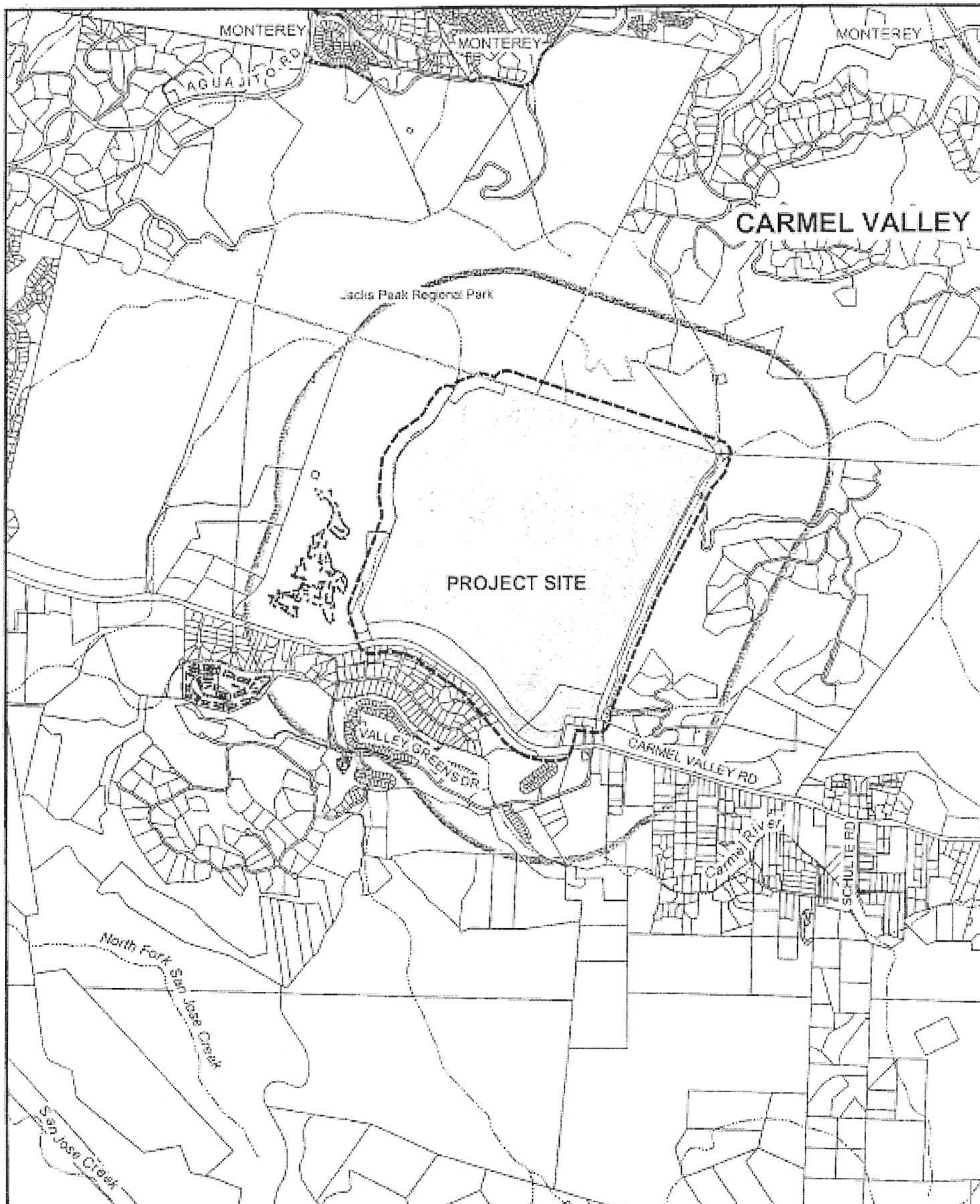
September Ranch

Board Agenda 09-27-18

Supplemental Materials



APPLICANT: SEPTEMBER RANCH PARTNERS

APN: 015-171-010-000M FILE # PLN050001 & GPZ050001

300' Limit 2500' Limit City Limits

0 2,000
Feet

PLANNER: KNASTER

Clear Peak Development

Request

to Provide Water Service

for September Ranch

Sept 12, 2018

CLEAR PEAK
DEVELOPMENT

September 12, 2018

Barbara Buikema
General Manager
Carmel Area Wastewater District
3945 Rio Road
Carmel, CA 93922

SENT VIA E-MAIL to buikema@cawd.org

Dear Barbara,

Thank you for meeting with us and considering our request to provide water services for September Ranch in addition to the wastewater services to be provided. Per our discussion and your request, we have provided the following background information as well as a conceptual proposal for service. We are hopeful that this provides the needed information for you to review with your board at the next available meeting.
We look forward to working with you and the Board to allow for both wastewater and potential water service to the September Ranch property.

Background

Clear Peak Development ("Clear Peak") on behalf of Carmel Reserve LLC, purchased the September Ranch property from Jim Morgens in February 2018. September Ranch has a vested tentative subdivision map approved by the County Board of Supervisors in 2010 for 73 market-rate lots and 22 inclusionary housing units on the 891 -acre property, including approximately 801 acres of dedicated open space and parkland. Clear Peak and its design team are currently fulfilling the required Conditions of Approval ("COA") for the County of Monterey and expect to receive a Final Map for Phase 1 of the project during Q1/2019 (a Phase 2 Final Map for the 2nd half of the property will occur in a subsequent year).

September Ranch is located within the current district boundaries of Carmel Area Wastewater District ("CAWD") and the COA provide that wastewater collection and treatment are to be provided by CAWD. CAWD and Clear Peak's design team are currently working on completing the improvement plans for these necessary improvements. When the system is complete, September Ranch will be providing wastewater to CAWD which will support CAWD's reclaimed wastewater supply and its overall mission.

As to September Ranch's water system, the COA require Clear Peak to bond and install the approved improvements that are being designed by Whitson Engineering and Schaaf & Wheeler. The water system supply (2 onsite wells) and distribution system are completely self-contained within the property. Further, conditions prohibit an interconnection with the neighboring California American Water Company (Cal-Am) system. The water system, its source and long-term sustainable supply were thoroughly reviewed during the environmental review process. The system will be regulated by permits under the Monterey Peninsula Water Management District ("MPWMD"), Monterey County Environmental Health Department ("County Health"), Monterey County Water Resources Agency (MCWRA) and California State Water Resources Control,Board, Division of Drinking Water (SWRCB/DDW). The specifics of the permitted system are outlined in an approved water system distribution permit from MPWMD dated November 19, 2012. This permit as well as other conditions mandate ongoing monitoring which ensures long-term regulatory oversight and compliance from MPWMD as well as Monterey County. Additionally, findings from both the MPWMD and Monterey County document the source supply and long-term viability of the water source.

Under current plans and requirements, upon construction of the completed system under the above oversight, ownership and operation of the water system would then be transferred to either a mutual water company, a regulated water utility company, or a governmental special district. Our preference is to be served by an *existing* special district rather than to form a new special district to provide water services specifically for the September Ranch service area (rather than to have September Ranch form a new CSD or CSA).

In discussions with the Local Agency Formation Commission ("LAFCO"), their suggestion and preferred alternative was to request service from CAWD as a preferred approach to a CSD or CSA or special district because CAWD is a well-established, well-run public entity; is already committed to providing other services to September Ranch; CAWD may exercise its powers to provide water service; and creation of new district would be redundant unless CAWD or other nearby district could not provide service.

[Note: Both we and State Department of Real Estate prefer service by a special district such as CAWD to assure proper oversight and management. Service by a regulated water utility company is limited by the restriction on connection to Cal-Am. Thus, operation by CAWD is the preferred alternative for safe operation of the system for its residents and neighboring communities.]

<u>Request for Consideration by the Board and Suggested Steps/Actions for Service Augmentation</u>

<u>In light of the above,</u> Clear Peak respectfully requests the Board of Directors of CAWD to review the information contained in this letter, and consider the following actions to further a Service Augmentation Request to the September Ranch property for water:

A) Board direction to staff to work with Clear Peak to provide water service for the property;
B) Staff to coordinate with LAFCO in order to activate CAWD's latent powers and to provide water service to September Ranch in addition to the wastewater services it will already be providing to September Ranch,
C) Staff to work with Clear Peak to develop an initial term sheet identifying CAWD and September Ranch conceptual service items as noted below.

D) Develop agreements and contract with Clear Peak to accept the system per specific and agreed upon conditions including fees, cost reimbursements, operating subsidy agreements from Clear Peak and other features as suggested below.
E) Issue a can and will serve letter for use by other agencies, such as the County for final map purposes and the Department of Real Estate for consumer protection purposes, and to
F) Provide water system operation services to the September Ranch service area subject to the conditions and provisions as outlined above and further defined below.

Rationale and Potential Benefits for CAWD Providing Water System Operation Services

Per your request, the following potential benefits and rationale to justify the above request are hereby provided for consideration by your Board:

- CAWD's mission is to provide water-related services for the community. September Ranch is already within CAWD's service boundary and will be receiving wastewater services from CAWD.
- CAWD has approved latent powers to provide water service which we understand can be activated for this request.
- CAWD has trained staff and management capable of operating this system. This will also provide an opportunity for further development of staff expertise as to water services.
- Since CAWD is operating the wastewater collection system, there will be synergy and cost savings due to combined onsite inspections, maintenance, billing, and management. Specifically, such savings would benefit existing CAWD wastewater ratepayers system-wide (by appropriate allocation and spreading of CAWD overhead expenses) and benefit the new CAWD wastewater ratepayers in the September Ranch service area (by the combined cost savings potential of operating both the water and wastewater system).
- Per LAFCO, use of an existing special district is a more efficient use of public resources than forming and monitoring a new CSD or CSA.
- CAWD will have the wastewater source supply from September Ranch to augment its reclaimed water supply. By managing the water system also, CAWD will be supporting the overall water/wastewater production and operations mission. This would also likely lead to better coordination as to systems planning, wastewater flow forecasting, and better coordination of maintenance activities (periodic flushing of hydrants/water lines / wastewater collection mains).
- CAWD as a governmental entity (rather than a mutual water company owned by an HOA) is more likely to appropriately operate and maintain such a water system. CAWD is also likely more suited to work with MPWMD, County Health, and State Health to report on, regulate, and safeguard the water resources of September Ranch and of its neighboring Carmel Valley properties.

- September Ranch is providing 22 Inclusionary Housing units as part of the public benefits resulting from the subdivision. CAWD would be providing service to these residents and supporting that benefit to the greater community.

Specifics of Proposal and Risk Mitigations

If CAWD determines that conceptually it could accept and operate the September Ranch water system, the next step would be to develop the specifics and terms of the service augmentation. As part of this effort, it will be important to assure CAWD and its current rate payers that providing this augmented service would not impact existing wastewater rates, would not negatively impact the current level of service or create inappropriate risk for the district. Corresponding risk mitigation measures may include:

- Clear Peak (as the project developer) to be 100% responsible for designing, bonding, building, and start-up of the system. Clear Peak is using Whitson Engineers and Schaaf & Wheeler for their professional engineering and water system design team. CAWD would review draft drawings to approve the system will be acceptable to CAWD, however, regulatory oversight on water system design is also built into the County of Monterey approval process.
- Upon successful startup and signoff by the design team, the improvements would be inspected for compliance by CAWD as part of the turnover process.
- Clear Peak to agree to funding all start-up costs incurred by CAWD and to fund any operating shortfalls during an initial start-up period. This may include funding guarantee until sufficient homes are connected to cover the operating cost and +/- 2 years after the last phase of construction of infrastructure improvements. Clear Peak to provide appropriate indemnification to CAWD during this period to mitigate any risk exposure.
- Clear Peak to pay an "annexation" fee as appropriate for direct/indirect costs of CAWD undertaking this service augmentation.
- CAWD to establish a distinct service area for water service at September Ranch. Consumers in that service area are to pay 100% of costs of service / appropriate overhead so that rates of other CAWD customers are not negatively impacted. CAWD to set appropriate rates (per unit consumed rates and/or annual fixed charges and would include any fire hydrant maintenance charges) to pay for operating costs, operating reserves, and capital reserves.
- MPWMD, County Health, and DDW have regulatory responsibilities and powers that will support CAWD's task of providing water service to this service area. If this service request is conceptually approved, Clear Peak and CAWD would meet with MPWMD to confirm compliance with the MPWMD permit and establish reporting procedures.

CLEAR PEAK
DEVELOPMENT

Conclusion

We appreciate CAWD's consideration of this request and believe it is in the interests of not only the future property residents, but also the ratepayers of the District and the general public to move forward with this proposal. We hope you will be able to consider this at your upcoming September Board Meeting. We plan to attend along with our project counsel Tony Lombardo and/or our water system design and engineering consultant Andrew Sterbenz (Schaaf & Wheeler) or Richard Weber (Whitson Engineers), so that we may answer any questions your board members may have. If you or your staff have any questions on the system design improvements or requirements, our engineering team is available at any time as well.

Thank you,

Allan Melkesian
Director, Clear Peak Development LLC
on behalf of Carmel Reserve LLC

Potential Scope of Study for September Ranch Water System Analysis

Potential Scope of Study for September Ranch Water System Analysis

- Regulatory agency costs (Division of Water Rights, LAFCO, Public Utilities Commission, etc.)
- System engineering and design costs for construction and permitting, including pump tests, two water supply well sources, a 50-foot source protection zone around said wells, and monitoring costs.
- Construction costs, backup electricity for pumps to maintain 40 psi minimum pressure, proper construction of distribution system, installation of meters, adequate storage capacity, and fire capacity.
- Monthly electricity costs for pumps, other utilities, interest on any debt service
- Cost of as-built maps
- Annual water-treatment quality chemical costs, and equipment for distribution monitoring of any added chemical treatment (dependent on the type of needed treatment
- Ongoing raw water chemical monitoring sampling and analysis costs
- Ongoing bacteriological monitoring sampling and analysis costs for untreated water
- Ongoing bacteriological monitoring sampling and analysis costs for treated water
- Maintenance of bacteriological plans and emergency notification plans for notification of water quality emergencies
- Required lead and copper monitoring sampling and analysis costs and maintenance of lead and copper plan
- Required disinfection byproducts monitoring costs and maintenance of associated plan
- Customer water quality complaint program
- Flushing, valve and meter maintenance, and maintaining maps
- Cross connection program and annual backflow device testing and maintenance
- Salary for licensed operator staff costs, including time for reports and inspections required by Division of Drinking Water staff

- The cost to maintain written procedures for system maintenance, for example main line breaks procedures, etc.

- Source capacity planning studies and permit amendments for any additional growth

- Annual Consumer Confidence Report preparation and distribution costs

- Annual electronic Report to State Water Resource Control Board-Division of Drinking Water

- Records of the estimated life of all pumps, treatment, storage, and distribution system and an annual capital improvement plan to fund replacement

- Metering and billing staff costs

- Emergency reserve costs for drought, regulatory changes, public notice of bacteriological or chemical failures, etc.

- Maintaining of business licenses and paying annual permit fees and any State enforcement fees for actions resulting from water system non-compliance

- Appropriate workspace to house staff, records, and appropriate containment of chemicals

- Insurance and liability for staff, for duties including climbing tanks, handling hazardous chemicals, if appropriate.

- Knowledgeable management staff costs to coordinate the above and maintain financial controls and office supplies

- Continuous operator supervision of the water treatment plant when operating

- Chemical monitoring equipment, at minimum turbidity and chlorine

- Operations Plan

- Alarms

- Monthly monitoring reports to the Division of Drinking Water

- Additional raw water sampling requirements

- Watershed Sanitary Survey, every five years

- Engineering Report after one year of operation for system optimization for alternative technologies

- Analysis of the system's total projects water supplies available during normal, single dry, or multiple dry water years to meet current demand and anticipated growth over the next 20 years.

- Water rates necessary to support calculated system O&M costs – assuming 10%, 25%, 50%, 75% and 100% build out over 20 years

- Because there will be 20 inclusionary units, provide calculations of water rates as a percentage of projected household income.

What is a Public Water System

And

What are the Requirements to Create & Maintain a Public Water System

What is a Public Water System?

A public water system is defined as a system that provides water for human consumption[1] to 15 or more connections or regularly serves 25 or more people daily for at least 60 days out of the year.

CALIFORNIA Water Boards

What types of Public Water Systems are there?

Many people think of public water systems as large city or regional water suppliers, but they also include small housing communities, businesses and even schools and restaurants that provide water. A public water system is not necessarily a public entity, and most public water systems are privately owned. There are three legal distinctions between the types of public water systems: community, non-transient non-community, and transient. The type of water system is based on how often people consume the water. Drinking water regulations impose the most stringent monitoring requirements on community and non-transient non-community water systems because the people they serve obtain all or much of their water from that system each day.

Community Water Sytems are city, county, regulated utilities, regional water systems and even small water companies and districts where people live.

Non-community non-transient water systems are places like schools and businesses that provide their own water. The same people have a regular opportunity to consume the water, but they do not reside there.

Transient water systems include entities like rural gas stations, restaurants and State and National parks that provide their own potable water source. Most people that consume the water neither reside nor regularly spend time there.

What does it take to be a public water system?

Being a public water system means providing affordable, safe drinking water to your customers 24 hours a day, 7 days a week, 365 day a year. This includes the associated legal, fiscal, and operational responsibilities, and future planning. Public water systems typically are run more efficiently when costs can be spreadout over a large group of people to obtain good economies of scale. Small public water systems without a very high level of managerial, technical and financial capacity tend to be unsustainable.

Public water systems are required to have domestic water supply permits. The first step of the process to obtain a permit for a new public water system is to complete a preliminary technical report. The report involves contacting other existing public water systems to see if the service area of the proposed system could, instead, be served by an existing system. It also evaluates the long-term costs of creating a new public water system. **The preliminary technical report must be submitted at least 6-months prior to any water related construction.** A copy of the preliminary technical report template and the subsequent permit application materials can be obtained by contacting the State Water Resources Control Board, Division of Drinking Water's District Office. A map with District Offices can be found at the following website:

http://www.waterboards.ca.gov/drinking_water/programs/documents/ddwem/DDWdistrictofficesmap.pdf

[1] Human consumption means the use of water for drinking, bathing or showering, hand washing, oral hygiene, or cooking, including but not limited to, preparing food and washing dishes per Section §116275(e) of the Health and Safety Code.

What are the requirements to create and maintain a public water system?

A new water system applicant should consider all requirements for a public water system that are listed below and on the following page. **Typically, a public water system will incur costs associated with most or all of the required elements.** Other requirements may also be applicable, depending on whether the system is a public or private entity, such as requirements imposed by other programs with the State Water Board, such as Division of Water Rights, and other regulatory agencies, such as Local Area Formation Commissions, Public Utilities Commission, city and county governments. The section from the California Code of Regulations (CCR) Title 22, discussing the specific requirements or the section of the California Health and Safety Code (CHSC) is identified in parentheses. If the requirement comes from another regulatory section, the location is noted. Note that this is a partial list of regulatory requirements.

- $ Permitting engineering and technical reports (§64552), including pump tests (§64554), at least two water supply well sources for communities (§64554c and §64561), a 50-foot radius source protection zone around all new wells (§64560), a minimum of a 50-foot annular seal on new wells (§64560), a well flow meter (§64561) and initial monitoring
- $ Construction, including elevated storage or backup electricity for pumps to maintain 40 pounds per square inch (psi) minimum pressure at all times (§64602), proper construction of distribution systems (§64570-64580), adequate storage capacity (§64554 and 64585) and fire capacity (contact local fire official)
- $ As-built maps (§64604)
- $ Annual water-treatment chemicals (§64590) and equipment for distribution monitoring of any added chemical treatment (dependent on the type of needed treatment)
- $ Ongoing raw water chemical monitoring sampling and analysis (§64431-64445.2)
- $ Ongoing raw water bacteriological monitoring sampling and analysis (§64430)
- $ Ongoing treated water bacteriological monitoring sampling and analysis (§64421-64430)
- $ Maintenance of bacteriological plans (§64422) and emergency notification plans for water quality emergencies (§64463-64466)
- $ Ongoing lead and copper monitoring including sampling and analysis and maintenance of a lead and copper plan (§64670-64690.80)
- $ Ongoing disinfection byproducts monitoring and maintenance of an associated plan (§64530-64537.6);
- $ Maintaining a customer water quality complaint program (§64470)
- $ Main flushing (§64575), valve and meter maintenance (§64600), and maintaining system maps (§64604)
- $ Cross connection program and annual backflow device testing (from Title 17, §7583-7605)
- $ Licensed water treatment operator and distribution staff (§64413.1-64413.7)
- $ Written procedures for system maintenance, for example pipeline break procedures, etc. (§64580, 64582, & 64583)
- $ Source capacity planning studies and permit amendments for any additional growth (§64558 and §64556)
- $ Annual Consumer Confidence Report preparation and distribution (§64480-64483)
- $ Annual Electronic Report submittal to State Water Resource Control Board-Division of Drinking Water (CHSC §116530)
- $ Records of the estimated life of all pumps, treatment, storage, and distribution system and an annual capital improvement plan to fund infrastructure replacement (CHSC §116540)

- $ Metering and billing staff (CHSC §116540)
- $ Emergency reserves for drought, regulatory changes, public notice of bacteriological or chemical failures, etc. (CHSC §116540)
- $ Maintaining of business licenses, annual drinking water permit fees (CHSC §116565) and payment of any State enforcement fees for actions resulting from water system non-compliance (CHSC §116577)
- $ Appropriate working area for staff, chemicals, and records (§64470, §64423.1)
- $ Insurance and liability for staff, with duties including climbing tanks, handling hazardous chemicals, etc.
- $ Management staff that is knowledgeable about drinking water. Staff coordinate the above and maintain financial controls (per Corporation Code and Government Code requirements and CHSC §116540)
- $ If the source is surface water, there may be additional requirements:
  - A water treatment plant meeting all Surface Water Treatment Rule requirements (§64650-64666),
  - Continuous operator supervision of the water treatment plant when in service (§64660)
  - Chemical monitoring equipment, at minimum turbidity and chlorine (§64655-64656.5, §64659)
  - Operations Plan (§64661) and Alarms (§64659)
  - Monthly monitoring reports to the Division of Drinking Water (§64662-64664.2)
  - Additional raw water sampling requirements (§64654.8)
  - Watershed Sanitary Survey, every five years (§64665)

Is there any flexibility on these requirements?

All public water systems are subject to the same health based standards and laws whether they are a big city, a small community, or a rural restaurant. However, there are some minor adustments that are made to monitoring frequencies based on population and water system type. Each public water system is expected to continuously supply high quality water meeting all the applicable requirements.

How do I find an existing public water system to serve my project area?

California Environmental Health Tracking Program: http://cehtp.org/page/water/water_system_map_viewer
This website provides a map of the boundaries of public water systems. It is currently under development and does not include all public water systems, but is searchable by address or county.

Drinking Water Watch: https://sdwis.waterboards.ca.gov/PDWW/
All active and inactive public water systems in California are provided on this website as well as a contact phone number or address for the public water system. The listing can be filtered by county, but no map is provided.

Contact the Division of Drinking Water District Office Serving Your Area and Ask: If you are unable to find a public water system nearby, contact the District Engineer for additional support. A webpage link of Division District offices and contacts is provided on the first page of this document.

Anecdotal Conversation

with

Mr. Brian Garneau

of

Carmel Lahaina Utility Services

Recap of Conversation with Mr. Brian Garneau of Carmel Lahaina Utility Services, Inc., August 13, 2018

- Make sure the District is involved in the Design-Build process
- The treatment infrastructure required for 1 home is the same for 100 homes
- Carmel Lahaina is private and operates under the PUC. The rate structure is based on full buildout which may take many years to occur. That means it could be operating at a loss of many years. Example: Monterra (1997) is 52% sold and Tehama (2006) is 30% sold. He did not have the data on Lucia Preserve but suspects it also has unsold units
- Mr. Garneau feels that there have been potential buyers that have walked away from a sale at Monterra when they find out the cost of water
- Under PUC rules they are limited on what they may charge Inclusionary Housing units. This means the rest of the system needs to subsidize inclusionary usage.
- Don't build something we cannot operator or something that is highly dependent on CAWD. This size system should not require a full-time employee. If there is sufficient automation on part time person who may need assistance changing RO units and granulated carbon should be adequate
- Lab analysis on the well indicates the presence of iron & manganese – these will need to be removed
- Additionally, the Total Dissolved Solids and Conductivity are too high. RO system to control will create brine that needs to be disposed. Current Tehama is paying $50K/yr. to dispose of its brine
- Pretreatment may be necessary for Iron & Manganese removal (Montera). Mr. Garneau believes that testing has shown traces of cadmium in the water that will also need to be removed
- Remember to consider chemical handling and storage requirements at site
- The well at September Ranch have always put out "lots of water". However, there is only one well and we will need a second well for redundancy
- If the subdivision exceeds its water allocation as given in the EIR the operator is responsible for initiating water rationing

CARMEL LAHAINA
Utility Services, Inc.
P.O. Box 6, Carmel Valley, Ca. 93924 (831) 659-3595, Fax 656-9480
carmellahaina@aol.com

March 31, 2006

September Ranch Partners
PO Box 222255
Carmel, CA 93922

Dear Jim,

Carmel Lahaina Utility Service, Inc. is a utility management corporation with specific focus to the water and wastewater industry. We oversee and inspect utility installation projects, tank erections, pumping plants, package treatment plants and pond construction. We have assisted clients in water treatment plant startup, reverse osmosis plant startup, wastewater plant startup, water reclamation plant startup, and operation of the same. Our staff currently holds Grades 1, 2 and 5 State licenses in Wastewater, Grades 1, 2 and 3 in Water, Grades 2 and 3 in Distribution, and General Engineering Contracting.

I am writing you this letter to inform you that Carmel Lahaina Utility Services, Inc. is ready, willing and able to contract operate any treatment facility located at September Ranch here in Carmel, CA. I would like to thank you in advance for giving us the opportunity to serve September Ranch Partners. Please do not hesitate to call if you have any questions.

Sincerely,

Brian Garneau
Office Manager

Draft

Revised Environmental Impact Report

for the

September Ranch Subdivision Project

Dec 2004

Draft
Revised Environmental Impact Report for the September Ranch Subdivision Project

State Clearinghouse Number 1995083033
PC 95062

December 2004

Prepared for:

County of Monterey
Planning and Building Inspection Department
2620 1st Avenue
Marina, CA 93933
Contact: Alana Knaster, Chief Assistant Director

Prepared by:

Michael Brandman Associates
2000 Crow Canyon Place, Suite 415
San Ramon, CA 94583
Contact: Jason M. Brandman, Project Manager

4.3 Water Supply and Availability

This section of the EIR considers the availability of a water supply for the September Ranch Project along with the impact of using that water supply on other water rights holders and on the environment.

To better understand the hydrologic issues, Kennedy/Jenks Consultants (KJC) prepared a hydrogeologic report for the proposed project in December 2004. The purpose of the hydrological report was to assess the existence of a long-term water supply for the project, to prepare a water balance for the project, to determine where September Ranch's water rights fit in the hierarchy of water rights, and to determine the effect of diversions for September Ranch on nearby water supplies. KJC reviewed the Final EIR prepared by Denise Duffy & Associates and related documents and supplemented the findings in these documents as necessary to provide sufficient and substantial evidence in the determination of sustainable yield to supply the project demand.

The following is a synopsis of the conclusions reached by KJC as further explained in this section and included in their entirety in Appendix C of this Draft REIR.

KJC uses an amount of three (3) acre-feet per year as the appropriate baseline for pre-existing project conditions. This amount was determined by the County as the relevant condition prior to and at the time of the 1995 project application. The amount is based on water usage for a single residence (0.5 AFY) and the amount of water applied for 50 horses (45 gallons per horse per day for a total of 2.5 AFY). The selected baseline appears to be reasonable and representative of aggregate average water usage of undeveloped nonresidential land-use in the Camel Valley. However, it is acknowledged within this section, that the current usage at the project site is 99 AFY.

Based upon these conclusions and the project's water demand of 57.21 AFY, as discussed in detail in Section 4.3.4, KJC concludes that the September Ranch Aquifer (SRA), which underlies the project site, contains an adequate and reliable water supply for the proposed project. This conclusion is based upon a historical record of variable rainfall and on a detailed understanding of the groundwater resources in the SRA. Even in the driest years on record, sufficient rainfall and recharge occurred as to ensure sufficient water is stored within the SRA to meet the project. KJC also concludes that the project will have a less than significant effect on the adjacent Carmel Valley Aquifer (CVA) in relation to the significant water resources within the CVA. KJC calculates the demand based upon a collection of water pumping and water rights data from a number of locations and concludes that the exercise of water rights by September Ranch will have no effect on those water rights that are more senior to, or of the same priority as, September Ranch. KJC also examined the connection between the SRA and the CVA and concluded there is very limited hydrologic connectivity and that exchange of groundwater occurs under existing conditions and under proposed project conditions when rainfall within the September Ranch basin available for recharge exceeds the storage capacity of the SRA is "rejected" (because of lack of storage space) and is thus, stored within the CVA.

4.3.1 Overview of California Water Rights

Due to the complexities associated with groundwater hydrology and the bifurcated nature of water rights in California, this section provides an overview of water rights in California and explains how the water rights system provides interplay with the hydrology present in and around the proposed project.

California administers its water rights under a bifurcated system that generally separates water rights associated with surface water (such as the water in streams, rivers, and lakes) from the water rights associated with groundwater (water found in its natural state below the surface of the ground). These two systems of water rights operate almost completely separately and demands on one system are generally not considered in determining whether adequate water supplies are available under the other system. One exception to the separation described above exists when the groundwater is deemed to be underflow of a surface water system. Under this exception, because the groundwater is in close hydrologic connectivity with the surface water, and withdrawals of the underflowing groundwater have a direct impact on the availability of the surface water for diversion, the underflowing groundwater is deemed to be surface water subject to surface water rights.

In 1995 the State Water Resources Control Board (SWRCB), in evaluating the water rights of the California-American Water Company (Cal-Am) in the Carmel Valley, concluded that the groundwater in the Carmel Valley Aquifer (CVA) below and surrounding the Carmel River was not properly classified as groundwater, but rather was classified as underflow of the Carmel River and, thus, subject to the surface water rights system (SWRCB Order No. WR 95-10, [July 6, 1995]). Therefore, any diversions of water from the CVA would need to be made pursuant to a surface water right.

While exceptions exist, the two primary types of surface water rights in California are the riparian right and the appropriative right. The riparian right is a right that exists by nature of a parcel sitting adjacent to a water course. Because of the proximity of the parcel to the water course, the law imputes to the parcel a right to divert water to the parcel. All owners of riparian parcels may divert the water necessary for use on their parcel, so long as the use is reasonable and beneficial. The right, however, is said to be "correlative" with all other riparian rights. This means that in a time of shortage, all riparian parcels must reduce their use of water on a *pro rata* basis. A parcel will generally lose its riparian status if the parcel becomes separated from the water course. Under this limitation, if a parcel is riparian and is subdivided into two parcels (one still being adjacent to the water course and the other now being separated from the water course by the other parcel), then unless explicitly stated otherwise in the documents affecting the subdivision, the parcel no longer adjacent to the water course will generally lose its riparian status.

The second primary type of surface water right in California is the appropriative right. The appropriative right is a right that does not rely on the proximity of the land to the water course. Prior to 1914, an appropriative right was established by the diversion of water for beneficial use on a parcel of land. Such diversion and use needed to be publicly manifested (either through open and notorious use or through the filing or posting of the right). Beginning in 1914, one could only establish an appropriative right by filing an application with the State and being granted a permit (and eventually a license) for the appropriative right. In contrast to the correlative nature of the riparian right, the appropriative right is based on a priority system. That is, in times of shortage, water must be allocated to the most senior holder of an appropriative right before being made available to holders of junior appropriative rights. For appropriative rights, the seniority or priority is determined by the date on which water was first put to beneficial use. Thus, for example, in a year of shortage, water would be available for a right established in 1920 before it would be available for a right established in 1921.

The interplay of riparian and appropriative rights in time of shortage is complex. In simplest form, in order to determine the appropriate allocation of water in times of shortage, a priority date must be applied to each riparian parcel, so that the riparian rights may be fit into the priority system. The date that is used for this is the date that the parcel was first patented from the United States. Thus, due to the fact that most lands in California were patented in the 1800s or early 1900s, riparian rights tend to be fairly senior rights.

Just as surface water rights exist as a bifurcated system (riparian versus appropriative), groundwater rights (commonly called rights to percolating groundwater to distinguish them from rights to underflow – which is also groundwater) also exist as a bifurcated system of rights. The first percolating groundwater right is the overlying right. An overlying right is akin to a riparian right in that it exists by nature of the parcel of land overlying an aquifer of percolating groundwater. The overlying right is a right to withdraw percolating groundwater from the aquifer in an amount that may be used in a reasonable and beneficial manner on the overlying parcel. As with riparian rights, the overlying right is a correlative right, meaning that all overlying parcel owners must cut back on their usage in time of shortage.

The second percolating groundwater right is the appropriative right (not to be confused with a surface water appropriative right). An appropriative right to percolating groundwater exists where one withdraws percolating groundwater for use on a parcel that does not sit over the aquifer from which the water is withdrawn (this right also exists where the water is withdrawn by municipalities in certain circumstances not relevant here). Percolating groundwater is only available for an appropriative right when there is more water in the aquifer than is needed to satisfy the needs of the overlying users. In other words, an appropriative right to percolating groundwater only exists when there is percolating groundwater that is surplus to the needs of the overlying parcels.

The SWRCB does not have jurisdiction over percolating groundwater. Thus, all issues of percolating groundwater must be resolved in a court of law. There is also no system of registration for water rights associated with percolating groundwater.

4.3.2 Conclusions Regarding Water Rights of September Ranch

The administrative record that went before the Monterey County Board of Supervisors for the approval of the project contained the following key conclusions that affected issues of water rights:

- The sub-basin underlying 21 acres of the September Ranch property was not entirely separate from the CVA and there was water exchange between the sub-basin and the CVA.
- Because the groundwater in the CVA is underflow of the Carmel River and the sub-basin is connected to the CVA, a surface water right is required to withdraw water from the sub-basin.
- The September Ranch property holds a riparian right to the waters in the CVA and the sub-basin.

In response to these conclusions, the Court of Appeal questioned whether there was adequate evidence in the administrative record to support a riparian right and then raised eight questions associated with those riparian rights:

> The Supplemental EIR presented new and significant information regarding the applicants' asserted riparian right, which raised important water issue questions. If the validity of such a right were determined, would this entitle the applicant to rights superior to those of appropriative water users? How would these rights be superior?

> How would this affect other riparian water users in the area during times of drought? If the exercise of a riparian right would not require a permit, but would be subject only to a rule of "reasonable use," how is water use regulated and controlled? Can a riparian right underlying one portion of the property be the basis for a private mutual water company providing water to the entire subdivision? Does the exercise of such a right create a precedent for other subdivisions and thus result in growth-inducing impact? Is the exercise of a riparian right, which may justify an expanded use of water, consistent with local policies limiting water for new development? Were further mitigation measures warranted?

In response to these questions, the County undertook two examinations. First, as described above, KJC was retained to analyze the hydrologic issues associated with the water diversions, including developing a more complete understanding of the inter-relationship between the sub-basin and the CVA. Second, the law firm of Downey Brand LLP (Sacramento, California) was retained to determine whether the September Ranch property was riparian to the underflow of the CVA, and the relative priority of the water rights held by the September Ranch property.

As previously discussed, the conclusion reached by KJC is that there is relatively little exchange of water between the SRA and the CVA. Based on the groundwater gradient, the exchange that may occur is dominantly in the direction from the SRA to the CVA. With this information in mind, pumping in the SRA is unlikely to affect the CVA. This is important because of the numerous water rights held by other pumpers to the waters of the CVA. This section of the EIR provides the reasoning associated with that conclusion.

However, due to a competing (though less persuasive) body of evidence that the SRA and the CVA are sufficiently hydrologically connected for them to be considered a common basin (for example, a letter from the SWRCB stating that "the alluvium underlying the September Ranch is part of the Carmel River subterranean Stream") this EIR also includes analysis of whether diversions by September Ranch from the CVA will affect others holding senior water rights to the CVA. This analysis makes relevant the conclusion reached by Downey Brand LLP that the September Ranch property is riparian to the CVA.

In the fall of 2002, the County retained Downey Brand LLP to perform an independent review of the water rights of September Ranch and to determine what water rights (if any) were associated with that parcel of land. Downey Brand LLP's review was based on a chain of title of deeds and other conveyance documents for the September Ranch parcel (gathered by an independent researcher) that went back to the original patenting of the parcel. After reviewing the complete chain of title in January of 2003 Downey Brand LLP concluded that the September Ranch parcel is riparian to the Carmel River.

However, due to an agreement that is part of the chain of title (between the predecessors-in-interest of September Ranch Partners and Cal-Am) the riparian right held by September Ranch has been subordinated to the pre-1914 rights held by Cal-Am. In order to effectuate this subordination, Downey Brand LLP assigned a priority date to September Ranch which was more junior than the priority date of Cal-Am's pre-1914 rights. For purposes of analyzing the relative priority of the water rights, Downey Brand LLP assumed that September Ranch's riparian right was also subordinated to other riparian parcels. While this assumption may not be supported by an actual review of the chain of title for other riparian properties, it was appropriate because it made Downey Brand LLP's conclusions more conservative. In other words, the use of the assumption decreased the margin of error associated with determining whether September Ranch's exercise of its riparian right would harm any other senior water rights holder.

Thus, based upon the findings of Downey Brand, KJC's analysis focused on collecting and evaluating the appropriate information to:

- Identify the water rights held by the September Ranch Partners for the property;
- Identify the quantities associated with relevant superior water rights to those of September Ranch; and
- Determine whether pumping in the SRA might negatively affect the superior water rights.

Analysis of Information at Relevant Water Rights

The Water Rights Information Management System (WRIMS) database managed by the State Water Resource Control Board was used to collected data for the water rights analysis. Use of the database required substantial preprocessing of data and holder of rights locations. The method used was as follows:

- The rich text format (RTF) file provided was manually entered into a spreadsheet database because there was no expedient means of converting the file and SWRCB could not provide an electronic file that could be easily converted into a spreadsheet or database format. Duplicate records were eliminated.
- The data that were classified as of type "STATE" were assembled, since they represent those records that could include riparian water rights and pre-1914 rights. All of the other data types were for post-1914 appropriative rights that are therefore subordinate to September Ranch.
- A map that shows the Carmel River Watershed with the township, range, and section delineations consistent with the U.S. Geological Survey topographic mapping was prepared (see Exhibit 4.3-1). It was determined that those water rights found in Aquifer subunits 1 and 2 (AQ 1 and AQ 2) were not considered further for the analysis because the water balance analysis accounts for water rights by only examining that flow of water that exists after diversions in AQ 1 and AQ 2, since the project site is downstream from these subunits. The water balance will be the basis for determining the potential effects of pumping in the SRA on the CVA as discussed in further detail under 4.3.4, Project Impacts.
- The records in the WRIMS database that remained after removing all record types except for those identified as STATE and removing all record types associated with the point of diversion locations upstream of the project site in AQ 1 and AQ 2, are those potential riparian and appropriative water rights in Aquifer subunits 3 and 4 (AQ 3 and AQ 4), which are relevant for consideration to evaluate the potential effects of pumping in the SRA.

Water Rights Decision 1632 Tables 5, 12, and 13 and WRD 95-10

Since the remaining data in the WRIMS database does not distinguish between riparian and appropriative water rights, Tables 5, 12, and 13 from Water Rights Decision 1632, were reviewed because they contain some limited information on those entities that filed water rights claims and the basis (riparian, pre and post 1914 appropriative, and groundwater) for the claim. Water Rights

Decision 1632 - Table 15 is entitled Prior Right Protests, Table 12 is entitled Protests Based Upon Riparian Claims and Table 13 is entitled Carmel River Watershed – SWRCB Determination of Priority and Quantities Obtained from Stipulations, Applications, or Protests (AFA).

Based on the information contained in those tables, the remaining data in the WRIMS database were reviewed to remove those entries that were based on an application number (i.e., post-1914 appropriative). Any record from Table 12 that was based on a tributary to the Carmel River was also removed since it is assumed that most of the tributaries are in AQ 1 and AQ 2. Table 12 does not provide any information on the location of the water diversion. Cal-Am's pre-1914 appropriative rights are set at 1,137 AFA; however, it should be noted that according to Water Rights Decisions 95-10 allows Cal-Am to divert a maximum of 14,106 AFA from the Carmel River "until unlawful diversions from the Carmel River are ended." The analysis in this section relies upon the results of Carmel Valley Simulation model (CVSIM) provided by MPWMD, which accounts for all Cal-Am diversions from the Carmel River, not just those exercising the pre-1914 appropriative rights.

MPWMD Pumping Reports

MPWMD pumping reports for 2002 were reviewed and as previously discussed, pumping in AQ1 and AQ2 were not considered. Those records that remained for AQ3 and AQ4 were compared to the information in the WRIMS database that remained after applying filters. For those entities that remained, the actual 2002 production values were compared with claims made as part of Statements of Diversion submitted to the SWRCB and entered into the WRIMS database. In most cases, the estimated diversions made in the Statements of Diversions were much higher than those reported as actual usage to MPWMD.

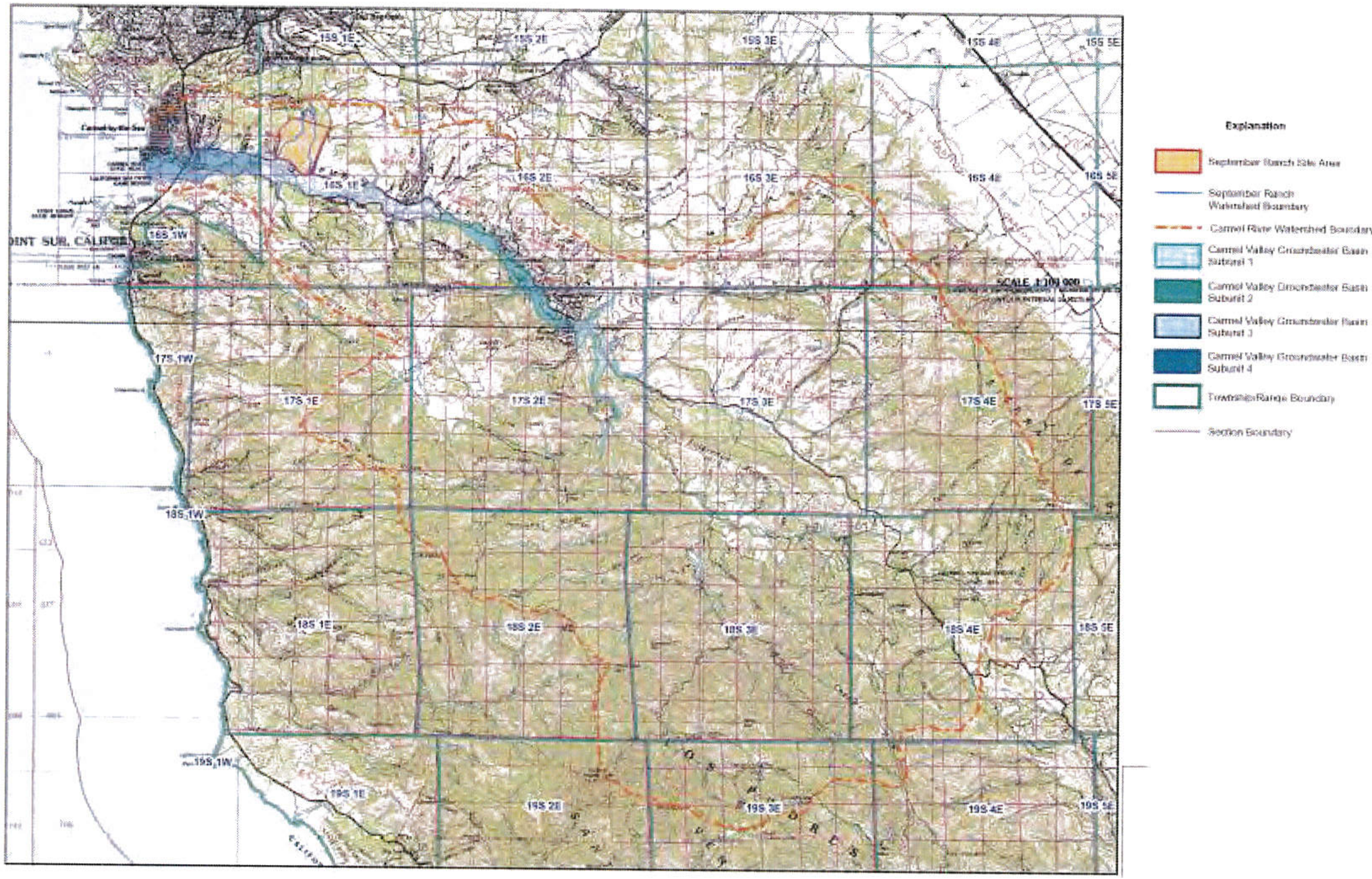
Then, those entities in AQ3 and AQ4 that reported pumping to MPWMD but did not report the pumping to the SWRCB were assumed to be riparian users. The actual pumping in 2002 for each of these riparian users was summed to provide a point of reference for the quantities. The information is summarized in Table 4.3-1 below.

Table 4.3-1: MPWMD 2002 Pumping Data in AQ3 and AQ4

Aquifer Subunit	Total Pumped and Reported to MPWMD (AFA)(excludes Cal-Am)	Total Reported as STATE to SWRCB (AFA)	Total Not Reported to SWRCB (AFA)
3	1,161	513	648
4	786	570	216
Source: Kennedy/Jenks Consultants, December 2004.			

Relevant Water Rights

Table 8 of Appendix C of this REIR, summarizes those water rights that remained after applying the appropriate filters to remove irrelevant records. Under the theory of the data analysis model used for this report, those records that remain represent riparian rights holders and pre-1914 appropriative Cal-Am rights of 1,136 AFA.



Source: Kennedy/Jenks Consultants, November 2004.

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Exhibit 4.3-1
Carmel River Watershed

The data from the different sources were reviewed and an estimate made up of the maximum annual use that these water rights holders may represent. Where available, the information from Table 13 of WRD 1632 was used, otherwise, the Maximum Annual Use in the WRIMS database was used. In the case where neither of these information sources was available, the maximum direct diversion rate was applied for 365 days per year to estimate a total maximum use.

The 2002 estimated pumping in AQ3 and AQ4 from MPWMD were each increased by 20 percent to represent the inherent variability in pumping as well as under-pumping and unreported pumping by riparian users. It is estimated that 20 percent is appropriate because of the limited potential for additional large development, and hence additional large water demands, in the area of influence of the Carmel River. In addition, in most cases, actual pumping is much lower than the water rights claims that have been documented with the SWRCB.

Some of the WRIMS records that remain are for APPLC, which appears to indicate that even though the entity has a riparian right they have chosen to file for an appropriative right as well, or based on other information, that the entity is a riparian rights holder.

Based on this evaluation, there appears to be a maximum annual use of up to 4,550 AFA for riparian rights and pre-1914 appropriative rights holders in AQ3 and AQ4. Although there is not sufficient information to better allocate these water rights holders to AQ3 and AQ4, an estimate based on pumping reported to MPWMD is that 60 percent of the pumping may occur in AQ3 and 40 percent in AQ4. At these ratios, AQ3 may represent about 2,705 AFA and AQ4 may represent about 1,845 AFA of water use by riparian and pre-1914 appropriators.

This maximum annual use number is conservative in that it assumes that the maximum use cited by an entity is pumped. Based on the MPWMD pumping data, actual water use appears to be significantly lower than that which an entity cites.

This evaluation does not include the following:

- Estimates of future demands for riparian water based on changes/maturing of land uses because such estimates would be extremely speculative.
- Conclusive identification of all pre-1914 appropriative rights holders. It appears likely that all of the significant pre-1914 water rights have been identified through the methodology used by KJC. In addition, the conservative factors built into the methodology should cover other unidentified pre-1914 right holds.
- Confirmation of points of diversion in WRIMS database for accuracy and cross-referencing with assessors parcel numbers or other information that could improve the accuracy of locating water rights users. Once again, however, the conservative factors built into the methodology should cover any errors in this area.

Conclusions of Water Rights Evaluation

As may be expected, there is considerable water use in AQ3 and AQ4 that may fall into the category of riparian or pre-1914 water rights holders. In order to evaluate whether pumping in the SRA could affect these potentially senior water rights that have been identified in the CVA, several things should be considered.

- There is extremely limited hydraulic connectivity between the SRA and the CVA AQ3; and in most cases, it is likely to be flow from the SRA to the CVA AQ3. It is extremely unlikely for the hydraulic gradient to allow flow from the CVA AQ3 to the SRA. Therefore, it is expected that there is almost no effect of pumping in the SRA to the CVA AQ3.
- To evaluate whether the exercising of September Ranch's riparian rights would impact those water rights identified in this report that are (or potentially are) senior within the CVA, one must determine whether there is more water available than is needed, and if so, how much water is available. Analyses of CVSIM water balance simulation model results provided by MPWMD for AQ3 and AQ4 were prepared with results as follows:
  - CVA AQ3 - Based on the 45 year CVSIM simulation results provided, the water balance in AQ3 is such that the average difference between the inflow and the outflow is about 7,500 AFY. During the 1984 - 1991 dry period, the average difference between the inflow and the outflow in AQ3 is about 6,800 AFA. When compared to the approximately 2,705 AFA that is needed to meet the estimated maximum annual use in AQ3 described above, it appears that sufficient groundwater is available in storage in AQ3 on average as well as during a dry period to meet the needs of the riparian and pre-1914 appropriative rights holders. Therefore, there appears to be sufficient water in AQ3 with excess flow to meet the needs of the riparian and pre-1914 appropriate rights holders.
  - CVA AQ4 - The analogous analysis of the 45-year CVSIM simulation results provided for AQ4 indicates that the average difference between the inflow and the outflow is about 2,500 AFY. During the 1984 - 1991 dry period, the average difference between the inflow and the outflow in AQ4 is about 2,300 AFA. When compared to the approximately 1,845 AFA that is needed to meet the estimated maximum annual use in AQ4, it appears that sufficient groundwater is available in storage in AQ4 on average as well as during a dry period to meet the needs of the riparian and pre-1914 appropriative rights holders. Therefore, there appears to be sufficient water in AQ4 with excess flow to meet the needs of the riparian and pre-1914 appropriate rights holders
  - Aggregate CVA AQ3 and AQ4 - Since the distribution of riparian and pre-1914 appropriators in AQ3 and AQ4 were estimated and have not been confirmed, it is appropriate to evaluate the water availability in aggregate for AQ3 and AQ4 against the aggregate water rights for AQ3 and AQ4 based on a water balance as summarized below:

    Inflow – Outflow AQ3 for 45 years = 7,500 AFA
    Inflow – Outflow AQ4 for 45 years = 2,500 AFA
    Total Inflow – Outflow for AQ3 and AQ4 for 45 years = 10,000 AFA

    Total Riparian and Pre-1914 Riparian Water Rights for AQ3 and AQ4 = 4,550 AFA which is less than 10,000 AFA available

    Inflow – Outflow AQ3 for 1984 – 1991 dry period = 6,800 AFA
    Inflow – Outflow AQ4 for 1984 – 1991 dry period = 2,300 AFA
    Total Inflow – Outflow for AQ3 and AQ4 for 1984 to 1991 dry period = 9,100 AFA

    Total Riparian and Pre-1914 Riparian Water Rights for AQ3 and AQ4 = 4,550 AFA which is less than 9,100 AFA available

Under existing conditions, there appears to be sufficient water on aggregate in AQ3 and AQ4 to meet the needs of the riparian and pre-1914 appropriate rights holders. Moreover, potential spillage from the SRA is not needed to meet the maximum use in AQ3 and is likely to be part of excess outflow from AQ3 to AQ4. KJC concludes then any reduction in rejected flow (spillage) from the SRA will not have significant affect on the Carmel River and its underlying aquifer. This conclusion is further supported by the fact that actual use is often much lower than that cited for submittal to the SWRCB.

4.3.3 Environmental Setting

Baseline Water Usage

Kennedy/Jenks' analysis does not include an independent evaluation of the baseline water usage. During the certification of the Final EIR the County Supervisors determined that a baseline of 51 acre-feet per year was appropriate. This amount, however, included within the baseline water pumped after the initiation of the EIR process, and also included water pumped as part of an aquifer test. This methodology was found by the Court of Appeal to be flawed based upon the period of the pumping, the inclusion of water pumped for an aquifer test, and the failure to present documented water usage from prior to the initiation of the EIR:

> "... there is no objection to the EIR's methodology of estimating historical water use on property where no documentation is available to verify actual use. But estimating water used for irrigation where there was no substantial evidence to show that the property was in fact irrigated does not accurately reflect existing conditions. Appellant's argument that it was entitled to use this amount of water for irrigation is not the same as actual use. As various courts, including this one, have held, the impact of the project must be measured against 'real conditions on the ground."

Therefore, as previously stated, this report uses an amount of three (3) acre-feet per year as the appropriate baseline for pre-existing project conditions. This amount was determined by the County as the relevant condition prior to and at the time of the 1995 project application. The amount is based on water usage for a single residence (0.5 AFY) and the amount of water applied for 50 horses (45 gallons per horse per day for a total of 2.5 AFY). The selected baseline appears to be reasonable and representative of aggregate average water usage of undeveloped nonresidential land-use in the Camel Valley.

Hydrologic Setting

Physiography

The northern portion of the project site consists essentially of north-south trending ridges and three canyons (September Ranch, Roach, and Canada de la Segunda) sloping southward to the Carmel River Valley. The drainages are generally deeply incised and have steep canyon walls. The ridges are locally modified by side canyons, erosional gullies, landslides, colluvial wedges, and old river terraces. The southern portion of the project site is a flat to gently sloping, east-west trending, elongated terrace bounded on the north by the sharp slope break with the ridges and on the south by a low knoll. The knoll separates the terrace from the Carmel River channel; the top of the knoll is approximately 60 feet above the lowest elevation of the terrace surface and 100 feet above the elevation of the Carmel River (Kleinfelder 2003).

Hydrometeorologic Setting

Since the lands overlying the SRA are relatively isolated from adjacent watersheds, the main source of recharge is from precipitation. The September Ranch Subdivision Project is about 3¼ miles from the Pacific Ocean in the Carmel Valley and its climate is influenced by fog from the west. The Mediterranean climate of Carmel Valley is typically wet in winter and dry in summer. The rainfall at the September Ranch site is considered to be approximately 18.17 inches in average rainfall years. Table 4.3-2 identifies the 20-year average precipitation within the general project area.

Table 4.3-2: Carmel Valley Rainfall Averages 1959-1978

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Total Precipitation (in.)	3.65	3.05	2.60	1.48	0.29	0.10	0.03	0.09	0.20	0.64	2.32	2.82	17.26
Source: Kennedy/Jenks Consultants, December 2004.													

The rainfall data was recorded at the San Clemente Dam, which is located approximately 17 miles upstream from the proposed project site, is calculated to be 21.4 inches in average rainfall years according to Monterey Peninsula Water Management District (MPWMD). As discussed in Todd (1992), the average rainfall at the September Ranch site is assumed to be 15.1 percent less than that recorded at the San Clemente Dam based on the California Department of Forestry Fire and Resource Assessment Program contour map. Based on precipitation data from the San Clemente Dam, total precipitation for representative average water years 1996 and 1997 was 19.02 and 18.40 inches, respectively. Average precipitation for representative drought water years 1987 through 1991 was 11.0 inches. This data was used by KJC to assess potential recharge to the September Ranch Aquifer.

Soils

Soils present on the September Ranch terrace include Lockwood series shaly loam (LeC), Chualar loam (CbB), xerorthents dissected (Xd), and Arroyo Seco gravelly sandy loam (AsB) (Kleinfelder 2003).

LeC soils are black, slightly acid, shaly and very shaly loams that are underlain by brown very gravelly sandy loam. They contain 45 to 50 percent gravel and 10 to 20 percent cobbles. The CbB has a surface layer of loam to light sandy clay loam that is commonly 10 to 20 inches thick. The substratum varies considerably over short distances and in places is underlain by gravel, cobbles, or clay deposits. The Xd soils consist mainly of unconsolidated or weakly consolidated alluvium that commonly contains pebbles, and cobbles. AsB soils are gently sloping soils on alluvial fans and plains. The soils are grayish brown, neutral to mildly alkaline, gravelly sandy loam.

Geology

The following is a summary of the site geology and a more detailed discussion is included within Section 4.2, Geology and Soils and within Appendix B of this REIR. The basal geologic unit within the proposed project site area is the Aguajito Shale member of the Miocene Monterey Formation (Tm), consisting generally of thin-bedded siliceous shale (Kleinfelder 2003; Geoconsultants 1995; Todd 1992). The Tm is exposed in the hills in the northern portion of the project site, on the Knoll in the southeast portion of the project site, and has been encountered in water wells and detected in vertical electric sounding (VES) probes conducted at the site (Todd 1997).

The Tm is overlain by several unconsolidated clastic sedimentary deposits. The oldest unit present in the southern part of the proposed project site is older alluvium terrace deposits that have been divided by Todd (1992) into units, dating from the youngest:

- Alluvium (Qg and Qa) and colluvium (Qcol) landslide deposits that occur in the northern and southern parts of the site (Geoconsultants 1995; Kleinfelder 2003; Todd 1992);
- Younger, primary water bearing unit Qoa1 shown as Qt1 in Kleinfelder (2003); and
- Older low-permeability Qoa2 that is classified as an aquitard separating Qoa1 and the underlying Tm. This unit impedes groundwater flow between the SRA and CVA at certain locations.

The Hatton Canyon Fault

A trace of the Hatton Canyon Fault (the name of a group of northwest-trending, steeply-dipping reverse faults) (Rosenberg and Clark 1994), traverses the project site from the northwest to the southeast, slightly southwest of the slope break dividing the flatter southern portion of the site from the hilly northern portion of the site (Kleinfelder 2003). Trenches excavated by Terratech in December 2002 show landslide deposits offset along this trace, suggesting that the fault is active.

Based on the mapped location of the Hatton Canyon fault and the best available well locations at September Ranch, the September Ranch wells may all be southwest of the Hatton Canyon fault (see 24.3-1, Well Locations). The wells are not located in a portion of the aquifer that would be confined by the fault. It is not currently known if the Hatton Canyon fault offsets alluvial material within the September Ranch terrace. If the fault extends upward to near the terrace surface, it could form a full or partial (leaky) barrier to groundwater flow.

Based on Kleinfelder's 2003 findings, there is no evidence currently known to suggest that the Hatton Canyon fault serves as a hydraulic barrier or conduit of groundwater to influence water resources in the SRA or influence the SRA's hydraulic connection with the CVA.

Surface Water Resources and Drainage

The drainages dissecting the northern portion of the project area generally flow only during precipitation events. The Carmel River flows generally parallel to the southern boundary of the site and is located approximately 800 feet to the south at the closest approach. Stream flow in the Carmel River can vary greatly over the year, with the greatest stream flow in the winter and the lowest in the summer.

As described in Kleinfelder (2003), drainage courses at the proposed project site are the result of surface-water erosion controlled by relatively uniform bedrock. The central September Ranch Canyon is incised in a typical dendritic drainage pattern. Generally, drainage courses at the site are irregular only where they have been interrupted by local deep-seated landslides such as in the northwest and northeast property corners.

Observed channel bottoms of the drainage courses are composed of sandy or clayey soil with little gravelly surface material. Surface water generally flows relatively unimpeded to the terrace deposit lying adjacent to the base of the ridges. Drainages do not dissect the terrace, suggesting that the surface water infiltrates the terrace and recharges the groundwater (Todd 1992).

The central watershed was estimated at approximately 561 acres, adjusting for elevations, based on a "summed-element" method of calculation performed in a geographic information system.

Current Water Usage

Current groundwater usage at the Site (which is not considered baselined for purposes of CEQA) is primarily for pasture irrigation. The current pumping from the single production well located at the Site is approximately 99 acre feet per year (AFY) (Todd, 2002). More pumping occurs in the six summer months from June to December than during the remaining six months of the year, with the summer extractions totaling approximately 59 acre feet (AF). Water pumping is also somewhat heavy in the spring of each year resulting in the extraction of 38 AF on average.

Water levels at the closest non-September Ranch well, the Brookdale Well, exhibited drops in water levels on the order of 5 to 7 feet corresponding to the usage months of the September Ranch well. However, water levels in this well have consistently recovered later in the year to about 40 feet mean sea level (MSL) as indicated by available water level data collected since 1996.

September Ranch Groundwater Basin/Aquifer

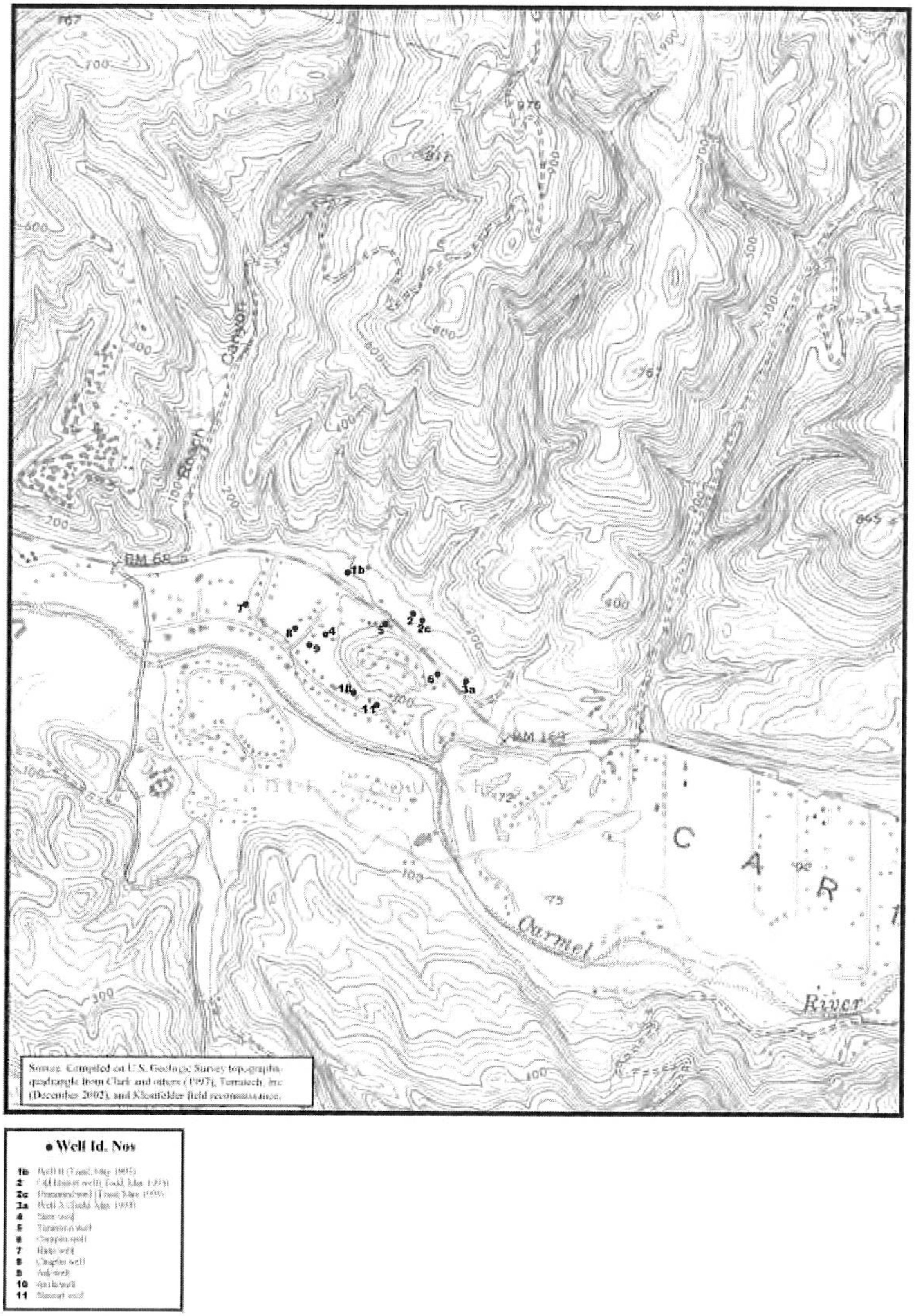
The September Ranch Groundwater Basin, also referred to as the September Ranch Basin (basin) or September Ranch Aquifer (SRA) (Exhibit 4.3-3) is a small and nearly closed basin bound almost entirely by Monterey Shale™. In this independent evaluation of hydrogeologic evidence collected by others, Kennedy/Jenks concludes that the September Ranch basin is bounded on the north by the hills, on the south by the Knoll, on the east by exposed Tm east of the Knoll, and on the southwest it contacts the CVA across a subsurface ridge of Qoa_2 (see Cross-section M-M' on Exhibits 4.3-4a through 4.3-4c).

The surface area of the SRA, as defined by the lateral reach of the water table, changes with seasonal variations of the water table and with yearly variations in rainfall. The basin area is relatively larger during average rainfall years and smaller during below average rainfall periods. The saturated surface area is about 51.8 acres in average rainfall periods (e.g., water year 1997) and about 49.2 acres in below average periods (e.g., water years 1998, 1999, and 2000).

The fluctuations in basin size between average and drought periods affect the storage volumes estimates calculated from wells and VES data for the three aquifer boundaries and properties (Qoa_1, Qoa_2, and Tm). Details of groundwater storage are discussed in further detail below.

Water Bearing Units in the SRA

There are two main water bearing units , that collectively are referred to as the SRA. The main water-bearing unit in the SRA is the Qoa_1, although some water is stored in the Qoa_2 and Tm (Todd 1997). To assess groundwater storage, the shape of the basin boundaries has to be understood. The shape of the basin is shown in Exhibit 4.3-5 and Exhibit 4.3-6. Additionally, Exhibit 4.3-5 depicts the



Source: Kleinfelder, Inc., November 2004.

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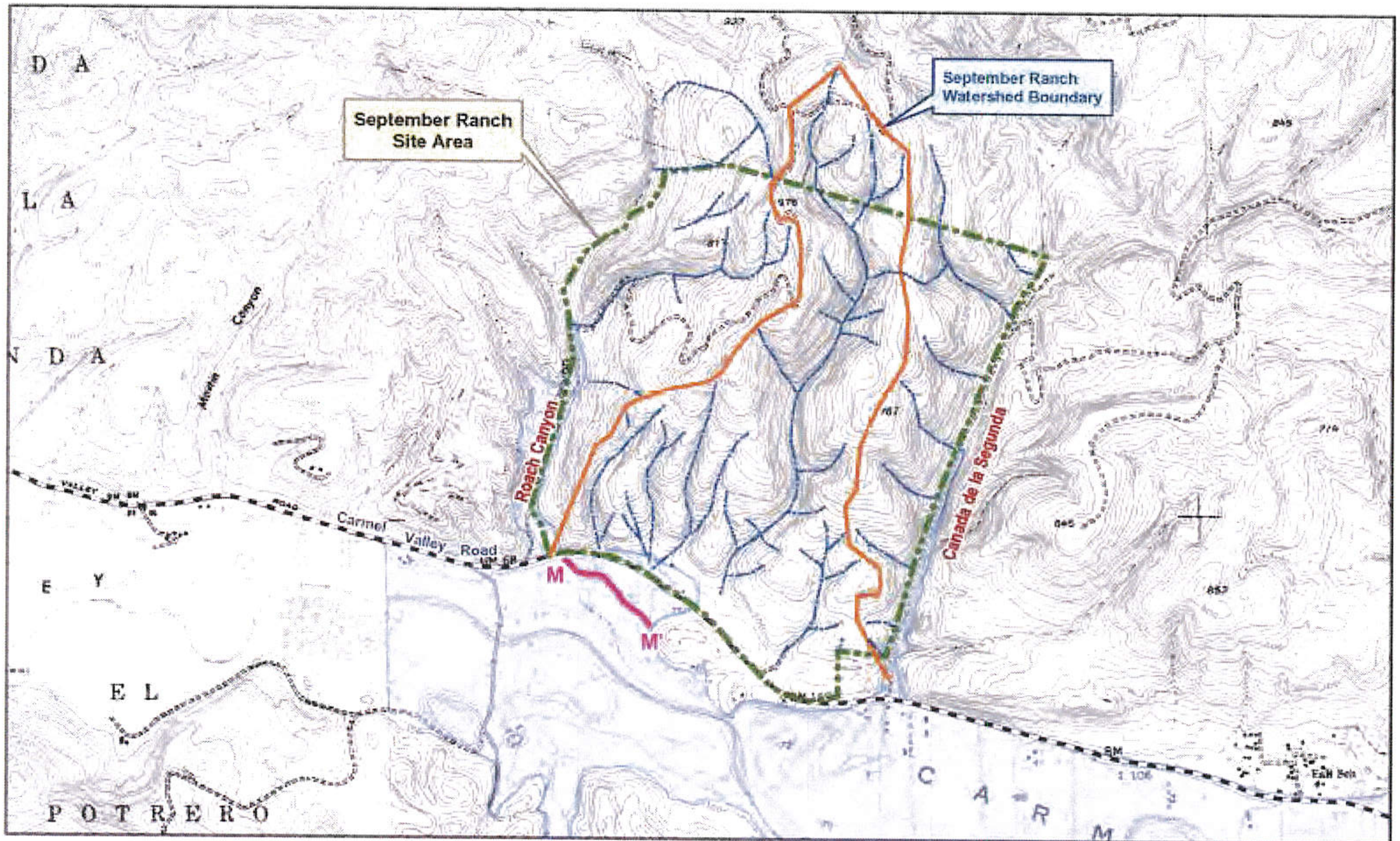
Exhibit 4.3-2
Well Locations Map



Base Map: U.S. Geological Survey, Monterey and Seaside 7.5-minute quadrangles

Explanation

- September Ranch drainage system
- Cross-section trace M-M'
- Carmel Valley Aquifer Subunit 3

Source: Kennedy/Jenks Consultants, November 2004.

Michael Brandman Associates

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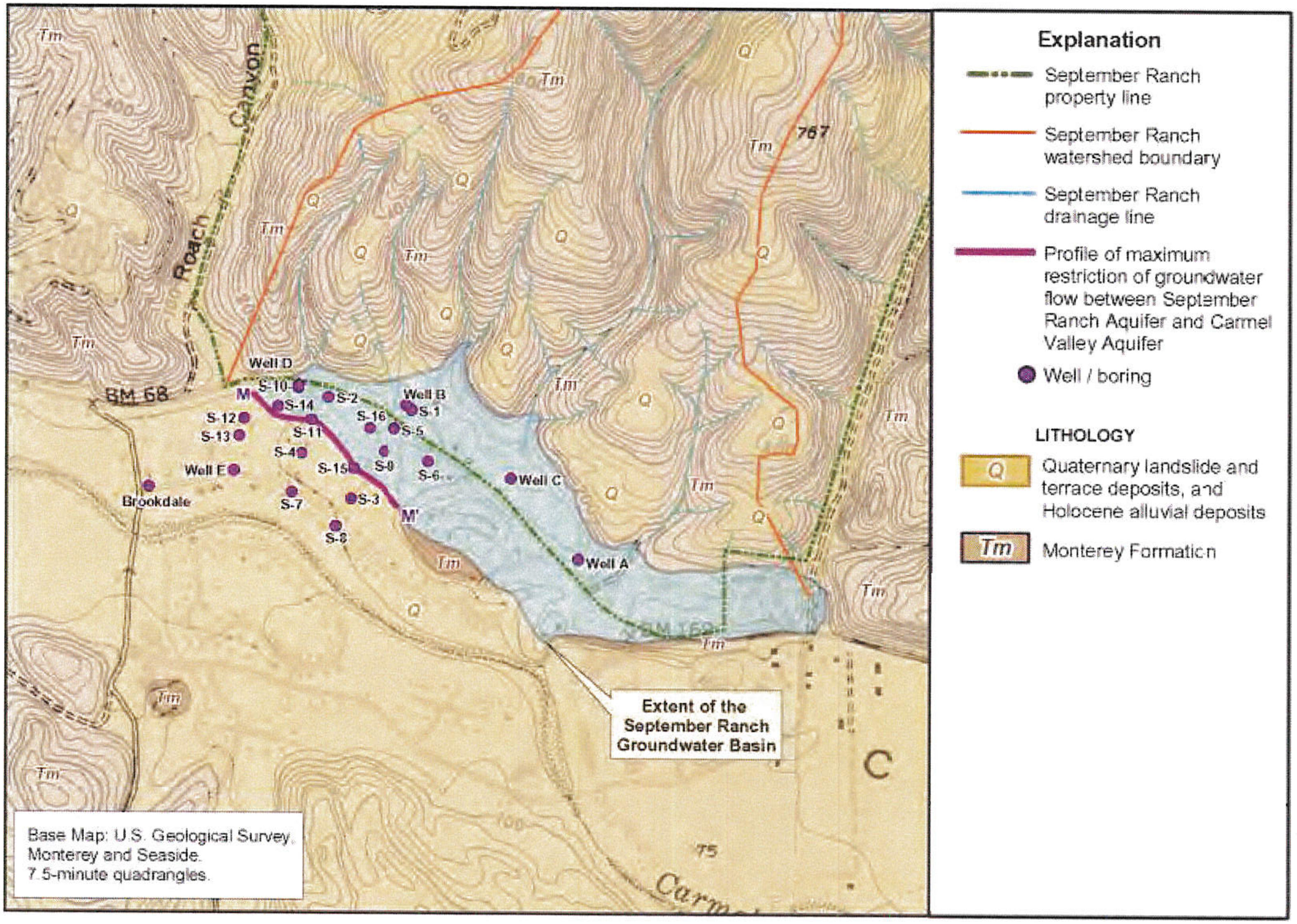
Exhibit 4.3-3
Hydrologic Site Setting Map



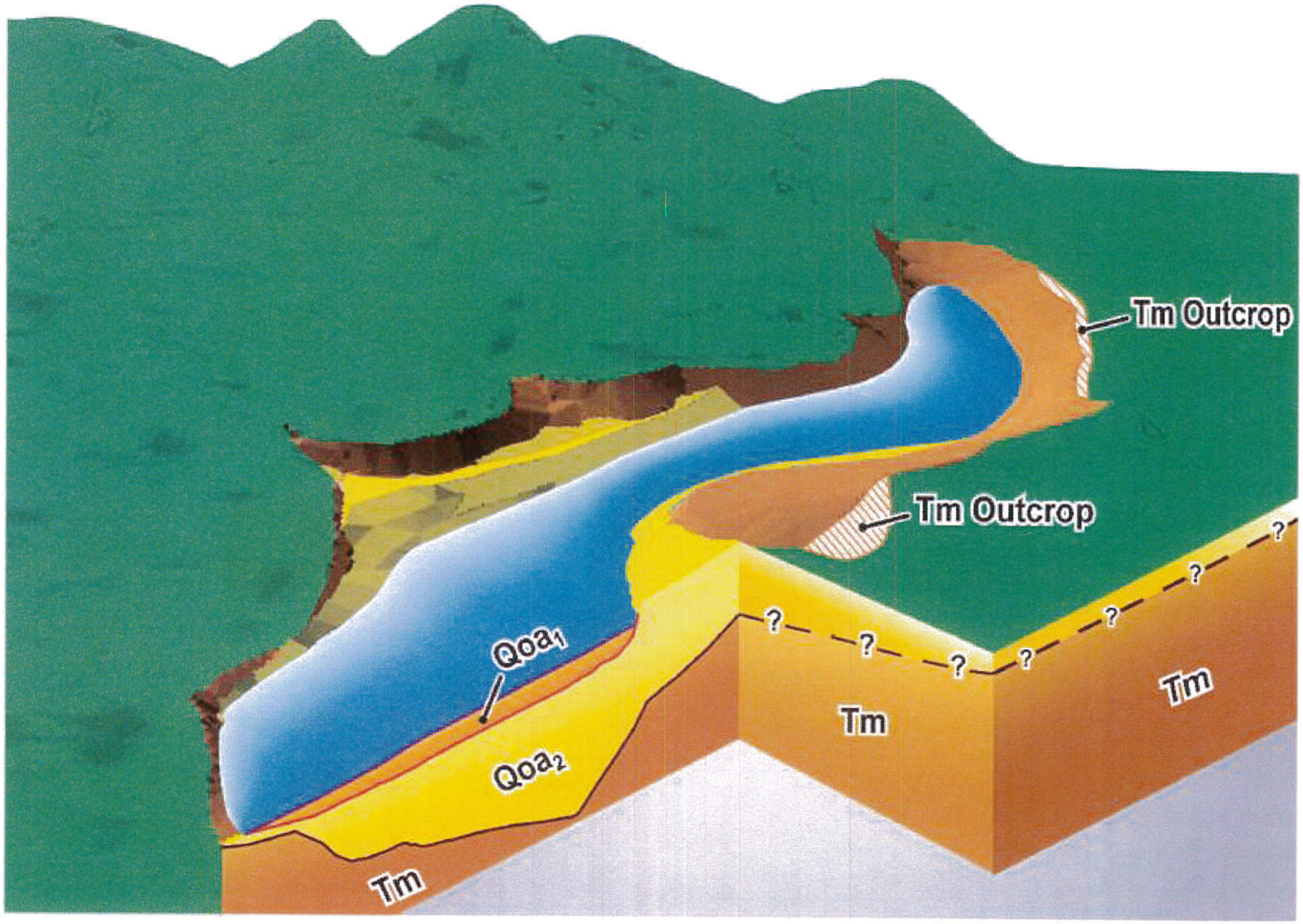
Source: Kennedy/Jenks Consultants, November 2004.

Michael Brandman Associates

NORTH

1315 657.5 0 1315
SCALE IN FEET

Exhibit 4.3-4a
Cross-Sections and Conceptual Modeling



Source: Kennedy/Jenks Consultants, November 2004.

NOT TO SCALE

Michael Brandman Associates

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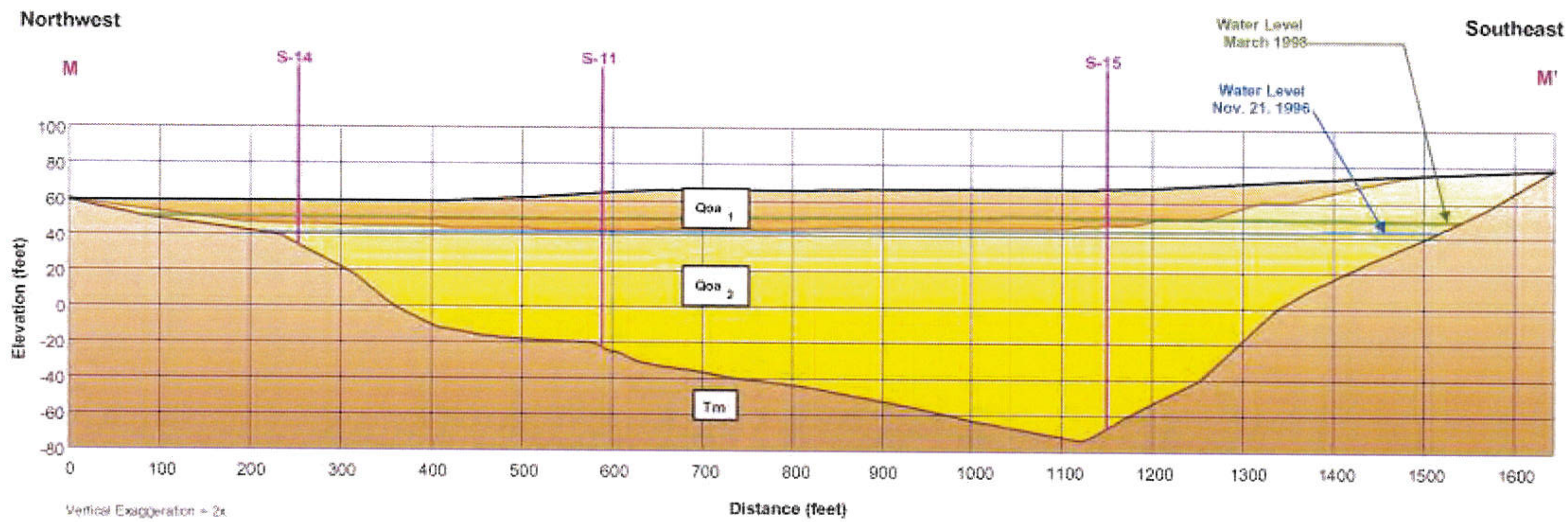
Exhibit 4.3-4b
Cross-Sections and Conceptual Modeling

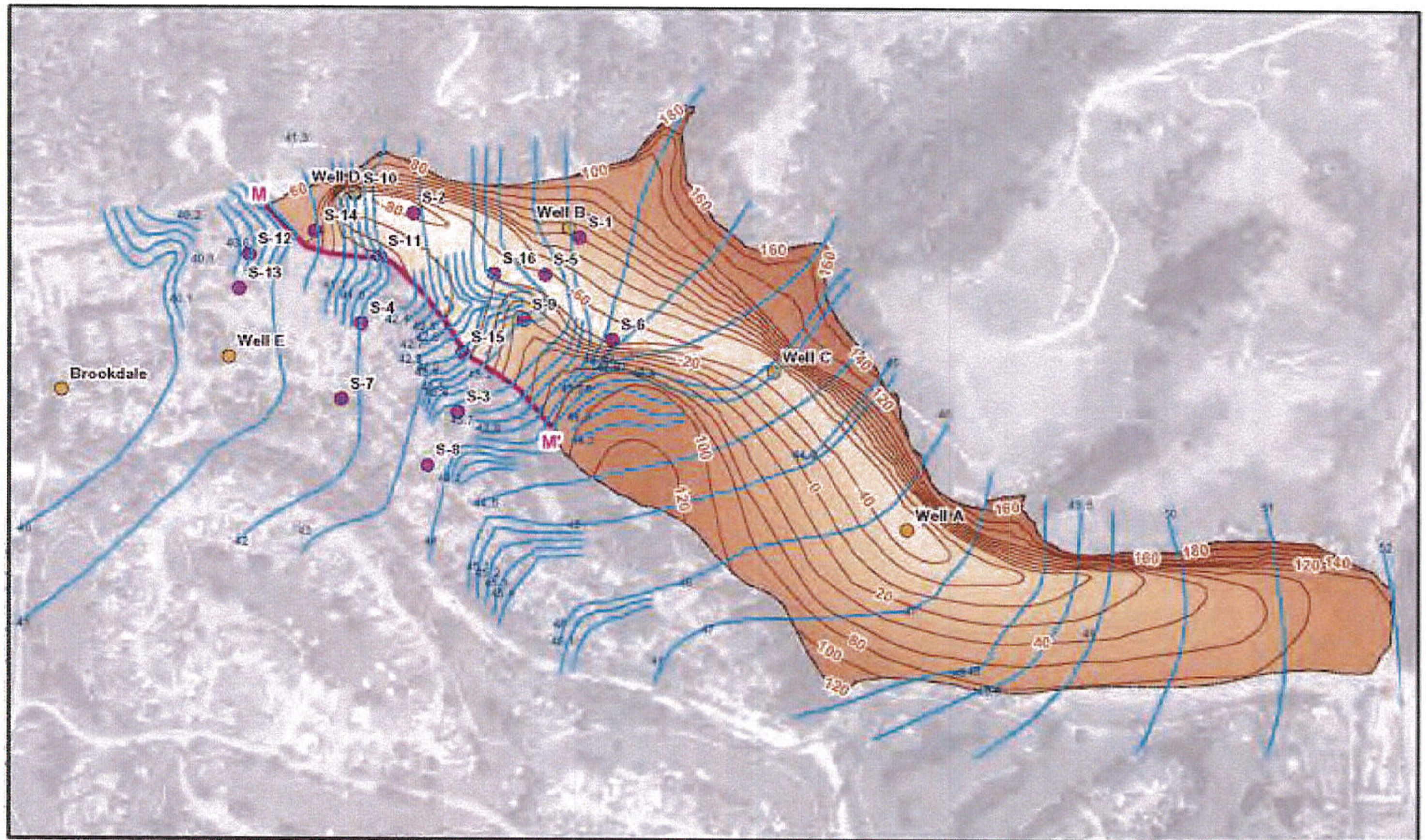


Source: Kennedy/Jenks Consultants, November 2004.

NORTH NOT TO SCALE

Michael Brandman Associates

Exhibit 4.3-4c
Cross-Sections and Conceptual Modeling

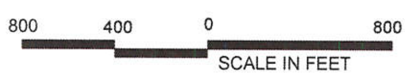


Aerial Photograph: Seaside SW quadrangle, September 7, 1998

Explanation

- Top of Monterey Formation, 20-foot contour interval (feet, MSL)
- Groundwater level contours (feet, MSL), November 21, 1996
- September Ranch Aquifer boundary
- Monterey Formation (Tm)
- Cross-section trace M-M'
- Well
- Boring

Source: Kennedy/Jenks Consultants, November 2004.



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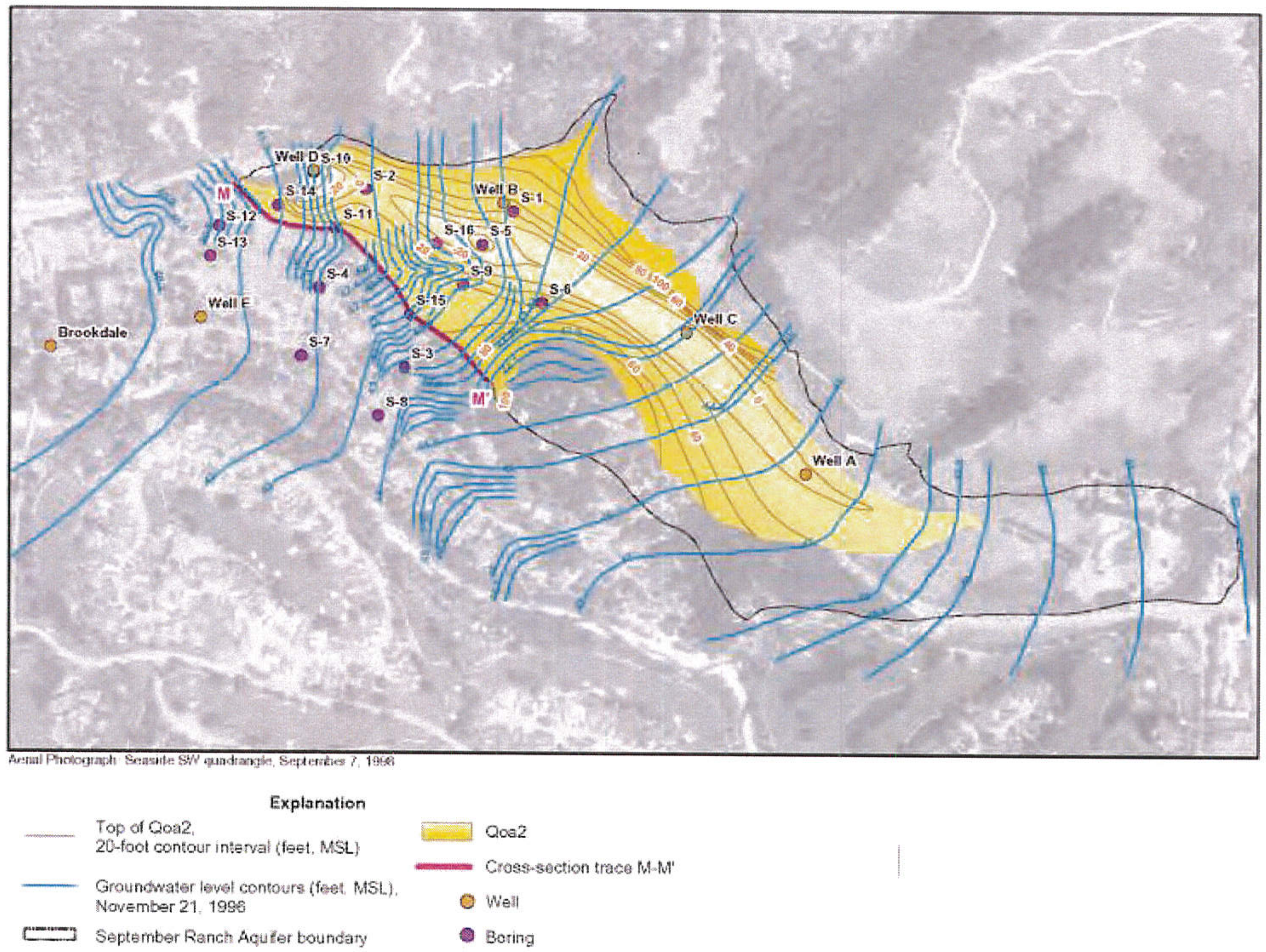
Michael Brandman Associates

Exhibit 4.3-5
Top of Monterey Formation and Groundwater Levels



Source: Kennedy/Jenks Consultants, November 2004.

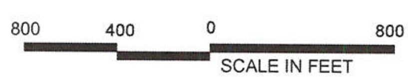


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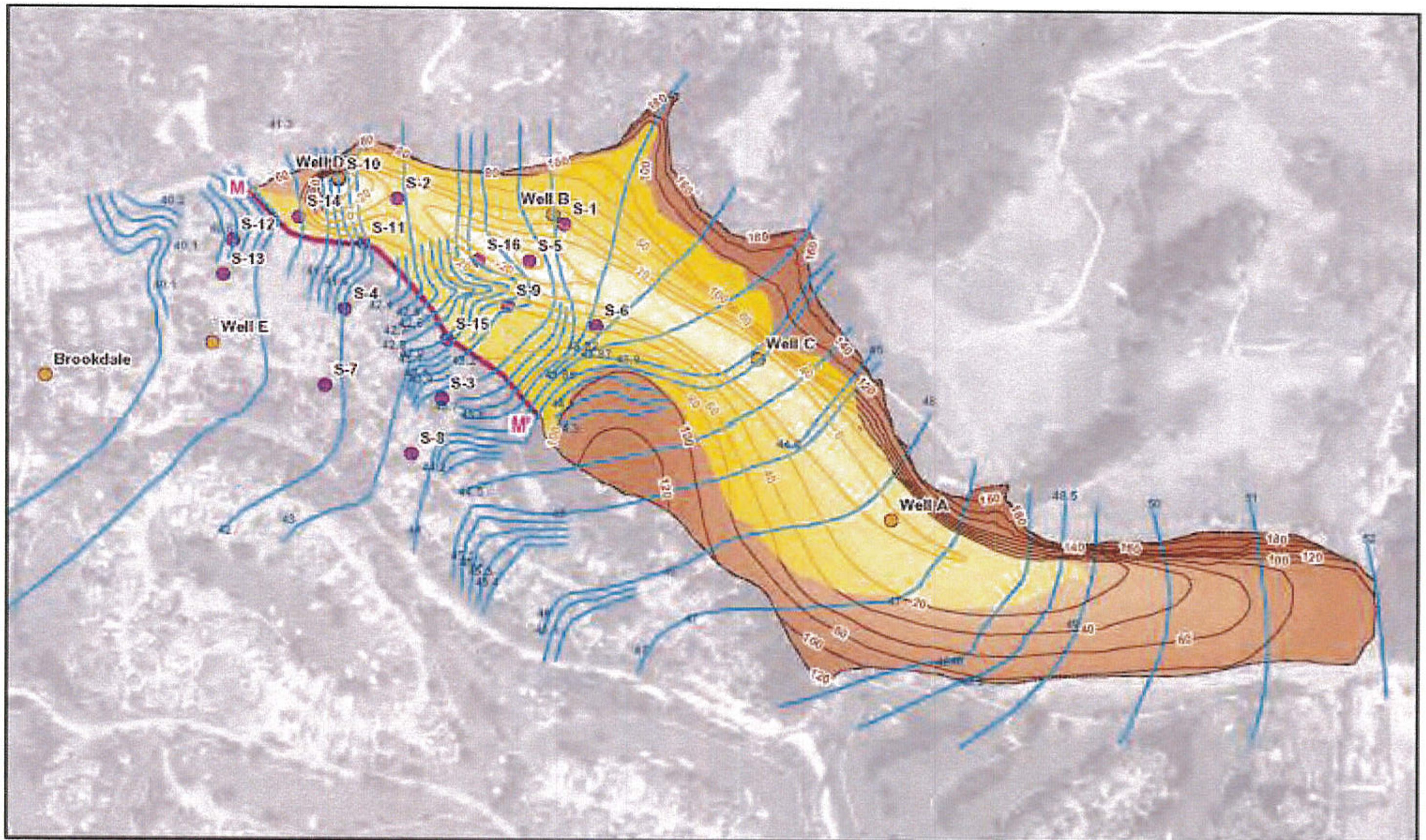
Exhibit 4.3-6
Top of Older Alluvium - Qoa_2 and Groundwater Levels



Aerial Photograph: Seaside SW quadrangle, September 7, 1998

Explanation

Top of Monterey Formation 20-foot contour interval (feet, MSL)	Monterey Formation (Tm)
Top of Qoa2 20-foot contour interval (feet, MSL)	Qoa2
Groundwater level contours (feet, MSL), November 21, 1996	Cross-section trace M-M'
September Ranch Aquifer boundary	Well
	Boring

Source: Kennedy/Jenks Consultants, November 2004.

Michael Brandman Associates

NORTH

800 400 0 800
SCALE IN FEET

Exhibit 4.3-7
Combined Top of Monterey Formation and Older Alluvium - Qoa_2

elevation of the top of Tm. As identified in Exhibit 4.3-5, to the east the Tm is shallow and deepens to the west, forming a depression, or trough in the west and southwest portions of the basin. Exhibit 4.3-6 gives the elevation of the top of the Qoa_2 which shows that it is deepest in the central part of the basin and shallow in the southwest part of the basin. This indicates that the Qoa_1, the more transmissive unit and the main portion of the aquifer at the site, is thickest in the central to west part of the basin.

In addition, Exhibit 4.3-6 in conjunction with Exhibit 4.3-4b and Exhibit 4.3-4c illustrate the ridge of Qoa_2 , which borders the southwest side of the basin. The length of this boundary is about 1,620 feet or approximately 20 percent of the basin boundary. Contours of equal elevations on the top of Qoa_2 and depiction of the ridge-like feature (elevation 60 feet above mean sea level [AMSL]) of the aquitard are illustrated in Exhibit 4.3-5 and Exhibit 4.3-6.

Exhibit 4.3-4c shows the only portion of the SRA in hydraulic contact with the CVA. Evidence of this connectivity was first interpreted from borings, water well logs, and a VES survey conducted by Todd (1992 and 1997). The KJC study provides an independent assessment of the shape of the SRA and degree of connectivity between the SRA and the CVA. KJC independently constructed a three-dimensional (3-D) model of the physical boundaries of the basin (See Exhibit 4.3-4b) using existing data, including that presented in Todd (1997) and Kleinfelder (2003).

In the previous Final EIR (1998), the SRA was treated as an aquifer with a finite storage and in limited communication with the adjacent CVA. KJC concurs with this conclusion and notes that recent evidence does not suggest otherwise.

Groundwater Storage

The analysis included an independent estimate of groundwater storage by using existing data as presented in Todd 1992 and 1997. KJC refined Todd's estimates by constructing more detailed elevation contours of the three hydrologic formations Qoa_1, Qoa_2, and the Monterey Shale. A 3-D GIS was used to calculate volumes from the aquifer units.

Groundwater stored beneath the September Ranch project site is entirely within the nearly closed basin bounded almost entirely by Monterey Shale (see Exhibit 4.3-4a). The limited hydraulic connectivity with the CVA occurs only when groundwater levels in the SRA are higher than the top of the Monterey Shale bedrock so that seasonally excess groundwater from the SRA spills over and serves as recharge to the CVA. This is known as "rejected recharge" in that the spilling water cannot recharge the SRA (as the SRA is full), and so the water is rejected from the SRA and instead goes into the CVA.

The available groundwater storage was calculated by plotting the elevations of the top of the Qoa_2 aquitard and the top of the Tm from well logs, soil borings, and VES data from the September Ranch site and from neighboring domestic wells in the CVA immediately south of the September Ranch project area into a 3-D GIS program (Exhibit 4.3-4a). The data was presented in Todd (1992 and 1997).

The top-of-formation elevations of the Tm and Qoa_2 are combined in Exhibit 4.3-7 to show the extent of the functional bottom of the September Ranch basin. Groundwater elevation contours for November 1996 (water levels recorded prior to the major aquifer test of late 1996) are also shown on

Exhibit 4.3-7. The thickness of the saturated Qoa_1, and therefore the functional thickness of the available storage in the entire September Ranch basin, can be estimated using Exhibit 4.3-7 by subtracting the top of formation elevation from the water table elevation.

Data for Calculating Storage for Normal Rainfall Years

It is important to note that a conservative calculation of aquifer storage is primarily a function of the actual recorded water levels, which are themselves entirely dependent on surface recharge. Hence, in selecting yearly water level data for calculating storage for normal and below average rainfall periods, average and below normal surface recharge values are used (instead of using total annual rainfall amounts) as indicators of normal and below average groundwater recharge periods.

The groundwater elevations for the water years 1997 (October through December) and 1998 (January through September) were used to represent average rainfall years in calculating storage. Estimates for pumping at the project site are based on available pumping data from Todd 2002 and PG&E electrical consumption billings from 1996. KJC used the data from the CVSIM for water year 1997 to represent average conditions. Surface recharge in the CVSIM model represents the amount of surface recharge that is available to recharge groundwater on a monthly basis. According to the CVSIM model, a total of 7,085 AF of surface recharge was recorded to the CVA in 1997 and 7,664 AF in 1998. According to KJC, these are fairly average recharge values (see Table 3, Appendix B of Appendix C of this REIR).

Data for Calculating Storage for Below Average Rainfall Years

The water year 1999 was used to represent a water year that received markedly below average surface recharge, with a total recharge of 5,091 AF (Table 3, Appendix B of Appendix C of this REIR). This value is the second lowest surface recharge value calculated by the MPWMD since 1981; the lowest groundwater recharge occurred in 1994, with only 4,720 AF of groundwater recharge. Hence, a conservative aquifer storage value is attained by using water levels recorded in the 1999 low surface recharge year. It is important to note that data from 1999 was used instead of water levels from drought years 1987 - 1991 because water levels were not available for these years since the September Ranch wells were installed after the 1991 drought.

Results of Analysis of Seasonal Storage

Table 4.3-3 below, is a summary of the results of the seasonal storage analysis.

Table 4.3-3: Seasonal Storage Analysis Results

Average Rainfall Seasons	Qoa_1 (AF)	Qoa_2 (AF)	Total (AF)	Below Average Rainfall Seasons	Qoa_1 (AF)	Qoa_2 (AF)	Total (AF)
12/1997 Fall	167	102	269	12/1998 Fall	183	104	287
3/1998 Winter	217	106	323	3/1999 Winter	193	105	297
6/1998 Spring	220	106	327	6/1999 Spring	185	104	289
9/1998 Summer	192	105	297	9/1999 Summer	170	102	273
Yearly Average	199	105	304		183	104	287
Source: Kennedy/Jenks Consultants, December 2004.							

The groundwater storage in the September Ranch basin was previously estimated by Todd (1992) at 261 AF for Qoa_1, and 121 AF in the lower permeability Qoa_2, giving an average total estimated storage of about 382 AF. Todd (1992) developed the storage estimates by using an average thickness and depth of the Qoa_1 and Qoa_2 units. But despite Todd's use of an average thickness, the base of each aquifer unit is actually irregular in elevation and the groundwater surface elevation is dependent on seasonal rainfall. Thus, we believe that Todd's methodology unduly inflates the estimated quantity of groundwater storage in the SRA. KJC also notes that on August 23, 1994 the MPWMD entered in a Memorandum of Understanding with the September Ranch Partners, which used the value of 261 AF as estimated storage.

KJC's independent analysis of seasonal storage presents a refinement of the original Todd estimates. KJC's analysis estimates that about 304 AF is available in storage in average rainfall years and about 286 AF in a below average year. The 304 AF amount for average rainfall years falls between the original Todd estimate of 382 AF and the number used in the MOU with the MPWMD.

Groundwater Recharge

Groundwater recharge in the September Ranch basin is primarily through infiltration of precipitation. The September Ranch terrace is largely recharged by streams originating in the uplands of the ranch that discharge (drain) water to the alluvium and Qoa_1 that make up the primary water-bearing zone of the terrace (Kleinfelder 2003). Drainage within the September Ranch watershed is fairly efficient because of the well-defined (high relief) ridges (see the red line marking the watershed boundary in Exhibit 4.3-3) that influence the convergence drainage pattern within the watershed. Surface water generally flows relatively unimpeded to the terrace deposit lying adjacent to the base of the ridges.

The amount of monthly and seasonal recharge for the site was developed by utilizing rainfall data collected at the San Clemente Dam, approximately 17 miles upstream of the site (see Table 4.3-2). As discussed previously in this section (see Hydrometeorlogic Setting), a 15.1 percent reduction factor was used to calculate monthly rainfall at the September Ranch site. Monthly rainfall values were applied to the watershed area of 561 acres with an evapotranspiration (ET) loss-factor of 70 percent and an infiltration based on Soil Conservation Service method TR-55. These factors were also presented in Todd (1992) with concurrence by the MPWMD. Recharge estimates were established by subtracting surface runoffs from precipitation on a monthly basis. Resultant monthly recharge values are listed in Appendix C of this REIR and the annual cumulative recharges are summarized in Table 4.3-4.

Table 4.3-4: Annual Cumulative Recharge Values

Average Water Year	San Clemente Dam Rainfall (in)	September Ranch Site Precipitation Over 561 Acres (AF)	Net Recharge with ET-loss of 70% Adjusted for Infiltration (AF)	Below Average Water Years	San Clemente Dam Rainfall (in)	September Ranch Site Precipitation Over 561 Acres (AF)	Net Recharge with ET-Loss of 70% Adjusted for Infiltration (AF)	Net Recharge with ET-Loss of 85% (AF)[1]
1996	22.4	889.1	262.0	1987	11.02	437.4	131.2	65.6
1997	21.7	860.1	244.0	1988	11.07	439.4	131.8	65.9
—	—	—	—	1989	12.80	508.0	152.4	76.2

Table 4.3-4 (cont): Annual Cumulative Recharge Values

Average Water Year	San Clemente Dam Rainfall (in)	September Ranch Site Precipitation Over 561 Acres (AF)	Net Recharge with ET-loss of 70% Adjusted for Infiltration (AF)	Below Average Water Years	San Clemente Dam Rainfall (in)	September Ranch Site Precipitation Over 561 Acres (AF)	Net Recharge with ET-Loss of 70% Adjusted for Infiltration (AF)	Net Recharge with ET-Loss of 85% (AF)[1]
—	—	—	—	1990	13.09	519.6	155.9	77.9
—	—	—	—	1991	16.87	669.9	182.2	81.7
Yearly Average			**253**	—	—	—	**151**	**73**

Note: estimated runoffs were subtracted from ET-loss corrected recharges rates
[1] Adjusted for infiltration
Source: Kennedy/Jenks Consultants, December 2004

The 1998 Final EIR invalidated by the Court of Appeal utilized a factor of 242 AFY of recharge for average years and zero recharge for drought years. The analysis above indicates that range from 244 to 262 AF of potential recharge is available to the September Ranch terrace during an average rainfall year. The MPWMD and the Monterey County Health Department take the position that during severe droughts all infiltrated moisture is taken up by vegetation and other losses resulting in zero recharge being available to the groundwater basin. It is KJC's opinion that for below average rainfall years a zero recharge is unrealistic given the Mediterranean climate. Thus, KJC maintains that an ET loss-factor of 70 percent is realistic for both average and below average precipitation years. However, to address this difference in opinion and for comparative analysis, a conservative 85 percent ET loss-factor is used for this Draft REIR for below average rainfall years. As shown in Table 4.3-4, the 85 percent ET results in lower recharge values for this conservative recharge scenario with estimates ranging from 65.6 AFY to 81.7 AFY and an average of 73 AFY. Additionally, as identified in Table 4.3-4, the analysis conducted by KJC indicates that a range of 244 to 262 AF of potential recharge is available to the September Ranch terrace during an average rainfall year.

Groundwater Gradient

The typical groundwater flow pattern in the SRA and the CVA is illustrated in Exhibits 4.3-5 and 4.3-6. The groundwater elevations of these figures were recorded on November 21, 1996, prior to a large-scale aquifer test. The groundwater on this date flowed from the east end of the September Ranch basin, from Canada de le Segunda, where groundwater is at 52 feet above mean seal level (AMSL), towards Roach Canyon in the west, where groundwater is at 41 feet AMSL (Well D). The groundwater gradient magnitude shown in these exhibits is approximately 0.0025 feet per foot (ft/ft) in the eastern half of the basin and about 0.0022 ft/ft in the western half of the basin where the SRA meets the CVA. This is a relatively shallow gradient that indicates a low velocity. The northwest to west gradient direction is generally parallel to the Carmel River flow direction.

The KJC study also focused on the difference in groundwater gradients between:

- Four quarters or seasons in a year; and
- Average rainfall periods and below average years.

The objective of this more detailed analysis of groundwater gradient was to quantify the volume of groundwater exchange between the SRA and CVA across the ridge of Qoa_2 (see Exhibit 4.3-4c), given that KJC established only an extremely low level of connectivity between the two water resources. The approach is to examine the direction of groundwater gradient based on water levels in the SRA and those in the CVA. The most suitable and available data to support this analysis are the water levels measured in Wells B and D located in the September Ranch basin, and Well E and the Brookdale well, located in the CVA. These wells are located in a roughly linear fashion, across Cross-Section M-M'.

In this analysis, it is not enough to base the use of data and seasonal gradient characterizations on rainfall amounts generally; the corresponding surface recharge rates in normal and below average precipitation periods must be assessed as well.

The reason for the focus on surface recharge rates (rather than total rainfall) is that the cumulative volume of surface recharge directly influences groundwater level. In contrast, a certain quantity of the total rainfall at the site is eventually discharged by surface runoff into the Carmel River and, hence, does not influence groundwater levels. A good example of this is the intense rainfall month of February in 1998 (18.24 inches), which largely did not influence groundwater levels because the majority of the intense rains became runoff into the Carmel River. For this reason, KJC chose data sets of groundwater levels with equal emphasis on surface recharge rates as represented in the CVSIM subunit 3 results (see Table 3, Appendix B of Appendix C of this REIR).

Normal Rainfall and Surface Recharge Years for the September Ranch Area

KJC considered that the most representative period of normal rainfall and surface recharge to characterize groundwater gradients are the years 1996 (8,090 AF), 1997 (7,085 AF), and 1998 (7,664 AF) (see Appendix B of the hydrogeologic report in Appendix C of the Draft REIR). Since there was a 270 gallons per minute (gpm) 47-day aquifer test conducted during late 1996 through February 1997, water levels measured in late 1997 through the first three quarters of 1998 were used to calculate gradients and thus to avoid the post aquifer testing recovery period of lower than normal water levels.

Below Normal Rainfall and Surface Recharge Years for the September Ranch Area

KJC considers that the most representative below average rainfall and surface recharge years are 1987 through 1991. Since water level data for the SRA are not available for these years, KJC chose a comparable period of low rainfall in water year 1999 (5091 AF of recharge and 17.41 inches of rainfall) to serve as surrogate data set for this analysis.

Exhibit 4.3-8 graphically illustrates data from these wells for an average rainfall and surface recharge water year of 1997, a below average rainfall water year of 1999, and the record drought period of 1989 and 1990. Additionally, the data is presented by quarters or by seasons in the year. The boundary between the SRA and the CVA is depicted in Exhibit 4.3-8, which illustrates groundwater flow direction between the two systems. Table 4.3-5 is a summary of groundwater gradients calculated between Wells D, E, and the Brookdale wells.

Table 4.3-5: Calculated Well Groundwater Gradients

Average Rainfall Water Year 1997	Gradient Between Well D and Brookdale Well	Below Average Rainfall Water Year 1999	Gradient Between Well D and Brookdale Well	Below Average Rainfall Water Year 1989	Gradient Between Well E and Brookdale Well
12/1997 Fall	-0.0014	12/1998 Fall	-0.0016	9/1989 Fall	-0.013
3/1998 Winter	-0.0059	3/1999 Winter	-0.0022	—	—
6/1998 Spring	-0.0030	6/1999 Spring	-0.0020	—	—
9/1998 Summer	-0.0021	9/1999 Summer	-0.0042	—	—
Average	-0.0031	Average	-0.0025	—	—

Note: negative sign indicates groundwater flow from the SRA to the CVA.
Source: Kennedy/Jenks Consultants, December 2004.

Water level data from several seasons were compared to assess gradient direction and magnitude. Within the September Ranch basin, groundwater typically flows toward Well C (located near the pumping well SR 1). Near the SRA-CVA contact at the southwest part of the SRA, flow is generally southerly from the SRA to the CVA.

Groundwater Gradient in Aquifer Tests

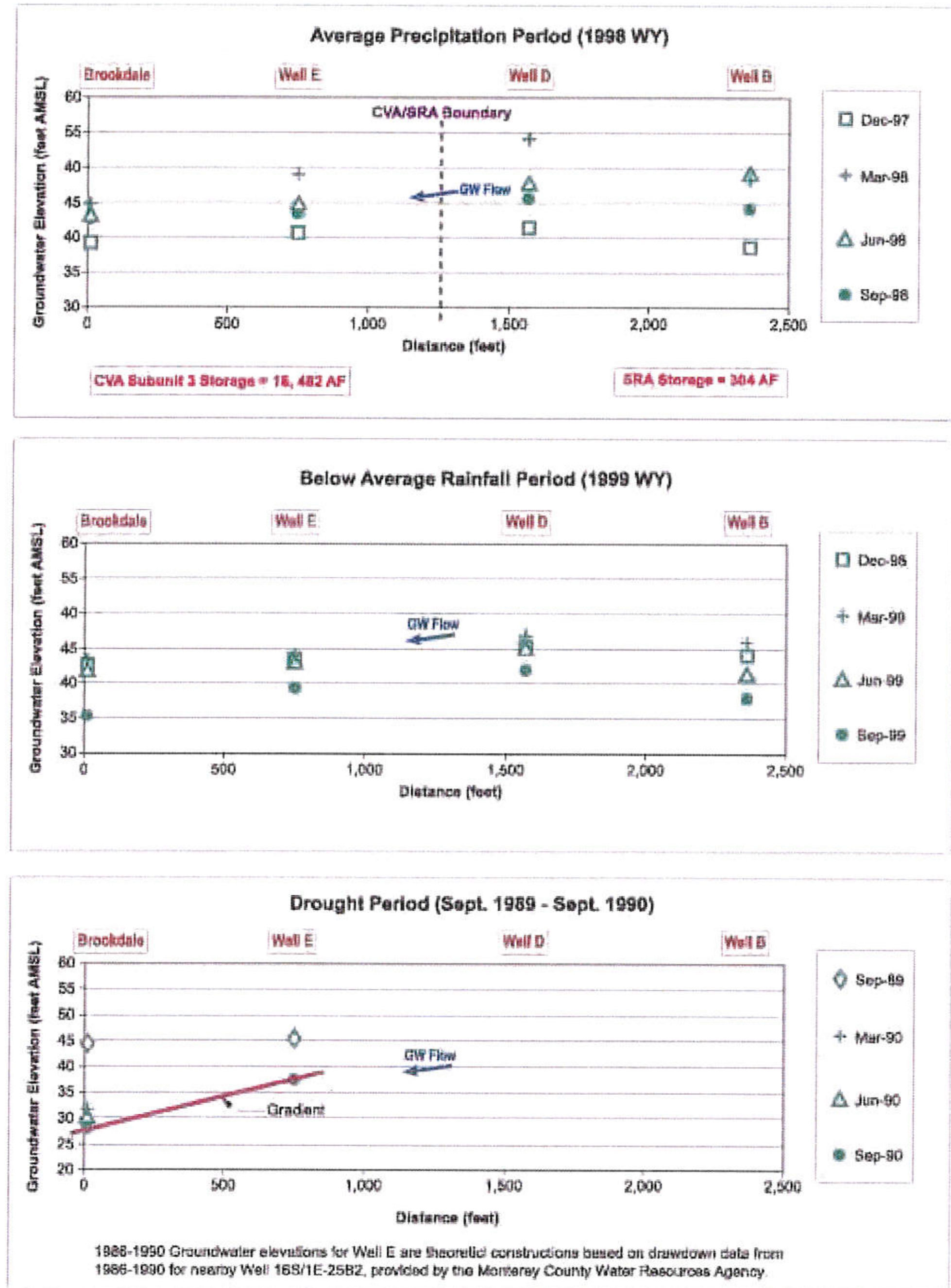
The groundwater gradient before and during an extensive 47-day aquifer test concluded in the winter of 1996/1997 as shown in Todd (1997). The direction of the groundwater gradient prior to the aquifer test in the September Ranch basin and the adjoining CVA was northwest to west, as depicted in Exhibits 4.3-5 and 4.3-6.

The groundwater elevations contoured during the aquifer test suggest a greater influence on water levels in the September Ranch basin compared to water levels in the CVA, although it appears the aquifer test did have some influence on the CVA. The 270 gpm pumping rate almost instantly created a groundwater divide at the hydraulic contact between the two systems and at Well D. The divide shifted further southwest to Well E on day 19 of the test. The groundwater divide shifted back towards Well D in January 1997 near the end of the test. The occurrence and shifting of the groundwater divide is indicative of impeded or constricted flow due to the ridge-like feature made up of mainly Qoa_2 aquitard material at the location of M-M' or between Wells D and E (see Exhibit 4.3-6). It is likely that the movement of groundwater in this area is both impeded by the less-permeable material and constricted above the ridge-like structure in the Qoa_1 material, the path of less resistance.

KJC agrees with the comments by the MPWMD that results and interpretation of the 1996 47-day aquifer test are debatable, and that the response in wells closer to the Carmel River is less than

expected, probably due to the suspected effect that concurrent rainfall and high river flows had on water levels during the aquifer test.

However, water levels in Well D in both the 1992 and 1996 aquifer tests recovered at slow rates after the pumping tests. Based on its location, KJC believes that water levels in Well D are responding



Explanation

CVA Carmel Valley Aquifer

SRA September Ranch Aquifer

GW Groundwater

Source: Kennedy/Jenks Consultants, November 2004.

Michael Brandman Associates

Exhibit 4.3-8
Groundwater Gradients Across Cross-Section M-M

first to recharge in the SRA and secondarily to recharge from the CVA. In the CVA, the large volume of river recharge along the Carmel River after rainfall sends rejected outflow towards the SRA. KJC concludes that the rise in water levels after the test in Well D is in response to the rise in water levels within the SRA due to groundwater recharge from infiltration and drainage of the September Ranch uplands. Records show that overall water levels rose slowly and stayed depressed in the summer and fall of 1997.

KJC also suggests that it required unique conditions, with multiple stimuli, including a concurrent 47-day aquifer test with a pumping rate of 270 gpm and a large rain event, to produce an appreciable exchange of groundwater from the CVA to the SRA. Specifically, the drawdown during the pumping test created a significant gradient towards the SRA at the location of the groundwater divide (apparent in the pumping test groundwater level contours). The gradient towards the SRA was further enhanced by an excess water level rise in the CVA due to excess recharge in the Carmel River Basin, sending appreciable rejected underflow towards the SRA. This interpretation is supported by the rapid rise in water levels after rainfall in the CVA, which KJC believes is due to the increase in river stage and the rise in groundwater levels in the CVA. The overall water level rise in the CVA is consistent with those in wells closer to the Carmel River. These unique conditions are not expected to be replicated with the lower and slower pumping rates projected for the project because the total extractions during the 47 day test would roughly equal the total extractions expected during one year of project operations.

4.3.4 Project Impacts

Standards of Significance

The project will have a significant water supply and availability impact if it will:

- Substantially degrade or deplete groundwater resources;
- Interfere with groundwater recharge;
- Use water in a wasteful manner.

In addition, in accordance with local and regional mandates for water resources management, the project will have a significant water supply and availability impact if it will:

- Increase the pumping and demand on the Carmel Valley Aquifer;
- Result in a yield in the groundwater system that is not sufficient to provide the project water demand on a long-term average basis and during droughts; or
- Substantially decreases the availability of groundwater to existing users of the same groundwater basin.

Impact Analysis and Mitigation Measures

Less than Significant Impact - Substantially Degrade and Deplete Groundwater or Interfere with Groundwater Recharge: Table 4.3-6 provides a comparison of the baseline water demand and the projected water demand in relation to the findings of the 1998 Final EIR. As shown in Table 4.3-6, the water demand of the September Ranch Subdivision project at build-out is expected to be 57.21

AFY. This is based upon interior and exterior water use at homes, use at the equestrian center, and system losses.

Table 4.3-6: Baseline and Projected Water Demand at Build-out

	Proposed Project	1998 Final EIR
Baseline Use	3 AFY	45 AFY
Current Use	99 AFY	99.39 AFY
Projected September Ranch Water Demand	57.21* AFY	61.15 AFY
Difference between Baseline and Project Use	54.21 AFY	16.15 AFY

* Todd (1997) assumed a demand of 66.7 AFY, based upon consumption of 55.6 AFY and a 20% sustainability margin.
Source: Kennedy/Jenks Consultants, December 2004.

The estimates of annual water demand for the proposed project are based on average water use of 0.50 AFY for single-family residences and 0.231 AFY per unit for multi-family areas. The total housing demand, including landscaping, is 50.5 AFY, with 3 AFY for the equestrian center and 3.74 AFY for system losses. The total demand excludes water needed to irrigate the pastures (the previous 1998 Final EIR and as indicated in Section 4.5 this Draft REIR reclaimed wastewater would be used to irrigate the pasture

The 1998 Final EIR estimates that about two-thirds of the production would occur between June and November and correspondingly one-third of the production would occur between December and May. The metered pumping rate currently at the site is approximately 99 to 110 AFY. According to Todd (2002), an average of 99.39 AF per water year was pumped from September Ranch wells between October 1998 and September 2001. From June 1998 to September 1998, 40.41 AF was pumped and 67.72 AF was pumped between October 2001 and July 2002. The average weekly pumping rate between June 1998 and July 2002 was 2.23 AF and the median was 2.49 AF. As a result, there would be a reduction of demand from the current pump rate of 99 AFY to an estimated proposed pump rate of 57.21 AFY at build-out. Yet it should be noted that while project implementation will result in a reduction in water demand of 41.79 AFY in relation to the current pump rate, project implementation will result in an increases demand of 54.21 AFY than the established baseline usage of 3 AFY.

In addition to assessing the project's water demands, to fully address the issue of the depletion or degradation of groundwater resources or the project's interference with groundwater recharge (in the form of a reduction in rejected recharge to the CVA), KJC examined the groundwater exchange between the SRA and the CVA.

Groundwater Exchange Between the SRA and the CVA

The following focuses on the hydraulic exchange of groundwater between the SRA and the CVA. As previously discussed, flow of groundwater (rejected recharge) is typically from the SRA towards the CVA for both average and below average rainfall periods. Groundwater flow from the CVA to the SRA is probably rare and would require specific combined conditions such as an aquifer test where a well in the SRA is pumped at a high flow rate aquifer test and a concurrent rainfall event (conditions met during the 1996/1997 aquifer test).

Based on available hydrogeologic data and the results of groundwater storage and recharge estimates presented by KJC and previously discussed within this section, the method of water balance presented below is the most reliable approach in estimating the degree of connectivity or groundwater exchange between the two aquifers. However, to provide further analysis and verification, a second evaluation of connectivity between the SRA and the CVA, the Darcy flux method, is also presented.

Water Balance

A water balance is the net groundwater storage resulting from the difference between recharge into the September Ranch basin and the expected water production and outflow or rejected groundwater from the September Ranch basin to the CVA. More specifically, a change in groundwater storage equals the inflow minus the outflow; thus the change in groundwater storage in the basin equals recharge to the September Ranch basin minus usage and runoff within that basin.

KJC performed an independent analysis of site-specific recharge based on rainfall data collected at the San Clemente Dam, as discussed previously within this section (see Table 4.3-2). The water balance analysis was performed for the extended drought years of 1988 through 1991 and for the average rainfall water years of 1996 and 1997. KJC notes that water balance calculations are based on recharge and outflow data and do not require actual water levels in the analysis. Yearly total inflow or recharge is distributed into four quarters or seasons and as discussed previously, it has been reduced to account for runoffs. The yearly outflow is the project demand of 57.21 AFY. Total flow than represents available groundwater in storage and flow between the SRA and the CVA given the right conditions.

As previously discussed, recharge to the basin is reduced to account for runoffs. Table 4.3-7 provides a summary of yearly total flow or change in storage in acre feet. The cumulative drawdowns are calculated as fall or rise of the water table per unit change in aquifer storage; values are carried over from one season to another in the course of a water year. The drawdown (negative signs) or water level rise (positive values) are based on a specific yield (S_y) of 0.33, derived from a Neumann solution of the 1992 Well C aquifer test data. The Neumann solution is used in unconfined aquifers (Kruseman and de Ridder 2000). Predicted changes for water levels are summarized Table 4.3-7.

Table 4.3-7: Predicted Water Level Changes in the September Ranch Aquifer

Average Rainfall Years	Inflow (AF)	Outflow (AF)	Total Flow (AF)	Cumulative Drawdown (ft)	Below Average Rainfall	Inflow (AF)	Projected Usage	Total Flow (AF)	Cumulative Drawdown (ft)
1996	262.1	-57.21	204.9	13.73	1987	65.5	-57.21	8.3	0.56
1997	244.0	-57.21	186.8	26.32	1988	65.9	-57.21	8.7	0.59
—	—	—	—	—	1989	76.4	-57.21	19.2	1.29
—	—	—	—	—	1990	78.0	-57.21	20.8	1.40
—	—	—	—	—	1991	81.9	-57.21	24.7	1.66
Source: Kennedy/Jenks Consultants December 2004.									

In either the average water year or below-average water years, the exceedance of natural recharge over use can have two effects: 1) potentially generates a net gain in storage or 2) excess groundwater as rejected flow into the CVA. The calculated cumulative water level increase suggests that groundwater storage will not be depleted even in drought years. These estimates of water level increases are generally consistent with groundwater measurements taken in the field, meaning even in below average rainfall periods the water levels have not been observed to fall significantly. Therefore KJC suggests that the estimated water level increases and their consistency with field data serve as ground-truthing parameters for a water balance.

The total flow or net gain in storage in water years with average rainfall suggests that there is between 187 and 205 AFY of water that is available for exchange between the SRA and CVA (that is, to flow from the SRA to the CVA). In extended drought periods, there is approximately 8 to 25 AFY of available rejected flow for exchange. These two sets of storage results categorically suggest that in either normal or drought precipitation periods pumping the projected project demand from the SRA will not result in a reduction of groundwater storage volume in the CVA.

KJC concurs with the analysis presented in Todd (1992) and Todd (1997), that in average rainfall years and above average rainfall years the CVA and SRA would be in equilibrium, meaning that both aquifers would have insignificant net flow between them (Todd 1997). This is because the independent sources of recharge to both aquifers meeting or exceeding the water demand in both systems. KJC believes based on current calculations that this is valid for the project pumping scenario of 57.21 AFY where the amount of recharge is estimated to be between 244 and 262 AFY in average rainfall years and 65 to 81 AFY in below average years (see Table 1 in Appendix C of this Draft REIR), which still exceeds the project's estimated demand of 57.21 AFY and, as discussed below, the total demand of the SRA (57.90 AFY). Therefore, the effect of pumping in the September Ranch basin in average rainfall years does not impact the CVA significantly because recharge to the SRA exceeds groundwater usage in the September Ranch basin. The effect of pumping in the September Ranch on the CVA basin in drought years is also not considered to have a significant impact because recharge to the SRA is likely to remain an average of 73 AFY, well in excess of planned total usage of 57.90 AFY by all wells within the SRA.

Darcy Flux

The purpose of the following analysis is to present another method of calculating groundwater exchange between the two aquifers. The specific benefit in the following is to provide an independent check on the seasonal variability of limited groundwater exchange between the two aquifers. It is noted that the calculated volume of groundwater exchanged as Darcy Flux is less reliable in this situation than those presented above because of the uncertainty in the hydraulic conductivity value of 0.14 gal/day/ft^2 estimated for the Qoa_2 aquifer unit. Nonetheless, the reason for and the advantage in these flux calculations in this method is that they are dependent on the seasonal variability in groundwater levels; whereas, the above analysis only accounts for the difference between inflow and outflow, yearly seasonally. It is noted that the calculated volume of groundwater exchanged as Darcy Flux is less reliable in this situation than those presented above because of the uncertainty in the hydraulic conductivity value of 0.14 gal/day/ft^2 estimated for the Qoa_2 aquifer unit. Again, the purpose of this analysis is to independently check the relative variability in groundwater exchange between the two systems.

The hydrostratigraphic details of connectivity between the SRA and CVA was discussed previously in this section. The following focuses on the hydraulic exchange of groundwater between the two systems. As identified, flow of groundwater is typically from the SRA towards the CVA for both average and below average rainfall periods. Groundwater flow from the CVA to the SRA is probably rare and would require specific combined conditions such as an aquifer test where a well in the SRA is pumped at a high flow rate aquifer test and a concurrent rainfall event (conditions met during the 1996/1997 aquifer test) (see Section 3.4.1 in Appendix C of this Draft REIR).

Calculations of the groundwater exchange based on Darcy flux (Freeze and Cherry 1987) is discussed below using the groundwater gradient information discussed in the previous section (see Table 5 of Appendix C for details and assumptions used for the Darcy calculations). The Dupuit formulation of Darcy flux (Fetter 1994) was used for the unconfined groundwater in the Qoa_1 water-bearing zone due to its variable gradients across the section M-M' (see Exhibit 4.3-4a through Exhibit 4.3-4c). Groundwater flux for the Qoa_2 was provided by Darcy's equation:

$$Q = K\ i\ A, \text{ where}$$

Q is the Darcy flux (AFY), K is the hydraulic conductivity of the water bearing material (gallons per day per square–foot), i is groundwater gradient (ft/ft) across the profile M-M', and A is the cross-sectional area of the profile M-M' (ft^2).

Hydraulic conductivity values (K) represent the degree of transmissiveness of groundwater in a particular permeable material. The K-values used in this study were derived by Todd (1997) from the 1996/1997 aquifer test. The pumping test yielded only the K-value for the Qoa_1 aquifer of 28.0 gal/day/ft^2. The K-value for the Qoa_2 was derived from a permeameter test of a single core, which yielded a value of 0.14 gal/day/ft^2. These values were used to calculate flow across the two systems.

The groundwater gradient (i) and cross-sections area (A) are dependent on the fluctuations in seasonal water levels. Table 4.3-8 is a summary of groundwater exchange rates in terms of Darcy flux between the SRA and CVA in acre-feet per quarter (AFQ).

Table 4.3-8: Groundwater Exchange Rates

Season / Quarter	Q (AFQ) for Qoa_1 Average Rainfall	Q (AFQ) for Qoa_2 Average Rainfall	Q (AFQ) for Qoa_1 Below Average Rainfall	Q (AFQ) for Qoa_2 Below Average Rainfall	Q (AFQ) for Qoa_1 Below Average Rainfall	Q (AFQ) for Qoa_2 Below Average Rainfall
	Water Year 1998	Water Year 1998	Water Year 1999	Water Year 1999	Water Year 1989	Water Year 1989
Fall	0.0	-0.0046	0.0	-0.0057	0.0	-0.0408[a]
Winter	-0.4995	-0.0213	-0.0566	-0.0077	—	—
Spring	-0.1026	-0.0108	-0.0180	-0.0070	—	—
Summer	-0.0257	-0.0074	0.0	-0.0136	—	—
Annual Total (AFY)	-0.6278	-0.0441	-0.0746	-0.034	—	—
Annual Total for Combined Qoa_1 and Qoa_2 (AFY)	—	-0.6719	—	-0.1085	—	-0.0408

Note: negative sign indicates groundwater flow from the SRA to the CVA. Q values are in acre-feet per quarter (AFQ).
[a] Well D was installed after 1989, so water level data is not available. Water levels and flux assumed constant for all four quarters.
Source: Kennedy/Jenks Consultants, December 2004.

These results suggest that exchange of groundwater between the two systems is greatest in the spring months, primarily through Qoa_1, with up to 0.4995 AF for three months. The least exchange occurs in the fall months.

Results of the Darcy calculations also suggest that the overall exchange of groundwater in the Qoa_2 is extremely small, with a maximum amount of 0.04 AFY in the average rainfall years. This low volume of exchange between the two systems can be attributed to the ridge of Qoa_2 separating the SRA and CVA and the low hydraulic conductivity of the Qoa_2. Groundwater must flow over the ridge of Qoa_2 or through it, thus; in either case, flow is both impeded and constricted moving between the SRA and CVA. This is supported by the Darcy results of no flow in Qoa_1 in the fall months. Specifically, groundwater levels in Qoa_1 must be higher than the top elevations of the Qoa_2 in the area of M-M' to achieve appreciable rejected flow to and from the CVA. In the fall months, storage is depleted and water levels (40 to 41 feet AMSL) fall one to two feet below the top of the Qoa_2, which is at approximately 43 feet AMSL. As a result, the Darcy flux through the Qoa_1 is zero for the fall months and summer months of water year 1999.

Due to the uncertainty in the hydraulic conductivity values for the Qoa_2, KJC believes this methodology is unreliable for estimating actual volume of groundwater exchange between the SRA and CVA based on calculations of Darcy flux. The Darcy estimates of exchange are on the order of 0.6 to 1 AFY which in the opinion of KJC is unrealistically minor. Therefore, KJC places greater confidence in the results of the water balance (groundwater exchange) between the two systems with the values stated above of 182 to 201 AFY. Therefore, while the project's demand of 57.21 AFY will reduce the recharge to the CVA it will not substantially deplete or degrade water resources and it can be accommodated by the resources available in the CVA without affecting senior water right holders (see Section 4.3.1 and the impact discussions below). Moreover, as also discussed in Section 4.9, Biological Resources of this Draft REIR, KJC concludes that impacts on biology can be a result of a prolonged or permanent decrease in baseflow due primarily to prolonged draught condition. Since a river baseflow is directly proportional to the amount of surface outflow and that the volume of surface outflow in the CVA is much larger than the amount of groundwater diverted for use by the project, it follows then there would be an insubstantial change in the baseflow of the Carmel River due to the relatively small amount of loss from project usage.

***Less than Significant Impact – Use of Water in a Wasteful Manner*:** As identified in the thresholds of significance, the project is considered to have a significant impact if it is considered to use water in a useful manner. While this is not a CEQA standard identified in Appendix G of the CEQA Guidelines, the 1998 Final EIR addressed this issue; thus it will be addressed within this REIR.

The proposed project will result in the development of 94 market rate residential units and 15 inclusionary housing units that will utilize approximately 57.21 AFY of water. Conversely, the project site as it currently exists with 2 residential units, utilizes 99 AFY. Thus, in relation to current conditions, project implementation will provide greater housing opportunities while reducing onsite water usage by 41.79 AFY. This reduction is primarily achieved by irrigating pasture lands with treated wastewater rather than potable water. In addition, as discussed in Section 4.5 of this REIR, wastewater that is not reclaimed onsite may be conveyed to the Carmel Area Water District's (CAWD) water recycling plant for eventual release into the Carmel Valley Lagoon. Presently, during the summer and fall months the lagoon waters are at critically low levels, which jeopardize the survival of the lagoon's steelhead populations. With additional wastewater flows, such as those from the project, CAWD will have a greater opportunity to and release more wastewater. Therefore, not only does the project reduce the water demand in relation to the existing demand levels, it also provides greater opportunity to allow for beneficial reuse. Therefore, the proposed project is not considered to use water in a wasteful manner. Affects upon increased pumping within the CVA and the sustainable yield of the SRA are discussed in greater detail below.

***Less Than Significant Impact - Result in a Yield in the Groundwater System that is not Sufficient to Provide the Project Water Demand on a Long-Term Basis or During Droughts or Decreases the Availability of Groundwater to Existing Users of the Same Groundwater Basin*:** The project's sustainable yield is the amount of water that can be extracted from storage in the September Ranch basin without affecting other users with senior water rights on a long-term basis. KJC concludes, based on the estimated amount of yearly recharge, that a conservative estimate of groundwater available long term from the SRA during normal rainfall periods is about 244 to 262 AFY for all users within the SRA. These values (244 and 262) are primarily calculated based on the 70 percent ET loss over a 561-acre watershed for average rainfall periods. KJC also estimates that a conservative amount of 65 AFY to 81 AFY of groundwater is available for all wells within the SRA based on an 85 percent ET loss for extended below average rainfall periods. With the exception of SR1, wells within the SRA with production records are listed in Table 4.3-9.

Table 4.3-9: SRA Wells Production Levels

Other Production Wells Within the SRA	Production Rate (AFY)
Tarantino (Todd, 1997)	0.35
Campisi (Todd, 1997)	1.3
Spicher (Todd, 1997)	0.5
Steine (Todd, 1997)	0.5
Total Production Four Wells (MPWMD, 1993)	0.88
Total Production Four Wells (MPWMD, 1995)	0.79
Total Production Four Wells (MPWMD, 1996)	0.62
Average Total Usage	**0.76**
Source: Kennedy/Jenks Consultants, December 2004.	

The sustainable yield for the project is then the available amount of groundwater minus the usage of these four known domestic wells. The sustainable yield calculations are summarized in Table 4.3-10. below.

Table 4.3-10: Sustainable Yield Summary

	Available Groundwater in the SRA[1] (AFY)	Average Usage of Other SRA Users (AFY)	Project Sustainable Yield[2] (AFY)
Average Precipitation Period	244 - 262	0.76	243 - 261
Below Average Precipitation	65 - 81	0.76	64 - 80

Notes:
1 Based on total recharge within the September Ranch watershed;
2 Project sustainable yield is the amount of naturally available groundwater in SRA minus the current total usage by other SRA users.
Source: Kennedy/Jenks Consultants, December 2004.

As shown in Table 4.3-8, the estimated average amount for other SRA users is 0.76 AFY; with the inclusion of the project's demand of 57.21 AFY, the total groundwater demand for the SRA is 57.90 AFY. The estimated annual recharge in average rainfall years ranges from 244 to 262 AFY and in drought years ranges from 65 to 81 AFY. Subtracting the average use of other wells in the SRA from the recharge indicates the sustainable yield for the project in average rainfall years is 243 to 261 AFY and in drought years is 64 to 80 AFY. The estimated water use for the project at build-out is 57.21 AFY, and therefore, the project's water use is within the sustainable yield for the SRA including the project and other users.

The effect of pumping in the September Ranch basin in average rainfall years does not impact the CVA significantly because recharge to the SRA exceeds groundwater usage in the September Ranch basin. The effect of pumping in the September Ranch on the CVA basin in drought years is also not considered to have a significant impact because recharge to the SRA is likely to remain an average of 73 AFY, well in excess of planned total usage of 57.90 AFY by all wells within the SRA.

As discussed under 4.3.2, Overview of Conclusions Regarding Water Rights of September Ranch, based on the 45 year CVSIM simulation results provided, the water balance in AQ3 is such that the average difference between the inflow and the outflow is about 7,500 AFY. During the 1984 – 1991 dry period, the average difference between the inflow and the outflow in AQ3 is about 6,800 AFA. When compared to the approximately 2,705 AFA that is needed to meet the estimated maximum annual use in AQ3 described above, it appears that sufficient groundwater is available in storage in AQ3 on average as well as during a dry period to meet the needs of the riparian and pre-1914 appropriative rights holders in addition to the 57.21 AFY required to support the September Ranch project. Therefore, since there appears to be sufficient water in AQ3 with excess flow to meet the needs of the riparian and pre-1914 appropriate rights holders, pumping in the SRA will not have significant effect on water rights holders in AQ3. Moreover, the analogous analysis of the 45-year CVSIM simulation results provided for AQ4 indicates that the average difference between the inflow and the outflow is about 2,500 AFY. During the 1984 – 1991 dry period, the average difference between the inflow and the outflow in AQ4 is about 2,300 AFA. When compared to the approximately 1,845 AFA that is needed to meet the estimated maximum annual use in AQ4, it appears that sufficient groundwater is available in storage in AQ4 on average as well as during a dry period to meet the needs of the riparian and pre-1914 appropriative rights holders. Therefore, since there appears to be sufficient water in AQ4 with excess flow to meet the needs of the riparian and pre-1914 appropriate rights holders and there is sufficient supplies to meet the project's demands of 57.21 AFY, pumping in the SRA will not have significant effect on water rights holders in AQ4.

Hence, since there appears to be sufficient water on aggregate in AQ3 and AQ4 to meet the needs of the riparian and pre-1914 appropriate rights holders with and excess to meet the additional water demands of the SRA, the project will not have an effect on those water rights users. Moreover, potential spillage from the SRA is not needed to meet the maximum use in AQ3 and is likely to be part of excess outflow from AQ3 to AQ4. KJC concludes then any reduction in rejected flow (spillage) from the SRA will not have significant affect on the Carmel River and its underlying aquifer. This conclusion is further supported by the fact that actual use is often much lower than that cited for submittal to the SWRCB.

Less than Significant Impact - Increase in Pumping Demand on the Carmel Valley Aquifer: The above conclusions regarding sustainable yield centers of the finding that the September Ranch basin is fairly isolated in terms of hydrogeology with limited exchange of groundwater between the SRA and CVA largely because of the approximate neutral gradient between them and the high ridge of relatively impermeable material. KJC has taken into consideration that the CVA AQ 3 collocates with the westernmost portion of the SRA west of the knoll. This portion of the CVA occupies about 35 percent of the total SRA aquifer and is the most productive portion of the SRA. Additional pumping wells would most likely be proposed in this area due to the presence of the relatively thick Qoa_1 water bearing unit, as compared to water bearing zones encountered elsewhere in the September Ranch basin.

Even with planned future additions of pumping wells in this portion of the SRA, and given that the project usage limit is 57.21 AFY, it is likely that the groundwater in the SRA and CVA would maintain similar water levels – i.e. near neutral gradient. There are two contributing factors to the sustained neutral gradient with project demand: 1) groundwater levels have always been slightly higher in the SRA than the downgradient CVA due to the SRA watershed's higher topography and hence flow towards the CVA; and 2) the relatively small usage in the SRA compared to the large amount of storage in AQ3 of the CVA.

The groundwater gradient between Well E in the SRA and the Brookdale Well in the CVA are typically around 0.0020 ft/ft, with flow towards the CVA. KJC concludes, based on the water balance, that it is unlikely that the proposed usage of groundwater in the SRA would induce further declines in water levels in neighboring wells.

The effect on the CVA water resources must also be assessed in terms of overall surface-water outflow from the CVA; more specifically as to this project, this Draft REIR must examine water coming out of AQ3 and AQ4. The amount of annual outflow as reported in the CVSIM model is an indicator of the Carmel River baseflow. The CVSIM model calculates baseflow whenever the storage capacities in AQ1 through AQ4 are exceeded. In the CVA, groundwater storage is normally exceeded during peak flow months from December through May. The baseflow then determines the amount of surface-water and groundwater (subsurface) outflows on a monthly basis in each of the CVA aquifer units.

The average surface outflows in normal precipitation years (e.g. 1996 and 1997) are 91,849 AF in AQ3 and 90,830 AF in AQ4 (CVSIM data). Surface outflows during below normal rainfall years (e.g. 1987 through 1991) are 7,530 AF in AQ3 and 6,149 AF in AQ4. The years 1987 through 1991 are considered as critically dry years when the groundwater storage in the CVA was recorded at its lowest volume since 1981 (see Table 3 in Appendix B of Appendix C of this Draft REIR). The driest year was 1990 with surface flows declining to 2,554 AF in AQ3 and 1,315 AF in AQ4. CVSIM data indicate that outflows in the CVA during the summer months of June through November 1990 are mostly of subsurface nature (i.e. groundwater) and which notably did not diminish as compared to normal rainfall years. Surface-water flow in 1990 did decline and its occurrence was restricted to the winter months from December through May, similar to normal rainfall periods.

Project design features are included in the project to ensure that any future pumping wells in the September Ranch basin should be located based on long-term pumping tests designed and executed appropriately to yield information on the radius of influence of potential multiple pumping wells. In addition, the project applicant will ensure that representative transmissivities for the three aquifer units (Qoa_1, Qoa_2, and Tm) will be made available for informed decisions on placement of future wells so as to minimize their effects on neighboring wells (particularly in the westernmost project area where the two aquifers are in direct hydraulic contact). Moreover, prior to the issuance of permits for future groundwater pumping wells, as required, the County of Monterey will review and approve well site plans to ensure the insertion of new wells will not have an impact on nearby wells.

Thus, KJC concludes that a long term deficit of 57.21 AFY due to project demand in the SRA would not have a significant effect on the much larger volume of surface-water outflows in the CVA during normal and below average rainfall years.

Consistency with Relevant Plans and Polices

The following policies of the Carmel Valley Master Plan (CVMP) are applicable to the proposed project:

CVMP Policy 6.1.3: All beneficial uses of total water resources of Carmel Valley and its tributaries shall be considered and provided for in future planning decisions.

CVMP Policy 6.1.4: Pumping from the Carmel River aquifer shall be managed consistently with the Carmel River Management Program. Any drawdown of the aquifer, which threatens natural vegetation in the judgment of the Monterey Peninsula Water Management District or its successors, must be accompanied by a program of irrigation with the affected area.

CVMP Policy 26.1.22: Developed areas should be evaluated in light of resource constraints especially the water supply constraint addressed in Policy 54.17 (CV) and the character of each area. No further development in such areas shall be considered until a need is demonstrated through public hearings.

CVMP Policy 54.1.7: The County of Monterey supports the new San Clemente dam project or some other water project as a means of assuring an adequate supply of water for future growth in the Carmel Valley. Without additional supplies, development will be limited to vacant lots of record and approved projects. All development, which requires a water supply shall be subject to County adopted water allocation and/or ordinances applicable to the lands in the Carmel Valley Master Plan area. This is the Low Growth Alternative addressed in the Final SEIR 85-002.

Consistency Analysis: Consistent with the CVMP, the hydrogeologic reports prepared by KJC, considered the effects on the Carmel River surface and groundwater system and has included design features to insure impacts remain less than significant. The proposed project does not have a water authorization from the County of Monterey and no water is available for this project in the County's allocation. Rather, consistent with the CVMP, the proposed project will pump groundwater from the SRA for potable water needs. The September Ranch basin is isolated in terms of hydrogeology with limited exchange of groundwater between the SRA and CVA largely because of the approximate neutral gradient between the two systems. Even with planned future additions of pumping wells in this portion of the SRA and the project usage limit of 57.21 AFY, it is likely that the groundwater gradient between the SRA and CVA will maintain its near neutrality because of the relatively small usage in the SRA and the large amount of storage in the CVA available for underflow into the SRA. The effect of pumping in the September Ranch basin in average years will not affect the CVA significantly because recharge most likely exceeds usage. The effect of pumping in the September

Ranch basin in drought years on the CVA is also minimal because recharge will most likely exceed the planned usage of 57.21 AFY. Therefore, no impacts on natural vegetation would occur.

In accordance with the CVMP, the project will be the subject of public hearings by the Monterey County Subdivision Review Committee, the County Planning Commission, and the County Board of Supervisors.

4.4 Hydrology and Water Quality

This section presents the results of the preliminary drainage report prepared for the proposed project by Whitson Engineers (June 3, 1996). The study describes the approximate peak rates of discharge for the watersheds in the project site and recommends a drainage infrastructure to capture and discharge surface runoff. The report and a peer review provided by Monterey Bay Engineers for the previous FEIR (June 15, 1996) is incorporated by reference and is on file and available for public review at the Monterey County Planning and Building Inspection Department.

4.4.1 Environmental Setting

Watersheds

As shown on Exhibit 4.4-1, the primary drainage basins associated with this project are identified as watersheds A, B, C, D, and E. The terrain within these individual watersheds is predominantly hilly with slopes varying from 30 to above 50 percent. As one moves southward across the project site, the terrain becomes gentler and ultimately level as one approaches Carmel Valley Road.

Watershed A is comprised of approximately 202 acres of land. The total amount of land in the watershed is approximately 850 acres, most of which is located in Jacks Peak County Park to the north, and Del Mesa Carmel to the west. Drainage from Watershed A generally flows south through Roach Canyon, passing under Carmel Valley Road through a 36-inch corrugated metal pipe (CMP). This 36-inch pipe ultimately connects with a 48-inch storm drainpipe, which runs along Bonita Way through and extending to the Carmel River.

Watershed B is 136 acres in size and has two culverts, a 24-inch CMP and an 18-inch CMP, which provide for drainage under Carmel Valley Road. More specifically, storm water flows through the 24-inch CMP then along a ditch parallel to Carmel Valley Road extending to Canada Way. The 24-inch storm drainpipe continues along Canada Way, under Brookdale Drive, eventually daylighting into the Carmel River. Additionally, storm water flows through the 18-inch CMP under Carmel Valley Road and along a ditch parallel to Carmel Valley Road extending to Pancho Way. A 30-inch storm drain continues to carry the flow along Pancho Way, under Brookdale Drive, and to the Carmel River.

Watershed C is made up of approximately 230 acres. The upper reach of the watershed, 70 acres, is located outside of the project site, extending into Jacks Peak County Park and the Monterra subdivision. Currently, no storm drainpipes exist within this watershed to carry flow from the site, under Carmel Valley Road, to the Carmel River. Storm water that reaches Carmel Valley Road is diverted west along the roadside ditch to the 18-inch CMP located in Watershed B.

Watershed D contains approximately 67 acres. Storm water flows from this watershed drain beneath Carmel Valley Road, through an existing 36-inch CMP. This drainage extends through a 15-inch concrete pipe located along Brookdale Drive to Paseo Robles continuing through a 36-inch CMP along Brookdale Drive, under Glen Place, and through to the Carmel Valley River.

Watershed E is comprised of approximately 210 acres. It is part of a large 2,100-acre basin, which is located predominantly in the Monterra subdivision and the Canada Woods subdivision. Storm water runoff in this watershed flows south through Canada de la Segunda Canyon to Carmel Valley Road.

It then extends easterly along Carmel Valley Road to an 18-inch CMP under Carmel Valley Road, across agricultural land to the Carmel River. Drainage improvements that extend from Carmel Valley Road to the Carmel River, for this watershed, are part of the requirements for the adjacent Canada Woods subdivision.

Existing Hydrology

In agreement with the Monterey County Water Resources Agency, the preliminary drainage report utilized the Soil Conservation Service (SCS) TR-55 method for determining the stormwater runoff generated from the individual watersheds described above. The SCS TR-55 method takes into account many significant factors such as local precipitation patterns, basin area, length and slope of channel, configuration, ground cover, soil type, degree of urbanization, and most importantly, infiltration and runoff.

The estimated pre-development peak runoff flows for the respective watersheds were computed by Whitson Engineers as part of their preliminary drainage report and are provided in Table 4.4-1.

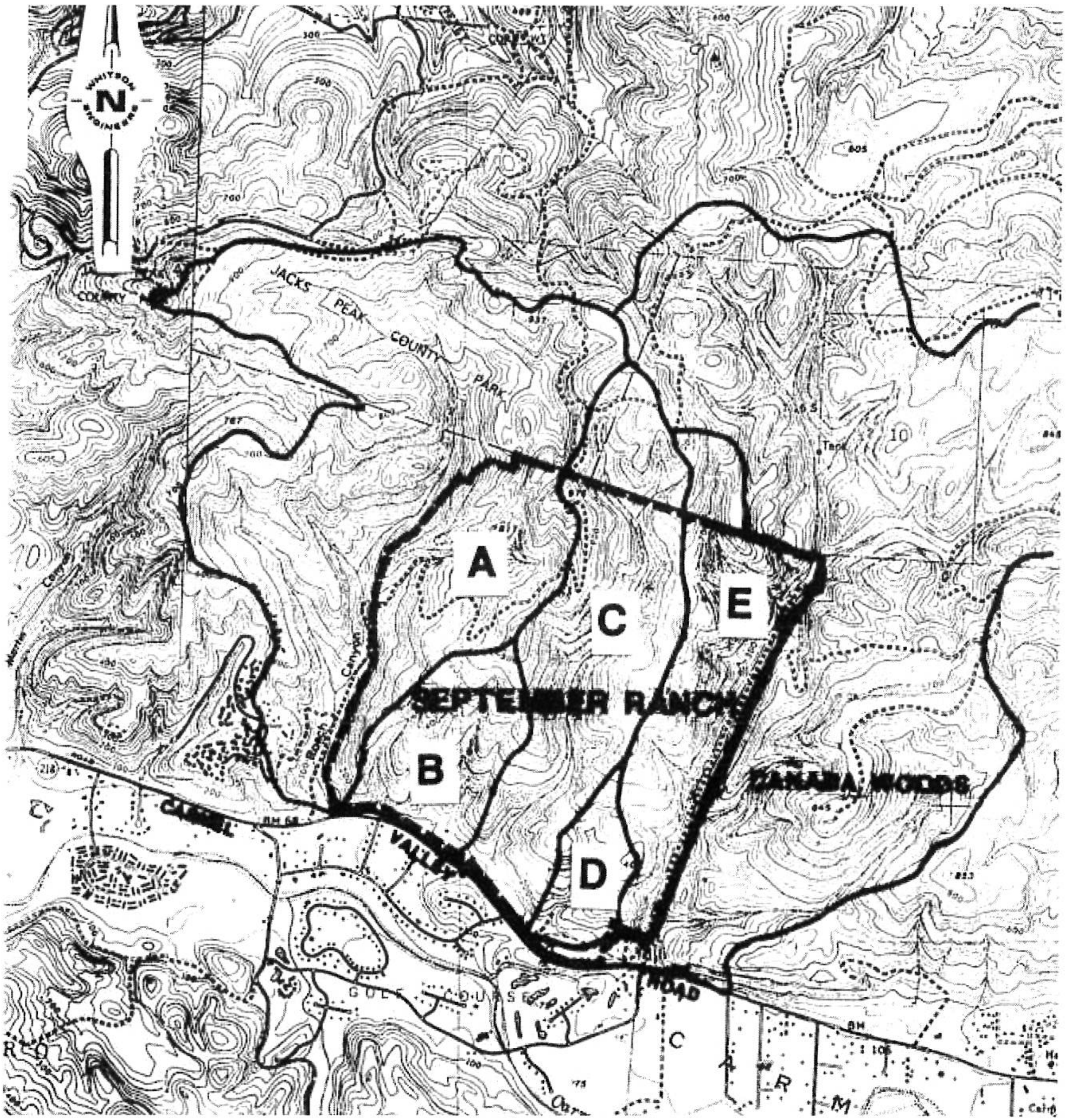
Table 4.4-1: Pre-Development Peak Storm Discharges

Location	Estimated Pre-Development Flows
Watershed A	Q_{10} = 3.0 cfs Q_{100} = 36.9 cfs
Watershed B	Q_{10} = 2.1 cfs Q_{100} = 31.1 cfs
Watershed C	Q_{10} = 4.0 cfs Q_{100} = 47.8 cfs
Watershed D	Q_{10} = 1.0 cfs Q_{100} = 16.0 cfs
Watershed E	Q_{10} = 2.9 cfs Q_{100} = 34.8 cfs

Q_{10} = estimated 10 year peak flow.
Q_{100} = estimated 100 year peak flow.
Source: Whitson Engineers, June 1996.

Flooding

According to the CVMP EIR, substantial portions of the Carmel Valley lie within the 100-year flood plain of the Carmel River. During the past 50 years, several major floods have occurred along the Carmel Valley River. The largest of these floods was in March 1995, which caused extensive flooding near Highway 1 and Rio Road. The entire project is located within Zone C, defined as areas of minimal flooding, as shown on FEMA Flood Insurance Rate Map 060195-0185 D.



Source: Whitson Engineers, November 2004.

1800 900 0 1800
SCALE IN FEET

Michael Brandman Associates

Exhibit 4.4-1
Watershed Map

Water Quality

Surface Water Quality

The Federal Water Pollution Control Act, also referred to as the Clean Water Act (CWA), states that discharge of pollutants into waters of the United States from any points source is unlawful unless the discharge complies with the National Pollution Discharge Elimination System (NPDES) permit. Section 402(p) of the CWA establishes a framework for regulating municipal and industrial storm water discharges under the NPDES program. The NPDES program is administered by the California Regional Water Quality Control Board (RWQCB). Locally, the Central Coast RWQCB is responsible for determining the County's compliance with the water quality requirements of the CWA.

General Construction Activity Storm Water NPDES permits are issued for storm water discharges by the RWQCB. Construction activities that may be subject to this general permit include clearing, grading, and disturbances to the ground such as stockpiling or excavation that result in soil disturbances. Storm water pollution prevention plans are required for issuance of a construction NPDES permit and typically include both structural and non-structural Best Management Practices (BMPs) to reduce water quality impacts.

Groundwater Quality

Water samples were collected in 1991 from SR1 by Monterey Peninsula Water Management District (MPWMD) during pumping tests of the Old Hatton Well and in 1992 by the property owner of a new well referred to as SR1. These samples were subjected to analytical testing from general mineral, physical, and inorganic constituents.

Water from SR1 can be characterized as calcium-bicarbonate type water. The analytical data area is summarized in Table 4.4-2 and compared with the analytical results from three of Cal-Am's wells in the Carmel Valley; Cypress, Carlos, and Canada. Substantial chemical differences exist between the Cal-Am wells and SR1. Notably, iron and manganese concentrations are substantially greater in the Cal-Am wells than in SR1; calcium, chloride, alkalinity, and electrical conductivity (EC) are higher in SR1. Moreover, TDS, iron, and manganese exceed the federal and state drinking water standards of 500 parts per million (ppm), 0.30 ppm, and 0.05 ppm, respectively for SR1. Therefore, groundwater from the SR aquifer would need to be treated prior to distribution.

Table 4.4-2: Comparison of Water Quality Parameters

Parameter	SR1 (avg. of 3 samples)	Cal-Am Wells (avg. of 3 wells)
Calcium	159.00	111.00
Magnesium	38.00	34.00
Sodium	110.00	—
Potassium	5.00	—
Bicarbonate	424.00	—

Table 4.4-2 (Cont.): Comparison of Water Quality Parameters

Parameter	SR1 (avg. of 3 samples)	Cal-Am Wells (avg. of 3 wells)
Sulfate	198.00	—
Chloride	164.00	44.00
Hardness	552.00	—
Alkalinity	347.00	156.00
pH	7.60	6.90
EC	1,336.00	971.00
TDS	965.00	—
Nitrate	1.10	1.30
Iron	0.47	4.40
Manganese	0.36	0.67
Fluoride	0.73	—
All values in parts per million (ppm). Source: Todd Engineers, December 1992.		

4.4.2 Project Impacts

Impact Analysis and Mitigation Measures

Standards of Significance

The proposed project is considered to have a significant impact upon hydrology and water quality if:

- It causes increased runoff to exceed capacity of storm drain facilities or cause downstream or offsite drainage problems;
- It causes increased runoff to result in potential water quality degradation or lead to a significant increase in erosion and sedimentation;
- It will substantially degrades groundwater quality; or
- It will be constructed within a flood hazard zone.

Potentially Significant (Hydrology and Water Quality Impact 1) - Storm Water Runoff and Drainage: Implementation of the proposed project will result in the conversion of relatively undeveloped areas of the September Ranch site to residential uses. This transition of land use will result in previously pervious land being covered with impervious surfaces such as roads, driveways, and various structures (e.g., houses, patios, parking lots, etc.). Hence, the project is expected to modify the amount of runoff to existing drainage facilities, affecting the time it takes for runoff to peak or crest, potentially resulting in significant impacts to their operation. As expected, peaks in runoff will occur sooner under developed conditions compared with undeveloped conditions.

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and improvements including, but not limited to, development of roads, water tanks, water system, and drainage detention areas; 6) a Use Permit for an exception to General Plan Policy 26.1.10 to allow development on slopes greater than 30 percent for subdivision infrastructure and improvements; and 7) an Administrative Permit for inclusionary housing, equestrian center caretaker unit /public office, a tract sales office and security gatehouse.

Please see page 6-44 of the Recirculated Draft REIR for a discussion of the potential impacts of the 73/22 Alternative.

MR-17: Water Demands

For purposes of environmental review of the proposed September Ranch project, the County evaluated water demand information provided by the Monterey Peninsula Water Management District ("Water Management District," "District" or "MPWMD") for two existing subdivisions, Monterra and Pasadera, within the District's service area.. These two subdivisions were selected for evaluation based on the recommendation of the Water Management District and due to the lack of actual, reliable water use data for other developments within the District.

As outlined below, the demand information for these subdivisions is consistent with the projected demand for the proposed September Ranch project as presented in the Draft Revised Environmental Impact Report for September Ranch (Dec. 2004) and the Recirculated Portion of the Draft Revised Environmental Impact Report for September Ranch (Feb. 2006) ("Recirculated Draft REIR"). The information does not implicate any new impacts, much less significant impacts, not already described in the Recirculated Draft REIR.

The Recirculated Draft REIR concludes impact of project water demand on the resources of water availability/supply, the health of local groundwater basins, and water-related biological resources is less than significant. Consequently, CEQA does not require imposition of mitigation measures for these resource areas. However, the County may impose conditions of approval to provide additional environmental protection and controls under its police power, to respond to public concerns and to account for uncertainty. Accordingly, to accommodate public concern and to provide additional environmental protection, if the project is approved the County intends to impose an overall water use limit as a condition of approval to ensure the project would stay within the demand figure analyzed in the Recirculated Draft REIR. This condition may be incorporated into the CEQA mitigation measures to ensure accurate public understanding of the project's water use parameters.

The following table presents water demand data for subdivisions as identified in the 1998 Final EIR:

Reference	Water Demand for Market Rate Units	Water Demand for Inclusionary Housing
Canada Woods Final EIR - 1993	0.379 AFY	0.167 AFY
Carmel Valley Master Plan EIR	0.416 AFY	0.169 AFY
Spanish Bay Resort EIR	0.28 AFY	0.16 AFY
Quail Meadows Subdivision EIR	0.414 AFY	N/A

Reference	Water Demand for Market Rate Units	Water Demand for Inclusionary Housing
Rancho San Carlos EIR	0.75 AFY	0.169 AFY

For purposes of the Recirculated Draft REIR and Final EIR, the County received updated demand data from the MPWMD, including actual consumption figures where available. The following section discusses the water use experiences at these two developments. The next section then discusses the water demand of the project including considerations related to water treatment, and conditions/mitigation measures proposed to control water demand at September Ranch.

MONTERRA

The following information is taken from the Annual Water Monitoring Program Report for Water Year 2005 (October 1, 2004 – September 30, 2005) for Canada Woods Water Company (including the former Monterra Ranch Mutual Water Company), Monterey County California (Feb. 15, 2006) ("Monitoring Report"), and other records provided by the Water Management District. The Monitoring Report is available in the September Ranch files at the County of Monterey, and from the Water Management District. Cal-Am Water Company does not provide the District with actual water consumption data by individual Cal-Am customer.

Market Rate Homes

Table 15 of the Monitoring Report demonstrates that over the last six years, the average annual water use within Monterra has been approximately 0.586 acre-feet per year ("AFY"), with water use starting low at 0.46 afy and 0.40 afy, increasing to 0.60 afy and 0.78 afy, and then steadily declining from 0.78 afy to 0.70 afy to 0.58 afy in WY 2005. The Monitoring Report demonstrates that average water use for market rate homes declined by about 17 percent in WY 2005 as compared with WY 2004. The drop in water use after 2004 is attributed to the startup of billing for water which began on June 1, 2005.

Inclusionary Housing

There was also an approximate 10 percent drop in water use rates for inclusionary housing in WY 2005 as compared to WY 2004. Table 16 of the Monitoring Report demonstrates that the average annual water use over the past eight years has ranged from 0.18 to 0.34, starting low at 0.18 afy (truncated reporting) and 0.23 afy and gradually increasing to a high of 0.34 in WY 2003 and WY 2004, and declining again to WY 0.30 afy in WY 2005. The average annual water use over the eight-year period for inclusionary housing at Monterra was 0.284 AFY.

Monterra is at approximately 10% build-out, and it was only until recently that the Public Utilities Commission approved water rates, and water use has decreased since metered billing was initiated. Monterra water use for inclusionary housing has been shown to be down about 15% and market rate housing water use is down about 33% since water billing went into effect. The Monitoring Report also suggests that initial planting and establishment of landscaping by property owners result in temporary higher water use amounts.

PASADERA

The following information is taken from Water Management District records, available in the September Ranch project files and from the Water Management District.

Standard and Structured Lots

At Pasadera, standard lots are permitted at a use of 0.569 AFY, and the District estimates actual average use at 0.458 AFY. Structured (inclusionary) housing is permitted at 0.302 AFY, and the District estimates actual average use at 0.320 AFY. Altogether, District records demonstrate that the average use per connection at Pasadera from 1999 to 2003 = 0.399 AFY

Pasadera demand concerns have largely focused on lack of enforceable conditions limiting water use, as well as problems with construction implementation (unpermitted laterals off irrigation pipeline, lining of golf course ponds preventing recharge). The District also reports a need to improve the format and consistency of reporting. Note that Pasadera includes golf course uses (which have high water use), whereas September Ranch would not.

QUAIL MEADOWS

In compiling the Recirculated Draft REIR and Final EIR, the County also reviewed information provided for permitted water quantities at the Quail Meadows Subdivision. MPWMD indicated that actual consumption data was not available for Quail Meadows. As noted in the Table above, the Quail Meadows EIR estimated market rate lots at 0.414 AFY. MPWMD's data indicates that the permitted quantities at Quail Meadow average approximately 0.726 AFY, but that this average represents a wide fluctuation of permitting from .316 AFY to 2.152 AFY. A key distinction between the Quail Meadows subdivision and September Ranch is that Quail Meadows does not operate under an enforceable cap as would September Ranch. Water-control measures would be adopted for September Ranch in order to correct issues that have arisen with past developments such as Quail Meadows. Because the permitted numbers do not reflect actual consumption data, and because Quail Meadows consumption is not controlled by limiting conditions of approval or mitigation measures, the County believes the permitted quantities have limited relevance to predicting demand at other subdivisions. To the extent the permitted quantities are relevant, because the lowest quantity is 0.316 AFY, the quantities demonstrate that it is reasonable to expect that market rate homes *can* build-out at a demand of 0.5 AFY or less, particularly where enforceable controls are adopted as proposed for September Ranch.

SEPTEMBER RANCH WATER DEMAND

Residential Uses & System Losses. The September Ranch project, as proposed, would include 94 market rate homes at 0.5 AFY (including landscaping, auxiliary units, and other uses) (0.5 AFY x 94 = 47 AFY) and 15 inclusionary housing units at 0.231 AFY (including landscaping) (0.231 x 15 = 3.47 AFY). The total residential use is 50.47 AFY, plus the baseline equestrian center use of 3 AFY. The Recirculated Draft REIR significance analysis would not be affected by small increases in these numbers; however, as discussed below, the County intends to impose a water use cap of 57.21 AFY on the project.

Service of water to the proposed project would also include two other types of water use: treatment losses and system losses. System loss is estimated at 7% consistent with the experience of County environmental health department. The amount of treatment loss depends on the treatment technology selected for the project. The maximum treatment loss is estimated at 15% of water use for one-stage reverse osmosis (RO) treatment, which was originally proposed by Questa Engineering. (Questa, 2006; see also Technical Memorandum No. 9 ("TM 9") attached as Appendix A.) Other potential treatment technologies include multi-stage RO and pellet softening. Each option has technological and cost considerations, discussed below.

Pellet Softening. Pellet softening processes are commonly used in European, Florida, and mid-Western U.S. water treatment projects, and have been pilot tested and evaluated in California at Soquel, Hollister, Cambria, Santa Paula, Oxnard, Valencia and other locations. Pellet softening targets the removal of calcium and bicarbonate by precipitation to produce a calcium-carbonate solid particle which forms a hard crystal upon a small sand grain. This provides concentrated dry granules of calcite which can be usually beneficially used to reduce soil alkalinity. Lime pellet softening is estimated to reduce TDS from 992 mg/l to about 480 mg/l and total hardness from 512 mg/l $CaCO_3$ to about 215 mg/l $CACO_3$. The iron and manganese in the water would be oxidized by aeration stripping and would be co-precipitated onto the calcite pellets, almost totally removing these constituents. Elevated PH would be likely to substantially reduce viable total coliform, which can further be destroyed by chlorination prior to filtration.

The capital cost of pellet softening-filtration is anticipated to be less than half the cost of an RO membrane system; and power, energy, and chemical costs of less than a quarter of RO costs. The largest savings would be in solids residue disposal costs as compared to brine.

As compared to RO reject stream of 9,000 gallons per day, reject stream of pellet softening filtration is less than 200 gpd. (.022 percent)

Multi-Stage RO. Under multi-stage RO, brine from the first stage is pumped to and treated by a second stage and in some cases a third stage. Reject water losses differ with RO stages. First stage RO has a 15% loss, second stage RO has a 10% loss, third stage RO with softening has a 5% loss, and third stage RO with crystallization has a 1% loss. Multi-stage RO would result in a 90% reduction in brine haul costs, however, there would be considerably greater capital and O&M costs.

Nanofiltration. Nanofiltration is an alternative membrane process used to remove 60-80% of hardness and as a result a substantial reduction of TDS, although treated water would be approximate 15 mg/l above CAWD's requirements. The overall water recovery would be about 90% for a one-stage process, and 97% for a two-stage process.

The County's Environmental Health Division reviewed the treatment alternatives during consideration of the Recirculated Draft EIR and has indicated that they would apply the following performance standards in approving a treatment method for the proposed September Ranch project:

- Indicia of treatment success (*e.g.,* successful application in similar community treatment facilities) to ensure protection of public health within relevant treatment standards;
- the method must be technologically feasible;
- the method must be economically feasible; and

- reject water quantity should be as low as possible in light of the above factors, within the range of 0% to 15%.

It is recognized that if treatment losses are as high as 15% it is possible that given the configuration of the proposed project, it is possible that demand at build-out theoretically could exceed 57.21 AFY. To address this issue, the County is proposing to impose a condition that would limit water use by the project to 57.21 AFY, and that would preclude additional units from being built once the water cap is triggered. Development would be phased appropriately to ensure build-out of inclusionary units.

WATER DEMAND CONCLUSIONS

As demonstrated by the Monterra and Pasadera discussions above, the September Ranch estimates of 0.5 AFY (market rate)/0.231 AFY (inclusionary) are well within the range of water use estimated and/or documented at the Monterra (0.586 AFY (and declining)/0.284 AFY (and declining) and Pasadera (0.458 AFY/0.320 AFY) subdivisions. The Monterra experience demonstrates that water use declines over time, and the decline is sharper when billing is initiated. The demand figures for the proposed project would decrease if an alternative is approved that includes fewer housing units or a different mix of housing units.

During the course of build-out of the September Ranch lots, it is anticipated that water use averages would fluctuate as homes are being built. Water use would also fluctuate in response to the different water demands for the individual homes, as well as other factors such as the implementation of water rates and/or initial planting and final establishment of landscaping. In this regard, studies demonstrate that drought-tolerant landscaping will use more water in the first few years to establish a sufficient root system and then where water is limited will survive on less water over time.

The lot owners would be building their own homes, and therefore the house sizes would vary; moreover, water use for landscaping would depend upon individual landscape plans. Thus it would be infeasible to assign a water use for each individual lot. However, an enforceable condition of approval that limits overall water use from the SRA to 57.21 AFY would ensure that the project does not exceed the total water allotment. Water Management District staff have indicated that having a condition of approval which limited overall water use on the project site would address the District's comments regarding water demand at September Ranch.

MR-18: Hydrology and Water Availability

This master response is prepared to address comments regarding hydrology and water supply in the Draft REIR dated December 2004 and the Recirculated Portion of the Draft REIR dated February 2006 ("Recirculated Draft REIR"). Clarifications presented herein are intended to address specific issues regarding potential impacts and the significance of those impacts on the baseline state of the Carmel Valley Aquifer (CVA) and on existing groundwater users in the CVA.

These discussions are intended to further clarify the analyses presented in the Recirculated Draft REIR of the following topics by referencing existing technical memoranda on impacts to the Carmel River (TM-5), cumulative impacts in a Project scenario (TM-6), and impacts to existing pumpers in the CVA (TM-7). The following responses are organized into four hydrology master response

(HMR-1 to HMR-4) issue topics and are intended to facilitate ease of reference in response to specific comments.

For purposes of the CEQA impacts analysis, because the Recirculated Draft REIR and Final EIR analyses conservatively assume a maximum impact equivalent to the actual project demand of 57.21 AFY (or, even more conservatively, approximately 71.5 AF total during an 19-month period in the context of extended drought periods of five years or more consistent with the historical record), the degree of connectedness between the CVA and SRA ultimately has little if any effect on the impacts analysis. The conclusion of limited connectedness results in the conclusion that the maximum potential impact is a conservative assumption that is not likely to occur except in very specific (and likely infrequent) hydrologic conditions, but because maximum impact is assumed, there would be no change in the impact analysis even if the conclusion regarding the degree of connectedness was assumed to be incorrect. In this regard, however, for the reasons presented in the Recirculated Draft REIR and outlined again below, KJC continues to believe that the most supportable conclusion is one of limited connectivity between the CVA and SRA.

HMR-1 - GROUNDWATER RECHARGE IN THE SRA

Water supply in and in the vicinity of the proposed September Ranch Subdivision, regardless of whether the supply is pumped from groundwater or diverted from surface water, is entirely dependent on precipitation and its percolation into available groundwater storage. More importantly, it is the efficiency of a watershed in its ability to replenish groundwater storage (also known as "recharge") that creates sustainability for existing uses of water and growth in consumptive use of water.

Drainage within the September Ranch watershed is fairly efficient because of the well-defined (high relief) ridges that influence the convergence/drainage pattern within the watershed. Generally, surface water flows relatively unimpeded to the terrace deposit lying adjacent to the base of the ridges. Efficient drainage means groundwater recharge in the SRA is also fairly consistent in that the basin quickly refills itself annually under both normal rainfall years, and during and after prolonged drought periods. Recharge is estimated by subtracting surface runoff and evapotranspiration (ET-loss) from precipitation on a monthly basis. Since the September Ranch watershed is a fairly closed hydrologic basin as defined by topography, surface runoff to adjacent watersheds is virtually nonexistent; hence, all runoff minus ET-losses are then available for recharge through infiltration and percolation into groundwater.

The Recirculated Draft REIR quantitatively evaluated recharge in the SRA by using rainfall data recorded at the San Clemente Dam with a 15.1% reduction factor for the SR area from water years 1996 and 1997 for normal rainfall years and 1987 to 1991 as critically dry water years. Of less importance than recharge in assessing sustainable use of water is aquifer storage. Insufficient groundwater data (water levels) prior to 1996 prevents representative analysis of SRA storage based data from the critically dry years of 1987 to 1991.

WY 1996 and 1997 were used to calculate recharge and drawdown in the Recirculated Draft REIR (Table 4.3.3). Although this original analysis was accurate, to address the District's concerns, additional estimates using WY 2000 and WY 2001 as normal rainfall recharge years have been calculated for the response to comments in the Final EIR. These alternative analyses result in recharge values of 228.5 to 235.9 AFY. These values reflect a smaller amount of groundwater (than the 1996 and 1997 estimates) available for exchange between the SRA and CVA (under project condition) of 171 AFY to 178 AFY.

Since storage capacity of 305 AF exceeds recharge of 228.5 to 235.9 AF in normal rainfall periods and 73 to 151 AF in critically dry years, it is recharge that determines the viability of yearly sustained usage of groundwater, and not storage. Based on this fact, the Recirculated Draft REIR demonstrated that water is available to fulfill the project demand of 57.21 AFY which is 24 percent of annual recharge in a normal rainfall year and between 37 to 78 percent in dry years. A reality check is that although due to judicial direction current water use on the property (99 AFY) is not used as the CEQA baseline, the fact is that water in excess of the project demand has been pumped at the project site for approximately 9 years.

HMR-2 - WATER BALANCE

The Draft REIR was updated with a brief statement in the Recirculated document Page 4.3-42 that ". . . all (recharged) groundwater not consumed or stored in the SRA would normally benefit the CVA. . ." The Recirculated Draft REIR essentially agrees with a comment by the Monterey Peninsula Water Management District ("District") proposing the concept that groundwater in the SRA is shared with the CVA mainly in the collocated portions of the two aquifers, as illustrated in Figure 4.3-3, where cross-section M-M' characterizes the depth to bedrock of these aquifers. KJC agrees with the District's comment that since there is effectively no surface runoff, then recharged groundwater in excess of storage and usage must benefit the CVA AQ3.

To address the District's comments, additional estimates of recharge using WY 2000 and WY 2001 as normal rainfall recharge years have been calculated. The Final EIR includes for informational purposes both the original analysis, which remains valid, and the additional analysis of the use of normal rainfall WY 2000 and 2001, resulting in recharge values of 228 to 235 AF per year. Comparatively, these values decrease the amount of groundwater available for exchange between the SRA and CVA (under project condition) to 171 to 178 AFY (0.08% and 0.13% change from the recharge estimates of 187 and 205 AFY presented in the Recirculated Draft REIR). Responses to comments estimate recharge based on WY 2001 of 178 AFY.

Although there is established hydraulic connectivity – *i.e.* shared groundwater – between the two aquifers under certain hydrologic conditions, it is not possible to demonstrate the rate of exchange of groundwater due to uncertainty in the transmissiveness (*i.e.,* the rate) of groundwater flow in the older alluvium Qoa_2 and specifically in the collocated portions of the aquifers. Groundwater flow is generally slow in the SRA as indicated by the groundwater gradient of 0.0025 ft/ft averaged throughout the basin. The slow movement of groundwater is primarily the result of a relatively closed basin with limited subsurface outflow to downgradient ground waters such as AQ3. Thus, that area of the two aquifers connected by the older alluvium Qoa_2 is described in the Recirculated Draft REIR as "effectively" an aquitard or groundwater barrier, although it does not form a complete barrier. The District's proposed concept of a more transmissive Qoa_2 water bearing alluvium is conceivable, which would allow more exchange of excess recharge to flow across M-M', but this concept is currently not supported by data. The best conclusion is that Qoa_2 is best characterized as a low transmissive unit, based on ample data collected in the 1997 aquifer test and the laboratory analysis from boring C-7 (described in the Recirculated Draft REIR). KJC has evaluated, in detail, both sets of data, and the following discussion is intended to clarify the use of these data in the

Recirculated Draft REIR in support of our conclusion that there is limited hydraulic connectivity between the CVA and SRA.

Laboratory Analysis of Hydraulic Conductivity

In 1996, Todd Engineers conducted supplemental laboratory analysis of selected core samples from boring C-7 (Memorandum dated 14 March 1997). Daniel B. Stephens & Associates (Albuquerque, NM) reported results from permeameter tests for the following samples:

- A silty sand of Qoa_1 with laboratory tested conductivity of 28.0 gpd/ft^2,
- A clayey silt of Qoa_2, with laboratory tested conductivity of 0.14 gpd/ft^2, and
- A siltstone of Monterey Formation, with laboratory tested conductivity of 7.8E^{-5} gpd/ft^2.

The District commented that results of three samples from a single soil core can be suspect and that the 0.14 gpd/ft^2 value is anomalously low compared with estimates from samples from nearby investigations. The principle is acknowledged, and because of this uncertainty, the Darcy flux method of calculating groundwater exchange between the two systems has been deemed unreliable. Moreover, because of this uncertainty, KJC has accepted the conservative and reasonable assumption that under the baseline condition (3 AFY) between 225.5 (WY2000) and 232.9 AFY (WY2001) of groundwater are available for exchange between the SRA and CVA and that in extended drought periods the available exchange decreases to 62 and 79 AFY (WY1987 to 2001 and conservative ET-loss of 85%). KJC also acknowledges the District's comment that under the project condition of 57.21 AFY usage there may be an additional 54.21 AFY on top of the 3 AFY baseline amount less groundwater available to recharge AQ3; although KJC believes that this impact is likely to occur only under specific hydrologic conditions, the impact analysis provided assumes a worst case scenario impact of 54.21 AFY plus the 3 AFY baseline (i.e. 57.21 AFY). However, as explained above, the 0.14 gpd/ft^2 value is useful because it is actual data from Qoa_2, and KJC concludes that this actual data is, albeit limited, somewhat more persuasive than the competing data identified in the District's comment which is from a different site altogether. In light of the limited and uncertain state of the data, KJC recommends that further speculation regarding the actual numerical value of transmissivity for the alluvium specifically Qoa_2 is of little value. Instead, KJC believes that the best approach is to focus on the 1996/1997 aquifer pumping test and distill evidence of a barrier by examining flow patterns.

The low transmissivity of the Qoa_2 water bearing zone, which implicates a limited hydraulic connectivity between the SRA and the CVA, is supported by aquifer test results from 1996/1997 conducted within the SRA. In the test, 47 days of 270 gpm pumping in Well SR-1 abruptly created a groundwater flow divide. KJC has closely examined the 1996/1997 aquifer test in the September Ranch groundwater basin, and agrees with the comments by the District that the response in wells closer to the Carmel River is less than expected, probably due to the suspected effect that concurrent rainfall and high river flows had on water levels during the aquifer test. Notably, KJC's analysis of the pumping test data is based on comparing the relative change in groundwater flow patterns - and not the amount of response (water level fluctuations) in each well - as the test progressed from pretest water levels (in response to pumping) to groundwater flow patterns (contours) at the end of the 47-day test. It is agreed that the absolute drawdown of water levels in both aquifers might have been less than expected, and hence less emphasis was placed in examining drawdown data in each well in the interpretation.

Three sets of interpreted groundwater contours were examined; A) Pre-testing water levels measured on 11/21/1996, B) Day 4 of pumping test with water levels measured on 12/2/1996; and C) Day 38 and beyond with water levels measured starting on 1/3/1997.

> Pre-test - Interpreted groundwater contours from pre-test data indicate groundwater flow as sub-parallel to each other in the SRA and CVA, starting from the east ends of aquifers at Well A and Well 5, respectively near Brookdale Drive. The parallel flow of groundwater is separated by the Monterey shale bedrock outcrop; the bedrock high is subterranean starting at the Ask and Stein wells where it is overlain by the older (Qoa_2) and less permeable alluvium and that in turn is covered by the younger and more water bearing alluvium (Qoa_1). Groundwater flow within both aquifers continues to be parallel, implying minimal exchange in flow between the two systems in these locations. Groundwater from the two aquifers then converges in the CVA in the areas of Well E and the Brookdale well.
>
> Day 4 - Interpreted groundwater contours from Day 4 of test indicate groundwater in the CVA will flow towards the extraction Well SR1 and Well-C almost in a reversed gradient pattern in the areas of Wells 8, 9, and 10. Groundwater in the CVA flowing towards the extraction well is expected in this area because of the existence of the younger alluvium and that groundwater is closer to the extraction well. Groundwater in the CVA flows away from the pumping well west of Well 9 and the Romer Well; whereas, groundwater in the SRA in this area continues to flow towards Well C; hence, groundwater in the SRA in this area is still under the influence of the pumping well. This apparent divergence of flow means that while there is exchange in groundwater between the two systems, a groundwater divide developed in the pumping test data which can be attributed to the limited hydraulic communication between the two systems in this area largely due to the less permeable older alluvium (50 feet thick) beneath the younger more permeable alluvium but with a much lesser thickness of 20 feet wherein groundwater flow mostly occurs.
>
> Day 38 - Similar groundwater patterns are apparent in the Day 38 (1/3/97) of the pumping test with a flat gradient maintained in the area west of Well 9 – at about 43 feet MSL. The flat gradient is an attribute of limited groundwater movement between the two aquifers. Groundwater contours for 2/15/97 and 2/28/97 show a clear divergence of groundwater flow (divide) Wells 9 and D where groundwater flows away (westerly) from the SRA in the CVA while flow is still towards the pumping well in the SRA.

Based on the relative change in groundwater flow during the 47 days pumping test, it is concluded that data shows a sustained divergence of groundwater flow between the two systems which is attributed to a groundwater divide. Under lesser (normal) pumping conditions, the groundwater in the two aquifers flows in sub-parallel directions toward the northwest. The two systems are separated by the less permeable shaley bedrock and overlying clayey-silt older alluvium, and are semi-isolated. They have separate sources of groundwater recharge.

Comparison of the Two Data Sets and Conclusions Drawn

KJC emphasizes that its conclusion regarding the groundwater flow divide is factual, based on the distinctive changes in groundwater flow patterns induced by pumping at the SR-1 well. KJC dos not recommend the use of an aggregate transmissivity or hydraulic conductive of about 990 gpm/ft^2 for the whole of the alluvium (Qoa_1 and Qoa_2) to estimate groundwater outflow to the CVA. Even though the screen interval of SR-1 is screened in the Qoa_2 and Monterey Formation, no specific Qoa_2 and Monterey Formation transmissivities can be derived from the test. Acknowledging the conductivity values derived from the laboratory permeameter test are less reliable from just a single soil core and that the Qoa_2 value could be characterized as anomalously low, the results none-the-less provide a measure of the relative difference between the three types of aquifer properties, silty-sand, clay, and siltstone. Under all of the circumstances, the best conclusion is that the Qoa_2 is less permeable than the overlying alluvium and, although larger in volume, groundwater stored in Qoa_2 is less available because of the low transmissivity.

KJC concurs with the analysis presented in Todd (1992) and Todd (1997), that in average rainfall years and above average rainfall years the CVA and SRA would be in equilibrium, meaning that both aquifers would have insignificant net flow between them (Todd 1997). The REIR has independently calculated groundwater gradient for normal rainfall periods of 0.0014 to 0.006 and for extended dry periods of 0.0016 to 0.017, showing a slightly steeper gradient during drought years. These are fairly gentle to practically neutral gradients which suggest low flow to equilibrium groundwater conditions between the SRA and CVA systems.

The hydrogeologic limitations are a function of the underlying geology which includes the younger alluvium Qoa_1 of approximately 20 feet thickness which is more permeable by approximately 2 to 3 orders of magnitude than the underlying older alluvium Qoa_2.

The groundwater exchange occurs largely in an area above the deeper bedrock where the alluvium (Qoa_1 and Qoa_2) is the thickest (Figure 4.3-4b in the Recirculated Draft REIR). Within that alluvium, the majority of the groundwater exchange, were it to occur, occurs in younger alluvium Qoa_1 because of the significantly higher permeability of Qoa_1 than that of the older alluvium Qoa_2. During average and above average rainfall years, the groundwater exchange occurs in Qoa_1. Dryer years can coincide, seasonally, with much larger groundwater gradients between the SRA and the CVA. In dryer years, when water levels drop below the Qoa_1, flow can occur only in Qoa_2 which is also limited.

HMR-3 SIGNIFICANCE OF IMPACT ON THE CVA AND CARMEL RIVER IN TERMS OF FISHERIES

The Recirculated Draft REIR concludes that recharge into the SRA exceeds existing uses from the SRA plus proposed project water usage. The extra recharge is a potential rejected flow that is available to flow to the CVA (see also discussions in HMR-2). Because the project has an estimated demand of 57.21 acre feet, and because the current baseline usage of water is 3 acre feet, the maximum annual impact on the Carmel Valley Aquifer could be 54.21 acre feet. The District commented that a worst case impact on the Carmel Valley Aquifer would be approximately 270 AF of reduced flow over a five year prolonged drought period. This impact is not believed to be likely because, as described below, the historical record demonstrates that the CVA efficiently recharges even during a prolonged drought period.

Less Than Significant Impact to the CVA

In addition to limited hydrogeologic connectivity between the CVA and the SRA, the small amount of flow between the two aquifers is primarily due to a practically neutral groundwater gradient that exists between the SRA and CVA under average and below average rainfall conditions. The neutral groundwater gradient is influenced by upstream reservoir releases as managed by the Monterey Peninsula Water Management District, that in turn influences the groundwater levels in the CVA. Groundwater contours in Figure 4.3-5 in the Recirculated Draft REIR demonstrate that the flow of groundwater in each aquifer is parallel to each other from southeast to northwest in the two aquifers. It is believed that parallel groundwater flow generally occurs year-round.

The reduction of 57.21 AFY of flow to the CVA is considered a less than significant impact on the CVA because of the small amount of flow between the two systems compared to the total flow in the CVA and because the aquifers have independent sources of recharge. While the CVA is fed by source waters upstream of the Carmel River, the SRA is being recharged by the watershed uplands and groundwater is stored in the terrace deposits (or alluvium). Historically, these sources of recharge have been consistently refilling both aquifers annually under both normal rainfall years and after extended drought periods (see more discussion in HMR-4).

The District commented that the SRA and CVA share the same source of recharge from the uplands of the SR watershed and that the excess recharge in the SRA is a small part of the approximately 2,600 AFY of recharge along the sidewalls of CVA AQ3. KJC agrees with this comment, but this is consistent with the conclusion that there are two sources of recharge and that only a comparatively small amount of excess recharge in the SRA is shared with the CVA as compared to subsurface recharge from AQ2.

Less Than Significant Impact to the Carmel River

In response to comments on the Recirculated Draft REIR analysis of impact level under project conditions on the Lower Carmel River and on AQ3, monthly calculations of reduced flow to the Carmel River Subunit 3 were performed to conclusively demonstrate the less than significant impact on Steelhead and other aquatic species during dry months of each year. The analyses were done for below normal rainfall (Case 1) and normal rainfall periods (Case 2).

Using the value of 8 AFY of rejected flow during a dry period as calculated as 65.6 AFY of inflow less 57.21 AFY of September Ranch pumping (WY 1987) and a more conservative normal year value of 178 AFY of rejected flow as calculated as 235.9 AFY of inflow less 57.21 AFY of September Ranch pumping (WY 2001), a monthly analysis was prepared for both dry year (WY 1987 - Case 1) and normal year (WY 2001 - Case 2). The previous normal year analysis for WY 1997 remains valid. This alternative normal year analysis is provided in response to MPWMD comments. The conclusions remain the same regardless of the normal year used.

The monthly analysis uses the September Ranch recharge estimates for the respective water years identified above found in Table 1 of the Project Specific Hydrogeologic Report whereby recharge is a positive number. The monthly water demands for September Ranch are then calculated by assuming that 75% of the 57.21 AFY demand occurs from June to October and the remaining 25% occurs from November to May whereby demands are a negative number. The Maximum Potential Spillover to the

CVA is then calculated by summing the recharge (positive) with the demand (negative). If the resultant sum (i.e. the Maximum Potential Spillover) is negative, then the Maximum Potential Spillover to CVA is assumed to be zero (as occurs when recharge is less than pumping). If the resultant sum is positive, then the resulting value for the month is entered.

The difference in Maximum Potential Spillover with and without the September Ranch project is then calculated by subtracting the "with September Ranch" calculation from the "without September Ranch" calculation. Then, the Maximum Potential Spillover in cfs for each month is converted to AF/month. The sum of the twelve AF/month calculations is not equal to the September Ranch demand because when the Maximum Potential Spillover to the CVA is negative (as occurs when recharge is less than pumping) the value is zero. The monthly variations in recharge can result in significant differences in the Maximum Potential Spillover estimate for any given month.

Maximum Potential Spill Over from SRA to CVA was then compared to the actual mean monthly flow in the Carmel River at US Geological Survey (USGS) stream flow gage No. 11143250 immediately downstream of the September Ranch development. When the gage flow = 0; it is assumed that the Carmel River is a losing stream (i.e. the water table is below the channel bottom) and therefore the reduced potential spill over from the SRA to the CVA results only in a reduced water table. The results of the revised monthly analysis are summarized in the revised Table 4.3-9 below. It should be noted that the revision to the analysis does not result in any changes to the conclusions in the Recirculated Draft REIR.

As noted above, for purposes of responding to the District's comments, the 2000 and 2001 water years were assessed. In these years, the range of potential maximum monthly reduction that can be considered potential recharge to the CVA and thence to the Carmel River remains, as with the original analysis, 0.024 to 0.033 cfs in dry years (Table 4.3-9 Draft REIR Case 1 – WY 1987). The potential maximum reduction is increased slightly 0.022 to 0.14 cfs flow in the Carmel River in normal rainfall year (Case 2 – WY 2001). In interpreting these results, it is important to remember that reduction in recharge to the Carmel River can only happen within the hydrogeologically feasible flow from the SRA to the CVA. The reduction is difficult to estimate since the gradients are fairly neutral at any given time in a year and the resulting flow is less than -0.033 cfs. In a conservative scenario, any reduction of flows from the SRA into the CVA will likely occur during summer months of peak water usage. However, during this time of year the reduced exchange from SRA to CVA will likely have limited impact on water levels in the Carmel River because there are generally no flows during the summer-early fall in the River. Flows in the River were identified based on a review of USGS stream flow gage No. 11143250 immediately downstream of the proposed September Ranch development (Downstream Gage).

In the location of the Downstream Gage, flows are typically high, sometimes in excess of 500 cfs (224,000 gpm) in the winter time and then taper to zero flow in the summer months. Zero flows can occur as early as May in a relatively dry year to as late as July in a relatively wet year. Therefore, during the wet season, the reduction of flow of up to 0.033 cfs to the CVA and potentially to the Carmel River cannot be discerned in the flow of the Carmel River because the river flows are so high. When the Carmel River is dry, the water table is below the river bottom and the reduction of flow of up to -0.033 cfs also cannot be discerned in the Carmel River because the reduction in these months are actually in groundwater and not surface water; the flow reduction then could result in a minimal drop in groundwater level (see HMR-4).

Flow reductions to the CVA and thence to the Carmel River during the late spring months when the flows are tapering are also likely to be indiscernible in the accuracy of the gage. The maximum potential reduction in flow of 0.033 cfs in dry years ranges from 0.05% to 0.13% of the respective monthly flows in the Carmel River for the appropriate month. It is important to note that the maximum potential reduction of flow of 0.14 cfs from the SRA to the CVA in October 2001, although numerically equal to the average flow in the Carmel River during that time, the reduction is actually of groundwater. The reduction in flow from the SRA to CVA, especially in October, is likely to be occurring only in the subsurface and would not manifest as a reduction in flow in the Carmel River. During an extended drought period (e.g. 1987 to 1991) the downstream gauge registered zero flow therefore the maximum reduction of 0.14 cfs is all occurring in groundwater.

It should be noted that pumping in the CVA by many users further complicates the analysis of impact on the Carmel River. The CVA acts as a buffer zone of groundwater flow between the river and the SRA. What limited groundwater flow occurs from the SRA to the CVA then has to travel a distance of 850 feet to the Carmel River due south of the September Ranch watershed. Potential effects on the Carmel River baseflow as a result of -0.033 cfs (dry year) up to 0.140 cfs (normal year) of possible reduced groundwater resources from the SRA is conservatively presented as a 1:1 reduction by SRA usage on reduced flow to the River. However, in reality this is a fairly unlikely impact. The impact cannot be quantified with certainty because of the additional pumping in the CVA between sources and receiving waters, which as noted is a factor, which tends to reduce the potential for SRA pumping to affect the River. Also, it is expected that the reduction, if any, will occur in the subsurface and be indiscernible both in the subsurface and in the surface water. About 10,000 AF per year is currently diverted in AQ3 for consumptive use (MPWMD CVSIM data).

Lastly, it is estimated that the adjacent watersheds namely the Canada De La Segunda in the east and the Roach Canyon in the west have four to five times the drainage and recharge capacities to the CVA (Kleinfelder, 2004). The Canada De La Segunda is technically an upgradient source water of the CVA relative to the September Ranch Project. Its direct contribution to the CVA and then to the Carmel River may eclipse the minor contribution of recharge from the SRA.

Revised Table 4.3-9: Maximum Potential Spill Over of Water from SRA to CVA for Below Normal and Normal Precipitation

Case 1: Maximum Potential Spill Over of Water from SRA to CVA (cfs) for Below Normal Precipitation (WY 1987)												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Case 1a: Below Normal Precipitation WITH September Ranch	0.00	-0.019	-0.061	-0.178	-0.359	-0.224	-0.0009	0.0000	0.0000	0.0000	0.0000	0.0000
Case 1b: Below Normal Precipitation WITHOUT September Ranch	0.00	-0.052	-0.094	-0.211	-0.392	-0.257	-0.034	-0.024	0.00	0.00	0.00	0.00
Difference (Case 1a minus Case 1b)	0.00	-0.033	-0.033	-0.033	-0.033	-0.033	-0.033	-0.024	0.00	0.00	0.00	0.00
WY 1987 Monthly Mean Flow in the Carmel River (cfs)	0	0	0	0	0	36.11	60.88	18.42	0	0	0	0
Case 2: Maximum Potential Spill Over of Water from SRA to CVA (cfs) for Normal Precipitation WY 2001												
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Case 2a: Normal Precipitation WITH September Ranch	0.496	0.032	0.019	1.156	0.868	0.548	0.454	0.000	0.000	0.000	0.000	0.000
Case 2b: Normal Precipitation WITHOUT September Ranch	0.635	0.066	0.052	1.189	0.904	0.581	0.488	0.000	0.000	0.000	0.000	0.022
Difference (Case 2a minus Case 2b)	0.140	0.034	0.033	0.033	0.037	0.033	0.034	0.000	0.000	0.000	0.000	0.022
WY 2001 Monthly Mean Flow in the Carmel River (cfs)	0.14	7.08	9.71	86.07	186.50	373.29	92.00	38.19	5.73	0.00	0.00	0.00

HMR-4 - SIGNIFICANCE OF IMPACT ON EXISTING CVA GROUNDWATER USERS

The discussion presented herein is intended to respond to those requests by clarifying and providing additional analysis to support the conclusion that the CVA efficiently refills during and after drought periods. Based on groundwater elevation data provided by the Monterey County Water Resources Agency (5 February, 2004 from R. Johnson), groundwater levels immediately upstream of the SRA in the CVA AQ3 (Figure 2 TM-7, in wells 16S/1E25-B02, 16S/1E22-E01, 16S/1E22-H01, 16S/1E22-J01 [no data from 1985 on], 16S/1E23-J02, 16S/1E23-F01, and 16S/1E23-K01) do recover during the critically dry period of 1987 to 1991 to their pre-drought levels. Groundwater recoveries during this extended and critically dry period are nearly completely the same as the groundwater elevations (Figure 2) during normal rainfall years; moreover, recoveries occur consistently during the winter and spring months (February through May) in a water year.

Lessened Impact

The fact during extended dry periods that AQ3 of the CVA refills to nearly pre-drought groundwater levels supports the conclusion that water supply impact of maximum 57.21 AF of project demand on the CVA is accurately characterized as less than significant, even with the assumption of zero recharge (runoff and river during dry years) in the CVA. According to the historical record (which typically used to predict the impact of changes in hydrology), groundwater levels remained depressed for, at most, only one and a half years (from February 1987 to March 1989) in a five year critically dry period. Otherwise, water levels fully recovered to their normal levels during these dry years. Based on the recovery of groundwater water levels to their pre-drought conditions, KJC concludes that the impact of the proposed project demand on the CVA would not be substantially adverse. The aquifer efficiently recovers during an extended drought period.

Significance of impact should also account for *depleted groundwater storage* over the drought period at issue. KJC agrees with the District's comment that there was a notable depletion of perennial groundwater storage from 18,979 AF (1986) to 14,286 AF (1990) in AQ3 during the critically dry years of 1986 to 1991 (MPWMD CVSIM3). The historical average yearly water in storage in AQ3 is approximately 16,927 AFY and the high value of water in storage of 18,979 AF in 1986 was due to a particularly wet winter in 1986 which was followed by a dry summer and the beginning of the extended dry period. Even assuming the District's proposed worst case scenario of 270 AF, the average water in storage during the five year dry period is 16,745 AFY. A reduction of recharge by the Project of 270 AF, which is overly conservative as described below, then represents 1.5 percent of total water in storage over this time period in AQ3 which is considered insignificant even for reduced storage caused by prolonged below normal precipitation condition.

An alternative monthly analysis of maximum potential reduction of recharge by the Project in the SRA during the dry period from WY 1987 – WY 1991 was conducted. The analysis included:

1. Subtraction of the estimated monthly SR Pumping (totaling 57.21 AFY) from the estimated monthly recharge to SRA (from Table 1 of Project Specific Hydrogeologic Report)

2. Cumulative pumping from Oct 1986 and the beginning of WY 1987 to September of 1991 minus recharge value for each month.

The result is at the end of Sept 1991, there is 78.9 AF more water in storage in the SRA than has been pumped out (i.e. recharge exceeds pumping). There is sufficient recharge to SRA on a seasonal basis that the supply exceeds the demand over the entire dry period. Therefore, the District's proposed worst case scenario of 270 AF (57.21 AF x 5 years) of depleted groundwater storage in the SRA (and thence the impact to the CVA) is extremely conservative and highly unlikely to occur. The analysis rather supports the conclusion that the worst case impact for reduction of recharge by the project is more closely tied to the historical record of approximately 71.5 AF over a 19 month period before water levels recovered (see comparison of reduced flow and river flow in page 3-29).

Two Sources of Groundwater

The replenishment of the CVA AQ3 and hence the variations of water levels discussed above is primarily dependent on surface recharge by the Carmel River and percolating into groundwater and secondarily by subsurface inflow from the upgradient AQ2 unit. Subsurface inflow according to CVSIM information is fairly steady at 2,781 AFY; hence, groundwater level fluctuations are then primarily a response to surface recharge by the Carmel River.

CVSIM data show that the historical average yearly surface recharge is 8,000 AFY. The averaged yearly recharge between 1987 and 1991 is 7,000 AFY or 35,000 AF over five years. Recharge dropped from 7,451 AF in 1986 to 5,476 AF in 1987 followed by a slight rise of 6,176 AF of recharge in 1988. A notable rise in groundwater recharge during this critically dry period of 7,383 AF occurred in 1989 followed by a repeating low recharge of 5,396 AF in 1990. Surface recharge then again achieved a high during 1991 of 10,370 AF. The cyclical pattern of rise and fall of subsurface recharge is consistent with the groundwater level fluctuations shown in hydrographs presented in the attached Figure 2 in this response (reference Figure 2 TM-7). Groundwater responded efficiently to the combined surface and subsurface recharges in the drought period of 1987 to 1991.

Even assuming the District's worst case scenario, then, a reduction of recharge by the Project of 270 AF would represent 0.7 percent of total recharge over this time period in AQ3 which is again considered insignificant even for reduced recharge caused by low rainfall condition. Moreover, it is KJC's opinion that the groundwater exchange between the two systems in a yearly basis has been substantially less than 57.21 AFY due to a low permeability groundwater barrier. During normal precipitation years, groundwater would spill over the low permeability barrier when water levels rise above 47 feet MSL. However, during prolonged dry period, groundwater levels would be lowered during but only part of the dry period such as 1987 and 1988. As shown in Figure 1 TM-7, the closest well to SRA is 16S/1E-25B2 with a normal water level of about 43 feet MSL. This means that water levels in the SRA would have to be higher than firstly the top of Qoa_2 (about 47 feet MSL) and then higher than 43 feet MSL of the nearby CVA water levels. During dry years, water levels in both systems would drop below their normal elevations of about 43 feet MSL such as those exhibited in well 16S/1E-25B2 during 1987 and 1988. In this scenario, there would be very limited to no groundwater exchange between the two systems.

While the CVA is fed by source waters upstream of the Carmel River, the SRA is being recharged by the watershed uplands and groundwater is stored in the terrace deposits (or alluvium). Hence, groundwater flows are parallel to each other in the CVA and the SRA and at approximately equal water surface elevations resulting in near neutral groundwater gradients between the two aquifers.

Historically, these sources of recharge have been consistently refilling both aquifers annually under both normal rainfall years and after extended drought periods. Comment by the District questions the opinion of independent sources of water by stating that a small portion of recharge into the CVA along its northern sidewalls of AQ3 would still be affected by increased pumping from the SRA (MPWMD 4/7/06 comment on Appendix C, page iv, paragraph 5). KJC agrees with District that the SRA and CVA share the same source of recharge from the uplands of the SR watershed and that the excess recharge in the SRA is a small part of the approximately 2,600 AFY of recharge along the sidewalls of CVA AQ3. KJC is firm in its findings that there are two sources of recharge and that only a comparatively small amount of excess recharge in the SRA is shared with the CVA as compared to subsurface recharge from AQ2.

IMPACT ON EXISTING CVA PUMPERS

KJC agrees with the District that there would be an impact to the CVA as a result of project demand, and this impact is acknowledged in the Recirculated Draft REIR. However, this impact is accurately characterized as non-substantial to the overall sustainable yields of existing users of groundwater in the CVA in light of the fact that the two systems are separate with limited hydraulic communication and that there are two sources of groundwater recharge.

As pointed out by commentors, the analysis of the potential impact to both riparian and appropriative water rights holders in the CVA is not directly applicable to assess impacts to all of the pumpers in the CVA, AQ3. To assess the potential impacts to existing users, KJC reviewed the amount of additional drawdown in groundwater levels that would result from the proposed project use of 57.21 AF as if it were to occur in the CVA directly.

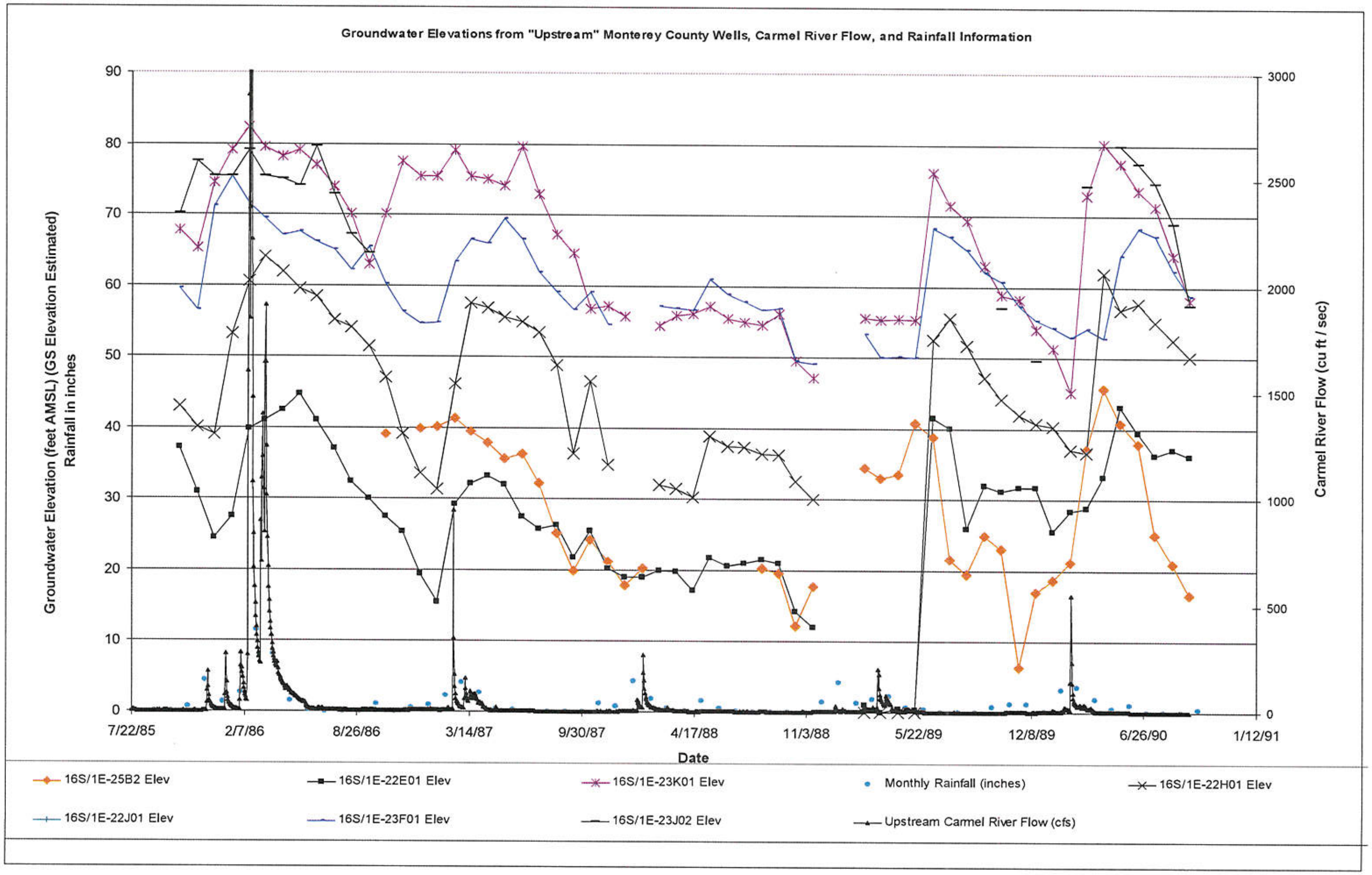
In order to evaluate potential changes to water level in the CVA, the total demand of 57.21 AF/yr was assumed to come entirely out of the CVA,-AQ3. This analysis used an area for CVA – AQ3 of 1,558 acres as estimated in a geographic information system map. Then an aquifer porosity of 33% was used and it was estimated that the change in water level over the 1,558 acres as a result of pumping 57.21 AF/yr is 0.009 in/yr, which is almost indiscernible in a well. If a more conservative approach is taken and all of the pumping were to occur in 10% of the CVA-AQ3 or 155.8 acres, then the resultant change in water level is estimated to be 0.09 in/yr or almost a tenth of an inch.

To clarify the potential for cumulative long-term impacts to existing CVA users, the analysis assumed that if water levels were to drop below the perforation intervals in existing water wells, those dry wells might require existing pumpers to drill a deeper well to extract water supply from deeper in the aquifer during critically dry periods, which would be a significant impact. For purposes of this analysis, the total demand in the CVA-AQ3 was assumed to include reasonably foreseeable developments with net water use, including remaining Quail Meadows lots as identified in comments, plus the proposed project. It is noted that since release of the Recirculated Draft REIR, the County has determined that the "Dow" development is no longer reasonably foreseeable; removing the "Dow" development and adding in the remaining Quail Meadows lots, the cumulative foreseeable demand remains the same (a little lower) than identified in the Recirculated Draft REIR. In anticipation of questions, however, the Response to Comments discussion presents an alternative assessment of cumulative demand that includes both Dow and remaining Quail Meadows lots demand, and the total for this estimated demand is 112.9 AF/yr which is assumed to come entirely out of the CVA,-AQ3. Used an area for CVA - AQ3 of 1,558 acres with an aquifer porosity of 33%, it was estimated that the change in water level over the 1,558 acres as a result of pumping 112,9 AF/yr is 0.027 in/yr, which is barely measurable in a well. If a more conservative approach is taken and all of the pumping were to occur in 10% of the CVA-AQ3 or 155.8 acres, then the resultant change in water level is estimated to be 0.27 in/yr or slightly more than a quarter of an inch. Based on the foregoing, even over the long-term it is highly unlikely that water levels would drop below the perforation intervals of existing wells.

While a hypothetical drawdown of water levels cannot be accurately estimated because of the uncertainty in actual amount of groundwater exchange between the two systems, a comparison can be made by reviewing the calculated drawdowns in the SRA as an alternative to the above analysis. The predicted drawdowns for 57.21 AF of discharge in the SRA (as presented in the Recirculated Draft REIR for the extended dry years 1987 to 1991) are 0.96 foot in the summer and fall seasons and then water level rises in the winter season. These calculated drawdowns are based on aquifer storage of 305 AF in the SRA. Since the storage in the CVA AQ3 is about 16,929 AF which is two orders of magnitude large than that in the SRA, the corresponding lowering of groundwater levels as a result of 57.21 AF of denied recharge is than 0.013 foot in the summer and 0.006 foot in the winter which is very consistent with the above analysis of average drawdown of 0.0095 using porosity of 33% over 1158 acres of AQ3. The average well screen of water supply wells in the Carmel Valley is about 20 feet long and about 135 feet deep. The small amount of potential additional lowering of water levels would not result in water level declines in a well casing to below the pump depth and that there is no possibility of a dry well scenario. As shown in Figure 2, fluctuations in water levels are about 35 feet in normal yearly seasonal changes and between normal and dry precipitation periods. Hence, the small potential and additional changes in water levels are well within seasonal water levels fluctuations.

Separate recharge sources further supports the opinion that during an extended dry period the effect of the proposed project demand of 57.21 AF would be less than significant in terms of impact to ecology and water supply. The contribution of this maximum amount of 57.21 AFY from the SRA in dry years is likely substantially less than this amount which supports the conclusion that the proposed Project would not impact existing sustainable use in the CVA, and that the demand of the proposed project would not require existing users to look for an alternative source(s) of water in future extended dry periods.

Figure 2: Groundwater Elevations from Carmel Valley Aquifer Wells Upstream of September Ranch



MR-19: Significance Thresholds Regarding Water Supply and Availability

The Recirculated Draft REIR adopts significance thresholds for water supply and availability that are designed to evaluate how the proposed use of water affects environmental resources such as groundwater volume and levels, recharge, water supplies available to meet demand, fish and wildlife populations and essential functions, and aquatic and riparian habitat. Specifically, the Recirculated Draft REIR provides that the proposed project would have a significant water supply and availability impact if the project would:

- substantially degrade or deplete groundwater resources in the SRA or the CVA;
- interfere with groundwater recharge;
- use water in a wasteful manner;
- increase pumping or demand on the SRA or CVA so as to require person who diverts from the SRA or CVA to decrease water use or find substitute supplies in order to compensate for reduced water availability from the SRA or CVA;
- increase pumping or demand on the SRA or CVA so as to impair the health of the CVA itself by permanently affecting the ability of the CVA to recharge; and
- result in a yield from the groundwater system that is not sufficient to provide the project water demand on a long-term average basis and during droughts.

Some comments suggest that the EIR should adopt a significance threshold wherein any reduction in water availability (i.e., as a result of using water from the SRA) within the CVA or the Carmel River would constitute a significant impact *per se*, without reference to the nature or magnitude of those impacts and their effects on other resources. Some comments suggest or imply that a *per se* significance threshold is required based on the findings of Order No. WR 95-10 of the State Water Resources Control Board (SWRCB) and/or the 2002 document issued by NOAA Fisheries (aka National Marine Fisheries Service) regarding bypass flows on the Carmel River. The comments suggest that these documents indicate that environmental conditions on the Carmel River are so severe that *any* additional water use must, as a matter of law, constitute a significant impact.

For purposes of the Recirculated DEIR, the SWRCB Order No. 95-10 and the NOAA Fisheries 2002 Report, as well as other regulatory guidance documents, were carefully reviewed. As explained below, these documents primarily address circumstances that are substantially factually different than those presented by the proposed project. Moreover, to the extent these documents discuss the Carmel River generally, a fact-specific review of the documents demonstrates that they do ***not*** require the adoption of a *per se* significance threshold for water availability and supply. To the contrary, as explained below, those documents contain factual information that supports the significance thresholds adopted in the Recirculated Draft REIR and the impact conclusions derived from those thresholds.

SWRCB ORDER NO. WR 95-10

Prior to 1994, the State Water Resources Control Board ("SWRCB") received several complaints alleging that the California American Water Company ("Cal-Am"), a private water purveyor serving the Monterey Peninsula, was diverting water from the Carmel River without basis of right. The SWRCB investigated the complaints, held a public hearing, and considered evidence from Cal-Am and the complainants. Subsequently, in 1995 the SWRCB issued Order No. WR 95-10 in which it concluded that Cal-Am had legal rights for only up to 3,376 acre-feet per year ("AFY") of the 14,106

AFY that Cal-Am was then diverting from the Carmel River. However, the SWRCB determined that it would not exercise its enforcement authority so as to prohibit diversions as long as total annual diversions by Cal-Am do not exceed 11,285 AFY. The SWRCB has since confirmed that, as long as Cal-Am meets certain conditions (such as reporting and restrictions on place-of-use) and ultimately legitimizes its diversions, the total amount of water that Cal-Am can use without risking enforcement by the State Board is 11,825 AFY plus up to 380 AFY of treated wastewater supplies.

Order No. 95-10 necessarily considered only the rights of parties to that proceeding, and the impacts of the exercise of such rights by such parties. Neither the hydrology nor the water rights of the September Ranch property, that physical area comprising the September Ranch Aquifer ("SRA"), or the extent of connection between the SRA and CVA were issues in the SWRCB proceedings leading to Order No. 95-10. The only statement regarding hydrology in Order 95-10 was:

> "Cal-Am and other parties did not contest testimony and evidence which describes subsurface flow of the Carmel River as a subterranean stream flowing through a known and definite channel. Nor did Cal-Am or other parties offer evidence that the groundwater in the alluvial basin should be classified as percolating ground water not within the SWRCB's permitting jurisdiction. Accordingly, we find that downstream of RM 15 the aquifer underlying and closely paralleling the surface water course of the Carmel River is water flowing in a subterranean stream and subject to the jurisdiction of the SWRCB."

(Order, pp. 12-13.) This statement does not address the hydrology in the project area. Indeed, the only input from the SWRCB regarding the hydrology in the proposed project area is a 1998 letter submitted by a member of the Division of Water Rights staff member on the first environmental document that was prepared for the proposed project back in the mid-1990s. (The Recirculated Draft REIR does not rely on that original environmental document; see also Response SOCR1 to SOCR1-5.) Partly in response to the 1998 letter, and as part of preparation of the new, stand-alone Recirculated Draft REIR, the County commissioned an expert consultant team to evaluate the hydrology of the SRA and any connection the SRA might have to the CVA. Such investigation is unique to the environmental review process for the proposed September Ranch project, and has never been undertaken by the SWRCB or any other entity.

The extensive technical investigation undertaken for the Recirculated Draft REIR demonstrates that there is very limited connectivity between the CVA and the SRA and also that the two aquifers have separate sources of recharge. Accordingly, based on this investigation, the County has concluded that the SRA is a separate basin consisting of percolating groundwater. The analysis and conclusion were presented in the Recirculated Draft REIR provided for review in February 2006, along with specific responses to the issues raised in each paragraph of the 1998 letter from SWRCB staff. SWRCB staff did not submit any comments on the Recirculated Draft REIR.

In any case, regardless of how the hydrology of the two basins is characterized, the primary concern of all comments, including the SWRCB, has always been for the County to quantify and assess the degree to which pumping from the SRA area will, as a factual matter, affect flows in the Carmel River. The County performed such quantitative analysis in the Recirculated Draft REIR, and this analysis demonstrates that even at a worst case scenario of a 1:1 impact from pumping in the SRA to the CVA (which is considered to be highly unlikely), such pumping will have immeasurably small and less than significant impacts on flow within the Carmel River.

The proceedings leading to Order 95-10 focused on the area below RM 10, nearly seven miles upstream from the area potentially affected by the proposed project. Order 95-10 expressed a concern that dry season surface flows had been depleted below the Narrows at RM 10 due to heavy groundwater pumping adjacent to the River, and that this pumping had a rapid effect of causing River levels to drop dramatically to the point where juvenile fish were stranded. These facts do not apply to the proposed project, which proposes minimal groundwater pumping a considerable distance from the River, with numerous pumping activities between the proposed project in the River. As explained in the Recirculated Draft REIR, due to the location of the proposed project, the only potentially affected area of the Carmel River is approximately the lowermost three miles of the Carmel River, downstream from River Mile ("RM") 3.6. Both NOAA Fisheries and fisheries experts consulted during environmental review of the proposed project have indicated that from RM 3.6 downstream to the ocean, fishery/steelhead habitat is limited and of poor quality, that there is little to no spawning habitat, and that the primary value of flows below RM 5.5 is to facilitate passage through shallow areas. As noted above, in reviewing the potential effects of the proposed project, fisheries biologists have concluded that even the maximum potential reduction will not have any measurable impact on water levels, and thus no impact on fish passage (and thus no potential for stranding) downstream of RM 3.6.

It is important to note that Order 95-10 did not preclude Cal-Am from continued pumping, but allowed Cal-Am to continue pumping at nearly 12,000 AFY even though Cal-Am had demonstrated rights for only a fraction of that quantity. Here, the water demand of the proposed project is .0045838% of the diversions that the SWRCB said Cal-Am could sustain without unreasonably impacting biological resources (11,825 AFY). The SWRCB allowed Cal-Am to continue substantial pumping where such pumping did not unreasonably impact biological resources; likewise, here, the Recirculated Draft REIR has undertaken a fact-specific analysis that demonstrates that there will be *no* impact to Carmel River steelhead or similar resources, much less an unreasonable one. Because projects result in benefits to the community as well as potential impacts, the County has determined that such fact-specific analysis and consideration of benefits in light of impacts is preferred to simply adopting a per se significance threshold that ignores specific data. This is entirely consistent with the approach taken in Order 95-10. Moreover, in light of the facts, a *per se* approach would be likely to be inconsistent with the guidance provided in Title 14, California Code of Regulations section 15041(a), which reaffirms constitutional requirements for a nexus between a project's causal connection to significant impacts, and the mitigation measures imposed.

SWRCB ORDER NO. WR 98-08 (FULLY APPROPRIATED STREAMS DECLARATION)

In Order No. WR 98-08, the SWRCB listed the Carmel River as "fully appropriated" from May 1 through December 31 of each year, in a document known as the Declaration of Fully Appropriation Streams ("FAS Declaration"). In the context of the FAS Declaration, "fully appropriated" is a legal/regulatory term of art that does not equate to a complete prohibition on additional uses of water from a listed water system. Instead, the listing of a watercourse on the Fully Appropriated Streams Declaration operates only to limit the circumstances under which new applications for appropriation of water may be accepted and processed by the SWRCB. Existing water right holders, including overlying and riparian property owners, fully retain their rights to divert water from those watercourses (and the exercise of these rights is assumed by the Declaration). Moreover, a FAS Declaration specifies circumstances in which new applications to appropriate will still be accepted despite the listing. A FAS Declaration is thus a legal device for precluding new applications to appropriate, and is not strictly based on a factual assessment that no additional water is available for any person under any circumstances. Consequently, it does not support a per se significance threshold.

Absent a full adjudication of all water rights on a system by a court or the SWRCB or a contractual agreement to the contrary, the water rights of overlying or riparian right holders are superior to appropriative rights. The Recirculated Draft REIR concludes that the waters contained within the September Ranch basin are percolating groundwater not subject to the jurisdiction of the SWRCB. In the interest of providing a well-rounded picture for public discussion, the Recirculated Draft REIR also analyzes whether the project proponent would have riparian rights if such rights were relevant, and concludes that it would. Because the project proponent has rights that attach to the ownership of property, water use by the proposed project is not subject to the jurisdiction of the SWRCB or the FAS Declaration.

In any case, regardless of priority or regulatory jurisdiction, the Recirculated Draft REIR considers whether as a physical matter, water is available for use by the project, and also whether the reduction of water availability in the CVA or Carmel River as a result of the proposed project would be significant. The Recirculated Draft REIR demonstrates that water is available to the project. A reality check is that although due to judicial direction current water use on the property is not used as the CEQA baseline, the fact is that water in excess of the project demand has been pumped at the project site for over 11 years. Water is available as a physical matter. Moreover, based on a quantitative assessment of baseline pumping at 3 AFY plus anticipated project demand, the Recirculated Draft REIR concludes that water use associated with the proposed project would not be significant because such use would not result in any person or entity that currently uses water to have to reduce or forgo water use or to seek a new source of supply; would not adversely affect the integrity of the basins; and would not adversely affect biological resources within the Carmel River.

NOAA FISHERIES (AKA NATIONAL MARINE FISHERIES SERVICE OR NMFS) 2002 REPORT

The NMFS Report was primarily prepared to provide guidance to decision-makers considering approval of large off-stream storage projects that would result in appreciable reductions in Carmel River flow. (NMFS Report, p. 2) The Report recommends protection of surface and subterranean flows in the lower Carmel River during the low flow season specifically because of the value of summer flows for: 1) creating rearing habitat, 2) minimizing the stranding and dessication of juvenile fish, 3) providing a migratory corridor for the movements of fish and other aquatic life, 4) restoring riparian vegetation and habitats, and 5) restoring the quality of the Lagoon as habitat. (NMFS, iv.) The Report emphasizes that one of the purposes of flow recommendations are to preserve the natural flow variability and high stream flows to maintain ecosystem functions such as cleansing fine sediments from coarse substrates. (*Id.*) <u>It is in order to protect these specific values</u> that the Report recommends the following measures: no new diversions June 1 to October 1, minimum bypass flows of 20 cfs and 40 cfs during November and December, respectively, and limits on cumulative maximum instantaneous rates of diversion wherein such diversions should not exceed 5% of Q2 (*i.e.*, the average 2 year high flow event), equivalent to an average daily flow of 72 cfs or an instantaneous rate of about 115 cfs. (*Id.*) The NOAA Fisheries Report expressly states that these recommendations are provided "in the absence of site-specific studies," and that estimates of water available for diversion "are a preliminary analysis and are not finely tuned for differences in stream flow at varying points along the river, nor do they include tributary flow below Robles del Rio gage or gains associated with removing unauthorized diversions from the River."

For the reasons outlined above, the 2002 Report does not support a *per se* significance threshold; to the contrary, the Report specifically recommends site-specific (*i.e.*, factual) studies such as that undertaken in the Recirculated Draft REIR. Here, the proposed project would potentially affect only one of the five values identified in the 2002 Report: *i.e.,* migration/passage; in this regard, the Report itself confirms the conclusion of the Recirculated Draft REIR and consulting biologists Entrix that the area of the Carmel River potentially affected by the proposed project (roughly, downstream of River Mile ("RM") 3.6) has limited habitat value for steelhead. Specifically, the Report confirms that below River Mile 5.5 "spawning habitat is very limited and of poor quality," and that the key value of flows below RM 5.5 is to "facilitate passage through shallow riffles." (*Id.,* p. iii.) The Recirculated Draft REIR assesses whether the maximum potential reduction in Carmel River flow resulting from the project would adversely affect steelhead passage, and concludes that based on the value of the habitat, the specific level of impact, the remote likelihood that such impact would occur, and considering the context of the baseline flows in the Carmel River and the accuracy of the gauges, that the proposed project would not, even under a worst case scenario, adversely affect steelhead passage below RM 3.6.

MR-20: Aquatic Biological Resources

Comments on the Recirculated Draft REIR raised no new issues and provided no new facts regarding potential impacts to aquatic biological resources. For clarity, the following discussion summarizes the analysis presented in the Recirculated Draft REIR. (See Recirculated Draft REIR, Section 4.9 and references cited therein.)

The area of the Carmel River potentially affected by the proposed project is the approximately the lowermost three miles of the Carmel River (downstream of River Mile ("RM") 3.6, which consist of a confined, sand-bottomed channel with essentially no steelhead rearing or spawning habitat. According to consulting fisheries biologists, as confirmed by a Carmel River discussion issued by NOAA Fisheries, the biological value of the potentially affected reach for steelhead is primarily as a migration corridor (i.e., for passage) from November through May. (See Recirculated Draft REIR, pp. 4.9-14 to 4.9-17; see also MR-19: Significance Thresholds Regarding Water Supply & Availability.)

As presented in the Recirculated Draft REIR, the range of maximum potential Carmel River flow reductions in dry (below normal precipitation) years is - 0.022 to -0.033 cubic feet per second (cfs), and in normal precipitation years from -0.002 to -0.034 cfs. (Tables 4.9-2 and 4.9-3.) In this portion of the Carmel River (downstream of RM 3.6), flows are typically high in the wintertime (sometimes in excess of 500 cfs) and then taper to zero flow in the summer months. During the wet season, the maximum potential reduction of flow of up to 0.034 cfs to the CVA thence Carmel River cannot be discerned in the flow of the Carmel River because the river flows are so high. When the Carmel River is dry, the water table is below the channel bottom and the reduction of flow of up to 0.034 cfs also

Questa: September Ranch

Water Plan Summary

Questa: September Ranch Water Plan Summary

QUESTA
Civil, Environmental & Water Resources

September Ranch
Water Plan Summary

April 3, 2006

This report provides a summary of the planned domestic water supply facilities for the September Ranch project, incorporating the results of extensive groundwater studies by the applicant's consultant (Todd Engineers) as well as independent environmental analysis contained in the 1998 EIR and the 2006 Recirculated Draft EIR (RDEIR).

Project Water Demand

The September Ranch project will include 94 market rate homes, 15 inclusionary housing units, and continuation of the existing equestrian center. The estimated annual water demand for the project, including system losses, is 57.21 acre-feet per year (AFY), or roughly 0.156 acre-feet per day. The EIR estimated that about two-thirds of the water use will occur during the dry season (June-November) and the remaining one-third during the other half of the year (December-May). Accordingly, these water demand estimates equate, respectively, to average daily water use of 0.208 acre-feet per day during June-November and 0.104 acre-feet per day during the rest of the year. Thus, during the period of greatest water demand, the sustained water use will amount to about 68,000 gallons per day, or approximately 47 gallons per minute (gpm). Peak single day production during the period of maximum use may be as much as twice the average rate, or roughly 95gpm.

New Water Supply Wells

The water for the project will be supplied from two new production wells that will draw from the September Ranch Aquifer (SRA). The wells will be installed in the same general vicinity and with the same approximate depth (150 to 200 feet deep) as the existing agricultural supply well (SR1) which is located in the front pasture area, approximately 500 feet east of the existing equestrian center (**Figure 1**). The two new wells will be located approximately 500 feet apart as indicated in **Figure 1** – one to the east and one to the west of SR1. Existing well SR1 will remain available for use as an emergency backup supply well. The recommended location for the new wells is based on the following considerations:

- **Verified Water Availability.** The use of the SR1 well, which has been operated at an average annual production rate of approximately 99 AFY as identified in the Brandman Revised EIR; i.e., at nearly 175% of the projected pumping rate for the project demonstrates a sufficient supply of groundwater at the recommended locations.
- **Completed Pumping Tests.** Extensive pumping tests of SR1 (at rates of 205 and 250 gpm) have been completed to determine the aquifer characteristics (e.g., transmissivity, storavity and specific capacity) in the vicinity of SR1 as well as

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the hydraulic relationship between the September Ranch Aquifer and the Carmel Valley Aquifer. This information can be used as a reliable basis for the design and operation of new production wells located in the area of SR1.

- **Groundwater Impact Analysis.** The impacts on groundwater flow patterns and drawdown influence on other neighboring wells from groundwater extraction in the area of SR1 has been evaluated as part of the environmental review process. The long-term pumping tests for SR1 as well as the sustained use of the well over many years has provided a firm basis for concluding that the continued extraction of groundwater from this location at the planned production rates for the project will have a negligible effect on other neighboring water supply wells.

- **Documented Water Quality.** The water quality of the September Ranch Aquifer in the area of SR1 has been documented through sampling and analytical testing, including several samples obtained in 1992 as well as a recent (March 2006) comprehensive analysis for compliance with drinking water standards (see **Attachment A** for laboratory report). With the exception of mineral content (TDS, iron and manganese), the analyses show the groundwater quality to be in compliance with all drinking water standards. As discussed below, water treatment facilities will be included at September Ranch to bring the mineral content into compliance with secondary (consumer acceptance) standards.

- **Contributing Watershed Recharge Area.** According to the RDEIR the total watershed area estimated to contribute to recharge of the September Ranch Aquifer is 561 acres; and this results in an average annual recharge volume of approximately 244 to 262 AFY. Nearly 75% of the contributing recharge area lies upgradient of SR1 where the new production wells are proposed. As compared with other possible well locations farther to the east or to the west, this proposed location will afford the wells the greatest opportunity for annual replenishment at rates that substantially exceed the projected annual water demands for the project.

- **Minimize Well Interference.** The separation distance of 500 feet between the two wells will greatly minimize the potential for any drawdown influence or interference between the two wells.

Water Well Design and Operation

The design, construction and operation of the new water wells will be in accordance with recommendations provided by Todd Engineers (1992), including the following:

- Steel well casing;
- Stainless steel or low carbon steel wire wrap screen;
- Proper aperture size selection sized for the correct aquifer or sand pack dimensions;

- Thorough well development;
- Short-term pumping test to verify aquifer conditions are similar to SR1; and
- Utilization of only two-thirds of the available drawdown for 12-hour pumping cycles.

Through pumping tests, Todd Engineers determined the September Ranch Aquifer to have a transmissivity of 50,000 gpd/ft in the vicinity of SR1 and an estimated storativity of 30 percent. They also documented SR1 to have specific capacity of approximately 5.2 gpm per foot of drawdown, and a well efficiency of 20 percent, which is unusually low. Todd Engineers estimated that the low specific capacity for SR1 may be due to improper well development and/or misplaced well screen locations. Properly designed and operated wells should have substantially higher efficiencies, in the range of 70 to 80 percent. For the September Ranch Aquifer, this would result in specific capacities on the order of nearly 20 gpm/ft of drawdown. Accordingly, the expected water level drawdown caused by sustained pumping of 47 gpm by one of the new production wells would be on the order of approximately 2.5 feet at the well location. For short-term peak daily production of 95 gpm, the maximum drawdown could be twice this amount, or 5 feet. These are insignificant drawdown levels that will result in a very limited zone of influence around the pumping well. For the above cited transmissivity and storativity values (per Todd), operation of one of the new wells at a sustained pumping rate of 47 gpm for 180 days would result in an estimated water table drawdown of approximately 0.5 feet at a distance of 300 feet from the pumping well (see **Attachment B** for calculations).

Water Treatment Facilities

A reverse osmosis (RO) water treatment system will be required for the September Ranch domestic water supply to reduce the concentration of iron, manganese and total dissolved solids for compliance with drinking water standards. The water treatment plant will be located in the vicinity of the former quarry, in the approximate location shown in **Figure 1**. Permit issuance for the water treatment plant will be subject to review and approval by the County of Monterey.

Waste by-products (reject) from the RO treatment process will be disposed by one or a combination of the following: (1) sanitary sewer discharge to the Carmel Area Wastewater District (CAWD) facilities; and (2) hauling and disposal to an approved wastewater treatment plant ocean outfall system.

Based on discussions with CAWD District Manager Ray von Doren, the CAWD will permit discharge of the RO reject water to be commingled with the sanitary sewer flow from September Ranch, subject to certain monitoring requirements and concentration limits, including most critically a sodium limit of approximately 140 to 150 mg/L. Preliminary calculations indicate that this will allow up to approximately half of the RO reject water to be discharged directly to the sanitary sewer (see **Attachment C**).

Any remaining RO reject will be hauled to the Monterey Regional Water Pollution Control Plant for metered discharge into their ocean outfall. According to one of the plant engineers (Greg Antosz), the Monterey facility currently receives similar RO reject water from the Monterra Ranch Mutual Water Company and Culligan, and would have capacity and provisions to take similar waste from September Ranch. The City of Watsonville Treatment Plant also currently receives and discharges RO reject water through their ocean outfall.

Water System Operations

The September Ranch water system will be operated under contract with a properly qualified and licensed water treatment operator. Provided in **Attachment D** is a letter from Carmel-Lahaina Utility Services, Inc., indicating their interest and availability to provide contract water system operation for September Ranch. Among their activities, Carmel-Lahaina currently operates the water system for Monterra Ranch Mutual Water Company, a nearby system similar in size and facilities as that planned for September Ranch.

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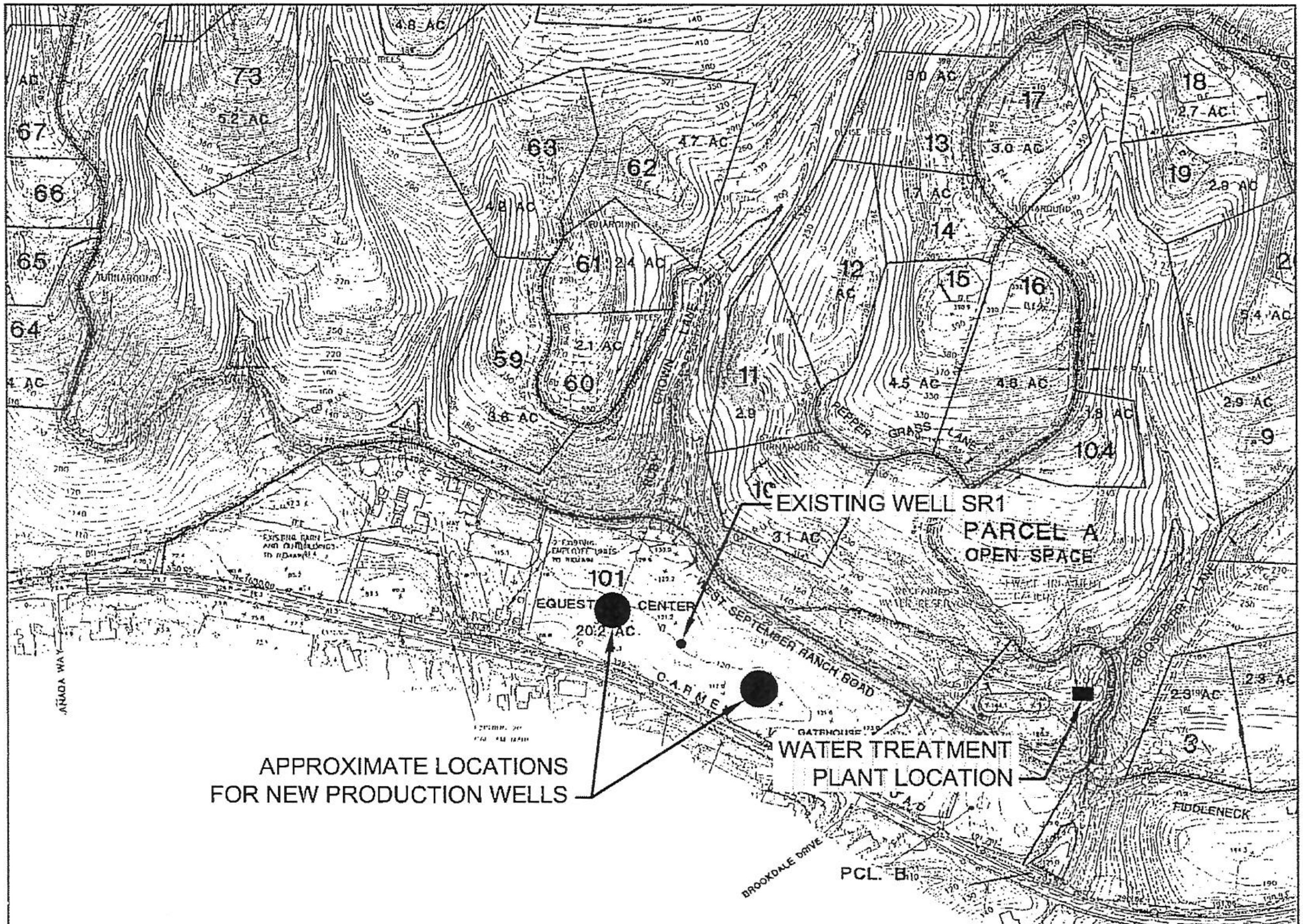

Date: 3/30/06	QUESTA Civil Environmental & Water Resources	WATER WELL & TREATMENT PLANT LOCATIONS	FIGURE
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Dwg. No: 220019_.dwg			

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Preliminary Calculations for RO Treatment Reject Water Disposal

September Ranch
Preliminary Calculations for RO Treatment Reject Water Disposal

ASSUMPTIONS

- Annual potable water demand, including system losses: 57.21 AFY
- RO reject water production: 15%
- RO treatment system removal target 50%
- Groundwater sodium concentration: 120 mg/L
- Daily wastewater flow for 110 connections @ 250 gpd/unit: 27,500 gpd
- Sodium addition from household wastes: 40-60 mg/L
- CAWD sodium limit for wastewater connections: 140-150 mg/L

CACLULATIONS

- Average daily potable water requirement:
  - (57.21 AFY)/(365 days) = 0.1567 AF/day
  - (0.1567 AF/day)(325,851 gal/AF) = 51,060 gpd; round to 51,000 gpd

- Average groundwater pumping demand, adjusted for 15% RO reject:
  - (51,000 gpd)/(1-0.15) = 60,000 gpd

- Average RO reject waste volume:
  - 60,000 gpd – 51,000 gpd = 9,000 gpd

- Average daily mass sodium pumped from groundwater (#/day):
  - Mass = (8.34)(0.060 MGD)(120 mg/L) = 60 #/day

- Average sodium concentration in RO reject water, based on 50% removal:
  - Sodium, mg/L = (0.5 x 60 #/day)/(8.34)(0.009 MGD) = 400 mg/L

- Average sodium concentration in treated water: (0.5)(120 mg/L) = 60 mg/L

- Average sodium concentration in sanitary wastewater:
  - (60 mg/L) + (40 to 60 mg/L waste addition) = 100 to 120 mg/L

- Average resultant sodium concentration in "blended" sanitary + RO reject water:

  - @ 40% of RO reject water discharge to sewer:

$$\frac{(27{,}500\text{ gpd})(100\text{ to }120\text{ mg/L}) + (3{,}600\text{ gpd})(400\text{ mg/L})}{27{,}5000\text{ gpd} + 3{,}600\text{ gpd}} = \mathbf{135\text{ to }152\text{ mg/L}}$$

  - @ 50% of RO reject water discharge to sewer:

$$\frac{(27{,}500\text{ gpd})(100\text{ to }120\text{ mg/L}) + (4{,}500\text{ gpd})(400\text{ mg/L})}{27{,}5000\text{ gpd} + 4{,}500\text{ gpd}} = \mathbf{142\text{ to }159\text{ mg/L}}$$

Kennedy Jenks: Technical Memorandum No. 8

Kennedy Jenks: Technical Memorandum No. 8

26 May 2006

Technical Memorandum No. 8

To: Sachi Itagaki, P.E., Project Manager

From: Robert Ryder, P.E., Process Engineer

Subject: September Ranch Water Treatment Alternatives
K/J 034813*03

Background

The proposed water supply for the September Ranch residential development is a groundwater well with an allowable annual yield of 57.21 AF per year (18.64 MG per year). Sampling and analysis of the water quality of the Main Well was completed this year and the concentration of total dissolved solids (TDS), iron, manganese, and total coliform bacteria were found to exceed California primary and secondary maximum contaminant limits or levels.

A summary report by Questa Engineers in April 2006 proposed that a reverse osmosis (RO) membrane water treatment plant be utilized to lower the TDS and other constituents to below drinking water limits. A concentrated brine reject water of 15% of the daily potable supply which would be 9,000 gpd average would be produced of which only half could be discharged to the sanitary sewer due to a sodium limitation for wastewater concentrations and the other 4,500 gpd hauled away each day to the Monterey Wastewater Treatment Plant's outfall for disposal to the ocean. The water capacity loss for R.O. treatment and the handling of brine residues would be a problematic water capacity loss and a continuing major expense for the September Ranch development.

You initially inquired if a pellet softening water treatment alternative could be feasible for this facility as a possibility to reduce well water pumping quantities and offsite disposal quantities for water treatment residues. Kennedy/Jenks Consultants has been interested in pellet softening as is commonly used in European and also in many Florida and Midwestern U.S. water treatment projects (Merkel, 1999; Benefield, 1999). Our interest in pellet softening was initiated as a means of reducing salinity of sodium ion exchange water softeners and TDS in water supplies and waste discharges in California in recent years. We have pilot tested and evaluated pellet softening processes at Soquel, Hollister, Cambria, Santa Paula, Oxnard, Valencia, and other locations; and are quite familiar with the chemistry and technology for application in California.

The concept of multi-stage R.O. treatment to reduce brine disposal quantities and thereby produce more usable potable water is also extensively used by industrial power plants, but less commonly by municipal facilities. There is also a third alternative for hardness and TDS removal that has been extensively used for municipal water supplies in Florida which is nanofiltration membranes. These are larger pore size membranes than R.O. but effectively remove the larger divalent ions, including calcium, magnesium, bicarbonate, sulfate, etc. from water and these like lime treatment for pellet softening also remove a substantial portion of TDS. A study conducted

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by Kennedy/Jenks with Port Hueneme Water Agency (PHWA) using reverse osmosis, nanofiltration, and electro dialysis removal (EDR) is found in the attached references.

Pellet Softening

The pellet softening process targets the removal of calcium and bicarbonate by precipitation to produce a calcium carbonate (calcite-limestone) solid particle which forms a hard crystal upon a small sand grain (Graveland, 1983; Horsley, 2005). This provides very concentrated dry granules of calcite which can be hauled away and usually beneficially used to "lime" and reduce alkalinity of acidic soils of farmed fields and vineyards typical of coastal areas of California (Cornwall, 1990).

In a recent article (deBoer, 2005) pellet crystallization is described as a zero-discharge technique that has resulted in numerous applications world wide, not only for softening and TDS removal, but for fluoride, phosphate and heavy (toxic) metals and organics removal as well (Mercer, 2005). Two types of alkaline chemicals are commonly used to raise the pH of the water to the calcium carbonate saturation limit of 10.5±, sodium hydroxide (NaOH) or calcium hydroxide ($Ca(OH)_2$). NaOH is utilized when a simple liquid chemical is chosen, and increase in sodium ion in the water is not of concern. However, the use of calcium hydroxide is also used and in that case similar to any cold lime water softening slurry process, and has the advantage of greater reduction in TDS, no sodium increase, lower chemical cost, but greater solids residues. Both chemicals were tested at Soquel and performed equally. It is the latter, chemical calcium hydroxide addition that is viable for September Ranch because of the necessity to lower sodium in discharges to the wastewater system.

The Soquel Creek Water District (SCWD) is currently considering installation of pellet softening at their five groundwater treatment plants if and at such time as their consumers wish to improve aesthetic water quality to include centralized water softening. The pilot plant testing and conceptual level pricing provided SCWD with a conceptual plan of providing centralized softening to lower hardness, TDS, and improve the aesthetic quality of the water on very limited land area sites.

Water Quality and Pellet Softening Effects

A compilation of the Main Well water quality in terms of general constituents; principal cations and anions, metals, and other pertinent characteristics relating to lime-pellet water softening are shown in Table 1. This table shows that the well water is a low pH, high TDS, hardness, iron and manganese water which also indicates the presence of Total Coliform, probably of soil origin as the fecal source E. Coli were not detected.

The well waters' principal ions are calcium and bicarbonate as shown in the calculated milli-equivalent/liter (MEQ/L) column. However, there is an excess of anions, which are attributable

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to a high carbon dioxide (CO_2) concentration, which can be readily stripped off by aeration to then lower bicarbonate alkalinity, elevate the pH to about 7.5 and greatly reduce the quantity of calcium hydroxide lime slurry needed for pellet softening and as a result the quantity of calcite solids residues for disposal.

The Main Well water quality is ideal for lime pellet softening as there is a predominance of both calcium and alkalinity, and dosage with lime slurry to a pH of 10 to 10.5 will enable the crystallization of calcite to form hard pellets of 3 to 4 millimeters in diameter. Treatment will occur in an upflow slurry contactor. The third column in the table indicates what should be the finished water quality following treatment stages which include (Horsley, 2005):

1. Air stripping to reduce CO_2 and elevate pH to 7.5±
2. Lime pellet softening to pH 10.5±
3. CO_2 neutralization to pH 8±
4. Granular media pressure filtration to remove the cloudy lime milk turbidity carry over from the pellet softener.

Lime pellet softening is estimated to reduce the TDS from 992 mg/l to about 480 mg/L and the total hardness from 512 mg/l $CaCO_3$ to about 215 mg/L $CaCO_3$. The iron and manganese in the well water will be oxidized by aeration stripping and will be coprecipitated onto the calcite pellets, which should almost totally remove these constituents (Permutit, 1994). It is expected that the elevated pH will also substantially reduce viable total coliform, which can further be totally destroyed by chlorination prior to filtration. A discussion of pellet softening as found in an American Water Works Research Foundation (AWWARF) document is found in the attached references.

Although a Monterey County health staff member commented on our 22 May 2006 conference call that 480 mg/L TDS is very close to the 500 mg/L best secondary containment level and does not leave much margin for error, the response can be that the actual long term upper secondary contaminant level for TDS in California is in fact 1,000 mg/L; and even the untreated well water meets that criteria, and is a typical quality for many communities in California (DHS, 1998).

The sodium concentration of the water will not be affected, and remain at 121 mg/L. There are no primary or secondary drinking water standards for sodium. Questa Engineers indicates a typical sodium increase of 40 to 60 mg/L by domestic use, with resultant waste discharges of sodium at 161 mg/L, slightly above the limit of 150 mg/L of the Carmel Area Wastewater District (CAWD).

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There are possibilities of lowering the incremental sodium increase in domestic use to 20 to 30 mg/L which would then be within the sodium acceptance parameters of the CAWD. These sodium reduction methods would include provisions to require that any residential water softeners, if homeowners use them, use potassium chloride rather than sodium chloride for ion exchange regeneration, encourage potassium chloride for hypochlorite disinfection for swimming pools, if allowed, and potassium hydroxide rather than sodium hydroxide in cleaning products.

At any rate, the predicted sodium concentration in the wastewater even with a 40 mg/L incremental sodium increase is 161 mg/L compared to the R.O. projections of a maximum of 159 mg/l (Attachment C of Questa Report), so the difference is not significant and may be tolerable to the CAWD.

Overall, the capital cost of the pellet softening-filtration alternative should be less than half of the cost of an R.O. membrane system; and power, energy, and chemical costs of less than a quarter of R.O. costs. However, the largest savings will be in solids residue disposal costs as compared to brine discussed as follows; and the fact that rather than an average RO reject stream of 9,000 gallons per day of water; the reject stream will be less than 200 gpd, and primarily of filter backwash water. Questa estimates that 50% to 60% or 4,500 to 5,400 gpd of the RO reject stream would have to be trucked each day to the Monterey Regional Water Polution Control Plant while the remainder could be discharged to the sanitary sewer.

At a predicted peak daily treatment capacity of double that of the daily average for water treatment facilities, 120,000 gpd, or 85 gpm is the size needed for the water treatment facility and the brine level would then be 9,000 gpd or two 4,500 gallon trucks.

Air stripping would be accomplished at a 10 gpm/sf rate, in a 3 1/2 feet diameter stripping tower, pellet softening is at a 15 to 20 gpm/sf rate and would be accomplished by two 3 feet diameter redundant pellet softener columns, and filtration at a 3 gpm/sf rate by two 6 feet diameter anthracite and silica sand media pressure filters (Permutit, 1994).

There is moderate use of pellet softening for municipal supplies in the United States, but many installations in Europe and Japan. The largest municipal installation in the U.S. is at Hollywood, Florida. Permutit literature cites municipal installations in Wyoming and Iowa, but since acquisition by U.S. Filter Company there has been no aggressive marketing of pellet softening in this county. We have contacted Permutit and they have supplied a list (attached as a reference) of 62 municipal pellet softening facilities in the U.S., 41 in Florida, but only six west of the Mississippi River, the closest being at Gillette, Wyoming. In the Netherlands, calcite pellets from softening plants are sold to farmers to lime agricultural lands (Cornwall, 1980). However, that may not be possible for one small facility in California.

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In the United States, in the late 1990s there was an introduction of a Dutch pellet softener through Wheelabrator (1998), but since their acquisition by U.S. Filter, that improved pellet softener is no longer available. Information on the Wheelabrator technology is found in the attached references. Recently, Kennedy/Jenks Consultants in the interest of utilizing more of this innovative technology in the western U.S. have had Roberts Filter Co. of Darby, Pennsylvania fabricate pilot pellet softeners and have designed systems up to 800 gpm capacity for full scale production. The pellet softening results were favorable in all pilot test situations and implementing final design and construction is pending for most of these agencies as an economical means to reduce salinity.

Residue Disposal

The waste from a pellet softening plant is small hard crystals of limestone surrounding the tiny silica sand grains used as the nucleus (deBoer, 2005).

The calculated annual quality of limestone pellets is 93,300 pounds = 46.65 tons per year. The overall volume is about 40 cubic yards per year. The pellets can be discharged into 20 cubic yard dumpster containers and hauled offsite about twice per year, as shown on the attached page of pellet softening calculations (Table 2).

It is quite likely that the pellet disposal cost would be minimal, as there are nearby agricultural land areas of acidic soil in the Salinas Valley that can benefit from lime addition. Typically, vineyards and other agricultural land utilize about 50 pounds of lime per acre per year, which would require an approximately 1,900 acre area to agronomically utilize the lime pellets.

Even with pellet disposal costs to a landfill estimated at $200 per ton, the annual costs would be $9,400 per year as compared to a brine waste disposal cost estimated at $0.10 per gallon, which would total $164,000 per year. The difference is very substantial.

TDS Removal by Lime Softening

There were comments received from various California Department of Health Services Engineers questioning if water softening reduces TDS. The response is, of course, it does, as calcium, magnesium, and bicarbonate are all precipitated and used by lime softening processes. However, cold lime softening is not a usual water treatment practice in California as it is in the Midwest, Florida, and other regions in the United States. The only municipal water treatment plant that I know of in California that utilizes a cold lime softening process is at Lompoc; and the DHS and Monterey County Environmental Health staff can visit Lompoc at any time to verify that lime softening reduces TDS. There may be others; however, it is not only what is shown on the table below that demonstrates both the hardness and TDS reduction, but a table of results for Spiractor (Permutit, 1994) in the attached literature.

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Characteristic	Concentration	Harlan, IA WTP Raw	Harlan, IA WTP Treated	Gillette, WY WTP Raw	Gillette, WY WTP Treated
pH	units	7.4	9.8	7.7	8.4
Calcium	mg/L	220	60	152	56
Magnesium	mg/L	98	80	28	24
Sodium	mg/L	37	37	66	68
Bicarbonate	mg/L	224	14	162	54
Carbonate	mg/L	0	3.2	--	--
Chloride	mg/L	31	31	80	80
Sulfate	mg/L	100	100	4	4
TDS	mg/L	335	177	532	296
Total Hardness	mg/L $CaCO_3$	991	466	180	80

One of the difficulties that may confront DHS reviewers is that the constituents of TDS, iron, and manganese are all Secondary Maximum Contaminant Levels for aesthetic water quality and the technology for achieving the objectives are not as defined in regulations as for primary contaminents. The secondary MCLs for iron equal 0.3 mg/L; manganese equals 0.05 mg/L; turbidity equals 5 NTU, but is flexible for TDS chloride and sulfate. Secondary Maximum Containment Levels (DHS, 1998).

Characteristics	Units	Recommended	Upper	Short Term
TDS	mg/L	500	1,000	1,500
Chloride	mg/L	250	500	600
Sulfate	mg/L	250	500	600

There is no limit for water hardness in public health regulations; and that has resulted in a proliferation in California of many consumers to have sodium or potassium chloride ion exchange softeners. Only in recent years is there now concern that the discharges for these ion exchange units are resulting in excessive TDS, chloride and sulfate in washwater and degradation of water quality in surface water and groundwater is of more concern to the State Water Quality Control Board than the DHS as these are for the most part environmental rather then public health concerns.

The conference call of 22 May 2006, with owners, attorneys, environmental specialists, and engineers representing September Ranch and Monterey Environmental and Health staff indicated that regulatory agency staff had had limited exposure to lime softening, and the resultant TDS reduction or pellet softening.

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Communication between Monterey County with California Department of Health Services (CDHS) staff when queried about pellet softening indicated that CDHS staff also had limited knowledge and experience with this technology although it is an older water treatment technology than the better known R.O. or other membrane process; and had recently been presented in two recent American Water Works Associations publications (Horsley, 2005 and Benefield, 1999)

There was, of course, knowledge of the Reverse Osmosis (RO) process as it has been used rather extensively in California for the past ten years as a means for TDS reduction of brackish water, but with relatively substantial brine discharge proportions (Duranceau, 2001). Projected results from the Oxnard RO project are also found in the attached references.

However, it is necessary to incorporate a lime precipitation water softening process for removal of calcium, magnesium, bicarbonate, and silica to achieve R.O. reject brine proportions as low as 5%, the objective for September Ranch (O'Brien and Gere, 2006).

Quite likely as environmental process engineers like, Dr. Val Frenkel and myself, we have worked on and are aware of technological process developments and experience world wide; and State and County regulators do not have the same opportunity.

Kennedy/Jenks has conducted five pellet softening water treatment pilot plant tests in California on brackish water TDS reduction in recent years as stated previously and State DHS and local regulators were informed, observed, and or reviewed the data for each of these tests. Kennedy/Jenks could do a pilot plant pellet softening test at September Ranch to demonstrate the simplicity, capital, chemical, and energy cost savings and it is suggested that this remain an option to multistage R.O. treatment that is discussed as follows to propose a water treatment process that is apparently approvable because of past knowledge by the regulators.

Multi-Stage R.O.

A common means to increase the usable water supply and reduce brine discharges is by multi-stage R.O., where the brine from the first stage then is pumped to and treated by a second stage, and in some cases even a third stage of R.O. (Duranceau, 2001).

Typical reject proportions are 70% for the second stage and 50% for the third stage. Then it is possible to reduce brine haul costs by using a multi-stage R.O. approach. The attached data sheets for 3 stage RO by Dr. Val Frenkel, Kennedy/Jenks Consultants' Membrane Specialist indicates that it is possible to utilize antiscalent chemical inhibitors to minimize R.O. membrane fouling by calcium carbonate and silica to produce a 90% recovery and 10% brine discharge, but to achieve a 95% recovery and 5% discharge both calcium carbonate and silica would have to be removed by a chemical precipitation lime softening process.

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Zero discharge of R.O. treated water in industrial and power plant water treatment projects has been rather common for the past ten years and Dr. Frenkel has designed facilities of this type, including one at the Nevada Power Company near Las Vegas. Kennedy/Jenks designs of R.O. treatment at Ventura and Oxnard are also multistage facilities, but not as low as < 5% reject.

There is now interest in zero discharge in municipal R.O. treatment and patented system by O'Brien and Gere of New York called Arrow Advanced Reject Recovery (2006), which also utilizes a softening process in the treatment train. Again, it is likely that there is no current operational facilities of this type or municipal water suppliers in California and just why this is a patented process when so commonly used in power plant and industrial systems is unclear.

However, it is a near zero discharge multistage R.O. water softening treatment process that is proposed as the apparent best water treatment process to maximize potable water availability and minimize brine reject for September Ranch. The Walker Claricone slurry softener (Walker, 1998) is suggested as a compact, operationally simple process that could fit in well with the proposed treatment train. Literature for Walker is provided in the attached references.

R.O. Stage	Reject Water % of Raw	Total GPD
First	15	9,000
Second	10	6,000
Third (with softening)	5	3,000
Third (with crystallization)	1	< 600

This alternative would reduce brine haul costs by more than 90% and instead of a daily haul, only twice a week. However, there would be considerably greater capital and O&M costs for multi-stage R.O., and not only would iron and manganese require removal by oxidation-filtration processes before the first stage R.O. but water softening and silica removal would be required before second or third stage R.O. However, the potable water percentage would increase to nearly 99% of what is proposed for groundwater withdrawal.

Nanofiltration

Nanofiltration is also a viable membrane process which is used to remove 60 to 80% of hardness and as a result a substantial reduction of TDS (Faller, 1999). The expected treated water quality for nanofiltration would be:

Characteristic	Units	Well Water	Nanofiltered Water
Total Hardness	mg/L $CaCO^3$	512	135
TDS	mg/L	992	515

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The overall water recovery would be about 90% for a first stage unit, and 97% for a two stage nanofiltration unit. Overall, this would reduce the haul to about 1,800 gpd.

Summary

1. The September Ranch groundwater quality appears ideal for a cold lime pellet softening water treatment approach to reduce TDS, iron and manganese below potable water quality levels for residential drinking water consumption.

2. The capital cost of the pellet softening equipment and filters should be less than half of the cost of an iron-manganese filter – R.O. or nanofiltration, water treatment facility.

3. The O&M costs of the pellet softening alternative should be less than one quarter the cost of R.O. and principally be in reduced electric energy costs.

4. The cost of removal of the calcite pellets is less than ten percent of the costs of excess brine haul of a single stage R.O. system for disposal at Monterey WWTP, and occur twice a year rather than every day.

5. The pellet softened water with rigorous sodium use reduction criteria for residents should assure that an acceptable residential wastewater discharge sodium concentration to the Carmel Area Wastewater District even without sodium reduction by water treatment.

6. There is minimal need to pump an excess of water beyond the 57.21 AF per year or lose a portion of the allowable water supply required for the September Ranch Development, as water treatment losses with pellet softening should be less than 200 gpd.

7. Iron and manganese removal prior to membrane filtration would be required for both R.O. or nanofiltration, but will be removed as an intrinsic part of the pellet softening process.

8. Three stage R.O. treatment with water softening can reduce brine reject volumes to 600 gpd, and result in nearly 99% usable water supply; however, at substantially high capital and O&M costs and complexity for facilities.

9. Nanofiltration is also an option for TDS reduction and can result in 97% water recovery for a two-stage system and brine reject volumes of 1,800 gpd. It could have substantially less costs than R.O.

10. A rigorous analysis of compatible siting facilities, capital, O.M., and disposal costs are necessary to verify what is the best water treatment process to utilize for the September Ranch. However, at this stage, multistage R.O. with softening is the apparent best

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project to achieve regulatory approval. It is suggested that the door be kept open to compare pellet softening with multistage R.O. softening treatment, and if necessary operate a pilot plant at September Ranch to demonstrate and verify advantages and to fund a trip for State and County regulatory staff to observe pellet treatment in Florida and the Netherlands as necessary to seek approval of use.

We are available to discuss any of the data and findings of this Technical Memorandum in more detail and provide as requested additional support information of the pellet softening and related water treatment processes.

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Table 1: September Ranch Water Plan

Water Quality Before and After Pellet Softening for Iron, Manganese, and TDS Removal - Main Well(1)

Characteristics General	Units	Well Water		Softened and Filtered Water		Drinking Water Limit
pH	--	6.9		8.0		6.5 – 8.5
Turbidity	NTU	3.8		< 0.5		5
Odor	TON	2		< 1		3
Conductivity	umhos	1,700		800		--
Total Dissolved Solids	mg/L	992		480		500
Color	CU	14		< 5		15
Total Hardness	mg/L $CaCO_3$	512		215		200*
Total Alkalinity	mg/L $CaCO_3$	442		50		200*
CATIONS			MEQ/L		MEQ/L	
Calcium	mg/L	139	6.95	20	1.00	--
Magnesium	mg/L	40	3.28	40	3.28	--
Sodium	mg/L	121	5.26	121	5.26	170*
Potassium	mg/L	3.6	0.09	3.6	0.09	--
			$\sum$ =15.58		$\sum$ =9.63	--
ANIONS						
Bicarbonate	mg/L	512	8.39	0.02	--	--
Carbonate	mg/L	ND	--	--	--	--
Chloride	mg/L	161	4.53	161	4.53	250
Sulfate	mg/L	250	5.10	250	5.10	250
Nitrate (N)	mg/L	ND	–	ND		10
Fluoride	mg/L	0.54	–	0.1		1
			$\sum$ =18.02		$\sum$ =9.63	
METALS						
Iron	mg/L	0.46			< 0.10	0.30
Manganese	mg/L	0.229			< 0.02	0.05
Chromium	µg/L	18			< 10	100
Lead	µg/L	6			ND	15
Selenium	µg/L	12			ND	50
Copper	µg/L	ND			ND	1,300
Zinc	µg/L	ND			ND	5
OTHER						
CO_2	mg/L	140			5	5*
Coliform Total	±	Present			Absent	ND
Coliform E Coli	±	Absent			Absent	ND

Notes:
* Suggested by KJC as desirable, but not a mandatory limit or level.
(1) Sample collected 20 March 2006 and analyzed by Monterey County Chemistry Laboratory ID AA86939.

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Table 2: September Ranch – Pellet Softening Analysis

Estimated TDS Reduction from Pellet Softening:

Lower calcium by 6.45 MEQ/L

Ca Loss: 139 - 20 mg/L Loss =119 mg/L

Alkalinity Loss	6.45 MEQ/L x 61 =	393 mg/L
	Total TDS Loss =	512 mg/L

Net TDS after Pellet Softening = 992 – 512 = 480 mg/L

Below to 500 mg/L recommended TDS level; therefore pellet softening will reduce TDS to recommended levels

Hardness Remaining After Pellet Softening

Hardness as $CaC O_3$	Ca = 20 mg/L x 2.5 =	50 mg/L $CaCO_3$
	Mg = 40 mg/L x 50/12.2 =	164 mg/L $CaCO_3$
	Total Hardness =	215 mg/L $CaCO_3$

Waste Solids Residue Produced at 57.2 AF/year x .326 MG/AF = 18.64 MG

Reaction $Ca(OH)_2 + Ca(HCO_3) \rightarrow 2CaCO_3 + 2H_2O$

Therefore sludge as Ca = 200/40 = 5 x 119 mg/L= 600 mg/L as $CaCO_3$

Lbs/year = 18.64 MG x 600 mg/L x 8.34 Lbs/year = 93,300 calcite #/year = 46.65 tons/year

At 1.2 T/CY = 38.9 CY per year.

Therefore, about two 20 cubic yard truckloads of calcite-limestone pellets per year to be sold for application to acidic agricultural soils.

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