El Sur Ranch
Water Right Application No. 30166
Draft Environmental Impact Report
SCH No. 2006061011

Monterey, California

Prepared for:

California State Water Resources Control Board
Division of Water Rights

Prepared by:

PBS&J®

October 2009

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TABLE OF CONTENTS

TABLE OF CONTENTS

Appendices

Tables **Page**

Figures **Page**

1.0 INTRODUCTION

CHAPTER 1 INTRODUCTION

PURPOSE OF THE EIR

The State Water Resources Control Board (SWRCB) is the Lead Agency for preparing an Environmental Impact Report (EIR) for the El Sur Ranch water right Application No. 30166.

This Draft Environmental Impact Report (DEIR) was prepared in conformance with the California Environmental Quality Act (CEQA) of 1970 (as amended). (Public Resources Code, Section 21000 et seq.) CEQA requires the preparation of an EIR when there is substantial evidence that a project could have a significant effect on the environment. The EIR is an informational document for use by decision-makers and the general public that fully discloses the potential environmental effects of the proposed project. The EIR process is specifically designed to evaluate the potentially significant direct, indirect, and cumulative impacts of the proposed project, and to describe reasonable alternatives to the proposed project that could avoid or reduce those impacts. As provided for in the State CEQA Guidelines,[1] public agencies are charged with the duty to avoid or minimize environmental damage where feasible (Section 15021 of the CEQA Guidelines.) In determining whether changes in a project are feasible, the public agency may consider specific economic, environmental, legal, technological, and social factors. In addition, CEQA requires that an EIR identify any adverse impacts determined to remain significant after mitigation.

PROJECT OVERVIEW

The El Sur Ranch (Ranch) is a working cattle operation located on the coast of Monterey County, California, just north of the Big Sur River and west of State Route 1 (Highway 1). The Ranch has been in operation at this location for more than 150 years. Irrigation of the upland pastures has historically come from water pumped from wells located within the adjacent Andrew Molera State Park, on land originally deeded to the California State Parks system from the Ranch. One of the wells (the “Old Well”) has been in operation since 1949, while the other (the “New Well”) was put into operation in 1984.

The SWRCB has determined that water pumped from these wells is groundwater flowing in a subterranean stream,[2] rather than from percolating groundwater. As a result, the appropriation of this water comes under the jurisdiction of the SWRCB’s Division of Water Rights (Division). In determining whether to approve a water right application and under what conditions, the SWRCB must consider the project’s potential environmental impacts and any appropriate

1 The CEQA Guidelines are found in the California Code of Regulations, Title 14, Section 15000 et seq.

2 The SWRCB initially found that the water came from the “underflow” of the Big Sur River. At the time of the SWRCB’s determination, the term “underflow” was commonly used in referring to a subterranean stream subject to the SWRCB’s permitting authority. Although El Sur Ranch is diverting from the subterranean stream portion of the Big Sur River, henceforth the document will just refer to diversion from the Big Sur River.

mitigation measures identified through the CEQA process. The Ranch originally filed Application No. 30166 with the Division in July 1992 for the appropriation of water from the subterranean flow of the Big Sur River. The application was amended in November and December 2005, and again in October 2006; the current amendment represents the proposed project.

This DEIR evaluates the environmental impacts of the El Sur Ranch water right Application No. 30166 (the proposed project), as amended October 17, 2006. If approved, this would allow for the appropriation of water from the subterranean flow of the Big Sur River, Monterey County, California. The “points of diversion” are the two existing El Sur Ranch groundwater wells located in Andrew Molera State Park. The “place of use” is existing irrigated pasture on El Sur Ranch just north of the park and west of Highway 1. The proposed project would allow for water from the El Sur River’s subterranean flow to continue to be used for irrigation of existing pasture. Chapter 2 of this DEIR describes the proposed project in detail, including background information.

SCOPE OF THE EIR

Consistent with Section 15161 of the CEQA Guidelines, this DEIR is a “Project EIR” and is intended to evaluate the environmental impacts of the proposed project. The DEIR is focused only on those issues identified in the June 2006 Initial Study (Appendix A) as having a potentially significant effect.

The Environmental Analysis section of this DEIR (Chapter 4) discusses the environmental setting, impacts, and mitigation measures for Hydrology, Geohydrology, and Water Quality (Section 4.2) and Biological Resources (Section 4.3). The structure of these sections in Chapter 4 is described in Section 4.1, Introduction to the Environmental Analysis. Also presented in Section 4.1 is a discussion of the “environmental baseline” used in assessing hydrologically-based impacts of the proposed project. The environmental baseline defines hydrological conditions that exist prior to project implementation. This baseline is used to assess anticipated changes in hydrology that are expected to occur as a result of the proposed project.

For the following topics, the analysis in the June 2006 Initial Study (see Appendix A of this DEIR) concluded the proposed project would result in no impact or impacts that are less than significant: Aesthetics, Agricultural Resources, Air Quality, Cultural Resources, Hazards and Hazardous Materials, Land Use, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation and Traffic, and Utilities/Service Systems. No comments were received on the NOP (Appendix A) or during agency scoping meetings (see below) that indicated those topics should be addressed further in this EIR.

The evaluation of cumulative impacts is presented on a resource-by-resource basis in Chapter 4 of the DEIR and is summarized in Chapter 5. Chapter 5 also presents the following CEQA-required assessments:

- Climate Change and Greenhouse Gas Emissions
- Growth-Inducing Effects
- Significant Irreversible Impacts
- Significant and Unavoidable Effects

Additionally, this DEIR evaluates four alternatives to the proposed project. This evaluation is presented in Chapter 6.

CEQA PROCESS

Notice of Preparation

In 2002, the State Water Board issued a Notice of Preparation (NOP) for the El Sur Ranch Water Right Application No. 30166 project. Public scoping meetings were held in October 2002 in Monterey. Written and oral comments were received on the NOP from the public and agencies. By letters dated November 1, 2005, December 24, 2005, and October 17, 2006, the Ranch subsequently amended its application. The SWRCB did not complete an Environmental Impact Report for the project described in the 2002 NOP.

The SWRCB subsequently circulated a new Notice of Preparation (NOP) of an EIR for the proposed project in June 2006 (Appendix A of this DEIR). An Initial Study checklist was included with the NOP. The NOP and Initial Study were provided to government agencies and to other interested persons to inform them that the proposed project could have significant effects on the environment and to solicit their comments. Written comments on the Initial Study/NOP are included in Appendix B of this DEIR.

Agency Scoping Meetings

Two scoping meetings were held in September and November 2007 to solicit input on the DEIR. On September 18, 2007, SWRCB staff met with representatives of the California Department of Fish and Game and the California Department of Parks and Recreation. A meeting was held on November 13, 2007 with National Marine Fisheries Service.

Issues raised by agency staff focused on the following: the proposed diversion amounts and limits; the environmental baseline for developing the analysis of environmental effects of the proposed project as it relates to the project evaluated in this DEIR; scope and conclusions of technical studies prepared in response to protests on the application (see Chapter 2, Project Description, Proposed Appropriative Water Right Application and Protests), which also provide background on environmental conditions in the project area; alternatives to the proposed project; and cumulative effects.

Public Review of Draft EIR

This DEIR was circulated for public review and comment on October 8, 2009. The 45-day public review period concludes on **November 23, 2009.** During the public review period, written comments on this document may be submitted to the SWRCB at the following address:

Paul Murphey
Division of Water Rights
State Water Resources Control Board
Post Office Box 2000
Sacramento, CA 95812

Final EIR and EIR Certification

Pursuant to Section 15088 of the CEQA Guidelines, comments received during the comment period from persons who reviewed the DEIR will be addressed in the Final EIR (FEIR). The FEIR will be considered for certification by the SWRCB in accordance with the CEQA Guidelines. The SWRCB, as the lead agency, is required to consider the information in the EIR, along with any other available information, in making its decision (Section 15121 of the CEQA Guidelines).

Prior to certification of the EIR, the lead agency is required to prepare written findings of fact for each significant environmental impact identified in the EIR. For each significant impact, the lead agency must:

- determine if the proposed project has been changed to avoid or substantially lessen the magnitude of the impact;
- find that changes to the proposed project are within another agency's jurisdiction, and such changes have been or should be adopted; and
- find that specific economic, social, or other considerations make mitigation measures or proposed project alternatives infeasible.

The findings of fact prepared by the lead agency must be based on substantial evidence in the administrative record and must include an explanation of any differences between evidence in the record and the conclusions required by CEQA.

If the lead agency elects to proceed with the proposed project and the project would result in significant and unavoidable impacts, a "statement of overriding considerations" must be prepared. A statement of overriding considerations explains why the lead agency determines that the benefits of the project outweigh the unavoidable environmental impact of the project.

Any mitigation measures adopted by the SWRCB as conditions of approval for the proposed project will be included in a monitoring and reporting program (MMRP) to verify compliance. These are also likely to be included in the conditions for the water right permit. Section 15097 of the CEQA Guidelines requires that a lead agency establish a program to report on or monitor measures adopted as part of the environmental review process to mitigate or avoid significant effects on the environment. The MMRP is intended to help ensure that the mitigation measures proposed in the EIR are implemented effectively. The plan describes monitoring and reporting procedures, monitoring responsibilities, and monitoring schedules for all mitigation measures identified in the DEIR.

HOW TO USE THIS REPORT

In addition to this Introduction chapter, this report includes six principal parts: Project Description, Summary, Environmental Analysis (Setting, Impacts, and Mitigation Measures), CEQA Considerations, Alternatives Analysis, and Appendices.

The **Project Description** (Chapter 2) describes the location of the project, project background, existing conditions on the project site, and the nature and location of specific elements of the El Sur Ranch water right Application No. 30166.

The **Summary** (Chapter 3) presents an overview of the results and conclusions of the environmental evaluation. This section list all identified impacts of the El Sur Ranch water right Application No. 30166 and all mitigation measures presented in the DEIR.

The **Environmental Analysis** (Chapter 4) includes a topic-by-topic analysis of impacts that would or could result from implementation of the proposed project. Each section is organized into two major subsections: Setting (existing conditions), and Impacts and Mitigation Measures, including cumulative impacts and mitigation measures.

The **CEQA Considerations** (Chapter 5) discusses issues that must be addressed under CEQA, including: unavoidable adverse impacts, irreversible environmental changes, growth inducement, and a summary of cumulative impacts.

The **Alternatives Analysis** (Chapter 6) includes an assessment of alternative methods for accomplishing the basic objectives of the project. This assessment, required under CEQA, must provide adequate information for decision makers to make a reasonable choice between alternatives based on the environmental aspects of the proposed project and alternatives.

The **Appendices** contain a number of reference items providing support and documentation of the analyses performed for this report. Appendices A and B contain the NOP/Initial Study and responses to the NOP, respectively. The water right Application No.30166 is included in Appendix C. Appendix D contains the Water Availability Analysis (WAA) in support of the water right application. Data and graphics that supplement the hydrology and water quality impact analysis in Section 4.2 are provided in Appendix E. Additional information about water resources regulations is contained in Appendix F. Appendix G provides supporting data and additional quantitative analysis for the alternatives analysis presented in Chapter 6.

2.0 PROJECT DESCRIPTION

CHAPTER 2 PROJECT DESCRIPTION

INTRODUCTION

The proposed project is the issuance of a water right permit to allow the appropriation of water from the Big Sur River to maintain irrigated pasture on El Sur Ranch in Monterey County, California. El Sur Ranch has diverted water from groundwater wells for irrigation purposes since 1949. The proposed appropriation would occur in accordance with permit requirements and other conditions specified in the El Sur Ranch water right Application No. 30166, as amended October 17, 2006. The issuance of the permit would be a discretionary action on the part of the SWRCB and, therefore, the project is subject to CEQA review.

The El Sur Ranch water right Application No. 30166, as amended October 17, 2006, is for the appropriation of water from the Big Sur River. The "points of diversion" are two existing El Sur Ranch groundwater wells located in Andrew Molera State Park. The "place of use" is existing irrigated pasture on El Sur Ranch just north of the park and west of State Route 1 (Highway 1). The proposed project would allow for water from the El Sur River to be used for irrigation of existing pasture in amounts that could exceed past practices. The water right Application No. 30166, as amended October 17, 2006, is included as Appendix C in this DEIR.

This chapter describes in detail the proposed objectives of the project applicant in securing appropriative water rights for El Sur Ranch, the purpose of use, the proposed place of use, assumptions used to develop numerical diversion and rate limits, the proposed specific diversion limitations requested in the permit application, and proposed operating practices. The project location and background, including the history of water development at the El Sur Ranch as it relates to the water right application are also described. To assist the reader, this chapter provides a summary of information from technical investigations that were prepared in response to water right application protests and in support of the requested appropriation. Further, this chapter explains SWRCB authorities in granting appropriative water rights, describes the types of water rights issued by the Board, discusses public trust considerations, and explains the process for appropriation of water.

CALIFORNIA WATER RIGHTS AND WATER RIGHT PROCESS

This section briefly describes the SWRCB's authority, key water rights regulatory requirements, and the water rights process. This information is provided to assist the reader in reviewing the proposed project description and the analysis presented in this DEIR.

California employs a dual system of surface water rights that recognizes both appropriative and riparian rights. An appropriative water right consists of the right to divert a specified quantity of water for a reasonable, beneficial use. Under the riparian doctrine, the owner of land contiguous to a watercourse has the right to the reasonable, beneficial use of the natural flow of water on his or her land. A riparian user may not seasonally store water or use water outside the watershed.

The SWRCB administers the state's statutory water right permit and license system, which applies to appropriations of water from surface streams and subterranean streams flowing through known and definite channels. (Wat. Code, § 1200.) Since 1914, the permit and license system provides the exclusive means of acquiring a new appropriative water right. (*Id*., § 1225.) Certain surface water users, such as pre-1914 water right holders and riparian water right holders, are not required to obtain a water right permit but must file a statement of diversion and use with the SWRCB. (*Id.*, § 5101.) To obtain a new appropriative water right, a person must file a water right application with the SWRCB to appropriate water and use it for a reasonable and beneficial purpose. (Wat. Code, §§ 100, 1252.) In part, the water right application must identify the nature and amount of the proposed use, the proposed point(s) of diversion, the type of the diversion works, and the proposed place of use, and must provide sufficient information to demonstrate a reasonable likelihood that the unappropriated water is available for the proposed appropriation. (*Id*., § 1260.) In acting on an application, the SWRCB must consider the relative benefit to be derived from all beneficial uses of water concerned, including the preservation and enhancement of fish and wildlife, and uses protected in a relevant water quality control plan. (*Id*., § 1257.) The SWRCB may impose terms and conditions that will best develop, conserve, and utilize in the public interest the water sought to be appropriated, protect fish and wildlife, and carry out water quality control plans. (*Id*., §§ 1253, 1257, 1257.5, 1258.)

In addition to its statutory responsibilities, the SWRCB has an independent obligation to consider the effect of the proposed project on public trust resources and to protect those resources where feasible. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419 [189 Cal.Rptr. 346].) This CEQA document is intended to support the SWRCB decision process in making the necessary water rights findings and determinations related to the protection of public trust resources.

Following issuance of a water right permit, a permittee can only use water as specified in the permit. The permittee must diligently pursue construction of the project and the application of water to beneficial use. Once a permittee has completed the maximum beneficial use of water, the SWRCB issues a license, which is the final confirmation of the water right. In issuing permits and licenses, or approving changes to those rights, the SWRCB may include terms and conditions to protect existing water rights, the public interest, and the public trust, and to ensure that water is put to reasonable and beneficial use.

PROJECT LOCATION

El Sur Ranch (the Ranch) is located along the Big Sur Coast in Monterey County, California, approximately 25 miles south of the City of Monterey on Highway 1 between the Santa Lucia Mountains to the northeast and the Pacific Ocean to the southwest (Figure 2-1). The Ranch, established in 1834, consists of approximately 7,000 acres of privately-owned land located

***Sources*:** Microsoft Trips and Streets, 2006; PBS&J, 2008.

PBS&J

FIGURE **2-1**

Regional Location

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immediately north of the Big Sur River and Andrew Molera State Park and approximately one and one-half miles south of the Point Sur State Historic Park.

The project site occupies approximately 292 acres within the Ranch. As illustrated in Figure 2-2, it is bounded by Highway 1 on the northeast, the Andrew Molera State Park on the east, and the Pacific Ocean on the southwest. Groundwater wells that provide water to the site are within Andrew Molera State Park, between the park boundary and the Big Sur River. Swiss Canyon bisects the project site. The northwestern border is approximately 1,400 feet west of Swiss Canyon. Swiss Canyon is a perennial, incised creek supporting native grass, shrubs, and other riparian plants. It is fed indirectly by seepage from the Ranch, and it conveys runoff from off- site areas east of Highway 1 and from the Ranch to the ocean. The canyon is accessible to cattle for grazing.

PROJECT SITE

The "project site" consists of the intended place of use (POU), the intended points of diversion (PODs), the existing ranch roads and irrigation facilities/infrastructure, a tailwater pond, and two outfalls, the locations of which are shown in Figure 2-2.

Existing Place of Use

The POU boundaries are generally delineated physically by barbed-wired fencing and the following major features: Highway 1 to the northeast; the Pacific Ocean to the southwest; an unnamed creek to the northwest; and the Andrew Molera State Park to the south. Evidence of continuous water use in the POU since 1950 is documented in the records of the Ranch, and includes the irrigation system plans and specifications, contracts for construction of the irrigation systems, well logs, and records of pumping and power use at the wells.

The POU is divided into two functional units for accommodating the Ranch's pumping and irrigation requirements. The POU contains the North Pasture and Pastures 1, 2, 7, and 8, and the South Pasture, Pump House Field Pasture, and Pastures 3, 4, 5, and 6 (Figures 2-2 and 2-3).

Approximately 25 acres of the 292-acre project site comprise dunes, the tailwater pond, outfall, access roads, and irrigation canals. The remaining 267 irrigated acres is the POU. Of those 267 acres, approximately 25 acres is within the Big Sur River watershed and is, therefore, served by the applicant's existing riparian water right. The location of the riparian area within the POU is shown in Figure 2-2. Under a riparian right, water diverted from the Big Sur River can only be applied to land adjacent to the river and within the watershed. It cannot be diverted to irrigate other pasture land that is non-riparian. The remaining 242 acres of pasture comprise the area for which the proposed appropriative water right is being requested.

Although Swiss Canyon bisects the POU, it is not within the POU and is not part of the irrigated area under existing or proposed conditions.

Existing Points of Diversion

Groundwater used to irrigate pasture within the Ranch POU is pumped from two wells: the Old Well, which was constructed in 1949, and the New Well, which was constructed in 1975 and placed in operation in 1984. The locations of these wells are shown in Figures 2-2 and 2-3. The Old Well and New Well are located approximately 500 and 1,000 feet east of the Ranch pasture boundary, respectively, in an easement within Andrew Molera State Park. As stated in the Application No. 30166, both points of diversion are in SE ¼ of NW ¼ of Section 16, Township 19 S, Range 1 E, Mount Diablo Base Meridian. Under the California Coordinate Zone System (Zone 4), North American Datum 1927, the coordinate distances are N 358,650/E 1,158,000 for the Old Well and N 358,750/E 1,158,400 for the New Well.

The Old Well, located approximately 500 feet from the river and approximately 1,300 feet from the mouth of the Big Sur River, includes a secured pump house with corrugated metal siding and noise reduction material, two standpipes, an electric-powered pump and associated pipes and fittings. The New Well, located approximately 400 feet from the river and approximately 1,375 feet upstream from its mouth, is surrounded by brush and trees, and is situated adjacent to a side trail along the park boundary. The New Well is housed in a secured structure with an electric-powered turbine pump and associated valves, pipes, and fittings. Three sides of the New Well housing are covered in noise abatement material to reduce pump noise detection along the park trail. Together, these wells convey water directly west and uphill to the Ranch's pasturelands via an underground pipe.

The Old Well is equipped with an electric motor, 60-horsepower (hp) pump that has reported pump rates between approximately 1,145 and 2,000 gallons per minute (gpm). Since no well drilling report exists, the depth of the Old Well is unknown. The New Well is approximately 32 feet deep and equipped with an electric motor driving a 50-hp pump that has reported pump rates between approximately 963 and 1,567 gpm. Both wells' pumps can be operated simultaneously at their maximum pump rates when water is needed for irrigation of pastures, typically during dry periods of the year (e.g., summer months). However, the pumps are typically used to irrigate different fields, so they are operated simultaneously only when the needs of those fields require it.

PROJECT BACKGROUND

El Sur Ranch Irrigation System Operation

The Ranch's irrigated pasture is surface irrigated with "border strips." Border-irrigated fields consist of strips of land that slope slightly from top to bottom with minimal sloping side to side. These strips of land are contained between low earth berms (i.e., dikes, checks, or ridges). The

FIGURE 2-2
PROJECT LOCATION

El Sur Ranch Water Right
Application No.30166

Monterey County, CA

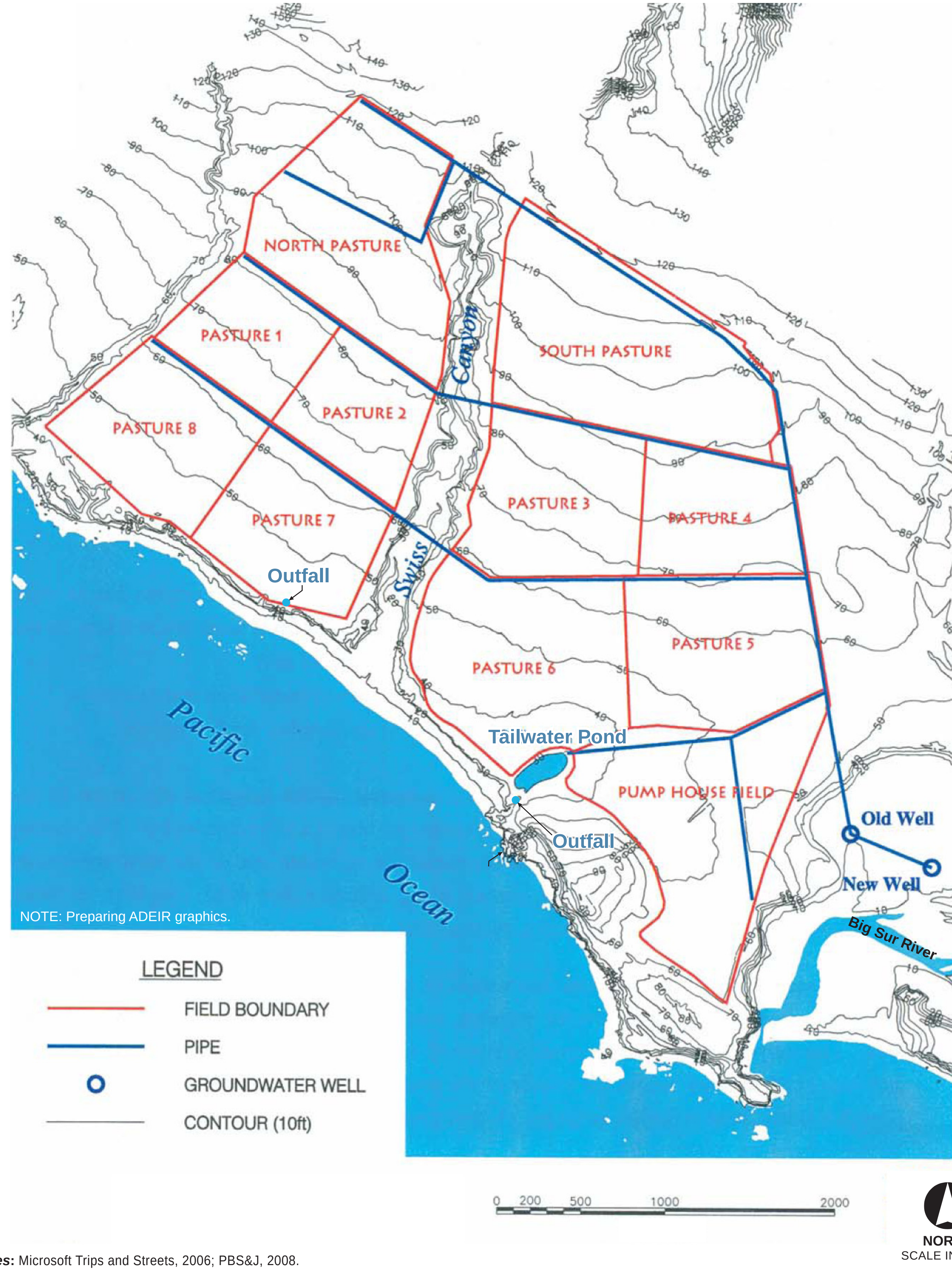
- Project Site
- Place of Use
- Pasture Boundaries
- Big Sur River Riparian Area
- Wells
- Andrew Molera State Park

0 700 1,400
Feet
1:8,400

PBS&J

0D5091103

N:\GIS\Projects\D50911 El Sur Water Rights\Project Location 20080924.mxd



Sources: Microsoft Trips and Streets, 2006; PBS&J, 2008.

PBS&J

FIGURE **2-3**

El Sur Ranch Property and Infrastructure Irrigation System

border strips on the Ranch's irrigated pasture are 14 feet wide (top to bottom) and vary in length from about 500 to 1,000 feet (side to side). Border strips are irrigated from lateral pipelines. Irrigation water is introduced at the upslope end of the border strips and gravity directs flows to the bottom slope end of the border strips. The tailwater from all but the bottom set of borders flows to the next downstream set of borders. The tailwater from the northern pastures ultimately drains to an outfall at the bottom of the northern pastures, while the tailwater in the southern pastures drains to a tailwater pond located at the southwestern edge of the Ranch property. There is an outfall from the tailwater pond to the beach consisting of two 4-foot-diameter corrugated metal pipes that direct flow into a concrete culvert then the beach (Figures 2-2 and 2-3).

Water from the wells is conveyed through a pipeline system with valves to deliver water to the pasture (see Figure 2-3). The pipeline consists of 14-inch diameter concrete or PVC with valves placed 28 feet apart across the head of the pastures. One valve irrigates two border strips. While both wells can be used to irrigate any of the pastures, the Old Well is used primarily to supply water to the upper irrigated pastures and the New Well is primarily used on the middle and lower pastures.

The frequency of irrigation of each field is adjusted according to soil conditions and topography. For example, the Pump House field has more porous soil and, therefore, needs shorter, higher-velocity flows than other fields. The irrigation schedule is periodically adjusted to accommodate unscheduled outages and/or scheduled outages for maintenance of the irrigation system. Precipitation and other climatic conditions, including wind, temperature, humidity, solar radiation, are also factors that affect the timing and duration irrigation.

The pastures are fertilized annually and are occasionally aerated to improve water percolation, reduce compaction, and improve overall productivity. On rare occasions, in years with late spring and early summer rains, the grazing of cattle in the non-irrigated portion of the Ranch is extended, allowing the irrigated pasture area to be cut and harvested for hay. After the hay is harvested, the pastures are irrigated and grazed through the remainder of the summer and fall. The number of cattle raised on the Ranch varies with the productivity of the pastures, but averages approximately 400 head, up to a maximum of 700 head.

Under the terms of a 1982 easement agreement with the Andrew Molera State Park (discussed below), the Ranch may be prohibited from pumping from the New Well when salinity levels exceeding specific thresholds are observed in the well water. The Ranch is required to monitor water salinity from water samples taken from the New Well. Salinity is measured by the electrical conductivity of water in the well. The primary source of increased salinity in the water in the vicinity of the wells comes from the occurrence of spring (unusually high) tides, which occur at the full and new moons when the sun and moon align to provide extra gravitational pull.

According to information in the Ranch's water right application (as amended October 17, 2006), the Ranch typically stops pumping the well voluntarily when salinity levels, measured as electrical conductivity, reach 1.0 micromhos per centimeter (mmhos/cm).[3] When electrical conductivity is above 1.0 mmhos/cm, the Ranch must perform additional analysis to determine if the chloride concentration exceeds 250 parts per million (ppm). In 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.

Project History

The Ranch's Old Well (State Well Number 19S 01E 16F 02M) was constructed in 1949 on what was then El Sur Ranch property (now Andrew Molera State Park property), and has been used continuously to flood irrigate lands on the Ranch since that time. In 1957, the Ranch allowed construction of another well (i.e., the "Navy Well") to serve the U.S. Naval Facility at Point Sur, approximately two miles to the northwest. Plans, specifications, and contracts for the construction of the original irrigation system document that the system was built in 1950. The system has been in continuous operation to the present time.

In 1971, the Molera Parcel, on which the Old Well was originally located, was deeded to the DPR and became part of the Andrew Molera State Park. The deed reserved the Ranch's water rights associated with the parcel, and allowed for continued use of, and access to, the Old Well. During the early 1970s, the Ranch sought to improve water distribution reliability by increasing access to available water supplies through the development of the New Well and associated pump system.

In 1972, a temporary use permit was issued by DPR authorizing the drilling of three wells in the park. One well was intended to serve the Andrew Molera State Park headquarters, a second well was intended to serve the U.S. Naval facility, and the third well was intended for Ranch irrigation (Letter from H.R. Howell to file of El Sur Ranch, July 12, 1985). This permit granted an easement for construction and access if a sufficient water supply was discovered. The first well was drilled at the DPR headquarters in 1972 (DWR Drillers Report No. 86694).

Litigation related to development of the well sites ensued in 1977, and ultimately resulted in DPR granting access to the Molera Parcel by the Ranch to complete development of its new irrigation well. Approximately four test wells were drilled north of the river on the Molera Parcel to find the best groundwater yield. On October 28, 1975, the Ranch completed construction of the New Well. According to the Applicant, the New Well was built primarily to optimize irrigation efficiency, reduce overall power use and costs, and make better use of available groundwater resources. The "Agreement and Grant of Easement", dated September 1, 1982, between DPR and the Ranch, contains provisions for the Ranch's use and operations of the New Well, including monitoring water quality.

3 A unit of conductance, equal to the conductance between two points of a conductor such that a potential difference of one volt between these points produces a current of 1 ampere; the conductance of a conductor in siemens is the reciprocal of its resistance in ohms also known as reciprocal ohm or mho.

On August 31, 1990, the DPR filed a complaint with the SWRCB alleging the excessive use of water by the Ranch resulted in potential impacts on the Big Sur River, and questioning the Ranch's right to divert water. DPR claimed that a 3,000-foot section of the lower portion of the Big Sur River had become dry, and that the lagoon at the mouth of the river had reached critically low levels as a result of the Ranch's operation of the two wells. The DPR's complaint alleged that the water source for these wells, previously believed to be percolating groundwater, was actually subterranean flow to the river and thus came under the SWRCB's permitting jurisdiction. The complaint claimed that the Ranch's pumping had dried up reaches of the Big Sur River, thus having the potential to cause both short- and long-term impacts to public trust resources: specifically, short-term impacts due to the loss of fresh water in both the river and lagoon; and potential long-tem impacts resulting from salt-water intrusion and degradation to fish habitat. A 1990 report by DPR staff asserted that the Ranch's pumping caused the dewatering of the river.

At the time the complaint was filed, most of California, including the Big Sur area, was experiencing its fourth consecutive dry or critically dry year. During the time that the river was observed to go dry, DPR was implementing a bank stabilization project approximately 2,500 feet upstream of the New Well location. The project included instream work, for which a section of the river had been diverted into a constructed bypass channel. The length of river that went dry began in the location of the bank stabilization project work.

The SWRCB subsequently conducted a field investigation in 1991 to determine whether the Ranch's diversion of water from the Big Sur River was subject to the SWRCB's permitting authority. SWRCB staff determined the Ranch was diverting subterranean streamflow from the alluvium of the Big Sur River and, therefore, the Ranch's diversion was subject to SWRCB permitting authority under the Water Code. As noted above, technical studies supported the SWRCB's conclusion that the Ranch was diverting water from a subterranean stream (Jones & Stokes, 1999).

On April 12, 1992, the SWRCB issued a letter report documenting the investigation conducted by its staff in response to DPR's complaint. This report confirmed DPR's claim that the source of water for the two wells was indeed a subterranean stream, rather than percolating groundwater. The SWRCB concluded, however, based on the terms of the deed of the Molera Parcel, that the Ranch possessed a valid riparian right to use the wells to divert water to a portion of the Ranch. Under a riparian right, water cannot be diverted outside of the watershed or conveyed to parcels of land not contiguous to, or not abutting, the watercourse. Due to the topography of the pasturelands, the SWRCB concluded that this right was limited to 90 acres of riparian pastureland owned by the Ranch, (Moeller, 1992) with a corresponding total diversion limit of 270 acre-feet per annum (AFA).[4] The SWRCB recommended that the Ranch either

4 When the Ranch amended its application on November 1, 2005, it identified the riparian portion, in two distinct areas, as totaling 25 acres.

cease diversions of water that serve non-riparian land or, alternatively, apply for an appropriative water right that would serve the non-riparian land.

As illustrated in Table 2-1 below, the use of water to irrigate the pastures has historically varied from year-to-year. This is due to variables such as the number of cattle on the Ranch, the condition of the non-irrigated pastures and range, seasonal weather conditions, labor constraints, economic considerations, and the periodic need for irrigation system maintenance. For example, in 2006 the number of cattle on the Ranch was lower than both the maximum and the average historical herd numbers, and spring rains provided good forage in the non-irrigated pastures and range. Thus, irrigation of the pastures during that season was substantially reduced relative to the historic average, but was still able to produce adequate forage.

Table 2-1 presents the estimated historical irrigation diversions based on analysis of energy usage by the irrigation pumps and pump efficiency tests.

Land Use/Crops

El Sur Ranch is largest remaining working cattle ranch on the coast between San Simeon and Monterey. The Ranch's irrigated pastures are an integral part of the Ranch's cattle operation. The irrigated pastures provide a suitable location near the Ranch's headquarters and high-quality forage for the calves when they are weaned. The pastures are used by the weaned calves from May through August (the date the calves are moved from the pasture can vary based on the forage needs for the next group of cattle moved to the pasture). In August, the pregnant cows are moved to the irrigated pasture for calving. The irrigated pastures provide good forage for the mother cows, and the pastures are near the Ranch headquarters so the cows can be observed and assisted during calving. The mother cows are left in the pasture for a few months or until the pastures become wet and muddy from winter rains. The cows are then put back on the non-irrigated pasture and range on the Ranch to preserve the pasture border dikes and maintain the pasture (i.e., prevent damage that can be caused by cattle traffic on wet soils). The date the calves are moved from the pasture varies based on the forage needs of the next group of cattle moved to the pasture.

Species historically grown on the Ranch pastures have been orchard grass, fescue, harding grass, clover, birdsfoot trefoil, and other native weeds and grasses. These pasture crops are suitable for forage by cattle, as well as for harvest for hay.

Original Appropriative Water Right Application Protests and Response

On July 10, 1992, the Ranch filed water right Application No. 30166 with the SWRCB for an appropriative right to divert (i.e., pump) 1,800 AFA from the PODs (i.e., the two wells) for use on the POU (i.e., the irrigated pasture lands described above). On May 25, 1994, the SWRCB issued a notice of the application.

TABLE 2-1

EL SUR RANCH HISTORICAL DIVERSIONS (ACRE-FEET)[1]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1975	0	0	0	0	36	193	206	206	133	63	1	3	840
1976	3	34	48	58	212	186	190	201	189	40	51	0	1212
1977	0	0	138	203	198	228	180	190	183	108	119	64	1611
1978	0	0	0	0	164	153	125	125	221	153	0	0	940
1979	0	0	0	0	59	229	206	208	168	162	0	0	1032
1980	0	0	0	0	23	226	196	188	186	75	107	37	1037
1981	0	0	0	0	143	204	215	230	160	93	0	0	1045
1982	0	0	0	0	120	200	202	184	203	136	1	0	1046
1983	0	0	0	0	14	15	208	133	61	46	0	0	476
1984	30	0	0	241	262	262	253	301	177	213	0	0	1737[2]
1985	0	0	0	0	240	272	231	210	32	0	0	0	984
1986	0	0	0	0	105	339	189	199	127	0	32	0	1012
1987	0	0	0	0	0	275	264	205	196	10	0	0	950
1988	0	0	0	239	21	265	68	71	99	215	76	0	1054
1989	0	0	0	0	35	71	92	79	161	134	0	0	572
1990	0	0	0	50	143	62	60	173	269	199	64	0	1021
1991	17	0	0	0	52	196	191	136	116	170	0	57	934
1992	0	0	0	0	267	257	116	99	241	119	0	0	1099
1993	0	0	0	0	159	178	202	218	147	87	0	0	992
1994	0	0	0	0	111	139	102	102	182	33	0	0	669
1995	0	0	0	0	87	83	225	155	201	111	0	0	862
1996	0	0	0	0	129	164	170	184	190	128	8	0	973
1997	0	0	0	118	150	122	94	97	121	98	0	0	800
1998	0	0	0	0	0	20	140	123	109	71	5	0	468
1999	0	0	1	0	85	89	106	177	127	90	0	0	675
2000	0	0	0	0	37	206	129	116	191	35	0	0	714
2001	0	0	0	0	39	188	174	116	158	21	0	0	697
2002	0	0	0	0	161	174	135	104	105	88	0	0	767
2003	0	0	0	0	6	144	205	125	142	102	37	0	760
2004	0	0	0	94	253	199	156	161	177	96	0	0	1136
30-year average	2	1	6	33	110	178	168	161	159	97	17	5	937
20-year rolling average 1985-2004	1	0	0	37	104	172	152	143	155	90	11	3	857

Notes:
1 Based on analysis of electrical energy usage by pump motors and pump efficiency test.
2 New well added in 1984.
Source: El Sur Ranch Water Right Application No. 30166, revised October 17, 2006.

The DPR, the California Department of Fish and Game (DFG), and the California Sportfishing Protection Alliance (CSPA) submitted protests against the application based on alleged potential injuries to public trust resources. These protests were based on the possible effects of groundwater pumping on the Big Sur River. The alleged effects included reduced river flows and corresponding lowered water levels in the river, saltwater intrusion, and the resulting potential impacts to riparian flora and fauna, especially special-status species (including steelhead, California red-legged frog, and southwestern pond turtle). Additionally, the DPR protest asserted that the quantity of water that the Ranch sought to divert for irrigation was excessive for its intended purpose, citing erosion effects purportedly due to irrigation runoff.

Technical Studies Prepared in Response to Protests

In response to the protests, technical studies were prepared by the Ranch to examine the various issues central to the protests. These included site-specific surveys of biological resources (BioSystems Analysis, 1995), an analysis of irrigation water usage needs, and a hydrologic study (Jones and Stokes, 1999). The hydrologic study was used to address questions related to the hydraulic connection between the water pumped by the wells, and the river. The purpose and objectives of this investigation were to characterize the hydrologic regime of the river system, and to determine the extent to which irrigation pumping from Ranch wells influenced surface flows, depth, and water quality of the Big Sur River, the estuary, or groundwater levels in the Creamery Meadow. The potential effect of pumping on fisheries, riparian resources, or other flora and fauna was not evaluated at that time. The hydrologic study concluded that the Ranch's wells pump from a combination of Big Sur River subterranean flow and groundwater; that the groundwater system is highly transmissive and hydraulically connected to the river; and that well pumping by the Ranch does not significantly affect river flow or stage.

The Ranch commissioned an additional investigation that, in May 2005, culminated in a detailed report, "*Technical Reports in Support of Water Right Application #30166, El Sur Ranch, Monterey County, California*". Three separate studies were included in that document:

- *Hydrogeologic Investigation and Conceptual Site Model Within the Lower Big Sur River,* (May 20, 2005)
- *Assessment of Habitat Quality & Availability Within the Lower Big Sur River: April – October, 2004*, (March 11, 2005)
- *Reasonable Beneficial Use – Land Use Study for El Sur Ranch Irrigated Pastures, Water Rights Application #30166*, (May 18, 2005)

The hydrogeologic investigation confirmed previous findings regarding the source of water, hydraulic connectivity, and effects of well pumping on river water surface. Data collected during extensive well pump tests in 2004 were used to support this conclusion. Additionally, the report authors established a river flow of 5.3 cfs at the upstream United States Geologic Survey (USGS) river gauge as a supportable measure of flow when considering future monitoring and management requirements to maintain river flows.

The land use/beneficial use study component of the technical studies concluded that the flood irrigation method and system for the Ranch is efficient and appropriate for the site, and that other methods such as sprinkler or drip irrigation would not be suitable given site-specific conditions. The report noted that irrigation application on the Ranch is less than the California Department of Water Resources (DWR) estimates for similar locations and conditions for the irrigation period, as well as on an annual average basis. The study authors concluded that the Ranch irrigation efficiencies are reasonable and within the expected range of efficiency values for surface irrigated fields, but noted that they have increased with time. Specifically, the 1994-2004 period included several years of high irrigation efficiency that was likely the result of under-irrigation. Based on water use data, the report identified and revised diversion rates and volumes for the water right application that would address the actual irrigation requirements. These diversion rates and volumes are included in the amended water right Application No. 30166, as amended October 17, 2006, and are evaluated in this DEIR.

These reports were augmented by additional studies in 2007, which were conducted to address specific requests from interested parties involved in the water rights protests. The information developed in these reports supports the conclusions presented in the 2005 report, and is incorporated as part of the analysis contained in this DEIR. One of the key differences in the 2007 studies is a revision to the land use/beneficial use study. The new analysis, using an irrigation efficiency factor of 65 percent and a leaching factor of 10 percent, provided slightly different demand figures than had been estimated in previous studies. The other reports provided additional information regarding the biological resources of the proposed project site.

By letters dated November 1, 2005, December 24, 2005, and October 17, 2006, the Ranch subsequently amended its application. Application No. 30166 now seeks a maximum direct diversion of 1,615 AFA, with a 20-year rolling average not to exceed 1,200 AFA. The maximum diversion (pumping) rate would not exceed 5.34 cubic feet per second (cfs) on a 30-day running average (equal to roughly 2,400 gallons per minute (gpm)) and would not exceed 5.84 cfs (roughly 2,620 gpm) at any time. The current application also identifies a seasonal diversion limit of 735 acre-feet (AF) between July 1 and October 31, and a monthly seasonal diversion limit of 235 AF during that period. This is described in greater detail below, in "Project Description."

Riparian Right

The applicant claims a riparian right to divert flow from the Big Sur River from the Old Well and New Well for irrigation of 25 acres of riparian land, which are included within the 267-acre POU, and which lie within the watershed of the Big Sur River (Figure 2-2). The applicant filed two Statements of Water Diversion and Use (S14132 and S14133) in October 1993, which were subsequently accepted by the Division of Water Rights on November 10, 1994, in order to document this riparian right. The source of the water subject to the riparian right is the Big Sur River system, including, but not limited to, the portion that is subterranean flow. The year of first riparian use was not later than 1951. Approximately 23 acres of the 25 acres are currently irrigated pasture. The total quantity and rate of water diversion requested under the water right application, as amended October 17, 2006, is for use on 267 irrigated acres within the 292-acre project site, and includes water needed to irrigate the applicant's claimed existing riparian 25 acres. It is not uncommon for a land owner to have both a riparian right and an appropriative right for the same piece of property. Although the pending application denotes the Ranch's claimed riparian right, the SWRCB's approval authority is limited to the appropriative water right sought in the Ranch's application.

Water Availability Analysis

The Big Sur River has not been determined to be a fully appropriated stream (Water Code, § 1205) by the SWRCB. A Water Availability Analysis (WAA) was prepared to determine whether water would be available for appropriation in accordance with Water Code section 1275, subdivison (d); and to determine the potential effect of the requested diversions on streamflow in the Big Sur River to inform the fishery resources impacts analysis in this DEIR. The Water Availability Analysis is included in this DEIR in Appendix D.

Streamflow and other hydrologic data were used to calculate the Cumulative Flow Impairment Index (CFII), expressed as a percent. Typically, if the CFII is less than five percent there is little chance of significant cumulative impacts on fishery resources, and no further study is warranted. However, for the proposed project, additional extensive hydrologic and biotic studies (see following paragraph) were completed during a low-flow year to support the WAA. These studies showed that river flow below the POD *exceeds* that upstream of the POD, and the fish population is large and healthy under the conditions of the historic diversions. According to the study, the data and history of the Big Sur River fishery, flows, and diversions support a conclusion that water is available for the diversions sought by Application No. 30166.

PROJECT DESCRIPTION

The proposed project, as considered by the SWRCB as the Lead Agency under CEQA, and analyzed in this DEIR, is water right Application No. 30166, as amended October 17, 2006. Through this application, the Ranch seeks to directly divert water from the lower Big Sur River through pumping of the two existing wells. The Application No. 30166, as amended October 17, 2006, is included as Appendix C in this DEIR.

If the SWRCB approves the full appropriation requested in the Ranch's water right application, as amended October 17, 2006, the Ranch will have a right to divert (pump) through the two existing wells, subject to any terms or conditions that the SWRCB imposes in the permit. The total water use on the POU would not exceed the amount allowed under the permit. As discussed in detail below, the diversion amount that would be allowed under the proposed permit would represent an increase in annual diversions relative to diversions that have historically occurred on the project site.

The priority date of the water right would be July 10, 1992, which was the date of the filing of the original application. The Ranch would have to seek the SWRCB's approval of any changes to the authorized POU, purpose of use, or PODs, if these were proposed to be changed in the future. Such an action would require further environmental analysis at that time. Specific details regarding each of the limitations – and assumptions used to identify specific numerical diversion limits and rates – are described in are described below.

Project Objectives

The objectives of the proposed project are to:

- allow for the appropriation of water from the Big Sur River for use on the El Sur Ranch through issuance of an appropriative water right permit, consistent with the SWRCB's responsibility to consider water availability, the public interest, the protection of fish, wildlife, and public trust resources, water quality, prior legal water rights, and to condition the appropriation as necessary;
- allow for the continued diversion and beneficial use of water for irrigation of 267 acres of pasture for cattle grazing; and
- continue economic use of the land for agricultural purposes and grazing of cattle consistent with Monterey County Zoning Ordinance, Coastal Implementation Plan, and the Monterey County General Plan.

Proposed Purpose of Use

As discussed above, El Sur Ranch's irrigated pastures are an integral part of the Ranch's cattle operation. The irrigated pastures provide a suitable location near the Ranch's headquarters and high-quality forage for the calves when they are weaned from their mothers in May. The proposed purpose of use is irrigation of pasture crops.

Proposed Place of Use

The proposed water right would allow water diverted from the Big Sur River to be applied on 267 acres of the Ranch's 292 acres. For purposes of the application, and as used in this DEIR, the area to be irrigated includes the 25 acres of land that is currently served by an existing riparian water right.

Riparian land consists of 25 acres of irrigated pasture that are riparian to the Big Sur River. Recent field topographic survey and stereographic analysis of 1929 aerial photographs were used to delineate that portion of the irrigated pasture that is within the Big Sur Basin. The Irrigated Area, which includes the riparian land, comprises the POU, the boundary of which is illustrated in Figure 2-2. The "Irrigated Area" consists of Assessor Parcel Numbers (APN) 159-011-05 and 159-031-04).

Proposed Points of Diversion

The proposed points of diversion would be the existing Old Well and New Well.

Numerical Diversion and Rate Limits Assumptions

El Sur Ranch's water right application is for the irrigation of pasture, which is considered a beneficial use of water. The law also requires that this water be put to reasonable use and that waste or unreasonable use of water be prevented (i.e., the amount required to supplement the water naturally provided by precipitation and other climatic factors should reasonably match the requirements of that use so that the water is not wasted). Because precipitation, climate, and other factors vary, often considerably, from year-to-year, the diversions required for this reasonable and beneficial use will vary, considerably, from year-to-year, month-to-month, or even day-to-day. The rest of this chapter describes the applicant's basis for requesting to appropriate a particular amount of water that the applicant believes can be put to reasonable and beneficial use. This chapter does not reflect the SWRCB's determination or judgment as to whether the proposed diversion and use of water is reasonable and beneficial.

The applicant has indicated that circumstances unique to El Sur Ranch (Table 2-2), and that are a factor in determining irrigation needs for the proposed diversion, include the Ranch's location at the very end of the Big Sur River system (i.e., the wells are located in the vicinity of the mouth of the river). Another relatively unique condition is the indirect method of diversion, by wells drawn from subterranean flow rather than direct surface water diversion or impoundment under the proposed appropriative right.

TABLE 2-2

CRITERIA AFFECTING REASONABLE IRRIGATION EFFICIENCY ON THE EL SUR RANCH

Criteria	Optimal	El Sur Ranch
Irrigation method	Based on soils, crops, slopes, economic considerations.	Limited to border surface irrigation to help maintain natural view of the coastline, regulatory prohibitions on natural landform alteration, grazing requirements, and economics.
Slope	Based on soil border length, soils, crops, and water supply.	Limited to existing slope due to soil profile, regulatory prohibitions on natural landform alteration, grazing requirements, and need to maintain natural view of coastline.
Border flow rates	Variable with the ability to apply water at optimal rates (i.e., generally order large flow rates for short durations of 1-2 days)	Limited to flow from two existing wells, and spring tide constraints on the Old Well that can limit pumping.
Border irrigation set times	Based on soil border length, soils, crops, and water supply.	Limited based on available ranch labor.
Labor	Full-time irrigator during irrigation that occurs over a few days at timely scheduled irrigation intervals.	Limited to periodic checking and two set changes per day, based on available ranch labor and herd size conditions.
Irrigation scheduling	Irrigation scheduling based on crop needs.	Limited based on water supply that limits the irrigation interval.
Tail water recovery	Installed to capture and use tail water for irrigation	May be limited due to regulatory, environmental and cost constraints on expanded tail water recovery.
Irrigation efficiency	75 to 85 percent	60 to 70 percent (65 percent typical)

Source: El Sur Ranch Water Right Application No. 30166, revised October 17, 2006.

According to the applicant, in many years the Ranch applied less water for irrigation than was required for optimal crop production. Ranch foremen have described the historic levels of irrigation as being generally adequate for irrigation of the pasture for ordinary grazing purposes. In a few instances, the annual diversions exceeded crop irrigation diversion requirements; such occurrences have been rare, although it can be reasonably expected that such conditions could occur again in the future.

The historical estimated irrigation diversions provide a range of irrigation needs based on the unique conditions that existed at that time. According to the applicant, these conditions do not necessarily provide a reliable forecast of irrigation needs in the future, so the monthly and annual amount of irrigation water needed to supplement that provided by precipitation and other climatic factors cannot be known in advance. However, they do provide good historical evidence of past practices, and can be used as basis for the assumptions made in calculating crop irrigation diversion requirements (or calculated crop water need), including irrigation efficiency, crop water use, and leaching requirements at the Ranch. These data, and the analyses thereof, provide the technical basis for amount of diversions requested in the water right application.

Irrigation Efficiency

The applicant's review of technical literature concluded that reasonable or acceptable irrigation efficiencies are based on several factors, including crop, irrigation method, economics, uniformity and properties of soils, uniformity of water application, water supply, and weather conditions. The applicant has indicated irrigation efficiency on Ranch pasture is limited by the water supply, irrigation system, soils, labor constraints, regulatory constraints, and imperfect forecast of rainfall events. Criteria affecting reasonable irrigation efficiency on the El Sur Ranch, as compared to optimal practices, are summarized in Table 2-2 to illustrate the specific constraints for determining El Sur Ranch irrigation efficiency.

Based on these factors, the applicant proposes that a reasonable irrigation efficiency achievable on the Ranch is expected to be approximately 65 percent. Analysis of historical pumping indicates the irrigation efficiencies on the Ranch have been both above and below this value. The water right Application No. 30166, which is the source of information presented in Table 2-2, contends that often times high irrigation efficiencies are indicative of under irrigation, which decreases crop production.

Crop Water Use

Potential crop water use is a function of the crop, crop health and vigor, and climate. Crop water requirements for the Ranch were based on weather data obtained at the Ranch irrigated pasture from August 2004 through August 2006. The site-specific data was correlated with weather from Monterey, California (approximately 25 miles north) to calculate the irrigation diversion requirement for optimal pasture production for 1975 through 2005.

Leaching Requirement

Leaching is required when irrigating with water that has a salinity level that can, over time, affect yield. The salinity of the irrigation water supply for the Ranch depends highly on which well is being used. Water salinity from the New Well is relatively stable, and water from the Old Well is often higher in salinity as a result of spring tides. The leaching requirement at the Ranch varies based on the variable salinity of the water pumped from the wells and the spatial variability of the soils, but is estimated to be approximately 10 percent.

Calculated Irrigation Diversion Requirement

The irrigation diversion requirement is a mathematical equation that compares the net overall requirement to the irrigation efficiency, expressed as a percent. That is, the irrigation diversion equals the net overall requirement divided by the irrigation multiplied by 100. The results of this calculation for the years 1977 through 2005 are presented in Table 2-3.

Future diversion volumes in most years are likely to continue to be less than the calculated crop irrigation requirement. It is not expected the volume of water diverted would be significantly greater than that needed to provide optimum forage production in those years when suitable forage would be reasonably required. As such, the water right application accounts for that maximum volume requirement based on both historic estimated irrigation levels and calculated need.

Specific Diversion Limitations

Table 2-4 summarizes the specific numerical limits the applicant is seeking in its water right application, as amended October 17, 2006. The basis for each of the limits is described in this section.

Maximum Diversion Limit

Although the Ranch observed a 30-year average annual pumping rate of 937 AF (1975 to 2004), occasionally conditions have resulted in significantly higher totals. When reviewing the Ranch's pumping records (see Table 2-1), maximum historical diversions of 1,611 AF and 1,737 AF have occurred in 1977 and 1984, respectively. The conditions that led to these two totals were very different. The water year 1976-77 represents the drought year of record in California, with practically no precipitation occurring during that period. As a result, water demand during the 1977 irrigation season was at an all-time high. The water year 1983-84 was not as dry, 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. In establishing the proposed maximum diversion limit in the application, the applicant assumed that the cyclical nature of California's weather patterns could result in other extremely dry periods with

TABLE 2-3

ESTIMATED IRRIGATION DIVERSION REQUIREMENTS ON THE EL SUR RANCH (BASED ON 65 PERCENT IRRIGATION EFFICIENCY AND 10 PERCENT LEACHING FRACTION)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
No Precip	88	98	131	168	166	195	195	169	172	154	112	83	1730
1975	34	0	0	99	152	183	193	147	167	98	92	62	1227
1976	82	0	64	74	159	175	190	126	139	114	76	11	1210
1977	37	63	57	150	120	213	197	177	148	157	111	0	1430
1978	0	0	0	0	152	188	197	177	164	148	49	40	1116
1979	0	0	11	142	171	196	176	170	188	89	11	0	1153
1980	0	0	48	99	151	196	167	170	194	160	109	35	1331
1981	0	40	3	141	147	188	205	153	167	85	0	46	1176
1982	0	28	0	56	159	191	181	157	101	62	0	0	935
1983	0	0	0	25	144	175	182	164	120	136	0	0	946
1984	94	23	90	135	159	191	205	191	202	97	0	24	1409
1985	49	49	14	121	162	171	212	170	204	84	0	25	1262
1986	11	0	0	155	136	213	205	164	131	145	84	30	1274
1987	0	14	51	144	163	204	190	157	155	106	57	0	1242
1988	13	75	132	114	156	186	190	177	167	162	22	0	1394
1989	35	33	43	141	147	196	197	177	124	82	58	74	1307
1990	0	0	78	159	93	204	182	164	155	151	102	34	1323
1991	62	11	0	160	159	204	205	175	174	106	113	0	1369
1992	12	0	0	157	146	174	190	169	161	129	106	0	1244
1993	0	0	38	173	155	178	222	170	174	169	65	11	1355
1994	0	0	130	126	155	221	205	184	161	161	30	9	1382
1995	0	66	0	90	137	133	175	164	174	154	86	4	1183
1996	0	0	43	136	109	196	222	177	174	126	43	0	1226
1997	0	104	136	179	179	188	205	156	161	132	0	0	1441
1998	0	0	7	61	112	183	188	191	187	137	29	25	1120
1999	0	0	0	90	167	184	190	170	161	137	46	63	1207
2000	0	0	33	114	109	172	182	164	145	17	91	76	1104
2001	0	0	41	98	174	204	175	156	178	136	0	0	1163
2002	35	35	78	120	138	203	182	157	155	148	33	0	1282
2003	24	25	76	62	110	172	182	157	167	127	61	0	1164
2004	35	0	103	148	152	195	184	170	178	36	59	0	1260
2005	17	19	43	116	146	189	192	167	163	119	51	19	1240

Source: El Sur Ranch Water Right Application No.30166, revised October 17, 2006

TABLE 2-4

SUMMARY OF DIVERSION LIMITS, RATES, AND OPERATING PRACTICES FOR EL SUR RANCH WATER RIGHT APPLICATION NO. 30166

	Limitations
Place of Use (Irrigated Area)	Any 267 acres of 292 acres, includes riparian area (25 acres)
Riparian Area	25 acres of the 267 acres
Method of Diversion	Two existing wells (the Old and New Wells) located on lands deeded to the California Department of Parks and Recreations and within Andrew Molera State Park
Crops	Coastal grasses, pasture crops for cattle
Total Annual Diversion	▪ No more than 1,615 AF in any one calendar year; ▪ 20-year running average of no more than 1,200 AFA; and ▪ In no event exceed that quantity reasonably required for irrigation, taking into account leaching and irrigation efficiency
Period of Use	January 1 to December 31
Seasonal Limit	735 AF (July 1 to October 31)
Monthly Limit	230 AF each calendar month from July 1 to October 31
Maximum Rate	5.84 cfs instantaneous
Average 30-day Rate	5.34 cfs 30-day running average
Operating Practices Limits	Crop types, irrigation system and operation

Source: El Sur Ranch Water Right Application No. 30166, revised October 17, 2006.

conditions approaching those experienced in 1976-77, and used the observed 1977 diversions as a maximum limit in terms of potential effects.

For comparative purposes, a year with no precipitation at all would result in an estimated water demand of 1,730 AF (see Table 2-3), while the dry year of record (1977) would have required 1,430 AF of pumping. Thus, although Application No. 30166 requests a 20-year rolling average for pumping in the amount of 1,200 AFA, it also includes a maximum diversion rate (1,615 AFA) that matches the highest observed total during the period of record. The calculated irrigation diversion requirements for the same period of time were developed to estimate the maximum diversion limit based on historical climatological records, the irrigation efficiency and leaching requirement noted above, and irrigation values based on monthly crop evapo-transpiration (ET) and estimated precipitation.

According to the applicant, years 1977 and 1997 represent the years of greatest water use on the project site since 1975. Assuming 65 percent irrigation efficiency and a 10 percent leaching requirement, approximately 1,430 AF would be the calculated need for 1977, and 1,441 AF would be the calculated need for 1997. If years like 1977 and 1997 should repeat, including a repeat of the relative monthly allocation of precipitation, it could be difficult to provide reasonable forage with diversions limited to 1,430 AF or 1,440 AF. “Banking” soil moisture ahead a full calendar year by extra irrigation during the previous December to ensure adequate crop production would be difficult and probably ineffective as compared to banking prior to the seasonal (July through October) diversions, according to the water right application, as amended October 17, 2006.

Therefore, based on these data, the water right application requests an annual maximum irrigation diversion of 1,615 AF. This volume is considered by the project applicant to be the volume required to provide "optimum forage production" in those years when it is reasonably required to provide suitable forage. According to the application, as amended October 17, 2006, it would not be reasonable for the applicant (regardless of water reasonably needed to provide suitable forage) to divert a volume of water significantly greater than that required for the growth of the "optimal forage production", and this requirement is reasonably suited as a limit or "cap."

20-Year Running Average Diversion Limit

In addition to the maximum annual diversion limits discussed above, the application requests implementing a 20-year running average[5] diversion limit of 1,200 AFA. The Ranch has observed an average annual pumping total of 937 AFA (1975-2004). Over the 20-year period of 1985-2004, the average was somewhat less (857 AFA) as the extreme drought years of 1976 and 1977, as well as 1984 (when the New Well was added) were removed. The proposed 20-year running average diversion limit of 1,200 AFA would allow for fluctuations in demand due to annual variations in precipitation, temperature, soil moisture, and other factors that would affect the irrigation demand. The running average would take the pumping records for the previous 19 years, and then calculate what the maximum diversion for the coming year would be to reach the 20-year running average.

Seasonal Diversion Limitation

July 1 through October 31 is the period of lowest flows in the Big Sur River. The seasonal maximum irrigation diversion limit would be 735 AF during that period. This volume is the calculated maximum diversion requirement for optimal forage production during those months using 65 percent irrigation efficiency and 10 percent leaching requirement, based on the estimates of irrigation diversion requirements from 1975 through 2005. Historically, July through October diversions have exceeded 735 AF twice over a 30-year period. As a measure of protection against the risk of these high seasonal demands occurring again, although infrequently, the applicant may decide to irrigate the pasture prior to July to minimize the need to divert more than 735 AF during July through October. However, any diversion prior to July would be subject to the approved and permitted annual diversion limits.

Monthly Diversion Limitation

For the period July through October, the maximum calendar month diversion would be limited to 230 AF. This volume is the calculated maximum irrigation diversion requirement for optimal

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5 A 20-year running average is calculated by adding the volume of annual diversions for the previous 19 years to the projected maximum diversion for the coming irrigation season and dividing by 20. Under the proposed project, if the 20-year average exceeds 1,200 AFA, the projected diversion limit for the coming irrigation seasons would need to be reduced until the 20-year average is equal to or less than 1,200 AFA.

forage production in July, and is based on an average pumping rate not-to-exceed 5.34 cfs for the period July through October.

In developing the 230 AF limit, the applicant assumed the soil moisture is the same at the beginning and ending of the month, which seldom exists, however. For example, if the soil moisture is low at the beginning of the month, it would be desirable to apply more irrigation than the amount calculated based solely on crop ET. A higher-than-calculated irrigation diversion in one month will normally be preceded or followed by a lower-than-calculated monthly irrigation diversion.

If diversions were to occur at the maximum monthly cap for the entire four-month period, the seasonal limit for that period would be exceeded. This monthly cap slightly exceeds the seasonal limit (i.e., if the seasonal limit were equally divided among the four-month period) to provide flexibility for unforeseen conditions such as pipeline breaks, labor disruptions, or other unavoidable circumstances. Regardless, total diversions during the four-month July to October period would be limited to 735 AF under conditions presented in the application, as amended October 17, 2006.

Operating Practices

Crops

As noted previously, species historically grown on the Ranch's irrigated pasturelands have been orchard grass, fescue, harding grass, clover, birdsfoot trefoil, and other native weeds and grasses. Under the proposed project, crops would be limited to pasture crops, primarily grasses and legumes such as those historically grown and suitable for forage by cattle.

Irrigation System Components

The irrigation system would consist of the existing irrigation facilities that have been used historically and as shown in Figure 2-3. Operation and maintenance of the following irrigation system elements are considered part of the project description evaluated in this DEIR:

- transmission pipelines conveying water from the river-level pumps to the system of distribution laterals located at the higher elevation pastures of the POU;
- pipeline laterals that carry water from the transmission lines across the head (i.e., the upper elevation boundary of each pasture field to facilitate irrigation;
- the borders leading down-gradient through the fields from the laterals for a distance of 500 to 1,000 feet;
- adjustable valves located within the laterals to discharge water into the borders;

- borders that are designed to allow tailwater to flow to the next down-gradient set of borders, with tailwater from the bottom set of borders discharged to the tailwater pond or to a water control structure to discharge water to the ocean; and
- an approximately 1-acre tailwater pond facility designed to facilitate the reuse of accumulated tailwater or discharge the same to the ocean through a water control structure.

From an operational standpoint, a three- to four-week pasture rotation would be employed to satisfy the irrigation requirements of all of the fields, with temporary cessation if useful precipitation occurs. Although both the Old Well and the New Well have the capability to irrigate the entire pasture, it is more energy efficient to use the Old Well primarily to irrigate the upper portion of the pasture, and the New Well to primarily supply the middle and lower pastures.

Irrigation System Operating Practices

Under the proposed water right application, the irrigation system would continue to be operated as it has in the past, with the timing, order or irrigation, extent of irrigation to the various pastures, and frequency determined by the irrigator. The analysis in this DEIR assumes the following practices, as stated in the water right application:

- frequency of irrigation of each field would be adjusted according to soil conditions and topography (e.g., the Pump House field has more porous soil and, therefore, needs shorter, higher-velocity flows than other fields);
- adjustment of irrigation schedule would occur due to unscheduled outages and/or scheduled outages for maintenance of the irrigation system;
- adjustment of irrigation timing and duration would be made in response to precipitation and other climatic conditions, including wind, temperature, humidity, solar radiation;
- adjustment of diversion would be made based on salinity readings at the pumps (e.g., water quality exceeding 1.0 mmhos/cm may occasionally be pumped from the Old Well in the future);
- adjustment of valves would be made to equalize the down-gradient advances of water flows within certain areas of the borders;
- controlled discharge of tailwater to ocean and/or reuse of certain quantities of water from the tailwater pond would occur;
- adjustments to irrigation would occur based on for soil moisture conditions of the fields at the beginning of an irrigation set;
- adjustment of duration and timing of irrigation set would be made taking into account factors such as grazing stages, or the mix of grasses and legumes present within the pasture;
- adjustment of the operating rates of the pumps would be made to take into account the elevation above the wells of the particular pasture fields being irrigated, and the limits on the rates of diversion identified in Table 2-4.

- adjustment of duration of irrigation set taking into account whether irrigation occurs in daytime or nighttime irrigation and taking into account labor constraints;
- potential soil erosion would be controlled, in part, by maintaining dense growth within the pasture fields, by maintaining drainage gullies, and by controlling runoff into the canyons, the bluff at the bottom of the pasture, and the embankment at the tailwater pond; and
- diversion greater than the lesser of those required for the reasonable and beneficial irrigation of the POU or than permitted by the volumetric limitations of the permit would be avoided (for example, the operator normally would not irrigate to optimize forage production, but would do so only in response to the reasonable and beneficial use standard).

REQUIRED PERMITS AND APPROVALS

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.

3.0 SUMMARY

INTRODUCTION

This DEIR is a project-level environmental impact report (EIR) that evaluates the environmental impacts of the El Sur Ranch water right Application No. 30166 (the proposed project), as amended October 17, 2006. The State Water Resources Control Board (SWRCB) is the Lead Agency for preparing an EIR. In determining whether to approve a water right application and under what conditions, the SWRCB must consider the project's potential environmental impacts and any appropriate mitigation measures identified through CEQA process.

This chapter provides a brief description of the project background, an overview of its operational characteristics, alternatives to the proposed project, areas of controversy identified during the scoping process, and a summary of impacts and mitigation measures.

PROJECT BACKGROUND AND OVERVIEW

The El Sur Ranch (Ranch) is a working cattle operation located on the coast of Monterey County, California, approximately 25 miles south of Monterey, just north of the Big Sur River and west of State Route 1 (Highway 1), and adjacent to Andrew Molera State Park. The Ranch has been in operation at this location for more than 150 years. Irrigation of the upland pastures has historically come from water pumped from wells located within the adjacent Andrew Molera State Park, on land originally deeded to the California State Parks system from the Ranch. One of the wells (the "Old Well") has been in operation since 1949, while the other (the "New Well") was put into operation in 1984. There is an existing irrigation system and roads that access the pasture and wells.

The State Water Resources Control Board (SWRCB) has determined that water pumped from the two wells comes from the subterranean flow of the Big Sur River, rather than from percolating groundwater.

The Ranch originally filed Application No. 30166 with the Division in July 1992 for the appropriation of water from the subterranean flow of the Big Sur River. The application was amended in November and December 2005, and again in October 2006; the current amendment represents the proposed project and is included in Appendix C in this DEIR.

If approved, the permit would allow for the appropriation of water from the underflow of Big Sur River, Monterey County, California. The "points of diversion" are the two existing El Sur Ranch groundwater wells located in Andrew Molera State Park. The "place of use" is existing irrigated pasture on El Sur Ranch just north of the park and west of Highway 1. The proposed project would allow for water from the El Sur River underflow to continue to be used for irrigation of existing pasture. Chapter 2 of this DEIR describes the proposed project in detail, including background information.

CEQA PROCESS

The SWRCB circulated a Notice of Preparation (NOP) of an EIR for the proposed project in June 2006 (Appendix A to this DEIR). An Initial Study checklist was included with the NOP. The NOP and IS were provided to government agencies and to other interested parties to inform responsible agencies and the public that the proposed project could have significant effects on the environment and to solicit their comments. Written comments on the Initial Study/NOP are included in Appendix B to this DEIR.

Two scoping meetings were held in September and November 2007 to solicit input on the DEIR. On September 18, 2007, SWRCB staff met with representatives of the California Department of Fish and Game and the California Department of Parks and Recreation. A meeting was held on November 13, 2007 with National Marine Fisheries Service.

This DEIR was circulated for public review and comment on October 8, 2009. The 45-day public review period concludes on **November 23, 2009**. During the public review period, written comments on this document may be submitted to the SWRCB at the following address:

Mr. Paul Murphey
Division of Water Rights
State Water Resources Control Board
Post Office Box 2000
Sacramento, CA 95812

Pursuant to Section 15088 of the State CEQA Guidelines, the lead agency will review all comments on the DEIR received during the comment period and will prepare written responses to all substantive comments received. These responses will be included in a Final EIR (FEIR). The FEIR will be considered for certification by the SWRCB in accordance with State CEQA Guidelines.

All mitigation measures adopted by the SWRCB as conditions of approval for the proposed project, will be included in a monitoring and reporting program (MMRP). The MMRP is intended to help facilitate and monitor effective implementation of adopted mitigation measures. These measures are also likely to be included in the conditions for the proposed water right permit.

ALTERNATIVES TO THE PROJECT

This DEIR considers and evaluates four alternatives to the proposed project. These alternatives are:

1. No Project/No Permit Alternative;

2. No Change in Existing Practices/Historical Diversions Alternative;
3. Alternate Irrigation Efficiency Alternative; and
4. Alternative Limits on Diversions Alternative.

Chapter 6, Alternatives Analysis, presents a description of each of the proposed project alternatives, a comparative analysis of the potential impacts of each alternative relative to the proposed project, and an analysis of each alternative's ability to meet the basic project objectives.

Table 6-1 in Chapter 6 includes a comparison of the proposed project and each alternative relative to anticipated diversions of water from the Big Sur River. Chapter 6 also includes a determination of the "environmentally superior" alternative evaluated in this DEIR. Other than the No Project Alternative, Alternative 2 (No Change in Existing/Historical Diversions) was found to be environmentally superior to the proposed project and Alternatives 3 and 4.

AREAS OF CONTROVERSY IDENTIFIED AND ADDRESSED IN THE DEIR

A number of issues of concern pertaining to proposed project were raised by state and federal resource agency staff and the public in the course of scoping process for this DEIR. Key issues pertinent to the environmental review included:

- conditions in the proposed water right that would increase allowable diversion amounts and limits to levels slightly higher that historical rates;
- the use of historical diversion rates as the environmental baseline for purposes of determining potential project impact on hydrological conditions and aquatic resources; and
- concern regarding the adequacy of the scope and conclusions of technical studies prepared in response to protests on the application.

SUMMARY OF ISSUES ADDRESSED IN THE INITIAL STUDY

For the following topics, the analysis in the Initial Study (Appendix A) concluded the proposed project would result in no impact or impacts would be less than significant: Aesthetics, Agricultural Resources, Air Quality, Cultural Resources, Hazards and Hazardous Materials, Land Use, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation and Traffic, and Utilities/Service Systems. No comments on the Notice of Preparation were received indicating these topics should be evaluated in detail, and, therefore, these issue areas are not included in Chapter 4.

SUMMARY OF ENVIRONMENTAL IMPACTS

Table 3-1, Summary of Impacts and Mitigation Measures, at the end of this chapter, has been organized to correspond with environmental issues discussed in Chapter 4.

The summary table is arranged in four columns. The table is organized as follows:

1. Environmental impacts;
2. Level of significance;
3. Applicable mitigation; and
4. The level of significance after implementation of mitigation.

Significant Impacts and Mitigation Measures

Under CEQA, a significant effect on the environment is defined as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

A comprehensive list of impacts is presented in Table 3-1 at the end of this chapter.

For all project impacts found to be significant in this DEIR, feasible mitigation measures are available to reduce those impacts to levels that are considered to be less than significant.

Analyses presented in Sections 4.2 and 4.3 and Chapter 5 of this DEIR address all potentially considerable project contributions to the cumulative impact on resources significantly affected by the project (i.e., hydrology, geohydrolgy, water quality, and biological resources). As presented in Sections 4.2 and 4.3 and Chapter 5, for all cumulative impacts found to be potentially significant, feasible measures are available to reduce the project's contribution to the cumulative impact to levels that are not considerable.

Significant and Unavoidable Impacts

For all project and cumulative impacts determined to be potentially significant in this DEIR, effective and feasible mitigation measures are presented to reduce those impacts to levels that are less than significant. Therefore, the project would not result in any significant and unavoidable impacts.

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
PROJECT IMPACTS			
4.2 Hydrology, Geohydrology, and Water Quality (Project Impacts)			
4.2-1 Implementation of the proposed project would result in a direct reduction in local groundwater levels but would not substantially deplete groundwater supplies or interfere with existing or pending water rights.	LS	None required.	LS
4.2-2 Implementation of the proposed project would alter the groundwater-to-surface-water gradient and substantially reduce flow within the Big Sur River and may alter the natural channel forming flow regime.	PS	4.2-2 Extreme Critical Dry and Critical Dry Flow Rate Limitations on Project Diversions. Extreme Critical Dry and Critical Dry flows could result in significant aquatic habitat and water quality constraints. The Applicant shall immediately develop and implement an Irrigation Water Management Plan (IWMP) incorporating protocols and operator training to ensure that Project diversions do not cause or contribute to Extreme Critical Dry flows (less than the 10^{th} percentile flow rate) or Critical Dry flows (less than the 20^{th} percentile flow rate) greater than under Baseline rates as follows: • For July through October, May, and December, when mean daily flow at the USGS gage is below the 10^{th} percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 20^{th} percentile mean daily flow rate (see also Mitigation Measures MM #4.3-1 and MM #4.3-2). • For January through April, when mean daily flow at the USGS gage is below the 5^{th} percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 10^{th} percentile mean daily flow rate (see also Mitigation Measure MM #4.3-1).	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		• For June and November, when flow at the USGS gage is below the 10th percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 10th percentile mean daily flow rate. • Table A lists the USGS Limiting Flow Rates (10th percentile or 20th percentile, as required, above), for each month. If flow at the USGS gage is less than the USGS Limiting Flow Rate, the Project diversions cannot exceed Baseline (Allowable) Diversion Rates until flow at the USGS gage is equal to or above the USGS Limiting Flow Rate. Any modification to the IWMP shall require the Applicant to incorporate and implement a monitoring program in the IWMP to field verify that Project diversion protocols and operations do not reduce flows within Zone 4 through Zone 2 such that the Extreme Critical Dry or Critical Dry flow rate conditions, as appropriate, critical passage conditions, and critical dissolved oxygen (DO) conditions are not violated. Diversions for the purpose of making flow rate measurements, pursuant to this mitigation measure or subsequent mitigation measures, are exempt from the diversion limitations imposed by this mitigation measure if notification of testing is provided to the SWRCB prior to the beginning of testing. Modifications to the IWMP shall be submitted to the SWRCB for review and approval prior to implementation of the modified IWMP.	
4.2-3 Implementation of the proposed project could alter the groundwater-to-surface-water gradient and reduce the water surface elevation within the lagoon.	LS	None required.	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)		Level of Significance After Mitigation
4.2-4	**Implementation of the proposed project could substantially alter the existing drainage pattern of the POU through increased irrigation rates that could result in substantial erosion or siltation on- or off-site.**	PS	4.2-4	The Applicant shall prepare an Erosion Control and Operations Management Plan (ECOMP) and submit it to the SWRCB for review and approval. This ECOMP shall incorporate the IWMP and operations and management protocols to minimize surface runoff and erosion potential arising from the Project. The Applicant shall incorporate protocols for excess irrigation applications and to prevent on- and off-site erosion because of increased application rates or volumes, intensification of grazing, or other conditions attributable to the proposed project. The IWMP shall include management practices to avoid bare soil conditions and to limit grazing intensification over pre-project levels on land with less than 50-percent ground cover. Areas disturbed by grazing or other operational activities attributable to the proposed project shall be re-vegetated. Vegetation shall be maintained on areas adjacent to drainage ways. Erosion and sediment transport BMPs shall be implemented as necessary. The ECOMP shall also include a site inspection and maintenance program. Site inspection shall occur at the beginning of each irrigation season to evaluate erosion and runoff control devices (e.g., embankments, flow control structures, vegetated ground cover, and others). Project-related erosion or erosion hazards conditions shall be repaired prior to the beginning of the irrigation season. Monthly inspections shall be performed during the irrigation season and repair and maintenance of any runoff or erosion control structures shall be performed as necessary. A final inspection and maintenance of structures shall occur at the end of the irrigation season or by no later than October 15.	LS

LS = Less than Significant   PS = Potentially Significant   S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		Inspection and maintenance reports shall be kept on file by the Applicant or their operations manager and be made available to the SWRCB upon request. The ECOMP shall designate the responsible party(s) for completing inspections, maintenance, and training. Operations and management protocols shall be incorporated into the IWMP to minimize the potential for excessive project irrigation and irrigation runoff. Operator training on effective irrigation and irrigation management shall also be incorporated into the associated IWMP. The IWMP shall designate the responsible party(s) for ensuring compliance with the IWMP.	
4.2-5 Implementation of the proposed project could substantially alter the existing drainage pattern of the POU by increasing the amount of irrigation that could substantially increase the rate or amount of surface runoff in a manner that would result in on-or off-site flooding.	LS	None required.	LS
4.2-6 Implementation of the proposed project could increase surface runoff from the POU that could contribute additional sources of polluted runoff to Swiss Canyon, the tailwater pond, and/or the Pacific Ocean.	PS	4.2-6 Implement Mitigation Measure 4.2-4.	LS
4.2-7 Implementation of the proposed project could alter the local groundwater gradient and cause or contribute to seawater intrusion and aquifer salinity.	LS	None required.	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
4.2-8 Implementation of the proposed project would result in an alteration in the local groundwater to surface water gradients and surface water flow regime with concurrent effects on surface water quality.	PS	4.2-8 Implement Mitigation Measure 4.3-4.	LS
		4.3 Biological Resources (Project Impacts)	
4.3-1 The proposed project could reduce water depths to a level that would impair passage of adult steelhead between November 1 and May 31.	PS	4.3-1 a) In extreme critical dry conditions, when the mean daily flow at the USGS gage is below the 10th-percentile value between December 1 and May 21, pumping shall be reduced to Baseline rates until stream flows exceed the 10th-percentile values for the months of January through April, and the 20th-percentile values for the months of December and May. This measure shall remain in effect until replaced by the flow monitoring and operations plan discussed below (Mitigation Measure 4.3-1(b)). Table A lists the Baseline (Allowable) Diversion Rate pumping rates to be used for Extreme Critical Dry and Critical Dry conditions when mean daily flow at the USGS gage is less than the 10th- and 20th-percentile flow, as described above. b) The Applicant shall prepare a detailed flow monitoring and operations plan, for review and approval by the SWRCB, that provides a structured feedback process whereby streamflows during the adult migration period (between November 1 and May 31) are monitored, passage restrictions evaluated, and changes in Project pumping are made to reduce the effect of Project irrigation on adult steelhead movement. The plan shall be prepared in consultation with NMFS and CDFG. Elements to include within this plan are: real-time monitoring protocols (including protocols established pursuant to Mitigation Measure 4.2-2), the flow thresholds established in the FEIR, pump change requirements, recordkeeping,	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		reporting, and an adaptive management feedback system. Following approval by the SWRCB, this plan shall be incorporated into the IWMP and put into effect.	
4.3-2 The proposed project would reduce water depths to a level that would impair passage of juvenile steelhead between June 1 and October 31.	PS	4.3-2 a) In critical dry conditions, when the mean daily flow at the USGS gage is below the 20th percentile value between July 1 and October 31, project pumping shall be reduced to Baseline (Allowable) Diversion Rates, as specified in Table A (see Mitigation Measure 4.2-2), until streamflows exceed the 20th percentile values for the months of July through October. This measure shall remain in effect until replaced by the flow monitoring plan discussed below (Mitigation Measure 4.3-2(b)). This measure does not limit diversions required to make measurements specified in Mitigation Measure 4.3-2(b), if notification of testing is provided to the SWRCB prior to the test period. b) The Applicant shall prepare a detailed flow monitoring and operations plan in consultation with NMFS and CDFG, for review and approval by the SWRCB, that provides a structured feedback process whereby streamflows during the months of June and October are monitored, passage restrictions evaluated, and changes in project pumping are made to reduce the effect of project irrigation on juvenile steelhead movement. Elements to include within this plan are: real-time monitoring protocols (including protocols established pursuant to Mitigation Measure 4.2-2), the flow thresholds established in the FEIR, pump change requirements, recordkeeping, reporting, and an adaptive management feedback system. Following approval by the SWRCB, this plan shall be incorporated into the IWMP and put into effect.	LS
4.3-3 The proposed project would not increase mean daily water temperatures above 20°C or hourly water temperatures over 24°C.	LS	None required.	LS

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TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
4.3-4 The proposed project would contribute to the reduction of dissolved oxygen (DO) levels in the lower Big Sur River below 7.0 mg/L.	S	4.3-4 a) Reductions in dissolved oxygen (DO) are most problematic during periods of extremely low flow when pumping causes or contributes to stagnant water conditions in the lower river. When mean daily flow at the USGS gage in the Big Sur River is below 10 cfs and mean daily water temperature is above 18°C, the Applicant shall reduce project pumping to Baseline (Allowable) Diversion Rates (see Table A, Mitigation Measure 4.2-2), except as provided in Mitigation Measure 4.3-4(b). Project pumping shall not resume until the mean daily flow is above 10 cfs, regardless of water temperature changes, or until the Applicant can demonstrate to the satisfaction of the SWRCB that DO levels are consistently above those considered stressful to steelhead (6 mg/L). This Mitigation Measure shall remain in force unless the Applicant implements Mitigation Measure 4.3-4(b) in its entirety. This measure does not limit diversions required for making measurements, as specified in Mitigation Measure 4.2-2. b) If the Applicant elects to make project diversions when flow at the UGSG gage is below 10 cfs and mean daily water temperature is above 18°C, then the Applicant must install a seasonal aeration system in the lower river. The goal of such a system would be to provide DO to aquatic species when project pumping may cause or contribute to stagnant conditions. The system shall consist of an electric compressor located near the New Well, temporary piping laid on the surface of the ground to the river bank, and a distribution system of perforated pipe laid on the bottom of the Big Sur River. The in-stream portion of the distribution system shall, at a minimum, result in average river DO level of six (6) mg/l at each passage transect from transect 2 through and including transect 8. The network on the stream bottom shall be painted black or brown to minimize	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact	Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
		visual disruption for park users. All equipment shall be removed from the active channel by November 1. The overall feasibility of such a system is unclear. Aeration systems have been installed on ponds and lakes, but in-stream systems are extremely rare. A feasibility study shall be prepared and all required permits obtained before this measure is implemented in lieu of Mitigation Measure 4.3-4(a). This feasibility study shall include an evaluation of potential impacts associated with implementation of the Mitigation Measure including potential impacts on noise and visual quality, construction impacts associated with installation of the compressor and utility lines, equipment maintenance and operations, and other considerations, as required by the SWRCB. It is expected that the required permits would include specific requirements to minimize potential impacts to aquatic habitat, such as erosion and siltation, from implementation of this Mitigation Measure.	
4.3-5 The proposed project would not result in sedimentation, or other changes in water quality, of habitat used by sensitive amphibians such that the habitat would become unusable for any life stage.	LS	None required.	LS
4.3-6 The proposed project would not result in flow alterations such that amphibian breeding habitat in Swiss Canyon or the Big Sur River becomes unsuitable.	LS	None required.	LS
4.3-7 The proposed project would not result in flow alterations that would create unsuitable habitat for aquatic reptiles.	LS	None required.	LS
4.3-8 The proposed project would not result in degradation of sensitive vegetation communities.	LS	None required.	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)		Level of Significance After Mitigation
CUMULATIVE IMPACTS					
4.2 Hydrology, Geohydrology, and Water Quality (Cumulative Impacts)					
4.2-9	**The proposed project could contribute to reductions in local groundwater levels but would not substantially reduce groundwater supplies.**	LS	None required.		LS
4.2-10	**The proposed project could contribute to reductions in the groundwater to surface water gradient and reductions in flow within the Big Sur River, which, in turn, may alter the natural channel forming flow regime.**	PS	4.2-10	Implement Mitigation Measure 4.2-2.	LS
4.2-11	**The proposed increase in pasture irrigation in combination with past practices on the project site could contribute to substantial alterations in the drainage pattern of the POU and increased erosion or siltation on- or off-site.**	PS	4.2-11	Implement Mitigation Measure 4.2-4.	LS
4.3 Biological Resources (Cumulative Impacts)					
4.3-9	**The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of adult steelhead between November 1 and May 31.**	PS	4.3-9	Implement Mitigation Measures 4.3-1(a) and 4.3-1(b).	LS
4.3-10	**The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of juvenile steelhead between June 1 and October 31.**	PS	4.3-10	Implement Mitigation Measures 4.3-2(a) and 4.3-2(b).	LS
4.3-11	**The proposed project would not increase mean daily water temperatures above 20°C or hourly water temperatures over 24°C.**	LS	None required.		LS
4.3-12	**The proposed project would contribute to the cumulative reduction of dissolved oxygen (DO) levels in the lower Big Sur River below 7.0 mg/L.**	PS	4.3-12	Implement Mitigation Measures 4.3-4(a) and 4.3-4(b).	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)	Level of Significance After Mitigation
4.3-13	**The proposed project would not result in sedimentation, changes in water quality, or alteration in flow, such that the habitat used by sensitive reptiles or amphibians would become unusable for any life stage.**	LS	None required.	LS
4.3-14	**The proposed project would not contribute to the cumulative degradation of sensitive vegetation communities along the Big Sur River or on the El Sur Ranch site.**	LS	None required.	LS
Climate Change (Cumulative Impacts)				
5-1	**Implementation of the proposed project, in combination with past, ongoing, and future diversions could alter the groundwater-to-surface water gradient and reduce the water surface elevation within the lagoon.**	LS	None required.	LS
5-2	**Implementation of the proposed project, in combination with past and ongoing diversions, could alter the local groundwater gradient and cause or contribute to cumulative seawater intrusion and aquifer salinity changes associated with global climate change.**	LS	None required.	LS
5-3	**Implementation of the proposed project, in combination with past and ongoing diversions and development in the watershed, would result in an alteration in the local groundwater-to-surface water gradients and surface water flow regime with concurrent effects on surface water quality. This could incrementally contribute to global climate change-related changes in surface water quality in the Big Sur River.**	LS	None required.	LS

LS = Less than Significant PS = Potentially Significant S = Significant

TABLE 3-1

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Impact		Level of Significance Prior to Mitigation	Mitigation Measure(s)		Level of Significance After Mitigation
5-4	**Implementation of the proposed project, with past and ongoing diversions and development in the watershed, would contribute to cumulative climate change-related impacts on upstream migrating adult steelhead and rearing juvenile steelhead because of expected increased frequency and duration of low flows in the Big Sur River and low-DO conditions.**	PS	5-4	Implement Mitigation Measures 4.3-1, 4.3-2, and 4.3-4.	LS
5-5	**Proposed project energy use associated with operation of the groundwater wells, in combination with past and ongoing energy use and air emissions in the watershed, would contribute to greenhouse gas emissions.**	LS	None required.		LS

LS = Less than Significant PS = Potentially Significant S = Significant

4. ENVIRONMENTAL ANALYSIS

4.1 Introduction to the Environmental Analysis

4.1 Introduction to the Environmental Analysis

INTRODUCTION

Section 4.1 of this DEIR describes the overall approach to the evaluation of proposed project impacts and the contents of the technical sections presented in Chapter 4. In addition, this section describes the development of "environmental baseline conditions" that form the basis of the assessment of environmental impact in this DEIR. The difference between baseline conditions and conditions created by the proposed project represents the potential for project impact. How this "net change" is characterized with respect to the requested appropriation (diversion maximums and limits) is also discussed in the following section.

OVERVIEW OF APPROACH TO IMPACT ASSESSMENT

An EIR analyzes the environmental effects of a proposed project, indicates ways to reduce or avoid potential environmental damage resulting from the project, and identifies alternatives to the proposed action. The purpose of this DEIR is to provide the public and decision makers with an objective analysis of these issues. The DEIR does not recommend either approval or denial of the project, but provides information to aid in the decision-making process, taking the environmental consequences of the proposed project into account. The Environmental Analysis section of this DEIR discusses the environmental setting, impacts, and mitigation measures for Hydrology, Geohydrology, and Water Quality (Section 4.2) and Biological Resources (Section 4.3). For the following topics, the analysis in the Initial Study (Appendix A) concluded the proposed project would result in no impact or impacts would be less than significant: Aesthetics, Agricultural Resources, Air Quality, Cultural Resources, Hazards and Hazardous Materials, Land Use, Mineral Resources, Noise, Population and Housing, Public Services, Recreation, Transportation and Traffic, and Utilities/Service Systems. No comments were received on the NOP (Appendix A) or during agency scoping meetings (see Chapter 1, Introduction) that indicated that additional analysis of those topics should be included in this DEIR.

Technical Analysis Section Format

The two technical sections presented in this DEIR (4.2: Hydrology, Geohydrology and Water Quality and 4.3: Biological Resources) are divided into four subsections, including; Environmental Setting; Regulatory Setting; Impact Standards of Significance; and Impacts and Mitigation Measures. Each impact and mitigation section includes an assessment of direct, indirect and cumulative impact that may occur with implementation of the proposed project.

Each technical section in this DEIR begins with a description of the proposed project's **environmental setting** and a **regulatory setting** as it pertains that particular issue. The environmental setting provides a point of reference for assessing the environmental impacts of the proposed project and alternatives. The setting discussion addresses the conditions that exist prior to implementation of the proposed project. This setting establishes the baseline by which the proposed project and alternatives are measured for environmental impacts. The regulatory setting discussion presents pertinent laws, ordinances, regulations and standards that are relevant to implementing the project, and describes the roles and responsibilities of regulatory agencies that are or will be involved with project permitting and implementation.

Standards of significance are used to determine if the impact of the proposed project, when evaluated against the environmental baseline, could result in a "significant" environmental impact under CEQA. Under CEQA Guidelines Section 15064(b), "the determination of whether a project may have a significant effect on the environment "calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An iron-clad definition of significant effect is not always possible because the significance of an activity may vary with the setting." Thus, the standards of significance are specific to each technical issue area and are explained in the technical chapters. The standards of significance are intended to provide a "bright line" of demarcation between a less-than-significant impact and a significant impact.

The standards of significance description in each section is followed by an **impacts and mitigation** section. This section includes a description of the methods used to evaluated impacts and presents the determination of all impacts found to be significant and data and analysis to support that conclusion. In accordance with the requirements of CEQA, the DEIR addresses all potential impacts that arise as a direct or indirect result of the project. In addition, the DEIR must address all impacts that may be considered individually to be insignificant, but whose contribution to the cumulative impact on a resource is considerable when viewed in light of similar impacts from past, present and foreseeable projects. For all impacts found to be significant, the Lead Agency must list feasible measures to mitigate impacts to a less-than-significant level, when such measures are available.

The impacts and mitigation portion of each section of this DEIR is formatted to include impact statements, prefaced by a number in bold-faced type. An explanation of each impact is followed by an analysis of its significance. Mitigation measures pertinent to each individual impact appear after the impact section. The degree of relief provided by identified mitigation measures is also evaluated. An example of the project-specific impact and mitigation format is shown below:

Impact 4.X-1	**Statement of impact for the proposed project.**

General discussion of impact for the proposed project in paragraph form. Statement of the ***level of significance*** before mitigation in bold type and italics.

Mitigation Measures

Statement that the following mitigation measure(s) would/would not reduce the above impact to a *less-than-significant level.*

4.X-1 (a) *Recommended mitigation measure in italics and numbered in consecutive order.*

(b) *Additional mitigation, as necessary.*

Discussion of how the mitigation measure(s) would reduce the impacts.

Cumulative Impacts

As noted above, each impact and mitigation subsection of the DEIR includes an assessment of cumulative impact. As required by CEQA (Section 15130 of the CEQA Guidelines), the proposed project is analyzed in relation to other projects in the area having impacts that are considered to overlap or interact in a cumulative manner with those of the proposed project. It is important to consider the combined effects of all past, present, and reasonably foreseeable future projects to determine the cumulative effect of these projects on the region because, even though a single project may have individually minor impacts, when considered together with other projects, the effects may be collectively significant. A cumulative impact, then, is the additive effect of all projects in the same geographic area producing related impacts. The project itself would have a significant cumulative impact if the project's contribution to the overall significant cumulative effect is of a cumulatively considerable magnitude.

An introductory statement that defines the cumulative context for each impact topic is included. In general, there will be a cumulative impact discussion that corresponds to each of the project-specific impacts. However, in some instances, an impact will be specific to the project and will not contribute to cumulative conditions. Where appropriate, analysis includes an explanation as to why those impacts would not contribute to cumulative impacts.

Impact 4.X-2	**Statement of impact in combination with cumulative development.**

Discussion of cumulative impact and how the proposed project would contribute to it. Statement of ***level of significance*** for cumulative impact.

Mitigation Measures

Statement that the following mitigation measure(s) would/would not reduce the above impact to a *less-than-significant* level.

4.X-2 (a) *Recommended mitigation measure presented in italics and numbered in consecutive order.*

(b) *Additional mitigation, as necessary.*

Discussion of how the mitigation measure(s) would reduce the impacts.

CEQA REQUIREMENTS PERTAINING TO BASELINE CONDITIONS

Overview

In CEQA impact analyses, potential project impacts are assessed against environmental *baseline* conditions. An EIR must include a description of the physical environmental conditions in the vicinity of the project as they exist at the time the NOP is published. This environmental setting will normally constitute the baseline conditions by which the lead agency determines whether an impact is significant. By definition, if a project results in no significant adverse changes in environmental baseline conditions, then no significant impact will occur requiring mitigation under CEQA.

Approval of water right Application No.30166 would establish an appropriative water right for diverting water from the Big Sur River to be applied on El Sur Ranch's irrigated pastureland, thus allowing continuation of an existing, but unpermitted, water right activity. Water diverted under the proposed water right would be applied on 267 acres of the Ranch's 292-acre pastureland. For purposes of the application, and as used in this DEIR, irrigated acreage would include 25 acres of the riparian land that are served under the Ranch's existing riparian water right. The irrigated area, which includes the riparian land, comprises the Place of Use (POU) for the water right, the boundary of which is illustrated in Figure 2-2 in Chapter 2, Project Description. As discussed in Chapter 2, the total water use on the Ranch's POU would not exceed the amount allowed under the requested permit.

CEQA Baseline as Defined in this DEIR

The SWRCB issued a NOP for this project on June 2, 2006. Thus, the environmental setting at this time constitutes the baseline physical conditions against which impacts of the project will be evaluated. As part of identifying this baseline condition, however, the SWRCB also had to consider the Ranch's historic water diversions, which are part of the existing environment. The SWRCB considered several options in accounting for the Ranch's historic diversions as part of the existing environment.

Ultimately, as described in the 2006 Initial Study, the SWRCB defined a baseline that reflected the Ranch's average annual use over a 20-year period of record – from 1983 to 2002 – when both wells were in operation. For purposes of this document, the period of record is 1985 to

2004. The year 1985 was chosen for the beginning of the 20-year period because that was the year that both wells (the Old Well and New Well) began operating simultaneously. The 20-year period ends with the year 2004 because that was the last year data was available prior to the issuance of the NOP in 2006. For analytical purposes, the difference between the period of record identified in the Initial Study (1983-2002) and the period analyzed herein (1985-2004) is insignificant.

In contrast, selecting a single year of water use would have been misrepresentative of historic conditions because there have been and will continue to be, significant variations in weather conditions and associated irrigation demands from year to year. Historic conditions have included a broad range of diversions to meet irrigation demands based on environmental conditions, ranging from lows of 476 AF in 1983 (the wettest year on record) and 468 AF in 1998 (another very wet year) to a high of 1,611 AF in 1977 (the driest year on record). The highest observed usage (1,737 AF in 1984) is likely an outlier because that was the year the new well was placed into service and includes significant usage for pump testing in addition to meeting irrigation demands.

Using the 20-year period as the representative period of water use and averaging the Ranch's documented annual water use over this period of time produces an average baseline condition of 857 AFA. The highest usage during the period of 1985 to 2004 was 1,136 AF in 2004. The highest usage during the primary irrigation period of July 1 through October 31 came in 1990 with a total of 701 AF. Averaging water use over this 20-year period provides a reasonable assessment of the Ranch's historic water use over a range of water year types under the present conditions with both wells operating.

As a result, the SWRCB will consider the environmental effects of authorizing the increase in diversion from the average existing use over the period 1985-2004 of 857 AFA, with a maximum historic use of 1,136 AFA and a maximum historic seasonal usage of 701 AF.

Hydrological Baseline Conditions and Impact Determination

The difference between baseline diversions for El Sur Ranch irrigated pasture and diversions that would occur under the proposed project is the basis for determining potential direct project impacts on surface water and groundwater hydrology and indirect impacts on water quality and biological resources in Sections 4.2 and 4.3 of this DEIR. For purposes of this EIR, this difference is defined by the average difference between the historic conditions and the calculated demand for maximum pasture production on the project's place of use (POU). As noted above, this is the difference between the 20-year average baseline condition of 857 AFA (representing the existing condition) and the proposed project of a 20-year average of 1,200 AFA, (which represents the calculated actual average irrigation demand).

The difference between these two figures represents a 20-year running average maximum delta of 343 AFA. The difference between the highest usage single-year usage during the 20-year period (1,136 AF) and the requested maximum (1,615 AF) is 479 AF. The difference between the 20-year average and the highest calculated water irrigation requirement (estimated at 1,441 AF in 1997) is 305 AFA.

As a result, the proposed project represents an average increase (20-year running average) of 343 AFA and a maximum annual increase of 489 AF at the times of maximum diversion, although the difference of the maximum calculated requirement is only 305 AF (see Table 4.1-1). These differences represent the project to be analyzed in this DEIR in comparison with the baseline.

TABLE 4.1-1

WATER RIGHT APPLICATION NO.30166
SUMMARY OF BASELINE ASSUMPTIONS AND PROPOSED CHANGES (1985-2004)
AS EVALUATED IN THIS DEIR

Diversion Type	Baseline[1] 1985-2004	Proposed Project[2] 19 years plus next year	Net Change Evaluated in the DEIR
Maximum annual usage	1,136 AF (2004)	1,615 AF	+479 AF
Maximum calculated usage	1,441 AF (1997)	1,615 AF	+174 AF
20-year annual rolling average	857 AF	1,200 AF	+343 AF
30-day average rate (5.34 cfs)	234 AF (Aug/Sept 1997)	318 AF	+84 AF
Maximum monthly rate	5.84 cfs	5.84 cfs	+0 cfs
Maximum monthly diversion (July 1 – Oct 31)	269 AF (Sept 1997)	230 AF	- 39 AF
Maximum seasonal diversion (July – Oct 31)	701 AF (1997)	735 AF	+34 AF

Notes:
1. See Table 2-1, this DEIR (1985-2004 historic average with two wells in operation).
2. El Sur Ranch Application No. 30166, revised October 17, 2006
Source: El Sur Ranch Application No. 30166, revised October 17, 2006; ESR Technical reports (SGI 2005, 2006).

According to the terms presented in the latest water right application, the requested permit would include "an absolute limit on the amount of water that may be diverted from July 1 through October 31 of each year and a specific cap on monthly diversions during that period. This 'seasonal limit' is based on crop water needs for optimal forage production, and the monthly cap provides slightly more than that amount, to provide flexibility for unforeseen conditions such as pipeline breaks, labor disruptions and other unavoidable circumstances, without violating permit terms."

As noted above, the above discussion addresses only hydrological baseline conditions directly related to diversions, and is not intended to serve as a comprehensive description of the environmental setting. The environmental and regulatory setting descriptions for hydrological and biological resources are presented in Sections 4.2 and 4.3 of this DEIR, respectively.

4.2 Hydrology, Geohydrology, and Water Quality

4.2 Hydrology, Geohydrology, and Water Quality

INTRODUCTION

This section describes the hydrology and water quality conditions present at the project site, including surface and groundwater resources, and potential impacts of the project on those resources. This section also describes regulations, laws and ordinances in place that pertain to these resources. As described in Chapter 2 (Project Description) of this DEIR, the proposed project is the acquisition of an appropriative water right to allow the continued diversion of water from two wells near the Big Sur River) to serve irrigated pasture within the 267-acre POU on El Sur Ranch (the Ranch). Diversions under the proposed water right could affect surface water flow in the river, surface water elevations, dissolved oxygen (DO) levels, salinity, aquatic habitat, as well as local groundwater resources in the area. Key elements of the impact evaluation presented in this section include potential project effects on groundwater and surface water depths, flow within the river, and changes in surface water quality during operation of the proposed project. Because it is relevant to the evaluation of groundwater resources and potential project impacts on soil erosion and water quality, this section also contains a discussion of geological and soils resources.

Information presented in this section has been obtained through a review of the reports that were prepared and submitted in support of Water Right Application No. 30166 El Sur Ranch, Monterey County, California (SGI and Hanson 2005), Additional Data Collection and Analysis of The Big Sur River and El Sur Ranch Pastures, 2006-2007 in Support of Water Right Application #30166 Volume 2 (SGI and Hanson 2007), Additional Data Collection and Analysis of The Big Sur River Hydrology and Biology Low Flow Conditions 2007 in Support of Water Right Application #30166 Volume 3 (SGI and Hanson 2008), as well as the Monterey County California Big Sur Coast Land Use Plan Local Coastal Program (County of Monterey Planning Department 1986), Big Sur River Protected Waterway Management Plan Local Coastal Program (County of Monterey Planning Department 1986), Water Quality Control Plan for the Central Coast Region (CCRWQCB 1994 [Basin Plan]), and other available references as cited.

Throughout this section there are references to specific hydrologic data (figures and graphics, and appendices) included in technical reports prepared by The Source Group (SGI) and Norcal Geophysical Consultants, Inc. (NGCI). The referenced data are provided in Appendix E in this DEIR and are arranged by report year.

Issues identified in letters of response to the NOP/Initial Study are also addressed in this section. Applicable issues that were identified primarily pertain to extraction of groundwater that could affect flow within the Big Sur River during critical dry periods, which could, in turn, affect aquatic habitat, water availability and water balance, DO, salinity and seawater intrusion, water temperature, riparian health and canopy, winter diversions, groundwater elevations and quality, and losing and gaining conditions along the Big Sur River. Additional effects of potential increases in diversion amounts could affect runoff water quality, erosion and sediment transport, and drainage pathways. The effect of the proposed project on biological resources due to potential changes in aquatic habitat, riparian health and canopy, and water quality parameters, are addressed in the Section 4.3, Biological Resources, of this DEIR.

ENVIRONMENTAL SETTING

Physical Environment

The project site is located on the El Sur Ranch along the Big Sur Coast in Monterey County, California, roughly 25 miles south of the City of Monterey on State Route 1 (Highway 1) between the Santa Lucia Mountains to the northeast and the Pacific Ocean to the southwest (Figure 2-1 in Chapter 2, Project Description). The Ranch was established in 1834 and consists of approximately 7,000 acres of privately-owned land located immediately north of the Big Sur River and Andrew Molera State Park and approximately one and one-half miles south of the Point Sur State Historic Park. The proposed project would serve approximately 267 acres of irrigated pasture on 292 acres of the Ranch; an additional 25 acres of the 292 acres is occupied by existing infrastructure such as access roads, irrigation canals, and a holding pond and do not serve as pasture on the proposed project site. Water for the proposed project would be extracted from two off-site wells, the Old Well and New Well, located on the alluvial floodplain aquifer near the Big Sur River. The locations of these features are shown in Figures 2-2 and 2-3 in Chapter 2, Project Description.

The alluvial floodplain area to the west of the river is termed for purposes for the analysis in this section, the 'area of diversions'. The area served by the proposed project irrigation is the POU. The project site includes both of the project's points of diversion (Old Well and New Well); the POU and areas supporting related irrigation facilities such as the tailwater pond, irrigation features; and tailwater outfalls. The area to the southeast of the river is referred to as the Creamery Meadow and is not considered part of the project site (see Figure 2-2).

Regional Setting

Surface Hydrology

The project site is located within the Central Coast Hydrologic Region (HR), the Santa Lucia Hydrologic Unit (HU), Hydrologic Area (HA), and Hydrologic Sub-Area (HAS), Pfeiffer Big Sur Super Planning Watershed (SPWS), Big Sur River Planning Watershed (PWS) (project site south of Swiss Canyon), and the Little Sur River SPWS and Point Sur PWS (project site north of Swiss Canyon).

The Central Coast Hydrologic Region is an over 300-miles-long by 40-mile-wide section of the State's central coast. Its geographic area encompasses all of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara Counties as well as the southern one-third of Santa Clara County, and small portions of San Mateo, Kern, and Ventura Counties (Basin Plan 1994). Included in the region are urban areas such as the Monterey Peninsula and the Santa Barbara coastal plain; prime agricultural lands as the Salinas, Santa Maria, and Lompoc Valleys; National Forest lands, extremely wet areas like the Santa Cruz mountains; and arid areas like the Carrizo Plain.

The seacoast within the Central Coast HR is rugged with three parallel ranges of the Southern Coast Mountains within the interior. Ridges and peaks of these mountains, the Diablo, Gabilan, and Santa Lucia Ranges, reach to 5,800 feet with broad valleys in between (Basin Plan 1994). These Southern Coast Ranges abut the west to east trending Santa Ynez Mountains of the Transverse Ranges that parallel the southern exposed terraces of the Santa Barbara Coast.

This coastal area includes urbanized and agricultural areas along Monterey Bay, the Big Sur Coast, Morro Bay, the sandy clam beds of Pismo Beach, and a varied coastline south to Point Conception and eastward along the terraces and recreational beaches that line the Santa Barbara Channel. Variations in terrain, climate, and vegetation account for many different landscapes; seacliffs, sea stacks, white beaches, cypress groves, and redwood forests along the coastal areas contrast with the dry interior landscape of small sagebrush, short grass, and low chaparral.

Big Sur River Watershed

The entire Big Sur Watershed is about 58.9 square miles in area.[6] Water from the upper basin is funneled through the Big Sur Gorge in the eastern portion of Pfeiffer-Big Sur State Park. The Lower Big Sur River Basin is approximately 10.2 square miles in area[7] on the west slope of the Santa Lucia Mountain Range. The river enters its lower basin through the Big Sur Gorge at the eastern boundary of Pfeiffer-Big Sur State Park, and then flows in a northerly direction through the Big Sur Valley, parallel to State Highway One, to the mouth in the Andrew Molera State Park, a distance of approximately 7.6 miles (PWMP 1986). Pfeiffer Ridge, averaging six to seven hundred feet in elevation, separates the Big Sur Valley from Sycamore Canyon and the Pacific Ocean to the west (PWMP 1986). The common ridge of Post Summit (3,455 feet) and Manuel Peak (3,379 feet) divides the Lower Big Sur from the south fork of the Little Sur River to the east. Major tributaries from the eastern (west-facing) slope include Pfeiffer-Redwood Creek, Juan Higuera Creek, and Pheneger Creek (PWMP 1986). The Post Creek drainage defines the southern limit of the basin which is bounded on the east by Pine Ridge (LUP/LCP 1986). At the north end of the valley, the Big Sur River again turns west across an extensive floodplain as it

6 This area is calculated by sum of contributing watersheds based on the Calwater 2.2.1 (2004), the State GIS watershed delineations.

7 This area is calculated by sum of contributing watersheds based on the Calwater 2.2.1 (2004), the State GIS watershed delineations.

nears its mouth. The mouth of the Big Sur River forms a lagoon that changes in size and shape as the sandbar between the river and the ocean changes with the seasons.

A U.S. Geological Survey (USGS) stream gauge is located on the Big Sur River just below the Big Sur River Gorge (next to the abandoned bridge abutment in Weyland Camp - 0.4 miles upstream from the mouth of Post Creek) in Pfeiffer-Big Sur State Park about 7 miles upstream of the El Sur Ranch diversion wells (USGS Station No. 11143000). The Big Sur River is in a relatively natural state, unregulated by any dams, and there are no known diversions upstream from the USGS gage. Consequently, the USGS gage measures unimpaired streamflow and the natural hydrology of the river.

Flow at the USGS gage station was used to identify Big Sur River flow classifications (Critical Dry, Dry, Normal, Above Normal, and Wet) for the three study years. Table 4.2-1 lists the historic flow rates and classifications. Critical Dry conditions correspond to flows less than the 20^{th} percentile non-exceedance flow rate.[8] Dry conditions correspond to flow rates within the 20^{th} to 40^{th} percentile of flows; Normal conditions correspond to flows within the 40^{th} to 60^{th} percentile flow rates; Above Normal conditions correspond to flows within the 60^{th} to 80^{th} percentile flows rates; and Wet conditions correspond to flows above the 90^{th} percentile flow rate. The flow percentiles were based on the average daily flow rates for the period of record, USGS daily flow records from April 1, 1950 through August 18, 2008. Classification of flow regimes is used to interpret study data and to identify impacts when conditions may be constrained by natural flows.

Flow in the Big Sur River is characterized by high and rapid peak flows in response to rainfall events with an annual recession to base flow that persists through the dry season above the Andrew Molera State Park. Base flow in the late summer is comprised of the gradual drainage of water stored in bedrock fractures and the unconsolidated alluvial deposits within the upper watershed. The amount of base flow each year appears to be related to the total amount of precipitation during the preceding winter (Jones and Stokes 1999). During the Critical Dry years, base flow is less than 8.3 to 17 cubic feet per second (cfs). During Normal years, base flow is about 12 to 25 cfs, about 45 to 200 percent higher than Critical Dry years.

Water Use

Water use in the Lower Big Sur River Basin is characterized by individual and small community water systems at numerous points along the valley floor and tributary streams (PWMP 1986). These water systems serve the residences in the Big Sur Valley, the restaurants, motels, and stores along Highway 1, and the campgrounds along the river (PWMP 1986).

8 In other words, for the period of record, 20 percent of flows are less than the 20th percentile flow.

TABLE 4.2-1

AVERAGE DAILY HISTORIC FLOW RATES AT USGS GAGE NO. 11143000 BIG SUR RIVER NEAR BIG SUR CALIFORNIA (CFS)

	Non-Exceedance Flow Rates[a]							
Month	**10%**	**20%**	**40%**	**60%**	**80%**	**Median[b]**	**Minimum**	**Maximum**
January	18	25	51	129	315	86	6.3	3830
February	26	49	90	168	418	120	7.1	3770
March	34	53	89	169	334	119	10	4150
April	26	37	60	104	192	78	7.5	3260
May	17	25	39	63	96	49	6.7	918
June	12	16	25	39	56	32	4.6	164
July	7.8	11	17	25	36	21	4.5	85
August	6.9	9	13	19	25	15	2.6	61
September	6.6	8.3	12	17	20	14	2.6	400
October	7.2	9	13	17	21	15	2.6	676
November	10	12	17	21	32	19	2.6	2540
December	13	18	26	49	116	36	5.8	4120
Annual	24.7	42.0	72.5	103.5	156.4	78.3	14.3	323
Seasonal (July through October)	7.0	9.3	13.0	19.0	25.0	16.0	2.6	676

Notes:
[a] Non-Exceedance Flow Rates: for any given month in the historical record, a percentage of daily flows will not exceed a certain flow rate. For January, 10 percent of daily flow rates will not exceed 18 cfs. The Department of Water Resources characterizes flows less than the 20 percent non-exceedance flow rate as Critical Dry; 20 to 40 percent non-exceedance flow rate as Dry; 40 to 60 percent non-exceedance flow rate as Normal; 60 to 80 percent non-exceedance flow rate as Above Normal; and greater than the 80 percent non-exceedance flow rate as Wet.
[b] The median flow rate is the flow rate where 50 percent of daily flows are greater and 50 percent are less.
cfs = cubic feet per second
Source: PBS&J 2008 and USGS daily flow records 4/1/1950 through 8/18/2008.

The only development of water for agricultural purposes is near the mouth of the Big Sur River associated with the El Sur Ranch operations (PWMP 1986). The largest single water system serves Pfeiffer-Big Sur State Park (PWMP 1986). Four mutual water companies transport and supply water out of the Lower Big Sur River Basin to supply properties on the west slope of Pfeiffer Ridge. Most of the isolated home sites in the Big Sur Valley have their own wells and/or springs.

The vast majority of the water systems (two or more connections) are either relatively shallow wells sunk in the alluvium alongside the Big Sur River or stream diversions on the mid- and upper- portions of the major tributary creeks (PWMP 1986). Table 5-1 (see Chapter 5 of this DEIR) lists the known water rights applications on file with the State Water Resources Control Board.

Geology and Soils

The regional geology is dominated by the general structural trend of the Coast Ranges and Santa Lucia Mountains. The main structural features are the Sur Hill fault and Sur fault (Sur Thrust) thrust faults and associated rock formations that were thrust several thousand feet upward and over both younger and older geologic formations. Movement of these faults was in a generally southwesterly direction. The Big Sur River crosses the northwest-trending Sur

Thrust, the major structural boundary of the Santa Lucia mountain Range. East of the Sur Thrust are Cretaceous-aged granitic intrusive rocks and pre-Cretaceous-aged metamorphic roc (primarily gneiss, quartzite, and schists) of the Sur Series (Sur Complex) (Trask, 1926).

The Sur Thrust splits into two parallel faults in the Big Sur area, the Sur Hill fault on the east and the Sur fault on the west. Between these two faults is a narrow wedge of Tertiary-aged sandstone, sometimes called the Santa Margarita Sandstone (Oakeshott, 1951). These rocks form a weak foundation along the base of hillslopes northeast of the Big Sur River and are more easily weathered and eroded than those of the Sur Series that are stacked above them to the west.

The Franciscan Formation lies to the west of the Sur Thrust faults. These rocks are primarily sandstone and shale. Slopes are generally less steep on the Franciscan rocks and alluvial deposits discontinuously overlie the bedrock geology along the Big Sur River where it flows between and across the Sur Thrust faults.

The strike of the Franciscan Formation beds is roughly parallel to the coast line and the dip is fairly uniformly 40 to 60 degrees northeast (Gilbert, 1971). This belt of the Franciscan Formation rocks forms a mixed underlying geology of sheared and faulted medium-grained, lithofeldspathic wacke or greywacke (a type of sandstone), micrograywacke, silt stone, or shale and conglomerate containing clasts of greywacke, siltstone, chert, and metavolcanic rocks in exposures along the coast between Point Sur and the Big Sur River.

Climate

The jagged topography within the region causes many different microclimates such that redwoods grow within sight of cacti. However, overall, the climate in the Big Sur area is a Mediterranean climate with mild temperatures year-round and sunny, dry summer and fall, and cool, wet winter. At Big Sur State Park, long term climate (from 1915 to 2008) average annual precipitation is 40.9 inches with about 93 percent occurring from November through April (WRCC n.d.). Mean monthly maximum temperature during the summer is 76.1 degrees Fahrenheit (ºF) and mean monthly minimum temperature is 49.6ºF (WRCC 2008). In the winter, mean monthly maximum temperature is 60.3ºF with a mean monthly minimum temperature of 43.9ºF (WRCC 2008). Daily extreme high temperatures can reach 101ºF in the summer and 85ºF in the winter (WRCC 2008). Further inland, away from the ocean's moderating influence, temperatures are much more variable.

Regional Water Quality

According to the Water Quality Control Plan for the Central Coast Region (CCRWQCB 1994 [Basin Plan]), adequate quality water for many beneficial uses in the Central Coastal Basin is considered to be in short supply. Water rationing for domestic purposes is sometimes implemented during water shortages. The use of water by the human population and its activities is increasing in the basin. Water mining and seawater intrusion have also occurred in some locations. Consequently, the competition for water of adequate quality is expected to become more intense in the future. Water quality problems most commonly encountered in the Central Coastal Basin are excessive salinity or hardness of local groundwater. Groundwater basins containing 1000 mg/l Total Dissolved Solids (TDS) or higher are found near Hollister, the Lower Forebay of the Salinas Sub-basin, the Carrizo Plain, the Santa Maria and Cuyama Valleys, San Antonio Creek Valley, Lompoc and Santa Rita Basins of the Santa Ynez River Valley, and Goleta and Santa Barbara. The Carrizo Plain groundwater is the most highly mineralized in the Central Coast region, averaging over 5,000 mg/l TDS. Increasing nitrate concentrations is a growing problem in the Salinas River Basin, Los Osos Creek Basin, the Santa Maria Valley, and near Arroyo Grande. Surface water problems are less frequently evident, although bacteriological contamination of coastal waters has been a problem in Morro Bay and South Santa Barbara County. Eutrophication[9] occurs in Pajaro River and Llagas Creek, Salinas River below Spreckels, and in the lower reaches of San Luis Obispo Creek. Some streams in the basin are naturally highly mineralized and contribute to the excessive salinity of local groundwater; examples include Pancho Rico Creek in the Salinas River Sub-basin, and the Cuyama River in the Santa Maria Sub-basin, which both contain more than 1000 mg/l TDS.

Local Setting

Geology

The project site is underlain mainly by Pleistocene-aged marine and marine-terrace deposits (CGS, 1971). These coastal terrace deposits are described as partially consolidated marine sand with discontinuous gravel layers overlying volcanic rocks, mudstones, and silica-rich rocks such as chert that were likely laid down as beach deposits when the sea level was falling during Pleistocene time (CGS, 1971). Locations along the southern area of the project site, including the area of diversions, are underlain by Holocene-aged alluvium (CGS, 1971). These sediments are unconsolidated and heterogeneous and contain silt, sand, and clay, with locally containing large amounts of gravel. These deposits are underlain by the Franciscan Formation at depth. The Franciscan Formation is a varied formation with several different rock types occurring throughout the project area. It is a mélange of fractured sandstone, greywacke, chert, metavolcanics, and other rock types (Jones and Stokes 1999). This formation is mainly composed of greywacke sandstone, or deep-sea trench deposits, in the vicinity of the project site (CGS, 1971). Along the weathering-resistant narrow ridge at the ocean's edge, the Franciscan Formation consists of massive sandstone, fractured shale, and altered volcanic rock (metavolcanic rock) known as greenstone.

The Franciscan Formation bedrock underlying the alluvium in the project area where the diversion wells are located (north of the Big Sur River) consists of dark gray clay that grades into a weathered micro-graywacke at depth, as evidenced in core samples collected during the

9 Eutrophication refers to the process of fertility/nutrient enrichment, often resulting in excessive algal growth.

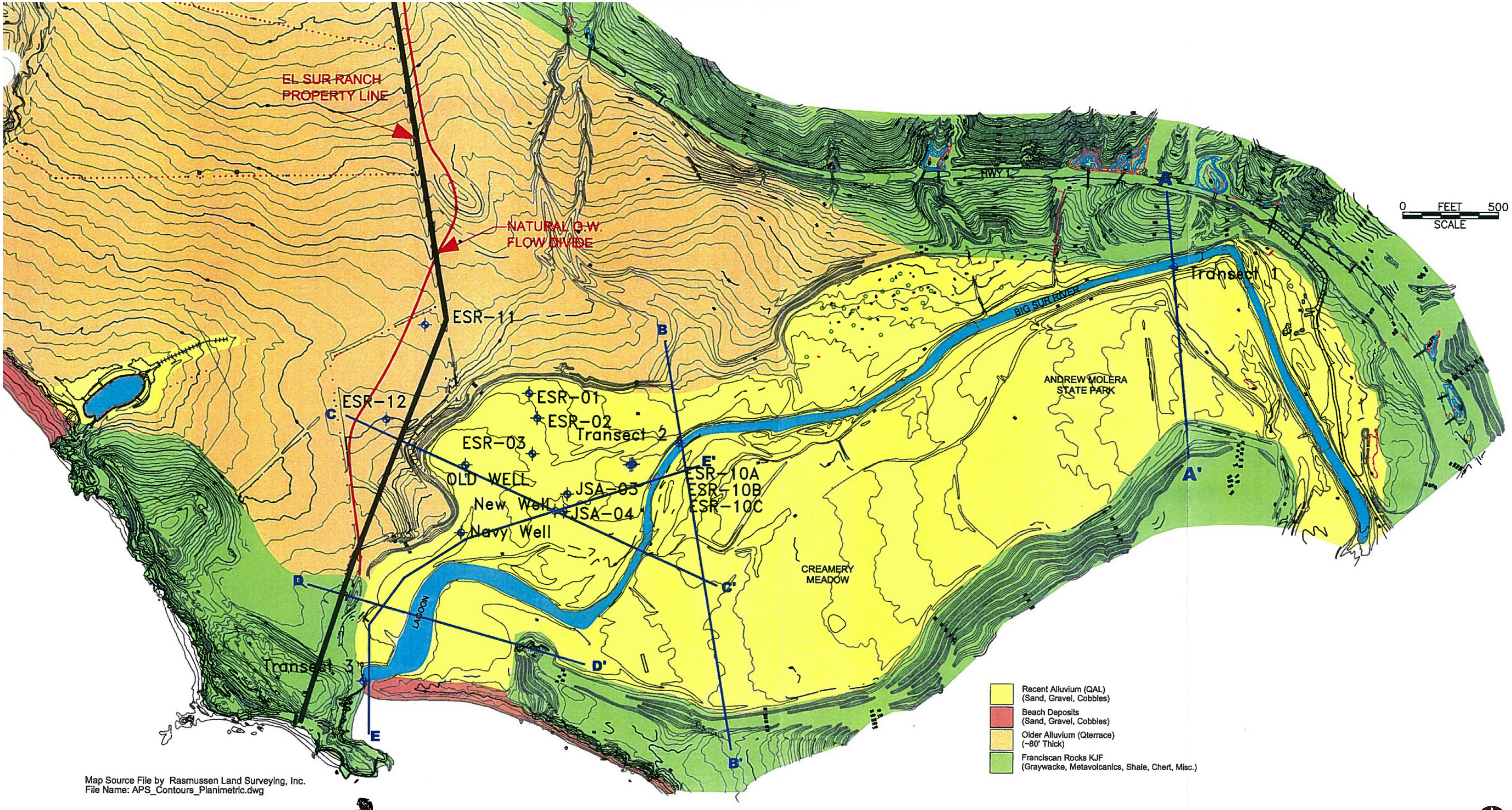
drilling of monitoring wells for the 2004 monitoring study (SGI 2005). This bedrock formation stores and transmits a small amount of water in fractures but its overall storage capacity and permeability are much smaller than those of the sands and gravels in the overlying groundwater basin (Jones and Stokes 1999).

Figure 4.2-1 shows the local geology. Figures 4.9-2a and 4.9-2b show subsurface geology along cross-sections through the project area.

A series of terraces up to 500 feet in elevation occurs along the coast from south of Point Sur to south of the Big Sur River and forms the ocean-side cattle grazing lands of the El Sur Ranch, including the POU. The terraces slope gently seaward at about 2-3 degrees (3 to 5 percent slope) (REJA 2007). This terrace separated the mouth of the Big Sur River from the abrupt rise of the Santa Lucia Mountains to the east (SGI 2005). This terrace alluvium is poorly stratified, poorly sorted, and very angular material and the type of rocks found depends upon the nature of rock present in the mountains to the east of the terraces (SGI 2005). A cliff along the coastlines terminates the terrace abruptly. The terrace deposits at the project site consist of primarily of semi- to weakly-consolidated material made up of cobbles, gravel, sand, silt, and some clay (SGI 2005). To the east, where the land rises, landslide deposits consisting of rock and mudflow debris overlie the terrace deposits (SGI 2005).

Two geophysical surveys of the area (NGCI 2005) were performed in 2004 to characterize the underlying geology within the area of diversions (alluvial plain where the Old and New wells are located). Four transects were evaluated in the survey: 1) along the lagoon coastal line, 2) within the Big Sur River from the mouth of the lagoon to the location of the Navy Well line, 3) within the area of diversion from about the Navy Well to north of the New Well, and 4) along the right side of the lagoon area adjacent to the bluff southwest of the Creamery Meadow. The time domain electromagnetic (TEM) surveys identified six layers underlying the project site and adjacent areas. Layers R1 through R3 were considered to comprise the ‘overburden’ (soils) within the area, and layers R4 through R6 represent the underlying bedrock, primarily consisting of Franciscan bedrock. All layers were consistent throughout the area of diversion, except for R3, which forms a lens (non-contiguous unit) in the lower portion of the Big Sur River where the diversions are made. The following summarizes the characteristics underlying layers as described in the geophysical surveys (NGCI 2005). A location map and cross-sections showing the layers at the survey points in the NGCI (2005) study s provided in Appendix E in this DEIR.

- R1 is the surface layer and has high resistance, ranging in thickness from 3 to 30 feet. This layer likely represents sand and gravel deposits that are either unsaturated or are saturated with relatively fresh water.
- R2 is a layer with low resistivity. This layer ranges in depth from 2 to 30 feet below ground surface (bgs) with a thickness of about 3 to 100 feet. It is typically thickest near the shorelines and thins and deepens going inland. The low resistivity is attributed to high salinity groundwater that penetrates this layer, as well as the inherent mineralogy of the layer.



Source: The Source Group, Inc, 2005.

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FIGURE **4.2-1**

Project Area Geology and Cross-Section Locations

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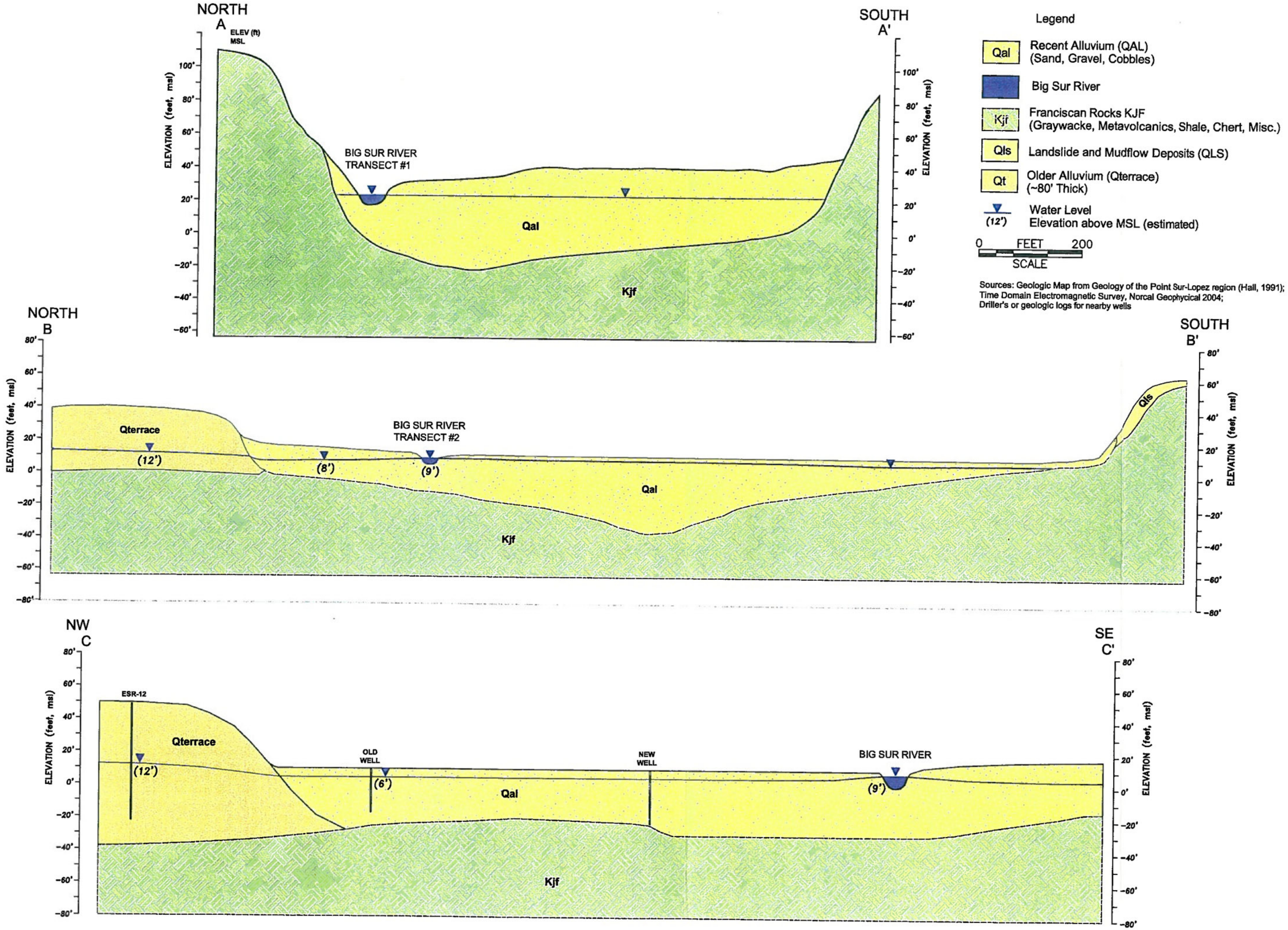

Source: The Source Group, Inc, 2005.

FIGURE **4.2-2a**

Cross-Sections A-A' Thru C-C'

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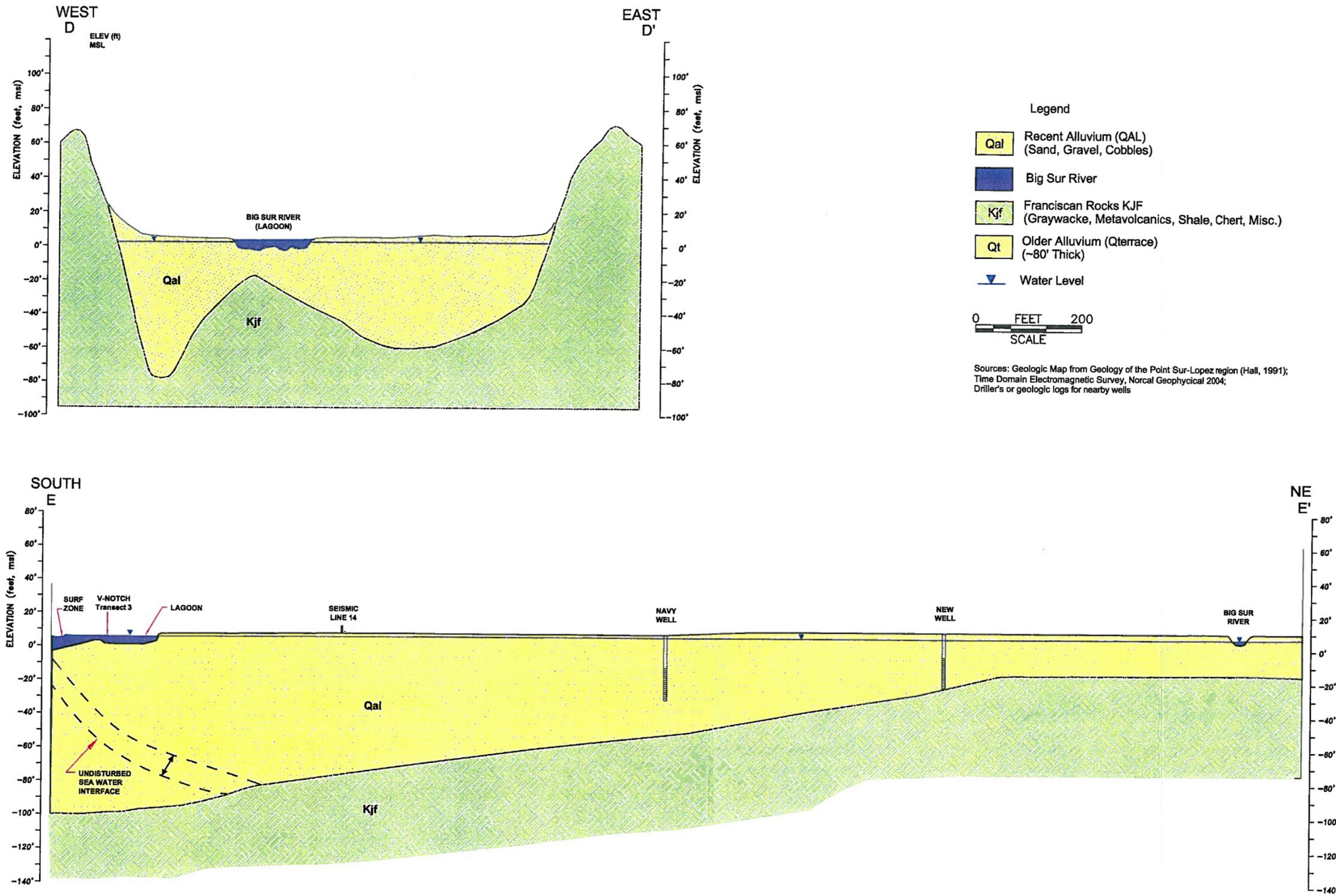


Source: The Source Group, Inc, 2005.

FIGURE **4.2-2b**

Cross-Sections D-D' Thru E-E'

- R3 is a layer with moderate resistivity. It ranges in depth from about 15 to 97 feet and in thickness from about 0 to 80 feet. R3 is the bottom of the overburden layer and consists of sands and gravels. Because the resistivity of this layer is higher than R2, the saturating water is likely less saline. It is possible that freshwater flows into R3 from upstream areas. During high tides, this layer is depressed. It could also be more resistive because it contains less clays and fine material than layer R2.
- R4 has high resistivity. It ranges in depth from 18 to 100 feet bgs and in thickness from 5 to 115 feet. Geologic information provided by TSG indicates that R4 represents the upper portion of the underlying bedrock. The high resistivity is typical of relatively competent, impermeable bedrock.
- R5 has low resistivity. It ranges in depth from about 40 to 155 feet bgs and in thickness from 15 to over 120 feet. The low resistivity is not typical of most types of rock, and therefore, may contain conductive materials such as shale or a serpentinized zone. Alternatively, it may represent a zone within the rack that is closely fractures and, therefore, relatively permeable and saturated with saline water.
- R6 has high resistivity and ranges in depth from over 87 to 210 feet bgs. Because it forms the bottom of the surveyed area, its depth cannot be defined. The high resistivity most likely represents rock that is only slightly weathered and, therefore, relatively impermeable.

Within the Big Sur River transect, the R2 layer (saline layer) is relatively shallow at the south end (near the shoreline), then dips downward further inland, and then levels off at the top of bedrock (R4). It is very thin on top of the bedrock until near the Old Well pipeline, at which point it thickens again as the bedrock surface drops off. The moderate resistivity layer (R3) is very thick at the southwest (shoreline) but thins rapidly going inland and is absent for most of the length until near the line with the Old Well. The top of the bedrock is deep (about 95 feet bgs) near the south end of the river, but only about 20-25 feet deep until near the Old Well line, after which it is about 40 feet bgs.

Within the area of diversions, both low resistivity (saline) layers (R2 and R5), decrease substantially in thickness going inland. This suggests that both layers could be related to seawater intrusion. The bedrock surface is relatively flat in this area, with just a slight northward increase in elevation.

Southwest of the Creamery Meadow, both low resistance (saline) layers (R2 and R5) and the bedrock surface increase in elevation in an inland direction. This tends to contradict the notion that the low resistance layers are a result of seawater intrusion and in this area, they may instead be more related to variations in the geologic material such as clay and silt content and potentially conductive rocks.

Soils

Soils within the POU are primarily derived from alluvium and/or formed in the residuum[10] from weathered shale or sandstone. These soils are generally characterized by moderately deep to deep profiles with generally coarse-textured surface horizons. The subsurface portion of these profiles is distinguished by a generally higher content of clay and small to medium-diameter rock fragments. Soils up-slope of the POU tend to occur on steeper slopes and are characterized by shallower soil depths and coarser soil textures which, in turn, result in more excessive drainage. According to the Soil Survey for Monterey County, seven soil map units are found in the place of use including Santa Ynez fine sandy loam; 2 to 9 percent slopes (78 percent); Lockwood Shaly Loam, 2 to 9 percent slopes (9 percent); Pfeiffer fine sandy loam 2 to 9 percent slopes (4 percent); Dune land (4 percent); and Xerorthents, dissected (about 1 percent) (NRCS 2007). These soil map units are mainly differentiated based on their corresponding landscape position (e.g., foot-slope, drainage channel, and others). Each mapping unit has several identified properties for assessing potential management and use constraints.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. Group A soils have the highest infiltration rate (lowest runoff potential when wet and Group D soils have very slow infiltration rates (high runoff potential) when wet.

The land capability class (LCC) identifies, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. Class 1 soils have slight limitations that restrict their use for growing crops; Class 2 soils have moderate restrictions and require moderate conservation practices, Class 3 soils have severe limitations; Classes 4 through 8 have very severe limitations and restrictions. Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral. The letter shows the main hazard associated with crop production on the soils (e.g., the letter 'e' indicates that the main hazard is the risk of erosion unless close-growing plant cover is maintained).

The majority of soils (78 percent) within the POU are Santa Ynez fine sandy loam, 2 to 9 percent slopes. These soils were formed on fine-loamy alluvium derived from igneous and sedimentary rock. The Santa Ynez soils have a high runoff rate when wet (Hydrologic Group D)

10 Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

with severe limitations for growing field crops and a risk of erosion (LCC 3e), and high erosion factor (Kf = 0.43) (NRCS 2007).

Alluvial Aquifer

This section describes the alluvial aquifer and underlying geologic conditions that govern the interaction between local groundwater and the Big Sur River. Although all water occurring below ground surface within soils or geologic media is considered groundwater, as explained previously, for the SWRCB's water right permitting purposes, there is a legal distinction between percolating groundwater and groundwater flowing in a subterranean stream. The El Sur Ranch diversions pump from a subterranean stream.

Alluvial aquifers are formed by the normal depositional process for fluvial (river) deposits (sediment). During periods of flooding, the alluvium (river sediment) is deposited in the channel as well as the floodplain when the flow velocities, and consequently, the flow energies, start to decrease. As flow energy/velocity decreases, it is no longer able to suspend particles in the river flow and they settle out. Coarse gravel is deposited in the stream channel, sand and fine gravel forms natural levees along the banks, and silt and clay are deposited on the floodplains (Fetter 1980). This deposited alluvium is reworked by streams as they meander across the floodplain, as in the case of the Big Sur River.

The alluvial aquifer in the area of diversions consists of alluvium that is fairly coarse in nature because of the high energy of the regular winter flows that dominate the depositional cycle of the river valley (SGI 2005); normal winter flows of up to 169 cfs (Table 4.2-1). In the eastern part of the Big Sur River watershed, the river has a steep grade through hard crystalline rocks to form the narrow, rock-bound valley called the Gorge (SGI 2005). Further downstream from the Gorge, the topography flattens and the river velocity slows and larger particles (e.g., boulders, cobbles, gravel, and sand) drop out to form the alluvium. These materials have filled in the mouth of the river. Because of scouring and erosion of finer-grained materials, the top several feet consists almost entirely of gravel and cobbles, with some large boulders (SGI 2005). Below this upper zone of very coarse material, deposits consists of silt and sand layers, with lenses of gravel, cobbles, and boulders (Dames and Moore, 1964). This coarse and highly permeable Quaternary alluvium material fills the ancestral river canyon that was cut by the river at lower sea levels. Inspection of the streambed indicates the presence of very large cobbles and boulders up to 2 feet in diameter with point bar deposits composed of large cobbles (6 to 10 inches) with coarse gravels and sand (SGI 2005).

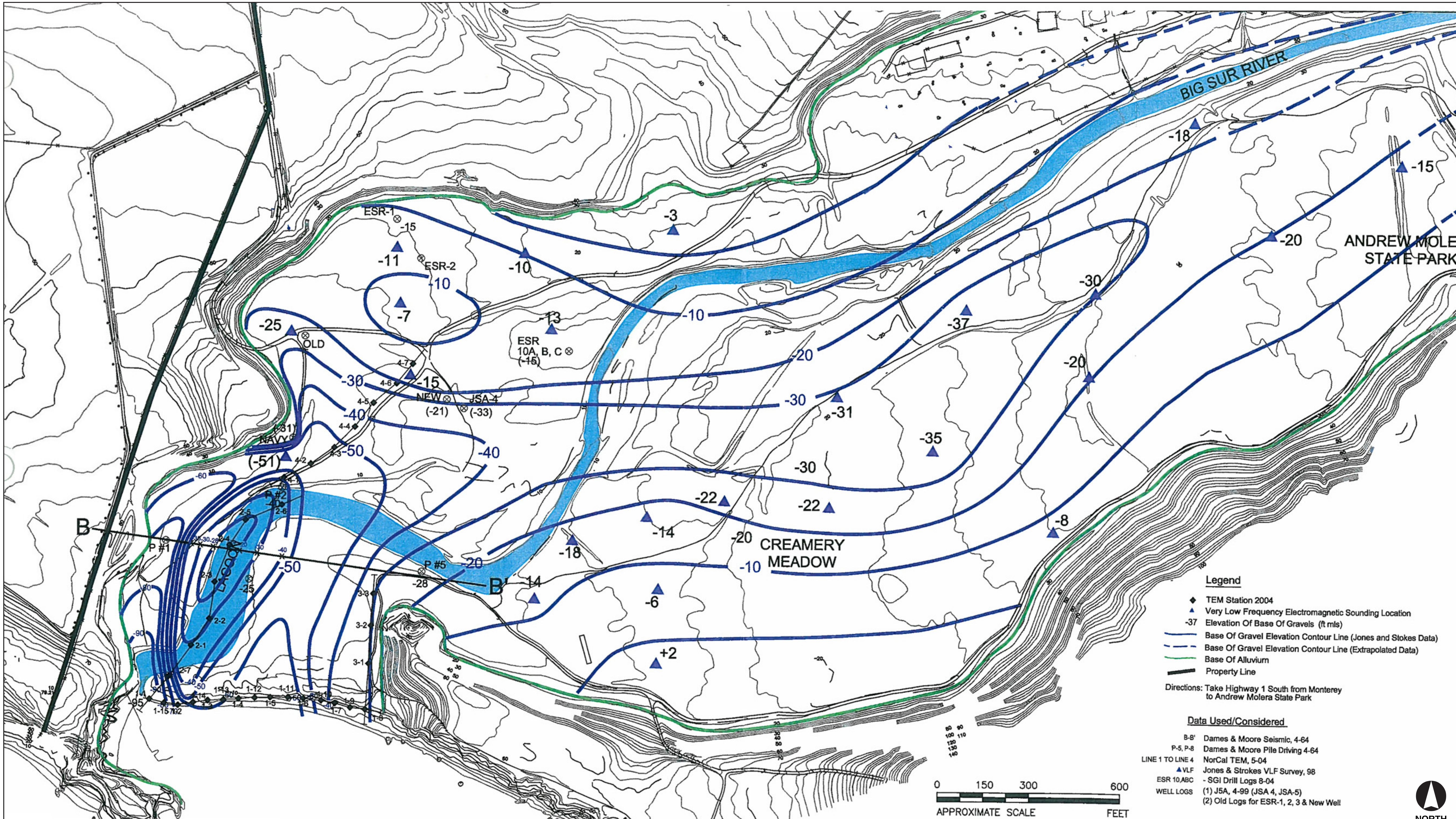
The geology of the Big Sur River valley in the Andrew Molera State Park defines the boundaries of the alluvial aquifer and its degree of connection to the river. The geologic conditions also regulate how water moves into and through the alluvial aquifer, the volume of storage within the aquifer, and how much can be extracted at a pumping well (aquifer yield).

This alluvial groundwater basin within the project site and vicinity is composed of the rocks, cobbles, sand, and gravel (unconsolidated Quaternary alluvial deposits) resting on more-consolidated and less-permeable terrace and bedrock formations (see Figure 4.2-1). The lateral boundaries of the groundwater basin are created by contrast in permeability between the alluvial sands and gravels and the adjoining consolidated formations (Jones and Stokes 1999). Cross-sections showing these spatial relationships are shown in Figures 4.2-2a and 4.2-2b. The spaces between the rocks and sands store and transmit waters that has infiltrated into these spaces through precipitation, percolation from the Big Sur River, and groundwater flows from upgradient areas.

The total area of the groundwater basin is 133 acres (Jones and Stokes 1999). The alluvial deposits extend up the Big Sur River approximately 2 miles, but probably become relatively thin along the narrow reach upstream of the entrance to the Andrew Molera State Park station parking lot and the sharp bend in the river channel in the lower reaches (Jones and Stokes 1999). The groundwater basin is connected to the Pacific Ocean through a notch that was eroded into the Franciscan Formation by the ancestral Big Sur River (Jones and Stokes 1999). The notch is now buried at an unknown depth, but the width of the groundwater basin at the coastline is only about 500 feet.

A study by Jones and Stokes (1999) determined that the bottom boundary of the area of diversion groundwater aquifer was the top of an extensive clay layer (about 30 feet bgs) found within the unconsolidated deposits. The areal continuity of the clay layer and overlying clean sands was confirmed by geophysical study using electromagnetic soundings. The clay layer forms a trough ranging in elevation from about sea level near the edges of the basin to about 30 feet below sea level in the center. Figure 4.2-3 depicts this ancestral canyon as contours on the base of the gravels (alluvium), but it also shows contours on top of the Franciscan bedrock. The axis of the trough is not exactly aligned with the present river channel and likely indicates an older channel alignment. However, additional surveying and analysis of core logs indicates that the bottom may extend to bedrock at up to a 95-foot depth and that this 30-foot clay layer observed by Jones and Stokes may have actually been a greywacke layer (NGI 2005; SGI 2005). The alluvial aquifer extends about 2 miles to the southeast along the Big Sur River and becomes thin near the Andrew Molera State Park entrance.

The northern boundary of the alluvial aquifer is formed by marine terrace and dune deposits that are older than the recent river channel deposits and the permeability of these deposits was not tested. Based on observations of similar deposits elsewhere along the central coast of California, the terrace material is usually finer grained and more consolidated than recent stream deposits and is sometimes lightly cemented as well (Jones and Stokes 1999). North, near the terraces, constant and continuous drawdown indicated the presence of a no-flow boundary to the north (Jones and Stokes 1999). These deposits are only minimally permeable and do not serve to recharge the alluvial aquifer adjacent to the Big Sur River although some groundwater from these terraces are transmitted to the alluvial aquifer. Relatively small



Source: The Source Group, Inc, 2005.

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FIGURE **4.2-3**

Base of Gravels Elevation Map

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drawdown and rapid equilibrium and recovery rates within the area of diversions suggest that the Big Sur River and lagoon act as recharge boundaries (Jones and Stokes 1999).

The width of the groundwater basin decreases substantially at the downstream end, where the river and alluvium pass through a narrow gap in the Franciscan Formation near where the Big Sur River curves to flow southwestwardly (Jones and Stokes 1999). This bedrock constriction naturally forces groundwater to seep into the lower-most reach of the river as the path of least resistance to the ocean. Moist, seeping banks were observed above the river level near the upper end of the lagoon, which presumably was discharging groundwater (Jones and Stokes 1999). Additionally, the resumption of streamflow downstream of the intermittent reach in 1990 (when the river ran dry near the Andrew Molera State Park, further upstream) is evidence that groundwater discharges into the river in the lower reaches. Geophysical surveys (SGI 2005) identified a deeper ancestral canyon on the northern boundary of the alluvial aquifer within the floodplain. Density dependant groundwater flow and transport modeling using SEAWAT 2000[11] indicated that this canyon is a preferential flow path for seawater intrusion (SGI 2005).

The Franciscan Formation, which underlies the alluvial aquifer and project site, forms the southern boundary of the alluvial aquifer. This formation consists of a mixture of fractured sandstone and other rock types. Storage and transport of water in this formation is minimal essentially forming a no-flow boundary south of the Creamery Meadow.

A shallow zone of sand and gravels that overlie clay, bedrock, or other consolidated materials forms the water bearing layer of the alluvial aquifer. Jones and Stokes (1999) performed an aquifer pump test to measure geohydrologic characteristics of this water bearing layer. Measured water levels at the observation wells were corrected for tidal effects before calculating the aquifer flow characteristics, transmissivity and hydraulic conductivity. The Creamery Meadow well was used to estimate tidal variation because it did not react to pumping at the Old or New Wells. Storage capacity in the aquifer was calculated as 765 cubic feet (assuming a 133-acre surface area, average depth to the clay layer of 30 feet, and average depth to water of 7 feet and specific yield of 25 percent). Based on these pumping tests and those by SGI (2005), the average hydraulic conductivity was calculated as 3,567 feet per day (ft/day) (SGI 2005) to 3,679 ft/day (Jones and Stokes 1999). The natural estimated groundwater flow rate in this area was calculated to average about 3.16 to 3.81 cfs (Jones and Stokes 1999; SGI 2005).

Groundwater levels were found to be in dynamic equilibrium with riverflow during winter runoff events and recharge is by the river, as indicated in the drawdown plots for aquifer tests conducted (SGI 2005 and 2006). Additionally, the similarity between flow at the USGS gage station and water levels in monitoring wells suggest that groundwater levels are in dynamic equilibrium with river stage, further confirming that the river and aquifer are closely coupled

11 A Computer Program for Simulation of Three-Dimensional Variable-Density Ground-Water Flow and Transport. SEAWAT is a generic MODFLOW/MT3DMS-based computer program designed to simulate three-dimensional variable-density ground-water flow coupled with multi-species solute and heat transport. The program has been used for a wide variety of ground-water studies including those focused on brine migration in continental aquifers as well as those focused on saltwater intrusion in coastal aquifers.

(Jones and Stokes 1999). No impermeable layers were found that might impede percolation in or near the river channel in well logs or during a geomorphologic survey, and the measured high aquifer transmissivity (600,000 gallons per day per foot) is conducive to rapid exchange of water between the river and aquifer (Jones and Stokes 1999). Groundwater elevations, within the area of diversions, during a Wet July through October season was about 0.7 feet higher than groundwater elevation during Critical Dry season (Fig 3-11 SGI 2007 and Fig 3-3 SGI 2008).

Recharge to the alluvial aquifer within the project area is primarily by seepage from streambeds and subterranean flow from up-gradient areas (Jones and Stokes 1999; SGI 2006). Rainfall recharge and subsurface inflow from bedrock and marine terrace areas surrounding the basin contribute minor amounts of recharge that are much smaller than the recharge capacity of the river and that would not support present pumping amounts (Jones and Stokes 1999). In Critically Dry years, seepage from the Big Sur River can be a substantial percent of total groundwater flow (Jones and Stokes 1999). Between the USGS gage station and where the river turns to flow southwestwardly by the project site, the river loses flow to groundwater recharge, even during Critical Dry years (SGI 2008).

The ability of water to move rapidly between the river and aquifer implies that the prevailing direction of groundwater flow is down-valley and parallel to the river (Jones and Stokes 1999). The slope of the water table most likely closely matches the river gradient. In the absence of pumping, this seaward groundwater gradient would tend to prevent seawater from intruding into the groundwater basin (Jones and Stokes 1999).

Creamery Meadow

A pumping test within the project area was conducted in September 1988 to determine the alluvial aquifer characteristics (Jones and Stokes 1999). This pumping test included several monitoring wells within the diversion area within the alluvial aquifer on the left[12] side of the Big Sur River and one monitoring well within the alluvial aquifer in the Creamery Meadow (right side of the river), approximately opposite of the New Well. The pumping test was run at a constant rate of extraction from the New Well (1,150 gallons per minute or 2.56 cfs for 27 hours. The measured aquifer hydraulic conductivity (about 3,623 ft/day) was within the middle of the range reported for clean sands and gravels. This test had no effect on the monitoring well within the Creamery Meadow alluvial aquifer indicating that the Creamery Meadow Aquifer was not hydrologically linked to the Big Sur River. However, this observation well was located at the very southwestern corner of the Creamery Meadow and may not have been within the well extraction zone of influence[13] (ZOI), which may have been because of the test not being run long enough to measure influence in the well. During the study period, in 1998, a storm event altered the course of the river and this well was lost; therefore, groundwater data in the Creamery Meadow was limited.

12 Positional references are from the middle of the Big Sur River looking upstream.

13 The zone of influence (ZOI) refers to the area within which measurable drawdown of groundwater levels occur by extraction at the well.

Pumping tests in 2004 calculated that the lateral extent of the wells' ZOI extended into the Creamery Meadow aquifer by about 500 feet from the right bank of the Big Sur River (SGI 2005). Potentiometric surface[14] measurements taken along the right bank of the river, to evaluate the effect of pumping on groundwater gradients, indicated that the groundwater gradient on the Creamery Meadow side of the Big Sur River results in discharge of groundwater to the river within the reaches adjacent to the area of diversions (SGI 2007; 2008). Furthermore, pumping tests affected the Creamery Meadow aquifer vertical gradients and therefore, the Creamery Meadow aquifer is hydrologically connected to the area of diversions either by alterations in the hydraulic gradient between the Creamery Meadow aquifer and river or because of groundwater subterranean flow (SGI 2005).

Jones and Stokes (1999) concluded that the Big Sur River is a fully penetrating recharge boundary. A fully penetrating recharge boundary refers to a boundary that extends from the top of an aquifer all the way to the bottom. In this case, the bottom of the river would be expected to extend to the top of the clay layer, which is approximately 30 feet bgs. However subsequent geophysical surveys, evaluations of field data and monitoring data, and seawater intrusion modeling indicated that the river is not likely to be fully penetrating within the area of diversions (SGI 2005 and 2006; NGCI 2005). When the stream does not penetrate to the bottom of the aquifer, groundwater flow can pass under the stream. Thus, depending upon the flow gradients, flow from the Creamery Meadow groundwater could pass under the river to reach the area of diversions (subterranean flow). If the stream is fully penetrating, any effect of pumping on the Creamery Meadow aquifer would be limited to altered gradients in the river that would act as a fully penetrating recharge boundary to the Creamery Meadow and drive the Creamery Meadow groundwater flow gradients.

Historic Pumping Regime

Two active water supply wells for irrigation are located within the Big Sur River floodplain. The New Well is currently about 500 feet from the river (SGI 2008) at an elevation of about 5 feet above the normal water level of the river (Moeller 1992). Because of the active nature of the Big Sur River channel, the New Well was located only 160 feet from the river in 1992 but the Big Sur River has since carved its channel further to the south. The New Well pumps from a depth of 14 to 32 feet bgs (Moeller, 1992). The Old Well is located about 820 feet from the river. No information is available on depth of pumping for the Old Well.

Wells are operated to irrigate upland pastures such that surface runoff is minimized (SGI 2007). The timing, application duration, and placement of irrigation depends upon seasonal conditions and pasture management. The irrigation rate depends upon the pasture(s) irrigated; higher elevation and further distant pastures receive irrigation at lower rates than closer pastures because of the extra energy it takes to move water to these locations. A statistical analysis of historic pumping rates are listed in Table 4.2-2 (El Sur Ranch baseline (1985-2004) Irrigation).

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14 The potentiometric surface is the potential level to which water will rise above the water level in an aquifer in a well that penetrates a confined aquifer. Water will flow from a higher potentiometric surface to a lower one.

TABLE 4.2-2

STATISTICAL ANALYSIS OF EL SUR RANCH BASELINE (1985-2004) IRRIGATION

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average Pumping Volume (AF)												
Minimum	0	0	0	0	0	20	60	71	32	0	0	0
25th percentile	0	0	0	0	37	114	105	103	120	34	0	0
Median	0	0	0	0	96	176	148	130	152	93	0	0
75th percentile	0	0	0	0.1	152	218	194	179	190	121	6	0
Maximum	17	0	0.6	239	267	339	264	218	269	215	76	57
Mean	0.8	0	0	25	104	172	152	143	155	90	12	3
Standard Deviation	4	0	0.1	60.4	84	83	57	46	54	62	24	13
Monthly Average Pumping Rate (cfs)												
Minimum	0	0	0	0	0	0.34	0.98	1.15	0.54	0	0	0
25th percentile	0	0	0	0	0.60	1.92	1.71	1.68	2.01	0.55	0	0
Median	0	0	0	0	1.56	2.96	2.41	2.12	2.56	1.52	0	0
75th percentile	0	0	0	0	2.47	3.67	3.15	2.91	3.20	1.97	0.10	0
Maximum	0.27	0	0.01	4.01	4.35	5.70	4.29	3.55	4.52	3.50	1.27	0.93
Mean	0.01	0	0	0.42	1.69	2.89	2.48	2.32	2.60	1.47	0.20	0.05
Standard Deviation	0.10	0	0	1.02	1.36	1.40	0.93	0.75	0.91	1.01	0.41	0.21

Notes:
Pumping rates are based on relationships developed between electrical usage and pump flow measurements at the well head.
Source: PBS&J 2008 and SGI 2008.

The number of cattle grazed on the El Sur Ranch is directly related to the ability to irrigate the pastures, which is limited by the salt content of the irrigation water. When the well water electrical conductivity or EC (a measure of salinity) reaches 1,000 uS/cm, irrigation from the pump is halted because of the potential for damage to the pasture and build up of salt in the soils. This limits the amount of time wells can be in operation during the irrigation season. Typically, the more irrigation or rainfall that occurs, the more productive the pastures are for cattle grazing. Historically, in years with higher precipitation, less irrigation was applied.

Sea Water Intrusion

The Old Well has historically experienced high salinity that exceeds the trigger for cessation of pumping (1,000 uS/cm). Because the Old Well is located near the Pacific Ocean (about 1,200 feet), it has been speculated that high salinity may be a result of seawater intrusion caused by pumping-related changes in groundwater gradients. Comparison of salinity levels and tides (Figure 3-46 SGI 2005)[15] suggests that the high salinity levels in groundwater at the Old Well are more likely a result of tidal action as opposed to pumping-induced seawater intrusion. A hydrogeologic conceptual model concluded that the spring tides provided the driving force for the saline wedge to migrate up the subterranean alluvial channel to the general location of the Old Well (SGI 2005). During a water quality monitoring study in 2006, the Navy

15 Throughout this section there are references to specific hydrologic data (figures and graphics, appendices) included in the SGI 2005, 2007, and 2008 reports. The referenced data are provided in Appendix D in this DEIR and are arranged by report year.

Well, which is about 400 to 500 feet closer to the Pacific Ocean than the Old Well, experienced no salt water intrusion during pumping of either the Old or New Well, which was as predicted by the conceptual model (SGI 2007).

Surface Hydrology

Big Sur River, Tributaries, and Subterranean Streamflow and Upwelling

Historic flow at the USGS gage station is listed in Table 4.2-1. However, this station is more than 7 miles upstream of the project site and consequently, river flow at the USGS gage does not necessarily reflect flow at the project site. A few measurements of flow in tributaries to the Big Sur River below the USGS gage station were made during a Critical Dry summer (1977) to characterize flow contributions between the USGS gage and the project site (Jones and Stokes 1999). Jones and Stokes (1999) used these flows to represent base flows[16] contributing to river flow and approximated average flow characteristics for these watersheds based on standard rainfall-runoff relationships. Table 4.2-3 lists the calculated contributions from tributaries to the Big Sur River below the USGS gage station.

TABLE 4.2-3

ESTIMATED FLOW WITHIN THE BIG SUR RIVER BELOW THE USGS GAGE

Tributary	Base Flow cfs	Annual Flow acre-feet	Drainage Area $miles^2$
Big Sur River	5.59	171,590	58.5
Pheneger Creek	0	1,730	0.8
Juan Higuera Creek	0.82	4,200	1.8
Pfeiffer-Redwood Creek	0.13	2,200	1.0
Pfeiffer Creek	0	270	0.1
Post Creek	0.03	2,980	1.4

Source: Jones and Stokes 1999 Table 4

Two of the tributaries, Pheneger Creek and Pfeiffer Creek, are essentially dry during the summer and have no base flow. The total base flow from the other tributaries is about 0.98 cfs, which is about 18 percent more flow added to the Lower Big Sur River below the USGS gage. However, there is evidence that the Lower Big Sur River is a losing reach[17] below the USGS gage, which would serve to further modify flows reaching the project site. Jones and Stokes (1999) calculated the average annual water budget for the river below the USGS gage in order to determine the potential flow rates in the river at the Andrew Molera State Park. Table 4.2-4 compares the average flow rate at the USGS gage station with calculated flows at the Andrew Molera State Park based on the Jones and Stokes (1999) average annual water budget.

16 Base flow is the flow within a river system that occurs consistently from groundwater inflows and not a result of rainfall runoff into the river.

17 A 'losing' reach is a section of the river that contributes to groundwater recharge within the area – it 'loses' water from the river bed to groundwater. A 'gaining' reach is a section of the river that receives inflow from local groundwater – it 'gains' water from local shallow groundwater through the river banks and bed.

TABLE 4.2-4

BIG SUR RIVER AVERAGE ANNUAL FLOW RATES

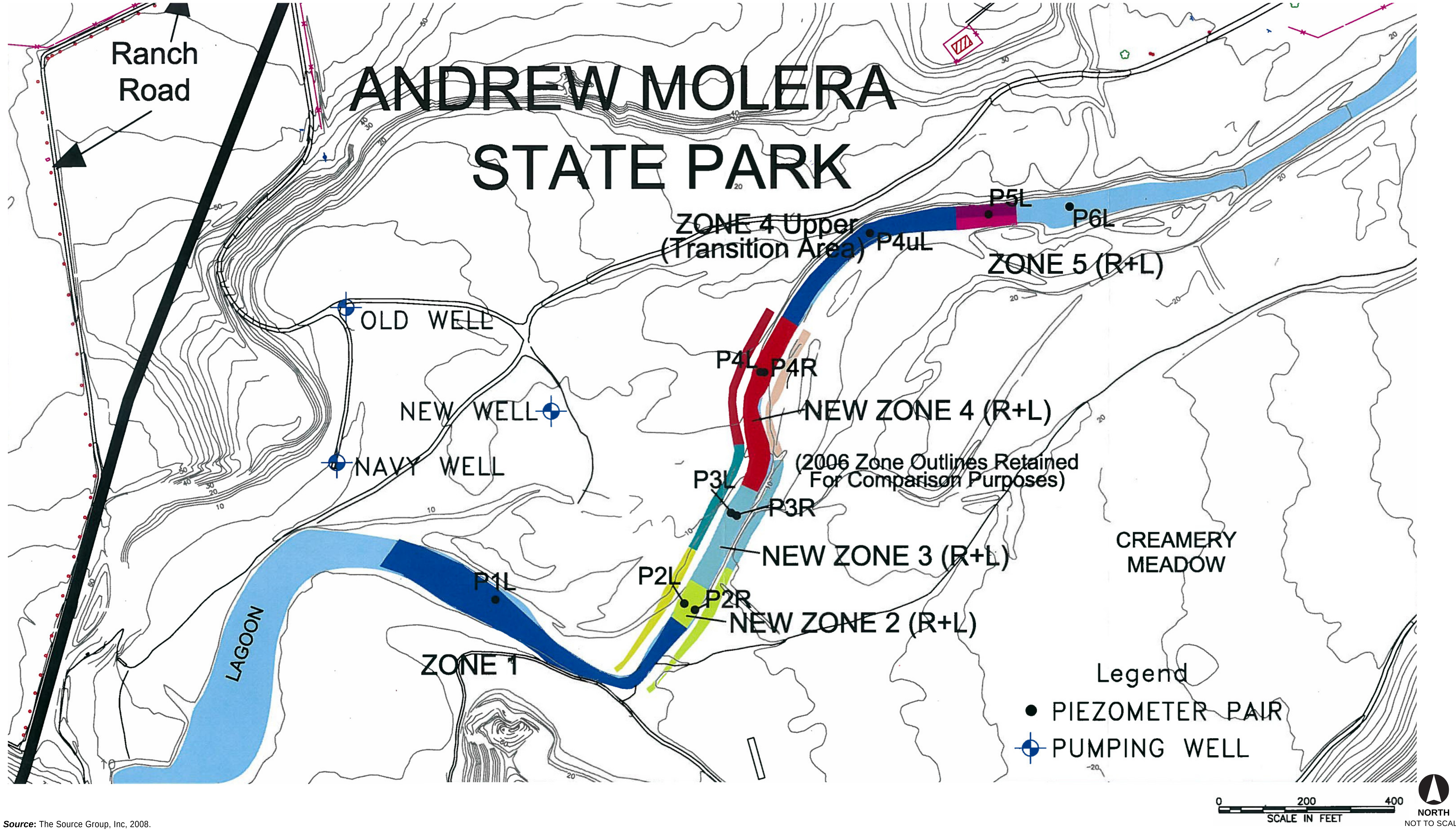
Month	At USGS Gage cfs	At Andrew Molera State Park cfs	Difference cfs	%
January	223	251	28	13%
February	267	292	25	9%
March	220	239	19	9%
April	146	150	4	3%
May	66	68	2	3%
June	36	37	1	3%
July	23	24	1	4%
August	17	18	1	6%
September	15	16	1	7%
October	18	19	1	6%
November	47	64	17	36%
December	102	125	23	23%

Source: Jones and Stokes 1999 and PBS&J 2008.

Based on monitoring studies (SGI 2005; 2007; and 2008), the Lower Big Sur River near the project site was divided into five zones, reflecting the areas where changes in hydrologic conditions[18] may expected and where monitoring equipment was installed (Figure 4.2-4). Zone 1, the lowermost reach, is just upstream from the lagoon and highly influenced by tidal action and lagoon opening/closing. Zone 2, is the lower portion of the area that may be affected by well pumping, Zone 3 is the mid-reach area that may be affected by pumping, Zone 4 is the upper area that may be affected by well pumping, and Zone 5 is the area that is likely outside of the area that may be affected by well pumping.

To better characterize flow the flow regime in the Lower Big Sur River near the project site, temporary continuous gage stations (velocity transects [VT]) were installed during a series of three studies that were conducted in 2004, 2006, and 2007 (SGI 2005; 2007; and 2008, respectively). The locations of the velocity transects is shown in Figure 4.2-5. One gage station (VT1) was about 4,000 feet upstream of the project site (Figure 3-18 SGI 2008), one gage station (VT3) was located after Lower Big Sur River curves to run in a southwesterly direction in Zone 4 (2007 study only), and the other gage station (VT2) was located at the downstream end just before the upper lagoon at the boundary between Zone 1 and Zone 2. During the studies, river flow upstream of the project site at gage station VT1 was always higher than flow adjacent to the area of diversions at gage station VT3, indicating that the river loses flow to groundwater within this section (Figure 3-28 SGI 2008). River flow measured just before the upper lagoon (VT2) was almost always higher than where the Lower river adjacent to the area of diversions (VT3), indicating that this section of the river gains water from groundwater inflows.

18 For example, change from gaining or losing conditions, reach within the area of influence by well pumping, reach with high response to tidal action or lagoon opening/closing, lagoon area.



Source: The Source Group, Inc, 2008.

FIGURE **4.2-4**

Streambed Zones

0D5099103

El Sur Ranch Water Right Application No.30166

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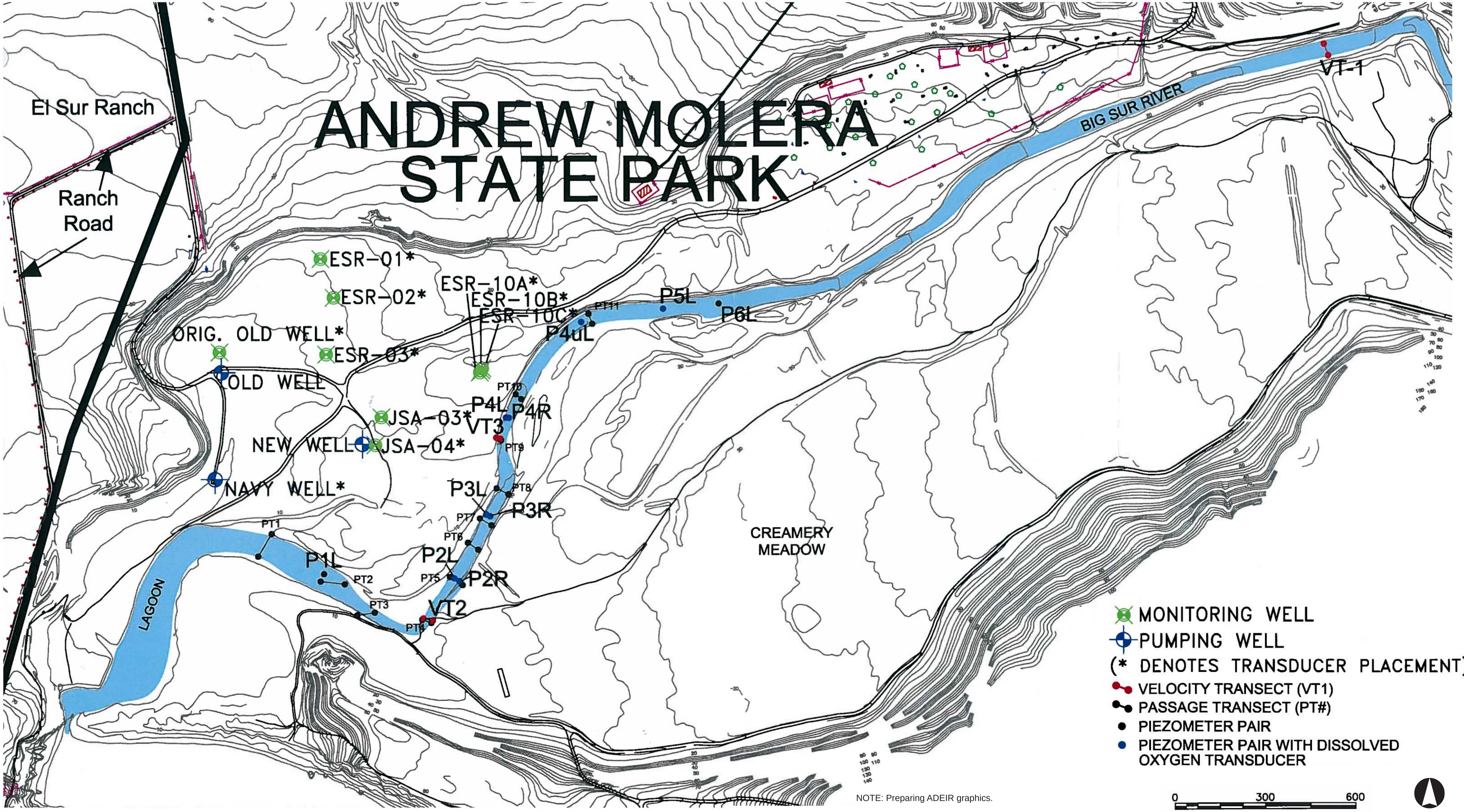

Source: Source Group, Inc., January 2008.

PBS&J

FIGURE **4.2-5**

Study Area Groundwater and Surface Water Monitoring Locations

0D5099103

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In Critical Dry years, seepage from the river can be a substantial percent of total groundwater flow (Jones and Stokes 1999). The estimated flow losses from the USGS gage to about 4,000 feet up-gradient of the project site are about 3.6 cfs (SGI 2005) to 8.9 cfs (Jones and Stokes 1999) in August and 1.93 cfs (Jones and Stokes 1999) to 3.85 cfs (SGI 2005) during September.

As noted above, under natural conditions, the river and alluvial aquifer are in a dynamic equilibrium within the lower reaches of the river; groundwater serves to recharge the river when river flows are low and groundwater levels are high, and the river serves to recharge groundwater when river flows are high and groundwater levels are low. The PWMP (1986) and the SWRCB (Moeller, 1992) recognize that both the Old and New Wells are pumping from the subterranean flow of the Big Sur River and not from percolating groundwater.

Following a major storm event in February 1998, the river near the Ranch wells migrated about 60 to 80 feet southward and destroyed the flow gaging stations and the Creamery Meadow monitoring well (Jones and Stokes, 1999). Additionally, Moeller (1992) reported that the New Well was located 160 feet from the Big Sur River, but it is currently located about 500 feet from the river. This suggests that the river channel within the alluvial floodplain may continue to meander within the floodplain as a response to large storm events.

Agricultural Runoff

Drainage

As mentioned above, soils within the POU are primarily Hydrologic Group D, and therefore, have slow infiltration properties and high runoff rates when wet. The POU slopes generally to the south at about a 3 to 5 percent grade and the POU is surface irrigated pasture land with borders (Hanson 2006a). The borders are generally perpendicular to the slope of the land and bounded by ridges of soil. The borders on the Ranch pastures are generally 14 feet wide and vary in length from 500 to 1000 feet (Hanson 2006a). Irrigation water is introduced at the top of the pasture via manual adjustment of irrigation pipeline valves bounding the up-slope pastures (Hanson 2006a). Irrigation water then flows to the bottom of the border. Tailwater from all but the bottom set of borders flows to the next downstream set of borders. Embankments are constructed along most of the field boundaries where off-site runoff could discharge onto steep, unprotected slopes to prevent off-site runoff to these locations (Hanson 2006a).

Surface runoff from the southern pastures flows into a tailwater pond prior to discharge through a flow control structure to the adjacent beach and Pacific Ocean. The flow control structure is designed to minimize erosion impacts (Hanson 2006b). The tailwater pond is located at the downstream end of a pre-existing deep erosional gully. This gully has since been filled in, as noted on aerial photographs from 1967 (REJA 2007). Runoff spills through a flow control structure and discharges to the adjacent beach and the Pacific Ocean when surface runoff (either irrigation excess or stormwater) exceeds the storage capacity of the tailwater pond. The storage capacity in the tailwater pond is unknown.

Surface runoff from the northern pastures flows into drainage channels to a flow control structure that discharges directly to the adjacent beach and Pacific Ocean northwest of the mouth of the river.

The amount of natural stormwater runoff or irrigation excess has not been measured. However, water management, in both the south and north portions of the POU, is conducted to minimize excess irrigation runoff (SGI 2007). The flow control structures for discharging excess surface irrigation flow also help reduce erosion impacts at the bluff face at the Pacific Ocean boundary during rainfall-runoff events.

Soil Erosion and Sedimentation

The POU occupies an elevated marine terrace that is partially overlain by a veneer of dune sand. These terrace deposits and beach bluffs are relatively erodible especially by wave action along the coast (REJA 2007). The terrace deposits are underlain predominantly by metamorphosed volcanic rock and greywacke sandstone. The bedrock is more resistant to erosion, in particular where bedrock is coherent and relatively unsheared (REJA 2007). As noted previously, the majority of soils overlying the terraces have an LCC of 3e and erosion factor greater than 0.42, indicating the high risk for erosion.

In addition to the flow control structures, off-site soil erosion is also controlled by embankments constructed along most of the field boundaries where off-site runoff could discharge onto steep, unprotected slopes (Hanson 2006b). A survey of erosion potential from irrigation of the lowest field adjacent to the Andrew Molera Park was conducted by SGI between March and July 2005, based primarily on a report of erosion near the Headlands Trail area and other potential erosion concerns (SGI 2007). In response to the noted erosion from off-site discharges of runoff water, an embankment was constructed to prevent loss of irrigation or rainfall-runoff water to the Headlands Trail area. Additionally, proper water management training was implemented to prevent operations from contributing to runoff from other areas onto the park property (SGI 2007). This survey noted that generally, although irrigation water was also noted to flow off the Ranch onto the park property in other areas, there was no evidence that this flow resulted in erosion or damage. However, evidence of historic erosional conditions was noted. On-site soil erosion is controlled by the dense groundcover of the pasture and by controlling the runoff into the canyons, drainage gullies, and bluffs at the bottom of the pastures (Hanson 2006b).

A study by REJA (2007), to determine historic erosion within Swiss Canyon, the POU, and adjacent bluffs, was conducted by primarily analyzing stereo aerial photographs. Conditions prior to 1949 were used to determine natural erosional conditions because this represents conditions at the project site prior to construction of the Old Well in 1949. The normal coastal bluff retreat occurs at an average annual rate of 1.8 to 2 feet per year along the bluff segment fronting the southern portion of the POU. This bluff retreat was determined to be episodic, when the combination of high tides and large ocean storms come from a direction that affords the least protection from natural barriers such as offshore sea stacks, reefs, and others.

Additionally, a large off-shore trough from the eastern portion of the POU coastline can allow for more powerful waves to hit the bluffs with a consequent increase in their rate of retreat.

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.

During the field survey, no bedrock was exposed in the face of the bluff in the southern portion of the POU; however, metavolcanic bedrock forms the headland east of the shear zone near the outlet to the tailwater pond, located near the southeast corner of the POU. Northwest of the POU, hard bedrock was exposed within the lower portion of the bluff, which would be resistant to erosive forces.

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 tailwater pond is located at the downstream end of a pre-existing deep erosional gully. This gully has since been filled in as noted on aerial photographs from 1967 (REJA 2007).

Lagoon

At the lower end of the Lower Big Sur River, the lagoon is often closed when storm surges deposit sediment at the mouth, blocking the free passage of flows from the Lower river. This closure prevents flushing of flows within the lower reaches of the river and can contribute to altered water quality conditions brought about by ponded water. Lagoon status (open or closed) can also alter the hydrology of the lower reaches of the river because of changes in the water surface elevation in the lower reaches[19] (SGI 2005).

Pending Appropriative Water Right Applications

Two other users within the Big Sur River watershed, besides the Applicant, have applications for appropriative water rights for river flow: the Clear Ridge Mutual Water Company and the

19 Surface flows are a function of the hydraulic gradient. Water will flow from a higher hydraulic water surface elevation, to a lower water surface elevation. The steepness of this gradient, along with other factors, will affect the flow rate. If the lower water surface elevation is increased, the gradient will be flattened (not as steep) and the energy for flow between upstream and downstream areas will be reduced, thereby reducing the flow rates. Lagoon conditions pond water allowing the lower reaches to have a higher water surface elevation than when water can flow freely into the ocean, thereby reducing flow rates within the lower portions of the Big Sur River.

California Department of Parks and Recreation. The total diversion rates of these water users are 0.135 cfs. Other water uses have applications for diversions from tributaries within the Big Sur River watershed. The total diversions from other users within the river watershed are 0.88 cfs. The majority of other water diversions are for domestic use. The total water rights diversions, including tributary diversions, are 6.851 cfs with 5.975 from Big Sur River flow including the 5.84 cfs for El Sur Ranch. Table 6-1 in Chapter 6 of this DEIR under the subheading "Cumulative Impacts" lists the appropriative water rights in more detail.

Surface Water Quality

Big Sur River

Based on limited monitoring data, the surface water quality within the Big Sur River is generally good with few exceedances of water quality criteria. The Central Coast Ambient Monitoring Program (CCAMP), a component of the State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP) has collected water quality data on the river at the Pfieffer-Big Sur River State Park (Station 308BSU Big Sur at Pfieffer, Weyland camp) from 2002 to 2003 and at the Andrew Molera State Park (Station 308 Big Sur River Big Sur at Andrew Molera) from 2001 through 2006 (CCAMP 2008). Typical parameters measured at both stations include nutrients, algal growth, bank cover, salinity, minerals, DO, pH, pathogens, turbidity, dissolved and suspended solids, and hardness. Results from about 20 to 60 measurements were available for water quality parameters at the Andrew Molera State Park site and from about 8 to 14 measurements at the Pfieffer-Big Sur River State Park site. During 2002, one measurement of sediment metals and pesticide concentrations at the Andrew Molera State Park site was also reported.

In general, at both sites, the geometric mean[20] concentration for each measured parameter was within the Basin Plan water quality objectives or other applicable water quality criteria, where available, except for sulfate at the Andrew Molera State Park site and pH at the Pfieffer-Big Sur River State Park site. At both sites, the geometric mean for TDS was within 5 percent of the applicable criteria. However, the maximum measured value for some parameters exceeded applicable water quality criteria. Consequently, although water quality is generally good (within the Basin Plan water quality objectives or other applicable water quality criteria), it may occasionally exceed applicable standards or criteria. Table 4.2-5 lists the parameters and concentrations where they exceeded the applicable criteria.

20 The geometric mean is the average of the logarithmic values of a data set, converted back to a base 10 number. The geometric mean tends to dampen the effect of very high or low values, which might bias the mean if a straight average (arithmetic mean) were calculated. This is helpful when analyzing concentrations where levels may vary anywhere from 10 to 10,000 fold over a given period.

TABLE 4.2-5

WATER QUALITY EXCEEDANCES IN THE BIG SUR RIVER

Parameter (units)	Andrew Molera State Park	Pfieffer-Big Sur River State Park	Criteria	Source
Geometric Mean pH (SU)	< 8.3	8.34	8.3	Basin Plan Water Quality Objective for cold freshwater habitat (CCRWQCB 1994)
Geometric Mean Sulfate (mg/L)	20.3	<20	20	Water Quality Objective for the Big Sur River (CCAMP n.d.)
Geometric Mean Total Dissolved Solids (mg/L)	191	194	200	Water Quality Objective for the Big Sur River (CCAMP n.d.)
Maximum pH (SU)	8.52	8.56	8.3	Basin Plan Water Quality Objective for cold freshwater habitat (CCRWQCB 1994)
Maximum Fecal Coliforms (MPN/100mL)	2,400	<400	400	Basin Plan Water Quality Objective for Water Body Contact Recreation (CCRWQCB 1994)
Maximum Total Dissolved Solids (mg/L)	994	934	200	Water Quality Objective for the Big Sur River (CCAMP n.d.)
Maximum Sulfate (mg/L)	26	25	20	Water Quality Objective for the Big Sur River (CCAMP n.d.)
Maximum Algal Cover, filamentous (%)	95	<40	40	CCAMP n.d.
Maximum Algal Cover, periphyton (%)	95	90	40	CCAMP n.d.
Maximum Chlorophyll a (ug/L)	4.2	<1.78	1.78	US EPA 2002[a]
Maximum Total Nitrogen (mg/L)	0.48	<0.380	0.380	US EPA 2002[a]
Maximum Turbidity (NTU)	41	5.8	2.34	US EPA 2002[a]

Notes:
[a]For streams and rivers in Aggregate Ecoregion Level III: Xeric West (USEPA n.d.)
Units:
SU = Standard Units
mg/L = miligrams per liter
MPN/100mL = Most Probable Number (of colonies) per 100 mililiters
NTU = Nephelometric Turbidity Unit
Source: compiled from Central Coast Ambient Monitoring Program (CCAMP) n.d.

Almost all contaminants tested for in sediment at Andrew Molera State Park were detected, but the concentrations were also all substantially less (less than 10 percent of the applicable criteria) than the applicable criteria, where available. Higher fecal coliforms and nitrogen at the Andrew Molera State Park site may be indicative of local septic system inflows between the Pfieffer-Big Sur State Park and the Andrew Molera State Park.

During 2004, 2006, and 2007 (SGI 2005; 2007; and 2008, respectively) a monitoring program was implemented within the Big Sur River to measure flow rates, temperature, dissolved oxygen, and salinity within the closer to the project site within the lower reaches of the river during the irrigation season. Salinity was measured as electrical conductivity and ranged from about 240 to 270 uS/cm, which is similar to the CCAMP (n.d.) geometric means values at Andrew Molera State Park. However, in the deep pool area, measured EC was typically 30 to 40 uS/cm lower than the rest of the river (Hanson 2005). Big Sur River DO varied throughout the studies, both in location, time, and year of study, and was commonly less than the Basin Plan water quality objective minimum value of 7.0 mg/L within the reaches adjacent to the area of diversions during Normal and Critical Dry irrigation seasons (Hanson 2005; SGI 2008) but was typically above 8.0 mg/L at further upstream locations (Figure 3-27 SGI 2008) and higher than 7.0 mg/L during the Wet irrigation season study (SGI 2007).

Temperature was about 13.9 to 17.2ºC throughout the area of the Big Sur River near the project site during the Normal irrigation season study and was typically higher in the lagoon and upper reaches compared to Zones 3 and 4, where groundwater seeps into the river (Figure 3-31 SGI 2005; Hanson 2005). During the Critical Dry irrigation season (September through early October), water temperatures decreased fairly steadily from 18.9 to 12.2ºC in Zone 4 and further upstream. Two precipitation events caused water temperatures to temporarily increase by about 1.7ºC (Figure 3-21 SGI 2008). Through Zone 3, water temperature was fairly consistent and cooler than upstream temperatures and there was a distinct difference between left bank and right bank water temperature (Figure 3-25 SGI 2008). At the lagoon, water temperature dropped from about 16.6 to 13.3ºC and there was no discernable effect of lagoon closure on water temperatures and only a slight temperature increase in response to the precipitation events (Figure 3-26 SGI 2008).

The lagoon is primarily a freshwater system with episodes of high salinity (SGI 2005). However, episodic conditions of high tides and wind conditions that create high waves can result in ocean waters overtopping the lagoon and splashing into the lagoon, creating higher salinity conditions upt to 2,400 uS/cm (Jones and Stokes 1999; SGI 2005). This increase in salinity is temporary and quickly moved out by freshwater within the river system (SGI 2005).

Tailwater Pond

Irrigation within the southern portion of the POU is designed to flow across the fields and collect in drainage trenches between fields, ultimately flowing into the tailwater pond at the southwest corner of the POU. When the tailwater pond is full, drainage from the fields spills out of the tailwater pond to discharge into the Pacific Ocean. Irrigation in the northern portion of the POU does not collect in a tailwater pond prior to discharge; excess irrigation water flows directly into drainage ditches and into an outfall that discharges to the Pacific Ocean via a flow control structure. No water quality measurements have been reported for the tailwater pond or other runoff. However, if runoff occurs, it can be expected to contain sediment and nutrients from fertilizers and animal waste and pathogens from animal waste.

Agricultural runoff that collects in the tailwater pond may partially undergo natural degradation or infiltration prior to discharge. Typical detention ponds can remove 28 to 50 percent of nitrogen, 20 to 94 percent of phosphorous, and 46 to 98 percent of suspended solids (sediment) (FHWA 2002). Typical infiltration basins can remove 45 to 70 percent of nitrogen, 50 to 75 percent of phosphorous, 75 to 99 percent of suspended solids, and 75 to 98 percent of bacteria (FHWA 2002).

Groundwater Quality

Historically, groundwater quality in the alluvial aquifer has been suitable for pasture irrigation. However, pumps periodically have to shut down in response to high salinity levels. As noted above, EC is used as an indicator of salinity. EC is monitored during the irrigation cycle and if values exceed 1,000 uS/cm and chloride concentrations exceed 250 mg/L, the DPR may require the El Sur Ranch to cease pumping. For operational efficiency, the El Sur Ranch ceases irrigation when the EC threshold is met in order to prevent salt build up in the soil. Salt build up would require additional irrigation when groundwater EC is low in order to flush out built-up salts. No other water quality issues have been documented in the project area.

Groundwater quality was measured in wells within the aquifer underlying the area of diversions and wells within the aquifer underlying the terrace area in 2004 (Appendix M SGI 2005). Dissolved oxygen was typically low, ranging from 0.6 mg/L to 4.8 mg/L with no discernable difference between the aquifers underlying the floodplain or terrace areas. EC ranged from 211 to 327 uS/cm and temperature was about 56 to 66ºF in the floodplain aquifer. EC ranged from 418 to 482 uS/cm and temperatures ranged from 60 to 62ºF in the terrace aquifer.

No water quality information is available for the aquifer underlying the Creamery Meadow. However, surface water monitoring along the right bank of the Big Sur River indicates that Creamery Meadow groundwater DO concentrations are low (less than 5.0 mg/L) and likely similar to those measured under the area of diversions (SGI 2008). Additionally, because the underlying aquifer was formed by the same depositional processes as the aquifer underlying the area of diversions, the resulting mineralogy and groundwater-surface water interactions can be expected to be similar, resulting in a similar natural water quality.

REGULATORY CONTEXT

The following summarizes laws and regulations that apply to the proposed project. Additional detail is provided in Appendix F in this DEIR.

Federal

Clean Water Act (CWA)

The federal CWA was enacted with the primary purpose of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. Section 319 mandates specific actions for the control of pollution from nonpoint sources. The EPA has delegated responsibility for implementation of portions of the CWA, including water quality control planning and control programs, to the State Water Resources Control Board (SWRCB), and the nine Regional Water Quality Control Boards (RWQCBs).

Section 303(c)(2)(b) of the CWA requires states to adopt water quality standards for all surface waters of the United States based on the water body's designated beneficial use and to update those These water quality standards are required to be updated on a triennial basis. Where multiple uses exist, water quality standards must protect the most sensitive use. Water quality standards are typically numeric, although narrative criteria based upon biomonitoring methods may be employed where numerical standards cannot be established or where they are needed to supplement numerical standards. Water quality standards applicable to the proposed are listed in the California Central Coast RWQCB's (CCRQWCB) Basin Plan.

Section 303(d) of the CWA requires that each state develop a total maximum daily load (TMDL) for certain listed pollutants. The TMDL is the amount of the pollutant that the water body can receive and still be in compliance with water quality objectives. The TMDL is also a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. EPA must either approve a TMDL prepared by the state or disapprove the state's TMDL and issue its own.

State

Streamflow Protection Standards

Division 10 of the California Public Resources Code established streamflow protection standards to ensure adequate protection for stream-related fish and wildlife resources. Section 10001 requires the Director of Fish and Game identify and list those streams and watercourses throughout the state for which minimum flow levels need to be established in order to assure the continued viability of stream-related fish and wildlife resources. Additionally, Section 10002 requires that the Director of Fish and Game prepare proposed streamflow requirements, in terms of cfs, for each stream or watercourse identified pursuant to Section 10001.

The Director of Fish and Game has not yet provided streamflow requirements for the lower Big Sur River. However, in accordance with Public Resources Code, the Director of Fish and Game would review the proposed project water right application and, if necessary, impose stream flow requirements.

California Coastal Act

Public Resources Code Division 20 is the California Coastal Act, which was authorized by the Legislature through adoption of the Coastal Act in 1976. The Coastal Act established the Coastal Zone as the area in which the CCA applies management policies and regulations. Within the area of El Sur Ranch, the Coastal Zone extends from the shoreline to the top of the first inland ridge.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act establishes the State Water Resources Control Board (SWRCB) and each Regional Water Quality Control Board (RWQCB) as the principal state agencies for coordinating and controlling water quality in California. The Porter-Cologne Water Quality Control Act authorizes the SWRCB to adopt, review, and revise policies for all waters of the state (including both surface and groundwaters) and directs the RWQCBs to develop regional Basin Plans.

Water Quality Control Plan for the Central Coast Region (Basin Plan)

Water quality objectives for the El Sur River and its tributaries are specified in the Water Quality Control Plan for the Central Coast Region (Basin Plan). The principal elements of the Basin Plan are a statement of beneficial water uses protected under the plan; water quality objectives necessary to protect the designated beneficial water uses; and strategies and time schedules for achieving the water quality objectives. The water quality objectives are achieved primarily through the establishment and enforcement of waste discharge requirements. Because the project site is located within the CCWQCB's jurisdiction, potential effects on surface water or groundwater are subject to the Basin Plan requirements.

Beneficial Uses

Surface Water

Designated beneficial uses for the Big Sur River include municipal and domestic supply; agriculture supply; groundwater recharge; freshwater replenishment; water contact and non-contact water recreation; wildlife habitat; cold and warm fresh water habitat; spawning, reproduction, and/or early development; commercial and sport fishing; preservation of biological habitats of special significance; rare, threatened, or endangered species; and, migration of aquatic organisms. Designated beneficial uses for the Big Sur Estuary include water contact and non-contact water recreation; wildlife habitat; cold and warm fresh water habitat; spawning, reproduction, and/or early development; commercial and sport fishing; preservation of biological habitats of special significance; rare, threatened, or endangered species; estuarine habitat; shellfish harvesting; and, migration of aquatic organisms. Coastal waters from Point Pinos to Point Piedras Blancas have designated beneficial uses of water contact and non-contact water recreation; commercial and sport fishing; rare, threatened, or endangered species; navigation; and, marine habitat.

Surface water bodies within the Region that do not have beneficial uses designated for them, including Swiss Canyon, are assigned municipal and domestic water supply and protection of both recreation and aquatic life beneficial uses. However, the Basin Plan is not specific as to which level of recreation and aquatic life beneficial uses must be protected. It is not specified if water contact or non-water contact recreation must be protected, nor is it specified whether cold, warm, migration, spawning, shellfish, or other aquatic life protection is required.

Groundwater

There are no DWR-identified groundwater basins within the project area and no groundwater basin specified within the Basin Plan. However, the Basin Plan notes that:

> Ground water throughout the Central Coastal Basin, except for that found in the Soda Lake Subbasin, is suitable for agricultural water supply, municipal and domestic water supply, and industrial use.

Furthermore, salt concentrations for irrigation waters must be controlled through implementation of the anti-degradation policy to the effect that mineral constituents of currently, or potentially, usable waters is not increased. It is also emphasized that no controllable water quality factor is allowed to degrade the quality of any groundwater resource or adversely affect long-term soil productivity. Therefore, the Big Sur River alluvial aquifer would be considered suitable for agricultural water supply, municipal and domestic supply, and industrial use.

Water Quality Objectives

Applicable water quality objectives are based on the most stringent beneficial use and include non-numeric, numeric, and site specific objectives. Pertinent water quality objectives for water resources within the project area are identified below. For a complete list of water quality objectives, the reader is referred to Appendix F in this DEIR.

Surface Water

Pertinent water quality objectives for the Big Sur River are listed below:

- The pH value shall not be depressed below 7.0 or raised above 8.3. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters.
- The dissolved oxygen concentration shall not be reduced below 7.0 mg/l at any time.
- At no time or place shall the temperature be increased by more than 5^{o}F above natural receiving water temperature.
- At all areas where shellfish may be harvested for human consumption, the median total coliform concentration throughout the water column for any 30-day period shall not exceed 70/100 ml, nor shall more than ten percent of the samples collected during any 30-day period exceed 230/100 ml for a five-tube decimal dilution test or 330/100 ml when a three-tube decimal dilution test is used.

Because the specific beneficial use categories are not identified for Swiss Canyon, except for municipal and domestic supplies, the pertinent water quality objectives for Swiss Canyon are listed below, for surface waters with no identified beneficial uses:

- For waters not mentioned by a specific beneficial use, the pH value shall not be depressed below 7.0 or raised above 8.5. The pH value for municipal and domestic supplies shall neither be depressed below 6.5 nor raised above 8.3.

- For waters not mentioned by a specific beneficial use, dissolved oxygen concentration shall not be reduced below 5.0 mg/l at any time. Median values should not fall below 85 percent saturation as a result of controllable water quality conditions.
- Temperature objectives for enclosed bays and estuaries are as specified in the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (SWRCB 1972 [Thermal Plan]) including any revisions. Pertinent objectives from the Thermal Plan are listed below:

  5. A. (1)

  b. Elevated temperature waste discharges either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.

  c. No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place.

  d. Additional limitations shall be imposed when necessary to assure protection of beneficial uses.

- Additionally, the natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.

Groundwater

Pertinent water quality objectives for the alluvial groundwater aquifer, for groundwater used for agricultural supplies, are listed below:

- Ground waters shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Table 3-3 of the Basin Plan.
- In addition, water used for irrigation and livestock watering shall not exceed the concentrations for those chemicals listed in Table 3-4 of the Basin Plan.
- No controllable water quality factor shall degrade the quality of any ground water resource or adversely affect long-term soil productivity. The salinity control aspects of ground water management will account for effects from all sources.

Total Maximum Daily Load

Under Section 303(d) of the CWA, states are required to develop lists of water bodies that would not attain water quality objectives after implementation of required levels of treatment by point source dischargers (municipalities and industries). The Big Sur River is not listed as impaired for meeting its designated beneficial uses on any 303(d) TMDL list.

Other Water Quality Criteria

Other water quality criteria include the California Toxics Rule (CTR), Inland Surfaces Waters Plan (ISWP), and a State Implementation Plan (SIP) for priority pollutants. The criteria established through these programs generally apply to effluent or discharges to receiving waters. Additional information is presented in Appendix F in this DEIR.

Local

Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Irrigated Lands WDR)

On July 9, 2004, the CCRWQCB adopted Order No. R3-2004-0117, Conditional Waiver of Waste Discharge Requirements (WDR) for Discharges from Irrigated Lands. The Irrigated Lands WDR is a mandatory program for all commercial, irrigated farming operations in the Central Coast. All commercial, irrigated farming operations were required to comply beginning January 1, 2005. Lands that are being prepared for planting also need to enroll. Appendix F in this DEIR contains additional information about enrollment requirements.

Inspections are an integral part of all CCRWQCB regulatory programs, and the CCRWQCB conducts on-farm inspections throughout the region, both on a random basis to verify submitted information, to better understand what farmers are implementing, and in response to complaints or identified problems. The primary goal of inspections is to see what practices farmers are implementing, work with them to solve problems, and make referrals to technical assistance providers when appropriate.

Monitoring is also a mandatory part of the Irrigated Lands WDR. The Cooperative Monitoring Program was established to allow growers a lower-cost alternative to individual monitoring. All those who have selected cooperative monitoring on their Notice of Intent are obligated to pay fees established by the Cooperative Monitoring Program, run by Central Coast Water Quality Preservation, Inc.

The CCRWQCB is responsible for enforcing the Irrigated Lands WDR requirements. The current focus of enforcement effort is twofold: to bring the remaining growers who have not yet enrolled into the program, and to ensure that those who are in the program are meeting their monitoring obligations (either by conducting individual monitoring or by participating in the Cooperative Monitoring Program). Those that do not enroll are out of compliance and subject to enforcement. Initial letters are sent out to potential non-filers. Those that have not responded are sent Notice of Violation letters by certified mail. Those that do not respond to the Notice of Violation will be scheduled for Administrative Civil Liability Complaints (ACL), which will involve fines. All those receiving ACL Complaints must either pay the fines or appear at a hearing before the Regional Water Quality Control Board.

Monterey County, California Big Sur Coast Land Use Plan Local Coastal Program (LUP/LCP)

Monterey County has prepared the California Big Sur Coast Land Use Plan Local Coastal Program (LUP/LCP) (1986), consistent with CCA requirements. The plan contains policies addressing the protection of environmentally sensitive habitats (Section 3.3 of the plan) and water resources management (Section 3.4 of the plan). Specific policies applicable to hydrology and water quality are listed in Appendix F in this DEIR. In addition, the policies set forth in the LCP and the LUP require that the County review and coordinate review of water diversion and increase use requests with the SWRCB. Because this DEIR is being prepared for the SWRCB, the applicant is complying with the requirements of the LCP that require this coordination.

Big Sur River Protected Waterway Management Plan (PWMP)

Monterey County developed a protected waterway management plan (PWMP) for the Big Sur River as part of their overall LCP planning process and in compliance with the California Protected Waterways Plan. The goal of the Big Sur River PWMP is "To maintain and enhance the value of the Lower Big Sur River and its watershed as a domestic water supply, fish and wildlife habitat, and recreational and scenic resource and to mitigate adverse effects of activities and facilities on these resources" (Monterey County 1986). The Water Conservation and Water Quality Protection and Enhancement elements of the PWMP contain policies addressing riparian uses of groundwater, the need for hydrologic studies, data collection and review, monitoring, flows, general development considerations, and the role of the Division of Water Rights as it pertains to water appropriation in the planning area. Relevant policies regarding hydrology and water quality are listed in Appendix F in this DEIR.

STANDARDS OF SIGNIFICANCE

For the purposes of this EIR, impacts on hydrology, geohydrology, and water quality are considered significant if the proposed project would:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level such that the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted or that lowered levels would impact the health of the riparian corridor;
- Substantially decrease the amount of streamflow such that there would be a potential for impacts to other public trust resources such as river functions, riparian vegetation, and lagoon functions;

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site;
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Impair the achievement of beneficial uses (both surface water and groundwater) by either causing or contributing to a violation of water quality standards or waste discharge requirements;
- Otherwise substantially degrade water quality (seawater intrusion); or
- Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow

IMPACTS AND MITIGATION MEASURES

Methods of Analysis

The proposed project may affect water resources in terms of both quantity and quality. The significance of proposed project effects on both water quantity and quality conditions are often directly related to effects on aquatic life support. Therefore, the effects of diversions on riparian vegetation, aquatic habitat, and water quality (dissolved oxygen, salinity, and temperature) on fisheries resources are addressed in Section 4.3, Biological Resources of this DEIR. Those issues not addressed in Section 4.3, are addressed in this section.

The proposed project could affect hydrology and water quality in a number of ways. Key among are:

- a lowering in groundwater elevations resulting in a reduction in water supplies;
- reductions in groundwater levels and gradient changes to the Big Sur River – changes in groundwater elevations, gaining/losing conditions within the river, and groundwater to surface water gradients and effects on river flow rates and water surface elevations;
- changes in the Big Sur River flow regime contributing to geomorphologic characteristics and function (flood flows and bankfull flow);
- changes in groundwater levels/gradients and effects on water quality – changes in proportion of local groundwater sources (e.g., groundwater underlying the Creamery Meadow versus area of diversions), reduced flows, groundwater-ocean gradients, and surface water draw down into the aquifer, and their respective effects on water quality;
- increased erosion and sedimentation because of applied water; and/or

- changes in pasture management (fertilization, tailwater pond quality, others)

The effects of the proposed project on river surface water elevation are discussed in greater detail in the Biology section (4.3) of this DEIR because changes could affect fish passage. However, because water surface elevations in the river, compared to the adjacent aquifer, affect flow gradients, changes in water surface elevations as they relate to gradient changes are addressed in this section.

Water Use

Water Right Application No. 30166 proposes potential numerical diversion rates and limits, which are listed in Table 2-4 in Chapter 2, Project Description. For purposes of the impact analysis, diversion rates were specifically calculated for each month during the irrigation season and for the July through October season based on the data in the water right application to determine the proposed project potential increases in pumping rates due to the proposed project. Baseline conditions were evaluated based on data provided in SGI 2007 and were based on the relationship between electrical usage and pump flow rates to calculate monthly average diversion rates from 1985 through 2004. Average potential diversion rates, along with the mean baseline diversion rates, are listed in Table 4.2-6, below. These data provide the basis for identifying potential increases in the incremental reduction in Big Sur River flow and groundwater levels.

TABLE 4.2-6

BASELINE AND PROPOSED PROJECT DIVERSIONS

Period	Baseline Mean (1985-2004) acre-feet	cfs	Project 20-Year Average[a] acre-feet	cfs	Project Maximum[a] acre-feet	cfs
November through April	7	0.02	185	0.52 (0.50)	244	0.68 (0.66)
May	104	1.69	318	**5.34** (3.65)	318	**5.34** (3.65)
June	172	2.89	318	**5.34** (2.45)	318	**5.34** (2.45)
July	152	2.48	184	3.09 (0.62)	184	3.09 (0.62)
August	143	2.32	184	3.09 (0.76)	184	3.09 (0.76)
September	155	2.60	184	3.09 (0.49)	184	3.09 (0.49)
October	90	1.47	184	3.09 (1.63)	184	3.09 (1.63)
Seasonal (July through October)	540	2.21	**735**	3.01[b] (1.80)	**735**	3.01[b] (1.80)
Seasonal Maximum Monthly Avg.	269	4.52	**230**	3.87 (-0.65)	**230**	3.87 (-0.65)

Notes:
[a] Values in parenthesis are the difference between the proposed project and baseline. Bold italics are proposed project application constraints. Other values are calculated based on application constraints. The Project 20-Year Average has a 20-year average annual diversion of 1,200 acre feet; the Project Maximum has a maximum annual diversion rate of 1,615 acre-feet.
[b] The difference between this value and monthly values is based on rounding errors.
Source: PBS&J 2008.

SGI Studies 2004, 2006, and 2007

The hydrology and water quality impacts analysis are primarily based on the results of the technical studies that evaluated a variety of factors potentially affecting hydrology and water quality in the lower Big Sur River that have been conducted by Jones and Stokes (1999), SGI (SGI 2005; 2007; and 2008), Hanson Environmental (Hanson 2005; 2007; 2008) in 1998, 2004, 2006, and 2007. These documents form the basic data set from which pumping-generated changes in hydrology and water quality can be evaluated. However, these studies had several limitations (discussed below) that affect their usefulness in determining proposed project potential effects on the river and alluvial aquifer hydrology and water quality.

The 2007 study data provides the most comprehensive data set on conditions that might occur during Critical Dry conditions, where the greatest impacts can be expected. Therefore, the impacts analysis will primarily focus on the 2007 study results, with the 1998, 2004 and 2006 study data and associated reports providing additional information, where applicable. Study methods and their limitations, to be considered in determining potential impacts, are addressed below.

The majority of work for the 2006 and 2007 studies focused on a 2,000-foot stretch of the Lower Big Sur River bounded downstream by the upper lagoon and upstream by the 'deep pool' area where the river curves to flow in a southwestwardly direction (Zone 4 Upper through Zone 1) (see Figure 4.2-4). Data from the 2006 study indicated that the hydraulic impacts of pumping were only discernable in the area of the river that curves around the pumping well field (Zones 4 through Zone 1). The results of these studies were evaluated to determine the validity of these conclusions and to qualitatively determine the potential effects of the proposed project on alterations in aquifer river flow characteristics and public trust resources.

Study Limitations

In each year monitored for the SGI and Hanson Environmental studies, only one trial was run for each pumping test condition (both pumps on, Old Well only, and New Well only) and their subsequent recovery conditions for the 2006 and 2007 studies. No information was provided on pre-test conditions and operations management for the 2006 and 2007 studies.

The 2004 study was conducted during a hydrologically Normal July through October season (mean daily flow rate of 18.42 cfs at the USGS gage station). Therefore, potential conditions are not necessarily indicative of the more critical conditions that would occur if maximum pumping occurred during a Dry or Critical Dry year, when river flows were lower; a sufficient volume of water would be flowing through the system such that small changes resulting from the proposed project would not be expected to be discernable. Additionally, this study did not measure the effects of pumping compared to not pumping during the same season; non-pumping effects were evaluated during the spring before the irrigation season and during the fall after the irrigation season. Furthermore, the lagoon was closed from August 26, 2005 through

October 14, 2004 (Figure 3-43 SGI 2005) during the new well pump test (Figure 3-44 SGI 2005). Therefore, results of this study serve only to provide information on area characteristics and are not used to identify incremental effects from the additional proposed project pumping.

The 2006 study was conducted during a Wet July through October season (mean daily flow rate of 27.32 cfs at the USGS gage station), and therefore, does not provide an assessment of potential pumping effects under even Normal year conditions. Additionally, this study did not provide continuous monitoring for water quality parameters and Big Sur River flow rates closer to the area of diversions that could be affected by diversions. This study did not describe lagoon closing or open conditions, nor did they describe potential rainfall events that could affect both Big Sur River flow and water quality. Two peaks in flow measured at the upstream flow station, VT1 (about 4,000 feet upstream of the expected area influenced by pumping diversions), during 2006 indicate that precipitation events are likely to have occurred during the study period (Figure 3-27 SGI 2007). Consequently, results of this study are used qualitatively and to support potential effects observed during the 2007 study or to illuminate the differences that can occur during Wet conditions compared to Critical Dry conditions.

The 2007 study was conducted during a Critical Dry July through October season (mean daily flow rate of 8.21 cfs at the USGS gage station), which could provide information on the effects of pumping on critical dry year conditions. However, both the Hanson and SGI studies in 2007 are confounded by the closing of the lagoon between September 3 and 12, tidal events that could be affecting flow and depth for some distance upstream, and rainfall events on September 21 and October 10. These additional variables prevent any determination of statistical significance and limit the data available for comparison of non-pumping versus pumping conditions. For example, the first pumping event (New Well test) occurred during lagoon closing and therefore cannot be compared with the second pumping event, which occurred after the lagoon opened. Additionally, the first non-pumping event began with the lagoon closed, but then the lagoon opened near the end of the non-pumping event. Therefore, the first non-pumping event cannot be compared with the first pumping event because changing lagoon conditions could alter both flow and water quality conditions. For the purposes of this analysis, the effects of the pump test using both the Old and New Wells will be used for this analysis because it provides the data with minimum artifacts in the pre-diversion compared to diversion conditions, and it maximizes the potential diversion effects because of the higher extraction rate. However, this means that this impacts analysis relies on effectively one data point. Therefore, while incremental effects are quantified, where possible, the analysis remains a qualitative analysis.

Consequently, in general, these studies do not provide for a means to correlate diversion effects on the Big Sur River or groundwater conditions; determinations of lack of correlation are expected when many external variables are likely to be interfering with and masking or modifying potential effects of diversions. Because of these potentially confounding variables, the lack of correlation based on this data also does not allow for a supportable determination of "no effect". Additionally, relationships derived from a single test case (e.g., Critical Dry year with both pumps working), would not be statistically suitable for determining overall correlation or lack of correlation. However, using the best available data within these studies, certain trends can be identified that are useful even though quantification is not reliable.

Additionally, it should be noted that because the various Ranch pastures lie at varying elevations and distances from the well field, the extraction rate for each well is dependant upon irrigation practices and depth to groundwater at the time of extraction. The maximum flow rate from each pump is estimated as 4.45 cfs for the Old Well and 3.48 cfs for the New Well (SGI 2006). However, the maximum irrigation rate from pumps is lower for higher elevation pastures and pastures further from the wells. Therefore, the average diversion rate for the 2006 study was 6.26 cfs when both pumps were on, 2.42 cfs when only the Old Well was on, and 2.76 cfs when only the New Well was on (Hanson 2007b Table 3). For the 2007 study, the average diversion rate when both wells were on was 5.02 cfs, 2.26 cfs when only the Old Well was on, and 2.37 cfs when only the New Well was on. Diversion rates were greater during 2006 (Wet season) compared to 2007 (Critical Dry season). Diversion rates exceeded the proposed project maximum daily rate of 5.84 cfs in 2006 but not in 2007. During the 2004 Study, the average diversion rate was 3.3 cfs from April through October (SGI 2005). The maximum applied rates were those that could be applied without causing surface runoff and flooding.

Groundwater

Hydrogeology and Groundwater Gradients

Increased pumping with implementation of the proposed project has the potential to lower groundwater tables and alter the surface water to groundwater hydraulic gradients. These changes in gradients could affect both Big Sur River flow characteristics and water quality. Additionally, changes in groundwater levels could affect other water supplies and cause or contribute to subsidence.

Pump tests were conducted in 2004, 2006, and 2007 by SGI to evaluate the potential effect of pumping on groundwater levels within the project area, to determine the ZOI, groundwater gradients, and measure other characteristics. Groundwater elevations were measured in several monitoring wells throughout the area of diversions to determine the response to pumping and under natural conditions.

During the 2004 Study, the potentiometric surface of groundwater was measured by manually recording the depth to water in the available groundwater monitoring wells within the alluvial aquifer on the left side of the Big Sur River to determine groundwater flow gradients and aquifer characteristics. In April (before the irrigation season) and October (after the irrigation season), 2004, the natural groundwater wet-weather gradient within the area was towards the river to the southwest at about 0.002 ft/ft; in other words, groundwater served to recharge the river (‘gaining’ river conditions) during wet-weather conditions with no pumping. 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 and generally followed the direction of Big Sur River flow to the southwest.

In early July through September 2004, groundwater elevations were measured while wells had been in operation for over one week. The alluvial aquifer gradient ranged from 0.002 to 0.014 ft/ft during the irrigation/diversion season and was either captured by the wells or continued to flow in generally the same direction as the Big Sur River. The monitoring wells in the alluvial terrace indicated that groundwater flow from the terrace deposit moved south and southeast to the alluvial aquifer with a groundwater gradient ranging between about 0.012 to 0.019 ft/ft. Tidal influences were noted in the changes in the potentiometric surface readings in all groundwater monitoring wells, including the terrace wells (Figures 3-40 and 3-41 SGI 2005).

Aquifer pump tests were also conducted in 2006 to determine the likely extent of the ZOI for each well (Figures 3-7 and 3-8 SGI 2007). Water drawdown in monitoring wells within the area of diversions was measured as a direct response to pumping. Distance and drawdown plots were extrapolated to the distance where there would be no change in groundwater elevation. The distance from the Old Well to no change in groundwater elevation was extrapolated from measurements as 1,120 feet radius from the Old Well (Figure 3-7 SGI 2007). The distance from the New Well to no change in groundwater elevation was extrapolated from measurements as 1,000 feet (Figure 3-8 SGI 2007). The radius of the ZOI for both wells pumping was considered to be 1,000 feet from the New Well, as shown on Figure 4.2-6 (approximately 500 feet into the Creamery Meadow because the Old Well drawdown radius falls within the boundaries of the New Well radius towards the Big Sur River (SGI 2007). The ZOI for both wells pumping would not extend beyond the New Well radius towards the river. 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.

Groundwater gradients were also measured in the field at several locations for the 2006 and 2007 SGI study to identify ‘gaining’ and ‘losing’ reaches of the Big Sur River, adjacent to and near the area of diversions and to calculate the amount of river flow loss that might be attributed to groundwater extraction. Vertical flow gradients between the river and groundwater were measured using piezometers (shallow wells) in the river bed and at about a 3-foot depth below the river bed. The locations of the piezometers and wells are shown in Figure 4.2-5. 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). However, piezometers within the right bank of the Big Sur River effectively monitor groundwater to surface water gradients associated with the Creamery Meadow. Changes in gradients at each location, in response to pumping, can be used to characterize incremental effects of diversions. 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).

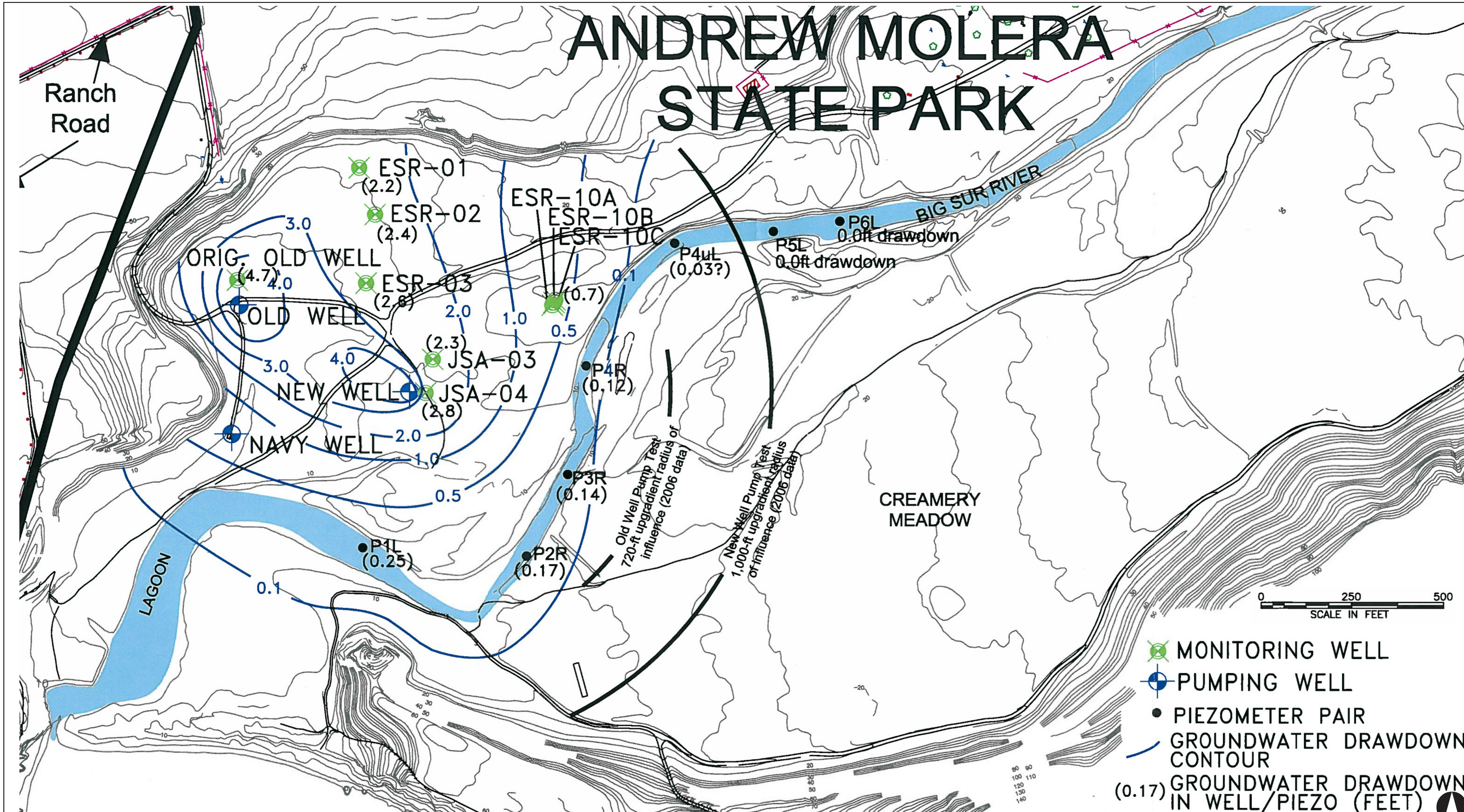
Review of the groundwater gradient data was conducted and results used to identify the likely ZOI and effect of diversions on the changes in groundwater elevation and gradients. Results of these studies are used to evaluate the potential effects of the additional proposed project average diversion increase of up to 1.63 cfs during the July to October irrigation season.

Aquifer Water Quality and Effects on Surface Water Quality

Continuous DO concentrations, salinity, and temperature were measured in the deep river piezometers (3-foot depth) and groundwater monitoring wells during 2006 and 2007 using automatic data loggers to characterize groundwater quality. Groundwater quality was also periodically measured in the groundwater monitoring wells and the Big Sur River during the 2004 study; however, none of these measurements included water quality directly within the Creamery Meadow aquifer. Additionally, during the 2004 irrigation season, pumping occurred nearly continuously (Figure 3-30 SGI 2005) and therefore, the effect of diversions on changes in hydrology and water quality cannot be determined. Therefore, the 2006 and 2007 data is used to identify potential water quality impacts associated with altering the contributions of groundwater to surface water and the relative contributions from each source (Creamery Meadow or area of diversions) by implementing the proposed project.

Seawater Intrusion

Two geophysical surveys of the area (NGCI 2005) were performed in 2004 to characterize the underlying geology within the area of diversions (alluvial plain where the Old and New wells are located). One survey was conducted in April during high-flow and non-diversion (non-pumping) conditions. The other survey was conducted during August during low-flow and pumping conditions. Geophyscial TEM soundings were used in the surveys to map potential saltwater intrusion by determining the approximate depth, configuration, and extent of electrically conductive layers that may be associated with sea water intrusion. Previous studies of the area geology were summarized and used in the surveys to identify underlying geologic properties. A density-dependent model (SEAWAT 2000), based on the geophysical surveys and other available information, was prepared and used to determine the extent of seawater intrusion during pumping (SGI 2005). Results of this modeling effort and measured well salinity levels (SGI 2007; 2008) are used to evaluate the potential effects of the proposed project on seawater intrusion.



Source: The Source Group, Inc, 2008.

SCALE IN FEET

PBS&J

FIGURE **4.2-6**

Irrigation Well Radius of Influence and Conceptual Groundwater Drawdown Map (2007 Maximum Pumping Conditions Depicted)

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Surface Water

Flow

Big Sur River

Flow at the USGS gage station was used to identify Big Sur River flow classifications (Critical Dry, Dry, Normal, Above Normal, and Wet) for the three study years. Critical Dry conditions correspond to flows less than the 20th percentile non-exceedance flow rate.[21] Dry conditions correspond to flow rates within the 20th to 40th percentile of flows; Normal conditions correspond to flows within the 40th to 60th percentile flow rates; Above Normal conditions correspond to flows within the 60th to 80th percentile flows rates; and Wet conditions correspond to flows above the 90th percentile flow rate. The flow percentiles were based on the average daily flow rates for the period of record, USGS daily flow records from April 1, 1950 through August 18, 2008. Classification of flow regimes is used to interpret study data and to identify impacts when conditions may be constrained by natural flows. Table 4.2-1 lists the flow rates corresponding to each classification. Table 4.2-7 shows the monthly daily average, annual daily average, and seasonal daily average flow rates and classifications for the three studies (2004, 2006, and 2007).

TABLE 4.2-7

**STUDY PERIOD FLOW AT USGS GAGE NO. 11143000
BIG SUR RIVER NEAR BIG SUR CALIFORNIA**

	Average Daily Flow Rate					
Month	2004 cfs	Class[a]	2006 cfs	Class[a]	2007 cfs	Class[a]
January	117.2	N	262.5	AN	24.7	CD
February	218.3	AN	106.9	N	79.8	D
March	141.2	N	360.3	W	51.8	CD
April	50.4	D	740.2	W	24.0	CD
May	33.7	D	152.8	W	15.7	CD
June	23.4	D	71.3	W	11.5	CD
July	14.6	D	39.8	W	8.5	CD
August	12.3	D	26.5	W	7.5	CD
September	12.2	N	21.0	W	7.5	CD
October	34.6	W	20.9	AN	9.3	CD
November	24.6	AN	22.1	AN	11.2	D
December	191.0	W	39.3	N	18.2	CD
Annual	72.5	N	156.0	AN	22.5	CD
Seasonal (July through October)	17.4	N	27.7	W	8.2	CD

Note:
[a] CD = Critical Dry; D = Dry; N = Normal; AN = Above Normal; and W = Wet. See Table 4.2-1 for non-exceedance flow rates for each class.
Source: PBS&J 2008 and USGS daily flow records 4/1/1950 through 8/18/2008.

The 2006 SGI study monitored continuous flow in the Lower Big Sur River at two locations near the area of diversions; VT1 and VT2 (see Figure 4.2-5). VT1 was about 4,000 feet above the

21 In other words, for the period of record, 20 percent of flows are less than the 20th percentile flow.

area of diversions and VT2 (Zone 2) was near the lagoon, at the bottom of the Lower Big Sur River. In the 2007 SGI study, an additional continuous flow station was added, VT3, within the ZOI of both wells (Zone 4). During the 2004 SGI study, and 2006 and 2007 Biology studies (Hanson 2007 and 2008), instantaneous flows were also measured at several locations along the river. 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. However, the instantaneous flow data is actual measured flow and not subject to errors based on a derived relationship. Consequently, only the continuous flow data is used in assessing proposed project hydrology and water quality impacts. Instantaneous flows are used, where appropriate, only to clarify conditions. The 2006 study was conducted during an Above Normal year and Wet July through October irrigation season. This may mask potential effects of pumping on hydrology and water quality because the extraction rates would be small in comparison to the amount of water in the system. During the Critical Dry conditions, extractions and their potential effect could be substantial in comparison to the amount of water in the system. Therefore, the 2007 study represents the best data available for evaluating potential proposed project impacts on the hydrologic regime.

Continuous flow within the Big Sur River was monitored using stilling wells and stage-discharge relationships. A stilling well is used to measure the depth (stage) of water at a location in the river. Measured depth versus flow (discharge) can then be used to produce a stage-discharge relationship. Once this relationship between river depth and river flow is known, continuous flow at that cross-section can be measured by simply measuring the depth of water in the stilling well and applying the derived relationship. However, in the lower reaches of the river, tidal action can affect flow rates and reduce the reliability of stage-discharge relationships for determining flow rates. Higher water depths are correlated with higher flow rates when using a stage-discharge relationship. However, if water rises because of tidal action or lagoon closure, and not because of higher flows from upstream sources, calculated flow rates using a stage-discharge relationship would be higher than actual.[22] 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. Lagoon closure/opening was not identified for the 2006 study and potential effects on water surface elevations cannot be factored into the

22 Water flows from a higher water surface elevation (WSE) to a lower one. The rate of flow is dependant upon the slope/gradient between the two locations. If water levels at the downstream location increase in response to tidal action or lagoon closure, the slope between the upstream and downstream locations would be lower and the resulting flow would be lower than if the downstream WSE was not elevated by tidal action or lagoon closure. Therefore, high WSE elevation caused by tidal action or lagoon closure would result in lower flow rates rather than the higher flow rates expected when using a stage-discharge relationship to determine flow rates.

analysis. Therefore, the 2007 study flow data was used to determine potential proposed project effects on changes in river flow during Critical Dry conditions, when effects would be maximized.

Hydraulic Gradients and Groundwater Inflow/Outflow

Total net flow gain or loss within each reach of the lower Big Sur River that could be influenced by the proposed project was determined by measuring the vertical flow gradient across the streambed in each reach during pumping compared to non-pumping conditions. If the potentiometric surface of groundwater below the riverbed (deep wells) was higher than at the bottom of the riverbed (shallow wells), groundwater would seep into the riverbed (gaining conditions). If the deep well potentiometric surface was lower than the shallow well, groundwater would seep from the riverbed into groundwater (losing conditions). The total change in net flow gain or loss was calculated based on the measured vertical hydraulic gradients, Darcy's Law,[23] and area of flow (SGI 2007; 2008). 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. The 2007 study data when both pumps were operating was the primary data used to assess potential proposed project effects because lagoon status and precipitation artifacts were not present. The 2006 study did not fully document these external conditions and is therefore limited in use.

Bankfull Flow

Changes in hydrology could affect stream function and geomorphology. The evaluation of "bankfull conditions" of a stream and how a project will affect the frequency of these conditions can help characterize the impact of project-caused changes in hydrology.

Bankfull flow is the maximum amount of discharge that a stream channel can carry without overflowing. Bed load is sediment that moves along the bottom of a stream channel. The bankfull discharge is regarded as the discharge most influential in forming the channel. In alluvial rivers, such as the Big Sur River, bed load is transported at flows smaller than bankfull and is increased as bankfull flow is approached. Once bankfull flow is exceeded, flow spills onto the floodplain, which reduces the rate of increase in bed load transport. Ideally, the bankfull flow rate is measured during an event when the stream water level reaches the top of its banks.

One means of characterizing the frequency of achieving bankfull conditions is by determining the "return period" for these conditions. Typically, this is done using a well established stream gage with a long history of data collection. Because this information is not available for the Big Sur River within the zone that might be affected (ZOI) by project-related pumping, the bankfull

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23 Where the flux (flow) = hydraulic gradient/area.

flow was estimated as the 1.5- to 2.5-year return period (DWR 2000). Put another way, the probability of bankfull conditions occurring in the project area in any given year ranges from about 67 percent (1.5-year return period) to 40 percent (2.5-year return period).

To estimate the effect the additional pumping by the proposed project diversion on bankfull flow the SGI 2008 study considers a number of factors including: 1) the relationship between the USGS gage flow data and flow across the reach adjacent to the area of diversions; 2) the relationship between diversion rate and changes in flow[24] within this section of the river; and 3) the average diversion rate for each month for each baseline year (SGI 2007).

Because diversions have historically occurred within the ZOI, the baseline bankfull flow, which is used to compare potential proposed project effects, will have been affected by these historic diversions. Additionally, in order to conform to required conditions of analysis for baseline conditions, the estimates are based on the 20-year period from 1985 through 2004. The non-pumping relationship[25] (Figure 3-35 SGI 2008) was used to estimate the potential flow in the river adjacent to the area of diversion based on USGS gage flows (see Appendix G, Daily Flow Calculation Methodology). The effect of irrigation extractions on reducing flow during the baseline period was estimated based on the extraction rate to groundwater inflow reduction factor for when both pumps are in operation (0.24 cfs per 1.0 cfs of pumping [Table 3-1 SGI 2008]). This provided an estimate of the flow rate in the area of the river that might be affected by pumping. While both pumps cannot be expected to always have been in operation during the baseline period, assuming a groundwater flow reduction for both pumps provides a reasonable approximation. The potential effect of the proposed project on bankfull flow was then estimated by increasing the average pumping rate to the average diversion flow rate (3.01 cfs) that could occur during each month of the year for each day of the baseline flow records. This provides an estimate of the effect the additional pumping by the proposed project diversion would have on bankfull flow.

Swiss Canyon

Hanson (2006b) also monitored irrigation excess overflows to Swiss Canyon in 2006. Two stations (Stations 2 and 3) were up-gradient of the fields irrigated during the study and one station (Station 1) was located near the mouth of Swiss Canyon and down-gradient of the fields irrigated during the study. Water surface elevations were measured at each station from September 6 through October 16, 2006. Data from this study, POU characteristics, and operational practices are used to evaluate potential proposed project effects on runoff and erosion of Swiss Canyon.

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24 The reduction in Big Sur River flow within the area of influence that could be affected by each cfs of pumping.

25 Flow adjacent to the project site = 1.3352*USGS flow rate – 7.771

Water Quality

In the 2007 SGI study, continuous water temperature and DO were measured in the Big Sur River and adjacent groundwater using automatic data loggers. Automatic data loggers were installed within the shallow piezometers within the river and in the lagoon to essentially measure surface water quality. Piezometers were installed along both the right and left banks and monitored the potential effects of groundwater from the Creamery Meadow (right bank) and area of diversions (left bank) on surface water quality. Navy Well salinity, river and groundwater well temperature, and DO at two locations in the Big Sur River were monitored continuously during the 2006 study. Instantaneous lagoon and river water quality was also monitored during the 2005 SGI study. This data provides the basis for evaluating the proposed project potential effects on surface water quality to determine if the proposed project would cause or contribute to a violation of water quality standards or further degrade the river when water quality standards are already violated.

Erosion

Erosion is the detachment and movement of soil material initiated through water or wind processes. Depending upon the nature of the soil, local landscape position, and climatic conditions, soil erosion can be very slow to very fast. Because the POU is located within a Mediterranean climate, the wet winters and dry summers can result in soil susceptibility to both wind and water erosional processes. Several soil characteristics affect the erosion potential of the soils within the POU. These include the inherent soil characteristics, type and quantity of ground cover, landscape position, compaction, irrigation practices, and management practices that may disturb the soil surface. Grazing of fields may reduce the ground cover and compact fields, thereby reducing the protective cover and infiltration rates, and accelerate potential erosion. Irrigation practices can also increase surface runoff and water erosion potential and wet soils during the dry season and reduce wind erosion potential.

The high erosion factor ($Kf > 0.42$) for the majority of soils within the POU (Sana Ynez and Lockwood Shaly Loam) indicate that these soils are highly susceptible to erosion. The steep banks along Swiss Canyon and the bluffs on the ocean side also indicate that these areas may be subject to high erosion potential from runoff waters.

Information in the report on coastal erosion and erosion of Swiss Canyon (REJA 2007) is used, along with existing POU characteristics, and the Hanson bluff erosion study (Hanson 2006a), and REJA (2007) report to evaluate the potential effects of the proposed project on erosion and sediment transport.

Bluff erosion was monitored along the coastline of the western portion of the POU during September 6 though October 16, 2006 (Hanson 2006a). Field surveys were conducted to assess bluff erosion at several locations along the edge of the POU including the Swiss Canyon outfall. About 0.1 inches of rainfall fell during this time period and all fields in the northern portion were irrigated at some point during the monitoring period for 2 to 4 days. About 131 acre-feet of water was applied during the monitoring period to four fields within the northern POU. No bluff erosion was identified. The REJA (2007) report looked at historic aerial photographs to determine gulley erosion and bluff retreat. A field study was also performed to evaluate bluff retreat.

Project Impacts and Mitigation Measures

Impact 4.2-1	Implementation of the proposed project would result in a direct reduction in local groundwater levels but would not substantially deplete groundwater supplies or interfere with existing or pending water rights.

The proposed project could increase the consistent rate of pumping, compared to average existing conditions, by 20 to over 100 percent (see Table 4.2-6), which could affect local groundwater table levels. The maximum ZOI for either just the New Well or both wells pumping has been extrapolated as 1,000 feet from the New Well (SGI 2007). Pumping with both wells would not extend beyond the New Well radius of influence because the Old Well radius of influence does not extend beyond the New Well radius of influence towards the river. The maximum groundwater drawdown at the right bank suggested that the actual radius of the ZOI may be smaller than extrapolated (Figure 3-12 SGI 2007). During the 2007 study, when both wells were pumping at about 5.02 cfs, there was an approximately 0.04-foot drawdown of groundwater in the river about 1,100 feet up-gradient from the New Well (Figure 3-2 SGI 2008). The authors reported that this was a natural downward trend in response to the cessation of a precipitation event. However, depicted river flow trends and the previous pumping test elevations do not support this assertion for the following reasons:

1. Just before the test using both pumps (about September 28), groundwater levels appeared to stop dropping, but the irrigation pump test begins too soon afterwards to allow for stabilization.
2. Groundwater levels continue to drop during the irrigation pump test, despite a constant river flow.
3. The process used to interpolate trends for downstream locations was not applied to this location.

Consequently, it can be expected that measured ZOI would extend to at least 1,100 feet from the New Well (see Figure 4.2-6).

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). Therefore, the SGI (2008) data suggests that pumping above 5.0 cfs could result in a small drawdown up to 600 feet into the Creamery Meadow. However, this did not have a discernable effect on the surface water elevations at distances more than 1,000 feet from the old well (Appendix G SGI 2008).

The baseline average pumping rate is about 1.46 to 2.60 cfs during the July through October season (Table 4.2-6). The maximum drawdown in the right bank of the Big Sur River adjacent to the project site during the monitoring period was only about 0.12 to 0.17 feet when both pumps were operating at about a 5.02-cfs flow rate (Figure 3-1 SGI 2008). If this effect was a 'worst-case' straight line relationship between pumping rate and maximum drawdown, it would mean that each 1.0 cfs of pumping could contribute up to 0.034 feet of drawdown along the right bank of the river. This would translate into a baseline drawdown of about 0.05 to 0.09 feet along the right bank of the river and the groundwater drawdown from the proposed project irrigation average pumping rate (3.01 cfs) could be about 0.04 to 0.07 feet[26] more than baseline with the maximum sustained July through October season pumping rate (3.67 cfs). However, the overall proposed project drawdown would still not be greater than 0.18 feet in the right bank of the river (5.34 cfs 30-day maximum diversion rate). Although, in accordance with the application constraints, a 30-day average 5.34 cfs diversion rate would not occur during July through October; the maximum average July through October diversion rate would be 3.67 cfs.

As noted above, the radial extent of this drawdown is unknown, but it would be expected to extend approximately 600 feet into the Creamery Meadow based on the 2006 SGI study. The magnitude of drawdown would be lower the further inland from the bank of the river, until there is no effect. Consequently, even if the radius of drawdown is greater than the calculated ZOI, the maximum drawdown throughout this zone would not be substantial and would be less than 0.18 feet.

Within the area of diversions on the left side of the river, the maximum drawdown near the wells was about 4 feet and drawdown 100 feet from the left bank of the river was about 0.5 feet. This translates to a drawdown near the wells of about 0.8 feet per 1.0 cfs of pumping and 0.1 feet per 1.0 cfs of drawdown in groundwater close to the river. Compared to baseline, the proposed project could reduce groundwater levels within the area of diversions by about 1.97 to 2.91 feet near the wells and by 0.25 to 0.36 feet near the river when pumping at a sustained 5.34 cfs flow rate. However, the maximum additional drawdown during July through October would be 0.85 to 1.76 feet near the well and 0.11 to 0.22 feet near the river.

Historically, groundwater withdrawals have been periodically in excess of 6 cfs (SGI 2005), which exceeds the maximum allowable rate under the proposed project (5.84 cfs). Additionally, well water surface monitoring and potentiometric surface studies by SGI (2005, 2007, and 2008) show that groundwater recovers from pumping effects in about 4 days following the cessation of pumping (Figure 3-2a, 3-2b SGI 2007); therefore, groundwater would not be permanently lowered. It should also be noted that lagoon closure contributed to higher groundwater elevations in some groundwater monitoring wells (SGI 2005 and SGI 2008), despite continued diversions.

26 The additional drawdown is calculated by determining the difference between proposed project average pumping rate (3.09 cfs) and study flow rate (e.g., 1.46) times the drawdown factor of 0.034 feet of drawdown per cfs of pumping rate.

Because the proposed project area of diversions is located at the lower end of the Big Sur River, diversions cannot affect water supplies available to the majority of diverters along the river because they are substantially further upstream. Based on the SGI 2006 and 2007 studies, the effect of pumping on the local groundwater table does not extend beyond a 1,100-foot radius from the New Well. Consequently, at a distance greater than 600 feet from the river, the Creamery Meadow water supplies would be unaffected by the proposed project and groundwater would still be available for extraction. Therefore, wells other than the Navy Well within the Big Sur River watershed would not be affected by the proposed project drawdown because they are substantially further than 1,100 feet from the New Wells. Additionally, as noted in the Environmental Setting section, the Big Sur River is in a dynamic equilibrium with the river and diversions within the floodplain. In other words, when groundwater gradients are low, the river surface flows serve to recharge groundwater. When Big Sur River surface flows are low, the groundwater serves to recharge the river.

The Navy Well has historically been used as a water supply well with a diversion rate of less than 0.1 cfs (SGI 2005). During the 2006 study, the Navy Well was in operation. The Navy Well lies within the ZOI of drawdown from both the Old and New Wells. If the Navy Well is used as a water supply, the proposed project could affect water supplies available from the Navy Well. At the Navy Well, there was about a 0.75 feet drawdown when both wells were extracting at 5.02 cfs during the Critical Dry irrigation season (Figure 3-1 SGI 2008). This corresponds to a 'worst-case' groundwater elevation drop of 0.18 feet for each 1.0 cfs extracted. Consequently, an additional 0.37 to 0.55 foot drawdown could occur at the Navy Well for the maximum sustained proposed project monthly diversion rate (5.34 cfs) compared to baseline conditions (1.69 cfs), and 0.16 to 0.33 foot drawdown during the maximum average July through October diversion rate (3.67 cfs). Because the Big Sur River is in dynamic equilibrium with local groundwater and groundwater levels rebound within 4 days following pumping, this reduction in groundwater levels is not expected to substantially alter the ability of the Navy Well to supply water. Furthermore, groundwater levels within the area of diversions quickly respond to rainfall events (Figure 3-33 SGI 2005) indicating that recharge is rapid. Therefore, is it unlikely that the proposed project would substantially lower groundwater levels such that water supplies are affected and impacts on water supplies would be ***less than significant***.

Impact 4.2-2	**Implementation of the proposed project would alter the groundwater-to-surface-water gradient and substantially reduce flow within the Big Sur River and may alter the natural channel forming flow regime.**

The potential proposed project increase in average diversion rate could increase the amount of groundwater capture from north of the Big Sur River that would normally flow to the river, compared to baseline conditions. Based on the 2004 SGI study (SGI 2005), groundwater capture would be even greater if both wells were in use at the same time. Additionally, associated changes in the groundwater elevations could alter the gradients between the Creamery Meadow underlying aquifer and the river; the area of diversions underlying aquifer and the river; and the Creamery Meadow and area of diversions underlying aquifers. Changes in gradients could cause or contribute to changes in the river flow regime. Based on the 2004 SGI study (SGI 2005), it is not likely that flow from the aquifer under the terraces would be substantially altered.

Pumping at the New Well captures groundwater flow from north of the river, and flow that is not captured continues to flow towards the river (SGI 2005). Results of aquifer monitoring suggest that the Old Well captures more water from north of the river than the New Well, with the remainder again continuing southward to the river near the lagoon, and that both wells capture most of the water flow north of the river. Within the area of diversions, the groundwater flow gradient was about 0.002 towards the river during non-pumping conditions, both before and after the irrigation season (SGI 2005). This translated into an unaffected groundwater velocity of about 29 ft/day (SGI 2005). During the irrigation season, the groundwater gradient increased to about 0.005 to 0.012 ft/ft, 2.5 to 6 times greater than prior to pumping. When both wells were in operation with a total extraction rate of 3.3 cfs, the maximum groundwater velocity was calculated as 203 ft/day (SGI 2005), or 7 times higher than the unaffected flow velocity. 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. The terrace groundwater gradient flows to the south/southeast, towards the alluvial aquifer with a gradient of about 0.019 ft/ft, or a velocity of about 6 to 9.5 ft/day, regardless of pumping status (SGI 2005). No information is available regarding the groundwater gradient in the aquifer underlying the Creamery Meadow.

Data from shallow piezometers, which essentially measure the Big Sur River surface water elevations, indicate that groundwater extraction from project wells has a slight effect on river water depth (Appendix G SGI 2008). Furthermore, the flow measurements show a decrease in flow rate in response to project pumping. As flow rate measurements are based on river water depth, this too indicates that river water depth decreases in response to pumping (Figure 3-12 SGI 2008). While decreases in surface water elevation and flow rates (decreases that occur in response to project increases in baseline pumping rates) may be slight from the standpoint of overall stream hydrology and water quality, even slight potential reductions in river water depth could have a measurable impact on fish passage (refer to Section 4.3 Biological Resources for a discussion on critical passage impacts).

It should be noted also the proposed 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 will be caused by the anticipated increase in pumping that will occur as a result of the proposed project. While baseline pumping conditions, by definition, do not require mitigation under CEQA, 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.

Surface Water-to-Groundwater Gradients

During the 2006 and 2007 studies, several pairs of shallow piezometers were installed within the right and left banks of the Big Sur River to measure groundwater gradients and river depth (water surface elevation). These studies generally measured a higher groundwater gradient to surface water along the right side of the river, primarily attributed to the river flowing more perpendicular to the groundwater gradient along the right bank (SGI 2008).

The reduction in groundwater inflow to the river was directly correlated to the amount of water pumped. When both wells were in operation, every 1.0 cfs of water pumped by the wells reduced groundwater inflow into the river within the ZOI between approximately 0.3 cfs (Table 3-4 SGI 2007) and 0.24 cfs (Table 3-1 SGI 2008).

Above the ZOI

The reaches above the ZOI to just about 300 feet within the ZOI are generally losing reaches; surface water from the Big Sur River recharges the local groundwater aquifer (Figure 3-20 SGI 2007 and Figure 3-5 SGI 2008). The shallow groundwater piezometers (surface water) measured higher potentiometric surface (groundwater elevation) than the deep (groundwater) in the river above the ZOI; the vertical hydraulic gradient was from the river to the underlying groundwater (Figure 3-5 SGI 2008). Therefore, these upper reaches are losing reaches. As noted in Impact 4.2-1, diversion of 5.02 cfs with both pumps appears to have reduced the potential deep groundwater elevation in the river up to at least 100 feet above ZOI (Figure 3-5 SGI 2008).

During the 2006 study (wet irrigation season conditions), there was no substantial effect of pumping on groundwater elevations or gradients at locations above the expected ZOI; groundwater elevations tended to respond to flows measured at the far upstream location (VT1, 4,000 feet upstream of the ZOI) (Figure 3-17 SGI 2007). Therefore, during wet irrigation season conditions, the additional proposed project pumping would not affect surface water to groundwater gradients above the expected ZOI.

However, during the 2007 study (Critical Dry irrigation season conditions), at a distance of up to about 600 feet upstream from the expected ZOI, the groundwater gradient became more negative when both well were pumping and dropped from about -0.31 ft/ft to -0.36 ft/ft (Figure 3-5 SGI 2008). A negative gradient means that surface flows are lost to groundwater. Consequently, pumping during the Critical Dry irrigation season could result in more water lost to groundwater in the Big Sur River up to at least about 100 feet outside of the expected ZOI. Insufficient information is available to identify the incremental effect of pumping on this gradient change and the subsequent flow loses. Therefore, conclusions regarding the potential proposed project effects on gradients in river above the ZOI are limited during Critical Dry irrigation season but, can reasonably be expected to be up to about 16 percent when diversions exceed 5.0 cfs.

Within the New Well ZOI

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.

Within the ZOI of Both Pumps

Data from the 2006 and 2007 studies showed that, in the area where the Big Sur River flows southwestwardly and adjacent to the area of diversions (Zones 4 and 3), the river naturally gains water from the underlying aquifer and the groundwater gradient is higher on the right side (Creamery Meadow) by about 0.02 to 0.0.4 ft/ft compared to the left side (area of diversions) (Figure 3-16 SGI 2007, Figures 3-13, 3-14, and 3-16 SGI 2008). This indicates that more water is flowing into the Big Sur River from the Creamery Meadow side compared to the area of project diversions. However, even when both pumps are extracting groundwater, the river remains in an overall gaining condition (groundwater seeps into the river); the left bank gradient is reduced to almost zero (no gain from groundwater), but the right bank gradient is still about 0.01 to 0.02 ft/ft (groundwater flows into the river). Consequently, although groundwater is still flowing into the river within this area when both pumps are extracting at 5.02 to 6.26 cfs, not as much is flowing in as would be expected when no pumps are extracting groundwater and, as a result, groundwater upwelling is reduced.

In Zone 2, the overall groundwater gradient is negative along both banks, indicating that this section is losing flow to groundwater (Figure 3-9 SGI 2008). The vertical gradient was about -0.08 ft/ft with the left bank vertical gradient, slightly higher to about the same as the right bank vertical gradient. When both pumps were in operation, the gradient was reduced by -0.05 to -0.12 ft/ft. Along the right bank, groundwater elevations dropped by about 0.17 feet with a 5.02 cfs diversion (Figure 3-1 SGI 2008). Consequently, both banks were naturally losing surface water to groundwater within this lower reach of the river (about 0.2 cfs on each side) (Figure 3-15 SGI 2008).

Calculated river flow losses from 5.02 cfs of diversion, based on measured groundwater to surface water gradients, were about 0.8 cfs in Zones 3 and 4 and 0.5 cfs in Zone 2 (Figures 3-13, 3-14, and 3-15 SGI 2008). Zone 3 was still gaining flow, and Zones 3 and 2 were losing flow. However, there was no discernable effect the water surface elevation in the river (Appendix G SGI 2008).

It should be noted that lagoon closure status substantially affects both the left and right bank groundwater gradients within this region of the river (Figures 3-7, 3-8, and 3-9 SGI 2008), although the effect is greater for the left bank gradients. At all locations, lagoon closure resulted in higher groundwater gradients such that the river is losing to groundwater. In fact, in the lower Zone 2, where gradients are typically negative, lagoon closure resulted in a positive gradient. Effects of lagoon closure on groundwater gradients were substantially greater than the effects of the 5.02 cfs diversions. Calculated effects of lagoon closure on Big Sur River flow resulted in about a 0.6 cfs gain in all zones, with all zones showing a positive groundwater to surface water gradient (Figures 3-13, 3-14, and 3-15 SGI 2008).

Big Sur River Flow

The average flow rate was higher at the furthest downstream station (VT2) compared to the station within the section of the Big Sur River adjacent to the area of diversions (VT3), except when both pumps were pumping. The higher flow rate at the downstream flow station and lack of ambient precipitation or other direct contributions to stream flow indicates that this section of the river is typically a gaining reach with groundwater inflow contributing to stream flow. However, when both pumps were in operation, flow at VT2 was 0.4 cfs lower than flow at VT3 (Figure 3-12 SGI 2008). This suggests that the diversion of up to 5.02 cfs may cause or contribute to the section of the river between VT3 and VT2 to lose surface water to groundwater and thus transition from a gaining reach into a losing reach.

There are three primary ways that diversions could adversely affect stream flow. Diversions could: 1) cause the river or a section of the river to transition from a gaining condition to a losing condition, 2) simply reduce the amount of groundwater inflow contributing to stream flow, but the stream remains in a gaining condition, or 3) cause or contribute to additional flow losses when the river is already in a losing condition. The magnitude of losses associated with the first effect is both the amount of river flow lost to groundwater plus the amount of flow that would have been gained by the river in the absence of diversions. The total reduction in flow gain plus the amount of flow lost to groundwater was about 0.8 cfs when pumps were operating at 5.02 cfs, which is similar to values calculated from groundwater gradient changes. 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.

Therefore, based on this single flow rate loss situation and assuming a ‘worst-case’ linear relationship between diversion rate and river flow, the overall river loss to groundwater would be 0.08 cfs per 1.0 cfs diverted, or an overall loss of flow rate (loss of flow gain plus flow loss to groundwater) of 0.16 cfs per1.0 cfs diverted. It follows then that for baseline conditions (average July through October diversion rate of 2.21 cfs), the loss of surface water to groundwater would be about 0.18 cfs and the overall loss of river flow would be 0.35 cfs. The proposed project could increase the typical irrigation season average diversion rate and monthly maximum diversion rate compared to baseline. The higher diversion rates would translate into an increase in loss to groundwater of 0.18 cfs for average irrigation season conditions and 0.36 cfs at the maximum July through October monthly diversion rate. The increase in overall loss of river flow would be 0.06 cfs more than baseline for the average July through October season and 0.05 cfs less than baseline at the maximum monthly July through October diversion rate.

During the Critical Dry irrigation season, ambient flow within Zones 4 though 2 during September was as low as 2.3 cfs. Baseline pumping would reduce this flow rate to about 1.84 cfs (2.60 cfs average September diversion rate; see Appendix G, El Sur Ranch Monthly Pumping (cfs) in this DEIR). The proposed project would reduce this flow rate to about 1.82 cfs during average July through October diversion conditions and 1.68 cfs at the maximum monthly July through October diversion rate. Consequently, there would still be flow within Zones 4 through 2, but flow would be reduced by about 0.48 to 0.62 cfs. This would be a substantial effect if it caused or contributed to constrained conditions for aquatic life support, loss of riparian vegetation, or loss of stream form and function. Furthermore, increasing groundwater elevations associated with lagoon closure would minimize potential effects of diversion drawdown and alterations in the local flow regime. Effects on aquatic life support and riparian vegetation are evaluated in Impacts 4.3-1 through 4.3-8 in Section 4.3, Biological Resources.

Channel-Forming Factors

Stream form and function are highly affected by channel-forming factors related to the hydrologic flow regime. Both baseline and proposed project bankfull flow, the important channel-forming flow, were calculated based on the flow gain/loss characteristics along the river and accounting for losses to groundwater, gains from groundwater, and losses associated with diversions. Table 4.2-8 lists baseline and proposed project estimated bankfull flow rates.

TABLE 4.2-8

ESTIMATED BANKFULL AND FLOOD FLOW IN THE LOWER BIG SUR RIVER AFFECTED AREA

	Flow Rate	
Return Period Return Year	**Baseline cfs**	**Proposed Project cfs**
Bankfull		
1.5	18.02	17.91
2	28.21	28.29
2.5	41.02	40.86
Flood		
10	257.2	257.0

Source: PBS&J 2008.

Slight proposed project changes in stream flow of 0.24 cfs per 1.0 cfs of increased diversions (Table 3-1 SGI 2008) are higher than those calculated based on flow gradient changes. However, use of this value provides for a more conservative ('worst-case') estimate of potential effects of diversions. Proposed project changes in the hydrologic flow regime, across Zones 4 through Zone 2, would not substantially alter bankfull flow or flood flows. The estimated bankfull flows would be reduced by only 0.08 to 0.16 cfs, depending upon the appropriate relationship.

This would lengthen the proposed project return period by less than 0.02 years[27] compared to baseline. The 10-year storm event flows (flood flows) through Zone 4 through Zone 2 are over 257.2 cfs for the baseline conditions. The proposed project effect would have only a slight effect (0.2 cfs decrease) on the flood flow return period. Overall, the proposed project diversions would alter Big Sur River flow statistics by only a very small amount. Flow diversion effects would be small compared to the overall river hydrologic system flow regime, and diversions would not be expected substantially alter the frequency or amount of these channel forming flows compared to baseline diversions. Therefore, potential effects of the incremental increase in proposed project diversions over baseline on channel-forming flood and bankfull flows would be ***less than significant***. Furthermore, the proposed project diversions would result in the 1.5- and 2-year bankfull flows and 10-year flood flows that are more similar to no-diversion conditions when compared to baseline (17.96, 28.64, and 256.4 cfs non-diversion flow rates for the 1.5-year, 2-year, and 10-year flows, respectively).

Loss of Flow

A reduction in flow rate within Zones 4 through 2 of the Big Sur River caused by increased diversions would be critical during extreme low flow conditions. The sustained maximum diversion rate of 5.34 cfs could increase flow losses by an average of 1.28 cfs, while the average irrigation season diversion rate could be up to 3.09 cfs, with average flow losses of 0.74 cfs[28]. If these diversions cause flow in the river to drop to zero more often than under baseline conditions, this would be considered a substantial effect on river hydrology. Moreover, if flow drops below a minimum flow rate necessary to maintain aquatic habitat and riparian vegetation more often than baseline conditions, this would also be a substantial effect on river hydrology. Because no minimum flow has been established, a flow rate of at least 1 cfs was used to estimate potential proposed project effects on maintaining minimum flows. As for bankfull flow and flood flows, the proposed project diversions were applied to the baseline period of record flows at the USGS gage to determine the frequency with which these conditions occur (0 flow or 1 cfs of flow). Table 4.2-9 lists the effects of proposed project on critical flows through the Big Sur River Zones 4 through Zone 2.

Overall, the proposed project would result in only a slight increase in the incidence of critical flow conditions in the Big Sur River Zones 4 through 2. The incidence of no-flow conditions would increase by about 0.15 percent, and the incidence of flows less than 1 cfs would increase by 0.53 percent. These no-flow and low flow conditions primarily occur during the dry season of Critical Dry years. Although these increases are very small, the river supports critical habitat for endangered species. Therefore, any flow reduction that could affect the support and passage of anadromous fish life is considered ***potentially significant***.

27 The recurrence interval for 18.02 cfs, the baseline 1.5 year return flow, is about a 1.52-year return flow in the proposed project hydrologic regime.

28 Assume a flow loss rate of 0.24 cfs per 1.0 cfs diverted (Table 3-1 SGI 2008).

TABLE 4.2-9

FREQUENCY OF MEETING NON-EXCEEDANCE CONDITION

Diversion Condition	Non-Exceedance Condition[a] 0 cfs Left in Big Sur River % Non-Exceedance[b]	1 cfs Left in Big Sur River % Non-Exceedance[b]
Baseline Diversion	1.08%	1.96%
Average Proposed Project	1.23%	2.49%

Note:
[a] Non-exceedance condition refers to the condition during which flows do not exceed either 0 cfs or 1 cfs in Zones 2 through 4 of the Big Sur River.
[b] % Non-exceedance is the percent of daily average flows with implementation of diversions that do not meet the non-exceedance condition of either 0 cfs or 1 cfs left in the Big Sur River.
Source: PBS&J 2008.

Further, while only a slight yet significant increase in the incidence of critical flow conditions would result from the proposed increase in 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 will be caused by the anticipated increase in pumping that will 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 the any adverse cumulative effect of project pumping on aquatic resources.

Winter Diversions

Operational constraints outlined in the proposed water right application would allow for greater winter diversions of up to 201 acre-feet to achieve maximum allowable diversions during all seasons. However, up to 5.34 cfs of sustained (30-day) pumping could occur during any month from November through June. This could reduce the Zone 4 through Zone 2 flow by 1.28 cfs.[29] The average baseline November flow is 29.8 cfs and over 100 cfs for all other months.[30] Consequently, diversions during November would be expected to have the greatest effect. A flow reduction of 1.28 cfs during November would reduce the flow rate by an average of 4.3 percent. However, historically, November may have no flow within Zone 4 and Zone 2. Diversions during conditions of no-flow in November would result in a ***potentially significant impact***.

Swiss Canyon

A field study by Hanson (2006b) indicated that flow in Swiss Canyon was not affected by up to 6.3 cfs irrigation on the POU. A point of upwelling groundwater was recorded near the border between Field 2 and Field 7 that may be natural groundwater seepage or percolation of

29 Assume a flow loss rate of 0.24 cfs per 1.0 cfs diverted (Table 3-1 SGI 2008).

30 Flow rates at Zone 4 through Zone 2 are calculated using the same relationship between measured USGS flow rates and flow in Zone 4 through Zone 2 for the 1985 through 2004 flow record. This is the same analysis as used for estimating bankfull flows.

irrigation water. Regardless, monitored water surface elevations at the downstream location remained fairly constant during the study indicating no response to irrigation. Therefore, it is unlikely that increasing seasonal irrigation rates to an average of 3.1 cfs or maximum sustained rate of 5.34 cfs would likely cause a change in Swiss Canyon flow regime and impacts would be ***less than significant***.

Mitigation Measure

Implementation of operational restrictions during Critical Dry (20th percentile flows or less) and Extreme Critical Dry (10th percentile flows or less) conditions would prevent an increase in incidence of critical flows and reduce potential flow impacts to ***less-than-significant levels***. Although this mitigation measure would reduce the proposed project incremental increase in diversions above baseline impacts to less-than-significant levels, continued pumping at baseline levels during the Critical Dry and Extreme Critical Dry conditions would still result in adverse effects on the BSR flow regime, although effects would be small (0.16 percent more no-flow days and 0.62 percent more days with flow less than 1 cfs than under no-diversion conditions).

4.2-2 *Extreme Critical Dry and Critical Dry Flow Rate Limitations on Project Diversions. Extreme Critical Dry and Critical Dry flows could result in significant aquatic habitat and water quality constraints. The Applicant shall immediately develop and implement an Irrigation Water Management Plan (IWMP) incorporating protocols and operator training to ensure that Project diversions do not cause or contribute to Extreme Critical Dry flows (less than the 10th percentile flow rate) or Critical Dry flows (less than the 20th percentile flow rate) greater than under Baseline rates as follows:*

- *For July through October, May, and December, when mean daily flow at the USGS gage is below the 10th percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 20th percentile mean daily flow rate (see also Mitigation Measures MM #4.3-1 and MM #4.3-2).*
- *For January through April, when mean daily flow at the USGS gage is below the 5th percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 10th percentile mean daily flow rate (see also Mitigation Measure MM #4.3-1).*
- *For June and November, when flow at the USGS gage is below the 10th percentile mean daily flow rate, Project diversions shall be limited to Baseline rates until streamflows exceed the 10th percentile mean daily flow rate.*
- *Table A lists the USGS Limiting Flow Rates (10th percentile or 20th percentile, as required, above), for each month. If flow at the USGS gage is less than the USGS Limiting Flow Rate, the Project diversions cannot exceed Baseline (Allowable) Diversion Rates until flow at the USGS gage is equal to or above the USGS Limiting Flow Rate.*

TABLE A

EXTREME CRITICAL DRY AND CRITICAL DRY FLOW RATE LIMITATIONS ON PROJECT DIVERSIONS

Month	USGS Limiting Flow Rate[a] cfs (flow rate percentile)[c]	Baseline (Allowable) Diversion Rate[b] cfs
January	18 (10th)	0.01
February	23 (10th)	0.00
March	31 (10th)	0.00
April	26 (10th)	0.42
May	22 (20th)	1.69
June	11 (10th)	2.89
July	10 (20th)	2.48
August	8.4 (20th)	2.32
September	7.7 (20th)	2.60
October	7.9 (20th)	1.47
November	9.8 (10th)	0.20
December	17 (20th)	0.05

Notes:
a. When flow rates at the USGS gage drop below this value, Project diversions shall not exceed Baseline (Allowable) Diversion Rate
b. The 20-year historic Baseline average diversion rate is the allowable diversion rate when flow at the USGS gage drops below the USGS Limiting Flow Rate
c. These numbers represent the USGS daily flow rate at the with the corresponding 20-year historic flow rate percentile in parenthesis. For example, in January, 18 cfs at the USGS gage station corresponds to the 10th percentile flow rate.
Source: PBS&J 2009.

Any modification to the IWMP shall require the Applicant to incorporate and implement a monitoring program in the IWMP to field verify that Project diversion protocols and operations do not reduce flows within Zone 4 through Zone 2 such that the Extreme Critical Dry or Critical Dry flow rate conditions, as appropriate, critical passage conditions, and critical dissolved oxygen (DO) conditions are not violated. Diversions for the purpose of making flow rate measurements, pursuant to this mitigation measure or subsequent mitigation measures, are exempt from the diversion limitations imposed by this mitigation measure if notification of testing is provided to the SWRCB prior to the beginning of testing. Modifications to the IWMP shall be submitted to the SWRCB for review and approval prior to implementation of the modified IWMP.

Impact 4.2-3 Implementation of the proposed project could alter the groundwater-to-surface-water gradient and reduce the water surface elevation within the lagoon.

Lagoon

Water elevation in the lagoon is highly influenced by tidal action and lagoon closure (Figure 3-19 SGI 2007, Appendix G SGI 2008). The vertical gradient was not affected by diversions (Figure 3-7 SGI 2007 and Figure 3-10 SGI 2008); however, the water surface elevation may be slightly affected by diversions from both wells at 5.02 cfs (Appendix G SGI 2008). The vertical gradient between surface water and groundwater fluctuated between gaining and losing conditions during Above Normal year conditions (Figure 3-19 and 3-20 SGI 2007). During the

Critical Dry year, after the lagoon was reopened, the vertical gradient remained fairly constant (Figure 3-10 SGI 2008). The lagoon water surface elevation is also a function of climatic variations. The lagoon water surface elevation was about 0.75 to 1.5 feet higher during the Above Normal test conditions compared to the Critical Dry conditions (Figure 3-36 SGI 2007 and Appendix G SGI 2008). Water surface elevations within the lagoon area are primarily a function of tidal action, sea levels, and opening and closing of the lagoon. The proposed project cannot and would not affect these factors. The proposed project would not alter the closure of the lagoon; lagoon closure is a response to storm surges along the coast. Even under low flow conditions in the river, between 1 and 2 cfs, the lagoon naturally reopened (Figure 3-11 SGI 2008). Consequently, the proposed project would not substantially alter lagoon conditions, such as water elevation and lagoon closures, and impacts would be ***less than significant.***

Impact 4.2-4	**Implementation of the proposed project could substantially alter the existing drainage pattern of the POU through increased irrigation rates that could result in substantial erosion or siltation on- or off-site.**

The proposed project would increase the amount of water that could be applied for irrigation by 343 to 478 acre-feet per year (see Table 6-1 [Alternatives Comparison] in Chapter 6 of this DEIR). Currently, irrigation is applied as necessary based on climatic conditions, soils type, pasture growth, and grazing patterns. Under existing conditions, irrigation is conducted for maximum efficiency in supporting the pastures and minimizing runoff. Under the proposed project, more irrigation water could be applied to fields. Calculations of leaching requirements and crop growth requirements indicate that additional irrigation water can be effectively used. 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. If this additional irrigation water is not effectively used, application of the additional water could result in over application and excess irrigation runoff that could cause or contribute to on- or off-site erosion.

Surface erosion is affected by climatic factors (intensity and duration of rainfall or wind), surface drainage, local soils, vegetation cover and type, and landscape position (e.g., slopes). Erosion can be accelerated by management and land use practices that disturb natural features and alter the drainage conditions. The historic land use associated with the POU is cattle-grazing of irrigated pastures. Cattle grazing affects soil infiltration, runoff, and erosion potential by soil compaction, destruction of soil stability, and removal of vegetation. Soil compaction and reduced aggregate stability by long-term grazing in limited areas essentially presses the solid soil particles together and eliminates interbedded pore spaces. This can lead to reduced infiltration rates, and, therefore, higher runoff rates. Exposed (bare) soil surfaces, caused by grazing animal traffic, are more susceptible to erosive forces because there is no protective cover. Compaction may also limit the reestablishment of vegetation that can help protect soil surfaces and increase soil stability and infiltration. Over time, erosion can also reduce the long-term productivity of land by removing the nutrient- and organic-rich surface material, requiring fertilization and irrigation to maintain pasture grass growth.

The POU is bounded by embankments along the edges adjacent to steep slopes, which prevents excess irrigation water from eroding these slopes. Irrigation from the southern portion of the POU is detained in a tailwater pond prior to discharge through a flow control structure to the Pacific Ocean that moderates the discharge of excess irrigation and reduces potentially erosive energies of such discharges. Excess irrigation from the northern portion of the POU is discharged through a flow control structure that also reduces potentially erosive energies. These structures would effectively reduce the potential for off-site erosion from increases in irrigation excess runoff. Additionally, the REJA study (2007) noted that the good cover of pasture has effectively reduced the potential for surface erosion and gulley formation on the POU since 1949. The historic drainage to the tailwater pond has been filled and is, therefore, currently less susceptible to erosion. Additionally, riparian vegetation has established in Swiss Canyon, thereby reducing the potential for bed and bank erosion in Swiss Canyon.

A field study by Hanson (2006b) indicated that flow in Swiss Canyon was not affected by up to 6.3 cfs of irrigation on the POU. Water surface elevations remained fairly constant during the study, indicating no response to irrigation. Water surface elevations declined at the station down gradient of the irrigated fields when the most water was applied (about 6.3 cfs) to the adjacent fields south of Swiss Canyon, indicating no effect of irrigating the south fields on water reaching Swiss Canyon (Hanson 2006b). Water surface elevations at Station 1 were uniform from September 14 through October 16, indicating no response to irrigation when the other fields were irrigated. A point of upwelling groundwater was recorded upstream of Station 1, near the border between Field 2 and Field 7. Consequently, monthly average irrigation rates of 2.6 cfs and seasonal average irrigation rates of 2.2 cfs have not caused or contributed to off- or on-site erosion. Therefore, it is unlikely that increasing irrigation rates to an average of 3.1 cfs or maximum sustained rate of 5.34 cfs would likely cause excess irrigation runoff to Swiss Canyon or other off-site areas, in particular, because runoff and irrigation excesses are directed to the surface drainage system that discharges to the adjacent beaches and Pacific Ocean.

Regardless, the possibility exists that increasing the average sustained irrigation rate by up to 0.9 cfs (64 percent) could result in more irrigation excess runoff if irrigation operations are not performed to minimize runoff. Additionally, the effect of a sustained increase in irrigation on runoff to the tailwater pond and northern area outlet structure is unknown. The tailwater pond may be sufficient to detain the baseline irrigation excess runoff, but may not be able to detain a sustained runoff from a 64 percent increase in application rate. Furthermore, a greater intensity of cattle grazing (as a result of increased irrigation) could cause or contribute to surface conditions more susceptible to erosion. Therefore, the proposed project impact on increasing surface runoff and erosion is ***potentially significant impact***.

Mitigation Measure

Implementation of the following mitigation measure would ensure that the potential increase in irrigation excess runoff caused by the incremental increase in diversions under the proposed project (compared to baseline conditions) is minimized, and that embankments, vegetation, and other structures are maintained to prevent on- and off-site erosion. Implementation of the measure will reduce the potential impact to a level that is ***less than significant***. It should be noted that continued pumping at baseline levels would still result less erosion than if no irrigation occurred on the project site because of the improved vegetative cover that is maintained through irrigation.

4.2-3 *The Applicant shall prepare an Erosion Control and Operations Management Plan (ECOMP) and submit it to the SWRCB for review and approval. This ECOMP shall incorporate the IWMP and operations and management protocols to minimize surface runoff and erosion potential arising from the Project.*

The Applicant shall incorporate protocols for excess irrigation applications and to prevent on- and off-site erosion because of increased application rates or volumes, intensification of grazing, or other conditions attributable to the proposed project. The IWMP shall include management practices to avoid bare soil conditions and to limit grazing intensification over pre-project levels on land with less than 50-percent ground cover. Areas disturbed by grazing or other operational activities attributable to the proposed project shall be re-vegetated. Vegetation shall be maintained on areas adjacent to drainage ways. Erosion and sediment transport BMPs shall be implemented as necessary.

The ECOMP shall also include a site inspection and maintenance program. Site inspection shall occur at the beginning of each irrigation season to evaluate erosion and runoff control devices (e.g., embankments, flow control structures, vegetated ground cover, and others). Project-related erosion or erosion hazards conditions shall be repaired prior to the beginning of the irrigation season. Monthly inspections shall be performed during the irrigation season and repair and maintenance of any runoff or erosion control structures shall be performed as necessary. A final inspection and maintenance of structures shall occur at the end of the irrigation season or by no later than October 15.

Inspection and maintenance reports shall be kept on file by the Applicant or their operations manager and be made available to the SWRCB upon request. The ECOMP shall designate the responsible party(s) for completing inspections, maintenance, and training.

Operations and management protocols shall be incorporated into the IWMP to minimize the potential for excessive project irrigation and irrigation runoff. Operator training on effective irrigation and irrigation management shall also be incorporated into the associated IWMP. The IWMP shall designate the responsible party(s) for ensuring compliance with the IWMP.

Impact 4.2-5	**Implementation of the proposed project could substantially alter the existing drainage pattern of the POU by increasing the amount of irrigation that could substantially increase the rate or amount of surface runoff in a manner that would result in on-or off-site flooding.**

As noted in Impact 4.2-4, the proposed project would increase irrigation rates on the POU that could lead to surface runoff. Additionally, operational constraints outlined in the water rights application would allow for greater winter diversions of about 178 to 237 acre-feet to achieve maximum allowable diversions during all seasons. Greater application rates during the winter season could result in more runoff because wet soils have lower infiltration rates.

As noted above, irrigation water management and maintenance of berms and outlet structures in accordance would be implemented with Mitigation Measure 4.2-4, which would reduce the potential for surface runoff leaving the project site. Additionally, the potential maximum irrigation rate (5.84 cfs) is less than historical rates (more than 6.0 cfs) (Hanson 2006b), which did not result in either on- or off-site flooding. Consequently, the proposed project would not be expected to result in a substantial amount of irrigation or runoff (Hanson 2006b) that could lead to on- or off-site flooding. Furthermore, the tailwater pond serves as a detention facility for both irrigation and stormwater runoff and the project site does not discharge to an area susceptible to flooding; irrigation water and stormwater runoff from both the northern and southern portions of the POU is discharged to directly to the beaches and Pacific Ocean through flow control structures. Therefore, even without Mitigation Measure 4.2-4, the proposed project would not contribute substantially to on- or off-site flooding and off-site flooding impacts would be ***less than significant***.

Impact 4.2-6	**Implementation of the proposed project could increase surface runoff from the POU that could contribute additional sources of polluted runoff to Swiss Canyon, the tailwater pond, and/or the Pacific Ocean.**

As discussed above in Impacts 4.2-4 and 4.2-5, the proposed project could increase excess irrigation runoff rates. Irrigation runoff could carry pollutants such as nutrients from fertilizers and animal waste, and pathogens from animal waste to the tailwater pond, Swiss Canyon Creek, or the Pacific Ocean. The El Sur Ranch typically fertilizes and aerates the pastures on an annual basis.

The proposed project would be subject to CCRWQCB Order No. R3-2004-0117, Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. The Irrigated Lands WDR is a mandatory program for all commercial, irrigated farming operations in the Central Coast Region. All applicants must submit and Notice of Intent (NOI) and additional information on operations, responsible parties, management practices, and water quality plan, if applicable. Additionally, monitoring is a mandatory part of the Irrigated Lands WDR.

Operations that have not submitted an NOI and are not participating in a cooperative monitoring or other monitoring program are subject to enforcement including fines and hearings. The CCRWQCB conducts on-farm inspections throughout the region, both on a random basis to verify submitted information, to better understand what farmers are implementing, and in response to complaints or identified problems. Currently there are no required best management practices or discharge limitations. However, the CCRWQCB has prepared this WDR to be protective of water quality from irrigated lands. Existing operations and drainage of the POU already prevents substantial erosion and runoff from the POU. Additionally, implementation of Mitigation Measure 4.2-4 would further control erosion and minimize the potential for runoff. Therefore, the incremental increase in proposed project diversions, compared to baseline, would not substantially increase the amount of polluted runoff and impacts would be ***less than significant with incorporation of Mitigation Measure 4.2-4***. Continued irrigation under baseline conditions would also be subject to existing regulations that would serve to minimize potential effects on polluted runoff.

Mitigation Measure

4.2-6 *Implement Mitigation Measure 4.2-4.*

Impact 4.2-7	**Implementation of the proposed project could alter the local groundwater gradient and cause or contribute to seawater intrusion and aquifer salinity.**

Historically, groundwater quality in the alluvial aquifer has been suitable for pasture irrigation. However, pumps periodically have to shut down in response to high salinity levels. Higher diversion rates under the proposed project could result in enhanced seawater intrusion and aquifer salinity if pumping gradients affect seawater intrusion into the underlying aquifer or adjacent lagoon.

The Old Well is located about 1,200 feet from the ocean and occasionally exhibits elevated electroconductivity[31] (EC) levels during the pumping season, suggesting that pumping itself might be responsible (SGI 2006). The SEAWAT model developed for the 2004 Study (SGI 2005) indicated that salt water intrusion in the area of diversions depended upon pumping, river flow, and tidal dynamics, but the driving force was the spring tides that force the saline wedge to migrate up the subterranean alluvial channel, along the northern boundary of the alluvial aquifer, to the general location of the Old Well. However, none of these components were quantified in the SGI 2005 report. Monitoring of salinity at the Navy Well during the 2006 study (Figure 3-34 SGI 2007) showed that salinity actually decreased at the Navy Well in response to pumping at both the Old Well and the New Well, which was as predicted by the conceptual model. Salinity levels remain high even when not pumping and even increase in some cases after pumps are turned off (Figure 3-34 SGI 2007). Overall salinity was within

31 Electroconductivity is a surrogate measure for salinity. There is a direct relationship between high electroconductivity and salinity.

about 250 to 285 uS/cm, which is not substantially different that salinity within the Big Sur River surface water at the Andrew Molera State Park (CCAMP n.d.), which is expected if these systems are in a dynamic equilibrium. Furthermore, irrigation operations of the Old Well require shut off when salinity levels reach 1,000 uS/cm. Therefore, whenever salinity is intruding far enough inland to reach the Old Well, pumping is stopped, thereby, preventing further draw-in of saline ocean waters.

Given the shallow depths of the irrigation wells and the presences of a laterally extensive shallow clay horizon, direct intrusion of seawater to the wells is considered very unlikely. Also, the freshwater head in the lagoon appears to be at least 1 foot above sea level (Jones and Stokes 1999). If this head is uniform throughout the thickness of the aquifer, it is sufficient to repel seawater intrusion to a depth of 40 feet in the aquifer, which includes the majority of the aquifer strata above the bottom confining layer (Jones and Stokes 1999). The high coincidence of historical salinity peaks in the wells with high tides suggest that the wells may induce seepage out of the lagoon and that the subsurface travel time from the lagoon to the wells is rapid (less than 2 days) (Jones and Stokes 1999).

Water levels in Creamery Meadow aquifer were not affected by pumping, only by tidal influences from the Pacific Ocean and lagoon effects (Jones and Stokes 1999). Therefore, diversions at the Old and New Wells would not affect seawater intrusion to the aquifer underlying the Creamery Meadow.

The maximum diversion rates under which the 2006 and 2007 study were conducted were higher than the sustained average allowable under the proposed project for the July through October irrigation season, and pumping was nearly continuous during the 2004 study with rates of over 6.0 cfs. Under the proposed project, the maximum allowable sustained rate of pumping from November through June is 5.34 cfs, which is only 0.32 cfs higher than the maximum diversion rate during the 2007 study and lower than the maximum diversion rate during the 2004 and 2006 studies. Consequently, if seawater intrusion and aquifer salinity were to be affected by the proposed project diversions, it would be expected to have been affected during these three studies. Seawater intrusion was found not to be related to pumping. Therefore, the proposed project diversions would not substantially affect seawater intrusion, and aquifer salinity and impacts would be ***less than significant***.

Impact 4.2-8	**Implementation of the proposed project would result in an alteration in the local groundwater to surface water gradients and surface water flow regime with concurrent effects on surface water quality.**

As noted in the Environmental Setting section, measured water quality within the Big Sur River is generally good and meets water quality standards except high sulfates and periodically high pH, fecal coliforms, TDS, total nitrogen, and algae parameters, measured upstream of the proposed project ZOI. Only salinity (EC), DO, and temperature were measured during the SGI studies. No measurements of other water quality parameters have been conducted, and therefore, potential proposed project effects on these cannot be evaluated. The river is not listed as impaired for meeting its designated beneficial uses on any CWA 303(d) list for TMDLs.

Temperature

During the 2004, 2006, and 2007 monitoring periods, surface water temperature was monitored in the Big Sur River. Temperatures ranged from about 57 to 63ºF about 4,000 feet upstream of the project site (SGI 2005). Near the beginning of ZOI, temperatures were not substantially different from upstream areas but dropped slightly before entering the lagoon (SGI 2005), presumably from inflows of cooler groundwater.

Big Sur River surface water temperatures were about the same from 4,000 feet upstream of the project site to just above the ZOI (Figure 3-21 and Figure 3-22 SGI 2008). Within the ZOI, water temperatures increased, with right bank temperatures slightly higher than left bank temperatures, but did not reflect any response to pumping (Figure 3-23 SGI 2008). This area is also characterized by inflowing groundwater (Figure 3-13 SGI 2008 and Figure 3-24 SGI 2007), whereas further upstream locations are losing surface water to groundwater. The higher temperatures at the upper end of the ZOI may be a result of reduced riparian canopies (lack of shade) and associated increase in solar heating. Within the middle of the ZOI, adjacent to the area of diversions, water temperature is substantially lower than upstream values, with right bank temperatures up to 3ºF colder than left bank temperatures when flow is low (Figure 3-24 SGI 2008). The right bank surface water temperatures are similar to groundwater temperatures measured in the area of diversions near the river (Figure 3-20 SGI 2008), and the river is gaining flow from groundwater under the Creamery Meadow in this location (Figure 3-14 SGI 2008 and Figure 3-25 SGI 2007). In the upper lagoon, temperature is less variable, with a declining trend from about 56 to 60ºF throughout the study period (Figure 3-25 SGI 2008). The groundwater gradient within this area is neutral to variable (Figure 3-20 SGI 2007 and Appendix G SGI 2008). While surface water temperatures were generally declining throughout the study period, temperature in the groundwater well near the Big Sur River was slowly increasing from about 54.5 to 55.3ºF (Figure 3-20 SGI 2008).

None of these monitoring locations exhibited any measurable temperature responses to pumping. If there were an effect of pumping, it would be expected to be most prominent during this Critical Dry irrigation season study because flows are low in the Big Sur River and pumping has the greatest effect on river flow rates and groundwater gain/loss to the river (Figures 3-24 to 3-26 SGI 2007, Figures 3-13 to 3-15 SGI 2008). Consequently, diversions of up to 5.02 cfs during the Critical Dry year did not substantially affect surface water temperatures and the water quality objective of no change in temperature greater than 5ºF was not violated. Consequently, the proposed project diversions with a maximum average of 3.67 cfs during July through October or 5.34 cfs maximum average throughout the rest of the year, would not cause or contribute to violation of water quality standards with respect to temperature.

Dissolved Oxygen (DO)

The Basin Plan DO water quality objective for the Big Sur River is 7.0 mg/L. Groundwater within both area of diversions and Creamery Meadow have lower DO contents than the surface water in the river and are typically about 2.5 mg/L and below 5.0 mg/L (Appendix M SGI 2005). Any reduction in groundwater inflow to the river would, therefore, be expected to exhibit improved DO concentrations within the river. DO concentrations above the ZOI are generally good (greater than 7.0 mg/L) and show an increasing trend throughout the study period (Figure 3-27 SGI 2008). DO concentration within the upper ZOI is low and generally less than 5.0 mg/L (Figure 3-29 SGI 2008). DO within this area shows a slight tendency to increase in response to stream flow. In the middle of the ZOI, DO is substantially higher along the left bank compared to the right bank and the right bank DO shows a sharp (about 3 mg/L increase) response to higher incoming stream flows (Figure 3-30 SGI 2008). Right bank DO is less than 6.0 mg/L until the rain event at the end of the study period. Left bank DO is below 7.0 mg/L in the beginning of the study period and then averages about 7.5 mg/L until just after the both pump tests. As noted above, the river is gaining water from the Creamery Meadow in this area, which likely accounts for the suppressed DO concentrations along the right bank. DO at the bottom of the river is typically below 7.0 mg/L (Figure 3-31 SGI 2008). Measurements along the right bank are accomplished by placement of the transducers on the left side of the thalweg (the deepest part of the stream) and more likely measures mid-river DO instead of right bank DO (Figure 3-31 SGI 2008). If this is indeed the case, mid-river temperatures were typically below 7.0 mg/L until flows increased in response to rain events. No DO measurements were reported for the upper lagoon. Low initial river flow rates are attributed to Labor Day weekend, because higher recreational use of the Piefer-Big Sur State Park results in greater diversion from the river to meet the greater demand, and the lagoon closure, and exhibited the lowest DO concentrations at all sites.

DO data was highly variable and no correlations with pump tests were identified. However, because the ambient conditions are typically close to or less than 7.0 mg/L (Basin Plan objective), any further reduction in DO would be substantial and cause or contribute to a violation of water quality standards. Diversions that reduce the flow of low DO groundwater to the Big Sur River could result in improved conditions within the river. Diversions that increase the gradient from the Creamery Meadow to the river would cause or contribute to substantial effects. Data appears to indicate that groundwater to surface water gradients are reduced in response to pumping. However, the subsequent reduction in flow rate may also affect ambient DO by causing or creating stagnant water conditions that might affect aquatic resources.

Because of data variability, no conclusions regarding pumping effects on DO can be made. The proposed project would increase the seasonal average diversion rate and, therefore, could alter the baseline flow regime. Consequently, because these lower reaches of the river do not meet water quality standards during at least Critical Dry irrigation seasons, any alterations in the pumping regime could have an adverse effect on Big Sur River DO concentrations. Therefore, the proposed project potential violation of water quality standards is ***potentially significant***.

Mitigation Measure

Irrigation practices that minimize Big Sur River flow losses during low flow conditions would reduce the potential for creation of stagnant water conditions and further reductions in DO. Alternatively, implementation of in-stream aeration would ensure that DO concentrations do not reach adverse levels. These measures are included as options in Mitigation Measure 4.3-4 presented in Section 4.3 (Biological Resources) of this DEIR. Implementation of either option presented in Mitigation Measure 4.3-4 would ensure that aquatic life support and habitat conditions related to DO levels in the river are maintained and potential the incremental increase in proposed project over baseline impacts would be ***less than significant*** with implementation of this measure. Continued pumping at baseline levels, however, would still contribute to low DO conditions in the BSR.

4.2-8 *Implement Mitigation Measure 4.3-4.*

Salinity

Continuous Big Sur River salinity was not measured during the study periods; however, instantaneous measurements were taken during the 2007 Biological Survey (Hanson 2008). Generally, salinity, as measured by EC, within the lower reaches of the river were not different than the salinity measured 4,000 feet upstream of the ZOI and was generally consistent, each day monitored, throughout the study area (just before the river curves to the southwest to within the upper lagoon area) (Hanson 2008). Values at the furthest downstream site were a few uS/cm lower than values in the upper reaches; values at the flow monitoring station about 4,000 feet upstream from the ZOI were generally, but not always, slightly lower than values within the study area. EC ranged from about 198 uS/cm to 277 uS/cm; no discernable factor could be identified for changes in salinity from one monitoring event to another. A large spike on September 27, 2008 in the lower reaches was measured but did not extend upstream to beyond the upper lagoon area, which is consistent with the 2004 study effects of wave overwash (SGI 2005). 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 Piefer-Big Sur State Park) effects of diversions cannot be identified. However, the consistent measurements and similarity to values measured outside of the affected area indicate that salinity was not responsive to diversions. Additionally, salinity values measured in the river were similar to groundwater measurements both near the river (211 to 327 uS/cm) and close to the New Well (242 to 262 uS/cm) during 2004 (Appendix M SGI 2005). There are no Basin Plan water quality objectives for salinity; however, measured values are below the limit for severe problems for agriculture (3,000 uS/cm). For these reasons, the potential impact of proposed increases in diversions above baseline conditions would have a ***less-than-significant impact*** on groundwater salinity levels.

Cumulative Impacts and Mitigation Measures

Under CEQA, an EIR must analyze the "cumulative impacts" of a proposed project. A cumulative impact refers to individual effects that, when considered together, are considerable or compound other environmental impacts. The individual effects may be changes resulting from a single project or multiple separate projects. CEQA requires a finding that the project may have a significant effect on the environment if the possible effects of a project are individually limited, but cumulatively considerable when viewed in connection with the effects of past, current, and probable future projects. The effects of past, current, and probable future projects is generally referred to as the "cumulative context" within which the proposed project's impact contribution is evaluated.

The cumulative context for determining potential impacts is the Point Sur Planning Watershed and the Lower Big Sur River Watershed for surface water impacts and the river alluvial aquifer, including the aquifer underlying the Creamery Meadow, for groundwater impacts and associated cumulative growth and diversions. Cumulative conditions take into account past development of irrigated pasture on the El Sur Ranch site and historical irrigation practices that are ongoing at the ranch. The cumulative context also takes into account existing permits or licenses, applications, small domestic use registrations, and statements of diversion and use (referred to herein as "claims") on file for the river and its tributaries. The cumulative context is discussed in greater detail in Chapter 5 of this DEIR under the subheading "Cumulative Impacts."

To summarize, existing diversions and pending applications in the Big Sur River watershed, including the unpermitted historical maximum diversions for El Sur Ranch, amount to total approximately 1,412 AFA. With the addition of increased diversions sought under the water right Application No. 30166, total cumulative maximum diversions would be approximately 1,891 AFA. The difference in these values is 479 AFA and represents the maximum annual diversion due to the proposed project that would contribute to the cumulative impact on resources supported by Big Sur River flow and local groundwater conditions.

Impact 4.2-9	The proposed project could contribute to reductions in local groundwater levels but would not substantially reduce groundwater supplies.

The Big Sur River is not a fully appropriated river, therefore, continued development within the river watershed could result in increases in water demand and use, and consequently, increases in water diversions and a reduction in water supplies. The current total water diversions are about 6.85 cfs, with the majority of diversions as river underflow occurring within the alluvial aquifer formed by the river and the rest as diversions of tributaries within the Lower river. Increased demand could result in more appropriations, but new water users or expanded diversions would have to undergo the CEQA process in order obtain water rights. The CEQA process would provide an evaluation of potential effects associated with additional water diversions. Additionally, the LUP/LCC and PWMP include policies designed to protect water supplies and function of the river as a public trust resource.

The Big Sur River alluvial aquifer is not very extensive and thins considerably within 2 miles upstream from the floodplain area rendering the efficacy of this aquifer as a water supply further from the floodplain area limited. Consequently, future water users likely would be limited to small surface water diversions, primarily along the river tributaries, low yielding groundwater wells within the upper areas of the river aquifer, or within the Creamery Meadow.

The proposed increase in diversions at El Sur Ranch could lower local groundwater tables, including the aquifer under the Creamery Meadow. However, the amount and extent of drawdown would not be substantial and would not greatly affect the ability of other water user to extract water from either the aquifer underlying the Creamery Meadow or within the upper aquifer area. Additionally, the proposed project is located at the downstream end of the river and diversions from the river would not affect water supplies or water rights users further up in the watershed. Consequently, proposed project impacts on groundwater levels and water supplies would not be significant and impacts would not be cumulatively considerable. Therefore, the project's cumulative impact on available groundwater supplies is ***less than significant***.

Impact 4.2-10	**The proposed project could contribute to reductions in the groundwater to surface water gradient and reductions in flow within the Big Sur River, which, in turn, may alter the natural channel forming flow regime.**

Ongoing and future water diversions within the Big Sur River watershed could result in greater demand for water resources, which, in turn, could alter the river hydrologic regime. New or expanded diversions within the watershed, however, are expected to be relatively small and each would have to undergo the CEQA process in order obtain water rights. The CEQA process would provide an evaluation of potential effects associated with additional water diversions. Additionally, the LUP/LCC and PWMP include policies designed to protect water supplies and function of the river as a public trust resource.

The existing river is a flashy system experiencing large storm flows and smaller base flows. Small user diversion of surface water or underflow would not be expected to substantially alter this hydrologic regime. Consequently, impact of future pending increases in diversions and new diversions upstream of the proposed project site are not expected to have a substantial effect on the hydrologic regime of the river.

The proposed project would not alter the Big Sur River hydrologic regime such that channel forming processes are affected or substantial flow losses occur. The amount of river flow loss that could be attributed to the proposed project would be minimal (less than about 0.7 cfs with about 1.6 cfs remaining during Critical Dry irrigation seasons). The incidences of no-flow conditions that currently occur in the river, however, may increase slightly as would the incidence of less-than-1 cfs. Although these anticipated increases would be very small, as noted above, the river supports critical habitat for endangered fish species and, therefore, this project's contribution to the cumulative impact is potentially considerable and, therefore, *cumulatively* ***potentially significant***.

Mitigation Measure

Mitigation Measure 4.2-2, above, would prevent project contributions to flow losses in river flow to result in river flow of less than 1 cfs even during critical flow conditions. The project's contribution would be reduced to a less-than-considerable level, reducing the project's cumulative impact to ***less than significant***.

4.2-10 *Implement Mitigation Measure 4.2-2.*

Impact 4.2-11	**The proposed increase in pasture irrigation in combination with past practices on the project site could contribute to substantial alterations in the drainage pattern of the POU and increased erosion or siltation on- or off-site.**

As described above, storm and irrigation runoff from the project site does not enter the Big Sur River. As such, potential project-related increases in erosion and sedimentation in no way affect cumulative conditions within the Big Sur watershed upstream of the project site. The cumulative context for this impact, therefore, is limited to past and ongoing irrigation practices within the project site boundaries, and the potential for erosion and sedimentation related to those practices.

Increases in irrigation on the project site in combination with past and ongoing practices within the POU could alter existing drainage patterns which may, in turn, result in increased erosion and sediment transport from the project site. Such an increase is considered potentially considerable. This impact, therefore, is considered *cumulatively* ***potentially significant***.

Mitigation Measure

Implementation of Mitigation Measure 4.2-4, above, ensures that the proposed project would not increase the potential for erosion and sediment transport by implementing practices that adequately control runoff and erosion on the project site. With this mitigation, the potential for cumulative impact is ***less than significant***.

4.2-11 *Implement Mitigation Measure 4.2-4.*

Global Climate Change

The potential future cumulative impact of the proposed project on various hydrologically-related issues such as surface water flows, surface water quality, and groundwater resources, could be influenced by rising sea levels caused by global climate change. In this DEIR, this issue is addressed separately in Chapter 5, CEQA Considerations.

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4.3 Biological Resources

4.3 Biological Resources

INTRODUCTION

The central California coast supports a variety of sensitive plant and animal resources. This section of the DEIR presents an analysis of project-generated effects on the biological resources of the study area.

As is discussed in Chapter 2 (Project Description) of this DEIR, the proposed project is the acquisition of an appropriative water right to divert water from the Big Sur River for use on irrigated pasture within El Sur Ranch. El Sur Ranch has diverted water to irrigated pasture on the Ranch for a number of years through the use of two offsite wells located on Andrew Molera State Park, adjacent to the Ranch site. As discussed in Section 4.1 of this DEIR, under the heading of "Environmental Baseline," approval of the Ranch's application would allow the continued extraction of water via the two existing wells for use on the Ranch. In its application, the Ranch seeks to divert more water relative to historic or baseline conditions. The extent of this increase is illustrated in Table 4.1-1 in Section 4.1, Introduction to the Analysis.

The infrastructure (wells, pipelines, access roads, etc) already exists to implement the project, and no modifications to the infrastructure are proposed. Because the project would continue historic diversions and would divert additional water above the historic amounts, this analysis of the potential project impacts on biological resources focuses on three main issues. These are:

1. Potential adverse effects on Big Sur River aquatic and riparian resources resulting from increased Ranch diversions.
2. Potential adverse effects on animals and habitat resulting from increased application of irrigation water on pasture.
3. Potential effects of increased runoff from irrigated pasture on biological resources.

Naming conventions for animals follow the most current commonly accepted scientific conventions (Nelson et al 2004; AOU 1998; Banks et al. 2007).

ENVIRONMENTAL SETTING

The environmental setting is discussed in both a regional and local context. The specifics of the local setting focus on those areas most likely to be affected by the project: the Big Sur River, the POU, and Swiss Canyon, which comprise the "study area" for the evaluation of impacts on biological resources.

Regional Setting

California Central Coast

The central coast of California is dominated by the Santa Lucia Mountains. In most places from Carmel south to Morro Bay, there is a relatively narrow area of coastal terrace where various land uses tend to be concentrated. It is these terraces that have often been cleared and fenced to support livestock or farming.

Climate

The climate of the area is dominated by the Pacific Ocean. Winter storms can bring heavy rains, high wind, and strong surf. In the summer, warm and dry weather is interspersed with periods of cool summer fog. Temperatures range from lows of 6-7 degrees Celsius (°C) in the winter months to seasonal highs of 23-25°C in the summers.[32] On average, the area receives about 42 inches of rain a year with almost 91 percent of this coming between November and April (Table 4.3-1).

TABLE 4.3-1

MONTHLY AVERAGE MAXIMUM AND MINIMUM AIR TEMPERATURES AND AVERAGE MONTHLY PRECIPITATION AT BIG SUR STATE PARK BETWEEN JULY 1, 1948 AND JUNE 30, 2007

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg Max (°C)	15.6	16.1	18.2	19.4	21.9	23.6	24.6	25.2	24.3	22.4	18.3	15.6	
Avg Min (°C)	6.2	6.8	6.7	6.9	8.0	8.9	10.4	10.1	10.1	8.8	7.6	6.6	
Avg Monthly Rainfall (in.)	8.69	7.45	6.14	3.19	0.91	0.22	0.04	0.09	0.49	1.82	5.15	7.75	41.94

Source: WRCC 2007.

Local Setting

Physical characteristics of the project site and vicinity are generally described in Section 4.2, Hydrology, Geohydrology, and Water Quality.

The following description of biological resources in the study area is based on two field visits by PBS&J biologists. One of these occurred on November 2, 2005 and focused on Andrew Molera State Park (AMSP) and the Big Sur River. The second was an escorted tour of El Sur Ranch which occurred on July 21, 2006. 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. It also takes into account work done by

32 Temperatures are reported in degrees Celsius (°C) throughout this analysis to be consistent with temperature criteria used for evaluation of potential impacts.

Hanson Environmental in 2004, 2006, and 2007 and Miriam Green and Associates in 2006 (Hanson 2005; 2007; 2008; Miriam Green 2007).

Vegetation

The primary plant communities found within the area include irrigated pasture, coastal prairie, coastal bluff scrub, non-native annual grassland, willow riparian forest, and cottonwood-sycamore riparian forest (Figure 4.3-1). The field visit to El Sur Ranch on July 21, 2006 documented 68 species of plants (Table 4.3-2). Work by Miriam Green and Associates (2007) in 2006 and 2007 documented 267 species of plants in the study area. Other minor plant communities include oak woodlands, eucalyptus forest, and coastal prairie. A small tailwater pond located in the southern portion of El Sur Ranch is fringed with freshwater marsh, as is a small pond at the mouth of Swiss Canyon. Other areas include the sandy beaches along the base of the bluffs and at the mouth of the Big Sur River.

TABLE 4.3-2

PLANT SPECIES OBSERVED WITHIN THE PROJECT AREA

Common Name	Scientific Name
bird's-foot trefoil	*Lotus corniculatus*
red clover	*Trifolium pratense*
ladino (white) clover	*Trifolium repens*
Alfalfa	*Medicago sativa*
alta fescue	*Festuca arundinacea*
orchard grass	*Dactylis glomerata*
rescue grass	*Bromus catharticus*
field bindweed	*Convolvulus arvensis*
rough cat's-ear	*Hypochaeris radicata*
sweet fennel	*Foeniculum vulgare*
Italian thistle	*Carduus pycnocephalus*
milk thistle	*Silybum marianum*
bull thistle	*Cirsium vulgare*
fiddle dock	*Rumex pulcher*
black mustard	*Brassica nigra*
annual beardgrass	*Polypogon monspeliensis*
Italian ryegrass	*Lolium multiflorum*
rip-gut brome	*Bromus diandrus*
Bluegrass	*Poa pratensis*
Harding grass	*Phalaris aquatica*
common rush	*Juncus effusus*
California poppy	*Eschscholzia californica*
yellow bush lupine	*Lupinus arboreus*
Lupine	*Lupinus* sp.
bracken fern	*Pteridium aquilinum* var. *pubescens*
Iris	*Iris* sp.
common yarrow	*Achillea millefolium*
blue flax	*Linum bienne*
coast goldenrod	*Solidago spathulata* ssp. *spathulata*
purple needlegrass	*Nasella pulchra*
wild oat	*Avena fatua*
coyote brush	*Baccharis pilularis*

TABLE 4.3-2

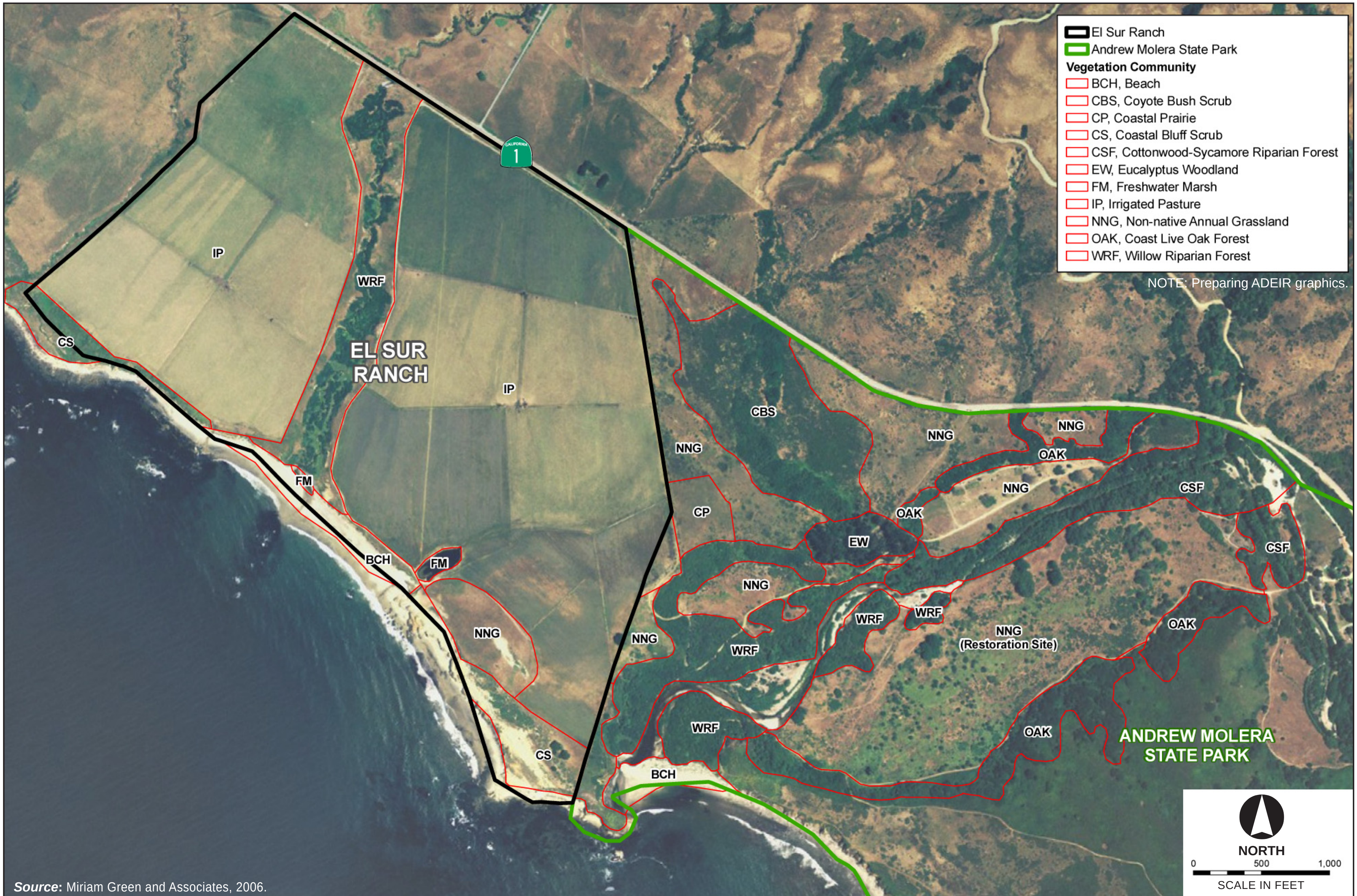
PLANT SPECIES OBSERVED WITHIN THE PROJECT AREA

Common Name	Scientific Name
California sage	*Artemisia californica*
wild lilac	*Ceanothus* sp.
poison oak	*Toxicodendron diversilobum*
lizard tail	*Eriophyllum staechadifolium*
Monterey Indian paintbrush	*Castilleja latifolia*
seaside plantain	*Plantago maritima*
beach strawberry	*Fragaria chiloensis*
coast wallflower	*Erysimum ammophilum*
bluff lettuce	*Dudleya farinosa*
seaside daisy	*Erigeron glaucus*
hedge-nettle	*Stachys bullata*
primrose	*Oenothera* sp.
and mugwort	*Artemisia douglasiana*
Pacific willow	*Salix lucida*
toyon	*Heteromeles arbutifolia*
coast live oak	*Quercus agrifolia*
western sycamore	*Platanus racemosa*
coast redwood	*Sequoia sempervirens*
rattail fescue	*Vulpia myuros*
hedgehog dogtail	*Cynosurus echinatus*
common verbena	*Verbena lasiostachys*
dock	*Rumex conglomeratus*
English plantain	*Plantago lanceolata*
poison hemlock	*Conium maculatum*
tall flatsedge	*Cyperus eragrostis*
silverleaf	*Potentilla anserina*
common horsetail	*Equisetum arvense*
brass buttons	*Cotula coronopifolia*
watercress	*Nasturtium officinale*
tule	*Schoenoplectus [Scirpus] acutus* var. *occidentalis*
Tule	*Schoenoplectus americanus*
panicled bulrush	*Schoenoplectus microcarpus*
broad-leaved cattail	*Typha latifolia*
sticky monkeyflower	*Mimulus aurantiacus*
California bee plant	*Scrophularia californica*

Source: PBS&J site visit, July 21, 2006.

Irrigated Pasture

The majority of the POU consists of two large pastures (bisected by Swiss Canyon) that occur on a nearly level, gently sloping terrace above the Pacific Ocean, as shown in Figures 2-2 and 2-3. Because the pastures have been managed for crop production since the 1920s, they no longer support a high percentage of native species. The pastures are irrigated to support year-round cattle grazing, and have been periodically planted with various range seed mixes containing legumes and graminoid species including bird's-foot trefoil (*Lotus corniculatus*), red clover (*Trifolium pratense*), ladino (white) clover (*Trifolium repens*), alfalfa (*Medicago sativa*), alta fescue (*Festuca arundinacea*), orchard grass (*Dactylis glomerata*), and rescue grass



Source: Miriam Green and Associates, 2006.

FIGURE **4.3-1**

Approximate Boundaries of Vegetation Communities

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(*Bromus catharticus*). Other seeded or locally naturalized broad-leaved plants and grasses include field bindweed (*Convolvulus arvensis*), rough cat's-ear (*Hypochaeris radicata*), sweet fennel (*Foeniculum vulgare*), Italian thistle (*Carduus pycnocephalus*), milk thistle (*Silybum marianum*), bull thistle (*Cirsium vulgare*), fiddle dock (*Rumex pulcher*), black mustard (*Brassica nigra*), annual beardgrass (*Polypogon monspeliensis*), Italian ryegrass (*Lolium multiflorum*), rip-gut brome (*Bromus diandrus*), bluegrass (*Poa pratensis*), and Harding grass (*Phalaris aquatica*). Native species persisting within the irrigated pasture include common rush (*Juncus effusus*), California poppy (*Eschscholzia californica*), and yellow bush lupine (*Lupinus arboreus*).

Coastal Prairie

Degraded coastal prairie habitat occurs within a separate, unirrigated pasture outside the east-central edge of the project site and POU (see Figure 4.3-1). Native and non-native species observed included California poppy, rough cat's-ear, Italian ryegrass, lupine (*Lupinus* sp.), bracken fern (*Pteridium aquilinum* var. *pubescens*), iris (*Iris* sp.), common yarrow (*Achillea millefolium*), blue flax (*Linum bienne*), coast goldenrod (*Solidago spathulata* ssp. *spathulata*), purple needlegrass (*Nasella pulchra*), and wild oat (*Avena fatua*). Scattered shrub species included yellow bush lupine, coyote brush (*Baccharis pilularis*), California sage (*Artemisia californica*), wild lilac (*Ceanothus* sp.), and poison oak (*Toxicodendron diversilobum*).

Coastal Bluff Scrub

Coastal bluff scrub habitat occurs on stabilized backdune slopes and rocky soils along the bluffs above the beach. A high-quality example of this community can be found within AMSP on the bluffs overlooking the mouth of the Big Sur River. Plant species observed included purple needlegrass, Italian ryegrass, yellow bush lupine, iris, coyote brush, poison oak, California sage, lizard tail (*Eriophyllum staechadifolium*), Monterey Indian paintbrush (*Castilleja latifolia*), seaside plantain (*Plantago maritima*), beach strawberry (*Fragaria chiloensis*), coast wallflower (*Erysimum ammophilum*), bluff lettuce (*Dudleya farinosa*), seaside daisy (*Erigeron glaucus*), hedge-nettle (*Stachys bullata*), primrose (*Oenothera* sp.), and mugwort (*Artemisia douglasiana*).

Central Coast Riparian Scrub

Central Coast riparian scrub habitat can be found along the lower Big Sur River and within the widely incised channel of Swiss Canyon. The dominant woody vegetation found in Swiss Canyon is Pacific and arroyo willow (*Salix lucida; Salix lasiolepis*). Along the lower Big Sur River from approximately the campground downstream to the mouth, willows dominate the woody vegetation. Less frequent woody associates include poison oak, coyote brush, toyon (*Heteromeles arbutifolia*), alder (*Alnus* sp.), coast live oak (*Quercus agrifolia*), western sycamore (*Platanus racemosa*), and coast redwood (*Sequoia sempervirens*). Native and non-native herbaceous species observed within the understory included common rush, orchard grass, Italian ryegrass, annual beardgrass, Harding grass, bird's-foot trefoil, rough cat's-ear, California blackberry (*Rubus ursinus*), rattail fescue (*Vulpia myuros*), hedgehog dogtail

(*Cynosurus echinatus*), common verbena (*Verbena lasiostachys*), dock (*Rumex conglomeratus*), English plantain (*Plantago lanceolata*), poison hemlock (*Conium maculatum*), tall flatsedge (*Cyperus eragrostis*), silverleaf (*Potentilla anserina*), common horsetail (*Equisetum arvense*), brass buttons (*Cotula coronopifolia*), and watercress (*Nasturtium officinale*).

Freshwater Marsh

Freshwater marsh habitat occurs along the edges of the tailwater pond located between Pasture 6 and the Pump House Field in the POU (see Figure 2-2 for location of the tailwater pond). The dominant herbaceous emergent species was tule (*Schoenoplectus* [*Scirpus*] *acutus* var. *occidentalis*). Other species observed included dock, common rush, tall flatsedge, brass buttons, and common horsetail. There is a very small, isolated freshwater marsh located at the mouth of Swiss Canyon that contains silverleaf, annual beardgrass, tall flatsedge, common horsetail, dock, tule (*Schoenoplectus americanus*), panicled bulrush (*Schoenoplectus microcarpus*), and broad-leaved cattail (*Typha latifolia*).

Cottonwood-Sycamore Riparian Forest

Cottonwood-Sycamore riparian forest occurs along the Big Sur River. This community replaces the willow riparian forest near the campground at AMSP and is found from there upstream along the river. The plant community is dominated by large black cottonwood and western sycamore trees. The understory is a mix of willow, California blackberry, and poison oak with smaller occurrences of hoary nettle (*Urtica dioica* ssp. *holosericea*), mugwort, and common horsetail.

Oak Woodland

Small areas of oak woodlands are present along the edges of the campgrounds at AMSP and on the south side of Creamery Meadow. These areas are dominated by coastal live oaks and have a mixed understory of native and non-native species including various grasses, poison oak, and blackberry.

Eucalyptus Forest

A small area of eucalyptus forest is located along the north trail that runs from the AMSP parking area to the beach. This grove was planted to shelter a cabin found in this location. As is typical with most eucalyptus forests, the primary species is blue gum (*Eucalyptus globulus*), and the understory is essentially non-existent.

Wildlife

Terrestrial Species

Wildlife of the project area is closely associated with the more native habitats. In general, most species diversity is present in the riparian and coastal scrub habitats. Almost 100 terrestrial species have been observed in the area (Table 4.3-3). Birds were the most diverse with 79 species being documented in the area. Mammals were the next most diverse with 13 species. Three species of reptiles were observed along with two species of invertebrates. Wildlife is associated with the different vegetation communities previously discussed. Raptors roost and perhaps nest in the trees of the riparian corridor and forage over non-native grasslands and irrigated pastures. Smaller passerines (warblers, sparrows, etc) likely nest and forage in the scrub and riparian habitats. The larger grazing mammals (deer and pigs) would be found in the non-native grasslands and the irrigated pastures. Predators (bobcat, coyote) utilize most habitats in their search for prey.

TABLE 4.3-3

WILDLIFE SPECIES OBSERVED WITHIN THE PROJECT AREA.

Common Name	Scientific Name	Status[1] (Federal/State/CNPS)	Location[2]	Source[3]
Amphibians and Reptiles				
California Red-legged Frog	*Rana aurora draytonii*	FT/CSC/-	Swiss Canyon	2, 4
Pacific Chorus Frog	*Pseudacris regilla*	-/-/-	Swiss Canyon	2, 4
Western Aquatic Garter Snake	*Thamnophis*	-/-/-	Big Sur River	1
Western Fence Lizard	*Sceloporus occidentalis*	-/-/-	Various	1, 2, 4
Southern Alligator Lizard	*Gerrhonotus multicarinatus*	-/-/-		4
Invertebrates				
Monarch Butterfly	*Danaus plexippus*	-/-/-	AMSP - Riparian	1
Signal Crayfish	*Pacifastacus leniusculus*	-/-/-	Big Sur River	3
Fish				
Steelhead	*Oncorhynchus mykiss*	FT/CSC/-	Big Sur River	1, 2, 3
Riffle Sculpin	*Cottus gulosus*	-/-/-	Big Sur River	3
Starry Flounder	*Platichthys stellatus*	-/-/-	Big Sur River	3
Three-spined Stickleback	*Gasterosteus aculeatus*	-/-/-	Big Sur River	3
Mosquito Fish	*Gambusia affinis*	-/-/-	El Sur Ranch Watering Troughs	2
Birds				
Pied-billed Grebe	*Podilymbus podiceps*	-/-/-		4
Brown Pelican	*Pelecanus occidentalis*	FE/SE/- (nesting and roosting areas only)	AMSP	2, 4
Brandt's Cormorant	*Phalacrocorax penicillatus*	-/-/-		4
Double-crested Cormorant	*Phalacrocorax auritus*	-/-/-		4
Pelagic Cormorant	*Phalacrocorax peligicus*	-/-/-		4
Great Egret	*Ardea alba*	-/-/-	AMSP	2, 4
Great Blue Heron	*Ardea herodias*	-/-/-	AMSP	1, 4
Black-crowned Night Heron	*Nycticorax nycticorax*	-/-/-		4
American Coot	*Fulica americana*	-/-/-	AMSP	1, 2, 4
Mallard	*Anas platyrhynchos*			4
Ruddy Turnstone	*Arenaria interpres*	-/-/-	AMSP-Beach	1
Black Turnstone	*Arenaria melanocephala*	-/-/-	AMSP-Beach	1
Killdeer	*Charadrius vociferus*	-/-/-		4
Whimbrel	*Mumenius phaeopus*	-/-/-		4
Long-billed Curlew	*Numenius americanus*	-/-/-		4
Marbled Godwit	*Limosa fedoa*	-/-/-		4
Sanderling	*Calidris alba*	-/-/-		4

TABLE 4.3-3

WILDLIFE SPECIES OBSERVED WITHIN THE PROJECT AREA.

Common Name	Scientific Name	Status[1] (Federal/State/CNPS)	Location[2]	Source[3]
California Gull	*Larus californica*	-/-/-		4
Heerman's Gull	*Larus heermanni*	-/-/-		4
Western Gull	*Larus occidentalis*	-/-/-		2
Turkey Vulture	*Cathartes aura*	-/-/-	Various	1, 2
White-tailed Kite	*Elanus leucurus*	-/FP/-		4
Sharp-shinned Hawk	*Accipiter striatus*	-/-/-	AMSP, El Sur Ranch	1, 2
Red-shouldered Hawk	*Buteo lineatus*	-/-/-	AMSP	2
Merlin	*Falco columbarius*	-/-/-	AMSP	1
Golden Eagle	*Aquila chrysaetos*	-/FP/-		4
California Quail	*Callipepla californica*	-/-/-	AMSP	2
Mourning Dove	*Zenaida macroura*	-/-/-	El Sur Ranch	2, 4
Anna's Hummingbird	*Calypte anna*	-/-/-	AMSP	1, 4
Northern Flicker	*Colaptes auratus*	-/-/-	AMSP	1, 4
Nuttall's Woodpecker	*Picoides nuttallii*	-/-/-	AMSP-Riparian	2, 4
Acorn Woodpecker	*Melanerpes formicivorus*	-/-/-		4
Black Phoebe	*Sayornis nigricans*	-/-/-	AMSP	1, 2, 4
Say's Phoebe	*Sayornis saya*	-/-/-		4
Violet-green Swallow	*Tachycineta thalassina*	-/-/-	El Sur Ranch	2
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	-/-/-	El Sur Ranch	2
Barn Swallow	*Hirundo rustica*	-/-/-	El Sur Ranch	2, 4
Hutton's Vireo	*Vireo huttoni*	-/-/-		4
Warbling Vireo	*Vireo gilvus*	-/-/-		4
Western Scrub-jay	*Aphelocoma californica*	-/-/-	AMSP	1, 4
American Crow	*Corvus brachyrhynchos*	-/-/-	Various	1, 4
Common Raven	*Corvus corax*	-/-/-	AMSP	2
Oak Titmouse	*Baeolophus inornatus*	-/-/-		4
Wrentit	*Chamaea fasciata*	-/-/-	AMSP	2
Chestnut-backed Chickadee	*Poecile rufescens*	-/-/-	AMSP-Riparian	1, 4
Bushtit	*Psaltriparus minimus*	-/-/-	AMSP-Riparian	1, 2, 4
Ruby-crowned Kinglet	*Regulus calendula*	-/-/-	AMSP-Riparian	1
Bewick's Wren	*Thryomanes bewickii*	-/-/-		4
American Dipper	*Cinculus mexicanus*	-/-/-	AMSP	4
Loggerhead Shrike	*Lanius ludovicianus*	-/CSC/-	El Sur Ranch	2, 4
Hermit Thrush	*Catharus guttatus*	-/-/-		4
American Robin	*Turdus migratorius*	-/-/-		4
California Thrasher	*Toxostoma redivivum*	-/-/-		4
European Starling	*Sturnus vulgaris*	-/-/-	El Sur Ranch	2
Orange-crowned Warbler	*Vermivora celata*	-/-/-		4
Yellow-rumped Warbler	*Dendroica coronata*	-/-/-	AMSP-Riparian	1
Yellow Warbler	*Dendroica petechia*	-/CSC/- (Nesting)		4
Black-throated Grey Warbler	*Dendroica nigrescens*	-/-/-		4
Townsend's Warbler	*Dendroica townsendi*	-/-/-		4
MacGillvray's Warbler	*Oporornus tolmiei*	-/-/-		4
Common Yellowthroat	*Geothlypis trichas occidentalis*	-/-/-		4
Wilson's Warbler	*Wilsonia pusilla*	-/-/-		4
Western Tanager	*Piranga ludoviciana*	-/-/-		4
Spotted Towhee	*Pipilo maculatus*	-/-/-	AMSP	1, 4
California Towhee	*Pipilo crissalis*	-/-/-	AMSP	2, 4
Song Sparrow	*Melospiza melodia*	-/-/-	AMSP	2, 4

TABLE 4.3-3

WILDLIFE SPECIES OBSERVED WITHIN THE PROJECT AREA.

Common Name	Scientific Name	Status[1] (Federal/State/CNPS)	Location[2]	Source[3]
Lincoln's Sparrow	*Melospiza lincolnii*	-/-/-		4
White-crowned Sparrow	*Zonotrichia leucophrys*	-/-/-	AMSP	1, 4
Golden-crowned Sparrow	*Zonotrichia albicollis*	-/-/-		4
Dark-eyed Junco	*Junco hyemalis*	-/-/-		4
Lazuli Bunting	*Passerina amoena*	-/-/-		4
Western Meadowlark	*Sturnella neglecta*	-/-/-	El Sur Ranch	2
Red-wing Blackbird	*Agelaius phoeniceus*	-/-/-		4
Brewer's Blackbird	*Euphagus cyanocephalus*	-/-/-	AMSP	2, 5
Brown-headed Cowbird	*Molothrus ater*	-/-/-		4
House Finch	*Carpodacus mexicanus*	-/-/-		4
Pine Siskin	*Carduelis pinus*	-/-/-		4
Lesser Goldfinch	*Carduelis psaltria*	-/-/-		4
American Goldfinch	*Carduelis tristis*	-/-/-	AMSP	2, 4
Mammals				
Monterey Dusky-footed Woodrat	*Neotoma macrotis luciana*	-/CSC/-	Riparian of Big Sur River and Swiss Canyon	1, 2, 4
California Ground Squirrel	*Spermophilus beecheyi*	-/-/-	Various	2, 4
Myotis Bat	*Myotis spp*	Varies depending on species		4
Brush Rabbit	*Sylvilagus bachmani*	-/-/-		4
Desert Cottontail	*Sylvilagus audubonii*	-/-/-		4
Western Gray Squirrel	*Scirus griseus*	-/-/-		4
Botta's Pocket Gopher	*Thomomys bottae*	-/-/-		4
Coyote	*Canis latrans*	-/-/-		4
Gray Fox	*Urocyon cinereoargenteus*	-/-/-		4
Raccoon	*Procyon lotor*	-/-/-		4
Bobcat	*Lynx rufus*	-/-/-		4
Feral Pig	*Sus scrofa*	-/-/-		4
Black-tailed Deer	*Odocoileus hemionus*	-/-/-		4

Notes:
Status:
Federal
FE Federally listed as Endangered
FT Federally listed as Threatened
State
SE State listed as Endangered
FP Fully Protected
CSC CDFG designated Species of Special Concern
Location: Location information is provided when known. AMSP is Andrew Molera State Park, El Sur Ranch is El Sur Ranch pastures. Locations of species from other sources are left blank unless specified within that source.
Sources: PBS&J site visits, November 2, 2005 and July 21, 2006; Hanson 2005, Hanson 2007, or Hanson 2008; Miriam Green and Associates 2006.

Aquatic Species

Aquatic species are those that spend all of their life in water or rely on water for reproduction. This includes the two species of amphibians observed within the area and five species of fish (Table 4.3-3). The amphibians include California red-legged frog (*Rana aurora draytonii*) and Pacific chorus frog (*Pseudacris regilla*). As discussed in greater detail, below, red-legged frogs were observed by PBS&J biologists in Swiss Canyon in 2006. With one exception, all of the observed fish species are found in the Big Sur River. The exception is Western mosquito fish (*Gambusia affinis*) which were observed in the stock watering tanks within the El Sur Ranch pastures. The lagoon of the Big Sur River supports species such as starry flounder (*Platichthys stellatus*) which spend a portion of their life-cycle in tidal lagoons and estuaries. The river itself is known to support riffle sculpin (*Cottus gulosus*), three-spine stickleback (*Gasterosteus aculeatus*), and steelhead (*Oncorhynchus mykiss*).

Sensitive Species

The California Natural Diversity Data Base (CNDDB) and California Native Plant Society (CNPS) databases were reviewed to determine the potential presence of sensitive species within the study area. Queries of both databases included all the species and habitats reported within the US Geological Survey 7.5-minute quadrangles for Soberanes Point, Mt. Carmel, Carmel Valley, Ventana Cones, Big Sur, Point Sur, Pfeiffer Point, and Partington Ridge. The data from these datasets were combined into a comprehensive table that includes each species state and federal status, preferred habitat, and likelihood of occurrence within the project area (Table 4.3-4). The resulting occurrences within 5 miles of the POU are shown in Figure 4.3-2. A letter was sent to the USFWS in Ventura requesting an official species list for the project area. Those on this list (USFWS 2008) species not reported from the CNDDB or CNPS queries were added to the overall list (Table 4.3-4).

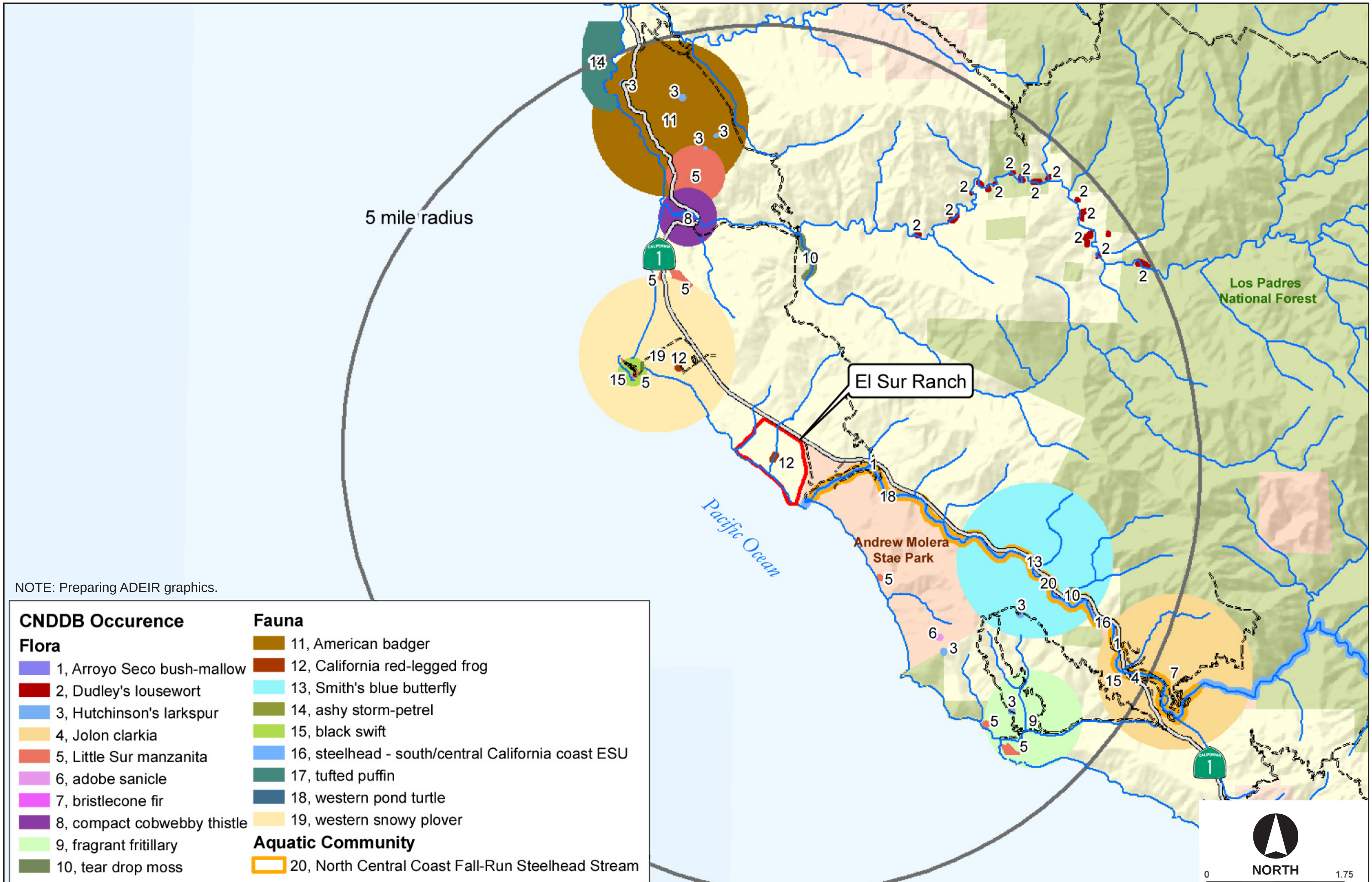
Plants and Natural Communities

Plants

There is a wide array of sensitive species of plants that are known to occur within the general project area. Of the 33 species have been documented within the CNDDB, CNPS, and USFWS databases (Table 4.3-4), 10 are within 5 miles of the POU (Figure 4.3-2). These range from federally endangered Yadon's rein orchid (*Piperia yadonii*) to a numerous CNPS List 1 and 2 species. None were documented within the POU during plant-specific surveys conducted in May and June 2006 and March 2007 (Miriam Green and Associates 2007).

Natural Communities

Three sensitive natural communities were reported in the CNDDB query: Central marine chaparral, Monterey pine forest, and north central coast fall-run steelhead stream. The only community reported by the database that is within the area potentially affected by the project is the north central coast fall-run steelhead stream, which is the Big Sur River (Figure 4.3-2). Other communities that would be considered sensitive that occur within the area and are not reported by the database include two riparian vegetation series (willow-riparian forest and cottonwood-sycamore riparian forest) and freshwater marsh (Figure 4.3-1). The riparian vegetation occurs along the Big Sur River and Swiss Canyon. Two small areas of freshwater marsh are located at the downstream end of Swiss Canyon just above the beach and the tailwater pond of El Sur Ranch.



Source: CA Dept. of Fish & Game, CNDDB, July 2008.

PBSJ

FIGURE **4.3-2**

CNDDB Occurences Within 5-Mile Radius

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TABLE 4.3-4

LIST OF SENSITIVE FLORA AND FAUNA REPORTED FROM THE GENERAL AREA BY THE CNDDB, CNPS, AND USFWS INCLUDING HABITAT INFORMATION AND LIKELIHOOD OF OCCURRENCE WITHIN THE ACTUAL PROJECT AREA

Common Name	Scientific Name	Status (Federal/State/ CNPS)	Habitat and Seasonal Distribution	Likelihood of occurrence within project vicinity
PLANTS				
Bristlecone fir	*Abies bracteata*	none/none/1B.3	On rocky soils in coniferous forests	Absent - Suitable habitat not present
Little Sur manzanita	*Arctostaphylos edmundsii*	none/none/1B.2	Coastal bluff scrub, typically on sandy terraces.	Moderate - Suitable habitat exists, not observed within POU.
Hooker's manzanita	*Arctostaphylos hookeri* ssp. *Hookeri*	none/none/1B.2	Found on sandy soils in chaparral, scrub, woodland and forest habitats.	Moderate - Suitable habitat exists, not observed within POU.
Muir's tarplant	*Carlquistia muirii*	none/none/1B.3	Granite ledges and dry sandy soils of chaparral, and coniferous forests.	Absent - Suitable habitat not present
Compact cobwebby thistle	*Cirsium occidentales* var*. compactum*	none/none/1B.2	On sand and clay soils in dune, chaparral, prairie and scrub habitats.	Absent - Suitable habitat not present
Jolon clarkia	*Clarkis jolonensis*	none/none/1B.2	Cismontane woodlands	Absent - Suitable habitat not present
Seaside bird's-beak	*Cordylanthus rigidus* ssp. *littoralis*	none/SE/1B.1	Sandy soils usually within chaparral or coastal scrub. Also found in coniferous forest, woodlands, and coastal dunes.	Moderate - Suitable habitat exists, not observed within POU.
Tear drop moss	*Dacryophyllum falcifolium*	none/none/1B.3	Limestone substrates and rocky outcrops in coastal redwood forests.	Absent - Suitable habitat not present
Hutchinson's larkspur	*Delphinium hutchinsoniae*	none/none/1B.2	Forests, chaparral, prairie and coastal scrub, usually in moist, shaded areas on west-facing slopes.	Low – limited habitat available onsite, none within the POU.
Eastwood's goldenbrush	*Ericameria fasciculata*	none/none/1B.1	Sandy areas in chaparral, coastal scrub, and coastal dunes.	Absent - Suitable habitat not present
Pinnacles buckwheat	*Eriogonum nortonii*	none/none/1B.3	Sandy soils in chaparral and grasslands, often in recently burnt areas.	Absent - Suitable habitat not present
Talus fritillary	*Fritillaria falcata*	none/none/1B.2	On shale, granite, or serpentine talus of chaparral, woodland, and coniferous forest.	Absent - Suitable habitat not present
Fragrant fritillary	*Fritillaria liliacea*	none/none/1B.2	Coastal scrub, prairie, and grasslands over serpentine soils. Other soils are reported usually containing clay.	Absent - Serpentine soils not present onsite
Cone Peak bedstraw	*Galium californicum* ssp. *Luciense*	none/none/1B.3	Partial shade of oak or pine forests often on forest duff or talus slopes.	Absent - Suitable habitat not present
Santa Lucia bedstraw	*Galium clementis*	none/none/1B.3	Montane coniferous forests on shaded rocky areas often over granite or serpentine at elevations over 3,700 ft.	Absent - Suitable habitat not present

TABLE 4.3-4

LIST OF SENSITIVE FLORA AND FAUNA REPORTED FROM THE GENERAL AREA BY THE CNDDB, CNPS, AND USFWS INCLUDING HABITAT INFORMATION AND LIKELIHOOD OF OCCURRENCE WITHIN THE ACTUAL PROJECT AREA

Common Name	Scientific Name	Status (Federal/State/ CNPS)	Habitat and Seasonal Distribution	Likelihood of occurrence within project vicinity
San Francisco gumplant	*Grindelia hirstula* var. *maritima*	none/none/1B.2	Sandy or serpentine bluffs of coastal scrub and valley and fooyhill grasslands	Low - Only reported from San Francisco and San Mateo counties.
Carmel Valley bush-mallow	*Malacothamnus palmeri* var. *involucratus*	none/none/1B.2	Talus slopes of woodlands and chaparral sometimes on serpentine soils. Burn dependant.	Absent - Suitable habitat not present
Arroyo Seco bush-mallow	*Malacothamnus palmeri* var*. lucianus*	none/none/1B.2	Chaparral and meadows, usually over gravel or rocky soils on west-facing slopes in full sun.	Moderate - Suitable habitat exists, not observed within POU.
Carmel Valley malacothrix	*Malacothrix saxatilis* var. *arachnoidea*	none/none/1B.2	Rocky outcrops in chaparral	Absent - Suitable habitat not present
Dudley's lousewort	*Pedicularis dudleyi*	none/SR/1B.2	Coastal chaparral, coniferous forest, and grassland habitats. Usually in shaded areas.	Absent - Suitable habitat not present
Monterey pine (Native occurrences)	*Pinus radiata*	none/none/1B.1	Coniferous forest, woodlands on dry bluffs and slopes.	Absent - Suitable habitat not present
Yadon's rein orchid	*Piperia yadonii*	FE/none/1B.1	On sandstone and sandy soils of coniferous forest, chaparral, and coastal scrub.	Moderate - Suitable habitat exists, not observed within POU.
Hooked popcorn flower	*Plagiobothrys uncinatus*	none/none/1B.2	Disturbed or burned areas over sandstone within chaparral, woodland, coastal scrub, and grasslands.	Absent - Suitable habitat not present
Pine rose	*Rosa pinetorum*	none/none/1B.2	Closed-cone coniferous forest	Absent - Suitable habitat not present
Adobe sanicle	*Sanicula maritima*	none/SR/1B.1	Meadows and seeps of grasslands, chaparral, and coastal prairie, usually found on clay and iron-rich soils.	Low – No seep habitat present except possibly in Swiss Canyon. Soils are likely too sandy.
California screw moss	*Tortula californica*	none/none/1B.2	On sandy soils in scrub and grasslands.	Moderate – Suitable soils exist.
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	FT/none/1B.2	Coastal dunes, chaparral, woodlands and scrub habitats. Usually on sandy soils	Low – Suitable habitat present, but all records from northern Monterey County.
Beach layia	*Layia carnosa*	FE/SE/1B.1	Coastal dunes with sparse vegetation, usually behind foredunes	Low – Suitable habitat not present. All records from Monterey Peninsula.
Tidestrom's lupine	*Lupinus tidestromii*	FE/SE/1B.1	Partially stabilized coastal dunes in close proximity to ocean	Low – Suitable habitat present but all records north of Pebble Beach.
Coastal dunes milk-vetch	*Astragalus tener* var. *titi*	FE/SE/1B.1	Coastal bluff scrub and dunes in moist sandy areas near the ocean.	Low – Suitable habitat present, but only known record from the Monterey Peninsula

TABLE 4.3-4

LIST OF SENSITIVE FLORA AND FAUNA REPORTED FROM THE GENERAL AREA BY THE CNDDB, CNPS, AND USFWS INCLUDING HABITAT INFORMATION AND LIKELIHOOD OF OCCURRENCE WITHIN THE ACTUAL PROJECT AREA

Common Name	Scientific Name	Status (Federal/State/ CNPS)	Habitat and Seasonal Distribution	Likelihood of occurrence within project vicinity
Gowen cypress	*Cupressus goveniana* ssp. *gaveniana*	FT/none/1B.2	Coniferous forests on coastal terraces with sandy soils	Absent – Suitable habitat not present
Hickmen's potentilla	*Potentilla hickmanii*	FE/SE/1B.1	Coastal scrub, coniferous forest, meadows, marshes etc. Especially near freshwater seeps and streams in open or forested areas	Low – marginally suitable habitat along the Swiss Canyon. Not observed within project area.
Monterey clover	*Trifolium trichocalyx*	FE/SE/1B.1	Coniferous forests with poorly drained, nutrient deficient soils.	Absent – Suitable habitat not present
SENSITIVE NATURAL COMMUNITIES				
Central maritime chaparral		CDFG Sensitive habitat – S2.2		Present – bluff scrub in park and along El Sur Ranch bluffs
Monterey pine forest		CDFG Sensitive habitat – S1.1		Absent – community not found within project area.
North Central Coast fall-run steelhead stream		CDFG Sensitive habitat – Not Ranked		Present – Big Sur River
INVERTEBRATES				
Smith's blue butterfly	*Euphilotes enoptes smithi*	FE/none/none	Typically associated with coastal dunes and coastal sage scrub communities. Buckwheat (*Eriogonum* spp) are used as larval and adult host plants.	Moderate – presence of host plants unknown. Most records further inland except one south of Andrew Molera State Park.
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT/none/none	Small clear seasonal pools and grassy swales.	Absent-Suitable habitat not present.
FISH				
South/Central California steelhead	*Oncorhynchus mykiss*	FT/CSC/none	Coastal streams with stable water supply, clean gravels, and good quality riparian habitat.	Present – Observed in Big Sur River
AMPHIBIANS				
California tiger salamander	*Ambystoma californiense*	FT/CSC/none	Occurs in grasslands and open oak woodland that provide suitable aestivation (i.e., summer retreats) and/or breeding habitat in close proximity to vernal pools, seasonal wetlands, or artificial impoundments (e.g., stock ponds).	Low – Tailwater pond is marginal breeding habitat. No records of this species within 5 miles of the ranch.
California red-legged frog	*Rana aurora draytonii*	FT/CSC/none	Pools in slow-moving streams and ponds with well-developed emergent freshwater marsh vegetation. Adjacent riparian habitat also important.	Present – Observed in Swiss Canyon, likely in Big Sur River.

TABLE 4.3-4

LIST OF SENSITIVE FLORA AND FAUNA REPORTED FROM THE GENERAL AREA BY THE CNDDB, CNPS, AND USFWS INCLUDING HABITAT INFORMATION AND LIKELIHOOD OF OCCURRENCE WITHIN THE ACTUAL PROJECT AREA

Common Name	Scientific Name	Status (Federal/State/ CNPS)	Habitat and Seasonal Distribution	Likelihood of occurrence within project vicinity
Coast Range newt	*Taricha torosa torosa*	none/CSC/none	Breeds in ponds and slow moving streams. Lives in upland habitats of coastal drainages.	High – Suitable habitat exists both within the Big Sur River and Swiss Canyon.
REPTILES				
Western pond turtle - and - Southwestern pond turtle	*Actinemys [Emys] marmorata* *Actinemys marmorata pallida*	none/CSC/none	Associated with permanent or nearly permanent water in a wide variety of aquatic habitats. Requires basking sites. Nest sites may be found up to 0.5 km from water	High – Recent record from the Big Sur River. Suitable habitat exists for both nesting and year-round use.
BIRDS				
Brown Pelican (Nesting colony and communal roosts)	*Pelecanus occidentalis*	FE/SE/none	Nests colonially on offshore islands. Communal roosts range from offshore islands to artificial structures.	Absent-Individuals observed, but roosting and nesting do not occur
Ashy storm-petrel (Rookery)	*Oceanodroma homochroa*	none/CSC/none	Nests colonially in off shore islands.	Absent - Suitable habitat not present
Tricolored blackbird (Nesting colony)	*Agelaius tricolor*	FSC/CSC/none	Highly colonial species. Most numerous in the Central Valley. Requires open water, cattail or tulle marshes, protected nesting substrate, and a foraging area with insect prey within a few kilometers of the colony	Low-Freshwater marsh habitat of tailwater pond likely too small to support breeding colony.
Black Swift (Nesting)	*Cypseloides niger*	none/CSC/none	Nests on cliffs near water.	Absent - Suitable habitat not present
Loggerhead shrike (Nesting)	*Lanius ludovicianus*	none/CSC/ none	Found in broken woodlands, savannah, and riparian woodlands. Prefers open country with perches for hunting and fairly dense shrubs and brush for nesting.	High – Individual observed on ranch property. Nesting not suspected but not confirmed.
Tufted puffin (Nesting colony)	*Fratercula cirrhata*	none/CSC/none	Pelagic species that nests on off shore islands and cliffs. Soils must be allow for digging of burrows.	Absent - Suitable habitat not present
Western snowy plover (Nesting)	*Charadrius alexandrinus nivosus*	FT/CSC/none Designated Critical Habitat	Breeds on sandy beaches well up from the surf line.	Moderate – Beaches adjacent to the ranch may be used as nesting. Likely also support wintering birds.
California condor	*Gymnogyps californianus*	FE/SE/none		Low – May overfly ranch on occasion, but nesting habitat is not present.
Yellow-billed cuckoo	*Coccyzus americanus*	FCS/SE/none		Low – outside known range of occurrences.

TABLE 4.3-4

LIST OF SENSITIVE FLORA AND FAUNA REPORTED FROM THE GENERAL AREA BY THE CNDDB, CNPS, AND USFWS INCLUDING HABITAT INFORMATION AND LIKELIHOOD OF OCCURRENCE WITHIN THE ACTUAL PROJECT AREA

Common Name	Scientific Name	Status (Federal/State/ CNPS)	Habitat and Seasonal Distribution	Likelihood of occurrence within project vicinity
MAMMALS				
Monterey dusky-footed woodrat	*Neotoma macrotis luciana*	none/CSC/none	Forest, riparian, and chaparral habitats where mound-like nests are built of sticks, leaves, etc.	Present – Nests observed in riparian along Big Sur River.
American badger	*Taxidea taxus*	none/CSC/none	Occupies a diversity of habitats throughout the state; principal habitat requirements include sufficient prey base, friable soils, and relatively open, uncultivated ground.	Low – only known from single collection in 1966 near Pt. Sur; Not reported since.
Southern sea otter	*Enhydria lutris nereis*	FT/CFP/none	Nearshore marine habitats with kelp beds a required element. No terrestrial life stages.	Moderate – kelp beds are present offshore. Not observed during site visits.

Notes:

1- Special Status Species: Animals that were included in this table have a ranking of CSC or higher from CDFG. Special-status plants that were included in this table have been placed on the CNPS List 2 or higher.

2-Status:

Federal
FE Federally listed as Endangered
FT Federally listed as Threatened
FCS Federal Candidate Species

State
SE State listed as Endangered
ST State listed as Threatened
SR State rare
CFP CDFG designated Fully Protected, permit required for "take."
CSC CDFG designated Species of Special Concern

Other
CNPS 1A Presumed extinct in California
CNPS 1B Plants that are rare, threatened, or endangered in California and elsewhere.
CNPS 2 Plants that are rare, threatened, or endangered in California, but more common elsewhere.

CNPS Threat Code Extension
1. Species seriously endangered in California
2. Species fairly endangered in California
3. Species not very endangered in California

Habitat Codes
S1 Less than 6 Element Occurrences (EOs) OR less than 1,000 individuals OR less than 2,000 acres
S2 6 - 20 EOs OR 1,000 - 3,000 individuals OR 2,000 - 10,000 acres
S3 21 - 100 EOs OR 3,000 - 10,000 individuals OR 10,000 - 50,000 acres

Habitat Code Extensions
Very Threatened
Threatened
No current threats known

Example: Monterey Pine Forest has a code of S1.1 because there are three known occurrences for just under 400 acres and naturally occurring pine forests are very threatened in California.

3-Likelihood of Occurrence:

Present - Species that have been observed in the project area.
High - Species not observed, but where data indicates suitable habitat and onsite conditions warrant a high probability of occurrence.
Moderate - Species which occur in the vicinity and could use suitable habitat onsite, but for which the likelihood of occurrence is difficult to assess.
Low - Species not found during surveys and not be expected to occur, given the regional distribution or the onsite habitat quality.
Absent - Means that there is no suitable habitat onsite that could support this species and/or the site is outside the known range.

Sources: CNDDB 2008; CNPS 2008; USFWS 2008.

Terrestrial Animals

Nine species of terrestrial animals have been reported from the nine-quadrangle area queried in the CNDDB. These include one invertebrate, seven species of birds, and two mammal species. The only sensitive terrestrial species observed were loggerhead shrike (*Lanius ludovicianus*) and Monterey dusky-footed woodrat (*Neotoma macrotis luciana*). The only others reported species that could occur within the area is the western snowy plover.

Loggerhead Shrike

Loggerhead shrikes are small birds found in grasslands with nearby scrub habitat that they use for nesting. They forage in the grasslands for insects and small reptiles. A loggerhead shrike was observed foraging near the upstream end of Swiss Canyon on El Sur Ranch during a July 21, 2006 field visit. This individual was foraging in the pastures from perches on fences and bushes near Highway 1. The riparian habitat of the canyon along with associated coyote bush scrub would provide suitable nesting habitat for this species. Nesting is suspected, but not verified. Because their preferred nesting and foraging habitats have been lost to development, nesting Loggerhead shrikes are considered a species of special concern by CDFG.

Monterey Dusky-footed Woodrat

Monterey dusky-footed woodrat is a small- to medium-size rat native to the riparian woodlands and scrub habitats of central California. Found in areas of dense vegetation this rat builds an almost impenetrable nest of sticks and twigs that can reach several feet in height. Woodrat nests were observed within the riparian woodlands along the Big Sur River on all field visits. Because of the loss of riparian and scrub habitats to human-generated causes, CDFG considers the Monterey dusky-footed woodrat to be a species of special concern.

Western Snowy Plover

Snowy plovers are small shorebirds that nest on beaches of the California coast. They use dry sand well above the surf line for their nests. Relatively large numbers of birds winter and a couple pairs per year nest on a beach just north of Point Sur, north of the POU (70 Federal Register [FR] 75608). This beach is designated critical habitat for this federally threatened species (70 FR 75608). The beaches along the El Sur Ranch provide suitable nesting habitat for this species, but they are not critical habitat and nesting has not been documented.

Aquatic Animals

Steelhead (South-Central California Coast)

Regulatory Background. The National Marine Fisheries Service (NMFS) has placed the population of steelhead[33] found in the Big Sur River in the South Central California Coast Distinct Population Segment (DPS). This DPS includes all naturally spawned populations from the Pajaro River to the Santa Maria River, but does not include the Santa Maria River itself. The steelhead was originally listed as a threatened species in August 1997 (62 FR 43937) and that listing was reaffirmed in January 2006 (71 FR 834). The NMFS proposed the designation of critical habitat for steelhead on the South-Central Coast in 1999 (64 FR 5740) and adopted a final rule in September 2006 (70 FR 52488). The final critical habitat designation includes the Big Sur River. This species is not protected under the California ESA, but this DPS is considered a species of concern by CDFG.

Life History. Steelhead are an anadromous species, which means that the adults mature in the ocean and return to spawn in freshwater. Juvenile steelhead rear in freshwater before migrating to the ocean. Adults spend between 1 and 3 years on average in the ocean before returning to spawn.

Adult steelhead move into the Big Sur River after prolonged winter storms have opened the sandbar that forms at the mouth of the lagoon. In this area of coastal California, migration may not start until December but could last though May, peaking in the wettest months of the year (Moyle 2002). Adults migrate through the lower river on their way to spawning habitat in the upper river.

Adults choose spawning habitat based on flow and gravel size. Preferred substrates are generally less than 6 inches in size with a minimal amount of fine sediments (Moyle 2002). Spawning females dig a nest (redd) and deposit eggs that are fertilized by the male at the time of deposition. The female then covers the eggs with more gravel. Intergravel flows provide oxygen to buried eggs and remove waste products. Eggs hatch after 3-4 weeks depending on water temperature and the fry emerge from the gravel after an additional 2-3 weeks (Moyle 2002).

Once they emerge from the gravel, steelhead fry move into stream margins utilizing low-velocity areas and cover to avoid predation. As they get larger, they move into riffles and eventually pools. Smaller fish tend to use pool margins and riffles with larger fish found more frequently in pools. Juvenile steelhead rear in freshwater for 1-3 years depending on the productivity of the stream. Freshwater growth is a function of both temperature and available food supplies. Generally, it takes 2 years before fish reach a size where it can undergo the physiological

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33 There is often confusion about the status of rainbow trout found within streams occupied by steelhead. These are the same species that exhibit different life-cycle patterns; rainbow trout are the non-anadromous form of steelhead. According to NMFS, any *Oncorhynchus mykiss* found in waters that are accessible to steelhead is considered a steelhead and afforded the protection of the federal ESA.

changes, a process known as smoltification, which will allow it to survive in salt water. As smoltification takes place, fish move downstream and eventually into the ocean. They may rear for some time in the lagoon before entering the ocean itself.

Snorkel surveys were conducted in the lower Big Sur River in July and October 2004 and October 2007. Yearling and juvenile fish have been observed rearing throughout the reach during each snorkel survey (Table 4.3-5). In 2004, fish generally were using a variety of pool and riffle habitat (Hanson 2005). However, within the study area the distribution of fish changed between the July and October 2004 surveys as a result of changes in water quality, primarily a reduction in dissolved oxygen which forced fish to move out of Reach 2 and into the lagoon. In 2004 surveys conducted in July and October, most fish were observed in the lower 2,500 feet of the Big Sur River; a reach that included the lagoon (Hanson 2005). Surveys in 2007 resulted in similar observations. Steelhead densities were highest in roughly the lower 1,300 feet of the Big Sur River and declined dramatically upstream of that point (Hanson 2008). In both years, peak densities of steelhead were observed in those stream reaches with the most instream cover (Hanson 2005; 2008).

TABLE 4.3-5

NUMBER OF JUVENILE STEELHEAD OBSERVED IN THE LOWER BIG SUR RIVER DURING SNORKEL SURVEYS CONDUCTED IN 2004 AND 2007

Date	Number of Fish	Observed Size Range (mm)	Dominant Size Range (mm)/Percent
July 2004	417	20-300	61-100 / 72 %
October 2004	358	61-300	101-150 / 46 %
October 2007	379 [a]	60-300[a]	81-150 / 57 %

Note:
A-One adult steelhead was observed in 2007 and is not included in the observed size range data or the number of fish.
Source: Hanson 2005; 2008.

Habitats - The habitat within the lower Big Sur River is generally classified differently for each life-stage of steelhead that is of interest. For adults, this reach is primarily a migratory corridor, although they could “stage” (i.e., linger) in the lagoon and some of the larger pools of the lower river while waiting for flows to allow upstream passage. Most of the steelhead observed within the lower Big Sur River are juvenile and yearling fish. Based on the surveys, the first 1,500-2,000 feet of the river, including the lagoon, appears to provide the habitat most frequently used by juvenile steelhead. This area overlaps with the zone of influence associated with the proposed project.

Water Quality Requirements - Steelhead are traditionally known as a cold water fish. Temperature is perhaps the water quality parameter that has received the most study as it relates to steelhead. For juvenile rearing, most productive growth occurs at water temperatures of 15-18°C (Moyle 2002). When water temperatures exceed approximately 20°C, fish seek cooler water refuges. These areas include groundwater seeps, stratified pools, overhanging shaded cover. Others move into riffles where more food is found to support the higher temperature-driven metabolic rates. Summaries of water temperature data collected within the lower Big Sur River in 2004, 2006, and 2007 indicate that in general, water temperatures in the late summer and early fall are suitable for rearing steelhead (Hanson 2005; 2007; 2008).

Dissolved oxygen (DO) is another important water quality parameter for steelhead habitat. Cooler water from groundwater seeps can be low in DO. In general, steelhead can survive relatively low levels of DO when water temperatures are extremely low and fish metabolic rates are also low. Typically, DO levels near “saturation” are required for productive growth (Moyle 2002). When DO levels drop below about 3 milligrams per liter (mg/L), they are considered lethal for juvenile steelhead (Matthews and Berg 1997). Dissolved oxygen levels have been monitored in the lower Big Sur River as part of the fisheries and groundwater studies conducted by Hanson and SGI. For DO, the results of these studies are not entirely clear. It appears that most of the time, DO levels are adequate for rearing steelhead. However, all the studies have documented, either with spot data or continuous data loggers, periods of time and locations where DO levels drop below those considered suitable for rearing steelhead. Most frequently this is an area on the right bank near Creamery Meadow (see Figure 2-2), where it appears that low-DO groundwater is percolating into the river. In 2007, a more extensive portion of the lower river contained low levels of DO. This area stretched from piezometer station 2 upstream to station 4uL (see Figure 4.2-5 in Section 4.2, Hydrology, Geohydrology, and Water Quality, for monitoring locations) and lasted from the time monitors were installed on August 31 through late September (Hanson 2008; SGI 2008). Piezometer station 2 is about 1,800 feet upstream of the mouth of the river and station 4uL is just under 1,000 feet upstream of station 2. During this period DO levels dropped as low as 2 mg/L in some locations: conditions considered lethal to juvenile steelhead. Snorkel surveys in 2007 found steelhead within the area between stations 2 and 4uL indicating that while peizometer data indicated DO levels were very low, steelhead were finding areas of higher DO in which they could survive.

Western Pond Turtle

Western pond turtle is an aquatic turtle that ranges throughout much of the state from the Sierra Nevada foothills to the coast, and in coastal drainages from the Oregon border to Baja California. It occurs in suitable habitat throughout this range in ponds, slow moving streams and rivers, irrigation ditches, and reservoirs that have abundant emergent and/or riparian vegetation (Ernst *et al.* 1994). The turtle requires adjacent uplands for nesting and egg-laying. Nests are dug in locations with soils with high clay or silt component on unshaded, south-facing slopes with peak nesting in May-July (Ernst *et al.* 1994). Hatchlings emerge from the nests in late summer and move into aquatic habitats. Western pond turtles are reported from the Big Sur River in AMSP where four adults were observed in 1995 (CNDDB 2008). Pond turtles were not observed during any of the fisheries work conducted for this project in Big Sur River, nor were they observed in the tailwater pond or Swiss Canyon. The creek in Swiss Canyon is likely too small to support turtles, but the tailwater pond is considered suitable habitat. There are abundant breeding areas in the grasslands on both sides of the Big Sur River.

California Red-legged Frog

California red-legged frogs are the largest native frogs in California. They have suffered from a dramatic decline in available habitat, competition from non-native bullfrogs, and predation from introduced fish species. Accordingly, the USFWS listed the California red-legged frog as federally threatened in 1996 (61 FR 25813). Although the USFWS has designated critical habitat for this species, the designation does not include the project area.

Red-legged frogs begin breeding in November when males enter breeding areas and vocalize to advertise their presence. Preferred breeding habitats are ponds, floodplain pools, and backwater margins of streams where water velocities are relatively low. Adults choose breeding locations that are protected from high flows, have shrubby and emergent vegetation, and are usually over 2 feet deep (USFWS 2002). The tailwater pond on the south pastures of El Sur Ranch, Swiss Canyon, and the Big Sur River all provide suitable breeding habitat. Most egg-laying occurs in March. Eggs are attached to submerged aquatic vegetation or sticks and twigs of small woody debris. Eggs hatch after 6-14 days depending on water temperatures. The tadpoles remain in the breeding location through mid-summer, typically having completed their metamorphosis into juvenile frogs by mid-August, 11-20 weeks after hatching (USFWS 2002). Some overwintering by tadpoles has been observed, but affects only a small percentage of the population.

Dispersal from breeding habitats occurs when adults have completed breeding and when tadpoles complete the metamorphosis into juvenile frogs. Adults will spend the entire year in freshwater, although not necessarily the breeding areas, when suitable habitat is available. Studies of tagged adult frogs in a coastal area near Santa Cruz indicated that most frogs remain in aquatic habitat throughout the year and those that do move to upland locations, are generally found within 60 meters from their breeding sites (Bulger et al*.* 2003). In areas where summer-time water sources are not stable, adults spend the dry part of the year in riparian habitats or subterranean burrows where there is sufficient moisture to prevent desiccation. Upland habitat used by red-legged frogs includes grasslands with small mammal burrows and riparian habitats with an abundant understory and structure.

Like most frogs, California red-legged frogs are sensitive to changes in water quality, especially high salinities. Complete mortality had been observed when eggs are exposed to salinities over 4.5 parts per thousand (ppt), and larvae die when exposed to salinities over 7.0 ppt (USFWS 2002). Adults have been reported from coastal lagoons in areas where the salinity reached 10.8 ppt; however, adult frogs generally moved out of areas with salinities over 6.5 ppt (Jennings and Hayes 1990). These frogs are slightly more tolerant of changes in water temperature. Eggs survive at water temperatures of 9-21°C, and tadpoles can be found at temperatures of 15-25°C, although they are more common in some systems at temperatures below 22°C (USFWS 2002).

California red-legged frogs are present on the project site and in the vicinity of the project. They have been reported as recently as 2007 from near Pt. Sur about 1.5 miles northwest of the POU (CNDDB 2008). In July 2006, PBS&J biologists along with representatives from El Sur Ranch, SWRCB, and Hanson Environmental observed 12 adult frogs and numerous tadpoles in the lower portion of Swiss Canyon. Within the Big Sur River, red-legged frogs were reportedly observed during fisheries studies conducted by CDFG in 1993 and 1994 (Biosystems 1995). No red-legged frogs were observed in the Big Sur River during any of the work conducted for the proposed project, but staff were generally not on-site during the breeding season. Overall, there is suitable breeding habitat along the Big Sur River, within the tailwater pond at El Sur Ranch, and within SC.

REGULATORY SETTING

This section describes the state and federal regulatory context for biological resources, namely federal and state laws governing the protection of threatened and endangered species and water quality-related issues. These laws include the Federal Endangered Species Act, the California Endangered Species Act, CEQA, and the Porter-Cologne Water Quality Control Act.

Federal Law

Federal Endangered Species Act of 1973

The Federal Endangered Species Act (FESA) of 1973 (16 U.S.C. §§ 1531-1544), as amended, establishes a program to protect threatened and endangered fish, wildlife, and plants species and the ecosystems on which they depend. Section 3 of FESA (16 U.S.C. § 1532) defines an endangered species as any species "in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as any species or subspecies "likely to become endangered within the foreseeable future throughout all or a significant portion of its range." The USFWS and NMFS are responsible for implementation of FESA, including determining whether to list a species as endangered or threatened species. As discussed above, federally-listed species known to exist in the area include California red-legged frog and steelhead.

It is unlawful under FESA for any person to "take" any endangered or threatened fish or wildlife species. "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" and includes habitat alteration. In certain circumstances, an incidental take permit may be issued for a listed species provided a habitat conservation plan is developed.

State Law

California Endangered Species Act (Fish and Game Code Section 2050 et seq.)

The California Endangered Species Act (CESA) declares that deserving plant or animal species will be given protection by the State because they are of ecological, educational, historical, recreational, aesthetic, economic, and scientific value to the people of the State. The CESA established that it is State policy to conserve, protect, restore, and enhance endangered species and their habitats. Under State law, plant and animal species may be formally designated rare, threatened, or endangered by official listing by the California Fish and Game Commission. Although it is unlawful under state law to "take" a threatened or endangered species, the CDFG may issue incidental take permits in certain circumstances. Brown pelicans (*Pelecanus occidentalis*) are the only state-listed species known to occur within the area although California condor (*Gymnogyps californianus*) may fly over the area on occasion.

California Environmental Quality Act Treatment of Listed Plant and Animal Species

Both the FESA and CESA protect only those species formally listed as threatened or endangered (or rare in the case of the state list). Section 15380 of CEQA Guidelines, however, independently defines "endangered" species of plants, fish or wildlife as those whose survival and reproduction in the wild are in immediate jeopardy and "rare" species as those who are in such low numbers that they could become endangered if their environment worsens. For proposed projects that require CEQA review, it is contingent upon the CEQA lead agency to evaluate the potential impact on such species. The significance of impacts on a species under CEQA must be based on analyzing actual rarity and threat of extinction despite legal status or lack thereof. There are numerous species reported from the general project area that fit this definition. Most of the CDFG species of concern would probably qualify for evaluation under this criterion.

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act (Porter-Cologne Act) (Wat. Code, § 13000 et seq.), the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCB) have primary responsibility for protecting water quality throughout California. In general, the SWRCB establishes statewide policy for implementing state and federal laws. The RWQCB must adopt, implement, and review water quality control plans (Basin Plans) for their regions that conform to SWRCB policies.

Among other things, a Basin Plan must:

- identify beneficial uses of water to be protected,

- establish narrative or numerical water quality objectives for the reasonable protection of the beneficial uses, and
- establish a program of implementation for achieving the water quality objectives.

The Central Coast Regional Water Quality Control Board has adopted a Basin Plan for the Central Coast Region (CCRWQCB 1994). The Big Sur River is within the Santa Lucia Hydrologic Unit. The plan establishes the beneficial uses for the Big Sur River and the Big Sur River estuary (Table 4.3-6).

TABLE 4.3-6

BENEFICIAL USES FOR THE BIG SUR RIVER AND THE BIG SUR RIVER ESTUARY

Beneficial Use	Meaning – Application to Biological Resources
MUN	Municipal Water Supply – No biological resources application.
AGR	Agricultural Water Supply – Application of irrigation water from the Big Sur River to the POU is an identified beneficial use and the focus of this DEIR. Indirectly tied to biological resources.
GWR	Groundwater Recharge – Indirectly tied to biological resources through the interaction of the river and groundwater that is extracted for irrigation.
EST	Estuarine – Use of water that supports estuarine habitats applies to the lagoon system of Big Sur River.
RARE	Rare, Threatened, or Endangered Species – Use of water to support habitat required for survival of species protected under state and federal regulations. The steelhead and red-legged frogs both fall into this category.
REC1	Water Contact Recreation – Rafting, swimming, etc, all of which are not applicable to fisheries.
REC2	Non-water Contact Recreation – Wildlife viewing, hiking, sport fishing etc most of which are not applicable to biological resources. Recreational fishing is included here, but the project does not change fishing access or open/closed seasons which are set independently by CDFG.
WILD	Wildlife Habitat – Use of water that supports terrestrial ecosystems, such as the riparian corridor that borders the Big Sur River and the species supported by that habitat.
WARM	Warm Freshwater Habitat – Use of water to support warm water ecosystems. This does not apply to the river within this area.
MIGR	Migration of Aquatic Organisms – Use of water that allows for seasonal migration of aquatic species, especially anadromous fish like steelhead.
BIOL	Preservation of Biological Habitats of Special Significance – Use of water to support designated areas such as parks, preserves, sanctuaries, etc. Not directly applicable to biological resources for the Big Sur River although water in the river does support AMSP.
FRSH	Freshwater Replenishment – Use of water for maintenance of surface water quality or quantity. Not directly applicable to biological resources of this project.
COLD	Cold Freshwater Habitat – Use of water to support cold water ecosystems. This is the aquatic community of the lower river.
SPWN	Spawning Reproduction and/or Early Development – This includes the spawning of all species and rearing of juvenile fish. The steelhead found in the lower river are in the early development phase and the other resident fish spawn in the river.
COMM	Commercial and Sport Fishing – Use of water to support recreational and commercial sport fishing. Not directly applicable to the biological resources of the area.
SHELL	Shellfish Harvesting – Use of water to support harvest of shellfish. Not directly applicable to the project area.

Source: CCRWQCB 1994.

Even though there are a multitude of beneficial uses listed for the Big Sur River and Big Sur River Estuary, the only ones that directly apply to the biological resources of the project area are

COLD, SPWN, EST, RARE, and WILD (Table 4.3-6). The beneficial uses that directly apply to fisheries are COLD and SPWN. COLD refers to cold freshwater habitat for fish and SPWN refers to the early development of fish (steelhead, starry flounder, etc).

To protect these beneficial uses, the Basin Plan establishes thresholds for temperature, DO, pH, and chemical constituents (CCRWQCB 1994). The temperature threshold allows an increase of 2.8°C (5°F). That is, if a project results in a temperature increase that is less than the 2.8°C (5°F) threshold set in the Basin Plan, the project would be considered consistent with the plan's temperature objectives. The DO threshold sets a desired DO concentration of 7.0 mg/L.

The other three uses (EST, RARE, and WILD) relate to resources supported by water, but the plan does not include quantitative water quality objectives as were established for COLD and SPWN. Thresholds were established (see Standards of Significance) that include elements to address the potential for the proposed project to result in impacts on the estuary (EST), habitat used by federally-protected species (RARE), and riparian habitats that support wildlife (WILD). The other beneficial use that applies to the aquatic resources of the Big Sur River is REC2, which refers to passive recreational uses and includes sport fishing. The CDFG independently sets open and closed fishing seasons for the lower Big Sur River based on streamflows at the USGS gage upstream of the project area (CDFG 2008). Because CDFG decides at which streamflow fishing would be allowed, the proposed project does not influence this beneficial use.

California Coastal Act

The California Coastal Act (Public Resources Code, §§ 30000-30900) was created in 1976 to protect, maintain, and enhance the state's nature and scenic coastal resources. The Coastal Act created the California Coastal Commission, which is charged with managing the resources in the coastal zone (as defined by the Act). The Act also establishes a planning and development process in which a permit is required for most development within the coastal zone. In the El Sur Ranch vicinity, the coastal zone extends from the shoreline to the top of the first inland ridge. No development is contemplated under this project.

Local Coastal Plan

The Coastal Act requires that local governments along the coast create Local Coastal Plan (LCP). Monterey County has prepared a Monterey County Coastal Implementation Plan (Monterey County 1988) and a Big Sur Land Use Plan (Monterey County 1996) that together are considered the LCP and includes policies to manage resources within the Big Sur area. These plans designate environmentally sensitive habitat areas that include the Big Sur River, the coastal scrub-covered bluffs, and the beaches south of the Big Sur River. In general, the policies set forth in the LCP and the Big Sur Land Use Plan require that the County work with the SWRCB and CDFG to manage surface and groundwater resources. In addition, applicants requesting to use off-site water sources are required to obtain the necessary rights and permits from the SWRCB (Monterey County 1996: 27).

Local Plans and Regulations

Monterey County

Big Sur River Protected Waterway Management Plan (PWMP)

In 1985 the Monterey County Board of Supervisors adopted the Big Sur River Protected Waterway Management Plan (PWMP or plan; Monterey County 1986). The goal of the Big Sur River PWMP is "[t]o maintain and enhance the value of the Lower Big Sur River and its watershed as a domestic water supply, fish and wildlife habitat, and recreational and scenic resource and to mitigate adverse effects of activities and facilities on these resources" (Monterey County 1986). The plan contains several objectives to support this goal. It requires management of the Big Sur River for water supply, water quality, maintenance and enhancement of instream fisheries resources, restoration of riparian vegetation, development of river-oriented recreational opportunities, and conservation of the scenic value of the Big Sur River. The PWMP acknowledges that the precise data required for management of adequate instream flows is lacking and includes policies to support the collection of this data. Appendix 5 of the PWMP specifies the passage criteria to be used for adult steelhead as 0.6 feet in depth with 25 percent of the total stream width, 10 percent of which is contiguous, meeting this criteria. This is the same depth criteria used in the various fisheries studies conducted for the applicant. However, in addition there is a velocity component that states maximum water velocities should be less than 8 feet per second (fps). There was no velocity criterion used in the fisheries studies conducted in association with the proposed project (Hanson 2005; 2007; 2008). Appendix 5 also establishes a juvenile rearing habitat criteria of minimum depths of 0.5 feet with velocities between 0.5 and 3.5 fps.

Monterey County General Plan

The current Monterey County General Plan was certified in by the Board of Supervisors in 2007. The updated General Plan incorporates the Big Sur LUP (Monterey County 1996), Coastal Implementation Plan (Monterey County 1988), and Big Sur River Protected Waterway Management Plan (Monterey County 1986) by reference and does not change these plans (Monterey County 2007: vi) The updates made to the General Plan do not apply to the Coastal Zone.

IMPACTS AND MITIGATION MEASURES

Methods of Analysis

The proposed project does not involve construction or alteration of terrestrial habitat because the infrastructure (wells, pipelines, access roads, etc) to support the project has already been constructed. Accordingly, the primary effects of the proposed project relate to the diversion of water from the Big Sur River, application water to the POU, and disposal of return water. Application of water to irrigated fields (POU) is not discussed because these areas do not support any sensitive biological resources.

Species Not Affected by the Project

A diverse array of sensitive terrestrial species associated with upland habitats has been reported or observed in the project area (Figure 4.3-2). In general, these terrestrial species do not exist within the POU or are not affected by the removal of water from the Big Sur River. Specifically, although loggerhead shrike have been observed within the POU, there are no operational changes to ranching practices associated with the project that would alter the habitat used by this species. Similarly, Monterey dusky-footed woodrat occurs within the riparian forests along the Big Sur River but the project will not affect riparian forests, and thus, would not affect the species. Western snowy plover could nest on the beaches that front along El Sur Ranch, but the project includes no activities or elements that would alter this habitat or directly affect this species. For these reasons, these three species are not discussed further in this DEIR.

Species Potentially Affected by the Project

This document focuses on potential effects on aquatic or terrestrial species that may be affected by the diversion of water from the Big Sur River, the application of water to the POU, or disposal of return flows. The species potentially affected by these actions are steelhead, California red-legged frog, and western pond turtle. This document also addressed sensitive vegetation communities that could be affected by changes in water availability.

Steelhead

Because all the water for the project is extracted from wells adjacent to the river, there is no potential to directly entrain steelhead. As wells extract groundwater, they locally depress the groundwater levels and the river recharges this depression (SGI 2005). It is this connection between the groundwater and the river that could result in pumping-generated impacts on steelhead. The analysis of potential project impacts on steelhead is broken down into separate topics that relate to adult and juvenile passage, water temperatures, DO, and salinity.

Data Sources

Technical studies that evaluated a variety of factors potentially affecting steelhead have been conducted by Hanson Environmental (Hanson 2005; 2007; 2008). Concurrent with the fisheries studies the SGI Group conducted detailed evaluations of the hydrology and groundwater (SGI Group 2005; 2007; 2008). These documents form the basic data set from which pumping-generated changes in habitat used by steelhead are discussed.

Passage

The reduction of instream flows has the potential to create conditions whereby passage from one area to another is impaired. The passage criteria used in this evaluation are for adult steelhead upstream movement. The criteria require a minimum depth of 0.6 feet with 25 percent of the total width at least that deep and 10 percent of the width over 0.6 feet deep must be contiguous (Bjornn and Reiser 1991).

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.

Because these factors may have influenced the initial conclusions presented in the 2007 study, the impact analysis presented in this section uses a different approach, which is explained below.

To evaluate passage of adult steelhead, the evaluation in this DEIR focused on flows in December during extremely dry water years. Passage of juveniles occurs in both up and downstream directions throughout the year. However, low flows in the late summer and fall create the most restrictive conditions for juvenile movement. The juvenile evaluation focused on the transect data collected in August and September 2007 (Hanson 2008).

The basic premise used in this evaluation is twofold: first, pumping has been shown to reduce water depth within the zone of influence by 0.17 feet (SGI 2008); and second, a relationship has been developed that shows about 0.3 cfs of instream flow is lost for each 1 cfs diverted (SGI 2005). It was assumed that the 0.17-foot drop in water surface elevation was the maximum change observed at the maximum pump rate (5.02 cfs). In this case, the elevation drop per 1 cfs was calculated to be about 0.03 feet. At a diversion rate attributable to the project of 1.4 cfs, and because there is a direct relationship between the diversion of subterranean flow and reductions in surface flow, this works out to a reduction in water surface elevations of about 0.05 feet. These reductions in flow and depth were applied qualitatively to the transect data (Hanson 2008) for the shallowest of riffles during the 2007 field season.

Mean daily discharge data from the USGS streamflow gage on the Big Sur River (Station Number 11143000) was used to generate average monthly exceedance values from the historic USGS dataset. These exceedance flows were compared to those present during the 2007 study to provide historical context and relate the frequency of occurrence of conditions in 2007. Any reduction attributable to the project that created passage conditions that violated the criteria or made an already impassable riffle worse were considered a potentially significant impact. The passage criteria is both related to depths and widths. Depths over 0.6 feet are required, but 10 percent of the contiguous stream width must be over 0.6 feet and 25 percent of the total width must be over 0.6 feet. Because of the multiple levels, it is possible that a riffle meets one element of the criteria and not another. For example, it's possible that a contiguous 10 percent of the stream width was over 0.6 feet, but not more than 25 percent of the total width was over 0.6 feet. In this case, the passage criteria would not have been met and the riffle would be considered impassable. However, it is possible that project-generated changes in depth could create a condition where the one criterion that had been met, was now not met. In the preceding example, if the project reduced water depths such that what had been a contiguous 10 percent of the width over 0.6 feet was now only 8 percent of the total width, conditions for passage were considered to have gotten worse. This was considered a potentially significant impact.

The recent studies on the Big Sur River did not observe complete loss of connectivity (drying of the river), even in the critically dry 2007 water year (Hanson 2008). Therefore, connectivity itself is not evaluated further in this DEIR.

Temperature Changes

Steelhead are typically considered a cool or cold water fish. Steelhead can survive in water temperatures up to about 24°C when acclimated to warm water. Extended exposure to temperatures above 24°C tend to be extremely stressful to the fish and can easily be lethal (Moyle 2002). As temperatures increase, growth rates are reduced and fish condition actually gets worse as metabolism exceeds food intake rates. The mean daily temperature of 20°C is set as a threshold for this evaluation because this is the temperature below which positive growth and increasing body condition can be expected. The upper limit of hourly temperatures of 24°C was set because temperatures above this tend to be extremely stressful and potentially lethal to fish. The most detailed evaluations of pumping-induced changes in water temperatures were conducted by Hanson (2008) during the critically dry 2007 water year. The analysis relies on this data almost exclusively.

Dissolved Oxygen

Steelhead can survive in waters with DO at extremely low levels (2 mg/L) when water temperatures are also extremely low, but typically DO levels near saturation are required for growth (Moyle 2002). The Basin Plan sets a limit of 7.0 mg/L for designated COLD and SPWN habitats which includes the Big Sur River (CCRWQCB 1994). Because the Basin Plan indicates that the DO level shall not be reduced below this level, any changes related to the project that would reduce DO levels below 7.0 mg/L would be considered a significant degradation of steelhead habitat. Portions of the zone of influence were below this threshold during the 2007 study (Hanson 2008). In these cases any decrease in DO attributable to pumping would be considered significant degradation of steelhead habitat.

Continuous monitoring of DO was conducted in 2006 and 2007 (Hanson 2007; 2008). The data from 2006 is from only two locations (Hanson 2007). In 2007 DO was monitored at more locations (Hanson 2008) and the resulting data set is relatively complete. The analysis in this DEIR relies on the 2007 data set, which begins on August 31, 2007 when both pumps are on. There is no data for 2007 prior to August 31 which could provide baseline data. Dissolved oxygen levels were below the 7 mg/L threshold when monitoring was initiated on August 31, 2007 and it is unknown when in the summer of 2007 the levels dropped below that threshold.

Salinity

In general, steelhead tolerances for water of different salinities are not well understood. Steelhead are known to rear in brackish water estuaries and lagoons of coastal systems, like the Big Sur River. Juvenile steelhead have been observed in the lagoon area during most of the fish surveys conducted for this project (Hanson 2005; 2007; 2008). Based on morphological characteristics, some of these observations indicate these fish may have already smolted indicating they were capable of living in the ocean.

The three Hanson studies (2005; 2007; 2008) used a conductivity threshold of 1,500 μmhos as a surrogate for salinity. They considered salinities above this level to be stressful or unsuitable for juvenile steelhead rearing. There is a direct relationship between salinity and conductivity with 1,500 μmhos equating to about 0.96 ppt (Hanson 2007). Salinity of pure sea water varies somewhat depending on mixing and freshwater inputs but is typically near 33 ppt. The threshold used is about 3 percent of true seawater salinity. Salinity data was collected during the pumping tests to determine if pumping influenced salinities in the study area.

The conductivity data collected during these studies was reviewed to determine if the proposed project contributed to changes in salinity that could be considered detrimental to steelhead. This data indicates that there was little change in salinity during any of the surveys with values recorded of less than 300 µmhos or about 0.2 ppt (Hanson 2007). Steelhead were observed throughout the river using water ranging from completely fresh in the upstream areas to brackish in the lower areas. Because there was no measured change in the conductivity threshold correlated to operations of the wells, during the studies, it can be inferred that pumping does not affect salinity of the river water in the study area.

Western Pond Turtle

Western pond turtles could be affected by changes in flow if these changes were large enough to substantially alter available instream habitat. For example, if instream habitat was altered to a degree that turtles were exposed to predation or lacked escape areas, then the project may have an impact on this species. Accordingly, this document examines the potential for changes in flow related to project operations that may cause major shifts in instream pool habitat above the lagoon. Because turtles breathe air, nest in upland locations, and actively control their own body temperatures, issues relating to water quality such as temperature and DO are not likely to affect pond turtles and are not discussed.

California Red-legged Frog

To evaluate the potential project-related impacts on red-legged frogs, we reviewed the studies of hydrology within Swiss Canyon (Hanson 2007b; 2008) to see if there was any direct connection between irrigation practices and impacts to frogs or their required habitat. The potential for changes in flows in Swiss Canyon that could impact frogs during the breeding season was conducted by evaluating historic pumping practices during the breeding season. Studies by Hanson (2007b; 2008) evaluated the connection between irrigation and runoff in Swiss Canyon.

The potential for changes in flows in the Big Sur River during the breeding season was conducted by evaluating historic pumping practices during the breeding season and comparing that to flows in the Big Sur River. Streamflow data was evaluated for pumping-induced shifts in streamflow that could create unfavorable breeding conditions.

Any tadpoles rearing in the lower portions of the Big Sur River, above saltwater influence, could be subject to changes in water quality, especially DO levels which would be stressful or lethal (65 FR 25813). The studies that have been conducted in the Big Sur River since 2005 have documented areas with low levels of DO in the lower river. Tadpoles are less mobile than steelhead and would be less able to avoid these areas. Data on DO was compared to known tolerance levels for red-legged frogs. Any reductions below tolerance levels attributable to the proposed project would be considered a reduction in available habitat for this species and a potentially significant impact.

Sensitive Vegetation Communities

Sensitive Vegetation Communities include riparian vegetation along the Big Sur River and within Swiss Canyon and the freshwater marshes at the mouth of Swiss Canyon and the tailwater pond. The potential for the project to impact riparian vegetation along the Big Sur River was evaluated by Miriam Green and Associates in 2006 (Miriam Green 2007). The analysis is based on the maximum increase in seasonal diversion of 34 AF (Table 4.1-1 in Section 4.1, Introduction to the Analysis). This was converted to a number of days of pumping at the maximum diversion rate. That increase in pumping days would correspond to a reduction in groundwater levels for the corresponding period. The other sensitive community is freshwater marsh at the mouth of Swiss Canyon and the tailwater pond. The project-related effects on this habitat was evaluated by reviewing the hydrology studies of Swiss Canyon and any proposed changes in irrigation practices associated with the project.

Standards of Significance

The following standards of significance are based on the biology of the species involved and the regulatory mechanisms that protect the natural resource of the study area. The DO threshold is from the Water Quality Control Plan for the Central Coast Basin (Central Coast Basin Plan; CCRWQCB 1994). Passage criteria are taken from Bjornn and Reiser (1991) and correspond to those recommended in the Big Sur River PWMP. The temperature threshold from the Basin Plan was not used because it allows for a project-generated increase of 2.8°C above baseline temperature regardless of the suitability of the temperatures for rearing fish to be consistent with the Basin Plan. Accordingly, steelhead temperature tolerances from literature sources (Moyle 2002) and the various studies conducted for this project (Hanson 2005; 2007; and 2008) are used instead of the Basin Plan values.

The proposed project is considered to have a potentially significant impact on biological resources if it will:

- Impair passage of adult steelhead between November 1 and May 31 by reducing water depth below 0.6 feet for 25 percent of the total stream width or reducing depth such that less than 10 percent of the contiguous stream width is under 0.6 feet deep;
- Impair passage of juvenile steelhead between June 1 and October 31 by reducing water depth below 0.3 feet for 25 percent of the total stream width or reducing depth such that less than 10 percent of the contiguous stream width is under 0.3 feet deep;
- Increase mean daily water temperature above 20°C or hourly temperatures over 24°C;
- Decrease DO below 7.0 mg/L in the Big Sur River;
- Result in sedimentation of habitat used by sensitive amphibians, or other changes in water quality, such that the habitat would become unusable for any life stage;
- Result in flow alterations such that amphibian breeding habitat in Swiss Canyon or the Big Sur River becomes unsuitable;

- Result in flow alterations that created unsuitable habitat for aquatic reptiles; or
- Result in degradation of sensitive vegetation communities.

Impacts in any of the above categories would be considered unavoidable significant effects if they could not be (a) eliminated, (b) avoided or minimized by redesign of some components of the projects, (c) reduced to a less-than-significant level, or (d) compensated for by replacement of equal habitat extent and value.

Project-Specific Impacts and Mitigation Measures

Impact 4.3-1	The proposed project could reduce water depths to a level that would impair passage of adult steelhead between November 1 and May 31.

In general, the adult steelhead migration period begins in December and extends through March depending on the year. Downstream movement of spawned out adults can occur through May. Streamflows during the December through May period generally do not limit movement of fish. Steelhead are extremely adjustable and able to time their entry into the system to correspond to periods when flows are generally adequate for upstream movement. However, in the driest of years, pumping for irrigation purposes in December could reduce the amount of water in the stream and slow movement of fish. Data from the USGS gage indicates that the 95th-percentile exceedance flow for December is an average of 10 cfs (Table 4.3-7).

TABLE 4.3-7

MEAN DAILY EXCEEDANCE FLOWS AT THE USGS GAGE IN THE BIG SUR RIVER - DECEMBER 1 THROUGH MAY 31 (CFS)

Month	95th-Percentile	90th-Percentile	80th-Percentile	75th-Percentile
December	10	13	18	20
January	14	18	26	32
February	16	25	48	59
March	21	32	54	61
April	17	28	39	47
May	14	17	27	31

Source: USGS 2008.

The passage study conducted in September 2006 occurred during a wet water year, and flows were above 18 cfs at all evaluation points (Hanson 2007). Using the riffle profile data collected in September 2006, upstream passage criteria are met at 18 cfs for passage transects 1-9 (Hanson 2007). Data from passage transects 10 and 11 did not consistently meet the passage criteria at flows just above 18 cfs in 2006 (Hanson 2007). In 2007 passage transects were again evaluated in relation to the same passage criteria, but this time under extremely low-flow conditions. Mean daily flow at the USGS gage ranged from just over 6 to 18 cfs during in September and October 2007 (USGS 2008). Even when flows reached 12 cfs on October 12, 2007, the passage criteria were not met at passage transects 4, 9, 10, and 11 (Hanson 2008). Passage transect 4 and 9 are clearly within the zone of influence of the irrigation wells, while transects 10 and 11 are on the edge of this zone (SGI 2007; 2008). The SGI study (2008) indicates that vertical drawdown in the Big Sur River measured as a result of pumping was 0.17 feet. The change in elevation attributable to the project was considered to be determined by the ratio of maximum change (0.17 feet) to the maximum pumping during the tests (5.02 cfs) or 0.03 feet per cfs pumped. The maximum pumping increase attributable to the proposed project is calculated to be 0.05 feet at 1.4 cfs. With passage criteria set at 0.6 feet, a reduction of 0.05 feet is an 8 percent reduction in overall depth. For locations such as those found at passage transect 4, 10, or 11, this small change could easily impair upstream movement.

In most years, no irrigation occurs in December (Table 2-1 in Chapter 2, Project Description), and the project would not affect migration. An evaluation of the irrigation requirements in critically dry years is appropriate because irrigation would also be highest in these years. The three years with the highest rates of December pumping are 1977, 1980, and 1991 when 64, 37, and 57 AF were pumped, respectively, (Table 2-1); average critical dry-year December irrigation use is 53 AF. Divided evenly across the month, this is a pumping rate of about 1.8 cfs. The relationship developed by SGI (2005) indicates that about 0.30 cfs is lost from the river for each 1 cfs pumped. This equates to an instream loss of about 0.5 cfs. The passage transect data from 2006 and 2007 indicates that small changes in flow can result in a transect meeting or not meeting the passage criteria. For example, at passage transect 11 on October 10, 2006, site-specific instantaneous flows had come up to 21.34 cfs over the previous data point of 19.81 cfs, an increase of 1.53 cfs, and yet the data indicate that neither the 25 percent nor 10 percent criteria were met on October 10 (Hanson 2007). The mean daily flow at the USGS gage for these two days is 24 and 21 cfs on October 5 and 10, 2006, respectively, just above the 75th-percentile flow (Table 4.3-7).

Because the increased pumping of water for irrigation purposes above the baseline conditions in the driest of years could impair the upstream passage of adult steelhead by reducing water depths such that they do not meet the specified criteria, the proposed project would have a ***potentially significant impact*** on this sensitive resource.

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.

<u>Mitigation Measures</u>

Implementation of these mitigation measure(s) would reduce the impacts, from the incremental increase in proposed project pumping above baseline rates, on upstream migrating adult steelhead to a level considered ***less than significant*** by requiring a reduction in project pumping during extremely dry years.

4.3-1 a) *In extreme critical dry conditions, when the mean daily flow at the USGS gage is below the 10th-percentile value between December 1 and May 21, pumping shall be reduced to Baseline rates until stream flows exceed the 10th-percentile values for the months of January through April, and the 20th-percentile values for the months of December and May. This measure shall remain in effect until replaced by the flow monitoring and operations plan discussed below (Mitigation Measure 4.3-1(b)).*

Table A lists the Baseline (Allowable) Diversion Rate pumping rates to be used for Extreme Critical Dry and Critical Dry conditions when mean daily flow at the USGS gage is less than the 10th- and 20th-percentile flow, as described above.

b) *The Applicant shall prepare a detailed flow monitoring and operations plan, for review and approval by the SWRCB, that provides a structured feedback process whereby streamflows during the adult migration period (between November 1 and May 31) are monitored, passage restrictions evaluated, and changes in Project pumping are made to reduce the effect of Project irrigation on adult steelhead movement. The plan shall be prepared in consultation with NMFS and CDFG. Elements to include within this plan are: real-time monitoring protocols (including protocols established pursuant to Mitigation Measure 4.2-2), the flow thresholds established in the FEIR, pump change requirements, recordkeeping, reporting, and an adaptive management feedback system. Following approval by the SWRCB, this plan shall be incorporated into the IWMP and put into effect.*

TABLE A

EXTREME CRITICAL DRY AND CRITICAL DRY FLOW RATE LIMITATIONS ON PROJECT DIVERSIONS

Month	*USGS Limiting Flow Rate[a] cfs (flow rate percentile)[c]*	*Baseline (Allowable) Diversion Rate[b] cfs*
January	*18 (10^{th})*	*0.01*
February	*23 (10^{th})*	*0.00*
March	*31 (10^{th})*	*0.00*
April	*26 (10^{th})*	*0.42*
May	*22 (20^{th})*	*1.69*
June	*11 (10^{th})*	*2.89*
July	*10 (20^{th})*	*2.48*
August	*8.4 (20^{th})*	*2.32*
September	*7.7 (20^{th})*	*2.60*
October	*7.9 (20^{th})*	*1.47*
November	*9.8 (10^{th})*	*0.20*
December	*17 (20^{th})*	*0.05*

Notes:
a. When flow rates at the USGS gage drop below this value, Project diversions shall not exceed Baseline (Allowable) Diversion Rate
b. The 20-year historic Baseline average diversion rate is the allowable diversion rate when flow at the USGS gage drops below the USGS Limiting Flow Rate
c. These numbers represent the USGS daily flow rate at the with the corresponding 20-year historic flow rate percentile in parenthesis. For example, in January, 18 cfs at the USGS gage station corresponds to the 10th percentile flow rate.
Source: PBS&J 2009.

The above measures reduce proposed project pumping above baseline conditions impacts on upstream migrating adult steelhead by requiring a reduction in pumping during extremely dry years. This limits the project's interaction with the river, thereby preserving instream flow for fish movement. The second measure provides an avenue for the applicant to create a specific monitoring plan that could allow operational flexibility while preserving adult fish passage.

Impact 4.3-2	The proposed project would reduce water depths to a level that would impair passage of juvenile steelhead between June 1 and October 31.

Although juvenile steelhead move up and downstream throughout the year, their movements are restricted most in the late summer and early fall when streamflows are naturally the lowest. (This analysis does not address conditions at passage transects 1-3 because they are affected by the cycle of the tides and the opening and closing of the sandbar at the lagoon mouth.) Observations in 2004 indicated that when the lagoon mouth closed, water backed up in the river almost to velocity transect 2 which, in 2004, was located near where passage transect 11 was in the 2006 and 2007 studies (Hanson 2005). This would indicate that in a dry water year like 2004, any transect data could be influenced by the lagoon condition.

During the studies in 2004, the mean monthly flows in the Big Sur River for July, August, and September were at least above the 75th-percentile exceedance flow (Tables 4.3-8 and 4.3-9). In 2006, mean monthly flows for these same months ranged from 40 to 21 cfs; near the 20th-percentile exceedance flows. The year 2007 was a critically dry year, with monthly discharges near the 90th-percentile exceedance flow (Tables 4.3-8 and 4.3-9). Actual daily flows in early September 2007 were closer to the 95th-percentile. Because 2007 was a critically dry year, the upstream influence of the lagoon was limited to the lower three passage transects.

TABLE 4.3-8

MEAN MONTHLY FLOW BASED ON DAILY DISCHARGE DATA FOR THE USGS GAGE IN THE BIG SUR RIVER FOR THE THREE YEARS WHEN FISHERIES STUDIES WERE CONDUCTED

Month	2004	2006	2007
June	23.4	72.6	11.7
July	14.6	40.5	8.6
August	12.3	26.9	7.6
September	12.2	21.0	7.5
October	34.6	20.9	9.2

Source: USGS 2008.

TABLE 4.3-9

MEAN DAILY EXCEEDANCE FLOWS AT THE USGS GAGE IN THE BIG SUR RIVER JUNE 1 THROUGH OCTOBER 31 (CFS)

Month	95th-Percentile	90th-Percentile	80th-Percentile	75th-Percentile	50h-Percentile
June	9	12	17	19	22
July	6	7	12	13	16
August	5	7	10	11	14
September	5	7	9	10	15
October	6	7	9	10	22

Source: USGS 2008.

Passage transects 4-11 are all within the zone of influence (Figure 4.2-6 in Section 4.2, Hydrology, Geohydrology, and Water Quality) shows the zone of influence). Data indicates that the passage criteria for juvenile steelhead were not met at passage transects 4, 10, and 11 in 2007. In contrast, the passage criteria were met for juvenile fish at passage transect 9 regardless of pumping. This riffle is much narrower than the riffles where criteria were not met. It is likely that this difference in geometry makes it more passable then the other riffles. Accordingly, the discussion below focuses on the passage transects where the criteria were not met.

Summary of the facts:

- Passage is most difficult under critically dry conditions like those present in fall 2007.
- Based on surveys conducted September 9, 19, and October 3, passage transect 4 violated the criteria only when pumps were operating (Table 7 in Hanson 2008).
- Passage transect 10 violated the criteria on August 30 and September 5 at extremely low flow conditions (Table 15 in Hanson 2008). When pumps were off on August 30 only the 10 percent contiguous threshold was violated. When both pumps were operating on September 5, both thresholds were violated (the 10 percent contiguous width deeper then 0.3 feet and 25 percent of total stream width over 0.3 feet).
- Depths at passage transect 11 were in violation of the criteria on all sample dates in 2007 regardless of flow and pumping operations (Table 17 in Hanson 2008). This is likely a function of the geometry of this particular riffle which is extremely wide and shallow with no defined thalweg.
- Pumping reduces water surface elevations by a max of 0.17 feet (SGI 2008).
- Each 1 cfs pumped reduces instream flow by at most 0.3 cfs (SGI 2008).

Because passage transect 4 is located in the area subject to the greatest amount of drawdown, this analysis focuses on this location. On August 30, water depths at this transect averaged only 0.13 feet, and did not meet the 25 percent of the stream width deeper than 0.3-feet criterion. This transect did meet the 10 percent contiguous criterion because about 2.5 feet of the overall width that was continuously 0.3 feet deep; overall wetted width was 22.7 feet.

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. Of the amount pumped, about 1.4 cfs would be attributable to increased diversions over baseline conditions (Table 4.0-1). On September 2, the Old Well was shut down because of increasing salinities, but the New Well remained in operation through September 7 at 2.37 cfs (SGI 2008). Because this volume is considered part of historic baseline conditions, impacts associated with this level of operation are not considered attributable to the proposed project.

Depth data was again collected at passage transect 4 on September 5. Mean depth was 0.12 feet. Wetted-width dropped by over 4 feet to 18.6 feet. Individual depth readings were consistently shallower than those on August 30. This combination of a narrower stream with less water lead to the violation of the 10 percent contiguous width criterion; only four readings were equal or over 0.3 feet, and only two of these (1 foot of stream width or about 5 percent) were contiguous.

What amount of this change is attributable to the increased pumping of the proposed project? The project pumping in this period would equate to 1.4 cfs, that is, the increase in the 30-day average pumping rate (Table 4.1-1). SGI (2008) indicates that for every 1 cfs that is pumped, 0.3 cfs is extracted from the river. Therefore, 1.4 cfs of increased pumping relates to a reduced instream flow of about 0.42 cfs. Measured flows at velocity transect 2, at the same location as passage transect 4, dropped between August 31 and September 5 by about 0.32 cfs which is very similar to the predicted drop in flows. Mean daily flow at the USGS gage dropped over this period from 7.1 to 6.4 cfs indicating that flows were naturally declining. SGI (2008) indicated that water surface elevations were reduced by up to 0.17 feet by pumping. Assuming this is a linear relationship and occurred during the period of highest pumping, 5.02 cfs, it is predicted that 1 cfs of pumping would reduce instream water surface elevation by 0.03 feet. Therefore, the 1.4 cfs attributable to the proposed project was predicted to reduce depths by about 0.05 feet. When this minor change in depth, about 6 tenths of an inch, was applied to the August 31 transect data, no portion of the transect was predicted to be over 0.3 feet deep. In reality, four readings on September 5 were over 0.3 feet deep, but the Old Well was turned off on September 2 which would have reduced the amount of water diverted from the river to a fraction that is attributable to the New Well. This difference in pumping operations could explain the difference in predicted and observed depths.

Passage data and the precise relationship between pumping attributable to the project and reductions in water surface elevations are both somewhat limited. However, the reasonable assumptions made in this analysis indicate that the increase in proposed project pumping above baseline rates could reduce water surface elevations and streamflows. These reductions would combine to create passage conditions that do not meet the threshold established for this project. Therefore, pumping associated with the project would have a ***potentially significant impact*** on the movement of juvenile steelhead.

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.

<u>Mitigation Measures</u>

Implementation of these mitigation measure(s) would reduce the impacts on juvenile steelhead to a level considered ***less than significant***.

4.3-2 a) *In critical dry conditions, when the mean daily flow at the USGS gage is below the 20th percentile value between July 1 and October 31, project pumping shall be reduced to Baseline (Allowable) Diversion Rates, as specified in Table A (see Mitigation Measure 4.2-2), until streamflows exceed the 20th percentile values for the months of July through October. This measure shall remain in effect until replaced by the flow monitoring plan discussed below (Mitigation Measure 4.3-2(b)). This measure does not limit diversions required to make measurements specified in Mitigation Measure 4.3-2(b), if notification of testing is provided to the SWRCB prior to the test period.*

b) *The Applicant shall prepare a detailed flow monitoring and operations plan in consultation with NMFS and CDFG, for review and approval by the SWRCB, that provides a structured feedback process whereby streamflows during the months of June and October are monitored, passage restrictions evaluated, and changes in project pumping are made to reduce the effect of project irrigation on juvenile steelhead movement. Elements to include within this plan are: real-time monitoring protocols (including protocols established pursuant to Mitigation Measure 4.2-2), the flow thresholds established in the FEIR, pump change requirements, recordkeeping, reporting, and an adaptive management feedback system. Following approval by the SWRCB, this plan shall be incorporated into the IWMP and put into effect.*

These two mitigation measures would reduce proposed project impacts of pumping above baseline rates on upstream migrating juvenile steelhead by requiring a reduction in pumping during extremely dry years. This would limit the project's interaction with the river thereby preserving instream flow for fish movement at baseline levels. The second measure provides an avenue for the Applicant to create a specific monitoring plan that could allow operational flexibility while preserving juvenile fish passage.

Impact 4.3-3	**The proposed project would not increase mean daily water temperatures above 20°C or hourly water temperatures over 24°C.**

As explained above, steelhead are relatively sensitive to warm water temperatures although they can tolerate warmer water if acclimatized. This discussion focuses on steelhead thermal requirements because they are the most temperature-sensitive fish in the lower Big Sur River. If conditions are not stressful for steelhead, then other species similarly should not be stressed. The critical time of year for steelhead in the Big Sur River is late summer and early fall when flows are at their seasonal low point and air temperatures are generally at their peak. Water temperatures are directly influenced by flow levels and air temperatures. Generally, the more water flowing through the river, the lower the water temperatures remain through the low-flow season. Water temperatures have been monitored continuously during the summer and early fall at several locations in the lower Big Sur River in 2004, 2006, and 2007. Mean daily values were not presented for 2004 data, but the instantaneous values ranged from about 10-22°C (Hanson 2005). Daily mean water temperatures in 2006 and 2007 ranged from about 13 to 18°C (Hanson 2007; 2008). Therefore, the thresholds of mean daily temperatures over 20°C or hourly temperatures over 24°C were not crossed in any of these years regardless of pumping activity. A detailed statistical evaluation of water temperatures was conducted in 2007 which showed a statistically significant relationship between increases in water temperature and pumping (Hanson 2008). However, this increase was only 0.3°C, a value that is within normal diurnal fluctuation of water temperatures, unlikely to be noticed by aquatic species and within the accepted measurement error range of the temperature data loggers used for the 2007 study. Therefore, because the baseline pumping has been associated with increases in water temperature, but these values are below the thresholds identified for this resource area, the incremental increase in proposed project pumping over baseline rates would have a ***less-than-significant impact*** on aquatic resources through modifications of temperature.

Mitigation Measures

Because the impacts on aquatic resources (e.g. steelhead and sensitive amphibians) are considered less than significant, no mitigation is necessary.

Impact 4.3-4	The proposed project would contribute to the reduction of dissolved oxygen (DO) levels in the lower Big Sur River below 7.0 mg/L.

Dissolved oxygen levels are determined by several parameters that include temperature, flow, water mixing, water chemistry (pH), biologic productivity, and respiration. Because of this complex relationship, it is not possible to obtain a direct correlation to pumping activity and changes in DO.

Groundwater inflow is known to occur within the zone of influence (SGI 2008). The detailed river-groundwater interaction was studied in 2006 and 2007 (SGI 2007; 2008). These studies indicate that pumping reduces groundwater inflow to the river by at most 0.30 cfs per cfs pumped. So at the increase in maximum diversion rate attributable to the project of about 1.4 cfs per day (Section 4.1 of this DEIR), streamflow would be reduced by 0.4 cfs. Further, the

2007 study indicates that when pumping is occurring during periods of low flows, stagnant conditions are created in the zone of influence where DO levels were extremely low (SGI 2008; page 3-16). Between August 31 and September 8, 2007 DO levels ranged 0.7 to 8.6 mg/L. There were seven contiguous hours on August 31 and two blocks of time (two and four continuous hours respectively) on September 1, where DO levels were above the 7 mg/L threshold established by the Basin Plan. However, DO concentrations remained below 7.0 mg/L until the early morning of September 8. Overall, there were 186 hours when levels were below the threshold. Additionally, DO levels reached such minimal concentrations (less than 1.5 mg/L) that they would be extremely stressful, if not lethal, to steelhead. Cech *et al.* (1990) noted that steelhead would not exist where hypoxic conditions were present at water temperatures of 20°C and would be stressed by hypoxic conditions at 15°C. Water temperatures during this period in late summer 2007 were between 15.6 and 18°C; warm enough to create extremely stressful if not lethal conditions for any steelhead within this area. Pumping contributes to the decline in flow and thereby exacerbates reductions in DO in the lower Big Sur River by facilitating formation of stagnant water. Because this condition is stressful or lethal for steelhead, the proposed project incremental increase in pumping over baseline rates is considered a ***significant impact***.

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 stagnant conditions than would be caused by the anticipated incremental increase in pumping that would occur as a result of the proposed project. While baseline pumping conditions, by definition, do not require mitigation under CEQA, the effect of baseline pumping on stagnant conditions during low flow situations, serves to magnify any adverse cumulative effect of project pumping on aquatic resources.

<u>Mitigation Measures</u>

The following mitigation measure(s) would reduce the above impact to a ***less-than-significant level****.*

4.3-4 a) *Reductions in dissolved oxygen (DO) are most problematic during periods of extremely low flow when pumping causes or contributes to stagnant water conditions in the lower river. When mean daily flow at the USGS gage in the Big Sur River is below 10 cfs and mean daily water temperature is above 18°C, the Applicant shall reduce project pumping to Baseline (Allowable) Diversion Rates (see Table A, Mitigation Measure 4.2-2), except as provided in Mitigation Measure 4.3-4(b). Project pumping shall not resume until the mean daily flow is above 10 cfs, regardless of water temperature changes, or until the Applicant can demonstrate to the satisfaction of the SWRCB that DO levels are consistently above those considered stressful to steelhead (6 mg/L). This Mitigation Measure shall remain in force unless the Applicant implements Mitigation Measure 4.3-4(b) in its entirety. This measure does not limit diversions required for making measurements, as specified in Mitigation Measure 4.2-2.*

b) *If the Applicant elects to make project diversions when flow at the UGSG gage is below 10 cfs and mean daily water temperature is above 18^{o}C, then the Applicant must install a seasonal aeration system in the lower river. The goal of such a system would be to provide DO to aquatic species when project pumping may cause or contribute to stagnant conditions. The system shall consist of an electric compressor located near the New Well, temporary piping laid on the surface of the ground to the river bank, and a distribution system of perforated pipe laid on the bottom of the Big Sur River. The in-stream portion of the distribution system shall, at a minimum, result in average river DO level of six (6) mg/l at each passage transect from transect 2 through and including transect 8. The network on the stream bottom shall be painted black or brown to minimize visual disruption for park users. All equipment shall be removed from the active channel by November 1.*

The overall feasibility of such a system is unclear. Aeration systems have been installed on ponds and lakes, but in-stream systems are extremely rare. A feasibility study shall be prepared and all required permits obtained before this measure is implemented in lieu of Mitigation Measure 4.3-4(a). This feasibility study shall include an evaluation of potential impacts associated with implementation of the Mitigation Measure including potential impacts on noise and visual quality, construction impacts associated with installation of the compressor and utility lines, equipment maintenance and operations, and other considerations, as required by the SWRCB. It is expected that the required permits would include specific requirements to minimize potential impacts to aquatic habitat, such as erosion and siltation, from implementation of this Mitigation Measure.

Implementation of these measures would reduce the project's contribution to low DO levels in the lower Big Sur River that are stressful and potentially lethal to steelhead. Although stressful conditions could still occur, the proposed project incremental increase in pumping of water above baseline conditions would not contribute to low DO levels above baseline rates following implementation of these mitigation measures.

Impact 4.3-5	**The proposed project would not result in sedimentation, or other changes in water quality, of habitat used by sensitive amphibians such that the habitat would become unusable for any life stage.**

Concerns were raised by CDFG in response to the NOP (CDFG 2006) regarding the potential for application of water at the POU to result in erosion of the bluffs above Swiss Canyon and where the creek crosses the beach. As discussed above, a population of red-legged frogs was observed in Swiss Canyon n 2006 and is assumed to be extant. A detailed study of conditions within Swiss Canyon was conducted in 2006 and 2007 (Hanson 2007; 2008). Both of these studies indicate that while aquatic habitat remains present in the lower portions of Swiss Canyon, the upper reaches typically are dry even under relatively wet conditions such as those in 2006 (Hanson 2007). A survey of the creek channel in October 2006 discovered an in-channel spring about a third of the way up the canyon that provided consistent flow to lower SC. The obvious seepage of irrigation water or surface run-off from the adjacent pastures was not noted (Hanson 2007; 2008). This would indicate that baseline application of water to the POU does not result in erosion of the Swiss Canyon streambanks, which would degrade aquatic habitat for red-legged frogs or other amphibian species. The increase in irrigation that could result from the project is not expected to result in a change in flow in SC. Because of this, there would be no increase in erosion at the mouth of Swiss Canyon attributable to the project incremental increases in irrigation above baseline rates. All factors considered together, the proposed project will have no impact on sensitive amphibian resources in SC.

The project's contribution to reductions in DO has been discussed previously (Impact 4.3-4). Low levels of DO could be problematic if amphibian larvae occupied the lower Big Sur River. However, under baseline pumping conditions, the low levels of DO appear to be a seasonal occurrence that corresponds to the low flow period in late fall when water temperatures are relatively high. If red-legged frogs breed in the lower Big Sur River it is expected that most larvae would have metamorphosed into juvenile frogs by late summer. Low levels of DO in the water would not be an issue for air-breathing juveniles or adult frogs. Therefore, because most larvae would have left the stream before project contributions to reductions in DO became problematic, the proposed project is considered to have a ***less-than-significant impact*** on sensitive amphibians in the Big Sur River.

Mitigation Measures

Because the impacts on sensitive amphibians are considered less than significant, no mitigation is necessary.

Impact 4.3-6	**The proposed project would not result in flow alterations such that amphibian breeding habitat in Swiss Canyon or the Big Sur River becomes unsuitable.**

California red-legged frogs have been documented within the Big Sur River and Swiss Canyon. Suitable breeding habitat can be found within the zone of influence in the Big Sur River and likely also occurs in Swiss Canyon, although outside the zone of pumping influence. Because red-legged frogs breed in December through February when irrigation pumping is minimal in most years. However, the project could affect this species during critically dry years that require pumping in the breeding season. The maximum vertical water surface changes observed in the Big Sur River are 0.17 feet (SGI 2008) of which about 0.05 feet is attributable to the project as previously discussed. Breeding red-legged frogs attach their egg masses to submerged aquatic vegetation. A change in the water surface elevation of about 2 inches would not result in a substantial reduction in available breeding habitat. Nor would it result in increased egg mass exposure that would substantially increase predation rates. The studies of run-off into Swiss Canyon indicate that flows in this creek are more likely a result of watershed run-off from east of Highway 1 and a groundwater spring in the lower canyon than irrigation (Hanson 2007; 2008). Direct overland flow into the canyon from the POU has not been documented in any of these studies under baseline conditions. Therefore, the incremental increase in the project's application of water to the POU during the red-legged frog breeding season would not result in changes in flow that would make Swiss Canyon unsuitable breeding habitat. The proposed project's minor change in available habitat in the Big Sur River in extremely dry years is considered to be a ***less-than-significant impact*** on sensitive amphibians.

Mitigation Measures

Because the impacts on sensitive amphibians are considered less than significant, no mitigation is necessary.

Impact 4.3-7	The proposed project would not result in flow alterations that would create unsuitable habitat for aquatic reptiles.

Western pond turtles have been observed within the Big Sur River upstream of the zone of influence. Pond turtles are relatively tolerant of a wide variety of water quality conditions. They move from pool to pool within river habitats and into adjacent upland areas for nesting. Although pond turtles have not been observed within the zone of influence, suitable habitat exists in this area. Because turtles nest in upland locations and are tolerant of a range of water quality, the only avenue by which the proposed project could affect this species is through alteration of flow that would make habitat unsuitable. The maximum change in flow that is attributable to the increased pumping of the project is about 1.4 cfs per day (Section 4.0). During periods of high flow, this change is minor and would not create unsuitable habitat. Under low-flow conditions found in critical water years, this reduction is not expected to reduce pool volume to the point that turtles would be exposed to greater levels of predation. Because these changes in available habitat for pond turtles are considered minor, the proposed project is considered to have a ***less-than-significant impact*** on sensitive aquatic reptiles.

Mitigation Measures

Because the impacts on sensitive amphibians are considered less than significant, no mitigation is necessary.

Impact 4.3-8	The proposed project would not result in degradation of sensitive vegetation communities.

Along the lower Big Sur River, the riparian community within the zone of influence, willow riparian forest, is considered a sensitive habitat. The extraction of groundwater associated with the pumping creates local depressions in the groundwater levels (SGI 2008). If the water levels were to drop below the root zone of the riparian vegetation for an extended period of time, these plants would become stressed and could eventually die. The drawdown levels measured in the immediate vicinity of Old and New wells was about 4 feet (SGI 2008). In general, groundwater returned to pre-pumping levels within 24-48 hours following the cessation of pumping (SGI 2007; 2008). The larger tree species that provide the bulk of the riparian forest structure include pacific willow, cottonwood, alder, and western sycamore. These species have estimated root depths of about 5-7 feet (Crow 2005). Actual root depths vary greatly and are largely dependant on soil types. These species would have roots that extend through the surface soils and penetrate to groundwater. This root system has developed under the current, baseline pumping regime.

The proposed project would actually decrease maximum monthly diversion by about 39 acre-feet (af) and increase the seasonal diversion total by 34 af in the driest summer months, July to October (Table 4.1-1). The decrease in the maximum pumped in any month would help limit reductions in groundwater levels that could affect riparian vegetation. However, if the increased maximum seasonal pumping results in groundwater levels dropping below the root zones of riparian vegetation for an extended period of time, they could be stressed or eventually die. The overall increase in the seasonal diversion total amounts to about three extra days in a four month span if pumping occurs from both wells at the maximum rate of 5.84 cfs (Table 4.1-1) where water levels would be lowered by the project. Because groundwater levels rebound relatively quickly, this drawdown is temporary and the corresponding effects on riparian vegetation are expected to be minor. A study of the riparian area during 2006 did not observe vegetation that appeared to be water-stressed (Miriam Green 2007). Therefore, the added drawdown of water associated with the proposed project would not result in the degradation of this sensitive vegetation community. Furthermore, the existing vegetative communities have developed under the baseline pumping and irrigation regime. Because there would be some change in groundwater levels, the impact of the project is considered ***less than significant***.

Swiss Canyon also supports a relatively well defined riparian community. As was discussed previously (Impact 4.3-5) there is no direct run-off of irrigation water from the POU into the canyon. While there may be some connection between the POU and local groundwater levels that support the riparian community within SC, no reduction in irrigation is proposed. Therefore, the proposed project would not result in degradation of the riparian community within Swiss Canyon and is considered to have no impact on this resource.

The other sensitive vegetation community found within the project area is freshwater marsh. One of these locations is the tailwater pond on the south pastures of El Sur Ranch. This pond receives the tailwater from the pastures before water is released over the adjacent bluff and into the ocean; this marsh community is supported by baseline pumping. There are no proposed changes to occur at this location and increased irrigation that could result from the proposed project would not reduce the quality of this habitat. The other area of freshwater marsh is found in a small lagoon at the mouth of SC. As has been previously discussed, there does not appear to be a direct connection between application of water to the POU and run-off in SC. Therefore, the proposed project would not alter water supply to this marsh. Combined, the project impact on either freshwater marsh community is considered to be ***less than significant***.

Mitigation Measures

Because the impacts on sensitive amphibians are considered less than significant, no mitigation is necessary.

Cumulative Impacts and Mitigation Measures

The context for this discussion of cumulative impacts is generally the Big Sur Watershed. This is appropriate because the resources that are most likely to be impacted by the project are fish that rely on the entire watershed for their existence. The Big Sur Watershed covers about 58 square-miles of mostly National Forest and Wilderness lands. It is one of the few largely unmanaged rivers on California's central coast with a productive population of federally threatened steelhead.

Chapter 5, CEQA Considerations, in this DEIR includes additional information about related projects in the watershed (Table 5-1).

Impact 4.3-9	**The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of adult steelhead between November 1 and May 31.**

The project is located on the mouth of the Big Sur River. As such this area is the bottleneck through which all adult steelhead must move to reach spawning grounds at points further upstream. The analysis found that pumping in December of critically dry years could impair the passage of fish through the lower river. While this would be expected to happen relatively infrequently, perhaps 5-10 percent of the time, the impact to the steelhead population was still determined to be potentially significant. It is expected that steelhead would move into the lagoon area and hold there if upstream access is not possible. Because the project could reduce access to habitat for an undetermined period of time, these fish would continue to wait, using stored fat reserves, and generally becoming less fit as they waited. If the delay in accessing the upstream areas is long enough, their spawning fitness would be decreased. This would in turn reduce the number of fish that hatch to form the next generation. There are other water users within the Big Sur River and in critically dry years, extraction of water from upstream locations would occur. When other water uses are combined with the increase in diversion associated with the proposed project, upstream passage for adult steelhead could be impaired beyond the lower river. Impairment of movement in the lower river, when coupled with potential passage difficulties upstream, is cumulatively considerable and, therefore, considered a ***potentially significant cumulative impact***.

Mitigation Measures

4.3-9 *Implement Mitigation Measures 4.3-1(a) and 4.3-1(b).*

Implementation of Mitigation Measures 4.3-1(a) and 4.3-1(b) would require that project pumping above baseline rates be curtailed during the adult migration season in the driest of years. Also required would be the development of a detailed flow monitoring plan that would help manage diversions in relation to fisheries habitat. Implementation of these two Mitigation Measures should reduce project's contribution to the upstream access problems to a less-than-considerable level, reducing the project's cumulative impact to ***less than significant***.

Impact 4.3-10	**The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of juvenile steelhead between June 1 and October 31.**

Rearing conditions within the gorge area and the Ventana Wilderness (the mouth of the gorge is just under 8 miles upstream of the project area) are substantially more extensive and productive that those found in the lower Big Sur River. Even so, surveys conducted as part of the Applicant's background research identified a relatively consistent population of juvenile steelhead in the lower river. Although not actively migrating for most of the year, these fish do move from location to location as water quality and foraging conditions dictate. Additionally, juvenile and smolt steelhead move through the project area on their way to the lagoon and the ocean. The impact analysis found that pumping-generated decreases in water depths would impair the movement of these fish in the study area. In the spatial context of the watershed, the study area is the link to the ocean from upstream rearing habitats. If juvenile steelhead are impaired or unable to reach the lagoon or the ocean, large segments of the population could be at risk. The extraction of water in other areas of the lower river is expected to continue. Any contribution to reductions in flow by these other water uses when combined with the proposed project, could lead to a considerable disruption in the ability of steelhead to move through the lower river. Even though the proposed project would only affect localized movement in the lower river, this is the area through which the entire smolt population must migrate if they are to reach the ocean. When combined with other water uses in extremely dry years, the proposed project could have a considerable affect on movement of juvenile steelhead within the Big Sur River. Because the proposed project could have a cumulatively considerable affect, this is considered a ***potentially significant cumulative impact***.

<u>Mitigation Measures</u>

4.3-10 *Implement Mitigation Measures 4.3-2(a) and 4.3-2(b).*

Implementation of Mitigation Measures 4.3-2(a) and 4.3-2(b) would require that project pumping above baseline rates be curtailed during the juvenile migration season in the driest of years. Also required would be the development of a detailed flow monitoring plan that would help manage diversions in relation to fisheries habitat. Implementation of these two Mitigation Measures should reduce the project's contribution to upstream access problems to a less-than-considerable level, reducing the project's cumulative impact to ***less than significant***.

Impact 4.3-11	The proposed project would not increase mean daily water temperatures above 20°C or hourly water temperatures over 24°C.

The impact analysis found that proposed project could result in a minor increase in water temperatures in the lower river. Because mean daily temperatures are well below the 20°C threshold in most cases, the 0.3°C increase attributable to the proposed project was determined to be relatively minor and without significant effect. This minor increase in temperature potentially could have a significant cumulative effect on the fishery if there were a substantial increase in diversions upstream of the lower river that reduced inflow. Although there are known diversions upstream of the lower river, those diversions are part of the baseline conditions against which the 0.3 C increase is determined to be minor, and there are no significant cumulative effects. There are no reasonably foreseeable probable future projects that would increase water diversions and reduce inflow. Therefore, potential changes in water temperatures are not cumulatively considerable and this is considered to be a ***less-than-significant cumulative impact***.

Mitigation Measures

Because the impact is considered less than significant, no mitigation is necessary.

Impact 4.3-12	The proposed project would contribute to the cumulative reduction of dissolved oxygen (DO) levels in the lower Big Sur River below 7.0 mg/L.

The impact analysis indicated that when flows were relatively low in the lower Big Sur River, pumping could exacerbate the already low DO conditions by reducing overall flow and creating more stagnant water. The 2007 data indicated that conditions could have been lethal for steelhead because DO levels were so low. When conditions are made unsuitable for rearing of juvenile steelhead, the fish either move into other more suitable areas, or simply die if DO levels get too low. Estuaries and coastal lagoons are known to provide important rearing habitat for juvenile steelhead. Snorkel surveys noted that many of the larger fish observed in the lagoon and larger pools appeared to have smolt characteristics. These are the larger juvenile fish that have survived 2-3 years in freshwater and are in the process or have already made the change to survive in saltwater. It is not uncommon for the larger fish to move into the lower river and wait for an opportune time to move into the ocean.

2007 data indicate that DO levels were extremely low when data collection was started (Hanson 2008). Data collected that fall indicate that the proposed increase in project diversions would exacerbate conditions that are stressful or even lethal for these fish: conditions that are, in part, the result of the cumulative effect of upstream diversions and historical diversions at the project site. Because these larger fish that are headed into the ocean represent the adults that will come back to spawn in 2-3 years, they are extremely important to the overall population. Because the proposed increase in pumping would contribute to conditions that are significantly adversely affecting these fish, the proposed project has a cumulatively considerable affect on this sensitive resource. This effect is considered a ***potentially significant cumulative impact***.

Mitigation Measures

Implementation of the following Mitigation Measure would reduce the project's contribution to the cumulative impact to a less-than-considerable level, and the project's cumulative impact would be ***less than significant***.

4.3-12 *Implement Mitigation Measures 4.3-4(a) and 4.3-4(b).*

Impact 4.3-13	The proposed project would not result in sedimentation, changes in water quality, or alteration in flow, such that the habitat used by sensitive reptiles or amphibians would become unusable for any life stage.

The overall project-related effects on sensitive reptiles and amphibians was found to be less than significant. The studies indicate that there is no change in habitat availability in Swiss Canyon that is attributable to pumping and irrigation of the POU. Swiss Canyon is the primary area where red-legged frogs have been recently observed. Similarly, changes in water quality are not expected to significantly impact these species. This is in part because red-legged frogs metamorph from tadpoles to juvenile forms before DO levels are likely to be problematic in the lower Big Sur River. Also, both frogs and turtles actively thermoregulate by basking or moving into shaded areas, so changes in water temperatures are not an issue. Additionally, all of the turtles and juvenile and adult frogs breathe air, making the low levels of DO also not an issue. All of these effects are relatively localized in time and limited to the lower river or Swiss Canyon. In the context of the watershed, the changes that the proposed project has that could influence red-legged frogs or western pond turtles is not considerable. Therefore, this impact is considered ***cumulatively less than significant***.

Mitigation Measures

Because the cumulative impact is considered less than significant, no mitigation is necessary.

Impact 4.3-14	The proposed project would not contribute to the cumulative degradation of sensitive vegetation communities along the Big Sur River or on the El Sur Ranch site.

The only sensitive vegetation community potentially affected by the proposed project is the riparian community along the Big Sur River. The impact analysis reviewed the levels of drawdown related to pumping and determined that because this is a temporary result of pumping, the impact was not significant. In the cumulative context, there are not expected to be any long-term deleterious effects of pumping on the riparian community. No acreage will be lost and the overall condition should remain high. The extraction of groundwater will not alter riparian conditions in other areas of the watershed. Because the project is at the mouth of the river, there are no areas downstream that would be affected by a reduced water supply. The temporary localized reductions in groundwater levels associated with pumping is not cumulatively considerable and the cumulative impact is considered ***less than significant***.

Mitigation Measures

Because the cumulative impact is considered less than significant, no mitigation is necessary.

Global Climate Change

The potential future cumulative biological resources impacts of the proposed project in conjunction with global climate change are addressed separately in Chapter 5, CEQA Considerations.

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5.0 CEQA CONSIDERATIONS

CHAPTER 5 CEQA CONSIDERATIONS

INTRODUCTION

This chapter of the DEIR presents various assessments that are statutorily required under CEQA. These include:

- Cumulative Effects
- Climate Change and Greenhouse Gas Emissions
- Growth-Inducing Effects
- Significant Irreversible Impacts
- Significant and Unavoidable Effects

CUMULATIVE EFFECTS

Introduction

Under CEQA, an EIR must analyze the “cumulative impacts” of a proposed project. A cumulative impact refers to individual effects that, when considered together, are considerable or compound other environmental impacts. The individual effects may be changes resulting from a single project or multiple separate projects. CEQA requires a finding that the project may have a significant effect on the environment if the possible effects of a project are individually limited, but cumulatively considerable when viewed in connection with the effects of past, current, and probable future projects.

The proposed project involves the continued diversion of subterranean flow from the Big Sur River at increased rates of diversion. The project will not require new construction, and will involve and only minor modifications to operations that currently exist as part of the environmental baseline. As such, the “cumulative context,” (i.e., the range of project types and locations that could affect the same resources affected by the proposed project) is relatively limited. To address the potential cumulative impacts, the following section of this DEIR presents a listing of existing and pending water rights and diversions within the Big Sur River watershed in order to frame the cumulative context for this discussion. It is important to note that, because historic diversions from the subterranean flow for irrigation of El Sur Ranch are considered part of the environmental baseline for this DEIR, these diversions are necessarily considered part of the cumulative context in determining the potential cumulative impact of the water right Application No. 30166.

Cumulative Context/Related Projects

To evaluate cumulative impacts, this DEIR examined existing and proposed water diversions within the Big Sur River watershed. Impacts caused by other water diversions within the watershed could potentially combine with the proposed project to create cumulative impacts. The Big Sur River watershed covers an area approximately 58.9 square miles in size and contains several tributaries, including North and South forks of the Big Sur River, Pheneger Creek, Juan Higuera Creek, Pfeiffer Redwood Creek, and Post Creek. At the time of the preparation of this DEIR, the SWRCB had 30 permits or licenses, applications, small domestic use registrations, and statements of diversion and use (referred to herein as “claims”) on file for the Big Sur River and its tributaries, including the proposed project. Of these filings, 16 were licensed water rights; nine were statements of diversion and use; two were small domestic use registrations; one was a permitted water right, while the remaining two were listed as pending, including the proposed project. In sum, there are 28 existing diversions, and 2 applications to appropriate water. Table 5-1 below lists the existing water rights and pending applications within the watershed, along with the date, amount, location, type and status of the application, claim, or registration.

To summarize, existing diversions and pending applications in the Big Sur River watershed, including the unpermitted historical maximum diversions for El Sur Ranch, amount to total approximately 1,412 AFA.

With the addition of increased diversions sought under the water right Application No. 30166, total cumulative maximum diversions would be approximately 1,891 AFA. The difference in these values is 479 AFA and represents the maximum annual diversion due to the proposed project that would contribute to the cumulative impact on resources supported by Big Sur River flow and local groundwater conditions.

Summary of Cumulative Impacts and Mitigation Measures

As noted, the proposed project would result in an increase in existing diversions from the subterranean flow of the Big Sur River, with no new construction, and no significant change in land use within the project area. As such, potential project contributions to cumulative impact are limited to the effects (direct or indirect) that will result from the proposed increases in project diversions from the river. These impacts include potential effects on river hydrology, groundwater hydrology, water quality, soil erosion (due to increased application and runoff of irrigation water), and aquatic resources supported by river surface flow and subterranean flow. The cumulative effects of the project on each of these issues are addressed in Sections 4.2 (Hydrology, Geohydrology, and Water Quality) and 4.3 (Biological Resources). Each of the cumulative impacts addressed in Sections 4.2 and 4.3 are listed below along with the determination of whether the proposed project will result in a considerable contribution to a significant cumulative impact.

TABLE 5-1

EXISTING AND POTENTIAL WATER RIGHTS WITHIN THE BIG SUR WATERSHED

Number	Date	Location/ Watershed Source	Amount (AFA)	Type	Status
S015407	4/10/2003	Big Sur River	67.2	Statement of Div and Use	Claimed
S015408	4/10/2003	Big Sur River	7.6	Statement of Div and Use	Claimed
S014966	6/18/1998	Big Sur River	0	Statement of Div and Use	Claimed
D030884R	6/7/2004	Big Sur River	5	Small Domestic Reg	Registered
S014133	11/10/1994	Big Sur River Underflow	0	Statement of Div and Use	Claimed
S014132	11/10/1994	Big Sur River Underflow	0	Statement of Div and Use	Claimed
A030946	9/17/1999	Big Sur River Underflow	42	Appropriative	Pending
D031117R	6/30/2006	Big Sur River Underflow	5.8	Small Domestic Reg	Registered
A013078	5/9/1949	Cold Spring	0	Appropriative	Licensed
A020132	5/16/1961	Juan Higuera Creek Underflow, Unnamed Stream	0	Appropriative	Licensed
A020133	5/16/1961	South Fork Juan Higuera Creek	0	Appropriative	Licensed
A014302	5/11/1951	Pfeiffer-Redwood Creek	0	Appropriative	Licensed
A008901	2/19/1937	Pfeiffer Creek	0	Appropriative	Licensed
A023116	8/19/1968	Pheneger Creek	15	Appropriative	Licensed
A025573	n/a	Pheneger Creek	2.6	Appropriative	Licensed
A019154	n/a	Pheneger Creek	0	Appropriative	Licensed
A019156	n/a	Pheneger Creek	0	Appropriative	Licensed
A021520	11/1/1963	Pheneger Creek	0	Appropriative	Licensed
A019029	n/a	Pheneger Creek	0	Appropriative	Licensed
A027760	5/26/1983	Pheneger Creek	3.4	Appropriative	Licensed
A012176	n/a	Post Creek	36.2	Appropriative	Licensed
F011093S	7/1/1984	Unnamed Spring	0	Federal Filings	Claimed
F011094S	7/1/1984	Unnamed Spring	0	Federal Filings	Claimed
F006373S	7/1/1984	Unnamed Spring	0	Federal Filings	Claimed
F006374S	7/1/1984	Unnamed Spring	0	Federal Filings	Claimed
A023152	n/a	Unnamed Spring	15	Appropriative	Licensed
A008094	6/23/1939	Unnamed Spring	36	Appropriative	Licensed
A029840	n/a	Unnamed Spring, Unnamed Stream	40	Appropriative	Permitted
A009206	n/a	Unnamed Stream	0	Appropriative	Licensed
El Sur Ranch Historical Maximum Annual Usage - Unpermitted (2004 Water Year)	n/a	Big Sur River	1,136	Unpermitted	Pending
Total Existing and Potential Diversions			**1,411.8**		
Proposed Project: A030166	7/27/1992	Big Sur River	1,615	Appropriative	Pending
Total Cumulative Diversions Plus the Proposed Project			**1,890.8**		

Source: State Water Resources Control Board, Division of Water Rights, 2008.

Section 4.2 - Hydrology, Geohydrology, and Water Quality

The following section lists potential cumulative impacts identified in Section 4.2 of this DEIR. Cumulative impact statements are presented along each of their number designations. Each statement is followed by a brief summary of impact significance discussion presented in Section 4.2. If mitigation is required to reduce the project's contribution of impact to a level that is considered less than considerable, those measures are also listed below.

4.2-9 The proposed project could contribute to reductions in local groundwater levels but would not substantially reduce groundwater supplies.

As described in Section 4.2, the proposed increase in diversions at El Sur Ranch could lower local groundwater tables. However, the amount and extent of drawdown would not be substantial and would not greatly affect the ability of other water users to divert groundwater. Additionally, the proposed project is located at the downstream end of the river and diversions from the river would not affect water supplies or water users further up in the watershed. Consequently, the proposed project's impacts on groundwater levels and water supplies would not be significant and impacts would not be cumulatively considerable. Therefore, the project's cumulative impact on available groundwater supplies is ***less than significant***.

4.2-10 The proposed project could contribute to reductions in the groundwater to surface water gradient and reductions in flow within the Big Sur River, which, in turn, may alter the natural channel-forming flow regime.

The proposed project would not alter the Big Sur River hydrologic regime such that channel forming processes are affected or substantial flow losses occur. The amount of river flow loss that could be attributed to the proposed project would be less than about 0.7 cfs with about 1.6 cfs remaining during Critical Dry irrigation seasons. The incidences of no-flow conditions that currently occur in the river may increase slightly as would the incidence of less-than-1-cfs conditions. Although these anticipated increases would be very small, as noted above, the river supports critical habitat for endangered fish species and, therefore, this project's contribution to the cumulative impact is potentially considerable and, therefore, *cumulatively significant*.

With implementation of Mitigation Measure 4.2-2, project contributions to flow losses in river flow that result in river flow of less than 1 cfs would be prevented, even during critical flow conditions. The project's contribution would, therefore, be reduced to a less-than-considerable level, thus reducing the project's cumulative impact to ***less than significant***.

4.2-11 The proposed increase in pasture irrigation in combination with past practices on the project site could contribute to substantial alterations in the drainage pattern of the POU and increased erosion or siltation on- or off-site.

Increases in irrigation on the project site in combination with past and ongoing practices within the POU could alter existing drainage patterns which may, in turn, result in increased erosion and sediment transport from the project site. Such an increase is considered potentially considerable. This impact, therefore, is considered *cumulatively significant.*

Implementation of Mitigation Measure 4.2-4 ensures that the proposed project would not increase the potential for erosion and sediment transport by implementing practices that adequately control runoff and erosion on the project site. With this mitigation, the potential for cumulative impact is ***less than significant*****.**

4.3 - Biological Resources

The following section lists potential cumulative impacts identified in Section 4.3 (Biological Resources) of this DEIR. Cumulative impact statements are presented along each of their number designations. Each statement is followed by a summary of impact significance discussion presented in Section 4.3. Mitigation measures needed to reduce the project's impact contribution to a level considered to be less than considerable are also listed below.

4.3-9 The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of adult steelhead between November 1 and May 31

The project is located on the mouth of the Big Sur River. As such this area is the bottleneck through which all adult steelhead must move to reach spawning grounds at points further upstream. The analysis found that pumping in December of critically dry years could impair the passage of fish through the lower river. While this would be expected to happen relatively infrequently, perhaps 5-10 percent of the time, the impact to the steelhead population was still determined to be potentially significant. It is expected that steelhead would move into the lagoon area and hold there if upstream access is not possible. Because the project could reduce access to habitat for an undetermined period of time, these fish would continue to wait, using stored fat reserves, and generally becoming less fit as they waited. If the delay in accessing the upstream areas is long enough, their spawning fitness would be decreased. This would in turn reduce the number of fish that hatch to form the next generation. There are other water users within the Big Sur River and in critically dry years, extraction of water from upstream locations would occur. When other water uses are combined with the increase in diversion associated with the proposed project, upstream passage for adult steelhead could be impaired beyond the lower river. Impairment of movement in the lower river, when coupled with potential passage difficulties upstream, is cumulatively considerable and, therefore, considered a *potentially significant cumulative impact*.

Mitigation Measures

4.3-9 *Implement Mitigation Measures 4.3-1(a) and 4.3-1(b).*

4.3-10 The proposed project could contribute to cumulative reductions in water depths to a level that would impair passage of juvenile steelhead between June 1 and October 31.

The impact analysis presented in Section 4.3 found that pumping-generated decreases in water depths would impair the movement of these fish in the study area. In the spatial context of the watershed, the study area is the link to the ocean from upstream rearing habitats. If juvenile steelhead are impaired or unable to reach the lagoon or the ocean, large segments of the population could be at risk. The extraction of water in other areas of the lower river is expected to continue. Any contribution to reductions in flow by these other water uses when combined with the proposed project, could lead to a considerable disruption in the ability of steelhead to move through the lower river. Even though the proposed project would only affect localized movement in the lower river, this is the area through which the entire smolt population must migrate if they are to reach the ocean. When combined with other water uses in extremely dry years, the proposed project could have a considerable affect on movement of juvenile steelhead within the Big Sur River. Because the proposed project could have a cumulatively considerable affect, this is considered a *potentially significant cumulative impact*.

<u>Mitigation Measures</u>

4.3-10 *Implement Mitigation Measures 4.3-2(a) and 4.3-2(b).*

Implementation of Mitigation Measures 4.3-2(a) and 4.3-2(b) would require that project pumping above baseline rates be curtailed during the juvenile migration season in the driest of years. Also required would be the development of a detailed flow monitoring plan that would help manage diversions in relation to fisheries habitat. Implementation of these two Mitigation Measures should reduce the project's contribution to upstream access problems to a less-than-considerable level, reducing the project's cumulative impact to ***less than significant.***

4.3-11 The proposed project would not increase mean daily water temperatures above 20°C or hourly water temperatures over 24°C.

As noted in Section 4.3, the impact analysis found that proposed project could result in a minor increase in water temperatures in the lower river. Because mean daily temperatures are well below the 20°C threshold in most cases, the 0.3°C increase attributable to the proposed project was determined to be relatively minor and without significant effect. This minor increase in temperature potentially could have a significant cumulative effect on the fishery if there were a substantial increase in diversions upstream of the lower river that reduced inflow. Although there are known diversions upstream of the lower river, those diversions are part of the baseline conditions against which the 0.3°C increase is determined to be minor, and there are no significant cumulative effects. There are no reasonably foreseeable probable future projects that would increase water diversions and reduce inflow. Therefore, potential changes in water temperatures are not cumulatively considerable and this is considered to be a ***less-than-significant cumulative impact***.

4.3-12 The proposed project would contribute to the cumulative reduction of dissolved oxygen levels in the lower Big Sur River below 7.0 mg/L.

The project's contribution to Cumulative Impact 4.3-12 was found to be potentially substantial and the impact shown as a *potentially significant cumulative impact*. With implementation of Mitigation Measure 4.3-12; however, the impact on the river's dissolved oxygen levels would be reduced to a level considered ***cumulatively less than significant***. Mitigation Measure 4.3-12 would implement Mitigation Measures Implement Mitigation Measures 4.3-4(a) and 4.3-4(b). These are listed below:

4.3-4 a) *Reductions in dissolved oxygen (DO) are most problematic during periods of extremely low flow when pumping causes or contributes to stagnant water conditions in the lower river. When mean daily flow at the USGS gage in the Big Sur River is below 10 cfs and mean daily water temperature is above 18^{o}C, the Applicant shall reduce project pumping to Baseline (Allowable) Diversion Rates (see Table A, Mitigation Measure 4.2-2), except as provided in Mitigation Measure 4.3-4(b). Project pumping shall not resume until the mean daily flow is above 10 cfs, regardless of water temperature changes, or until the Applicant can demonstrate to the satisfaction of the SWRCB that DO levels are consistently above those considered stressful to steelhead (6 mg/L). This Mitigation Measure shall remain in force unless the Applicant implements Mitigation Measure 4.3-4(b) in its entirety. This measure does not limit diversions required for making measurements, as specified in Mitigation Measure 4.2-2.*

b) *If the Applicant elects to make project diversions when flow at the UGSG gage is below 10 cfs and mean daily water temperature is above 18^{o}C, then the Applicant must install a seasonal aeration system in the lower river. The goal of such a system would be to provide DO to aquatic species when project pumping may cause or contribute to stagnant conditions. The system shall consist of an electric compressor located near the New Well, temporary piping laid on the surface of the ground to the river bank, and a distribution system of perforated pipe laid on the bottom of the Big Sur River. The in-stream portion of the distribution system shall, at a minimum, result in average river DO level of six (6) mg/l at each passage transect from transect 2 through and including transect 8. The network on the stream bottom shall be painted black or brown to minimize visual disruption for park users. All equipment shall be removed from the active channel by November 1.*

The overall feasibility of such a system is unclear. Aeration systems have been installed on ponds and lakes, but in-stream systems are extremely rare. A feasibility study shall be prepared and all required permits obtained before this measure is implemented in lieu of Mitigation Measure 4.3-4(a). This feasibility study shall include an evaluation of potential impacts associated with implementation of the Mitigation Measure including potential impacts on noise and visual quality, construction impacts associated with installation of the compressor and utility lines, equipment maintenance and operations, and other considerations, as required by the SWRCB. It is expected that the required permits would include specific requirements to minimize potential impacts to aquatic habitat, such as erosion and siltation, from implementation of this Mitigation Measure.

4.3-13 The proposed project would not result in sedimentation, changes in water quality, or alteration in flow, such that the habitat used by sensitive reptiles or amphibians would become unusable for any life stage.

The overall project-related effects on sensitive reptiles and amphibians was found to be less than significant. The studies indicate that there is no change in habitat availability in Swiss Canyon that is attributable to pumping and irrigation of the POU. Swiss Canyon is the primary area where red-legged frogs have been recently observed. Similarly, changes in water quality are not expected to significantly impact these species. This is in part because red-legged frogs metamorph from tadpoles to juvenile forms before DO levels are likely to be problematic in the lower Big Sur River. Also, both frogs and turtles actively thermoregulate by basking or moving into shaded areas, so changes in water temperatures are not an issue. Additionally, all of the turtles and juvenile and adult frogs breathe air, making the low levels of DO also not an issue. All of these effects are relatively localized in time and limited to the lower river or Swiss Canyon. In the context of the watershed, the changes that the proposed project has that could influence red-legged frogs or western pond turtles is not considerable. Therefore, this impact is considered ***cumulatively less than significant***.

4.3-14 The proposed project would not contribute to the cumulative degradation of sensitive vegetation communities along the Big Sur River or on the El Sur Ranch site.

The only sensitive vegetation community potentially affected by the proposed project is the riparian community along the Big Sur River. The impact analysis reviewed the levels of drawdown related to pumping and determined that because this is a temporary result of pumping, the impact was not significant. In the cumulative context, there are not expected to be any long-term deleterious effects of pumping on the riparian community. No acreage will be lost and the overall condition should remain high. The extraction of groundwater will not alter riparian conditions in other areas of the watershed. Because the project is at the mouth of the river, there are no areas downstream that would be affected by a reduced water supply. The temporary localized reductions in groundwater levels associated with pumping is not cumulatively considerable and the cumulative impact is considered ***less than significant***.

CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS

Most of the climate change models agree that California will get warmer and drier over the next 100 years. The IPCC (2007) predicts that runoff could decrease by 10 to 30 percent in mid-latitudes. Decreases in rainfall would result in corresponding lower flows in rivers and streams.

With projected long-term warming of global climate conditions, sea levels are predicted to rise over the next century. The precise rate of change is subject to debate and will change continually if greenhouse gasses are controlled on a global scale, but the known rate of sea level rise is about 10 to 12 inches per century based on historic records (USEPA 1995).

Wave-induced surge on a beach can be of the order of the significant breaker height, which can reach 5 or 6 feet during large wave events. Projections suggest substantial sea level rise may occur over the next century by over 2 feet (Cayan et al. 2006). Most climate models operate at a scale that accounts for global circulation and, therefore, prevent any accurate discussion of the central California coast. Because the extent of sea level rise is unknown and its effect on the ocean-groundwater gradient is unknown, cumulative impacts without the proposed project would be potentially significant.

The effect climate change will have on aquatic ecosystems in California over the next century is not easily quantified. The models used to predict changes in temperature, precipitation, and sea level rise all generate different results. Model outputs range from predicted decreases to increases in streamflow to seasonal changes precipitation without changing the total rainfall. Therefore, this discussion is qualitative in nature and considers the potential ramifications of overall reduced runoff, warmer temperatures, and changes in seasonal precipitation.

The following impact statements reflect the potential cumulative impacts of the proposed project, taking into account long-term environmental changes resulting from global climate change.

Impact 5-1	**Implementation of the proposed project, in combination with past, ongoing, and future diversions could alter the groundwater-to-surface water gradient and reduce the water surface elevation within the lagoon.**

Lagoon water surface elevations are primarily a function of tidal action. Cumulative development within the watershed would not affect lagoon water surface elevations. However, global climate change could cause or contribute to accelerated sea level rise. Accelerated sea level rise would increase the Pacific Ocean water surface elevation, with respect to the lagoon, and the frequency of high tides that serve to increase the lagoon water surface elevation. Therefore, it can be expected that the lagoon water surface elevation will increase over time. As a result, any cumulative changes in the groundwater-to-surface water gradients caused by increased diversions (and hence, lower Big Sur River flow rates) within the Big Sur River watershed that could reduce lagoon water depths would not be substantial. The proposed project diversion effects on water depth in the lagoon are less than significant; lagoon water surface elevations are primarily controlled by the Pacific Ocean, tidal actions, and episodic closing of the lagoon mouth. Therefore, the proposed project's contribution to cumulative impacts would not be considerable, and cumulative impact of the project, therefore, would be ***less than significant***.

Impact 5-2	Implementation of the proposed project, in combination with past and ongoing diversions, could alter the local groundwater gradient and cause or contribute to cumulative seawater intrusion and aquifer salinity changes associated with global climate change.

Sea levels are predicted to rise over the next century. In relation to the project, if sea levels increase enough, then saline water intrusion could become a more frequent problem than it is now.

Salt water intrusion within proposed project aquifer is primarily driven by tidal action and the gradient between the aquifer potentiometric surface and Pacific Ocean sea levels. Jones and Stokes (1999) estimated that the hydraulic head on the alluvial aquifer is as much as 40 feet, enough to prevent salt water intrusion to the depth of the alluvial aquifer. However, tidal action has been shown to increase salt water intrusion within the aquifer, in particular, within the ancestral canyon on the northern boundary. Considering 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.

However, the proposed project would not cause or contribute to seawater intrusion, because diversions at the proposed project wells have no measurable effect on aquifer salinity (see Impact 4.2-7 in Section 4.2, Hydrology, Geohydrology, and Water Quality). Without a considerable contribution, the project's cumulative impact on seawater intrusion is considered to be ***less than significant***.

Impact 5-3	Implementation of the proposed project, in combination with past and ongoing diversions and development in the watershed, would result in an alteration in the local groundwater-to-surface water gradients and surface water flow regime with concurrent effects on surface water quality. This could incrementally contribute to global climate change-related changes in surface water quality in the Big Sur River.

As discussed in Sections 4.2 and 4.3 of this DEIR, the proposed project's diversions could affect surface water quality. Reduced Big Sur River flow rates by increased diversion of subterranean flow, in particular during critical flow conditions, could affect local DO concentrations. However, with implementation of Mitigation Measure 4.2-3, potential proposed project effects on surface water quality would be less than significant and the proposed project would not contribute considerably to cumulative impacts. Although existing regulations would serve to minimize impacts from human development and use within the watershed, global climate change and sea level rise could still be substantial. While this impact would be considered cumulatively significant, the project's contribution to this impact is less-than-considerable. Therefore, project's cumulative impact is ***less than significant***.

Impact 5-4 **Implementation of the proposed project, with past and ongoing diversions and development in the watershed, would contribute to cumulative climate change-related impacts on upstream migrating adult steelhead and rearing juvenile steelhead because of expected increased frequency and duration of low flows in the Big Sur River and low-DO conditions.**

Because flows in the Big Sur River are driven by rainfall, a decrease in rain would lead to corresponding lower flows in the Big Sur River. If the IPCC prediction were to be accurate, over time it would be expected that periods of extremely low flows would become more frequent than the current 90^{th} or 95^{th} percentile. Fish passage and water quality conditions in the Big Sur River could, therefore, be directly and adversely affected by climate change, regardless of whether the proposed project is implemented.

As described in Impacts 4.3-1, 4.3-2, and 4.3-4, the proposed project has the greatest potential to impact fish passage and water quality (i.e., DO) during periods of extremely low flow. As the region becomes warmer and drier, it is reasonable to expect that to maintain proper forage El Sur Ranch would be required to irrigate for more months of the year, and more frequently during those months then under current conditions. The project's pumping from subterranean flow, in combination with lower flows associated with climate change in the Big Sur River, would result a greater frequency of low flows over a longer time period. The poor passage and rearing conditions that already exist under periods of extremely low flow could be exacerbated by the combination of project pumping and climate change related changes in hydrology.

The net change in subterranean flow withdrawal due to the project's pumping would not be substantial, as compared to baseline. However, as shown in Table 5-1 and as described in "Cumulative Impacts" the project would account for approximately 25 percent of the diversions that would contribute to the cumulative impact on resources supported by Big Sur River flow and local groundwater conditions. Therefore, under cumulative conditions, the project's contribution to changes in existing and projected adverse low-flow conditions that would further impact poor rearing and fish passage conditions would be considered cumulatively considerable. This is a *potentially significant cumulative impact*.

<u>Mitigation Measures</u>

Implementation of these mitigation measure(s) would reduce these climate change-related aquatic resources impacts to a level considered ***less than significant***. Mitigation Measures 4.3-1 and 4.3-2 would reduce impacts on upstream migrating adult steelhead and rearing juvenile steelhead by requiring a reduction in pumping during extremely dry periods. This limits the project's interaction with the river, thereby preserving instream flow for fish movement. Mitigation Measure 4.3-4 would reduce the project's contribution to low DO levels in the lower Big Sur River that are stressful and potentially lethal to steelhead. Although stressful conditions could still occur as a result of climate change, pumping of water would not contribute to these conditions following implementation of these mitigation measures.

5-4 *Implement Mitigation Measures 4.3-1, 4.3-2, and 4.3-4.*

Impact 5-5	Proposed project energy use associated with operation of the groundwater wells, in combination with past and ongoing energy use and air emissions in the watershed, would contribute to greenhouse gas emissions.

Analyzed under CEQA, a project's global climate change contribution would be considered significant if due to its size and nature the project would generate, during and after construction, a substantial increase in greenhouse gas (GHG) emissions, over existing conditions.

The Old Well and New Well are equipped with electric-motor, 60-horsepower (hp) pumps. During 2004 pump tests, Old Well energy use ranged from approximately 238 to 246 kilowatt-hours per acre-foot (kW-hr/AF). The New Well energy use ranged from approximately 111 to 158 kW-hr/AF. The maximum production capacity of the Old Well is approximately 1,145 gpm (2.55 cfs), and the New Well maximum pumping rate is 1,567 cfs (3.49 cfs) (SGI 2007). The energy use, although minimal, is an existing source of greenhouse gas emissions that contribute to climate change.

Both wells' pumps can be operated simultaneously at their maximum pump rates when water is needed for irrigation of pastures, typically during dry periods of the year (e.g., summer months). However, the pumps are typically used to irrigate different fields, so they are operated simultaneously only when the needs of those fields require it. The water right Application No. 30166 proposes a maximum instantaneous diversion rate of 5.84 cfs, which assumes both pumps operating at the same time.

The proposed project would increase seasonal maximum diversions above average baseline (702 AF) by 33 AF (see Table 6-1, Chapter 6, Alternatives, in this DEIR). This would be an approximate 4 percent increase over baseline. The pump energy use associated with this increase could result in additional energy use that could be a source of greenhouse gas emissions. As indicated in the water use analysis for the project (SGI 2007), the amount of energy use would, however, depend on which well pump is being used and which fields are being irrigated. For purposes of this evaluation, it is assumed historic pumping practices would not change substantially, and the diversion of an additional 33 AF seasonal diversion would result in an increase in energy use that is directly proportional to the increase in diversion amount. Because total energy use on the project site represents is negligible relative to regional electrical use, and given the increase under the proposed project represents only a few percent, the project's contribution to cumulative levels of GHG emissions is not considered substantial. Impacts would be ***less than significant***.

GROWTH-INDUCING EFFECTS

An EIR must discuss the growth-inducing effects of a project, such as the ways in which a proposed project could foster economic or population growth or the construction of additional housing in the vicinity of the project, either directly or indirectly, in the surrounding environment (see CEQA Guidelines section 15126.2, subdivision(d)). For example, growth may be induced if the project eliminates an existing obstacle to growth. Growth can also be induced through the stimulation of economic activity. This can occur when implementation of the proposed project could cause increased activity in the local or regional economy. Examples of economic effects that could potentially induce growth can be characterized as either:

a) Increased Indirect Demand: The extent to which the proposed project would generate secondary or indirect effects on other employment in the region; or

b) Increased Pressure on Land Use Intensification: The extent to which expansion of development into areas that are currently designated for lower intensity development outside of, but adjacent to the project boundary, could result in increased pressure on the local planning agency to redesignate the land to higher land use intensities.

Approval of water right Application No. 30166 would allow continued diversion of the subterranean flow of the Big Sur River for use on irrigated pasture on El Sur Ranch. The project does not propose to alter existing land uses on the project site (i.e., livestock grazing and grass production) nor would the applicant's right to divert and apply slightly greater quantities of irrigation water result in the elimination of regulatory obstacles to growth. The project does not involve the creation of new infrastructure. The project would not directly result in an increase in population or the construction of new housing. Therefore, the project would not directly induce growth or development.

One of the proposed project objectives presented in water right Application No. 30166 is to increase annual diversions in order to correct presumed historic "under-irrigated" conditions on the project site. Therefore, it is reasonable to assume that the project would result in some increase in productivity of pasture forage production. Whether or not this increase in forage would result in increased cattle production on the ranch is unclear. It is reasonable to assume, however, that any increase in production would be relatively limited and would not result in a significant change in local or regional economies, at least to the extent that such a change would result in an increase in population, employment or development. Therefore, the growth-inducing impact of the proposed project is ***less than significant***.

SIGNIFICANT IRREVERSIBLE IMPACTS

Under CEQA Guidelines section 15126.2, subdivision (c), an EIR must analyze any significant irreversible environmental changes that would be caused by the project if it was implemented. An EIR is also required to evaluate the irretrievable commitments of natural resources to assure that such consumption is justified.

As stated above, the proposed project involves granting a permit for water right Application No. 30166, which would allow El Sur Ranch to continue and increase diversions of subterranean flow from the El Sur River to serve irrigated pasture. As the project does not include the construction of any new facilities, it would not commit any non-renewable natural resources such as oil, gas, and iron ore to such activities. The proposed project would result in a limited increase to power use consistent with an increase in average annual diversions of roughly 343 AFA. Water diverted from the El Sur River in increased quantities under the proposed water right is considered a renewable natural resource and its use is not considered an irreversible commitment of resources. Accordingly, the project ***will not involve any significant irreversible impacts.***

SIGNIFICANT AND UNAVOIDABLE EFFECTS

According to CEQA Guidelines section 15126.2, subdivision (b), a EIR must include a description of those impacts identified as significant and unavoidable if the proposed action is implemented. Unmitigable significant effects must be described, as well as effects that can be mitigated but not reduced to a level of insignificance.

For all impacts determined to be potentially significant in this DEIR, effective and feasible mitigation measures are presented to reduce those impacts to levels that are less than significant. Therefore, the project ***would not result in any significant and unavoidable impacts***.

6.0 ALTERNATIVES ANALYSIS

CHAPTER 6 ALTERNATIVES ANALYSIS

INTRODUCTION

In accordance with CEQA, this section analyzes a range of reasonable alternatives to the proposed project. The *CEQA Guidelines* specify that the alternatives should be designed to feasibly attain most of the basic objectives of the proposed project while avoiding or substantially lessening significant adverse impacts. A feasible alternative is one that can be "accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors" (Public Resources Code, Section 21061.1 [defining "feasible"]; CEQA Guidelines, Section 15364).

As discussed in Chapter 2, Project Description, the proposed project is the issuance of a permit for water right Application No. 30166, as amended October 17, 2006. Through this application, the El Sur Ranch seeks to continue existing, historic direct diversions from the subterranean flow of the lower Big Sur River through pumping from two existing wells, as limited by conditions described in the application and specific requirements for monitoring and reporting diversions and rates. The application also proposes to adjust irrigation operations to more fully meet the irrigation demands of the pasture crops, which could result in water diversions that exceed past practices.

The choice of alternatives is guided primarily by the need to reduce potential impacts associated with the proposed project, while still achieving the project's basic project objectives. As stated in Chapter 2 (Project Description) of this DEIR, the specific objectives of the project are to:

- allow for the appropriation of water from the Big Sur River for use on the El Sur Ranch through issuance of an appropriative water right permit, consistent with the SWRCB's responsibility to consider water availability, the public interest, the protection of fish, wildlife, and public trust resources, water quality, prior legal water rights, and to condition the appropriation as necessary;
- allow for the continued diversion and beneficial use of water for irrigation of 267 acres of pasture for cattle grazing; and
- continue economic use of the land for agricultural purposes and grazing of cattle consistent with Monterey County Zoning Ordinance, Coastal Implementation Plan, and the Monterey County General Plan.

ALTERNATIVES ANALYSIS

This DEIR considers and evaluates four alternatives to the proposed project. These alternatives are:

1. No Project/No Permit Alternative;

2. No Change in Existing Practices/Historical Diversions Alternative;
3. Alternate Irrigation Efficiency Alternative; and
4. Alternative Limits on Diversions Alternative

The following discussion presents a description of each of the proposed project alternatives, a comparative analysis of the potential impacts of each alternative relative to the proposed project, and an analysis of each alternative's ability to meet the basic project objectives. Appendix G in this DEIR includes additional data, assumptions, and methodologies that were used in quantifying hydrologic impacts for the alternatives.

Alternative 1: No Project/No Permit Alternative

Description

CEQA requires the evaluation of a "No Project" alternative and its impacts (CEQA Guidelines, Section 15126[e]). The purpose of assessing the no project alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. Under CEQA, the no project alternative must discuss the existing conditions at the time the Notice of Preparation was published, as well as "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." (Section 15126.6[(e)(2)] of the State CEQA Guidelines). The No Project/No Permit Alternative represents the scenario that could reasonably be expected to occur in the event that the proposed project (i.e., the water right application) is not approved. If the water right application were to be denied, it is assumed that under this alternative, all future water diversions occurring at El Sur Ranch would be limited to the applicant's existing riparian water right,[34] which would only allow for the use of that water on the 25 acres of the property located within the Big Sur River watershed (see Figure 2-2), leaving 242 acres of currently-irrigated pasture without irrigation under an appropriative water right. The denial of the water right application would require that pumping of the subterranean flow of the Big Sur River for non-riparian pasture cease, so water that usually would have pumped out of the ground to use for the irrigation of 242 acres within the POU would be left in the subterranean flow of the river. El Sur Ranch could continue its diversion of water under riparian right on the existing 25 acres of riparian property. The projected irrigation amounts associated with Alternative 1 are provided in Table 6-1.

As shown in Table 6-1, although annual pumping amounts vary from year to year, depending on demand at the time, an average of 857 AFA of water was pumped each year for use at the El Sur Ranch. The maximum amount of water pumped was 1,137 AF in 2004. Under this

34 In its application, El Sur Ranch claims a riparian right to irrigate 25 acres of pasture. The use of this figure in this document does not amount to a determination by the State Water Board of the quantity or validity of the applicant's claimed riparian right.

TABLE 6-1

COMPARISON OF ALTERNATIVES' WATER USE

			Annual						Seasonal (July through October)							
		Irrigated Area (acres)	20-year Average acre-feet	20-year Average inches	Annual Maximum acre-feet	Annual Maximum inches	Monthly Maximum acre-feet	Monthly Maximum cfs	20-year Seasonal Average acre-feet	20-year Seasonal Average average cfs	Seasonal Maximum acre-feet	Seasonal Maximum average cfs	Monthly Maximum acre-feet	Monthly Maximum cfs	Maximum 30 Day Average Diversion Rate (cfs)	Maximum Instantaneous Diversion Rate (cfs)
	Baseline 1985-2004	267	857	38.5	1,137	51.1	339	5.70	540	2.21	702	2.88	269	4.52	5.70	>6.0[a]
	Project/Alternative Description															
	Project	**267**	**1,200**	53.9	**1,615**	72.6	318	**5.34**	**735**	3.01	**735**	3.01	**230**	3.87	**5.34**	**5.84**
1	**No Project/No Permit Alternative**	25	80	38.5	106	51.1	32	5.70	51	2.21	66	2.88	25	4.52	0.53	>6.0[a]
2	**No Change in Historical Diversions[b]**	267	857	38.5	1,137	51.1	339	5.70	540	2.21	702	2.88	269	4.52	5.70	>6.0[a]
3	**Alternate Irrigation Efficiency[c]**	267	862	38.7	946	42.5	146	2.45	430	1.76	453	1.86	138	2.24	2.45	>6.0[a]
4	**Alternative Limitations on Diversion[d]**	267	1,200	53.9	1,615	72.6	318	5.34	735	3.01	735	3.01	230	3.87	5.34	5.84
	Above Base Line															
	Project	0	**343**	**15.4**	**478**	**21.5**	-21	-0.36	**195**	**0.80**	33	0.13	-39	-0.65	-0.36	<-0.2
1	**No Project/No Permit Alternative**	-242	-777	0.0	-1,031	0.0	-307	0.00	-489	0.00	-636	0.00	-244	0.00	-5.17	0
2	**No Change in Historical Diversions**	0	0	0.0	0	0.0	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0
3	**Alternate Irrigation Efficiency**	0	5	0.2	-191	-8.6	-193	-3.25	-110	-0.45	-249	-1.02	-131	-2.28	-3.25	0
4	**Alternative Limitations on Diversion**	0	**343**	**15.4**	**478**	**21.5**	-21	-0.36	**195**	**0.80**	33	0.13	-39	-0.65	-0.36	<-0.2

a Based on Table 6-13 measured pumping in 2004 (SGI 2005)
b Equal to baseline
c APPROXIMATE VALUES based on historic (1975-2006) monthly Irrigation Requirements and a 80% Irrigation Efficiency
d Diversion quantities same as Project with proposed operational limitations to reduce impacts.
Bold text: Equal to greater than 10% increase over baseline.
Blue bold text: El Sur Ranch water right Application No. 30166 Request.

alternative, the amount of water available to be used within the ranch would be reduced to 75 AFA, which would be provided through the existing riparian right. This water would only be available for use within the 25 acres of El Sur Ranch irrigated pasture that are located within the Big Sur River watershed. As shown in Table 6-1, this is 777 AFA below existing environmental baseline usage on average.

Comparative Analysis of Impact

With denial of the water right application and substantially reduced pumping of the subterranean flow of the Big Sur River, the direct, indirect and cumulative impacts attributed in this DEIR to proposed diversions under water right Application No. 30166 would not occur. Without an appropriative water right, non-riparian portions of El Sur Ranch irrigated pasture would lose their source of irrigation water. For purposes of this DEIR we assume that an alternative source of water for irrigation would not be available under the No Project scenario. Lands within the El Sur Ranch that are currently irrigated using water pumped from the subterranean flow would no longer have an irrigation water source, so these fields would no longer be irrigated unless the project applicant is able to successfully secure another approved water source. In addition to impacts on the ranch, water from the subterranean flow of the Big Sur River that had previously been pumped would now remain within the river system, potentially affecting the existing hydrology, fisheries, and riparian wildlife and vegetation within and surrounding the river.

Hydrology, Geohydrology, and Water Quality

The No Project/Permit Alternative limits diversions to 25 acres with a maximum 30-day diversion rate of 0.53 cubic feet per second (cfs). This is about one tenth of the 30-day maximum diversion rate compared to baseline and the proposed project and less than one fifth of the proposed project July through October maximum 30-day diversion rate. The No Project/No Permit Alternative, therefore, would reduce local groundwater levels less than pumping under historical (baseline) conditions or under the proposed project: therefore, the No Project/No Permit Alternative would have less effect on subterranean flow.

Except for the Navy Well, there are no water users within the Big Sur River system that could be affected by diversions by the El Sur Ranch. But because the No Project/No Permit Alternative would have no effect on Navy Well water supplies, impacts on water supplies and potential lowering of the local groundwater table associated with the No Project/No Permit Alternative would be less than the proposed project.

Diversion of less water would also mean that effects on flow within the Big Sur River would be less than both baseline and the proposed project. As described in Section 4.2, Hydrology, Geohydrology, and Water Quality, under baseline conditions, 0.23 to 0.35 cfs of flow could be lost to the lower reaches of the river.[35] Using the same methodology,[36] the No Project/No

35 Overall loss rate is approximately 0.16 cfs per 1.0 cfs diverted.

36 See Appendix G in this DEIR for flow calculations and methodology.

Permit Alternative would reduce these losses to about 0.03 cfs, whereas the proposed project increases these flow loss rates, as shown in Table 6-2.

TABLE 6-2

IRRIGATION SEASON DIVERSION EFFECT ON BIG SUR RIVER FLOW LOSS

	Baseline cfs	Proposed Project cfs	No Project Alternative cfs	Historic Diversions cfs	Alternative Irrigation Efficiency cfs	Alternative Limits on Diversions cfs
Diversion[a]						
Monthly Maximum	4.52	3.87	0.42	4.52	2.24	3.87
Seasonal Average	2.21	3.01	0.21	2.21	1.76	3.01
Big Sur River Flow Loss[b]						
Monthly Maximum	0.72	0.62	0.07	0.72	0.36	0.62
Seasonal Average	0.35	0.48	0.03	0.35	0.28	0.48
Difference from Baseline						
Monthly Maximum	--	-0.10	-0.66	0.00	-0.36	-0.10
Seasonal Average	--	0.13	-0.32	0.00	-0.07	0.13
Difference from Proposed Project						
Monthly Maximum	--	--	-0.62	0.12	-0.29	0.00
Seasonal Average	--	--	-0.50	-0.14	-0.23	0.00

Notes:
[a]From Table 6-1
[b]Where Big Sur River (BSR) Flow Loss is estimated as 0.16 cfs per 1.0 cfs diverted (See Section 4.2, Impact 4.2-2, gradient method)
-- = not applicable

Regardless, the No Project/No Permit Alternative would alter the frequency of the channel forming bankfull flow compared to baseline. However, as with the proposed project, the No Project/No Permit Alternative would not substantially alter the flood or bankfull flow rates, as shown in Table 6-3.

TABLE 6-3

FLOW RATES FOR CHANNEL-FORMING FACTORS AND FREQUENCY FOR NON-EXCEEDENCE OF CRITICAL FLOW RATES

				No Project Alternative Difference			Alternative Irrigation Efficiency Difference	
Flow Condition cfs	Baseline/ Historic cfs	Proposed Project/ Alternative Limits on Diversions cfs	No Project Alternative cfs	Baseline cfs	Proposed Project cfs	Alternate Irrigation Efficiency cfs	Baseline cfs	Proposed Project cfs
Flood								
10-year	257.2	257.0	257.2	0.01	0.26	257.2	0.01	0.26
Bankful								
2.5-year	41.02	40.86	41.91	0.89	1.05	41.45	0.43	0.59
2.0-year	28.21	28.29	28.61	0.4	0.32	28.20	-0.01	-0.09
1.5-year	18.02	17.91	18.24	0.22	0.33	18.13	0.11	0.22
Critical Flow (Frequency of Non-Exceedence)								
1 cfs	1.94	2.3	1.48	-0.46	-0.82	1.97	0.03	-0.33
0 cfs	1.08	1.23	0.92	-0.16	-0.31	1.07	-0.01	-0.16

Additionally, the No Project/No Permit Alternative would reduce the percent of flows that fall to 1 cfs and 0 cfs. Flows less than 1 cfs would occur approximately 35 percent less often with the No Project/No Permit Alternative, compared to the proposed project, and no-flow conditions would occur about 25 percent less often for the No Project/No Permit Alternative compared to the proposed project.

Winter diversions could still occur with implementation of the No Project/No Permit Alternative. November through March, baseline diversions average 0.02 to 0.29 cfs (see Appendix G, El Sur Ranch Monthly Pumping (cfs)). As with the proposed project, only during November could there be a potential effect; December through March flows are high such that the small flow losses associated with the No Project/No Permit Alternative would not be substantial. During November, flow occasionally (2 percent of days) drops to 0 cfs within the lower reaches of the river. However, the No Project/No Permit Alternative would reduce monthly maximum flow loss to the river by approximately 0.83 cfs during November compared to baseline, and would reduce monthly maximum potential flow loss to the river by 0.77 cfs compared to the proposed project.[37] During typical conditions,[38] the No Project/No Permit Alternative would result in slightly lower (0.12 to 0.17 percent) incidences of no flow and flow less than 1 cfs compared to baseline and lower (0.50 to 0.84 percent) incidences of no flow and flow less than 1 cfs compared to the proposed project.

As with the proposed project, the No Project/No Permit Alternative would not substantially alter the lagoon water elevations or salinity, or groundwater salinity, because these are primarily controlled by external factors (e.g., tides, wind and wave action, and sea levels). Additionally, the No Project/No Permit Alternative would not substantially affect on-site flooding because it would limit irrigation to the 25 riparian acres and would not irrigate with higher rates than baseline conditions.

The No Project/No Permit Alternative would reduce irrigation on the POU and in doing so, reduce the amount of excess irrigation runoff. By reducing the amount of excess irrigation runoff, it is reasonable to assume that erosion potential and sediment transport associated with this runoff would also be reduced. It is, however, important to note that, with reduced irrigation, less vegetative cover would be maintained in the majority of the POU. This in turn would result in a likely increase the potential for erosion during the winter storm season. Historic aerial photographs show that prior to irrigation of the POU in 1949 when the Old Well was constructed (see Section 4.2, Hydrology, Geohydrology, and Water Quality), erosion within the POU and Swiss Canyon was more substantial and has decreased with irrigation of the pastures. It follows then, that erosion and sediment transport under the proposed project would be less than would be expected for the No Project/No Permit Alternative because the irrigated pastures provide enhanced vegetative cover, erosion management, and drainage management.

37 Flow loss of 0.16 cfs per 1.0 cfs diverted, as applied to the values in Table 6-2.

38 See Appendix G, Daily Flow Calculations for details on methods.

The No Project/No Permit Alternative would not divert as much low-DO subterranean flow from the Big Sur River compared to baseline and the proposed project allowing low-DO shallow groundwater to continue to flow into the river; the proposed project would divert 0.80 cfs more of low-DO groundwater from the river compared to the No Project/No Permit Alternative. As with the proposed project, the No Project/No Permit Alternative is expected to have a minimal effect on Big Sur River temperature and salinity; temperature and salinity are primarily affected by incoming stream flow and natural conditions.

The potential for the No Project/No Permit Alternative to affect flow in Swiss Canyon is limited; only 80 to 106 AF would be applied, which is less than 10 percent of the baseline application and less than 7 percent of the proposed project application. Application of water would not occur on the fields adjacent to Swiss Canyon.

Aside from potentially increasing sediment in runoff water, the No Project/No Permit Alternative could reduce the amount of pollutants in runoff compared to both baseline and proposed project conditions because cattle grazing operations would be minimized. Reduced cattle operations would require less fertilization and result in less animal waste material deposited on the surface, which would reduce the potential for nutrients and pathogens to be transported in runoff.

Overall, the No Project/No Permit Alternative would reduce potential effects on water supplies and flow loss rates in the Big Sur River compared to the proposed project. It would also alter the channel-forming flows, but as with the proposed project, these effects would not be significant and the pollution potential from nutrients and pathogens would be less for the No Project/No Permit Alternative compared to the proposed project. No Project/No Permit Alternative impacts on the lagoon and seawater intrusion would not be different than the proposed project. The No Project/No Permit Alternative would, however, likely increase erosion potential within the POU and Swiss Canyon, and possibly the bluffs along the Pacific Ocean side and may contribute to depressed DO in the Big Sur River compared to the proposed project by reducing vegetative cover on the POU relative to the proposed project.

Biological Resources

Implementation of the No Project/No Permit Alternative would substantially reduce pumping which in turn corresponds to an overall reduction in the total volume of water removed from the river (see Table 6-1). This alternative would result in more water remaining in the river during the low-flow season in late summer and early fall.

Under this alternative, the maximum diversion rate is 0.53 cfs which equates to about 0.016 feet (0.19 inch or just over 3/16th of an inch) of reduction in depth attributable to implementation of this alternative. This change is much less than the 0.05 feet attributable to the proposed project. In addition, this level of diversion, and corresponding reductions in water depth, is much less than the baseline conditions. Baseline pumping at a maximum 30-day average diversion rate of 5.7 cfs has been measured to reduce water elevations within the Big Sur River by 0.17 ft; about 2 inches (SGI 2008). This reduction in depth is large enough that the shallower riffles do not meet the passage criteria established for adult or juvenile steelhead. Hanson (2008) measured depths at passage transects that were below the 0.6 and 0.3 feet required for adult and juvenile passage. Implementation of the No Project/No Permit Alternative would decrease the diversion rate and could result in a corresponding increase in depth. Therefore, because implementation of the No Project/No Permit Alternative would result in more water being in the river than would occur under baseline conditions, the No Project/No Permit Alternative could be considered to benefit passage of adult and juvenile steelhead. In relation to the proposed project, the No Project/No Permit Alternative would reduce potential impacts on steelhead to a level considered beneficial.

The Big Sur River may enter periods where dissolved oxygen levels are extremely low (below the Basin Plan objective) even if no pumping occurs on the El Sur Ranch. Low dissolved oxygen levels appear related to periods of extremely low streamflow when water movement essentially stops in the lower river. When this occurs, dissolved oxygen is rapidly depleted from the water.

The reduced pumping under the No Project/No Permit Alternative means less water would be removed from the river when compared to baseline conditions and the proposed project. Under this alternative the maximum 30-day average diversion rate would be about 0.53 cfs which equals an instream flow reduction of about 0.16 cfs. When compared to the proposed project's reduction of instream flow of about 0.4 cfs (Section 4.3), the No Project/No Permit Alternative has a much smaller contribution to reductions in flow. Therefore, implementation of the No Project/No Permit Alternative would have a smaller contribution to flow reductions and low levels of dissolved oxygen than the proposed project.

The No Project/No Permit Alternative would allow more water to remain in the river. In relation to water temperatures, this would allow for more rapid movement of water through the lower river, reducing warming and generally improving conditions when compared to the proposed project.

Overall, implementation of the No Project/No Permit Alternative would reduce levels of impact on sensitive resources when compared to the proposed project. In relation to passage of adult and juvenile steelhead, the No Project/No Permit Alternative would be considered to have a beneficial impact compared to a potentially significant impact of the proposed project. In terms of dissolved oxygen, the No Project/No Permit Alternative could still contribute to reductions in levels of DO, but the magnitude of change is impossible to predict with the available information. Impacts associated with changes in temperature would likely remain less than significant if the No Project/No Permit Alternative were implemented. These reductions are because the No Project/No Permit Alternative would result in substantially less water being pumped for irrigation purposes.

Ability of the No Project/No Permit Alternative to Meet the Basic Objectives of the Proposed Project

The following evaluates the ability of the proposed project alternative to feasibly attain most of the basic objectives of the project. As noted in Chapter 2 (Project Description) of this DEIR under the subheading "Project Objectives," the State Water Board is responsible for ensuring the reasonable beneficial uses of water that would be appropriated by the El Sur Ranch under water right Application No. 30166, as well as the protection of the waters of the state, other water rights holders, and public trust resources. The basic project objective of the applicant generally includes the continuation of the historical land uses, including existing ranch activities and pasture irrigation.

Although the No Project/No Permit Alternative would substantially avoid or lessen the significant effects of the proposed project, most of the basic project objectives, particularly the key objective of authorizing the historical water use on the Ranch's irrigated pasture would not be realized. Even though 25 acres of the 267 acres within the proposed POU could continue to be irrigated using the applicant's riparian water right, and the remaining POU acreage could be used as non-irrigated pasture, the desired objectives of the project—which require irrigation of the entire POU (as described in Chapter 2 of this DEIR and the water right Application No. 31066)—would not be achieved. For example, irrigated pasture is necessary to provide good forage for cows and calves close to the ranch headquarters where calving can be more easily monitored and to maintain forage for other cattle at other times of the year. Thus, under the No Project/No Permit Alternative, the project objectives related to continued historic cattle operations and continued economic use of the land for agricultural and cattle grazing purposes consistent with the various county plans, would be significantly impeded.

Alternative 2: No Change in Existing Practices/ Historical Diversions

Description

The No Change in Existing Practices/Historical Diversions Alternative (Alternative 2) represents historical and ongoing water diversion practices at El Sur Ranch. It assumes that current diversions and irrigation practices would continue, with no change in the amount of water pumped. The amount of water that is currently pumped and used at the ranch for irrigation purposes would remain the same using the same methods of pumping and diversion from the Big Sur River, and the same application methods for irrigation. The irrigation limits will be based on the baseline years of 1983 to 2002. Based on historic usage presented by applicant (NRCE March 2007), irrigation has operated at 73 percent irrigation efficiency during baseline period. The revised calculations for the irrigation amounts are in Appendix G and summarized in Table 6-1.

Historically, an average of 857 AF of water has been pumped from the wells each year. However, groundwater pumping has varied in the past based on need. The maximum amount of water pumped over the 20-year baseline period was 1,137 AF in 2004. As shown in Table 6-1, under this alternative, the same pumping rates would continue, so a running average of 857 AF would be pumped from the river's subterranean flow annually. This is the same amount as the baseline annual use.

Comparative Analysis of Impact

Hydrology

The No Change in Existing Practices/Historical Diversions Alternative essentially represents environmental baseline conditions for the project site. The alternative would not, therefore, increase or reduce diversion rates compared to baseline conditions and therefore, by CEQA definition there would be no impact associated with the alternative.

Under this alternative, annual irrigation diversions would generally be about 30 percent less than the under the proposed project. The July through October maximum average rate of diversion, however, would be about 17 percent higher than the proposed project.[39] Additionally, the overall maximum 30-day diversion rate could be 6 percent higher than the proposed project. Consequently, irrigation season impacts on local groundwater levels and water supplies could temporarily be greater for this alternative compared to the proposed project, but the overall July through October seasonal average would be lower (0.8 cfs), as shown in Table 6-3.

Diversion of less water, on average, would also mean that effects on flow within the Big Sur River would be less the proposed project. Under this alternative, an average of 0.40 cfs of flow could be lost to the lower reaches of the river during the irrigation season (Table 6-2). The No Changes in Historical Practices/Historical Diversions Alternative would very slightly increase the bankfull and flood flows compared to the proposed project by about 0.16 to 0.20 cfs (Table 6-3). Regardless, this alternative would not alter the frequency of the channel-forming bankfull flow or flood flow, compared to the proposed project. This alternative would also reduce the percent of flows that fall to 1 cfs and 0 cfs compared to the proposed project (Table 6-3). Flows less than 1 cfs would occur approximately 18 percent less often with this alternative, compared to the proposed project, and no-flow conditions would occur about 12 percent often for this alternative compared to the proposed project. Although these reductions are very small, the Big Sur River supports critical habitat for endangered species and the slightly lower incidence of low flow with the No Changes in Historical Practices/Historical Diversions Alternative would, therefore, be substantial.

Winter diversions could still occur with implementation of this alternative, with November through March diversions average of 0 to 0.20 cfs, with a November average of 0.20 cfs and

39 Calculated based on Table 6-1.

maximum of 1.27 cfs (Appendix G, El Sur Ranch Monthly Pumping (cfs)). This translates into a flow loss in the Big Sur River of about 0.05 cfs on average and 0.30 cfs maximum in November (Appendix G, Baseline and Historic Diversions (Alt 2) El Sur Ranch Monthly Pumping Effect on BSR Flow Rate Losses (cfs)).[40] The proposed project was estimated to divert about 0.5 cfs flow on average throughout November.[41] Therefore, this alternative would reduce flow losses in the Big Sur River by 0.07 cfs on average. This would be a benefit for the alternative because, during November, flow occasionally drops to 0 cfs within the lower reaches of the Big Sur River.

As with the proposed project, the No Changes in Historical Practices/Historical Diversions Alternative would not substantially alter the lagoon water elevations or salinity, or groundwater salinity, because these are primarily controlled by external factors (e.g., tides, wind and wave action, and sea levels). This alternative could increase on-site flooding compared to the proposed project because mitigation incorporated into the proposed project would include management practices designed to minimize on-site flooding, whereas this alternative does not necessarily include such requirements. With implementation of these practices, however, the difference between the alternative and proposed project would be negligible relative to flooding.

The No Change in Existing Practices/Historical Diversions Alternative would reduce the potential for erosion due to irrigation of the POU by reducing the amount of applied water and, thus, reducing the amount of excess irrigation runoff. Under the alternative, existing levels of vegetative cover would be reduced slightly which may result in the potential for some additional erosion, but this is not expected to be significant. The alternative would not substantially affect the cattle grazing intensity within the POU. For purposes of this evaluation, we assume that this alternative would incorporate runoff maintenance and erosion controls that are included as elements of the proposed project and, therefore, any benefit of these measures would be applied equally for the proposed project and this alternative.

The No Change in Existing Practices/Historical Diversions Alternative would not divert as much low-DO groundwater from the Big Sur River, compared to the proposed project, allowing low-DO groundwater to continue to flow into the river. This alternative would divert an average of 2.88 cfs and maximum 30-day average of 4.52 cfs during the July through October season, whereas the proposed project would divert an average of 3.01 and 30-day maximum average of 3.87 cfs during the July through October season (see Table 6-1). Therefore, this alternative could divert a 30-day maximum average of 0.11 cfs more low-DO groundwater during July through October from the river, compared to the proposed project. However, the seasonal average diversion would be about 0.02 cfs less for this alternative compared to the proposed project. It follows then that, if river flow remains high enough to prevent stagnant conditions, the No Changes in Historical Practices/Historical Diversions Alternative could provide a slight additional benefit on Big Sur River DO compared to the proposed project. However, if flows are

40 See Appendix G, Daily Flow Calculations for details on methods.

41 See Appendix G, Daily Flow Calculations for details on methods.

low, the higher diversion rates could result in a higher incidence of stagnant conditions that could adversely affect river DO compared to the proposed project.

The No Change in Existing Practices/Historical Diversions Alternative would have no impact on river temperature and salinity because the Alternative would simply maintain environmental baseline conditions. As presented in Section 4.2 of this DEIR, the proposed project would have a minimal effect on river temperature and salinity. Temperature and salinity are primarily affected by incoming stream flow and natural conditions.

The No Change in Existing Practices/Historical Diversions Alternative would not affect existing flow in Swiss Canyon. Flows to Swiss Canyon under the proposed project would be slightly reduced due to runoff controls that are proposed as part of the proposed project. In addition, with the implementation of restrictions on application rates under the proposed project, allowable application rates under the proposed project could be as much as 0.36 cfs lower relative to this alternative.

Aside from potentially increasing sediment in runoff water, the No Changes in Historical Practices/Historical Diversions Alternative could reduce the amount of pollutants in runoff compared to the proposed project conditions because cattle grazing operations would be reduced. Reduced cattle operations would require less fertilization and result in less animal waste material deposited on the surface, which would reduce the potential for nutrients and pathogens to be transported in runoff.

Overall, the No Changes in Historical Practices/Historical Diversions Alternative would reduce potential effects on water supplies compared to the proposed project. It may, however, increase November flow loss rates in the Big Sur River, such that critical flow conditions are created, because this alternative has no mitigation to minimize diversions during critical low flow conditions. This alternative would not alter the channel-forming flows, and the pollution potential from nutrients and pathogens would be less for this alternative compared to the proposed project. The No Changes in Historical Practices/Historical Diversions Alternative impacts on the lagoon and seawater intrusion would not be different than the proposed project. This alternative would, however, likely increase erosion potential within the POU and Swiss Canyon, and possibly the bluffs along the Pacific Ocean side, and may contribute to depressed DO in the Big Sur River compared to the proposed project because no mitigation would be implemented to prevent such occurrences.

Biological Resources

The No Changes in Historical Practices/Historical Diversions Alternative would maintain irrigation operations that have occurred historically on the El Sur Ranch POU; therefore environmental baseline conditions, as defined for this DEIR (Section 4.1), would not change. In relation to the proposed project, implementation of this alternative would on average result in lower levels of diversion. As demonstrated in Sections 4.2 and 4.3 of this DEIR, there is a direct relationship between the diversion rate and instream flow and water depth. This means that a lower pumping rate results in less water diverted from the river in relation to the proposed project. This alternative would result in 20-year average July-October diversion rates of about 2.21 cfs, roughly 0.8 cfs less than the rate of the proposed project (see Table 6-1, above) of Alternatives' Water Use). This would result in about 0.24 cfs of water that would not be diverted (at 0.3 cfs of instream flow lost per 1 cfs pumped). On average, this alternative would result in more water being present in the river during the low flow season. However, more water could be pumped under the monthly maximum that allows 339 AF on an annual basis and 269 AF during the July-October period (see Table 6-1). Even though the seasonal diversions are greater, the overall amount of water diverted would be less. The low levels of DO that have been observed in the lower river are exacerbated by periods of extremely low flow when the water starts to stagnate thereby reducing gas exchange. During these periods, this minor amount of additional water left in the stream by this alternative could be enough to help the river to continue moving, thereby reducing stagnation and improving DO levels.

Overall, implementation of the No Changes in Historical Practices/Historical Diversions Alternative would reduce the levels of impact on sensitive aquatic resources in the Big Sur River when compared to the proposed project. However, the magnitude of change relative to the proposed project is difficult to predict. Because seasonal maximum volumes are higher than the proposed project, this alternative could still result in significant impacts on steelhead habitat through reductions in flow or DO.

Ability of the No Change in Existing Practices/ Historical Diversions Alternative to Meet the Basic Objectives of the Proposed Project

The basic project objectives specified in water right Application No. 30166 generally include the continuation of the historical land uses, including existing ranch activities and pasture irrigation.

In addition to the above objectives, water right Application No. 30166 identifies a condition of under-irrigation that has occurred under historical applications. To correct this condition, the Applicant seeks to acquire the right to divert and apply water in quantities that slightly exceed historic rates of diversion. The intent of the increase is to improve forage quality and production on the POU.

Under the No Changes in Historical Practices/Historical Diversions Alternative, diversions and irrigation on the project site would continue consistent with historical practices within the POU. In doing so, the main basic objectives of the proposed project described above would be achieved. Increased diversions requested under water right Application No. 31066 would not be permitted, thus potentially reducing forage production on irrigated pasture relative to what might be achieved under the proposed project, but there is no substantial evidence presented in the

Application or elsewhere in the record to suggest that this reduction would substantially affect the economic use or viability of the agricultural operations on the project site.

Alternative 3: Alternate Irrigation Efficiency

Description

The Alternate Irrigation Efficiency Alternative (Alternative 3) would propose feasible on-site irrigation improvements, which would address potential concerns related to the increase in the amount of water that would be diverted under the proposed project, possible impacts associated with that increase, and the applicant's desire to correct historical conditions on the project site which, according to the applicant, have resulted in the "under-irrigation" of pasture.

Currently, pasture on the project site is irrigated using border-strip irrigation practices. In a border strip, because of the configuration and the crop friction, water takes a long time to run over the fields. Thus, under current practices, irrigation is typically turned off in a border strip before water reaches the end of a strip (WWD 2008). This can lead to under-irrigation of crops. The amount of water able to infiltrate the soil depends on the intake rate of the soil and the opportunity time, which is the total time that water is present at any point in the border strip. The irrigation system, as it currently exists, has a greater opportunity time at the top of the field (where the irrigation system starts) and a lower opportunity time at the bottom end of the field. Therefore, more water has a chance to infiltrate the top end of the field compared to the bottom end of the field.

Water running off the bottom end of a field as part of normal irrigation practices is referred to as tailwater. Tailwater is necessary in border strip irrigation to adequately irrigate the bottom end of a field because a sufficient infiltration time is required to allow the desired amount of water to infiltrate the soil. To achieve good distribution uniformity (evenness) of applied irrigation water across the field, it is recommended that the inflow rate to the border strip be kept high. This advances water across the field quickly and minimizes the differences in infiltration time (and thus the differences in the amount of infiltrated water) between the top and bottom of the field. A high flow rate tends to generate greater tailwater. Good management practices involve collecting the tailwater for reuse (UC DANR n.d.).

In order to increase the efficiency of the irrigation system and eliminate the under-irrigation of pasture, a tailwater return system would be constructed under this alternative. A pump and ditch or pipeline conveyance system would be used to move the tailwater from the bottom end of the field back to the top of the field or wherever it would be applied. This type of system, when well operated, maximizes irrigation efficiency and reduces environmental impact, as summarized below (UC DANR n.d.).

The advantages of this type of system include the following:

- reduced potential adverse effects of off-site tailwater runoff;

- improved irrigation efficiency since tailwater is beneficially reused as irrigation water; and
- potentially reduced groundwater pumping costs through reuse even though pumping from the tailwater pond will be required for reuse.

Disadvantages related to the tailwater return system include:

- increased costs related to construction, maintenance and operation of the tailwater return system;
- potential inconsistencies with local and regional land use plans related to construction of new facilities in the coastal zone; and
- reduced forage production due to the conversion of some pasture to support a new and/or expanded tailwater pond and other system components.

This alternative uses the historic evapotranspiration (ETo) data and an assumed irrigation efficiency of 80 percent (including the leaching fraction) to calculate the irrigation requirements for 267 acres. Operation between 1994 and 2006 had an average of 82 percent irrigation efficiency (see Appendix G). The pumping parameters are summarized in Table 6-1.

A tailwater return system is recommended to consistently achieve 80 percent irrigation efficiency. Furthermore, the infrastructure improvements would need to be coupled with proper management to ensure distribution uniformity. The timing of application and amount of water necessary to adequately irrigate all pastureland would be best managed by a trained operator.

As shown in Table 6-1, under this alternative, 862 AF of water would be pumped and used for irrigation of the 267-acre POU, an increase of 5 AF from the baseline historical annual average of 857 AF. This alternative would also include improvements to the irrigation application methods, to allow the more efficient use of less water. Based on this alternative the project applicant could improve irrigation of the POU while reducing the amount of water pumped from the river underflow.

Comparative Analysis of Impact

Hydrology

The Alternate Irrigation Efficiency Alternative would reduce the average annual diversion by 338 AF and the maximum annual diversion by 669 AF, compared to the proposed project. This alternative would slightly increase the average annual diversion (5 AF) and reduce the maximum annual diversion by 191 AF compared to baseline. This alternative would also reduce the July through October irrigation rate by 0.45 cfs and average monthly maximum by 2.28 cfs compared to baseline conditions. This would result in a 1.25 cfs reduction in the seasonal average and 1.15 cfs reduction in the average monthly maximum July through October diversion rate, compared to the proposed project.

The Alternate Irrigation Efficiency Alternative would not, therefore, reduce local groundwater levels by as much as either the No Change Alternative or the proposed project, and more underflow would be available for water supplies. Except for the Navy Well, there are no water users within the Big Sur River system that could be affected by diversions by the El Sur Ranch. This alternative would have less of an effect on Navy Well water supplies, and impacts on water supplies associated with this alternative would be less than those for the proposed project.

Diversion of less water would also mean that effects on flow within the Big Sur River would be less than both baseline conditions and the proposed project. The Alternate Irrigation Efficiency Alternative would reduce July through October average losses to 0.32 cfs (0.08 cfs less than baseline and 0.22 cfs less than the proposed project) and maximum monthly losses to 0.36 cfs (0.41 cfs less than baseline and 0.30 cfs less than the proposed project) (Table 6-2). Less diversions and flow losses for this alternative would alter the frequency of the channel forming bankfull flow compared to both baseline and the proposed project. However, as with the proposed project, the effects of this alternative on bankfull and flood flow rates would not be substantial. Additionally, the reduced flow diversions under this alternative would reduce the percent of flows within the Big Sur River that fall to 1 cfs and 0 cfs, compared to the proposed project (Table 6-3).

Winter diversions could still occur with implementation of the Alternate Irrigation Efficiency Alternative. As with the proposed project, only during November could there be a potential effect; December through March flows are high such that the small flow losses associated with this alternative would not be substantial. During November, flow occasionally drops to 0 cfs within the lower reaches of the river. However, the maximum November monthly flow loss would for this alternative be about 0.29 cfs (Appendix G, Alternative Irrigation Efficiency (Alt 3) El Sur Ranch Monthly Pumping Effect on BSR Flow Rate Losses (cfs)) compared to flow loss from the maximum monthly proposed project diversion rate of 5.34 cfs (1.28 cfs flow loss).[42] This would reduce the potential flow loss to the river by 0.99 cfs compared to the proposed project. Realistically, however, the maximum allowable diversion rate would not occur under the proposed project and diversion rates of the more typical 0.5 to 2.0 cfs would result in flow losses of 0.12 to 0.48 cfs with the proposed project.

As with the proposed project, the Alternate Irrigation Efficiency Alternative would not substantially alter the lagoon water elevations or salinity, or groundwater salinity, because these are primarily controlled by external factors (e.g., tides, wind and wave action, and sea levels). This alternative could increase on-site flooding compared to the proposed project because mitigation incorporated into the proposed project would include management practices designed to minimize on-site flooding, whereas this alternative does not necessarily include such requirements.

42 Flow loss of 0.24 cfs per 1.0 cfs diverted.

The Alternate Irrigation Efficiency Alternative would reduce the potential for erosion due to irrigation of the POU by reducing the amount of applied water and, thus, reducing the amount of excess irrigation runoff. Under the alternative, existing levels of vegetative cover would be maintained further reducing the potential for erosion. The alternative would not reduce the cattle grazing intensity because efficient irrigation should provide as much crop growth as the proposed project. For purposes of this evaluation, we assume that this alternative would incorporate runoff maintenance and erosion controls that are included as elements of the proposed project.

On an average, the Alternate Irrigation Efficiency Alternative would not divert as much low-DO groundwater from the Big Sur River, compared to the proposed project, allowing low-DO shallow groundwater to continue to flow into the river. This alternative would reduce July through October average losses by 0.22 cfs less than the proposed project and maximum monthly losses to by 0.30 cfs less than the proposed project (Table 6-2). It follows then that, if river flow remains high enough to prevent stagnant conditions, this alternative could provide a reduction in benefit to Big Sur River DO compared to the proposed project. However, if flows are low, the lower diversion rates could result in a lower incidence of stagnant conditions that could adversely affect river DO compared to the proposed project.

As with the proposed project, the Alternate Irrigation Efficiency Alternative is expected to have a minimal effect on Big Sur River temperature and salinity; temperature and salinity are primarily affected by incoming stream flow and natural conditions.

The potential for this alternative to affect flow in Swiss Canyon is lower than the unmitigated proposed project because less runoff would be expected to occur with efficient irrigation. However, with mitigation of the proposed project, impacts would be expected to be similar.

Aside from potentially increasing sediment in runoff water, the Alternate Irrigation Efficiency Alternative could reduce the amount of pollutants in runoff compared to the proposed project conditions because efficient irrigation would incorporate runoff prevention; excess irrigation runoff would be collected and reused on the project site preventing off-site transport.

Overall, the Alternate Irrigation Efficiency Alternative would reduce potential effects on water supplies compared to the proposed project. It would also reduce the November flow loss rates in the Big Sur River such that incidence of critical flow conditions are reduced. This alternative would alter the channel-forming flows compared to both baseline conditions and the proposed project, but effects would not be significant. The erosion and pollution potential from nutrients and pathogens would be less for this alternative compared to the proposed project because of the reduction in runoff. The Alternate Irrigation Efficiency Alternative could contribute to depressed DO in the river, compared to the proposed project, because less low-DO groundwater would be diverted from the river. However, it would also be less likely to cause or contribute to stagnant water low-DO conditions during critical flow periods, compared to the proposed project, because of lower diversions from the Big Sur River.

Biological Resources

The Alternate Irrigation Efficiency Alternative (Alternative 3) assumes that improvements can be made to the irrigation system whereby irrigation can be achieved with more efficiency than has historically occurred. This alternative has the potential to adversely affect biological resources through construction of new infrastructure and changes in pumping.

This alternative could require construction of the following system improvements: a tailwater pond on the north pastures, return piping for the north and south pastures, installation of pumps for both tailwater ponds, and installation of electrical supply lines for the pumps. Alternatively, tailwater from the north pastures could be collected and piped across Swiss Canyon to the existing pond on the south pastures. A return line would also have to be installed to allow tailwater to be pumped back to the top of the north pastures from the existing pond. This analysis assumes that the existing supply lines from the pumps near the river are adequate and do not need to be altered. Additionally, it is assumed that return lines and ancillary connections to the existing distribution system would be placed within the existing pastures or access roads thereby minimizing impacts on sensitive habitats.

Construction

Impacts on Sensitive Plants and Vegetation Communities

Construction of a new pond in the north pastures could impact coastal scrub habitat if the pond is placed near the bluffs where this community is found (Figure 4.3-2). While this is not a sensitive habitat, some of the sensitive plant species documented in the database searches utilize coastal scrub habitats (Table 4.3-4). No sensitive plant species have been observed in the POU, but focused surveys were not conducted of this area because the proposed project included no infrastructure changes. Construction of a new pond in coastal scrub habitat has the potential to result in significant impacts on sensitive plant species.

If the existing pond on the south pastures is used, a drain would have to be constructed in the north pasture with a return line that crosses Swiss Canyon. The drain would likely be within existing pastures and not impact sensitive resources. The return line however, would have to cross riparian habitat of Swiss Canyon. Construction of this return line could result in the removal of riparian habitat. Because this habitat is considered sensitive, this change would be considered a potentially significant impact of the Alternate Irrigation Efficiency Alternative.

Impacts on Sensitive Wildlife Species

Installation of a new return pipeline that crosses Swiss Canyon could impact the population of federally-threatened California red-legged frogs found in Swiss Canyon. Construction would require heavy equipment that could crush frogs and trenching for the pipes would likely require temporarily open ditches into which frogs (and sensitive species of wildlife such as dusky-footed woodrat) could fall and become injured or trapped. Installation of the required pipes in the pastures could also result in trapped wildlife, especially if open trenches are left in close proximity to existing coastal scrub and riparian habitats. Similar risks exist if the pumps installed to move water back to the head of the pastures are electric and require new below-ground supply lines. Because there is a potential for red-legged frogs to be killed or injured during construction, this is considered a potentially significant impact of the Alternate Irrigation Efficiency Alternative.

Operation

Once in place, the infrastructure required for this alternative should require little maintenance. Therefore, operation of a return system is not expected to impact terrestrial resources near the POU, the Big Sur River, or within Swiss Canyon.

More efficient use of water would require that less water is pumped. Overall, it is expected that the Alternate Irrigation Efficiency Alternative would require less water than baseline conditions established for this DEIR. Baseline pumping is a 20-year average of about 857 AF. This alternative would require only 866 AF, which is about 334 AF less than the proposed project. The 20-year seasonal average (July-October) is over 300 AF less than the proposed project which equates to approximate reductions in pumping of 1.3 cfs. A reduction in pumping of 1.3 cfs would equate to about 0.4 cfs of instream flow that would not be diverted (at 0.3 cfs of instream flow lost per 1 cfs pumped). This also corresponds to an increase in depth over the shallowest riffles of the lower river of about 0.04 ft, almost half an inch. During the driest parts of the year (September and October typically), this additional water would serve two purposes. First, the 0.4 cfs that remains in the stream would help water to continue to move through the lower river reducing the amount of stagnation and the project's contribution to low levels of dissolved oxygen. Second, the increase in flow would provide more water over the shallowest of riffles which would facilitate passage of juvenile steelhead. Even though a half-inch increase in depth may not sound like much, review of the passage transect data collected in 2007 (Hanson 2008) indicates that this added depth would not have created water depths at passage transect 11 that met the criteria for juvenile movement. At passage transect 4, the added water would have created conditions where the requirement that a contiguous 10 percent of the width be over 0.3 feet would have been met (September 5, 2007 data) but the 25 percent of the total width over 0.3 feet criterion would not have been met. Neither of these criteria was met for this riffle on September 2, 2007 (Hanson 2008).

Implementation of the Alternate Irrigation Efficiency Alternative would, on average, improve conditions for steelhead in the lower Big Sur River in relation to the proposed project and baseline conditions. This would be considered a beneficial impact of this alternative.

Summary

The Alternative Irrigation Efficiency Alternative would reduce the significant impacts on aquatic resources associated with the proposed project to levels that would be considered less than significant. However, the new infrastructure required for implementation of the Alternate Irrigation Efficiency Alternative could result in potentially significant impacts on sensitive species

(California red-legged frogs and dusky-footed woodrat), sensitive riparian vegetation, and sensitive plant species as a result of project-related construction. These impacts would not occur under the proposed project and therefore, would not require mitigation. In order to reduce or avoid potential impacts on sensitive species under this alternative, the implementation of feasible and effective mitigation measures as identified for the proposed project would be required.

Ability of the Alternate Irrigation Efficiency Alternative to Meet the Basic Objectives of the Proposed Project

The basic project objective specified in water right Application No. 30166 generally includes the continuation of the historical land uses, including existing ranch activities and pasture irrigation.

In addition to the above objectives, water right Application No. 30166 identifies a condition of under-irrigation that has occurred under historical applications. To correct this condition, the application asked to acquire the right to divert and apply subterranean flow in quantities that slightly exceed historic rates of diversion. The intent of the increase is to improve forage production on the POU.

Under the Alternate Irrigation Efficiency Alternative, diversions of Big Sur River subterranean flow for irrigation on the project site would be reduced by constructing and operating irrigation system improvements described above. Under this alternative, each of the basic project objectives could be achieved. Cost of constructing and operating the proposed system would affect the economic use of the property, but these costs would be somewhat offset by long-term reductions in groundwater pumping and potential reductions in mitigation costs related to instream impacts on Big Sur River aquatic resources.

Alternative 4: Alternative Limits on Diversions

Description

The applicant has proposed an alternative that would limit diversions from the subterranean flow when specific hydrologic or water quality conditions occur in the El Sur River. Under the Alternative Limits on Diversions Alternative (Alternative 4), river conditions that would result in limitations on diversions include: (1) a loss of surface water connectivity with the El Sur Ranch reach,[43] (2) if the DO concentration level falls below 6 mg/l at each of the Two Sonde Stations,[44] or (3) both a loss of connectivity and low DO occur.

43 The reach of the Big Sur River that lies between a point that lies 100 yards upstream from the most easterly of the applicant's two point of diversion and a point that lies 100 yards downstream from the most westerly point of diversion.

44 The two recording data sondes deployed on the Big Sur River to monitor DO, one located near the river bottom within an upwelling pool (near Station 8) and the second located near the river bottom near the head of the lagoon at Station 6.

If any of these scenarios would occur at any point during pumping upon implementation of this alternative, then for the next seven days, the project applicant would be required to limit the combined pumping rate of the wells to an operating rate of no more than 3 cfs. During that seven-day period, manual monitoring of DO, water temperature, and electrical connectivity and visual inspection of surface water, habitat connectivity, and other habitat features, would be conducted daily in order to monitor the response of DO and habitat connectivity to the reduced pumping. If after this period of reducing pumping DO has not increased to 6 mg/l at the downstream recording sonde or the stream connectivity remains disrupted, pumping would cease for seven more days. If these conditions remain after the second seven-day period of no pumping, then the project applicant would need to consult with the SWRCB, California Department of Fish and Game (DFG), and the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA Fisheries) regarding further well operations during the next 72 hours following the second seven-day cessation of pumping to determine allowable amounts of pumping. It is important to note that this consultation process is proposed by the applicant without evidence that such a process is, in fact, feasible. If, under this alternative, the consultation process is found to be infeasible, we assume that the provisions described below (pertaining specifically to what would happen in the absence of a four-party agreement) would be implemented.

If, after the 72-hour period, the four parties cannot agree how to proceed with further well operations, then the project applicant would then follow the following steps to determine whether or not it could resume diversions. The project applicant would conduct daily monitoring of surface water connectivity within the El Sur Ranch reach and the depth of the river at the designated "depth location,"[45] and the DO at the downstream recording sonde. The project applicant could resume permitted diversions if for any period of the seven consecutive days, both the water level and the DO increase at the downstream recording sonde and the reach has at least 0.5 feet of water depth at the depth location and no loss of surface water connectivity exists throughout the El Sur Ranch reach. If, following the resumption of these permitted diversions, there occurs any of the following conditions, then the project applicant would then again need to cease diversions: (1) a loss of surface water connectivity within the El Sur Ranch reach, or (2) for a period of seven consecutive days, the DO level at the downstream recording sonde is below 6 mg/l, or (3) both. The project applicant could not resume diversions until the El Sur Ranch reach has at least 0.5 feet of water depth at the depth location, or loss of surface water connectivity exists throughout the El Sur Ranch reach, and the and the water flow rate exceeds the low flow rate,[46] or the El Sur Ranch reach has at least 0.5 feet of water depth at the depth location, no loss of water connectivity exists throughout the Reach, and the DO at the downstream recording sonde is 6 mg/l or above.

45 The depth location is defined as the location which is at or near the point where surface water flow was last present within the area first incurring a loss of surface water connectivity within the El Sur Reach.

46 Low flow rate is defined as when during any seven-day period the average rate of flow at the USGS Gage equals 9 cfs or less, but more than 7 cfs.

The project applicant need not comply with these conditions if the applicant's diversions ceased before the occurrence of a low flow rate and were not resumed until after the low flow rate ceases.

Comparative Analysis of Impact

Hydrology

The Alternative Limits on Diversion Alternative would divert the same amount of water as the proposed project and therefore, would be subject to the same impacts. However, this alternative would also reduce pumping to 3.0 cfs when certain Big Sur River flow constraints are identified, in order to prevent stagnant water and associated low-DO conditions. The reduced diversion rates, however, would be 0.13 cfs more than average baseline conditions during the irrigation season and the same as the proposed project during July through October, if Big Sur River limiting conditions do not occur. It would reduce the July through October maximum monthly average diversion rate for baseline conditions by 0.65 cfs and would not alter the July through October maximum monthly average diversion rate for the proposed project unless flow constraints are identified (see Table 6-1). It would also reduce the maximum November pumping rate by 2.7 cfs compared to baseline, if Big Sur River limiting conditions are met (Appendix G, El Sur Ranch Monthly Pumping (cfs)). This would reduce the potential impacts on low-DO conditions exacerbated by diversion reductions in flow rates within the Big Sur River compared to both baseline and the proposed project without mitigation. It may reduce potential impact of the proposed project with mitigation, depending upon if maintenance natural flows up to 1 cfs within the Big Sur River lower reaches would also prevent exacerbation of low-DO conditions caused by stagnant waters.

Overall, the Alternative Limits on Diversion Alternative impacts would be the same as the proposed project, except for effects on Big Sur River DO concentrations. However, whether or not this alternative would substantially improve DO concentrations compared to the proposed project with mitigation cannot be determined precisely. If this alternative would improve DO concentrations substantially compared to the proposed project, it would also allow for continued diversions of up to 3.0 cfs during critical flow conditions that would be prevented by the proposed project.

Biological Resources

The Alternative Limits on Diversion Alternative (Alternative 4) would place limits on diversions during periods of low flow. As has been discussed previously (Section 4.3) the proposed project has the potential to impact aquatic resources when flows in the river are very low. The Limits on Diversion Alternative establishes pumping limits based on actual conditions in the lower Big Sur River.

The periods when the proposed project is most likely to cause problems are those times when flows are extremely low. The Alternative Limits on Diversion Alternative requires that El Sur Ranch monitor conditions and reduce or stop pumping altogether when surface connectivity is lost (the river goes dry in areas) or DO levels drop below 6 mg/L. However, the alternative allows pumping to continue up to these thresholds. In other words, pumping is allowed until the river starts to go dry or DO levels get extremely low. For example, El Sur Ramch pumps at the seasonal maximum rate of 5.34 cfs until the DO levels drop below 6 mg/L. At this point pumping would be limited to the 3 cfs maximum rate. This limited pumping rate would still remove about 0.9 cfs from the river (0.3 cfs removed for each 1 cfs pumped). If conditions were such that the DO levels had already dropped below 6 mg/L, diversion of about 0.9 cfs would continue to exacerbate stagnation and negatively impact instream conditions. A similar argument can be made for continued decreases in depth of the river. If surface connectivity is lost, triggering the reduction in pumping, there has already been a significant change in available fish habitat. However, allowing pumping to continue, even at the reduced rate, could continue to reduce connectivity or limit re-connection. Without detailed modeling of this alternative, it is virtually impossible to predict the frequency of these events or what would occur when the pumping pattern was altered.

The intention of this alternative is to establish a process for monitoring instream conditions during periods of low flow and reducing pumping when conditions reach certain thresholds that are considered stressful to species in the river. The benefit of this process in reducing potential impact on steelhead, however, is somewhat questionable given that the alternative does not actually prevent these stressful conditions from occurring. Upon review of relevant data and studies, there is no substantial evidence to support the conclusion that implementation of measures contained in this alternative would significantly reduce impacts on water quality and fisheries identified in Section 4.3, Biological Resources, of this DEIR. While the implementation of the Alternative Limits on Diversion Alternative may help limit the extreme impacts associated with loss of connectivity, this alternative still allows substantial increases in overall pumping in relation to baseline (1,200 AF vs. 857 AF) and increases in seasonal diversions (735 AF vs. 540 AF between July and October). Implementation of this alternative would require monitoring of instream conditions, but the thresholds established would allow conditions to become stressful for steelhead before changes in pumping were required. Relative to the proposed project, the Alternative Limits on Diversion Alternative would appear to potentially reduce pumping-related contributions to low flow and low-DO conditions. However, absent detailed operational modeling necessary to predict instream effects of this alternative, the existing data and analysis do not support reaching a conclusion regarding the detailed effects on the Big Sur River fisheries under the Alternative Limits on Diversion Alternative relative to the proposed project.

Ability of the Alternate Limits on Diversion Alternative to Meet the Basic Objectives of the Proposed Project

The Alternative Limits on Diversion Alternative was developed by the project Applicant as a refinement to the proposed project that addresses concerns raised by the CDFG in comments submitted on the NOP for the DEIR and water right Application No. 30166 (see Appendix B). As shown in Table 6-1, the overall effect, hydrologically, of implementing the additional restrictions is relatively minor, and there is no evidence that the additional limits on diversion would hinder the ability of the project applicant to achieve any of the basic project objectives.

Environmentally Superior Alternative

A DEIR is required to identify the environmentally superior alternative from among the range of reasonable alternatives that are evaluated. Section 15126(e)(2) of the CEQA Guidelines states that "[i]f the environmentally superior alternative is the 'no project' alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives."

Based on a review of the alternatives evaluated in this chapter and their comparative impacts relative to the proposed project, the No Project/No Permit Alternative (Alternative 1) would be considered to be the Environmentally Superior Alternative. Under the No Project/No Permit Alternative, not only would proposed increases in Big Sur River diversions be eliminated, but historical non-riparian diversions for irrigated pasture operations on El Sur Ranch would cease, as well, in the absence of a valid appropriative water right. The elimination of these diversions would have a positive effect on aquatic species that rely on surface water flow in the river for habitat as well as improved surface and groundwater quality conditions in the project area. The elimination of irrigation on the El Sur Ranch, however, would adversely affect ranching operations on the 267-acre POU by reducing irrigation to only a 25-acre area currently served by a Big Sur River riparian water right, and the No Project/No Permit Alternative may result in increased erosion potential on the POU due to potential long-term reductions in vegetative cover.

From the remaining alternatives addressed in this DEIR, No Change in Existing Practices/Historical Diversions Alternative (Alternative 2), was determined to be environmentally superior. By definition, this alternative would perpetuate the environmental baseline conditions by continuing historical irrigation practices on the project site. Therefore, from a CEQA perspective, the alternative would result in no change in existing conditions and, therefore, no impact.

Compared to the Alternate Irrigation Efficiency Alternative (Alternative 3), the No Change in Existing Practices/Historical Diversions Alternative (Alternative 2) would result in slightly higher long-term diversions of Big Sur River flow (see Table 6-1, above), but would require construction and operation of new irrigation facilities which, as discussed above, could result in environmental impact. For this reason, the No Change in Existing Practices/Historical

Diversions Alternative (Alternative 2) is considered superior to the Alternate Irrigation Efficiency Alternative (Alternative 3).

The Alternative Limits on Diversions Alternative (Alternative 4) was designed to implement additional limitation of El Sur Ranch diversions, limits that are not currently in place, in order to benefit specific fishery and water quality requirements under specific flow conditions. As discussed above, while the implementation of the Alternative Limits on Diversions Alternative may help limit the extreme impacts associated with loss of connectivity, this alternative still allows substantial increases in overall pumping in relation to baseline (1,200 AF vs 857 AF) and increases in seasonal diversions (735 AF vs. 540 AF between July and October). Also as noted above, the Alternative Limits on Diversion Alternative would require monitoring river conditions and taking action in response to the results of monitoring to protect fisheries. The effectiveness of these elements of the alternative to improve protection lacks support. In that the Alternative Limits on Diversions Alternative would still permit additional diversions over and above baseline conditions, the No Change in Existing Practices/Historical Diversions Alternative (Alternative 2) is considered to be environmentally superior.

7.0 REPORT PREPARATION

CHAPTER 7 REPORT PREPARATION

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