximum annual baseline diversion occurred in 2004 at 1,137 acre-feet seems to conflict with the justification stated in the 3rd Amendment to the water rights application for the 1,615 acre-feet annual maximum. The DEIR baseline and the water rights application aren't using the period of time to justify the diversion rates.

78) Page 6-3: Table 6-1 provides a comparison of the alternative water use. The baseline maximum instantaneous diversion rate is listed as >6.0 cfs with a footnote that this values is based on 2004 diversions in Table 6-13 in SGI's 2005 report. The copy of the 2005 SGI report that I have doesn't have a table 6-13. The 2005 SGI report has a listing of daily diversions in Table 2-2. Diversions exceeded 6 cfs on only 3 days of the 2004 study, with the maximum rate of 6.06 cfs on April 28, 2004. The 2005 SGI report Tables 3-4 and 3-5 seem to imply that the maximum pumping rate with both wells running was 5.83 cfs during the 2004 study. A similar question applies to the other alternative where 6 cfs is given as the maximum instantaneous diversion rate.

    The no project alternative specifies the 20-year running average diversion rate as 80 acre-feet and an annual maximum of 106 acre-feet. What is the source of these data? The 1992 memorandum from Mr. Moeller states that 3 acre-feet per acre was a reasonable use for riparian lands. Thus the 25 acres of riparian would need 75 acre-feet per year maximum or 20-year running average.

79) Page 6-4: For the no project alternative, the maximum average 30-day diversion rate is stated as 0.53 cfs, why? Does this relate to the duty of 1 cfs per 50 acres? See my general comment 4e for a discussion of the applicability of this standard to the project. The wells can pump at a much higher rate and it's the instantaneous diversion rate that impact fisheries resources. Can the wells pumping be reduced to this low a rate? Elsewhere in the DEIR it is said that the pumping rate is in part controlled by the field that is being irrigated. What is the pumping rate know for the riparian field(s)?

80) Page 6-5: Table 6-2 compares the diversions for four alternatives. The table compares monthly maximum and seasonal average diversions in cfs. The table doesn't evaluate all six of the requested water right limits. And again the DEIR assumes that the maximum rate of 5.84 cfs won't occur, even though it was listed as part of Table 6-1. Flow losses to the Big Sur River are given as 16% of the total diversion, whereas 24% and 30% were used elsewhere in the DEIR. The diversion rates listed under Alternative 4 are the same as for the project. How is this an alternative if its diversions are the same as the project (see my comment 81)?

    Table 6-3 lists flow rates for the alternatives for channel forming factors by non-exceedence percentages. As discussed above, the method for calculating the flood flows should use the annual peak flood data set, not the daily flows. In addition, the DEIR is using both non-exceedence and exceedence percentages, but to avoid confusion should use only one.

81) Page 6-6 and 7: The discussion of erosion under the no project alternative states that the vegetative cover would be reduced without irrigation and that this reduction in vegetative cover would result in increased erosion over the project alternative. One would hope that the pastures would not be over grazed, with or without irrigation. The issue of how much forage would survive with only rainfall hasn't been addressed in the DEIR so I'm not sure that the conclusion that an increase in erosion would be measurable. The DEIR also doesn't consider the impact of the irrigation on erosion of the coastal bluff, which would likely benefit from cessation of irrigation. See my general comment no. 10 for a discussion of coastal bluff stability.

82) Pages 6-20 through 23: Alternative 4 would limit diversions when specific hydrologic and water quality conditions occur. The hydrology conditions include the loss of surface water connectivity. The alternative would allow for pumping until the river goes dry. If this means that when the river dries up, pumping will be dropped to 3 cfs, just above baseline, then there doesn't appear to be much of a surface water flow bypass requirement. The concept of bypass is to cease diversion before the flows become detrimental and going dry is the extreme case of detrimental for surface water flows.

Alternative 4 also introduces the concept of an El Sur Ranch Reach, which is defined in footnote 43 as the reach from 100 yards (300 feet) upstream from the most easterly of the two points of diversion (New Well?) and 100 yards (300 feet) downstream from the most westerly of the points of diversion (Old Well?). Where on the ground are the endpoints of the El Sur Ranch Reach? Is this reach shorter in extent than the ZOI plus the 600 feet upstream loss of river flow with both wells pumping?

The low dissolved oxygen (DO) condition implies that there will be relatively frequent water quality measurements of surface water flows in order to identify when the low DO condition is reached. Where and how often are these samples or instrument measurements going to be taken, and what is the reporting requirement? This appears to be an element of the future monitoring and operations plan. The procedures for implementing this alternative monitoring program require consultation with SWRCB, CDFG and NOAA fisheries only after 14 consecutive days of deficient flow conditions. This seems presumptive that any of these agencies would approve delaying notification of an impact. According to my experience with water quality and fisheries resource permit monitoring, notification of permit violation has to occur immediately. The alternative then requires a 72-hour waiting period to determine the acceptable rate of pumping. And then a 4-party agreement has to be reached.

Alternative 4 provides specific mitigation actions to be implemented if the 4 parties can't agree on what diversions are allowable. Specifically, diversion can resume when water depth reaches 0.5 feet at the "depth location" with no loss of surface water connectivity throughout the El Sur Ranch Reach and the downstream DO level increases for 7 consecutive days. Following the second loss of connectivity and/or low DO for 7 consecutive days, the project couldn't resume diversions until the reach has at least 0.5 feet of water depth, or loss of surface water connectivity exists throughout the reach and the flow rate exceeds the "low flow rate." The low flow rate is defined in footnote 46 as the 7-day average at the USGS gage of 9 cfs or less, but more than 7 cfs.

The no 4-party agreement section of the Alternative 4 has some curious requirements. First, the mitigation measure specifies in advance of a meeting of the 4-parties what the minimum conditions the government agencies can require. Second, the 0.5-foot depth requirement doesn't indicate whether this is at a point location, or a percentage of a passage-transect, or how it relates to fish passage. The third requirement is that following the second period of loss of surface water connectivity, pumping can't resume until a depth of 0.5 feet or a loss of surface water connectivity exists throughout the El Sur Ranch Reach. The requirement that the surface water connectivity be lost "throughout" the reach implies that unless the entire river goes entirely dry that diversions can continue subject to the additional "low flow rate" condition. The definition of the "low flow rate" appears to say that it occurs only between 7 cfs and 9 cfs. If the flow is less than 7 cfs, it is not considered a "low flow rate." Why the lower limit on definition of "low flow rate?"

Overall, Alternative 4 doesn't appear to be feasible because of its delayed notification requirement, predetermination of government agency options, lack of information on why the trigger conditions are appropriate, the apparent requirement that the river go dry before a reduction in pumping is required, and bracketed definition of "low flow" as being only from 7 cfs to 9 cfs. The final paragraph on page 6-23 appears to reach this conclusion that the Alternative is infeasible. Can an infeasible alternative be considered an acceptable alternative under CEQA? An infeasible alternative appears to be a contradiction to the concept of alternatives analysis.

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Attachment

5 Tables
16 Figures

Table 1
Comparison of Actual to Estimated Diversion

Year	July to October Diversions			Annual Diversions		
	Actual Table 2-1	Estimated Table 2-3	Difference	Actual Table 2-1	Estimated Table 2-3	Difference
no precipitation		690			1730	
1975	608	605	-3	840	1227	387
1976	620	569	-51	1212	1210	-2
1977	661	679	18	1611	1430	-181
1978	624	686	62	940	1116	176
1979	744	623	-121	1032	1153	121
1980	645	691	46	1037	1331	294
1981	698	610	-88	1045	1176	131
1982	725	501	-224	1046	935	-111
1983	448	602	154	476	946	470
1984	944	695	-249	1737	1409	-328
1985	473	670	197	984	1262	278
1986	515	645	130	1012	1274	262
1987	675	608	-67	950	1242	292
1988	453	696	243	1054	1394	340
1989	466	580	114	572	1307	735
1990	701	652	-49	1021	1323	302
1991	613	660	47	934	1369	435
1992	575	649	74	1099	1244	145
1993	654	735	81	992	1355	363
1994	419	711	292	669	1382	713
1995	692	667	-25	862	1183	321
1996	672	699	27	973	1226	253
1997	410	654	244	800	1441	641
1998	443	703	260	468	1120	652
1999	500	658	158	675	1207	532
2000	471	508	37	714	1104	390
2001	469	645	176	697	1163	466
2002	432	642	210	767	1282	515
2003	574	633	59	760	1164	404
2004	590	568	-22	1136	1260	124
30-yr Mean =	584	641	58	937	1241	304
30-yr Median =	599	651	53	962	1243	312
Baseline Mean =	540	649	109	857	1265	408
Baseline Median =	508	653	98	898	1261	377

Table 2
Summary of Flow Data for Transects VT1, and VT2
(From Table 3-1, SGI 2005)

Date	**Time**	**USGS**	**VT1**	**VT2**	**VT1-VT2**	**River Flow** VT1 to VT2
7/23/04	Morning	14	10.29	9.49	-0.80	Losing
8/5/04	Afternoon	14	8.87	7.22	-1.65	Losing
8/6/04	Morning	13	8.77	8.16	-0.61	Losing
8/19/04	Morning	12	7.95	6.97	-0.98	Losing
8/19/04	Afternoon	12	7.21	5.90	-1.31	Losing
8/30/04	Afternoon	12	8.25	9.40	1.15	Gaining
8/31/04	Morning	11	8.20	8.63	0.43	Gaining
8/31/04	Afternoon	12	8.31	10.42	2.11	Gaining
8/31/04	Afternoon*	12	8.83	8.93	0.10	Gaining
9/1/04	Morning	11	8.40	8.81	0.41	Gaining
9/1/04	Afternoon	12	10.21	14.65	4.44	Gaining
9/1/04	Afternoon*	12	9.91	13.84	3.93	Gaining
9/2/04	Morning	11	7.22	7.28	0.06	Gaining
9/2/04	Afternoon	11	10.88	10.26	-0.62	Losing
9/15/04	Afternoon	12	6.32	6.18	-0.14	Losing
9/16/04	Morning	12	7.26	5.96	-1.30	Losing
9/30/04	Afternoon	13	8.18	7.46	-0.72	Losing
10/1/04	Morning	13	9.07	8.02	-1.05	Losing
10/14/04	Afternoon	10	9.83	12.16	2.33	Gaining
10/15/04	Morning	10	11.75	11.84	0.09	Gaining
10/28/04	Morning	48	44.00	46.74	2.74	Gaining
10/28/04	Afternoon	45	40.66	45.56	4.90	Gaining

* Second reading
N.D. = No Data - Lagoon Closed

Table 3

Summary of Data on Changes in Flow on Big Sur River Between USGS Gage # 11143000 and VT1

Table 3 of Jones and Stokes, 1999

Date	USGS	S1 Andrew Molera SP	Change in Flow USGS to S1
8/22/97	19	10.1	**-8.9**
11/11/97	18	15.4	-2.6
9/16/98	29	27.4	-1.6
9/23/98	32	29.3	-2.7
9/25/98	32	29.5	-2.5

Table 3-1 of SGI, 2005

Date	Time	USGS	VT1	Change in Flow USGS to VT1
7/23/04	Morning	14	10.29	-3.71
8/5/04	Afternoon	14	8.87	-5.13
8/6/04	Morning	13	8.77	-4.23
8/19/04	Morning	12	7.95	-4.05
8/19/04	Afternoon	12	7.21	-4.79
8/30/04	Afternoon	12	8.25	-3.75
8/31/04	Morning	11	8.20	-2.80
8/31/04	Afternoon	12	8.31	-3.69
8/31/04	Afternoon*	12	8.83	-3.17
9/1/04	Morning	11	8.40	-2.60
9/1/04	Afternoon	12	10.21	-1.79
9/1/04	Afternoon*	12	9.91	-2.09
9/2/04	Morning	11	7.22	-3.78
9/2/04	Afternoon	11	10.88	-0.12
9/15/04	Afternoon	12	6.32	**-5.68**
9/16/04	Morning	12	7.26	-4.74
9/30/04	Afternoon	13	8.18	-4.82
10/1/04	Morning	13	9.07	-3.93
10/14/04	Afternoon	10	9.83	-0.17
10/15/04	Morning	10	11.75	1.75
10/28/04	Morning	48	44.00	-4.00
10/28/04	Afternoon	45	40.66	-4.34

* Second reading

Table 3 - Continued

Table 3-1 of Hanson, 2007

Date	USGS, cfs	VT1, cfs	Change in Flow USGS to VT1	Pump Status
9/1/06	21	21.92	0.92	9/01/06 Both off
9/6/06	20	19.21	-0.79	
9/11/06	23	20.54	-2.46	9/09/06 Both on
9/14/06	22	18.66	-3.34	
9/18/06	21	18.98	-2.02	9/15/06 Both off
9/21/06	20	18.48	-1.52	
9/25/06	20	18.17	-1.83	9/22/06 Old on
9/28/06	21	18.38	-2.62	
10/2/06	22	19.81	-2.19	9/29/06 both off
10/5/06	24	21.34	-2.66	
10/10/06	21	18.84	-2.16	10/06/06 New on
10/12/06	22	18.38	**-3.62**	10/12/06 both off

Table 17 - Transect 11 of Hanson, 2008

Date	USGS, cfs	VT1, cfs	Change in Flow USGS to VT1
8/30/07	7.3	2.40	-4.90
8/31/07	7.1	2.58	-4.52
9/5/07	6.4	1.62	-4.78
9/6/07	6.5	1.97	-4.53
9/12/07	7.0	5.03	-1.97
9/13/07	7.1	5.28	-1.82
9/19/07	7.2	5.06	-2.14
9/20/07	7.4	5.09	-2.31
9/26/07	8.2	5.27	-2.93
9/27/07	8.2	5.36	-2.84
10/3/07	8.2	5.30	-2.90
10/4/07	8.1	5.36	-2.74
10/10/07	12.0	6.93	**-5.07**
10/11/07	10.0	8.44	-1.56

Table 4

Daily Discharge Summary Statistics by Month in cfs

Big Sur Gage - USGS#11143000
April 1950 to August 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average	238.9	275.0	222.5	146.6	67.3	37.1	23.8	17.5	15.3	17.7	42.2	104.1
Median	130.7	186.4	154.1	79.1	52.5	31.6	20.9	15.6	13.8	15.7	22.1	56.9
High	1,047.0	1,329.0	964.1	842.5	332.5	119.3	71.4	43.0	39.4	86.8	302.2	449.1
Low	8.3	11.4	16.8	9.2	8.7	6.2	4.9	3.8	4.5	5.1	5.0	7.5

Exceedance Probability - flows greater than value % of time, cfs

	Percentage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Critically Dry	95	24.4	29.1	28.0	24.3	15.4	10.3	6.6	6.0	6.0	7.7	10.2	13.9	Critically Dry
	90	**25.9**	**52.6**	**38.1**	**28.5**	**18.0**	**11.7**	**8.4**	**7.4**	**7.3**	**8.5**	**11.3**	**17.7**	
	85	33.8	68.1	55.3	37.0	21.8	14.6	10.0	7.7	7.8	9.1	13.4	21.2	
	80	**37.4**	**80.2**	**65.7**	**40.7**	**27.0**	**16.8**	**11.8**	**8.9**	**8.1**	**10.1**	**14.4**	**24.7**	
Dry	75	47.1	84.8	67.6	45.6	30.3	18.9	13.0	11.0	10.5	11.4	17.3	28.9	Dry
	70	**64.3**	**89.4**	**79.7**	**51.3**	**32.9**	**20.4**	**14.9**	**11.6**	**11.1**	**13.1**	**18.0**	**35.7**	
	65	83.4	100.7	98.4	58.7	36.2	23.9	15.5	12.2	11.7	13.2	18.9	38.8	
Normal	**60**	**104.9**	**113.2**	**102.6**	**65.2**	**38.6**	**25.5**	**16.7**	**13.2**	**11.9**	**13.8**	**19.8**	**42.1**	Normal
	55	118.3	141.4	113.3	73.2	46.6	28.4	20.1	14.2	12.2	14.6	21.0	46.6	
	50	**130.7**	**186.4**	**154.1**	**79.1**	**52.5**	**31.6**	**20.9**	**15.6**	**13.8**	**15.7**	**22.1**	**56.9**	
	45	145.7	202.7	174.1	93.2	60.4	35.1	23.1	17.1	15.0	17.5	23.6	66.9	
	40	**179.9**	**217.1**	**242.7**	**107.1**	**65.2**	**41.0**	**26.0**	**18.7**	**17.0**	**18.7**	**24.6**	**90.2**	
Above Normal	35	240.8	265.6	250.0	123.6	71.9	44.4	27.4	19.8	17.9	19.4	28.4	101.5	Above Normal
	30	**263.2**	**289.2**	**316.2**	**147.6**	**81.2**	**46.8**	**28.5**	**22.1**	**18.9**	**20.3**	**36.0**	**114.9**	
	25	331.6	359.4	324.8	167.4	85.2	50.4	32.3	23.6	20.0	21.0	41.8	137.0	
Wet	**20**	**386.0**	**465.1**	**366.9**	**176.5**	**91.3**	**54.6**	**34.3**	**24.6**	**20.7**	**22.5**	**53.1**	**172.3**	Wet
	15	543.8	530.4	393.9	211.9	106.9	60.2	38.5	26.4	21.1	24.0	75.0	197.9	
	10	**698.7**	**699.2**	**454.4**	**342.8**	**135.1**	**70.4**	**44.2**	**31.3**	**23.1**	**25.4**	**106.0**	**277.3**	
	5	759.5	823.2	589.4	512.3	159.6	75.0	46.0	35.2	29.2	29.5	132.5	326.8	

NO DIVERSION

Bold line drawn along interim bypass flow recommendation; December to May at 132 cfs, June to November at 40 cfs

Table 5
DEIR Mitigation Monitoring Flow Limitation Criteria

Month	Mitigation 4.2-2 Extreme Critical and Critical Dry	Mitigation 4.3-1 Extreme Critical Dry	Mitigation 4.3-2 Critically Dry
	4.4-2; 4.2-6; 4.2-10; 4.2-11; 5-4	**4.3-9; 5-4**	**4.3-10; 5-4**
January	If USGS < 5th percentile (24.4 cfs), then baseline until > 10th percentile (25.9 cfs)	If USGS < 10th percentile (25.9 cfs), then baseline	
February	If USGS < 5th percentile (29.1 cfs), then baseline until > 10th percentile (52.6 cfs)	If USGS < 10th percentile (52.6 cfs), then baseline	
March	If USGS < 5th percentile (28.0 cfs), then baseline until >10th percentile (38.1 cfs)	If USGS < 10th percentile (38.1 cfs), then baseline	
April	If USGS < 5th percentile (24.3 cfs), then baseline until > 10th percentile (28.5 cfs)	If USGS < 10th percentile (28.5 cfs), then baseline	
May	If USGS < 10th percentile (18.0 cfs), then baseline until 20th percentile (27 cfs)	If USGS < 20th percentile (27.0 cfs), then baseline	
June	If USGS < 10th percentile (11.7 cfs), then baseline		
July	If USGS < 10th percentile (8.4 cfs), then baseline until > 20th percentile (11.8 cfs)		If USGS < 20th percentile (11.8 cfs), then baseline
August	If USGS < 10th percentile (7.4 cfs), then baseline until > 20th percentile (8.9 cfs)		If USGS < 20th percentile (8.9 cfs), then baseline
September	If USGS < 10th percentile (7.3 cfs), then baseline until > 20th percentile (8.1 cfs)		If USGS < 20th percentile (8.1 cfs), then baseline
October	If USGS < 10th percentile (8.5 cfs), then baseline until > 20th percentile (10.1 cfs)		If USGS < 20th percentile (10.1 cfs), then baseline
November	If USGS < 10th percentile (11.3 cfs), then baseline		
December	If USGS < 10th percentile (17.7 cfs), then baseline until > 20th percentile (24.7 cfs)	If USGS < 20th percentile (24.7 cfs), then baseline)	

Mitigation 4.3-4 (4.2-8; 4.3-12; 5-4): For all months, if 10 cfs or less and >18°C, then baseline diversions, unless a permitted instream aeration system is installed.

Figure 1
Mouth of Big Sur River from the USGS Digital Orthophoto Quadrangle, May 1994

Image source: USGS DOQQ file o36121c7sw.tiff

Figure 2
Big Sur River at Andrew Molera State Park, April 30, 1979
River flow at USGS Gage #11143000 at 99 cfs

Figure 3
Close up of Swiss Canyon from USGS Orthophoto Quadrangle, May 1994

Image source: USGS DOQQ o36121c7sw.tiff

Figure 4: Swiss Canyon at El Sur Ranch – April 1979

Photo 7934083.jpg used with permission.

Figure 5: Swiss Canyon at El Sur Ranch – September 2008

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Figure 6: Cliffs at El Sur Ranch Pasture 7 – January 1989

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Figure 7: Cliffs at El Sur Ranch Pasture 7 – October 2005

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Figure 8: Cliffs at El Sur Ranch Pasture 7 – September 2008

Figure 9: Cliffs at El Sur Ranch Pasture 7 – October 2005
Close up of groundwater sapping erosion causing scalloped erosion head scarps

Figure 10: Close up of cliffs at El Sur Ranch Pasture 7 – September 2008

Figure 11: Cliffs at El Sur Ranch Pasture 7 – April 1989

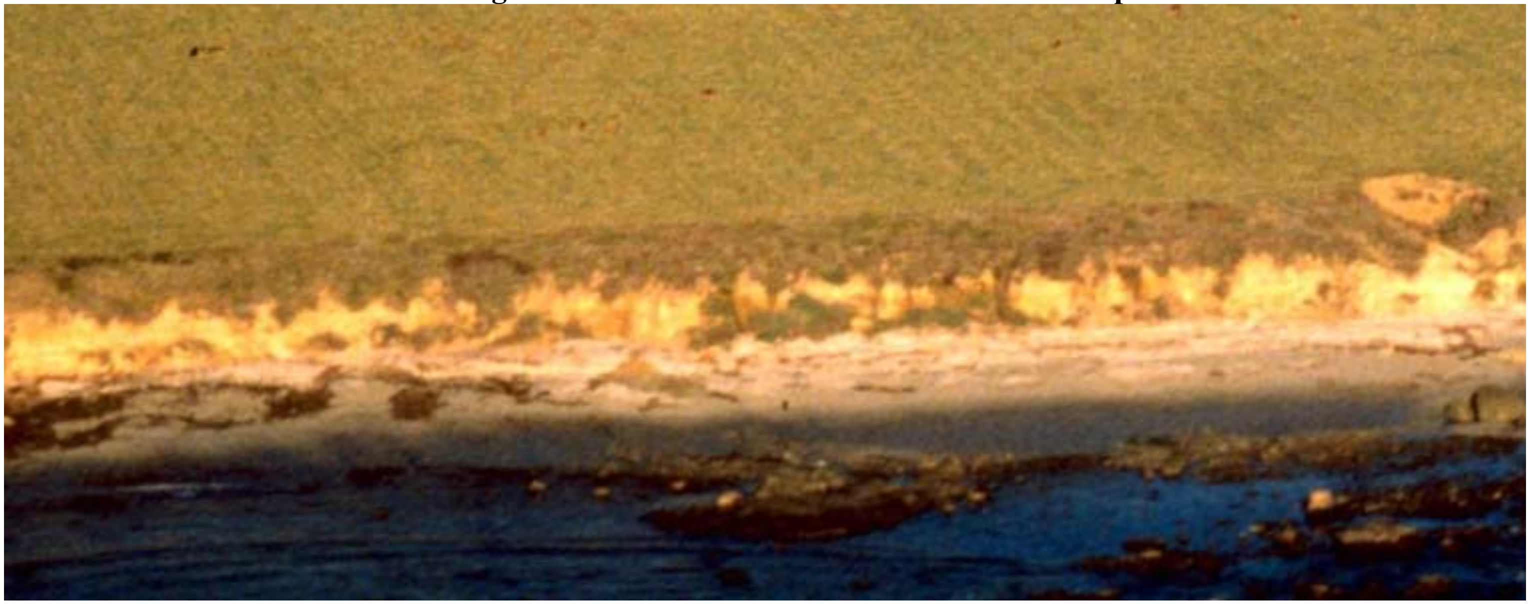

Figure 12: Cliff at El Sur Ranch Pasture 7 – September 2002

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Figure 13: Cliffs at El Sur Ranch Pasture 7 – October 2005

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Figure 14: Cliff at El Sur Ranch Pasture 7 – September 2008

Figure 15: Close up of seepage and pampas grass on cliff between Hanson's bluff survey points #3 and #4, October 2005.

Figure 16: Block failure along joint sets accelerated by seepage in sedimentary rocks of northern Monterey Bay, California. Seepage imparts a dark shade to t he cliff, visible at left side of photo. Note pampas grass in area of seepage. From Figure 26 of Hampton, M.A., and others, USGS Professional Paper 1693, 2004.