BEFORE THE STATE WATER RESOURCES CONTROL BOARD
OF THE STATE OF CALIFORNIA

In the Matter of Application 30166 by the El Sur Ranch, Big Sur, CA and Amendments (as amended October 17, 2006)	)))))))	Application No. 30166 TESTIMONY OF DAVID H. DETTMAN

TESTIMONY OF DAVID H. DETTMAN

I, David H. Dettman, provide the following written testimony under penalty of perjury in relation to Application 30166 and the Amendments most recently dated October, 17, 2006 and detailed in Appendix C of the Draft Environmental Impact Report for Application 30166.

Q1: PLEASE STATE YOUR NAME AND PERSONAL QUALIFICATIONS

1. My name is David H. Dettman. My education includes a Bachelor of Science Degree in Wildlife and Fisheries Biology (1973) and a Master's Degree in Aquatic Ecology from the University of California at Davis (1975). I was employed as a Marine Specialist with the University of California at Santa Cruz (1975-78), worked for eleven years (1979-89) as an aquatic biologist for D.W. Kelley and Associates, and 17 years for the Monterey Peninsula Water Management District. Included in my resume is a list of investigations and reports that I authored which are relevant to my experience and expertise. (**EXHIBIT CSPA/CBD-101**) I am presently employed part-time as an Environmental Inspector and Senior Biologist/Specialist with Avila & Associates, Inc. and continue to consult with clients under my own business name, DHDettman, Aquatic Biologist. I have been a member in good standing with the American Fisheries Society since 1974 and a member of the American Association for Advancement in Science since 1979.

2. In my capacity as a consulting and agency biologist I provided biological assessments of the effects of proposed water development projects and on fisheries resources in central California salmon and steelhead streams, including Lagunitas Creek in Marin County, Zayante Creek, San

Lorenzo River, and Soquel Creek in Santa Cruz County; the Carmel River and its tributaries, Arroyo Seco River, and the Salinas River in Monterey County.

3. I developed methods for improving biological assessments, of defining instream flows needed below dams and of incorporating such flows into hydraulic operation studies to assess impacts on biologic and hydrologic resources. Based on results of these studies I designed and implemented cooperative water supply operations to restore and maximize aquatic habitat <u>and</u> provide water for domestic and commercial use.

4. I developed approaches to assessing the combined effects of stream sedimentation and changing streamflow regimes on steelhead spawning and rearing habitat. I incorporated these approaches into development of habitat models using direct measurements of population density and using hydraulic simulations based on the USFWS Instream Flow Incremental Method. Where appropriate, I have used the USFWS Physical Habitat Simulation Model (PHABSIM) to develop and make recommendations for streamflow requirements below dams in several streams, including Lagunitas Creek (Kent Reservoir), Carmel River (San Clemente and Los Padres Dams), the American River (Folsom Reservoir).

5. I began studying steelhead populations in California during 1979. Since that time I have developed an understanding and knowledge of the factors that limit populations of sea-run steelhead in several central California streams, most notably in the Carmel River, Monterey County, CA, and most recently in Alameda Creek, Alameda County, CA.

Q2: BASED ON YOUR REVIEW OF AVAILABLE INFORMATION AND DATA, PLEASE DESCRIBE YOUR UNDERSTANDING OF STEELHEAD AND OTHER PUBLIC TRUST RESOURCES IN THE BIG SUR RIVER BASIN

6. The Big Sur River drains approximately 60 square miles of steep mountainous terrain with its headwaters at elevation of 4,000 to 4,200 feet in the Ventana Wilderness Area. It enters the Pacific Ocean just south of Point Sur, CA. Several principle headwater streams drain the upper reaches, including the North and South Forks, Ventana, Logwood, Lion and Redwood Creeks. The geologic formations underlying the basin are primarily granitic on the east side of a 130,000 year-

old Sur series fault running parallel to Coast Route below Pieffer-Big Sur State Park (PBS). Above PBS the mainstem flows through a narrow, gorge cut into steep granite walls. West of the fault and downstream of PBS the stream runs northwest along the fault to a point in Andrew Molera State Park (AMS), where is turns abruptly to the southwest and enters the ocean, approximately one mile downstream. The river appears to have deposited a relatively thin layer of alluvium in this 1-mile long reach below AMS day-use parking lot and only pockets of alluvium upstream of there, where bedrock outcrops control the channel configuration. The river coarse in the lower 1-mile long section is controlled on the northern side by cuts into a marine terrace overlain by younger alluvium.

7. Public trust resources in the Big Sur Area are noteworthy, ranging from abundant plant and wildlife species that are distributed in other parts of central California to isolated populations of unique species found nowhere else in California. A list of sensitive species was developed for animal species within the vicinity of the El Sur Ranch, including the California condor, Monterey dusky-footed woodrat, Southern sea otter, south-central California steelhead, California red-legged frog, Western snowy plover, Smith's blue butterfly, loggerhead shrike, yellow warbler, and brown pelican. (PBS&J 2009)[1]

8. Of special importance as a public trust resource is the wild, scenic character of landscape, its steep topography, the complex and diverse plant associations, and the supply of clean, freshwater running from the crest of the Coast Range to the sea. Aquatic resources in the Big Sur River are linked to the persistence of this freshwater – the cool, well-oxygenated water provides a continuous environment for a diverse assemblage of plants and animals. Riparian vegetation is dense along the lower Big Sur River, especially along the lower Molera Reach below the ANSP day-use parking lot where mixed cottonwood-sycamore and willow-riparian forests thrive. The riparian trees and vegetation in the lower Andrew Molera reach and around the Big Sur Lagoon function in several ways to maintain public trust resources: the dense canopy provides <u>shade</u>, which moderates stream water temperature; the trees and dense vegetation <u>trap large woody debris</u>, which adds complexity

[1] In addition to animal species, PBS&J (2009) documented 33 sensitive plant species in the Big Sur area and land with 5 miles of the El Sur Ranch Project

and structural components to instream and streamside cover for steelhead and other aquatic species; and the overhanging vegetation provides habitat for a myriad of terrestrial insects and other invertebrates, which are key food sources for aquatic species.

9. Steelhead Population – In 1997 the National Marine Fisheries Service listed the steelhead residing in south-central California as threatened under the federal Endangered Species Act. For purposes of protection, management and recovery, the naturally producing, anadromous steelhead returning to streams within the range from the Pajaro River (inclusive), southward to, but not including the Santa Maria River are grouped into the south-central California Distinct Population Segment.[2] The run of adult steelhead returning to the Big Sur River has not been regularly monitored, but early observations in 1940's documented its existence and several reviews and studies since that time have documented the status of the population in specific years and reported on its probable status, habitat features and limits to production in the basin:

a) Titus, Erman and Snider (in prep.) reviewed of the available historical CDFG field notes, files and office files and noted:

> "*Recent study of juvenile steelhead habitat use in the lower Big Sur River* [below the gorge in Pieffer Big Sur State Park] *shows that the entire area, from the lagoon to the gorge, remains highly functional for steelhead production. Preliminary analysis suggests that most juveniles leave the stream after only one year of rearing, and that there is a relatively small proportion of mainstem fish that appears to be resident rainbow trout.*"

b) In 2008 the Center for Ecosystem Management and Restoration (CEMAR) reviewed the available information on the distribution and qualitative abundance of steelhead in the Monterey County and noted that the Big Sur River (below the gorge) was currently a anadromous run, supported by natural reproduction during the last ten year, but that substantial evidence exists that a significant decline in abundance has

[2] The Endangered Species Act, as amended in 1978 defined species as "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." As such, a Distinct Population Segment (DPS) is considered to represent and be functionally equivalent to an Evolutionarily Significant Unit (ESU), as described in a joint policy by the USFWS and NMFS in *The Federal Register* for Wednesday, February 7, 1996 (Vol. 61), p. 4722.

occurred. (Becker and Reining 2008, Table 3, page 191)

c) In reviewing existing data and management activities for the Big Sur River Steelhead Enhancement Plan, Duffy (2003) noted that the California Department of Parks Recreation manages 6.5 miles the 8.5-mile long river corridor that is now accessible to steelhead in the Big Sur River. Duffy (2003) reviewed details of CDFG files (including angler reports) and conducted snorkel surveys in August 2002, when Streamflow ranged from 12-13 cfs (USGS gage 11143000)**.** Results of the snorkeling survey included the following important summary, which is pertinent to key issues for this hearing:

> "*Within the Andrew Molera sections, juvenile steelhead were most often observed in (1) riffle-runs, especially where there was abundant woody material or overhanging and submerged vegetation, such as willow and their roots; (2) at the heads of some pools, especially where flows were concentrated and there was cover habitat, such as woody material; and (3) deeper pockets (8-12") of riffles, especially adjacent to boulders. Fast velocity feeding stations appeared important, especially for larger juveniles. Few fish were observed in slow velocity runs and pools, with the exception of a large group of approximately 20 fish observed in a willow root mass in the middle of a long, deep run.*"

10. Hanson (2005) conducted field studies of the fish populations in the lower Big Sur River, including snorkel surveys on July 27 and October 16, 2004. This information, summarized in their Figures 76-78 (Hanson 2005) shows the relative numbers of three fish species, the distribution and abundance of juvenile steelhead, and the relative importance of the lagoon for rearing juvenile steelhead during this period. A comparison of the population abundance and density index data in Figure 76-78 with the descriptions of habitat conditions, water quality measurements and photos indicates that when late summer flows are below normal, the lagoon supports most of the juvenile steelhead in the lower one mile section of stream. Streamflow during the 2004 study was well below normal, ranging from 48 cfs in April to 10 cfs in mid-October. (**Appendix**, **Figure 1**) The study also documents areas in the lower river where water quality was not suitable for juvenile steelhead; and where few, if any, steelhead were rearing. Hanson attributed the poor water quality to localized site conditions and upwelling of groundwater, but a nexus to water production from El

Sur Ranch's pumps is also a likely cause, as the areas with poor dissolved oxygen are within the ZOI of the wells and water may be induced to flow into the surface stream from the aquifer on the south side of the river (left side).

11. Hanson (2007) conducted field studies testing the effect water production from El Sur Ranch's pumps on the steelhead habitats for upstream migration and water quality in the lower one-mile reach of the Big Sur. This work shows that limited production from the new and old wells has little or no influence on the ability of steelhead to migrate upstream, but this conclusion must be qualified by the experimental design and the environmental conditions, which included: 1) limiting the diversions, 2) alternating the pumps to on/off status during a 48-day long period, and conducting the demonstration during a period when streamflow was well above normal conditions.[3] (**Figure 2**) The effects on habitat conditions were minor, as might be expected when flows are higher than normal and water production is constrained with the production of ~84 AF/mo. (**Table 1**)

12. Hanson (2008) reported on studies conducted during summer 2007, a critically-dry water year with discharge ranging from 6 to 18 cfs during the study period from September 1 to October 31, 2007 at the USGS gage No. 11143000. (**Figure 3**) Flows within the study reach were extremely low, declining to season minima of 0.3-0.4 cfs during the Labor Day Weekend. Patterns in fish abundance and distribution during 2007 were similar to those observed in 2004, with steelhead abundance highest in the Lagoon and lower upstream, with a notable lack of fish in the vicinity areas where DO was measured below 6 mg/l. (Figures B-1 to B-4 in Appendix B; compared to Figures 52 – 56) Hanson (2008) attributed the low DO to universally low streamflows at that time of year and did not attribute any impact due to the effect of pumping from El Sur Ranch's wells. Evidence in the report illustrates the possible effects in Figures 52 – 55, where DO declines to the lowest levels of the study, when the New Pump is running during the first week of September

[3] A comparison of flows during this 48-day period shows that mean daily discharge ranged from 20 to 24 cfs at USGS gage No. 11143000, equivalent to 43-71% higher than the median discharge of 14 cfs during the period. Data available at: http://waterdata.usgs.gov/ca/nwis/dv?cb_00010=on&cb_00060=on&format=gif_stats&begin_date=2006-08-30&end_date=2006-10-17&site_no=11143000&referred_module=sw

and then increases after the pump is shut off. While a direct relationship between pumping and low DO is difficult to demonstrate; the DO patterns in Figures 52 – 56 call for caution in setting minimum bypass or allowing any diversions during the low-flow periods.

13. To help prepare for this hearing I conducted a one-day field reconnaissance of the Big Sur River in the lower Andrew Molera Reach; the purpose was to photo document the variety of stream habitats in the reach at a relatively high streamflow, while walking slowly upstream. (**Exhibit CSPA/CBD-102**) Streamflow on April 29, 2011 was 125 cfs at the USGS Gage No. 11143000 and 146 cfs in the Andrew Molera Reach. At 146 cfs, the base of the stream channel was covered bank-to-bank in most locations, the only notable exceptions being areas were high flows in March and April had deposited bedload and/or debris from nearby scour points and increased the channel width a bit. This can be most readily seen in Photo 19 where the base-width of the channel increased to 54 feet wide due to deposition of bedload from the accessory channel, located just upstream to the left of the photo and partially visible in Photo 20. At this flow habitats throughout the reach appeared suitable for all life history phases/stages of steelhead including adults (migrating and spawning), embryo incubation, fry emergence, fry residence, young-of-the-year and older summer age classes, pre-smolts and smolts that emigrate downstream. While habitats were suitable for all stages, water velocities in portions of many habitat units were above optimal levels for emergent fry and young-of-the-year, especially in middle of riffle sections, where surface velocity was measured in a few patches at more than 2.5 feet per second.

Q3: HAVE YOU REVIEWED AND FORMED AN OPINION ON THE CALIFORNIA DEPARTMENT OF FISH AND GAME'S RECOMMENDATIONS FOR MAXIMUM ANNUAL, SEASONAL, MONTHLY AND INSTANTANEOUS DIVERSIONS TO PROTECT PUBLIC TRUST RESOURCES IN THE BIG SUR RIVER?

14. Yes. As a responsible state agency, the Department makes recommendations to the SWRCB for bypass flows at diversion dams or flow releases below dams at storage reservoirs, and normally makes these recommendations based on project impacts that are described in technical reports and/or EIRs. Usually, the Department doesn't recommend specific diversion rates, but notes how diversions could affect public trust resources. In the case of El Sur Ranch's application, the Department expressed the following specific concern about El Sur Ranch's proposed annual and instantaneous maximum diversions:

> "*The Department protested El Sur Ranch's Water Right Application 30166 based on its proposal to divert from the underflow of the Big Sur River, 1,615 acre feet of water annually at a maximum rate of diversion of 5.84 cfs. The Department is concerned that the diversion will result in direct and cumulative adverse impacts to the resources of the river by reducing instream flow and water availability needed to maintain fish and wildlife habitat within and adjacent to the river.*" (CDFG, EIR Comment letter, dated December 14, 2009)

15. Based on my experience on working in other central California streams with steelhead population and other aquatic resources, I share the Department's concern regarding the potential impacts of diverting a maximum of 5.84 cfs on the biological resources in the Big Sur River. A comparison of this diversion rate with mean daily flows in the Big Sur River shows that the proposed diversion is within, or near, the range of seasonal minimum mean daily flows during many years.[4] (**Figure 4**) For example, in 2007 the mean daily streamflow declined from 18 cfs on May 1 to 6.3 by the first week in September. (**Figure 5**) Considering that flows shown in **Figure 4** & **Figure 5** represent unregulated inflow to the lower river, tributaries between the upper and lower gages are often dry, and evapo-transpiration and other uses may affect flows in the lower Andrew

[4] My review of the Draft EIR for El Sur Ranch WRA 30166 and supporting hydrologic documents leads me to believe that the relationship between groundwater pumping and surface discharge is not well understood, or clear. Until further information is available that documents the relationship under a variety of hydrologic conditions, references to direct diversion in my testimony are made with an assumption that the applied diversion quantities have a direct 1:1 correspondence to river discharge. This assumption may be supported by detailed hydrologic information in Hanson (2005, 2007, & 2008) and SGI (2005 and 2008); and additional review of this information is planned prior to my oral testimony in June 2011.

Molera State Park (AMSP) reach, means that El Sur Ranch's proposed maximum daily diversion of ~ 5.84 cfs carries with it a risk of drying the stream up in the lower AMSP reach. Impacts on flow would be most severe in multi-year droughts, similar to the 1987-1992 drought, when the unregulated flow fell below 6 cfs several years in a row. (**Figure 4**) Even in years when the proposed diversion is less than the unregulated inflow, the proposed diversion often represents a large fraction of the available unimpaired flow. This is illustrated in **Figure 6** showing a time series comparison of the maximum diversion rate compared to daily discharge, expressed as daily percentage. This information can be used to develop an understanding of the relative duration and magnitude of flow impacts over a sixty-year long period. For example, a close examination of the lower chart and the daily historical discharge record shows that the proposed maximum diversion is 40% of the discharge during 21% of the days in the 60-year record, and potentially affects dry season flows in 40 of 60 years.[5] In other words, the proposed diversion can frequently reduce daily flows and critical habitats, especially during low-flow periods.

16. Due to the close proximity of El Sur Ranch's pumps to the Big Sur River and the risk that a substantial proportion of the river's streamflow is diverted during the low-flow season, I believe CDFG's concern about long-term impacts on public trust resources, specifically aquatic resources is well-founded. Several streams, critical habitats, and steelhead populations in the Central California and South-Central California DPSs have been directly affected by groundwater pumping, surface diversions and the complex linkage between surface flows and groundwater flowing in known and definite channel. The most well-known instance is probably the Carmel River, but similar impacts have occurred in Cachagua Creek, Garrapatta Creek the Salinas River and tributaries, Pajaro River and tributaries, Soquel Creek, and the San Lorenzo River and tributaries.

17. In their comment letter, CDFG notes that diversions need to be modified or limited in ways to allow sufficient water to bypass the point-of-diversion, but does not recommend a specific limitation on pumping. This is consistent with CDFG's past practices and will protect public trust resources, so long as bypass requirements are specified, sufficient and monitored to ensure compliance.

Q4: HAVE YOU REVIEWED EL SUR RANCH'S REQUESTED DIVERSION LEVELS AND DETERMINED WHETHER THE DIVERSIONS WOULD AFFECT PUBLIC TRUST

[5] Source: EXCEL Workbook*: EXHIBIT_CSPA_CBD-105_DailyStreamflow_USGS11143100.xlsx* submitted in electronic format as **Exhibit CSPA/CBD-105**, or available from Adam Lazar @ mailto:alazar@biologicaldiversity.org or David H. Dettman @ mailto:dhdettman@sbcglobal.net

RESOURCES?

18. Yes. I reviewed El Sur's requested diversions as specified in Amendment No. 3 of WRA 30166 and note the following:

a) Their requested maximum daily diversion of 5.84 cfs represents a potentially substantial instantaneous impact to discharge in the Big Sur River, downstream of the diversion point and within the zone-of-influence. Depending on the connectivity between pumping and surface water, this diversion will significantly reduce discharge, which in turn will reduce aquatic habitat areas, volumes, streamside cover, food/energy transport, and the critical spatial habitats for juvenile and adult steelhead, especially during the spring, summer and fall low-flow periods. Currently, there is not enough information to quantify the habitat impacts in the Big Sur River, but based on relationships between flow and habitat in similar sized California coastal streams, it is reasonable to assume that the losses are proportional to the discharge that is diverted. So, in many years one could expect habitat losses to equal the relative reduction in surface flows. This is problematic, especially during low-flow periods and protracted droughts, because the level of ground water pumping is frequently a large fraction of the available surface flow. (**Figure 4 –Figure 6)**

b) Depending on the duration and timing of pumping at the maximum rate, the reduced flow could disrupt the natural hydrologic variability by magnifying the diurnal flux in discharge. This would likely reduce the abundance, distribution and diversity of macrobenthic invertebrates, especially the drifting insects that steelhead utilize for important food sources, and potentially lead to lower growth rates in the juvenile steelhead population.

c) The average maximum pumping rate over a 30-day long period is expected to equal 5.34 cfs, or 315 AF. While this quantity is about 0.5 cfs less than the instantaneous maximum, the extended duration of diverting at this rate over a 30-day long period would likely result in greater impacts to spatial rearing habitat, BMI food production, water chemistry, and hydrologic connectivity at the lagoon outlet.

Even more onerous, would be the effects of a 5.34 cfs, 30-day average diversion, coupled with several days of maximum pumping, especially if the maximum days were towards the end of a 30-day period. Scenarios with similar attributes occurred many times during my 17 years as a Senior Fisheries Biologist in charge of fish rescues on the Carmel River. These scenarios were often linked to short-term increases in water demand associated with hot weather, increased evapotranspiration losses, short-term failures of other Cal-Am production facilities, temporary increased domestic use, or a combination of these factor. In most cases, the impacts to streamflow, fish habitats and fish were observed relatively quickly, especially if the pumping from the aquifer increased following high demand periods, coupled with low flows. An analogous situation is likely to occur in the Big Sur River, if pumping is maximized following a 30-day period when 315 AF is diverted. For example, the DEIR references a pump-test period in when September 2007, when the streamflows were ranging from 6 – 10 cfs at the USGS Gage No. 11143000. At the beginning of the study period (September 1, 2007) the El Sur Ranch wells were purposefully turned off to begin a series of water quality and stage measurements. Coincidently, flows declined to the lowest levels of the year, with only 0.3 to 0.4 cfs in the study reach. Had the wells been running during this period, the stream would have likely dried up or been reduced to a series of stagnant pools. Clearly, conditions need to be placed on any permit to divert water under these conditions and to prevent the coincidence of diversions and naturally low discharge.

d) Contrary to presumptive statements in the original and amended WRA 30166, El Sur's requested annual maximum diversion volume of 1,615 AF represents an increase in annual diversions compared to historical levels.[6] While El Sur Ranch is proposing the increased maximum to accommodate unusual circumstances, the annual maximums that are proposed diversoin are significantly higher than historical levels. This is shown in **Figure 7**, where annual irrigation diversions would typically range from 935 to 1,441 AF/YR and average 1,241 AF/a, as compared to historical diversions that ranged from 468 to 1,737 AF/YR and averaged 937 AF/YR. **On average, the diversions would increase by 326 AF/YR.** The portion of the annual increase that is allocated to months July through November carries a significant risk of reducing spatial habitats for steelhead in the river, exacerbating low DO and reducing the frequency of lagoon opening.

[6] The original WR Application 30166 requested 1,800 AF per annum, which was modified to 1,615 AF. Both volumes are greater than the historical levels listed in Table 1 and represent increases above historical levels, which averaged 937 according to the third Amendment, dated October 17, 2006.

19. The Draft EIR (PBS&J, 2009) addresses potential impacts of El Sur Ranch's pumps on steelhead by examining impacts on four aspects of steelhead ecology, including passage conditions at critical riffles, water temperature relationships, dissolved oxygen concentrations and salinity tolerance. While the Draft EIR addresses the effects of pumping on water depths at critical riffles for adult and juveniles and the potential impacts to concentrations of dissolved oxygen, it does not address spatial habitat needs for potential adult spawning in the lower river, for adults, juvenile and smolt steelhead in the river and the lagoon. Nor does it adequately describe the importance of the lagoon/marine interface at the river mouth as a public trust resource and unique environment.

20. Passage conditions at critical riffles are an important aspect of steelhead ecology because restricted water depths force fish to expend additional energy swimming upstream, shallow depths are thought to delay migrations, and shallow areas expose fish to predators, making them more vulnerable to predation. Conditions potentially causing these problems were evident even during my reconnaissance survey on April 29, 2011, when flows were ~146 in the lower Andrew Molera Reach. Three locations where critical migration depths occur were identified during the recon survey and water depths were measured at the most severe location. (**CSPA/CBD-103**) This work and the studies summarized by Hanson (2007 and 2008) illustrate the importance of setting adequate bypass flows during migration periods. Of special concern are the migration conditions for juvenile fish, which may need to migrate downstream into the lagoon to avoid poor habitat in the reach upstream, whenever flows is low, spatial habitat restricted or DO is too low. Notably, the water depths as described in the DEIR show that young fish are forced to migrate through very shallow riffles with average depths of 0.12 to 0.13 feet and narrow, 1- to 2.5-foot wide flow strings with depths of 0.3 feet. Under these conditions the fish are likely very susceptible to numerous avian predators and depend on contact and associations with critical habitat elements including riparian trees, large woody debris, cobble, boulders. The Draft EIR describes the impacts of diversions on meeting depth criteria, but does not discuss whether the locations with suitable minimum depth criteria have other critical habitat elements, so that fish can avoid predators. Adequate bypass flows should be specified for late spring, summer and fall to maximize safe passage of juveniles during these periods; and no diversions should be permitted during periods when flow is less than 15 cfs at the USGS Gage No. 11143010.

21. The analysis in the Draft EIR does not take into account movements of adult steelhead into the river outside the normal migration season from December thru March. Yet, there are numerous

reports of adult steelhead using the Lower River and lagoon, outside the normal migration season. In order to fully protect the steelhead population, bypass flows are needed to protect these fish as they enter the lagoon during late spring, early summer, and fall months.

22. The physical and spatial habitat in the lagoon is generally good to excellent for juvenile and adults steelhead, as indexed by the population data collected by Hanson (2005, 2007 and 2008). The issue of how and whether El Sur Ranch's water production affects the lagoon and the degree of potential impacts is not resolved. The Draft EIR and Hanson (2008) documented the closure of the lagoon is related in complex ways to tides, inflow, beach sand mobilization, and high waves. While additional work is needed to document the impacts of inflow on the dynamics of the river mouth, the outlet and closure/open frequency, there is enough information to show that the lagoon is a unique coastal resource, in that it regularly maintains a surface water connection to the ocean throughout the dry season. (**CSPA/CBD-104**) This feature may be critically important in conserving and restoring steelhead runs within the south-central DPS, because the Big Sur population is still able to utilize the ocean/freshwater connection throughout the year. The connection functions to maintain life history variability and the population may serve as a gene pool for different life history patterns, and potentially as a source for restocking other streams in the DPS.

Q5: HAVE YOU REVIEWED CDFG'S PROPOSED BYPASS FLOW RECOMMENDATIONS AND FORMED AN OPINION SUPPORTING THEIR RECOMMENDATIONS, AND DO YOU HAVE ANY RECOMMENDED MODIFICATIONS TO THEIR RECOMMENDATIONS?

23. Yes. CDFG proposed preliminary or interim bypass flow recommendations are detailed in their comment letter on the EIR for El Sur Water Rights Application. (CDFG, EIR Comment letter, dated December 14, 2009) and consist of allowing diversions during two periods:

a) December through May of following year – 132 cfs as measured at USGS Gage No. 11143000; and

b) June through November – 40 cfs as measured at the USGS Gage No. 11143000

24. My opinion is that CDFG's proposed interim bypass flow requirements are likely to protect the public trust resources, but the recommendation seems to be based on a simplistic analysis of the median flows for February and application of it to all of the wet-season months. The referenced document (December 2007 Draft SWRCB's Policy for Maintaining Instream Flows in Northern California Coastal Streams, updated March 14, 2008) may be applicable to environmental

conditions in the Big Sur River, but the application of more complex bypass criteria, based on median flows in other months, meets a goal mimicking natural flows and recognizes the inherent natural variability in other wet-season months. The natural variability can be fully described for the Big Sur River based on the 60-year long record of flows at the USGS Gage No. 11143000.

25. For the June through November period, a 40 cfs bypass flow requirement would likely protect all public trust resources during this period, except perhaps for adult steelhead that enter the river early in October and November. In this situation, flows of 40 cfs would probably not allow adults to migrate upstream, but would be sufficient to allow them to access the lagoon and ocean at will.

26. Setting the dry season flow requirement is more problematic than the wet-season, because El Sur Ranch's proposed diversions affect critical habitats in the river and the lagoon to a greater degree or for a longer duration during the dry season. A 40 cfs requirement should be protective of all juvenile phases of the steelhead lifecycle in the river because it exceeds the typical flows in almost all summers.

27. <u>Alternative Interim Recommendation for Bypass Flow Requirements</u> – As an alternative or further modification to CDFG's interim bypass flow schedule, I recommend adopting interim bypass requirements, as outlined in **Appendix, Table 2** and illustrated in **Figure 8**.[7] These flows are based on the following technical considerations:

a) During the wet season a wide variation in flows is likely to protect the steelhead resource, because the steelhead populations have adapted to widely fluctuating flows over the last 10,000 years. The conceptual framework for continuing to provide variable flows has merit, so unless there is overriding conceptual, experimental or empirical evidence, a reasonable interim flow for this time of year is to require a minimum bypass equivalent to daily median flows. On streams without hydrologic data, this approach often means adopting a rule that sets the bypass requirements at the pre-project flow equal to the estimated median flow for the highest month of runoff. However, for the Big Sur River, where there is an active, 60-year long hydrologic record, the median historical flows for each day at the USGS Gage No. 11143000 can easily be used as a

[7] These interim bypass flows, and any other recommendations for bypass flows or modes of operating El Sur Ranch's diversion, should be reviewed and modified based on a detailed consideration of the results of CDFG's current IFIM/HABSIM study for the Big Sur River, outlined in CDFG (September 2009) STUDY PLAN: HABITAT AND INSTREAM FLOW RELATIONSHIPS FOR STEELHEAD IN THE BIG SUR RIVER, MONTEREY COUNTY

requirement, provided that no harm is done by setting the flow at this level. In the Big Sur River, the median daily flow gradually increases, beginning in November at about 20 cfs, climbs to 120 cfs by January 31, ranges from 120 to 160 during February and March, begins a gradual decline back to 20 cfs by mid-July (July 19th). (**Figure 8**)

b) Available information on water depths over critical riffles during upstream migration periods indicates that relatively high flows are needed for unimpeded adult passage. (Hanson 2007 and 2008; and **CSPA/CBD-103**) Provided adequate bypass flows are required, El Sur Ranch's proposed winter diversion for irrigation needs should not cause adult migration delays, as their expected monthly diversions in December, January, February, March and April average less than 2 cfs. While the projected average winter diversions are low, their allowed maximum diversion of 5.84 cfs and the 30-day running average of 315 acre are caused for concern. During some periods a 5.84 cfs diversion could cause reduced water depths that impair migration, so the application of bypass requirements are needed during the winter period to prevent impacts. Specifying a bypass flow at the daily median level will minimize any impacts to instantaneous flows during the upstream migration on days with above median flows. And, during droughts the daily flows are usually below the median daily values, so no diversions would be allowed. Over time, this approach will conserve the peak flows and allow unhindered passage during the winter season.

c) Based on my review of photos taken by Duffy (2003), Hanson (2005) and my recon survey (**CSPA/CBD-102**), the flows that shape the base channel during winter months retreat from the stream margins and shallow portions of the channel during the dry season. This naturally reduces habitat throughout much of the reach and is in part responsible for steelhead distribution patterns noted by Hanson (2005 & 2008) and Duffy (2003) where juveniles are concentrated into pockets of deeper water associated with boulders in riffle, logs, overhanging vegetation and undercut banks. To the extent that diversions reduce streamflow during the dry season, there is a threshold below which habitat decreases rapidly, and above which the habitat quality and quantity changes more slowly with increasing streamflow. While this threshold has yet to be determined for the Big Sur River, I believe the range from 20-40 cfs is reasonable for the Big Sur River. This is based on descriptions of depth and velocity across the channel that are provided in Hanson (2007 and 2008) at low flows; my examination of USGS gaging measurements for the stream channel at the Big Sur gaging station that show water depths, stream width and water velocity increase rapidly into appropriate ranges for juvenile steelhead as flow increases from 20 to 40 cfs. (**Figure 9**)

d) Data from Hanson (2005, 2007, and 2008) shows that production of groundwater from El Sur Ranch's pumps had minimal, or no effect on water quality, when streamflow was at least 20 cfs, as in 2006. Data from 2004 and 2007 is less clear-cut, but shows that at flows below 15 cfs there is low DO zone in the lower river, adjacent to the ZOI from the wells and that fish abundance is very low in the zone with low DO. While the effect of El Sur Ranch's well can be argued within the zone of ZOI at low flows, the data clearly demonstrates that the DO problem is ameliorated by flows above about 15 cfs. For this reason the minimum bypass flows within the lower Andrew Molera State Park reach should not be set below 15 cfs.

e) My review of historical photos dating back to 1972 indicates that Streamflow ranging above 10 or15 cfs are needed to maintain a regular outlet and surface water connection between the Big Sur Lagoon and the Pacific Ocean. (**CSPA/CBD-104**) This range is also supported by data in Hanson (2005, 2007, and 2008) showing the lagoon opening was kept open during 2006 with flows ranging from 20 to 24 cfs; was kept open with flows of at least 15 cfs, but temporarily closed when flow receded to 11 cfs; and closed off in early September 2007, when discharge declined to 6 cfs at the USGS gage No. 11143000 and 0.5 to 3 cfs in the lower Andrew Molera Reach. As a conservative protective measure, I recommend that a bypass requirement be set based on historical flow conditions at Gage No. 11143000, but that in practice the new lower USGS gage No. 11143010 be used for measuring the bypass requirement. This will act as a precautionary measure to minimize any influence of a diversion on the maintenance of a regular surface connection between the Lagoon and the ocean.

Q6: HAVE YOU REVIEWED EL SUR RANCH'S PROPOSED BYPASS FLOW REQUIREMENTS AND FORMED AN OPINION ON WHETHER THEIR PROPOSED OPERATIONS AND MITIGATION MEASURES WOULD PROTECT PUBLIC TRUST RESOURCES?

28. Yes. In WRA 30166, El Sur Ranch proposed operating the New and Old wells without any specific bypass flow requirements in the Big Sur River. However, in the Draft EIR a set of operating rules and flow criteria are included as a mitigation measure to help reduce the effects of the proposed diversions to "less-than-significant levels". The details are included in Table A on page 4.3-38 of the EIR and include setting the allowed diversion to Baseline levels, whenever monthly flows are less than or equal to the 10% or 20% percentile flow rates. During these months the diversion rates are proposed to vary between 0.0 and 2.89 cfs, with rates during the dry season ranging from 2.32 in August to 2.89 in June. While the proposed operation may reduce impacts during critically-dry months, I do not believe it will reduce the impacts to a "less-than-significant" level because the allowed Baseline diversion rates represent substantial fractions of the probable streamflow in the lower river and ZOI of El Sur Ranch's wells. Additionally, the flow criteria for Table A are based on flows that will be substantially reduced prior to reaching the ZOI. This means that it is likely the diversion will be an even greater relative reduction. In this situation, the flow and linked spatial habitat reductions will be substantial and significant.

29. In WRA 30166, El Sur Ranch proposes to limit monthly diversions to 230 AF during the period from July 1 to October 31, yet allow diversions to average 5.34 cfs over a 30-day period, which totals 315 AF over 30-days. These limitations would restrict diversions by calendar-month periods, but allow increased diversion of 85 AF during 30-day time periods. Depending on flows in the River, these increased diversions will result in additional impacts on critical habitats.

30. Operations and criteria in Table A ignore the impacts of flow and habitat reductions that may be linked to operations in the remaining 80-90% of the months, and the potential complex interaction amongst impacts due to operations in sequential months. These impacts are likely significant. For example, the criteria in Table A allow full well production in September when the flow is 8.0 cfs (flow criteria = 7.7 cfs), but restrict pumping at the same flow in August (flow criteria = 8.4). This could have the complicated consequence of allowing maximum production in a month with lower flows and possibly make the cumulative impact worse, because the pumping would be maximized during the month with less available water.

31. In short, the criteria in Table A will not work to protect public trust resources because the flow thresholds are too low, the Baseline diversions for the restrictive periods are too high, and no specific bypass requirement is proposed at the point-of-diversion and within the ZOI.

Q7: WHAT SPECIFIC MONITORING AND ENVIRONMENTAL CONDITIONS NEED TO BE PLACED ON THE APPLICANT'S PROPOSED DIVERSION FROM THE BIG SUR RIVER TO REDUCE ADVERSE OR POTENTIALLY ADVERSE IMPACTS?

32. In addition to the bypass flow requirements shown in **Figure 8**, the following environmental conditions should be placed on operation of El Sur Ranch's wells:

a) For the period from May 1 to November 30, I recommend restricting El Sur Ranch's instantaneous pumping rate to the monthly Baseline rates in Table A, whenever the hydraulic surface water connection from the lagoon to the ocean is closed. Evidence thus far, indicates that the surface connection between the ocean and lagoon is sensitive to small changes in inflow, so restricting diversions when the lagoon is closed will help to reverse any effects of the diversion on water levels and inflow to the lagoon.

b) Records of historical pumping have been based on converting and calibrating electrical usage records. While this technique may be sufficiently accurate for reconstructing historical diversions, actual daily operation of El Sur Ranch's wells should be based on installation, maintenance of standard calibrated flow meters that provide instantaneous and totalized measurements.

c) For the period from July thru October, I recommend restricting El Sur Ranch's instantaneous pumping rate to the monthly Baseline rates in Table A, whenever DO saturation levels drop below 90%; and ceasing pumping, whenever DO saturation drops below 75%.

d) Monitoring of streamflow in the Andrew Molera State Park reach will be needed for operation of the El Sur Ranch pump system. For this reason, I recommend El Sur Ranch fund a portion of the annual costs to have the USGS maintain and operate the gage.

e) A special water quality monitoring station should be established with approval of the CDFG, NMFS and CDPR within the ZOI at a point most sensitive to historical low DO readings. Water temperature and DO should be monitored at this location on a continuous basis during the period from July thru October; so that pumping operations can be adjusted based on the readings and comparison to DO criteria in c) above.

Q8: ARE THE POLCIIES OF THE CDFG AND NATIONA MARINE FISHERIES SERVICE MET BY OPERATING EL SUR RANCH'S WELL ACCORDING TO MEASURES OUTLINED IN THEIR WRA 30166?

Q9:

33. Policies of the CDFG and the National Marine Fisheries Service (NMFS) and the Endangered Species Act require project proponents to fully mitigate impacts to threatened steelhead populations ensuring there is no net loss of spawning and rearing habitats and minimal take associated with any project. In that sense, the amended terms and conditions in the WRA 30166 do not meet the standard of full mitigation, do-no harm, and no take that would apply to the steelhead population within the Big Sur River, or in the south-central DPS. As such, if the terms and conditions are not adopted with protective bypass flows, take of critical steelhead habitat will occur with the proposed operations and would this would necessitate obtaining a Section 10 permit from NMFS.

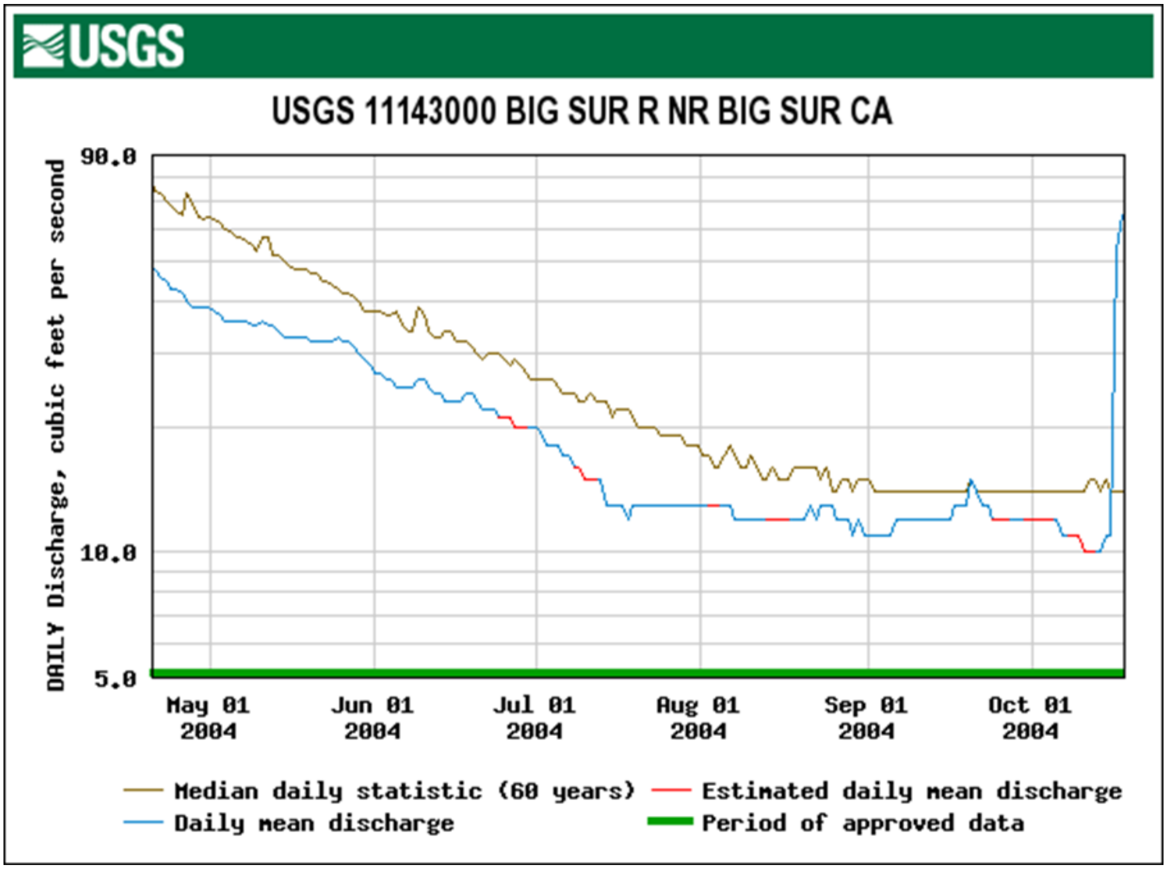


Figure 1: Discharge during the April 21 to October 18, 2004 at the USGS Gage No. 11143000, coinciding with the study period in Hanson (2005)

Table 1: Daily El Sur Ranch diversions during the 2006 habitat monitoring surveys[1]

	New Well (AF)	Old Well (AF)	Total (AF)	Daily Pumping (cfs)		
8/30/2006			0	0		
8/31/2006			0	0.00		
9/1/2006			0	0.00		
9/2/2006			0	0.00		
9/3/2006			0	0.00		
9/4/2006			0	0.00		
9/5/2006			0	0.00		
9/6/2006			0	0.00		
9/7/2006			0	0.00		
9/8/2006			0	0.00		
9/9/2006	7.21	4.93	12.14	6.13		
9/10/2006	6.94	4.81	11.75	5.93		
9/11/2006	7.11	4.94	12.05	6.09		
9/12/2006	6.99	4.92	11.91	6.02		
9/13/2006	8.38	5.9	14.28	7.21		
9/14/2006	3.72	2.8	6.52	3.29		
9/15/2006			0	0.00		
9/16/2006			0	0.00		
9/17/2006			0	0.00		
9/18/2006			0	0.00		
9/19/2006			0	0.00		
9/20/2006			0	0.00		
9/21/2006			0	0.00		
9/22/2006		4.81	4.81	2.43		
9/23/2006		4.84	4.84	2.44		
9/24/2006		4.86	4.86	2.45		
9/25/2006		4.97	4.97	2.51		
9/26/2006		4.7	4.7	2.37		
9/27/2006		4.72	4.72	2.38		
9/28/2006		4.74	4.74	2.39		
9/29/2006			0	0.00		
9/30/2006			0	0.00		
10/1/2006			0	0.00		
10/2/2006			0	0.00		
10/3/2006			0	0.00		
10/4/2006			0	0.00		
10/5/2006			0	0.00		
10/6/2006	4.02		4.02	2.03		
10/7/2006	5.81		5.81	2.93		
10/8/2006	5.94		5.94	3.00		
10/9/2006	4.59		4.59	2.32		
10/10/2006	6.68		6.68	3.37		
10/11/2006	5.78		5.78	2.92		
10/12/2006			0	0.00		
10/13/2006			0	0.00		
10/14/2006			0	0.00		
10/15/2006			0	0.00		
10/16/2006			0	0.00		
10/17/2006			0	0.00		
Total Pumped	73.17	61.94	135.11			
Duration of Schedule (days):		48				
Average pumping rate:		1.42				
Equivalent 30-day volume:		84				
[1] Source of Production Data: Table 4-1 in Hanson (2007)						

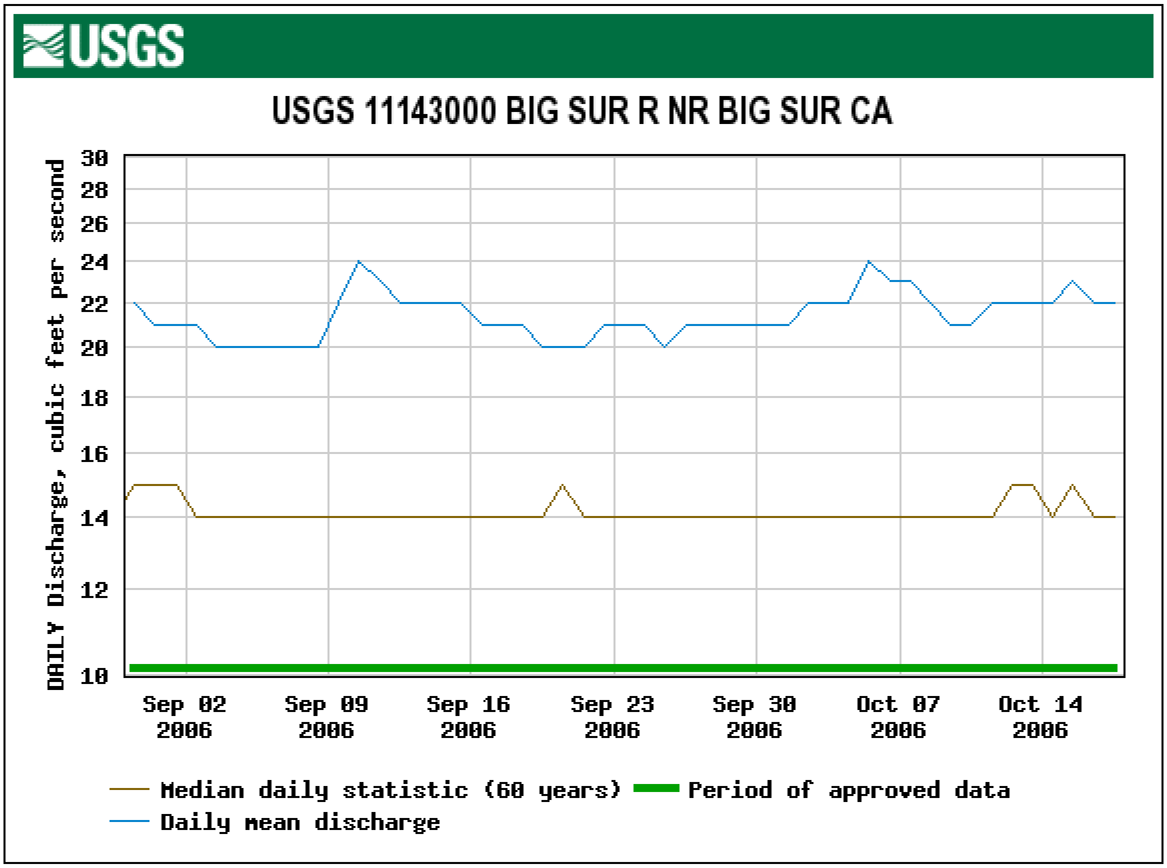


Figure 2: Discharge during the August 30 to October 17, 2006 at the USGS Gage No. 11143000, coinciding with the study period in Hanson (2007)

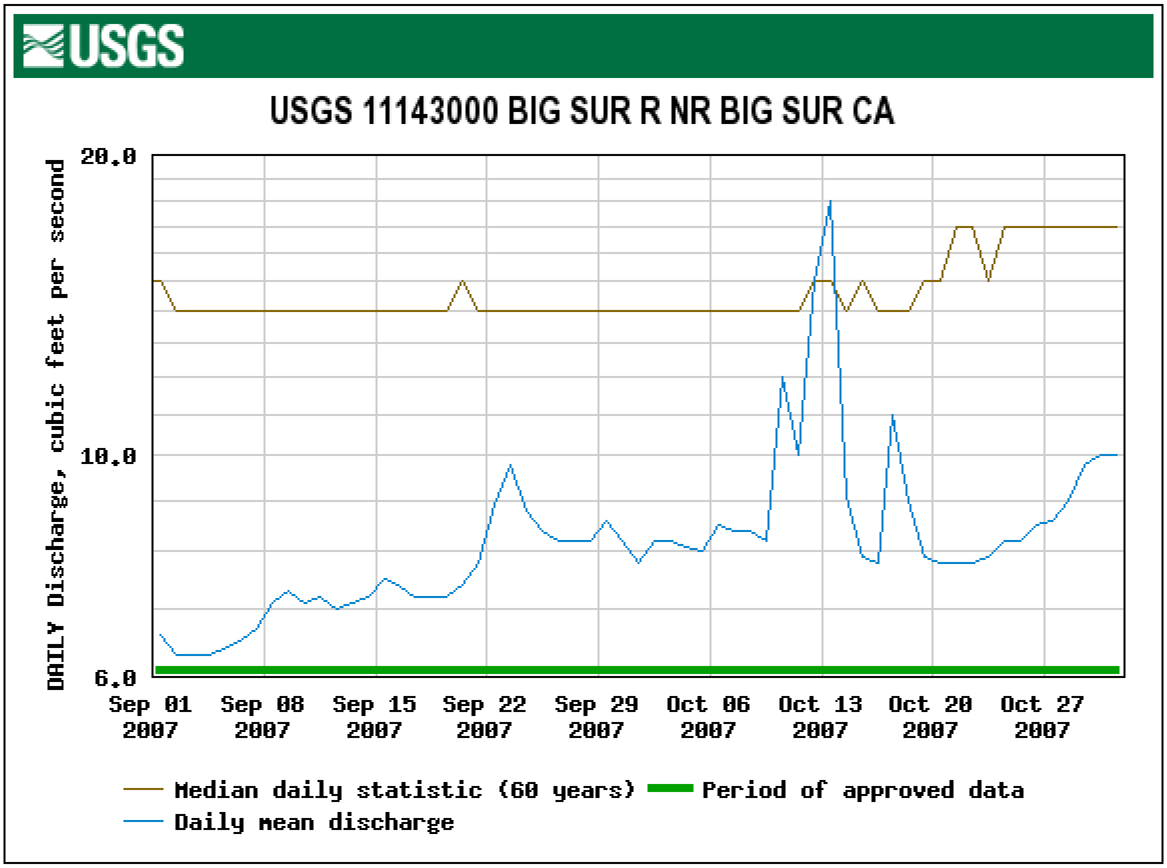


Figure 3: Discharge during September 1 to October 31, 2007 at the USGS Gage No. 11143000, coinciding with the study period reported in Hanson (2008)

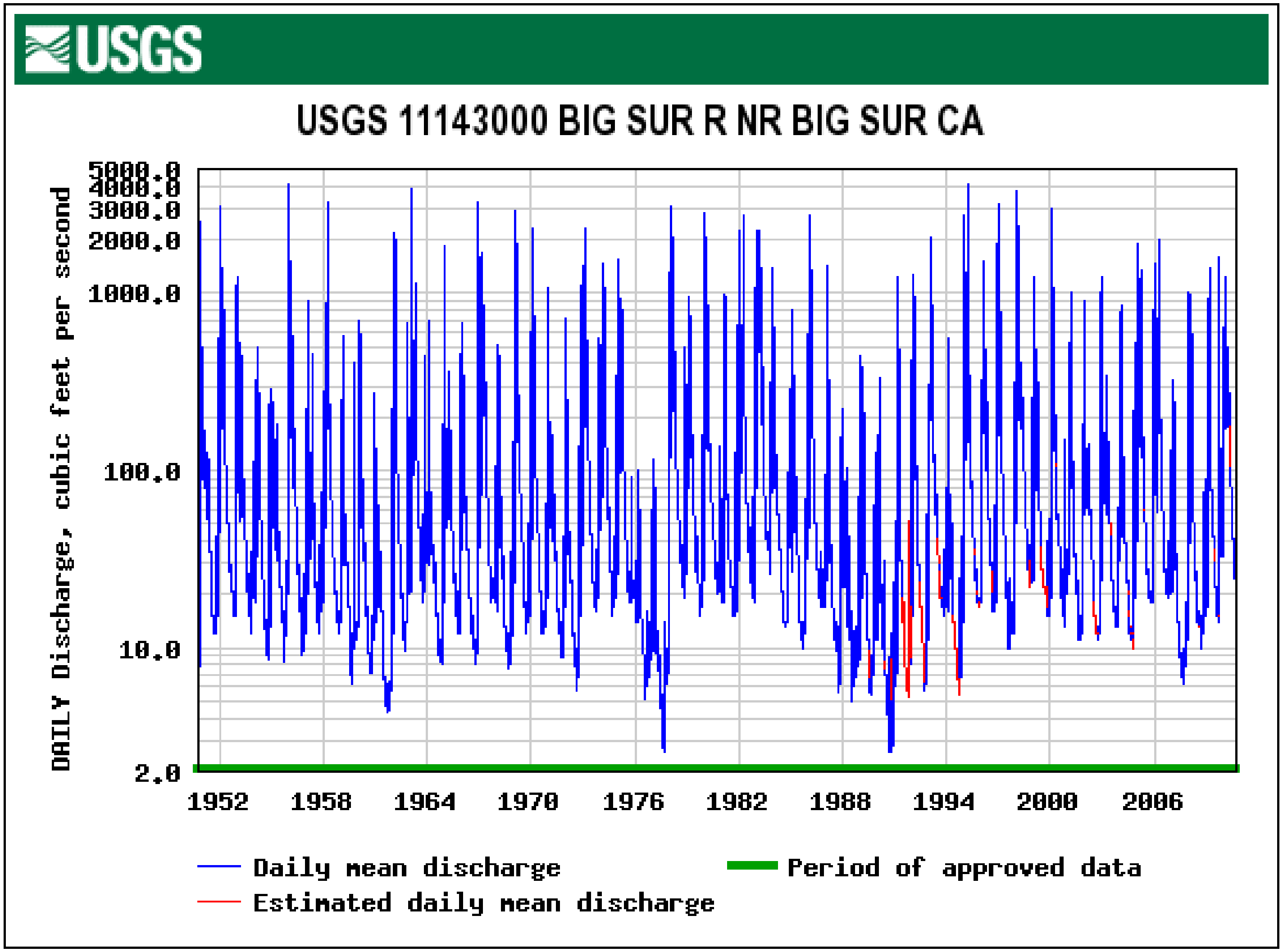


Figure 4: Mean daily streamflow (cfs) in the Big Sur River at USGS Gage No. 11143100 October 1, 1950 to September 30, 2001. Source: http://waterdata.usgs.gov/ca/nwis/dv?cb_00060=on&format=gif_default&begin_date=1950-10-01&end_date=2010-09-30&site_no=11143000&referred_module=sw

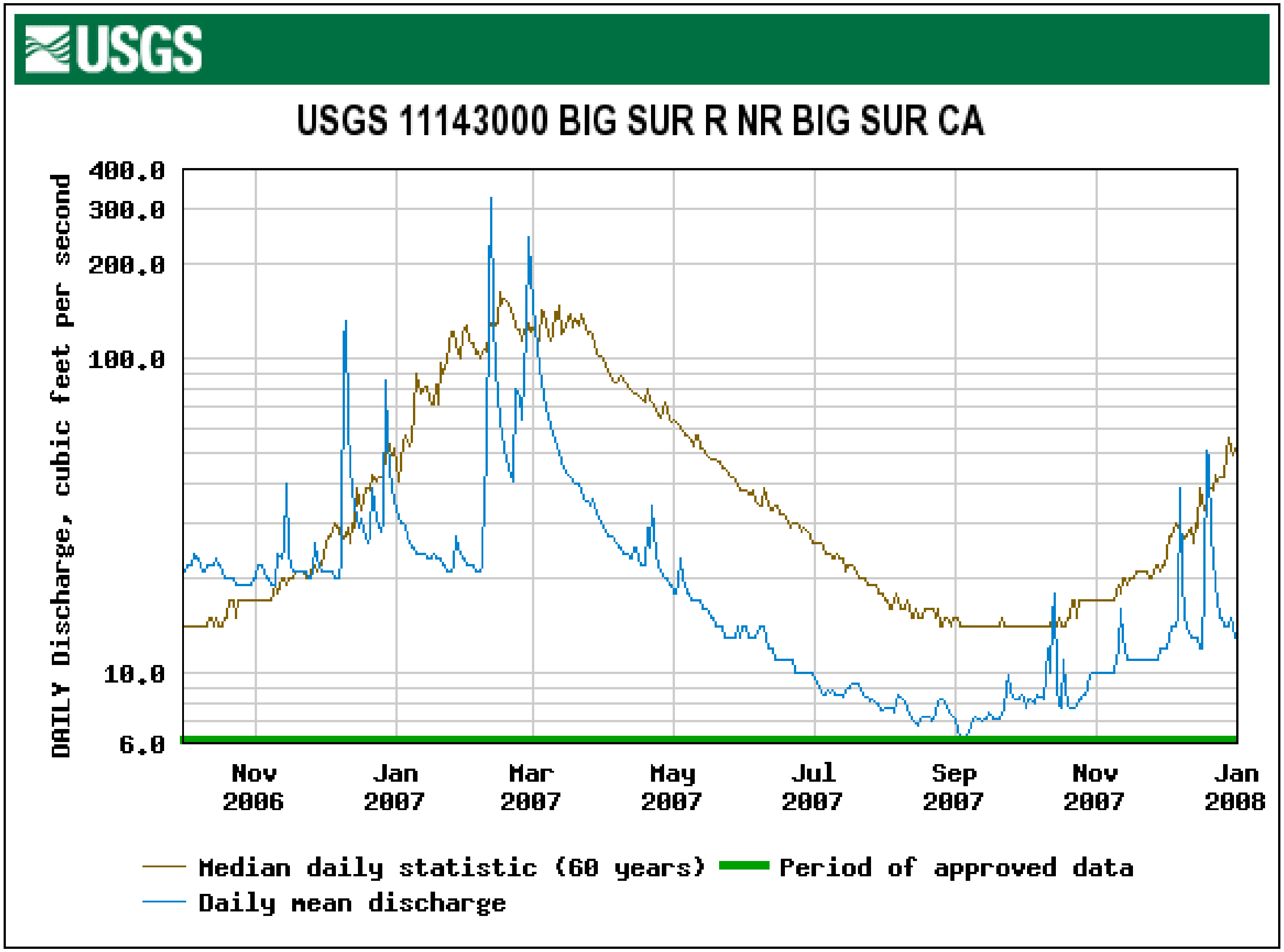
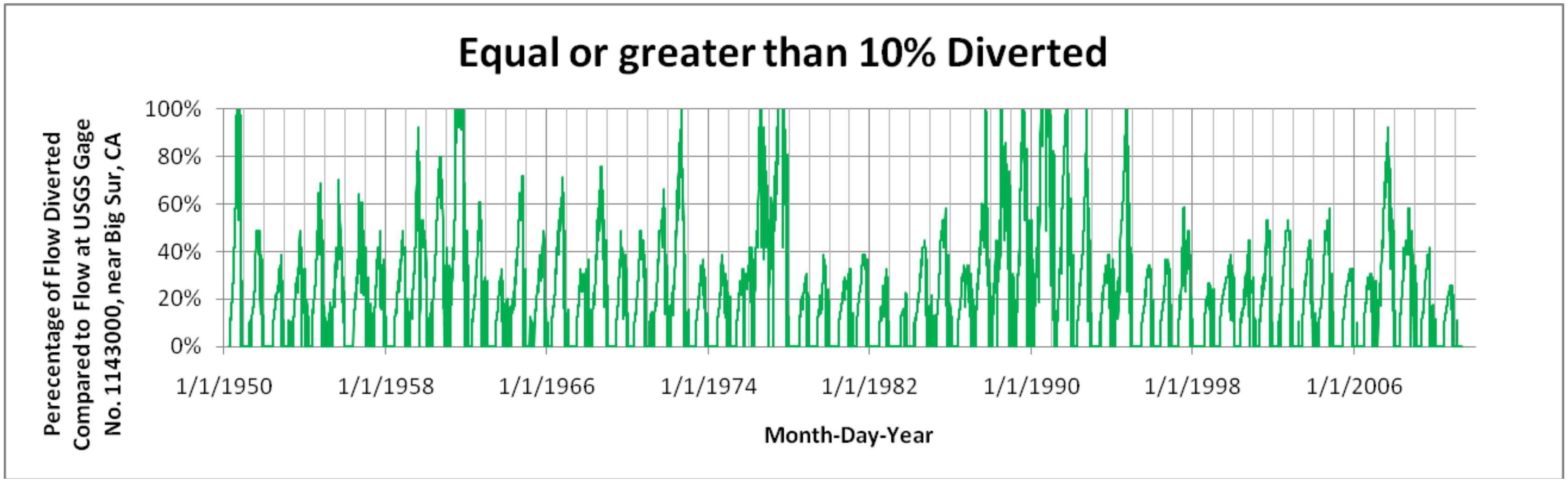


Figure 5: Mean daily streamflow in the Big Sur River at the USGS Gage No. 11143000, October 1, 2006 to December 31, 2007. Source: http://waterdata.usgs.gov/ca/nwis/dv?cb_00010=on&cb_00060=on&format=html&begin_date=2006-10-01&end_date=2007-12-31&site_no=11143000&referred_module=sw



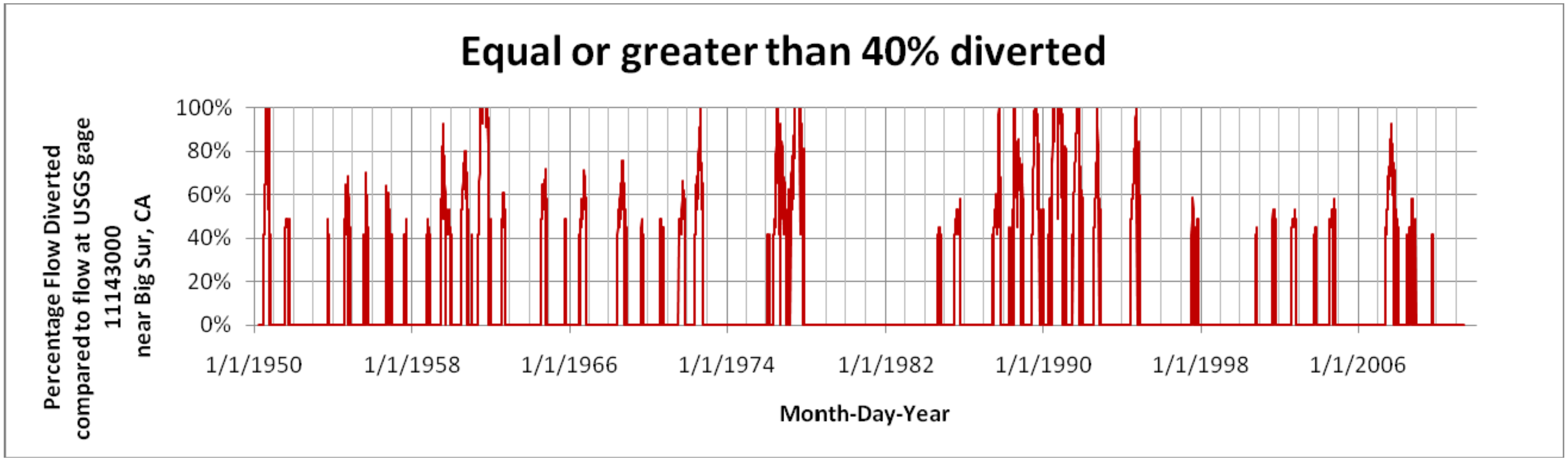


Figure 6: Percentage of flow potentially diverted from the Big Sur River as compared to mean daily streamflow at the USGS Gage No. 11143000, near Big Sur, CA. Graphs shows periods with percentage diverted greater than or equal to 10% (upper) or 40% (lower). Percentages are based on a comparison of El Sur Ranch's proposed maximum pumping rate of 5.84 cfs to the daily discharge record near Big Sur, CA. Actual duration and magnitude of flow impacts are likely to be higher during summer dry seasons and lower during winter wet seasons, depending on seasonal

tributary inflows, Water Year type, daily meteorological conditions, evapotranspiration vegetation losses, and other uses upstream.

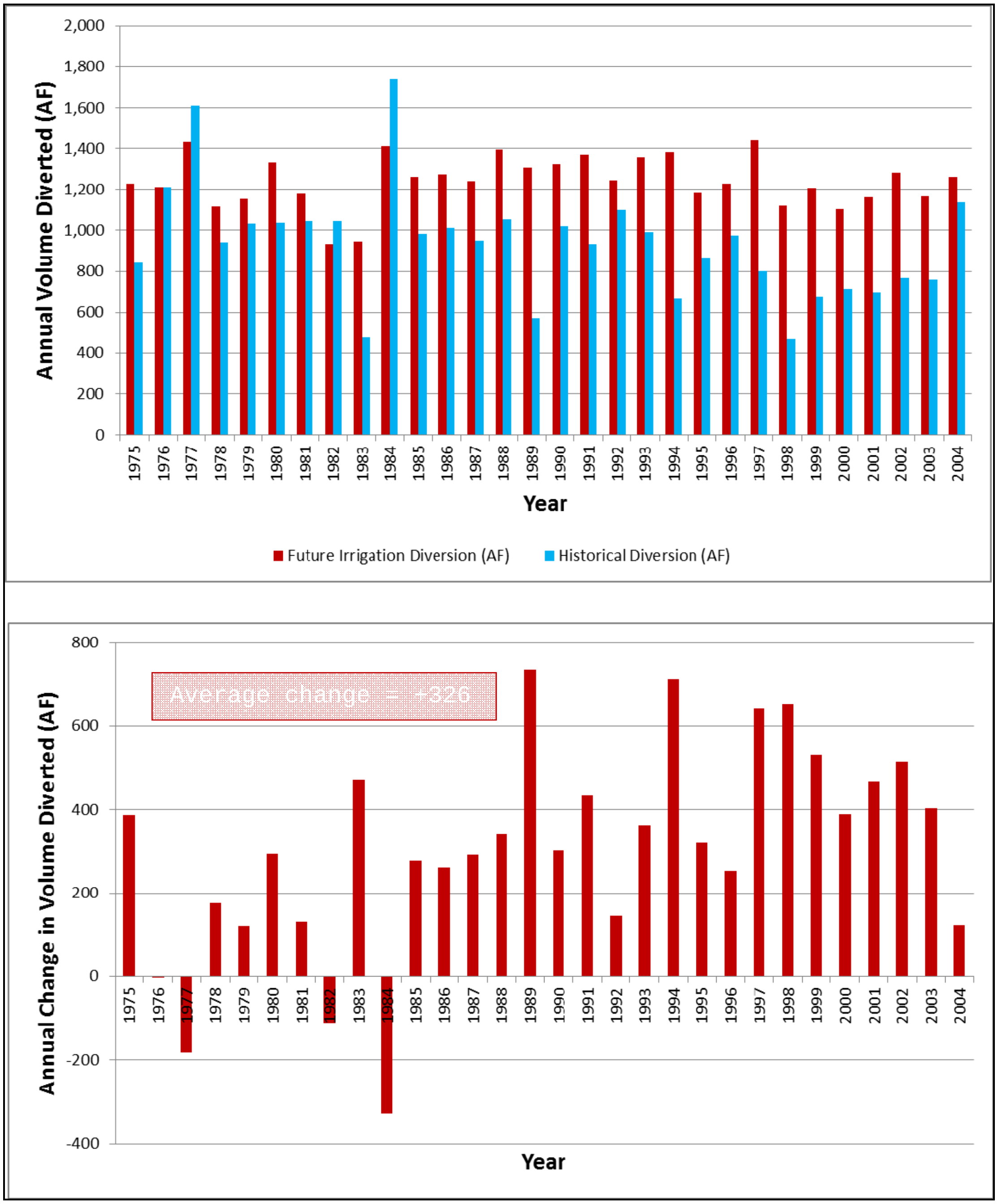


Figure 7: Comparison of annual historical diversions and expected annual irrigation diversion requirements for El Sur Ranch (*upper graph*) and the calculated change in monthly volumes of water pumped (*lower graph*) by El Sur Ranch to meet future irrigation demand, 1975-2004.[8] Graphs based on estimated historical pumping on El Sur Ranch (Table 2-1, Draft EIR) and calculated future irrigation requirements (Table 2-3, Draft EIR) and in amended WRA 30166, dated October 17, 2006.

---

[8] As noted on page 2-23 of El Sur Ranch Draft EIR (PBS&J 2009), historical pumping in 1984 was higher than needed for normal irrigation, *"The water year 1983-84 was not as dry [as 1977], but the second well was put into production during that period, and the pumping associated with putting that well into operation led to an elevated amount of total pumping. Therefore, the totals from 1984 do not represent normal operational conditions"*. For this reason the average difference shown in **Figure 7** does not include data for 1984.

Table 2: Recommended Interim Minimum Bypass Flow Requirements to protect the steelhead population and other aquatic public trust resources in the Big Sur River, within lower Andrew Molera State Park

Month	Bypass Flow Criterion[9]	Trend: Range or value	Bypass Flow Measured at USGS Gage:	
			Near Big Sur, No. 11143000	Andrew Molera, No. 11143010
January	Daily Median	Increasing: 41 to 124 cfs	X	
February	Daily Median	Variable: 101 to 162 cfs	X	
March	Daily Median	Variable: 102 to 147 cfs	X	
April	Daily Median	Declining: 100 to 63 cfs	X	
May	Daily Median	Declining: 64 to 38 cfs	X	
June	Daily Median	Declining: 39 to 26 cfs	X	
July[10]	Daily Median	Declining/Constant: 26 to 20cfs/then 20 cfs	X	X
August	Daily Instantaneous	Variable: 15-20 cfs		X
September	Daily Instantaneous	Variable: 15-20 cfs		X
October	Daily Instantaneous	Variable: 15-20 cfs		X
November	Daily Instantaneous	Constant: 20 cfs		X
December	Daily Median	Increasing: 22 to 56 cfs	X	

[9] During the period from December 1st thru July 19th of the following calendar year the daily bypass flow requirement is based on daily median flows, as determined by the daily provisional discharge record at USGS gage No. 11143000. During this period, the decision to divert is made by comparing the daily provisional discharge to the daily median for discharge record, for the period beginning April 2, 1950; and available at: http://waterdata.usgs.gov/ca/nwis/dvstat/?search_site_no=11143000&agency_cd=USGS&referred_module=sw&format=sites_selection_links

[10] During the period from July 20th thru November 30th the bypass requirement, as measured at the USGS gage No 11143010 in Andrew Molera State Park, ranges from 15 to 20 cfs, depending on whether the river mouth is open (15 cfs required for bypass) or closed (20 cfs required for bypass), and water quality in lower Andrew Molera State Park.

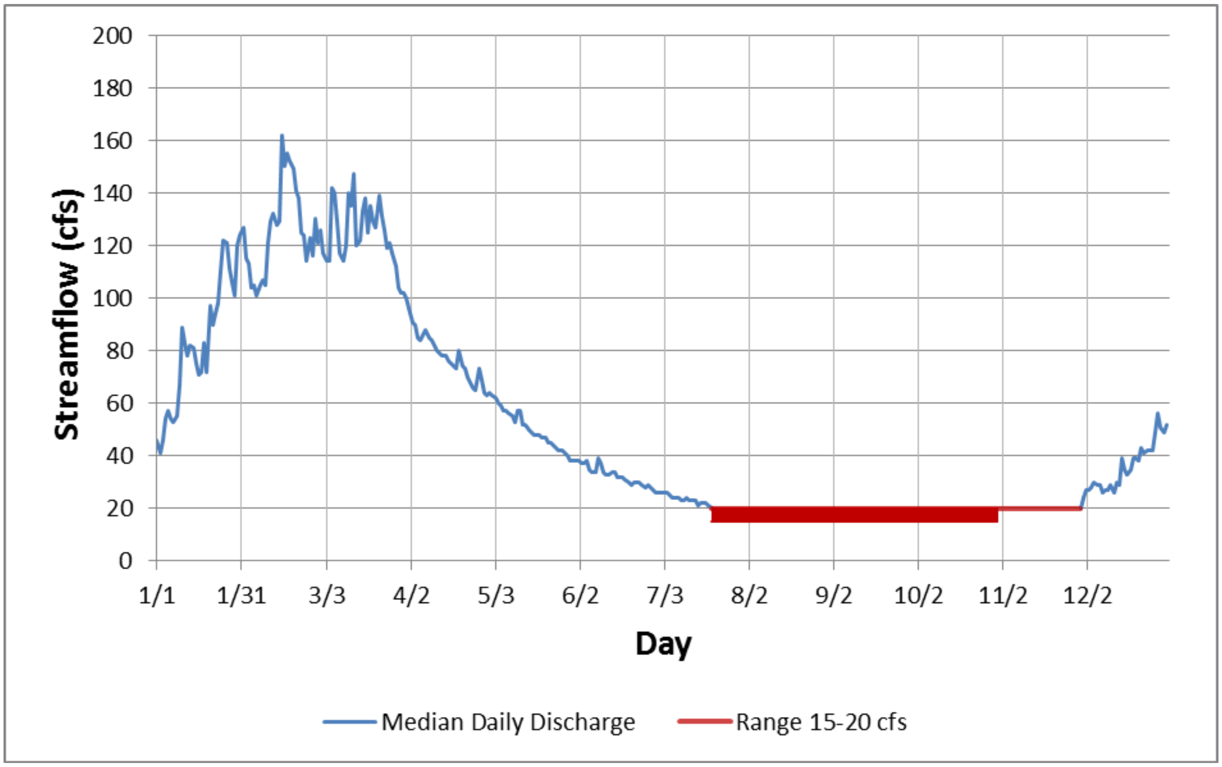


Figure 8: Recommended Interim Minimum Bypass Flow Requirements to protect public trust resources in the Big Sur River, within Andrew Molera Ranch State Park, as measured at USGS Gage Nos. 11143000 (December 1 thru July 19) and 11143010 (July 20 thru November 30)

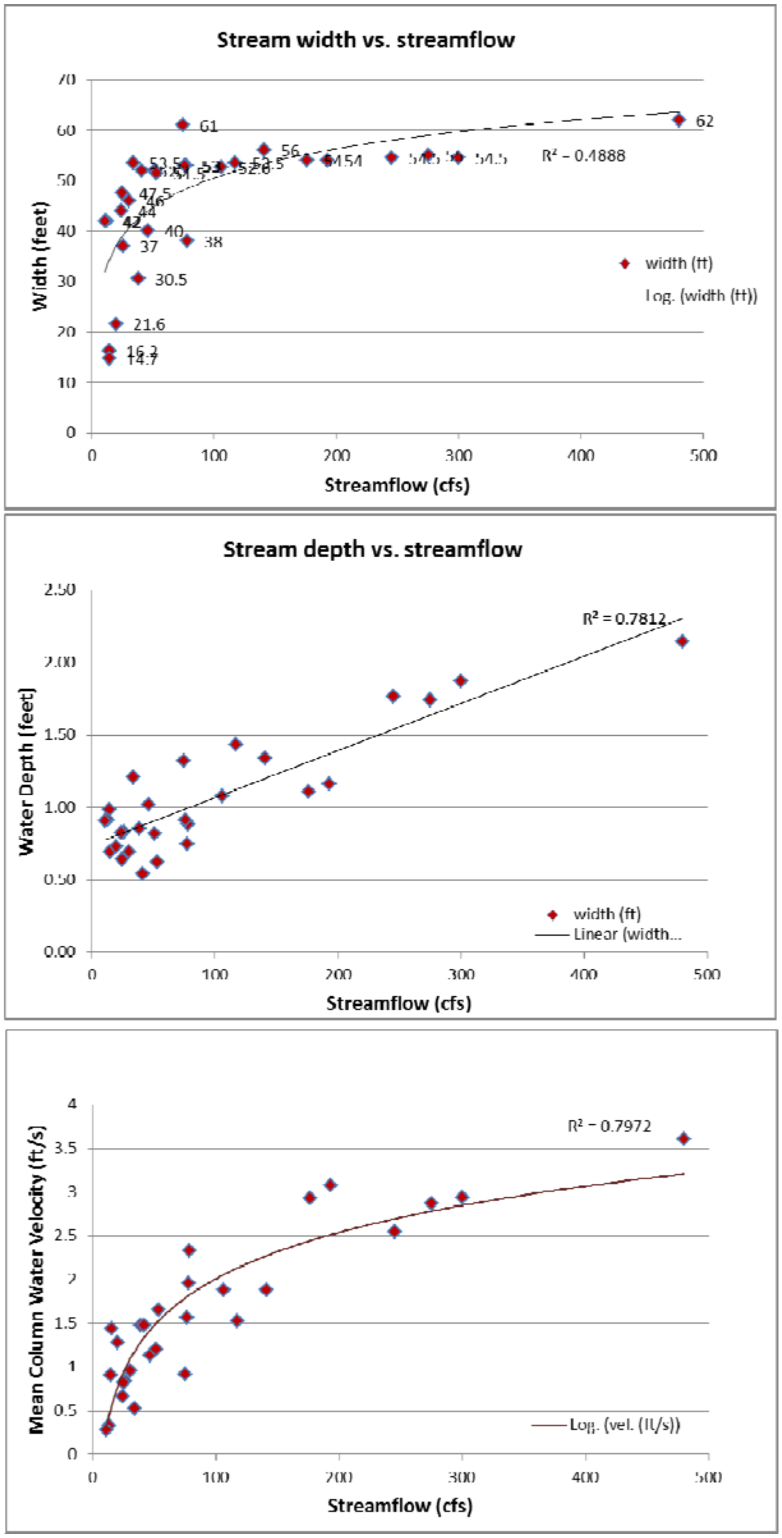


Figure 9: Stream width, water depth and mean column water velocity in the Big Sur River, downstream of the USGS gage No. 11143000, based on field measurements of depth and velocity at several locations within 375 feet downstream of the gaging station, Oct 2 2008 to January 11, 2011 and at flows ranging from 10.7 to 480 cfs.

References Cited by D. H. Dettman for Written Testimony

Becker, G.S. and I.J. Reining. 2008. Steelhead/rainbow trout *(Oncorhynchus mykiss)* resources south of the Golden Gate, California. Cartography by D.A. Asbury. Center for Ecosystem Management and Restoration. Oakland, CA. Available online @ http://www.cemar.org/ssrp.html

Titus, R. G., D. C. Erman, and W. M. Snider. (In prep.) History and status of steelhead in California coastal drainages south of San Francisco Bay. In draft, for publication as a Department of Fish and Game, Fish Bulletin.

PBS&J. 2009. El Sur Ranch Water Right Application No. 30166 Monterey, California Draft Environmental Impact Report. Prepared for the California State Water Resources Control Board Division of Water Rights. Sacramento, CA. Eight chapters, plus Appendices A–G

Hanson, C.H., J. Taplin, and K. Karkanen. 2005. Assessment of Habitat Quality & Availability within the Lower Big Sur River: April-October 2004. Hanson Environmental,Inc.

CDFG. 2009. Study Plan: Habitat and Instream Flow Relationships for Steelhead in the Big Sur River, Monterey County. Water Branch, Instream Flow Program, Sacramento, CA. 26 pp

Hanson, C. H. 2008. RANCH WELL OPERATIONS ON AQUATIC HABITAT WITHIN THE BIG SUR RIVER AND SWISS CANYON DURING LATE SUMMER AND EARLY FALL – 2007. Report prepared by Hanson Environmental, Inc. for El Sur Ranch, Monterey, CA.103 pp.

Taplin, J., C. H. Hanson, and K. Karkanen. 2007. EVALUATION OF THE POTENTIAL RELATIONSHIP BETWEEN EL SUR RANCH WELL OPERATIONS & AQUATIC HABITAT ASSOCIATED WITH THE BIG SUR RIVER DURING LATE SUMMER AND EARLY FALL - 2006 Prepared by Hanson Environmental, Inc. for El Sur Ranch, Monterey County, CA. 5 Chapters, plus Figures and Tables

Duffy & Associates, Inc. 2003. The Big Sur River Steelhead Enhancement Plan. Prepared by Denise Duffy and Associates and Kittleson Environmental Consulting, Fall Creek Engineering, Inc. for the California Department of Parks and Recreation, 45 pp. + Appendices I (photos) and II (projects)