BELTZ WELL NO. 12

DRAFT
ENVIRONMENTAL IMPACT REPORT
Research Park Drive, Soquel, CA

Prepared for:

CITY OF SANTA CRUZ WATER DEPARTMENT
212 Locust Street, Suite C
Santa Cruz, California 95060

Prepared by:

CHAMBERS GROUP, INC.
5 Hutton Centre Drive, Suite 750
Santa Ana, California 92707

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EXECUTIVE SUMMARY

E.S.1 INTRODUCTION

The City of Santa Cruz Water Department (City) proposes to construct a water well and associated facilities in the unincorporated community of Soquel, Santa Cruz County, California. The proposed well would be located on the northeast corner of Research Park Drive and Cory Street, in Soquel. Beltz Well No. 12 (Proposed Project) will be drilled to an approximate depth of 320 feet below ground surface (bgs) to provide up to approximately 700 gallons per minute (gpm) of water. Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's groundwater extraction, but would instead redistribute a portion of the City's historic production further inland and away from the Live Oak well field. The City's future maximum groundwater production with the addition of Beltz Well No. 12, will be up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years. The distribution of pumping will depend on the maintenance of coastal groundwater levels to protect the aquifer from seawater intrusion, but will generally draw first from the coastal wells to capture groundwater flow just prior to moving offshore.

E.S.2 PURPOSE OF THE ENVIRONMENTAL IMPACT REPORT

The primary purpose of the California Environmental Quality Act (CEQA) is to inform the public and decision makers as to the potential impacts of a project and to allow an opportunity for public input to ensure informed decision making. CEQA requires all state and local government agencies to consider the environmental effects of projects over which they have discretionary authority. CEQA also requires each public agency to mitigate or avoid the significant environmental impacts resulting from Proposed Projects, when feasible, and to identify a range of feasible alternatives to the Proposed Project that could reduce those environmental effects.

Under CEQA, a project Environmental Impact Report (EIR) analyzes the impacts of an individual activity or specific project and focuses primarily on changes in the environment that would result from the activity or project. The EIR must include the contents required by CEQA and the *CEQA Guidelines*, and examine all phases of the project, including planning, construction, operation, and any reasonably foreseeable future phases.

E.S.3 PROJECT BACKGROUND

The City is responsible for providing water to over 90,000 people in the City, unincorporated Santa Cruz County, a small part of the City of Capitola, and several agricultural customers along Highway 1 between the City limits and the town of Davenport.

The primary water management problem presently facing the City of Santa Cruz is the lack of adequate water supply during dry and drought years when rainfall and runoff are below normal. Operations studies conducted by the City show that the problem of water shortage will worsen, in terms of both frequency and magnitude, as the population of the region grows and demand for water increases over time.

The City's primary sources of water supply are surface water diversions; however, approximately 5% of the City's water supply is groundwater provided by the Live Oak well field. This well field only extracts

water from the coastal portions of the Purisima aquifer. While the Live Oak wells groundwater system is a small portion of the City's water supply, it is expected to be an increasingly important source of water as it is used to augment the City's water supply during peak demand and drought periods.

The City currently produces 1 million gallons per day (mgd) (700 gpm) during the peak season from the Live Oak wells. However, due to declining coastal groundwater levels, Beltz Well No. 12 is needed to restore water system reliability and to protect the Purisima aquifer from seawater intrusion, especially during critical drought periods. Groundwater extracted from Beltz Well No. 12 would be from the same zones of the Purisima aquifer as the existing Live Oak well field and would not increase the City's groundwater extraction.

E.S.4 PURPOSE AND NEED FOR THE PROJECT

A study completed by the City to investigate the hydrogeological conditions of the area concluded that new production wells developed by the City should be shifted inland from the existing Live Oak well field in an attempt to control groundwater levels and protect the Purisima aquifer from seawater intrusion (Hopkins Groundwater Consultants, Inc., 2009b). The City has proposed to develop Beltz Well No. 12 at the Research Park Drive site, which is located approximately 1.5 miles inland and northeast of the Live Oak well field.

The purpose of the Proposed Project is to maintain the City's historic groundwater production, to locate the well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system.

E.S.5 PROJECT DESCRIPTION

The proposed Beltz Well No. 12 and associated treatment facilities (Proposed Project) would be installed on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in Soquel, California. The new water well would include the following components: (1) a pump and chemical storage building, approximately 40 feet by 20 feet and approximately 12 feet in height; (2) an iron and manganese treatment system consisting of pressurized filter tanks, approximately 35 feet by 9 feet and approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 16 feet in diameter and approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height; and (5) station piping, including, treated water pipeline, sewer connections, and new stormwater drainage facilities that would connect to existing facilities in Research Park Drive. The Proposed Project site would be enclosed with a chain-link fence with privacy slats. The site would also be developed with a paved driveway connecting to Research Park Drive, security lighting, and crushed rock around the Proposed Project facilities.

The new well will be drilled to an approximate depth of 320 feet bgs to provide up to approximately 700 gpm of water. Tentative well design includes a 32-inch diameter bore hole and a 16-inch diameter well casing and screen design to facilitate the use of either a submersible pump or a vertical line-shaft turbine pump. The well will likely be located in a pump and chemical storage building which will also contain the pump controls and a storage area for the generation and storage of sodium hypochlorite (typically 350 gallons or less of 12.5% sodium hypochlorite). It is possible that the well will not be enclosed by a building but chemicals will still need to be stored inside an enclosed area that is protected from the sun. Sodium hypochlorite is used as a disinfectant for the finished water and for pretreatment in the removal of iron and manganese. The exact treatment process will be determined once the well

has been drilled since pilot testing should be done prior to design of wellhead treatment. However, iron and manganese treatment typically consists of adding sodium hypochlorite to oxidize the iron and manganese into a form that is easier to remove. Next the water is run through a filter media, such as green sand, anthrasand, or pyrolusite, where the iron and manganese is physically removed by filtration/straining action. There is a low possibility that potassium permanganate may also be used in the iron and manganese treatment system. The treated water is then piped to the City's potable water distribution line located adjacent to the Proposed Project site in Research Park Drive.

At least daily, the filter media is cleaned by backwashing to remove the accumulated iron and manganese. The backwash is then piped to the backwash tank. In this tank, the iron and manganese settle out from the groundwater. The clear water is recirculated to the wellhead treatment and the remaining sludge is transported offsite every year to an appropriate disposal facility or piped to the County sanitary sewer line located immediately adjacent to the Proposed Project site in Research Park Drive.

Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's groundwater extraction, but would instead redistribute a portion of existing City production further inland and away from the Live Oak well field. The City's future maximum groundwater production with the addition of Beltz Well No. 12, will be up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years. The distribution of pumping will depend on the maintenance of coastal groundwater levels to protect the aquifer from seawater intrusion, but will generally draw first from the coastal wells to capture groundwater flow just prior to moving offshore.

E.S.6 SUMMARY OF IMPACTS AND MITIGATION MEASURES

The content of the Draft EIR was established based on the findings of the Initial Study (IS) and public and agency input (see Chapter 1.2, Scope of the EIR). Based on the analysis contained in the IS and public and agency input, the following issue areas were analyzed:

- Hydrology and Water Quality (effects on non-City wells and groundwater contamination sites)
- Biological Resources (biological resource issues related to stream flow losses in Rodeo Gulch Creek and Soquel Creek)

Table 1 summarizes the potential impacts for the above mentioned issue areas, including cumulative impacts, associated with the Proposed Project. The discussion associated with these impacts is presented in Chapter 3. The level of significance for each impact was determined using significance criteria (thresholds) developed for each category of impacts. These criteria are presented in each topical section of Chapter 3. Significant impacts are those adverse environmental impacts that meet or exceed the significance thresholds; less-than-significant impacts would not exceed the thresholds. As indicated in Table 1, implementation of the Proposed Project would not result in any significant and unavoidable impacts.

Table 1: Summary of Impacts

Potential Impacts	Level of significance	Mitigation Measures
Section 3A - Hydrology and Water Quality		
Impact 3.A-1: Implementation of the Proposed Project could result in physical damage or an appreciable reduction in yield to existing and proposed SqCWD wells.	Less than significant.	None required.
Impact 3.A-2: Implementation of the Proposed Project could result in physical damage or an appreciable reduction in yield to existing nearby private wells.	Less than significant.	None required.
Impact 3.A-3: The Proposed Project could change the flow gradient or flow direction at nearby groundwater contamination sites.	Less than significant.	None required.
Impact 3.A-4: The Proposed Project could contribute to cumulative impacts at SqCWD existing and proposed wells.	Less than significant.	None required.
Impact 3.A-5: The Proposed Project could contribute to cumulative impacts to existing nearby private wells.	Less than significant.	None required.
Impact 3.A-6: The Proposed Project could contribute to cumulative change in the flow gradient or flow direction at nearby groundwater contamination sites.	Less than significant.	None required.
Section 3B - Biological Resources		
Impact 3.B-1: The groundwater pumping associated with the Proposed Project could adversely affect the baseflow in Rodeo Gulch Creek.	Less than significant.	None required.
Impact 3.B-2: The groundwater pumping associated with the Proposed Project could adversely affect the baseflow in Soquel Creek.	Less than significant.	None required.
Impact 3.B-3: The groundwater pumping associated with cumulative projects could adversely affect the baseflow in Rodeo Gulch Creek.	Less than significant.	None required.
Impact 3.B-4: The groundwater pumping associated with cumulative projects could adversely affect the baseflow in Soquel Creek.	Less than significant.	None required.

E.S.7 GROWTH INDUCEMENT POTENTIAL

Pursuant to the CEQA Guidelines, an EIR must address whether a project will directly or indirectly foster growth. Section 5.2, Growth-Inducing Impacts, evaluates whether the Proposed Project would directly, or indirectly, induce economic, population, or housing growth in the surrounding environment.

The Proposed Project would not directly induce growth as it does not include the addition of residential development. In addition, as the Proposed Project would maintain the City's current level of groundwater pumping, it would not remove the physical obstacle to population growth of insufficient water supply. The Proposed Project would not indirectly induce growth through substantial increase in employment opportunities or an employment-related increase in population as construction workers for the proposed project are expected to be drawn from the local labor pool. Therefore, no impacts related to growth inducement would occur.

E.S.8 PROJECT ALTERNATIVES

CEQA requires that an EIR describe a range of reasonable alternatives to the project, or to the location of the project, which could feasibly avoid or lessen any significant environmental impacts while substantially attaining the basic objectives of the project. An EIR should also evaluate the comparative merits of the alternatives. Chapter 4 describes potential alternatives to the Proposed Project that were considered, identifies alternatives that were eliminated from further consideration and reasons for dismissal, and analyzes available alternatives in comparison to the potential environmental impacts associated with the Proposed Project.

Two alternatives for the Draft EIR were identified and evaluated:

- No Project Alternative - assumes that improvements described for the Proposed Project would not be implemented.
- Reduced Pumping Alternative – Beltz Well No. 12 would be drilled to an approximate depth of 700 feet below ground surface (bgs) to provide approximately 210 gallons per minute (gpm) of water, achieving a production rate of 125 acre-ft/yr.

The No Project Alternative would not result in the potential impacts associated with the Proposed Project. However, under the No Project Alternative the project objectives to locate a new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system, would not be achieved.

The Reduced Pumping Alternative would result in the same type of potential impacts as those associated with the Proposed Project but reduced in degree. CEQA Guidelines require that, if the No Project Alternative is determined to be the environmentally superior alternative, an environmentally superior alternative must also be identified among the remaining alternatives (Section 15126.6 (e)(2). As such, the Reduced Pumping Alternative would result in the reduced environmental impacts as compared to the Proposed Project, while still achieving the objectives of the Proposed Project.

Chapter 4.0 discusses the alternatives and alternative analysis in more detail.

E.S.9 AREAS OF CONTROVERSY

Section 15123 (b)(2) of the CEQA Guidelines requires that an EIR Executive Summary identify areas of controversy known to the lead agency, including issues raised by other agencies and the public. Written comments were received during the public comment period between December 17, 2010 and January 17, 2011. Issues that were raised during public scoping are summarized in Chapter 1.2, Scope of the EIR. Refer to Appendix A for the Notice of Preparation (NOP) and for the comments received during NOP circulation.

One area of technical and scientific controversy has been identified for the Proposed Project: The following issue of controversy was expressed from SQCWD:

"The Hopkins October 2010 report has a different conceptual model of geology in the area than used in Johnson et al (2004) that is the basis for SqCWD's analysis for its Well Master Plan DEIR. Yet, the Hopkins October 2010 report refers to the Hopkins geology as 'the generally accepted delineation of the

Purisima Formation aquifer units.' (p. 3) In the DEIR, the City needs to acknowledge this as an area of controversy."

The reports prepared by Hopkins Groundwater Consultants, Inc., have a similar, but not identical, conceptual model of geology in the area than what is used in *Groundwater Assessment of Alternative Conjunctive Use Scenarios, Technical Memorandum 2: Hydrogeologic Conceptual Model [*Johnson et al (2004)]. These reports include the two hydrogeology reports prepared for this EIR: *City of Santa Cruz Beltz Well No. 12, 645 Acre-Feet Per Year Project Well Interference and Streamflow Impact Analysis Live Oak-Capitola Area, California*, June 2011; *City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project Well Interference and Streamflow Impact Analysis Live Oak-Capitola Area, California*, June 2011; and the referenced *City of Santa Cruz Beltz Well No. 12 Well Interference and Streamflow Impact Analysis Live Oak-Capitola Area, California*, October 2010.

The Hopkins' interpretation of the underlying Purisima Formation geology produces a slightly more conservative analysis with larger drawdown impacts to the critical A zone. This was deemed to be the more appropriate of the two interpretations to use in this EIR.

CHAPTER 1 – INTRODUCTION

1.1 PURPOSE OF THE ENVIRONMENTAL IMPACT REPORT

All "projects" within the State of California are required to undergo environmental review to determine the environmental impacts associated with implementation of the project in accordance with CEQA.

CEQA was enacted in 1970 by the California Legislature to disclose to decision makers and the public the significant environmental effects of a Proposed Project and identify possible ways to avoid or minimize significant environmental effects of a project by requiring implementation of mitigation measures or recommending feasible alternatives. CEQA applies to all California governmental agencies at all levels, including local, regional and state, as well as boards, commissions, and special districts. As such, the City is required to conduct an environmental review to analyze the potential environmental effects associated with the Proposed Project. The City is the lead agency for the preparation of this Draft EIR in accordance with CEQA.

One of the primary objectives of CEQA is to enhance public participation in the planning process; public involvement is an essential feature of CEQA. Community members are encouraged to participate in the environmental review process, request to be notified, monitor newspapers for formal announcements, and submit substantive comments at every possible opportunity afforded by the agency. The environmental review process provides ample opportunity for the public to participate through scoping, public notice, and public review of CEQA documents. A diagram illustrating the CEQA process is shown in Figure 1 below. Additionally, lead agencies are required to respond to public comments in Final EIRs and consider comments from the scoping process in the preparation of the Draft EIR.

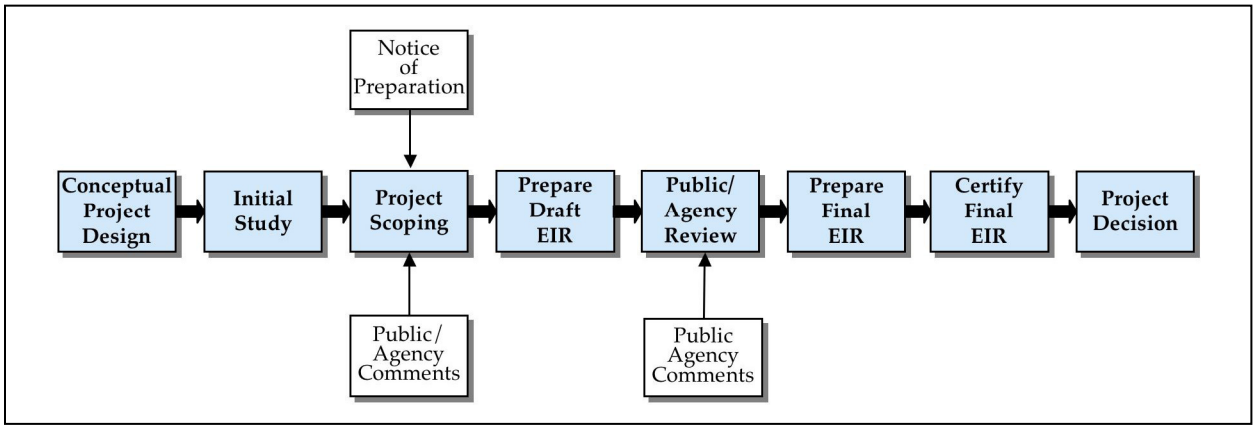


Figure 1: The Environmental Review Process

1.2 SCOPE OF THE EIR

This section provides a summary of the issues addressed in the EIR. This Draft EIR was prepared following input from the public, responsible agencies, and affected agencies through the EIR scoping process, which included the following:

- In accordance with the State CEQA Guidelines, a Notice of Preparation (NOP) and Initial Study (IS) were prepared and distributed on December 17th, 2010, to responsible agencies, affected agencies, and other interested parties.

- The NOP was posted in the County Clerk's office for 30 days. The NOP was submitted to the State Clearinghouse to officially solicit participation in determining the scope of the EIR.

- A scoping meeting was conducted on January 10, 2011 at 6:30 p.m. at the Best Western Capitola By-the-Sea Inn & Suites: 1435 41st Ave, Capitola, CA 95010.

- Information requested and input provided during the 30-day public review period and the scoping meeting, regarding the contents of the NOP/IS and the scope of the EIR were incorporated in this Draft EIR.

Written comments were received during the public comment period between December 17, 2010 and January 17, 2011. Comments on the following scope of analysis and issues were expressed:

- Impacts to neighboring private wells.
- Cumulative impacts to nearby wells.
- Concern that historic baseline pumping data does not reflect current conditions.
- Concern that baseline groundwater levels do not reflect current conditions.
- Demonstrate the effect of the Proposed Project on groundwater levels near the coast.
- Need to discuss drawdown impacts to SqCWD existing Garnet, Rosedale, Tannery wells and the Proposed O'Neil Ranch well, and private walls.
- The Hopkins October 2010 report has a different conceptual model of geology in the area than used in Johnson et al (2004) that is the basis for SqCWD's analysis for its Well Master Plan DEIR.
- Potential for Proposed Project pumping to interfere with cleanup activities at groundwater contamination sites.
- The Proposed Project (Beltz Well No. 12) is not a replacement for Beltz Well No. 4.
- Impacts associated with reduction in flow to Soquel Creek and Rodeo Gulch Creek.
- List Santa Cruz County Sanitation District for approval to discharge backwash water into sanitary sewer system.

The content of the Draft EIR was established based on the findings of the IS and public and agency input. Under the CEQA Guidelines, the analysis in the Draft EIR is focused on issues determined in the IS to be potentially significant, whereas issues found in the IS to have less than significant impacts or no impact, do not require further evaluation. Therefore, based on the analysis contained in the IS, the following issue areas were determined to have less than significant impacts or no impacts with respect to implementation of the Proposed Project and would not require further evaluation in the Draft EIR:

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources (with the exception of biological resource issues related to stream flow losses in Rodeo Gulch Creek and Soquel Creek)
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions/Climate Change

- Hazards and Hazardous Materials
- Hydrology and Water Quality (with the exception of effects on non-City wells and groundwater contamination sites)
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation and Traffic
- Utilities and Service Systems

This Draft EIR analyzes the following environmental issues:

- Hydrology and Water Quality (effects on non-City wells and groundwater contamination sites)
- Biological Resources (biological resource issues related to stream flow losses in Rodeo Gulch Creek and Soquel Creek)

In addition to the environmental issues identified above, this Draft EIR also includes all of the sections required by the CEQA Guidelines. Table 2 contains a list of sections required under CEQA Guidelines, along with reference to the chapter where these items can be found.

Table 2: Required Sections in CEQA Guidelines

Section Title	Location
Table of contents (Section 15122)	Table of Contents
Summary (Section 15123)	Executive Summary
Introduction (Section 15122)	Chapter 1
Project Description (Section 15124) and environmental setting	Chapter 2
Significant environmental impacts (Section 15126.2)	Chapter 3A-3B
Mitigation Measures (Section 15126.4)	Chapter 3A-3B
Cumulative impacts (Section 15130)	Chapter 3A-3B
Alternatives to the Proposed Project (Section 15126.6)	Chapter 4
Growth-inducing impacts (Section 15126.2)	Chapter 5
Effects found not to be significant (Section 15128)	Chapter 5
Unavoidable significant environmental impacts (Section 15126.2)	Chapter 5
Organizations and persons consulted (Section 15129)	Chapter 6 and 7
List of preparers	Chapter 7

1.3 DRAFT EIR ORGANIZATION

The Draft EIR is organized into the following chapters so the reader can easily obtain information about the Proposed Project and related environmental issues:

- Executive Summary – Presents a summary of the Proposed Project and alternatives, potential impacts and mitigation measures, and impact conclusions regarding growth inducement and cumulative impacts.

- Chapter 1: Introduction – Describes the purpose and use of the Draft EIR, provides a brief overview of the Proposed Project, and outlines the organization of the Draft EIR.

- Chapter 2: Project Description and Environmental Setting – Describes the project location, project details, baseline environmental setting and existing physical conditions and the City's overall objectives for the Proposed Project.

- Chapter 3: Environmental Analysis – Describes the existing conditions, or setting, before project implementation; methods and assumptions used in impact analysis; thresholds of significance; impacts that would result from the Proposed Project; and applicable mitigation measures that would eliminate or reduce significant impacts for each environmental issue.

- Chapter 4: Alternatives Analysis – Evaluates the environmental effects of project alternatives, including the No-Project Alternative and Environmentally Superior Project Alternative.

- Chapter 5: Other CEQA Considerations – Includes a discussion of issues required by CEQA that are not covered in other chapters. This includes unavoidable adverse impacts, impacts found not to be significant, irreversible environmental changes, and growth inducing impacts.

- Chapter 6: References – Identifies the documents and individuals consulted in preparing the Draft EIR.

- Chapter 7: Report Preparation – Lists the individuals involved in preparing the Draft EIR and organizations and persons consulted.

- Chapter 8: Acronyms/Abbreviations – Presents a list of the acronyms and abbreviations.

- Appendices – Present data supporting the analysis or contents of this Draft EIR. The Appendices include the following:

    - APPENDIX A Notice of Preparation, Initial Study, and Comments Received

    - APPENDIX B Hydrogeological Report for Proposed Project

    - APPENDIX C Hydrogeological Report for Reduced Pumping Alternative

1.4 AVAILABILITY OF THE DRAFT EIR

The Draft EIR for the Beltz Well No. 12 Project is being distributed directly to numerous agencies, organizations, and interested groups and persons for comment during the formal review period. The Draft EIR is also available for review at the following locations:

- City of Santa Cruz Water Department, Engineering Division, 212 Locust Street Suite C, Santa Cruz CA 95060
- Santa Cruz Public Library, Capitola Branch, 2005 Wharf Road, Capitola, CA 95010-2002
- Santa Cruz Public Library, Central Branch, 224 Church Street, Santa Cruz, CA 95060-38
- Online at the City of Santa Cruz Website (www.cityofsantacruz.com/index.aspx?page=1286)

1.5 AGENCY COMMENTS

If this document includes information necessary for your agency to meet any statutory responsibilities related to the Proposed Project, the City needs to know the views of your agency regarding the scope and content of the environmental information included in this Draft EIR. Your agency will need to use the environmental documents prepared by the City when considering any permits or other approvals necessary to implement the project. The environmental topics studied by the City are provided in Chapter 3 of this Draft EIR and in the IS provided in Appendix A. If the topics of concern to your agency have already been identified for analysis, your agency need not provide a response to this Draft EIR.

The project description, location, and the environmental issues to be addressed in this Draft EIR are contained in the attached materials. Due to the time limits mandated by state law [CEQA Guidelines Section 15205(d)], your comments must be sent to the City at the earliest possible date, but not later than October 6, 2011, which is 45 days after publication of the Notice of Availability (NOA) for this EIR. Please send your response to:

John Everett
Environmental Projects Analyst
City of Santa Cruz Water Department
212 Locust Street, Suite C
Santa Cruz, CA 95060

Your comments may also be sent by email at jeverett@cityofsantacruz.com or by FAX at (831) 420-5201. Please include “Comments on Beltz Well No. 12” in the subject line. Agency responses to the Draft EIR should include the name of a contact person within the commenting agency.

CHAPTER 2 – PROJECT DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 PROJECT BACKGROUND

The City is responsible for providing water to over 90,000 people in the City, unincorporated Santa Cruz County, a small part of the City of Capitola, and several agricultural customers along Highway 1 between the City limits and the town of Davenport (see Figure 2). There are four main sources of water supply for the City including North Coast sources (Laguna, Majors, and Riggardio Creeks and Liddell Spring), San Lorenzo River (including Tait Street Diversion, Tait wells, and Felton Diversion), Loch Lomond Reservoir, and Live Oak wells. Approximately 5% of the City's water supply is groundwater provided by the Live Oak well field (formerly called the Beltz well field).

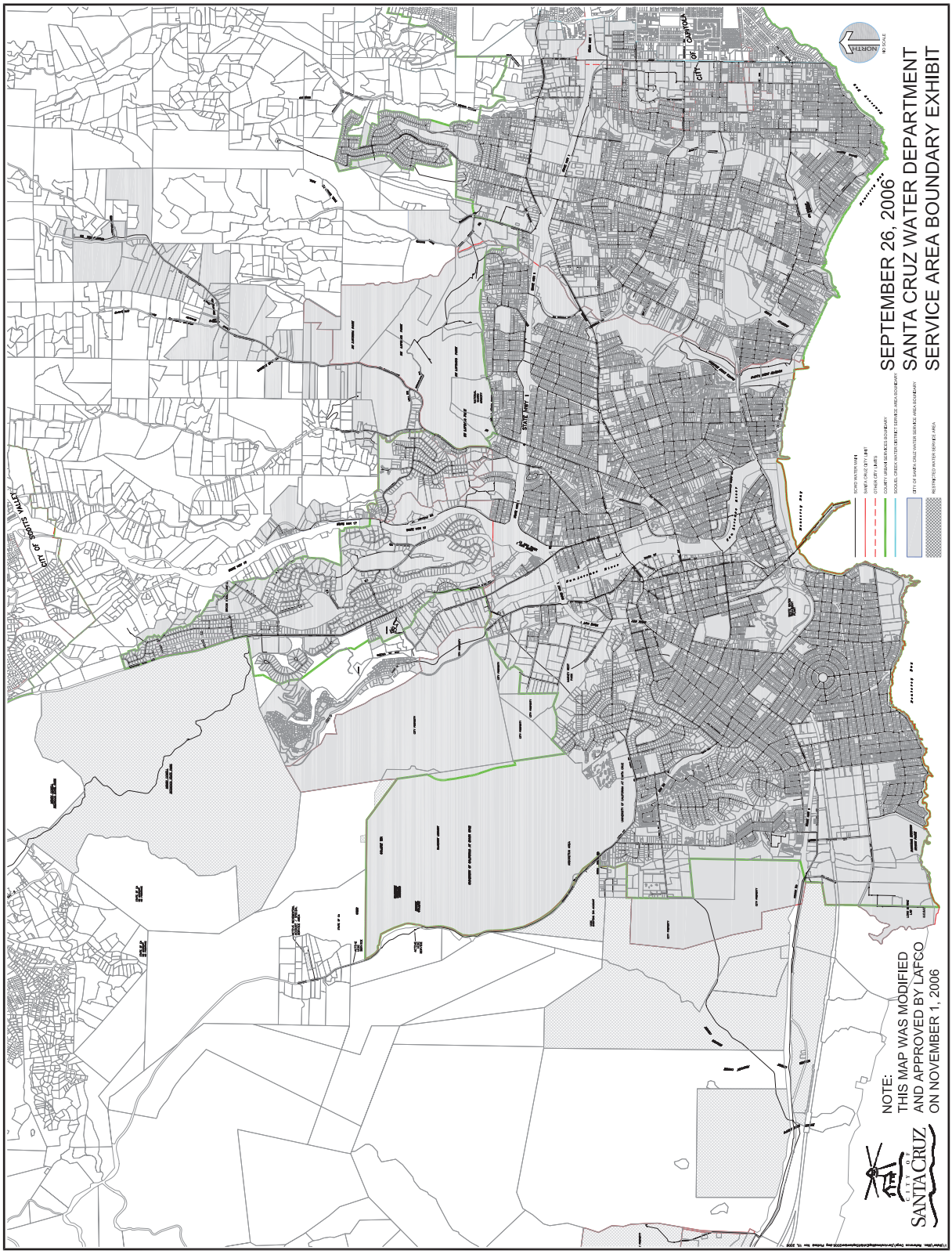
The primary water management problem presently facing the City of Santa Cruz is the lack of adequate water supply during dry and drought years when rainfall and runoff are below normal. In normal and wet years when rainfall and runoff are normal to abundant, base flows in the coast and river sources are restored by winter rains. Storage in Loch Lomond is typically replenished to full capacity with runoff from the Newell Creek watershed and water diverted from the San Lorenzo River at Felton. Under these weather conditions, the water supply system is capable of meeting the community's current total annual water requirements.

When the San Lorenzo River and coast sources run low, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In critically dry or multi-year drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond reservoir reduces available supply to a level that cannot support average dry season demands.

Operations studies conducted by the City show that the problem of water shortage will worsen, in terms of both frequency and magnitude, as the population of the region grows and demand for water increases over time. As noted above, the City's primary sources of water supply are surface water diversions; however, approximately 5% of the City's water supply is groundwater provided by the Live Oak well field. This well field only extracts water from the coastal portions of the Purisima aquifer. While the Live Oak wells groundwater system is a small portion of the City's water supply, it is expected to be an increasingly important source of water as it is used to augment the City's water supply during peak demand and drought periods.

Historically the City has produced groundwater in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of high production during drought conditions. The City's 25-year (from 1986 through 2010) average groundwater extraction rate from the Live Oak wells was approximately 516 acre-ft/yr. The 25-year period includes critically dry, dry, normal, and wet years with a range of annual groundwater production from 104 acre-ft/yr to as much as 1317 acre-ft/yr. Specifically, the City has operated its wells during a period of 150 to 200 days out of the year at a combined operational rate of about 1 mgd on average (SCWD, 2006). During the extended drought of 1987-1988, well operations peaked at a rate of 2 mgd (EDAW, Inc., 2005). The City's Integrated Water Plan (IWP) Program EIR (EDAW, Inc., 2005) documented the City's planning goal of maintaining groundwater production into the future at the maximum rate of approximately 2 mgd (1,500 gpm) or approximately 1,300 acre-ft/yr during drought conditions and included analysis of a future City average annual extraction rate of 574 acre-ft/year or 187 million gallons per year (mgy).

Figure 2: City of Santa Cruz Water Department Service Area



Since 2005, the City has been working with SqCWD to cooperatively manage pumping in the western portion of the Purisima and monitor the coastal groundwater levels. These efforts have led the City to limit planned Purisima extractions to up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years. The City's future operations, like its historic operation, will vary with hydrology - typically withdrawing lesser amounts in wet years.

Currently, the Live Oak well field has three active wells, named Beltz Wells (No. 8, No. 9, and No. 10). Beltz Wells No. 8 and No. 9 were installed in 1998 and began producing water for the City in 1999. Beltz Well No. 10 was installed in 2009. The City currently produces 1 mgd (700 gpm) during the peak season from the Live Oak wells. However, due to declining coastal groundwater levels, the Proposed Beltz Well No. 12 is needed to restore water system reliability and to protect the Purisima aquifer from seawater intrusion, especially during critical drought periods. Groundwater extracted from Beltz Well No.12 would be from the same zones of the Purisima aquifer as the existing Live Oak well field and would not increase the City's groundwater extraction.

2.2 PROJECT LOCATION

The Proposed Project site is located on a vacant lot at the northeast corner of Research Park Drive and Cory Street in Soquel, California. The community of Soquel is located in the central, western portion of Santa Cruz County, adjacent to the City of Santa Cruz. The Project Site is approximately 350 feet north of CA Highway 1 (Pacific Coast Highway). Figure 3 and Figure 4 illustrate the regional and local settings for the Proposed Project.

The Proposed Project area is zoned as M-1 (Light Industry) and is identified as Service Commercial (CS) in the County General Plan. The adjacent surrounding properties are developed with commercial and light industrial land uses.

2.3 PROJECT DESCRIPTION

The Proposed Project (Beltz Well No. 12 and associated treatment facilities) would be installed on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in Soquel, California. As shown in the Proposed Project Conceptual Site Plan (see Figure 5), the new water well would include the following components: (1) a pump and chemical storage building, approximately 40 feet by 20 feet and approximately 12 feet in height; (2) an iron and manganese treatment system consisting of pressurized filter tanks, approximately 35 feet by 9 feet and approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 16 feet in diameter and approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height; and (5) station piping, including, treated water pipeline, sewer connections, and new stormwater drainage facilities that would connect to existing facilities in Research Park Drive. The Proposed Project site would be enclosed with a chain-link fence with privacy slats. The site would also be developed with a paved driveway connecting to Research Park Drive, security lighting, and crushed rock around the Proposed Project facilities.

Figure 3: Regional Location Map

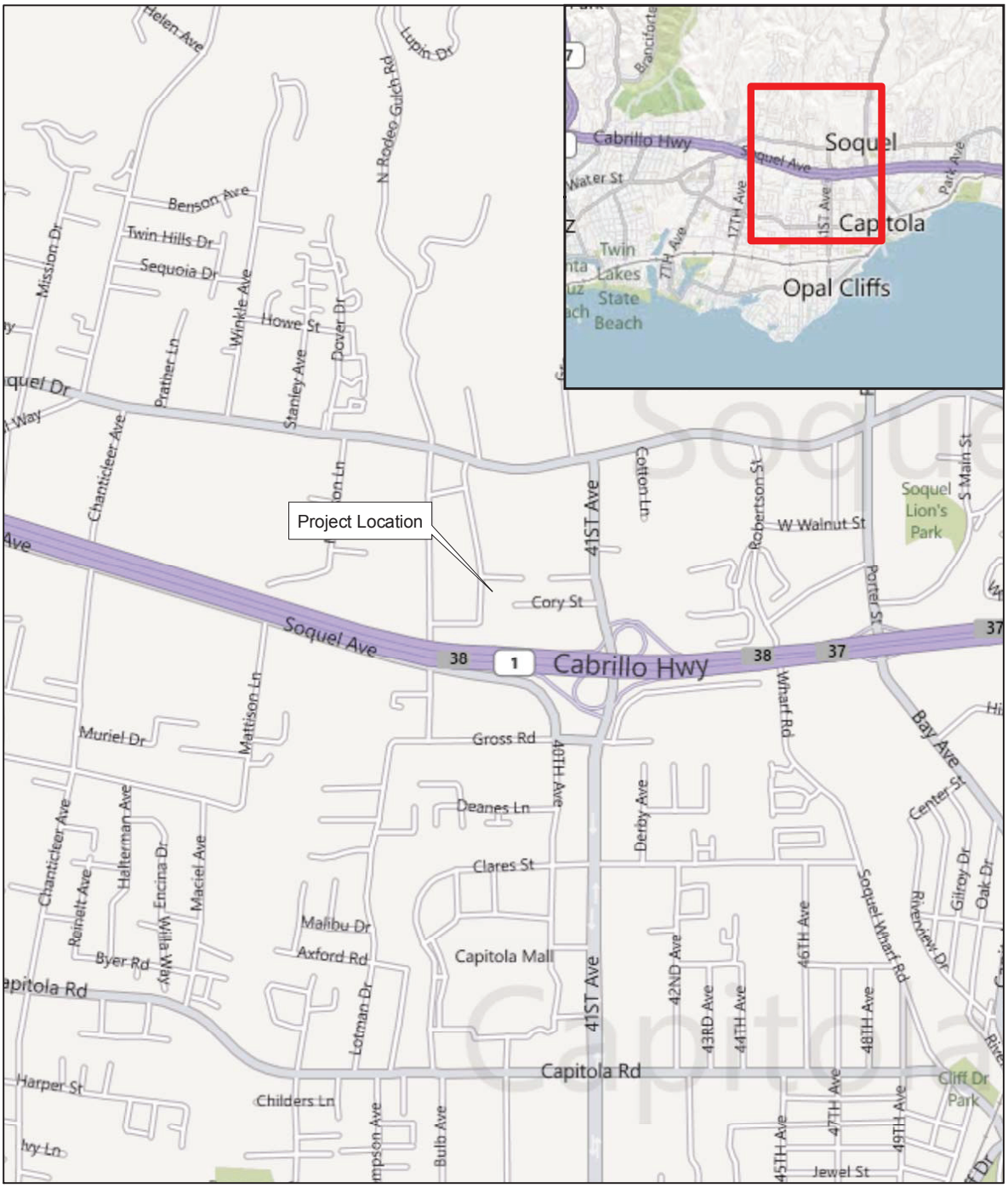


Figure 3
Project Location

Chambers Group, Inc.

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Figure 4: Local Vicinity Map

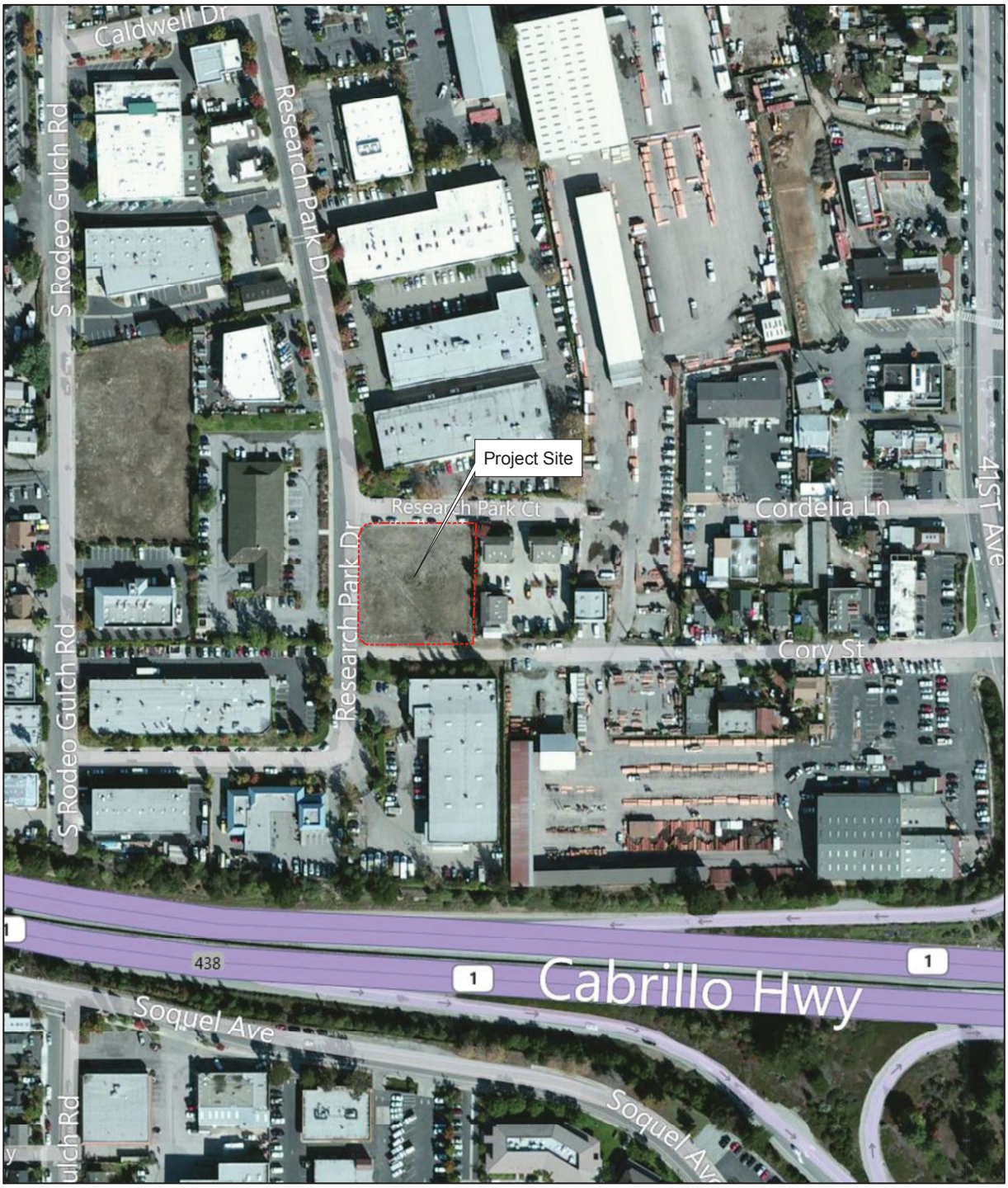

Figure 4
Proposed Project Site

Chambers Group, Inc.

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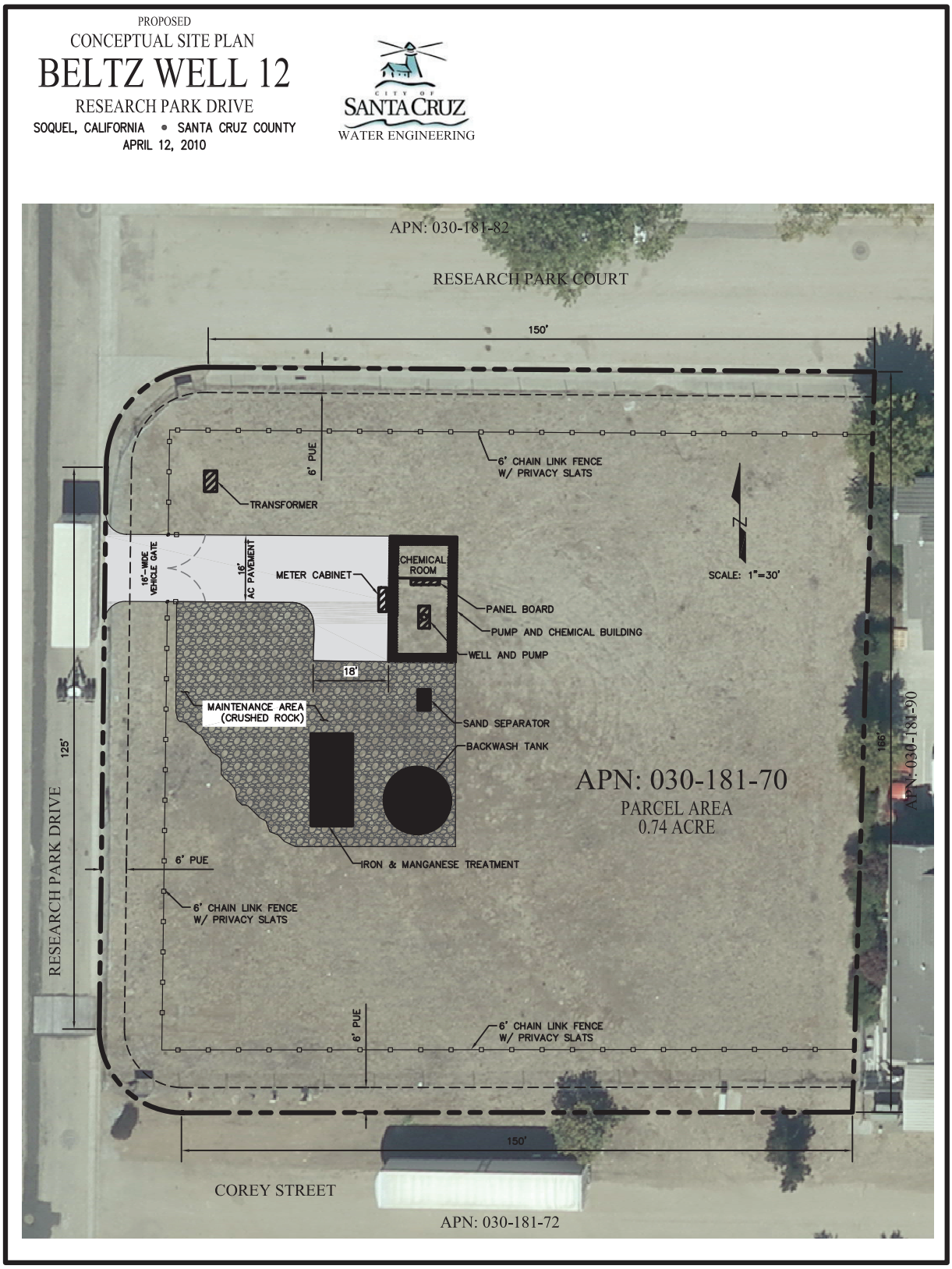
Figure 5: Proposed Project Conceptual Site Plan



The new well will be drilled to an approximate depth of 320 feet bgs to provide up to approximately 700 gpm of water. Tentative well design includes a 32-inch diameter bore hole and a 16-inch diameter well casing and screen design to facilitate the use of either a submersible pump or a vertical line-shaft turbine pump. The well will likely be located in a pump and chemical storage building which will also contain the pump controls and an area for the generation and storage of sodium hypochlorite (typically 350 gallons or less of 12.5% sodium hypochlorite). It is possible that the well will not be enclosed by a building but chemicals will still need to be stored inside an enclosed area that is protected from the sun. Sodium hypochlorite is used as a disinfectant for the finished water and for pretreatment in the removal of iron and manganese. The exact treatment process will be determined once the well has been drilled since pilot testing should be done prior to design of wellhead treatment. However, iron and manganese treatment typically consists of adding sodium hypochlorite to oxidize the iron and manganese into a form that is easier to remove. Next the water is run through a filter media, such as green sand, anthrasand, or pyrolusite, where the iron and manganese is physically removed by filtration/straining action. There is a low possibility that potassium permanganate may also be used in the iron and manganese treatment system. The treated water is then piped to the City's potable water distribution line located adjacent to the Proposed Project site in Research Park Drive.

At least daily, the filter media is cleaned by backwashing to remove the accumulated iron and manganese. The backwash is then piped to the backwash tank. In this tank, the iron and manganese settle out from the groundwater. The clear water is recirculated to the wellhead treatment and the remaining sludge is transported offsite every year to an appropriate disposal facility or piped to the County sanitary sewer line located immediately adjacent to the Proposed Project site in Research Park Drive.

Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's long term historic Purisima groundwater extraction, but would instead redistribute a portion of existing City production inland and away from the Live Oak well field. The City's maximum future Purisima groundwater production with the addition of Beltz Well No. 12, will be up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years. The distribution of pumping will depend on the maintenance of coastal groundwater levels to protect the aquifer from seawater intrusion, but will generally draw first from the coastal wells to capture groundwater flow just prior to moving offshore.

2.3.1 Construction Methods

The well would be drilled by a contractor licensed in the State of California, utilizing the reverse-circulation hydraulic rotary drilling method. Prior to well drilling, Underground Services Alert (USA) would be contacted to indentify the location of any existing utilities, which would be avoided. Equipment used for well construction would include a rotary drill rig with drilling fluid/mud system, temporary water storage tank, well development rig, two support trucks, and a forklift.

During borehole excavation, drill fluid (typically consisting of a water and bentonite clay slurry) and cuttings (consisting of native clay, silt, sand, and gravel) would be contained. A staging area would be located on the Proposed Project site to store drill-fluid containment, drill-cuttings containment, construction equipment and materials. The drill cuttings would ultimately be disposed of offsite, in accordance with state laws, at an appropriate disposal facility. Drilling fluids would be removed after construction using a qualified truck service and disposed of at a facility licensed to handle non-toxic and

non-hazardous liquid waste. Water generated during well development and aquifer testing will be discharged in the storm drain and monitored as required by the National Pollution Discharge Elimination System (NPDES) permit.

After the well installation the well pump and chemical building would be constructed, the filter tanks, the backwash tank, and the sand separator would be installed and connections would be made to the potable water, sanitary sewer, and stormwater drainage lines.

2.3.2 Schedule

Well installation construction is anticipated to take place over a two month period in summer 2012. The two month construction period begins with site preparation and continues with well drilling, development and pump testing through to final site clean-up. During this construction period, there will be intermittent periods of 24-hour construction activity associated with the well drilling, development and pump testing, required to proceed continuously until well casings can be sunk to avoid the risk of the walls collapsing.

Construction of wellhead treatment, as well as site improvement work, is expected to occur from over a three month period in summer/fall 2013. The Proposed Project is expected to become operational in winter 2013.

2.3.3 Operation and Maintenance

Routine maintenance would consist of a daily visit by a City staff person in a small truck to check on the facility operations.

In the event of a power failure, emergency power would be provided by a diesel generator that will otherwise be stored and maintained at an off-site location.

2.4 PURPOSE, NEED AND PROJECT OBJECTIVES

A study completed by the City to investigate the hydrogeological conditions of the area concluded that new production wells developed by the City should be shifted inland from the existing Live Oak well field in an attempt to control groundwater levels and protect the Purisima aquifer from seawater intrusion (Hopkins Groundwater Consultants, Inc., 2009b). The City has proposed to develop Beltz Well No. 12 at the Research Park Drive site, which is located approximately 1.5 miles inland and northeast of the Live Oak well field.

The purpose of the Proposed Project is to maintain the City's historic groundwater production, to locate the new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system.

2.5 REQUIRED PERMITS AND APPROVALS

As required by the *CEQA Guidelines*, this section provides, to the extent the information is known to the City, the CEQA Lead Agency, a list of the agencies that are expected to use this EIR in their decision making and a list of permits and other approvals required to implement the project.

2.5.1 Lead Agency Approval

The Final EIR must be certified by the Santa Cruz City Council as to its adequacy in complying with the requirements of CEQA before taking any action on the Proposed Project. The City Council will consider the information contained in the EIR in making a decision to approve or deny the Beltz Well No. 12 Project. The analysis in the EIR is intended to provide environmental review for the whole of the Proposed Project, including the project planning, site acquisition, site clearance, and construction of the well and appurtenant facilities in accordance with CEQA requirements.

2.5.2 Other Required Permits and Approvals

A Responsible Agency is a public agency, other than the lead agency, that has discretionary approval power over a project. The Responsible Agencies, and their corresponding approvals, for this project include the following:

- Santa Cruz County Public Works Department – encroachment permit
- Santa Cruz County Environmental Health Services – well installation permit
- Santa Cruz County Sanitation District – approval to discharge backwash water into sanitary sewer system
- California Department of Public Health (CDPH) – permit to treat the groundwater and distribute it in the municipal system
- Regional Water Quality Control Board (Central Coast) – National Pollutant Discharge Elimination System (NPDES) Permit for Discharges with Low Threat to Water Quality

2.6 CUMULATIVE PROJECTS

Cumulative impacts refer to the combined effect of Proposed Project impacts with the impacts of other past, present, and reasonably foreseeable future projects. CEQA requires that cumulative impacts be analyzed in an EIR. As set forth in the CEQA Guidelines, the discussion of cumulative impacts must reflect the severity of the impacts, as well as the likelihood of their occurrence; however, the discussion need not be as detailed as the discussion of environmental impacts attributable to the project alone. As stated in CEQA, “a project may have a significant effect on the environment if the possible effects of a project are individually limited but cumulatively considerable.”

According to the CEQA Guidelines:

“Cumulative impacts” refer to two or more individual effects which, when considered together, are considerable and which compound or increase other environmental impacts.

- The individual effects may be changes resulting from a single project or a number of separate projects.
- The cumulative impact from several projects is the change in the environment, which results from the incremental impact of the Proposed Project when added to other closely related past,

> present, and reasonably foreseeable probably future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time."

In addition, as stated in the CEQA Guidelines, it should be noted that:

> "The mere existence of significant cumulative impacts caused by other projects alone shall not constitute substantial evidence that the Proposed Project's incremental effects are cumulatively considerable."

Cumulative impact discussions for each issue area are provided in the technical analyses contained within Chapter 3 (Environmental Analysis).

As previously stated, and as set forth in the CEQA Guidelines, related projects consist of, "closely related, past, present, and reasonable foreseeable probable future projects that would likely result in similar impacts and are located in the same geographic area." An area of influence, defined by an approximate 1.5-mile radius from the Project site, was utilized in order to capture specific locations of other approved and pending projects.

The majority of the study area is an already highly urbanized area. The ability to develop new well projects within or adjacent to the study area is limited. Two proposed well projects were identified in within the study area:

- O'Neil Ranch Well Site, located 41st and Soquel Drive, Soquel, CA. The well is proposed to be approximately 600 feet deep and provide 750 gpm from the Purisima Unit14 AA as well as the underlying Tu aquifer.

- Cunnison Lane Well site, located on Cunnison Lane, north of Soquel Drive, Soquel, CA. The well is proposed to be approximately 500 to 600 feet deep and provide 538 gpm from the Purisima Unit A.

CHAPTER 3 – ENVIRONMENTAL ANALYSIS

3.1 ENVIRONMENTAL ISSUES ADDRESSED

An Initial Study (IS) was prepared for the Proposed Project in December 2010 (see Appendix A). Based on the findings documented in the IS, the City determined that an Environmental Impact Report (EIR) would be required for the Proposed Project. Environmental issue areas are listed by the level of significance of their impacts in Table 3 below, as determined by the IS process. Those issue areas identified as having potentially significant impacts in the IS are further analyzed in this EIR.

Table 3: Summary of Environmental Impacts Identified in the Initial Study

No Impact	Less Than Significant Impact	Potentially Significant Impact
Agricultural Resources	Aesthetics	Biological Resources
Land Use and Planning	Air Quality	Hydrology and Water Quality
Mineral Resources	Cultural Resources	Mandatory Findings of Significance associated with Cumulative Impacts and Biological Resources
Population and Housing	Geology and Soils	
Recreation	Greenhouse Gas Emissions / Climate Change	
	Hazards and Hazardous Materials	
	Noise	
	Public Services	
	Transportation/Traffic	
	Utilities and Service Systems	

The City used the IS, as well as agency and public input received during the public comment period (December 17, 2010 to January 17, 2011), to determine the final scope for this EIR. The issue areas and their corresponding subchapter numbers discussed in the EIR include:

- 3A – Hydrology and Water Quality
- 3B – Biological Resources

Chapters 3A and 3B provide a detailed discussion of the environmental setting, applicable project design features, impacts associated with the Proposed Project, cumulative impacts, and a determination of the level of significance of the impacts

3.2 ORGANIZATION OF ENVIRONMENTAL ANALYSIS

To assist the reader in comparing information about the various environmental issues, each chapter contains the following information:

- Introduction
- Existing Environmental Setting
- Applicable Regulations
- Impacts and Mitigation
- Methodology
    - Criteria for Determining Significance
    - Project Impacts
        - Mitigation Measures
        - Residual Impacts
    - Cumulative Impacts
        - Mitigation Measures
        - Residual Impacts

3.1 TERMINOLOGY USED IN THIS ANALYSIS

For each question listed in the IS checklist, a determination of the level of significance of the impact is provided. Impacts are categorized in the following categories:

- **No Impact.** A designation of *no impact* is given when no adverse changes in the environment are expected.

- **Less Than Significant.** A *less than significant impact* would cause no substantial adverse change in the environment.

- **Less Than Significant with Mitigation.** A *potentially significant (but mitigable) impact* would have a substantial adverse impact on the environment but could be reduced to a less-than-significant level with incorporation of mitigation measure(s).

- **Potentially Significant.** A *significant and unavoidable impact* would cause a substantial adverse effect on the environment and no feasible mitigation measures would be available to reduce the impact to a less-than-significant level.

CHAPTER 3A – HYDROLOGY AND WATER QUALITY

3A.1 INTRODUCTION

This chapter focuses on the impact that the Proposed Project may have on non-City wells and groundwater contamination sites and is based on the results of a hydrogeological study prepared for the Proposed Project (see Appendix B). As described in Initial Study, Section IV.9 (see Appendix A), project impacts related to water quality, on-site drainage, flood hazards, dam failure, and tsunami inundation were found to be less than significant and do not require further analysis within this EIR.

3A.2 EXISTING ENVIRONMENTAL SETTING

As described previously, in Section 2.1, Project Background, the City's primary sources of water supply are surface water diversions; however, approximately 5% of the City's water supply is groundwater provided by the Live Oak well field. This well field only extracts water from the coastal portions of the Purisima aquifer. While the Live Oak wells groundwater system is a small portion of the City's water supply, it is expected to be an increasingly important source of water as it is used to augment the City's water supply during peak demand and drought periods. Historically the City has produced groundwater in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of high production during drought conditions. The City's 25-year (from 1986 through 2010) average groundwater extraction rate from the Live Oak wells was approximately 516 acre-ft/yr. The 25-year period includes critically dry, dry, normal, and wet years with a range of annual groundwater production from 104 acre-ft/yr to as much as 1317 acre-ft/yr. Specifically, the City has operated its wells during a period of 150 to 200 days out of the year at a combined operational rate of about 1 mgd on average (SCWD, 2006). During the extended drought of 1987-1988, well operations peaked at a rate of 2 mgd (EDAW, Inc., 2005). The City's Integrated Water Plan (IWP) Program EIR (EDAW, Inc., 2005) documented the City's planning goal of maintaining groundwater production into the future at the maximum rate of approximately 2 mgd (1,500 gpm) or approximately 1,300 acre-ft/yr during drought conditions and included analysis of a future City average annual extraction rate of 574 acre-ft/year (187 mgy).

Since 2005, the City has been working with SqCWD to cooperatively manage pumping in the western portion of the Purisima and monitor the coastal groundwater levels. These efforts have led the City to limit planned Purisima extractions to up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years. The City's future operations, like its historic operation, will vary with hydrology - typically withdrawing lesser amounts in wet years.

In addition, a study of hydrogeologic conditions in the area completed by the City concluded that new production wells developed by the City should be shifted inland from the existing Live Oak well field in an effort to control groundwater levels and protect the Purisima aquifer from seawater intrusion (Hopkins Groundwater Consultants, Inc., 2009b).

Regional Groundwater Basins

The Purisima Formation and Santa Margarita Formation underlie the Proposed Project area and are part of the Soquel-Aptos Groundwater Basin. The Purisima Formation is the primary source of groundwater in the region. The entire production of the City's Live Oak well field is derived from groundwater contained in the Purisima Formation (Hopkins Groundwater Consultants, Inc. 2004) and accounts for

approximately 5% of the City's water supply. The primary aquifer units consist of fine-to-coarse grained marine sands interbedded and confined by silt and sandy clay strata (Hopkins Groundwater Consultants, Inc. 2004). The Purisima aquifer A and AA Units are relatively shallow under the City of Santa Cruz, but slopes southeast, becoming deeper under Soquel Creek. Potential groundwater recharge areas for the Purisima aquifer are located along the foothills of the Santa Cruz Mountains in the eastern and northern quarters of the City of Santa Cruz water service area.

The Santa Margarita and Lompico sandstones may be present in the area and lie beneath the deepest units of the Purisima Formation and are sometimes referred to as the Tu-unit (Johnson, et al., 2004). The Tu-unit is believed to be comprised of moderately cemented sandstone. Available data indicate that the Tu-unit (Santa Margarita and Lompico sandstones) likely ranges from 40 to 60 feet thick and lies on top of the crystalline bedrock which defines the effective base of fresh water. In the Live Oak area, the Santa Margarita aquifer is deeply buried and largely undeveloped.

Watersheds

The entire Proposed Project area is within the Big Basin Hydrologic Unit, as defined by the Central Coast Regional Water Quality Control Board, and includes portions of the San Lorenzo and Aptos Creek Hydrologic subareas (CCRWQCB 1994). At the coast, the San Lorenzo subarea stretches from Younger Lagoon east to the Santa Cruz Harbor at the outlet of Arana Creek. The Aptos Soquel subarea stretches east from the Santa Cruz Harbor to La Selva Beach.

The Soquel Creek Watershed and the Rodeo Gulch Creek watershed, located in the Aptos Soquel Basin in Capitola and unincorporated areas of Santa Cruz County, are in the vicinity of the Proposed Project site. Soquel Creek is located approximately 0.48 mile to the east of the Proposed Project site. Soquel Creek flows through unincorporated portions of Santa Cruz County in its upper watershed, and the center of Capitola as it approaches the ocean. Soquel Creek terminates at Capitola City Beach.

Rodeo Gulch Creek is located approximately 0.16 mile immediately west of the Proposed Project site. The Rodeo Gulch Creek watershed flows through the unincorporated area of Live Oak between the cities of Santa Cruz and Capitola. The watershed consists primarily of open space in the upper watershed, and residential use in the lower reaches. Rodeo Gulch Creek flows into Corcoran Lagoon, before terminating at the Pacific Ocean.

Seawater Intrusion

Historic pumping by the City, SqCWD and private pumpers in the western portion of the Soquel-Aptos Groundwater Basin has resulted in conditions conducive to seawater intrusion. The Live Oak well field's location near the coast makes it the last pumper to capture groundwater that would otherwise become offshore flow through the ocean floor outcrop. The City maintains a network of groundwater monitoring wells and regularly tracks water levels along the coast to detect conditions that could signify the presence of seawater intrusion and to understand how the aquifer responds to pumping stresses.

Groundwater Monitoring

The City currently maintains a network of groundwater monitoring wells in the Live Oak area to provide the City the ability to collect groundwater levels and water quality samples from individual aquifer zones in the Live Oak and coastal areas. Three Cory Street monitoring wells were constructed in a public right

of way adjacent to the Proposed Project site, in November of 2009. These monitoring wells provide the City the ability to monitor groundwater conditions further inland and collect site-specific hydrogeologic information for the development of Beltz Well No. 12. As constructed, the Cory Street monitoring wells consist of nested well designs that utilized 2-inch-diameter well casing and screen assemblies which range in depths from 70 to 350 feet bgs. The preliminary well designs were based on projections using a recent hydrogeological interpretation of the Purisima Formation aquifer zones (Hopkins Groundwater Consultants, Inc., 2009b), and were finalized based on the site specific geological findings obtained during the test hole drilling process.

The Cory Street Monitoring Well was drilled, constructed, and sampled between November 16, 2009 and December 4, 2009. A 10-inch-diameter pilot borehole was drilled to a depth of approximately 350 feet bgs. The hydrogeological information collected during the installation of the Cory Street Monitoring Well indicates that the main aquifer units at this location are the Purisima A and AA zones. It is possible the underlying Santa Margarita Formation may be a viable aquifer zone. The hydrogeological study also concluded that it is reasonable for a properly designed and constructed well in the vicinity of the Cory Street site to be capable of producing up to approximately 800 gpm during long-term operation.

3A.3 APPLICABLE REGULATIONS

The Federal Clean Water Act (CWA)

The CWA is the primary surface water protection legislation throughout the country. By employing a variety of regulatory and nonregulatory tools, including establishing water quality standards, issuing permits, monitoring discharges, and managing polluted runoff, the CWA aims to restore and maintain the chemical, physical, and biological integrity of surface waters to support “the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.” The CWA regulates both the pollutant content of point-source discharges as well as addressing polluted runoff (EDAW, Inc., 2005).

The State Water Resource Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs)

The SWRCB and RWQCBs are responsible for preserving, enhancing, and restoring “the quality of California’s water resources and ensuring their proper allocation and efficient use for the benefit of present and future generations” (EDAW, Inc., 2005). SWRCB makes statewide regulations governing water use and point source and nonpoint source pollutant discharge, while the RWQCBs work in smaller regions throughout the state to implement SWRCB policies and regulations. RWQCBs also establish additional region- and area-specific regulations and policies to achieve water quality goals.

The study area lies in the Central Coast Hydrologic Region and is governed by the Central Coast RWQCB. The RWQCB’s *Water Quality Control Plan* (Basin Plan), last updated in 1994, identifies the existing and potential beneficial uses of surface and groundwater in the region, as well as water quality objectives and implementation measures throughout the basin. The plan includes water quality objectives and implementation measures for water quality parameters.

The City of Santa Cruz General Plan and Local Coastal Program

The *City of Santa Cruz General Plan and Local Coastal Program* details the City's policies regarding water quality and hydrology in its Environmental Quality and Safety Elements.

Santa Cruz County General Plan and Local Coastal Program

The *Santa Cruz County General Plan and Local Coastal Program, Conservation and Open Space Element* discusses the County's policies regarding water and hydrological resources; and the Parks and Recreation and Public Facilities Element discusses water supply.

3A.4 IMPACTS AND MITIGATION

3A.4.1 Methodology

The potential impacts of the proposed well production were analyzed by establishing the hydrogeological framework in this portion of the Soquel-Aptos Groundwater Basin (Hopkins Groundwater Consultants, Inc., 2009b), sampling streambed materials to develop data for use in estimating streambed infiltration rates, and developing drawdown estimates anticipated from well pumping utilizing the Multi Layer Unsteady-state (MLU) computer program. See Appendix B for a detailed description of the MLU model.

Historical data summarized by other studies (Johnson, et al., 2004) and site specific data provided from the Cory Street Monitoring Well construction project (Hopkins Groundwater Consultants, Inc., 2010) were analyzed to develop aquifer parameters. The SqCWD has been studying groundwater and surface water conditions in the vicinity of its Main Street Well for over 20 years. Various water level data and hydrogeological reports were utilized for development of the streamflow impact analysis approach. To provide additional data for estimating streamflow impacts, Hopkins sampled creek bottom sediments and delivered the samples for laboratory hydraulic conductivity analyses (see Appendix B).

While the average annual extraction rate is used to predict groundwater overdraft impacts over long timescales (decadal), the maximum extraction rate and duration is used to predict the area potentially influenced by the Proposed Project at the end of a single extraction season and is thus used to predict well interference and surface water impacts. In order to analyze the greatest impact from the Proposed Project, this analysis assumes that the 645 acre-ft/yr is produced from Beltz Well No. 12 over the typical 215-day production season during a critically dry year. The impact analysis included the current and proposed critically dry year operations of the Beltz wells during the months of April through November. Critically dry year production of 645 acre-ft/yr was selected as the pumping operation to analyze because it represents the City's maximum projected Purisima extraction and potential impact to nearby wells and surface water flows. See Appendix B for a summary of the parameters that were used in the model and the simulated results.

Utilizing the MLU program, a multilayered groundwater system was simulated to assess the potential impacts in the vicinity of; a) the proposed Beltz Well No. 12 facility where the Purisima A Unit outcrops, b) Soquel Creek where the Purisima A and B Unit outcrop, and c) nearest SqCWD well facilities (Main Street and proposed O'Neill Ranch Wells). Aquifer parameters established by other regional studies (Johnson, et al., 2004) were used for this effort. The results of the modeling effort were compared with historical SqCWD Main Street Well production test results.

3A.4.2 Significance Criteria

Well Interference

As found in Appendix G of the CEQA Guidelines, a project is considered to have a significant impact on ground water resources if it would substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).

The water level drawdown in an aquifer that results from the extraction of groundwater commonly results in mutual interference between wells. The amount of interference drawdown (commonly 1 to 10 feet) is typically tolerable and is not ordinarily considered a significant impact. Excessive well interference that may result from the close proximity of a well producing at a high production rate for a sustained time period has the potential to cause physical damage or a loss of yield, which could represent a significant impact.

Physical damage to a properly designed and constructed well facility could occur if excessive well interference drawdown caused the water level to drop below the top of the well screen and adverse conditions resulted in a well facility (i.e., cascading water resulting in air entrainment) that could damage the well or well pump assembly. Damage resulting from this condition could occur if oxygenated water corroded the well screen interval and causes structural failure, or if cavitation causes excessive well pump wear.

Appreciable loss of well yield could occur if excessive aquifer dewatering reduces a well's performance (by lowering the specific capacity) or prevents the well pump from operating within its design parameters. An appreciable reduction in well yield is considered a significant impact on an existing well if the well is incapable of providing its historically measured; a) maximum daily production level, b) dry-season production level, or c) annual production levels under drought conditions. A significant impact could result if; 1) a substantial amount of the well screen were dewatered, 2) the groundwater gradient were altered, or 3) the groundwater elevation is reduced to cause seawater intrusion to affect a well.

Groundwater Contamination Sites

As described in the Initial Study, Section 8 (d), groundwater contamination sites near the proposed Project are outside the Proposed Project's capture zone. While impacts associated with nearby groundwater contamination sites were determined to be less than significant, concerns regarding the location of these sites were expressed during the Initial Study public review period. Therefore, additional analysis was prepared. A significant impact would occur if pumping at the Proposed Project site alters groundwater flow such that contaminants would be more likely to travel to nearby wells.

3A.4.3 Impact Analysis

Impact 3.A-1: Implementation of the Proposed Project could result in physical damage or an appreciable reduction in yield to existing and proposed SqCWD wells.

Simulated drawdown values indicate that the proposed production of approximately 700 gpm (645 acre-ft/yr) from Beltz Well No. 12 during typical operation would have an approximate 2.5-foot drawdown on

water levels at the SqCWD Main Street Well at the end of the seven month pumping season in November (see Figure 6). Drawdown impacts to the SqCWD Main Street Well at earlier times during the pumping period would be proportionally less. A summary of the water level change at all the SqCWD wells is provided in Table 4. The maximum water level effect indicated at the proposed O'Neill Ranch Well is a decline of 5.5 feet. However, as indicated below, the result of shifting City pumping inland will result in an increase of 0.25 feet at SqCWD's Garnet Well. This will contribute to the Proposed Project objective of protecting the Purisima aquifer from the threat of saltwater intrusion through maintaining coastal water levels at a higher elevation. This also provides a beneficial effect at Garnet Well.

Table 4: Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at SqCWD Wells

Well Name	Water Level Change (Feet)
O'NEIL RANCH (PROPOSED)	-5.5
MAIN STREET	-2.5
ROSEDALE	-1.9
MONTEREY	-1.2
TANNERY	-1.1
MAPPLETHORPE	-1.1
GARNET	0.25

Based on the calculations, the impacts from the Proposed Project on existing SqCWD wells and the proposed SqCWD O'Neill Ranch Well are expected to be minimal and not cause physical damage or an appreciable reduction in yield. Therefore, impacts on SqCWD municipal wells (existing and proposed) from the Proposed Project are less than significant.

Mitigation Measure

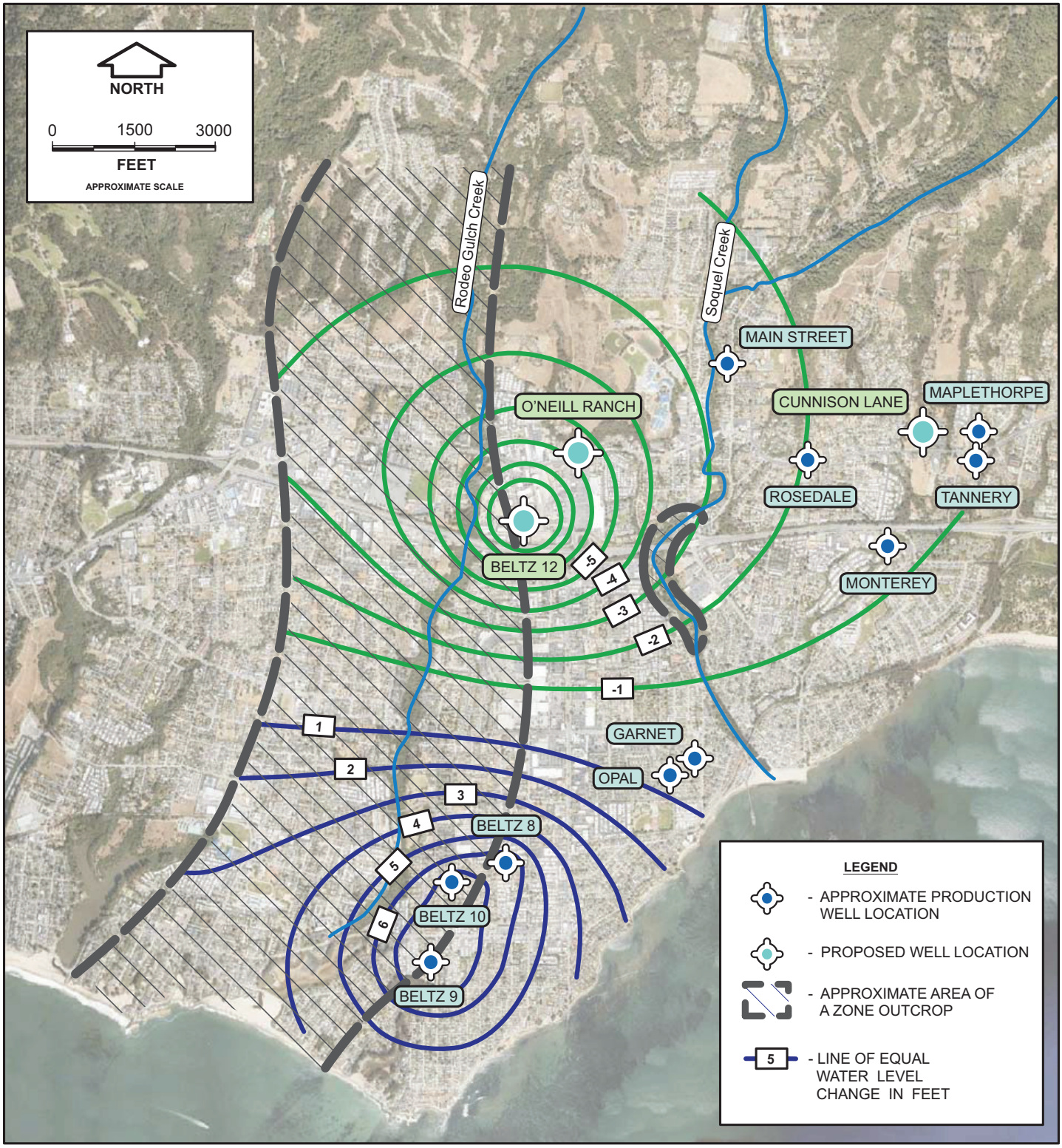
No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts to SqCWD wells are less than significant.

Impact 3.A-2: Implementation of the Proposed Project could result in physical damage or an appreciable reduction in yield to existing nearby private wells.

Figure 6: Maximum Effect of Beltz Well No. 12 Pumping on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 645 Acre-Feet Per Year Project, Plate B1, Hopkins Groundwater Consultants, June 2011.

The County of Santa Cruz and California Department of Water Resources provided the City with confidential well log information along with the estimated location of private wells in the vicinity of Beltz Well No. 12 site. These locations were estimated as well locations cannot be shown due to confidentiality laws governing use of the well log information. For this same reason the wells located within approximately 1,000 meters (3,300 feet) of the Proposed Project site were assigned arbitrary well identification numbers. The distance between these private wells and the Beltz Well No. 12 location is summarized along with the total well depth and the reported well production rates in Table 5.

Table 5: Summary of Privately Owned Well Information

Well Identification	Approximate Distance from Beltz Well No. 12 (ft)	Depth of Well (ft)	Flow Rate (gpm)	Date of Testing
1	3,300	497	12	8/3/1987
2	3,300	330	40	6/15/1976
3	2,200	200+	22	1/21/1987
4	2,890	200	35	2/16/1998
5	1,875	220	25	6/14/1984
6	2,275	200	NA	NA
7	880	99	NA	2/14/2003
8	2,135	148	30	4/9/1964
9	2,000	NA	NA	NA
10	3,540	110	NA	7/9/1966
11	2,060	NA	NA	NA
12	2,700	NA	NA	NA

Based on the construction depths and the locations within the basin, all the privately owned wells listed in Table 5 were determined to produce from the Purisima A Zone as defined by this study. The nearest estimated well location is approximately 880 feet away and is reportedly a monitoring well. All other privately owned wells are at distances greater than 1,875 feet away from the proposed well site (see Table 5).

Utilizing the MLU model simulation results, the pumping effects from the proposed Beltz Well No. 12 project (only) were identified for each of the privately owned well sites at the end of the Beltz Well No. 12 pumping period. These values are listed in Table 6. As shown, the water level drawdown values range from 3.3 to 7.3 feet. The closest privately owned well (Well No. 7) with the greatest pumping effect (7.3 feet) is reportedly a monitoring well which does not produce a supply that can potentially be affected by the reduced static water level (unlike domestic water supply wells).

Table 6: Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at Private Wells

Well ID	Screen Length (ft)	Depths (ft)			Water Level Change (ft)
		Top of Screen	Static Water	Pumping Water Level	Porposed Beltz Well No. 12 (No SQCWD Project)
1	120	377	320	360	-3.8
2	80	250	210	NA	-3.8
3	NA	NA	NA	NA	-4.7
4	NA	NA	210	237	-4.2

Table 6: Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at Private Wells

Well ID	Screen Length (ft)	Depths (ft)			Water Level Change (ft)
		Top of Screen	Static Water	Pumping Water Level	Porposed Beltz Well No. 12 (No SQCWD Project)
5	80	140	140	NA	-5.2
6	NA	NA	NA	NA	-4.8
7	20	79	86	NA	-7.3
8	40	104	97	100	-4.1
9	NA	NA	NA	NA	-3.3
10	40	65	26	NA	-3.3
11	NA	NA	NA	NA	-5.1
12	NA	NA	NA	NA	-4.1

Comparing the other drawdown values with the information provided on the well screen depths and the available pumping water levels indicates that the proposed Beltz Well No. 12 project results in less than significant impacts to private wells.

Assuming private domestic well pumps deliver the reported supply at approximately 30 pounds per square inch (psi) for use by the homeowners, the decline in existing well pump production is estimated to range between 0.11 and 0.72 gpm. In all cases this results in a less than 3.1-percent reduction in flow. Because the magnitude of the project effects on privately owned wells is minimal, the Proposed Project is not expected to result in well or well pump damage or an appreciable loss of well yield. Therefore, impacts on private wells from the Proposed Project are less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts to nearby private wells are less than significant.

Impact 3.A-3: The Proposed Project could change the flow gradient or flow direction at nearby groundwater contamination sites.

Two groundwater contamination sites associated with gasoline station spills or a Leaking Underground Fuel Tank are located within approximately 3,300 feet of the Proposed Project site. These are the BP 1240 site located at 2178 41st Avenue and the Exxon 7-3602 site located at 836 Bay Avenue. Analysis was conducted to determine if operation of the Proposed Project would increase the potential for contaminants to travel to nearby private wells.

Utilizing the MLU modeled drawdown values, the effects are evaluated by estimating the changed groundwater flow gradient from Proposed Project pumping. Maximum water level changes at the end of the Proposed Project pumping period are used for the evaluation of the two contamination sites. The operation of the Proposed Project does not steepen the flow gradient or appreciably change the flow

direction at either of the sites. As a result, there is no adverse impact associated with the Proposed Project on nearby private wells resulting from transport of known contaminants.

As the changes in groundwater elevations at the BP 1240 site are minimal (3.5 feet) and temporary, the marginal effect will not significantly alter the ongoing monitoring and cleanup operations. Because the Exxon 7-3604 site is located east of Soquel Creek and has monitoring wells that are located in the shallowest underlying unit (B Zone Aquifer), there is virtually no change in the groundwater gradient or flow direction and therefore no adverse impact associated with the Proposed Project on the ongoing monitoring or cleanup operations. Therefore, impacts on ongoing monitoring or cleanup operations at nearby groundwater contamination sites are less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts associated with groundwater contamination are less than significant.

3A.4.4 Cumulative Impacts

This section contains discussion of potential cumulative effects resulting from implementation of the Proposed Project together with the cumulative projects described in Section 2.6.

Impact 3.A-4: The Proposed Project could contribute to cumulative impacts at SqCWD existing and proposed wells.

The proposed City and SqCWD projects were combined in a simulation of cumulative water level changes in the Purisima A Zone (see Figure 7). Based on these calculations, the impacts from the cumulative proposed projects on existing SqCWD wells are expected to be minimal and not cause physical damage or an appreciable reduction in yield. In addition, the result of shifting City pumping inland will result contribute to the Proposed Project objective of protecting the Purisima aquifer from the threat of saltwater intrusion through maintaining coastal water levels at a higher elevation. Therefore, cumulative impacts on SqCWD municipal wells (existing and proposed) associated with the Proposed Project are less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Cumulative impacts to SqCWD wells are less than significant.

Impact 3.A-5: The Proposed Project could contribute to cumulative impacts to existing nearby private wells.

The cumulative proposed projects pumping effects were identified for each of the privately owned well sites at the end of the 7-month pumping period for the Proposed Project. As shown in Table 7, the maximum water level change ranges between 4.6 and 9.8 feet of drawdown (for water supply wells) and reflects the inland shift of pumping by both water agencies. While most all the privately owned wells are located at a substantial distance from the Proposed Project site (see Table 5), the wells with the greatest change in static water levels are those located closest to the O'Neill Ranch Well site.

Table 7: Maximum Effect of Cumulative Proposed Projects Pumping on Water Levels at Private Wells

Well ID	Screen Length (ft)	Depths (ft)			Water Level Change (ft)	
		Top of Screen	Static Water	Pumping Water Level	Proposed Beltz Well No. 12 (no SQCWD Project)	Cumulative Proposed Projects (City and SQCWD)
1	120	377	320	360	-3.8	-6.2
2	80	250	210	NA	-3.8	-6.3
3	NA	NA	NA	NA	-4.7	-8.3
4	NA	NA	210	237	-4.2	-6.6
5	80	140	140	NA	-5.2	-9.8
6	NA	NA	NA	NA	-4.8	-7.5
7	20	79	86	NA	-7.3	-11.1
8	40	104	97	100	-4.1	-5.5
9	NA	NA	NA	NA	-3.3	-4.6
10	40	65	26	NA	-3.3	-5.3
11	NA	NA	NA	NA	-5.1	-9.2
12	NA	NA	NA	NA	-4.1	-6.9

The percentage decrease in flow from well pump discharge is estimated to range between a 1.4 and 5-percent reduction. The decline in well pump production is estimated to range between 0.17 and 1.17 gpm. Comparisons of available water level data, well screen intervals, and estimated drawdowns show that drawdown from pumping Beltz Well No. 12 and the SqCWD wells will result in marginal effects on known wells within the designated radius. Because the magnitude of the project effects on privately owned wells is minimal, the Proposed Project is not expected to result in well or well pump damage or an appreciable loss of well yield. Therefore, impacts on private wells from the Proposed Project are less than significant.

Mitigation Measure

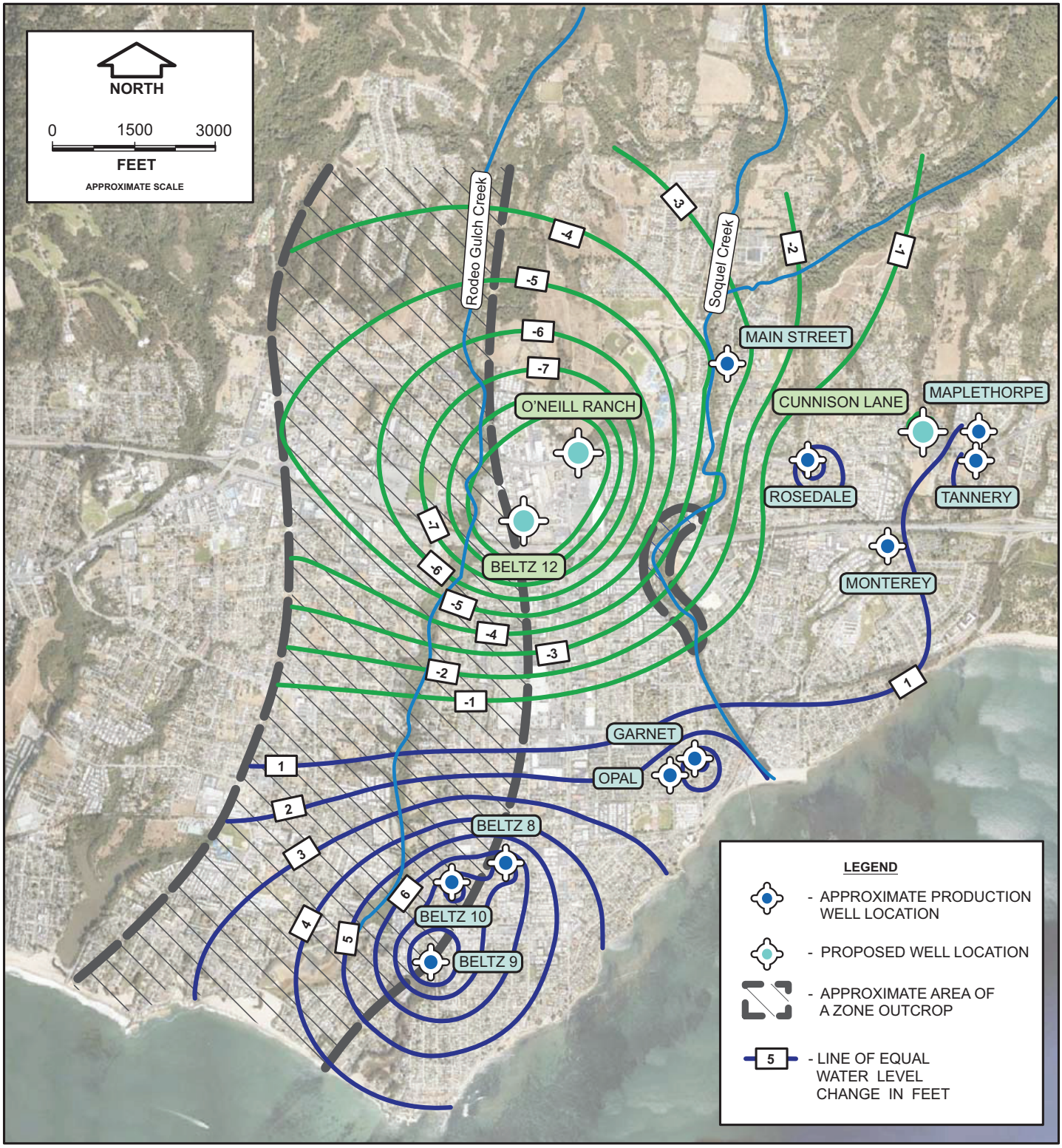
No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Cumulative impacts to nearby private wells are less than significant.

Impact 3.A-6: The Proposed Project could contribute to cumulative change in the flow gradient or flow direction at nearby groundwater contamination sites.

Figure 7: Maximum Effect of Cumulative Pumping on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 645 Acre-Feet Per Year Project, Plate B5, Hopkins Groundwater Consultants, June 2011

Analyzing the cumulative pumping effects indicates that while the maximum change in water level will be between 4 and 5 feet beneath the BP 1240 site, there is no appreciable change in the gradient or direction of groundwater flow (0.018 and S41W, respectively). Therefore, cumulative impacts on ongoing monitoring or cleanup operations at nearby groundwater contamination sites are less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts associated with groundwater contamination are less than significant.

CHAPTER 3B – BIOLOGICAL RESOURCES

3B.1 INTRODUCTION

This chapter focuses on the impact that the Proposed Project may have on habitat in Rodeo Gulch Creek and Soquel Creek from the Proposed Project, related to the potential for stream flow losses and is based on the results of a hydrogeological study prepared for the Proposed Project (see Appendix B). As described in Initial Study, Section IV4 (see Appendix A), project impacts to other biological resources on or adjacent to the Project site were found to be less than significant and do not require further analysis within this EIR.

Biological resources include Habitats and Vegetative Communities, Migratory Corridors, Plants, Wildlife, Fisheries, Species Status Species (regulated by law, regulation or policy, such as threatened and endangered species), and waters of the United States.

3B.2 EXISTING ENVIRONMENTAL SETTING

The Proposed Project site is a 0.74-acre vacant parcel devoid of substantial vegetation, surrounded by a chain link fence, and located in an urban area. The adjacent surrounding properties are developed with commercial and light industrial land uses and are landscaped with ornamental trees, shrubbery, and grasses.

Plant communities of Santa Cruz County that support threatened, endangered and California species of concern include: grasslands, coastal scrub, and coastal strand, coastal salt marsh, and freshwater marsh, riparian woodlands, redwood forests, closed cone coniferous forests, mixed evergreen forests, chaparral, foothill woodlands and oak/savanna grasslands. The Proposed Project site does not include and is not adjacent to any of these plant communities. No occurrences of candidate, sensitive, or special status wildlife or plant species have been recorded for the Proposed Project site (Initial Study, Appendix A). In addition, the Proposed Project site is not suitable for the listed species of concern that occur in Santa Cruz County (Initial Study, Appendix A). The Proposed Project site may provide limited habitat for common wildlife species that utilize urban landscaping and are tolerate of pedestrian and vehicle traffic.

No riparian habitat, wetlands, migration corridors or wildlife nursery sites occur within or adjacent to the Proposed Project site. Rodeo Gulch Creek is located approximately 0.16 mile west of the Proposed Project site, and Soquel Creek is located approximately 0.48 mile to the east of the Proposed Project site.

Soquel Creek supports a population of the federal threatened Evolutionarily Significant Unit (ESU) of south/central California Coast steelhead (Oncorhynchus mykiss irideus). In addition, Soquel Creek previously supported the federal and State endangered ESU of Central California Coast Coho salmon (Oncorhynchus kisutch). Soquel Creak has been designated as Critical Habitat for these species. Both the steelhead and the federal endangered tidewater goby (Eucyclogobius newberryi) also have been collected intermittently in Soquel Creek. See the Initial Study, Section IV.4 (see Appendix A) for further description of these biological resources.

Steelhead adults migrate upstream primarily from December through April and smolts migrate downstream primarily from March through May (Sogard et al 2009). The lower portions of Soquel Creek

and especially Soquel Creek Lagoon provide important summer rearing habitat for juvenile steelhead (Alley and Associates 2003, 2004). The lagoon typically produces 10 to 35 percent of the smolt-sized juveniles in the mainstem of Soquel Creek each year (Alley and Associates 2004). Steelhead populations in Soquel Creek lagoon are threatened by inadequate stream inflow in summer during drought years (Alley and Associates 2004).

3B.2.1 Stream-Aquifer Interactions

Typically, surface water features such as streams and lakes are connected hydraulically to shallow, unconfined aquifers. Groundwater discharge to creeks occurs in areas where the water table intersects and flows into the creek channel. Water discharged from groundwater to surface streams is known as baseflow and is an important source of continual creek flow between rainstorms. Baseflow augmentation from groundwater is intrinsically related to the type of streamflow regime, whether ephemeral, intermittent, or perennial. Ephemeral streams flow only during and immediately after storms; intermittent streams flow only during certain times of the year (e.g., the rainy season); and perennial streams flow continuously during wet and dry times, with baseflow dependent on groundwater movement into the channel. Ephemeral and intermittent creeks are dependent on precipitation for streamflow; however, due to baseflow from groundwater, perennial creeks are capable of maintaining sustainable amounts of low flow, even during the dry season. The magnitude of baseflow that is delivered to a perennial creek depends on the hydrogeologic characteristics of the underlying water-bearing aquifers, the connectivity of the deeper aquifer zones to the shallower water table zones, and the amount of groundwater pumping in all aquifers (ESA 2010).

The City has developed criteria for water year classification of critically dry, dry, normal, and wet water years (October 1 – September 30). For the period of record, from 1921 to 2008, one-third of all years are classified as wet, slightly over one-third as normal, and one-sixth each as dry and critically dry (SCWD, 2006). From historical data, multiple critically dry water years and single critically dry water years were identified. The following representative years are used in this analysis:

- 2007 – Single Dry Year, Critically Dry
- 1990 – Multiple Critically Dry Year
- 1977 – Multiple Dry Year, Most Severe Drought of Record

Table 8 shows the daily streamflow discharge at the gage and outlet for representative water years under existing pumping conditions during a critically dry year.

Table 8: Outlet Daily Soquel Creek Streamflow Discharge for Representative Years (USGS gauge 11160000)

	Soquel Creek Discharge in cubic feet per second (cfs)		
	2007	1977	1990
9-Nov	2.90	1.30	1.20
10-Nov	3.20	1.30	1.30
11-Nov	5.20	1.30	1.30
12-Nov	3.90	1.30	1.30
13-Nov	3.10	1.30	1.30
14-Nov	2.90	1.20	1.30
14-Nov	3.00	1.30	1.40
Average	3.46	1.29	1.30

3B.3 APPLICABLE REGULATIONS

Regulations relating to biological resources that may be applicable to the Proposed Project are described below.

3B.3.1 Federal

Endangered Species Act of 1973

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). The U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) have authority over projects that may affect the continued existence of a federally listed (threatened or endangered) species. Pursuant to the requirements of the FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region, and determine whether the proposed project would have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3],[4]). The "take"[1] prohibition of the FESA prohibits any action that adversely affects a single member of an endangered or threatened species.

Section 7 of the FESA outlines procedures for federal interagency cooperation to protect and conserve federally listed species and designated critical habitat. Critical habitat identifies specific areas that have the physical and biological features that are essential to the conservation of a listed species and that may require special management considerations or protection. Section 7(a)(2) requires federal agencies to consult with the USFWS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or to destroy or adversely modify designated critical habitat.

For projects where federal action is not involved and take of a listed species may occur, the project proponent may seek an incidental take permit under Section 10(a) of the FESA. Section 10(a) allows the USFWS to permit the incidental take of listed species if such take is accompanied by a Habitat Conservation Plan that includes components to minimize and mitigate impacts associated with the take.

Clean Water Act

The Clean Water Act was established to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Sections 401, 402, and 404 of the Clean Water Act control the discharge of pollutants and wastes into freshwater and marine environments.

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[1] "Take," as defined in Section 9 of the FESA, is broadly defined to include intentional or accidental "harassment" or "harm" to wildlife. "Harass" is further defined by the USFWS as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, and sheltering. "Harm" is defined as an act that actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

3B.3.2 State

California Endangered Species Act of 1984

Under the California Endangered Species Act (CESA), the California Department of Fish and Game (CDFG) has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code 2070). The CDFG also maintains a list of "candidate species," which are species formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. The CDFG also maintains lists of species of special concern, which serve as "watch lists." Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project region and determine whether the proposed project will have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that may impact a candidate species.

3B.4 IMPACTS AND MITIGATION

3B.4.1 Methodology

The MLU Model was utilized to directly simulate Soquel Creek losses (see Appendix B). The estimated reduction in streamflow was combined with observed flows in the creek during the three critically dry years of 1977, 1990, and 2007 to develop an understanding of the magnitude of the project's effect on flows during a worst case scenario while operating of Beltz Well No. 12.

3B.4.2 Significance Criteria

As found in Appendix G of the CEQA Guidelines, a project is considered to have a significant impact on biological resources if it would:

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service; or
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.
- The project would have a substantial adverse effect on a sensitive species or its habitat

Groundwater extraction can deplete baseflow in streams by intercepting groundwater that would otherwise seep into the stream (in gaining stream reaches) or by increasing the rate at which water seeps out of the stream (in losing stream reaches). Secondary impacts of baseflow depletion can include decreases in the total amount of aquatic habitat, interference with the migration of anadromous fish, and increased water temperature. Because groundwater baseflow to creeks can be affected by groundwater pumping, the redistribution of groundwater pumping could potentially alter the baseflow of nearby creeks, particularly at proposed well sites adjacent to perennial creek channels, but would have to occur at chronic depletion rates. However, previously observed changes in baseflow do not correlate with changes in groundwater pumping, and both the recent and previous studies have demonstrated no long-term trends or pumping-related baseflow depletion (ESA 2010). The effect of groundwater pumping is masked by various other factors that collectively have a greater impact on

baseflow by inducing increases or decreases in precipitation recharge over a watershed. However, it is estimated that chronic baseflow depletions as small as 0.5 cubic feet per second (cfs) could be detected, and that, if groundwater production from inland wells were to increase, such thresholds could be exceeded.

3B.4.3 Impact Analysis

Impact 3.B-1: The groundwater pumping associated with the Proposed Project could adversely affect the baseflow in Rodeo Gulch Creek.

There is no flow in Rodeo Gulch Creek during the summer and fall months of the year. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the Proposed Project will not have an effect on the ephemeral creek flows, nor will it appreciably reduce the seasonal recharge to Corcoran Lagoon, and therefore no significant impact would occur.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts associated with baseflow reduction in Rodeo Gulch Creek are less than significant.

Impact 3.B-2: The groundwater pumping associated with the Proposed Project could adversely affect the baseflow in Soquel Creek.

For each critically dry water year, the USGS hydrograph data were utilized to estimate streamflow discharge worst case scenario impacts at the end of the 215-day production season for the proposed Beltz Well No. 12 project with the entire production shifted from the existing Beltz Well Nos. 8, 9, and 10 operations. Daily mean discharge at the end of the pumping period was averaged over the final week (seven days) to account for any large variability at this point.

The results of the streamflow impacts analyses are provided in Table 9 for each of the representative critically dry water years at the end of the 215-day pumping period.

Table 9: Soquel Creek Flow Worst Case Scenario Impact Assessment
215 days from the start of the pumping season (approx. Nov. 15)

Impact from Beltz 12					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
single Cr. Dry	2007	**3.46**	3.61	-0.211	3.40
multiple Cr. Dry	1977	**1.29**	1.34	-0.211	1.13
	1990	**1.30**	1.36	-0.211	1.15

The effect to streamflow in Soquel Creek is limited primarily as a result of; a) the approximate ½-mile distance between the creek and the proposed well location, b) the moderate production rate proposed by the City (700 gpm), and c) the impedance to vertical flow of groundwater through the layered Purisima Formation and the creek bottom sediments.

As demonstrated in Table 9, redistributing City pumping inland to Beltz Well No. 12 would result in relatively small reductions to outlet discharge in any water year even for the worst-case scenarios modeled. Groundwater levels below Soquel Creek would recover each year since the City would not produce groundwater during the five month period between mid-November and mid-April and because precipitation typically increases during these winter/spring months.

City well production is limited to the summer/fall months (approximately April 15 to November 15), and, thus, would not be expected to affect winter and spring flows in Soquel Creek. Because potential drawdown would occur during the summer and fall, operation of the Proposed Project would not be expected to affect the migration and spawning of steelhead because steelhead adults migrate upstream primarily from December through April and smolts migrate downstream primarily from March through May (Sogard et al 2009).

As shown in Table 9, the estimated worst case effect of the Proposed Project's pumping on Soquel Creek discharges would be small (a reduction of 0.211 cfs). This is well below the 0.5 cfs, the smallest long-term change in baseflow that could reliably be detected (Johnson et al., 2004). Because adverse effects on steelhead habitat resulting from a 0.211 cfs reduction in stream baseflow are extremely difficult to substantiate, potential impacts to stream baseflow from future pumping of the Proposed Project are considered less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Impacts associated with baseflow reduction in Soquel Creek are less than significant.

3B.4.4 Cumulative Impacts

Impact 3.B-3: The groundwater pumping associated with cumulative projects could adversely affect the baseflow in Rodeo Gulch Creek.

There is no flow in Rodeo Gulch Creek during the summer and fall months of the year. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the proposed cumulative projects will not have an effect on the ephemeral creek flows, nor will they appreciably reduce the seasonal recharge to Corcoran Lagoon, and therefore no significant impact would occur.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Cumulative impacts associated with baseflow reduction in Rodeo Gulch Creek are less than significant.

Impact 3.B-4: The groundwater pumping associated with cumulative projects could adversely affect the baseflow in Soquel Creek.

For each critically dry water year, the USGS hydrograph data were utilized to estimate streamflow discharge worst case scenario impacts at the end of the 215-day production season for the proposed Beltz Well No. 12 project with the entire production shifted from the existing Beltz Well Nos. 8, 9, and 10 operations. The cumulative impacts that include the proposed SqCWD WMP production redistribution were also estimated for these same critically dry years. Daily mean discharge at the end of the pumping period was averaged over the final week (seven days) to account for any large variability at this point. The results of the streamflow impacts analyses are provided in Table 10.

Table 10: Soquel Creek Flow Cumulative Worst Case Scenario Impact Assessment
215 days from the start of the pumping season (approx. Nov. 15)

Cumulative Impacts					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
single Cr. Dry	2007	**3.46**	3.61	-0.241	3.37
multiple Cr. Dry	1977	**1.29**	1.34	-0.241	1.10
	1990	**1.30**	1.36	-0.241	1.12

The cumulative 0.24 cfs-loss in streamflow reduced the outflow from 3.61 to 3.37 cfs in 2007, and from 1.34 to 1.10 cfs in 1977. The Proposed Project's contribution to the cumulative effect on Soquel Creek discharges would be small (a reduction of 0.211 cfs). This is well below the 0.5 cfs, the level at which reductions in streamflow are estimated to be detectable and directly attributable to groundwater pumping (HydroMetrics LLC, 2009). Because adverse effects on steelhead habitat resulting from a 0.241 cfs reduction in stream baseflow are extremely difficult to substantiate, potential impacts to stream baseflow from future pumping of the Proposed Project are considered less than significant.

Mitigation Measure

No mitigation measures are required.

Residual Impacts after Mitigation

No mitigation measures are required. Cumulative impacts associated with baseflow reduction in Soquel Creek are less than significant.

CHAPTER 4 – ALTERNATIVES ANALYSIS

4.1 INTRODUCTION AND OVERVIEW

CEQA requires that an EIR describe a range of reasonable alternatives to the project, or to the location of the project, which could feasibly avoid or lessen any significant environmental impacts while substantially attaining the basic objectives of the project. An EIR should also evaluate the comparative merits of the alternatives. This chapter describes potential alternatives to the Proposed Project that were considered, identifies alternatives that were eliminated from further consideration and reasons for dismissal, and analyzes available alternatives in comparison to the potential environmental impacts associated with the Proposed Project.

Key provisions of the CEQA Guidelines pertaining to the alternatives analysis are summarized below:

- The discussion of alternatives shall focus on alternatives to the Proposed Project or its location that are capable of avoiding or substantially lessening any significant effects of the Proposed Project, even if these alternatives would impede to some degree the attainment of the Proposed Project objectives, or would be more costly.

- The No Project Alternative shall be evaluated along with its impact. The No Project analysis shall discuss the existing conditions at the time the Notice of Preparation is published. Additionally, the analysis shall discuss what would be reasonably expected to occur in the foreseeable future if the Proposed Project were not approved, based on current plans and consistent with available infrastructure and community services.

- The range of alternatives required in an EIR is governed by a “rule of reason”; therefore, the EIR must evaluate only those alternatives necessary to permit a reasoned choice. Alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the Proposed Project.

- For alternative locations, only locations that would avoid or substantially lessen any of the significant effects of the Proposed Project need to be considered for inclusion in the EIR.

- An EIR need not consider an alternative whose effects cannot be reasonably ascertained and whose implementation is remove and speculative.

The range of feasible alternatives is selected and discussed in a manner to foster meaningful public participation and informed decision-making. Among the factors that may be taken into account when addressing the feasibility of alternatives are environmental impacts, site suitability, economic viability, availability of infrastructure, general plan contingency, regulatory limitation, jurisdictional boundaries, and whether the proponent could reasonably acquire, control, or otherwise have access to the alternative site. An EIR need not consider an alternative whose effects cannot be reasonably identified, whose implementation is remote or speculative, and that would not achieve the basic project objectives.

4.2 PROJECT OBJECTIVES

As discussed in Chapter 2, Project Description and Environmental Setting, the Proposed Project is intended to maintain the City's historic groundwater production, to locate the new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system.

4.3 ALTERNATIVES TO THE PROPOSED PROJECT

The alternatives identified below, with the exception of the mandatory No Project Alternative, were selected due to their potential to attain the basic project objectives discussed above, and to lessen or avoid significant environmental effects resulting from implementation of the Proposed Project. Alternatives considered in this EIR include:

- No Project Alternative - assumes that improvements described for the Proposed Project would not be implemented.

- Reduced Pumping Alternative – Beltz Well No. 12 would be drilled to an approximate depth of 700 feet below ground surface (bgs) to provide approximately 210 gallons per minute (gpm) of water, achieving a production rate of 125 acre-ft/yr. Pumping from Beltz Well No. 12 could be required for a period of up to five months, corresponding to approximately May through September. Production from Beltz Well No. 12 would not increase the City's long term historic groundwater extraction, but would instead redistribute a portion of existing City production inland and from the Live Oak well field. The City's maximum future Purisima production with the addition of Beltz Well No. 12, will be up to 520 acre-ft/yr in non-critically dry years and up to 645 acre-ft/yr in critically dry years, as shown below in Table 11. The distribution of pumping will depend on the maintenance of coastal groundwater levels to protect the aquifer from seawater intrusion, but will generally draw first from the coastal wells to capture groundwater flow just prior to moving offshore. The balance of groundwater production may be shifted to the inland, Beltz Well No. 12.

Table 11: City Pumping Distribution under Reduced Pumping Alternative

	Non-Critically Dry Years	Critically Dry Years
Beltz Wells No. 8, 9, 10	0-520 acre-ft/yr	0-645 acre-ft/yr
Beltz Well No. 12	125-0 acre-ft/yr	125-0 acre-ft/yr
Total	**Up to 520 acre-ft/yr**	**Up to 645 acre-ft/yr**

Beltz No.12 would be producing water from the same zones of the Purisima aquifer as the existing Live Oak well field (Purisima A and AA units), as well as a new zone, the Tu unit which is not currently being used by the existing Live Oak well field.

In summary, the purpose of this section is to discuss feasible alternatives and to evaluate the ability of each alternative to reduce or avoid significant adverse environmental impacts, while achieving the basic project objective. The reader is referred to the individual sections of the EIR (Chapter 3) and to the Executive Summary for a detailed discussion of environmental impacts, by each issue area, that would result from implementation of the Proposed Project.

4.3.1 No Project Alternative

§15126.6(e) of the CEQA Guidelines requires analysis of a No-Project alternative that (1) discusses existing site conditions at the time the Notice of Preparation (NOP) is prepared or the EIR is commenced, and (2) analyzes what is reasonably be expected to occur in the foreseeable future based on current plans if the Proposed Project were not approved.

Under this alternative, the Proposed Project would not be implemented.

Potential effects for the No Project Alternative were compared to the areas of potential effects that could be a result of the Proposed Project.

Hydrology and Water Quality

Under the No Project Alternative, the less than significant impacts associated with either SqCWD or private well interference or the groundwater contamination sites would not occur. However, the No Project Alternative would not result in the beneficial effects of raising coastal groundwater levels to abate seawater intrusion while maintaining the City's historic ground water production. The No Project Alternative is considered neither environmentally superior nor inferior to the Proposed Project with respect to groundwater resources.

Biological Resources

The No Project Alternative would not change the existing City pumping patterns and would therefore not result in any changes to flows in Rodeo Gulch Creek or Soquel Creek. The No Project Alternative is considered environmentally superior to the Proposed Project with respect to biological resources.

Conclusion and Relationship to Project Objectives

The No Project Alternative would result in the continuation of existing conditions at the Proposed Project site and with no change to the City's current groundwater pumping program. The No Project Alternative is considered neither environmentally superior nor inferior to the Proposed Project with respect to groundwater resources and environmentally superior to the Proposed Project with respect to biological resources. While the overall environmental impacts associated with the No Project Alternative are considered to be environmentally superior to the Proposed Project, under the No Project Alternative the project objectives to locate a new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system, would not be achieved.

4.3.2 Reduced Project Alternative

Reduced Pumping Alternative would reduce the amount of groundwater pumping at Beltz Well No. 12. The well would be drilled deeper than the Proposed Project to an approximate depth of 700 feet bgs to provide approximately 210 gpm of water, achieving a production rate of 125 acre-ft/yr. The production schedule from Beltz Well No. 12 could be shorter than the Proposed Project, up to five months, corresponding to approximately May through September. As with the Proposed Project, production from Beltz Well No. 12 would not increase the City's long term historic groundwater extraction, but would instead redistribute a portion of existing City production inland and away from the Live Oak well

field. This section is based on the results of a hydrogeological study prepared for the Reduced Pumping Proposal Alternative (see Appendix C).

Hydrology and Water Quality

SqCWD Wells

Simulated drawdown values indicate that the proposed production of approximately 210 gpm (125 acre-ft/yr) from Beltz Well No. 12 would have less than 1-foot of drawdown on water levels at the SqCWD Main Street Well (see Figure 8) at the end of the approximate 4.5-month pumping period. This water level effect almost completely recovers by the end of the 7-month pumping season in November (see Figure 9). Drawdown impacts to the SqCWD Main Street Well at an earlier time during pumping period will be proportionally less. A summary of the water level change at all the SqCWD wells is provided in Table 12. The maximum water level effect indicated at the proposed O'Neill Ranch Well is a decline of 1.8 feet. In comparison, the maximum water level effect of the Proposed Project at the proposed O'Neill Ranch Well is a decline of 5.5 feet.

Table 12: Maximum Effect of Reduced Alternative Pumping on Water Levels at SqCWD Wells

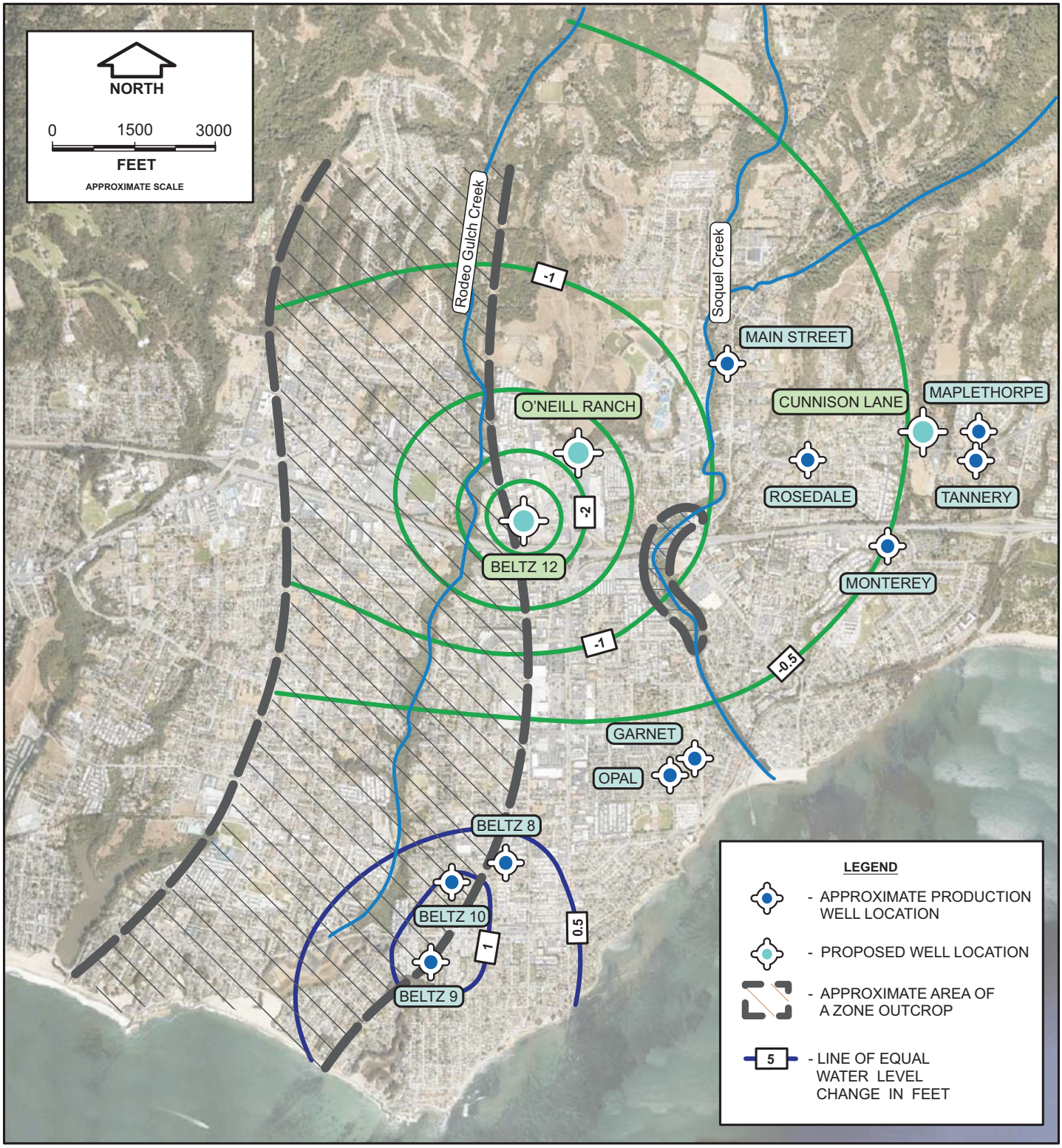
Well Name	Water Level Change (ft)
Proposed O'Neil Ranch	-1.8
Main Street	-0.84
Rosedale	-0.68
Monterey	-0.5
Tannery	-0.4
Mapplethorpe	-0.4
Garnet	-0.29

Based on the calculations, the impacts from the Reduced Pumping Alternative on existing SqCWD wells and the proposed SqCWD O'Neill Ranch Well are minimal and will not cause physical damage or an appreciable reduction in yield and would result in less than significant impacts. These impacts would be reduced in comparison with the Proposed Project. The Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to impacts to SqCWD wells.

Private Wells

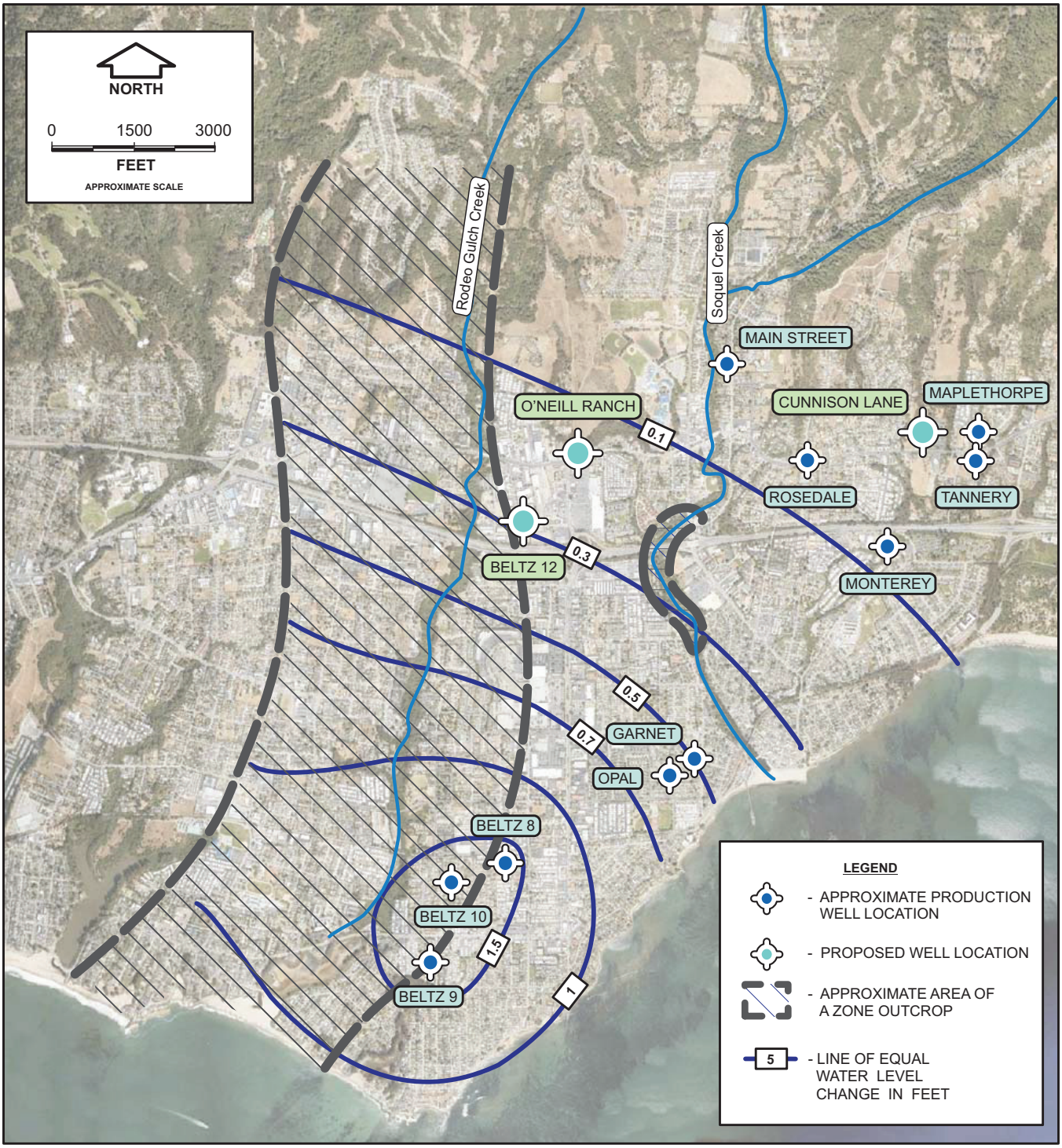
The pumping effects from the Reduced Pumping Alternative were identified for each of the privately owned well sites at the end of the Reduced Pumping Alternative pumping period. These values are listed in Table 13. As shown, the water level drawdown values range from 1.3 to 2.3 feet. In comparison, the water level drawdown values for the Proposed Project range from 3.3 to 7.3 feet. The closest privately owned well (Well No. 7) with the greatest pumping effect is reportedly a monitoring well which does not produce a supply that can potentially be affected by the reduced static water level (unlike domestic water supply wells).

Figure 8: Maximum Effect of Reduced Pumping Alternative on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project, Plate B1, Hopkins Groundwater Consultants, June 2011.

Figure 9: Maximum Effect of Reduced Pumping Alternative at End of City Pumping Season on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project, Plate B3, Hopkins Groundwater Consultants, June 2011.

Table 13: Maximum Effect of Reduced Pumping Alternative on Water Levels at Private Wells

Well ID	Screen Length (ft)	Depths (ft)			Water Level Change (ft)
		Top of Screen	Static Water	Pumping Water Level	Reduced Pumping Alternative (No SQCWD Project)
1	120	377	320	360	-1.25
2	80	250	210	NA	-1.25
3	NA	NA	NA	NA	-1.5
4	NA	NA	210	237	-1.4
5	80	140	140	NA	-1.7
6	NA	NA	NA	NA	-1.6
7	20	79	86	NA	-2.3
8	40	104	97	100	-1.4
9	NA	NA	NA	NA	-1.4
10	40	65	26	NA	-1.3
11	NA	NA	NA	NA	-1.65
12	NA	NA	NA	NA	-1.35

Comparing the other drawdown values with the information provided on the well screen depths and the available pumping water levels indicates that the Reduced Pumping Alternative results in less than significant impacts to private wells. The decline in existing well pump production ranged between 0.025 and 0.25 which is in all cases less than a 1.2-percent reduction in flow. Because the magnitude of the project effects on privately owned wells is minimal, the Reduced Pumping Alternative is not expected to result in well or well pump damage or an appreciable loss of well yield. These less than significant impacts would be reduced in comparison with the Proposed Project. The Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to impacts to private wells.

Groundwater Contamination Sites

Maximum water level changes at the end of the Reduced Pumping Alternative pumping period are used for the evaluation of the two contamination sites. The Reduced Pumping Alternative does not steepen the flow gradient or appreciably change the flow direction at either of the sites. As a result, there is no adverse impact associated with the Reduced Pumping Alternative on nearby private wells resulting from transport of known contaminants.

As the changes in groundwater elevations at the BP 1240 site are minimal (1.5 feet) and temporary, the marginal effect will not significantly alter the ongoing monitoring and cleanup operations. These marginal effects are reduced in comparison to the Proposed Project (3.5 feet). Because the Exxon 7-3604 site is located east of Soquel Creek and has monitoring wells that are located in the shallowest underlying unit (B Zone Aquifer), there is virtually no change in the groundwater gradient or flow direction and therefore no adverse impact associated with the Reduced Pumping Alternative on the ongoing monitoring or cleanup operations.

The Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to impacts to groundwater contamination sites.

Cumulative

SqCWD Wells. The proposed Reduced Pumping Alternative and SqCWD projects were combined in a simulation of cumulative water level changes in the Purisima A Zone (see Figure 10). The maximum cumulative water level changes are reduced in comparison to the cumulative projects with the Proposed Project (see Figure 7).

Upon cessation of pumping for the Reduced Pumping Alternative, water levels around the Beltz Well No. 12 site virtually recover by the end of the pumping season in November, and are comparable to the conditions developed by the pumping proposed by the SqCWD WMP project without the Beltz Well No. 12 project (see Figure 11 and Figure 12).

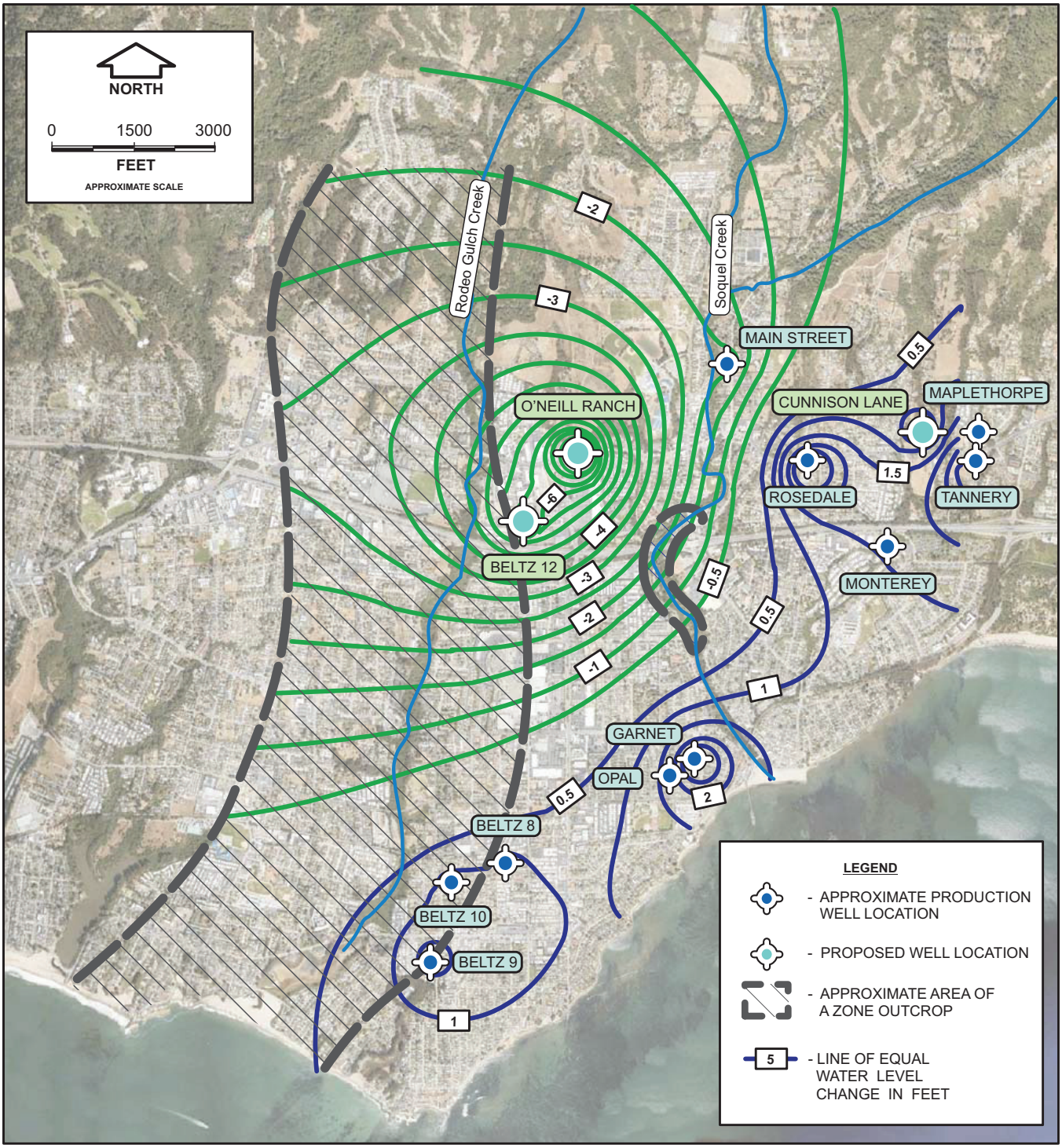
Based on these calculations, the impacts from the cumulative proposed projects on existing SqCWD wells are expected to be minimal and not cause physical damage or an appreciable reduction in yield. Therefore, cumulative impacts on SqCWD municipal wells (existing and proposed) associated with the Reduced Pumping Alternative are less than significant.

Cumulative impacts involving associated with the Reduced Pumping Alternative are considered environmentally superior to the Proposed Project with respect to impacts to SqCWD wells.

Private Wells. The cumulative proposed projects pumping effects were identified for each of the privately owned well sites for the Reduced Pumping Alternative. As shown in Table 14, the maximum water level change ranges between 2.5 and 7 feet of drawdown (for water supply wells) and reflects the inland shift of pumping by both water agencies. While most all the privately owned wells are located a substantial distance from the Beltz Well No. 12 site (see Table 5), the wells with the greatest change in static water levels are those located north of, and closest to the O'Neill Ranch Well site. The decline in well pump production for the Reduced Pumping Alternative ranged between 0.025 and 0.25 gpm, which is in all cases less than a 1.2-percent reduction in flow. In comparison, cumulative projects with the Proposed Project would result in a reduction in flow between a 1.4 and 5-percent. Therefore, cumulative impacts on private wells associated with the Reduced Pumping Alternative are less than significant. Cumulative impacts involving associated with the Reduced Pumping Alternative are considered environmentally superior to the Proposed Project with respect to impacts to private wells.

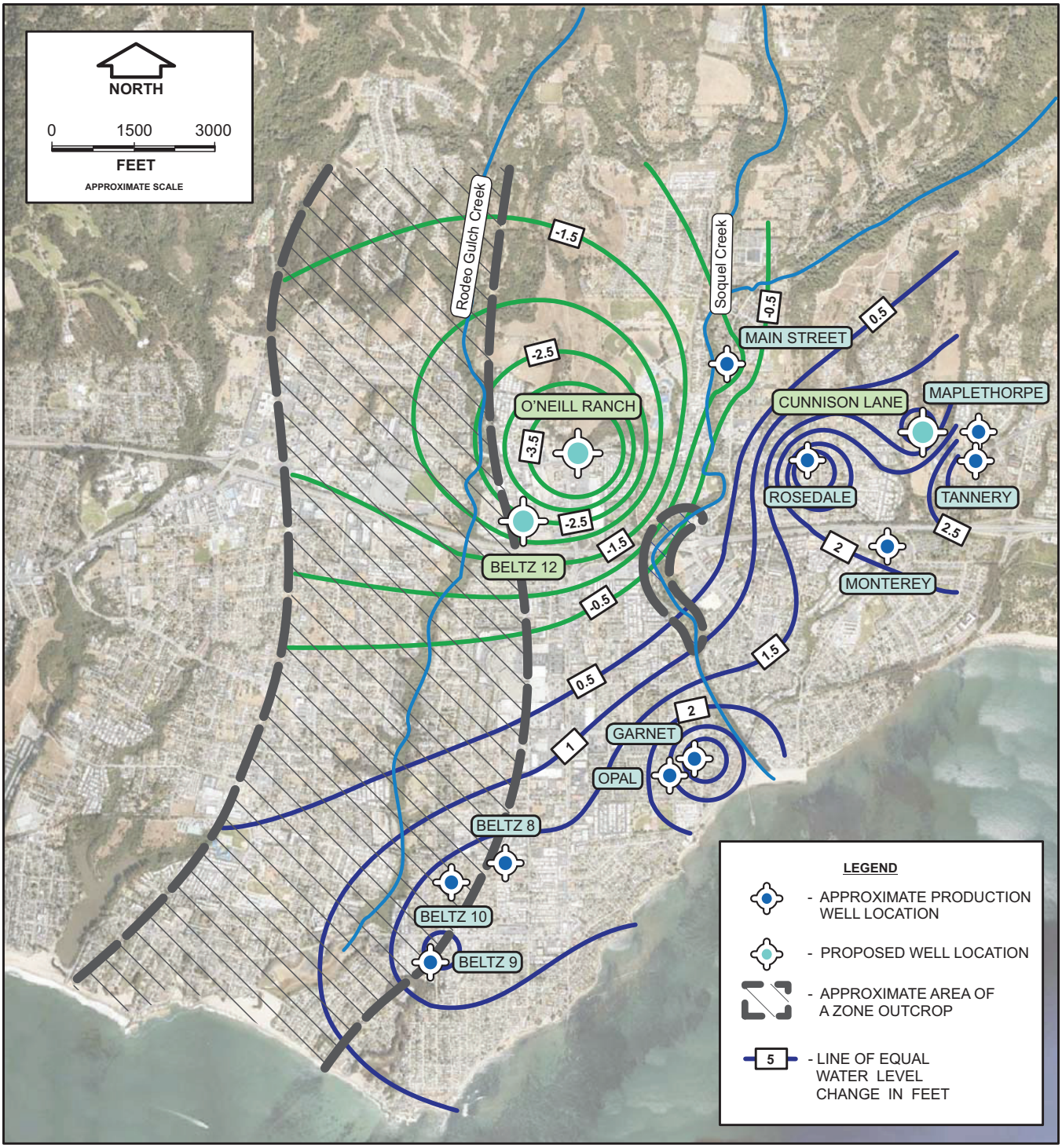
Groundwater Contamination Sites. Analyzing the cumulative pumping effects indicates that while the maximum change in water level will be between 2.5 and 2.75 feet beneath the BP 1240 site, there is no appreciable change in the gradient or direction of groundwater flow. This will result in a less than significant impact. In comparison, cumulative projects with the Proposed Project would result in a maximum change in water level will be between 4 and 5 feet beneath the BP 1240 site. Cumulative impacts involving associated with the Reduced Pumping Alternative are considered environmentally superior to the Proposed Project with respect to impacts to groundwater contamination sites.

Figure 10: Maximum Effect of Cumulative Pumping, with Reduced Pumping Alternative, on Purisima Zone A Water Levels



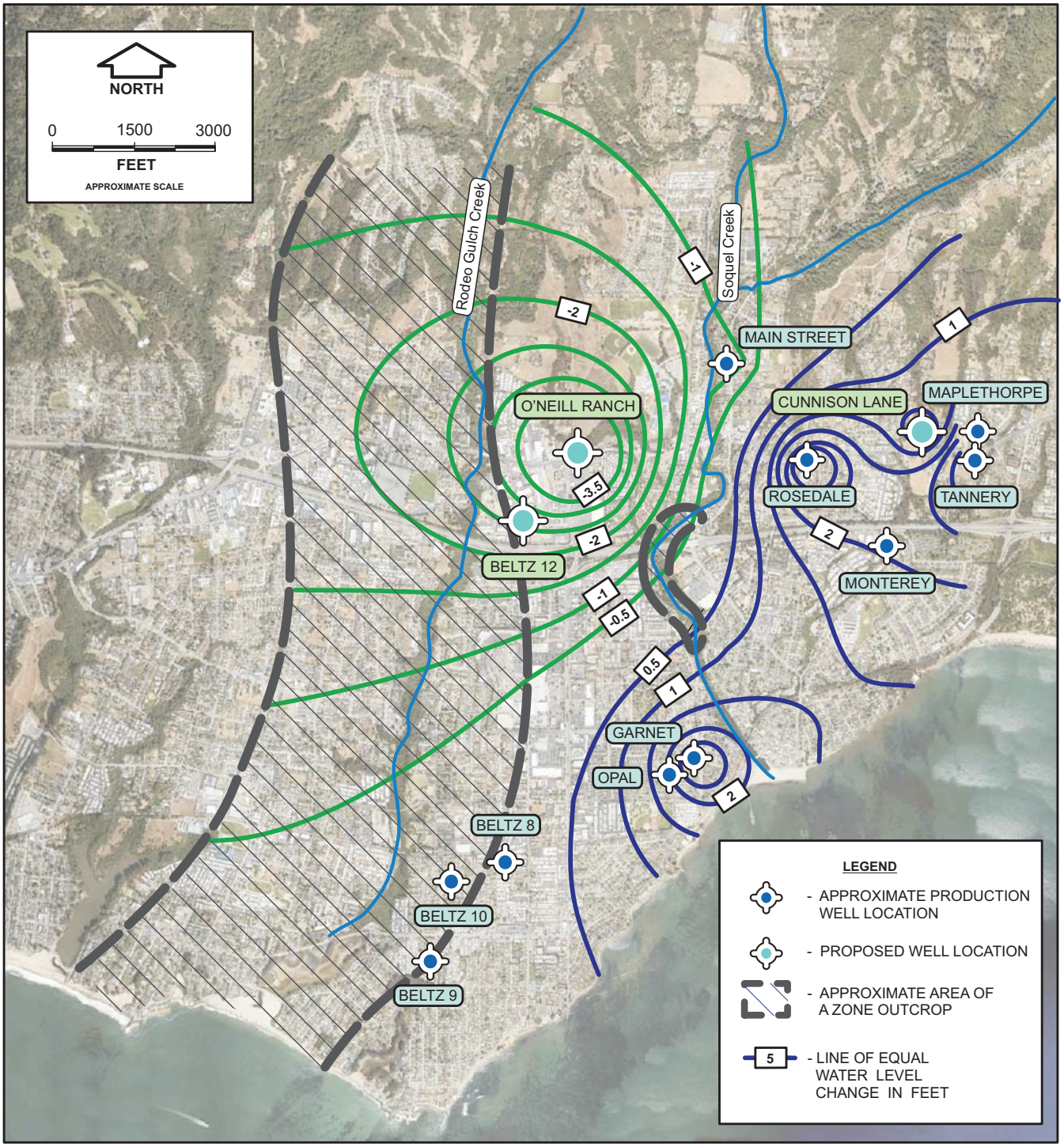
Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project, Plate B11, Hopkins Groundwater Consultants, June 2011.

Figure 11: Maximum Effect of Cumulative Pumping, With Reduced Pumping Alternative, at End of City Pumping Season on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project, Plate B13, Hopkins Groundwater Consultants, June 2011.

Figure 12: Maximum Effect of Cumulative Pumping, With No City Project, at End of City Pumping Season on Purisima Zone A Water Levels



Source: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year Project, Plate B7, Hopkins Groundwater Consultants, June 2011.

Table 14: Maximum Effect of Cumulative Proposed Projects Pumping on Water Levels at Private Wells

Well ID	Screen Length (ft)	Depths (ft)			Water Level Change (ft)	
		Top of Screen	Static Water	Pumping Water Level	Reduced Pumping Alternative (No SQCWD Project)	Cumulative Proposed Projects (City and SQCWD)
1	120	377	320	360	-1.25	-3.5
2	80	250	210	NA	-1.25	-3.75
3	NA	NA	NA	NA	-1.5	-5.0
4	NA	NA	210	237	-1.4	-4.0
5	80	140	140	NA	-1.7	-7.0
6	NA	NA	NA	NA	-1.6	-4.5
7	20	79	86	NA	-2.3	-6.5
8	40	104	97	100	-1.4	-3.0
9	NA	NA	NA	NA	-1.4	-2.5
10	40	65	26	NA	-1.3	-3.25
11	NA	NA	NA	NA	-1.65	-5.75
12	NA	NA	NA	NA	-1.35	-4.25

Biological Resources

Rodeo Gulch Creek

There is no flow in Rodeo Gulch Creek during the summer and fall months of the year. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the Reduced Pumping Alternative will not have an effect on the ephemeral creek flows, nor will it appreciably reduce the seasonal recharge to Corcoran Lagoon. The Reduced Pumping Alternative is considered environmentally similar to the Proposed Project with respect to impacts to Rodeo Gulch Creek.

Soquel Creek

For each critically dry water year, the USGS hydrograph data were utilized to estimate streamflow discharge impacts at the end of the approximate 135-day production season for the Reduced Pumping Alternative and the end of the City's 215 day production season. The results of the streamflow impacts analyses are provided in Tables 15 and 16 for each of the representative critically dry water years.

Table 15: Reduced Pumping Alternative Soquel Creek Flow Worst Case Scenario Impact Assessment End of the Reduced Pumping Alternative Pumping Season 169 days from the start of the pumping season (approx. Sept. 30)

Impact from Reduced Pumping Alternative					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
Single Cr. Dry	2007	**1.51**	1.58	-0.078	1.50
Multiple Cr. Dry	1977	**1.06**	1.11	-0.078	1.03
	1990	**1.46**	1.52	-0.078	1.44

Table 16: Reduced Pumping Alternative Soquel Creek Flow Worst Case Scenario Impact Assessment End of the City's Pumping Season 215 days from the start of the pumping season (approx. Nov 15)

Impact from Reduced Pumping Alternative					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
Single Cr. Dry	2007	**3.46**	3.61	0.013	3.62
Multiple Cr. Dry	1977	**1.29**	1.34	0.013	1.36
	1990	**1.30**	1.36	0.013	1.37

As demonstrated in tables above, redistributing City pumping inland to Beltz Well No. 12 would result in relatively small reductions to outlet discharge in any water year even for the worst-case scenarios modeled at the end of the Alternative's pumping season and a recovery of flow by the end of the City's pumping season.

As shown in Table 15, the estimated worst case effect of the Reduced Pumping Alternative's pumping on Soquel Creek discharges would be small (a reduction of 0.078 cfs). This is well below the 0.5 cfs, the level at which reductions in streamflow are estimated to be detectable and directly attributable to groundwater pumping (HydroMetrics LLC, 2009). Because adverse effects on steelhead habitat resulting from a 0.078 cfs reduction in stream baseflow are extremely difficult to substantiate, potential impacts to stream baseflow from future pumping of the Reduced Pumping Alternative are considered less than significant.

The estimated worst case effect of the Reduced Pumping Alternative's on Soquel Creek discharges (a reduction of 0.078 cfs) would be reduced in comparison to the Proposed Project (a reduction of 0.211). Due to the lower reduction in stream flows and quicker flow recovery, the Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to impacts to sensitive habitats and species in Soquel Creek.

Cumulative

Rodeo Gulch Creek. There is no flow in Rodeo Gulch Creek during the summer and fall months of the year. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the proposed cumulative projects will not have an effect on the ephemeral creek flows, nor will they appreciably reduce the seasonal recharge to Corcoran Lagoon. Cumulative impacts involving associated with the Reduced Pumping Alternative are considered environmentally similar to the Proposed Project with respect to cumulative impacts to Rodeo Gulch Creek.

Soquel Creek. For each critically dry water year, the USGS hydrograph data were utilized to estimate the cumulative streamflow discharge impacts at the end of the approximate 135-day production season for the Reduced Pumping Alternative and the end of the City's 215 day production season. The results of the streamflow impacts analyses are provided in Tables 17 and 18 for each of the representative critically dry water years.

Table 17: Cumulative Impacts for Reduced Pumping Alternative Soquel Creek Flow Worst Case Scenario Impact Assessment
End of the Reduced Pumping Alternative Pumping Season
169 days from the start of the pumping season (approx. Sept. 30)

Impact from Cumulative Projects					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
Single Cr. Dry	2007	**1.51**	1.58	-0.104	1.48
Multiple Cr. Dry	1977	**1.06**	1.11	-0.104	1.00
	1990	**1.46**	1.52	-0.104	1.42

Table 18: Cumulative Impacts for Reduced Pumping Alternative Soquel Creek Flow Worst Case Scenario Impact Assessment
End of the City's Pumping Season215
days from the start of the pumping season (approx. Nov 15)

Impact from Cumulative Projects					
Water Year	Representative Year – Scenario	Stream Flow (cfs)		Change in Stream Flow (cfs)	Stream Outlet Impacted Flow (cfs)
		Ave. USGS gauge 11160000	Calculated Outlet		
single Cr. Dry	2007	**3.46**	3.61	-0.015	3.60
multiple Cr. Dry	1977	**1.29**	1.34	-0.015	1.33
	1990	**1.30**	1.36	-0.015	1.34

As demonstrated in tables above, redistributing City pumping inland to Beltz Well No. 12 would result in relatively small reductions to outlet discharge in any water year even for the worst-case scenarios modeled at the end of the Alternative's pumping season and the end of the City's total pumping season.

The Reduced Pumping Alternative's contribution to the cumulative effect on Soquel Creek discharges would be small (0.078 cfs of the cumulative 0.104 cfs reduction). This is well below the 0.5 cfs, the level at which reductions in streamflow are estimated to be detectable and directly attributable to groundwater pumping (HydroMetrics LLC, 2009). Because adverse effects on steelhead habitat resulting from a 0.104 cfs reduction in stream baseflow are extremely difficult to substantiate, potential impacts to stream baseflow from future pumping of the Reduced Pumping Alternative are considered less than significant.

Due to the lower potential for reduction in stream flows, the Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to cumulative impacts associated to sensitive habitats and species in Soquel Creek.

Conclusion and Relationship to Project Objectives

The Reduced Pumping Alternative is considered environmentally superior to the Proposed Project with respect to groundwater resources and biological resources, with the exception of being slightly inferior in terms of reducing groundwater intrusion. The Reduced Pumping Alternative would also achieve the objectives provided in Chapter 4.2.2.

4.4 ALTERNATIVE ELIMINATED FROM FURTHER CONSIDERATION

In 2006, the City started researching sites that would be appropriate for a new well. The new well siting study was finalized in 2009 (Hopkins Groundwater Consultants, Inc., 2009a). Sites were identified that would accomplish the goal of moving pumping further inland away from the coastline, in order to help reduce the threat of saltwater intrusion. Approximately 37 sites in the Live Oak-Capitola-Soquel area of the Soquel-Aptos Basin were evaluate and ranked based on hydrogeological suitability, constructability and operations, environmental considerations, and ease of site acquisition.

In 2010, the City began actively pursing a new well site. By this time many of the sites had been developed, were no longer available, or were determine not to be suitable upon further investigation. Two sites, with adequate ranking, that were available were the Proposed Project site and the Rodeo Gulch Road Site. The Rodeo Gulch Road Site is located on Rodeo Gulch Road in Soquel and is approximately 450 feet northwest of the Proposed Project site. Due to its close proximity to the Proposed Project, this alternative would be expected to result in the same level of effects on groundwater and biological resources as the Proposed Project.

4.5 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Of the alternatives analyzed in the EIR, the No Project Alternative is considered the environmentally superior alternative as it would avoid some of the potential, though less than significant, impacts associated with operation of the Proposed Project. However, the No Project Alternative would not meet the objectives of the Proposed Project, as it would not provide essential groundwater facilities for the City water supply.

CEQA Guidelines require that, if the No Project Alternative is determined to be the environmentally superior alternative, an environmentally superior alternative must also be identified among the remaining alternatives (Section 15126.6 (e)(2). As such, the Reduced Pumping Alternative would result in reduced environmental impacts as compared to the Proposed Project, while still achieving the objectives of the Proposed Project.

CHAPTER 5 – OTHER CEQA CONSIDERATIONS

This chapter presents the evaluation of other types of environmental impacts required by CEQA that are not covered within the other chapters of this EIR. The other CEQA considerations include environmental effects that were found to not be significant, growth-inducing impacts, and significant and unavoidable adverse impacts.

5.1 ENVIRONMENTAL EFFECTS FOUND TO BE NOT SIGNIFICANT

The Initial Study (IS) for the Proposed Project, completed in December 2010, which is included in the EIR as Appendix A, determined that the Proposed Project would result in no impact or a less than significant impact to 14 of 17 environmental issue areas. The IS for the Proposed Project discusses why the project would have no impact or less than significant impacts for these issue areas, which are subsequently not discussed in detail in this EIR. The issue areas determined to have no impact or a less than significant impact in the IS analysis include the following:

- Aesthetics
- Agricultural Resources
- Air Quality
- Biological Resources (with the exception of biological resource issues related to stream flow losses in Rodeo Gulch Creek and Soquel Creek)
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions/Climate Change
- Hazards and Hazardous Materials
- Hydrology and Water Quality (with the exception of effects on non-City wells and groundwater contamination sites)
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation and Traffic
- Utilities and Service Systems

After a more detailed evaluation of the environmental issues associated with the Proposed Project, the EIR determined that impacts would be less than significant for the following environmental issue areas:

- Hydrology and Water Quality (effects on non-City wells and groundwater contamination sites)
- Biological Resources (biological resource issues related to stream flow losses in Rodeo Gulch Creek and Soquel Creek)

5.2 IRREVERSIBLE ENVIRONMENTAL CHANGES

According to CEQA Guidelines, "[u]ses of nonrenewable resources during the initial and continued phases of the project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway

improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified." Therefore, the purpose of this analysis is to identify any significant irreversible environmental effects of project implementation that cannot be avoided.

Both construction and operation of the Proposed Project would lead to the consumption of limited, slowly renewable, and non-renewable resources, committing such resources to uses that future generations would be unable to reverse. The new development would require the commitment of resources that include: (1) building materials; (2) fuel and operational materials/resources; and (3) the transportation of goods and people to and from the Proposed Project site.

Construction of the Proposed Project would consume certain types of lumber and other forest products, the raw materials in steel, metals such as copper and lead, aggregate materials used in concrete and asphalt such as sand and stone, water, petrochemical construction materials such as plastic, petroleum based construction materials and other similar slowly renewable or nonrenewable resources. Additionally, fossil fuels for construction vehicles and equipment would also be consumed. In terms of project operations, the following slowly renewable or nonrenewable resources would be required: electricity, petroleum based fuels, fossil fuels, and water. Title 24 of the California Administrative Code regulates the amount of energy consumed by new development. Nevertheless, the consumption of such resources would represent a long-term commitment of those resources.

The commitment of resources required for the construction and operation of the Proposed Project would limit the availability of such resources for future generations or for other uses during the life of the project. However, continued use of such resources is consistent with the anticipated growth and planned changes on the Proposed Project site and within the general vicinity. Furthermore, impacts to the energy supply would be less than significant given the existing levels of development within the Proposed Project area. Also the use of natural resources would be used to meet the objectives of the Proposed Project, to maintain the City's historic groundwater production, to locate the new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system; commitment of these resources would be justified.

5.3 GROWTH-INDUCING IMPACTS

Pursuant to the CEQA Guidelines: an EIR must address whether a project will directly or indirectly foster growth as follows:

[An EIR shall] discuss the ways in which the Proposed Project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of wastewater treatment plant, might, for example, allow for more construction in service areas). Increases in the population may further tax existing community service facilities so consideration must be given to this impact. Also, discuss the characteristic of some projects, which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

As discussed below, this analysis evaluates whether the Proposed Project would directly, or indirectly, induce economic, population, or housing growth in the surrounding environment.

5.3.1 Direct Growth-Inducing Impacts in the Surrounding Environment

Direct growth-inducing impacts occur when the development of a project induces population growth or the construction of additional developments in the same area of a proposed project, and produces related growth-associated impacts. Growth-inducing projects remove physical obstacles to population growth, such as the construction of a new road into an undeveloped area, a wastewater treatment plant expansion, and projects that allow new development in the service area. Constructions of such infrastructure projects are considered in relation to the potential development and the potential environmental impacts.

Implementation of the Proposed Project would maintain the City's current level of groundwater pumping. The Proposed Project does not include residential development and does not directly induce population growth. The Proposed Project will not remove obstacles to regional growth and related development.

5.3.2 Indirect Growth-Inducing Impacts in the Surrounding Environment

The purpose of the Proposed Project is to maintain the City's historic groundwater production, to locate the new well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system. The Proposed Project does not contain components likely to indirectly induce employment or an employment-related increase in population.

5.4 SIGNIFICANT UNAVOIDABLE ENVIRONMENTAL IMPACT

The potential effects of the Proposed Project are discussed in Chapter 3.0 of this EIR. The project would not result in any significant unavoidable impacts.

CHAPTER 6 – ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	Cubic feet per second
CWA	Clean Water Act
EIR	Environmental Impact Report
ESU	Evolutionary Significant Unit
FESA	Federal Endangered Species Act
ft	feet
gpd	Gallons per day
gpm	Gallons per minute
IS	Initial Study
IWP	Integrated Water Plan
mgd	Million Gallons per Day
MLU	Multi Layer Unsteady-state computer program
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
psi	per square inch
NPDES	National Pollution Discharge Elimination System
RWQCB	Regional Water Quality Control Board
SqCWD	Soquel Creek Water District
SWRCB	State Water Resources Control Board
USA	Underground Services Alert
USFWS	United States Fish and Wildlife Service
yr	year

CHAPTER 7 – REFERENCES

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CHAPTER 8 – REPORT PREPARATION

Name	Project Role/EIR Chapter
Lead Agency/Reviewers	
Linette Almond, P.E.	Deputy Director/Engineering Manager
John Everett	Environmental Projects Analyst
Leah Van Der Maaten, P.E.	Associate Civil Engineer
CEQA Consultant: Chambers Group, Inc.	
Greg McCafferty	Program Manager
Paula Fell	CEQA Project Manager
Meghan Directo	Environmental Planner
Patrick Zabrocki	Cultural Resources
Roma Stromberg	Noise Studies
Joe O'Bannon	Air studies
David Smith	Cultural Resources
Noel Davis, Ph.D.	Biological Resources

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR
APPENDIX A – NOTICE OF PREPARATION/INITIAL STUDY/COMMENTS RECEIVED

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR
NOTICE OF PREPARATION

DATE: December 8, 2010
TO: Public Agencies, Organizations and Interested Parties

FROM: Leah Van Der Maaten, Associate Civil Engineer

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report in Compliance with Title 14, Section 15082(a), 15103, and 15375 of the California Code of Regulations

---

Pursuant to the State of California Public Resources Code and the "Guidelines for Implementation of the California Environmental Quality Act of 1970" as amended to date, this is to advise you that the City of Santa Cruz Water Department has prepared an Initial Study on the following project:

Project Name: Beltz Well No. 12 – Research Park Drive

Agencies: The City of Santa Cruz requests your agency's views on the scope and content of the environmental information relevant to your agency's statutory responsibilities in connection with the proposed project, in accordance with California Code of Regulations, Title 14, Section 15082(b).

Organizations And Interested Parties: The City of Santa Cruz Water Department requests your comments and concerns regarding the environmental issues associated with construction and operation of the proposed project.

Location: The Proposed Project site is located on a small parcel (APN 030-18-170) at the corner of Research Park Drive and Cory Street in the unincorporated community of Soquel, Santa Cruz County, California (see Figure 1, Project Location Map, and Figure 2, Proposed Project Site).

Project Site Description: The Proposed Project site is currently vacant, surrounded by a chain link fence, and undeveloped. Adjacent to the site, in a public right of way on Cory Street, is a City of Santa Cruz monitoring well. The Proposed Project site is located in an area designated as Service Commercial under the County of Santa Cruz General Plan. The adjacent surrounding properties are developed with commercial and light industrial land uses. The site is located within the County Urban Services Line (USL) boundary, the area that defines where urban services are provided.

Project Purpose: The purpose of the Proposed Project is to replace Beltz Well No. 4 in order to maintain the City's historic groundwater production, to locate the replacement well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the reliability and flexibility of the City's groundwater well system.

Project Description: The City of Santa Cruz Water Department (City) provides water to the residents within the City of Santa Cruz, as well as additional customers outside of the City limits within the County of Santa Cruz, and a portion of the City of Capitola. Most of the City's water supply comes from surface water sources. A small but important amount (approximately 5%) comes from groundwater supplies, augmenting the City's water supply during peak demand season. Historically the City has produced groundwater in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of high production during drought conditions. The historic normal year groundwater production from the Live Oak well field is 645 ac-ft/yr, approximately 1 million gallons per day (MGD). The loss of Beltz Well No. 4 has impacted the City's capacity to maintain a stable groundwater supply.

The replacement for Beltz Well No. 4 (Beltz Well No. 12) is proposed to be built on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in

Soquel, California. Tentative well design would facilitate the use of either a submersible pump or a vertical line-shaft turbine pump. The replacement well would include the following components: (1) a pump and chemical building, approximately 12 feet in height; (2) an iron and manganese treatment system with pressurized filter tanks, approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height, and (5) station piping including, but not limited to, a treated water pipeline, a sanitary sewer pipeline, and stormwater drainage facilities that would connect to existing facilities in Research Park Drive. The replacement well will be drilled to an approximate depth of 320 feet below ground surface (bgs) to provide up to approximately 700 GPM of water. Groundwater extracted from Beltz Well No.12 would be from the same zone of the Purisima aquifer as the existing Live Oak well field and Beltz Well No. 4. Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's groundwater extraction, but would redistribute existing City production from the Live Oak well field. While the City maintains the option to produce up to 645 ac-ft/yr from either the existing Live Oak well field or Beltz Well No. 12 in any water year type, typically the City would produce a portion of annual groundwater supplies from the existing Live Oak well field and a portion from Beltz Well No. 12.

Environmental Issues: The City of Santa Cruz Water Department has prepared an Initial Study that describes the potential environmental effects of the proposed project. Based on the conclusions of the Initial Study, it has been determined that an EIR is the appropriate level of environmental documentation. The EIR will include the provision of alternatives.

Public Review Period: The City of Santa Cruz Water Department has determined to make this NOP and Initial Study available for public review and comment pursuant to California Code of Regulations, Title 14, Section 15082(b). The City of Santa Cruz Water Department will accept written comments for the NOP and Initial Study between December 17, 2010 and January 17, 2011.

Public Scoping Meeting: The City of Santa Cruz Water Department will receive public input on the project and the NOP/IS during the 30-day scoping period, at a public meeting to be held on January 10, 2011 at 6:30 p.m. at the Best Western Capitola By-the-Sea Inn & Suites: 1435 41st Ave, Capitola, CA 95010. Comments from the community and interested parties are encouraged.

Responses And Comments: By 5:00 p.m., January 17, 2011, please indicate a contact person for your agency or organization and send your comments to:

Leah Van Der Maaten, P.E., Associate Civil Engineer
City of Santa Cruz, Water Department
212 Locust Street Suite C, Santa Cruz CA 95060

Comments may also be sent by FAX at (831) 420-5201

Document Availability: The Initial Study is available for public review during regular business hours at the locations listed below.

- City of Santa Cruz Water Department, Engineering Division, 212 Locust Street Suite C, Santa Cruz CA 95060
- Santa Cruz Public Library, Capitola Branch, 2005 Wharf Road, Capitola, CA 95010-2002
- Santa Cruz Public Library, Central Branch, 224 Church Street, Santa Cruz, CA 95060-38
- City of Santa Cruz website (www.cityofsantacruz.com)

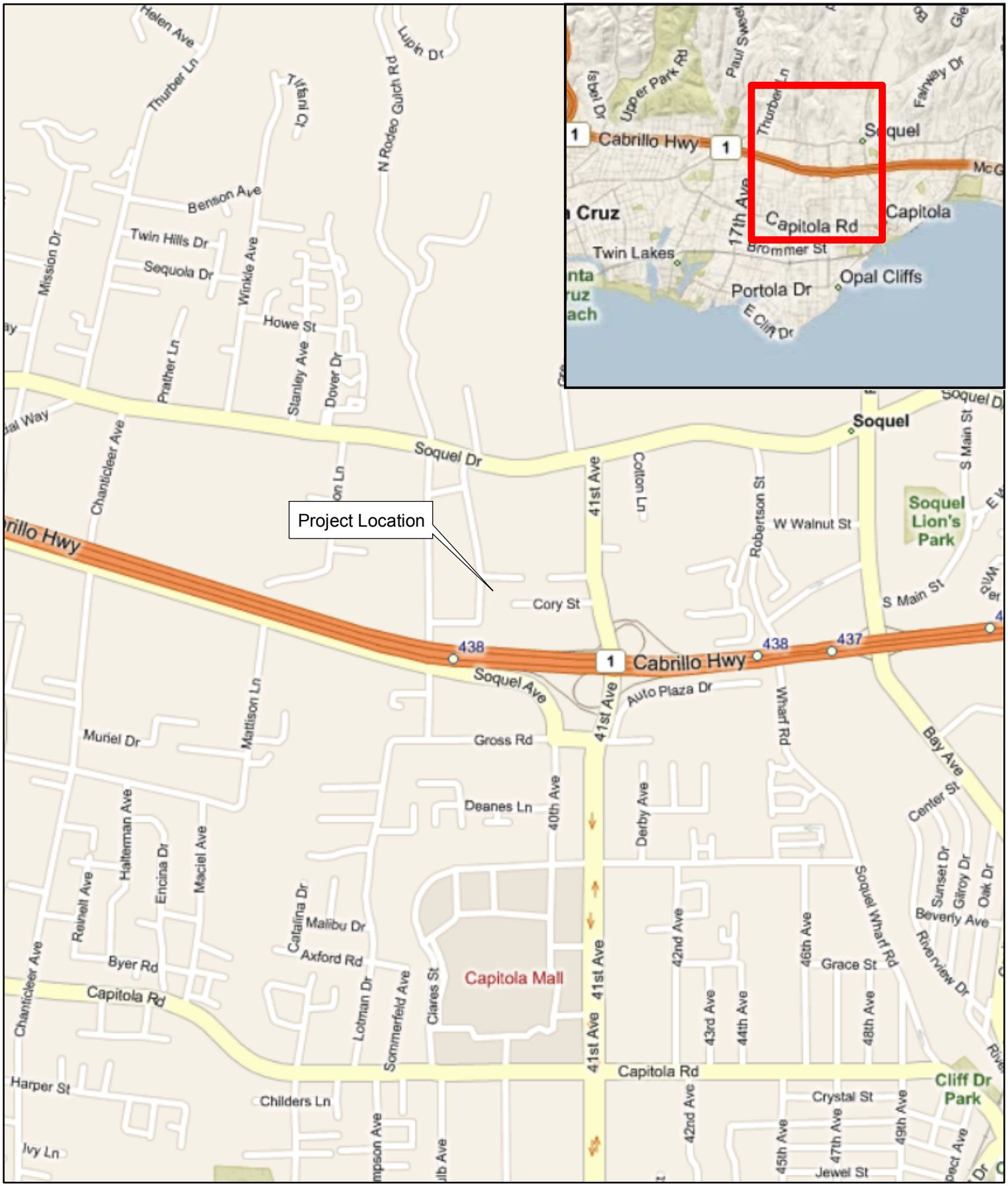

Figure 1
Project Location

Chambers Group, Inc.

Feet
0 360 720 1,440 2,160 2,880

© 2009 Microsoft Corp. - http://maps.live.com

Figure 2
Proposed Project Site

Chambers Group, Inc.

N
W E
S

0 80 160 320 480 640 Feet

© 2009 Microsoft Corp. - http://maps.live.com

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR
INITIAL STUDY

Beltz Well No. 12

Research Park Drive, Soquel, CA (Santa Cruz County)
Assessor's Parcel No. 030-18-170

Notice of Preparation / Initial Study

Lead Agency:

City of Santa Cruz
Water Department
212 Locust Street Suite C
Santa Cruz, CA 95060

Contact: Leah Van Der Maaten, P.E., Associate Civil Engineer

Date: December 8, 2010

DATE: December 8, 2010
TO: Public Agencies, Organizations and Interested Parties

FROM: Leah Van Der Maaten, Associate Civil Engineer

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report in Compliance with Title 14, Section 15082(a), 15103, and 15375 of the California Code of Regulations

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Project Name: Beltz Well No. 12 – Research Park Drive

Agencies: The City of Santa Cruz requests your agency's views on the scope and content of the environmental information relevant to your agency's statutory responsibilities in connection with the proposed project, in accordance with California Code of Regulations, Title 14, Section 15082(b).

Organizations And Interested Parties: The City of Santa Cruz Water Department requests your comments and concerns regarding the environmental issues associated with construction and operation of the proposed project.

Location: The Proposed Project site is located on a small parcel (APN 030-18-170) at the corner of Research Park Drive and Cory Street in the unincorporated community of Soquel, Santa Cruz County, California (see Figure 1, Project Location Map, and Figure 2, Proposed Project Site).

Project Site Description: The Proposed Project site is currently vacant, surrounded by a chain link fence, and undeveloped. Adjacent to the site, in a public right of way on Cory Street, is a City of Santa Cruz monitoring well. The Proposed Project site is located in an area designated as Service Commercial under the County of Santa Cruz General Plan. The adjacent surrounding properties are developed with commercial and light industrial land uses. The site is located within the County Urban Services Line (USL) boundary, the area that defines where urban services are provided.

Project Purpose: The purpose of the Proposed Project is to replace Beltz Well No. 4 in order to maintain the City's historic groundwater production, to locate the replacement well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the reliability and flexibility of the City's groundwater well system.

Project Description: The City of Santa Cruz Water Department (City) provides water to the residents within the City of Santa Cruz, as well as additional customers outside of the City limits within the County of Santa Cruz, and a portion of the City of Capitola. Most of the City's water supply comes from surface water sources. A small but important amount (approximately 5%) comes from groundwater supplies, augmenting the City's water supply during peak demand season. Historically the City has produced groundwater in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of high production during drought conditions. The historic normal year groundwater production from the Live Oak well field is 645 ac-ft/yr, approximately 1 million gallons per day (MGD). The loss of Beltz Well No. 4 has impacted the City's capacity to maintain a stable groundwater supply.

The replacement for Beltz Well No. 4 (Beltz Well No. 12) is proposed to be built on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in Soquel, California. Tentative well design would facilitate the use of either a submersible pump or a vertical line-shaft turbine pump. The replacement well would include the following components: (1) a pump and chemical building, approximately

12 feet in height; (2) an iron and manganese treatment system with pressurized filter tanks, approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height, and (5) station piping including, but not limited to, a treated water pipeline, a sanitary sewer pipeline, and stormwater drainage facilities that would connect to existing facilities in Research Park Drive.

The replacement well will be drilled to an approximate depth of 320 feet below ground surface (bgs) to provide up to approximately 700 GPM of water, or 1MGD. Groundwater extracted from Beltz Well No.12 would be from the same zone of the Purisima aquifer as the existing Live Oak well field and Beltz Well No. 4. Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's groundwater extraction, but would redistribute existing City production from the Live Oak well field. While the City maintains the option to produce up to 645 ac-ft/yr from either the existing Live Oak well field or Beltz Well No. 12 in any water year type, typically the City would produce a portion of annual groundwater supplies from the existing Live Oak well field and a portion from Beltz Well No. 12. Redistributing the production away from the coast during certain years is essential to protecting the Purisima Aquifer from saltwater intrusion and maintaining the City's water level goals along the coast.

Environmental Issues: The City of Santa Cruz Water Department has prepared an Initial Study that describes the potential environmental effects of the proposed project. Based on the conclusions of the Initial Study, it has been determined that an EIR is the appropriate level of environmental documentation. The EIR will include the provision of alternatives.

Public Review Period: The City of Santa Cruz Water Department has determined to make this NOP and Initial Study available for public review and comment pursuant to California Code of Regulations, Title 14, Section 15082(b). The City of Santa Cruz Water Department will accept written comments for the NOP and Initial Study between December 17, 2010 and January 17, 2011

Public Scoping Meeting: The City of Santa Cruz Water Department will receive public input on the project and the NOP/IS during the 30-day scoping period, at a public meeting to be held on January 10, 2011 at 6:30 p.m. at the Best Western Capitola By-the-Sea Inn & Suites: 1435 41st Ave, Capitola, CA 95010. Comments from the community and interested parties are encouraged.

Responses And Comments: By 5:00 p.m., January 17, 2011, please indicate a contact person for your agency or organization and send your comments to:

Leah Van Der Maaten, P.E., Associate Civil Engineer
City of Santa Cruz, Water Department
212 Locust Street Suite C, Santa Cruz CA 95060

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I. PURPOSE OF THE NOTICE OF PREPARATION AND INITIAL STUDY

The City of Santa Cruz Water Department (City) proposes to construct a replacement for Beltz Well No. 4 (Beltz Well No. 12) on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in Soquel, California, to maintain the City's historic groundwater production, to locate the replacement well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the reliability and flexibility of the City's groundwater well system.

All "projects" within the State of California are required to undergo environmental review to determine the environmental impacts associated with implementation of the project in accordance with the California Environmental Quality Act (Public Resources Code, Section 21000 et al. 2008). The California Environmental Quality Act (CEQA) was enacted in 1970 by the California Legislature to disclose to decision makers and the public the significant environmental effects of a Proposed Project and identify possible ways to avoid or minimize significant environmental effects of a project by requiring implementation of mitigation measures or recommending feasible alternatives. CEQA applies to all California governmental agencies at all levels, including local, regional and state, as well as boards, commissions, and special district. As such, the City is required to conduct an environmental review to analyze the potential environmental effects associated with the Proposed Project.

The findings in this Initial Study have determined that an Environmental Impact Report (EIR) is the appropriate level of environmental documentation. The Proposed Project could result in potential impacts in biological resources and hydrology issue areas. These issues areas shall be further addressed in the EIR.

The City will be the Lead Agency for the CEQA process related to this Proposed Project and for the EIR that is recommended in this Initial Study (IS) / Notice of Preparations (NOP). The attached IS analyzes the potential for the proposed project to result in environmental impacts.

The City needs to know the views of your agency regarding the scope and content of the environmental information that should be included in the Environmental Impact Report (EIR). The document will be prepared by the City and will include any information necessary for your agency to meet any statutory responsibilities related to the Proposed Project. Your agency will need to use the EIR when considering any permit or other approvals necessary to implement the project. A preliminary list of the environmental topics identified for study in this EIR is provided in the IS checklist (Section IV). If the topics of concern to your agency have already been identified for analysis in the IS, your agency need not provide a response to this notice.

The project description, location, and the environmental issues to be addressed in the EIR are contained in the attached materials.

Due to the time limits mandated by state law, your comments must be sent to the City at the earliest possible date but not later than 5:00 p.m., January 17, 2011. Please send your response to:

Leah Van Der Maaten, P.E., Associate Civil Engineer
City of Santa Cruz, Water Department
212 Locust Street Suite C, Santa Cruz CA 95060

Comments may also be sent by FAX at (831) 420-5201

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II. BACKGROUND

1. Project Title:	Beltz Well No. 12 – Research Park Drive
2. Lead Agency Name & Address:	City of Santa Cruz Water Department 212 Locust Street, Suite C Santa Cruz, California 95060
3. Contact Person & Phone Number:	**Leah Van Der Maaten, P.E., Associate Civil Engineer** Phone number: (831) 420-5356
4. Project Location:	The site is located in the unincorporated community of Soquel, Santa Cruz County, California at Research Park Drive and Cory Street, Assessor's Parcel No. 030-18-170. (Refer to Figure 1, Proposed Project Location).
5. General Plan Designation:	CS: Service Commercial
6. Zoning:	M-1 (Light Industry)
7. Other Public Agencies whose approval is required:	▪ Santa Cruz City Council – adoption of CEQA document and project approval ▪ Santa Cruz County Public Works Department – encroachment permit ▪ Santa Cruz County Environmental Health Services – well installation permit ▪ California Department of Public Health (DPH) – permit to treat the groundwater and distribute it in the municipal system ▪ Regional Water Quality Control Board (Central Coast) – National Pollutant Discharge Elimination System (NPDES) Permit for Discharges with Low Threat to Water Quality

III. ENVIRONMENTAL SETTING & PROJECT DESCRIPTION

A. Introduction

The City of Santa Cruz Water Department (City) proposes to construct a replacement water well and associated facilities in the unincorporated community of Soquel, Santa Cruz County, California (see Figure 1). The proposed well would be located on the northeast corner of Research Park Drive and Cory Street, in Soquel (see Figure 2). As shown in the Conceptual Site Plan (Figure 3), facilities would include: (1) a pump and chemical storage building, approximately 12 feet in height; (2) an iron and manganese treatment system consisting of pressurized filter tanks, approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height,

and (5) station piping including, but not limited to, a treated water pipeline, a sanitary sewer pipeline, and stormwater drainage facilities that would connect to existing facilities in Research Park Drive. The replacement well (Beltz Well No. 12) will be drilled to an approximate depth of 320 feet below ground surface (bgs) to provide up to approximately 700 gallons per minute (GPM) of water. Pumping from Beltz Well No. 12 could be required for a period of up to seven months, corresponding to approximately April 15 to November 15. Production from Beltz Well No. 12 would not increase the City's groundwater extraction, but would redistribute existing City production from the Live Oak well field. While the City maintains the option to produce up to 645 ac-ft/yr from either the existing Live Oak well field or Beltz Well No. 12 in any water year type, typically the City would produce a portion of annual groundwater supplies from the existing Live Oak well field and a portion from Beltz Well No. 12.

B. Department Overview

The City is responsible for providing water to over 90,000 people in the City, unincorporated Santa Cruz County, a small part of the City of Capitola, and several agricultural customers along Highway 1 between the City limits and the town of Davenport. There are four main sources of water supply for the City including North Coast sources (Laguna, Majors, and Riggardio Creeks and Liddell Spring), San Lorenzo River (including Tait Street Diversion, Tait wells, and Felton Diversion), Loch Lomond Reservoir, and Live Oak wells. Approximately 5% of the City's water supply is groundwater provided by the Live Oak well field (formerly called the Beltz well field).

The primary water management problem presently facing the City of Santa Cruz is the lack of adequate water supply during periods of drought. In normal and wet years when rainfall and runoff are normal to abundant, base flows in the coast and river sources are restored by winter rains. Storage in Loch Lomond is typically replenished to full capacity with runoff from the Newell Creek watershed and water diverted from the San Lorenzo River at Felton. Under these weather conditions, the water supply system is capable of meeting the community's total annual water requirements.

The system is highly vulnerable to shortage in below normal, dry, and drought years, however, when the San Lorenzo River and coast sources run low. In these years, the system relies more heavily on water stored in Loch Lomond to satisfy demand, which draws down the reservoir level lower than usual and depletes available storage. In critically dry or multi-year drought conditions, the combination of very low surface flows in the coast and river sources and depleted storage in Loch Lomond reservoir reduces available supply to a level that cannot support even average dry season demands.

The City experienced severe water supply deficiencies in both the 1976-77 and 1987-92 droughts. In 1977, the City imposed severe water rationing in response to a critical shortage of water. During the 1987-92 drought, a water supply emergency was declared and either usage restrictions or rationing was imposed each year for five consecutive years. The 1976-77 event has since been established as the most severe drought of record, and is used by the City as a benchmark for assessing system reliability. If a critical drought similar to 1976-77 occurred in 2005, shortages would have been in excess of 40%.

Operations studies conducted by the City show that the problem of water shortage will worsen, in terms of both frequency and magnitude, as the population of the region grows and demand for water increases over time.

As noted above, the City's primary sources of water supply are surface water diversions; however, approximately 5% of the City's water supply is groundwater provided by the Live Oak well field. This well field only extracts water from the coastal portions of the Purisima aquifer. While the Live Oak wells groundwater system is a small portion of the City's water supply, it is still an important source of water as it is used to augment the City's water supply during peak demand and drought periods. Historically the City has produced groundwater in response to widely fluctuating hydrologic conditions with periods of little production during extremely wet years and periods of high production during drought conditions. Specifically, the City has operated its wells during a period of 150 to 200 days out of the year at a combined

operational rate of about 1 MGD on average (City of Santa Cruz, 2006). During the extended drought of 1987-1988, operation averaged a rate of 2 MGD (City of Santa Cruz, 2005). In the City's Integrated Water Plan (IWP) Program DEIR (City of Santa Cruz, 2005), the City documented its planning goal of maintaining groundwater production into the future at the maximum rate of approximately 2 MGD (1,500 GPM) during drought conditions; which is equal to approximately 1,300 ac-ft/yr. However, the City recognized that the uncertain nature of groundwater conditions in the western portion of the basin is a serious issue and has limited future maximum extraction during all water years to 645 ac-ft/yr, or approximately 1MGD (700 GPM).

Currently, the Live Oak well field has four active wells, still referenced as Beltz wells (No. 7, 8, 9 and 10). Beltz Wells No. 8 and No. 9 were installed in 1998 and began producing water for the City in 1999. Beltz Well No. 10 was installed in 2009. Beltz Well No. 7, installed in 1974, has poor yield.. The City currently produces 1 MGD (700 GPM) from the Live Oak wells. A replacement of Beltz Well No. 4 is needed to restore water system reliability and to protect the Purisima aquifer from seawater intrusion, especially during critical drought periods. Groundwater extracted from Beltz Well No.12 would be from the same zone of the Purisima aquifer as the existing Live Oak well field and Beltz Well No. 4.

A recent study completed by the City to investigate the hydrogeological conditions of the area concluded that new production wells developed by the City should be shifted inland from the existing Live Oak well field in an attempt to control groundwater levels and protect the Purisima aquifer from seawater intrusion (Hopkins, 2009). The City has proposed to develop Beltz Well No. 12 at the Research Park Drive site, which is located approximately 1.5 miles inland and northeast of the Live Oak well field.

Groundwater Monitoring

The City currently maintains a network of groundwater monitoring wells in the Live Oak area to provide the City the ability to collect groundwater levels and water quality samples from individual aquifer zones in the Soquel, Capitola, Live Oak and coastal areas. Three Cory Street monitoring wells were constructed adjacent to the Proposed Project site, in a public right of way on Cory Street, in November of 2009. These monitoring wells provide the City the ability to monitor groundwater conditions further inland and collect site-specific hydrologeoloic information for the development of Beltz Well No. 12. As constructed, the Cory Street monitoring wells consist of nested well designs that utilized 2-inch-diameter well casing and screen assemblies which range in depths from 70 to 350 feet bgs. The preliminary well designs were based on projections using a recent hydrogeological interpretation of the Purisima Formation aquifer zones (Hopkins, 2009), and were finalized based on the site specific geological findings obtained during the test hole drilling process.

During monitoring well drilling hydrogeologists collected and analyzed drill cuttings, compiled a lithologic log, and monitored drill rig activities to determine the depths of specific Purisima Formation (Purisima) aquifer zones in this inland portion of the Live Oak-Capitola area. Upon reaching the planned depth for each borehole, an electric log of the borehole was recorded to provide additional data for final well design. Monitoring well design was determined through correlation of the lithological log and the geophysical survey (electric log).

The Cory Street Monitoring Well was drilled, constructed, and sampled between November 16, 2009 and December 4, 2009. A 10-inch-diameter pilot borehole was drilled to a depth of approximately 350 feet bgs. The hydrogeological information collected during the installation of the Cory Street Monitoring Well indicates that the main aquifer units at this location are the Purisima A and AA zones. While it is possible the underlying Santa Margarita Formation may be a viable aquifer zone, it likely lies at a depth of about 200 feet below the Cory Street monitoring well and is not presently being produced by the Beltz Wells. The hydrogeological study also concluded that it is reasonable for a properly designed and constructed well in the vicinity of the Cory Street site to be capable of producing up to approximately 800 GPM during long-term operation.

Regional Groundwater Basins

The Purisima aquifer and Santa Margarita formation underlie the Proposed Project area and are part of the Soquel-Aptos Groundwater Basin. The Purisima aquifer is the primary source of groundwater in the region. The entire production of the City's Live Oak well field is derived from groundwater contained in the Purisima Formation (Hopkins Groundwater Consultants, Inc. 2004) and accounts for approximately 5% of the City's water supply. The primary aquifer units consist of fine-to-coarse grained marine sands interbedded and confined by silt and sandy clay strata (Hopkins Groundwater Consultants, Inc. 2004). The Purisima aquifer is relatively shallow under the City of Santa Cruz, but slopes southeast, becoming deeper under Soquel Creek. Potential groundwater recharge areas for the Purisima aquifer are located along the foothills of the Santa Cruz Mountains in the eastern and northern quarters of the City of Santa Cruz water service area.

The Santa Margarita formation lies beneath the Purisima aquifer; it is believed to be comprised of a moderately cemented sandstone. Available data indicate it likely ranges from 40 to 60 feet thick and lies on top of the crystalline bedrock which defines the effective base of fresh water. In the Live Oak area, the Santa Margarita aquifer is deeply buried and undeveloped.

Watersheds

The entire Proposed Project area is within the Big Basin Hydrologic Unit, as defined by the Central Coast Regional Water Quality Control Board, and includes portions of the San Lorenzo and Aptos Creek Hydrologic subareas (CCRWQCB 1994). At the coast, the San Lorenzo subarea stretches from Younger Lagoon east to the Santa Cruz Harbor at the outlet of Arana Creek. The Aptos Soquel subarea stretches east from the Santa Cruz Harbor to La Selva Beach.

The City is divided into five sub-watersheds that make up the San Lorenzo Hydrologic subarea (City of Santa Cruz, 2003). Each drains directly to the Pacific Ocean. These watersheds are:

- Moore Creek Watershed
- Westside Watershed
- Neary Lagoon Watershed
- San Lorenzo River Watershed
- Arana Gulch Watershed

Two additional watersheds and a small lake are located in the Aptos Soquel Basin in Capitola and unincorporated areas of Santa Cruz County. These are:

- Rodeo Gulch Creek Watershed
- Soquel Creek Watershed
- Schwann Lake

The two watersheds located in the vicinity of the Proposed Project site are the Soquel Creek Watershed and the Rodeo Gulch Creek watershed. Soquel Creek is located approximately 0.48 mile to the east of the Proposed Project site. Soquel Creek flows through unincorporated portions of Santa Cruz County in its upper watershed, and the center of Capitola as it approaches the ocean. The creek is daylighted throughout its entire length as it flows through open space, residential, and commercial land uses. "Daylighted" refers to streams and creeks that are not enclosed in a culvert or pipe. Soquel Creek terminates at Capitola City Beach.

Rodeo Gulch Creek is located approximately 0.16 mile immediately west of the Proposed Project site. The Rodeo Gulch Creek watershed flows through the unincorporated area of Live Oak between the cities of Santa Cruz and Capitola. The watershed consists primarily of open space in the upper watershed, and residential use in the lower reaches. Rodeo Gulch Creek is daylighted for most of its length and flows into Corcoran Lagoon, before terminating at the Pacific Ocean.

Seawater Intrusion

Historic pumping from the Live Oak well field has resulted in conditions conducive to seawater intrusion. The Live Oak well field's location near the coast makes it the last pumper to capture groundwater that would otherwise become offshore flow through the ocean floor outcrop. The City maintains a network of groundwater monitoring wells and regularly tracks water levels along the coast to detect conditions that could signify the presence of seawater intrusion and to understand how the aquifer responds to pumping stresses. Measurements at a monitoring well near the coast (Pleasure Point) following the production period during the last drought (1987 and 1988) indicate that water levels along the coast dropped to near or below sea level. Following the drought, water levels then recovered to nearly 20 feet above mean sea level (Johnson et al. 2004). Pumping throughout the aquifer has progressively increased since the 1960's and is expected to continue. Conditions from 1994 to 2004 indicate that additional pumping by Soquel Creek Water District (SqCWD) and privately owned inland wells has lowered the amount of offshore flow available for capture by the Live Oak well field (Hopkins Groundwater Consultants, Inc. 2004).

C. Purpose and Need for Project

The purpose of the Proposed Project is to replace Beltz Well No. 4 in order to maintain the City's historic groundwater production, to locate the replacement well farther inland to protect the Purisima aquifer from the threat of saltwater intrusion, and to improve the Live Oak Well system's reliability and flexibility of the City's groundwater system.

D. Project Description

The replacement of Beltz Well No. 4 with Beltz Well No. 12 and associated treatment facilities would be installed on a vacant lot located at the northeast corner of the intersection of Research Park Drive and Cory Street in Soquel, California. As shown in Figure 3, the replacement water well would include the following components: (1) a pump and chemical storage building, approximately 40 feet by 20 feet and approximately 12 feet in height; (2) an iron and manganese treatment system consisting of pressurized filter tanks, approximately 35 feet by 9 feet and approximately 10 feet in height; (3) a backwash tank for the iron and manganese treatment, approximately 16 feet in diameter and approximately 15 feet in height; (4) a sand separator, approximately 7 feet in height; and (5) station piping, including, but not limited to, treated water pipeline, sewer connections, and new stormwater drainage facilities that would connect to existing facilities in Research Park Drive. The Proposed Project site would be enclosed with a chain-link fence with privacy slats. The site would also be developed with a paved driveway connecting to Research Park Drive, security lighting, and crushed rock around the Proposed Project facilities.

The replacement well will be drilled to an approximate depth of 320 feet below ground surface (bgs) to provide up to approximately 700 GPM of water. Tentative well design includes a 32-inch diameter bore hole and a 16-inch diameter well casing and screen design to facilitate the use of either a submersible pump or a vertical line-shaft turbine pump. The well will likely be located in a pump and chemical storage building which will also contain the pump controls and a storage area for the Sodium hypochlorite (typically 350 gallons or less of 12.5% Sodium hypochlorite). It is possible that the well will not be enclosed by a building but chemicals will still need to be stored inside an enclosed area that is protected from the sun. Sodium hypochlorite is used as a disinfectant for the finished water and for pretreatment in the removal of iron and manganese. The exact treatment process will be determined once the well has been drilled since pilot testing should be done prior to design of wellhead treatment. However, iron and manganese treatment typically consists of adding sodium hypochlorite to oxidize the iron and manganese into a form that is easier to remove. Next the water is run through a filter media, such as green sand, anthrasand, or pyrolusite, where the iron and manganese is physically removed by filtration/straining action. There is a slight possibility that Potassium permanganate would also be used in the iron and manganese treatment system. The treated water is then piped to the City's potable water distribution line located adjacent to the Proposed Project site in Research Park Drive.

At least daily, the filter media is cleaned by backwashing to remove the accumulated iron and manganese. The backwash is then piped to the backwash tank. In this tank, the iron and manganese settle out from the groundwater. The clear water is piped to the County sanitary sewer line located immediately adjacent to the Proposed Project site in Research Park Drive and/or recirculated to the wellhead treatment and the remaining sludge is transported offsite every year to an appropriate disposal facility.

E. Construction Methods and Schedule

Construction Methods

The well would be drilled by a contractor licensed in the State of California, utilizing the reverse-circulation hydraulic rotary drilling method. Prior to well drilling, Underground Services Alert (USA) would be contacted to indentify the location of any existing utilities, which would be avoided. Equipment used for well construction would include a rotary drill rig with drilling fluid/mud system, temporary water storage tank, well development rig, two support trucks, and a forklift.

During borehole excavation, drill fluid (typically consisting of a water and bentonite clay slurry) and cuttings (consisting of native clay, silt, sand, and gravel) would be contained. A staging area would be located on the Proposed Project site to store drill-fluid containment, drill-cuttings containment, construction equipment and materials. The drill cuttings would ultimately be disposed of offsite, in accordance with state laws, at an appropriate disposal facility. Drilling fluids would be removed after construction using a qualified truck service and disposed of at a facility licensed to handle non-toxic and non-hazardous liquid waste. Water generated during well development and aquifer testing will be discharged in the storm drain and monitored as required by the National Pollution Discharge Elimination System (NPDES) permit.

After the well installation the well pump and chemical building would be constructed, the filter tanks, the backwash tank, and the sand separator would be installed and connections would be made to the potable water, sanitary sewer, and stormwater drainage lines.

Schedule

Well installation construction is anticipated to take place over a two month period in late summer 2011. The two month construction period begins with site preparation and continues with well drilling, development and pump testing through to final site clean-up. During this construction period, there will be intermittent periods of 24-hour construction activity associated with the well drilling, development and pump testing. This is due to the need to proceed continuously until well casings can be sunk to avoid the risk of the walls collapsing.

Construction of wellhead treatment, as well as site improvement work, is expected to occur from over a three month period in late spring/early summer 2012. The Proposed Project is expected to become operational in fall 2012.

F. Operation and Maintenance

Routine maintenance would consist of a daily visit by a City staff person in a small truck to check on the facility operations.

In the event of a power failure, emergency power would be provided by a diesel generator that will otherwise be stored and maintained at an off-site location.

G. Environmental Measures

Environmental measures are methods, measures, or practices that avoid, reduce, or minimize a project's adverse effects on various environmental resources. They can be applied before, during, or after construction of the project to reduce or eliminate potential environmental effects. The following standard environmental measures would be implemented as part of the Proposed Project. They are drawn from city and county ordinances, and other applicable regulations and agency practices. The City would ensure that these measures are included in the project construction specifications, as appropriate.

1) **Measures to Minimize Effects of Construction-related Noise.** The following noise control measures will be included in the construction contract specifications to reduce and control noise generated from construction-related activities. The City will monitor successful compliance with the County noise ordinance.

   a) Except under special circumstances approved by the City, the normal working day for construction activities will be between the hours of 7:00 a.m. and 6:00 p.m. on weekdays and Saturday. No construction will occur on Sundays or legal holidays, or at night without prior written approval from the City and Santa Cruz County Planning Department. However, during the well drilling, development and testing, work will be 24 hours a day.

   b) Construction equipment will have appropriate mufflers, intake silencers, and noise control features, and will be properly maintained and equipped with exhaust mufflers that meet state standards.

   c) Vehicles and other gas- or diesel-powered equipment will be prohibited from unnecessary warming up, idling, and engine revving.

   d) Residents within 100 feet of construction activities will be notified by the City in writing (i.e., letter or flier) at least 1 week prior to construction activities. The notice should include construction hours, duration, and name and telephone number or e-mail address of the staff member the public should contact with noise complaints.

   e) A sign will be posted at all active construction sites, giving the name and telephone number or e-mail address of the staff member the public should contact with noise complaints. The sign is required to be at least 1,296 square inches (1 square yard) in size. All noise complaints will be recorded and submitted to the Santa Cruz County Planning Department as part of the annual report process. If necessary due to complaints, the construction contractor will provide additional noise attenuating measures such as sound blankets, additional mufflers, or engine shrouding.

   f) Although impact tools are not planned for breaking pavement, impact tools will be hydraulically or electrically powered, if used, to avoid noise associated with compressed air exhaust from pneumatically powered tools. If within 50 feet of a residence, they also will be shrouded and shielded.

2) **Measures to Control and Minimize Effects of Construction Traffic**. The following traffic control measures were developed in coordination with a county permit engineer and will be incorporated into the construction specifications.

   a) Provide through access for emergency vehicles at all times.

   b) Maintain access for driveways and private roads.

   c) Provide adequate off-street parking or use designated public parking areas for construction-related vehicles not in use through the construction period.

d) Maintain pedestrian and bicycle access and circulation during project construction, including the primary pedestrian and bicycle pathways. If construction encroaches upon sidewalk, a safe detour will be provided for pedestrians at the nearest painted cross walk. If construction encroaches on a bike lane, warning signs will be posted that indicate bicycles and vehicles are sharing the roadway.

e) Traffic controls on arterials and collectors should include flag persons wearing bright orange or red vests and using the "Stop/Slow" paddle to warn motorists of construction activity.

f) Maintain access to public transit and ensure that movement of public transit vehicles is not impeded as a result of construction activities.

g) Post standard construction warning signs in advance of the construction area and at any intersection that provides access to the construction area.

h) If there are lane closures, notify the Santa Cruz County Fire Department and Sheriff's Department of construction locations and ensure that alternative evacuation and emergency routes and designed to maintain response times during construction periods, if necessary.

i) Provide written notification to appropriate contractors regarding appropriate routes to and from construction sites and weight and speed limits for local roads used to access construction sites. Submit a copy of all such written notifications to the Santa Cruz County Planning Department.

j) Post a sign at all active construction sites, giving the name and telephone number or e-mail address of the City staff member the public should contact with complaints regarding construction traffic. The sign is required to be at least 1,296 square inches (1 square yard) in size. All construction traffic complaints will be recorded and forwarded to the Santa Cruz County Planning Department as part of the annual report process.

k) Repair or restore the road right-of-way to its original condition upon completion of the work for which an encroachment permit was issued.

3) **Measures to Protect Trees.**

a) No trees will be removed.

b) All trees with a diameter greater than 12 inches will be protected from disturbance during construction by installing a temporary fence around the tree's dripline, as required by the Santa Cruz County Planning Department.

c) There will be no stockpiling or staging beneath tree canopies.

d) If determined necessary by the City to remove pavement beneath tree canopies, a certified arborist will be present to direct any permitted root pruning. This is not anticipated.

4) **Measures to Protect Previously Unknown Cultural Resources and Human Remains.** If buried cultural resources are identified during ground disturbing activities, work will stop in that area and within 100 feet of the discovery site until a qualified archaeologist can assess the significance of the find. Cultural resources may include chipped stone or ground stone, historic debris, building foundations, or human bone. As necessary, appropriate measures will be developed in consultation with the Santa Cruz County Planning Department and Archaeologist, State Office of Historic Preservation, and other appropriate agencies.

If human skeletal remains are encountered, the County Coroner will be contacted immediately, as required by County Ordinance No. B6-18. If the County Coroner determines that the remains are Native American, the Coroner will contact the Native American Heritage Commission (pursuant to Section 7050.5c of the California Health and Safety Code) and the County Coordinator of Indian Affairs.

If any human remains are discovered in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until: 1) the County coroner has been informed and has determined that no investigation of the cause of death is required; and 2) if the remains are of Native American origin, the descendants from the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of with appropriate dignity the human remains and any associated grave goods, as provided in Public Resources Code Section 5097.98; or the Native American Heritage Commission was unable to identify a descendent or the descendent failed to make a recommendation with 24 hours after being notified by the Commission.

5) **Measures to Protect Water Quality.** To minimize the mobilization of sediment to adjacent water bodies, the following erosion and sediment control measures will be included in the construction specifications, based on the Santa Cruz County Ordinance (Chapter 16.22 Erosion Control) and standard dust reduction measures. Only minor grading of the project site for storm drain improvements would occur.

   a) Water all active construction areas where soil is exposed at least twice daily, and more often if needed, to control dust generation during earthmoving activities.

   b) Cover all trucks hauling drill cuttings and other loose materials, or require all trucks to maintain at least 2 feet of freeboard.

   c) Sweep all paved roads, parking areas, and staging areas at construction sites daily or more often, as needed to control dust.

   d) Cover or apply nontoxic soil stabilizers to inactive construction area (previously graded area inactive for 10 days or more) that could contribute sediment to waterways.

   e) Enclose and cover exposed stockpiles of dirt or other loose, granular construction materials that could contribute sediment to waterways.

   f) Limit traffic speeds on unpaved roads to 5 mph.

   g) Contain soil and filter runoff from disturbed areas by berms, vegetated filters, silt fencing, straw wattle, plastic sheeting, catch basins, or other means necessary to prevent the escape of sediment from the disturbed area.

   h) No earth or organic material shall be deposited or placed where it may be directly carried into a stream, marsh, slough, lagoon, or body of standing water.

   i) No insecticides, pesticides, or herbicides will be used.

   j) Prohibit the following types of materials from being rinsed or washed into the streets, shoulder areas, or gutters: concrete; solvents and adhesives; thinners; paints; fuels; sawdust; dirt; gasoline; asphalt and concrete saw slurry; chlorinated water. (None of these materials are anticipated.)

H. Permits Required

It is anticipated that permits will be required from the following agencies:

- Santa Cruz City Council – adoption of CEQA document and project approval
- Santa Cruz County Public Works Department – encroachment permit
- Santa Cruz County Environmental Health Services – well installation permit
- California Department of Public Health (DPH) – permit to treat the groundwater and distribute it in the municipal system
- Santa Cruz County Sanitation District – approval to discharge backwash water into sanitary sewer system
- Regional Water Quality Control Board (Central Coast) – National Pollutant Discharge Elimination System (NPDES) Permit for Discharges with Low Threat to Water Quality

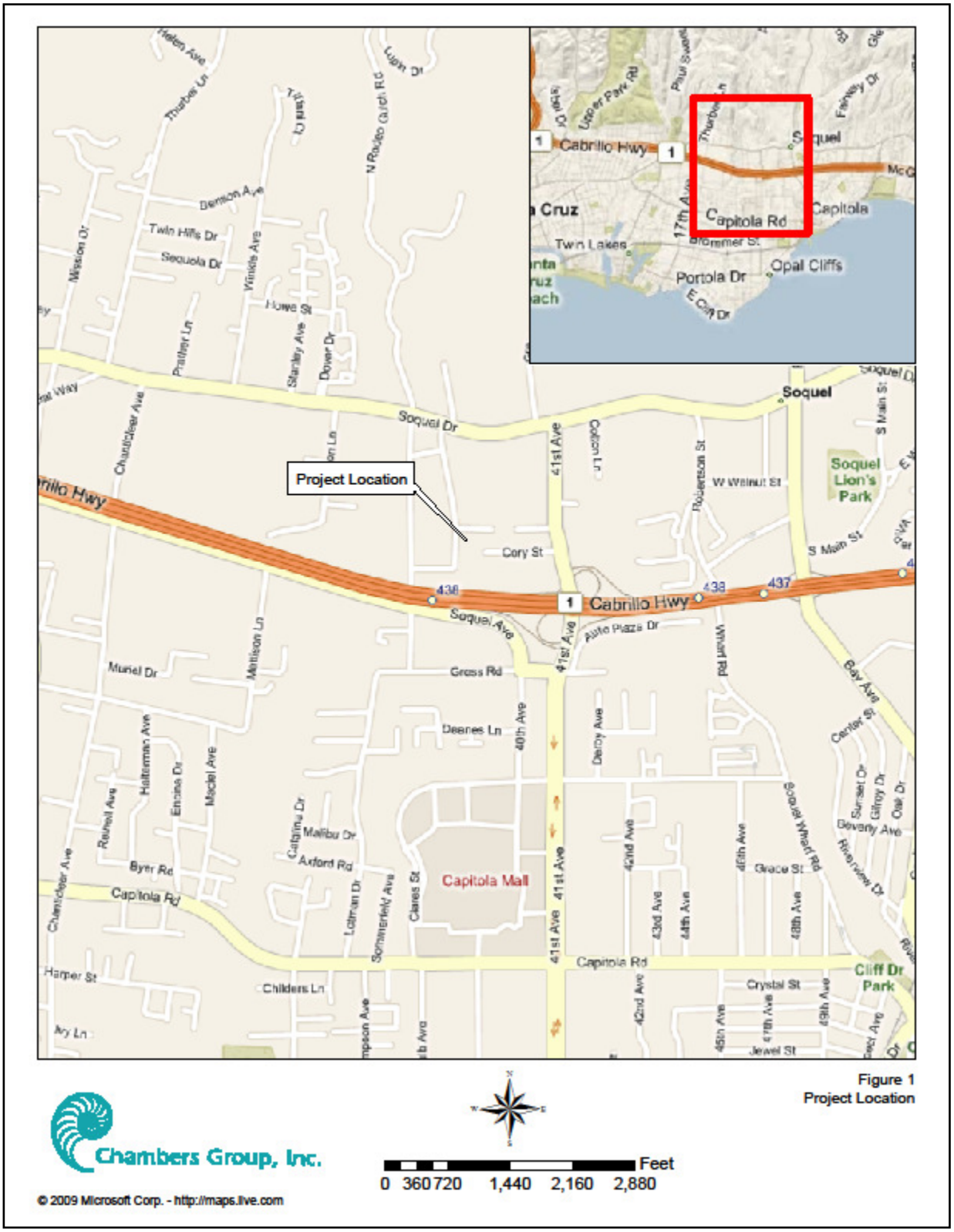

Figure 1. Project Location

Figure 2. Proposed Project Site

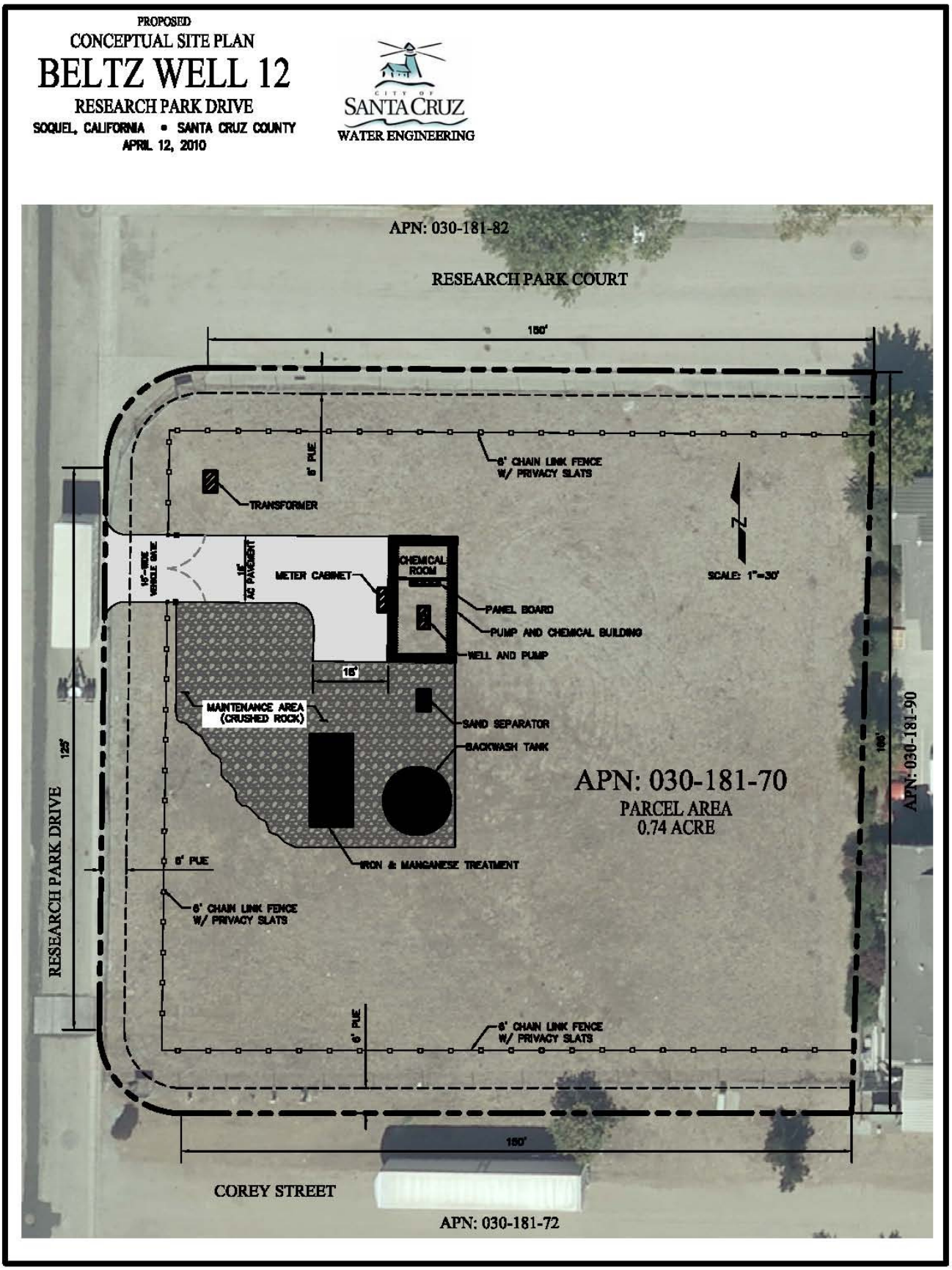

Figure 3. Conceptual Site Plan

IV. ENVIRONMENTAL CHECKLIST

Environmental Factors Potentially Affected: The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☒ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation / Traffic
☐ Utilities / Service Systems	☒ Mandatory Finding of Significance	

Instructions:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).
5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
   a) Earlier Analysis Used. Identify and state where they are available for review.
   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8) The explanation of each issue should identify:
   a) the significance criteria or threshold, if any, used to evaluate each question; and
   b) the mitigation measure identified, if any, to reduce the impact to less than significance

*Note: Instructions may be omitted from final document.

ENVIRONMENTAL EFFECTS	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
1. AESTHETICS.				
Would the project:				
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒

ENVIRONMENTAL EFFECTS	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?	☐	☐	☐	☒
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Discussion

(a-b) Effects on Vistas, Scenic Resources. Scenic views in the County of Santa Cruz, as well as the City, are either situated near the coast or toward the Santa Cruz Mountains. The southern portion of the Proposed Project site is located within a designated scenic corridor (County of Santa Cruz GIS). However, views of the and from the Proposed Project site are limited to the immediate surrounding commercial and light industrial land uses. These are made up of one and two story industrial and commercial buildings and urban landscaping. In addition, the Proposed Project site is flat, vacant, and is not developed or landscaped. Therefore, the installation of Beltz Well No. 12 would not impact the scenic views in the area. No further study of this issue is required.

The Proposed Project is not located near or within a state scenic highway. There are no officially designated state scenic highways in the County of Santa Cruz; however, State Highway 1 (CA-1) and State Highway 17 (CA-17) are eligible state scenic highways (California Department of Transportation, 2010). CA-1 is located approximately 0.1 mile south of the Proposed Project site. CA-17 is located approximately 2.9 miles to the east of the site. The Proposed Project site is not visible from either of these highways due to intervening structures. Therefore, the installation of Beltz Well No. 12 would not have an impact on either eligible state scenic highway. In addition, there are no scenic resources on the Proposed Project site, including trees, rock outcroppings, or historic buildings, and therefore would not result in an impact to scenic resources. No further study of this issue is required.

(c-d) Degradation of Surrounding Visual Character. The Proposed Project involves the installation of a well on a flat, vacant, and undeveloped parcel in a commercial zone. Construction impacts would be temporary and are not anticipated to change the character of the area substantially and would therefore be less than significant. The installation of Beltz Well No. 12 would result in a change in the existing visual character of the site from a vacant, undeveloped parcel to a parcel developed with water production facilities. These facilities would not be inconsistent with the surrounding commercial and light industrial development. In addition, there are no existing scenic resources on the Proposed Project site. Therefore, the Proposed Project would result in a less than significant impact to the existing visual character or quality of the site and its surroundings. No further study of this issue is required.

Existing lighting in the surrounding area currently consists of street lights, building outdoor and security lighting. The Proposed Project would add security lighting, similar to that of existing surrounding properties. Nighttime lighting will be limited to low-wattage outdoor security lighting. All lighting will be shielded and directed onto the Proposed Project site. New lighting impacts would be less than significant. No further study of this issue is required.

Further Study Required: Further evaluation of the potential aesthetics impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
2. AGRICULTURE AND FOREST RESOURCES				
Would the project: *(In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland.)*				
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d. Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Discussion

(a) The Proposed Project would not convert Prime Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency. The proposed site is not within any of the mapped farmland units designated by the California Resources Agency (California Division of Land Resource Protection, 2006). Aerial photographs show that the Proposed Project site has been vacant for at least the past 33 years (Atlas Engineering Services, Inc.). No impact would occur and no further study of this issue is required.

(b) The Proposed Project site is zoned for light industrial use, thus it would not conflict with existing zoning for agricultural use or a Williamson Act contract (County of Santa Cruz GIS). No impact would occur.

(c-e) The Proposed Project would involve the installation of a well on an undeveloped parcel within an urban area; and would not conflict with zoning for forest land or timberland, or convert forestland to non-forest use. Aerial photographs show that the Proposed Project site has been vacant for at least the past 33 years (Atlas Engineering Services, Inc.). No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential agricultural and forest resources impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
3. AIR QUALITY Would the project: (*Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations.)*				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c. Result in a cumulatively considerable net increase any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e. Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

The proposed project is located within the North Central Coast Air Basin (NCCAB), which is comprised of a single air district, the Monterey Bay Unified Air Pollution Control District (MBUAPCD). The MBUAPCD consists of Santa Cruz, San Benito, and Monterey Counties. As shown below, Santa Cruz County is currently in violation of the State 1-hour and 8-hour ozone standards and the State PM_{10} standard. Designations are made by pollutant according to the following categories:

Attainment – Air quality in the area meets the standard.
Nonattainment Transitional – Air quality is approaching the standard (State only).
Nonattainment – Air quality in the area fails to the applicable standard.
Unclassified – Insufficient data to designate area or designations have yet to be made.

Nonattainment designations are of most concern because they indicate that unhealthy levels of the pollutant exist in the area, which typically triggers a need to develop a plan to achieve the applicable standard. Current State and National designations for the NCCAB are shown below:

Table 1. Attainment Status for the North Central Coast Air Basin – 2010

Pollutant	State Standards	National Standards
Ozone (O_3)	**Nonattainment** [1)]	Attainment
Inhalable Particulates (PM_{10})	**Nonattainment**	Attainment
Fine Particulates ($PM_{2.5}$)	Attainment	Unclassified/Attainment
Carbon Monoxide (CO)	Monterey Co. - Attainment San Benito Co. - Unclassified Santa Cruz Co. - Unclassified	Attainment
Nitrogen Dioxide (NO_2)	Attainment	Attainment
Sulfur Dioxide (SO_2)	Attainment	Attainment
Lead	Attainment	Unclassified/Attainment

Notes: [1)] Nonattainment pollutants are highlighted in **Bold**.

MBUAPCD works directly with county transportation commissions and local governments cooperates actively with all federal and state agencies and is directly responsible for reducing emissions from stationary, mobile, and indirect sources. MBUAPCD has responded to this requirement by preparing a series of Clean Air Plans that provide emission reduction measures for each criteria pollutant that is currently or previously not in attainment. MBUAPCD's most recent Air Quality Attainment Plans (listed below), address feasible control measures to reach attainment status for ozone and PM.

2008 Air Quality Management Plan - Adopted August 2008. The District's AQMP for achieving the 2006 California ozone standard.

2007 Federal Maintenance Plan - Adopted May 2007. The District's plan for maintaining the 1997 federal ozone standard.

2005 Particulate Matter Plan - Adopted December 2005. The District's plan for particulate matter made in response to Senate Bill 656.

Discussion

(a, b) Consistency with Air Quality Plan, Violate an Air Quality Standard

The North Central Coast Air Basin does not meet State standards for ozone and PM_{IO}. Therefore, the regional pollutants of concern that would be emitted by the project are ozone precursors (Volatile Organic Compounds [VOCs] and nitrogen oxides [NOx]), and dust.

The project will emit small amounts of PM_{10}, VOCs and NOx during project construction and operation. In fact, project construction is expected to result in short-term, localized impacts to air quality due to generation of dust. However, standard dust control best management practices, such as periodic watering, will be implemented during construction to reduce these impacts to a less than significant level.

Project operational activities that may result in the emission of pollutants include daily vehicle trips for well maintenance and inspection; and operation of the proposed electrical pump and wellhead treatment. Emissions associated with theses activities would be negligible.

Neither construction nor operational activities associated with the proposed project are expected to result in air quality violations nor are they expected to contribute substantially to an existing air quality violation. The

proposed project therefore, would be consistent with existing MBUAPCD Air Quality Management Plans for Ozone and PM_{10} and no significant impact would occur.

(c) Cumulative Impacts

The proposed project air emissions would be negligible and would not result in any violations to existing air quality standards. The project therefore, would not contribute substantially to a cumulative air quality impact and no further study of this issue is required.

(d) Sensitive Receptors.

One of the primary reasons for air quality standards is the protection of those members of the population who are most sensitive to the adverse health effects of air pollution, termed "sensitive receptors". The term "sensitive receptors" refers to specific population groups as well as the land uses where they would reside for long periods. Sensitive receptors are land uses such as residences, schools, daycare centers, and medical recreational facilities that are more susceptible to the effects of air pollution than the population at large. The project site is surrounded by commercial and light industrial land uses. There are no nearby land uses that would be considered to be sensitive.

Short-term construction activities proposed by the project would result in diesel exhaust emissions from onsite heavy-duty equipment. Particulate exhaust emissions from diesel-fueled engines (diesel PM) were identified as a TAC by the California Air Resources Board (CARB) in 1998. The proposed construction activities will generate diesel PM emissions from the use of off-road diesel equipment required for site grading and earth movement, paving, and other construction activities.

Because the use of mobilized equipment would be temporary and there are no sensitive receptors located in close proximity to the project site, diesel PM from construction activities would not result in significant impacts. No further study of this issue is required.

(e) Odors.

Potential sources that may emit odors during construction activities include the application of materials such as asphalt pavement. The objectionable odors that may be produced during the construction process are short-term in nature and the odor emissions are expected to cease upon the drying or hardening of the odor producing materials. Due to the short-term nature and limited amounts of odor producing materials being utilized, and considering that there are no sensitive land uses and no outdoor use areas in general (with the exception of parking lots), no significant impact related to odors are anticipated during construction or operation of the proposed project. No further study of this issue is required.

Further Study Required: Further evaluation of the potential air quality impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
4. BIOLOGICAL RESOURCES				
Would the project:				
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
or U.S. Fish and Wildlife Service?				
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☒	☐	☐	☐
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐

Discussion

Biological resources include Habitats and Vegetative Communities, Migratory Corridors, Plants, Wildlife, Fisheries, Species Status Species (regulated by law, regulation or policy, such as threatened and endangered species), and waters of the United States. CEQA establishes State policy to prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures.

(a-f) Special Status Species and Sensitive Habitat Areas.

Construction

The Proposed Project site is a 0.74 acre vacant parcel devoid of substantial vegetation, surrounded by a chain link fence, and located in an urban area. The adjacent surrounding properties are developed with commercial and light industrial land uses and are landscaped with ornamental trees, shrubbery, and grasses.

Plant communities of Santa Cruz County that support threatened, endangered and California species of concern include: grasslands, coastal scrub, and coastal strand, coastal salt marsh, and freshwater marsh, riparian woodlands, redwood forests, closed cone coniferous forests, mixed evergreen forests, chaparral, foothill woodlands and oak/savanna grasslands. The Proposed Project site does not include and is not adjacent to any of these plant communities. No occurrences of candidate, sensitive, or special status wildlife or plant species have been recorded for the Proposed Project site (Chambers Group Inc. 2010, Appendix A). In addition, the Proposed Project site is not suitable for the listed species of concern that occur in Santa Cruz County (Chambers Group Inc. 2010). The Proposed Project site may provide limited habitat for common wildlife species that utilize urban landscaping and are tolerate of pedestrian and vehicle traffic, however, no significant impacts would be expected due to the small size of the area that would be developed and the abundance of surrounding urban habitat.

No riparian habitat, wetlands, migration corridors or wildlife nursery sites occur within or adjacent to the Proposed Project site. Rodeo Gulch Creek is located approximately 0.16 mile west of the Proposed Project site, and Soquel Creek is located approximately 0.48 mile to the east of the Proposed Project site. Construction activities would result in a minor amount of soil disturbance. If soil is not contained and is directly exposed to rain, soil erosion and sediment could flow off-site. This impact is considered less than significant because erosion and sediment control measures would be implemented as part of the project (see "Measures to Protect Water Quality" in Section G, Environmental Measures). Drilling fluids and well development fluids would be removed as necessary during construction using a qualified vacuum truck service and disposed of at a facility licensed to handle non-toxic and non-hazardous liquid waste. In addition, the Proposed Project site is separate from these creeks by urban development. There would be no discharge of sediment or well construction materials into Rodeo Gulch Creek or Soquel Creek, and therefore no significant impact would occur. No further study of this issue is required.

There are no trees located on the Proposed Project site. There are medium and large sized ornamental trees located on the properties surrounding the Proposed Project site. These trees may provide habitat for nesting birds. However, this vegetation is currently exposed to the noise associated with the existing truck and construction equipment activity from the surrounding industrial/commercial uses. Proposed Project related construction noise would be similar in nature and short term. During the operation of the Proposed Project, routine maintenance would consist of a daily visit by a City staff person in a small truck to check on the facility operations. In addition, the project includes several measures to minimize construction-related noise, and reduce dust, (see Section G, Environmental Measures). No significant impacts would be expected. No further study of this issue is required.

The County of Santa Cruz has an ordinance on Significant Tree Protection (County Code 16.34) that protects trees of significant size, age, or biological or cultural importance. There are no trees on the Proposed Project site and there would be no removal of trees associated with the Proposed Project. Additionally, the Proposed Project site is not located in a habitat conservation plan; natural community conservation plan; or any other local, regional, or state habitat conservation plan. No significant impact would occur and no further study of this issue is required.

Operations

Soquel Creek, which is located approximately 0.48 mile to the east of the Proposed Project site, supports a population of the federal threatened Evolutionarily Significant Unit (ESU) of south/central California Coast steelhead (*Oncorhynchus mykiss irideus*). In addition, Soquel Creek previously supported the federal and State endangered ESU of Central California Coast Coho salmon (*Oncorhynchus kisutch*). Soquel Creak has been designated as Critical Habitat for these species. Both the steelhead and the federal endangered tidewater goby (*Eucyclogobius newberryi*) also have been collected intermittently in Soquel Creek. Refer to Appendix A for further description of these biological resources.

City well production is limited to the summer/fall months (approximately April 15 to November 15), and, thus, would not be expected to affect winter and spring flows in Soquel Creek. Because potential drawdown

would occur during the summer and fall, operation of the Proposed Project would not be expected to affect the migration and spawning of steelhead because steelhead adults migrate upstream primarily from December through April and smolts migrate downstream primarily from March through May (Sogard et al 2009). However, the lower portions of Soquel Creek and especially Soquel Creek Lagoon provide important summer rearing habitat for juvenile steelhead (Alley and Associates 2003, 2004). The lagoon typically produces 10 to 35 percent of the smolt-sized juveniles in the mainstem of Soquel Creek each year (Alley and Associates 2004). Steelhead populations in Soquel Creek lagoon are threatened by inadequate stream inflow in summer during drought years (Alley and Associates 2004). A hydrogeological study calculating potential streamflow losses from Proposed Project is being prepared and this issue will be analyzed in the EIR.

Further Study Required: The EIR will include further study related to the potential for stream flow losses in Soquel Creek and Soquel Creek Lagoon from the Proposed Project.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
5. CULTURAL RESOURCES				
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☒	☐
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☒	☐
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐
d. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

Discussion

(a-c) The Northwest Information Center (NWIC), Sonoma State University, Rohnert Park, California has conducted a cultural resources records search (NWIC File No. 09-1232) for the subject property in Santa Cruz, California (Appendix B). The purpose of this review was to examine any existing cultural resources survey reports, archaeological site records, and historic maps to determine whether previously documented prehistoric or historic archaeological sites, architectural resources, cultural landscapes, or ethnic resources exist within or adjacent to the project area. The record search/literature review was also conducted to determine whether any historic properties listed on or determined eligible for listing on the National Register of Historic Places (NRHP) or California Register of Historical Resources (CRHR) exist within the project area.

There have been 26 cultural studies conducted within a ½ mile radius of the subject property. These consisted primarily of block surveys for parcels of various sizes. As a result of these studies, four archaeological sites have been recorded within a ½ mile radius of the subject property. Two of these sites are multi-component sites with prehistoric remains and historic residential remains. The remaining two are historic residential archaeological sites.

NWIC provided a list of addresses for known historic properties within a ½ mile radius of the subject property. A review of the streets, particularly Cory Street, indicated no historic structures are listed in the vicinity of the Proposed Project site. No properties listed as a California Landmark are within a ½ mile radius of the Proposed Project site.

No archaeological resources were identified during the records search for this project. However, there is a low potential to encounter cultural resources materials during ground-disturbing construction activities. A less than significant impact would occur because the Proposed Project includes minimization measures requiring that, in the event a cultural resource (i.e., historic or prehistoric artifact, fossilized shell, or bone) is discovered during ground-disturbing activities, all work be stopped within 100 feet and County planning staff and archaeologist be contacted to determine appropriate action (see Measure to Project Previously Unknown Cultural Resources and Human Remains" in Section G, Environmental Measures). No further study of this issue is required.

Fossils are paleontological resources that may exist in sedimentary and cool volcanic flow rocks and are considered to be a non-renewable resource by the Society of Vertebrate Paleontology. The Proposed Project site does not fall within an area sensitive for paleontological resources or fossils. With the implementation of the previously described minimization measure, a less than significant impact would occur in the event that a paleontological resource is discovered during ground-disturbing activities. No further study of this issue is required.

(d) The Proposed Project site does not contain any known human remains and there are no known cemeteries within the Project area. With the implementation of the previously described minimization measure, a less than significant impact would occur in the event that human remains are discovered during ground-disturbing activities. No further study of this issue is required.

Further Study Required: Further evaluation of the potential cultural resources impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
6. GEOLOGY AND SOILS				
Would the project:				
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on, or off, site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Discussion

(a, c, d) Seismic and Geologic Hazards. Northern California is a seismically active region that is prone to earthquakes. The Proposed Project site is located near the Coastal Range Geologic Province, and in the vicinity of active earthquake faults. The site is located near, but not within, designated Alquist Priolo Earthquake Fault Zones, Loma Prieta and Laurel. The Vergeles Fault and the San Andreas Fault are located to the northeast of the Proposed Project site. Therefore, the site is located in an area that may be subject to strong seismic ground shaking. However, the site is located approximately 52 miles away from the nearest County designated fault zone. The Proposed Project site has a low potential for seismic related ground failure, liquefaction, and landslides (County of Santa Cruz, 2002). Additionally, the Proposed Project would be designed in accordance with the California Building Code (CBC) for the peak site ground acceleration. Since the design and construction of the project would conform to the specific mandated structural design requirements to protect against strong seismic shaking, the potential impacts due to strong seismic shaking are less than significant. No further study of this issue is required.

(b, e) Soils and Erosion. The Proposed Project would not result in substantial soil erosion or the loss of topsoil. Although short-term impacts would normally occur during trenching and other construction work, the area involved is less than one acre. Construction activities would result in a minor amount of soil disturbance. If soil is not contained and is directly exposed to rain, soil erosion and sediment could flow off-site. This impact is considered less than significant because erosion and sediment control measures would be implemented as part of the project (see "Measures to Protect Water Quality" in Section G, Environmental Measures). No further study of this issue is required.

The Proposed Project would not result in new or increased demand for the use of septic tanks or alternative wastewater disposal systems. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential geology impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
7. GREENHOUSE GAS EMISSIONS				
Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Discussion:

Setting

No air district or other regulatory agency in California has identified a significance threshold for Greenhouse Gas (GHG) Emissions generated by a Proposed Project, or a methodology for analyzing impacts related to GHG emissions or global climate change. By adoption of AB 32 and SB 97; however, the State of California has established GHG reduction targets and has determined that GHG emissions as they relate to global climate change are a source of adverse environmental impacts in California. AB 32, California Climate Solutions Act of 2006 (See Statutes 2006, Chapter 488, enacting Health & Safety Code, Sections 38500–38599), establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions.

AB 32 includes language identifying the various environmental problems in California caused by global warming (Health & Safety Code, Section 38501[a]). SB 97 acknowledges that climate change is a prominent environmental issue that requires analysis under CEQA and the Governor's Office of Planning and Research to prepare State CEQA Guidelines revisions addressing the mitigation of GHGs or their consequences (Statutes 2007, Chapter 185 enacting Public Resources Code Sections 21083.05 and 21097). While the text of AB 32 focuses on major stationary and area sources of GHG emissions, the primary objective of AB 32 is to reduce California's contribution to global climate change by reducing California's total annual production of GHG emissions. To meet GHG emission targets of AB 32, California would need to generate less GHG emissions than current levels.

The proper context for addressing the issue in a CEQA document is the discussion of cumulative impacts, since the emissions of one single project would not cause global climate change, but GHG emissions from multiple projects throughout the world could result in a cumulative impact concerning global climate change. It is recognized, however, that for most projects no simple metric is available to determine if a single project would substantially increase or decrease overall GHG emission levels or conflict with the goals of AB 32.

The impact that GHG emissions have on global climate change does not depend on whether the emissions were generated by stationary, mobile, or area sources, or whether they were generated in one region or another. Thus, consistency with the state's requirements for GHG emissions reductions is the best metric for determining whether the proposed project would contribute to global warming. In the case of the proposed project, if the project substantially impairs the state's ability to conform with the mandate to reduce GHG emissions to 1990 levels by the year 2020, then the impact of the project would be cumulatively considerable (i.e., significant).

Impacts

(a) GHG emissions generated during construction and operation of the proposed project would predominantly be in the form of CO_2. In comparison to criteria air pollutants, such as ozone and PM_{10}, CO_2, and other GHG emissions persist in the atmosphere for a much longer period of time. GHG sources associated with construction activities of the project would include the operation of off-road construction equipment, worker vehicle trips, and trips by haul trucks bringing materials to the sites. While GHG emissions generated by these construction activities may be considered new, they would be temporary in nature and would not be considered substantial given the project's small size.

New long-term operational-GHG emissions associated with the proposed project would be generated by daily vehicle trips during operation of Beltz Well No. 12. As stated previously, operation of the proposed project will not result in pollutant levels that exceed criteria pollutant standards, nor will the project contribute substantially to cumulative air quality impacts. GHG emissions associated with project operations would be less than significant. No further study of this issue is required.

(b) There have been significant legislative and regulatory activities that directly and indirectly affect climate change and GHGs in California. The primary climate change legislation in California is AB 32, the California Global Warming Solutions Act of 2006. AB 32 focuses on reducing GHG emissions in California and AB 32 requires that GHGs emitted in California be reduced to 1990 levels by the year 2020.

The CARB is the state agency charged with monitoring and regulating sources of emissions of GHGs in California that contribute global warming in order to reduce emissions of GHGs. The CARB Governing Board approved the 1990 GHG emissions level of 427 million metric tons of CO_2 equivalent ($MMTCO_2e$) on December 6, 2007. Therefore, in 2020, annual emissions in California are required to be at or below 427 $MMTCO_2e$. The CARB Board approved the Climate Change Scoping Plan (Scoping Plan) in December 2008. The Scoping Plan "proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health" (CARB 2008). The measures in the Scoping Plan will be developed over the next two years through rule development at the CARB and other agencies and are expected to be in place by 2012.

As stated previously, project generated construction and operational GHG emissions would be marginal and therefore, the project would not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases. No further study of this issue is required.

Further Study Required: Further evaluation of the potential GHG impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
8. HAZARDS AND HAZARDOUS MATERIALS				
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
into the environment?				
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h. Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☒	☐

Discussion

(a) Material that is transported, stored, or disposed of during project construction and operation has the potential to contain hazardous materials and could present a hazard to construction workers, the public, or the environment if improperly managed. Vehicles and equipment used for construction would contain or require the temporary, short-term use of potentially hazardous substances, such as fuels, lubricating oils, and hydraulic fluid. Additionally, chemicals proposed to be onsite include sodium hypochlorite, used as a disinfectant for the finished water and pre-treatment in the iron and manganese treatment system, and possibly potassium permanganate, which may be used for pre-treatment in the iron and manganese treatment system. The City would ensure compliance with all environmental regulations managed by the Santa Cruz County Environmental Health Services Department and the Central Fire Protection District Of Santa Cruz County. The City would ensure compliance with any applicable rules and regulations, including the State of California CCR Title 23 Health and Safety Regulations, as managed by the Santa Cruz County Environmental Health

Services Department and the Central Fire Protection District Of Santa Cruz County. No significant impacts would occur and therefore, no further study of this issue is required.

(b) No significant risk of accidental upset or the release of hazardous substances is anticipated. The City will ensure compliance with applicable rules and regulations to reduce potential impacts relative to hazardous materials to less than significant levels. No further study of this issue is required.

(c) The nearest school to the Proposed Project site is Kinder Cottage, a privately owned child care center, and it is located approximately 0.25 mile south of the Proposed Project site, on the opposite side of CA-1. Other schools in the area include Good Shepherd Catholic located approximately 0.36 mile to the west, The Bay School located approximately 0.49 mile to the west, Soquel High School located approximately 0.56 mile to the east, and Soquel Elementary School located approximately 0.65 mile to the east. The Proposed Project is not anticipated to result in a release of hazardous emissions, hazardous or acutely hazardous material, or substances in the vicinity of sensitive receptors due to implementation of standard operational procedures and protocols, as well as BMPs. No significant impacts are expected and no further study of this issue is required.

(d) A Phase I Environmental Assessment was conducted for the Proposed Project (Atlas, Appendix C). This included a review of federal and state standard and supplemental databases to identify hazardous material sites pursuant to Government Code Section 65962.5 within one mile of the Proposed Project site; as well as review of local records, such as Santa Cruz County Environmental Health Services Hazardous Materials Files. A government records and public documents search conducted by Environmental Data Resources, Inc. (EDR), an environmental database service, did not identify the site as being on any environmental lists. The search identified 23 properties within one mile of the site listed on at least one of the databases searched (discounting redundant listings). The databases searched included, but was not limited to: the Federal National Priority List, the Federal CERCLIS (Comprehensive Environmental Response Compensation, and Liability Information System) list, Federal institutional controls / engineering controls registries, State and tribal landfill and/or solid waste disposal site lists, State and tribal leaking storage tank lists, State and tribal registered storage tank lists, and local lists of hazardous waste / contaminated sites.

The State Water Resources Control Board Geotracker (Geotracker) is an internet based database of leaking underground storage tank cleanup sites, other cleanup sites (e.g. solvents or metals), land disposal sites, military cleanup sites, and permitted underground storage tank sites. A search of the Geotracker database listed 27 sites, 20 closed and 7 active, within 1,000 feet of the Proposed Project site. The Proposed Project site was not listed.

Of the sites identified through the environmental database search and the Geotracker search, the Phase I Environmental Assessment determined that only one site, a Leaking Underground Fuel Tank (LUFT) site at 2178 41st Avenue, had the potential to impact the Proposed Project's water supply.

The LUFT site at 2178 41st Avenue may pose a risk to the quality of water pumped from a water supply well constructed on the Proposed Project site. A site inspection and environmental assessment field checklist were completed by Atlas on July 1, 2009. Upon inspection of the site, it was noted that there was no evidence to suggest that the site has a potentially significant environmental condition. Based on the recommendation in the Phase I report, a capture zone analysis was conducted to determine the likelihood of petroleum hydrocarbons from the LUFT site entering the well during production (Appendix D). The analysis calculated the capture zone for pumping Beltz Well No. 12 at the maximum production rate of 800 GPM to determine if the LUST site is within the capture zone. Based on the analysis, it was determined that the LUFT site located at 2178 41st Avenue does not pose a potentially significant environmental condition that could impact the use of the site for a drinking water well for the following reasons:

- The LUFT site is outside of the Proposed Project's capture zone. Groundwater outside of the well site capture zone would not drain into the proposed well.
- The contamination is much shallower than the depth of the proposed well perforations.
- The groundwater at the LUFT site flows away from the Proposed Project site.

No significant impacts would occur and therefore, no further study of this issue is required.

(e) The Proposed Project site is located approximately 10.4 miles northwest of the Watsonville Municipal Airport and would not result in a safety hazard for people working in the project area. Therefore, no impacts related to public airports would occur. No further study of this issue is required.

(f) The nearest private airstrip is in the unincorporated community of Bonny Doon, approximately 10.6 miles northwest of the Proposed Project site. No impact would occur and no further study of this issue is required.

(g) The Proposed Project would not interfere with emergency response plans or operations near the Proposed Project site. Very limited construction in Research Park Drive, in order to make connections to existing pipelines (water, sanitary sewer, stormdrain) would result in a less than significant impacts to emergency vehicle operations because the City would implement a traffic control plan (see "Measures to Control and Minimize Effects of Construction Traffic" in Section G, Environmental Measures). No further study of this issue is required.

(h) The Proposed Project site is not located in an area of the County that is subject to the risk of wildland fire (County of Santa Cruz 2002). All construction and operation activities would be conducted in compliance with standard safety protocols, which would minimize the potential release of flammable materials (including fuel, lubricants, paint, and solvents). No significant impacts are expected and no further study of this issue is required.

Further Study Required: Further evaluation of the potential hazards and hazardous materials impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
9. HYDROLOGY AND WATER QUALITY				
Would the project:				
a. Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☒	☐	☐	☐
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐
d. Substantially alter the existing drainage	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off- site?				
e. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f. Otherwise substantially degrade water quality?	☐	☐	☒	☐
g. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h. Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j. Inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

Discussion

(a, e, f) Water Quality.

Construction.

Construction activities would result in a minor amount of soil disturbance. If soil is not contained and is directly exposed to rain, soil erosion and sediment could flow into the storm drain system, resulting in the potential degradation of water quality. This impact is considered less than significant because erosion and sediment control measures would be implemented as part of the project (see "Measures to Protect Water Quality" in Section G, Environmental Measures).

Well hole excavation would generate drill cuttings, drilling fluids and mud. These materials will not be discharged in the storm drain system, but would be hauled offsite for disposal. A staging area would be located on the Proposed Project site to contain drill cuttings, and drilling fluids and mud, and store construction equipment and materials. Drill cuttings and mud would ultimately be disposed of offsite, in accordance with state laws, at an appropriate disposal facility. Drilling fluids would be removed, as necessary, during construction using a qualified truck service and disposed of at a facility licensed to handle non-toxic and non-hazardous liquid waste.

Water generated during well development and aquifer testing will be discharged into the storm drain in Research Park Drive and conveyed to Rodeo Gulch Creek. During well development a rubber packer assembly is hoisted up and down to swab the gravel envelope to remove sand, silt, and mud from the screened sections of the well. Typically this produces turbid water at a rate of approximately 100 to 200 GPM for up to 30 hours. Well development also requires pumping flows that are gradually increased to the maximum pumping rate of the well (approximately 1,000 GPM), which is anticipated to take approximately 40 hours. Each time the pumping rate is increased, turbid water is produced. Aquifer testing will include a 10 hour step draw-down test with discharge rates increasing up to approximately 1,000 GPM, followed by a 24 hour constant rate pumping test with a discharge rate of approximately 700 GPM. Water discharged from aquifer testing is not anticipated to be turbid.

Construction discharges into the storm drain system containing excessive levels of turbidity could degrade the quality of Rodeo Gulch Creek. Prior to construction of the Proposed Project the City will acquire a NPDES General Permit for Discharges with Low Threat to Water Quality from the Central Coast Regional Water Quality Control Board (CCRWQCB). As part of the permitting process, the City will design and implement a plan to treat water extracted for well development and aquifer testing prior to discharge into the storm drain system. Treatment of water shall occur as required to reduce turbidity to levels that protect the beneficial uses of Rodeo Gulch Creek, as outlined in the CCRWQCB Basin Plan. Monitoring/sampling of extracted water will occur prior to discharge, as needed to ensure turbidity level objectives are met. If turbidity cannot be reduced to levels that protect beneficial uses of receiving waters then extracted water will be hauled offsite disposed of at a facility licensed to handle non-toxic and non-hazardous liquid waste, such as the Liquid Waste Receiving Facility at 110 California Street in the City of Santa Cruz. With the implementation of this plan, impacts involving construction discharges into the storm drain system would be less than significant. No further study of this issue is required.

Groundwater Quality

A monitoring well was constructed adjacent to the Proposed Project site in a public right of way on Cory Street (CS) and sampled to evaluate water quality prior to construction of the production well (Hopkins, 2010a, Appendix E). The CS monitoring well consisted of nested well designs that utilized 2-inch-diameter well casing and screen assemblies which ranged in depths from 110 to 350 feet bgs.

Tests results for Well CS No. 1 (deep) (AA Zone) indicate that the groundwater is of a sodium bicarbonate/sulfate chemical character and has a total dissolved solids (TDS) concentration of 670 milligrams per liter (mg/l). Results for Well CS No. 2 (middle) indicate that the groundwater is of a sodium sulfate character and has a TDS concentration of 520 mg/l. Laboratory results for Well CS No. 3 (shallow) indicate that the groundwater is of a sodium bicarbonate character and has a TDS concentration of 440 mg/l. Consistent with the quality of other groundwater locally produced from the Purisima Formation, these data indicate that the groundwater will need to be treated to reduce the concentration of iron and manganese prior to distribution for municipal use. The water quality results for Well CS No. 3 (shallow) showed positive results of low concentrations of organic analyses for benzene, chloroform, and total trihalomethanes. Upon re-testing, no organics were detected (MWH Laboratories, 2010, Appendix E). The initial positive results are expected to have resulted from residual of components from previous testing conducted by the well contractor or laboratory error (i.e., poor decontamination clean-up of equipment).

In summary, the Title 22 water quality test results obtained during this study indicate that the potential aquifer zone(s) available for production will be of suitable quality for use as a drinking water supply (Hopkins, 2010a). Available data indicates that the water may be of a slightly better quality than the groundwater produced from the City's current well facilities in the Live Oak area (Hopkins, 2004) and (Fugro, 1998). No significant impacts are expected. No further study of this issue is required.

Operation.

During operation, the iron and manganese removed through the treatment system is piped to the backwash tank. In this tank, the iron and manganese settles out from the groundwater. The backwash water will be piped to the County sanitary sewer line located immediately adjacent to the Proposed Project site in Research Park Drive and the remaining sludge will be transported and disposed of offsite, in accordance with state laws, at an appropriate disposal facility. The City will obtain the necessary approval from Santa Cruz County Sanitation to discharge groundwater into the sanitary sewer system. There would be no discharge of backwash materials into storm drains, and therefore, no significant impact would occur. No further study of this issue is required.

(b) Groundwater. Historically the City has operated the Live Oak well field at 1 MGD during normal years and up to 2 MGD (1,500 GPM) during drought years, however, the City currently has the production capacity to extract only 1,055 GPM from the Live Oak well field (SCWD, 2006). Development of new wells in the Live Oak well field to restore the historical production rate during a drought (1,500 GPM) would contribute to decreasing groundwater levels near the coast in the Purisima aquifer and would contribute to conditions conducive to seawater intrusion. A recent study of hydrogeologic conditions in the area completed by the City concluded that new production wells developed by the City should be shifted inland from the existing Live Oak well field in an effort to control groundwater levels and protect the Purisima aquifer from seawater intrusion (Hopkins, 2009).

The Proposed Project is located approximately 1.5 miles inland and northeast of the coastal Live Oak well field and within the Purisima aquifer of the Soquel-Aptos Groundwater Basin. The Proposed Project involves the installation of Beltz Well No. 12 in order to augment the existing supply and recover the lost capacity from the existing or destroyed wells. Beltz Well No. 12 will be installed to regain the City's historic groundwater production rates from the Purisima aquifer, which was impacted by the loss of Beltz Well No. 4. While Beltz Well No. 12 would produce up to 700 GPM, the City would limit aggregate production from this well and the existing wells in the Live Oak well field to the historic normal year extraction rate of 1 MGD. The Proposed Project would result in groundwater extraction consistent with the City's Integrated Water Plan (2005). Groundwater extracted from Beltz Well No.12 would be from the same zone of the Purisima aquifer as the existing Live Oak well field and Beltz Well No. 4. Monitoring of coastal groundwater levels will continue after development of Beltz Well No. 12.

A hydrogeological analysis is being prepared and this issue will be analyzed in the EIR.

(c, d) Drainage. The Proposed Project would be located on a currently undeveloped parcel, with much of the installation occurring underground. Only minor site grading would occur and only a small portion of the 0.74 acre site would be covered with impervious surfaces. This small increase in impervious surfaces would not result in a significant change in drainage patterns or the amount of surface runoff. No significant impact associated with drainage patterns, flooding on- or offsite, or stormwater drainage systems would occur. The Proposed Project would not otherwise degrade water quality. No significant impact would occur and no further study of this issue is required.

(g-h) Flood Hazards. The Proposed Project does not involve the construction of housing. Therefore, no housing would be constructed within a 100-year flood hazard area as a result of the Proposed Project. No impact would occur. The Proposed Project would not involve the construction of structures that would impede or redirect flood flows. No impact would occur and no further study of this issue is required.

(i-j) Dam Failure/Tsunami Inundation. The Proposed Project site is in an area with no potential for hazard of inundation from failure of local dams, seiche, or mudflow. No significant impact would occur.

Although the Proposed Project site is located in a coastal region, the area has little to no potential for being exposed to inundation by a tsunami. In addition the well will be capped and underground and any inundation

would have minimal impact on the well. No significant impact would occur and no further study of this issue is required.

Further Study Required: The EIR will include further study related to groundwater supplies or recharge.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
10. LAND USE AND PLANNING				
Would the project:				
a. Physically divide an established community?	☐	☐	☐	☒
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Discussion

(a) The Proposed Project involves the addition of a water well on a small undeveloped parcel. The surrounding area is developed with commercial and light industrial land uses. The Proposed Project would not physically divide an established community. No impact would occur and no further study of this issue is required.

(b) The Proposed Project site involves the addition of a water well and associated facilities to a currently undeveloped parcel and would be compatible with existing County of Santa Cruz Zoning and General Plan designations of (CS) Service Commercial and M-1 (Light Industry) under the Santa Cruz County general plan and zoning designations. The Proposed Project is considered consistent with these designations, as well as relevant policies in the County General Plan and Local Coastal Program (LCP) (Santa Cruz County 1994), including those listed below.

- Public facility uses are allowed in all urban residential land use designation and zoning districts, as well as limited public facility uses in commercial designations and districts (Policy 2.21.2).
- All new and rehabilitated wells shall be required to comply with state and local construction standards, as specified in the County well ordinance, to prevent contamination of groundwater supplies (5.8.6 LCP). Well construction involving multiple zone completions will be provided with intermediate bentonite and neat cement seals to separate the discrete monitoring depths. These measures will mitigate the potential for abandoned wells to become a source groundwater contamination and prevent water quality degradation.
- Water system improvement programs for storage, treatment, and distribution facilities shall be supported to meet necessary water supply and fire suppression requirements (7.18.4 LCP).

No impact would occur and no further study of this issue is required.

(c) The Proposed Project site is not located in a habitat conservation plan; natural community conservation plan; or any other local, regional, or state habitat conservation plan. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential land use impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
11. MINERAL RESOURCES				
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Discussion:

(a, b) The Proposed Project site is not identified as being within a significant resource zone in the County's General Plan. As such, the construction of the replacement water well on a currently undeveloped parcel would not interfere with mineral resource extraction. The Proposed Project would be limited to a small area under an acre in size and would not result in the loss of availability of a known or locally important resource. No mineral resource extraction would occur as part of the Proposed Project. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential mineral resources impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
12. NOISE				
Would the project result in:				
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b. Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?	☐	☐	☒	☐
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
above levels existing without the project?				
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion:

The project site is within an urban area and there are no adjacent land uses that are traditionally considered as "sensitive" to noise (schools, libraries, churches, hospitals, and residential uses). The County of Santa Cruz General Plan Noise Element does however, have noise thresholds and guidelines to protect commercial and office land uses which are adjacent to the proposed project site. These are presented in the Land Use Compatibility for Community Noise Environments table and the Maximum Allowable Noise Exposure for Stationary Sources table.

The County of Santa Cruz General Plan Noise Element Land Use Compatibility table recommends that the normally acceptable noise level range for the exterior of office and commercial buildings be 50-60 CNEL. CNEL (Community Noise Equivalent Level) is a weighted, 24-hour average noise descriptor. Exterior noise levels of up to 80 CNEL are considered acceptable with noise reduction measures considered.

Table 2. Land Use Compatibility for Community Noise Environments

	Normally Acceptable	Conditionally Acceptable	Unacceptable
Office Buildings, Business Commercial, and Professional	50-60 CNEL	60-80 CNEL	80+ CNEL

Source: Modified from County of Santa Cruz General Plan Noise Element

The County of Santa Cruz General Plan Noise Element also includes maximum allowable noise exposure standards for stationary noise sources (below). Maximum hourly noise exposure due to project noise is not to exceed 50 Leq (Equivalent Continuous Noise Level) during the daytime and not to exceed 45 Leq during the nighttime. Maximum noise events are not to exceed 70 dB during the daytime and not to exceed 65 dB during the night; and impulsive noise is not to exceed 65 dB during the daytime and not to exceed 60 dB during the nighttime.

Table 3. Maximum Allowable Noise Exposure, Stationary Noise Sources

Maximum Allowable Noise Exposure Stationary Noise Sources [1]		
	Daytime [2] (7 PM to 10 PM)	Nighttime (10 PM to 7 AM)
Hourly Leq-average hourly noise level, dB	50	45
Maximum Level, dB	70	65
Maximum Level dB - Impulsive Noise	65	60

dB = decibel

(1) As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.
(2) Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced 5 dB if the ambient hourly Leq is at least 10 dB lower than the allowable level.

Source: Modified from County of Santa Cruz General Plan Noise Element

Impacts

(a, c, d)

Construction Noise

Land Uses Compatibility. As shown in Table 6 below, construction of the proposed project will generate noise levels that will generally range between 74 and 90 dBA Leq at the property line. These noise levels would result in a temporary noise level increase above ambient noise levels and would also exceed Stationary Noise Standards presented in the County of Santa Cruz General Plan Noise Element and may also occasionally exceed 24-hour average noise level standards presented in the General Plan Land Use Compatibility Guidelines.

Table 4. Typical Construction Equipment Noise Levels

Typical Construction Equipment Noise Levels		
Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 ft.)	Suggested Maximum Sound Levels for Analysis (dBA at 50 ft.)
Rock Drills	83-99	96
Jack Hammers	75-85	82
Pneumatic Tools	78-88	85
Pumps	74-84	80
Dozers	77-90	85
Scrapers	83-91	87
Haul Trucks	83-94	88
Cranes	79-86	82
Portable Generators	71-87	80
Rollers	75-82	80
Tractors	77-82	80
Front-End Loaders	77-90	86

Typical Construction Equipment Noise Levels		
Type of Equipment	Range of Maximum Sound Levels Measured (dBA at 50 ft.)	Suggested Maximum Sound Levels for Analysis (dBA at 50 ft.)
Hydraulic Backhoe	81-90	86
Hydraulic Excavators	81-90	86
Graders	79-89	86
Air Compressors	76-89	86
Trucks	81-87	86

Construction activities would result in less than significant impacts to noise because the City would implement noise minimization measures (see "Measures to Control and Minimize Effects of Construction-related Noise" in Section G, Environmental Measures). No further study of this issue is required.

Operational Noise

Operation of the proposed project is not expected to exceed either the Land Use Compatibility Guidelines or the Stationary Noise Standards presented in the County of Santa Cruz General Plan Noise Element nor will it result in significant long term increases in ambient noise levels. Noise from the well itself is expected to be below ambient levels and the proposed pump and appurtenances are proposed to be within a block brick enclosure. This type of enclosure is expected to provide approximately 20 dB of noise reduction. No significant operational noise impacts are expected and no further study of this issue is required.

(b) Groundborne Vibration

Ground-borne vibration is an oscillatory motion that is often described by the average amplitude of its velocity in inches per second or more specifically, peak particle velocity. Ground-borne vibration is much less common than airborne noise; the ambient peak particle velocity of a residential area is commonly .0003 inches per second or less, well below the threshold of human perception of .0059 inches per second. Nonetheless, human reactions to vibration are highly subjective, and even levels below the threshold can cause minor annoyances like rattling of dishes, doors, or fixtures.

Table 7 shows the peak particle velocities of some common construction equipment. The most vibration-causing piece of equipment that may be used on-site is the vibratory roller. This machine can cause vibration strong enough to annoy people over 100 feet away. Still, ground vibration is attenuated by distance even faster than noise and the majority of construction will take place more than 100 feet away from sensitive receptors. The proposed project will not result in excessive groundborne vibration or noise. No significant impact would occur and no further study of this issue is required.

Table 5. Typical Construction Equipment Vibration Emissions

Typical Construction Equipment Vibration Emissions			
Equipment	Peak Particle Velocity in inches per second[2]		
	at 25 ft.	at 50 ft.	At 100 ft.
Clam Shovel Drop (slurry wall)	0.202	0.143	0.101
Vibratory Roller	0.210	0.0148	0.105
Hoe Ram	0.089	0.063	0.045
Large Bulldozer	0.089	0.063	0.045
Caisson Drilling	0.089	0.063	0.045
Loaded Trucks	0.076	0.054	0.038
Jackhammer	0.035	0.025	0.018
Small Bulldozer	0.003	0.002	0.002

(e-f) The project area is not located within two miles of a public airport. The project site is located 12 miles northwest of the Watsonville Municipal Airport. Therefore, the proposed project would not expose people residing or working in the surrounding area to excessive levels of airport-generated noise, and no impacts would occur. No further study of this issue is required.

Further Study Required: Further evaluation of the potential noise impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
13. POPULATION AND HOUSING				
Would the project:				
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion

(a) Population Growth. The Proposed Project does not provide housing. The Proposed Project involves installation of a well to support an existing potable water system but does not involve the expansion of the service. The Proposed Project will improve system reliability and flexibility by replacing Beltz Well No. 4. It will continue to serve the City of Santa Cruz, some unincorporated areas of Santa Cruz County, a small part

of the City of Capitola, and several agricultural customers along Highway 1 between the City limits and the town of Davenport. No impact would occur and no further study of this issue is required.

(b-c) Removal of Housing and/or Displacement of Residents. The installation of Beltz Well No. 12 is taking place on an undeveloped parcel in a commercially zoned area. The Proposed Project would not displace any existing housing units, necessitating the construction of replacement housing elsewhere. No impact would occur.

The Proposed Project involves a well installation to support an existing water system. The Proposed Project would not displace any people, necessitating the construction of replacement housing elsewhere. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential population and housing impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
14. PUBLIC SERVICES Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a. Fire protection?	☐	☐	☒	☐
b. Police protection?	☐	☐	☒	☐
c. Schools?	☐	☐	☒	☐
d. Parks?	☐	☐	☒	☐
e. Other public facilities?	☐	☐	☒	☐

Discussion

(a-e) The Proposed Project involves the installation of a well to support an existing water system. The project would not increase the demand for fire and police protection, schools, parks, or other public facilities. Further, the project would not induce growth requiring the extension of existing services or creation of new services.

Very limited construction in Research Park Drive, in order to make connections to existing pipelines (water, sanitary sewer, stormdrain) would result in a less than significant impacts to emergency vehicle operations because the City would implement a traffic control plan (see "Measures to Control and Minimize Effects of Construction Traffic" in Section G, Environmental Measures).

No significant impacts would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential public facilities impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
15. RECREATION				
Would the project:				
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b. Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion

(a) The Proposed Project does not involve uses that would contribute to the increase use of existing neighborhood and regional parks or other recreational facilities such as substantial physical deterioration of the facility. No impact would occur and no further study of this issue is required.

(b) The Proposed Project does not include or require recreational facilities. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential population and housing impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
16. TRANSPORTATION/TRAFFIC				
Would the project:				
a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c. Result in a change in air traffic patterns,	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
including either an increase in traffic levels or a change in location that results in substantial safety risks?				
d. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e. Result in inadequate emergency access?	☐	☐	☐	☒
f. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Discussion

(a-b) Implementation of the proposed project would not result in a substantial increase that would have an adverse effect on roadways, affect roadway capacity or level of service, or contribute to a cumulative effect.

Traffic-generating construction activities include a minor amount of construction and delivery vehicles traveling to the Proposed Project site. During construction, these vehicles would be staged on the Proposed Project site. There would be a temporary increase in traffic during the construction phase due to materials being moved to and from the site. Once the project is completed, the City of Santa Cruz Water Department anticipates that the staff would to visit the Proposed Project site approximately 7 days per week.

This increase in traffic would result in a less than significant impacts because the traffic increase would be minor and short term, and several measures would be implemented to minimize and control effects of traffic on local roadways (see "Measures to Control and Minimize Traffic Effects" in Section G, Environmental Measures).

The Proposed Project would install a well on an undeveloped parcel. The Proposed Project would change the existing site use, but no significant increase in site traffic volumes, if any, are anticipated to occur. No impact would occur and no further study of this issue is required.

(c) The Proposed Project would not result in a change in air traffic patterns, including either an increase in air traffic levels or location of air traffic resulting in substantial safety risks. No impact would occur and no further study of this issue is required.

(d) The Proposed Project would not create or alter roadways in a manner that would increase hazards or result in an incompatible use. No impact would occur and no further study of this issue is required.

(e) The Proposed Project would not result in inadequate emergency access. No impact would occur.

(f) The Proposed Project would have adequate parking capacity anticipated to support the City of Santa Cruz Water Department maintenance staff. No impact would occur and no further study of this issue is required.

(g) The Proposed Project would not conflict with alternative transportation. Maintenance personnel would be the only traffic generated by the project once it is operational. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of traffic and transportation impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
17. UTILITIES AND SERVICE SYSTEMS				
Would the project:				
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g. Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Discussion

(a, b, e) Wastewater Collection and Treatment. Sewage generated from residential, commercial and industrial uses within the City of Santa Cruz and Santa Cruz County is collected and transported to the Santa Cruz Wastewater Treatment Facility, located near Neary Lagoon. The Santa Cruz Wastewater Treatment Facility is currently rated to treat up to approximately 17 MGD of wastewater, with an average daily flow of 10 MGD (City of Santa Cruz).

The Proposed Project would generate up to approximately 5,000 gallons per day of backwash to be discharged into the sanitary sewer when the well is in operation. This small amount would not cause an increased burden or need for wastewater or potable water facilities beyond that contemplated in the City's

General Plan and General Plan EIR. No significant impact would occur and no further study of this issue is required.

(c) Storm Drainage Facilities. The Proposed Project would not require additional or expanded stormwater conveyance facilities. No impact would occur and no further study of this issue is required.

(d) Water Supply. The Proposed Project would be operated by City of Santa Cruz Water Department. The Proposed Project would not require new or expanded entitlements. The Proposed Project would involve the installation of a replacement well to support the existing groundwater system. No impact would occur and no further study of this issue is required.

(f, g) Solid Waste Disposal. According to the County of Santa Cruz General Plan, solid waste generated in the County of Santa Cruz is disposed of at the Buena Vista Landfill. The Buena Vista landfill is permitted to accept 838 Tons/day and is expected to reach capacity in 2019 (California Department of Resources Recycling and Recovery). All solid waste generated during construction would be disposed properly according to the County of Santa Cruz standard construction practices by the construction contractor. Minimal solid waste would be generated during operation. The Proposed Project would comply with AB32 requirements for the diversion of solid waste from landfills. Issues related with hazardous waste disposal are addressed in Section VII. a.. No significant impact would occur and no further study of this issue is required.

The Proposed Project would comply with all relevant federal, state, and local statutes and regulations related to solid waste. No impact would occur and no further study of this issue is required.

Further Study Required: Further evaluation of the potential utilities impacts is not required.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less-Than-Significant Impact	No Impact
18. MANDATORY FINDINGS OF SIGNIFICANCE				
Would the project:				
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐

(a) The Proposed Project would involve the installation of a water well in an urban area and would not have the potential to substantially degrade the quality of the environment; reduce habitat of fish or wildlife species; threaten plant or animal communities; or reduce the number or restrict range of rare plants or animals; or eliminate important examples of the major periods of California history or prehistory. No cultural resources were identified during cultural resources investigation of the Proposed Project area. There is a low potential to encounter cultural resources materials during ground-disturbing construction activities, however, a less than significant impact would occur with the incorporation of the previously described Minimization Measures.

The Proposed Project would not result in a change in the significance of the biological resources and potential for resources to be found is extremely low. The Proposed Project site does not provide significant biological

habitat for species of concern and or federally listed species. No sensitive wildlife has been documented on the proposed project site. A hydrogeological study calculating potential streamflow losses from Proposed Project is being prepared. The effect of the Proposed Project's pumping on Soquel Creek discharges on sensitive species potentially located in Soquel Creek and Soquel Creek streambed habitat will be further analyzed in the EIR.

Further Study Required: The EIR will include further study related to groundwater supplies or recharge and the potential for stream flow losses in Soquel Creek and Soquel Creek Lagoon from the Proposed Project.

b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐

(b) Cumulative Effects. Implementation of the Proposed Project could have the potential to have impacts that are individually limited, but cumulatively considerable. Where the Proposed Project would have no impact, specifically with respect to agricultural resources, land use and planning, mineral resources, recreation, and population and housing, it would not contribute to cumulative impacts. In addition, issues specific to site conditions, such as site geology and soils, do not have cumulative effects. The Proposed Project is not growth inducing; thus, it would not contribute to the cumulative effects of population growth. The incremental effects of the Proposed Project on biological and hydrological resources could contribute to cumulative impacts. These issues will be further analyzed in the EIR, and, subsequently, their cumulative effects will also be analyzed in the EIR.

Further Study Required: The EIR will include further study related to groundwater supplies or recharge and the potential for stream flow losses in Soquel Creek and Soquel Creek Lagoon from the Proposed Project.

c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

(c) Substantial Adverse Effects on Human Beings. Construction and operation of the Proposed Project would not result in environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly. Minimization measures previously described would reduce any impacts to a less than significant level.

Further Study Required: Further evaluation of the substantial adverse effects on human beings is not required.

V. DETERMINATION

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at lest one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an EARLIER EIR or NEGATIVE DECLARATION pursuant to applicable legal standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____

Signature Date

Director
City of Santa Cruz Water Department

VI. REFERENCES AND DATA SOURCE LIST

The following is a list of references used in the preparation of this document. Unless attached herein, copies of all reference reports, memorandums and letters are on file with the City of Santa Cruz Water Department. References to Publications prepared by Federal or State agencies may be found with the agency responsible for providing such information.

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REPORT AUTHORS AND CONSULTANTS

City of Santa Cruz Water Department
Leah Van Der Maaten, P.E., Associate Civil Engineer
Ryan Jolley, Environmental Project Analyst

Chambers Group, Inc.
James Smithwick, Ph.D.
Vice President/Director of Planning

Paula Fell
Project Manager/Senior Environmental Planner

Greg McCafferty
Principal Planner

Noel Davis, Ph.D.
Principal Marine Biologist

Joe O'Bannon
Principal Air Specialist

Roma Stromberg
Principal Environmental Planner/Noise Specialist

David Smith
Senior Cultural Specialist

Meghan Directo
Associate Environmental Planner

APPENDIX A – Biological Resources Database Research

CHAMBERS GROUP

Beltz Well Project Number 20177
Literature Review

Reviewer	John Kanlund : Chambers Group, Inc.
Date	04/13/2010

Project Name: Beltz Well Project Number 20177
Study Area: Undeveloped Lot in Santa Cruz County, California

About the Project Location

The project is located in Northern California near Rodeo Gulch Creek and Soquel Creek.

Habitat Description:

Unimproved vacant lot in the County of Santa Cruz, California

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Habitat Concerns:

The project site is an unimproved vacant lot in the County of Santa Cruz, California and does not contribute additional habitat to species listed as threatened or endangered.

Endangered Species of Santa Cruz County, California

Listing Status Key:

E – Endangered
T – Threatened
CH – Critical Habitat
PE – Taxa proposed for listing as endangered
PT – Taxa proposed for listing as threatened
PCH – Critical habitat which has been proposed
C – Candidate species for which the Fish and Wildlife Service has on file sufficient information on the biological vulnerability and threats to support proposals to list as endangered or threatened.

Amphibians

California Red-Legged Frog
Rana aurora dratytonii

Listing Status: E, PCH

Habitat: Ponds marshes, streams and lagoons.

Characteristics: Size ranges from 1.5 to 5 inches in length. Large well-developed hind legs with webbed feet. Coloration includes white, brown, gray, red, olive and orange with a pattern of dark flecks or spots. The underside of the California Red-Legged Frog is primarily white with patches if bright red or orange.

Threats: Primary predation from garter snakes, raccoons and birds.

Web location: http://www.santacruzpl.org/endangered/species/1/
http://www.fws.gov/arcata/es/amphibians/crlf/crlf.html

California Tiger Salamander
Ambystoma californiense

Listing Status: E, PCH

Habitat: Grassland and open woodlands of foothills and valleys. Use rodent burrows of ground squirrels and gophers for shelter.

Characteristics: Males range from 7 to 8 inches in length and Females range from 6-7 inches in length. The coloration pattern is primarily white or yellow spots and or bars on a dark brown black body covering the sides and back. The underside of the California Tiger Salamander is white to a pale yellow in color.

Threats: Not known

Web location: http://www.santacruzpl.org/endangered/species/4/

Santa Cruz Long-Toed Salamander
Ambystoma macrodactylum croceum

Listing Status: E, PCH

Habitat: Coastal woodlands and chaparral near the ponds and freshwater marshes where it breeds. Species uses the underground burrows of mice, gophers and moles.

Characteristics: Size ranges from 4 to 12 inches in length. The coloration pattern is primarily orange and yellow stripping on a dark brown black body. The underside of the Santa Cruz-Toed Salamander is a dark brown in color.

Threats: Habitat loss, road construction and urbanization

Web location: http://www.santacruzpl.org/endangered/species/5/

Birds

Brown Pelican
Pelecanus occidentalis

Listing Status: E

Habitat: The Brown Pelican can be found on the Pacific and Atlantic and Gulf coasts in coastal and sandy beaches and lagoons. The Brown Pelican can also be found around waterfronts and marinas.

Characteristics: Adult Brown Pelican is a large dark gray, brown bird with white around the head and neck. The juvenile Brown Pelican is gray-brown above and has white on the neck with white underparts.

Threats: Pesticides and habitat loss.

Web location: http://www.santacruzpl.org/endangered/species/6/

California Clapper Rail
Rallus Longirostris Obsoletus

Listing Status: E

Habitat: The California Clapper Rail can be found year-round in coastal wetlands on the Pacific coasts in San Francisco, Monterey and Morrow Bays. The California Clapper Rail uses shallow water and mudflats for foraging. Species prefers areas with high vegetative cover nearby.

Characteristics: Adult California Clapper Rail measures 13-19 inches. It has a hen like appearance and has a downward-curving bill. The coloration pattern of the California Clapper Rail is Olive brown-upperparts and a cinnamon-buff colored breast.

Threats: Pesticides and habitat loss.

Web location: http://www.santacruzpl.org/endangered/species/7/

Marbled Murrelet
Brachyramphus marmoratus

Listing Status: T, CH

Habitat: The Marbled Murrelet can be found in salt-water coastal areas near the shoreline on the Pacific coast. The Marbled Murrelet uses coniferous forests near the ocean for nest sites.

Characteristics: Adult male and female Marbled Murrelets are small seabirds about the size of a robin. They have a black bill and a black tail.

Threats: Nest predation and prey limitation.

Web location: http://www.santacruzpl.org/endangered/species/8/

Western Snowy Plover
Charadrius alexandrinus nivosus

Listing Status: T, CH

Habitat: The Western Snowy Plover can be found on beaches and dry mud and salt flats near the sandy shores of rivers, lakes and ponds.

Characteristics: Male Western Snowy Plover is a small shorebird with a pale coloring and a sandy colored dorsum with a white venter and thin dark bill with a dark or grayish feet and legs. The adult male Western Snowy Plover

has a partial breast band and a dark ear patch. The adult female Western Snowy Plover may lack the black areas in the plumage. Juveniles may have light edges on dorsal body feathers resulting in a scaly pattern.

Threats: Native and introduced predators and human disturbances including ranking of the beach and continued loss of habitat.

Web location: http://www.santacruzpl.org/endangered/species/10/

Yellow-billed Cuckoo
Coccyzus americanus

Listing Status: C

Habitat: Can be found on beaches and dry mud-salt flats near the sandy shores of rivers, lakes and ponds.

Characteristics: The Yellow-billed Cuckoo is a medium-sized bird generally about 1 ft in length. The adult Yellow-billed Cuckoo has a long tail and gray to brown coloring on the head and back with white underparts.

Threats: Habitat loss and pesticides and predators.

Web location: http://www.santacruzpl.org/endangered/species/11/

Fish

Coho Salmon
Oncorhynchus Kisutch

Listing Status: E, CH

Habitat: Small tributary streams or possibly lakes with gravel for spawning and shaded streams with tree-lined banks for rearing.

Characteristics: Silver sides and a dark blue back. Adults have a darker red skin color with and are generally about 28 inches in length and weight ranges from 7-11 pounds.

Threats: Unknown

Web location: http://www.santacruzpl.org/endangered/species/2/

Steelhead Trout
Oncorhynchus mykiss

Listing Status: E, CH

Habitat: The Steelhead Trout is born in freshwater streams and then migrate to the open ocean. Native Steelhead Trout return to their native fresh water habitats to spawn.

Characteristics: Steelhead Trout are dark olive in color with silvery-white shading on the underside. A distinct pink to red strip can be seen running along the sides of the Steelhead Trout. They are generally 45 inches in length and can weigh up to 55 pounds.

Threats: Human induced and natural factors.

Web location: http://www.santacruzpl.org/endangered/species/3/
http://www.nmfs.noaa.gov/pr/species/fish/steelheadtrout.htm

Tidewater Goby
Eucyclogobius newberryi

Listing Status: E

Habitat: The Tidewater Goby frequents small coastal lagoons and lower reaches of streams and the larger portions of bays.

Characteristics: The Tidewater Goby is a small gray-brown fish that is considered a bottom-dwelling fish with large fins and a ventral sucker. The Tidewater Goby similar to many bottom-dwelling fish has a relatively large mouth. The Tidewater Goby typically averages two inches in length.

Threats: Salinity and tidal fluctuations. Threats also include degradation of coastal lagoons by human development.

Web location: http://www.santacruzpl.org/endangered/species/12/

Invertebrates

Mount Hermon June Beetle
Polyphylla barbata

Listing Status: E

Habitat: Sandy soils and sparsely vegetated soils.

Characteristics: Large white-lined June beetle.

Threats: Sand mining and urban development

Web location: http://www.santacruzpl.org/endangered/species/15/

Ohlone Tiger Beetle
Cincindela ohlone

Listing Status: E

Habitat: Coastal terraces and patches of grasslands.

Characteristics: Adults are elongated medium-sized beetles that are identified by their green, blue, red and yellow coloration often highlighted by stripes and spots.

Threats: A restricted range and relatively small population.

Web location: http://www.santacruzpl.org/endangered/species/16/

Smith's Blue Butterfly
Euphilotes enoptes smithi

Listing Status: E

Habitat: Coastal and inland sand dunes as well as steep slopes along the coast. Coastal buckwheat scrub habitats.

Characteristics: Sandy soils and sparsely vegetated soils.

Threats: Habitat destruction due to sand mining, invasion of non-native plants, off road vehicles and development.

Web location: http://www.santacruzpl.org/endangered/species/14/

Zayante Band-winged Grasshopper
Trimerotropis infantilis

Listing Status: E

Habitat: The Zayante Band-winged Grasshopper prefers open sparsely vegetated sandy parklands among chaparral or ponderosa pine stands.

Characteristics: Small grasshopper brownish-grey with bluish hind legs.

Threats: Habitat destruction due to sand mining and development.

Web location: http://www.santacruzpl.org/endangered/species/20/

Mammals
None listed Relevant to Work Zone

Plants

Ben Lomond Spineflower
Chorizanthe pungens var.

Listing Status: E

Habitat: Limited to sand hills habitat in the Santa Cruz Mountains.

Characteristics: Small annual herb in the buckwheat family native to California.

Threats: Human disturbances such as residential development and sand and gravel mining.

Web location: http://www.santacruzpl.org/endangered/species/18/

Monterey Spineflower
Chorizanthe pungens var. pungens

Listing Status: T, CH

Habitat: Limited to sandy soils near coastal areas.

Characteristics: White, rarely pinkish with margins on the lobes and a prostate to slightly ascending habitat.

Threats: Human disturbances such as urban development and introduction of non-natives.

Web location: http://www.santacruzpl.org/endangered/species/21/

Robust Spineflower
Chorizanthe rubusta var. robusta

Listing Status: E, CH

Habitat: Endemic species of California. Found on coastal and near-coastal areas of Santa Cruz County.

Characteristics: White, rarely pinkish with margins on the lobes.

Threats: Destroyed or degraded habitat due to urbanization and agricultural development as well as introduction of non-natives plants.

Web location: http://www.santacruzpl.org/endangered/species/22/
http://plants.usda.gov/java/profile?symbol=CHRO

Santa Cruz Cypress
Cupressus abramsiana

Listing Status: E

Habitat: Dry ridges in patches within coastal chaparral and mixed green vegetation.

Characteristics: Santa Cruz Cypress is identified by the grey bark thin and broken into vertical strips, scale-like leaves are bright green.

Threats: Habitat alteration, genetic introgression, insect infestation, competition from non-native plants and disease.

Web location: http://www.santacruzpl.org/endangered/species/24/

Santa Cruz Tarplant
Holocarpha macradenia

Listing Status: E

Habitat: Clay soils in grasslands.

Characteristics: Santa Cruz Tarplant, an annual herb, is identified by the yellow flowers in dense heads.

Threats: Continued urban development, agriculture and competition from non-native plants.

Web location: http://www.santacruzpl.org/endangered/species/26/

Santa Cruz Wallflower
Erysimum teretifoliumm

Listing Status: E

Habitat: Endemic to sandstone soils of the Santa Cruz Mountains. Found in northern maritime chaparral and within ponderosa pines in sand parklands.

Characteristics: Santa Cruz Wallflower is a perennial plant identified by the basal rosette of leaves and terminal spike.

Threats: Habitat removal by sand quarrying and residential development.

Web location: http://www.santacruzpl.org/endangered/species/19/

Scotts Valley Polygonum
Polygonum hickmanii

Listing Status: E

Habitat: Occurs with other small patches of annual grasslands in well-drained soils.

Characteristics: Scotts Valley Polygonum grows between 1-2 inches tall and is identified by the single white flowers found on the axils of the leaves.

Threats: Habitat alteration, displacement of non-native grasses and the limited amount of habitat.

Web location: http://www.santacruzpl.org/endangered/species/27/

Scotts Valley Spineflower
Chorizanthe robusta var. hartwegii

Listing Status: E, CH

Habitat: Sedimentary deposits of sandstone and mudstone.

Characteristics: Scotts Valley Spineflower is a low-growing herb with rose-pink margins confined to the regions with sedimentary sandstone and mudstone deposits.

Threats: Sand mining and residential development.
.
Web location: http://www.santacruzpl.org/endangered/species/23/

Reptiles
None listed Relevant to Proposed Project Site

Species of Concern Santa Cruz County, California

Plants

Coast Wallflower
Erysimum ammophilum

Listing Status: California Species of Concern

Habitat: This species prefers sandy areas near the coast.

Characteristics: A perennial with bright yellow flowers.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Eastwood's Goldenbush
Ericameria fasciculata

Listing Status: California Species of Concern

Habitat: This species prefers dunes and sandy areas near the coast.

Characteristics: A shrub that grows between 1 to 3.5 feet. Eastwood's Goldenbush has a radiating yellow flower heads in terminal clusters of 2 to 6 flowers.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Monterey Ceanothus
Ceanothus cuneatus var. rigidus

Listing Status: California Species of Concern

Habitat: This species prefers sandy hills and flats near forests from San Francisco Bay Area to San Luis Obispo County.

Characteristics: A large shrub that grows 4 to 8 feet tall with small dark green leaves.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Monterey Manzanita
Arctostaphylos montereyensis

Listing Status: California Species of Concern

Habitat: Native to coastal California

Characteristics: An evergreen shrub that is 3-7 feet tall with an erect and bristly leaves. The leaves are simple erect and blade like. Flowers are white and occur in dense clusters.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Sand Gila
Gila tenuifloia arearia

Listing Status: California Species of Concern

Habitat: Confined to areas of bare wind-sheltered areas of coastal sand dune areas.

Characteristics: A short sticky-haired annual herb.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Sandmat Manzanita
Arctostaphylos pumila

Listing Status: California Species of Concern

Habitat: Found in areas with dunes and coastal hills.

Characteristics: A gray low shrub that grows from 2 to 4 feet tall.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

---

Mammals

Monterey Ornate Shrew
Sorex ornatus salarius

Listing Status: California Species of Concern

Habitat/Range: species is found near water marshes along stream sides in valleys, forests and brushy foothills.

Characteristics: Monterey Ornate Shrew is a small mammal 3.5 to 4.25 inches in length with a grayish to brown colored back. The stomach is slightly paler in color and the tail is a dark brown, which is darkest at the tip.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

---

Reptiles

California black legless lizard
Anniella pulchra nigra

Listing Status: California Species of Concern

Habitat/Range: California black legless lizard is found near the Santa Cruz Mountains

Characteristics: The body is elongated, pencil thin and smooth. The California black legless lizard has moveable eyelids with no external ear openings.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Coast Horned Lizard
Phrynosoma coronatum

Listing Status: California Species of Concern

Habitat/Range: Found west of the Sierra Mountains

Characteristics: The Coast Horned Lizard is characterized by horns and the spiny appearance on its' back.

Threats: Unknown

Web location: http://ucreserve.ucsc.edu/FortOrd/protectedspecies.html

Native Animal Species to the Santa Cruz Biological Eco-region

American kestrel
western meadowlark
badger
western racer
Buckeye butterfly
white-tailed kite
burrowing owl
horned lark
California ground squirrel
lark sparrow
California ringlet
meadow vole
ferruginous hawk
Ohlone tiger beetle
golden eagle
oxeye satyr butterfly
gopher snake
savannah sparrow

grasshopper sparrow
western bluebird

Native Plant Communities of Santa Cruz County Eco-region

Typical plant communities of Santa Cruz County consist of: grasslands, coastal scrub, and coastal strand, coastal salt marsh, and freshwater marsh, riparian woodlands, redwood forests, sandhills, closed cone coniferous forests, mixed evergreen forests, chaparral, foothill woodlands and oak/savanna grasslands.

These plant communities also include sub-communities such as Monterey Pine Forest, Knobcone Pine Forest, Northern Interior Cypress Forest, Mixed Evergreen Forest, Coast Live oak Forest, Canyon Live Oak Forest, Interior Live Oak Forest, Tan-Oak Forest, Interior Live Oak Woodland, California Bay Forest, Northern Mixed Chaparral, Chamise Chaparral, Serpentine Chaparral, Buck Brush Chaparral, Blue Brush Chaparral, Northern Maritime Chaparral, Mesic North Slope Chaparral, Black Oak Woodland, Valley Oak Woodland, Valley Needle Grass Grassland.

Works Cited

California Department of Fish and Wildlife
http://www.dfg.ca.gov/

California Department of Fish and Wildlife Database
http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp

Santa Cruz Native Plant Society
http://cruzcnps.org/currentissues.html

Santa Cruz Public Libraries
http://www.santacruzpl.org/endangered/species/25/

Santa Barbara Natural History Museum
http://www.sbnature.org/collections/invert/entom/polyp_barba.php

APPENDIX B – Cultural Records Search

Chambers Group®
Solving Environmental Challenges

April 13, 2010

Ms. Paula Fell
Chambers Group, Inc.
5 Hutton Centre Drive Ste. 750
Santa Ana, CA 92707

Subject: Beltz Well Cultural Resource Records Search

Dear Ms. Fell:

The Northwest Information Center (NWIC), Sonoma State University, Rohnert Park, California has conducted a cultural resources records search (NWIC File No. 09-1232) for the subject property in Santa Cruz, California. The purpose of the records search is to determine if any cultural resources technical studies have been conducted on the subject property and if any historic or prehistoric sites are located on or in proximity to the subject property.

NWIC maintains 7.5 Minute USGS maps showing the locations for technical studies and historic properties and archaeological sites. Chambers Group provided NWIC a portion of the USGS 7.5 Minute Soquel Quadrangle depicting the subject property. A review of the NWIC map indicates the subject property has never been part of a cultural resources technical study and no sites or properties are recorded within the subject property.

There have been 26 cultural studies conducted within a ½ mile radius of the subject property. These consisted primarily of block surveys for parcels of various sizes. As a result of these studies, four archaeological sites have been recorded within a ½ mile radius of the subject property. Two of these sites are multi-component sites with prehistoric remains and historic residential remains. The remaining two are historic residential archaeological sites.

NWIC provided a list of addressed for known historic properties within a ½ mile radius of the subject property. A review of the streets, particularly Cory Street, indicated no historic structures are listed in the vicinity of the subject property.

No properties listed as a California Landmark are within a ½ mile radius of the subject property.

In summary, the subject property has never undergone a cultural resources technical study to determine if historic or prehistoric sites are within its boundary. Prehistoric archaeological sites and historic structures are located within a ½ mile radius of the subject property. It is presently unknown if any of these cultural resources are within the subject property.

Thank you for the opportunity to provide cultural resources services for your project. If you have any questions regarding the records search please contact me at your earliest convenience.

Respectfully,
Chambers Group, Inc.

David M. Smith
Project Manager, Archaeology

www.chambersgroupinc.com
A Certified Disabled Veteran Business Enterprise

REDLANDS
302 Brookside Avenue
Redlands, California 92373
909 • 335-7068
909 • 335-6318 fax

SAN DIEGO
8787 Complex Drive, Suite 220B
San Diego, California 92123
858 • 541-2800
858 • 565-8950 fax

CORPORATE OFFICE
5 Hutton Centre Drive, Suite 750
Santa Ana, California 92707
949 • 261-5414
949 • 261-8950 fax

RENO
1755 E. Plumb Lane, Suite 260
Reno, Nevada 89502
775 • 323-3555
fax 775 • 323-3554

COACHELLA
36-953 Cook Street, Suite 103
Palm Desert, California 92211
760 • 779-0108

APPENDIX C – Atlas Engineering Phase I Report

CHAMBERS GROUP

PHASE 1 ENVIRONMENTAL ASSESSMENT

APN 030-181-70
(Vacant Lot on Research Park Drive)
Soquel, California

July 15, 2009

Prepared For:

City of Santa Cruz Water Department

Prepared By:

Frederick A. Yukic, MS, REA
Principal Engineer

REGISTERED ENVIRONMENTAL ASSESSOR
FREDERICK A. YUKIC
No. 04079
Expires: 6/30/10
STATE OF CALIFORNIA

ATLAS
ENGINEERING SERVICES, INCORPORATED

P.O. BOX 1260, SANTA CRUZ, CA, 95061, (831) 426-1440
FAX: (831) 426-1288

1.0 INTRODUCTION

1.1 Purpose

A Phase 1 Environmental Assessment was conducted by Atlas Engineering Services, Incorporated (Atlas) for the City of Santa Cruz Water Department (SCWD). The purpose of this Environmental Assessment is to identify recognized environmental conditions connected with the property identified as Assessor's Parcel Number (APN) 030-181-70, a vacant lot on Research Park Drive in unincorporated Santa Cruz County, California (Figures 1 and 2). After review of relevant information, an opinion is rendered regarding the potential impact of the environmental data collected on the proposed use of the Site for construction of a monitor well and water supply production well.

1.2 Scope of Work

This Phase 1 was prepared with reference to the ASTM Standard E 1527-05, entitled "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process".

Project Review

Atlas reviewed planning documents to gain an understanding of the project including "Preliminary Hydrogeological Study, City of Santa Cruz, Test Hole and Monitoring Well Construction Project, Work Plan, Santa Cruz, California" dated May 2007 by Hopkins Groundwater Consultants, Inc. and "Preliminary Hydrogeological Study, City of Santa Cruz, Beltz Wells Nos. 11 and 12, Well Siting Study, Santa Cruz, California" dated February 2009 by Hopkins Groundwater Consultants, Inc.. The proposed use of the Site is for construction of a monitor well and a water supply production well.

Records Review

Atlas reviewed records, documents, and other relevant information sources, including: topographic maps, aerial photographs, state/federal regulatory databases, state agency files, and local agency files.

Site Inspection

Atlas conducted a site inspection. During a site inspection on July 1, 2009 an environmental assessment field checklist was completed, data were recorded, pertinent observations related to the condition of the environment at the Site were noted, and the area was inspected for potential environmental hazards.

Interviews

Atlas conducted an interview with the current property manager and an employee of a county agency.

Report Preparation

Atlas prepared this report summarizing recognized environmental conditions connected with the Site including a description of the Site, a summary of records reviewed, and an opinion by Atlas with regard to the recognized environmental conditions at the Site.

2.0 SITE LOCATION and DESCRIPTION

2.1Site Location

The Site is located on Research Park Drive in Soquel, California (Figure 1). The Site is comprised of Assessor Parcel Number (APN) 030-181-70, and is located between Research Park Court and Cory Street (Figure 2).

2.2 Site Description

The Site is approximately 0.65 acres of relatively flat land that is currently vacant. The area surrounding the Site consists primarily of commercial and light industrial properties.

3.0 RECORDS REVIEW

3.1 Chain-of-Title

The history of ownership of the subject property was investigated by searching the records at Santa Cruz County Recorder's Office (see attached Table 1).

3.2 Sanborn Fire Maps

There are no Sanborn Fire Maps for this area.

3.3 USGS Topographic Maps

United States Geological Services (USGS) maps from 1914, 1954, 1968, 1980 and 1994 were obtained from Environmental Data Resources, Inc. (EDR) and examined.

The 1914 map shows the Site undeveloped land. Highway 1 has not yet been constructed.

The 1954 map shows the Site undeveloped land with a few long structures to the north and a large rectangular structure to the south.

The photorevised map from 1968 shows the Site as undeveloped land with the same features identified in the 1954 map except increased development in the general

area of the Site including construction of Highway 1.

The photorevsied map from 1980 shows the Site as undeveloped land with the same features on the Site as in 1968 except that the structure to the south has been removed.

The 1994 map shows the Site as undeveloped land with surrounding properties also largely undeveloped. The long structures to the north have been removed, and new streets has been constructed to the east and north of the Site.

3.4 Aerial Photographs

Aerial photographs from 1948, 1956, 1977, 1987, and 1998 were obtained from Environmental Data Resources Inc. and examined.

The 1948 aerial photograph shows the Site is vacant land along a street on the west side of the Site. To the north is a facility that is accessed from Soquel Avenue that is comprised of four to five long buildings connected by a central, covered accessway. To the east is vacant land, to the south are what appears to be greenhouses, and to the west are a few small structures that are perhaps rural houses.

The 1956 aerial photograph shows the site is still vacant but has been mowed in lines that suggest row crops or hay. The surrounding properties appear the sam as in the previous photo.

The 1977 aerial photograph shows conditions unchanged except that the properties to the east have become increasingly developed including what appears to be a lumber yard to the southeast.

The 1987 aerial photograph shows the Site still vacant land, but that Research Park Drive has been constructed on the west and the structures to the north and greenhouses to the south have been removed.

The 1998 aerial photograph shows the Site as vacant land as in previous photos with new commercial/industrial buildings constructed to the north and south.

3.5 Government Records and Public Documents

Environmental Database Search

A government records and public documents search was conducted during the course of this environmental assessment by contracting with Environmental Data Resources, Inc. (EDR), an environmental database service (see Executive Summary in Appendix A). The service searched their database of government records and public documents for properties located within one mile of the Site. The complete list of databases searched is provided in the attached Executive Summary of the EDR report.

The search did not identify the Site as being on any environmental list.

The search identified 23 properties within one mile of the Site listed on at least one of the databases searched (discounting redundant listings).

State Water Resources Control Board Geotracker

The State Water Resources Control Board Geotracker (Geotracker) is an internet based database of leaking underground storage tank cleanup sites, other cleanup sites (e.g. solvents or metals), land disposal sites, military cleanup sites, and permitted underground storage tank sites. Geotracker lists 27 sites within 1,000 feet of the subject property, with 20 closed and 7 still active (Table 2). The subject property is not listed in Geotracker (Table 2).

Santa Cruz County Environmental Health Services Hazardous Materials Files

Atlas visited the offices of Santa Cruz County Environmental Health Services (SCCEHS) to review case files on the Subject Property, the 23 properties identified within one mile of the subject property by the EDR database search, and the 7 open sites listed in Geotracker. SCCEHS does not have any files on the Site.

Atlas reviewed the files on the 23 properties identified in the EDR report and the 7 open UST sites. Of the 7 open UST sites listed in Geotracker as within 1,000 feet of the subject property, the SCCEHS files show that two were closed in the past at the time of UST removal due to only low concentrations of petroleum hydrocarbons in soil (2685 Mattison Lane and 3098 Winkle). Of the five remaining open sites, two sites (4860 Soquel Avenue and 2501 South Main) reported low concentrations of petroleum hydrocarbons in recent water quality sampling [e.g. 5.2 micrograms per liter (ug/L) benzene and 26 ug/L MTBE] while three sites (836 Bay Avenue, 2178 41st Avenue, and 819 Bay Avenue) reported high concentrations of petroleum hydrocarbons (e.g. tertiary butyl alcohol at 1,400 ug/L, benzene at 2,500 ug/L, and benzene at 4,000 ug/L). However, upon a more detailed inspection of local maps it is apparent that these three sites are located more than 1,000 feet from the Site.

Atlas also reviewed the file for a site not listed in the EDR report or Geotracker, 3801 Soquel Drive, a former leaking underground storage tank (LUST) site. This site was granted no further action by SCCEHS, with xylenes present in groundwater at concentrations below the California Regional Water Quality Control Board Central Coast Water Quality Objectives. This file also contained documentation on water supply wells at 3801 Soquel Drive and on the adjoining property at 3715 Soquel Drive (see Appendix B).

Santa Cruz County Building Department

The Santa Cruz County Building Department (SCC Building) files on the Site show that it was formerly listed as 2950 Hillcrest Street, that it was owned by West Foods, Inc., and that a mushroom plant was on the Site and adjacent properties in 1968. SCC Building files also show that the area was subdivided in 1982 and that an attempt was made to develop the Site in 1990 but development was not completed.

Polk Directory

Atlas reviewed the Polk Directory reverse listing for information on the site. Listings for 3600 and 3620 Soquel Drive in 1960, 1965, 1970, and 1975 show occupants of West Foods, Inc. and Shady Oak Mushrooms.

4.0 SITE INSPECTION

On July 1, 2009 the Site was inspected, and an environmental assessment field checklist was completed and, data were recorded (Appendix C). Pertinent observations related to the condition of the environment at the Site were noted, and buildings were inspected for potential environmental hazards. No evidence of dry wells, underground storage tanks, or above ground storage tanks was observed. There was nothing to indicate a potentially significant environmental condition at the Site.

5.0 INTERVIEWS

Atlas interviewed Mr. Allen Guggenheim, realtor and property manager for the owner of the Site, Mr. Rolando Charles of the SCCEHS, and Ms. Dawn Smithson of SCWD.

Mr. Guggenheim had no knowledge that would indicate a recognized environmental condition.

Mr. Charles did not know of any recognized environmental conditions at the Site.

Ms. Smithson was interviewed using the ASTM E 1527-05 “User Questionnaire” (Appendix D). Ms. Smithson had no knowledge that would indicate a recognized environmental condition.

6.0 SUMMARY AND CONCLUSIONS

Atlas performed a Phase 1 Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-05 of the Site (APN 030-181-70) located on Research Park Drive at Research Park Court in Soquel, California (Figures 1 and 2). Atlas reviewed records about the Site including topographical maps, aerial photographs, government records, and a limited chain of title. Interviews were conducted with persons knowledgeable about the Site, and an inspection of the Site was conducted. Any exceptions to, or deletions from, this practice are described in Section 8 of this report.

The records review of the chain-of-title found no recognized environmental conditions (Table 1). No Sandborn Fire Maps were found for this area. The USGS topographic maps and the aerial photographs found no recognized environmental conditions. The government records and public documents revealed that the Site is not listed in any environmental. The EDR record search identified 23 properties within one mile of the Site listed on at least one of the environmental databases searched (Appendix A). The State Water Resources Control Board Geotracker lists 27 sites within 1,000 feet of the subject property, with 20 closed and 7 still active, and the Subject Property not listed (Table 2). Files at the offices of Santa Cruz County Environmental Health Services (SCCEHS) did not contain any entries for the Site. SCCEHS files also showed that of the 23 properties within one-mile and 27 listed by Geotracker as within 1,000 feet, only three (836 Bay Avenue, 2178 41st Avenue, and

819 Bay Avenue) had a potentially significant environmental condition that could impact the planned use of the Site. However, upon a more detailed inspection of local maps it is apparent that these three sites are located more than 1,000 feet from the Site, and that only the facility at 2178 41st Avenue is located close enough to the Site to have a potentially significant environmental condition that could impact the planned use of the Site. One additional file at SCCEHS for a closed former fuel tank site at 3801 Soquel Drive showed low levels of groundwater contamination, and contained documentation of two former water supply wells (Appendix B).

The site inspection (Appendix C) and interviews (Appendix D) did not reveal any potentially significant environmental conditions at the Subject Property or Site that might impact planned use.

Based on the information cited above, this assessment has revealed no recognized environmental conditions in connection with the intended use of the Site for construction of a monitor well.

Based on the information cited above, this assessment has revealed no recognized environmental conditions in connection with the intended use of the Site for construction of a water supply production well except for the following:

1. The Leaking Underground Fuel Tank (LUFT) site at 2178 41st Avenue may pose a risk to quality of water pumped from a water supply well constructed on the Site.

7.0 RECOMMENDATIONS

Based on the information and conclusions cited above Atlas recommends that the monitor well be constructed at the Site and sampled for petroleum hydrocarbons to evaluate water quality prior to construction of the production well.

In addition, a capture zone analysis of pumping a production well at this location should be conducted to ascertain the likelihood of petroleum hydrocarbons from the one potentially significant LUFT site entering the well during pumping.

8.0 LIMITATIONS

This Phase I Environmental Site Assessment was conducted in accordance with ASTM Practice E1527-05. The conclusions of this report are professional judgments concerning the significance of the observations made and data gathered during the course of the environmental assessment. No sampling has been conducted. Opinions rendered should not be construed as guarantee or warranty as to the potential liability associated with environmental conditions or impacts at the site.

9.0 CERTIFICATION

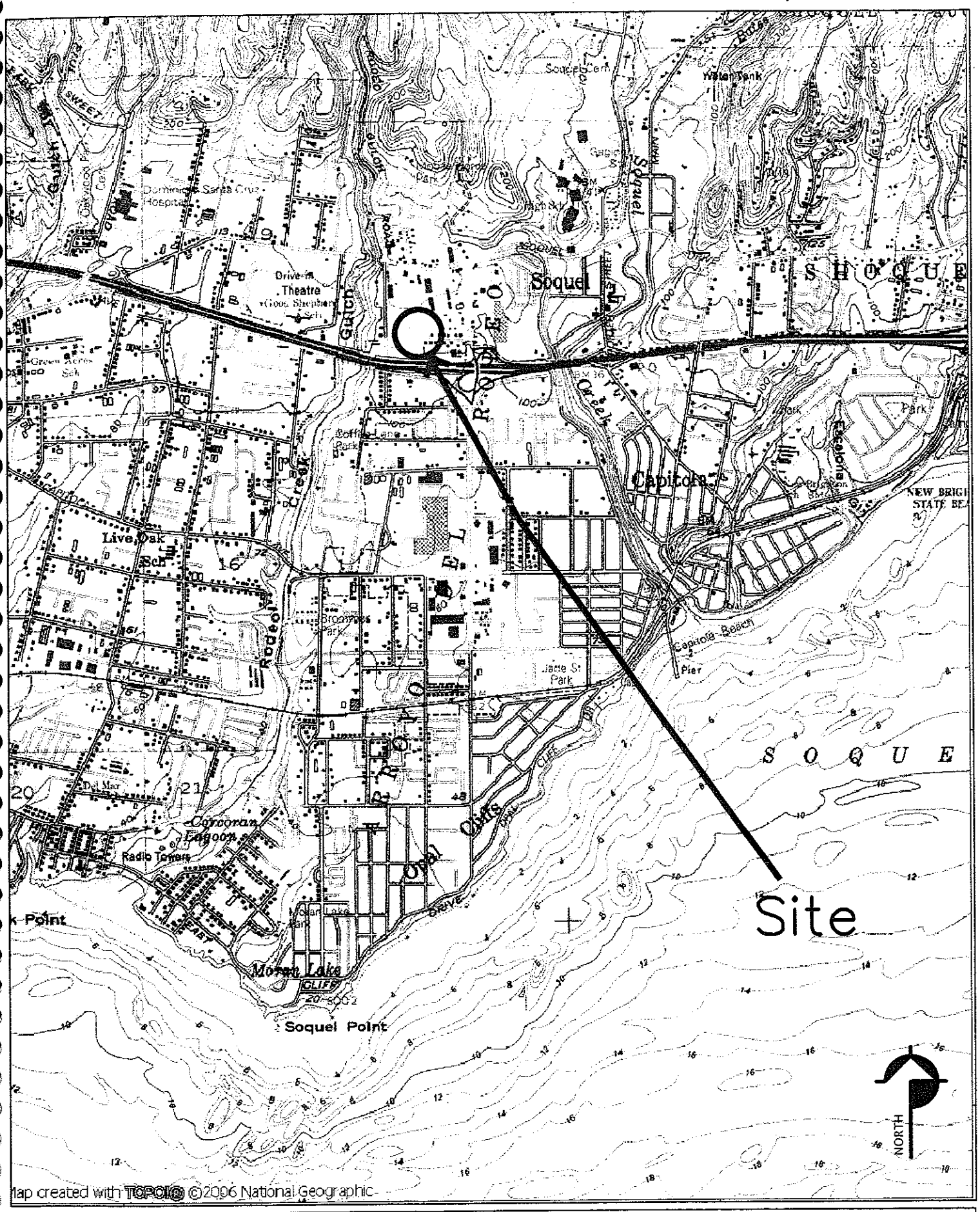
I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental professional as defined in Section 312.10 of 40 CFR 312. I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I have developed and performed the all appropriated inquiries in conformance with the standards and practices set forth in 40 CFR 312.

Table 1.
Chain of Title
APN 030-181-70
(vacant lot on Research Park Drive)
Soquel, California

Date	Owner
1940	Sierra Mushroom Company
December 29, 1949	L.A. Hughes, et al
December 30, 1949	Fay C Hughes
December 11, 1950	Roland E. West, et al
August 6, 1951	West Foods of California
October 31, 1984	Oceanic California, Inc.
July 20, 1990	Rikal Development Corporation
March 25, 1992	Cailber Exchange Corporation
November 4, 1993	Rikal Development Corporation
November 4, 1993	Castle & Cooke California, Inc., et al
April 10, 1996	Nahum Guzik
April 16, 2004	Guzik Trust

Table 2.
SWRCB Geotracker Sites Within 1,000 Feet
APN 030-181-70
(Vacant Lot on Research Park Drive)
Soquel, California

GEOTRACKER	SITE NAME	CLEANUP STATUS	ADDRESS	CITY
T0608700005	**FORMER EXXON 7-3604**	**OPEN - VERIFICATION MONITORIN**	**836 BAY AVE**	**CAPITOLA**
T0608700006	EXXON STATION 7-0281 FIRST LEA	COMPLETED - CASE CLOSED	2501 MAIN ST S	SOQUEL
T0608700052	SOQUEL PUMP STATION	COMPLETED - CASE CLOSED	809 BAY AVE	CAPITOLA
T0608700053	DANCO PROPERTY	COMPLETED - CASE CLOSED	2185 CHANTICLEER ST	SANTA CRUZ
T0608700067	SAN LORENZO LUMBER CO	COMPLETED - CASE CLOSED	2435 41ST AVE	SANTA CRUZ
T0608700070	CENTRAL COUNTY GARBAGE	COMPLETED - CASE CLOSED	2230 CHANTICLEER ST	SANTA CRUZ
T0608700078	**BP #11240**	**OPEN - VERIFICATION MONITORIN**	**2178 41ST AVE**	**CAPITOLA**
T0608700108	COCA-COLA ENTERPRISES - WEST	COMPLETED - CASE CLOSED	6100 SOQUEL AVE	SANTA CRUZ
T0608700119	TOSCO SERVICE STATION #4902	COMPLETED - CASE CLOSED	2255 41ST AVE	CAPITOLA
T0608700160	SERVICE STATION NO 88	COMPLETED - CASE CLOSED	2700 41ST ST	SOQUEL
T0608700168	**FORMER EXXON 7-0281**	**OPEN - VERIFICATION MONITORIN**	**2501 MAIN ST S**	**SOQUEL**
T0608700170	4100 SOQUEL DR	COMPLETED - CASE CLOSED	4100 SOQUEL DR	SOQUEL
T0608700195	FRITO LAY	COMPLETED - CASE CLOSED	2825 MATTISON LN	SANTA CRUZ
T0608700204	CAPITOLA PUMPING STATION	COMPLETED - CASE CLOSED	END OF ESPLANADE	CAPITOLA
T0608700205	CAPITOLA MALL/BROWN BULB RANCH	COMPLETED - CASE CLOSED	41ST AVE	CAPITOLA
T0608700221	CHEVRON STATION	COMPLETED - CASE CLOSED	5998 SOQUEL DR	SANTA CRUZ
T0608700231	**SKILL CENTER INC**	**OPEN - REMEDIATION**	**2685 MATTISON LN**	**SANTA CRUZ**
T0608700238	BP OIL FACILITY NO. 11240	COMPLETED - CASE CLOSED	2178 41ST AVE	CAPITOLA
T0608700242	**TOSCO - FACILITY #2452**	**OPEN - REMEDIATION**	**4860 SOQUEL DR**	**SOQUEL**
T0608700245	PONZA BROTHERS YARD	COMPLETED - CASE CLOSED	3131 PORTER ST	SOQUEL
T0608700250	ARCO STATION	COMPLETED - CASE CLOSED	2407 PORTER ST	SOQUEL
T0608700265	**REDTREE PROPERTIES**	**OPEN - SITE ASSESSMENT**	**819 BAY AVE**	**CAPITOLA**
T0608700293	CHEVRON STATION	COMPLETED - CASE CLOSED	600 BAY AVE	CAPITOLA
T0608700297	**JIMMY SMITH PLUMBING**	**OPEN - SITE ASSESSMENT**	**3098 WINKLE AVE**	**SANTA CRUZ**
T0608700304	E-Z SERVE #100981	COMPLETED - CASE CLOSED	4901 SOQUEL DR	SOQUEL
T0608700308	ULTRAMAR BEACON	COMPLETED - CASE CLOSED	2210 SOQUEL DR	SANTA CRUZ
T060876507	PACIFIC BELL FLEET OPERATIONS	COMPLETED - CASE CLOSED	7070 SOQUEL AVENUE	SANTA CRUZ



ATLAS
ENGINEERING SERVICES, INCORPORATED

Scale: 1"=2000'

Revised: 6/17/09

Figure 1. Location Map
Research Park Drive
Soquel, California

ATLAS ENGINEERING SERVICES, INCORPORATED	Not to scale Revised: 7/13/09	Figure 2. Site Map Research Park Drive Soquel, California

APPENDIX A

EDR GOVERNMENT RECORD SEARCH EXECUTIVE SUMMARY

SCW2
Research Park Drive
Santa Cruz, CA 95073

Inquiry Number: 2521766.2s
June 17, 2009

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

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Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

RESEARCH PARK DRIVE
SANTA CRUZ, CA 95073

COORDINATES

Latitude (North):	36.984400 - 36˚ 59' 3.8''
Longitude (West):	121.967800 - 121˚ 58' 4.1''
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	591863.5
UTM Y (Meters):	4093436.5
Elevation:	112 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	36121-H8 SOQUEL, CA
Most Recent Revision:	1994

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	2006, 2005
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL..... National Priority List

EXECUTIVE SUMMARY

Proposed NPL ..... Proposed National Priority List Sites
NPL LIENS ..... Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ..... National Priority List Deletions

Federal CERCLIS list

CERCLIS ..... Comprehensive Environmental Response, Compensation, and Liability Information System

Federal CERCLIS NFRAP site List

CERC-NFRAP ..... CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS ..... Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ..... RCRA - Transporters, Storage and Disposal

Federal RCRA generators list

RCRA-LQG ..... RCRA - Large Quantity Generators
RCRA-CESQG ..... RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS ..... Engineering Controls Sites List
US INST CONTROL ..... Sites with Institutional Controls

Federal ERNS list

ERNS ..... Emergency Response Notification System

State- and tribal - equivalent NPL

RESPONSE ..... State Response Sites

State and tribal landfill and/or solid waste disposal site lists

SWF/LF ..... Solid Waste Information System

State and tribal leaking storage tank lists

SLIC ..... Statewide SLIC Cases
INDIAN LUST ..... Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

AST ..... Aboveground Petroleum Storage Tank Facilities
INDIAN UST ..... Underground Storage Tanks on Indian Land

State and tribal voluntary cleanup sites

VCP ..... Voluntary Cleanup Program Properties

EXECUTIVE SUMMARY

INDIAN VCP ..... Voluntary Cleanup Priority Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS ..... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9 ..... Torres Martinez Reservation Illegal Dump Site Locations
ODI ..... Open Dump Inventory
WMUDS/SWAT ..... Waste Management Unit Database
SWRCY ..... Recycler Database
HAULERS ..... Registered Waste Tire Haulers Listing
INDIAN ODI ..... Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL ..... Clandestine Drug Labs
HIST Cal-Sites ..... Historical Calsites Database
SCH ..... School Property Evaluation Program
Toxic Pits ..... Toxic Pits Cleanup Act Sites
CDL ..... Clandestine Drug Labs

Local Land Records

LIENS 2 ..... CERCLA Lien Information
LUCIS ..... Land Use Control Information System
LIENS ..... Environmental Liens Listing
DEED ..... Deed Restriction Listing

Records of Emergency Release Reports

HMIRS ..... Hazardous Materials Information Reporting System
CHMIRS ..... California Hazardous Material Incident Report System
LDS ..... Land Disposal Sites Listing
MCS ..... Military Cleanup Sites Listing

Other Ascertainable Records

DOT OPS ..... Incident and Accident Data
DOD ..... Department of Defense Sites
FUDS ..... Formerly Used Defense Sites
CONSENT ..... Superfund (CERCLA) Consent Decrees
ROD ..... Records Of Decision
UMTRA ..... Uranium Mill Tailings Sites
MINES ..... Mines Master Index File
TRIS ..... Toxic Chemical Release Inventory System
TSCA ..... Toxic Substances Control Act
FTTS ..... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS ..... FIFRA/TSCA Tracking System Administrative Case Listing
SSTS ..... Section 7 Tracking Systems

EXECUTIVE SUMMARY

ICIS..... Integrated Compliance Information System
PADS..... PCB Activity Database System
MLTS..... Material Licensing Tracking System
RADINFO..... Radiation Information Database
FINDS..... Facility Index System/Facility Registry System
RAATS..... RCRA Administrative Action Tracking System
CA BOND EXP. PLAN..... Bond Expenditure Plan
CA WDS..... Waste Discharge System
NPDES..... NPDES Permits Listing
Cortese..... "Cortese" Hazardous Waste & Substances Sites List
WIP..... Well Investigation Program Case List
HAZNET..... Facility and Manifest Data
EMI..... Emissions Inventory Data
INDIAN RESERV..... Indian Reservations
SCRD DRYCLEANERS..... State Coalition for Remediation of Drycleaners Listing

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants..... EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

Federal RCRA generators list

RCRA-SQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

A review of the RCRA-SQG list, as provided by EDR, and dated 11/12/2008 has revealed that there are 5 RCRA-SQG sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
STUART AUTOMOTIVE	***4003 CORDELIA LN***	***ENE 1/8 - 1/4 (0.139 mi.)***	***4***	***8***
FABIAN'S BODY SHOP	***3921 SOQUEL DR AT 41ST***	***NNE 1/8 - 1/4 (0.237 mi.)***	***20***	***34***

Lower Elevation	Address	Direction / Distance	Map ID	Page
PACIFIC BELL	***7070 SOQUEL***	***SW 1/8 - 1/4 (0.143 mi.)***	***B8***	***11***
KRAFT'S BODY SHOP INC	***7000 SOQUEL AVENUE***	***SW 1/8 - 1/4 (0.146 mi.)***	***B9***	***16***
MASTER CLEANERS	***2660 41ST AVE***	***ENE 1/8 - 1/4 (0.177 mi.)***	***C12***	***20***

State- and tribal - equivalent CERCLIS

ENVIROSTOR: The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

A review of the ENVIROSTOR list, as provided by EDR, and dated 05/27/2009 has revealed that there is 1 ENVIROSTOR site within approximately 1 mile of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
SILVERCREST APARTMENTS Status: Active	***750 BAY AVENUE***	***ESE 1/2 - 1 (0.819 mi.)***	***30***	***55***

State and tribal leaking storage tank lists

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the State Water Resources Control Board Leaking Underground Storage Tank Information System.

A review of the LUST list, as provided by EDR, and dated 04/08/2009 has revealed that there are 10 LUST sites within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
SERVICE STATION NO 88 Status: Completed - Case Closed	2700 41ST ST	ENE 1/8 - 1/4 (0.188 mi.)	C16	29
4100 SOQUEL DR Status: Completed - Case Closed	4100 SOQUEL DR	NE 1/4 - 1/2 (0.306 mi.)	24	43

Lower Elevation	Address	Direction / Distance	Map ID	Page
PACIFIC BELL Status: Completed - Case Closed	***7070 SOQUEL***	***SW 1/8 - 1/4 (0.143 mi.)***	***B8***	***11***
SAN LORENZO LUMBER CO Status: Completed - Case Closed	***2435 41ST AVE***	***ESE 1/8 - 1/4 (0.179 mi.)***	***13***	***24***
FRITO LAY Status: Completed - Case Closed	***2825 MATTISON LN***	***WNW 1/4 - 1/2 (0.254 mi.)***	***21***	***37***
CHEVRON STATION Status: Completed - Case Closed	***5998 SOQUEL DR***	***WSW 1/4 - 1/2 (0.255 mi.)***	***22***	***39***

EXECUTIVE SUMMARY

Lower Elevation	Address	Direction / Distance	Map ID	Page
41ST AVENUE UNOCAL SERVICE Status: Completed - Case Closed	***2255 41ST AVE***	***SE 1/4 - 1/2 (0.277 mi.)***	***23***	***40***
B P OIL CO FACILITY SITE 11240 Status: Open - Verification Monitoring Status: Completed - Case Closed	***2178 41ST AVE***	***SSE 1/4 - 1/2 (0.310 mi.)***	***25***	***45***
KRAFT'S BODY SHOP INC Status: Completed - Case Closed	***6100 SOQUEL AVE***	***W 1/4 - 1/2 (0.327 mi.)***	***26***	***50***
SKILL CENTER INC Status: Open - Remediation	***2685 MATTISON LN***	***W 1/4 - 1/2 (0.359 mi.)***	***27***	***53***

State and tribal registered storage tank lists

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the State Water Resources Control Board's Hazardous Substance Storage Container Database.

A review of the UST list, as provided by EDR, and dated 04/08/2009 has revealed that there are 3 UST sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
USA GASOLINE #88	2700 41ST AVE	ENE 1/8 - 1/4 (0.188 mi.)	C17	31

Lower Elevation	Address	Direction / Distance	Map ID	Page
VALLE EUROPEAN AUTO SERVICE	2650 RESEARCH PARK DR	SW 0 - 1/8 (0.063 mi.)	A2	7
PACIFIC BELL NF508	7070 SOQUEL AVE	SW 1/8 - 1/4 (0.143 mi.)	B5	10

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Registered Storage Tanks

CA FID UST: The Facility Inventory Database contains active and inactive underground storage tank locations. The source is the State Water Resource Control Board.

A review of the CA FID UST list, as provided by EDR, and dated 10/31/1994 has revealed that there is 1 CA FID UST site within approximately 0.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
PACIFIC BELL NF-697	***7070 SOQUEL AVE***	***SW 1/8 - 1/4 (0.143 mi.)***	***B6***	***10***

EXECUTIVE SUMMARY

HIST UST: Historical UST Registered Database.

A review of the HIST UST list, as provided by EDR, and dated 10/15/1990 has revealed that there are 4 HIST UST sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
RAINTREE CAR WASH	***2731 41ST AVE***	***ENE 1/8 - 1/4 (0.182 mi.)***	***C14***	***26***
USA PETROLEUM COMPANY #88	***2700 41ST AVE***	***ENE 1/8 - 1/4 (0.188 mi.)***	***C15***	***28***

Lower Elevation	Address	Direction / Distance	Map ID	Page
PACIFIC BELL NF-697	7070 SOQUEL AVE	SW 1/8 - 1/4 (0.143 mi.)	B7	11
KMART ENTERPRISES	***2600 41ST AVE***	***E 1/8 - 1/4 (0.173 mi.)***	***11***	***20***

SWEEPS UST: Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

A review of the SWEEPS UST list, as provided by EDR, and dated 06/01/1994 has revealed that there are 4 SWEEPS UST sites within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
RAINTREE CAR WASH	***2731 41ST AVE***	***ENE 1/8 - 1/4 (0.182 mi.)***	***C14***	***26***

Lower Elevation	Address	Direction / Distance	Map ID	Page
VALLE VOLVO REPAIR	2650 RESEARCH PARK DR	SW 0 - 1/8 (0.063 mi.)	A1	7
PACIFIC BELL NF-697	***7070 SOQUEL AVE***	***SW 1/8 - 1/4 (0.143 mi.)***	***B6***	***10***
MANUEL ANECITO	3600 GROSS RD	S 1/8 - 1/4 (0.233 mi.)	19	34

Other Ascertainable Records

RCRA-NonGen: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

A review of the RCRA-NonGen list, as provided by EDR, and dated 11/12/2008 has revealed that there is 1 RCRA-NonGen site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
CALIFORNIA RADIOGRAPHICS INC	***3335 SOQUEL DR***	***NNW 1/8 - 1/4 (0.220 mi.)***	***18***	***31***

EXECUTIVE SUMMARY

HIST CORTESE: The sites for the list are designated by the State Water Resource Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES].

A review of the HIST CORTESE list, as provided by EDR, and dated 04/01/2001 has revealed that there are 5 HIST CORTESE sites within approximately 0.5 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
SAN LORENZO LUMBER CO	***2435 41ST AVE***	***ESE 1/8 - 1/4 (0.179 mi.)***	***13***	***24***
FRITO LAY	***2825 MATTISON LN***	***WNW 1/4 - 1/2 (0.254 mi.)***	***21***	***37***
CHEVRON STATION	***5998 SOQUEL DR***	***WSW 1/4 - 1/2 (0.255 mi.)***	***22***	***39***
B P OIL CO FACILITY SITE 11240	***2178 41ST AVE***	***SSE 1/4 - 1/2 (0.310 mi.)***	***25***	***45***
SKILL CENTER INC	***2685 MATTISON LN***	***W 1/4 - 1/2 (0.359 mi.)***	***27***	***53***

Notify 65: Notify 65 records contain facility notifications about any release that could impact drinking water and thereby expose the public to a potential health risk. The data come from the State Water Resources Control Board's Proposition 65 database.

A review of the Notify 65 list, as provided by EDR, and dated 10/21/1993 has revealed that there are 3 Notify 65 sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
WASH-N-DRY EM	2724 41ST STREET	ENE 0 - 1/8 (0.080 mi.)	3	7

Lower Elevation	Address	Direction / Distance	Map ID	Page
ARCO GAS STATION	819 BAY AVENUE	ESE 1/2 - 1 (0.598 mi.)	D28	55
ARCO GAS STATION	819 BAY AVENUE	ESE 1/2 - 1 (0.598 mi.)	D29	55

DRYCLEANERS: A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaners' agents; linen supply; coin-operated laundries and cleaning; drycleaning plants except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

A review of the DRYCLEANERS list, as provided by EDR, and dated 05/06/2009 has revealed that there are 2 DRYCLEANERS sites within approximately 0.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
ALL AMERICAN HONDA	***6990 SOQUEL AVE***	***SW 1/8 - 1/4 (0.147 mi.)***	***B10***	***18***
MASTER CLEANERS	***2660 41ST AVE***	***ENE 1/8 - 1/4 (0.177 mi.)***	***C12***	***20***

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
UNOCAL SERVICE STATION #2452/C/O R	SWEEPS UST
CAPITOLA CLEANERS	DRYCLEANERS
PINE MOUNTAIN LUMBER COMPANY	Notify 65, SLIC, ENVIROSTOR
MCMILLIAN RESIDENCE	CERC-NFRAP
CHEVRON STATION #1707/98958	UST
NEW BRIGHTON PUMPING STATION	UST
HOME DEPOT USA HD6968	RCRA-SQG, HAZNET
CALIFORNIA DEPARTMENT OF TRANSPORT	RCRA-SQG
OCEAN HONDA	RCRA-SQG
TESORO WEST COAST COMPANY LLC NO 6	RCRA-SQG
SOQUEL AVENUE PROPERTY	SCH, ENVIROSTOR
NEXCYCLE	SWRCY

OVERVIEW MAP - 2521766.2s

0 1/4 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: SCW2	CLIENT: Atlas Engineering Services,Inc
ADDRESS: Research Park Drive Santa Cruz CA 95073	CONTACT: Fred Yukic
LAT/LONG: 36.9844 / 121.9678	INQUIRY #: 2521766.2s
	DATE: June 17, 2009 5:59 pm

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DETAIL MAP - 2521766.2s

Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

Indian Reservations BIA

Oil & Gas pipelines

100-year flood zone

500-year flood zone

National Wetland Inventory

Areas of Concern

0 1/16 1/8 1/4 Miles

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: SCW2 ADDRESS: Research Park Drive Santa Cruz CA 95073 LAT/LONG: 36.9844 / 121.9678	CLIENT: Atlas Engineering Services,Inc CONTACT: Fred Yukic INQUIRY #: 2521766.2s DATE: June 17, 2009 6:02 pm

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MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL		1.000	0	0	0	0	NR	0
Proposed NPL		1.000	0	0	0	0	NR	0
NPL LIENS		TP	NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL		1.000	0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS		0.500	0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP		0.500	0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS		1.000	0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF		0.500	0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG		0.250	0	0	NR	NR	NR	0
RCRA-SQG		0.250	0	5	NR	NR	NR	5
RCRA-CESQG		0.250	0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS		0.500	0	0	0	NR	NR	0
US INST CONTROL		0.500	0	0	0	NR	NR	0
Federal ERNS list								
ERNS		TP	NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
RESPONSE		1.000	0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
ENVIROSTOR		1.000	0	0	0	1	NR	1
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF		0.500	0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST		0.500	0	3	7	NR	NR	10
SLIC		0.500	0	0	0	NR	NR	0
INDIAN LUST		0.500	0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
State and tribal registered storage tank lists								
UST		0.250	1	2	NR	NR	NR	3
AST		0.250	0	0	NR	NR	NR	0
INDIAN UST		0.250	0	0	NR	NR	NR	0
State and tribal voluntary cleanup sites								
VCP		0.500	0	0	0	NR	NR	0
INDIAN VCP		0.500	0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS		0.500	0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9		0.500	0	0	0	NR	NR	0
ODI		0.500	0	0	0	NR	NR	0
WMUDS/SWAT		0.500	0	0	0	NR	NR	0
SWRCY		0.500	0	0	0	NR	NR	0
HAULERS		TP	NR	NR	NR	NR	NR	0
INDIAN ODI		0.500	0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL		TP	NR	NR	NR	NR	NR	0
HIST Cal-Sites		1.000	0	0	0	0	NR	0
SCH		0.250	0	0	NR	NR	NR	0
Toxic Pits		1.000	0	0	0	0	NR	0
CDL		TP	NR	NR	NR	NR	NR	0
Local Lists of Registered Storage Tanks								
CA FID UST		0.250	0	1	NR	NR	NR	1
HIST UST		0.250	0	4	NR	NR	NR	4
SWEEPS UST		0.250	1	3	NR	NR	NR	4
Local Land Records								
LIENS 2		TP	NR	NR	NR	NR	NR	0
LUCIS		0.500	0	0	0	NR	NR	0
LIENS		TP	NR	NR	NR	NR	NR	0
DEED		0.500	0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS		TP	NR	NR	NR	NR	NR	0
CHMIRS		TP	NR	NR	NR	NR	NR	0
LDS		TP	NR	NR	NR	NR	NR	0
MCS		TP	NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA-NonGen		0.250	0	1	NR	NR	NR	1

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DOT OPS		TP	NR	NR	NR	NR	NR	0
DOD		1.000	0	0	0	0	NR	0
FUDS		1.000	0	0	0	0	NR	0
CONSENT		1.000	0	0	0	0	NR	0
ROD		1.000	0	0	0	0	NR	0
UMTRA		0.500	0	0	0	NR	NR	0
MINES		0.250	0	0	NR	NR	NR	0
TRIS		TP	NR	NR	NR	NR	NR	0
TSCA		TP	NR	NR	NR	NR	NR	0
FTTS		TP	NR	NR	NR	NR	NR	0
HIST FTTS		TP	NR	NR	NR	NR	NR	0
SSTS		TP	NR	NR	NR	NR	NR	0
ICIS		TP	NR	NR	NR	NR	NR	0
PADS		TP	NR	NR	NR	NR	NR	0
MLTS		TP	NR	NR	NR	NR	NR	0
RADINFO		TP	NR	NR	NR	NR	NR	0
FINDS		TP	NR	NR	NR	NR	NR	0
RAATS		TP	NR	NR	NR	NR	NR	0
CA BOND EXP. PLAN		1.000	0	0	0	0	NR	0
CA WDS		TP	NR	NR	NR	NR	NR	0
NPDES		TP	NR	NR	NR	NR	NR	0
Cortese		0.500	0	0	0	NR	NR	0
HIST CORTESE		0.500	0	1	4	NR	NR	5
Notify 65		1.000	1	0	0	2	NR	3
DRYCLEANERS		0.250	0	2	NR	NR	NR	2
WIP		0.250	0	0	NR	NR	NR	0
HAZNET		TP	NR	NR	NR	NR	NR	0
EMI		TP	NR	NR	NR	NR	NR	0
INDIAN RESERV		1.000	0	0	0	0	NR	0
SCRD DRYCLEANERS		0.500	0	0	0	NR	NR	0
EDR PROPRIETARY RECORDS								
EDR Proprietary Records								
Manufactured Gas Plants		1.000	0	0	0	0	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

APPENDIX B

PORTION OF SCCEHD HAZARDOUS MATERIALS FILE
ON
3801 SOQUEL DRIVE

SANTA CRUZ COUNTY HEALTH SERVICES AGENCY
ENVIRONMENTAL HEALTH SERVICE

FIELD NOTE DATA SHEET

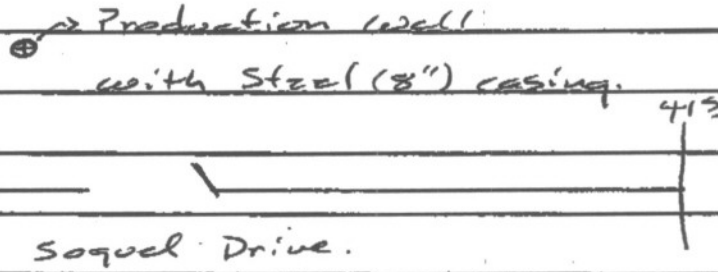
SUBJECT: Production Well Prep. for Closure

FILE 3801 Soq. Dr.

BY: Rolando

Page

DATE	
2/22/06	@ site @ Aaron (Weber Heights):



- well casing was cleaned to 160'
- Able to clean casing to bottom
will abandon well as per State Bulletin
tomorrow morning.

PHD-28
REV. 9/74

Over

SANTA CRUZ COUNTY HEALTH SERVICES AGENCY
ENVIRONMENTAL HEALTH SERVICE

FIELD NOTE DATA SHEET

SUBJECT: Prod. Well Destruction

FILE 3801 Soquel I

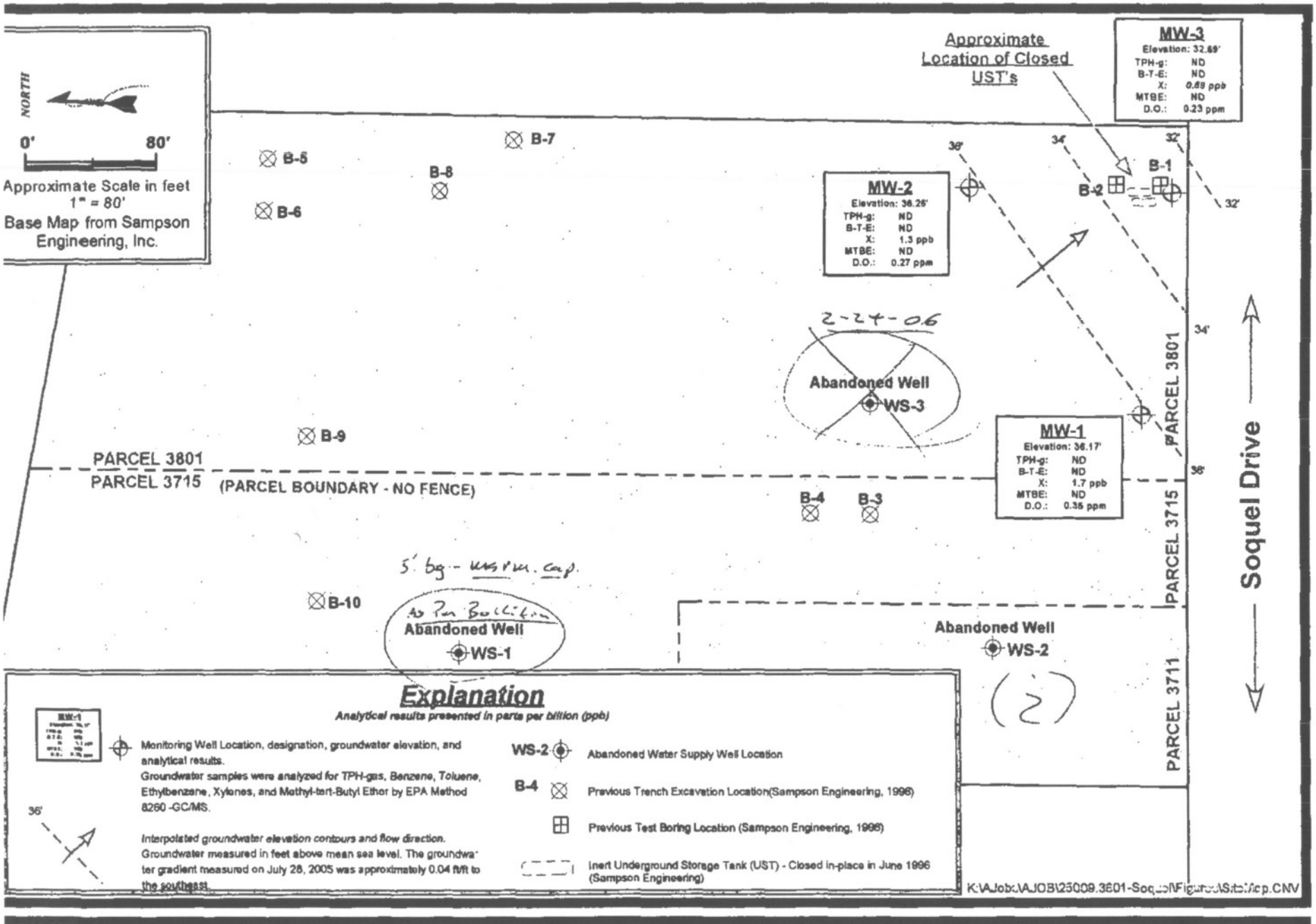
BY: Rolanda

Page

DATE	
2/24/06	@ site = Walter Hughes (Aaron):
	- H_2O @ 113'
	- Depth = 156'
	- Trémmie Pipe => 147'

PHD-28
REV. 9/74

Over ☐



Weber, Hayes & Associates
Hydrogeology and Environmental Engineering
120 Westgate Drive, Watsonville, Ca. 95076

Site Map with Groundwater Analytical Results & Groundwater Gradient - July 28, 2005
Former Markovich Property

FIGURE 2
Job #

5.0 ABANDONED WATER SUPPLY WELL CLOSURE

As outlined in our *Workplan for UST Site Cleanup and Closure,* we have completed the following steps towards properly closing two abandoned water supply wells at the site, located on parcel 3801 and parcel 3715:

- Hired a professional underground locator to aid in locating two wells reported to be buried and constructed of steel casing. The field mobilization was unsuccessful in locating these wells, as the site is littered with metallic debris left over from demolition operations.

- Uncovered an 8" diameter well casing constructed of steel on parcel 3801in an extensive effort with aid of a backhoe in a 400 foot area by 3.5 foot deep swath. We were extremely lucky in finding this well.

- Subcontracted with Maggiora Bros Drilling Inc. to extract pumps / debris from the two known supply wells on October 18, 2005.

- Subcontracted with Newman Well Surveys to video log the two known supply wells on October 2005 to check for perforation intervals, total depth, and to check for casing damage and / or obstructions in the well column.

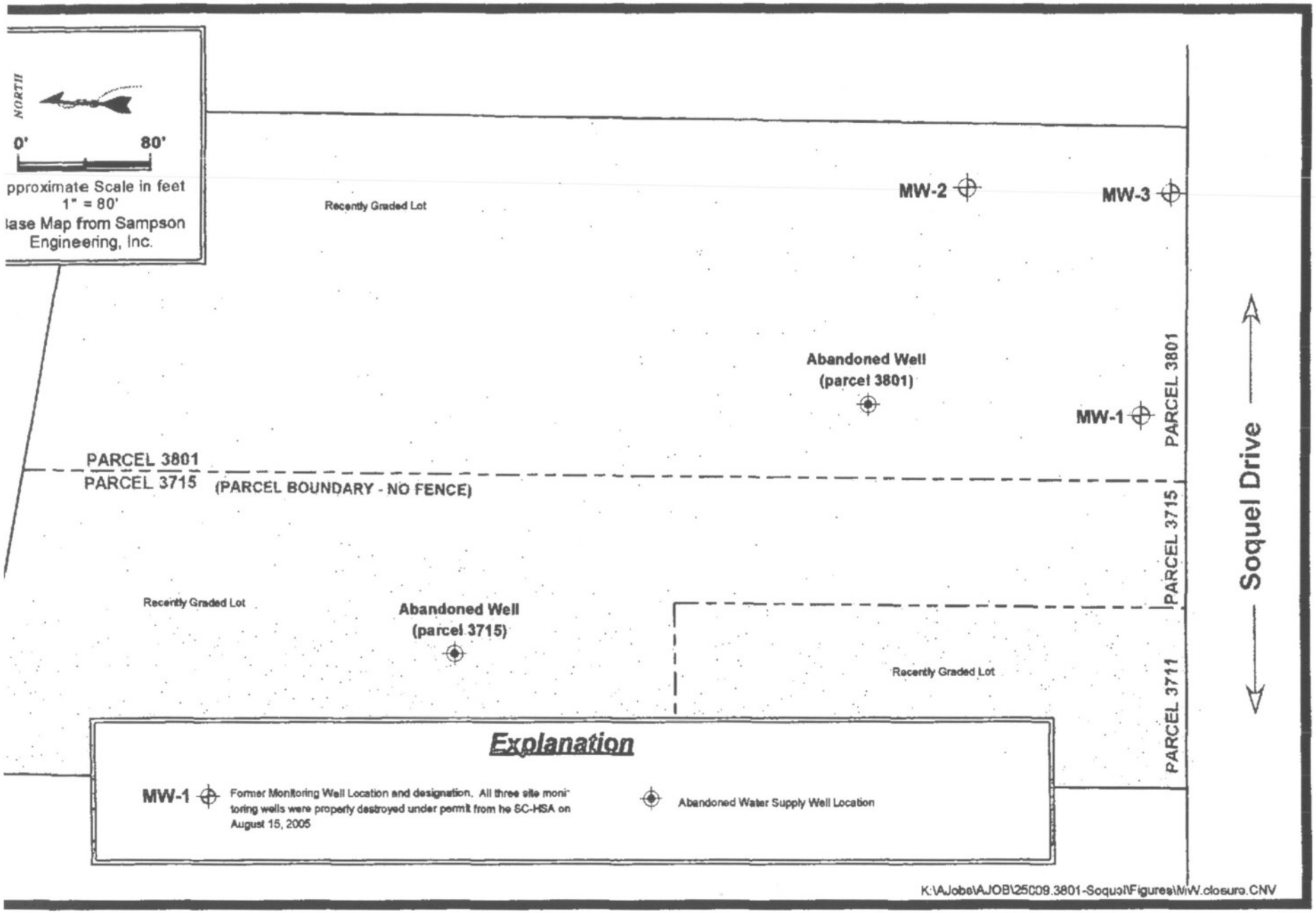
5.1 8" Steel Well - Parcel 3801: Approximately 120 feet of "screw jack" pump column was extracted from this well on October 18, 2005. No pump was attached to the extracted column. Upon video inspection, this well was discovered to be blocked with debris (i.e. soil) at approximately 7 feet bgs. The well casing was observed to be very old and decrepit.

5.2 5" PVC Well - Parcel 3715: Approximately 160 feet of PVC pump column and pump were extracted from this well on October 18, 2005. Video inspection of this well reveled "saw cut" perforations to start at 112 feet below the top of well casing (btoc). The perforations continued to the base of the well which was tagged at 162.5 btoc. Based on casing joint intervals (20 feet) the total depth of this well was determined to be 170.9 feet btoc, as the last joint was observed at 150.9 feet btoc. Based on this observation, there may be up to 8.4 feet of sediment at the base of this well. The well casing did not appear to be damaged.

6.0 CONCLUSIONS

- Three groundwater monitoring wells at the site were properly destroyed on August 15, 2005. Groundwater at the site was confirmed to be free of contamination during WHA confirmation sampling event conducted on July 28, 2005 (*Weber, Hayes and Associates*, August 3, 2005).

- A significant remedial excavation was completed in the removal of approximately 750 yds^3 of petroleum hydrocarbon impacted soils from the vicinity of a former UST system at the site. Based on



Weber, Hayes & Associates
Hydrogeology and Environmental Engineering
120 Westgate Drive, Watsonville, Ca. 95076

Site Map showing Former Monitoring Well Locations & Existing Abandoned Water Supply Well Locations

FIGURE 2
Job #

APPENDIX C

SITE INSPECTION FORM

ENVIRONMENTAL PROPERTY ASSESSMENT
FIELD CHECKLIST

SITE NAME Research Park Dr. NAME OF INSPECTOR F. Yukic

PROJECT NUMBER _____ DATE 7-1-04 TIME 3:45

		YES	NO	COMMENTS
1.	Flora/Fauna	✓		PL on E
2.	Wooded Area		✓	
3.	Stressed Vegetation		✓	
4.	Discolored or Disturbed Soils	✓		Disturbed grasses - no color
5.	Depressions/Pits	✓		3'x3' in center driving area
6.	Mounding/Piles of Soil	✓	✓	2 small mounds on S. end ea 2x2
7.	Landfills		✓	
8.	Scattered Debris	✓		scattered concrete and asphalt broken glass
9.	Solid Waste Repository		✓	
10.	Solid Waste Hauler		✓	
11.	Trails/Dead End Roads		✓	
12.	Railroad Track		✓	
13.	Railroad Spurs		✓	
14.	Building/Structures		✓	
	Discharge Outlets		✓	
	Air		✓	
	Water		✓	
15.	Noise	✓		street
16.	Dust/Smoke		✓	
17.	Unusual/Noxious Odors		✓	
18.	Surface Water		✓	
	a. Creeks		✓	
	b. Streams		✓	
	c. Rivers		✓	
	d. Ponds		✓	
	e. Wetlands		✓	
	f. Lakes		✓	
	g. Surface Impoundments	✓		N to S along E bdry
	h. Swale		✓	
	i. Drainage Ditch		✓	
19.	Discolored/Unusual Smelling Water		✓	
20.	Sanitary Sewer		✓	
21.	Storm ~~Sewer~~ Drain	✓		in street
22.	Septic System		✓	
23.	Underground Utilities	✓		Water buried street electrical to S

	YES	NO	COMMENTS
24. Pipelines		✓	
25. Water Wells		✓	
26. Monitoring Wells		✓	
27. Soil Borings		✓	
28. Underground Storage Tanks		✓	
29. Above-Ground Storage Tanks		✓	
30. Drums		✓	
31. Transformers	✓		offsite @ 4/5 corner
32. Other	✓		concrete box offside 5 6'x3'x4' separator ?
33. Other			
34. Other			
35. Describe Adjacent Land Use			

North

South

West

East

APPENDIX D

INTERVIEW FORM

Research Park Drive

7-15-09

Dawn Smithson, City of SC water

X3. USER QUESTIONNAIRE

INTRODUCTION

In order to qualify for one of the *Landowner Liability Protections (LLPs)*[35] offered by the Small Business Liability Relief and Brownfields Revitalization Act of 2001 (the "*Brownfields Amendments*"),[36] the *user* must provide the following information (if available) to the *environmental professional*. Failure to provide this information could result in a determination that "*all appropriate inquiry*" is not complete.

(1.) Environmental cleanup liens that are filed or recorded against the site (40 CFR 312.25).
Are you aware of any environmental cleanup liens against the *property* that are filed or recorded under federal, tribal, state or local law? No

(2.) Activity and land use limitations that are in place on the site or that have been filed or recorded in a registry (40 CFR 312.26).
Are you aware of any AULs, such as *engineering controls*, land use restrictions or *institutional controls* that are in place at the site and/or have been filed or recorded in a registry under federal, tribal, state or local law? Not that aware of

(3.) Specialized knowledge or experience of the person seeking to qualify for the LLP (40 CFR 312.28).
As the *user* of this *ESA* do you have any specialized knowledge or experience related to the *property* or nearby properties? No For example, are you involved in the same line of business as the current or former *occupants* of the *property* or an adjoining *property* so that you would have specialized knowledge of the chemicals and processes used by this type of business? No

(4.) Relationship of the purchase price to the fair market value of the *property* if it were not contaminated (40 CFR 312.29).
Does the purchase price being paid for this *property* reasonably reflect the fair market value of the *property*? If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the *property*? Yes, it will

(5.) Commonly known or *reasonably ascertainable* information about the *property* (40 CFR 312.30).
Are you aware of commonly known or *reasonably ascertainable* information about the *property* that would help the *environmental professional* to identify conditions indicative of releases or threatened releases? For example, as *user*,
(a.) Do you know the past uses of the *property*? ~~Yes~~ No
(b.) Do you know of specific chemicals that are present or once were present at the *property*? No
(c.) Do you know of spills or other chemical releases that have taken place at the *property*? No
(d.) Do you know of any environmental cleanups that have taken place at the *property*? No

(6.) The degree of obviousness of the presence of contamination at the *property*, and the ability to detect the contamination by appropriate investigation (40 CFR 312.31).
As the *user* of this *ESA*, based on your knowledge and experience related to the *property* are there any *obvious* indicators that point to the presence or likely presence of contamination at the *property*? No

---

[35] *Landowner Liability Protections*, or *LLPs*, is the term used to describe the three types of potential defenses to Superfund liability in EPA's *Interim Guidance Regarding Criteria Landowners Must Meet in Order to Qualify for Bona Fide Prospective Purchaser, Contiguous Property Owner, or Innocent Landowner Limitations on CERCLA Liability* ("*Common Elements*" Guide) issued on March 6, 2003.

[36] P.L. 107-118.

X3.1 In addition, certain information should be collected, if available, and provided to the *environmental professional* selected to conduct the Phase I. This information is intended to assist the *environmental professional* but is not necessarily required to qualify for one of the *LLPs*. The information includes:

(a) the reason why the Phase I is required,

(b) the type of *property* and type of *property* transaction, for example, sale, purchase, exchange, etc.,

(c) the complete and correct address for the *property* (a map or other documentation showing *property* location and boundaries is helpful),

(d) the scope of services desired for the Phase I (including whether any parties to the *property* transaction may have a required standard scope of services on whether any considerations beyond the requirements of Practice E 1527 are to be considered),

(e) identification of all parties who will rely on the Phase I *report*,

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APPENDIX D – Beltz Well Capture Zone Report

CHAMBERS GROUP

Beltz Well #12 Capture Zone Analysis Report
(Vacant Lot on Research Park Dr., Soquel, CA)

June 28, 2010

Prepared By: Leah Van Der Maaten

PURPOSE AND SCOPE

The Phase 1 Environmental Assessment dated July 15, 2009 by Atlas Engineering Services, Inc. determined that a Leaking Underground Fuel Tank (LUST) site is located close enough to the proposed Beltz Well #12 site to pose a potentially significant environmental condition that could impact the use of the site for a drinking water well. The report recommended that a capture zone analysis of the pumping production well be conducted to ascertain the likelihood of petroleum hydrocarbons from the LUST site entering the well during production. The City performed the capture zone analysis and the methods used, results, and conclusions are summarized in this report. The scope of the analysis was to calculate the capture zone for the proposed Beltz Well #12 and determine if the LUST site is within the capture zone.

BACKGROUND INFORMATION

The proposed Beltz Well #12 site, here in referred to as well site, is located on a vacant lot on Research Park Dr. in Soquel, California (APN 030-181-170). A drinking water monitoring well was constructed adjacent to the well site in a public right of way on Cory Street in November 2009. The hydrogeological information collected during the monitoring well installation was used in this capture zone analysis.

The LUST site of concern is located at 2178 41st Avenue in Capitola, California, approximately 1,650 feet (ft) southeast of the proposed well site. The following information about the site was obtained from the California State Water Resource Control Board Geotracker website:

- The case was opened in October 1992 and remediation began in October 2001.
- The contaminant of concern is Gasoline.
- Benzene and TBA are currently above the Regional Water Quality Board's cleanup goals.

The Purisma Aquifer A zone is the shallowest aquifer in the project area (Figure 2). The deepest monitoring well at the LUST site is 72.4 ft below ground surface (Stantec, 2009); therefore, the Purisma A zone is the only contaminated aquifer. The primary direction of groundwater flow at the LUST site is in the south and southeast direction, away from the well site (Stantec, 2009). The preliminary Beltz Well #12 design places the first screened interval beginning at 150 feet below ground surface, significantly deeper than the plume at the LUFT site.

METHOD OF ANALYSIS

Capture zone analyses are typically performed for pump and treat groundwater remediation projects. The capture zone analysis for this project is more straightforward than analyses used for remediation projects. Capture zone analyses for remediation projects are complex and often require modeling software because they need to address many variables, such as geological heterogeneities and time-varying influences, so that they can effectively contain and cleanup the contamination plume. The purpose of this analysis is solely to determine if the LUST site is within the capture zone of the proposed well site. The analysis was simplified by assuming a worst case scenario, as well as assuming that the water-bearing zone is homogeneous, isotropic, confined, uniform thickness, and uniform horizontal hydraulic gradient.

This capture zone analysis was performed using equations 10.16-10.18 from *Applied Hydrogeology* by C.W. Fetter; refer to Figure 5 for details. A worst case scenario was evaluated by assuming a maximum pumping rate of 800 gallons per minute (gpm), all water was assumed to come from the Purisma Aquifer A zone, and the aquifer was assumed to be confined. The following aquifer characteristics were used in the calculations: average hydraulic conductivity of 23 ft/day, saturated aquifer thickness of 130 feet (Hopkins, February 2010), and a hydraulic gradient of 0.009 in the absence of pumping (Hopkins, April 2010). The hydraulic conductivity in the A zone varied from 13 to 32 ft/day (Hopkins, February 2010). The average of these values was used in this analysis. The hydraulic gradient was determined using the static water levels of three nearby monitoring wells (Cory Street, Coffee Lane Park, and Auto Plaza Drive) and was determined to flow west (Figure 1). The reference axis of the capture zone passes through the well site and extends parallel to the direction of the hydraulic gradient.

FINDINGS

The capture zone calculations determined a stagnation point of 911 ft and a maximum half width of the 2,861 ft. The stagnation point is the radial distance in the down-gradient direction from the well site. These values produce a capture zone that is very large, extending over 8,800 ft west of the well site. This large area was adjusted to take into account the fact that the capture zone would not extend past the end of the Purisma A aquifer. Figure 2 is a map of the Pursima A zone that shows the western boundary used to shorten the capture zone. At the western boundary of the Purisma A zone the total width of the capture zone is approximately 4,800 ft. The final capture zone is shown in figure 3. The LUFT site is located outside of both the calculated and the adjusted well site capture zone.

In addition to performing the capture zone analysis, the City investigated active LUST sites within the capture zone and reviewed LUST information from the State Water Resource Control Board Geotracker website. Geotracker identified 25 LUST sites within 4,200 feet of the well site. Refer to Figure 4 for a map of the sites and Table 1 for a detailed list of these sites. A number of these sites are located outside of the capture zone

and a majority of the sites have completed their cleanups. Geotracker identified only one active LUST site within the capture zone of the proposed well site. This site is known as Skill Center Inc. and is located at 2685 Mattison Lane in Santa Cruz, approximately 2,000 ft from the well site. On May 12, 2010 Mr. John Gerbrandt from the Santa Cruz County Environmental Health Department informed us that contrary to what was reported on Geotracker, the cleanup of this LUST site is complete and the case is closed.

CONCLUSIONS

Based on this analysis, it appears that the LUST site located at 2178 41st Avenue does not pose a potentially significant environmental condition that could impact the use of the site for a drinking water well for the following reasons:

- The LUST site is outside of the capture zone. Groundwater outside of the well site capture zone does not drain into the pumping well.
- The contamination is much shallower than the depth of the proposed well perforations.
- The groundwater at the LUST site flows away from the well site.

There are no other active LUST sites within the capture zone of the well site.

REFERENCES

Fetter, C.W. (2001). Applied Hydrogeology. Fourth Edition. (pp.436-437)

CA State Water Resources Control Board GeoTracker. BP#11240. Retrieved May 5, 2010, from https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0608700078

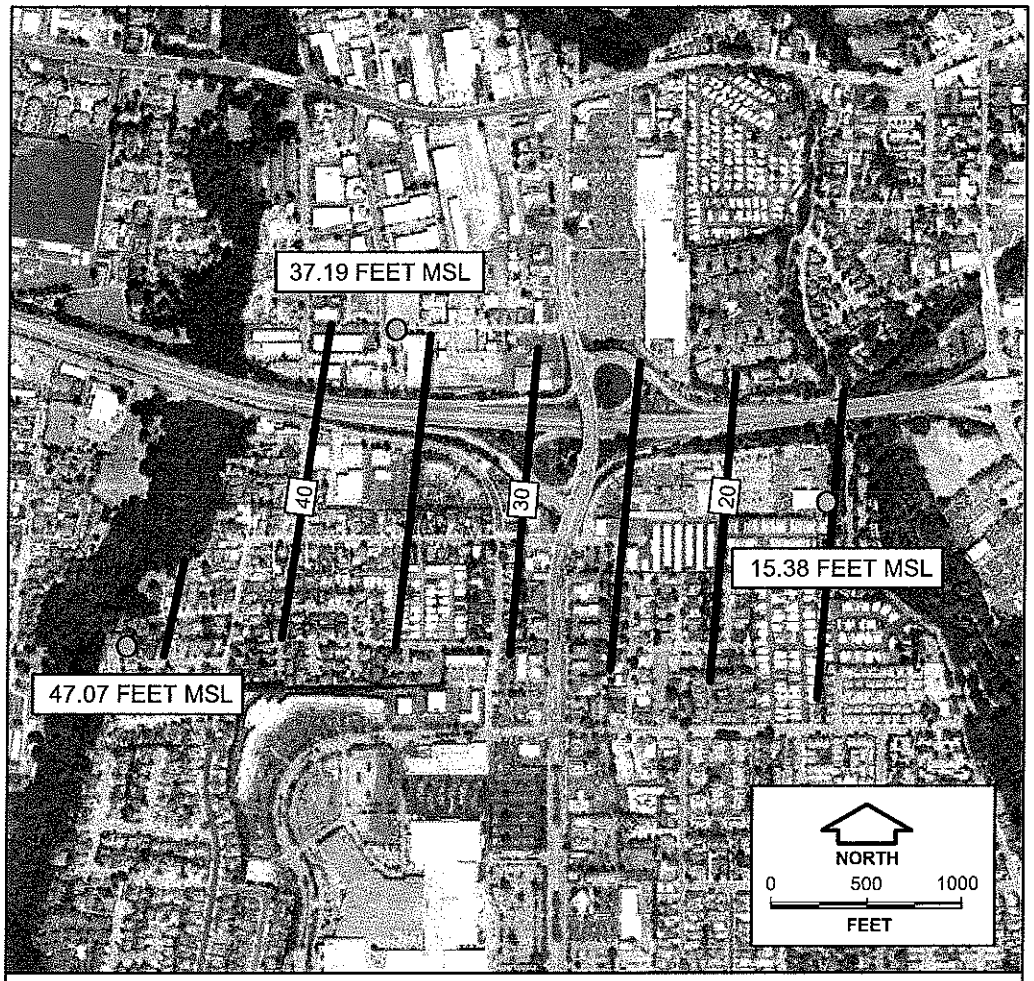
Hopkins Groundwater Consultants, Inc. (February 2010). Summary of Operations Report City of Santa Cruz Beltz Monitoring Well Construction Project Cory Street Well Site. (pp. 6-10)

Stantec. (January 19, 2009). Quarterly Groundwater Monitoring and Remediation Progress Report, Fourth Quarter 2008, Former BP Service Station No. 11240. (Table 5)

Hopkins Groundwater Consultants. (April 2010). Groundwater Gradient Map Project No. 01-010-08A.

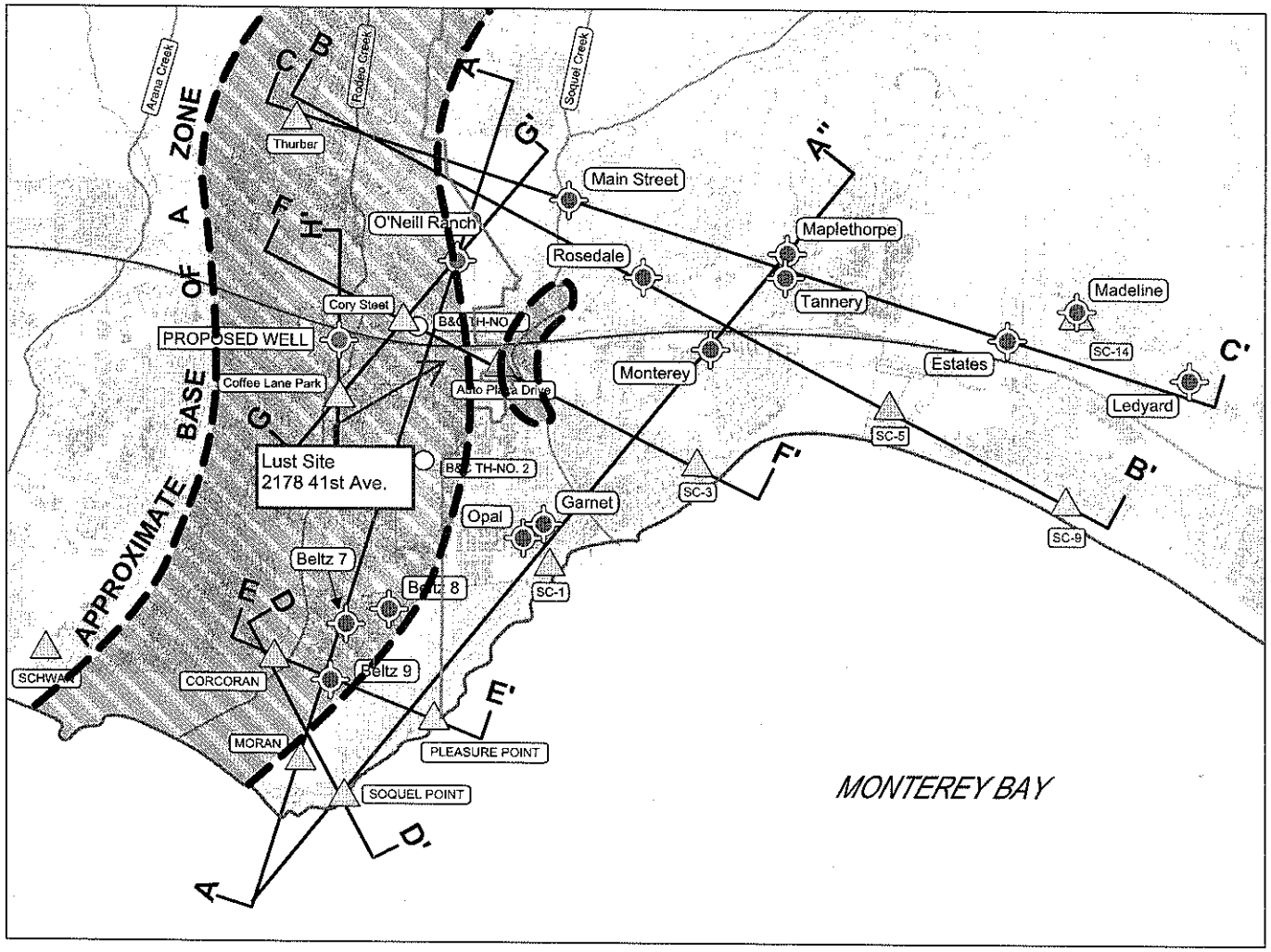
CA State Water Resources Control Board GeoTracker. Geotracker Map and Site List. Retrieved June 7, 2010, from https://geotracker.waterboards.ca.gov/map/?global_id=T0608700078

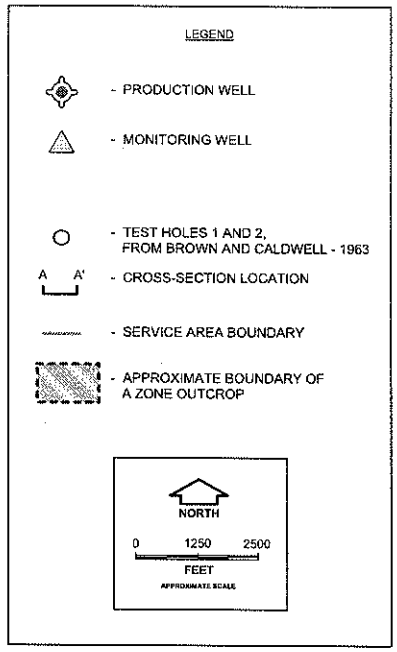
HOPKINS
GROUNDWATER
CONSULTANTS



GROUNDWATER GRADIENT: I = 0.009 (DIMENSIONLESS)

GROUNDWATER GRADIENT MAP
City of Santa Cruz
Santa Cruz, California





HYDROGEOLOGICAL CROSS-SECTION LOCATION MAP
Hydrogeological Conditions Study of Live Oak-Capitola Area
City of Santa Cruz
Santa Cruz, California

FIGURE 3

RESEARCH PARK DRIVE WELL SITE

CAPTURE ZONE ANALYSIS

800 GPM PUMPING RATE

SOQUEL, CALIFORNIA

MAY 11, 2010

LEGEND:

BOUNDARY OF CAPTURE ZONE

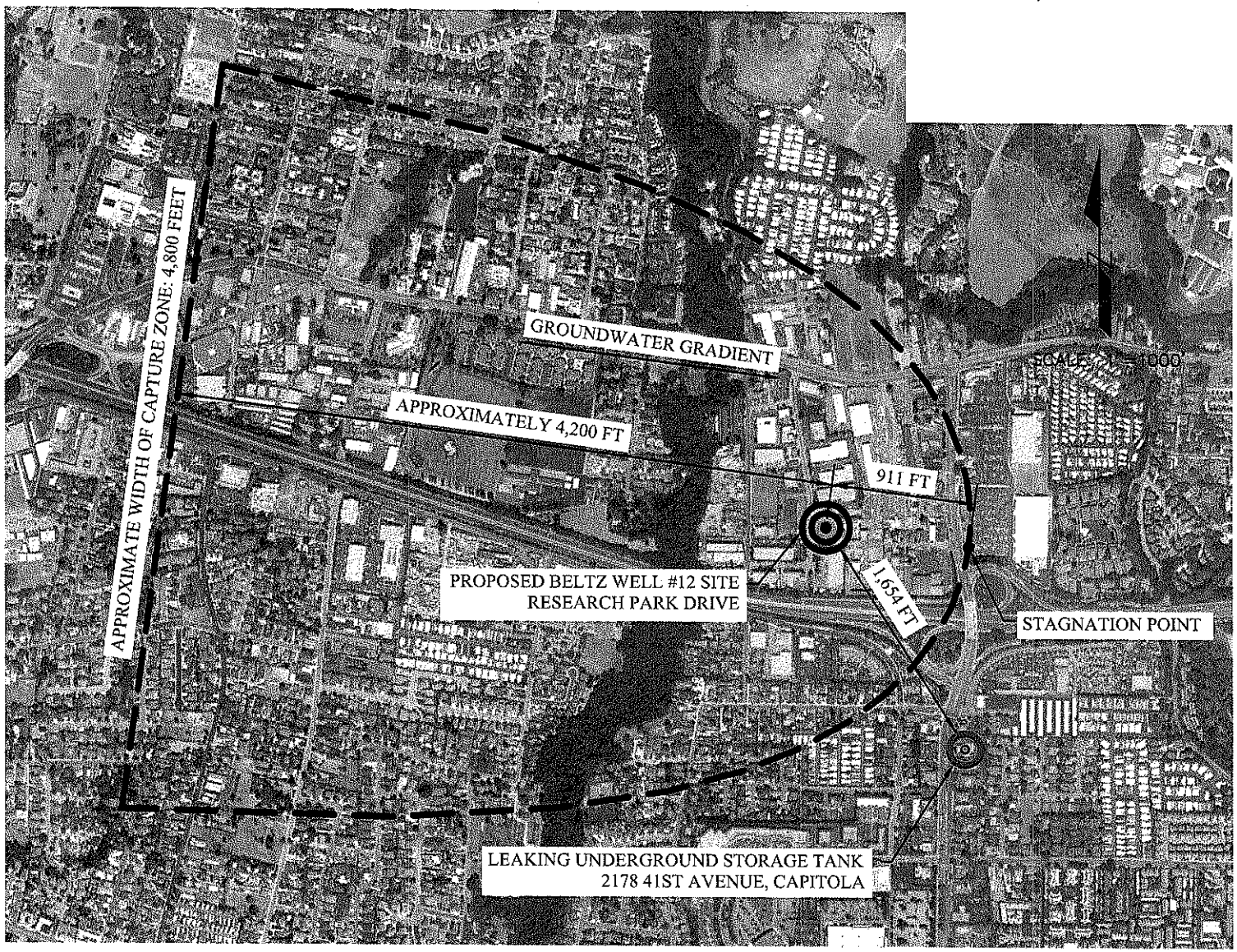


Figure 4

LINK TO THIS MAP

GEOTRACKER

LAYERS

- [x] Leaking Underground Tank (LUST) Cleanup Sites
- [x] Other Cleanup Sites
- [x] Land Disposal Sites
- [x] Military Sites
- [ ] Permitted Underground Storage Tank (UST) Facilities
- [x] Monitoring Wells
- [ ] DTSC Cleanup Sites
- [ ] DTSC Haz Waste Permit

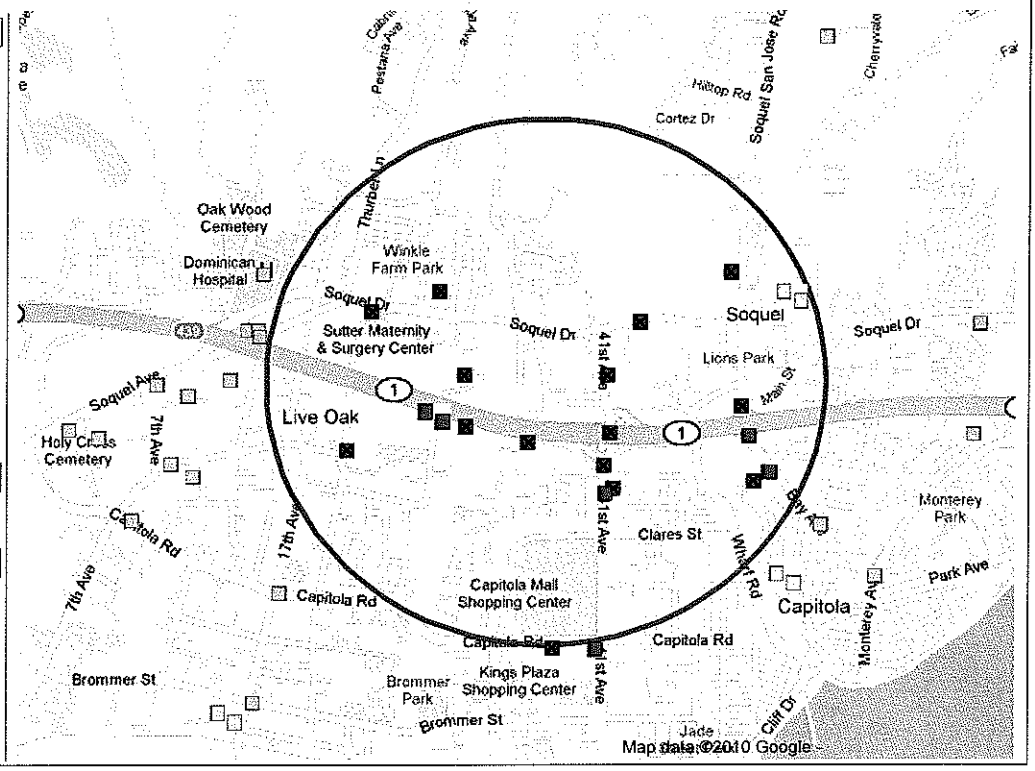
MAP SIZE

640x480

OPTIONS

- [ ] Site List - EXPORT TO EXCEL

25 Sites



[x] SHOW SITES WITHIN 4200 FEET OF THE FOLLOWING ADDRESS: Research Park Drive & Cory Street, Soquel [Go]

MAP AN ADDRESS: Research Park Drive & Cory Street, Soquel [Go!]

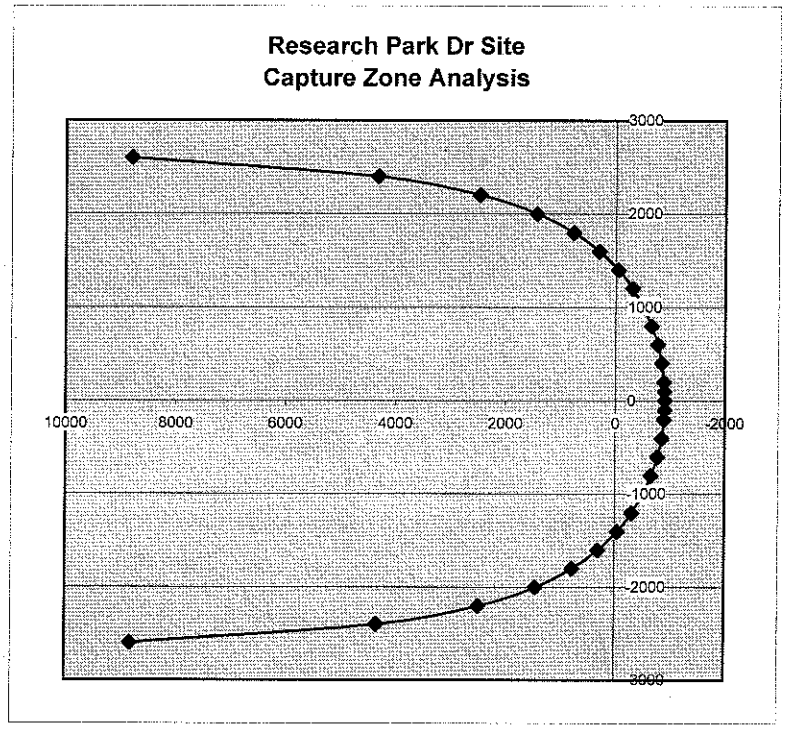
Table 1: Geotracker sites within 4,200ft of proposed Beltz Well #12 site at Research Park Drive & Cory Street, Soquel CA

GEOTRACKER ID	SITE NAME	CLEANUP STATUS	ADDRESS	CITY	Within Capture Zone
T060876507	PACIFIC BELL FLEET OPERATIONS	COMPLETED - CASE CLOSED	7070 SOQUEL AVENUE	SANTA CRUZ	yes
T0608700160	SERVICE STATION NO 88	COMPLETED - CASE CLOSED	2700 41ST ST	SOQUEL	yes
T0608700067	SAN LORENZO LUMBER CO	COMPLETED - CASE CLOSED	2435 41ST AVE	SANTA CRUZ	yes
T0608700119	TOSCO SERVICE STATION #4902	COMPLETED - CASE CLOSED	2255 41ST AVE	CAPITOLA	no
T0608700108	COCA-COLA ENTERPRISES - WEST	COMPLETED - CASE CLOSED	6100 SOQUEL AVE	SANTA CRUZ	yes
T0608700195	FRITO LAY	COMPLETED - CASE CLOSED	2825 MATTISON LN	SANTA CRUZ	yes
T0608700078	BP #11240	OPEN - SITE ASSESSMENT	2178 41ST AVE	CAPITOLA	no
T0608700238	BP OIL FACILITY NO. 11240	COMPLETED - CASE CLOSED	2178 41ST AVE	CAPITOLA	no
T0608700221	CHEVRON STATION	COMPLETED - CASE CLOSED	5998 SOQUEL DR	SANTA CRUZ	yes
T0608700231	SKILL CENTER INC	OPEN - REMEDIATION	2685 MATTISON LN	SANTA CRUZ	yes
T0608700170	4100 SOQUEL DR	COMPLETED - CASE CLOSED	4100 SOQUEL DR	SOQUEL	no
T0608700297	JIMMY SMITH PLUMBING	COMPLETED - CASE CLOSED	3098 WINKLE AVE	SANTA CRUZ	yes
T0608700250	ARCO STATION	COMPLETED - CASE CLOSED	2407 PORTER ST	SOQUEL	no
T0608700308	ULTRAMAR BEACON	COMPLETED - CASE CLOSED	2210 SOQUEL DR	SANTA CRUZ	yes
T0608700168	FORMER EXXON 7-0281	OPEN - VERIFICATION MONITORING	2501 MAIN ST S	SOQUEL	no
T0608700005	FORMER EXXON 7-3604	OPEN - VERIFICATION MONITORING	836 BAY AVE	CAPITOLA	no
T0608700006	EXXON STATION 7-0281 FIRST LEA	COMPLETED - CASE CLOSED	2501 MAIN ST S	SOQUEL	no
T0608700070	CENTRAL COUNTY GARBAGE	COMPLETED - CASE CLOSED	2230 CHANTICLEER ST	SANTA CRUZ	yes
T0608700053	DANCO PROPERTY	COMPLETED - CASE CLOSED	2185 CHANTICLEER ST	SANTA CRUZ	yes
T0608700052	SOQUEL PUMP STATION	COMPLETED - CASE CLOSED	809 BAY AVE	CAPITOLA	no
T0608700245	PONZA BROTHERS YARD	COMPLETED - CASE CLOSED	3131 PORTER ST	SOQUEL	no
T0608700265	REDTREE PROPERTIES	OPEN - SITE ASSESSMENT	819 BAY AVE	CAPITOLA	no
T0608700140	GOODYEAR TIRE AND RUBBER COMPA	COMPLETED - CASE CLOSED	3800 CAPITOLA RD	CAPITOLA	no
T0608742250	SHELL SERVICE STATION	OPEN - SITE ASSESSMENT	1649 41ST AVE	CAPITOLA	no
T0608700242	TOSCO - FACILITY #2452	OPEN - REMEDIATION	4860 SOQUEL DR	SOQUEL	no

Figure 5
Capture Zone Analysis
Site: Research Park Dr/Cory St

Maximum Well Pumping Rate (gpm), Q	800
Q (ft^3/day)	154000
Hydraulic Conductivity (ft/day), K	23
Saturated Thickness (ft), b	130
Hydraulic Gradient (dimensionless), i	0.009
stagnation point, x_o=-Q/(2*3.1416*Kbi)	-911
half width of capture zone, y_{max}=Q/(2Kbi)	2861

y	x=-y/[tan(2*3.1416*Kbiy/Q)]
2600	8810
2400	4325
2200	2477
2000	1443
1800	773
1600	301
1400	-47
1200	-311
1000	-512
800	-664
600	-775
400	-851
200	-896
100	-907
1	-911
-100	-907
-200	-896
-400	-851
-600	-775
-800	-664
-1000	-512
-1200	-311
-1400	-47
-1600	301
-1800	773
-2000	1443
-2200	2477
-2400	4325
-2600	8810



APPENDIX E – Water Quality Evaluation

CHAMBERS GROUP

MWH
LABORATORIES
A Division of MWH Americas, Inc.

750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Report

for

City of Santa Cruz
Water Quality Laboratory
715 Graham Hill Road
Santa Cruz, CA 95060
Attention: Hugh Dalton
Fax: 831-420-5481

Date of Issue
06/28/2010
Yolanda Martin
MWH LABORATORIES

YOM: Yolanda.O.Martin

Project Manager

ACCREDITED IN ACCORDANCE WITH nelac 01114CA

Report#: 335889
Project: SOURCE
Group: VOC & 525
PO#: 96-10035

Laboratory certifies that the test results meet all **NELAC** requirements unless noted in the Comments section or the Case Narrative. Following the cover page are Hits Reports, Comments, QC Summary, QC Report and Regulatory Forms. This report shall not be reproduced except in full, without the written approval of the laboratory.

MWH Laboratories

750 Royal Oaks Drive Suite 100, Monrovia, Ca 91016
Phone 626-386-1100/Fax: 626-386-1101

Acknowledgement of Samples Received

City of Santa Cruz
715 Graham Hill Road
Santa Cruz, CA 95060
Attn: Hugh Dalton
Phone: 831-420-5484

Customer Code: SANTACRUZ-CA
Group #: 335889
Project #: SOURCE
Sample Group: VOC & 525
Project Manager: Yolanda.O.Martin
Phone: 626-386-1104
PO #: 96-10035

The following samples were received from you on **June 11, 2010**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using MWH Laboratories.

Sample #	Sample Id	Sample Date
201006120044	Auto Plaza Deep MW_AP_DEEP	10-Jun-2010 0945
	@ML525	
201006120045	Auto Plaza Medium MW_AP_MED	10-Jun-2010 1045
	@ML525	
201006120046	Auto Plaza Shallow MW_AP_SHAL	10-Jun-2010 1100
	@ML525	
201006120047	Cory Stree Shallow MW_CORY_SHAL	10-Jun-2010 1135
	@VOASDWA	
201006120048	Travel Blank	10-Jun-2010 0000
	@VOASDWA TB	

Test Description

@ML525 -- Semivolatiles by GCMS
@VOASDWA -- Volatile Organics by GCMS
@VOASDWA TB -- Volatile Organics by GCMS

335889

Blank

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

CHAIN OF CUSTODY RECORD

MWH LABS USE ONLY:

LOGIN COMMENTS: _____

SAMPLE TEMP WHEN REC'D AT LAB: 6/ (Compliance: 4 +/- 2°C)

CONDITION OF BLUE ICE: FROZEN ___ PARTIALLY FROZEN ___ THAWED ___

SAMPLES CHECKED AGAINST COC BY: JJ

SAMPLES LOGGED IN BY: JS

SAMPLES REC'D DAY OF COLLECTION? [ ] (check for yes)

TO BE COMPLETED BY SAMPLER:

COMPANY, UTILITY or PROJECT:	SYSTEM #:	COMPLIANCE SAMPLES (check for yes) [ ] - Requires state forms [ ]	NON-COMPLIANCE SAMPLES (check for yes) [X] REGULATION INVOLVED: None (eg. SDWA, Phase V, NPDES, FDA,...)
City of Santa Cruz Water Quality Laboratory		Type of samples (circle one): ROUTINE SPECIAL CONFIRMATION	
MWH LABS CLIENT CODE: SANTACRUZ-CA	**P.O.# / PROJECT JOB #:** 91-10035	***SEE ATTACHED BOTTLE ORDER FOR ANALYSES*** [X] (check for yes), ***OR*** list ANALYSES REQUIRED (enter number of bottles sent for each test for each sample)	

SAMPLER PRINTED NAME AND SIGNATURE: Lindsay Neun Lindsay Neun

TAT requested: rush by adv notice only
STD_X_ 1 wk ___ 3 day __ 2 day___ 1 day __

SAMPLE DATE	SAMPLE TIME	STATION # or LOCATION	SITE NAME OR SAMPLE I.D.	MATRIX *	GRAB	COMP	CRVI-LOW	ML 525	VOASDWA											SAMPLER COMMENTS
6-/10/10	945	Auto Plaza Deep	MW_AP_DEEP				X	X												
6-/10/10	1045	Auto Plaza Medium	MW_AP_MED				X	X												
6-/10/10	1100	Auto Plaza Shallow	MW_AP_SHAL				X	X												
6-/10/10	1135	Cory Stree Shallow	MW_CORY_SHAL				X		X											

3/43

This portion can be removed for Recipient's records.

Date 6/10/10 FedEx Tracking Number 870491054070

Sender's Name Lindsay Neun Phone 831 420-5480

Company CITY OF SANTA CRUZ/WATER Q LAB

Address 715 GRAHAM HILL RD Dept./Floor/Suite/Room

City SANTA CRUZ State CA ZIP 95060

Our Internal Billing Reference

*** MATRIX TYPES:** RSW = Raw Surface Water; RGW = Raw Ground Water; CFW = Chlor(am)inated Finished Water; FW = Other Finished Water; CWW = Chlorinated; WW = Other Waste Water; SW = Storm Water; SL = Sludge

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
RELINQUISHED BY:	Lindsay Neun	Lindsay Neun	City of Santa Cruz/Chemist	6/10/10	1300
RECEIVED BY:	Joe Sanchez	JOE Sanchez	MWH	6-11-10	1125
RELINQUISHED BY:					
RECEIVED BY:					

C-O-C# _____

PAGE 1 OF ____

NOTE: SHORT HOLD TIME ON CRVI-LOW

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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Flags Legend:

E6 - Concentration estimated. Internal standard recoveries did not meet method acceptance criteria.

L4 - The associated blank spike recovery was below method acceptance limits.

LK - The associated blank spike recovery was above method acceptance limits. This target analyte was not detected in the sample.

M2 - Matrix spike recovery was low; the associated blank spike recovery was acceptable.

MC - Matrix spike recovery was high; the associated blank spike recovery was acceptable. MS/MSD RPD met acceptance criteria.

R1 - RPD/RSD exceeded the method acceptance limit.

R6 - LFB/LFBD RPD exceeded the method acceptance limit. Recovery met acceptance criteria.

S6 - Surrogate recovery was below laboratory and method acceptance limits. Re-extraction and/or reanalysis confirms low recovery caused by matrix effect.

The Comments Report may be blank if there are no comments for this report.

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Fax: 626 386 1101
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Laboratory
Hits Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL

SUMMARY OF POSITIVE DATA ONLY

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Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Auto Plaza Deep MW AP DEEP (201006120044) **Sampled on 06/10/2010 0945**

EPA 525.2 - Semivolatiles by GCMS

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	2,4-Dinitrotoluene	ND (L4)	ug/L	0.1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Acenaphthylene	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Alachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Aldrin	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	alpha-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Anthracene	ND	ug/L	0.02	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Atrazine	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Benz(a)Anthracene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Benzo(a)pyrene	ND (E6,S6)	ug/L	0.02	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Benzo(b)Fluoranthene	ND (E6,S6)	ug/L	0.02	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Benzo(g,h,i)Perylene	ND (E6,S6)	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Benzo(k)Fluoranthene	ND (E6,S6)	ug/L	0.02	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Bromacil	ND (L4)	ug/L	0.2	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Butachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Butylbenzylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Caffeine by method 525mod	ND (L4)	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Chrysene	ND (E6,S6)	ug/L	0.02	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND (E6,S6)	ug/L	0.6	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/L	0.6	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Di-n-Butylphthalate	ND	ug/L	1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Diazinon (Qualitative)	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Dibenz(a,h)Anthracene	ND (E6,S6)	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Dieldrin	ND	ug/L	0.2	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Diethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Dimethoate	ND (L4)	ug/L	0.1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Dimethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Endrin	ND	ug/L	0.2	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Fluoranthene	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Fluorene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	gamma-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:01	559437	(EPA 525.2)	Heptachlor	ND	ug/L	0.03	1

Rounding on totals after summation.
(c) - indicates calculated results

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750 Royal Oak Dr., Suite 100
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Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed		QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Heptachlor Epoxide (isomer B)	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Hexachlorobenzene	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND (E6,S6)	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Isophorone	ND	ug/L	0.5	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Lindane	ND	ug/L	0.04	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Methoxychlor	ND (E6,S6)	ug/L	0.1	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Metolachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Metribuzin	ND (L4)	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Molinate	ND	ug/L	0.1	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Pentachlorophenol	ND	ug/L	1	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Phenanthrene	ND	ug/L	0.04	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Propachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Pyrene	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Simazine	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Thiobencarb (ELAP)	ND	ug/L	0.2	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	trans-Nonachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Trifluralin	ND	ug/L	0.1	1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	1,3-Dimethyl-2-nitrobenzene	100	%		1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Acenaphthene-d10	75	%		1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Chrysene-d12	30	%		1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Perylene-d12	54	%		1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Phenanthrene-d10	72	%		1
6/21/2010	06/24/2010	18:01	559437	(EPA 525.2)	Triphenylphosphate	114	%		1

Auto Plaza Medium MW_AP_MED (201006120045) **Sampled on 06/10/2010 1045**

EPA 525.2 - Semivolatiles by GCMS

6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	2,4-Dinitrotoluene	ND (L4)	ug/L	0.1	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Acenaphthylene	ND	ug/L	0.1	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Alachlor	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Aldrin	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	alpha-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Anthracene	ND	ug/L	0.02	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Atrazine	ND	ug/L	0.05	1

Rounding on totals after summation.
(c) - indicates calculated results

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Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Benz(a)Anthracene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Benzo(a)pyrene	ND	ug/L	0.02	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Benzo(b)Fluoranthene	ND	ug/L	0.02	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Benzo(g,h,i)Perylene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Benzo(k)Fluoranthene	ND	ug/L	0.02	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Bromacil	ND (L4)	ug/L	0.2	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Butachlor	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Butylbenzylphthalate	ND	ug/L	0.5	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Caffeine by method 525mod	ND (L4)	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Chrysene	ND	ug/L	0.02	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND (M2)	ug/L	0.6	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Di-n-Butylphthalate	ND	ug/L	1	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Diazinon (Qualitative)	ND	ug/L	0.1	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Dibenz(a,h)Anthracene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Dieldrin	ND	ug/L	0.2	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Diethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Dimethoate	ND (L4)	ug/L	0.1	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Dimethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Endrin	ND	ug/L	0.2	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Fluoranthene	ND	ug/L	0.1	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Fluorene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	gamma-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Heptachlor	ND	ug/L	0.03	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Heptachlor Epoxide (isomer B)	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Hexachlorobenzene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Isophorone	ND	ug/L	0.5	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Lindane	ND	ug/L	0.04	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Methoxychlor	ND (MC)	ug/L	0.1	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Metolachlor	ND	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Metribuzin	ND (L4)	ug/L	0.05	1
6/21/2010	06/25/2010 14:16	559438	(EPA 525.2)	Molinate	ND	ug/L	0.1	1

Rounding on totals after summation.
(c) - indicates calculated results

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Monrovia, California, 91016-3629
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1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed		QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Pentachlorophenol	ND	ug/L	1	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Phenanthrene	ND	ug/L	0.04	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Propachlor	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Pyrene	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Simazine	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Thiobencarb (ELAP)	ND	ug/L	0.2	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	trans-Nonachlor	ND	ug/L	0.05	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Trifluralin	ND	ug/L	0.1	1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	1,3-Dimethyl-2-nitrobenzene	99	%		1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Acenaphthene-d10	98	%		1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Chrysene-d12	69	%		1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Perylene-d12	95	%		1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Phenanthrene-d10	99	%		1
6/21/2010	06/25/2010	14:16	559438	(EPA 525.2)	Triphenylphosphate	111	%		1

Auto Plaza Shallow MW_AP_SHAL (201006120046) **Sampled on 06/10/2010 1100**

EPA 525.2 - Semivolatiles by GCMS

6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	2,4-Dinitrotoluene	ND (L4)	ug/L	0.1	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Acenaphthylene	ND	ug/L	0.1	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Alachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Aldrin	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	alpha-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Anthracene	ND	ug/L	0.02	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Atrazine	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Benz(a)Anthracene	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Benzo(a)pyrene	ND	ug/L	0.02	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Benzo(b)Fluoranthene	ND	ug/L	0.02	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Benzo(g,h,i)Perylene	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Benzo(k)Fluoranthene	ND	ug/L	0.02	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Bromacil	ND (L4)	ug/L	0.2	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Butachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Butylbenzylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Caffeine by method 525mod	ND (L4)	ug/L	0.05	1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Chrysene	ND	ug/L	0.02	1

Rounding on totals after summation.
(c) - indicates calculated results

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Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/L	0.6	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Di-n-Butylphthalate	ND	ug/L	1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Diazinon (Qualitative)	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Dibenz(a,h)Anthracene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Dieldrin	ND	ug/L	0.2	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Diethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Dimethoate	ND (L4)	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Dimethylphthalate	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Endrin	ND	ug/L	0.2	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Fluoranthene	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Fluorene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	gamma-Chlordane	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Heptachlor	ND	ug/L	0.03	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Heptachlor Epoxide (isomer B)	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Hexachlorobenzene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Isophorone	ND	ug/L	0.5	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Lindane	ND	ug/L	0.04	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Methoxychlor	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Metolachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Metribuzin	ND (L4)	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Molinate	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Pentachlorophenol	ND	ug/L	1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Phenanthrene	ND	ug/L	0.04	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Propachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Pyrene	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Simazine	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Thiobencarb (ELAP)	ND	ug/L	0.2	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	trans-Nonachlor	ND	ug/L	0.05	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Trifluralin	ND	ug/L	0.1	1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	1,3-Dimethyl-2-nitrobenzene	100	%		1
6/21/2010	06/24/2010 18:49	559437	(EPA 525.2)	Acenaphthene-d10	97	%		1

Rounding on totals after summation.
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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed		QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Chrysene-d12	67	%		1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Perylene-d12	95	%		1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Phenanthrene-d10	96	%		1
6/21/2010	06/24/2010	18:49	559437	(EPA 525.2)	Triphenylphosphate	112	%		1

Cory Stree Shallow MW CORY SHAL (201006120047) **Sampled on 06/10/2010 1135**

EPA 524.2 - Volatile Organics by GCMS

6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1,1-Trichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1,2-Trichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1-Dichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,1-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2,3-Trichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2-Dichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2-Dichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,3-Dichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	2,2-Dichloropropane	ND (R6)	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	2-Butanone (MEK)	ND	ug/L	5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Benzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromochloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromodichloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromoethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromoform	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Bromomethane (Methyl Bromide)	ND (LK,R1)	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Carbon disulfide	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Carbon Tetrachloride	ND (R6)	ug/L	0.5	1

Rounding on totals after summation.
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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Chlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Chlorodibromomethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Chloroethane	ND (LK,R1)	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Di-isopropyl ether	ND	ug/L	3	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Dibromomethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Dichlorodifluoromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Dichloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Ethyl benzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Hexachlorobutadiene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Isopropylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	m,p-Xylenes	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	n-Butylbenzene	ND (R6)	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	n-Propylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Naphthalene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	o-Chlorotoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	o-Xylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	p-Chlorotoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	p-Isopropyltoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	sec-Butylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Styrene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	tert-amyl Methyl Ether	ND	ug/L	3	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/L	3	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	tert-Butylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Toluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 19:51	558133	(EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/L	0.5	1

Rounding on totals after summation.
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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed		QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Total THM	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Total xylenes	ND	ug/L	1	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Trichloroethylene (TCE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Trichlorofluoromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Vinyl chloride (VC)	ND	ug/L	0.3	1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	1,2-Dichloroethane-d4	115	%		1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	4-Bromofluorobenzene	100	%		1
6/15/2010	06/15/2010	19:51	558133	(EPA 524.2)	Toluene-d8	101	%		1

Travel Blank (201006120048) **Sampled on 06/10/2010 0000**

EPA 524.2 - Volatile Organics by GCMS

6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1,1-Trichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1,2-Trichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1-Dichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,1-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2,3-Trichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2-Dichloroethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,2-Dichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	1,3-Dichloropropane	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	2,2-Dichloropropane	ND (R6)	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	2-Butanone (MEK)	ND	ug/L	5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	Benzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010	20:15	558133	(EPA 524.2)	Bromobenzene	ND	ug/L	0.5	1

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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Data
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Samples Received on:
06/11/2010

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Bromochloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Bromodichloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Bromoethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Bromoform	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Bromomethane (Methyl Bromide)	ND (LK,R1)	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Carbon disulfide	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Carbon Tetrachloride	ND (R6)	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Chlorobenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Chlorodibromomethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Chloroethane	ND (LK,R1)	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Di-isopropyl ether	ND	ug/L	3	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Dibromomethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Dichlorodifluoromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Dichloromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Ethyl benzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Hexachlorobutadiene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Isopropylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	m,p-Xylenes	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	n-Butylbenzene	ND (R6)	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	n-Propylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Naphthalene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	o-Chlorotoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	o-Xylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	p-Chlorotoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	p-Isopropyltoluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	sec-Butylbenzene	ND	ug/L	0.5	1

Rounding on totals after summation.
(c) - indicates calculated results

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Laboratory Data
Report: 335889

City of Santa Cruz
Water Quality Laboratory
Hugh Dalton
715 Graham Hill Road
Santa Cruz, CA 95060

Samples Received on:
06/11/2010

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Styrene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	tert-amyl Methyl Ether	ND	ug/L	3	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/L	3	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	tert-Butylbenzene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Toluene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Total THM	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Total xylenes	ND	ug/L	1	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Trichloroethylene (TCE)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Trichlorofluoromethane	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Vinyl chloride (VC)	ND	ug/L	0.3	1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	1,2-Dichloroethane-d4	117	%		1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	4-Bromofluorobenzene	98	%		1
6/15/2010	06/15/2010 20:15	558133	(EPA 524.2)	Toluene-d8	99	%		1

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QC Ref # 558133 - Volatile Organics by GCMS **Analysis Date: 06/15/2010**

201006120047	Cory Stree Shallow MW_CORY_SHAL	Analyzed by: MCB
201006120048	Travel Blank	Analyzed by: MCB

QC Ref # 559437 - Semivolatiles by GCMS **Analysis Date: 06/24/2010**

201006120044	Auto Plaza Deep MW_AP_DEEP	Analyzed by: JWC
201006120044	Auto Plaza Deep MW_AP_DEEP	Analyzed by: JWC
201006120046	Auto Plaza Shallow MW_AP_SHAL	Analyzed by: JWC

QC Ref # 559438 - Semivolatiles by GCMS **Analysis Date: 06/25/2010**

201006120045	Auto Plaza Medium MW_AP_MED	Analyzed by: JWC

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Laboratory
QC Report: 335889

City of Santa Cruz

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
QC Ref# 558133 - Volatile Organics by GCMS by EPA 524.2						**Analysis Date: 06/15/2010**			
LCS1	1,1,1,2-Tetrachloroethane		5.0	4.4	ug/L	88	(70-130)		
LCS2	1,1,1,2-Tetrachloroethane		5.0	3.94	ug/L	79	(70-130)	20	11
MBLK	1,1,1,2-Tetrachloroethane			<0.25	ug/L				
MRL_CHK	1,1,1,2-Tetrachloroethane		0.5	0.480	ug/L	96	(50-150)		
LCS1	1,1,1-Trichloroethane		5.0	5.54	ug/L	111	(70-130)		
LCS2	1,1,1-Trichloroethane		5.0	4.56	ug/L	91	(70-130)	20	19
MBLK	1,1,1-Trichloroethane			<0.25	ug/L				
MRL_CHK	1,1,1-Trichloroethane		0.5	0.580	ug/L	116	(50-150)		
LCS1	1,1,2,2-Tetrachloroethane		5.0	5.18	ug/L	104	(70-130)		
LCS2	1,1,2,2-Tetrachloroethane		5.0	4.85	ug/L	97	(70-130)	20	6.6
MBLK	1,1,2,2-Tetrachloroethane			<0.25	ug/L				
MRL_CHK	1,1,2,2-Tetrachloroethane		0.5	0.540	ug/L	108	(50-150)		
LCS1	1,1,2-Trichloroethane		5.0	5.14	ug/L	103	(70-130)		
LCS2	1,1,2-Trichloroethane		5.0	4.81	ug/L	96	(70-130)	20	6.6
MBLK	1,1,2-Trichloroethane			<0.25	ug/L				
MRL_CHK	1,1,2-Trichloroethane		0.5	0.540	ug/L	108	(50-150)		
LCS1	1,1-Dichloroethane		5.0	5.47	ug/L	109	(70-130)		
LCS2	1,1-Dichloroethane		5.0	4.85	ug/L	97	(70-130)	20	12
MBLK	1,1-Dichloroethane			<0.25	ug/L				
MRL_CHK	1,1-Dichloroethane		0.5	0.560	ug/L	112	(50-150)		
LCS1	1,1-Dichloroethylene		5.0	5.12	ug/L	102	(70-130)		
LCS2	1,1-Dichloroethylene		5.0	4.19	ug/L	84	(70-130)	20	20
MBLK	1,1-Dichloroethylene			<0.25	ug/L				
MRL_CHK	1,1-Dichloroethylene		0.5	0.560	ug/L	112	(50-150)		
LCS1	1,1-Dichloropropene		5.0	5.77	ug/L	115	(70-130)		
LCS2	1,1-Dichloropropene		5.0	4.92	ug/L	98	(70-130)	20	16
MBLK	1,1-Dichloropropene			<0.25	ug/L				
MRL_CHK	1,1-Dichloropropene		0.5	0.590	ug/L	118	(50-150)		
LCS1	1,2,3-Trichlorobenzene		5.0	5.31	ug/L	106	(70-130)		
LCS2	1,2,3-Trichlorobenzene		5.0	4.59	ug/L	92	(70-130)	20	15
MBLK	1,2,3-Trichlorobenzene			<0.25	ug/L				
MRL_CHK	1,2,3-Trichlorobenzene		0.5	0.560	ug/L	112	(50-150)		
LCS1	1,2,3-Trichloropropane		5.0	5.15	ug/L	103	(70-130)		
LCS2	1,2,3-Trichloropropane		5.0	4.9	ug/L	98	(70-130)	20	5.0
MBLK	1,2,3-Trichloropropane			<0.25	ug/L				
MRL_CHK	1,2,3-Trichloropropane		0.5	0.560	ug/L	112	(50-150)		
LCS1	1,2,4-Trichlorobenzene		5.0	5.26	ug/L	105	(70-130)		

Spike recovery is already corrected for native results.
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(S) Indicates surrogate compound.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	1,2,4-Trichlorobenzene		5.0	4.4	ug/L	88	(70-130)	20	18
MBLK	1,2,4-Trichlorobenzene			<0.25	ug/L				
MRL_CHK	1,2,4-Trichlorobenzene		0.5	0.530	ug/L	106	(50-150)		
LCS1	1,2,4-Trimethylbenzene		5.0	5.09	ug/L	102	(70-130)		
LCS2	1,2,4-Trimethylbenzene		5.0	4.57	ug/L	91	(70-130)	20	11
MBLK	1,2,4-Trimethylbenzene			<0.25	ug/L				
MRL_CHK	1,2,4-Trimethylbenzene		0.5	0.550	ug/L	110	(50-150)		
LCS1	1,2-Dichloroethane		5.0	5.67	ug/L	113	(70-130)		
LCS2	1,2-Dichloroethane		5.0	5.3	ug/L	106	(70-130)	20	6.8
MBLK	1,2-Dichloroethane			<0.25	ug/L				
MRL_CHK	1,2-Dichloroethane		0.5	0.590	ug/L	118	(50-150)		
LCS1	1,2-Dichloroethane-d4 (S)			115	%	115	(70-130)		
LCS2	1,2-Dichloroethane-d4 (S)			115	%	115	(70-130)		
MBLK	1,2-Dichloroethane-d4 (S)			111	%	111	(70-130)		
MRL_CHK	1,2-Dichloroethane-d4 (S)			119	%	119	(70-130)		
LCS1	1,2-Dichloropropane		5.0	5.18	ug/L	104	(70-130)		
LCS2	1,2-Dichloropropane		5.0	4.9	ug/L	98	(70-130)	20	5.6
MBLK	1,2-Dichloropropane			<0.25	ug/L				
MRL_CHK	1,2-Dichloropropane		0.5	0.600	ug/L	120	(50-150)		
LCS1	1,3,5-Trimethylbenzene		5.0	5.22	ug/L	104	(70-130)		
LCS2	1,3,5-Trimethylbenzene		5.0	4.44	ug/L	89	(70-130)	20	16
MBLK	1,3,5-Trimethylbenzene			<0.25	ug/L				
MRL_CHK	1,3,5-Trimethylbenzene		0.5	0.520	ug/L	104	(50-150)		
LCS1	1,3-Dichloropropane		5.0	5.44	ug/L	109	(70-130)		
LCS2	1,3-Dichloropropane		5.0	4.97	ug/L	99	(70-130)	20	9.0
MBLK	1,3-Dichloropropane			<0.25	ug/L				
MRL_CHK	1,3-Dichloropropane		0.5	0.540	ug/L	108	(50-150)		
LCS1	2,2-Dichloropropane		5.0	5.59	ug/L	112	(70-130)		
LCS2	2,2-Dichloropropane		5.0	4.49	ug/L	90	(70-130)	20	**22**
MBLK	2,2-Dichloropropane			<0.25	ug/L				
MRL_CHK	2,2-Dichloropropane		0.5	0.520	ug/L	104	(50-150)		
LCS1	2-Butanone (MEK)		50	46.2	ug/L	92	(70-130)		
LCS2	2-Butanone (MEK)		50	45.4	ug/L	91	(70-130)	20	1.3
MBLK	2-Butanone (MEK)			<2.5	ug/L				
MRL_CHK	2-Butanone (MEK)		5.0	5.52	ug/L	110	(50-150)		
LCS1	4-Bromofluorobenzene (S)			98.0	%	98	(70-130)		
LCS2	4-Bromofluorobenzene (S)			97.2	%	97	(70-130)		
MBLK	4-Bromofluorobenzene (S)			97.0	%	97	(70-130)		

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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	4-Bromofluorobenzene (S)			94.0	%	94	(70-130)		
LCS1	4-Methyl-2-Pentanone (MIBK)		50	45.4	ug/L	91	(70-130)		
LCS2	4-Methyl-2-Pentanone (MIBK)		50	43.4	ug/L	87	(70-130)	20	4.5
MBLK	4-Methyl-2-Pentanone (MIBK)			<2.5	ug/L				
MRL_CHK	4-Methyl-2-Pentanone (MIBK)		5.0	5.39	ug/L	108	(50-150)		
LCS1	Benzene		5.0	5.26	ug/L	105	(70-130)		
LCS2	Benzene		5.0	4.65	ug/L	93	(70-130)	20	12
MBLK	Benzene			<0.25	ug/L				
MRL_CHK	Benzene		0.5	0.590	ug/L	118	(50-150)		
LCS1	Bromobenzene		5.0	4.65	ug/L	93	(70-130)		
LCS2	Bromobenzene		5.0	4.18	ug/L	84	(70-130)	20	11
MBLK	Bromobenzene			<0.25	ug/L				
MRL_CHK	Bromobenzene		0.5	0.520	ug/L	104	(50-150)		
LCS1	Bromochloromethane		5.0	4.46	ug/L	89	(70-130)		
LCS2	Bromochloromethane		5.0	4.09	ug/L	82	(70-130)	20	8.7
MBLK	Bromochloromethane			<0.25	ug/L				
MRL_CHK	Bromochloromethane		0.5	0.420	ug/L	84	(50-150)		
LCS1	Bromodichloromethane		5.0	5.47	ug/L	109	(70-130)		
LCS2	Bromodichloromethane		5.0	4.77	ug/L	95	(70-130)	20	14
MBLK	Bromodichloromethane			<0.25	ug/L				
MRL_CHK	Bromodichloromethane		0.5	0.580	ug/L	116	(50-150)		
LCS1	Bromoethane		5.0	4.48	ug/L	90	(70-130)		
LCS2	Bromoethane		5.0	4.02	ug/L	80	(70-130)	20	11
MBLK	Bromoethane			<0.25	ug/L				
MRL_CHK	Bromoethane		0.5	0.530	ug/L	106	(50-150)		
LCS1	Bromoform		5.0	4.42	ug/L	88	(70-130)		
LCS2	Bromoform		5.0	4.13	ug/L	83	(70-130)	20	6.8
MBLK	Bromoform			<0.25	ug/L				
MRL_CHK	Bromoform		0.5	0.410	ug/L	82	(50-150)		
LCS1	Bromomethane (Methyl Bromide)		5.0	6.6	ug/L	**132**	(70-130)		
LCS2	Bromomethane (Methyl Bromide)		5.0	5.23	ug/L	105	(70-130)	20	**23**
MBLK	Bromomethane (Methyl Bromide)			<0.25	ug/L				
MRL_CHK	Bromomethane (Methyl Bromide)		0.5	0.720	ug/L	144	(50-150)		
LCS1	Carbon disulfide		5.0	4.64	ug/L	93	(70-130)		
LCS2	Carbon disulfide		5.0	3.88	ug/L	78	(70-130)	20	18
MBLK	Carbon disulfide			<0.25	ug/L				
MRL_CHK	Carbon disulfide		0.5	0.550	ug/L	110	(50-150)		
LCS1	Carbon Tetrachloride		5.0	5.17	ug/L	103	(70-130)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used
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City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Carbon Tetrachloride		5.0	4.19	ug/L	84	(70-130)	20	**21**
MBLK	Carbon Tetrachloride			<0.25	ug/L				
MRL_CHK	Carbon Tetrachloride		0.5	0.500	ug/L	100	(50-150)		
LCS1	Chlorobenzene		5.0	4.84	ug/L	97	(70-130)		
LCS2	Chlorobenzene		5.0	4.43	ug/L	89	(70-130)	20	8.8
MBLK	Chlorobenzene			<0.25	ug/L				
MRL_CHK	Chlorobenzene		0.5	0.510	ug/L	102	(50-150)		
LCS1	Chlorodibromomethane		5.0	4.5	ug/L	90	(70-130)		
LCS2	Chlorodibromomethane		5.0	3.95	ug/L	79	(70-130)	20	13
MBLK	Chlorodibromomethane			<0.25	ug/L				
MRL_CHK	Chlorodibromomethane		0.5	0.400	ug/L	80	(50-150)		
LCS1	Chloroethane		5.0	6.63	ug/L	**133**	(70-130)		
LCS2	Chloroethane		5.0	4.83	ug/L	97	(70-130)	20	**31**
MBLK	Chloroethane			<0.25	ug/L				
MRL_CHK	Chloroethane		0.5	0.600	ug/L	120	(50-150)		
LCS1	Chloroform (Trichloromethane)		5.0	5.58	ug/L	112	(70-130)		
LCS2	Chloroform (Trichloromethane)		5.0	4.87	ug/L	97	(70-130)	20	14
MBLK	Chloroform (Trichloromethane)			<0.25	ug/L				
MRL_CHK	Chloroform (Trichloromethane)		0.5	0.610	ug/L	122	(50-150)		
LCS1	Chloromethane(Methyl Chloride)		5.0	5.14	ug/L	103	(70-130)		
LCS2	Chloromethane(Methyl Chloride)		5.0	4.84	ug/L	97	(70-130)	20	6.0
MBLK	Chloromethane(Methyl Chloride)			<0.25	ug/L				
MRL_CHK	Chloromethane(Methyl Chloride)		0.5	0.670	ug/L	134	(50-150)		
LCS1	cis-1,2-Dichloroethylene		5.0	5.18	ug/L	104	(70-130)		
LCS2	cis-1,2-Dichloroethylene		5.0	4.66	ug/L	93	(70-130)	20	11
MBLK	cis-1,2-Dichloroethylene			<0.25	ug/L				
MRL_CHK	cis-1,2-Dichloroethylene		0.5	0.520	ug/L	104	(50-150)		
LCS1	cis-1,3-Dichloropropene		5.0	5.37	ug/L	107	(70-130)		
LCS2	cis-1,3-Dichloropropene		5.0	5.02	ug/L	100	(70-130)	20	6.7
MBLK	cis-1,3-Dichloropropene			<0.25	ug/L				
MRL_CHK	cis-1,3-Dichloropropene		0.5	0.540	ug/L	108	(50-150)		
LCS1	Di-isopropyl ether		5.0	4.57	ug/L	91	(70-130)		
LCS2	Di-isopropyl ether		5.0	4.13	ug/L	83	(70-130)	20	10
MBLK	Di-isopropyl ether			<1.5	ug/L				
MRL_CHK	Di-isopropyl ether		0.5	0.490	ug/L	98	(50-150)		
LCS1	Dibromomethane		5.0	5.29	ug/L	106	(70-130)		
LCS2	Dibromomethane		5.0	4.75	ug/L	95	(70-130)	20	11
MBLK	Dibromomethane			<0.25	ug/L				

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RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Dibromomethane		0.5	0.540	ug/L	108	(50-150)		
LCS1	Dichlorodifluoromethane		5.0	3.63	ug/L	73	(70-130)		
LCS2	Dichlorodifluoromethane		5.0	3.68	ug/L	74	(70-130)	20	1.4
MBLK	Dichlorodifluoromethane			<0.25	ug/L				
MRL_CHK	Dichlorodifluoromethane		0.5	0.510	ug/L	102	(50-150)		
LCS1	Dichloromethane		5.0	4.91	ug/L	98	(70-130)		
LCS2	Dichloromethane		5.0	4.49	ug/L	90	(70-130)	20	8.9
MBLK	Dichloromethane			<0.25	ug/L				
MRL_CHK	Dichloromethane		0.5	0.570	ug/L	114	(50-150)		
LCS1	Ethyl benzene		5.0	5.21	ug/L	104	(70-130)		
LCS2	Ethyl benzene		5.0	4.63	ug/L	93	(70-130)	20	12
MBLK	Ethyl benzene			<0.25	ug/L				
MRL_CHK	Ethyl benzene		0.5	0.570	ug/L	114	(50-150)		
LCS1	Hexachlorobutadiene		5.0	4.74	ug/L	95	(70-130)		
LCS2	Hexachlorobutadiene		5.0	4.00	ug/L	80	(70-130)	20	17
MBLK	Hexachlorobutadiene			<0.25	ug/L				
MRL_CHK	Hexachlorobutadiene		0.5	0.580	ug/L	116	(50-150)		
LCS1	Isopropylbenzene		5.0	5.08	ug/L	102	(70-130)		
LCS2	Isopropylbenzene		5.0	4.33	ug/L	87	(70-130)	20	16
MBLK	Isopropylbenzene			<0.25	ug/L				
MRL_CHK	Isopropylbenzene		0.5	0.560	ug/L	112	(50-150)		
LCS1	m,p-Xylenes		10	10.1	ug/L	101	(70-130)		
LCS2	m,p-Xylenes		10	8.77	ug/L	88	(70-130)	20	14
MBLK	m,p-Xylenes			<0.25	ug/L				
MRL_CHK	m,p-Xylenes		1.0	1.05	ug/L	105	(50-150)		
LCS1	m-Dichlorobenzene (1,3-DCB)		5.0	4.56	ug/L	91	(70-130)		
LCS2	m-Dichlorobenzene (1,3-DCB)		5.0	4.12	ug/L	82	(70-130)	20	10
MBLK	m-Dichlorobenzene (1,3-DCB)			<0.25	ug/L				
MRL_CHK	m-Dichlorobenzene (1,3-DCB)		0.5	0.470	ug/L	94	(50-150)		
LCS1	Methyl Tert-butyl ether (MTBE)		5.0	4.86	ug/L	97	(70-130)		
LCS2	Methyl Tert-butyl ether (MTBE)		5.0	4.63	ug/L	93	(70-130)	20	4.8
MBLK	Methyl Tert-butyl ether (MTBE)			<0.25	ug/L				
MRL_CHK	Methyl Tert-butyl ether (MTBE)		0.5	0.530	ug/L	106	(50-150)		
LCS1	n-Butylbenzene		5.0	6.21	ug/L	124	(70-130)		
LCS2	n-Butylbenzene		5.0	5.04	ug/L	101	(70-130)	20	**21**
MBLK	n-Butylbenzene			<0.25	ug/L				
MRL_CHK	n-Butylbenzene		0.5	0.660	ug/L	132	(50-150)		
LCS1	n-Propylbenzene		5.0	5.13	ug/L	103	(70-130)		

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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	n-Propylbenzene		5.0	4.34	ug/L	87	(70-130)	20	17
MBLK	n-Propylbenzene			<0.25	ug/L				
MRL_CHK	n-Propylbenzene		0.5	0.540	ug/L	108	(50-150)		
LCS1	Naphthalene		5.0	5.81	ug/L	116	(70-130)		
LCS2	Naphthalene		5.0	4.92	ug/L	98	(70-130)	20	17
MBLK	Naphthalene			<0.25	ug/L				
MRL_CHK	Naphthalene		0.5	0.730	ug/L	146	(50-150)		
LCS1	o-Chlorotoluene		5.0	4.72	ug/L	94	(70-130)		
LCS2	o-Chlorotoluene		5.0	4.28	ug/L	86	(70-130)	20	9.8
MBLK	o-Chlorotoluene			<0.25	ug/L				
MRL_CHK	o-Chlorotoluene		0.5	0.490	ug/L	98	(50-150)		
LCS1	o-Dichlorobenzene (1,2-DCB)		5.0	4.74	ug/L	95	(70-130)		
LCS2	o-Dichlorobenzene (1,2-DCB)		5.0	4.33	ug/L	87	(70-130)	20	9.0
MBLK	o-Dichlorobenzene (1,2-DCB)			<0.25	ug/L				
MRL_CHK	o-Dichlorobenzene (1,2-DCB)		0.5	0.550	ug/L	110	(50-150)		
LCS1	o-Xylene		5.0	4.91	ug/L	98	(70-130)		
LCS2	o-Xylene		5.0	4.34	ug/L	87	(70-130)	20	12
MBLK	o-Xylene			<0.25	ug/L				
MRL_CHK	o-Xylene		0.5	0.490	ug/L	98	(50-150)		
LCS1	p-Chlorotoluene		5.0	4.8	ug/L	96	(70-130)		
LCS2	p-Chlorotoluene		5.0	4.1	ug/L	82	(70-130)	20	16
MBLK	p-Chlorotoluene			<0.25	ug/L				
MRL_CHK	p-Chlorotoluene		0.5	0.490	ug/L	98	(50-150)		
LCS1	p-Dichlorobenzene (1,4-DCB)		5.0	4.38	ug/L	88	(70-130)		
LCS2	p-Dichlorobenzene (1,4-DCB)		5.0	4.14	ug/L	83	(70-130)	20	5.6
MBLK	p-Dichlorobenzene (1,4-DCB)			<0.25	ug/L				
MRL_CHK	p-Dichlorobenzene (1,4-DCB)		0.5	0.510	ug/L	102	(50-150)		
LCS1	p-Isopropyltoluene		5.0	5.28	ug/L	106	(70-130)		
LCS2	p-Isopropyltoluene		5.0	4.47	ug/L	89	(70-130)	20	17
MBLK	p-Isopropyltoluene			<0.25	ug/L				
MRL_CHK	p-Isopropyltoluene		0.5	0.520	ug/L	104	(50-150)		
LCS1	sec-Butylbenzene		5.0	5.49	ug/L	110	(70-130)		
LCS2	sec-Butylbenzene		5.0	4.52	ug/L	90	(70-130)	20	19
MBLK	sec-Butylbenzene			<0.25	ug/L				
MRL_CHK	sec-Butylbenzene		0.5	0.590	ug/L	118	(50-150)		
LCS1	Styrene		5.0	4.84	ug/L	97	(70-130)		
LCS2	Styrene		5.0	4.46	ug/L	89	(70-130)	20	8.2
MBLK	Styrene			<0.25	ug/L				

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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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1 800 566 LABS (1 800 566 5227)

Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Styrene		0.5	0.480	ug/L	96	(50-150)		
LCS1	tert-amyl Methyl Ether		5.0	4.83	ug/L	97	(70-130)		
LCS2	tert-amyl Methyl Ether		5.0	4.43	ug/L	89	(70-130)	20	8.6
MBLK	tert-amyl Methyl Ether			<1.5	ug/L				
MRL_CHK	tert-amyl Methyl Ether		0.5	0.560	ug/L	112	(50-150)		
LCS1	tert-Butyl Ethyl Ether		5.0	4.75	ug/L	95	(70-130)		
LCS2	tert-Butyl Ethyl Ether		5.0	4.28	ug/L	86	(70-130)	20	10
MBLK	tert-Butyl Ethyl Ether			<1.5	ug/L				
MRL_CHK	tert-Butyl Ethyl Ether		0.5	0.520	ug/L	104	(50-150)		
LCS1	tert-Butylbenzene		5.0	5.12	ug/L	102	(70-130)		
LCS2	tert-Butylbenzene		5.0	4.37	ug/L	87	(70-130)	20	16
MBLK	tert-Butylbenzene			<0.25	ug/L				
MRL_CHK	tert-Butylbenzene		0.5	0.550	ug/L	110	(50-150)		
LCS1	Tetrachloroethylene (PCE)		5.0	4.88	ug/L	98	(70-130)		
LCS2	Tetrachloroethylene (PCE)		5.0	4.14	ug/L	83	(70-130)	20	16
MBLK	Tetrachloroethylene (PCE)			<0.25	ug/L				
MRL_CHK	Tetrachloroethylene (PCE)		0.5	0.480	ug/L	96	(50-150)		
LCS1	Toluene		5.0	5.11	ug/L	102	(70-130)		
LCS2	Toluene		5.0	4.55	ug/L	91	(70-130)	20	12
MBLK	Toluene			<0.25	ug/L				
MRL_CHK	Toluene		0.5	0.560	ug/L	112	(50-150)		
LCS1	Toluene-d8 (S)			101	%	101	(70-130)		
LCS2	Toluene-d8 (S)			102	%	102	(70-130)		
MBLK	Toluene-d8 (S)			99.4	%	99	(70-130)		
MRL_CHK	Toluene-d8 (S)			103	%	103	(70-130)		
LCS1	trans-1,2-Dichloroethylene		5.0	5.14	ug/L	103	(70-130)		
LCS2	trans-1,2-Dichloroethylene		5.0	4.32	ug/L	86	(70-130)	20	17
MBLK	trans-1,2-Dichloroethylene			<0.25	ug/L				
MRL_CHK	trans-1,2-Dichloroethylene		0.5	0.580	ug/L	116	(50-150)		
LCS1	trans-1,3-Dichloropropene		5.0	5.14	ug/L	103	(70-130)		
LCS2	trans-1,3-Dichloropropene		5.0	4.57	ug/L	91	(70-130)	20	12
MBLK	trans-1,3-Dichloropropene			<0.25	ug/L				
MRL_CHK	trans-1,3-Dichloropropene		0.5	0.460	ug/L	92	(50-150)		
LCS1	Trichloroethylene (TCE)		5.0	4.61	ug/L	92	(70-130)		
LCS2	Trichloroethylene (TCE)		5.0	4.02	ug/L	80	(70-130)	20	14
MBLK	Trichloroethylene (TCE)			<0.25	ug/L				
MRL_CHK	Trichloroethylene (TCE)		0.5	0.500	ug/L	100	(50-150)		

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Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Trichlorofluoromethane		5.0	5.22	ug/L	104	(70-130)		
LCS2	Trichlorofluoromethane		5.0	4.91	ug/L	98	(70-130)	20	6.1
MBLK	Trichlorofluoromethane			<0.25	ug/L				
MRL_CHK	Trichlorofluoromethane		0.5	0.530	ug/L	106	(50-150)		
LCS1	Trichlorotrifluoroethane(Freon		5.0	5.09	ug/L	102	(70-130)		
LCS2	Trichlorotrifluoroethane(Freon		5.0	4.97	ug/L	99	(70-130)	20	2.4
MBLK	Trichlorotrifluoroethane(Freon			<0.25	ug/L				
MRL_CHK	Trichlorotrifluoroethane(Freon		0.5	0.520	ug/L	104	(50-150)		
LCS1	Vinyl chloride (VC)		5.0	5.69	ug/L	114	(70-130)		
LCS2	Vinyl chloride (VC)		5.0	5.56	ug/L	111	(70-130)	20	2.3
MBLK	Vinyl chloride (VC)			<0.15	ug/L				
MRL_CHK	Vinyl chloride (VC)		0.5	0.740	ug/L	148	(50-150)		
QC Ref# 559437 - Semivolatiles by GCMS by EPA 525.2						**Analysis Date: 06/24/2010**			
LCS1	1,3-Dimethyl-2-nitrobenzene (S)			99.4	%	99	(70-130)		
LCS2	1,3-Dimethyl-2-nitrobenzene (S)			93.5	%	94	(70-130)		
MBLK	1,3-Dimethyl-2-nitrobenzene (S)			99.5	%	100	(70-130)		
MRL_CHK	1,3-Dimethyl-2-nitrobenzene (S)			101	%	101	(70-130)		
MS_201006120045	1,3-Dimethyl-2-nitrobenzene (S)			97.7	%	98	(70-130)		
LCS1	2,4-Dinitrotoluene		2.0	1.2	ug/L	**60**	(70-130)		
LCS2	2,4-Dinitrotoluene		2.0	1.25	ug/L	**62**	(70-130)	20	4.1
MBLK	2,4-Dinitrotoluene			<0.05	ug/L				
MRL_CHK	2,4-Dinitrotoluene		0.1	0.113	ug/L	113	(50-150)		
MS_201006120045	2,4-Dinitrotoluene	ND	2.0	1.52	ug/L	76	(70-130)		
LCS1	2,6-Dinitrotoluene		2.0	1.34	ug/L	**67**	(70-130)		
LCS2	2,6-Dinitrotoluene		2.0	1.3	ug/L	**65**	(70-130)	20	2.3
MBLK	2,6-Dinitrotoluene			<0.05	ug/L				
MRL_CHK	2,6-Dinitrotoluene		0.1	0.0920	ug/L	92	(50-150)		
MS_201006120045	2,6-Dinitrotoluene		2.0	1.65	ug/L	83	(70-130)		
LCS1	4,4-DDD		2.0	1.94	ug/L	97	(70-130)		
LCS2	4,4-DDD		2.0	1.94	ug/L	97	(70-130)	20	0.0
MBLK	4,4-DDD			<0.05	ug/L				
MRL_CHK	4,4-DDD		0.1	0.0940	ug/L	94	(50-150)		
MS_201006120045	4,4-DDD		2.0	1.85	ug/L	93	(70-130)		
LCS1	4,4-DDE		2.0	1.85	ug/L	93	(70-130)		
LCS2	4,4-DDE		2.0	1.87	ug/L	93	(70-130)	20	1.1
MBLK	4,4-DDE			<0.05	ug/L				
MRL_CHK	4,4-DDE		0.1	0.0910	ug/L	91	(50-150)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used
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QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201006120045	4,4-DDE		2.0	1.57	ug/L	78	(70-130)		
LCS1	4,4-DDT		2.0	1.86	ug/L	93	(70-130)		
LCS2	4,4-DDT		2.0	1.84	ug/L	92	(70-130)	20	1.1
MBLK	4,4-DDT			<0.05	ug/L				
MRL_CHK	4,4-DDT		0.1	0.120	ug/L	120	(50-150)		
MS_201006120045	4,4-DDT		2.0	1.55	ug/L	77	(70-130)		
LCS1	Acenaphthene		2.0	1.83	ug/L	91	(70-130)		
LCS2	Acenaphthene		2.0	1.81	ug/L	91	(70-130)	20	1.1
MBLK	Acenaphthene			<0.05	ug/L				
MRL_CHK	Acenaphthene		0.1	0.0980	ug/L	98	(50-150)		
MS_201006120045	Acenaphthene		2.0	1.83	ug/L	92	(70-130)		
LCS1	Acenaphthene-d10 (I)			87.6	%	88	(50-150)		
LCS2	Acenaphthene-d10 (I)			83.1	%	83	(50-150)		
MBLK	Acenaphthene-d10 (I)			96.5	%	97	(50-150)		
MRL_CHK	Acenaphthene-d10 (I)			94.4	%	94	(50-150)		
MS_201006120045	Acenaphthene-d10 (I)			78.2	%	78	(50-150)		
LCS1	Acenaphthylene		2.0	1.8	ug/L	90	(70-130)		
LCS2	Acenaphthylene		2.0	1.81	ug/L	91	(70-130)	20	0.55
MBLK	Acenaphthylene			<0.05	ug/L				
MRL_CHK	Acenaphthylene		0.1	0.0900	ug/L	90	(50-150)		
MS_201006120045	Acenaphthylene	ND	2.0	1.9	ug/L	95	(70-130)		
LCS1	Acetochlor		2.0	1.94	ug/L	97	(70-130)		
LCS2	Acetochlor		2.0	2.06	ug/L	103	(70-130)	20	6.0
MBLK	Acetochlor			<0.05	ug/L				
MRL_CHK	Acetochlor		0.05	0.0570	ug/L	114	(50-150)		
MS_201006120045	Acetochlor		2.0	2.14	ug/L	107	(70-130)		
LCS1	Alachlor		2.0	2.02	ug/L	101	(70-130)		
LCS2	Alachlor		2.0	2.00	ug/L	100	(70-130)	20	1
MBLK	Alachlor			<0.025	ug/L				
MRL_CHK	Alachlor		0.05	0.0730	ug/L	146	(50-150)		
MS_201006120045	Alachlor	ND	2.0	2.1	ug/L	105	(70-130)		
LCS1	Aldrin		2.0	1.42	ug/L	71	(70-130)		
LCS2	Aldrin		2.0	1.45	ug/L	73	(70-130)	20	2.1
MBLK	Aldrin			<0.025	ug/L				
MRL_CHK	Aldrin		0.05	0.0470	ug/L	94	(50-150)		
MS_201006120045	Aldrin	ND	2.0	1.66	ug/L	83	(70-130)		
LCS1	Alpha-BHC		2.0	1.93	ug/L	97	(70-130)		
LCS2	Alpha-BHC		2.0	1.94	ug/L	97	(70-130)	20	0.52

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RPD not calculated for LCS2 when different a concentration than LCS1 is used
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City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Alpha-BHC			<0.05	ug/L				
MRL_CHK	Alpha-BHC		0.1	0.0990	ug/L	99	(50-150)		
MS_201006120045	Alpha-BHC		2.0	2.01	ug/L	100	(70-130)		
LCS1	alpha-Chlordane		2.0	2.01	ug/L	100	(70-130)		
LCS2	alpha-Chlordane		2.0	1.87	ug/L	94	(70-130)	20	7.2
MBLK	alpha-Chlordane			<0.025	ug/L				
MRL_CHK	alpha-Chlordane		0.05	0.0510	ug/L	102	(50-150)		
MS_201006120045	alpha-Chlordane	ND	2.0	2.01	ug/L	100	(70-130)		
LCS1	Anthracene		2.0	1.81	ug/L	91	(70-130)		
LCS2	Anthracene		2.0	1.77	ug/L	89	(70-130)	20	1.7
MBLK	Anthracene			<0.01	ug/L				
MRL_CHK	Anthracene		0.02	0.0200	ug/L	100	(50-150)		
MS_201006120045	Anthracene	ND	2.0	1.87	ug/L	94	(70-130)		
LCS1	Atrazine		2.0	2.02	ug/L	101	(70-130)		
LCS2	Atrazine		2.0	2.03	ug/L	102	(70-130)	20	0.49
MBLK	Atrazine			<0.025	ug/L				
MRL_CHK	Atrazine		0.05	0.0530	ug/L	106	(50-150)		
MS_201006120045	Atrazine	ND	2.0	2.00	ug/L	100	(70-130)		
LCS1	Benz(a)Anthracene		2.0	1.86	ug/L	93	(70-130)		
LCS2	Benz(a)Anthracene		2.0	1.87	ug/L	93	(70-130)	20	0.54
MBLK	Benz(a)Anthracene			<0.025	ug/L				
MRL_CHK	Benz(a)Anthracene		0.05	0.0510	ug/L	102	(50-150)		
MS_201006120045	Benz(a)Anthracene	ND	2.0	1.62	ug/L	81	(70-130)		
LCS1	Benzo(a)pyrene		2.0	1.94	ug/L	97	(70-130)		
LCS2	Benzo(a)pyrene		2.0	1.94	ug/L	97	(70-130)	20	0.0
MBLK	Benzo(a)pyrene			<0.01	ug/L				
MRL_CHK	Benzo(a)pyrene		0.02	0.0220	ug/L	110	(50-150)		
MS_201006120045	Benzo(a)pyrene	ND	2.0	2.05	ug/L	103	(70-130)		
LCS1	Benzo(b)Fluoranthene		2.0	1.91	ug/L	95	(70-130)		
LCS2	Benzo(b)Fluoranthene		2.0	1.92	ug/L	96	(70-130)	20	0.52
MBLK	Benzo(b)Fluoranthene			<0.01	ug/L				
MRL_CHK	Benzo(b)Fluoranthene		0.02	0.0250	ug/L	125	(50-150)		
MS_201006120045	Benzo(b)Fluoranthene	ND	2.0	2.09	ug/L	105	(70-130)		
LCS1	Benzo(g,h,i)Perylene		2.0	1.88	ug/L	94	(70-130)		
LCS2	Benzo(g,h,i)Perylene		2.0	1.87	ug/L	94	(70-130)	20	0.53
MBLK	Benzo(g,h,i)Perylene			<0.025	ug/L				
MRL_CHK	Benzo(g,h,i)Perylene		0.05	0.0590	ug/L	118	(50-150)		
MS_201006120045	Benzo(g,h,i)Perylene	ND	2.0	1.78	ug/L	89	(70-130)		

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LABORATORIES
A Division of MWH Americas, Inc.

750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Benzo(k)Fluoranthene		2.0	2.02	ug/L	101	(70-130)		
LCS2	Benzo(k)Fluoranthene		2.0	1.92	ug/L	96	(70-130)	20	5.1
MBLK	Benzo(k)Fluoranthene			<0.01	ug/L				
MRL_CHK	Benzo(k)Fluoranthene		0.02	0.0270	ug/L	135	(50-150)		
MS_201006120045	Benzo(k)Fluoranthene	ND	2.0	2.07	ug/L	104	(70-130)		
LCS1	Beta-BHC		2.0	1.93	ug/L	97	(70-130)		
LCS2	Beta-BHC		2.0	1.91	ug/L	95	(70-130)	20	1.0
MBLK	Beta-BHC			<0.05	ug/L				
MRL_CHK	Beta-BHC		0.1	0.102	ug/L	102	(50-150)		
MS_201006120045	Beta-BHC		2.0	1.93	ug/L	97	(70-130)		
LCS1	Bromacil		2.0	1.39	ug/L	70	(70-130)		
LCS2	Bromacil		2.0	1.44	ug/L	72	(70-130)	20	3.5
MBLK	Bromacil			<0.05	ug/L				
MRL_CHK	Bromacil		0.1	0.148	ug/L	148	(50-150)		
MS_201006120045	Bromacil	ND	2.0	1.77	ug/L	88	(70-130)		
LCS1	Butachlor		2.0	2.05	ug/L	102	(70-130)		
LCS2	Butachlor		2.0	1.99	ug/L	99	(70-130)	20	3.0
MBLK	Butachlor			<0.025	ug/L				
MRL_CHK	Butachlor		0.05	0.0460	ug/L	92	(50-150)		
MS_201006120045	Butachlor	ND	2.0	2.13	ug/L	107	(70-130)		
LCS1	Butylbenzylphthalate		2.0	2.06	ug/L	103	(70-130)		
LCS2	Butylbenzylphthalate		2.0	2.1	ug/L	105	(70-130)	20	1.9
MBLK	Butylbenzylphthalate			<0.15	ug/L				
MRL_CHK	Butylbenzylphthalate		0.15	0.177	ug/L	118	(50-150)		
MS_201006120045	Butylbenzylphthalate	ND	2.0	2.06	ug/L	103	(70-130)		
LCS1	Caffeine by method 525mod		2.0	0.805	ug/L	**40**	(45-137)		
LCS2	Caffeine by method 525mod		2.0	0.790	ug/L	**40**	(45-137)	20	1.9
MBLK	Caffeine by method 525mod			<0.01	ug/L				
MRL_CHK	Caffeine by method 525mod		0.05	0.0510	ug/L	102	(50-150)		
MS_201006120045	Caffeine by method 525mod	ND	2.0	1.28	ug/L	64	(46-144)		
LCS1	Chlorobenzilate		2.0	1.94	ug/L	97	(70-130)		
LCS2	Chlorobenzilate		2.0	1.99	ug/L	99	(70-130)	20	2.5
MBLK	Chlorobenzilate			<0.05	ug/L				
MRL_CHK	Chlorobenzilate		0.1	0.107	ug/L	107	(50-150)		
MS_201006120045	Chlorobenzilate		2.0	2.05	ug/L	102	(70-130)		
LCS1	Chloroneb		2.0	1.91	ug/L	96	(70-130)		
LCS2	Chloroneb		2.0	1.91	ug/L	96	(70-130)	20	0.0
MBLK	Chloroneb			<0.05	ug/L				

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A Division of MWH Americas, Inc.

750 Royal Oak Dr., Suite 100
Monrovia, California, 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

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QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Chloroneb		0.1	0.109	ug/L	109	(50-150)		
MS_201006120045	Chloroneb		2.0	1.93	ug/L	96	(70-130)		
LCS1	Chlorothalonil(Draconil,Bravo)		2.0	1.9	ug/L	95	(70-130)		
LCS2	Chlorothalonil(Draconil,Bravo)		2.0	1.88	ug/L	94	(70-130)	20	1.1
MBLK	Chlorothalonil(Draconil,Bravo)			<0.05	ug/L				
MRL_CHK	Chlorothalonil(Draconil,Bravo)		0.05	0.0580	ug/L	116	(50-150)		
MS_201006120045	Chlorothalonil(Draconil,Bravo)		2.0	1.93	ug/L	97	(70-130)		
LCS1	Chlorpyrifos (Dursban)		2.0	1.99	ug/L	99	(70-130)		
LCS2	Chlorpyrifos (Dursban)		2.0	1.92	ug/L	96	(70-130)	20	3.6
MBLK	Chlorpyrifos (Dursban)			<0.025	ug/L				
MRL_CHK	Chlorpyrifos (Dursban)		0.05	0.0500	ug/L	100	(50-150)		
MS_201006120045	Chlorpyrifos (Dursban)		2.0	2.01	ug/L	101	(70-130)		
LCS1	Chrysene		2.0	1.9	ug/L	95	(70-130)		
LCS2	Chrysene		2.0	1.81	ug/L	91	(70-130)	20	4.8
MBLK	Chrysene			<0.01	ug/L				
MRL_CHK	Chrysene		0.02	0.0260	ug/L	130	(50-150)		
MS_201006120045	Chrysene	ND	2.0	2.04	ug/L	102	(70-130)		
LCS1	Chrysene-d12 (I)			87.2	%	87	(50-150)		
LCS2	Chrysene-d12 (I)			87.5	%	88	(50-150)		
MBLK	Chrysene-d12 (I)			90.2	%	90	(50-150)		
MRL_CHK	Chrysene-d12 (I)			79.4	%	79	(50-150)		
MS_201006120045	Chrysene-d12 (I)			52.9	%	53	(50-150)		
LCS1	Delta-BHC		2.0	1.91	ug/L	96	(70-130)		
LCS2	Delta-BHC		2.0	1.89	ug/L	94	(70-130)	20	1.1
MBLK	Delta-BHC			<0.05	ug/L				
MRL_CHK	Delta-BHC		0.1	0.110	ug/L	110	(50-150)		
MS_201006120045	Delta-BHC		2.0	1.93	ug/L	96	(70-130)		
LCS1	Di(2-Ethylhexyl)phthalate		2.0	1.8	ug/L	90	(70-130)		
LCS2	Di(2-Ethylhexyl)phthalate		2.0	1.78	ug/L	89	(70-130)	20	1.1
MBLK	Di(2-Ethylhexyl)phthalate			<0.15	ug/L				
MRL_CHK	Di(2-Ethylhexyl)phthalate		0.3	0.392	ug/L	131	(50-150)		
MS_201006120045	Di(2-Ethylhexyl)phthalate	ND	2.0	2.03	ug/L	102	(70-130)		
LCS1	Di-(2-Ethylhexyl)adipate		2.0	1.83	ug/L	91	(70-130)		
LCS2	Di-(2-Ethylhexyl)adipate		2.0	1.83	ug/L	91	(70-130)	20	0.0
MBLK	Di-(2-Ethylhexyl)adipate			<0.15	ug/L				
MRL_CHK	Di-(2-Ethylhexyl)adipate		0.3	0.315	ug/L	105	(50-150)		
MS_201006120045	Di-(2-Ethylhexyl)adipate	ND	2.0	1.37	ug/L	**68**	(70-130)		
LCS1	Di-n-Butylphthalate		4.0	4.02	ug/L	100	(70-130)		

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Monrovia, California, 91016-3629
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1 800 566 LABS (1 800 566 5227)

Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Di-n-Butylphthalate		4.0	4.03	ug/L	101	(70-130)	20	0.25
MBLK	Di-n-Butylphthalate			<0.15	ug/L				
MRL_CHK	Di-n-Butylphthalate		0.3	0.346	ug/L	115	(50-150)		
MS_201006120045	Di-n-Butylphthalate	ND	4.0	4.22	ug/L	106	(70-130)		
LCS1	Di-N-octylphthalate		2.0	1.76	ug/L	88	(70-130)		
LCS2	Di-N-octylphthalate		2.0	1.8	ug/L	90	(70-130)	20	2.3
MBLK	Di-N-octylphthalate			<0.05	ug/L				
MRL_CHK	Di-N-octylphthalate		0.1	0.147	ug/L	147	(50-150)		
MS_201006120045	Di-N-octylphthalate		2.0	1.68	ug/L	84	(70-130)		
LCS1	Diazinon (Qualitative)		2.0	1.97	ug/L	99	(70-130)		
LCS2	Diazinon (Qualitative)		2.0	1.93	ug/L	97	(70-130)	20	2.0
MBLK	Diazinon (Qualitative)			<0.05	ug/L				
MRL_CHK	Diazinon (Qualitative)		0.1	0.0960	ug/L	96	(50-150)		
MS_201006120045	Diazinon (Qualitative)	ND	2.0	1.98	ug/L	99	(70-130)		
LCS1	Dibenz(a,h)Anthracene		2.0	1.85	ug/L	93	(70-130)		
LCS2	Dibenz(a,h)Anthracene		2.0	1.82	ug/L	91	(70-130)	20	1.6
MBLK	Dibenz(a,h)Anthracene			<0.025	ug/L				
MRL_CHK	Dibenz(a,h)Anthracene		0.05	0.0620	ug/L	124	(50-150)		
MS_201006120045	Dibenz(a,h)Anthracene	ND	2.0	1.7	ug/L	85	(70-130)		
LCS1	Dichlorvos (DDVP)		2.0	1.82	ug/L	91	(70-130)		
LCS2	Dichlorvos (DDVP)		2.0	1.88	ug/L	94	(70-130)	20	3.2
MBLK	Dichlorvos (DDVP)			<0.025	ug/L				
MRL_CHK	Dichlorvos (DDVP)		0.05	0.0580	ug/L	116	(50-150)		
MS_201006120045	Dichlorvos (DDVP)		2.0	2.02	ug/L	101	(70-130)		
LCS1	Dieldrin		2.0	1.86	ug/L	93	(70-130)		
LCS2	Dieldrin		2.0	1.8	ug/L	90	(70-130)	20	3.3
MBLK	Dieldrin			<0.05	ug/L				
MRL_CHK	Dieldrin		0.1	0.104	ug/L	104	(50-150)		
MS_201006120045	Dieldrin	ND	2.0	1.94	ug/L	97	(70-130)		
LCS1	Diethylphthalate		2.0	2.02	ug/L	101	(70-130)		
LCS2	Diethylphthalate		2.0	2.04	ug/L	102	(70-130)	20	0.99
MBLK	Diethylphthalate			<0.15	ug/L				
MRL_CHK	Diethylphthalate		0.15	0.161	ug/L	107	(50-150)		
MS_201006120045	Diethylphthalate	ND	2.0	2.07	ug/L	104	(70-130)		
LCS1	Dimethoate		2.0	0.696	ug/L	35	(35-100)		
LCS2	Dimethoate		2.0	0.722	ug/L	36	(35-100)	20	3.7
MBLK	Dimethoate			<0.05	ug/L				
MRL_CHK	Dimethoate		0.1	0.0800	ug/L	80	(50-150)		

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1 800 566 LABS (1 800 566 5227)

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City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201006120045	Dimethoate	ND	2.0	1.05	ug/L	52	(34-111)		
LCS1	Dimethylphthalate		2.0	2.00	ug/L	100	(70-130)		
LCS2	Dimethylphthalate		2.0	1.96	ug/L	98	(70-130)	20	2.0
MBLK	Dimethylphthalate			<0.15	ug/L				
MRL_CHK	Dimethylphthalate		0.3	0.331	ug/L	110	(50-150)		
MS_201006120045	Dimethylphthalate	ND	2.0	2.03	ug/L	101	(70-130)		
LCS1	Endosulfan I (Alpha)		2.0	1.67	ug/L	83	(70-130)		
LCS2	Endosulfan I (Alpha)		2.0	1.64	ug/L	82	(70-130)	20	1.8
MBLK	Endosulfan I (Alpha)			<0.05	ug/L				
MRL_CHK	Endosulfan I (Alpha)		0.1	0.0690	ug/L	69	(50-150)		
MS_201006120045	Endosulfan I (Alpha)		2.0	1.69	ug/L	85	(70-130)		
LCS1	Endosulfan II (Beta)		2.0	1.86	ug/L	93	(70-130)		
LCS2	Endosulfan II (Beta)		2.0	1.89	ug/L	94	(70-130)	20	1.6
MBLK	Endosulfan II (Beta)			<0.05	ug/L				
MRL_CHK	Endosulfan II (Beta)		0.1	0.119	ug/L	119	(50-150)		
MS_201006120045	Endosulfan II (Beta)		2.0	1.94	ug/L	97	(70-130)		
LCS1	Endosulfan Sulfate		2.0	1.85	ug/L	93	(70-130)		
LCS2	Endosulfan Sulfate		2.0	1.89	ug/L	95	(70-130)	20	2.1
MBLK	Endosulfan Sulfate			<0.05	ug/L				
MRL_CHK	Endosulfan Sulfate		0.1	0.0980	ug/L	98	(50-150)		
MS_201006120045	Endosulfan Sulfate		2.0	1.94	ug/L	97	(70-130)		
LCS1	Endrin		2.0	2.01	ug/L	101	(70-130)		
LCS2	Endrin		2.0	2.15	ug/L	107	(70-130)	20	6.7
MBLK	Endrin			<0.05	ug/L				
MRL_CHK	Endrin		0.1	0.112	ug/L	112	(50-150)		
MS_201006120045	Endrin	ND	2.0	2.21	ug/L	111	(70-130)		
LCS1	Endrin Aldehyde		2.0	1.93	ug/L	96	(70-130)		
LCS2	Endrin Aldehyde		2.0	1.92	ug/L	96	(70-130)	20	0.52
MBLK	Endrin Aldehyde			<0.05	ug/L				
MRL_CHK	Endrin Aldehyde		0.1	0.107	ug/L	107	(50-150)		
MS_201006120045	Endrin Aldehyde		2.0	1.91	ug/L	95	(70-130)		
LCS1	EPTC		2.0	1.85	ug/L	92	(70-130)		
LCS2	EPTC		2.0	1.81	ug/L	91	(70-130)	20	2.2
MBLK	EPTC			<0.05	ug/L				
MRL_CHK	EPTC		0.1	0.0950	ug/L	95	(50-150)		
MS_201006120045	EPTC		2.0	1.82	ug/L	91	(70-130)		
LCS1	Fluoranthene		2.0	1.92	ug/L	96	(70-130)		

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City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Fluoranthene		2.0	1.89	ug/L	95	(70-130)	20	1.6
MBLK	Fluoranthene			<0.05	ug/L				
MRL_CHK	Fluoranthene		0.05	0.0530	ug/L	106	(50-150)		
MS_201006120045	Fluoranthene	ND	2.0	1.93	ug/L	96	(70-130)		
LCS1	Fluorene		2.0	1.85	ug/L	92	(70-130)		
LCS2	Fluorene		2.0	1.9	ug/L	95	(70-130)	20	2.7
MBLK	Fluorene			<0.05	ug/L				
MRL_CHK	Fluorene		0.05	0.0500	ug/L	100	(50-150)		
MS_201006120045	Fluorene	ND	2.0	1.88	ug/L	94	(70-130)		
LCS1	gamma-Chlordane		2.0	1.94	ug/L	97	(70-130)		
LCS2	gamma-Chlordane		2.0	1.96	ug/L	98	(70-130)	20	1.0
MBLK	gamma-Chlordane			<0.025	ug/L				
MRL_CHK	gamma-Chlordane		0.05	0.0570	ug/L	114	(50-150)		
MS_201006120045	gamma-Chlordane	ND	2.0	1.87	ug/L	94	(70-130)		
LCS1	Heptachlor		2.0	1.84	ug/L	92	(70-130)		
LCS2	Heptachlor		2.0	1.82	ug/L	91	(70-130)	20	1.1
MBLK	Heptachlor			<0.015	ug/L				
MRL_CHK	Heptachlor		0.04	0.0460	ug/L	115	(50-150)		
MS_201006120045	Heptachlor	ND	2.0	1.97	ug/L	98	(70-130)		
LCS1	Heptachlor Epoxide (isomer B)		2.0	1.78	ug/L	89	(70-130)		
LCS2	Heptachlor Epoxide (isomer B)		2.0	1.76	ug/L	88	(70-130)	20	1.1
MBLK	Heptachlor Epoxide (isomer B)			<0.025	ug/L				
MRL_CHK	Heptachlor Epoxide (isomer B)		0.05	0.0560	ug/L	112	(50-150)		
MS_201006120045	Heptachlor Epoxide (isomer B)	ND	2.0	1.86	ug/L	93	(70-130)		
LCS1	Hexachlorobenzene		2.0	1.8	ug/L	90	(70-130)		
LCS2	Hexachlorobenzene		2.0	1.8	ug/L	90	(70-130)	20	0.0
MBLK	Hexachlorobenzene			<0.025	ug/L				
MRL_CHK	Hexachlorobenzene		0.05	0.0510	ug/L	102	(50-150)		
MS_201006120045	Hexachlorobenzene	ND	2.0	1.76	ug/L	88	(70-130)		
LCS1	Hexachlorocyclopentadiene		2.0	1.8	ug/L	90	(70-130)		
LCS2	Hexachlorocyclopentadiene		2.0	1.73	ug/L	87	(70-130)	20	4.0
MBLK	Hexachlorocyclopentadiene			<0.025	ug/L				
MRL_CHK	Hexachlorocyclopentadiene		0.05	0.0410	ug/L	82	(50-150)		
MS_201006120045	Hexachlorocyclopentadiene	ND	2.0	1.86	ug/L	93	(70-130)		
LCS1	Indeno(1,2,3,c,d)Pyrene		2.0	1.85	ug/L	92	(70-130)		
LCS2	Indeno(1,2,3,c,d)Pyrene		2.0	1.85	ug/L	93	(70-130)	20	0.0
MBLK	Indeno(1,2,3,c,d)Pyrene			<0.025	ug/L				
MRL_CHK	Indeno(1,2,3,c,d)Pyrene		0.05	0.0660	ug/L	132	(50-150)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS or CCC. Criteria for duplicates are advisory only, unless otherwise specified in the method.
(S) Indicates surrogate compound.
(I) Indicates internal standard compound.
RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201006120045	Indeno(1,2,3,c,d)Pyrene	ND	2.0	1.73	ug/L	86	(70-130)		
LCS1	Isophorone		2.0	1.83	ug/L	91	(70-130)		
LCS2	Isophorone		2.0	1.83	ug/L	91	(70-130)	20	0.0
MBLK	Isophorone			<0.25	ug/L				
MRL_CHK	Isophorone		0.1	0.113	ug/L	113	(50-150)		
MS_201006120045	Isophorone	ND	2.0	1.86	ug/L	93	(70-130)		
LCS1	Lindane		2.0	1.78	ug/L	89	(70-130)		
LCS2	Lindane		2.0	1.87	ug/L	94	(70-130)	20	4.9
MBLK	Lindane			<0.02	ug/L				
MRL_CHK	Lindane		0.04	0.0460	ug/L	115	(50-150)		
MS_201006120045	Lindane	ND	2.0	1.82	ug/L	91	(70-130)		
LCS1	Malathion		2.0	2.07	ug/L	103	(70-130)		
LCS2	Malathion		2.0	2.03	ug/L	101	(70-130)	20	2.0
MBLK	Malathion			<0.05	ug/L				
MRL_CHK	Malathion		0.1	0.103	ug/L	103	(50-150)		
MS_201006120045	Malathion		2.0	2.1	ug/L	105	(70-130)		
LCS1	Methoxychlor		2.0	2.06	ug/L	103	(70-130)		
LCS2	Methoxychlor		2.0	2.02	ug/L	101	(70-130)	20	2.0
MBLK	Methoxychlor			<0.05	ug/L				
MRL_CHK	Methoxychlor		0.1	0.145	ug/L	145	(50-150)		
MS_201006120045	Methoxychlor	ND	2.0	2.77	ug/L	**139**	(70-130)		
LCS1	Metolachlor		2.0	2.02	ug/L	101	(70-130)		
LCS2	Metolachlor		2.0	2.00	ug/L	100	(70-130)	20	1
MBLK	Metolachlor			<0.025	ug/L				
MRL_CHK	Metolachlor		0.05	0.0520	ug/L	104	(50-150)		
MS_201006120045	Metolachlor	ND	2.0	2.09	ug/L	105	(70-130)		
LCS1	Metribuzin		2.0	1.37	ug/L	**68**	(70-130)		
LCS2	Metribuzin		2.0	1.42	ug/L	71	(70-130)	20	3.6
MBLK	Metribuzin			<0.05	ug/L				
MRL_CHK	Metribuzin		0.05	0.0500	ug/L	100	(50-150)		
MS_201006120045	Metribuzin	ND	2.0	1.87	ug/L	93	(70-130)		
LCS1	Molinate		2.0	1.95	ug/L	98	(70-130)		
LCS2	Molinate		2.0	1.99	ug/L	100	(70-130)	20	2.0
MBLK	Molinate			<0.05	ug/L				
MRL_CHK	Molinate		0.1	0.110	ug/L	110	(50-150)		
MS_201006120045	Molinate	ND	2.0	2.04	ug/L	102	(70-130)		
LCS1	Naphthalene		2.0	1.86	ug/L	93	(70-130)		
LCS2	Naphthalene		2.0	1.74	ug/L	87	(70-130)	20	6.7

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS or CCC. Criteria for duplicates are advisory only, unless otherwise specified in the method.
(S) Indicates surrogate compound.
(I) Indicates internal standard compound.
RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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Monrovia, California, 91016-3629
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Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Naphthalene			<0.05	ug/L				
MRL_CHK	Naphthalene		0.1	0.106	ug/L	106	(50-150)		
MS_201006120045	Naphthalene		2.0	1.82	ug/L	91	(70-130)		
LCS1	Parathion		2.0	1.86	ug/L	93	(70-130)		
LCS2	Parathion		2.0	1.85	ug/L	92	(70-130)	20	0.54
MBLK	Parathion			<0.05	ug/L				
MRL_CHK	Parathion		0.1	0.145	ug/L	145	(50-150)		
MS_201006120045	Parathion		2.0	1.99	ug/L	99	(70-130)		
LCS1	Pendimethalin		2.0	1.91	ug/L	95	(70-130)		
LCS2	Pendimethalin		2.0	1.84	ug/L	92	(70-130)	20	3.7
MBLK	Pendimethalin			<0.05	ug/L				
MRL_CHK	Pendimethalin		0.1	0.148	ug/L	148	(50-150)		
MS_201006120045	Pendimethalin		2.0	1.9	ug/L	95	(70-130)		
LCS1	Pentachlorophenol		8.0	7.15	ug/L	89	(70-130)		
LCS2	Pentachlorophenol		8.0	7.19	ug/L	90	(70-130)	20	0.56
MBLK	Pentachlorophenol			<0.6	ug/L				
MRL_CHK	Pentachlorophenol		0.5	0.603	ug/L	121	(50-150)		
MS_201006120045	Pentachlorophenol	ND	8.0	7.48	ug/L	94	(70-130)		
LCS1	Permethrin (mixed isomers)		4.0	3.83	ug/L	96	(70-130)		
LCS2	Permethrin (mixed isomers)		4.0	3.73	ug/L	93	(70-130)	20	2.6
MBLK	Permethrin (mixed isomers)			<0.1	ug/L				
MRL_CHK	Permethrin (mixed isomers)		0.15	0.325	ug/L	**217**	(50-150)		
MS_201006120045	Permethrin (mixed isomers)		4.0	3.97	ug/L	99	(70-130)		
LCS1	Perylene-d12 (S)			92.9	%	93	(70-130)		
LCS2	Perylene-d12 (S)			95.6	%	96	(70-130)		
MBLK	Perylene-d12 (S)			75.5	%	76	(70-130)		
MRL_CHK	Perylene-d12 (S)			80.8	%	81	(70-130)		
MS_201006120045	Perylene-d12 (S)			96.1	%	96	(70-130)		
LCS1	Phenanthrene		2.0	1.74	ug/L	87	(70-130)		
LCS2	Phenanthrene		2.0	1.75	ug/L	88	(70-130)	20	1.1
MBLK	Phenanthrene			<0.02	ug/L				
MRL_CHK	Phenanthrene		0.02	0.0210	ug/L	105	(50-150)		
MS_201006120045	Phenanthrene	ND	2.0	1.84	ug/L	92	(70-130)		
LCS1	Phenanthrene-d10 (I)			90.8	%	91	(50-150)		
LCS2	Phenanthrene-d10 (I)			88.3	%	88	(50-150)		
MBLK	Phenanthrene-d10 (I)			100	%	100	(50-150)		
MRL_CHK	Phenanthrene-d10 (I)			96.6	%	97	(50-150)		
MS_201006120045	Phenanthrene-d10 (I)			78.4	%	78	(50-150)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS or CCC. Criteria for duplicates are advisory only, unless otherwise specified in the method.
(S) Indicates surrogate compound.
(I) Indicates internal standard compound.
RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Propachlor		2.0	1.98	ug/L	99	(70-130)		
LCS2	Propachlor		2.0	2.02	ug/L	101	(70-130)	20	2.0
MBLK	Propachlor			<0.025	ug/L				
MRL_CHK	Propachlor		0.05	0.0610	ug/L	122	(50-150)		
MS_201006120045	Propachlor	ND	2.0	2.03	ug/L	102	(70-130)		
LCS1	Pyrene		2.0	1.94	ug/L	97	(70-130)		
LCS2	Pyrene		2.0	1.93	ug/L	96	(70-130)	20	0.52
MBLK	Pyrene			<0.025	ug/L				
MRL_CHK	Pyrene		0.05	0.0540	ug/L	108	(50-150)		
MS_201006120045	Pyrene	ND	2.0	1.96	ug/L	98	(70-130)		
LCS1	Simazine		2.0	1.54	ug/L	77	(70-130)		
LCS2	Simazine		2.0	1.67	ug/L	84	(70-130)	20	8.1
MBLK	Simazine			<0.025	ug/L				
MRL_CHK	Simazine		0.05	0.0590	ug/L	118	(50-150)		
MS_201006120045	Simazine	ND	2.0	1.93	ug/L	97	(70-130)		
LCS1	Terbacil		2.0	1.67	ug/L	83	(70-130)		
LCS2	Terbacil		2.0	1.65	ug/L	82	(70-130)	20	1.2
MBLK	Terbacil			<0.05	ug/L				
MRL_CHK	Terbacil		0.1	0.132	ug/L	132	(50-150)		
MS_201006120045	Terbacil		2.0	2.13	ug/L	107	(70-130)		
LCS1	Terbuthylazine		2.0	2.08	ug/L	104	(70-130)		
LCS2	Terbuthylazine		2.0	2.1	ug/L	105	(70-130)	20	0.96
MBLK	Terbuthylazine			<0.2	ug/L				
MRL_CHK	Terbuthylazine		0.1	0.115	ug/L	115	(50-150)		
MS_201006120045	Terbuthylazine		2.0	2.07	ug/L	103	(70-130)		
LCS1	Thiobencarb		2.0	1.98	ug/L	99	(70-130)		
LCS2	Thiobencarb		2.0	1.99	ug/L	100	(70-130)	20	0.50
MBLK	Thiobencarb			<0.1	ug/L				
MRL_CHK	Thiobencarb		0.1	0.103	ug/L	103	(50-150)		
MS_201006120045	Thiobencarb	ND	2.0	2.07	ug/L	103	(70-130)		
LCS1	trans-Nonachlor		2.0	1.91	ug/L	96	(70-130)		
LCS2	trans-Nonachlor		2.0	1.9	ug/L	95	(70-130)	20	0.53
MBLK	trans-Nonachlor			<0.025	ug/L				
MRL_CHK	trans-Nonachlor		0.05	0.0470	ug/L	94	(50-150)		
MS_201006120045	trans-Nonachlor	ND	2.0	1.83	ug/L	92	(70-130)		
LCS1	Trifluralin		2.0	1.93	ug/L	97	(70-130)		
LCS2	Trifluralin		2.0	2.01	ug/L	100	(70-130)	20	4.1
MBLK	Trifluralin			<0.05	ug/L				

Spike recovery is already corrected for native results.
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Criteria for MS and Dup are advisory only, batch control is based on LCS or CCC. Criteria for duplicates are advisory only, unless otherwise specified in the method.
(S) Indicates surrogate compound.
(I) Indicates internal standard compound.
RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

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Laboratory
QC Report: 335889

City of Santa Cruz
(continued)

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Trifluralin		0.1	0.125	ug/L	125	(50-150)		
MS_201006120045	Trifluralin	ND	2.0	2.01	ug/L	101	(70-130)		
LCS1	Triphenylphosphate (S)			109	%	109	(70-130)		
LCS2	Triphenylphosphate (S)			109	%	109	(70-130)		
MBLK	Triphenylphosphate (S)			109	%	109	(70-130)		
MRL_CHK	Triphenylphosphate (S)			105	%	105	(70-130)		
MS_201006120045	Triphenylphosphate (S)			105	%	105	(70-130)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS or CCC. Criteria for duplicates are advisory only, unless otherwise specified in the method.
(S) Indicates surrogate compound.
(I) Indicates internal standard compound.
RPD not calculated for LCS2 when different a concentration than LCS1 is used
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level)

ORGANIC CHEMICAL ANALYSIS (11/07)

Date of Report: 6/28/2010

Sample ID No.: 201006120044 - 335889

Laboratory Name: MWH Laboratories

Signature Lab Director:

Name of Sampler:

Employed by:

Date/Time Sample Collected: 6/10/2010 0945

Date/Time Received @Lab: 06/11/2010

Date Analyses Completed. 6/25/2010

System Name: XXXXXXXXXXX

System Number: XXXXXXX

Variable ID:

COC ID: Auto Plaza Deep MW_AP_DEEP

Name or Number of Sample Source:

User ID:

Station number: XXXXXXX-XXX

Date/Time of Sample: 10 06 10 0945
YY MM DD TTTT

Laboratory Code: |9|5|9|0|

Date Analyses completed: 10 06 25
YY MM DD

Submitted by: Hugh Dalton

Phone# 831-420-5484

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
	REGULATED ORGANIC CHEMICALS					
525.2	Lindane (gamma-BHC)	ug/L	39340	<0.2	0.2	0.2
525.2	Methoxychlor	ug/L	39480	<10.0	30	10.0
525.2	Diethylhexylphthalate (DEHP)	ug/L	39100	<3.0	4	3.0
525.2	Atrazine (Aatrex)	ug/L	39033	<0.5	1	0.5
525.2	Molinate (Ordram)	ug/L	82199	<2	20	2
525.2	Simazine (Princep)	ug/L	39055	<1	4	1
525.2	Thiobencarb (Bolero)	ug/L	A-001	<1.0	70	1.0
525.2	Alachlor (Alanex)	ug/L	77825	<1.0	2	1.0
525.2	Benzo(a)pyrene	ug/L	34247	<0.1	0.2	0.1
525.2	Di(2-ethylhexyl) Adipate	ug/L	A-026	<5.0	400	5.0
525.2	Hexachlorobenzene	ug/L	39700	<0.5	1	0.5
525.2	Hexachlorocyclopentadiene	ug/L	34386	<1.0	50	1.0
	UNREGULATED ORGANIC CHEMICALS					
525.2	2,4-Dinitrotoluene	ug/L	34611	<0.1		
525.2	Aldrin	ug/L	39330	<0.075		0.075
525.2	Bromacil (Hyvar)	ug/L	82198	<10.0		10.0
525.2	Butachlor	ug/L	77860	<0.38		0.38
525.2	Diazinon	ug/L	39570	<0.1		
525.2	Metribuzin	ug/L	81408	<0.05		
525.2	Propachlor	ug/L	38533	<0.5		0.5
525.2	Metolachlor	ug/L	39356	<0.05		

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
525.2	Dimethoate (Cygon)	ug/L	38458	<0.1		
	Pharmaceuticals and Surrogates:					
525.2	Caffeine	ug/L	81436	<0.05		

ORGANIC CHEMICAL ANALYSIS (11/07)

Date of Report: 6/28/2010

Sample ID No.: 201006120045 - 335889

Laboratory Name: MWH Laboratories

Signature Lab Director:

Name of Sampler:

Employed by:

Date/Time Sample Collected: 6/10/2010 1045

Date/Time Received @Lab: 06/11/2010

Date Analyses Completed. 6/25/2010

System Name: XXXXXXXXXXX

System Number:

Variable ID:

COC ID: Auto Plaza Medium MW_AP_MED

Name or Number of Sample Source:

User ID:

Station number:

Date/Time of Sample: 10 06 10 1045
YY MM DD TTTT

Laboratory Code: |9|5|9|0|

Date Analyses completed: 10 06 25
YY MM DD

Submitted by: Hugh Dalton

Phone# 831-420-5484

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
	REGULATED ORGANIC CHEMICALS					
525.2	Lindane (gamma-BHC)	ug/L	39340	<0.2	0.2	0.2
525.2	Methoxychlor	ug/L	39480	<10.0	30	10.0
525.2	Diethylhexylphthalate (DEHP)	ug/L	39100	<3.0	4	3.0
525.2	Atrazine (Aatrex)	ug/L	39033	<0.5	1	0.5
525.2	Molinate (Ordram)	ug/L	82199	<2	20	2
525.2	Simazine (Princep)	ug/L	39055	<1	4	1
525.2	Thiobencarb (Bolero)	ug/L	A-001	<1.0	70	1.0
525.2	Alachlor (Alanex)	ug/L	77825	<1.0	2	1.0
525.2	Benzo(a)pyrene	ug/L	34247	<0.1	0.2	0.1
525.2	Di(2-ethylhexyl) Adipate	ug/L	A-026	<5.0	400	5.0
525.2	Hexachlorobenzene	ug/L	39700	<0.5	1	0.5
525.2	Hexachlorocyclopentadiene	ug/L	34386	<1.0	50	1.0
	UNREGULATED ORGANIC CHEMICALS					
525.2	2,4-Dinitrotoluene	ug/L	34611	<0.1		
525.2	Aldrin	ug/L	39330	<0.075		0.075
525.2	Bromacil (Hyvar)	ug/L	82198	<10.0		10.0
525.2	Butachlor	ug/L	77860	<0.38		0.38
525.2	Diazinon	ug/L	39570	<0.1		
525.2	Metribuzin	ug/L	81408	<0.05		
525.2	Propachlor	ug/L	38533	<0.5		0.5
525.2	Metolachlor	ug/L	39356	<0.05		

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
525.2	Dimethoate (Cygon)	ug/L	38458	<0.1		
	Pharmaceuticals and Surrogates:					
525.2	Caffeine	ug/L	81436	<0.05		

ORGANIC CHEMICAL ANALYSIS (11/07)

Date of Report: 6/28/2010

Sample ID No.: 201006120046 - 335889

Laboratory Name: MWH Laboratories

Signature Lab Director:

Name of Sampler:

Employed by:

Date/Time Sample Collected: 6/10/2010 1100

Date/Time Received @Lab: 06/11/2010

Date Analyses Completed. 6/25/2010

System Name: XXXXXXXXXXX

System Number:

Variable ID:

COC ID: Auto Plaza Shallow MW_AP_SHAL

Name or Number of Sample Source:

User ID:

Station number:

Date/Time of Sample: 10 06 10 1100
YY MM DD TTTT

Laboratory Code: |9|5|9|0|

Date Analyses completed: 10 06 25
YY MM DD

Submitted by: Hugh Dalton

Phone# 831-420-5484

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
	REGULATED ORGANIC CHEMICALS					
525.2	Lindane (gamma-BHC)	ug/L	39340	<0.2	0.2	0.2
525.2	Methoxychlor	ug/L	39480	<10.0	30	10.0
525.2	Diethylhexylphthalate (DEHP)	ug/L	39100	<3.0	4	3.0
525.2	Atrazine (Aatrex)	ug/L	39033	<0.5	1	0.5
525.2	Molinate (Ordram)	ug/L	82199	<2	20	2
525.2	Simazine (Princep)	ug/L	39055	<1	4	1
525.2	Thiobencarb (Bolero)	ug/L	A-001	<1.0	70	1.0
525.2	Alachlor (Alanex)	ug/L	77825	<1.0	2	1.0
525.2	Benzo(a)pyrene	ug/L	34247	<0.1	0.2	0.1
525.2	Di(2-ethylhexyl) Adipate	ug/L	A-026	<5.0	400	5.0
525.2	Hexachlorobenzene	ug/L	39700	<0.5	1	0.5
525.2	Hexachlorocyclopentadiene	ug/L	34386	<1.0	50	1.0
	UNREGULATED ORGANIC CHEMICALS					
525.2	2,4-Dinitrotoluene	ug/L	34611	<0.1		
525.2	Aldrin	ug/L	39330	<0.075		0.075
525.2	Bromacil (Hyvar)	ug/L	82198	<10.0		10.0
525.2	Butachlor	ug/L	77860	<0.38		0.38
525.2	Diazinon	ug/L	39570	<0.1		
525.2	Metribuzin	ug/L	81408	<0.05		
525.2	Propachlor	ug/L	38533	<0.5		0.5
525.2	Metolachlor	ug/L	39356	<0.05		

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
525.2	Dimethoate (Cygon)	ug/L	38458	<0.1		
	Pharmaceuticals and Surrogates:					
525.2	Caffeine	ug/L	81436	<0.05		

ORGANIC CHEMICAL ANALYSIS (11/07)

Date of Report: 6/28/2010

Sample ID No.: 201006120047 - 335889

Laboratory Name: MWH Laboratories

Signature Lab Director:

Name of Sampler:

Employed by:

Date/Time Sample Collected: 6/10/2010 1135

Date/Time Received @Lab: 06/11/2010

Date Analyses Completed. 6/25/2010

System Name: XXXXXXXXXXX

System Number:

Variable ID:

COC ID: Cory Stree Shallow MW_CORY_SH

Name or Number of Sample Source:

User ID:

Station number:

Date/Time of Sample: 10 06 10 1135
YY MM DD TTTT

Laboratory Code: |9|5|9|0|

Date Analyses completed: 10 06 25
YY MM DD

Submitted by: Hugh Dalton

Phone# 831-420-5484

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
	REGULATED ORGANIC CHEMICALS					
524.2	Total Trihalomethane(TTHMs)	ug/L	82080	<0.5	80	
524.2	Bromodichloromethane	ug/L	32101	<1.0		1.0
524.2	Bromoform	ug/L	32104	<1.0		1.0
524.2	Chloroform(Trichloromethane)	ug/L	32106	<1.0		1.0
524.2	Dibromochloromethane	ug/L	32105	<1.0		1.0
524.2	Benzene	ug/L	34030	<0.5	1	0.5
524.2	Carbon Tetrachloride	ug/L	32102	<0.5	0.5	0.5
524.2	1,2-Dichlorobenzene (o-DCB)	ug/L	34536	<0.5	600	0.5
524.2	1,4-Dichlorobenzene (p-DCB)	ug/L	34571	<0.5	5	0.5
524.2	1,1-Dichloroethane (1,1-DCA)	ug/L	34496	<0.5	5	0.5
524.2	1,2-Dichloroethane (1,2-DCA)	ug/L	34531	<0.5	0.5	0.5
524.2	1,1-Dichloroethylene (1,1-DCE)	ug/L	34501	<0.5	6	0.5
524.2	cis-1,2-Dichloroethylene (c-1,2-DCE)	ug/L	77093	<0.5	6	0.5
524.2	trans-1,2-Dichloroethylene	ug/L	34546	<0.5	10	0.5
524.2	Dichloromethane(Methylene Chloride)	ug/L	34423	<0.5	5	0.5
524.2	1,2-Dichloropropane	ug/L	34541	<0.5	5	0.5
524.2	cis-1,3-Dichloropropene	ug/L	34704	<0.5	0.5	0.5
524.2	trans-1,3-Dichloropropene	ug/L	34699	<0.5	0.5	0.5
524.2	Total 1,3-Dichloropropene	ug/L	34561	<0.5	0.5	0.5
524.2	Ethyl Benzene	ug/L	34371	<0.5	300	0.5
524.2	Methyl Tert-Butyl Ether (MTBE)	ug/L	46491	<3.0	5.0	3.0
524.2	Monochlorobenzene (Chlorobenzene)	ug/L	34301	<0.5	70	0.5
524.2	Styrene	ug/L	77128	<0.5	100	0.5
524.2	1,1,2,2-Tetrachloroethane	ug/L	34516	<0.5	1	0.5

TEST METHOD	CHEMICAL ALL CHEMICALS EXCEPT 2,3,7,8 TCDD (DIOXIN) reported uG/L		ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Tetrachloroethylene (PCE)	ug/L	34475	<0.5	5	0.5
524.2	Toluene	ug/L	34010	<0.5	150	0.5
524.2	1,2,4-Trichlorobenzene	ug/L	34551	<0.5	5	0.5
524.2	1,1,1-Trichloroethane(1,1,1-TCA)	ug/L	34506	<0.5	200	0.5
524.2	1,1,2-Trichloroethane(1,1,2-TCA)	ug/L	34511	<0.5	5	0.5
524.2	Trichloroethylene (TCE)	ug/L	39180	<0.5	5	0.5
524.2	Trichlorofluoromethane (FREON 11)	ug/L	34488	<5	150	5
524.2	Trichlorotrifluoroethane(Freon113)	ug/L	81611	<10.0	1200	10.0
524.2	Vinyl Chloride (VC)	ug/L	39175	<0.5	0.5	0.5
524.2	m,p-Xylene	ug/L	A-014	<0.5		0.5
524.2	o-Xylene	ug/L	77135	<0.5		0.5
524.2	Total Xylenes (m,p, & o)	ug/L	81551	<1	1750	

UNREGULATED ORGANIC CHEMICALS

524.2	Bromobenzene	ug/L	81555	<0.5		0.5
524.2	tert-Amyl-Methyl Ether (TAME)	ug/L	A-034	<3.0		3.0
524.2	Bromochloromethane	ug/L	A-012	<0.5		0.5
524.2	Bromomethane (Methyl Bromide)	ug/L	34413	<0.5		0.5
524.2	n-Butylbenzene	ug/L	A-010	<0.5		0.5
524.2	tert-Butylbenzene	ug/L	77353	<0.5		0.5
524.2	Chloroethane	ug/L	34311	<0.5		0.5
524.2	Di-isopropyl Ether (DIPE)	ug/L	A-036	<3.0		3.0
524.2	Chloromethane (Methyl Chloride)	ug/L	34418	<0.5		0.5
524.2	2-Chlorotoluene	ug/L	A-008	<0.5		0.5
524.2	4-Chlorotoluene	ug/L	A-009	<0.5		0.5
524.2	Dibromomethane	ug/L	77596	<0.5		0.5
524.2	m-Dichlorobenzene (1,3-DCB)	ug/L	34566	<0.5		0.5
524.2	1,3-Dichloropropane	ug/L	77173	<0.5		0.5
524.2	2,2-Dichloropropane	ug/L	77170	<0.5		0.5
524.2	1,1-Dichloropropene	ug/L	77168	<0.5		0.5
524.2	Dichlorodifluoromethane (Freon 12)	ug/L	34668	<0.5		0.5
524.2	Ethyl-tert-Butyl Ether (ETBE)	ug/L	A-033	<3.0		3.0
524.2	Hexachlorobutadiene	ug/L	34391	<0.5		0.5
524.2	Isopropylbenzene (Cumene)	ug/L	77223	<0.5		0.5
524.2	p-Isopropyltoluene	ug/L	A-011	<0.5		
524.2	sec-Butylbenzene	ug/L	77350	<0.5		0.5
524.2	Naphthalene	ug/L	34696	<0.5		0.5
524.2	n-Propylbenzene	ug/L	77224	<0.5		0.5

524.2	1,1,1,2-Tetrachloroethane	ug/L	77562	<0.5		0.5
524.2	1,2,3-Trichlorobenzene	ug/L	77613	<0.5		0.5
524.2	1,3,5-Trimethylbenzene	ug/L	77226	<0.5		0.5
524.2	1,2,4-Trimethylbenzene	ug/L	77222	<0.5		0.5
524.2	Methyl ethyl ketone (MEK, Butanone)	ug/L	81595	<5.0		5.0
524.2	Methyl isobutyl ketone (MIBK)	ug/L	81596	<5.0		5.0

524.2	Carbon Disulfide	ug/L	77041	<0.5		0.5

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR
COMMENTS RECEIVED

SOQUEL CREEK WATER DISTRICT

Board of Directors
Dr. Thomas R. LaHue, *President*
Bruce Daniels, *Vice President*
Dr. Don Hoernschemeyer
Dr. Bruce Jaffe
Daniel F. Kriege

Laura D. Brown, *General Manager*

January 14, 2011

Leah Van Der Maaten, P.E., Associate Civil Engineer
City of Santa Cruz, Water Department
212 Locust Street Suite C
Santa Cruz CA 95060

Subject: Soquel Creek Water District Comments on Beltz Well No. 12 Notice of Preparation/Initial Study (NOP/IS)

Dear Ms. Van Der Maaten:

This letter provides the Soquel Creek Water District's (SqCWD) comments on the City of Santa Cruz Water Department's Notice of Preparation/Initial Study for the Beltz Well No. 12 project. Although the NOP/IS states that a hydrogeologic study is being prepared and issues such as groundwater impacts will be analyzed, the hydrogeologic study by Hopkins Groundwater Consultants, Inc. (Hopkins) titled "City of Santa Cruz Beltz Well No. 12 Well Interference and Stream Flow Impact Analysis Live Oak-Capitola Area, California, October 2010" was provided to SqCWD via e-mail from Linette Almond, Deputy Water Director/Engineering Manager on December 16, 2010. Many of our comments are based on this report and how it could be applied to the Draft Environmental Impact Report (DEIR).

Comment #1 Out of Date Baseline

1a. The use of out-of-date historical conditions as a baseline is not appropriate for evaluation of impacts from pumping. The out-of-date historical conditions do not reflect the current conditions that should be used as a baseline. Figure 1, "City of Santa Cruz Production Averaging" illustrates that the proposed 645 Acre-Ft/yr pumping is an increase in pumping and the impacts of such an increase should be evaluated in the draft environmental impact report (DEIR).

1b.The extraction rate of 700 gpm (1 MGD or 645 Acre-Ft/yr) is not appropriate for use as a baseline. The City should provide explanation as to why the need exists to pump up to the maximum extraction in all years as opposed to only in drought years. The City may use the historical rate as a goal for their total capacity, but it does not reflect current conditions or even historical conditions.

MAIL TO: P. O. Box 1550 • Capitola, CA 95010-1550
5180 Soquel Drive TEL: 831-475-8500 FAX: 831-475-4291 WEBSITE: www.soquelcreekwater.org

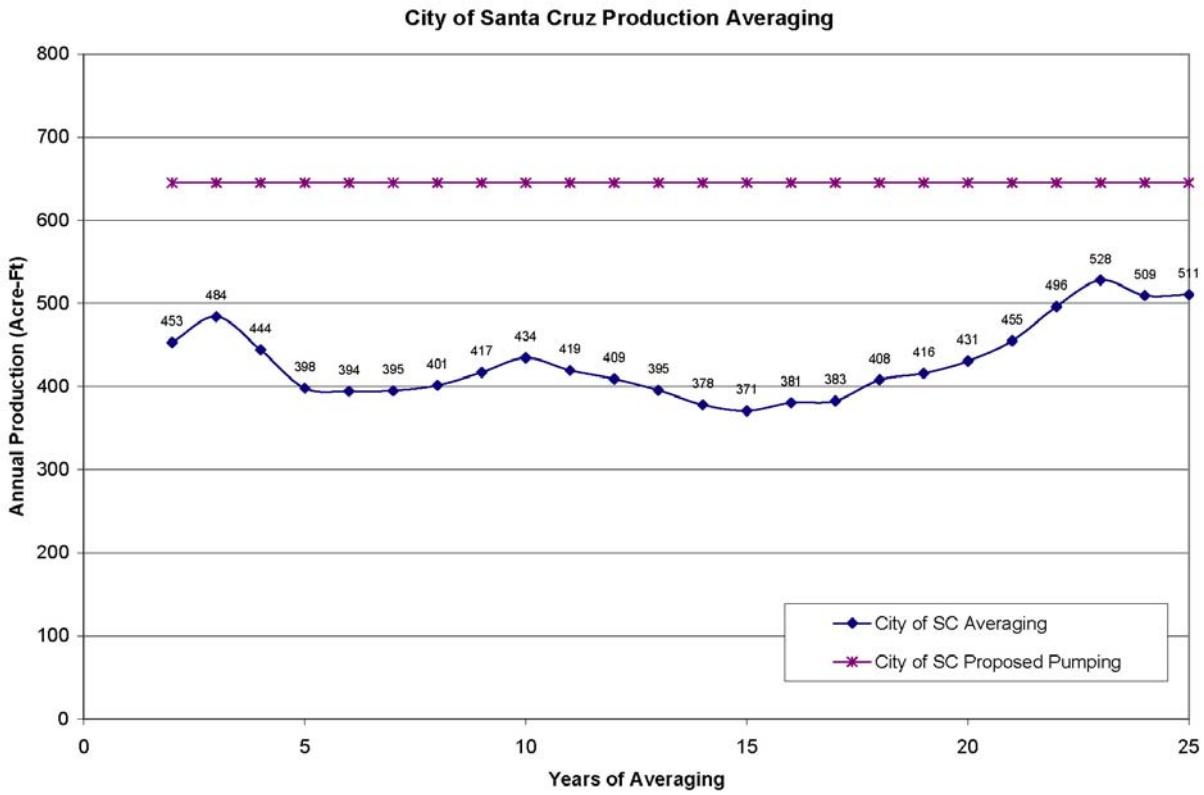


Figure 1. City of Santa Cruz Production Averaging

1c. Gallons per minute or per day extraction rates should not be used for baseline because groundwater level impacts are evaluated at the end of the pumping season. The appropriate baseline is the total volume currently pumped in the pumping season, or the City's annual pumping. The City has not pumped 645 acre-feet (the equivalent of 1 MGD over planned pumping period of 210 days) in any water year since 1994. For the period of 2005-2008 used by SqCWD as the baseline period in its Well Master Plan EIR, the City's pumping averaged about 385 acre-feet. For the ten year period from 2000-2009, the City's pumping averaged about 435 acre-feet. These values would be more appropriate for use as a baseline.

Comment #2 Terminology

Beltz #12 may not be properly labeled a replacement well for Beltz #4. It is not in the same location and Beltz #4 has not been used since 1992.

Comment #3 Groundwater levels

Groundwater levels cited in the NOP/IS do not reflect current conditions and are not

appropriate as a baseline for evaluating impacts from pumping. The groundwater levels cited were from Pleasure Point 20 feet above mean sea level (amsl) in 1998, following a recovery after the "last" drought in 1987-1988 (we attribute this recovery primarily to the City's decrease in pumping referenced in comment #1. However, current groundwater levels at the City's Pleasure Point, Soquel Point, and Moran Lake monitoring wells are near 6 feet amsl, the protective elevations suggested by the City (Hopkins, March 2010). Current groundwater levels at SC-1A are below 4 feet amsl, the protective elevation established by SqCWD (and also below the 6 feet protective elevation requested by the City). Protective elevations are meant to protect the basin against seawater intrusion and any lowering of water levels in these wells would increase the risk of seawater intrusion and be a significant impact.

Comment #4 Incomplete Evaluation of Impacts from Drawdown

4a. The Hopkins October 2010 report states that Beltz #12 is "part of the City's groundwater management strategy to maintain groundwater levels near the coast to abate seawater intrusion into the Purisima Formation," (p. 1). The DEIR should discuss Beltz #12 effect on groundwater levels near the coast and the additional risk of seawater intrusion due to pumping Beltz #12. The effect of Beltz #12 on groundwater levels near the coast should be evaluated against an appropriate baseline as discussed in comment #1.

4b. The Hopkins October 2010 report states that “excessive drawdown could reduce well yield.” The DEIR should address how higher risk of seawater intrusion could reduce well yield. Based on the City's plans, the City actually will increase its groundwater extraction in all years to a maximum of 645 acre-feet, an increase of 67% over the averaged 2005-2008 period (385 acre-ft) and an increase of 48% over average pumping during the 2000-2009 period (435 acre-ft); therefore, the potential for seawater intrusion would be increased and pumping at the Beltz #12 could increase that potential, a potentially significant impact.

4c. The Hopkins October 2010 report concludes that interference drawdown at the Main Street well of up to 2.5 feet “will not jeopardize operation of the well pump equipment or appreciably lower the well production rate (likely not at all),” but does not account for current conditions where lowered water levels at the well may lead SqCWD to reduce the pumping rate further.

4d. The estimated interference drawdown at the Main Street well of up to 2.5 feet may be underestimated because it is based on an inappropriate baseline as discussed in comment #1.

4e. The Hopkins October 2010 report does not discuss drawdown impacts at the Garnet, Rosedale, Tannery, the proposed O'Neill Ranch well and private wells although predicted drawdowns are presented on the results maps. The DEIR should address these impacts. For example, the Hopkins analysis (plates B2 and B3) shows A zone drawdowns in the vicinity of the Greenbrae wells of up to 5 feet, a value that may be underestimated because it is based on an inappropriate baseline as discussed in comment #1. According to Hopkins (disputed) interpretation of the geology, these 200 foot deep wells would be completed in the A zone. Comparing available water levels to available well construction information, the impact of Beltz 12 is probably not restrictive, but the City may want to join in SqCWD's monitoring and mitigation plan to address this potentially significant impact.

4f. The Hopkins October 2010 report includes projected decreases in pumping at the existing Live Oak wells Beltz 8 and 9. The baseline used for this pumping is 1 MGD over 210 days (approx 700 gpm continuously) of Plates B1-B4 labeled "Groundwater Elevation Change from Existing Condition." As stated in comment #1, the use of 1 MGD as a baseline is not representative of the existing condition as it is higher than recent pumping and the historical average.

4g. In the Hopkins October 2010 report, plates B2 and B4, show shifting the full 700 gpm from Beltz 8/9 to Beltz 12, despite the fact that existing Beltz wells haven't produced that equivalent amount since 1994. Plates B1 and B3 show shifting 350 gpm from Beltz 8/9 to Beltz 12. This shift represents a possible shift from existing conditions only if remaining Beltz 8/9 pumping is something less than 350 gpm such that the total is closer to the equivalent of actual pumping. However, Plates B1 and B3 include remaining Beltz 8/9 pumping of 350 gpm (0.5 MGD over 210 days) so are based on an inappropriate baseline.

4h. Plates B1-B4 in the Hopkins October 2010 report show groundwater level increases at the coast that are not representative of impacts from the City's planned pumping because they are based on a baseline of 1 MGD over 210 days (approx 700 gpm continuously) that is not representative of existing conditions. An analysis based on a baseline representative of existing conditions may show that the City's planned pumping results in groundwater level decreases.

4i. Existing water level conditions at the coastline are at or below protective elevations so any water level decrease is potentially restrictive. Therefore, an increase in total pumping to 700 gpm/1 MGD for 210 days by the City could be restrictive.

Comment #5 Conceptual Model of Geology

5a. The Hopkins October 2010 report has a different conceptual model of geology in the area than used in Johnson et al (2004) that is the basis for SqCWD's analysis for its Well Master Plan DEIR. Yet, the Hopkins October 2010 report refers to the Hopkins geology as "the generally accepted delineation of the Purisima Formation aquifer units." (p. 3) In the DEIR, the City needs to acknowledge this as an area of controversy.

5b. The Hopkins October 2010 report geology refers to Purisima zones/units above the A unit using labeling ("B", "C") similar to the older Luhdorff and Scalmanini labeling as opposed to the delineation re-defined by Johnson et al ("B","BC", "D").

5c. The Hopkins October 2010 report geology puts more of the Main Street well screen (and presumably more of the O'Neill Ranch well) in the A unit, when SqCWD's hydrogeologist, HydroMetrics, places these wells in the AA unit and lower based on Johnson et al.

Comment #6 Cumulative Impacts

6a. The DEIR should address cumulative impacts of pumping Beltz 12, SqCWD's proposed O'Neill Ranch well, the City's proposed Beltz 11 well, changes in pumping at the Live Oak well field, and changes in pumping at existing SqCWD wells. The changes in pumping at existing wells should be based on a baseline representative of existing conditions.

6b. Cumulative impacts to nearby wells, including private wells, may be greater than impacts of Beltz 12 alone.

6c. Cumulative impacts to Soquel Creek may be greater than impacts of Beltz 12 alone.

Comment #7 Monitoring and Mitigation

Given the potential for cumulative impacts from City and SqCWD pumping in the subject area, the DEIR should identify a joint monitoring and mitigation approach between our agencies for impacts on coastal groundwater levels, impacts on private wells and impacts on Soquel Creek streamflow.

Comment #8 Energy

The DEIR should assess the energy requirements for pump and treatment plant operation in addition to construction and vehicle trips.

Comment #9 Water Quality

The possibility that Beltz 12 pumping will interfere with the cleanup activities at the environmental clean-up sites should be evaluated.

Comment #10 Backwash Water Use

On Page 8 of the Project Description, it states: "The backwash is then piped to the backwash tank. In this tank, the iron and manganese settle out from the groundwater. The clear water is piped to the County sanitary sewer line located immediately adjacent to the Proposed Project site in Research Park Drive and/or recirculated to the wellhead treatment and the remaining sludge is transported offsite every year to an appropriate disposal facility." SqCWD requests the City evaluate designing the treatment plant process such that normal operations result in the clarified backwash water to be reclaimed and not discharged to the sanitary sewer. Furthermore, we request that controls be incorporated into the design allowing the sludge pump to be controlled by a counter. The intent is to not pump sludge to waste every backwash and minimize water waste. Working with the Sanitation District's total suspended solids discharge limit, the City should be able to reduce the amount of water pumped to the sewage system unnecessarily. SqCWD currently incorporates this simple process to save millions of gallons of groundwater each year with recovery percentages of 85%-90%.

Sincerely,

Soquel Creek Water District

Taj A. Dufour, P.E.
Engineering Manager/Chief Engineer

e-mailed to: lvandermaaten@cityofsantacruz.com
faxed to: 831-420-5201

County of Santa Cruz

HEALTH SERVICES AGENCY

701 OCEAN STREET, ROOM 312, SANTA CRUZ, CA 95060-4073
(831) 454-2022 FAX: (831) 454-3128 TDD: (831) 454-4123

ENVIRONMENTAL HEALTH

www.co.santa-cruz.ca.us/eh/ehhome.htm

January 14, 2011

Leah Van Der Maaten
City of Santa Cruz Water Dept.
212 Locust St., Suite C
Santa Cruz, CA 95060
Submitted by Fax: 831-420-5201

Subject: Comments on Notice of Preparation of an EIR for Beltz Well No. 12

Dear Ms. Van Der Maaten:

I am writing to provide comments regarding preparation of the subject EIR. As the NOP correctly indicates, drilling the well will require a well permit from County Environmental Health. County Code Chapter 7.70 provides that such a permit for a large water purveyor like the City of Santa Cruz is a discretionary permit, and as such will require a thorough analysis under the California Environmental Quality Act prior to issuance of a permit. While the NOP generally addresses the topics that should be addressed in the EIR, we have the following additional comments.

The project description indicates that this is to be a replacement well for Beltz Well No. 4. However, little or no information is provided on the existing well. Where is it located, how deep is it, where is it screened, what is its historical production, why does it need to be replaced? How do we know the proposed well will draw form the same zones of the Purisima formation? A map showing the proposed well site and the locations of the existing Beltz wells is needed, along with a geologic cross-section through the existing and proposed wells.

Although the NOP identified potentially significant cumulative impacts, there is very little discussion of current and proposed pumping by other entities from the same area. This will need to be addressed in the EIR. Soquel Creek Water District has been proposing for many years to drill the O'Neill well very close to this location. What is the potential for hydraulic interference? Why was the proposed location of Beltz No.12 chosen and are there other alternative sites? The EIR should consider an alternative in which the City and Soquel Water District enter into an agreement for joint management of that portion of the basin. The possibility of drilling a single well that would be utilized by both agencies should be considered. The City could go further and turn over all groundwater management and production activities to Soquel District, with the provision that Soquel would provide the City with at least 1 mgd under specified circumstances. This would allow for spreading the pumping impacts over a much larger area than just the Beltz area.

The NOP indicates that pumping by Soquel Creek Water District and privately owned individual wells has lowered the amount of offshore flow available for capture by the Live Oak wellfield. More information on this should be provided, particularly since the source report that was cited was not attached or made available on the City website. The City should also keep in mind that their appropriative groundwater rights are generally subordinate to private, overlying pumpers. Can the City reasonably expect to pump 1 mgd without contributing to adverse cumulative impacts? How would those impacts be determined, and what actions would the City take to reduce those impacts? Given that this is recognized as an overdrafted groundwater basin, the City should identify measures that it is taking to reduce demand and/or increase available storage or supply.

The NOP appropriately states that the City will be conducting further studies related to groundwater supply, recharge and potential streamflow losses in Soquel Creek and Soquel Lagoon. However, it is too soon to conclude that the well would not have an impact on winter and spring flows necessary for fish passage and spawning. Summer and fall depletion of groundwater by pumping could delay the recovery of groundwater storage and diminish the contribution of groundwater to winter baseflow during drought years. The City should consider joining with Soquel Creek Water District in their efforts to monitor and mitigate flow loss in Soquel Creek that could result from their proposed O'Neil well. The EIR should also address the potential impact on flow in Rodeo Gulch Creek and the potential reduction of freshwater inflow to Corcoran Lagoon. The proposed well site is very close (0.16 mile) to Rodeo Gulch and the capture zone analysis indicates that the capture zone extends under and well to the west of Rodeo Gulch. Although there are not anadromous fish in Rodeo Gulch, there are other biotic resources that could be adversely affected by a reduction in flow or dewatering.

Please consult with me during preparation of the EIR to ensure that it will be adequate to support our issuance of the well permit. Let me know if you have any questions on these comments.

Sincerely,

John A. Ricker
Water Resources Division Director

January 17, 2011

Leah Van Der Maaten
Associate Civil Engineer
City of Santa Cruz (City) Water Department
212 Locust Street, Suite C
Santa Cruz, CA 95060

Re: Beltz Well No.12 Project

Dear Ms. Van Der Maaten:

We are writing on behalf of 12 households on Greenbrae Lane, a private road located approximately one-third mile from the site of the proposed Beltz Well No. 12. All of these households rely on private wells for water. Since we only learned about the EIR scoping meeting after the fact, we would like to take this opportunity to express our concerns about the proposed well site.

As you know, it is almost certain that the Soquel Creek Water District (SqWCD) will develop a new production well at 41st and Soquel Drive. This will be a major well, with a production capacity of 750 gpm. When this site was first proposed, we expressed concern that such a large well could negatively impact the quantity and/or quality of the water from our private wells. We were pleased that the revised EIR of September 2010 acknowledged that the SqCWD well could potentially change local groundwater levels and therefore yields of neighboring private wells, and contained a detailed program for monitoring and mitigating any such impacts. We have enclosed the relevant section of the EIR for your information.

Needless to say, we are very concerned to learn that a second well may be placed in our vicinity. It seems logical that such a well could further lower local groundwater levels, thus increasing the risk of negative impacts on our private wells. We have the following comments and questions:

1. When the City Water Department selected the site for Beltz Well No. 12, did it take into account the possibility of a new SqCWD well only 1700 feet away at 41st Avenue and Soquel Drive ?

2. What studies will be done to determine the potential impacts of the Beltz Well No. 12 on neighboring private wells, and <u>the potential cumulative impacts</u> of the Beltz Well and a new SqCWD well at 41st Ave and Soquel Drive?

3. Once the Beltz Well No. 12 is in operation, how will the City Water Department determine the impact it is having on our private wells?

4. If the Beltz Well No. 12 negatively impacts our wells, what steps will the City Water Department take to rectify the problems?

4. How may we ensure that we will be informed of all future meetings, EIRS, etc., regarding this project?

Thank you for the opportunity to express our concerns. We look forward to continued dialogue in the process of developing an EIR for this project.

Sincerely,

Nikki Simpson

Nikki Simpson
4002 Greenbrae Lane
Soquel, CA 95073

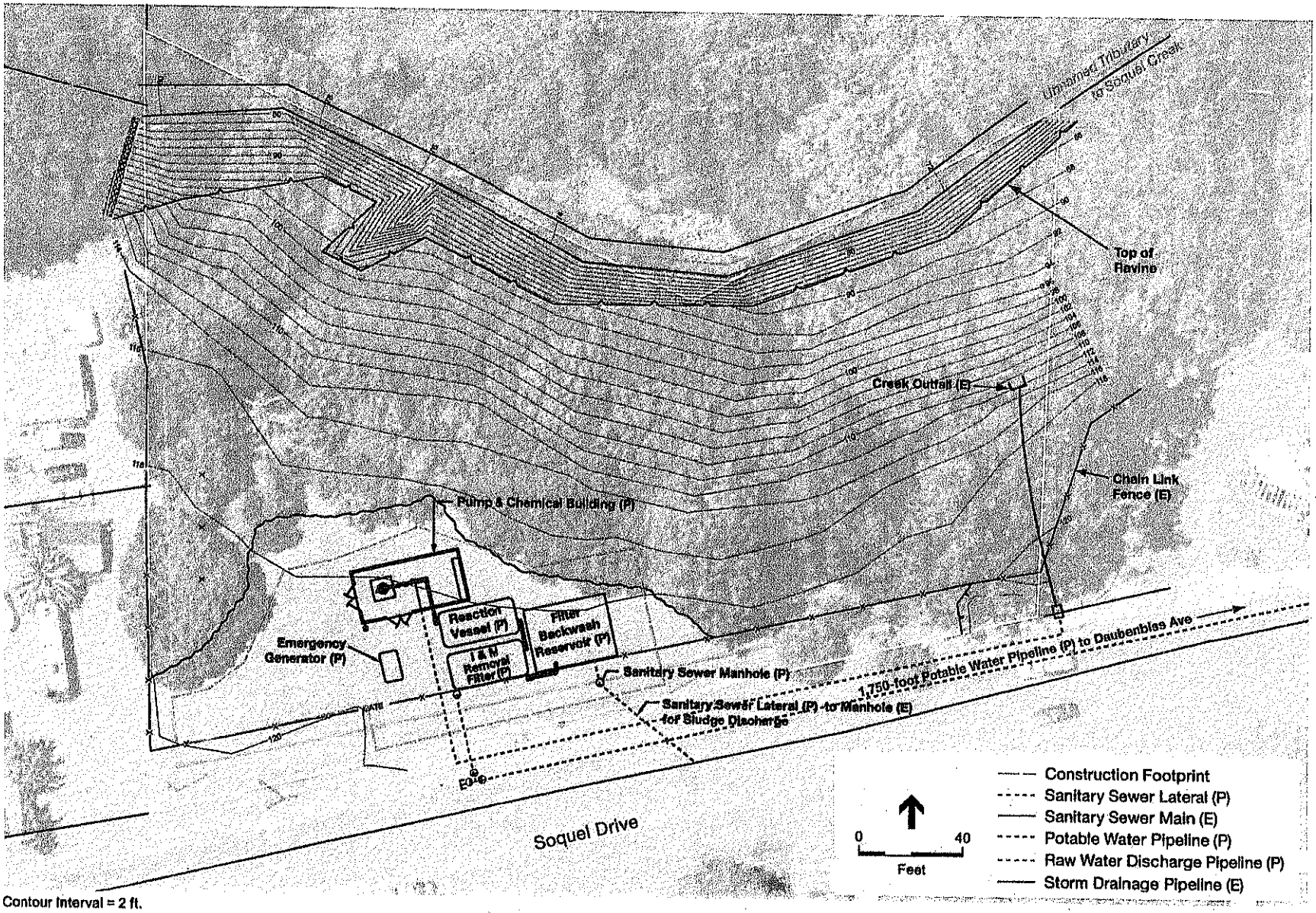
Jerome B. Walters

Robynn A. Walters

Jerome and Robynn Walters
4000 Greenbrae Lane
Soquel, CA 95073

Enclosure

cc: John Leopold, Board of Supervisors, District 1
Laura Brown, General Manager, SqCWD
Greenbrae Homeowners: Josh and Suzette Birnbaum; Dan Caudle; Joe and Carolyn Curtiss; Steve Ide; Satwal and Betsy Jauhal; Lester and Holly Ma; Kane Silverberg; Adam Turner



Contour Interval = 2 ft.

SOURCE: ESA, 2010.

SqCWD Well Master Plan EIR . 205491

Figure 2-3
O'Neill Ranch Well Site
Preliminary Site Plan

levels in municipal wells. During the most recent extended drought period, recorded water levels in municipal supply wells showed a drop of between -4 and -35 feet. Under drought conditions, private wells throughout the basin would be expected to experience a similar decline in groundwater levels. Droughts are considered temporary conditions and the water level decline that occurs, especially during an extended drought, would likely be far greater than the minor drawdown experienced by private wells due to implementation of the WMP. Groundwater levels would return to near original levels following the drought. Given the historic regional well declines caused by drought condition, the project is not expected to contribute to the increment of drawdown, which places the well in an adverse condition. Therefore, the lack of drought data for some wells is not considered a significant deficiency of the analysis.

Impact Conclusion

Implementation of the WMP would not translate into an overall increase in pumping by the District. Groundwater conditions at or near the historical low groundwater elevations at SqCWD's municipal wells during drought conditions, and subsequent effects to individual pumpers, have been experienced periodically within the Soquel-Aptos Groundwater Basin, and will continue to be experienced irrespective of the WMP. The District is not responsible for ensuring the adequacy of individual wells to operate at the historical low groundwater elevations that have been experienced within the basin. Maintenance of groundwater elevations above historical lows, including during drought periods, should not adversely affect an overlying property owner's ability to exercise the reasonable and beneficial use of groundwater on land overlying the groundwater basin.

The MLU model analysis provides a detailed evaluation of potential changes in the local groundwater levels and well yields at neighboring non-District wells resulting from implementation of the WMP. The analysis uses realistic and conservative assumptions of groundwater conditions in the vicinity of the proposed well sites. Under the modeled scenarios, the model predicts that adverse effects related to physical damage to or loss of yield at "average" private wells in the vicinity of all five of the proposed well sites would not result. However, although unlikely, future pumping at the O'Neill Ranch, Cunnison Lane, Polo Grounds, and Granite Way-Aptos Village Wells, and possibly at the Austrian Way Well, could potentially result in adverse effects at shallower "non-average" private wells, or at private wells for which well log information is not available. Because private wells are generally shallower than municipal wells, these wells are more sensitive to minor decreases in groundwater levels. To be conservative, the potential for the WMP to adversely affect "non-average" private wells is considered a potentially significant impact. However, with implementation of **Mitigation Measure 3.3-2a (Voluntary Monitoring and Mitigation Program for Private Wells)**, which would require that the District monitor any adverse effects resulting from future District pumping and develop a mechanism for mitigation, potential impacts to private wells would be reduced to a less-than-significant level.

In addition, due to the uncertainties regarding potential adverse effects on SCWD's wells in the vicinity of the O'Neill Ranch Well site, and on CWD's wells in the vicinity of the Polo Grounds Well, this EIR conservatively considers potential impacts on SCWD and CWD wells,

respectively, to be a potentially significant impact. However, with implementation of **Mitigation Measures 3.3-2b (Adaptive Management to Address Restrictive Effects at SCWD Wells)** and **3.3-2c (Adaptive Management to Address Restrictive Effects at CWD Wells)**, this impact would be reduced to a less-than-significant level. These mitigation measures require that the SqCWD conduct ongoing monitoring of groundwater levels and modify pumping if it is determined that SqCWD pumping is resulting in restrictive effects on SCWD and CWD wells, respectively.

Mitigation Measures

Measure 3.3-2a: Voluntary Monitoring and Mitigation Program for Private Wells (applies to all sites). As a condition of project approval, the SqCWD shall offer to private well owners the opportunity to participate in a voluntary program to monitor long-term changes in groundwater conditions at participating private wells, and provide a means by which the SqCWD mitigates for impacts to private wells as a result of physical damage and or loss in well yield. The following program applies to private wells that are within 1,000 meters (approximately 3,300 feet) of the proposed new SqCWD wells.

Terms of Monitoring and Mitigation Program

At least 12 months prior to the commencement of pumping at each proposed well site, the SqCWD shall mail notices to private well owners within 1,000 meters of the well site to provide information about the monitoring and mitigation program and the registration process. To participate in the monitoring and mitigation program, private well owners would be required to register formally for the program, either by filling out a registration form online, submitting a registration form by mail, or in person at the SqCWD office. As part of the registration process, each individual well owner would be required to enter into an agreement with the SqCWD holding the SqCWD harmless from any damage related to installation of the meter and water level transducer/data logger, granting limited access to SqCWD personnel to collect data from the private well, and accepting the terms and conditions of the program. The agreement shall also set forth the mitigatory actions that shall be taken by the SqCWD if it is determined that private wells have been adversely impacted as the result of SqCWD pumping. Participants in this program would consent to have the SqCWD install a production meter and water level transducer/data logger on their well at least six months prior to planned start-up of the corresponding new SqCWD well. Participants would be required to submit any existing information and data available for their well to the SqCWD (e.g. driller's logs, water level data, pumping records, etc.) to provide baseline information upon which to measure restrictive impacts attributable to SqCWD pumping. In cases where well log information is not available, a baseline condition would be established for that well during the registration process. All costs associated with the monitoring equipment and installation shall be borne by the SqCWD. The duration of the monitoring shall be 10 years, or less if canceled by the private well owner.

Data from the production meter shall be collected by the private well owner on a quarterly basis and provided to the SqCWD. In addition, participating private well owners shall grant SqCWD staff permission to access the property, download data from the water level transducers/data loggers, and record production meter readings on an annual basis. Prior to visits by SqCWD staff, the SqCWD shall provide participants with 14-day advance notice by mail of the schedule for the site visit (within a 48-hour window).

Demonstrating Restrictive Effects

The monitoring data shall be used to evaluate if SqCWD pumping of specific wells has had a restrictive effect on a participating private well. The evaluation and determination of restrictive effects shall be conducted by the SqCWD's groundwater hydrologist. For the purposes of the monitoring and mitigation program, restrictive effects shall be limited to the following:

1. Damage to the private well or pump caused by water levels falling below the top of well screens leading to screen corrosion or aeration of well water. If this type of damage is demonstrated, it is considered a restrictive effect caused by SqCWD pumping if one or more of the following conditions are met:

   (a) SqCWD pumping has caused static water levels at the private well to fall below the top of the well screens and the static water levels were above the screen prior to the SqCWD's pumping modifications in the vicinity of the corresponding new SqCWD well. Some private wells have static water levels (when the pump is off) that are already below the top of the screen. In these cases, a marginal amount of additional drawdown is of little consequence because the risk of screen collapse due to corrosion is already present.

   (b) SqCWD pumping has caused pumping water levels at the private well to fall below the top of the well screen and the pumping water levels were above the screen prior to the SqCWD's pumping modifications in the vicinity of the corresponding new SqCWD well. At some wells, pumping water levels (when the pump is on) are already below the top of the screen. Additional corrosion is not a restrictive effect in these situations because corrosion has already been induced by the existing low water levels, and a small increment of additional drawdown would not substantially increase the aeration/cavitation risk.

2. There is an appreciable diminution in the quantity of water produced by the private well. A reasonable definition of "appreciable" in this context is if historical production data is available for that private well for the previous six months and it is demonstrated that the SqCWD's pumping modifications in the vicinity of the corresponding new SqCWD well has rendered the nearby private well incapable of meeting its:

   (a) Historically measured maximum daily production level;

   (b) Historically measured dry-season production levels; or

   (c) Historically measured annual production levels under drought conditions.

   In practice, diminution in the quantity of water produced by the private well could result if a substantial percentage of the well screen were dewatered or water levels fall below the pump intake.

Mitigatory Actions

In the event the operation of a new SqCWD well causes a restrictive effect on a participating private well, the SqCWD shall assume responsibility for the restrictive effect and address the impact by taking one or more of the mitigatory actions described below, as determined appropriate based on effectiveness and least cost to the SqCWD:

1. If well monitoring data indicates an increased risk of damage to the private well as a direct result of SqCWD actions, the SqCWD shall respond proactively to inspect the well with a video log. If inspection shows an imminent risk of damage, then the SqCWD would take one of the appropriate mitigating actions described in items 2 through 5, below.

2. Replace and/or lower the well pump of the private well, which may include replacing the existing pump with a smaller physical size of equal production capacity.

3. Redistribute SqCWD pumping to restore water levels at the impacted well.

4. Drill a deeper replacement well for the affected private well owner.

5. Provide the affected private well owner with water service from the SqCWD. The option to connect to the SqCWD is conditioned by proximity to existing SqCWD mains and being within the SqCWD's service area or approved annexation by the Local Agency Formation Commission (LAFCO). The SqCWD would waive fees and charges associated with connecting to its system; however, the customer would be responsible for the rates and charges associated with service and water quantity that are paid by similarly classified customers.

As described above, for private wells that do not have driller's logs, the SqCWD reserves the right to evaluate the condition of the well during the registration process. The evaluation may include videoing the interior of the well.

In the event that there is well screen or pump failure prior to completion of mitigatory action and the well cannot serve the existing use, the SqCWD shall make a reasonable endeavor to provide an interim water supply, which may include a temporary connection to the SqCWD or delivering water via a tender truck to a storage tank on the property.

Measure 3.3-2b: Adaptive Management to Address Restrictive Effects at SCWD Wells (applies only to O'Neill Ranch Well site). As part of the SqCWD's adaptive management strategy, the SqCWD shall review groundwater level and water quality data from production and monitoring wells owned by the Santa Cruz Water Department (SCWD) in conjunction with data collected from the SqCWD's own production and monitoring wells to assess whether SqCWD pumping in the vicinity of the O'Neill Ranch Well has had a restrictive effect on the SCWD's existing Live Oak Wellfield. If restrictive effects are detected, the SqCWD shall modify pumping such that SqCWD pumping in the vicinity of the O'Neill Ranch Well is reduced. This mitigation measure addresses two possible restrictive effects on SCWD's production wells:

1. *Risk of damage to the production well caused by static or pumping water levels falling below the top of well screens.* This effect could occur if static or pumping water levels are above the top of the well screen prior to pumping at the O'Neill Ranch Well, and subsequently fall below the top of the well screen after the O'Neill Ranch Well is brought online and SqCWD pumping in the vicinity is increased. At one Live Oak Well, Beltz Well #7, pumping water levels are currently below the top of the well screen; thus, any lowering of pumping water levels would not be considered a restrictive effect unless the well screen were to become fully dewatered.

2. *Reduced well yields due to an increased risk of seawater intrusion.* This effect could occur if groundwater levels at SCWD's coastal monitoring wells were to fall below groundwater elevations that protect against seawater intrusion as a direct result of increased pumping by the SqCWD in the vicinity of the O'Neill Ranch Well.

This mitigation measure assumes the current average production at any Live Oak Well - defined as the average annual production for water years 2005 through 2008 – will not increase. If there is no increase in average annual production at individual Live Oak Wells and restrictive effects from increased pumping by the SqCWD in the vicinity of the O'Neill Ranch Well are observed, the SqCWD shall reduce pumping at the nearby Garnet Well such that overall pumping in the vicinity is reduced. If restrictive effects are observed and groundwater level declines at inland monitoring wells exceed the calculated drawdown presented in the *Hydrologic Effects of Well Master Plan* (HydroMetrics, 2009), the SqCWD shall reduce pumping at the O'Neill Ranch Well.

If a cooperative groundwater monitoring and mitigation agreement that includes specific provisions for monitoring and management of groundwater levels is established between the SqCWD and SCWD, the cooperative agreement could supersede this measure.

Measure 3.3-2c: Adaptive Management to Address Restrictive Effects at CWD Wells (applies only to Polo Grounds Well site). As part of the SqCWD's adaptive management strategy, the SqCWD shall review groundwater monitoring data from Central Water District's (CWD) existing production and monitoring wells in conjunction with data collected from the SqCWD's own production and monitoring wells to assess whether increased pumping by the SqCWD in the vicinity of the Polo Grounds Well has had a restrictive effect on CWD's existing production wells. This mitigation measure addresses two possible restrictive effects on CWD's production wells:

1. *Risk of damage to the production well caused by static or pumping water levels falling below the top of well screens.* This effect could occur if static or pumping water levels are above the top of the well screen prior to SqCWD pumping at the Polo Grounds Well, and subsequently fall below the top of the well screen after the Polo Grounds Well is retrofitted and SqCWD pumping in the vicinity is increased. CWD's Rob Roy Well No. 4 and Cox Well No. 5 have pumping water levels that are currently below the top of the well screens; thus, any lowering of pumping water levels would not be considered a restrictive effect unless the well screens were to become fully dewatered.

2. *Reduced well yield due to increased pumping lift.* This effect could occur if future pumping from the Polo Grounds Well were to adversely affect well yield at CWD's wells such that the wells must be pumped more than 50 percent of the time, averaged over a year. However, since annual production from CWD's wells for the water years 2005 through 2008 has been just over half of the wells' production capacity, small decreases in pumping rates can easily be compensated for by increased operating time without resulting in adverse effects.

This mitigation measure assumes the current production at any individual CWD well – defined as the average annual production for water years 2005 through 2008 – will not increase. If lowered groundwater levels and restrictive effects at CWD's wells from increased pumping by the SqCWD in the vicinity of the Polo Grounds Well are observed,

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR

APPENDIX B – HYDROGEOLOGICAL REPORT FOR PROPOSED PROJECT

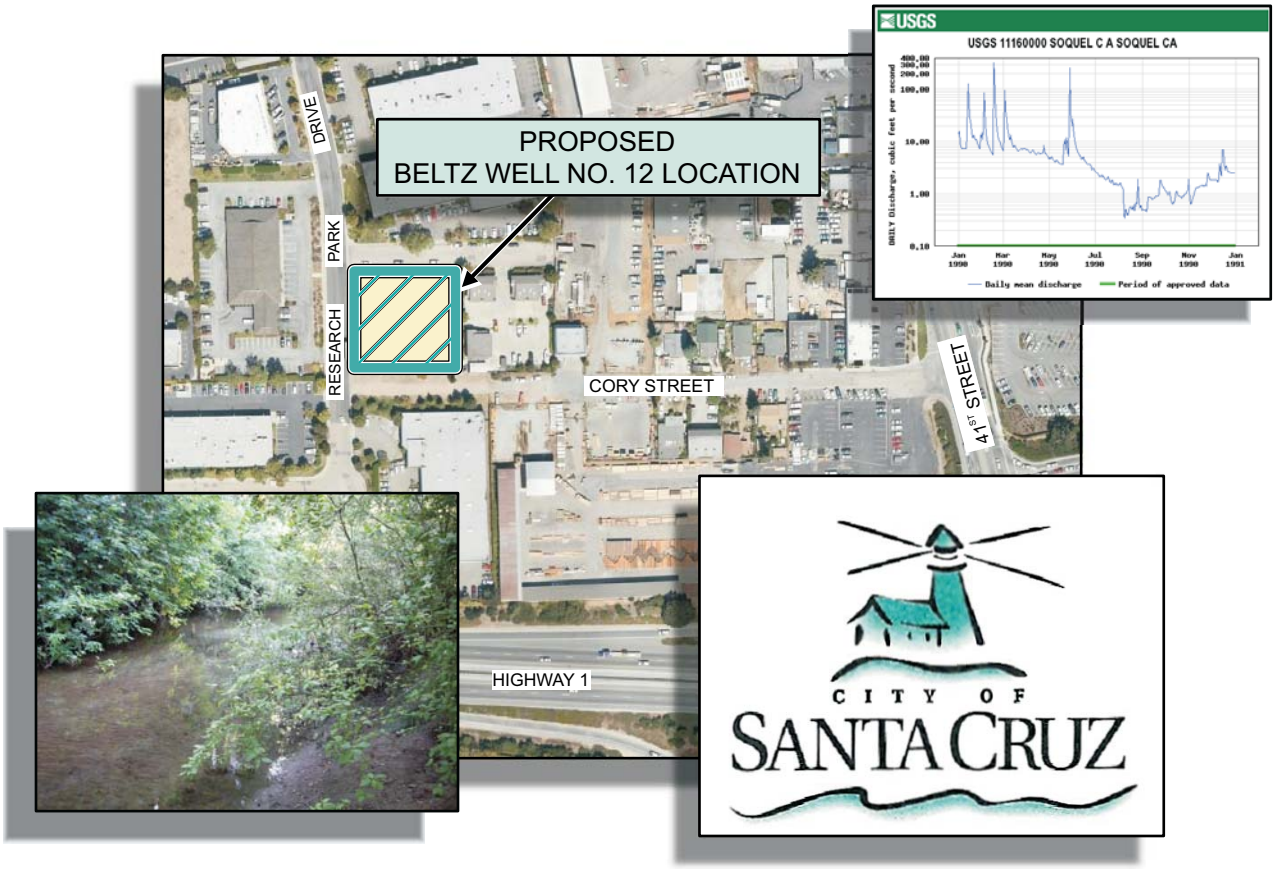
HOPKINS GROUNDWATER CONSULTANTS, INC.

HYDROGEOLOGICAL STUDY

CITY OF SANTA CRUZ BELTZ WELL NO. 12 645 ACRE-FEET PER YEAR PROJECT WELL INTERFERENCE AND STREAMFLOW IMPACT ANALYSIS LIVE OAK–CAPITOLA AREA, CALIFORNIA

Prepared for:
City of Santa Cruz

June 2011



HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

June 16, 2011
Project No. 01-010-06D

City of Santa Cruz
Water Department
212 Locust Street, Suite C
Santa Cruz, California 95060

Attention: Ms. Leah Van Der Maaten
Associate Engineer

Subject: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 645 Acre-Feet Per Year, Well Interference and Streamflow Impact Analysis, Live Oak-Capitola Area, California, Dated June, 2011.

Dear Ms. Van Der Maaten:

Hopkins Groundwater Consultants, Inc. is pleased to submit this report summarizing the findings and conclusions of the subject study of potential hydrogeological impacts that may arise from the operation of the proposed City of Santa Cruz Beltz Well No. 12 groundwater production facility. The potential impacts analyzed are based on an operational rate of approximately 700 gallons per minute over a 215-day production season, producing 645 acre-feet per year. The Soquel Creek flow analysis also includes potential worst-case impacts during a critically dry year. We trust the contents of this report are sufficient to support the project environmental study being conducted by the City. If you have any questions or need any additional information, please give us a call.

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

REGISTERED GEOLOGIST
CURTIS J. HOPKINS
EG NO. 1800
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Curtis J. Hopkins
Principal Hydrogeologist
Certified Engineering Geologist EG 1800
Certified Hydrogeologist HG 114

Brian M. Cosner
Staff Hydrogeologist

Copies Submitted: Three (3) Bound Copies and One (1) Electronic Copy

P.O. Box 3596, Ventura, California 93006 Phone: (805) 653-5306 e-mail: chop4@earthlink.net

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INTRODUCTION

General Statement

Presented in this report are the findings and conclusions that were developed from a hydrogeological analysis conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the City of Santa Cruz (City) with an assessment of the potential hydrogeological impacts that could result from the operation of a proposed municipal water supply well. The proposed well has been designated by the City as Beltz Well No. 12 and is preliminarily designed to produce at a rate of approximately 700 gallons per minute (gpm) yielding approximately 645 acre-feet per year (afy) over a 215-day-production season. The proposed well location is on Research Park Drive within an unincorporated portion of the County of Santa Cruz (County) located northwest of the City of Capitola. The study area and the proposed well location are shown on Plate 1 – Study Area Location Map.

The proposed Beltz Well No. 12 construction project is part of the City's groundwater management strategy to maintain groundwater levels near the coast that prevent seawater intrusion into the Purisima Formation aquifer units. The proposed project would provide the ability to conjunctively use the coastal Beltz Wellfield located in the unincorporated area of Live Oak and the proposed inland well facility (Beltz Well No. 12) to control water levels along the shoreline while maintaining the City's historical supply of groundwater. The location of existing and proposed City and Soquel Creek Water District (SqCWD) municipal wells in the vicinity of the proposed Beltz Well No. 12 location is shown on Plate 2 – Well Location Map.

Purpose and Scope

The purpose of this study is to develop an understanding of the potential hydrogeological impacts that could result from constructing and operating the proposed City well. This study supersedes the study summarized in the October 2010 report (Hopkins, 2010). The scope of work for this study was developed based on discussions with Ms. Leah Van Der Maaten, Associate Engineer with the City. The work scope includes the following tasks:

- Conduct a review of available hydrogeological data and studies,
- Conduct sample collection of streambed materials in Soquel Creek and Rodeo Gulch Creek for the purpose of laboratory testing of permeability to estimate the potential reduction in streamflow that could result from well operation,
- Identify and analyze potential impacts on existing municipal and private wells,
- Identify and analyze potential impacts on nearby streams,
- Identify and analyze potential impacts on proximate groundwater contamination sites,

- Prepare this report summarizing the findings and conclusions of the study.

Provided with this report are appendices that contain supporting technical information which include; Appendix A – Laboratory Hydraulic Conductivity Test Results of Streambed Soil Samples, Appendix B – MLU Model Parameters and Analytical Results, Appendix C – Soquel Creek Monitoring Well Data, Appendix D – Photographic Documentation of Creek Sample Station Conditions, Appendix E – Streamflow Impact Estimations, and Appendix F – Percent Streamflow Reduction in Critically Dry Years.

IMPACT ANALYSES METHODOLOGY

Impact Analysis Approach

The purpose of the analyses of this study is to determine if groundwater produced from the proposed Beltz Well No. 12 could create potential impacts to proximate well facilities whereby excessive drawdown could reduce well yield or cause physical damage to well pump equipment, and/or create potential impacts to streamflows by inducing significant recharge from streams into the underlying aquifer system. The potential impacts of the proposed well production were analyzed by establishing the hydrogeological framework in this portion of the Soquel-Aptos Groundwater Basin (Hopkins, 2009), sampling streambed materials to develop data for use in estimating streambed infiltration rates, and developing drawdown estimates anticipated from well pumping utilizing the Multi Layer Unsteady-state (MLU) computer program. Using the analytical solutions provided by MLU modeling, the potential interference drawdown impacts on existing wells can be estimated and potential streambed infiltration rates that may impact proximate streamflows can be calculated. A competent comprehensive numerical groundwater model would be an ideal tool for simulation of well pumping impacts; however, a numerical model of the entire Soquel-Aptos Groundwater Basin was not available at the time of this study. The analytical solutions provided by the MLU model are used to estimate the potential impacts anticipated from operation of the proposed City well and future cumulative impacts based on other proposed groundwater production changes by the SqCWD.

Historical data summarized by other studies (Johnson, et al., 2004) and site specific data provided from the Cory Street Monitoring Well Construction Project (Hopkins, 2010a) were analyzed to develop aquifer parameters that include hydraulic conductivity, transmissivity, and storage coefficient values to be used in model construction. Utilizing the commercially available MLU software, pumping related impacts on water levels in the Purisima formation aquifers were developed and utilized to assess the magnitude of impacts.

The SqCWD has been studying groundwater and surface water conditions in the vicinity of its Main Street Well for over 20 years. For this study, various water level data and findings of

hydrogeological reports about groundwater pumping impacts on Soquel Creek flows were utilized for development of the streamflow impact analysis approach. To provide additional data for estimating streamflow impacts, Hopkins sampled creek bottom sediments and delivered the samples for laboratory hydraulic conductivity analyses. The creek bed samples were collected on June 13, 2010, in the vicinity of the public easements at three Soquel Creek bridge crossings which are shown on Plate 3 – Creek Sediment Sample Location Map. Rodeo Gulch Creek was sampled at the Soquel Avenue Bridge and adjacent Coffee Lane Park (see Plate 3). Undisturbed samples of the streambed sediments were collected using a split-spoon hand sampler equipped with a slide hammer. Laboratory hydraulic conductivity tests were performed on the material obtained between the depths of 3 and 6 inches and the results are provided in Appendix A – Laboratory Hydraulic Conductivity Test Results of Streambed Soil Samples.

Aquifer Drawdown Analysis

The hydrogeology of the Soquel-Aptos Groundwater Basin has been the subject of numerous studies. The hydrogeological framework developed by the most recent study (Hopkins, 2009) which utilized geophysical (electric) log correlation for aquifer zone delineation was used for the analyses performed in this study. Plate 4 – Electric Log Trace Correlation of Aquifer Zones shows the generally accepted delineation of the Purisima Formation aquifer units. As shown, the Purisima B Zone (Unit) has an aquifer unit (porous sand layer) within the bottom portion of the strata which is subsequently referred to in this study as the basal aquifer zone (see Plate 4). The aquifer units shown on Plate 4 were used to construct hydrogeological cross-sections at the locations shown on Plate 5 – Hydrogeological Cross-Section Location Map. The hydrogeological cross-sections which provide a subsurface profile of the geology beneath the study area and specific locations of interest are provided on Plates 6 through 8 - Hydrogeological Cross-Section A-A', B-B', and C-C', respectively.

This hydrogeological framework was combined with the findings of numerous SqCWD studies which were reviewed and considered in the development of the analysis of water level drawdown impacts. Plate 9 – Hydrogeological Conditions at Main Street Well shows site specific water levels in the vicinity of Soquel Creek adjacent the SqCWD Main Street Well in August 2002 (L&S, 2003). The differing water levels in the monitoring wells and the lithological information provided by the cross-section are believed to confirm the interpreted hydrogeology in this portion of the basin and were used to assist in the development of the multiple layer leaky aquifer system constructed for the MLU analysis.

Model parameters required for the MLU analysis include bedding thickness, hydraulic conductivity, and storage coefficient (storativity) values. Aquifer zone transmissivity values are derived as the product of the aquifer thicknesses and the horizontal hydraulic conductivities. The vertical resistance to flow in an aquitard layer of the model is derived from the layer thickness divided by the vertical hydraulic conductivity. Aquifer properties for the various aquifer units present were obtained from average regional values documented by other studies

(Fugro, 1998 and Johnson, et al., 2004) and site specific estimates provided from the Cory Street Monitoring Well Construction Project (Hopkins, 2010a).

During the development of the MLU Model conditions, we recognized that the unconfined/semi-confined aquifer conditions at the location of the proposed Beltz Well No. 12 site are significantly different than the confined/leaky-confined conditions to the east along Soquel Creek. As shown on Plates 6 and 7, the aquifer units beneath the Beltz Well No. 12 site (the Purisima A, AA, and Tu Units) become confined beneath the Purisima B Unit located east of the site. The water level data presented on Plate 9 substantiate this condition in the vicinity of the Main Street Well where vertical hydraulic conductance beneath Soquel Creek is impeded by aquitard layers that create a substantial hydraulic head difference between the shallow, intermediate, and deep monitoring wells.

Provided with the understanding of the hydrogeological conditions described above and the proposed redistribution of well production when Beltz Well No. 12 is utilized, 4 conditions were developed to analyze the potential range of impacts that could be anticipated from operation of the proposed well facility. The 4 conditions (project scenarios) considered by this study include; 1) the existing groundwater conditions with no new wells and historical pumping patterns, 2) groundwater conditions with the proposed City Beltz Well No. 12 project only, 3) groundwater conditions with the proposed SqCWD Well Master Plan (WMP) project only, and 4) cumulative groundwater conditions with both the City and SqCWD proposed projects.

The impacts analysis included the historical and proposed operations of the City Beltz wells during the annual production season that lies between the months of April and November. The City proposes to typically produce a portion of annual groundwater supplies from the existing Live Oak Wellfield and a portion from Beltz Well No. 12; however they maintain the option to produce up to 645 afy from Beltz Well No 12 in any water-year type. In order to analyze the greatest impact from Beltz Well No. 12, this analysis assumes that the 645 afy is produced from Beltz Well No. 12 over the typical 215-day production season during a critically dry year. Analyzing impacts during a critically dry year provides the greatest impacts when compared to non-critically dry years because the creek flows are at their lowest rates. Beltz Well No. 12 would be operated to allow a shift of pumping away from the coastline and thereby maintain adequate water level elevations to reduce the threat of saltwater intrusion. Appendix B – MLU Model Parameters and Analytical Results provides a summary of the parameters that were used in the model, tables summarizing the proposed use of wells during the Beltz Well No. 12 production season, and the simulated results of producing Beltz Well No. 12 at a constant rate of approximately 700 gpm (645 afy) at the end of a 215-day pumping period.

The simulated changes in water level conditions are relative to the average aquifer conditions historically created by the existing cumulative 1 million gallons per day (mgd) (645 afy) production from the City Live Oak Wellfield. These changes include the water level drawdown at Beltz Well No. 12 from the proposed inland pumping as well as water level

recovery (reduced drawdown) that will result as annual production from Beltz Well Nos. 8, 9, and 10 is proportionally reduced. Water level recovery was simulated in the MLU Model by injecting at Beltz Well Nos. 8, 9 and 10 the proportional amount of pumping reduction. Tables B2 through B5 show the allocated seasonal increase and decrease of pumping from the individual wells historically produced by the City and the SqCWD and redistributed to the wells proposed for construction. Private well pumping is assumed to remain constant because historical pumping records are unavailable.

Streamflow Reduction Analysis

The MLU Model was utilized to directly simulate Soquel Creek losses that would be required to eliminate drawdown beneath the reaches of the creek that overlie the Purisima B Zone. Creek losses were simulated using injection wells and by increasing the injection rates until the inflow eliminated the simulated drawdown resulting from well production in the underlying Purisima A Zone for each production scenario. The cumulative injection rate was used to represent streamflow where the creek overlies the Purisima B Zone. The simulated drawdown values beneath the reach of Soquel Creek that overlies the Purisima A Zone aquifer were subsequently utilized along with the conductance equation to estimate streambed infiltration in this reach of the creek. Streambed infiltration in the Purisima A Zone was estimated using the average of the laboratory hydraulic conductivity test results of the streambed samples (see Appendix A) to calculate the vertical conductance beneath the flowing creek. A diagram showing the physical components of the conductance equation typically utilized in groundwater/surface water interaction modeling is presented on Plate 10 – Stream-Aquifer Interaction. Subsequently, the estimated reduction in streamflow was combined with observed flows in the creek during the three critically dry years of 1977, 1990, and 2007 to develop an understanding of the magnitude of the project's effect on flows during a worst case scenario while operating of Beltz Well No. 12.

SUMMARY OF IMPACT ANALYSES

Well Interference Impacts

The production potential of the proposed well site was preliminarily evaluated by the City through data that were collected during the construction of the Cory Street Monitoring Well. The production potential was estimated using the Cory Street geophysical surveys, which were correlated with surveys from existing production wells, and grain-size analyses which were used to approximate the hydraulic conductivity of the formation materials using the Hazen approximation method. Based on the estimated hydraulic conductivity value, the depths to groundwater and the top and bottom of the aquifer units were combined with typical well specific capacity values to determine that the anticipated production of Beltz Well No. 12 at this location could be up to 800 gpm. For the planning purposes of this impacts analysis, the

sustained well production of approximately 700 gpm (645 afy) is used to estimate the greatest potential impacts of the proposed City project.

Utilizing the MLU program, a multilayered groundwater system was simulated to assess the potential impacts in the vicinity of; a) the proposed Beltz Well No. 12 facility where the Purisima A Unit outcrops, b) Soquel Creek where the Purisima A and B Unit outcrop, and c) the nearest SqCWD well facilities (Main Street and proposed O'Neill Ranch Wells). Aquifer parameters established by other regional studies (Johnson, et al., 2004) were used for this effort and are summarized in Table B1 in Appendix B. The results of the modeling effort were compared with historical SqCWD Main Street Well production test results and the water level differences between the shallow and deep aquifer units documented on Plate 9. Additionally, the shallow monitoring well measurements collected along Soquel Creek since 2001 at the locations shown on Plate C1 were also compared to model-simulation results. As shown on Plates C2 through C4, the magnitude of seasonal fluctuation in the Soquel Creek water levels is typically on the order of 2 feet, and the shallow groundwater water levels typically oscillate on the order of 3 to 4 feet under present hydrological and hydrogeological conditions.

To simulate increased drawdown created by a no-flow boundary condition, an image well was located in the MLU Model west of the base of the Purisima A Zone an equidistant to the Beltz Well No. 12 location which is east of the outcrop boundary. While it would have been similarly valid to simulate the recharge boundary provided by Rodeo Gulch Creek in this manner, Rodeo Gulch Creek flows were observed to have ceased by the end of May. Because the proposed production from City Beltz Well No. 12 occurs during the mid-summer months, this major source of recharge to the Purisima A Unit was not included in the simulations. The estimated impacts therefore, are believed to be representative of groundwater conditions during the period of use of the proposed Beltz Well No. 12 when there are no flows in Rodeo Gulch Creek.

Simulated Drawdown Effects

Groundwater impacts estimated based on the proposed pumping scenarios associated with the City and SqCWD well construction projects include additional layers to simulate the presence of the Purisima B Zone in the vicinity of Soquel Creek (see Table B1). The three production scenarios simulated (City Project Only, SqCWD Project Only, and Cumulative Impacts) utilize the MLU aquifer parameters shown in Table B1 and the proposed well production timing and distribution shown on Tables B3 through B5.

The Purisima A Zone hydraulic conductivity value used in the model was provided by the Cory Street Monitoring Well formation grain-size analyses and averaged 23 feet per day (ft/day) (Hopkins, 2010a), which correlates with the range of values estimated from the SqCWD Service Area I wells of 23 to 28 ft/day (Johnson, et al., 2004). While the aquifer test data from the coastal Beltz Wellfield showed substantially higher conductivity values (50 to 100 ft/day)

which would result in a lower pumping drawdown and a reduced operational impact, these values were not used. Based on these model parameters, 90 percent of the Beltz Well No. 12 production is produced from the Purisima A Unit (approximately 630 gpm) and approximately 10 percent (70 gpm) is extracted from the AA Zone.

Well Production Effects on SqCWD and Private Wells

To adequately analyze the effects on nearby wells from installing new wells and redistributing pumping, it is necessary to qualify different levels of effects in order to separate potentially restrictive effects on proximate well operations from marginal effects that are merely noticeable. The water level drawdown in an aquifer that results from the extraction of groundwater commonly results in mutual interference between wells. The amount of interference drawdown (commonly 1 to 10 feet) is typically tolerable and is not ordinarily considered restrictive. Excessive well interference that may result from the close proximity of a well producing at a high production rate for a sustained time period has the potential to cause physical damage or a loss of yield, which could represent a restrictive effect.

Physical damage to a competently designed and constructed well facility could occur if excessive well interference drawdown caused the water level to drop below the top of the well screen and adverse conditions resulted in a well facility (i.e., cascading water resulting in air entrainment) that could damage the well or well pump assembly. Damage resulting from this condition could occur if oxygenated water corroded the well screen interval and causes structural failure, or if cavitation causes excessive well pump wear.

Appreciable loss of well yield could occur if excessive aquifer dewatering reduces a well's performance (by lowering the specific capacity) or prevents the well pump from operating within its design parameters. An appreciable reduction in well yield is considered a restrictive effect on an existing well if the well is incapable of providing its historically measured; a) maximum daily production level, b) dry-season production level, or c) annual production levels under drought conditions (Bachman et al., 2005). An appreciable effect could result if; 1) a substantial amount of the well screen were dewatered, 2) the groundwater gradient were altered, or 3) the groundwater elevation is reduced to cause seawater intrusion to affect a well.

For this study, we will utilize a qualitative rating system to describe the magnitude of the pumping effects analysis which has been adopted by similar water supply studies (Hydrometrics, 2009). The categories for the project's effects at nearby wells are listed below;

1. **Beneficial Effect –** an increase in groundwater levels or well yield.
2. **No Effect** – no change in groundwater levels or well yield.
3. **Marginal Effect** – a measureable lowering of groundwater levels or slight decreases in well yield that does not adversely affect a well or pump.

4. **Restrictive Effect** – a lowering of water levels that adversely affects the performance or yield of a well or pump. This effect may threaten to cause physical damage to the well or pump.
5. **Severe Effect** – a significant lowering of water levels or well yield likely causing physical damage to the well or pump. This effect would likely render the well inoperable and would be very difficult or not cost-effective to retrofit.

Well Production Effects on SqCWD Wells

Simulated drawdown values indicate that the proposed City production of approximately 700 gpm (645 afy) from Beltz Well No. 12 during typical operation would have an approximate 2.5-foot drawdown on water levels at the SqCWD Main Street Well (see Plate B1) at the end of the 7-month pumping season in November. Drawdown impacts to the SqCWD Main Street Well at an earlier time during the pumping period would be proportionally less. A summary of the water level change at all the SqCWD wells is provided in Table 1 – Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at SqCWD Wells. The maximum water level effect indicated at the proposed O'Neill Ranch Well is a decline of 5.5 feet.

Table 1 – Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at SqCWD Wells

WELL NAME	WATER LEVEL CHANGE (FEET)
MAIN STREET	- 2.5
ROSEDALE	- 1.9
MONTEREY	- 1.2
TANNERY	- 1.1
MAPPLETHORPE	- 1.1
GARNET	0.25

The proposed City and SqCWD mutually interfering projects are combined in a final simulation of water level changes in the Purisima A Zone which is presented on Plate B5. By the end of the 215-day production season (in November), a maximum combined water level drawdown of approximately 11 feet is projected to develop as a pumping trough between the proposed O'Neill Ranch Well and Beltz Well No. 12 (see Plate B5).

The model results indicate that the shift of City pumping inland, by the proposed project, will achieve the basin management goal of maintaining coastal water levels at a higher elevation which will contribute to abating the threat of seawater intrusion. This result provides a beneficial effect at the Garnet Well. These calculations lead to the conclusion that effects from pumping Beltz Well No. 12 on existing SqCWD wells and the proposed SqCWD O'Neill Ranch Well are minimal and will not cause physical damage or an appreciable reduction in yield. Thus, the water level effect on all SqCWD municipal wells (existing and proposed) from the intermittent production of Beltz Well No. 12 is marginal.

Well Production Effects on Private Wells

The County of Santa Cruz and California Department of Water Resources provided the City with confidential well log information along with the estimated location of private wells in the vicinity of Beltz Well No. 12 site. Reportedly, estimated well locations cannot be provided due to confidentiality laws governing use of the well log information. For this same reason the wells located within 1,000 meters (3,300 feet) of the site were assigned arbitrary well identification numbers. The distance between these private wells and the Beltz Well No. 12 location is summarized along with the total well depth and the reported well production rates in Table 2 – Summary of Privately Owned Well Information.

Based on the construction depths and the locations within the basin, all the privately owned wells listed in Table 2 were determined to produce from the Purisima A Zone as defined by this study. Cathodic protection wells are excluded from this list because groundwater level fluctuation is irrelevant to their function. The nearest estimated well location is approximately 880 feet away and is reportedly a monitoring well. All other privately owned wells are at distances greater than 1,875 feet away from the proposed well site (see Table 2).

Utilizing the MLU model simulation results that were used to create Plate B1, the pumping effects from the proposed Beltz Well No. 12 project (only) were identified for each of the privately owned well sites at the end of the Beltz Well No. 12 pumping period. These values are listed in Table 3 – Summary of Pumping Drawdown Effects. As shown, the water level drawdown values range from 3.3 to 7.3 feet. The closest privately owned well (Well No. 7) with the greatest pumping effect (7.3 feet) is reportedly a monitoring well which does not produce a supply that can potentially be affected by the reduced static water level (unlike domestic water supply wells).

Comparing the other drawdown values with the information provided on the well screen depths and the available pumping water levels indicates that the proposed Beltz Well No. 12 project (without the SqCWD WMP project) results in relatively minor changes to existing conditions.

Table 2 – Summary of Privately Owned Well Information

WELL IDENTIFICATION	APPROXIMATE DISTANCE FROM BELTZ WELL NO. 12 (FT)	DEPTH OF WELL (FT)	FLOW RATE (GPM)	DATE OF TESTING
1	3,300	497	12	8/3/1987
2	3,300	330	40	6/15/1976
3	2,200	200+	22	1/21/1987
4	2,890	200	35	2/16/1998
5	1,875	220	25	6/14/1984
6	2,275	200	NA	NA
7	880	99	NA	2/14/2003
8	2,135	148	30	4/9/1964
9	2,000	NA	NA	NA
10	3,540	110	NA	7/9/1966
11	2,060	NA	NA	NA
12	2,700	NA	NA	NA

Assuming private domestic well pumps deliver the reported supply at approximately 30 pounds per square inch (psi) for use by the homeowners, the total dynamic head was estimated for each well. The percentage of additional head created by the effect shown in Table 3 was used to estimate the percentage decrease in flow from well pump discharge. Using this method of estimation, the decline in existing well pump production ranged between 0.11 and 0.72 gpm which is in all cases less than a 3.1-percent reduction in flow. Because the magnitude of the project effects on privately owned wells is so small, the City project will not result in well or well pump damage or an appreciable loss of well yield. Thus, the pumping effects of the City project on privately owned wells are marginal.

Table 3 – Summary of Pumping Drawdown Effects

WELL ID	SCREEN LENGTH (FT)	DEPTHS (FT)			WATER LEVEL CHANGE (FT)	
		TOP OF SCREEN	STATIC WATER	PUMPING WATER LEVEL	PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)	CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
1	120	377	320	360	-3.8	-6.2
2	80	250	210	NA	-3.8	-6.3
3	NA	NA	NA	NA	-4.7	-8.3
4	NA	NA	210	237	-4.2	-6.6
5	80	140	140	NA	-5.2	-9.8
6	NA	NA	NA	NA	-4.8	-7.5
7	20	79	86	NA	-7.3	-11.1
8	40	104	97	100	-4.1	-5.5
9	NA	NA	NA	NA	-3.3	-4.6
10	40	65	26	NA	-3.3	-5.3
11	NA	NA	NA	NA	-5.1	-9.2
12	NA	NA	NA	NA	-4.1	-6.9

Utilizing the MLU modeled drawdown values shown on Plate B5, the cumulative pumping effects from the proposed Beltz Well No. 12 project and the proposed SqCWD WMP project were identified for each of the privately owned well sites at the end of the 7-month pumping period for Beltz Well No. 12. As shown in Table 3, the maximum water level change ranges between 4.6 and 9.8 feet of drawdown (for water supply wells) and reflects the inland shift of pumping by both water agencies. While most all the privately owned wells are located at a substantial distance from the Beltz Well No. 12 site (see Table 1), the wells with the greatest change in static water levels are those located closest to the O'Neill Ranch Well site.

Comparisons of available water level data, well screen intervals, and estimated drawdowns show that drawdown from pumping Beltz Well No. 12 and the SqCWD wells will result in marginal effects on known wells within the designated radius. Assuming private well pumps deliver the reported supply at approximately 30 psi for domestic use, the total dynamic

head was estimated for each well and combined with the percentage of additional head created by the projected drawdown values in Table 3. These values were used to estimate the percentage decrease in flow from well pump discharge which ranged between a 1.4 and 5-percent reduction. Using this method of estimation, the decline in well pump production ranged between 0.17 and 1.17 gpm. Therefore, cumulative drawdown from Beltz Well No. 12 and SqCWD will not appreciably affect the yield available to the nearby private wells or cause a well or well pump damage, and the resulting drawdown effect is marginal.

Well Production Effects on Streamflow

The potential effects of the proposed Beltz Well No. 12 groundwater production on streamflows were estimated by; a) using the MLU model to simulate streamflow losses where the creek flows across the Purisima B Zone, and b) using the conductance equation for calculating fluid flow through streambed sediments using the predicted head differential created over the more permeable Purisima A Zone aquifer unit. MLU simulations of the effects of the proposed Beltz Well No. 12 production on the Purisima B Zone water levels are shown on Plate B2. The cumulative rate of streambed losses to simulate no drawdown in the Purisima B Zone, as shown on this plate, were combined with the calculations of streamflow losses over the Purisima A Zone and summarized in the tables presented in Appendix E – Streamflow Impact Estimations.

As previously mentioned, there was no flow in Rodeo Gulch Creek at the upstream or the downstream sample locations at the time of streambed sampling (see Plate 3 and Appendix D). Based on these observations, well production during the dry season being analyzed will have no impact on the ephemeral streamflows in Rodeo Gulch Creek.

As mentioned above, losses through streambed materials into the underlying A Zone were calculated using the conductance equation. Factors considered in these infiltration estimates include observations of Soquel Creek conditions that were made during the collection of streambed samples. These observations indicate that the creek bottom is armored with exposed and partially buried coarse gravel and cobbles that were deposited during higher creek flows. Photographic documentation of creek conditions at the sample locations when the samples were collected is included in Appendix D. These impermeable materials were observed to comprise a minimum of 50 percent of the streambed area in Soquel Creek but were absent in the Rodeo Gulch streambed.

Filling the interstitial space between these impermeable clasts is a fine-grained silty sand/sandy silt matrix that was sampled for laboratory testing. The resulting hydraulic conductivity values for the Soquel Creek samples are summarized in Table 4 – Streambed Hydraulic Conductivity Values. For the purpose of estimating induced infiltration rates or reduced recharge rates to streamflow, the average hydraulic value of 0.601 feet per day (ft/day) and an inferred effective porosity for the silty sand material of 20 percent were used.

Table 4 – Streambed Hydraulic Conductivity Values

SAMPLE LOCATION	HYDRAULIC CONDUCTIVITY (CM/SEC)	HYDRAULIC CONDUCTIVITY (FT/DAY)
NO. 1	2.78E-05	0.078
NO. 2	2.42E-04	0.686
NO. 3	3.67E-04	1.040
AVERAGE	**2.12E-04**	**0.601**

Additional observation indicate that the active channel width varies along the course of Soquel Creek and was estimated at the time of sampling to average approximately 20 feet wide (see Appendix D). While the average depth of water in the stream changes throughout the course of the year (see Plates C2 through C5) and between pools and riffles, an average depth of 3 feet in the creek was used to estimate conductance through the streambed sediments during the proposed operational season of the year. Shallower creek depths would result in lower infiltration rates and reduced impacts to creek flows.

As described above, the cumulative injection rate required to eliminate the simulated drawdown beneath the creek in the B Zone while pumping Beltz Well No. 12 was used as the loss of flow over these reaches of the creek. In addition, the reduction in head simulated in segmented reaches of the A Zone was applied using the streambed conductance equation shown on Plate 10 to calculate losses in this reach of the creek. The cumulative reduction in creek flow estimated using these methods for all 3 of the groundwater scenarios evaluated (Beltz Well No. 12 project [only], SqCWD WMP project [only], and cumulative proposed projects) is provided in Appendix E and summarized in Table 5 – Proposed Projects Effects on Soquel Creek Streamflow. The proposed production scenarios for these projects results in a maximum decrease in streamflow at the end of the Beltz Well No. 12 production season which ranges from 0.029 cfs to 0.241 cfs (see Table 5).

Table 5 – Proposed Projects Effects on Soquel Creek Streamflow

PROPOSED PROJECT	EFFECTS ON STREAMFLOW AT THE END OF BELTZ WELL NO. 12 215-DAY PRODUCTION SEASON
CITY BELTZ WELL NO. 12 ONLY	0.211 CFS DECREASE
SQCWD WMP PROJECT ONLY	0.029 CFS DECREASE
CUMULATIVE PROPOSED PROJECTS	0.241 CFS DECREASE

In past study, the City has developed criteria for water year classification of critically dry, dry, normal, and wet water years (October 1 – September 30). For the period of record, from 1921 to 2008, one-third of all years are classified as wet, slightly over one-third as normal, and one-sixth each as dry and critically dry (SCWD, 2006). From historical data, multiple critically dry water years and single critically dry water years were identified. The following representative years are used in this analysis:

- 2007 – Single Critically Dry Year,
- 1990 – Multiple Critically Dry Years,
- 1977 – Multiple Critically Dry Years, Most Severe Drought of Record.

Data of Soquel Creek streamflow discharges are recorded at the United States Geological Survey (USGS) Gage No. 11160000, located approximately 9,000 feet upstream of the Soquel Creek outlet to the Pacific Ocean. This gage provides data of stream discharges since 1951 and is the only USGS gage located on the lower reach of Soquel Creek that may be affected by pumping Beltz Well No. 12. Hydrographs illustrating daily mean discharges during the representative critically dry water years 1977, 1990, and 2007 are provided in Appendix F.

The results of the streamflow impacts analyses provided in Appendix E were combined with these United States Geological Gauging data to evaluate the magnitude of the estimated creek flow reductions during the observed creek discharges in the critically dry years of 1977,

1990, and 2007. This analysis includes the change in well production distribution included below in Table 6 – Proposed Well Production Distribution Evaluated.

Table 6 –Proposed Well Production Distribution Evaluated

PRODUCTION SCENARIO	PRODUCTION SEASON	PRODUCTION LOCATION	APPROXIMATE WELL CAPACITY (GPM)	TOTAL (AF)
EXISTING CONDITIONS (NO PROJECT) WITHOUT BELTZ WELL NO.12	APRIL -NOV	BELTZ 8, 9, 10	700	645
PROPOSED PROJECT WITH BELTZ WELL NO. 12	APRIL -NOV	BELTZ 12	700	645

For each critically dry water year, the USGS hydrograph data shown in Appendix F were utilized to estimate streamflow discharge impacts at the end of the 215-day production season for the proposed Beltz Well No. 12 project with the entire production shifted from the existing Beltz Well Nos. 8, 9, and 10 operations. The cumulative impacts that include the proposed SqCWD WMP production redistribution were also estimated for these same critically dry years. Daily mean discharge at the end of the pumping period was averaged over the final week (seven days) to account for any large variability at this point.

To estimate reductions in streamflow from pumping Beltz Well No. 12, the hydrographs of representative water years were used to calculate streamflow discharges at the Soquel Creek outlet to the Pacific Ocean (outlet). The State Water Resources Control Board - Division of Water Rights (2006) provides a method for prorating USGS gage streamflow data at points of interest, as follows:

$$\mathbf{Q_2 = Q_1 \times (A_2/A_1) \times (I_2/I_1)}$$

Where: Q_2 = Daily flow (cfs) at point of interest on tributary watershed;
Q_1 = Daily flow (cfs) at nearby gage;
A_2 = Watershed area above point of interest;
A_1 = Watershed area above gage;
I_2 = Precipitation at point of interest; and
I_1 = Precipitation at gage.

The Soquel Creek watershed has a total area of 42.0 square miles and USGS Gage No. 11160000 has a watershed area of 40.2 square miles. Due to the close proximity of USGS Gage No. 11160000 and the outlet, the assumption can be made that precipitation is virtually the same at these locations. The results of the streamflow impacts analyses are provided in Appendix F as Table F1 for each of the representative critically dry water years at the end of the 215-day pumping period.

At the end of the Beltz Well No. 12 production period with the City only project, the inland shift of pumping resulted in reduced streamflows that ranged between 5.8 percent in 2007 and 15.7 percent in 1977. These percentages represent a 0.21 cfs reduction from the 3.61 cfs outflow in 2007 and the 1.34 cfs outflow in 1977. The cumulative impacts to streamflow were estimated to range in a loss of 6.7 to 17.9 percent of flow at the outlet to the ocean for 2007 and 1977, respectively. The cumulative 0.24 cfs-loss in streamflow reduced the outflow from 3.61 to 3.40 cfs in 2007, and from 1.34 to 1.10 cfs in 1977 (see Table F1 and F2).

Well Production Effects on Groundwater Contamination Sites

A potential effect from pumping Beltz Well No. 12 is the possible influence on nearby groundwater contamination sites. Table 7 – Estimated Effects on Groundwater Monitoring Sites shows three well locations associated with gasoline station spills within a 1,000 meter radius of the Beltz Well No. 12 location. The Exxon 7-0281 site was recently closed and is no longer considered an active petroleum release site. The other 2 locations are sites that are being monitored to verify that contaminants will not pose a threat to water resources. If pumping at Beltz Well No. 12 alters groundwater flow at a site such that contaminants would be more likely to travel to nearby private wells, the effect on the yield of nearby private wells could be restrictive.

Table 7 - Estimated Effects on Groundwater Monitoring Sites

SITE NAME AND ADDRESS	WATER LEVEL MEASUREMENT DATE AND (SOURCE)	REPORTED GRADIENT	REPORTED GRADIENT DIRECTION	BELTZ WELL NO. 12 EFFECT OR PERTINENT COMMENT
EXXON 7-0281 2501 S. MAIN STREET	2/11/2011 (CRWQCB, 2011)	NA	NA	NO EFFECT SITE CLOSED
BP 1240 2178 41ST AVE.	03/15/2011 (ARCADIS, 2011)	0.017	S42W	MARGINAL EFFECT GRADIENT 0.012 S73W
EXXON 7-3604 836 BAY AVE.	04/22/2010 (ERI, 2010)	0.003	S63W	NO EFFECT B ZONE AQUIFER EAST OF SOQUEL CREEK

Utilizing the MLU modeled drawdown values, the effects are evaluated by estimating the changed groundwater flow gradient from pumping Beltz Well No. 12. Maximum water level changes at the end of the Beltz Well No. 12 pumping period are used for the evaluation of the two remaining active sites. The reported and estimated gradients influenced by Beltz Well No. 12 pumping are shown in Table 7. The table shows that Beltz Well No. 12 pumping does not steepen the flow gradient or appreciably change the flow direction at either of the sites. As a result, there is no effect of Beltz Well No. 12 operation on nearby private wells resulting from transport of known contaminants.

Because the changes in groundwater elevations in the A unit at the BP 1240 site are minimal (3.5 feet) and temporary, there is only a marginal effect that will not alter the ongoing monitoring and cleanup operations using the projects shallow wells. Because the Exxon 7-3604 site is located east of Soquel Creek and has monitoring wells that are located in the shallowest underlying unit (B Zone Aquifer), there is virtually no change in the groundwater gradient or flow direction and thus no effect of Beltz Well No. 12 operation on the ongoing monitoring or cleanup operations.

Analyzing the cumulative pumping effects of the Beltz Well No. 12 project and the SqCWD WMP project using the same method indicates that while the maximum change in water level will be between 4 and 5 feet beneath the BP 1240 site, there is no appreciable change in the gradient or direction of groundwater flow (0.018 and S41W, respectively) and is a marginal effect.

CONCLUSIONS

The proposed Beltz Well No. 12 construction project is part of the City's groundwater management strategy (which complies with the AB3030 basin management objectives) to maintain protective groundwater levels near the coast that prevent seawater intrusion into the Purisima Formation aquifer units while maintaining the historical supply of groundwater to overlying users. The analyses of this study conclude that by project design and cooperative management with the SqCWD, the impacts of the project are minimized by the moderate duration of use (a 7-month pumping season).

The relocation of this moderate amount of pumping is demonstrated by this study to cooperatively benefit the coastal aquifer system from which the Beltz Wellfield, SqCWD, and numerous private pumpers produce an annual supply of water. The proposed relocation of historical groundwater production effectively raises coastal groundwater levels to abate seawater intrusion while maintaining this vital supply (see Plate No. B1). This conclusion is also supported by the analysis of the cumulative water level effects shown on Plate B5. Because the location of the Beltz Well No. 12 site maintains a moderate distance from privately owned wells and its production rate is moderate, its potential impacts are minimized. While the physical area

to redistribute pumping within the Purisima Formation aquifer system is limited (Hopkins, 2006), we conclude that the cumulative effects analyzed by this study indicate that the location of Beltz Well No. 12 is optimal for the cooperative needs of the City and the SqCWD WMP projects, while minimizing impacts to private pumpers.

SqCWD Wells

The impacts analysis provided in this study concludes that the proposed operation of Beltz Well No. 12 at 700 gpm (645 afy) at the Research Park Drive Site could potentially develop the greatest interference drawdown at the SqCWD Main Street Well of 2.5 feet at the end of the 7-month production season. Interference drawdown at the other existing SqCWD wells is less than what is seen at the Main Street Well (refer to Table 1). Based on the Main Street Well design and the available drawdown within the well, this amount of interference will not jeopardize operation of the well or the pump equipment nor will it appreciably lower the well's yield. This indicates that the pumping effects on the existing SqCWD facilities are marginal.

Privately Owned Wells

The potential maximum impact to private wells in the study area is proportional to their radial distance from the proposed Beltz Well No. 12 location. The relatively minor amount of drawdown at the location of privately owned water supply wells (ranging from 3.3 to 5.2 feet) that is anticipated in the A Zone aquifer from operation of the proposed Beltz Well No. 12 indicate that the impact to privately owned well yields is believed to be at most a marginal effect. The results of the study analysis indicate that the City project will not result in well or well pump damage or a significant loss of well yield (0.11 to 0.72 gpm).

Cumulative project effects on water levels are found to be moderate (up to 9.8 feet) at the closest privately owned wells located north of the O'Neill Ranch Well site. These maximum water level effects will occur over the last couple months of the proposed Beltz Well No. 12 pumping period and will immediately begin to reduce after cessation of Beltz Well No. 12 operation. The pumping impact under the cumulative project operations are believed to be a marginal effect that will not result in well or well pump damage or a significant loss of well yield (0.17 to 1.17 gpm).

Soquel Creek Flows

The estimated impact to flow in Soquel Creek at the end of 215 days of pumping Beltz Well No. 12 at a production rate of 700 gpm is approximately 0.211 cfs. The study results estimate that the maximum percent change in creek outflow is a reduction of approximately 15.7 percent that would occur under 1977 flow conditions and lower the creek outflow from approximately 1.34 cfs to 1.13 cfs. The cumulative percent change in creek outflow during this

same critically dry year condition is estimated at a maximum reduction of 17.9 percent at the end of the Beltz Well No. 12 production season resulting in a creek flow reduction from 1.34 cfs to approximately 1.10 cfs at the outlet (a 0.24 cfs reduction, see Table F1).

The minimal effect to streamflow in Soquel Creek is primarily a result of; a) the approximate ½-mile distance between the creek and the proposed well location, b) the moderate production rate proposed by the City (700 gpm), and c) the impedance to vertical flow of groundwater through the layered Purisima Formation and the creek bottom sediments.

Because there is no flow in Rodeo Gulch Creek during the summer and fall months of the year, there is no potential impact to flow from the proposed Beltz Well No. 12 production. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the proposed and cumulative projects will not have an effect on the ephemeral creek flows, nor will they appreciably reduce the seasonal recharge to Corcoran Lagoon.

Groundwater Contamination Sites

The significant distance between the proposed Beltz Well No. 12 site and the location of known groundwater contamination sites significantly reduces the potential for any effect. We conclude from the findings of this study that the proposed project will have no effect or at most a marginal effect on the known groundwater contamination sites within 1,000 meters (over a half mile) of the proposed well location. This marginal level of effect was determined to be the same for both the City only and the cumulative projects.

CLOSURE

This report has been prepared for the exclusive use of the City of Santa Cruz and its agents for specific application to the proposed Beltz Well No. 12 construction project located at the Research Park Drive Site in Santa Cruz County, California. The findings and conclusions presented herein were prepared in accordance with generally accepted hydrogeological engineering and planning practices. No other warranty, express or implied is made.

□

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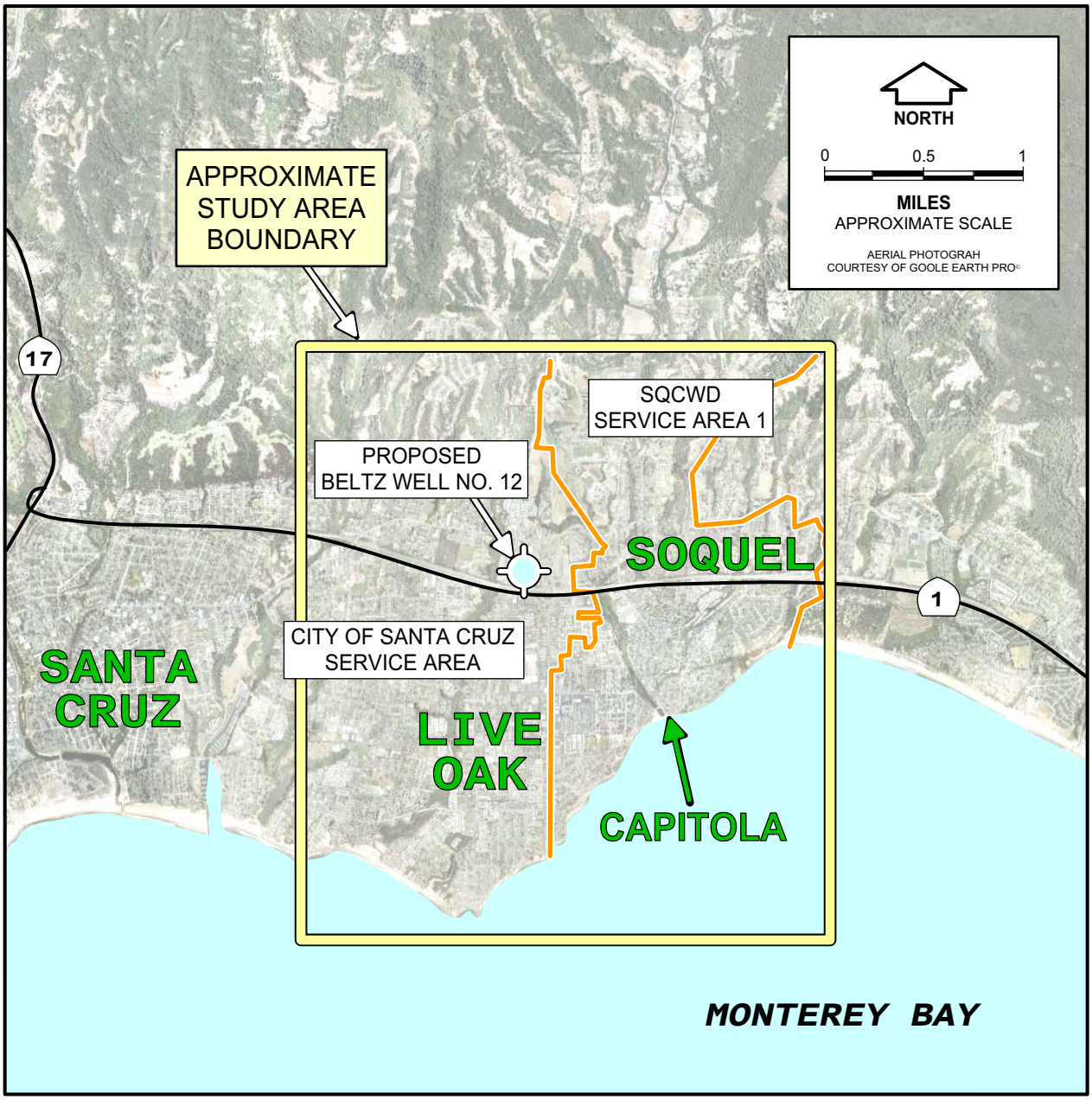
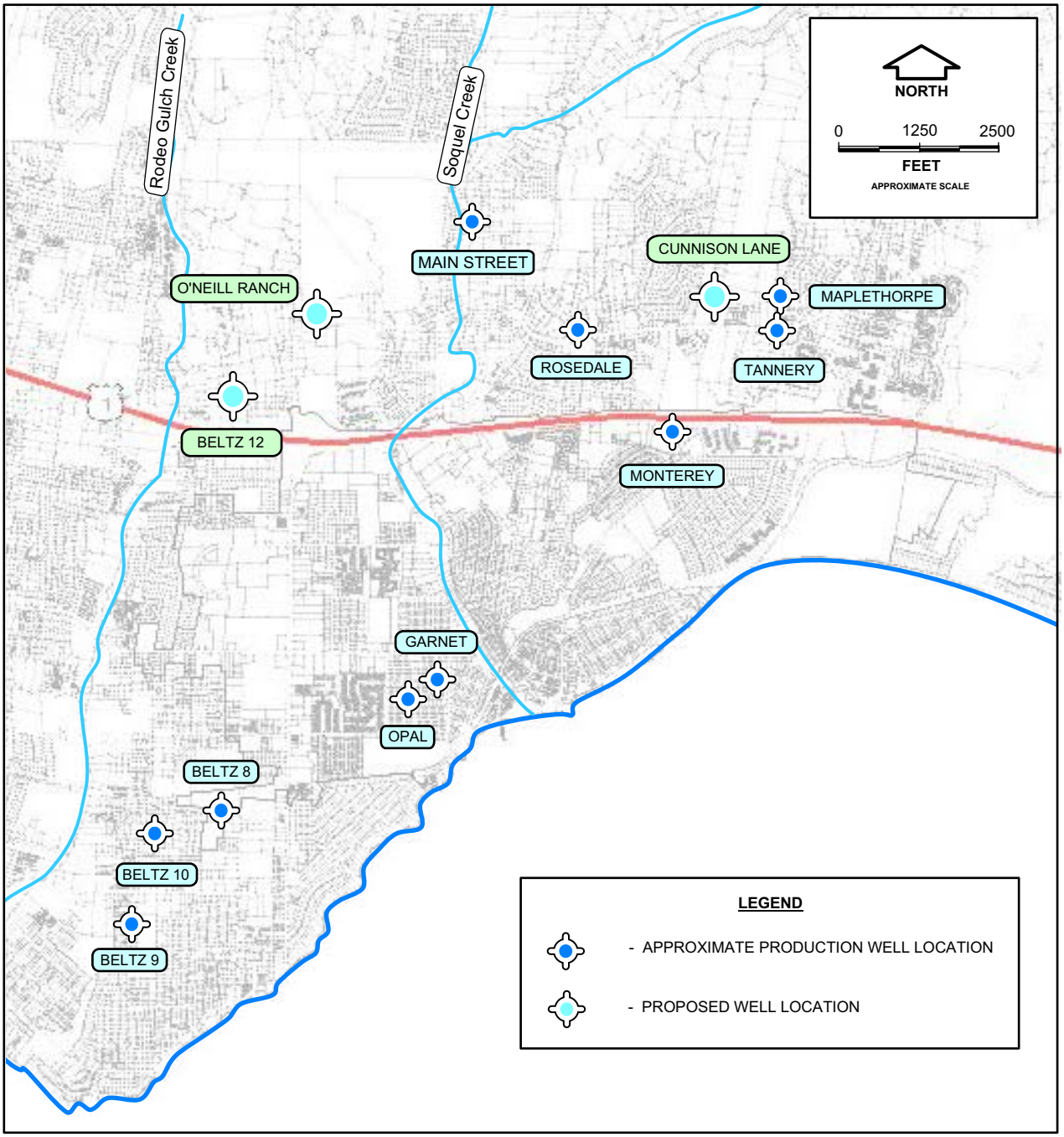
PLATES



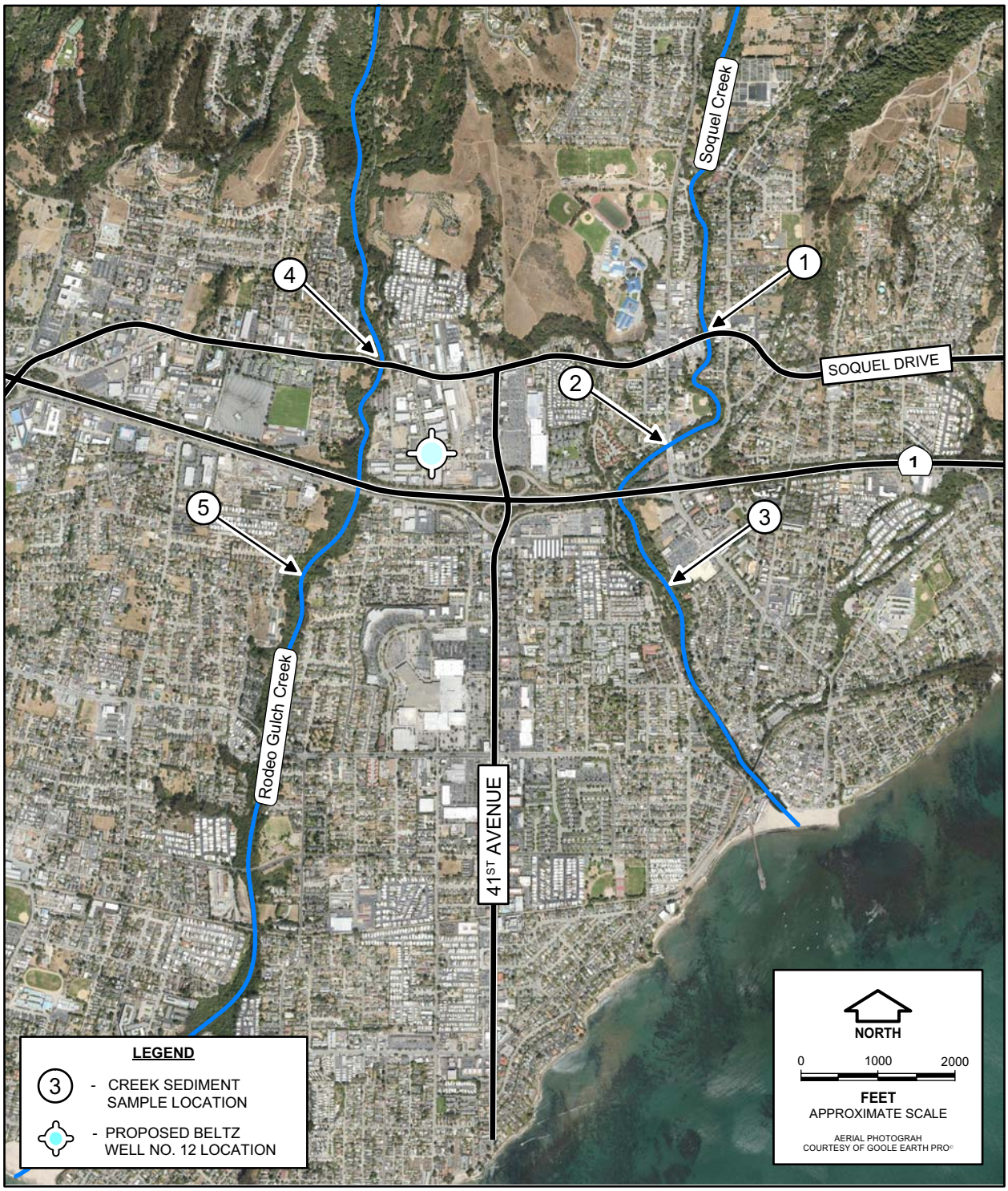
STUDY AREA LOCATION MAP
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 1



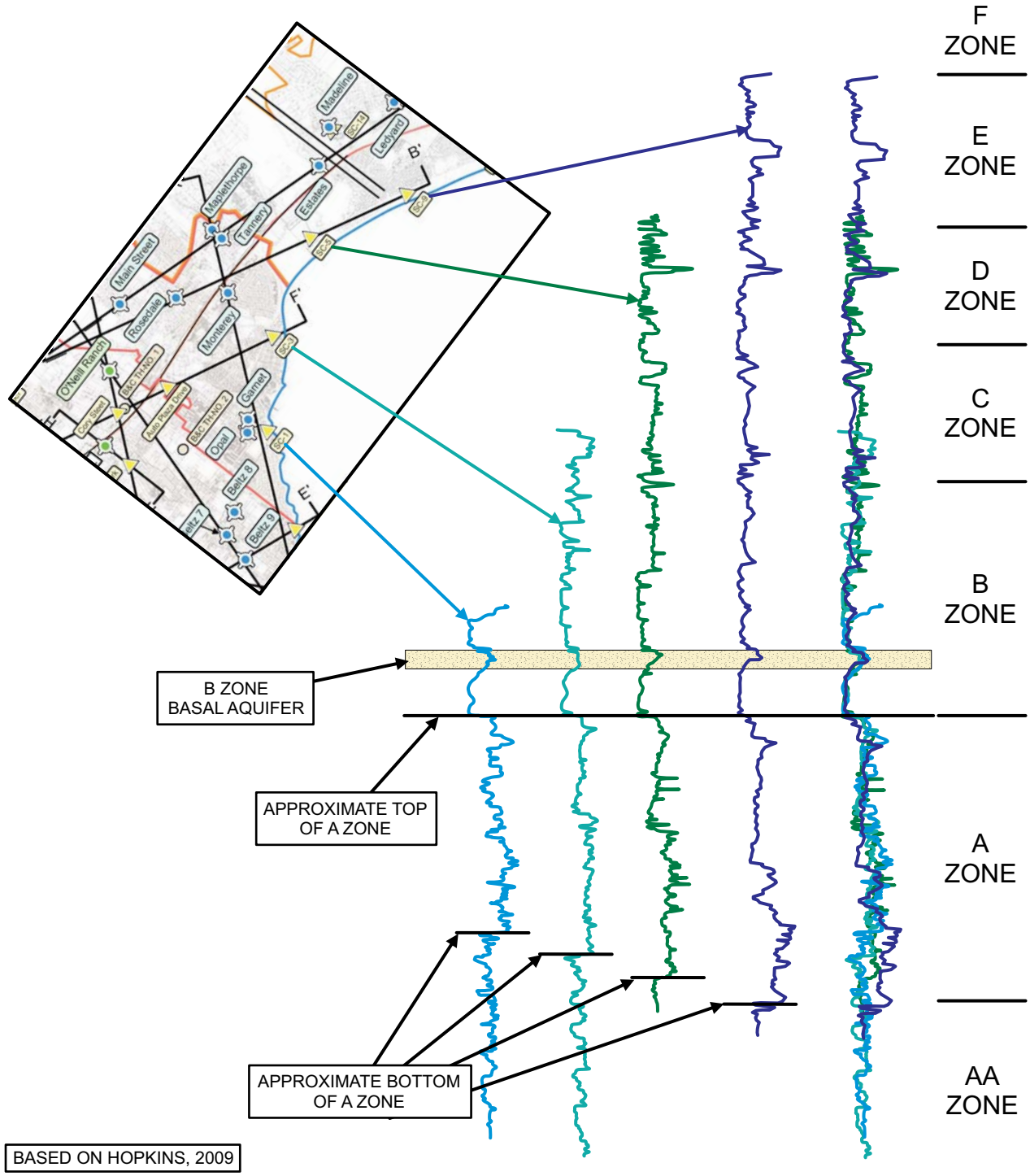
WELL LOCATION MAP
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 2



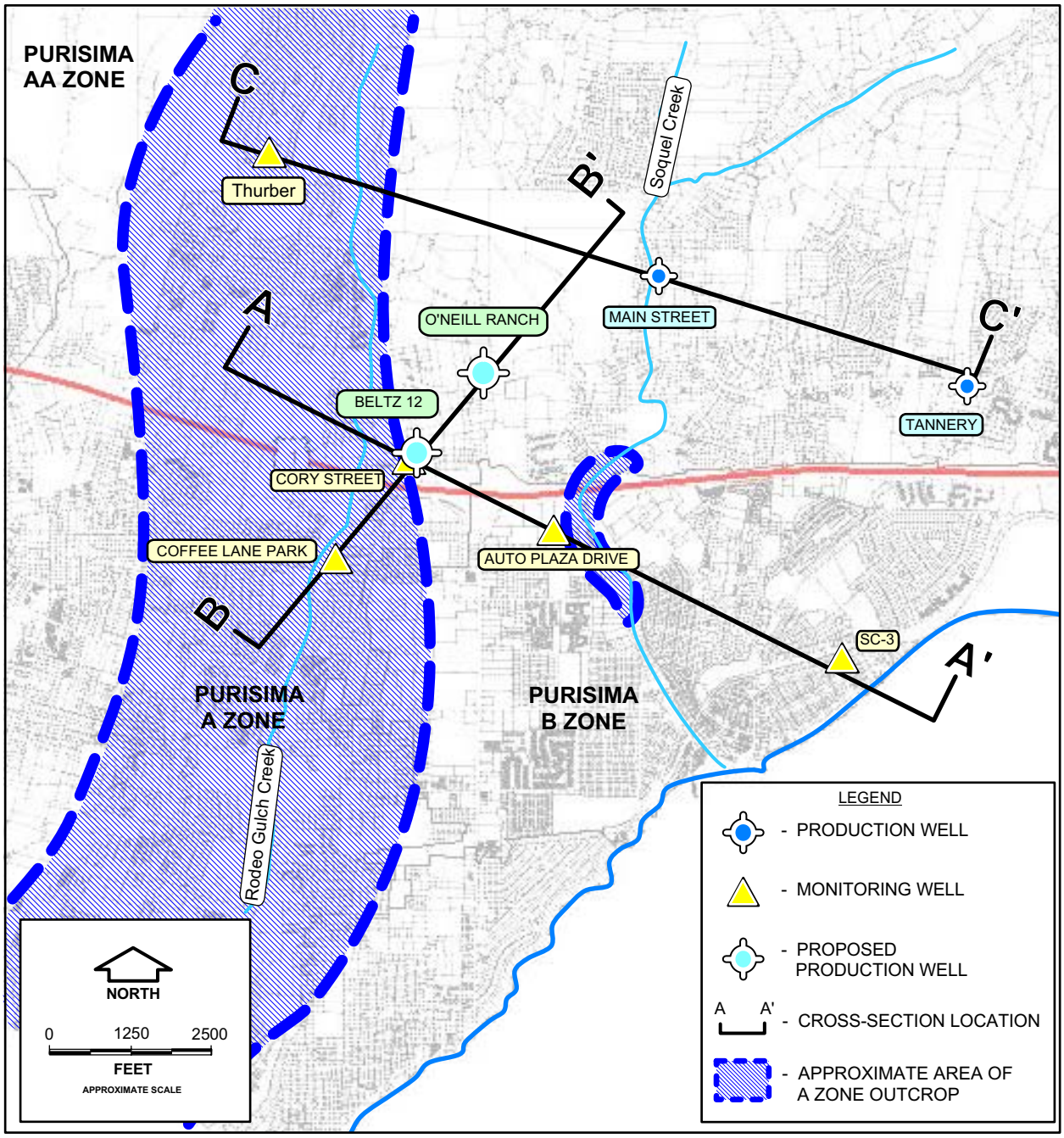
CREEK SEDIMENT SAMPLE LOCATION MAP
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 3



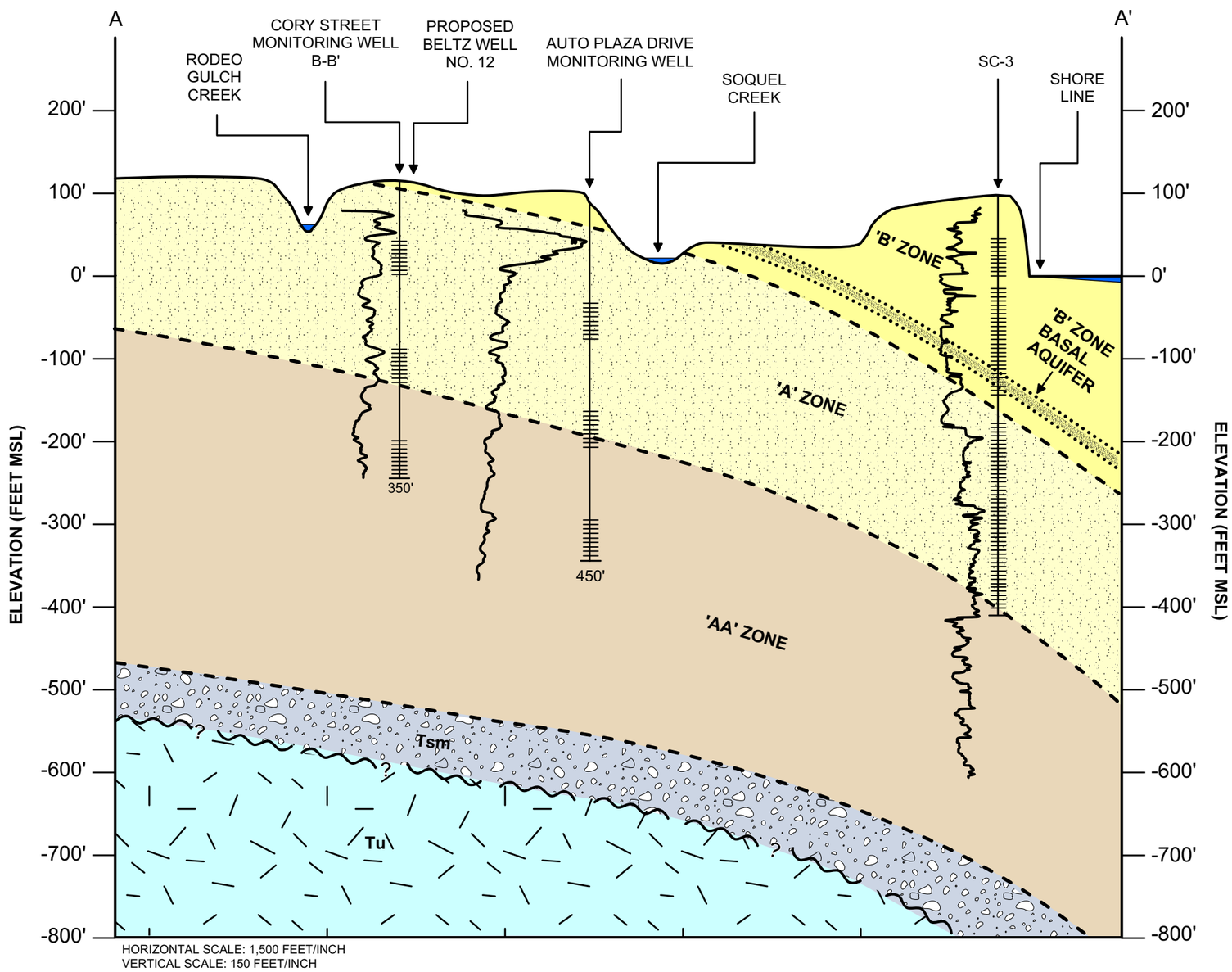
ELECTRIC LOG TRACE CORRELATION OF AQUIFER ZONES
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

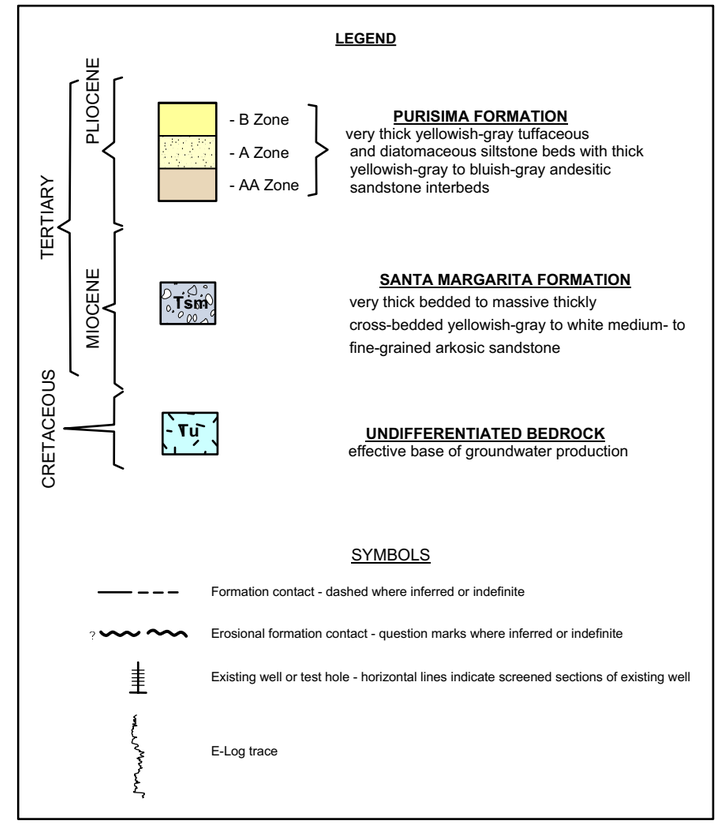
PLATE 4



HYDROGEOLOGICAL CROSS-SECTION LOCATION MAP
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

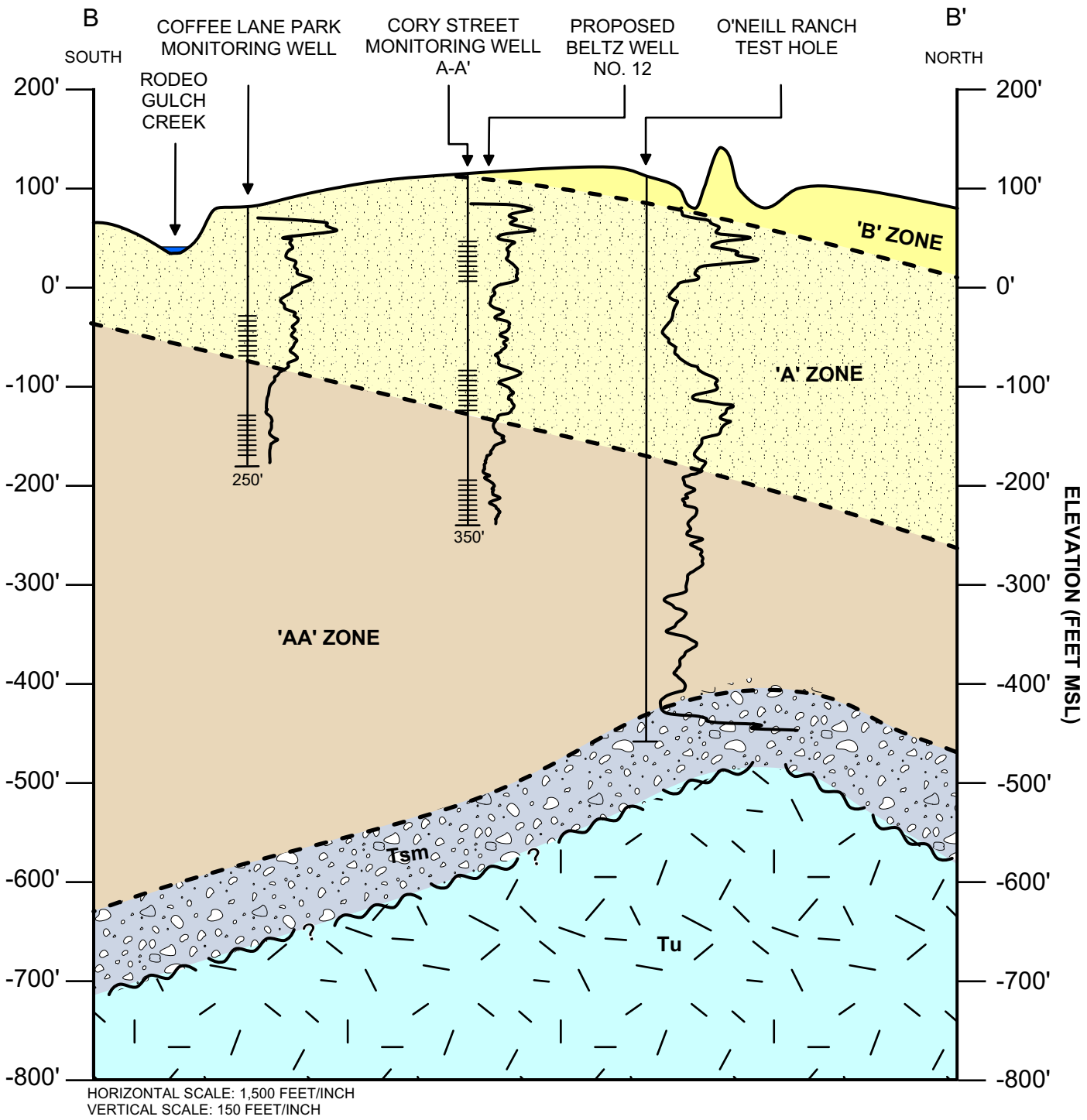
PLATE 5





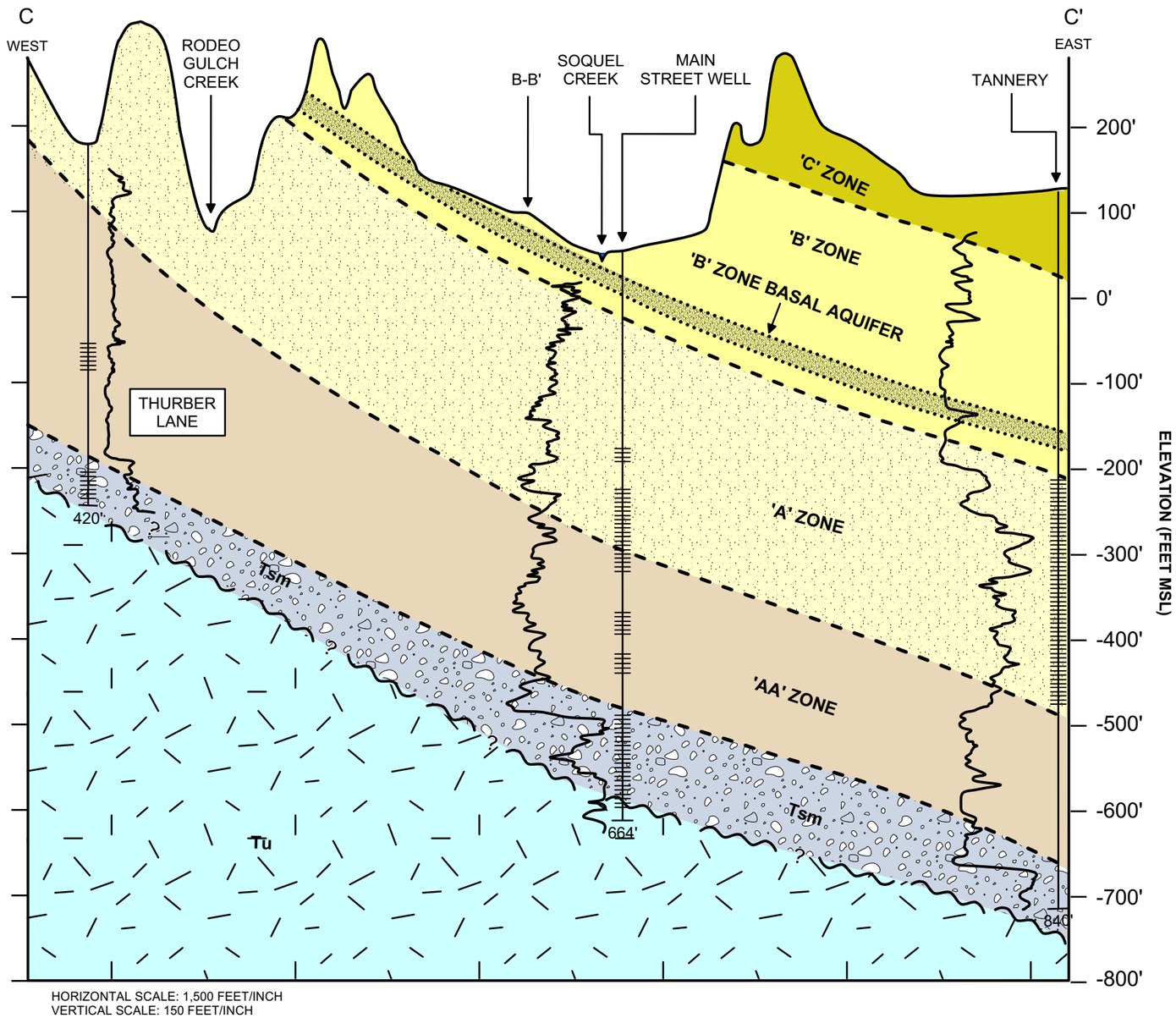
HYDROGEOLOGICAL CROSS-SECTION A-A'
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

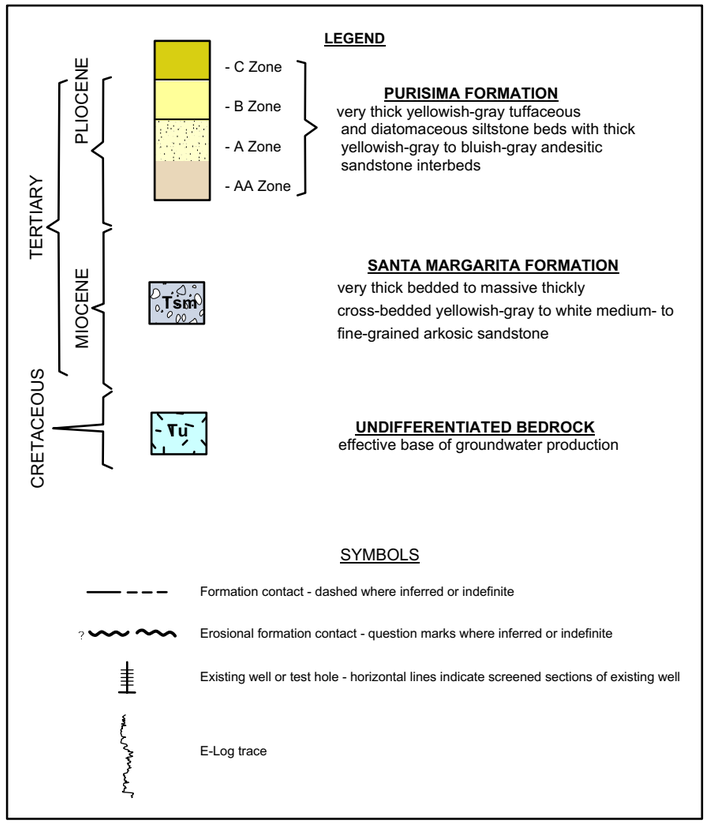
PLATE 6



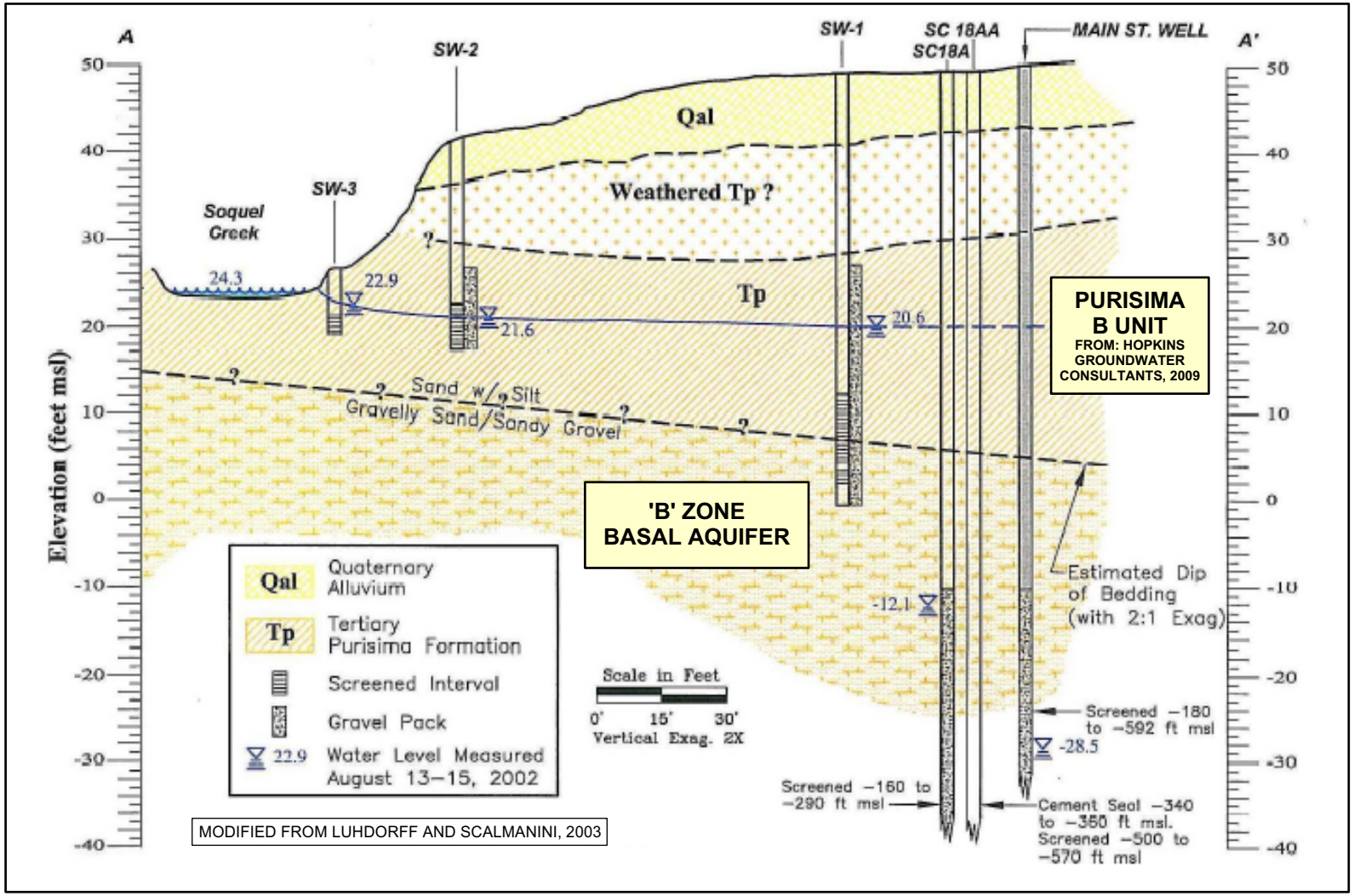
HYDROGEOLOGICAL CROSS-SECTION B-B'
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 7





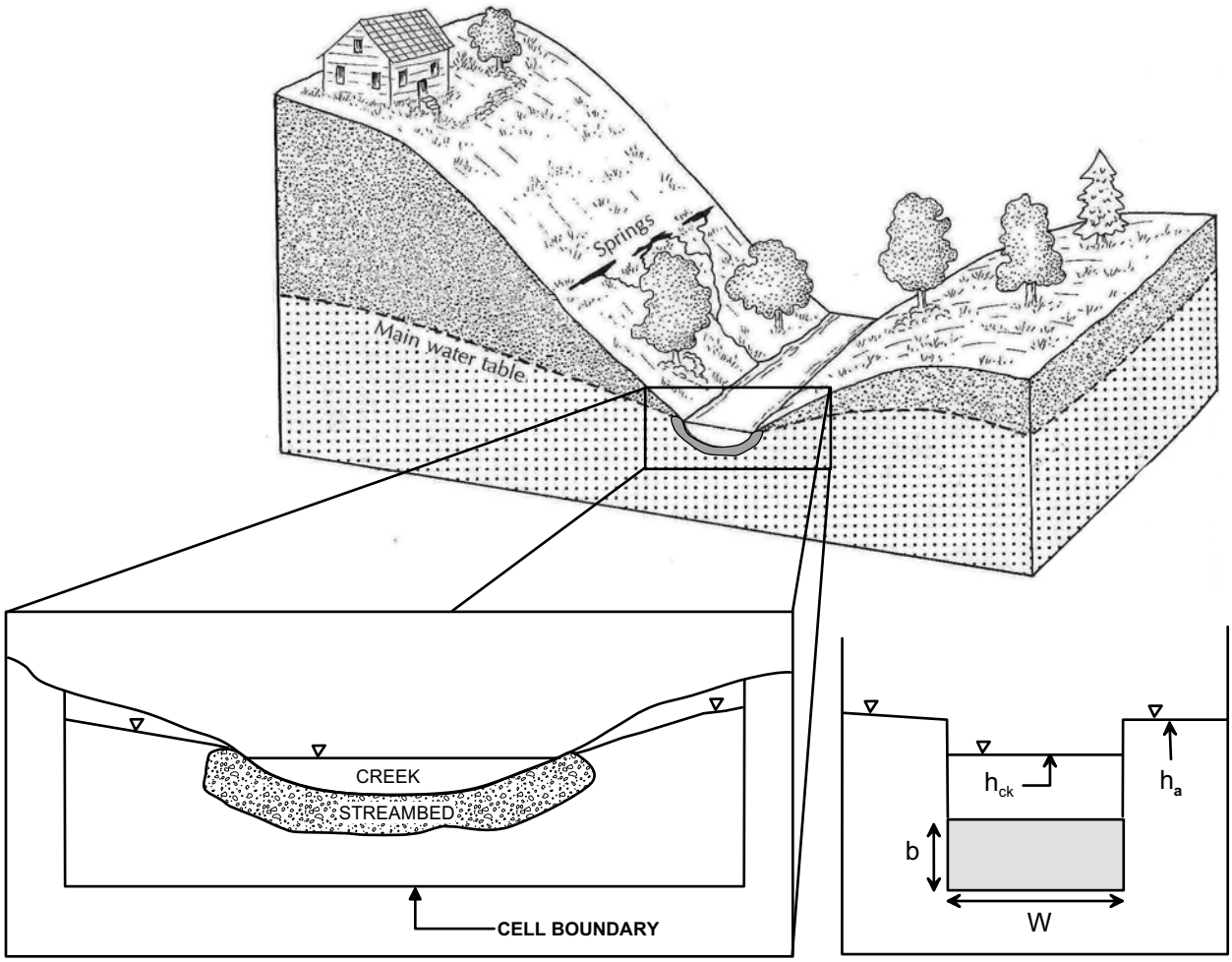
HYDROGEOLOGICAL CROSS-SECTION C-C'
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California



HYDROGEOLOGICAL CONDITIONS AT MAIN STREET WELL
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

June 2011
Project No. 01-010-06D

HOPKINS GROUNDWATER CONSULTANTS



$$Q_{ck} = \frac{KLW}{b} (h_{ck} - h_a)$$

Q_{ck} = FLOW IN OR OUT OF CREEK
K = HYDRAULIC CONDUCTIVITY
L = LENGTH OF CREEK
W = WIDTH OF CREEK
b = THICKNESS OF CREEK BED SEDIMENTS
h_a = HEAD IN AQUIFER
h_{ck} = HEAD IN CREEK

STREAM-AQUIFER INTERACTION
Beltz Well No. 12 (645 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 10

APPENDIX A
LABORATORY HYDRAULIC CONDUCTIVITY
TEST RESULTS OF STREAMBED SOIL SAMPLES

AP Engineering & Testing, Inc.

LETTER OF TRANSMITTAL

TO: Louie Hengehold	FROM: Andrew Phukunhaphan
COMPANY: Hopkins Groundwater Consultants	DATE: 6/21/2010
ADRRESS: Post Office Box 3596	TOTAL NO. OF PAGES TRANSMITTED 5
CITY AND STATE: Ventura, CA 93006	YOUR PROJECT NAME: Beltz No. 12 CEQA Study
SUBJECT: Permeability Test Results	YOUR PROJECT NUMBER: 01-010-06 D

☒ AS REQUESTED ☐ FOR YOUR REVIEW & COMMENT ☒ FOR YOUR USE

NOTES/COMMENTS:

Transmitted herewith are results of permeability tests performed on your soil samples delivered to us on June 15, 2010.

If you have any questions, please contact me at your convenience.

Respectfully submitted,

AP Engineering and Testing, Inc.

Andrew Phukunhaphan, P.E., G.E.
Principal Engineer

2607 Pomona Boulevard, Pomona, California 91768 Tel: (909) 869-6316 Fax: (909) 869-6318 E-mail:apengineer@sbcglobal.net

AP Engineering & Testing, Inc.

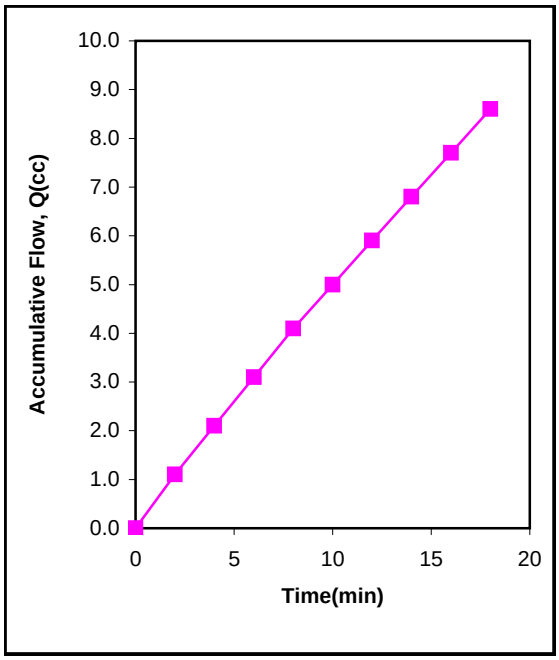
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	SQC Dr.	Checked by	AP	Date	06/18/10
Sample No.:	#1 SQC @ SQC Dr.				
Soil Description:	Dark Gray Silty Sand				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	2.90	in	Container No.		
Weight Before	397.59	g	Wt. Wet Soil+Container(gms)	397.59	548.78
			Wt. Dry Soil+Container(gms)	292.57	442.5
Wet Density	114.01	pcf	Wt. Container (gms)	0	149.93
Dry Density	83.89	pcf	Moisture, (%)	35.90	36.33

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	39.1	1	0.0	1.0	9.55	0
2	38.0	1	1.1	1.0	9.55	9.17E-03
4	37.0	1	2.1	1.0	9.55	8.33E-03
6	36.0	1	3.1	1.0	9.55	8.33E-03
8	35.0	1	4.1	1.0	9.55	8.33E-03
10	34.1	1	5.0	1.0	9.55	7.50E-03
12	33.2	1	5.9	1.0	9.55	7.50E-03
14	32.3	1	6.8	1.0	9.55	7.50E-03
16	31.4	1	7.7	1.0	9.55	7.50E-03
18	30.5	1	8.6	1.0	9.55	7.50E-03

Hydraulic Conductivity (cm/sec): 2.78E-05

AP Engineering & Testing, Inc.

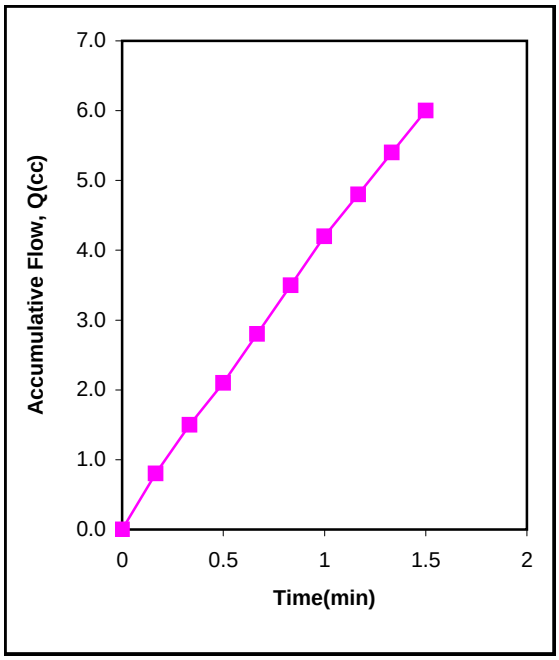
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Porter St.	Checked by	AP	Date	06/18/10
Sample No.:	#2 SQC @ Porter Street				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	443.54	g	Wt. Wet Soil+Container(gms)	443.54	598.49
			Wt. Dry Soil+Container(gms)	352.41	503.47
Wet Density	122.94	pcf	Wt. Container (gms)	0	151.06
Dry Density	97.68	pcf	Moisture, (%)	25.86	26.96

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	35.6	1	0.0	1.0	9.23	0
0.167	34.8	1	0.8	1.0	9.23	8.00E-02
0.333	34.1	1	1.5	1.0	9.23	7.00E-02
0.5	33.5	1	2.1	1.0	9.23	6.00E-02
0.667	32.8	1	2.8	1.0	9.23	7.00E-02
0.833	32.1	1	3.5	1.0	9.23	7.00E-02
1	31.4	1	4.2	1.0	9.23	7.00E-02
1.167	30.8	1	4.8	1.0	9.23	6.00E-02
1.333	30.2	1	5.4	1.0	9.23	6.00E-02
1.5	29.6	1	6.0	1.0	9.23	6.00E-02

Hydraulic Conductivity (cm/sec): 2.42E-04

AP Engineering & Testing, Inc.

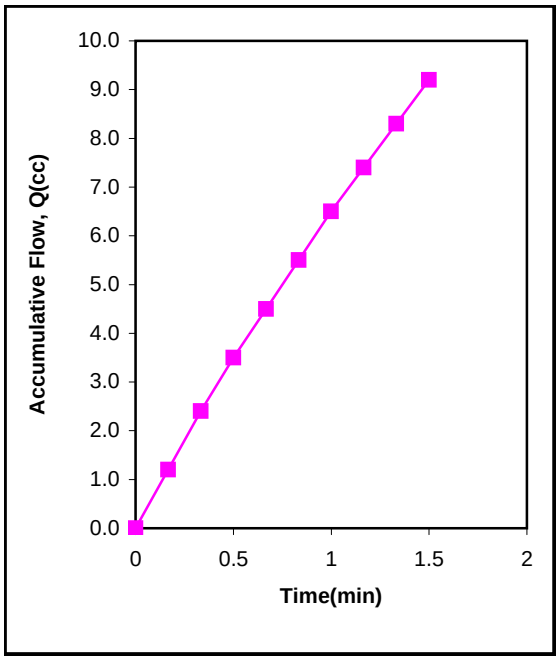
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Foot Bridge	Checked by	AP	Date	06/18/10
Sample No.:	#3 SQC @ Foot Bridge				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	438.92	g	Wt. Wet Soil+Container(gms)	438.92	592.85
			Wt. Dry Soil+Container(gms)	348.25	499.02
Wet Density	121.66	pcf	Wt. Container (gms)	0	150.77
Dry Density	96.53	pcf	Moisture, (%)	26.04	26.94

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	31.4	1	0.0	1.0	9.23	0
0.167	30.2	1	1.2	1.0	9.23	1.20E-01
0.333	29.0	1	2.4	1.0	9.23	1.20E-01
0.5	27.9	1	3.5	1.0	9.23	1.10E-01
0.667	26.9	1	4.5	1.0	9.23	1.00E-01
0.833	25.9	1	5.5	1.0	9.23	1.00E-01
1	24.9	1	6.5	1.0	9.23	1.00E-01
1.167	24.0	1	7.4	1.0	9.23	9.00E-02
1.333	23.1	1	8.3	1.0	9.23	9.00E-02
1.5	22.2	1	9.2	1.0	9.23	9.00E-02

Hydraulic Conductivity (cm/sec): 3.67E-04

AP Engineering & Testing, Inc.

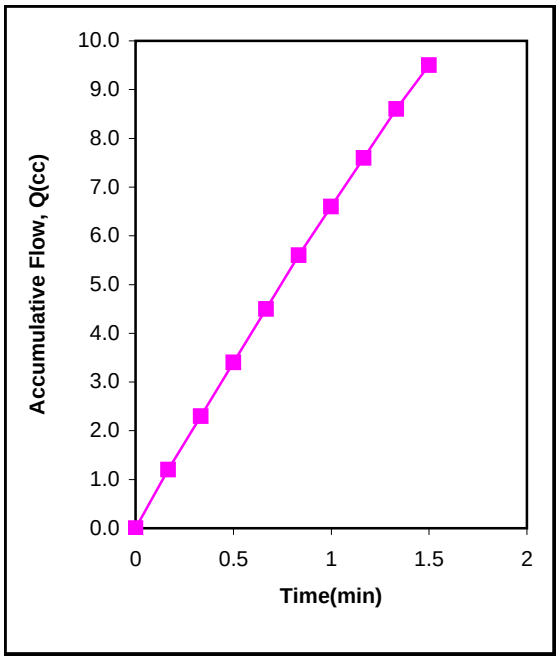
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Soquel Ave.	Checked by	AP	Date	06/18/10
Sample No.:	#4 RC @ Soquel Ave.				
Soil Description:	Very Dark Grayish Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	418.19	g	Wt. Wet Soil+Container(gms)	418.19	575.72
			Wt. Dry Soil+Container(gms)	325.4	473.91
Wet Density	115.92	pcf	Wt. Container (gms)	0	148.51
Dry Density	90.20	pcf	Moisture, (%)	28.52	31.29

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	27.4	1	0.0	1.0	9.23	0
0.167	26.2	1	1.2	1.0	9.23	1.20E-01
0.333	25.1	1	2.3	1.0	9.23	1.10E-01
0.5	24.0	1	3.4	1.0	9.23	1.10E-01
0.667	22.9	1	4.5	1.0	9.23	1.10E-01
0.833	21.8	1	5.6	1.0	9.23	1.10E-01
1	20.8	1	6.6	1.0	9.23	1.00E-01
1.167	19.8	1	7.6	1.0	9.23	1.00E-01
1.333	18.8	1	8.6	1.0	9.23	1.00E-01
1.5	17.9	1	9.5	1.0	9.23	9.00E-02

Hydraulic Conductivity (cm/sec): 3.89E-04

AP Engineering & Testing, Inc.

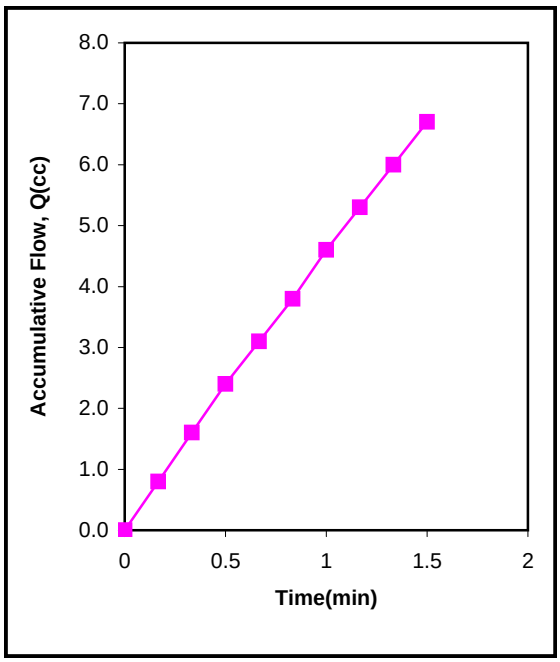
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Coffee	Checked by	AP	Date	06/18/10
Sample No.:	#5 RC @ Coffee				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	390.97	g	Wt. Wet Soil+Container(gms)	390.97	569.57
			Wt. Dry Soil+Container(gms)	321.68	470.42
Wet Density	108.37	pcf	Wt. Container (gms)	0	148.74
Dry Density	89.16	pcf	Moisture, (%)	21.54	30.82

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	31.8	1	0.0	1.0	9.23	0
0.167	31.0	1	0.8	1.0	9.23	8.00E-02
0.333	30.2	1	1.6	1.0	9.23	8.00E-02
0.5	29.4	1	2.4	1.0	9.23	8.00E-02
0.667	28.7	1	3.1	1.0	9.23	7.00E-02
0.833	28.0	1	3.8	1.0	9.23	7.00E-02
1	27.2	1	4.6	1.0	9.23	8.00E-02
1.167	26.5	1	5.3	1.0	9.23	7.00E-02
1.333	25.8	1	6.0	1.0	9.23	7.00E-02
1.5	25.1	1	6.7	1.0	9.23	7.00E-02

Hydraulic Conductivity (cm/sec): 2.71E-04

APPENDIX B
MLU MODEL PARAMETERS AND ANALYTICAL RESULTS

MLU MODEL
AQUIFER PARAMETERS

Table B1 - MLU Model Aquifer Parameters

Aquifer	Base [ft]	Thickness [ft]	Kh [ft/d]	Code	T [ft²/d]	#	Code	S' [-]	#	Name
1	-20	20	3	T1	60		S1	0.01		B ZONE
	-50	30	0.001	c2	30000		S'2	0		
2	-290	240	23	T2	5520		S2	0.003		A ZONE
	-320	30	0.0012	c3	25000		S'3	0		
3	-410	90	7	T3	630		S3	0.0025		AA ZONE
	-610	200	0.021	c4	9523.81		S'4	0		
4	-710	100	8	T4	800		S4	0.0025		Tsm/Tu
	-735	25	0.025	c5	1000		S'5	0		

MLU MODEL AQUIFER PARAMETERS USED TO SIMULATE WATER LEVEL CHANGES
RESULTING FROM THE CITY AND SQCWD PROPOSED PROJECTS

MLU MODEL
GROUNDWATER PRODUCTION PARAMETERS

Table B2 - Existing Groundwater Conditions

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION (AF)	MLU MODEL INPUT (AF)	MLU MODEL INPUT (CFD)
CUNNISON LANE	NA	215	0	NA	0	0
GARNET	NA	215	228	NA	0	0
MAIN STREET	NA	215	499	NA	0	0
O'NEILL RANCH	NA	215	0	NA	0	0
ROSEDALE	NA	215	323	NA	0	0
TANNERY 2	NA	215	336	NA	0	0
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT (AFY)	MLU MODEL INPUT (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	NA	0	0
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	NA	0	0
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	NA	0	0
BELTZ WELL NO. 12	NA	0	0	NA	0	0
TOTAL FOR SOQUEL CREEK			1,386	NA	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	NA	---	---

[1] - DATA PROVIDED BY SqCWD

Table B3 - Proposed Beltz Well No. 12 Project
(No SqCWD Project)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION (AF)	MLU MODEL INPUT (AF)	MLU MODEL INPUT (CFD)
CUNNISON LANE	NA	215	0	NA	0	0
GARNET	NA	215	228	NA	0	0
MAIN STREET	NA	215	499	NA	0	0
O'NEILL RANCH	NA	215	0	NA	0	0
ROSEDALE	NA	215	323	NA	0	0
TANNERY 2	NA	215	336	NA	0	0
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	0	161	32,670
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	0	323	65,340
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	0	161	32,670
BELTZ WELL NO. 12	MAY 19 - SEPT 30	215	0	645	645	130,680
TOTAL FOR SOQUEL CREEK			1,386	NA	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

Table B4 - Proposed SqCWD Project
(No City Project)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION[1] (AF)	MLU MODEL INPUT[2] (AF)	MLU MODEL INPUT[2] (CFD)
CUNNISON LANE	NA	215	0	123	123	24,920
GARNET	NA	215	228	69	159	32,214
MAIN STREET	NA	215	499	565	66	13,372
O'NEILL RANCH	NA	215	0	413	413	83,676
ROSEDALE	NA	215	323	96	227	45,991
TANNERY 2	NA	215	336	96	240	48,625
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	161	0	0
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	323	0	0
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	161	0	0
BELTZ WELL NO. 12	MAY 19 - SEPT 30	NA	0	0	0	0
TOTAL FOR SOQUEL CREEK			1,386	1,362	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

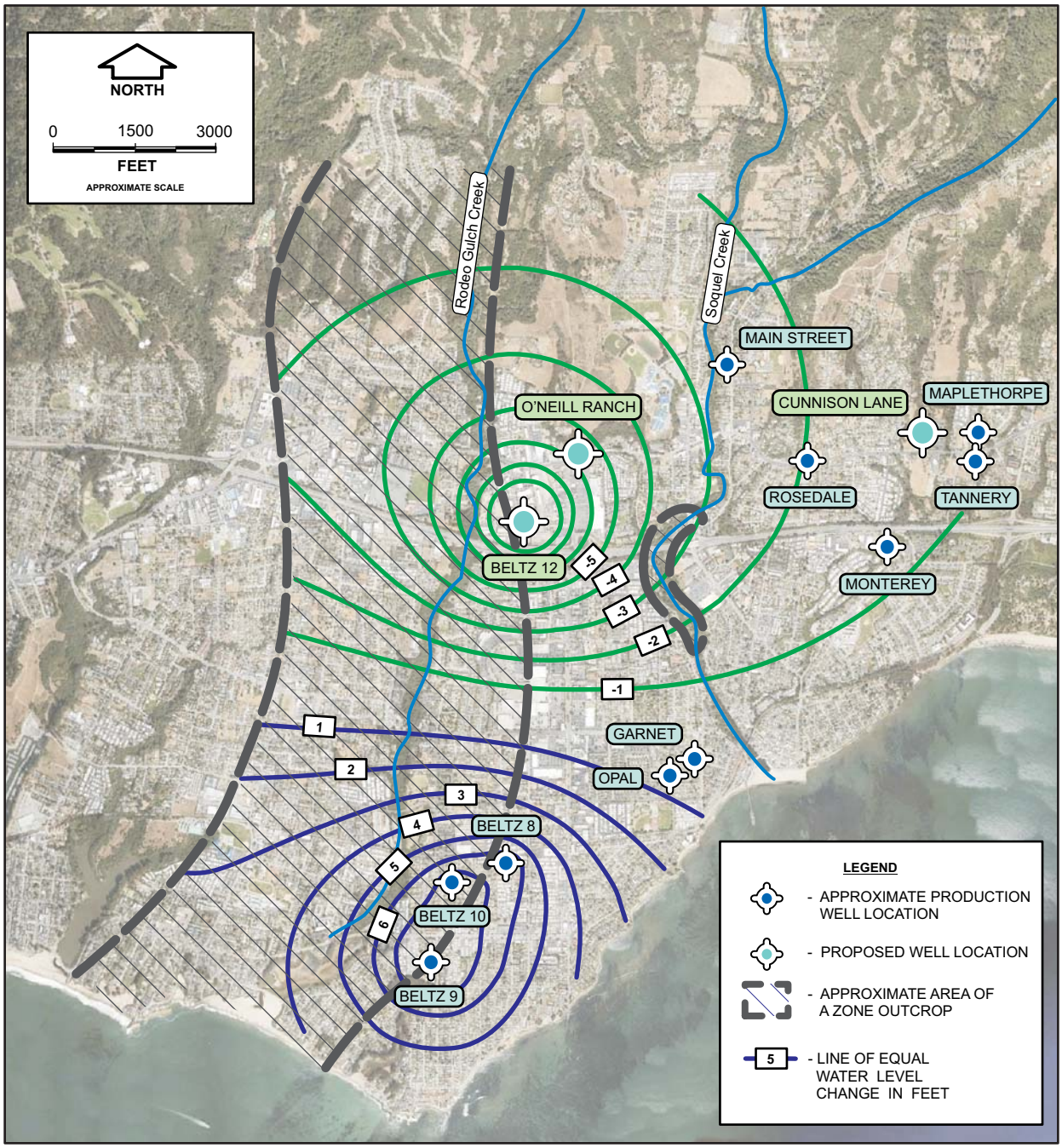
[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

Table B5 - Cumulative Proposed Projects (City and SqCWD)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION[1] (AF)	MLU MODEL INPUT[2] (AF)	MLU MODEL INPUT[2] (CFD)
CUNNISON LANE	NA	215	0	123	123	24,920
GARNET	NA	215	228	69	159	32,214
MAIN STREET	NA	215	499	565	66	13,372
O'NEILL RANCH	NA	215	0	413	413	83,676
ROSEDALE	NA	215	323	96	227	45,991
TANNERY 2	NA	215	336	96	240	48,625
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	0	161	32,670
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	0	323	65,340
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	0	161	32,670
BELTZ WELL NO. 12	MAY 19 - SEPT 30	215	0	645	645	130,680
TOTAL FOR SOQUEL CREEK			1,386	1,362	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

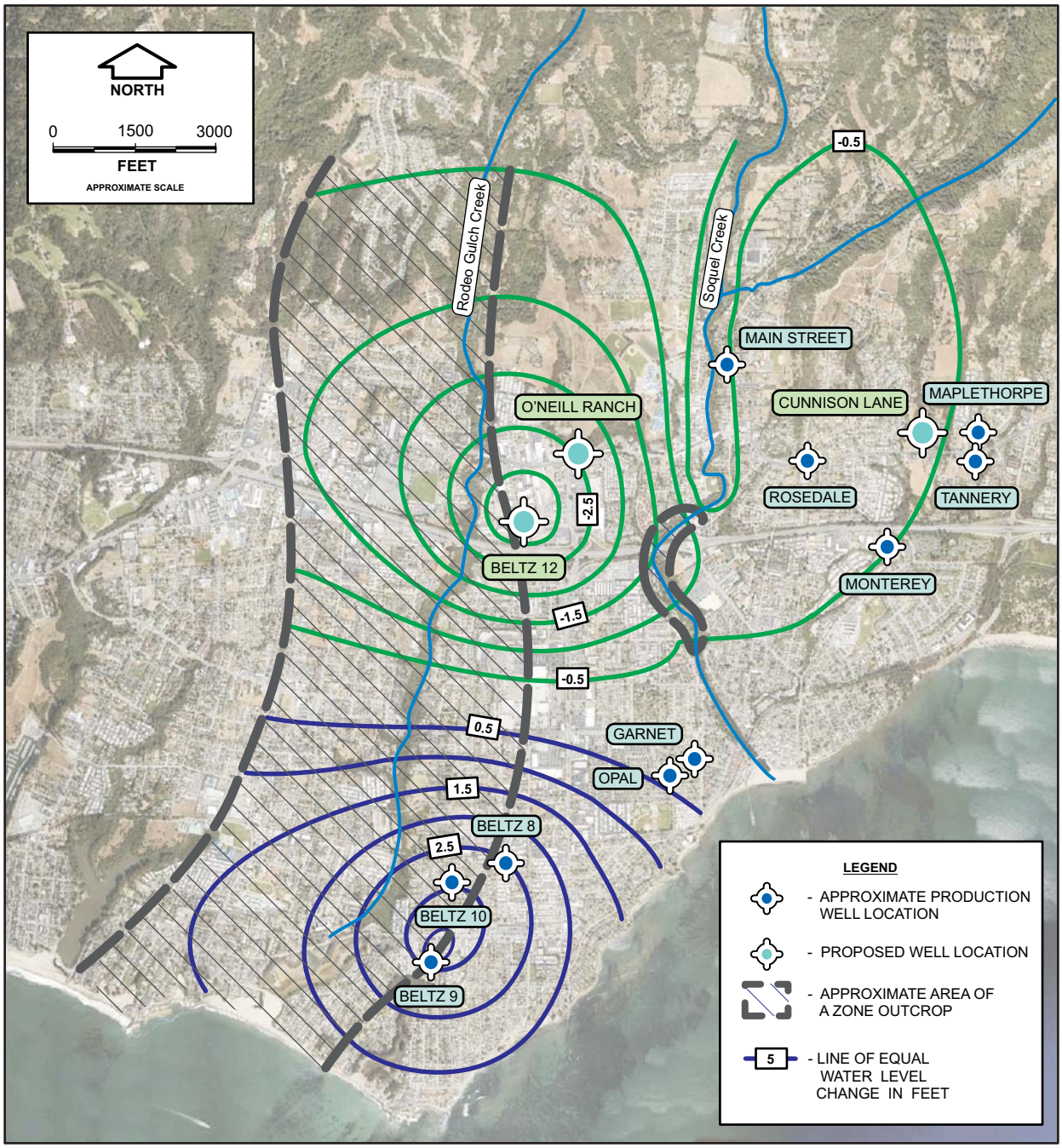
[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

MLU MODEL
SIMULATED CHANGES
IN GROUNDWATER LEVELS



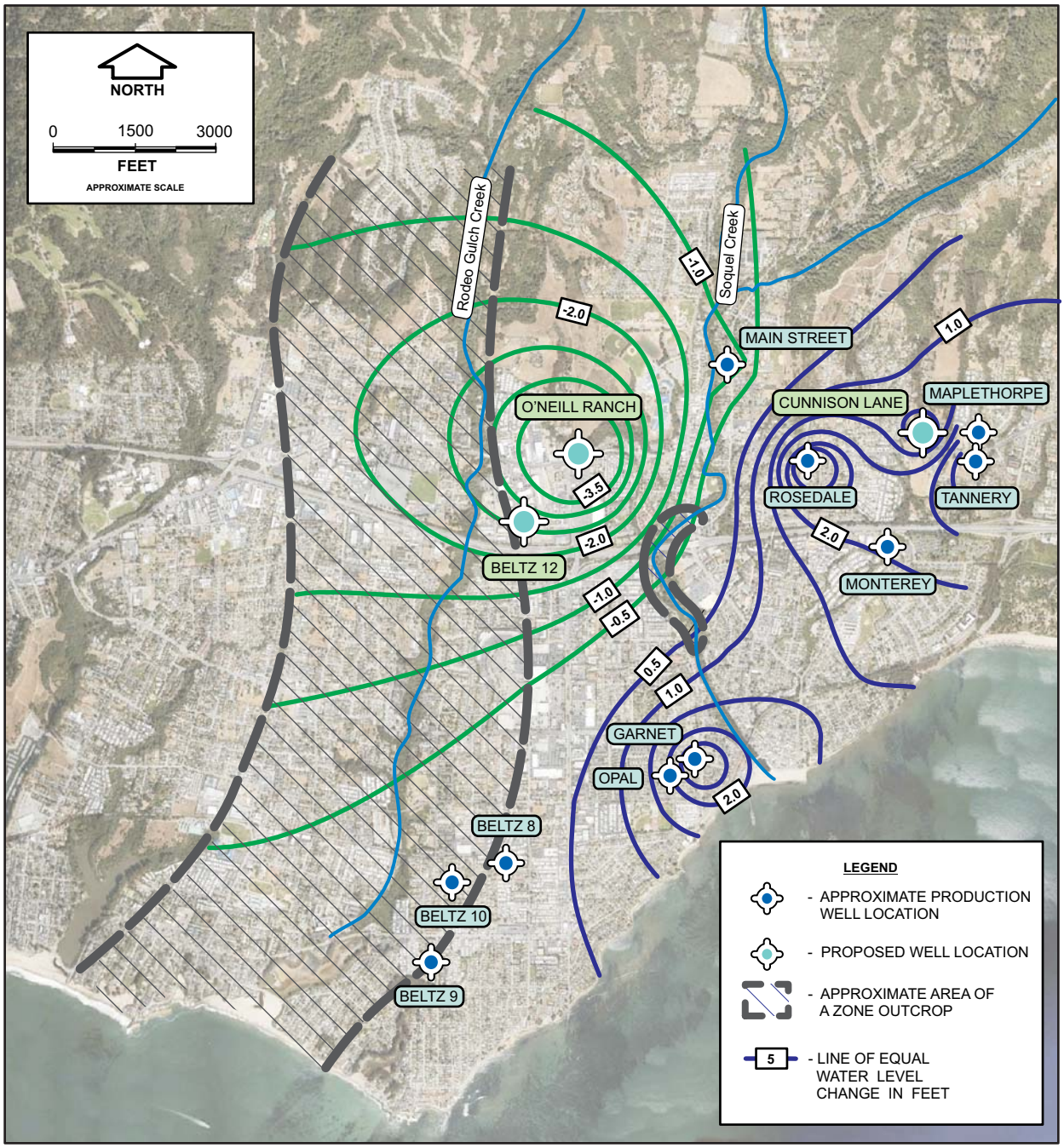
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B1



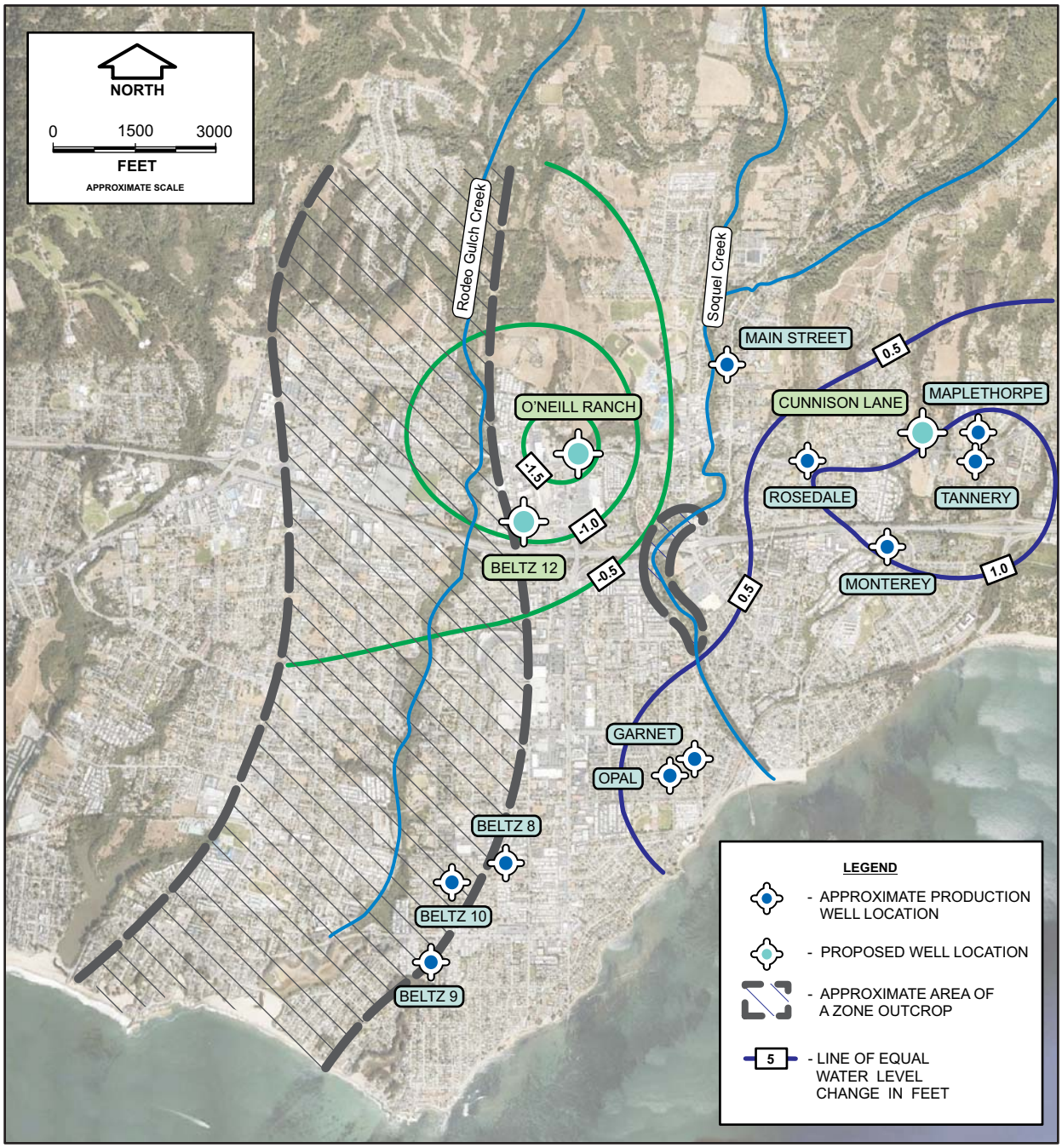
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B2



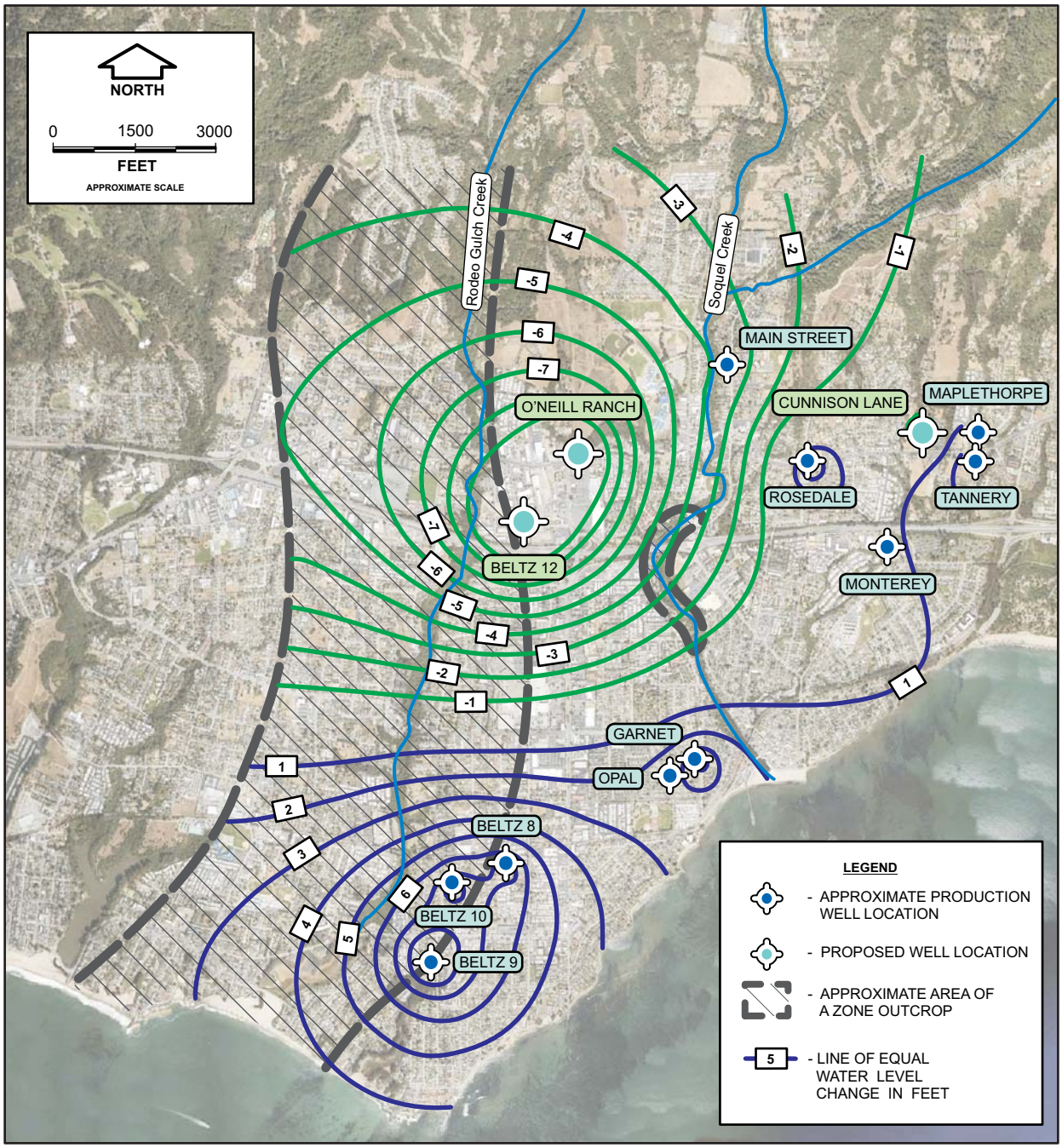
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B3



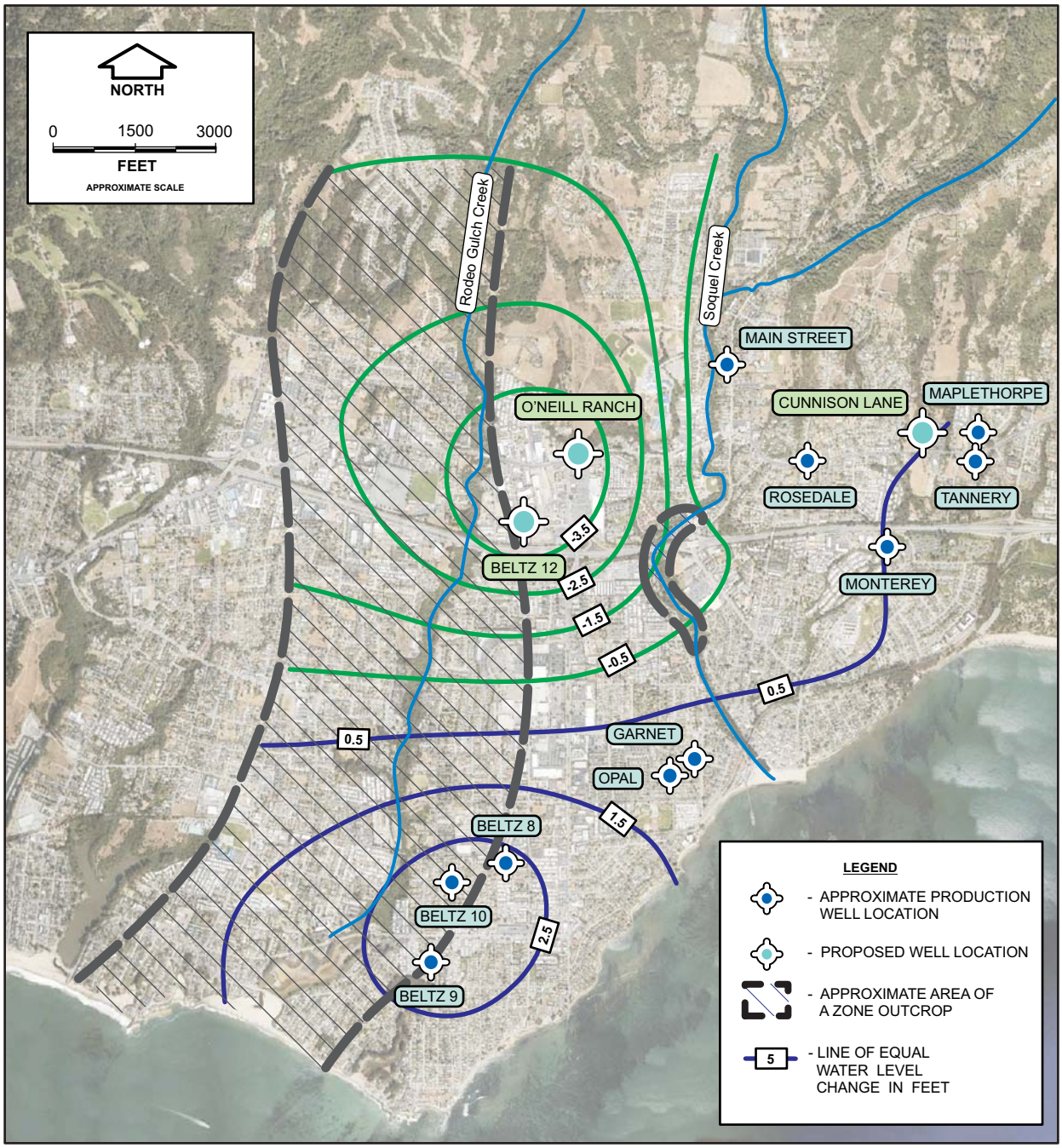
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B4



CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

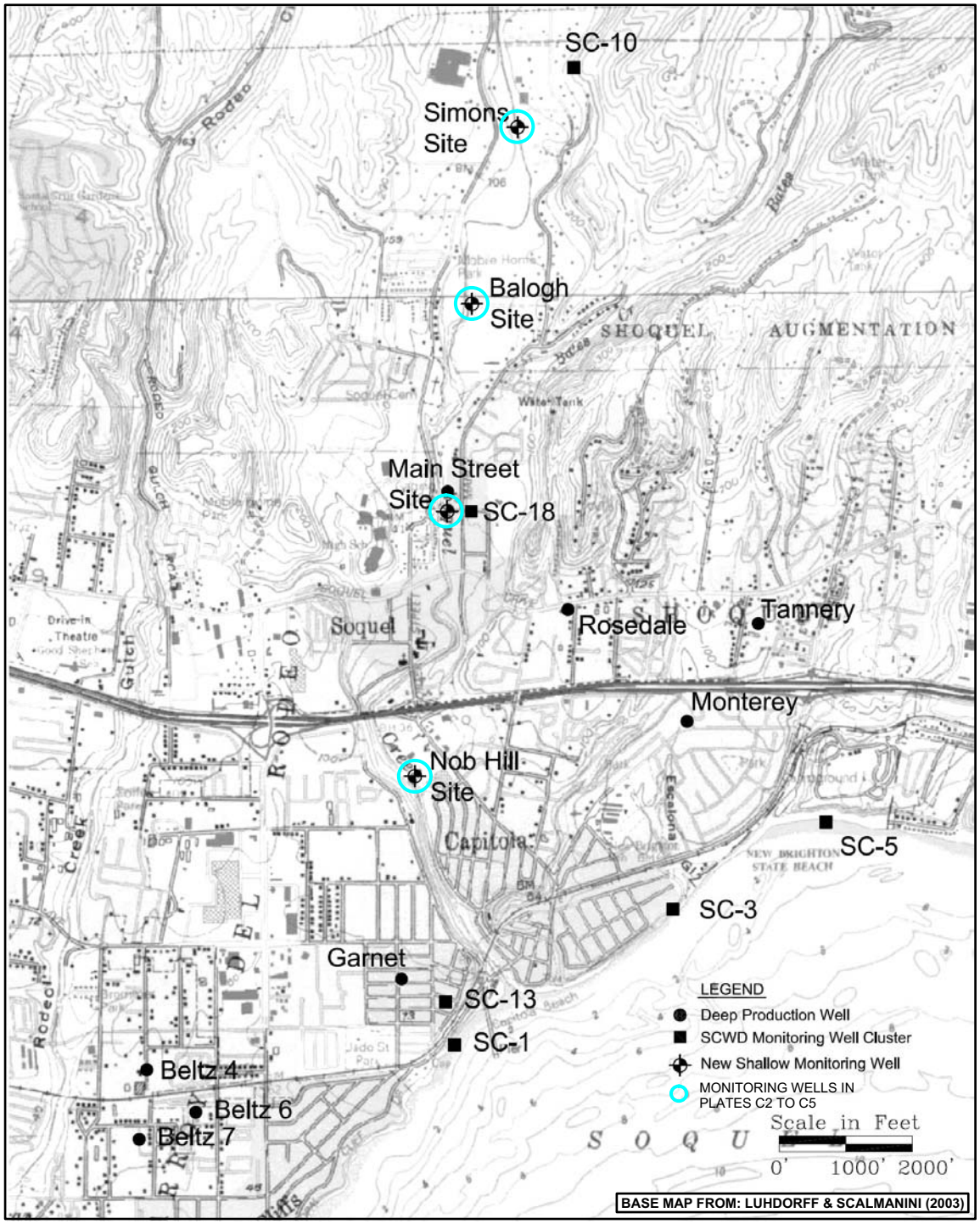
PLATE B5



CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

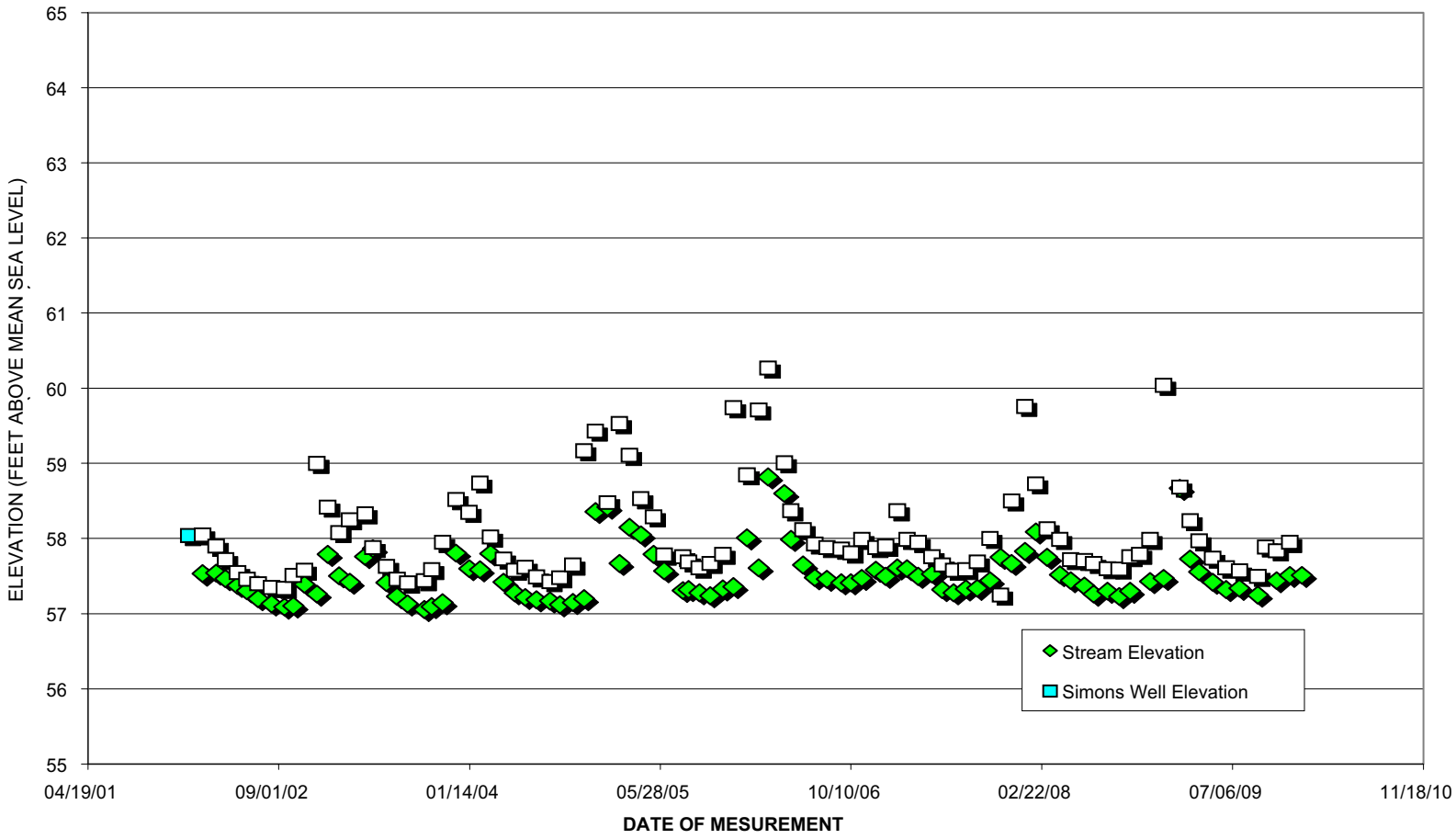
PLATE B6

APPENDIX C
SOQUEL CREEK MONITORING WELL DATA



SOQUEL CREEK MONITORING WELL LOCATION MAP
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C1

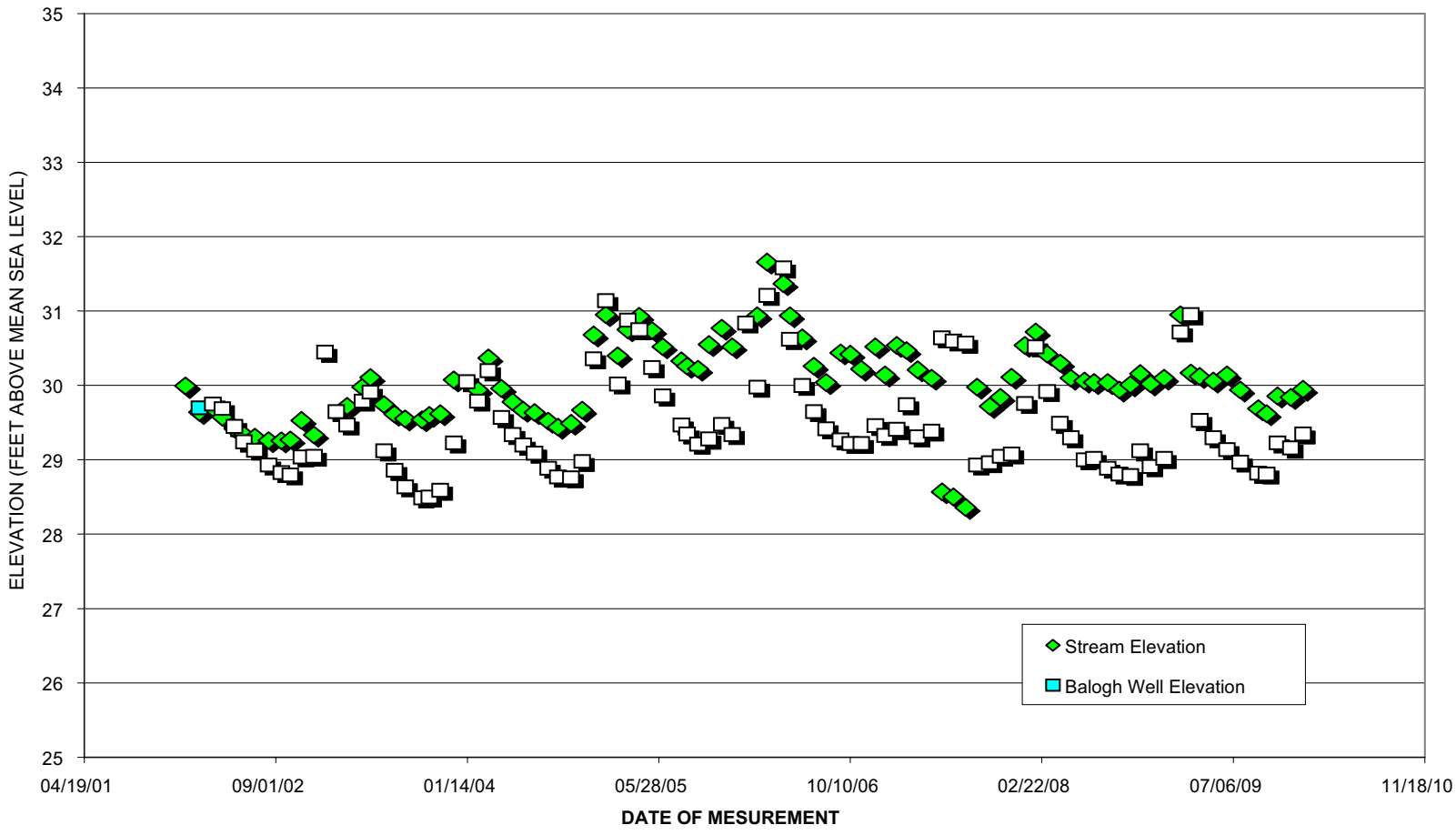


SIMONS MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C2

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

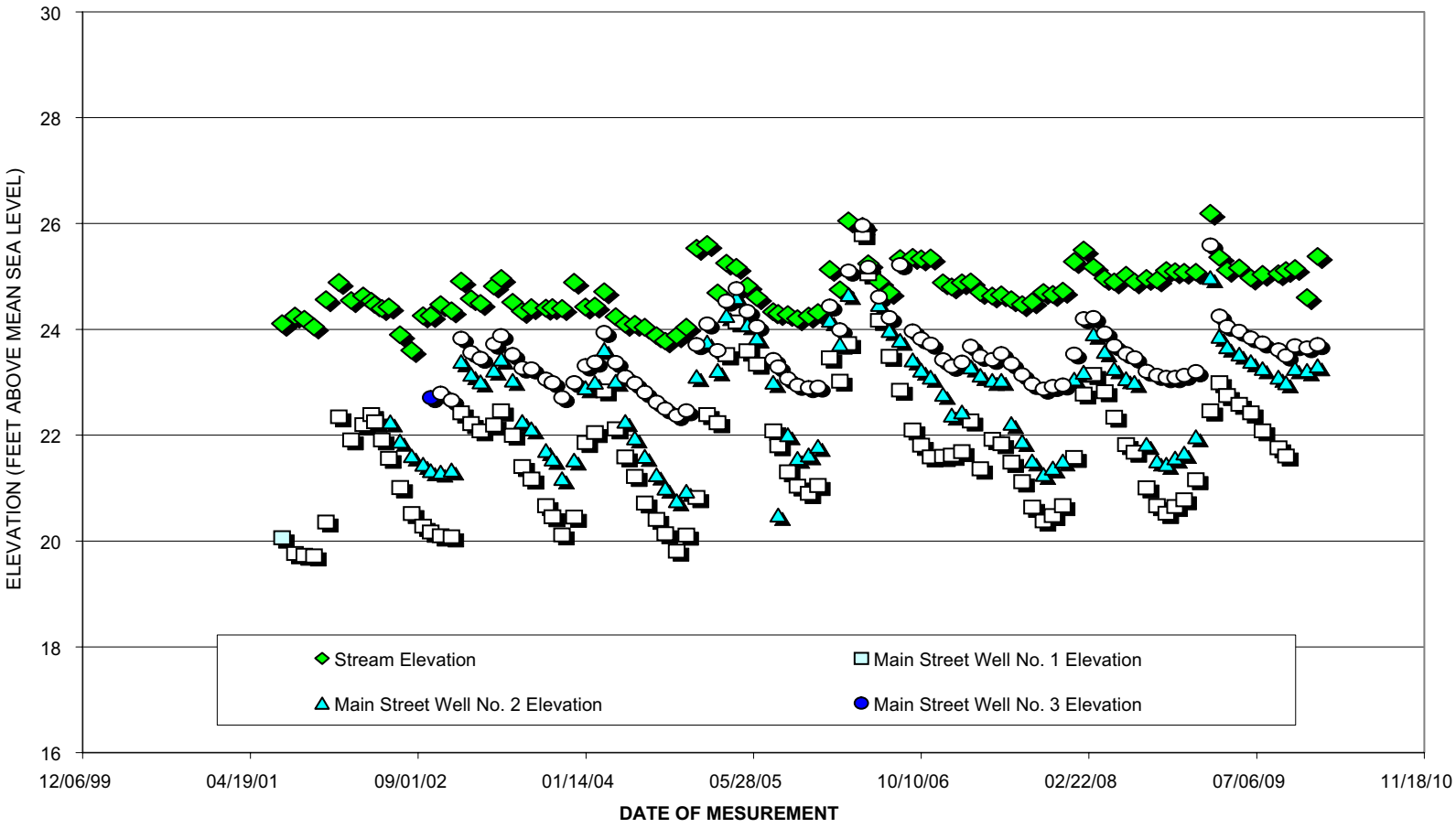


BALOGH MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C3

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

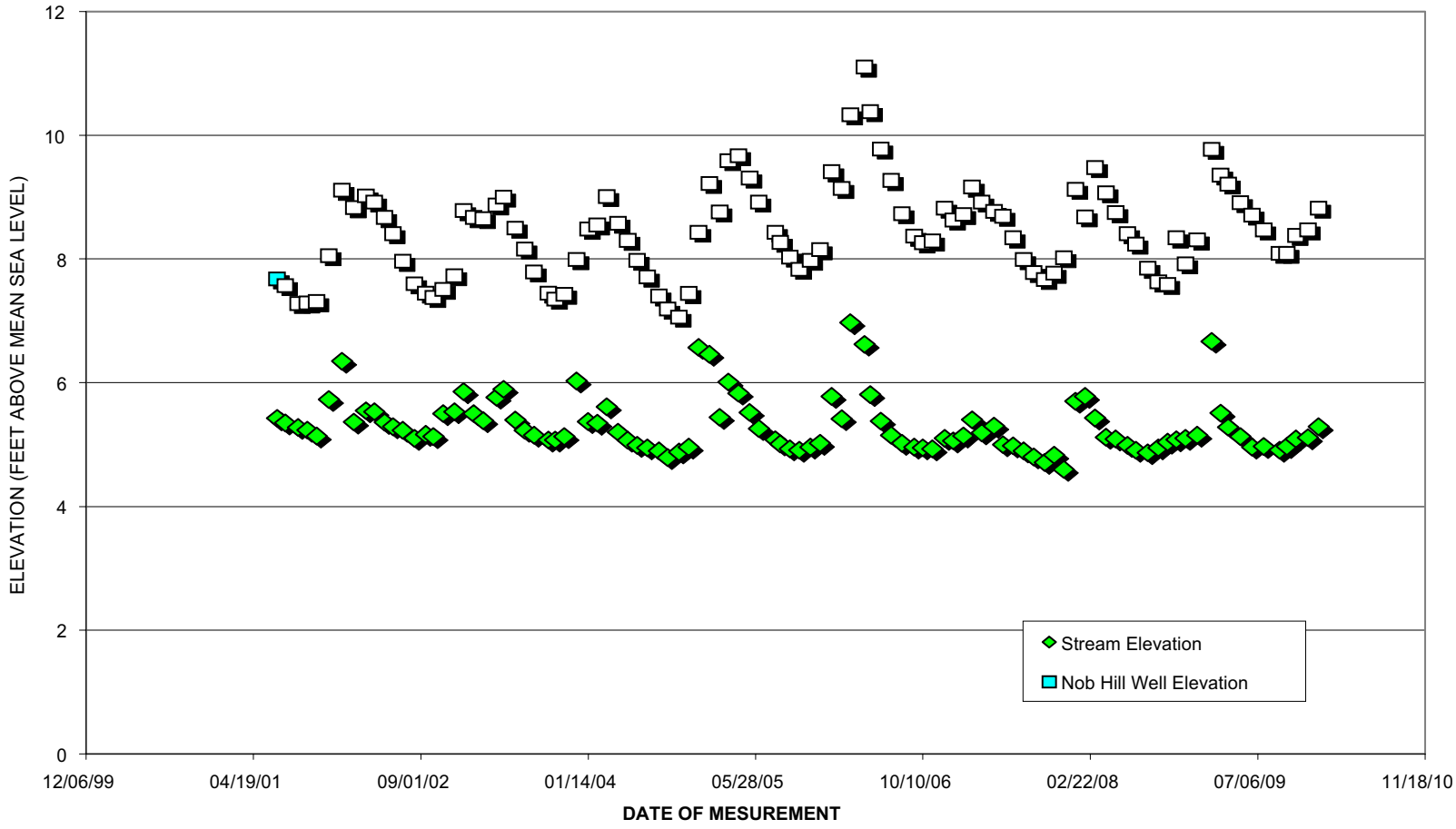


MAIN STREET MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C4

June 2011
Project No. 01-010-06D

HOPKINS GROUNDWATER CONSULTANTS



NOB HILL MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C5

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

APPENDIX D
PHOTOGRAPHIC DOCUMENTATION OF CREEK SAMPLE STATION CONDITIONS

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 1 (SOQUEL AVENUE)

STATION NO. 1 - UPSTREAM VIEW

STATION NO. 1 - DOWNSTREAM VIEW

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 2 (PORTER AVENUE)

STATION NO. 2 - UPSTREAM VIEW

STATION NO. 2 - DOWNSTREAM VIEW

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 3

STATION NO. 3 - UPSTREAM VIEW

STATION NO. 3 - DOWNSTREAM VIEW

RODEO GULCH CREEK - SEDIMENT SAMPLE STATION NO. 4 (SOQUEL AVENUE)

STATION NO. 4 - DOWNSTREAM VIEW

RODEO GULCH CREEK - SEDIMENT SAMPLE STATION NO. 5 (COFFEE LANE PARK)

STATION NO. 5 - DOWNSTREAM VIEW

APPENDIX E
STREAMFLOW IMPACT ESTIMATIONS

TABLE E1 - BELTZ WELL NO. 12 (NO SQCWD PROJECT)
END OF 215-DAY PRODUCTION SEASON

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK} (Ft^3/DAY[1])	Q_{CREEK} (CFS)
7(A)	0.601	500	20	10,000	3	1.21	3	1,793	0.0208
8(A)	0.601	500	20	10,000	3	0.74	3	2,264	0.0262
9(A)	0.601	500	20	10,000	3	0.04	3	2,965	0.0343
10(A)	0.601	500	20	10,000	3	-0.52	3	3,526	0.0408
11(A)	0.601	500	20	10,000	3	-0.52	3	3,526	0.0408
12(A)	0.601	500	20	10,000	3	-0.22	3	3,225	0.0373
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								17,299	0.200
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								945	0.011
							TOTAL	18,244	0.211

[1] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

TABLE E2 - SQCWD WMP PUMPING (NO CITY PROJECT)
END OF 215-DAY PRODUCTION SEASON

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK} (Ft^3/DAY[1])	Q_{CREEK} (CFS)
7(A)	0.601	500	20	10,000	3	3.5	3	-501	-0.0058
8(A)	0.601	500	20	10,000	3	3.1	3	-100	-0.0012
9(A)	0.601	500	20	10,000	3	2.64	3	361	0.0042
10(A)	0.601	500	20	10,000	3	2.14	3	861	0.0100
11(A)	0.601	500	20	10,000	3	2.05	3	952	0.0110
12(A)	0.601	500	20	10,000	3	2.33	3	671	0.0078
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								2,244	0.026
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								293	0.003
							TOTAL	2,536	0.029

[1] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

TABLE E3 - CITY AND SQCWD PROJECTS (CUMULATIVE PUMPING)
END OF 215-DAY PRODUCTION SEASON

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK} (Ft^3/DAY[1])	Q_{CREEK} (CFS)
7(A)	0.601	500	20	10,000	3	1.741	3	1,261	0.0146
8(A)	0.601	500	20	10,000	3	0.602	3	2,402	0.0278
9(A)	0.601	500	20	10,000	3	-0.082	3	3,087	0.0357
10(A)	0.601	500	20	10,000	3	-1.368	3	4,375	0.0506
11(A)	0.601	500	20	10,000	3	-1.293	3	4,300	0.0498
12(A)	0.601	500	20	10,000	3	-0.9	3	3,907	0.0452
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								19,332	0.224
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								1,470	0.017
							TOTAL	20,802	0.241

[1] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

APPENDIX F
PERCENT STREAMFLOW REDUCTION IN CRITICALLY DRY YEARS

FLOW IMPACT ANALYSIS TABLES

TABLE F1

Soquel Creek Flow Impact Assessment
215 days from the start of pumping season (approx. Nov. 15)

Impact from Beltz 12						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**3.46**	3.61	-0.211	3.40	-5.8%
multiple Cr. Dry	1977	**1.29**	1.34	-0.211	1.13	-15.7%
	1990	**1.30**	1.36	-0.211	1.15	-15.5%

Impact from SqCWD WMP						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**3.46**	3.61	-0.029	3.58	-0.8%
multiple Cr. Dry	1977	**1.29**	1.34	-0.029	1.31	-2.2%
	1990	**1.30**	1.36	-0.029	1.33	-2.1%

Cumulative Impacts						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**3.46**	3.61	-0.241	3.37	-6.7%
multiple Cr. Dry	1977	**1.29**	1.34	-0.241	1.10	-17.9%
	1990	**1.30**	1.36	-0.241	1.12	-17.7%

USGS Watershed	40.2	sq-miles from USGS website
Outlet Watershed	42.0	sq-miles
USGS Precipitation	1.0	
Outlet Precipitation	1.0	

	Creek Discharge During Last Week of Beltz 8,9,&10 Pumping Season (USGS gauge 11160000)		
	2007	**1977**	**1990**
9-Nov	2.90	1.30	1.20
10-Nov	3.20	1.30	1.30
11-Nov	5.20	1.30	1.30
12-Nov	3.90	1.30	1.30
13-Nov	3.10	1.30	1.30
14-Nov	2.90	1.20	1.30
15-Nov	3.00	1.30	1.40
Average	3.46	1.29	1.30

[1] Flow estimates at USGS gage No. 11160000.
[2] Prorated flow using SWRCB-DWR, 2006 method.
[3] Streamflow reduction values from Appendix E.
[4] Prorated outlet discharge minus cumulative streamflow reduction estimated in Appendix E.

TABLE F2

Summary of Soquel Creek Outlet Daily Streamflow Discharge Analysis[1]						
Representative Critically Dry Years-Scenarios	USGS Gage Discharge[2] (cfs)	Prorated Outlet Discharge[3] (cfs)	Beltz Well 12 Impacts		Cumulative Impacts	
			Stream Outlet Impacted Flow[4] (cfs)	Percent Change in Outlet Flow	Stream Outlet Impacted Flow[4] (cfs)	Percent Change in Outlet Flow
Nov-77	**1.29**	1.34	1.13	-15.7%	1.10	-17.9%
Nov-90	**1.30**	1.36	1.15	-15.5%	1.12	-17.7%
Nov-07	**3.46**	3.61	3.40	-5.8%	3.37	-6.7%

1 Discharge = selected daily mean discharge for representative w ater year and scenario.
2 Flow estimates at USGS gage No. 11160000.
3 Prorated flow using SWRCB-DWR, 2006 method.
4 Prorated outlet discharge minus cumulative streamflow reduction estimated in Appendix E.

USGS STREAM GAGE DATA FOR CRITICALLY DRY YEARS 1977, 1990, AND 2007

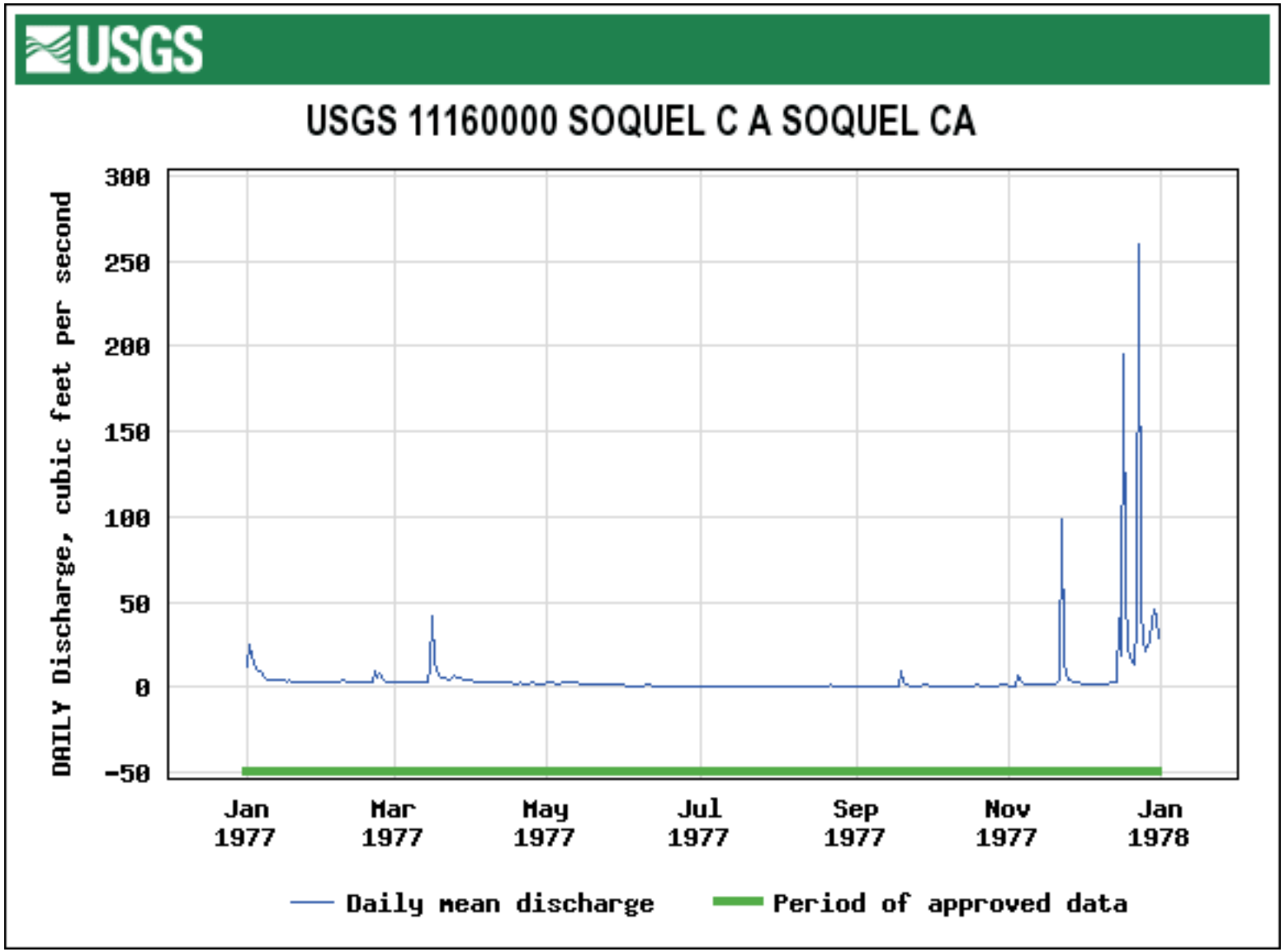
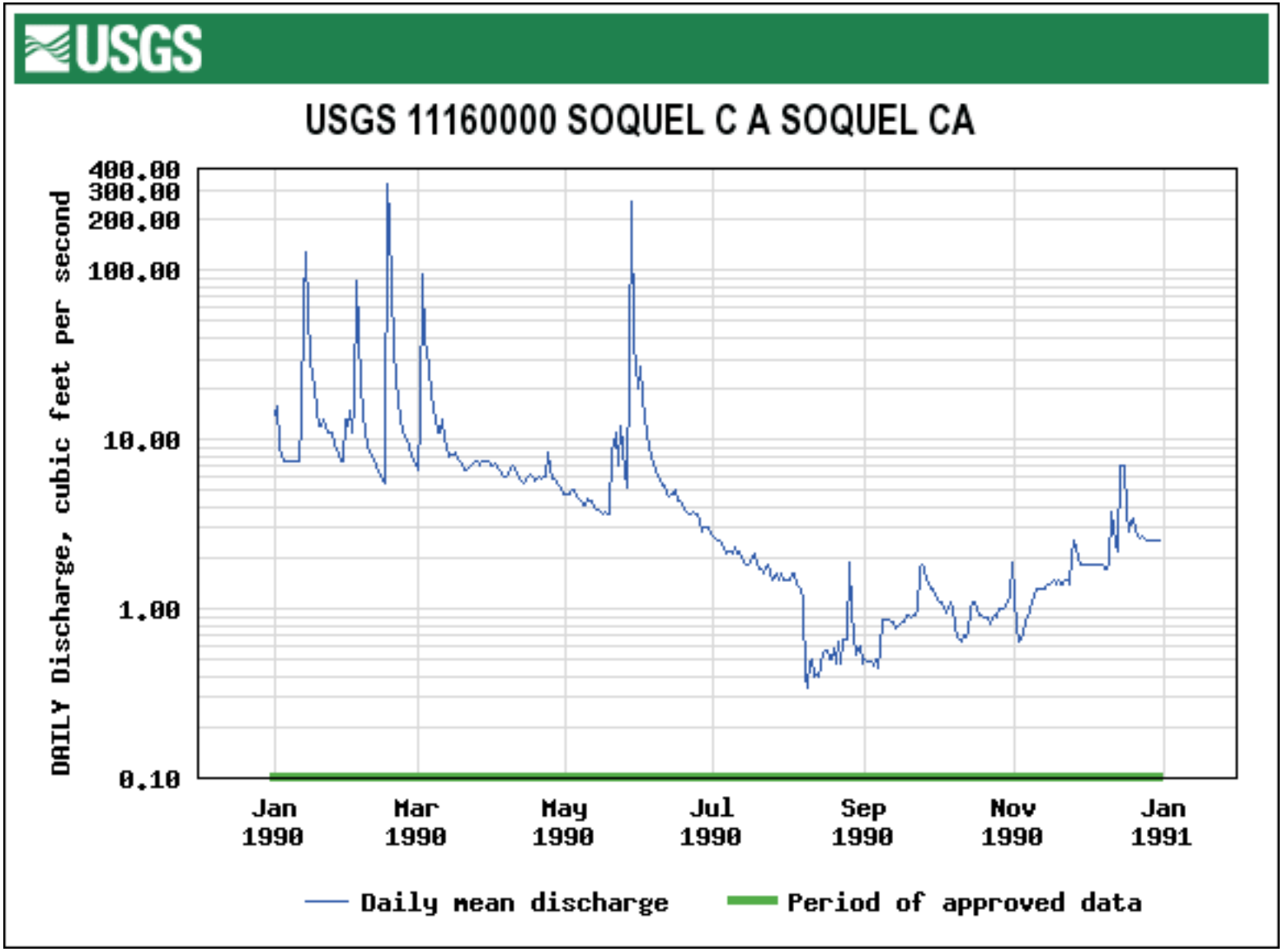

USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
300
250
200
150
100
50
0
-50
Jan 1977
Mar 1977
May 1977
Jul 1977
Sep 1977
Nov 1977
Jan 1978
Daily mean discharge
Period of approved data

PLATE F1


USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
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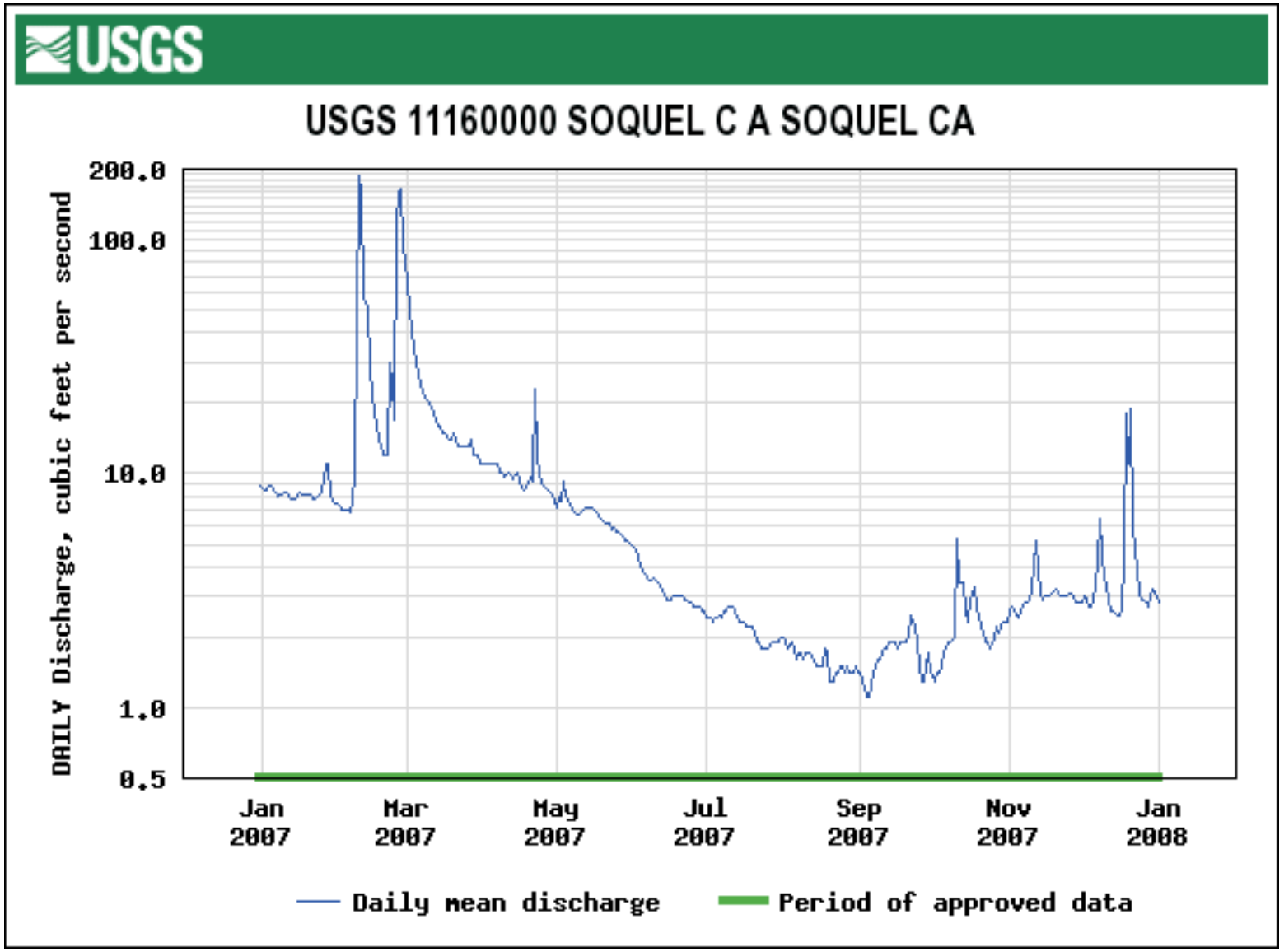
300.00
200.00
100.00
10.00
1.00
0.10
Jan 1990
Mar 1990
May 1990
Jul 1990
Sep 1990
Nov 1990
Jan 1991
Daily mean discharge
Period of approved data

PLATE F2


USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
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100.0
10.0
1.0
0.5
Jan 2007
Mar 2007
May 2007
Jul 2007
Sep 2007
Nov 2007
Jan 2008
Daily mean discharge
Period of approved data

PLATE F3

CHAMBERS GROUP

BELTZ WELL NO. 12 DRAFT EIR

APPENDIX C – HYDROGEOLOGICAL REPORT FOR REDUCED PUMPING ALTERNATIVE

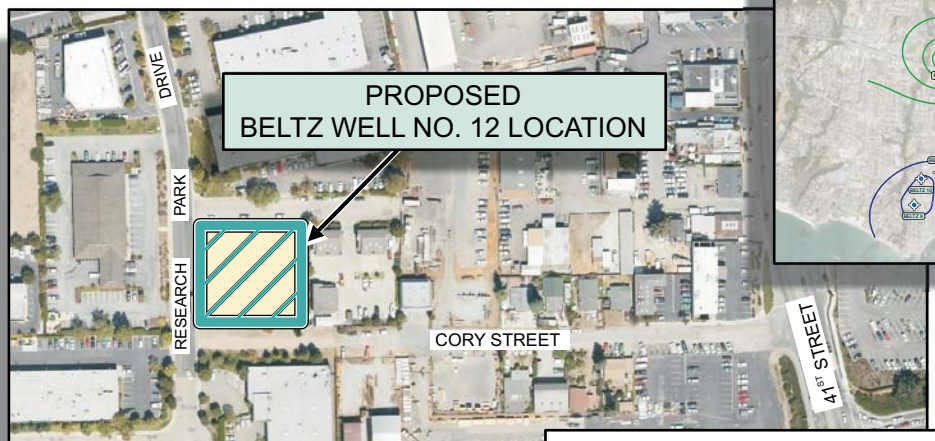
HOPKINS GROUNDWATER CONSULTANTS, INC.

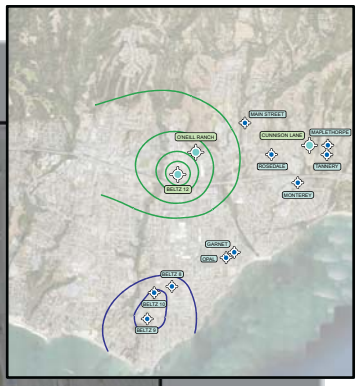
HYDROGEOLOGICAL STUDY

CITY OF SANTA CRUZ BELTZ WELL NO. 12 125 ACRE-FEET PER YEAR PROJECT WELL INTERFERENCE AND STREAMFLOW IMPACT ANALYSIS LIVE OAK–CAPITOLA AREA, CALIFORNIA

Prepared for:
City of Santa Cruz

June 2011





CITY OF SANTA CRUZ

HOPKINS
GROUNDWATER
CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

June 23, 2011
Project No. 01-010-06D

City of Santa Cruz
Water Department
212 Locust Street, Suite C
Santa Cruz, California 95060

Attention: Ms. Leah Van Der Maaten
Associate Engineer

Subject: Hydrogeological Study, City of Santa Cruz Beltz Well No. 12, 125 Acre-Feet Per Year, Well Interference and Streamflow Impact Analysis, Live Oak-Capitola Area, California, Dated June, 2011.

Dear Ms. Van Der Maaten:

Hopkins Groundwater Consultants, Inc. is pleased to submit this report summarizing the findings and conclusions of the subject study of potential hydrogeological impacts that may arise from the operation of the proposed City of Santa Cruz Beltz Well No. 12 groundwater production facility. The potential impacts summarized are based on an operational rate of approximately 210 gallons per minute over a 135-day production period, producing 125 acre-feet per year. The Soquel Creek flow analysis also includes potential worst-case impacts during a critically dry year. We trust the contents of this report are sufficient to support the project environmental study being conducted by the City. If you have any questions or need any additional information please give us a call.

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

REGISTERED GEOLOGIST
CURTIS J. HOPKINS
EG NO. 1800
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Curtis J. Hopkins
Principal Hydrogeologist
Certified Engineering Geologist EG 1800
Certified Hydrogeologist HG 114

Brian M. Cosner
Staff Hydrogeologist

Copies Submitted: Three (3) Bound Copies and One (1) Electronic Copy

P.O. Box 3596, Ventura, California 93006 Phone: (805) 653-5306 e-mail: chop4@earthlink.net

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INTRODUCTION

General Statement

Presented in this report are the findings and conclusions that were developed from a hydrogeological analysis conducted by Hopkins Groundwater Consultants, Inc. (Hopkins) to assist the City of Santa Cruz (City) with an assessment of the potential hydrogeological impacts that could result from the operation of a proposed municipal water supply well. The proposed well has been designated by the City as Beltz Well No. 12 and is preliminarily designed to produce at a rate of approximately 210 gallons per minute (gpm) (125 acre-feet per year [afy]) during a 135-day-production period. The proposed well location is on an undeveloped parcel on Research Park Drive within an unincorporated portion of the County of Santa Cruz (County) located northwest of the City of Capitola. The study area and the proposed well location are shown on Plate 1 – Study Area Location Map.

The proposed Beltz Well No. 12 construction project is part of the City's groundwater management strategy to maintain groundwater levels near the coast that prevent seawater intrusion into the Purisima Formation aquifer units. The proposed project would provide the ability to conjunctively use the coastal Beltz Wellfield located in the unincorporated area of Live Oak and the proposed inland well facility (Beltz Well No. 12) to control water levels along the shoreline while maintaining the City's historical supply of groundwater. The location of existing and proposed City and Soquel Creek Water District (SqCWD) municipal wells in the vicinity of the proposed Beltz Well No. 12 location is shown on Plate 2 – Well Location Map.

Purpose and Scope

The purpose of this study is to develop an understanding of the potential hydrogeological impacts that could result from constructing and operating the proposed City well. This study supersedes the study summarized in the October 2010 report (Hopkins, 2010). The scope of work for this study was developed based on discussions with Ms. Leah Van Der Maaten, Associate Engineer with the City. The work scope includes the following tasks:

- Conduct a review of available hydrogeological data and studies,
- Conduct sample collection of streambed materials in Soquel Creek and Rodeo Gulch Creek for the purpose of laboratory testing of permeability to estimate the potential reduction in streamflow that could result from well operation,
- Identify and analyze potential impacts on existing municipal and private wells,
- Identify and analyze potential impacts on nearby streams,

- Identify and analyze potential impacts on proximate groundwater contamination sites,
- Prepare this report summarizing the findings and conclusions of the study.

Provided with this report are appendices that contain supporting technical information which include; Appendix A – Laboratory Hydraulic Conductivity Test Results of Streambed Soil Samples, Appendix B – MLU Model Parameters and Analytical Results, Appendix C – Soquel Creek Monitoring Well Data, Appendix D – Photographic Documentation of Creek Sample Station Conditions, Appendix E – Streamflow Impact Estimations, and Appendix F – Percent Streamflow Reduction in Critically Dry Years.

IMPACT ANALYSES METHODOLOGY

Impact Analysis Approach

The purpose of the analyses of this study is to determine if groundwater produced from the proposed Beltz Well No. 12 could create potential impacts to proximate well facilities whereby excessive drawdown could reduce well yield or cause physical damage to well pump equipment, and/or create potential impacts to streamflows by inducing significant recharge from streams into the underlying aquifer system. The potential impacts of the proposed well production were analyzed by establishing the hydrogeological framework in this portion of the Soquel-Aptos Groundwater Basin (Hopkins, 2009), sampling streambed materials to develop data for use in estimating streambed infiltration rates, and developing drawdown estimates anticipated from well pumping utilizing the Multi Layer Unsteady-state (MLU) computer program. Using the analytical solutions provided by MLU modeling, the potential interference drawdown impacts on existing wells can be estimated and potential streambed infiltration rates that may impact proximate streamflows can be calculated. A competent comprehensive numerical groundwater model would be an ideal tool for simulation of well pumping impacts; however, a numerical model of the entire Soquel-Aptos Groundwater Basin was not available at the time of this study. The analytical solutions provided by the MLU model are used to estimate the potential impacts anticipated from operation of the proposed City well and future cumulative impacts based on other proposed groundwater production changes by the SqCWD.

Historical data summarized by other studies (Johnson, et al., 2004) and site specific data provided from the Cory Street Monitoring Well Construction Project (Hopkins, 2010a) were analyzed to develop aquifer parameters that include hydraulic conductivity, transmissivity, and storage coefficient values to be used in model construction. Utilizing the commercially available MLU software, pumping related impacts on water levels in the Purisima formation aquifers were developed and utilized to assess the magnitude of impacts.

The SqCWD has been studying groundwater and surface water conditions in the vicinity of its Main Street Well for over 20 years. For this study, various water level data and findings of hydrogeological reports about groundwater pumping impacts on Soquel Creek flows were utilized for development of the streamflow impact analysis approach. To provide additional data for estimating streamflow impacts, Hopkins sampled creek bottom sediments and delivered the samples for laboratory hydraulic conductivity analyses. The creek bed samples were collected on June 13, 2010, in the vicinity of the public easements at three Soquel Creek bridge crossings which are shown on Plate 3 – Creek Sediment Sample Location Map. Rodeo Gulch Creek was sampled at the Soquel Avenue Bridge and adjacent Coffee Lane Park (see Plate 3). Undisturbed samples of the streambed sediments were collected using a split-spoon hand sampler equipped with a slide hammer. Laboratory hydraulic conductivity tests were performed on the material obtained between the depths of 3 and 6 inches and the results are provided in Appendix A – Laboratory Hydraulic Conductivity Test Results of Streambed Soil Samples.

Aquifer Drawdown Analysis

The hydrogeology of the Soquel-Aptos Groundwater Basin has been the subject of numerous studies. The hydrogeological framework developed by the most recent study (Hopkins, 2009) which utilized geophysical (electric) log correlation for aquifer zone delineation was used for the analyses performed in this study. Plate 4 – Electric Log Trace Correlation of Aquifer Zones shows the generally accepted delineation of the Purisima Formation aquifer units. As shown, the Purisima B Zone (Unit) has an aquifer unit (porous sand layer) within the bottom portion of the strata which is subsequently referred to in this study as the basal aquifer zone (see Plate 4). The aquifer units shown on Plate 4 were used to construct hydrogeological cross-sections at the locations shown on Plate 5 – Hydrogeological Cross-Section Location Map. The hydrogeological cross-sections which provide a subsurface profile of the geology beneath the study area and specific locations of interest are provided on Plates 6 through 8 - Hydrogeological Cross-Section A-A', B-B', and C-C', respectively.

This hydrogeological framework was combined with the findings of numerous SqCWD studies which were reviewed and considered in the development of the analysis of water level drawdown impacts. Plate 9 – Hydrogeological Conditions at Main Street Well shows site specific water levels in the vicinity of Soquel Creek adjacent the SqCWD Main Street Well in August 2002 (L&S, 2003). The differing water levels in the monitoring wells and the lithological information provided by the cross-section are believed to confirm the interpreted hydrogeology in this portion of the basin and were used to assist in the development of the multiple layer leaky aquifer system constructed for the MLU analysis.

Model parameters required for the MLU analysis include bedding thickness, hydraulic conductivity, and storage coefficient (storativity) values. Aquifer zone transmissivity values are derived as the product of the aquifer thicknesses and the horizontal hydraulic conductivities.

The vertical resistance to flow in an aquitard layer of the model is derived from the layer thickness divided by the vertical hydraulic conductivity. Aquifer properties for the various aquifer units present were obtained from average regional values documented by other studies (Fugro, 1998 and Johnson, et al., 2004) and site specific estimates provided from the Cory Street Monitoring Well Construction Project (Hopkins, 2010a).

During the development of the MLU Model conditions, we recognized that the unconfined/semi-confined aquifer conditions at the location of the proposed Beltz Well No. 12 site are significantly different than the confined/leaky-confined conditions to the east along Soquel Creek. As shown on Plates 6 and 7, the production zone(s)/aquifer units beneath the Beltz Well No. 12 site (the Purisima A, AA, and Tu Units) become confined beneath the Purisima B Unit located east of the site. The water level data presented on Plate 9 substantiate this condition in the vicinity of the Main Street Well where vertical hydraulic conductance beneath Soquel Creek is impeded by aquitard layers that create a substantial hydraulic head difference between the shallow, intermediate, and deep monitoring wells.

Provided with the understanding of the hydrogeological conditions described above and the proposed distribution of well production when Beltz Well No. 12 would be utilized, 4 groundwater production scenarios were developed to analyze the potential range of impacts that could be anticipated from operation of the proposed well facility. The 4 production scenarios considered by this study include; 1) the existing groundwater conditions with no new wells and historical pumping patterns (no project), 2) groundwater conditions with the proposed City Beltz Well No. 12 project only, 3) groundwater conditions with the proposed SqCWD Well Master Plan (WMP) project only, and 4) cumulative groundwater conditions with both the City and SqCWD proposed projects.

The impacts analysis included the historical and proposed operations of the City Beltz wells during the annual production season that lies between the months of April and November. The City proposes to operate Beltz Well Nos. 8, 9, and 10 at a reduced rate over the typical 215-day pumping season and augment supply with the addition of Beltz Well No. 12 production during the period of peak summer demand between May and September. In order to analyze the greatest impact from Beltz Well No. 12, this analysis assumes that the 125 afy is produced from Beltz Well No. 12 over the 135-day production period within the typical Beltz Wellfield 215-day production season during a critically dry year even though the City may use the well in non-critically dry water-years. Analyzing impacts during a critically dry year provides the greatest impacts when compared to non-critically dry years because the creek flows are at their lowest rates. Beltz Well No. 12 would be operated to allow a shift of pumping away from the coastline and thereby maintain adequate water level elevations to reduce the threat of saltwater intrusion. Appendix B – MLU Model Parameters and Analytical Results provides a summary of the parameters that were used in the model, tables summarizing the proposed use of wells during the

production season, and the simulated results of Beltz Well No. 12 producing at a constant rate of approximately 210 gpm (125 afy) at the end of a 135-day production period.

The simulated changes in water level conditions are relative to the average aquifer conditions historically created by the existing cumulative 1 million gallons per day (mgd) (645 afy) production from the City Live Oak Wellfield. These changes include the water level drawdown at Beltz Well No. 12 from the proposed inland pumping, as well as, a moderate water level recovery (reduced drawdown) that will result as annual production from Beltz Well Nos. 8, 9, and 10 is proportionally reduced. Water level recovery was simulated in the MLU Model by injecting at Beltz Well Nos. 8, 9 and 10 the proportional amount of pumping reduction. Tables B2 through B5 show the allocated seasonal increase and decrease of pumping from the individual wells historically produced by the City and the SqCWD and redistributed to the wells proposed for construction. Private well pumping is assumed to remain constant because historical pumping records are unavailable.

Streamflow Reduction Analysis

The MLU Model was utilized to directly simulate Soquel Creek losses that would be required to eliminate drawdown beneath the reaches of the creek that overlie the Purisima B Zone. Creek losses were simulated using injection wells and by increasing the injection rates until the inflow eliminated the simulated drawdown resulting from well production in the underlying Purisima A Zone for each production scenario. The cumulative injection rate was used to represent streamflow where the creek overlies the Purisima B Zone. The simulated drawdown values beneath the reach of Soquel Creek that overlies the Purisima A Zone aquifer were subsequently utilized along with the conductance equation to estimate streambed infiltration in this reach of the creek. Streambed infiltration in the Purisima A Zone was estimated using the average of the laboratory hydraulic conductivity test results of the streambed samples (see Appendix A) to calculate the vertical conductance beneath the flowing creek. A diagram showing the physical components of the conductance equation typically utilized in groundwater/surface water interaction modeling is presented on Plate 10 – Stream-Aquifer Interaction. Subsequently, the estimated reduction (or gain) in streamflow was combined with observed flows in the creek during the three critically dry years of 1977, 1990, and 2007 to develop an understanding of the magnitude of the project's effect on flows during the proposed operation of Beltz Well No. 12.

SUMMARY OF IMPACT ANALYSES

Well Interference Impacts

The production potential of the proposed well site was preliminarily evaluated by the City through data that were collected during the construction of the Cory Street Monitoring

Well. The production potential was estimated using the Cory Street geophysical surveys, which were correlated with surveys from existing production wells, and grain-size analyses which were used to approximate the hydraulic conductivity of the formation materials using the Hazen approximation method. Based on the estimated hydraulic conductivity value, the depths to groundwater and the top and bottom of the aquifer units were combined with typical well specific capacity values to determine that the anticipated production of Beltz Well No. 12 at this location could be up to 800 gpm. For the planning purposes of this impacts analysis, the sustained well production of approximately 210 gpm (125 afy) is used to estimate the greatest potential impacts of the proposed City project.

Utilizing the MLU program, a multilayered groundwater system was simulated to assess the potential impacts in the vicinity of; a) the proposed Beltz Well No. 12 facility where the Purisima A Unit outcrops, b) Soquel Creek where the Purisima A and B Unit outcrop, and c) the nearest SqCWD well facilities (Main Street and proposed O'Neill Ranch Wells). Aquifer parameters established by other regional studies (Johnson, et al., 2004) were used for this effort and are summarized in Table B1 in Appendix B. The results of the modeling effort were compared with historical SqCWD Main Street Well production test results and the water level differences between the shallow and deep aquifer units documented on Plate 9. Additionally, the shallow monitoring well measurements collected along Soquel Creek since 2001 at the locations shown on Plate C1 were also compared to model-simulation results. As shown on Plates C2 through C4, the magnitude of seasonal fluctuation in the Soquel Creek water levels is typically on the order of 2 feet, and the shallow groundwater water levels typically oscillate on the order of 3 to 4 feet under present hydrological and hydrogeological conditions.

To simulate increased drawdown created by a no-flow boundary condition, an image well was located in the MLU Model west of the base of the Purisima A Zone an equidistant to the Beltz Well No. 12 location which is east of the outcrop boundary. While it would have been similarly valid to simulate the recharge boundary provided by Rodeo Gulch Creek in this manner, Rodeo Gulch Creek flows were observed to have ceased by the end of May. Because the proposed production from City Beltz Well No. 12 occurs during the mid-summer months, this major source of recharge to the Purisima A Unit was not included in the simulations. The estimated impacts therefore, are believed to be representative of hydrogeological conditions during the period of use proposed for Beltz Well No. 12 when there are no flows in Rodeo Gulch Creek.

Simulated Drawdown Effects

Groundwater impacts estimated based on the proposed pumping scenarios associated with the City and SqCWD well construction projects include additional layers to simulate the presence of the Purisima B Zone in the vicinity of Soquel Creek (see Table B1). The three production scenarios simulated (City Project Only, SqCWD Project Only, and Cumulative

Impacts) utilize the MLU aquifer parameters shown in Table B1 and the proposed well production timing and distribution shown on Tables B3 through B5.

The Purisima A Zone hydraulic conductivity value used in the model was provided by the Cory Street Monitoring Well formation grain-size analyses and averaged 23 feet per day (ft/day) (Hopkins, 2010a), which correlates with the range of values estimated from the SqCWD Service Area I wells of 23 to 28 ft/day (Johnson, et al., 2004). While the aquifer test data from the coastal Beltz Wellfield showed substantially higher conductivity values (50 to 100 ft/day) which would result in a lower pumping drawdown and a reduced operational impact, these values were not used. Based on these model parameters, 80 percent of the Beltz Well No. 12 production is produced from the Purisima A Unit (approximately 167 gpm). Proportionally, approximately 9 percent (19 gpm) and 11 percent (24 gpm) of the Beltz Well No. 12 production is extracted from the AA and Tu Zones, respectively.

Well Production Effects on SqCWD and Private Wells

To adequately analyze the effects on nearby wells from installing new wells and redistributing pumping, it is necessary to qualify different levels of effects in order to separate potentially restrictive effects on proximate well operations from marginal effects that are merely noticeable. The water level drawdown in an aquifer that results from the extraction of groundwater commonly results in mutual interference between wells. The amount of interference drawdown (commonly 1 to 10 feet) is typically tolerable and is not ordinarily considered restrictive. Excessive well interference that may result from the close proximity of a well producing at a high production rate for a sustained time period has the potential to cause physical damage or a loss of yield, which could represent a restrictive effect.

Physical damage to a competently designed and constructed well facility could occur if excessive well interference drawdown caused the water level to drop below the top of the well screen and adverse conditions resulted in a well facility (i.e., cascading water resulting in air entrainment) that could damage the well or well pump assembly. Damage resulting from this condition could occur if oxygenated water corroded the well screen interval and causes structural failure, or if cavitation causes excessive well pump wear.

Appreciable loss of well yield could occur if excessive aquifer dewatering reduces a well's performance (by lowering the specific capacity) or prevents the well pump from operating within its design parameters. An appreciable reduction in well yield is considered a restrictive effect on an existing well if the well is incapable of providing its historically measured; a) maximum daily production level, b) dry-season production level, or c) annual production levels under drought conditions (Bachman et al., 2005). An appreciable effect could result if; 1) a substantial amount of the well screen were dewatered, 2) the groundwater gradient were altered, or 3) the groundwater elevation is reduced to cause seawater intrusion to affect a well.

For this study, we will utilize a qualitative rating system to describe the magnitude of the pumping effects analysis which has been adopted by similar water supply studies (Hydrometrics, 2009). The categories for the project's effects at nearby wells are listed below;

1. **Beneficial Effect –** an increase in groundwater levels or well yield.
2. **No Effect** – no change in groundwater levels or well yield.
3. **Marginal Effect** – a measureable lowering of groundwater levels or slight decreases in well yield that does not adversely affect a well or pump.
4. **Restrictive Effect** – a lowering of water levels that adversely affects the performance or yield of a well or pump. This effect may threaten to cause physical damage to the well or pump.
5. **Severe Effect** – a significant lowering of water levels or well yield likely causing physical damage to the well or pump. This effect would likely render the well inoperable and would be very difficult or not cost-effective to retrofit.

Well Production Effects on SqCWD Wells

Simulated drawdown values indicate that the proposed City production of approximately 210 gpm (125 afy) from Beltz Well No. 12 would have less than 1-foot of drawdown on water levels at the SqCWD Main Street Well (see Plate B1) at the end of the approximate 4.5-month pumping period. This water level effect almost completely recovers by the end of the 7-month pumping season in November (see Plate B3). Drawdown impacts to the SqCWD Main Street Well at an earlier time during pumping period will be proportionally less. A summary of the water level change at all the SqCWD wells is provided in Table 1 – Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at SqCWD Wells. The maximum water level effect indicated at the proposed O'Neill Ranch Well is a decline of 1.8 feet.

Table 1 – Maximum Effect of Beltz Well No. 12 Pumping on Water Levels at SqCWD Wells

WELL NAME	WATER LEVEL CHANGE (FEET)
MAIN STREET	- 0.84
ROSEDALE	- 0.68
MONTEREY	- 0.5
TANNERY	- 0.4
MAPPLETHORPE	- 0.4
GARNET	-0.29

The proposed City and SqCWD mutually interfering projects are combined in a final simulation of water level changes in the Purisima A Zone which is presented on Plate B11. By the end of September, a maximum combined water level drawdown of approximately 6 feet is projected to develop as a relatively linear pumping trough between the proposed O'Neill Ranch Well and Beltz Well No. 12 (see Plate B11). Upon cessation of City pumping, water levels around Beltz Well No. 12 virtually recover by the end of the pumping season in November, and are comparable to the conditions developed by the pumping proposed by the SqCWD WMP project without the City project (compare Plate B7 with B13).

The model results indicate that the shift of City pumping inland, by the proposed project, will achieve the basin management goal of maintaining coastal water levels at a higher elevation which will contribute to abating the threat of seawater intrusion. These calculations lead to the conclusion that effects from pumping Beltz Well No. 12 on existing SqCWD wells and the proposed SqCWD O'Neill Ranch Well are minimal and will not cause physical damage or an appreciable reduction in yield. Thus, the water level effect on all SqCWD municipal wells (existing and proposed) from the intermittent short-term production of Beltz Well No. 12 is marginal.

Well Production Effects on Private Wells

The County of Santa Cruz and California Department of Water Resources provided the City with confidential well log information along with the estimated location of private wells in the vicinity of Beltz Well No. 12 site. Reportedly, estimated well locations cannot be provided due to confidentiality laws governing use of the well log information. For this same reason the wells located within approximately 1,000 meters (3,300 feet) of the site were assigned arbitrary well identification numbers. The distance between these private wells and the Beltz Well No. 12 location is summarized along with the total well depth and the reported well production rates in Table 2 – Summary of Privately Owned Well Information.

Based on the construction depths and the locations within the basin, all the privately owned wells listed in Table 1 were determined to produce from the Purisima A Zone as defined by this study. Cathodic protection wells are excluded from this list because groundwater level fluctuation is irrelevant to their function. The nearest estimated well location is approximately 880 feet away and is reportedly a monitoring well. All other privately owned wells are at distances greater than 1,875 feet away from the proposed well site (see Table 2).

Table 2 – Summary of Privately Owned Well Information

WELL IDENTIFICATION	APPROXIMATE DISTANCE FROM BELTZ WELL NO. 12 (FT)	DEPTH OF WELL (FT)	FLOW RATE (GPM)	DATE OF TESTING
1	3,300	497	12	8/3/1987
2	3,300	330	40	6/15/1976
3	2,200	200+	22	1/21/1987
4	2,890	200	35	2/16/1998
5	1,875	220	25	6/14/1984
6	2,275	200	NA	NA
7	880	99	NA	2/14/2003
8	2,135	148	30	4/9/1964
9	2,000	NA	NA	NA
10	3,540	110	NA	7/9/1966
11	2,060	NA	NA	NA
12	2,700	NA	NA	NA

Utilizing the MLU modeled drawdown values shown on Plate B1, the pumping effects from the proposed Beltz Well No. 12 project were identified for each of the privately owned well sites at the end of the Beltz Well No. 12 pumping period. These values are listed in Table 3 – Summary of Pumping Drawdown Effects. As shown, the water level drawdown values range from 1.3 to 2.3 feet. The closest privately owned well (Well No. 7) with the greatest pumping effect is reportedly a monitoring well which does not produce a supply that can potentially be affected by the reduced static water level (unlike domestic water supply wells).

Table 3 – Summary of Pumping Drawdown Effects

WELL ID	SCREEN LENGTH (FT)	DEPTHS (FT)			WATER LEVEL CHANGE (FT)	
		TOP OF SCREEN	STATIC WATER	PUMPING WATER LEVEL	PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)	CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
1	120	377	320	360	-1.25	-3.5
2	80	250	210	NA	-1.25	-3.75
3	NA	NA	NA	NA	-1.5	-5.0
4	NA	NA	210	237	-1.4	-4.0
5	80	140	140	NA	-1.7	-7.0
6	NA	NA	NA	NA	-1.6	-4.5
7	20	79	86	NA	-2.3	-6.5
8	40	104	97	100	-1.4	-3.0
9	NA	NA	NA	NA	-1.4	-2.5
10	40	65	26	NA	-1.3	-3.25
11	NA	NA	NA	NA	-1.65	-5.75
12	NA	NA	NA	NA	-1.35	-4.25

Comparing the other drawdown values with the information provided on the well screen depths and the available pumping water levels indicates that the proposed Beltz Well No. 12 project (without the SqCWD WMP project) results in relatively minor changes to existing conditions. Assuming private domestic well pumps deliver the reported supply rate at approximately 30 pounds per square inch (psi) for use by the homeowners, the total dynamic head was estimated for each well. The percentage of additional head created by the projected drawdown values in Table 3 was used to estimate the percentage decrease in flow from well pump discharge. Using this method of estimation, the decline in well pump production ranged between 0.025 and 0.25 gpm which is in all cases less than a 1.2-percent reduction in flow. Because the magnitude of the project effects on privately owned wells is so small, the City project will not result in well or well pump damage or an appreciable loss of well yield. Thus, the pumping effects of the City project on privately owned wells are marginal.

Utilizing the MLU modeled drawdown values shown on Plate B11, the cumulative pumping effects from the proposed Beltz Well No. 12 project and the proposed SqCWD WMP project were identified for each of the privately owned well sites at the end of the 4.5-month pumping period for Beltz Well No. 12. As shown in Table 3, the maximum water level change ranges between 2.5 and 7 feet of drawdown (for water supply wells) and reflects the inland shift of pumping by both water agencies. Pumping effects earlier in the pumping period are proportionally less and as shown on Plate B13, the effects from the proposed Beltz Well No. 12 project are virtually absent by the end of the Beltz Wellfield pumping season in mid-November. While most all the privately owned wells are located at a substantial distance from the Beltz Well No. 12 site (see Table 2), the wells with the greatest change in static water levels are those located north of, and closest to, the proposed O'Neill Ranch Well site.

Comparisons of available water level data, well screen intervals, and estimated drawdowns show that drawdown from pumping Beltz Well No. 12 and the SqCWD wells will result in marginal effects on known wells within the designated radius. Assuming private well pumps deliver the reported supply at approximately 30 psi for domestic use, the total dynamic head was estimated for each well and combined with the percentage of additional head created by the projected drawdown values in Table 3. These values were used to estimate the percentage decrease in flow from well pump discharge which ranged between a 0.8 and 4-percent reduction. Using this method of estimation, the decline in well pump production ranged between 0.1 and 0.83 gpm. Therefore, cumulative drawdown from Beltz Well No. 12 will not appreciably affect the yield available to the nearby private wells or cause well or well pump damage, which indicates the resulting water level effect is marginal.

Well Production Effects on Streamflow

The potential effects of the proposed Beltz Well No. 12 groundwater production on streamflows were estimated by; a) using the MLU model to simulate streamflow losses where the creek flows across the Purisima B Zone, and b) using the conductance equation for calculating fluid flow through streambed sediments using the predicted head differential created over the permeable Purisima A Zone aquifer unit. MLU simulations of the effects of the proposed Beltz Well No. 12 production on the Purisima B Zone water levels at the end of September and during November are shown on Plates B2 and B4, respectively. The cumulative rate of streambed losses to simulate no drawdown in the Purisima B Zone, as shown on these plates, were combined with the calculations of streamflow losses over the Purisima A Zone and summarized in the tables presented in Appendix E – Streamflow Impact Estimations.

As previously mentioned, there was no flow in Rodeo Gulch Creek at the upstream or the downstream sample locations at the time of streambed sampling (see Plate 3 and Appendix D). Based on these observations, well production during the dry season being analyzed will have no impact on the ephemeral streamflows in Rodeo Gulch Creek.

As mentioned above, losses through streambed materials into the underlying A Zone were calculated using the conductance equation. Factors considered in these infiltration estimates include observations of Soquel Creek conditions that were made during the collection of streambed samples. These observations indicate that the creek bottom is armored with exposed and partially buried coarse gravel and cobbles that were deposited during higher creek flows. Photographic documentation of creek conditions at the sample locations when the samples were collected is included in Appendix D. These impermeable materials were observed to comprise a minimum of 50 percent of the streambed area in Soquel Creek but were absent in the Rodeo Gulch streambed.

Filling the interstitial space between these impermeable clasts is a fine-grained silty sand/sandy silt matrix that was sampled for laboratory testing. The resulting hydraulic conductivity values for the Soquel Creek samples are summarized in Table 4 – Streambed Hydraulic Conductivity Values. For the purpose of estimating induced infiltration rates or reduced recharge rates to streamflow, the average hydraulic value of 0.601 feet per day (ft/day) and an inferred effective porosity for the silty sand material of 20 percent were used.

Table 4 – Streambed Hydraulic Conductivity Values

SAMPLE LOCATION	HYDRAULIC CONDUCTIVITY (CM/SEC)	HYDRAULIC CONDUCTIVITY (FT/DAY)
NO. 1	2.78E-05	0.078
NO. 2	2.42E-04	0.686
NO. 3	3.67E-04	1.040
AVERAGE	**2.12E-04**	**0.601**

Additional observation indicate that the active channel width varies along the course of Soquel Creek and was estimated at the time of sampling to average approximately 20 feet wide (see Appendix D). While the average depth of water in the stream changes throughout the course of the year (see Plates C2 through C5) and between pools and riffles, an average depth of 3 feet in the creek was used to estimate conductance through the streambed sediments during the proposed operational season of the year. Shallower creek depths would result in lower infiltration rates and reduced impacts to creek flows.

As described above, the cumulative injection rate required to eliminate the simulated drawdown beneath the creek in the B Zone while pumping Beltz Well No. 12 was used as the loss of flow over these reaches of the creek. In addition, the reduction in head simulated in segmented reaches of the A Zone was applied using the streambed conductance equation shown

on Plate 10 to calculate losses in this reach of the creek. The cumulative reduction in creek flow estimated using these methods for all 3 of the groundwater scenarios evaluated (Beltz Well No. 12 project [only], SqCWD WMP project [only], and cumulative proposed projects) is provided in Appendix E and summarized in Table 5 – Proposed Projects Effects on Soquel Creek Streamflow. The proposed production scenarios for these projects results in a maximum decrease in streamflow at the end of the Beltz Well No. 12 pumping period which ranges from 0.027 cfs to 0.104 cfs (see Table 5).

Table 5 – Proposed Projects Effects on Soquel Creek Streamflow

PROPOSED PROJECT	EFFECTS ON STREAMFLOW		
	34 DAYS INTO THE BELTZ WELLFIELD PRODUCTION SEASON (PRIOR TO BELTZ WELL NO. 12 OPERATION)	169 DAYS INTO THE BELTZ WELLFIELD PRODUCTION SEASON (END OF 135-DAY BELTZ WELL NO. 12 OPERATION)	END OF 215-DAY BELTZ WELLFIELD PRODUCTION SEASON
CITY BELTZ WELL NO. 12 ONLY	0.024 CFS INCREASE	0.078 CFS DECREASE	0.013 CFS INCREASE
SQCWD WMP PROJECT ONLY	0.013 CFS DECREASE	0.027 CFS DECREASE	0.029 CFS DECREASE
CUMULATIVE PROPOSED PROJECTS	0.011 CFS INCREASE	0.104 CFS DECREASE	0.015 CFS DECREASE

In past study, the City has developed criteria for water year classification of critically dry, dry, normal, and wet water years (October 1 – September 30). For the period of record, from 1921 to 2008, one-third of all years are classified as wet, slightly over one-third as normal, and one-sixth each as dry and critically dry (SCWD, 2006). From historical data, multiple critically dry water years and single critically dry water years were identified. The following representative years are used in this analysis:

- 2007 – Single Critically Dry Year,

- 1990 – Multiple Critically Dry Years,
- 1977 – Multiple Critically Dry Years, Most Severe Drought of Record.

Data of Soquel Creek streamflow discharges are recorded at the United States Geological Survey (USGS) Gage No. 11160000, located approximately 9,000 feet upstream of the Soquel Creek outlet to the Pacific Ocean. This gage provides data of stream discharges since 1951 and is the only USGS gage located on the lower reach of Soquel Creek that may be affected by pumping Beltz Well No. 12. Hydrographs illustrating daily mean discharges during the representative critically dry water years 1977, 1990, and 2007 are provided in Appendix F.

The results of the streamflow impacts analyses provided in Appendix E were combined with these USGS gauging data to evaluate the magnitude of the estimated creek flow reductions during the observed creek discharges in the critically dry years of 1977, 1990, and 2007. This analysis includes the well production distribution included below in Table 6 – Proposed Well Production Distribution Evaluated.

Table 6 –Proposed Well Production Distribution Evaluated

PRODUCTION SCENARIO	PRODUCTION SEASON	PRODUCTION LOCATION	APPROXIMATE WELL CAPACITY (GPM)	TOTAL (AF)
EXISTING CONDITIONS (NO PROJECT) WITHOUT BELTZ WELL NO.12	APRIL -NOV	BELTZ 8, 9, 10	700	645
PROPOSED PROJECT WITH BELTZ WELL NO. 12	APRIL -NOV	BELTZ 8, 9, 10	550	520
	MAY -SEPT	BELTZ 12	210	125
TOTAL				645

For each representative critically dry water years, the USGS hydrograph data were utilized to estimate streamflow discharge at the end of three time periods which includes; 1) 34 days after the start of the Beltz Wellfield pumping season, 2) 169 days after the start of the pumping season, and 3) 215 days, which marks the end of the Beltz Wellfield pumping season. These periods correspond with the beginning of the Beltz Well No. 12 pumping period, the end of the Beltz Well No. 12 pumping period, and the end of the Beltz Well Nos. 8, 9, and 10 production season, respectively. Groundwater conditions at each of these time periods were also analyzed for cumulative impacts. Daily mean discharge at the end of the pumping season was averaged over the final week (seven days) to account for any large variability at this point.

To estimate reductions in streamflow from pumping Beltz Well No. 12, the hydrographs of representative water years were used to calculate streamflow discharges at the Soquel Creek outlet to the Pacific Ocean (outlet). The State Water Resources Control Board - Division of Water Rights (2006) provides a method for prorating USGS gage streamflow data at points of interest, as follows:

$$\mathbf{Q_2 = Q_1 \times (A_2/A_1) \times (I_2/I_1)}$$

Where: Q_2 = Daily flow (cfs) at point of interest on tributary watershed;
Q_1 = Daily flow (cfs) at nearby gage;
A_2 = Watershed area above point of interest;
A_1 = Watershed area above gage;
I_2 = Precipitation at point of interest; and
I_1 = Precipitation at gage.

The Soquel Creek watershed has a total area of 42.0 square miles and USGS Gage No. 11160000 has a watershed area of 40.2 square miles. Due to the close proximity of USGS Gage No. 11160000 and the outlet, the assumption can be made that precipitation is virtually the same at these locations. The results of the streamflow impacts analyses are provided in Appendix F as Table F1, F2, and F3 for each of the representative water years at the end of each of the pumping stress periods. As indicated by these results, at the end of the first 34 days of pumping, the planned reduced pumping resulted in a beneficial effect on streamflow for both the Beltz Well No. 12 and the cumulative production scenarios (see Table F1).

At the end of the Beltz Well No. 12 production period (169 days) with the City only project, the inland shift of pumping resulted in reduced streamflows that ranged between 4.9 and 7.1 percent (a 0.08 cfs reduction from the 1.58 and 1.11 cfs flows at the outlet, respectively). The cumulative impacts to streamflow were estimated to range in a loss of 6.6 to 9.4 percent of flow at the outlet to the ocean (a 0.1 cfs loss) that would have reduced the 1.58 to 1.48 cfs in 2007, and the 1.11 to 1.01 cfs in 1977 (see Table F2). Subsequent recovery of the system at the end of the 215-day season was estimated to reduce streamflow between 0.4 and 1.0 percent (a 0.01 cfs reduction from the 3.61 and 1.34 cfs outflows during 2007 and 1977, respectively) (see Table F3). The results of the calculations included in Tables F1 through F3 are summarized in Table F4 for easy comparison.

Well Production Effects on Groundwater Contamination Sites

A potential effect from pumping Beltz Well No. 12 is the possible influence on nearby groundwater contamination sites. Table 7 – Estimated Effects on Groundwater Monitoring Sites shows three well locations associated with gasoline station spills within a 1,000 meter radius of the Beltz Well No. 12 location. The Exxon 7-0281 site was recently closed and is no longer

considered an active petroleum release site. The other 2 locations are sites that are being monitored to verify that contaminants will not pose a threat to water resources. If pumping at Beltz Well No. 12 alters groundwater flow at a site such that contaminants would be more likely to travel to nearby private wells, the effect on the yield of nearby private wells could be restrictive.

Table 7 - Estimated Effects on Groundwater Monitoring Sites

SITE NAME AND ADDRESS	WATER LEVEL MEASUREMENT DATE AND (SOURCE)	REPORTED GRADIENT	REPORTED GRADIENT DIRECTION	BELTZ WELL NO. 12 EFFECT OR PERTINENT COMMENT
EXXON 7-0281 2501 S. MAIN STREET	2/11/2011 (CRWQCB, 2011)	NA	NA	NO EFFECT SITE CLOSED
BP 1240 2178 41ST AVE.	03/15/2011 (ARCADIS, 2011)	0.017	S42W	MARGINAL EFFECT GRADIENT 0.017 S43W
EXXON 7-3604 836 BAY AVE.	04/22/2010 (ERI, 2010)	0.003	S63W	NO EFFECT B ZONE AQUIFER EAST OF SOQUEL CREEK

Utilizing the MLU modeled drawdown values, the effects are evaluated by estimating the changed groundwater flow gradient from pumping Beltz Well No. 12. Maximum water level changes at the end of the Beltz Well No. 12 pumping period are used for the evaluation of the two remaining active sites. The reported and estimated gradients influenced by Beltz Well No. 12 pumping are shown in Table 7. As shown, Beltz Well No. 12 pumping does not steepen the flow gradient or appreciably change the flow direction at either of the sites. As a result, there is no effect of Beltz Well No. 12 operation on nearby private wells resulting from transport of known contaminants. Because the changes in groundwater elevations in the A unit at the BP 1240 site are minimal (1.5 feet) and temporary, there is only a marginal effect that will not alter the ongoing monitoring and cleanup operations using the projects shallow wells. Because the Exxon 7-3604 site is located east of Soquel Creek and has monitoring wells that are located in the shallowest underlying unit (B Zone Aquifer), there is virtually no change in the groundwater gradient or flow direction and thus no effect of Beltz Well No. 12 operation on the ongoing monitoring or cleanup operations.

Analyzing the cumulative pumping effects of the Beltz Well No. 12 project and the SqCWD WMP project using the same method indicates that while the maximum change in water level will be between 2.5 and 2.75 feet beneath the BP 1240 site, there is no appreciable change in the gradient or direction of groundwater flow and is a marginal effect.

CONCLUSIONS

The proposed Beltz Well No. 12 construction project is part of the City's groundwater management strategy (which complies with the AB3030 basin management objectives) to maintain protective groundwater levels near the coast that prevent seawater intrusion into the Purisima Formation aquifer units while maintaining the historical supply of groundwater to overlying users. The analyses of this study conclude that by project design and cooperative management with the SqCWD, the impacts of the project are minimized by factors which include; a) the short duration of use (a 4.5-month-period within a 7-month pumping season), and b) the relatively low production rate of 210 gpm.

The relocation of this relatively minor amount of pumping is demonstrated by this study to cooperatively benefit the coastal aquifer system from which the Beltz Wellfield, SqCWD, and numerous private pumpers produce an annual supply of water. The proposed relocation of historical groundwater production effectively raises coastal groundwater levels to abate seawater intrusion while maintaining this vital supply (see Plate Nos. B1 through B4). This conclusion is also supported by the analysis of the cumulative water level effects shown on Plates B9 through B14. Because the location of the Beltz Well No. 12 site maintains a moderate distance from privately owned wells and its production rate is relatively low, its potential impacts are minimized. While the physical area to redistribute pumping within the Purisima Formation aquifer system is limited (Hopkins, 2006), we conclude that the cumulative effects analyzed by this study indicate that the location of Beltz Well No. 12 is optimal for the cooperative needs of the City and the SqCWD WMP projects, while minimizing impacts to private pumpers.

SqCWD Wells

The impacts analysis provided in this study concludes that the proposed operation of Beltz Well No. 12 at 210 gpm (125 afy) at the Research Park Drive Site could potentially develop the greatest interference drawdown at the SqCWD Main Street Well of less than 1-foot. Interference drawdown at the other existing SqCWD wells is less than what is seen at the Main Street Well (refer to Table 1). Based on the Main Street Well design and the available drawdown within the well, this amount of interference will not jeopardize operation of the well or the pump equipment nor will it appreciably lower the well's yield. This indicates that the pumping effects on the existing SqCWD facilities are marginal. Because the Main Street Well is the only local well that produces from the deeper Purisima AA and Tu Zones, the modeled impacts of the proposed City project included these zones. The calculated drawdown within these zones was virtually the same (less than 1 foot) at the Main Street Well location and indicates that the pumping effects on the existing SqCWD facilities remain marginal.

Privately Owned Wells

The potential maximum impact to private wells in the study area is proportional to their radial distance from the proposed Beltz Well No. 12 location and the aquifer being produced by each well. The relatively minor amount of drawdown that is anticipated in the A Zone aquifer at relatively short distances from the proposed well indicate that the impact to the yield of privately owned wells is believed to be at most a marginal effect. The results of the study analysis indicate that the City project will not result in well or well pump damage or an appreciable loss of well yield (0.025 to 0.25 gpm).

Cumulative project effects on water levels are found to be moderate (up to of 7 feet) at the closest privately owned wells located north of the O'Neill Ranch Well site. These maximum water level effects will occur over the last couple months of the proposed Beltz Well No. 12 pumping period and will immediately begin to reduce after cessation of Beltz Well No. 12 operations becoming virtually absent at the end of the Beltz Wellfield pumping season in mid-November. The pumping impact under the cumulative project operations are believed to be a marginal effect that will not result in well or well pump damage or a significant loss of well yield (0.1 and 0.83 gpm).

Soquel Creek Flows

The estimated impact to flow in Soquel Creek at the end of the approximate 135 days of pumping Beltz Well No. 12 at a production rate of 210 gpm is approximately 0.078 cfs. The study results estimate that the maximum percent change in creek outflow is a reduction of approximately 7.1 percent (1.11 cfs reduced to 1.03 cfs at the outlet) which would occur under 1977 flow conditions. The cumulative percent change in creek outflow during this same critically dry year condition is estimated at a maximum reduction of 9.4 percent (1.11 cfs reduced to 1.00 cfs at the outlet) at the end of the Beltz Well No. 12 production season.

The proposed pumping scenario of the project will also result in a beneficial impact to the creek flows at a rate of 0.028 cfs between the initiation of the reduced coastal Beltz Wellfield operation beginning in April and the start of Beltz Well No. 12 production period in May. Upon cessation of Beltz Well No. 12 production, impacts to creek flows reduce and return to a beneficial effect as an increased flow rate of 0.013 cfs at the end of the typical Beltz Wellfield production season.

The minimal effect to streamflow in Soquel Creek from the proposed project is primarily a result of; a) the approximate ½-mile distance between the creek and the proposed well location, b) the low production rate proposed by the City (210 gpm), and c) the impedance to vertical flow of groundwater through the layered Purisima Formation and the creek bottom sediments.

Because there is no flow in Rodeo Gulch Creek during the summer and fall months of the year, there is no potential impact to flow from the proposed Beltz Well No. 12 production. The Rodeo Gulch Creek bed was observed to be predominantly comprised of silty sand deposits. These deposits are very similar to the underlying Purisima Formation materials and likely transmit water at a comparable rate. After cessation of creek flows, the horizontal flow rate of groundwater beneath the creek in the shallow alluvium is believed comparable to or less than the underlying Purisima aquifer materials. Because of these creek conditions, the proposed and cumulative projects will not have an effect on the ephemeral creek flows, nor will they appreciably reduce the seasonal recharge to the Corcoran Lagoon.

Groundwater Contamination Sites

The significant distance between the proposed Beltz Well No. 12 site and the location of known groundwater contamination sites significantly reduces the potential for any effect. We conclude from the findings of this study that the proposed project will have no effect or at most a marginal effect on the known groundwater contamination sites within 1,000 meters (over a half mile) of the proposed well location. This marginal level of effect was determined to be the same for both the City only and the cumulative projects.

CLOSURE

This report has been prepared for the exclusive use of the City of Santa Cruz and its agents for specific application to the proposed Beltz Well No. 12 construction project located at the Research Park Drive Site in Santa Cruz County, California. The findings and conclusions presented herein were prepared in accordance with generally accepted hydrogeological engineering and planning practices. No other warranty, express or implied is made.

□

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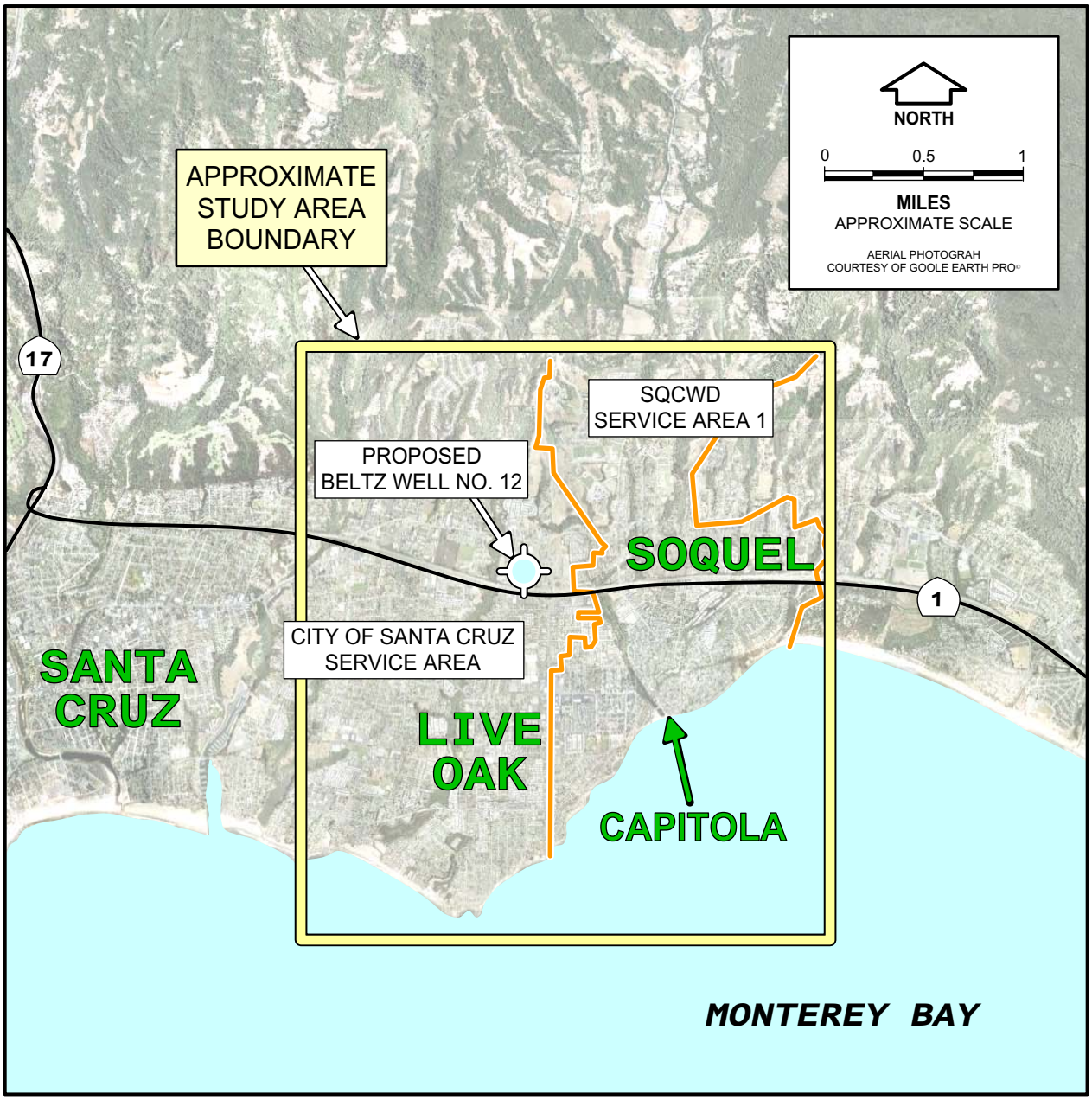
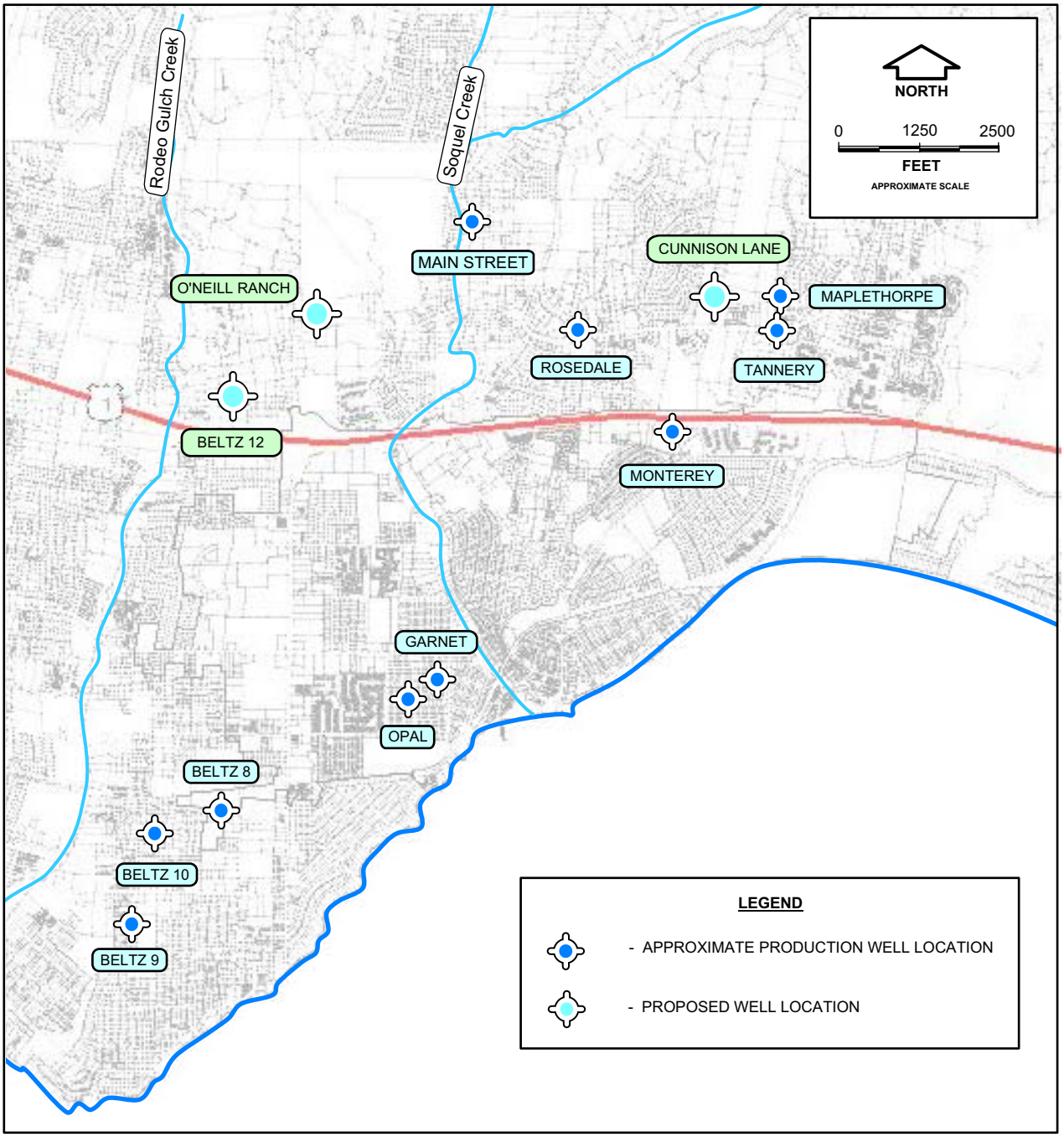
PLATES



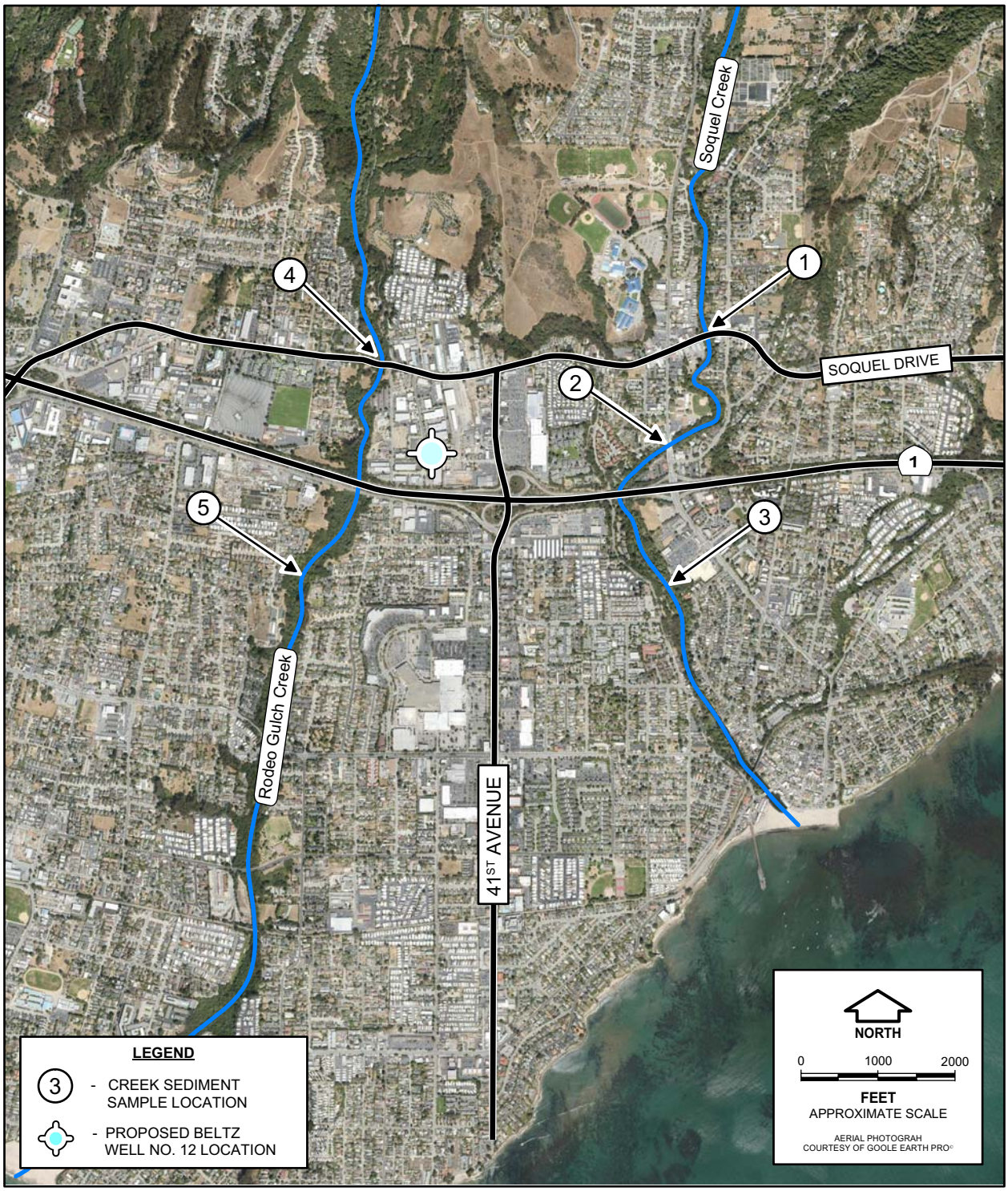
STUDY AREA LOCATION MAP
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 1



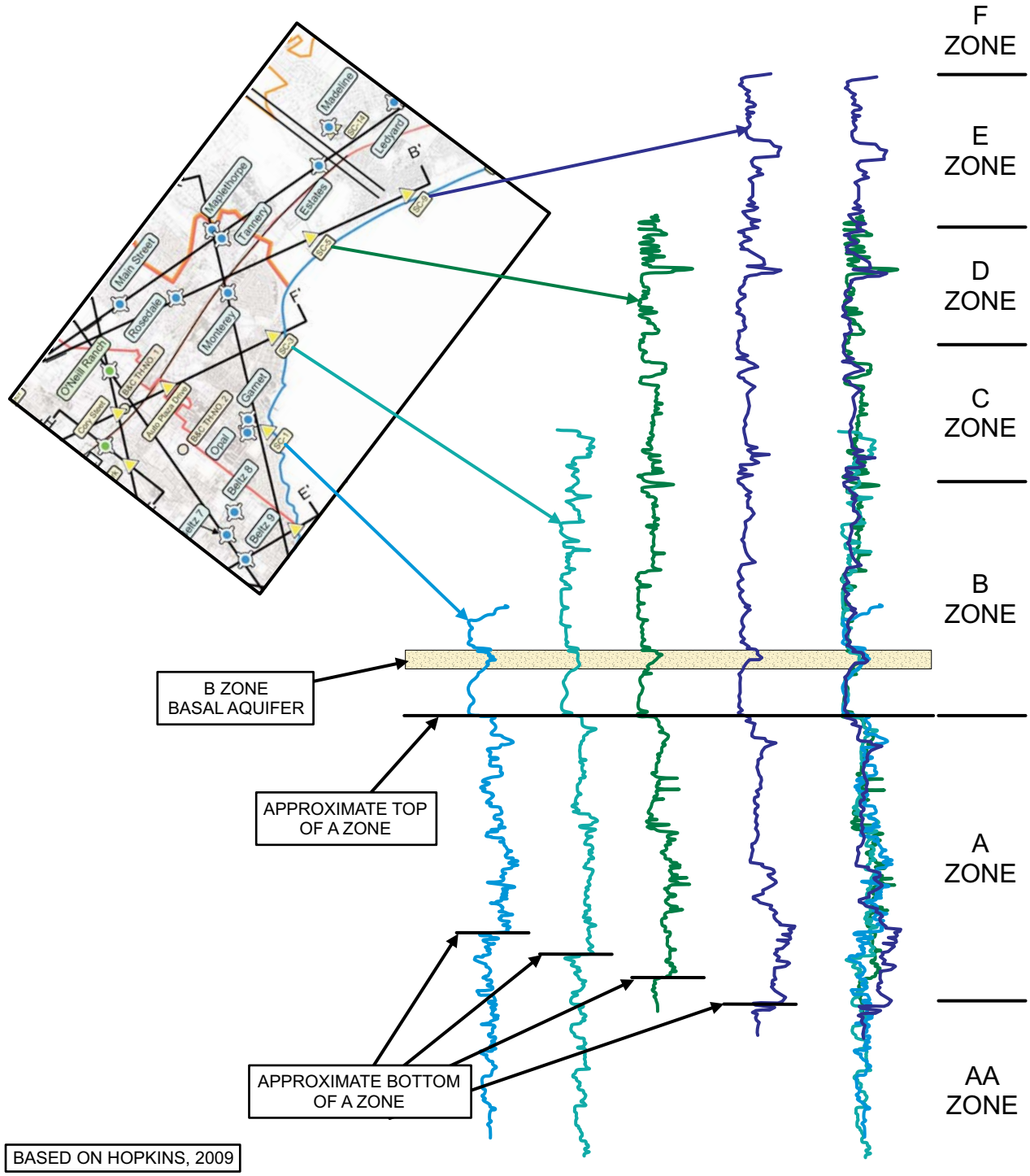
WELL LOCATION MAP
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 2



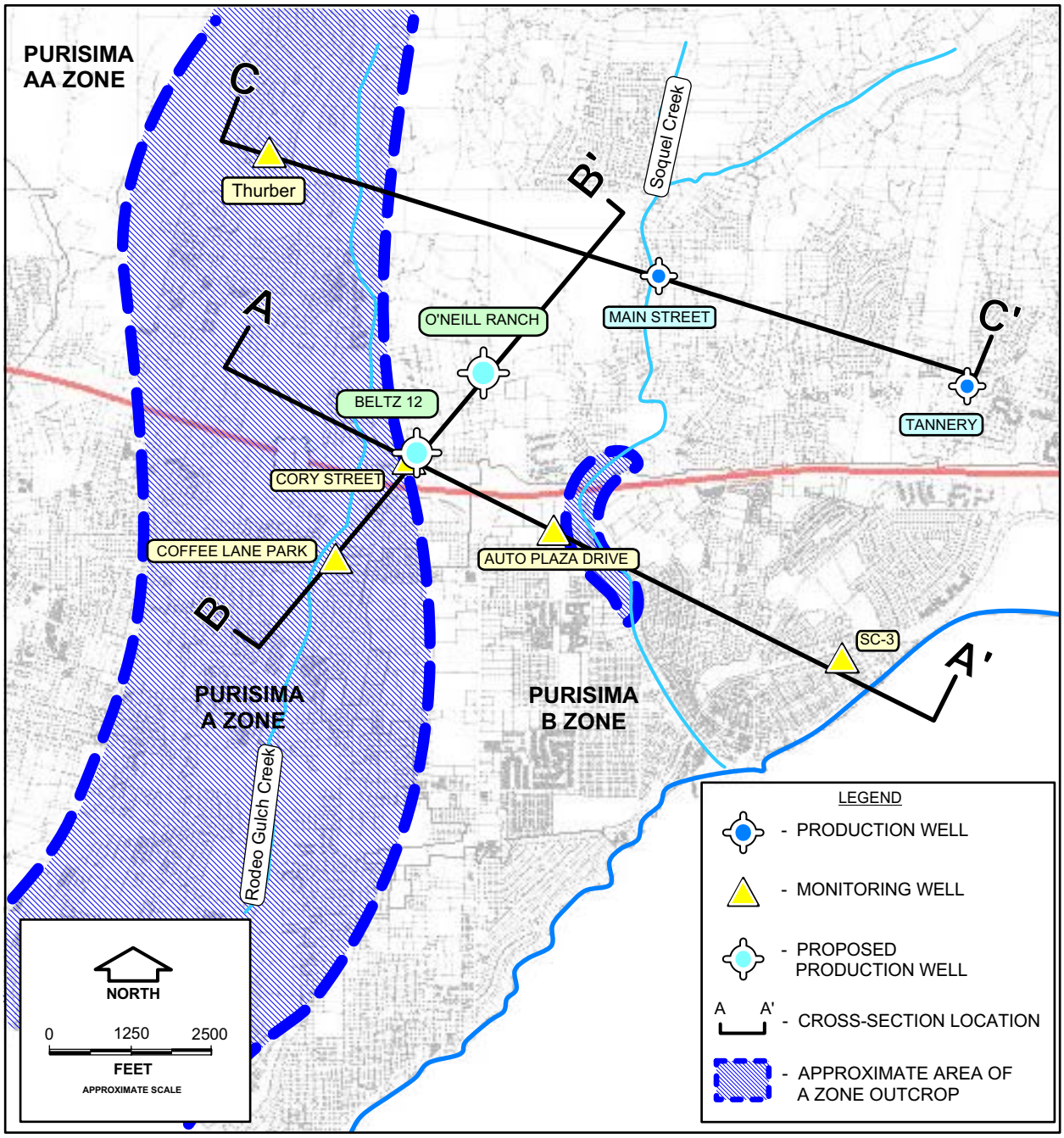
CREEK SEDIMENT SAMPLE LOCATION MAP
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 3



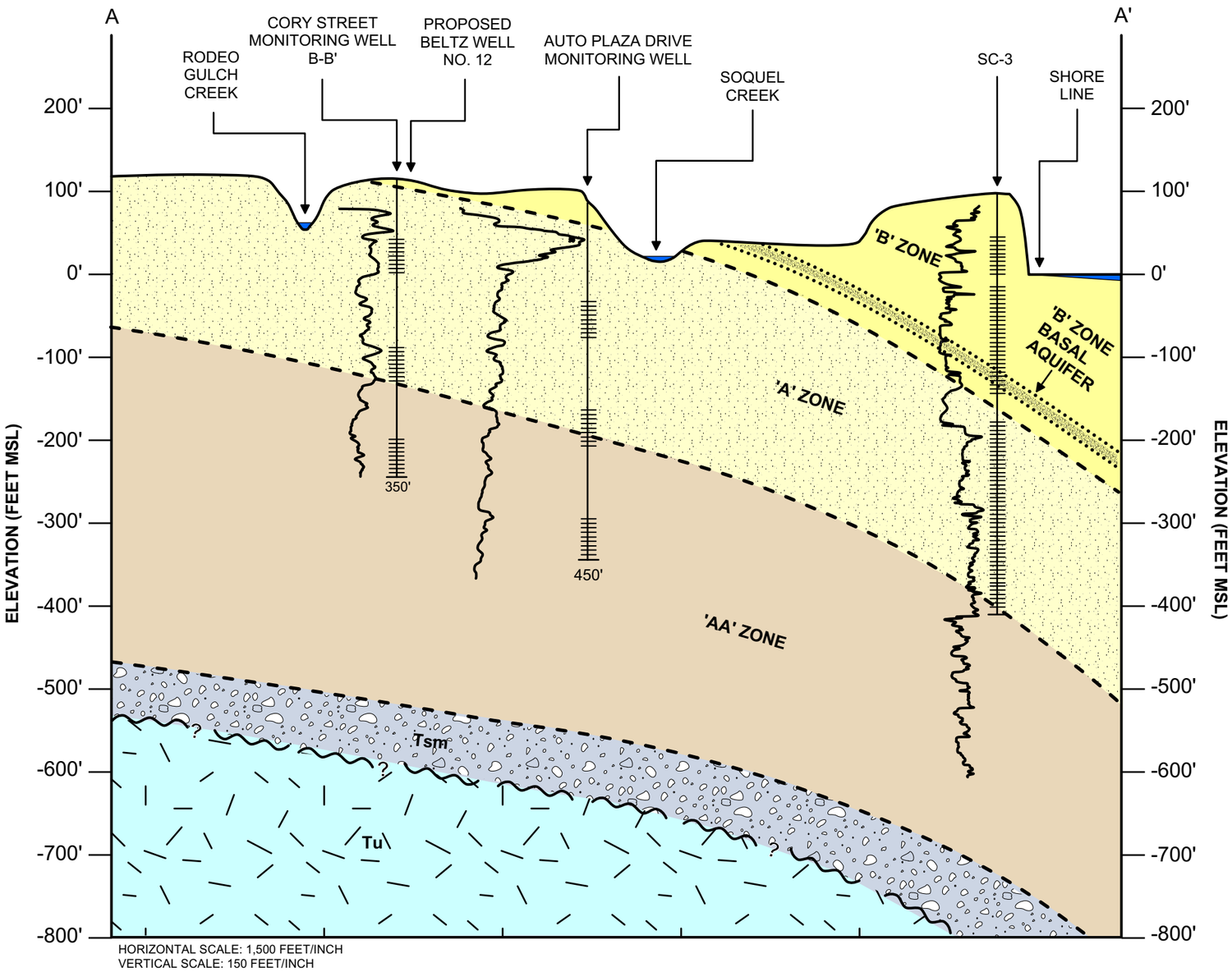
ELECTRIC LOG TRACE CORRELATION OF AQUIFER ZONES
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

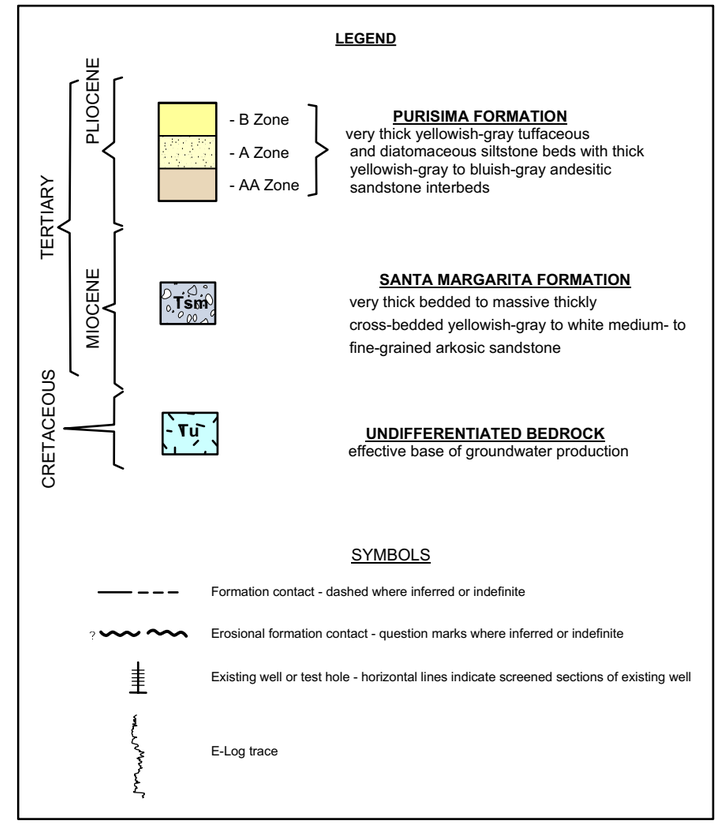
PLATE 4



HYDROGEOLOGICAL CROSS-SECTION LOCATION MAP
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

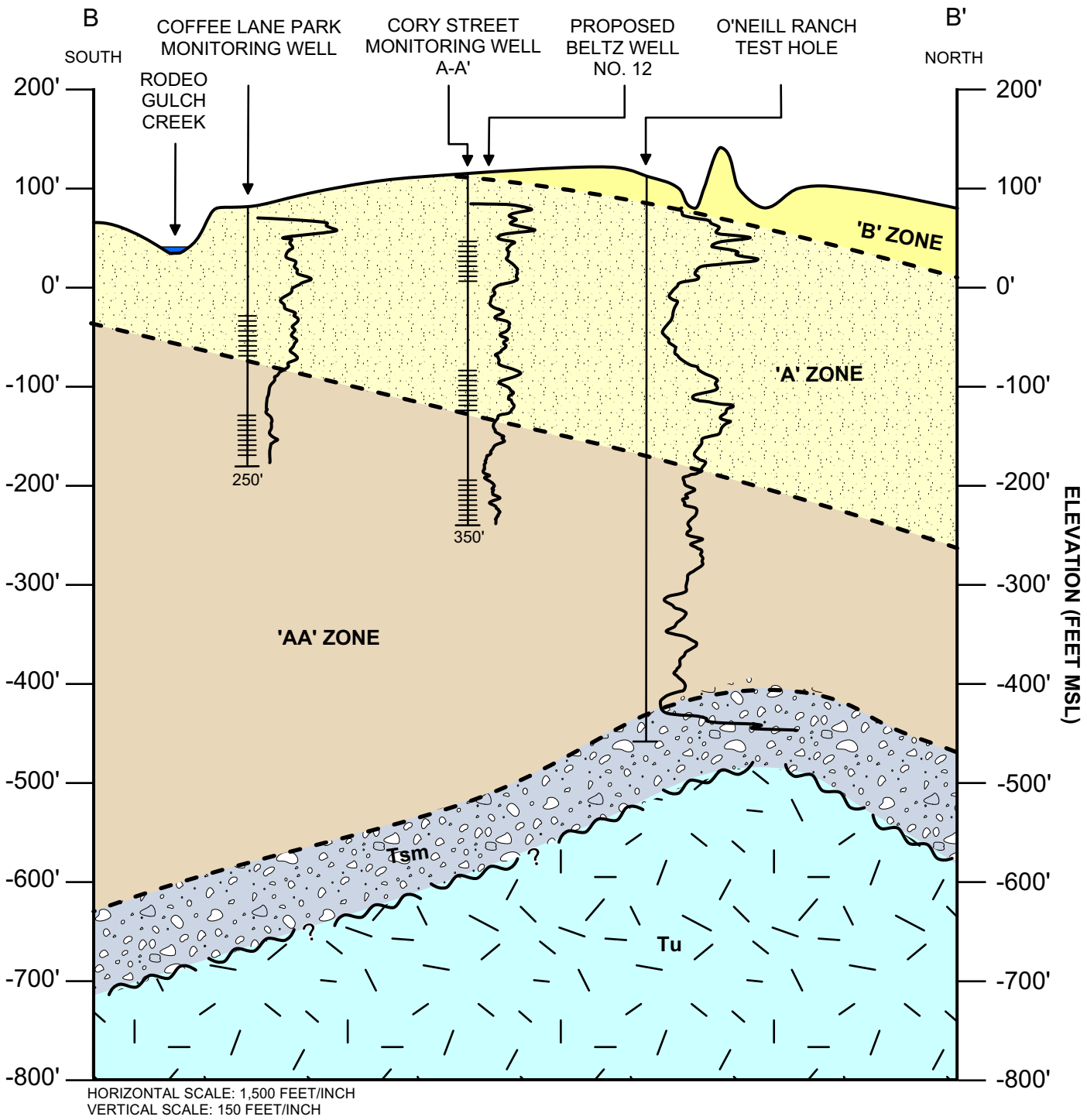
PLATE 5





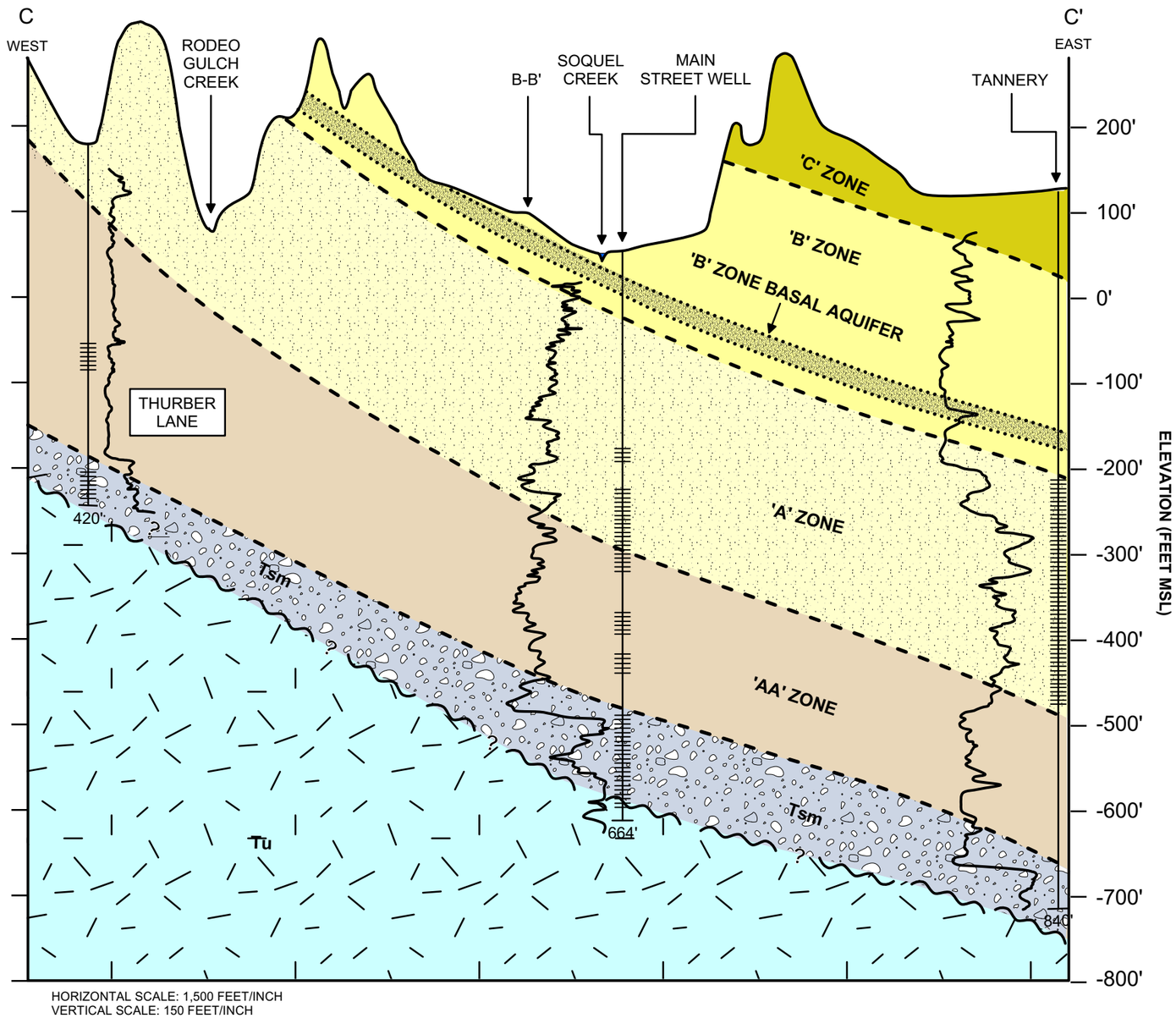
HYDROGEOLOGICAL CROSS-SECTION A-A'
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

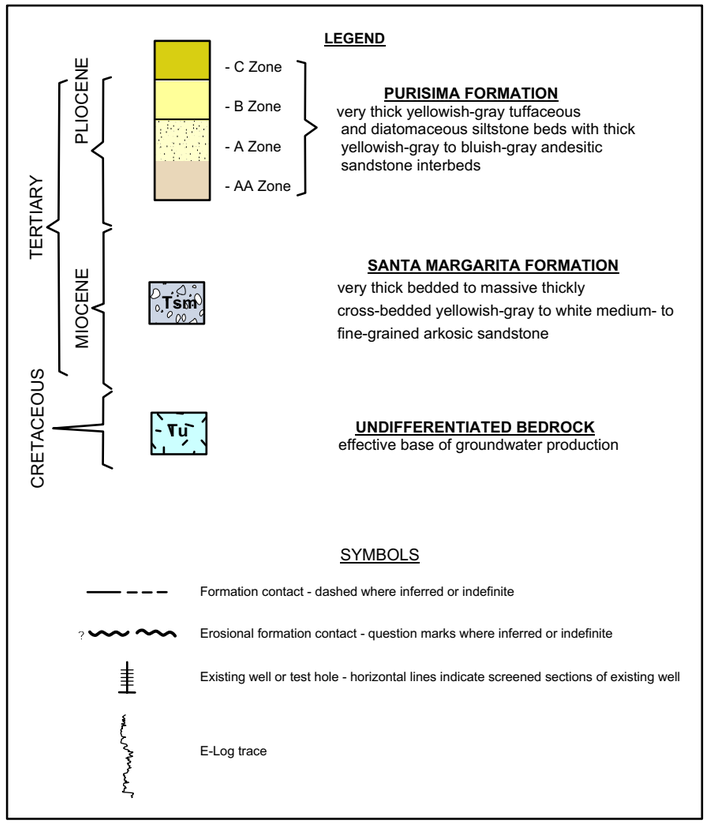
PLATE 6



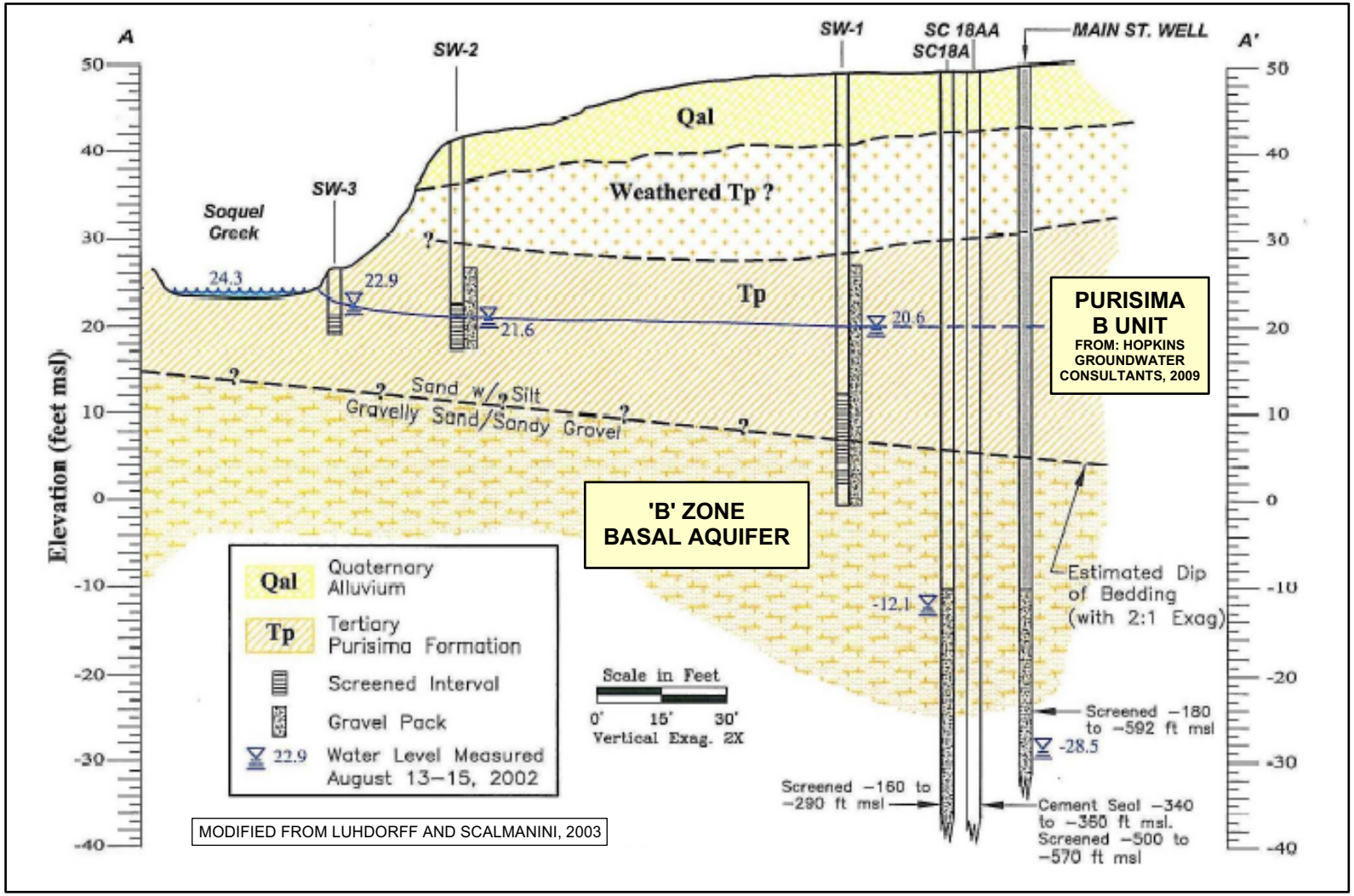
HYDROGEOLOGICAL CROSS-SECTION B-B'
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 7





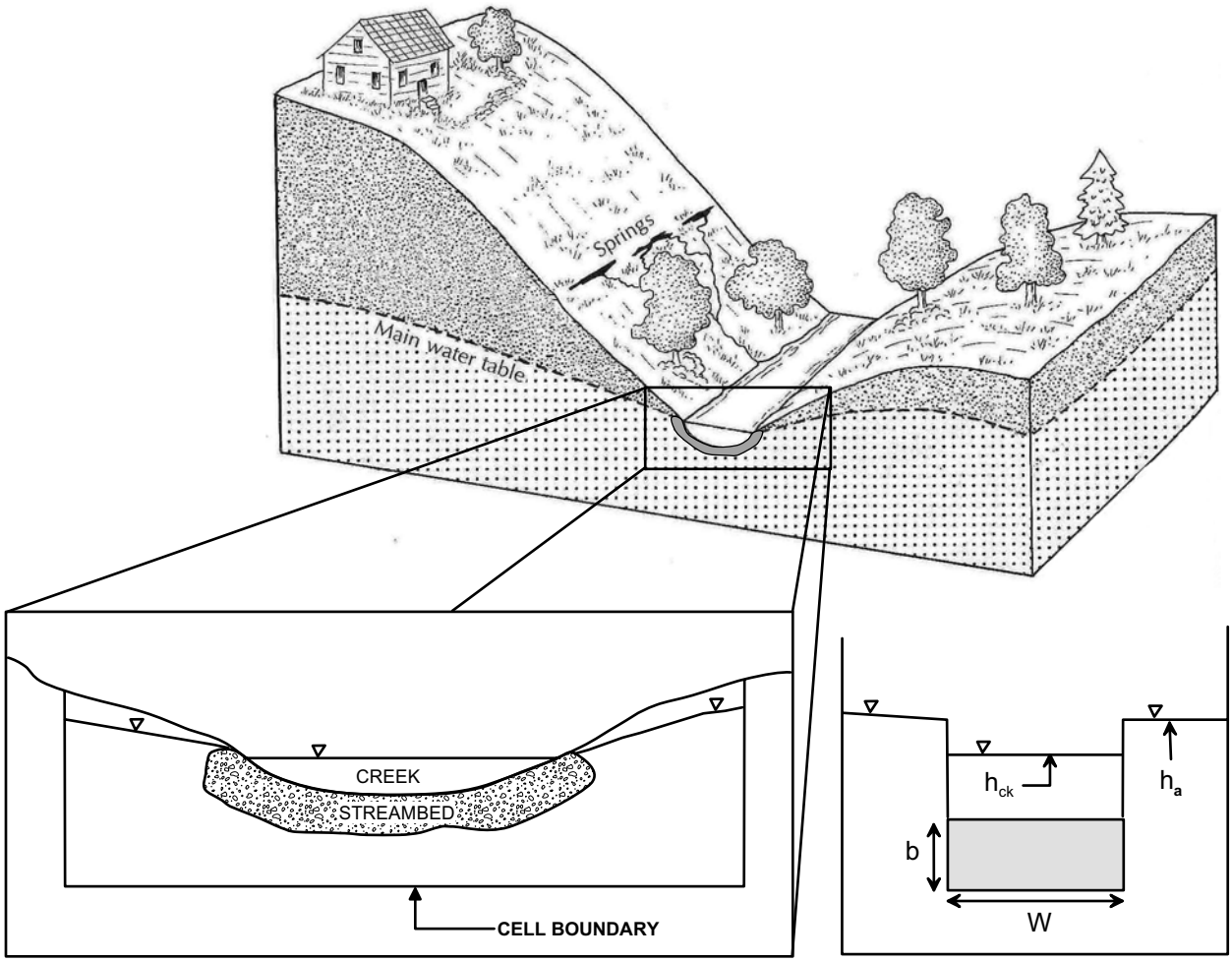
HYDROGEOLOGICAL CROSS-SECTION C-C'
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California



HYDROGEOLOGICAL CONDITIONS AT MAIN STREET WELL
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

June 2011
Project No. 01-010-06D

HOPKINS GROUNDWATER CONSULTANTS



$$Q_{ck} = \frac{KLW}{b} (h_{ck} - h_a)$$

Q_{ck} = FLOW IN OR OUT OF CREEK
K = HYDRAULIC CONDUCTIVITY
L = LENGTH OF CREEK
W = WIDTH OF CREEK
b = THICKNESS OF CREEK BED SEDIMENTS
h_a = HEAD IN AQUIFER
h_{ck} = HEAD IN CREEK

STREAM-AQUIFER INTERACTION
Beltz Well No. 12 (125 AFY Project)
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE 10

APPENDIX A
LABORATORY HYDRAULIC CONDUCTIVITY
TEST RESULTS OF STREAMBED SOIL SAMPLES

AP Engineering & Testing, Inc.

LETTER OF TRANSMITTAL

TO: Louie Hengehold	FROM: Andrew Phukunhaphan
COMPANY: Hopkins Groundwater Consultants	DATE: 6/21/2010
ADRRESS: Post Office Box 3596	TOTAL NO. OF PAGES TRANSMITTED 5
CITY AND STATE: Ventura, CA 93006	YOUR PROJECT NAME: Beltz No. 12 CEQA Study
SUBJECT: Permeability Test Results	YOUR PROJECT NUMBER: 01-010-06 D

☒ AS REQUESTED ☐ FOR YOUR REVIEW & COMMENT ☒ FOR YOUR USE

NOTES/COMMENTS:

Transmitted herewith are results of permeability tests performed on your soil samples delivered to us on June 15, 2010.

If you have any questions, please contact me at your convenience.

Respectfully submitted,

AP Engineering and Testing, Inc.

Andrew Phukunhaphan, P.E., G.E.
Principal Engineer

2607 Pomona Boulevard, Pomona, California 91768 Tel: (909) 869-6316 Fax: (909) 869-6318 E-mail:apengineer@sbcglobal.net

AP Engineering & Testing, Inc.

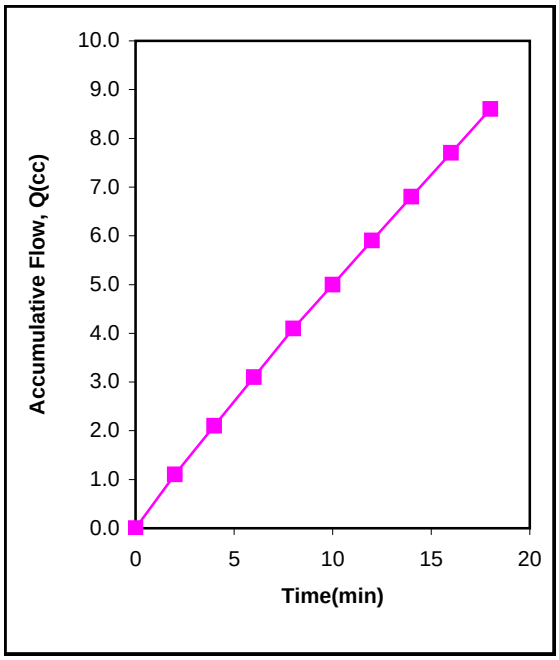
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	SQC Dr.	Checked by	AP	Date	06/18/10
Sample No.:	#1 SQC @ SQC Dr.				
Soil Description:	Dark Gray Silty Sand				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	2.90	in	Container No.		
Weight Before	397.59	g	Wt. Wet Soil+Container(gms)	397.59	548.78
			Wt. Dry Soil+Container(gms)	292.57	442.5
Wet Density	114.01	pcf	Wt. Container (gms)	0	149.93
Dry Density	83.89	pcf	Moisture, (%)	35.90	36.33

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	39.1	1	0.0	1.0	9.55	0
2	38.0	1	1.1	1.0	9.55	9.17E-03
4	37.0	1	2.1	1.0	9.55	8.33E-03
6	36.0	1	3.1	1.0	9.55	8.33E-03
8	35.0	1	4.1	1.0	9.55	8.33E-03
10	34.1	1	5.0	1.0	9.55	7.50E-03
12	33.2	1	5.9	1.0	9.55	7.50E-03
14	32.3	1	6.8	1.0	9.55	7.50E-03
16	31.4	1	7.7	1.0	9.55	7.50E-03
18	30.5	1	8.6	1.0	9.55	7.50E-03

Hydraulic Conductivity (cm/sec): 2.78E-05

AP Engineering & Testing, Inc.

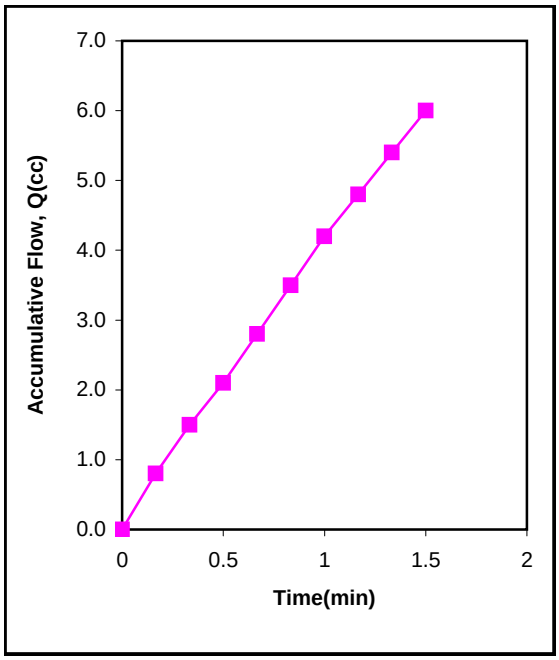
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Porter St.	Checked by	AP	Date	06/18/10
Sample No.:	#2 SQC @ Porter Street				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	443.54	g	Wt. Wet Soil+Container(gms)	443.54	598.49
			Wt. Dry Soil+Container(gms)	352.41	503.47
Wet Density	122.94	pcf	Wt. Container (gms)	0	151.06
Dry Density	97.68	pcf	Moisture, (%)	25.86	26.96

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	35.6	1	0.0	1.0	9.23	0
0.167	34.8	1	0.8	1.0	9.23	8.00E-02
0.333	34.1	1	1.5	1.0	9.23	7.00E-02
0.5	33.5	1	2.1	1.0	9.23	6.00E-02
0.667	32.8	1	2.8	1.0	9.23	7.00E-02
0.833	32.1	1	3.5	1.0	9.23	7.00E-02
1	31.4	1	4.2	1.0	9.23	7.00E-02
1.167	30.8	1	4.8	1.0	9.23	6.00E-02
1.333	30.2	1	5.4	1.0	9.23	6.00E-02
1.5	29.6	1	6.0	1.0	9.23	6.00E-02

Hydraulic Conductivity (cm/sec): 2.42E-04

AP Engineering & Testing, Inc.

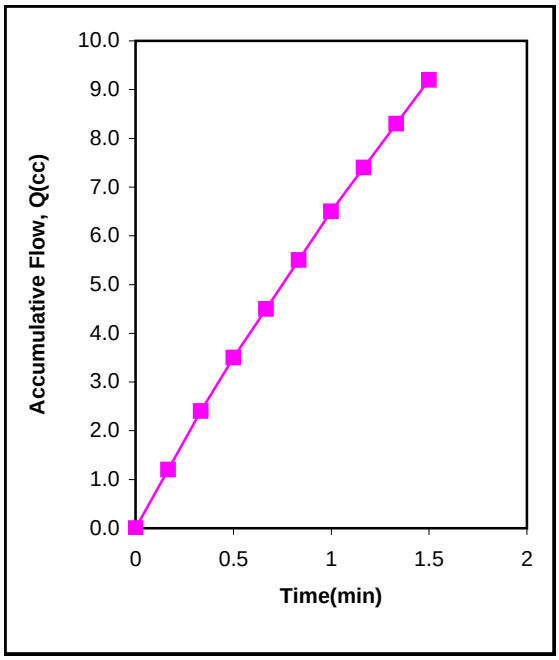
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Foot Bridge	Checked by	AP	Date	06/18/10
Sample No.:	#3 SQC @ Foot Bridge				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	438.92	g	Wt. Wet Soil+Container(gms)	438.92	592.85
			Wt. Dry Soil+Container(gms)	348.25	499.02
Wet Density	121.66	pcf	Wt. Container (gms)	0	150.77
Dry Density	96.53	pcf	Moisture, (%)	26.04	26.94

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	31.4	1	0.0	1.0	9.23	0
0.167	30.2	1	1.2	1.0	9.23	1.20E-01
0.333	29.0	1	2.4	1.0	9.23	1.20E-01
0.5	27.9	1	3.5	1.0	9.23	1.10E-01
0.667	26.9	1	4.5	1.0	9.23	1.00E-01
0.833	25.9	1	5.5	1.0	9.23	1.00E-01
1	24.9	1	6.5	1.0	9.23	1.00E-01
1.167	24.0	1	7.4	1.0	9.23	9.00E-02
1.333	23.1	1	8.3	1.0	9.23	9.00E-02
1.5	22.2	1	9.2	1.0	9.23	9.00E-02

Hydraulic Conductivity (cm/sec): 3.67E-04

AP Engineering & Testing, Inc.

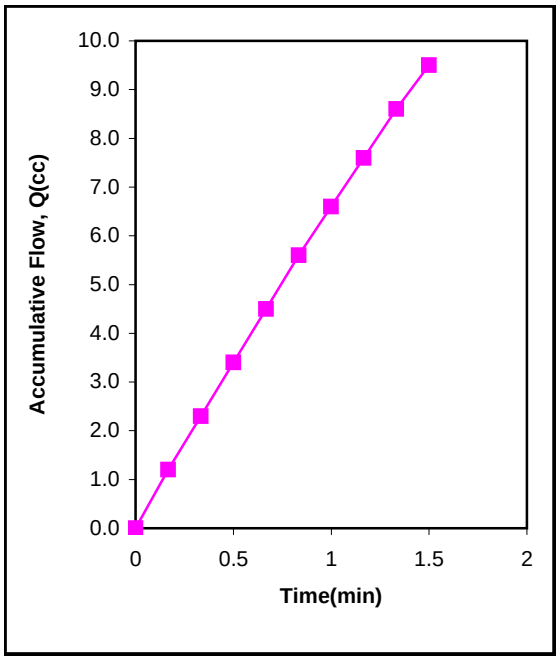
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Soquel Ave.	Checked by	AP	Date	06/18/10
Sample No.:	#4 RC @ Soquel Ave.				
Soil Description:	Very Dark Grayish Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	418.19	g	Wt. Wet Soil+Container(gms)	418.19	575.72
			Wt. Dry Soil+Container(gms)	325.4	473.91
Wet Density	115.92	pcf	Wt. Container (gms)	0	148.51
Dry Density	90.20	pcf	Moisture, (%)	28.52	31.29

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	27.4	1	0.0	1.0	9.23	0
0.167	26.2	1	1.2	1.0	9.23	1.20E-01
0.333	25.1	1	2.3	1.0	9.23	1.10E-01
0.5	24.0	1	3.4	1.0	9.23	1.10E-01
0.667	22.9	1	4.5	1.0	9.23	1.10E-01
0.833	21.8	1	5.6	1.0	9.23	1.10E-01
1	20.8	1	6.6	1.0	9.23	1.00E-01
1.167	19.8	1	7.6	1.0	9.23	1.00E-01
1.333	18.8	1	8.6	1.0	9.23	1.00E-01
1.5	17.9	1	9.5	1.0	9.23	9.00E-02

Hydraulic Conductivity (cm/sec): 3.89E-04

AP Engineering & Testing, Inc.

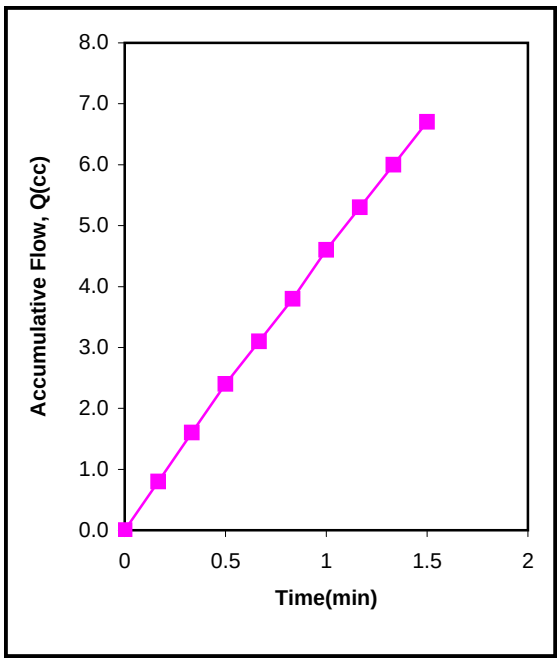
FLEXIBLE WALL HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084

Project Name:	Beltz No. 12 CEQA Study	Tested by	ST	Date	06/16/10
Project No.:	01-010-06D	Calculated by	KM	Date	06/18/10
Sample Location:	Coffee	Checked by	AP	Date	06/18/10
Sample No.:	#5 RC @ Coffee				
Soil Description:	Dark Olive Brown Sand w/silt				
Test Condition:	Undisturbed				
	Confining Pressure = 5 PSI				
Remarks:					

INITIAL CONDITION OF SPECIMEN

				Before	After
Diameter (d)	2.42	in			
Sample Area (A)	4.58	in²			
Length (L)	3.00	in	Container No.		
Weight Before	390.97	g	Wt. Wet Soil+Container(gms)	390.97	569.57
			Wt. Dry Soil+Container(gms)	321.68	470.42
Wet Density	108.37	pcf	Wt. Container (gms)	0	148.74
Dry Density	89.16	pcf	Moisture, (%)	21.54	30.82

TEST RESULTS



Time (min)	Flow Rdg (cm)	Burette Factor	Q (cc)	Head, h (psi)	h/L	Q/t (cc/s)
0	31.8	1	0.0	1.0	9.23	0
0.167	31.0	1	0.8	1.0	9.23	8.00E-02
0.333	30.2	1	1.6	1.0	9.23	8.00E-02
0.5	29.4	1	2.4	1.0	9.23	8.00E-02
0.667	28.7	1	3.1	1.0	9.23	7.00E-02
0.833	28.0	1	3.8	1.0	9.23	7.00E-02
1	27.2	1	4.6	1.0	9.23	8.00E-02
1.167	26.5	1	5.3	1.0	9.23	7.00E-02
1.333	25.8	1	6.0	1.0	9.23	7.00E-02
1.5	25.1	1	6.7	1.0	9.23	7.00E-02

Hydraulic Conductivity (cm/sec): 2.71E-04

APPENDIX B
MLU MODEL PARAMETERS AND ANALYTICAL RESULTS

MLU MODEL
AQUIFER PARAMETERS

Table B1 - MLU Model Aquifer Parameters

Aquifer	Base [ft]	Thickness [ft]	Kh [ft/d]	Code	T [ft²/d]	#	Code	S' [-]	#	Name
1	-20	20	3	T1	60		S1	0.01		B ZONE
	-50	30	0.001	c2	30000		S'2	0		
2	-290	240	23	T2	5520		S2	0.003		A ZONE
	-320	30	0.0012	c3	25000		S'3	0		
3	-410	90	7	T3	630		S3	0.0025		AA ZONE
	-610	200	0.021	c4	9523.81		S'4	0		
4	-710	100	8	T4	800		S4	0.0025		Tsm/Tu
	-735	25	0.025	c5	1000		S'5	0		

MLU MODEL AQUIFER PARAMETERS USED TO SIMULATE WATER LEVEL CHANGES
RESULTING FROM THE CITY AND SQCWD PROPOSED PROJECTS

MLU MODEL
GROUNDWATER PRODUCTION PARAMETERS

Table B2 - Existing Groundwater Conditions

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION (AF)	MLU MODEL INPUT (AF)	MLU MODEL INPUT (CFD)
CUNNISON LANE	NA	215	0	NA	0	0
GARNET	NA	215	228	NA	0	0
MAIN STREET	NA	215	499	NA	0	0
O'NEILL RANCH	NA	215	0	NA	0	0
ROSEDALE	NA	215	323	NA	0	0
TANNERY 2	NA	215	336	NA	0	0
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT (AFY)	MLU MODEL INPUT (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	NA	0	0
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	NA	0	0
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	NA	0	0
BELTZ WELL NO. 12	NA	0	0	NA	0	0
TOTAL FOR SOQUEL CREEK			1,386	NA	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	NA	---	---

[1] - DATA PROVIDED BY SqCWD

Table B3 - Proposed Beltz Well No. 12 Project
(No SqCWD Project)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION (AF)	MLU MODEL INPUT (AF)	MLU MODEL INPUT (CFD)
CUNNISON LANE	NA	215	0	NA	0	0
GARNET	NA	215	228	NA	0	0
MAIN STREET	NA	215	499	NA	0	0
O'NEILL RANCH	NA	215	0	NA	0	0
ROSEDALE	NA	215	323	NA	0	0
TANNERY 2	NA	215	336	NA	0	0
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	130	31	6,306
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	260	62	12,612
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	130	31	6,306
BELTZ WELL NO. 12	MAY 19 - SEPT 30	135	0	124.5	125	40,172
TOTAL FOR SOQUEL CREEK			1,386	NA	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

Table B4 - Proposed SqCWD Project
(No City Project)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION[1] (AF)	MLU MODEL INPUT[2] (AF)	MLU MODEL INPUT[2] (CFD)
CUNNISON LANE	NA	215	0	123	123	24,920
GARNET	NA	215	228	69	159	32,214
MAIN STREET	NA	215	499	565	66	13,372
O'NEILL RANCH	NA	215	0	413	413	83,676
ROSEDALE	NA	215	323	96	227	45,991
TANNERY 2	NA	215	336	96	240	48,625
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	161	0	0
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	323	0	0
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	161	0	0
BELTZ WELL NO. 12	MAY 19 - SEPT 30	NA	0	0	0	0
TOTAL FOR SOQUEL CREEK			1,386	1,362	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

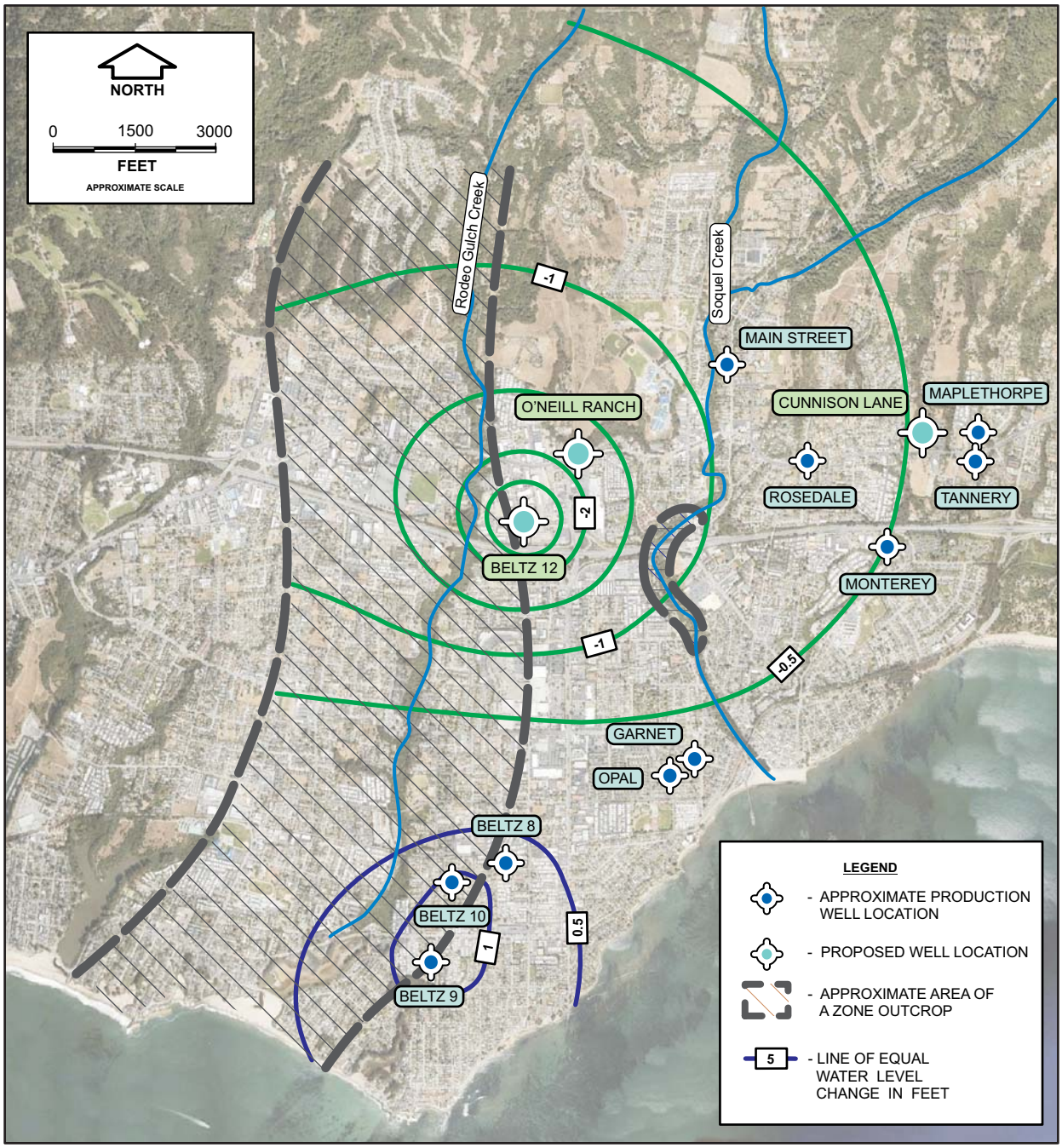
[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

Table B5 - Cumulative Proposed Projects (City and SqCWD)

SOQUEL CREEK WATER DISTRICT SERVICE AREA NO. 1 PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS[1] (AF)	PROPOSED GROUNDWATER PRODUCTION[1] (AF)	MLU MODEL INPUT[2] (AF)	MLU MODEL INPUT[2] (CFD)
CUNNISON LANE	NA	215	0	123	123	24,920
GARNET	NA	215	228	69	159	32,214
MAIN STREET	NA	215	499	565	66	13,372
O'NEILL RANCH	NA	215	0	413	413	83,676
ROSEDALE	NA	215	323	96	227	45,991
TANNERY 2	NA	215	336	96	240	48,625
CITY OF SANTA CRUZ WATER DEPARTMENT PRODUCTION WELLS						
WELL	PRODUCTION SEASON	NUMBER OF DAYS	EXISTING OPERATIONS (AFY)	PROPOSED GROUNDWATER PRODUCTION (AFY)	MLU MODEL INPUT[2] (AFY)	MLU MODEL INPUT[2] (CFD)
BELTZ WELL NO. 8	APR 15 - NOV 15	215	161	130	31	6,306
BELTZ WELL NO. 9	APR 15 - NOV 15	215	323	260	62	12,612
BELTZ WELL NO. 10	APR 15 - NOV 15	215	161	130	31	6,306
BELTZ WELL NO. 12	MAY 19 - SEPT 30	135	0	124.5	125	40,172
TOTAL FOR SOQUEL CREEK			1,386	1,362	---	---
TOTAL FOR CITY OF SANTA CRUZ			645	645	---	---

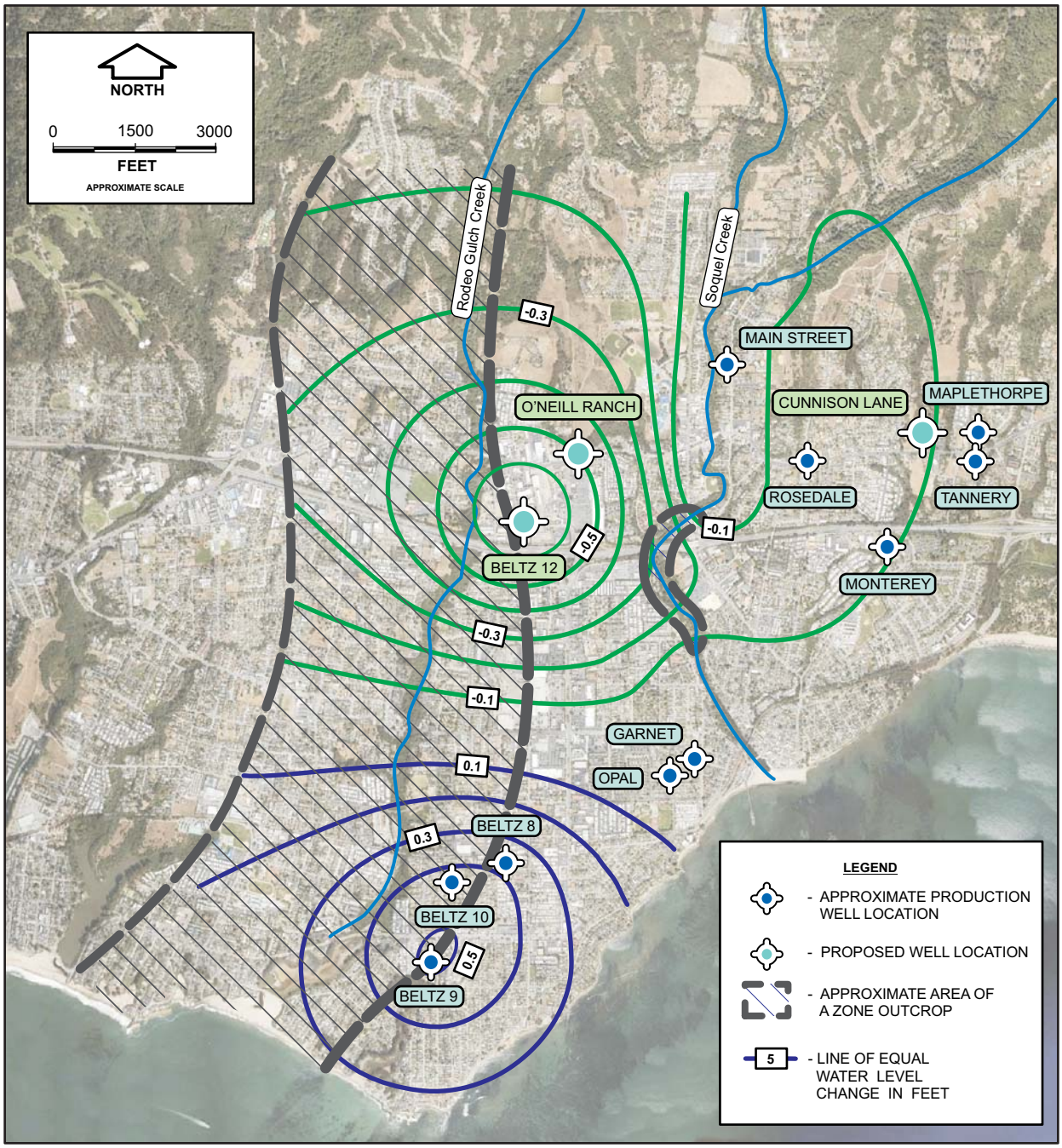
[1] - DATA PROVIDED BY SqCWD
[2] - RED LETTERING INDICATES INJECTION INTO THE MODEL REFLECTING THE CHANGE IN PUMPING FROM CURRENT CONDITIONS, BLACK LETTERING INDICATES GROUNDWATER EXTRACTED FROM THE MODEL.

MLU MODEL
SIMULATED CHANGES
IN GROUNDWATER LEVELS



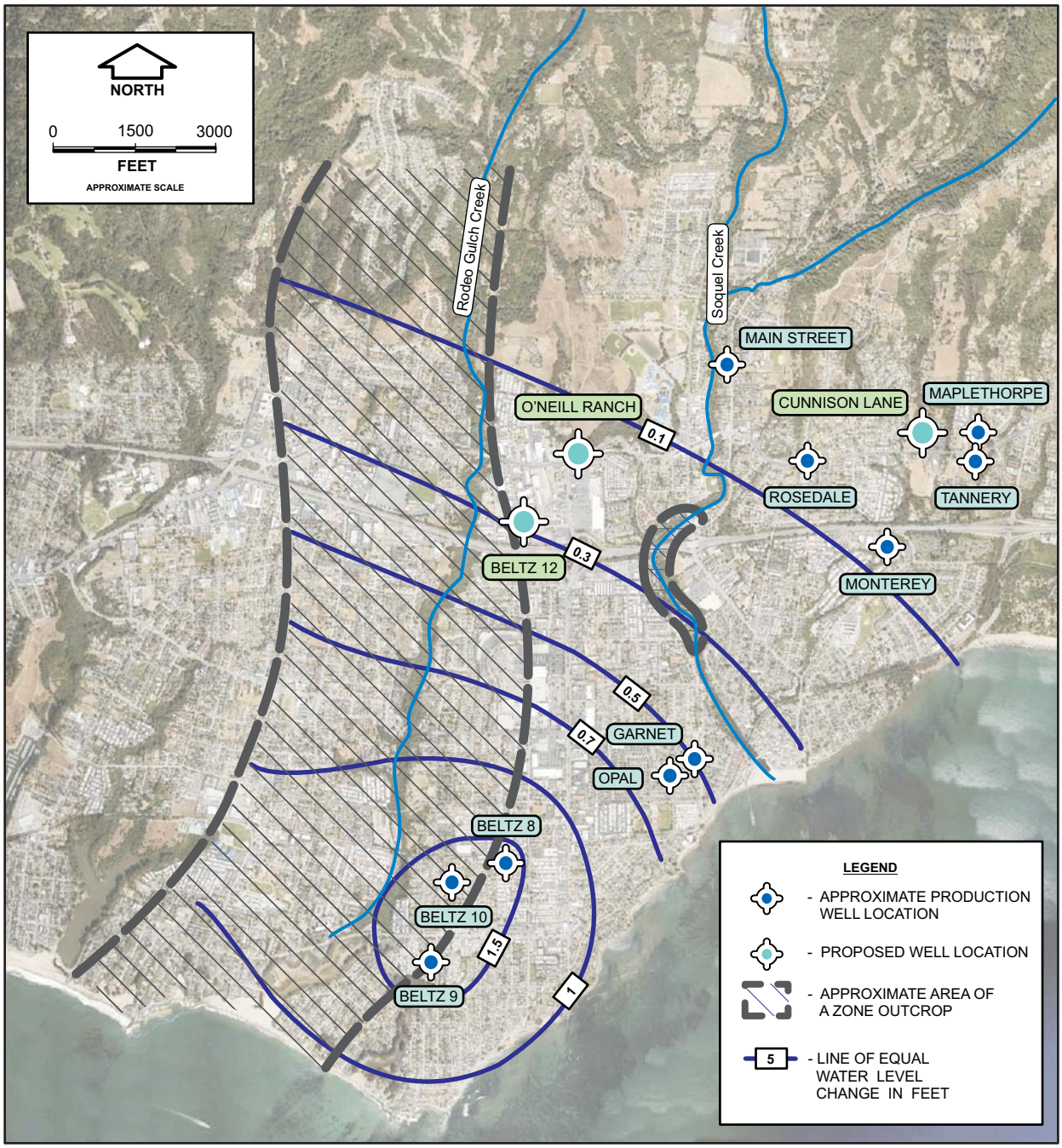
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
SEPTEMBER 30TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B1



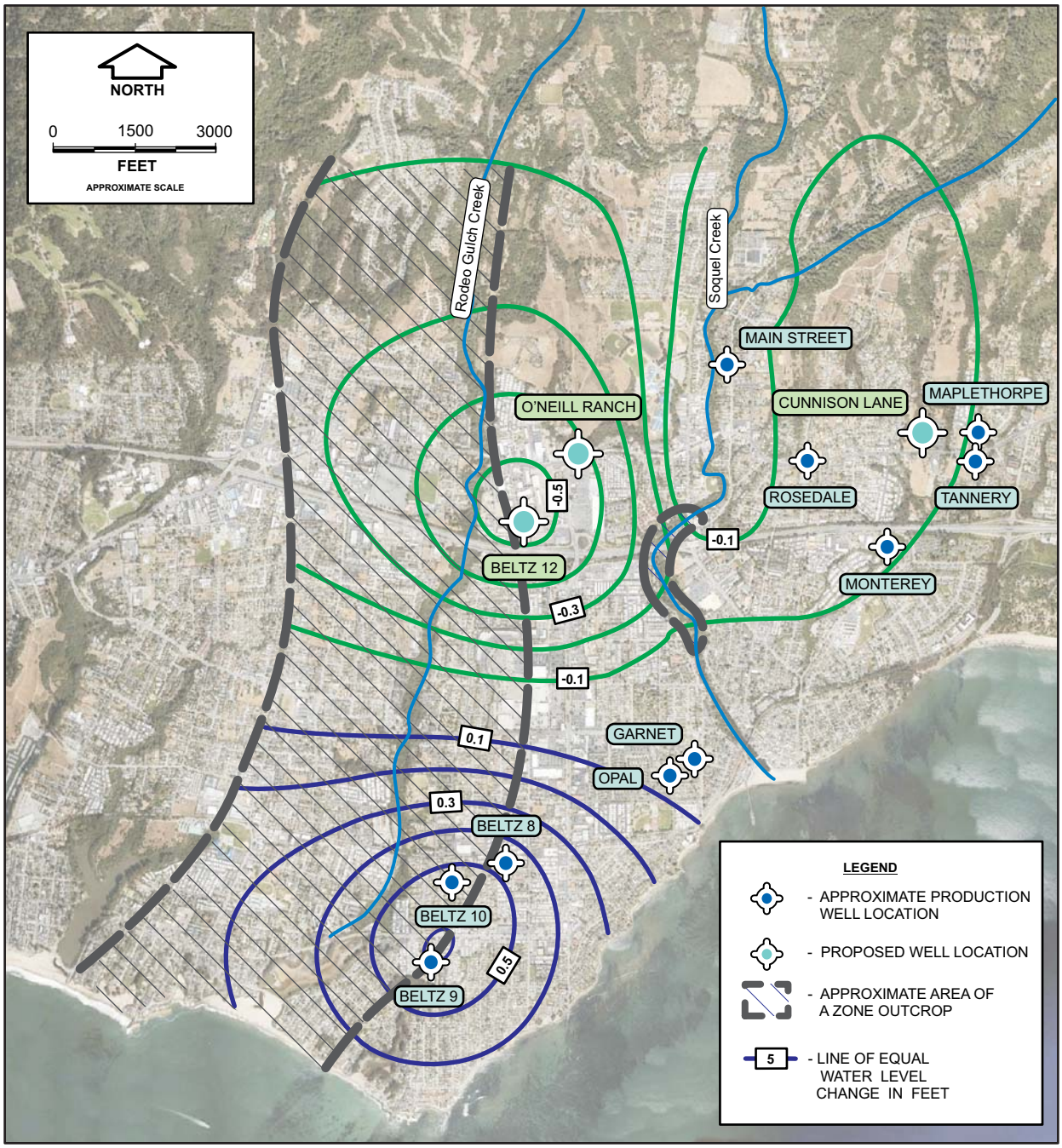
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
SEPTEMBER 30TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B2



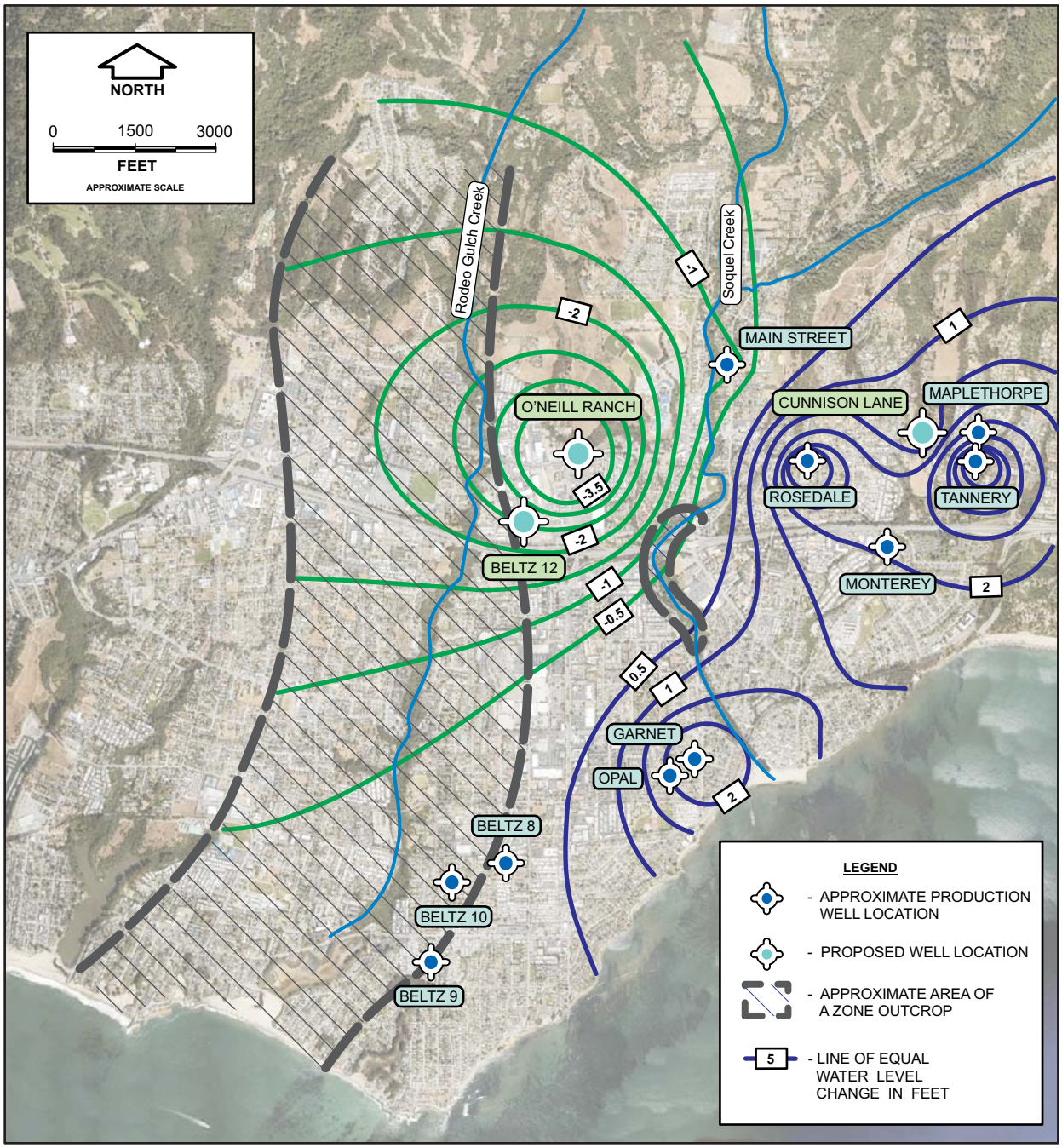
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
NOVEMBER 15TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B3



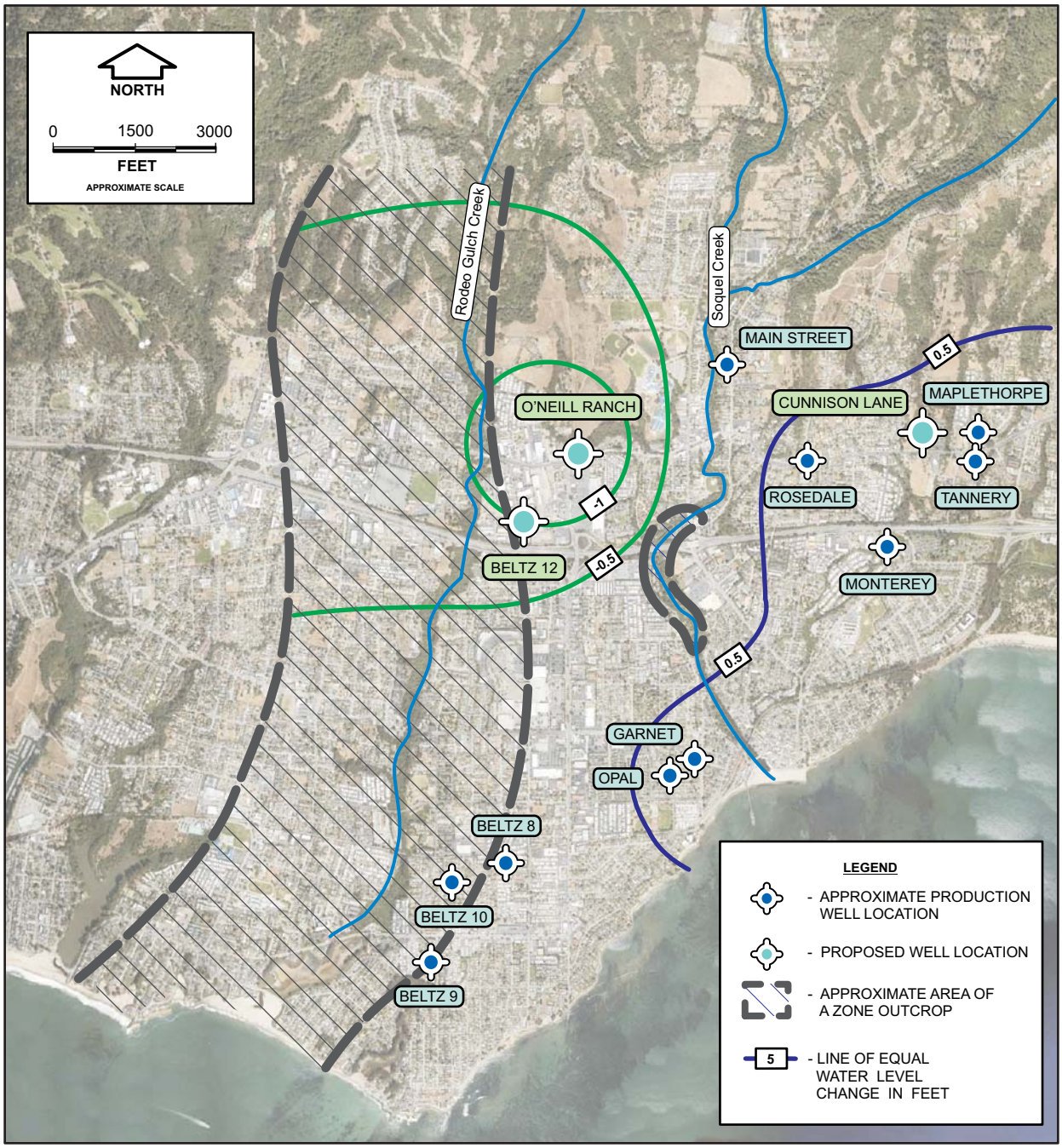
PROPOSED BELTZ WELL NO. 12 (NO SQCWD PROJECT)
NOVEMBER 15TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B4



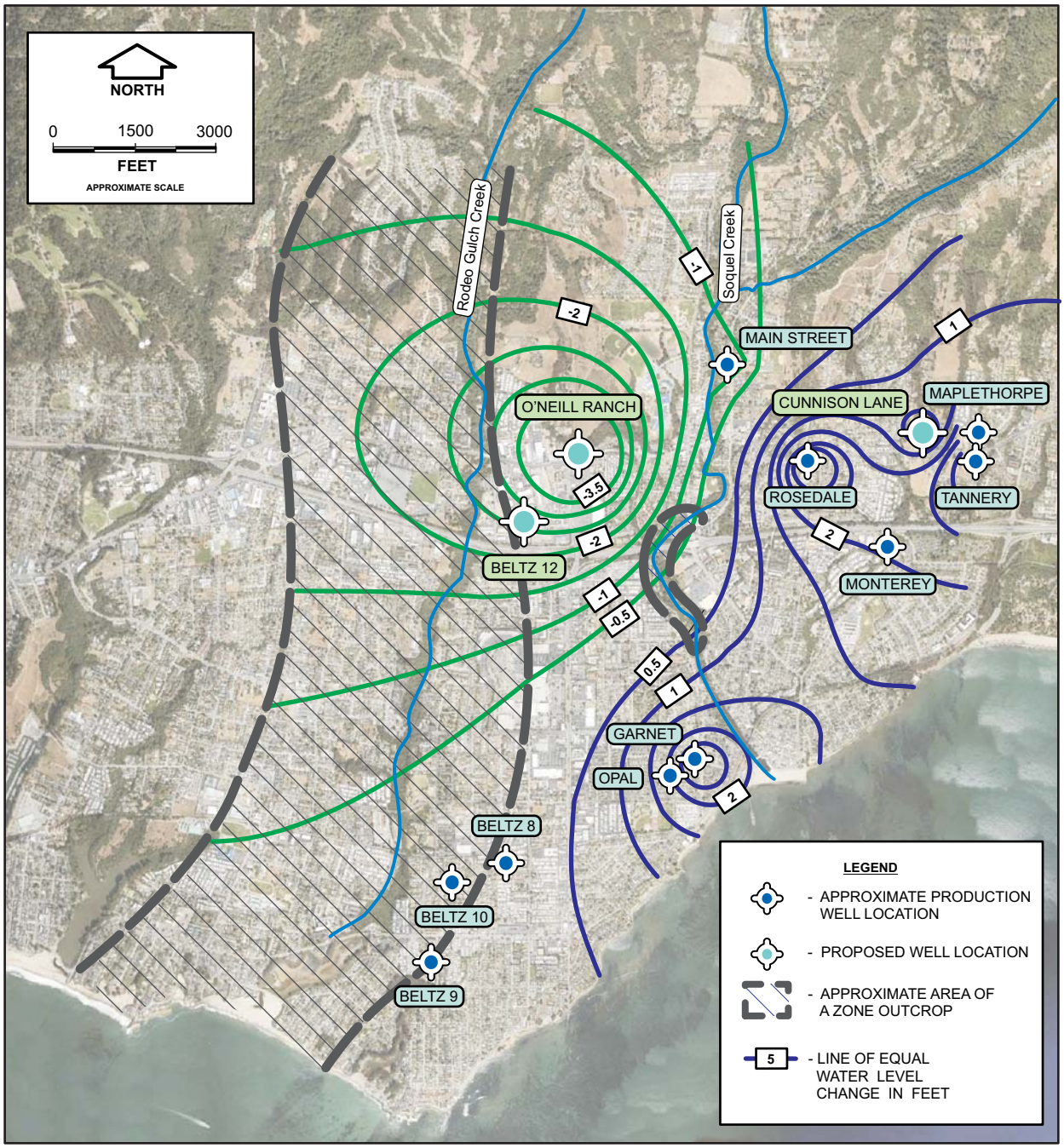
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
SEPTEMBER 30TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B5



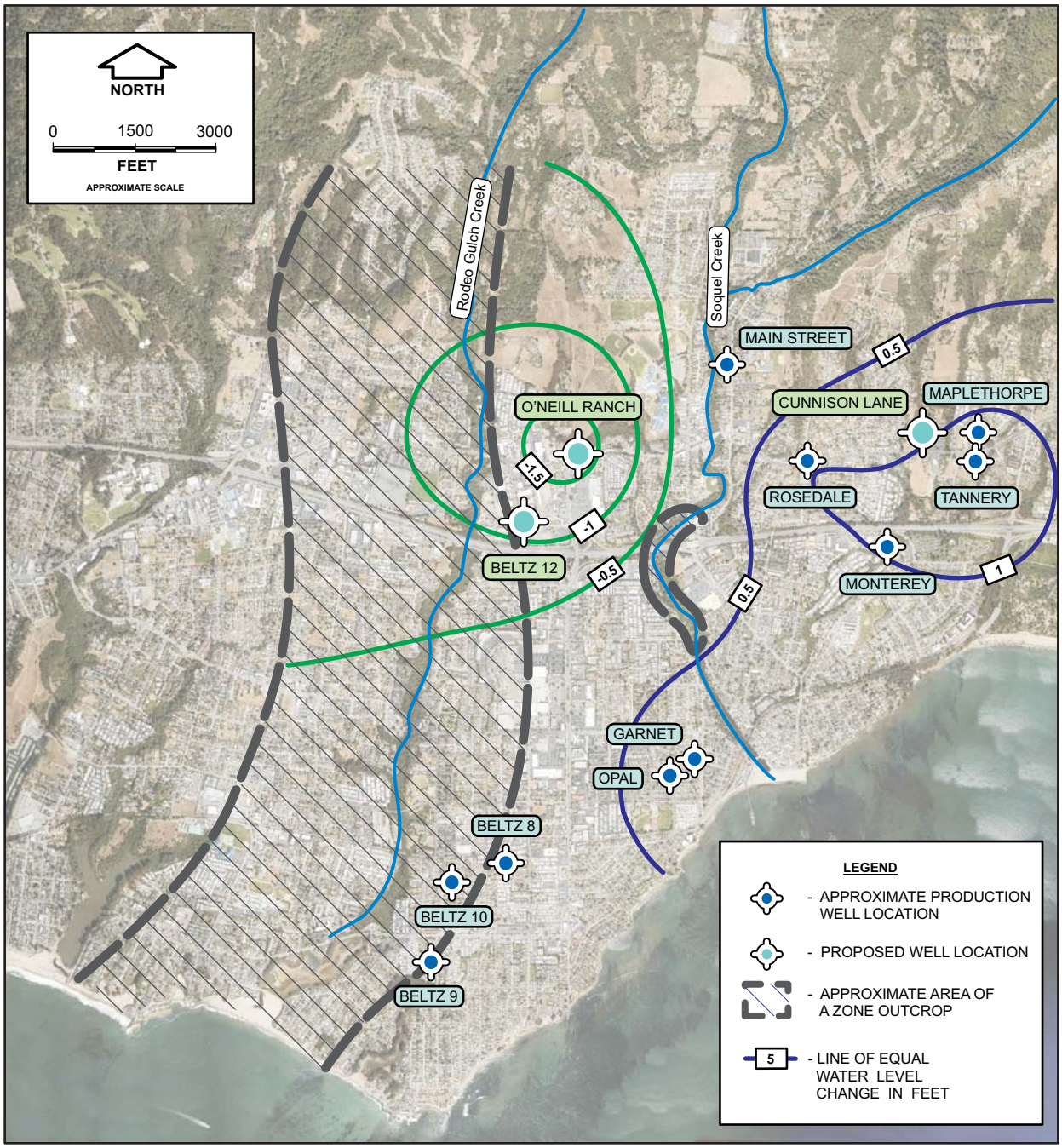
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
SEPTEMBER 30TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B6



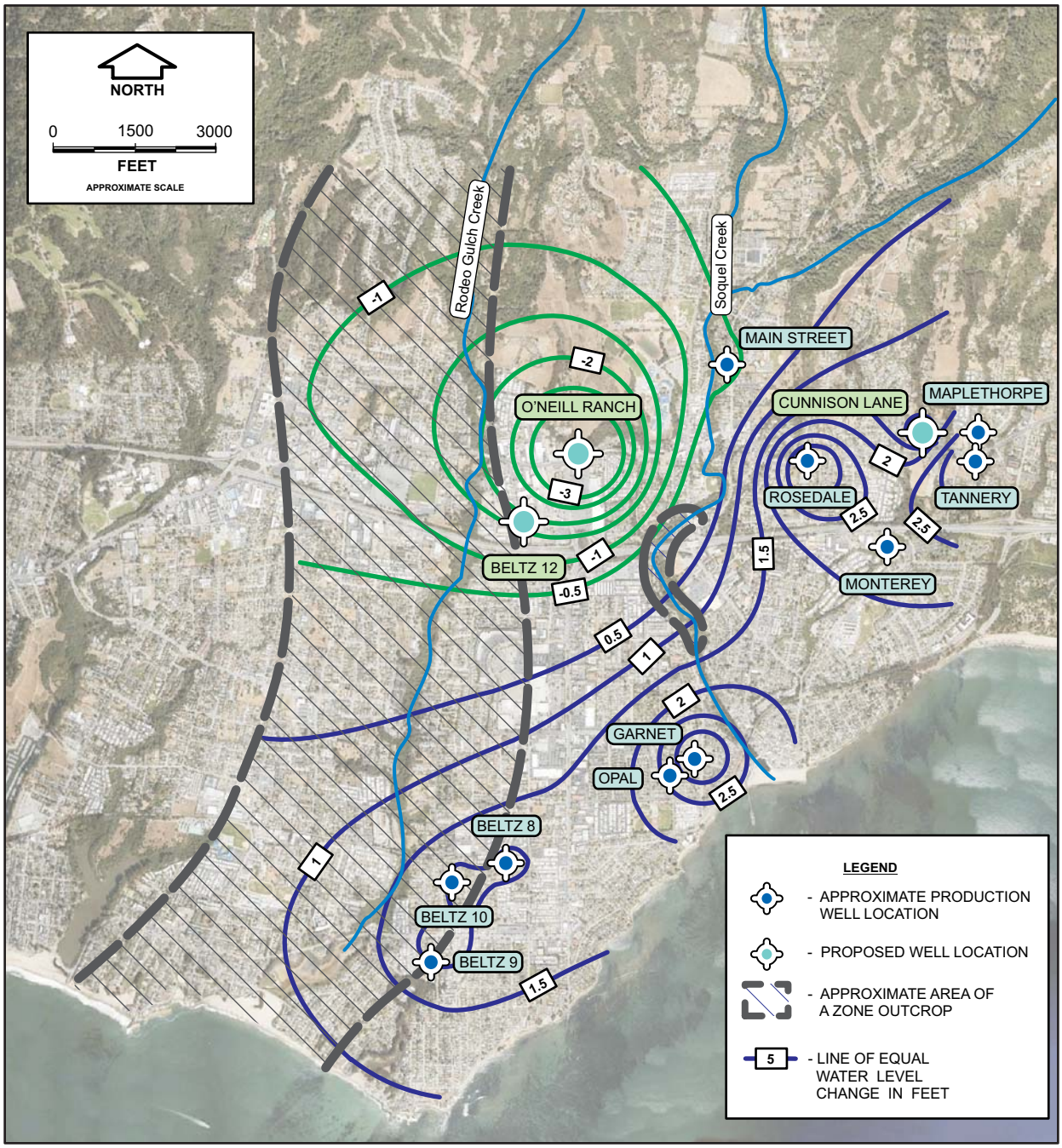
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
NOVEMBER 15TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B7



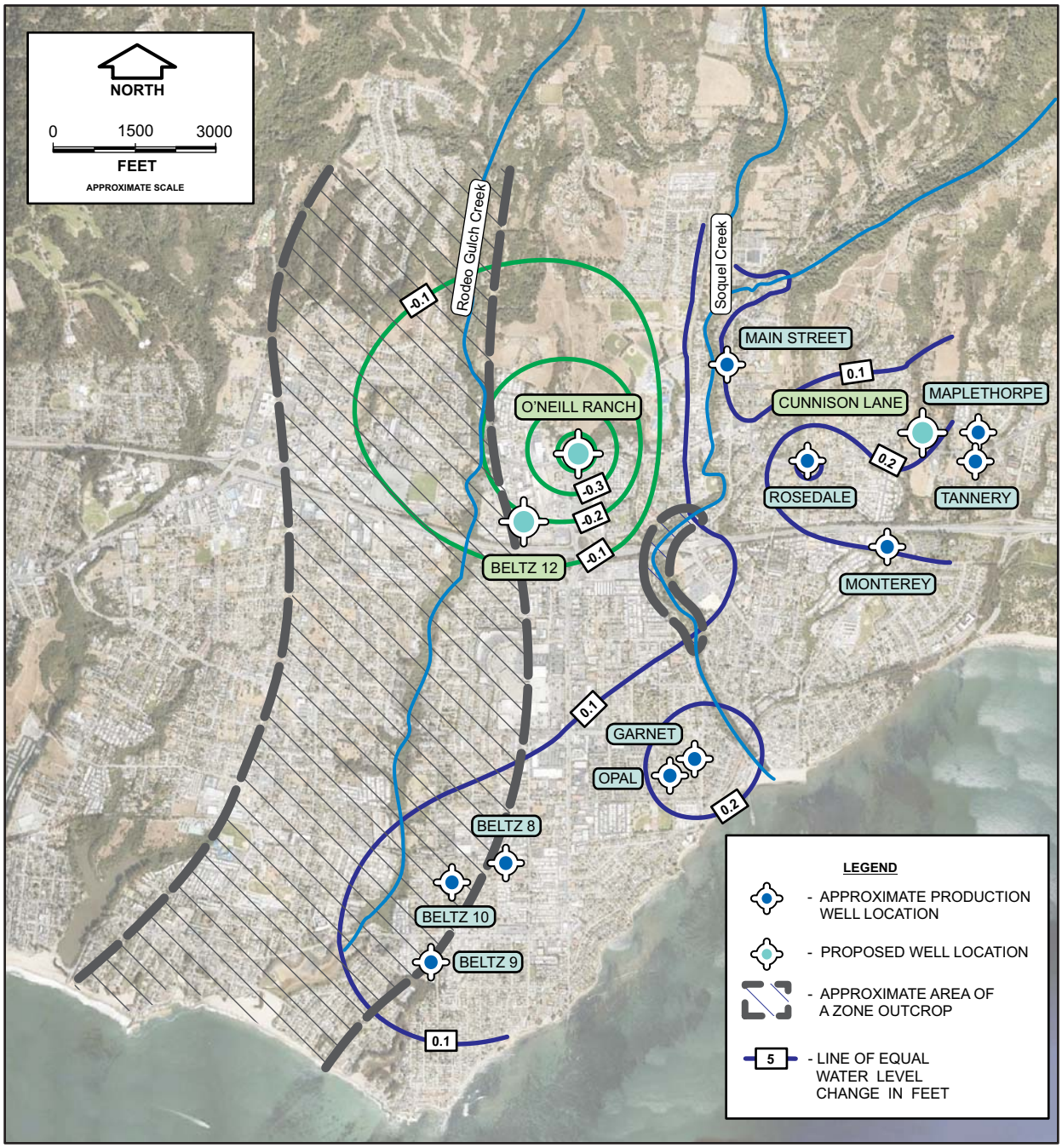
PROPOSED SQCWD PROJECT (NO CITY PROJECT)
NOVEMBER 15TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B8



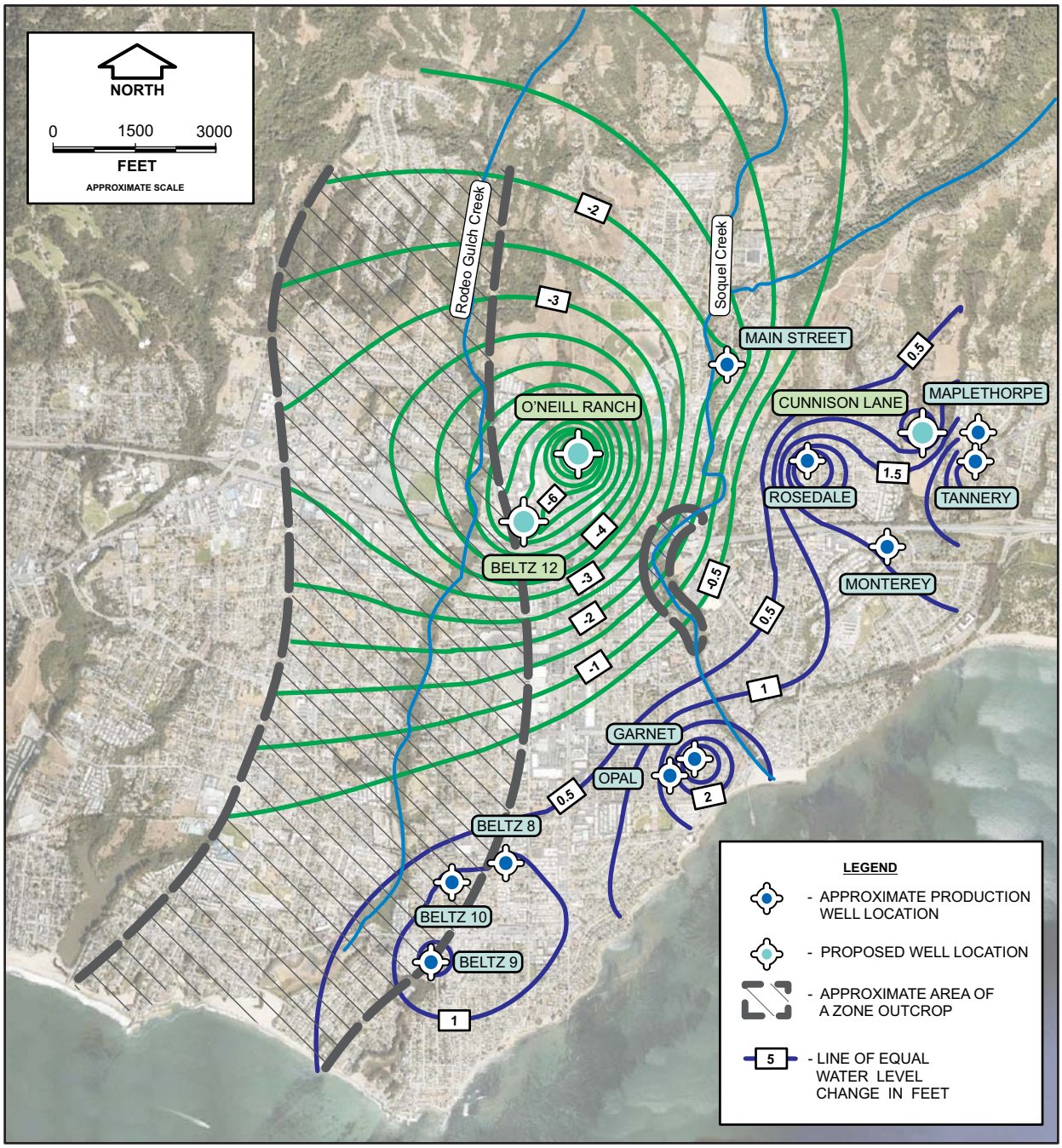
CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
MAY 18TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B9



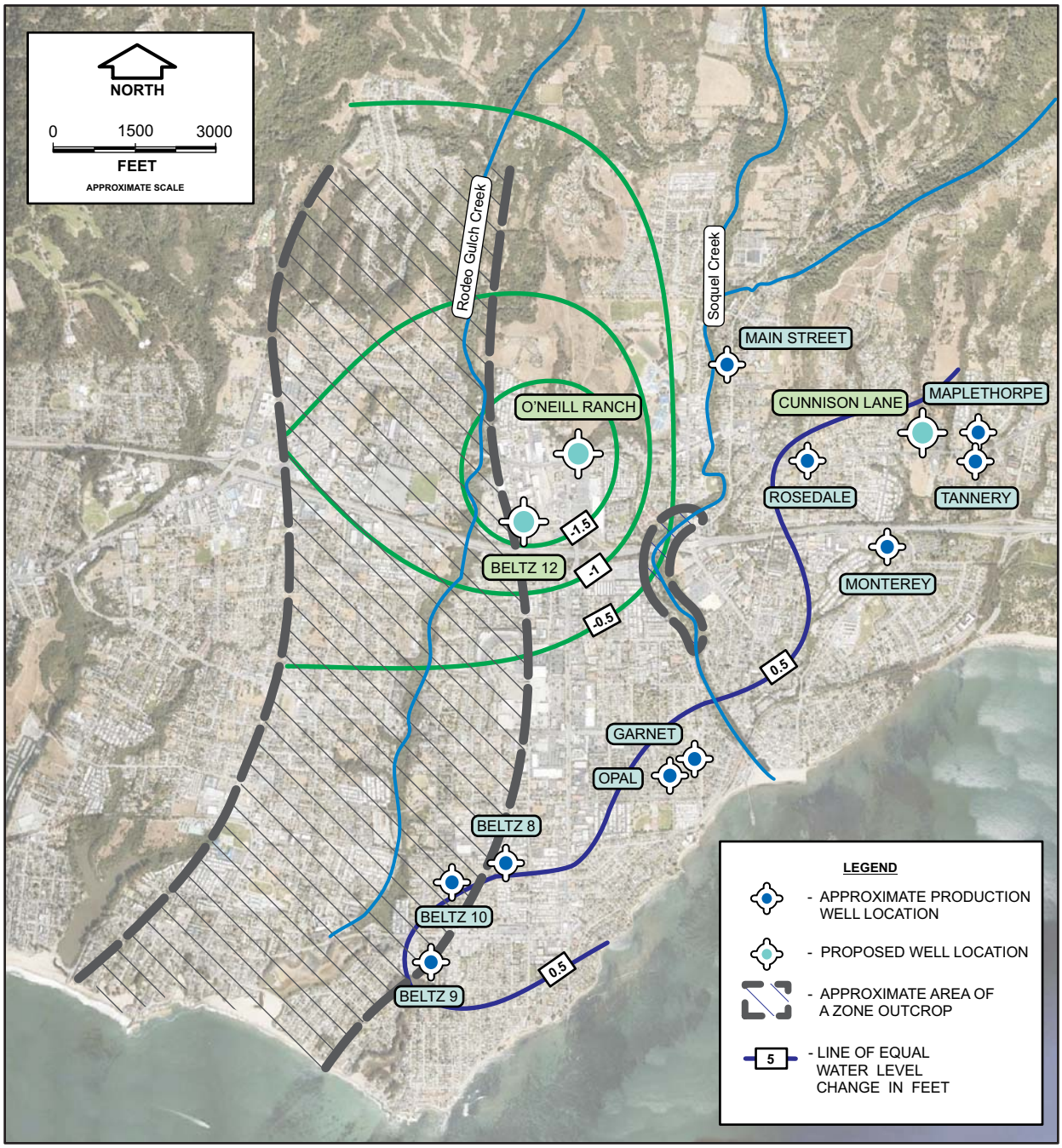
CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
MAY 18TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B10



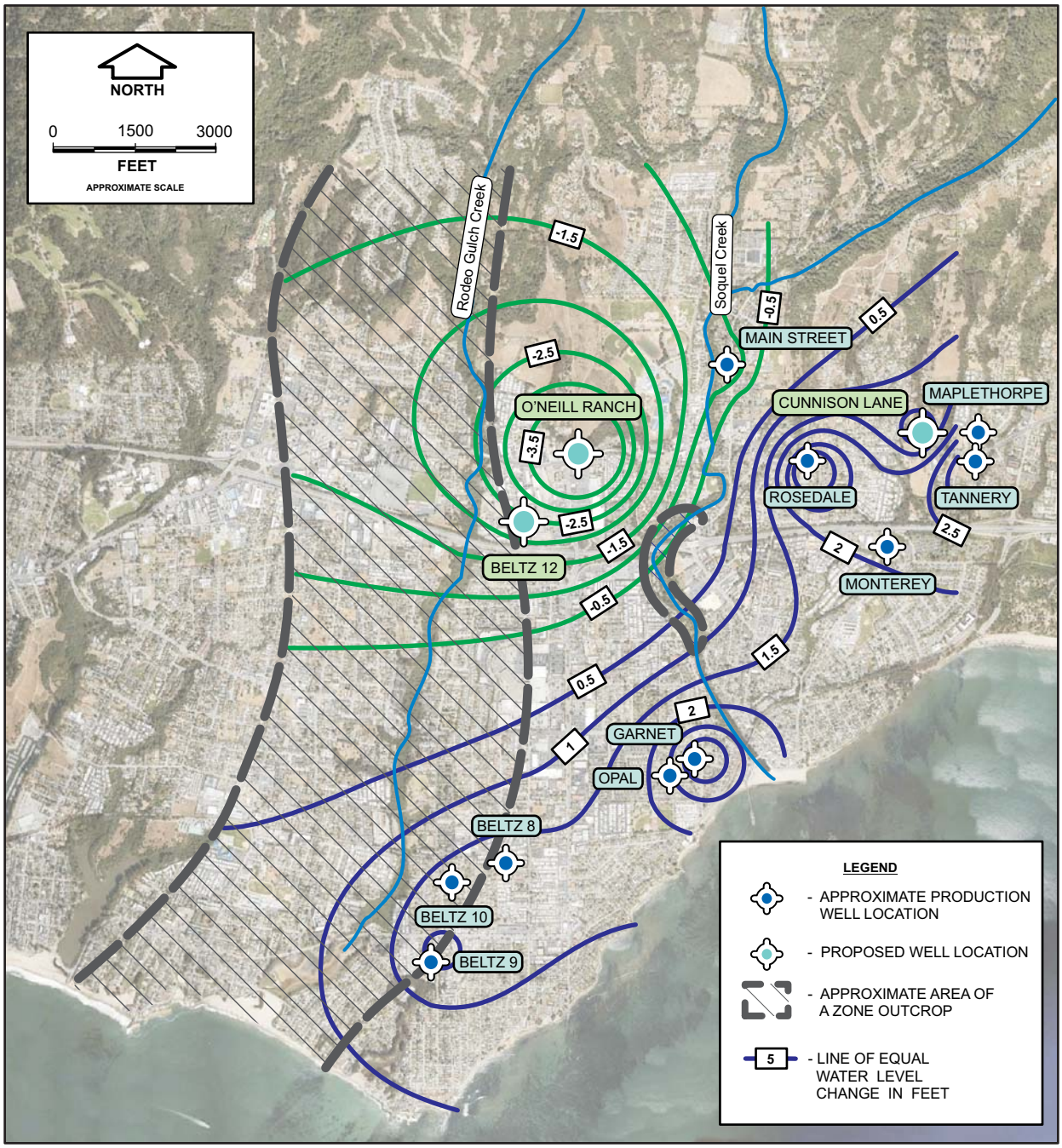
CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
SEPTEMBER 30TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B11



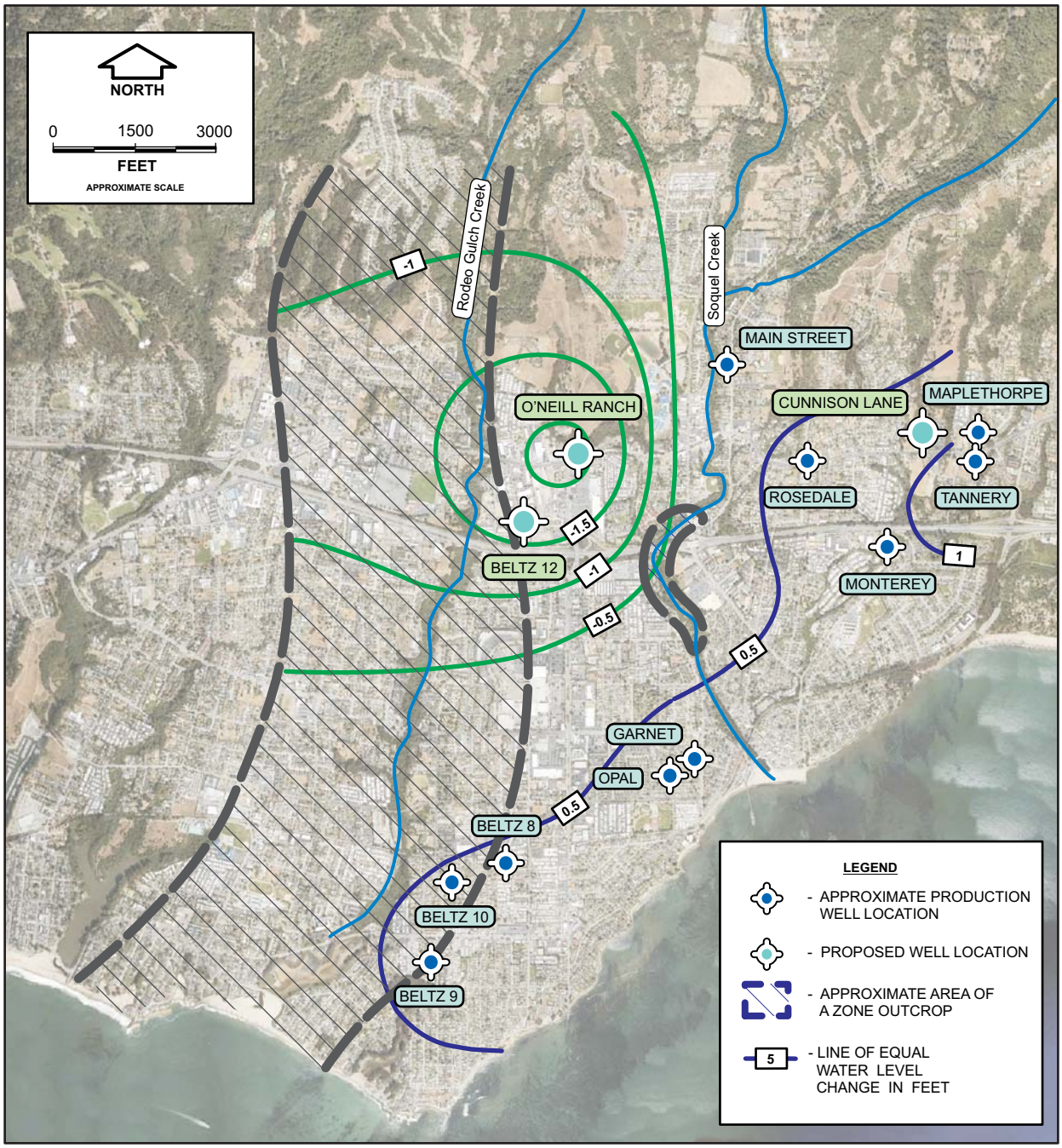
CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
SEPTEMBER 30TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE B12



CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
NOVEMBER 15TH, CHANGE IN PURISIMA A ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

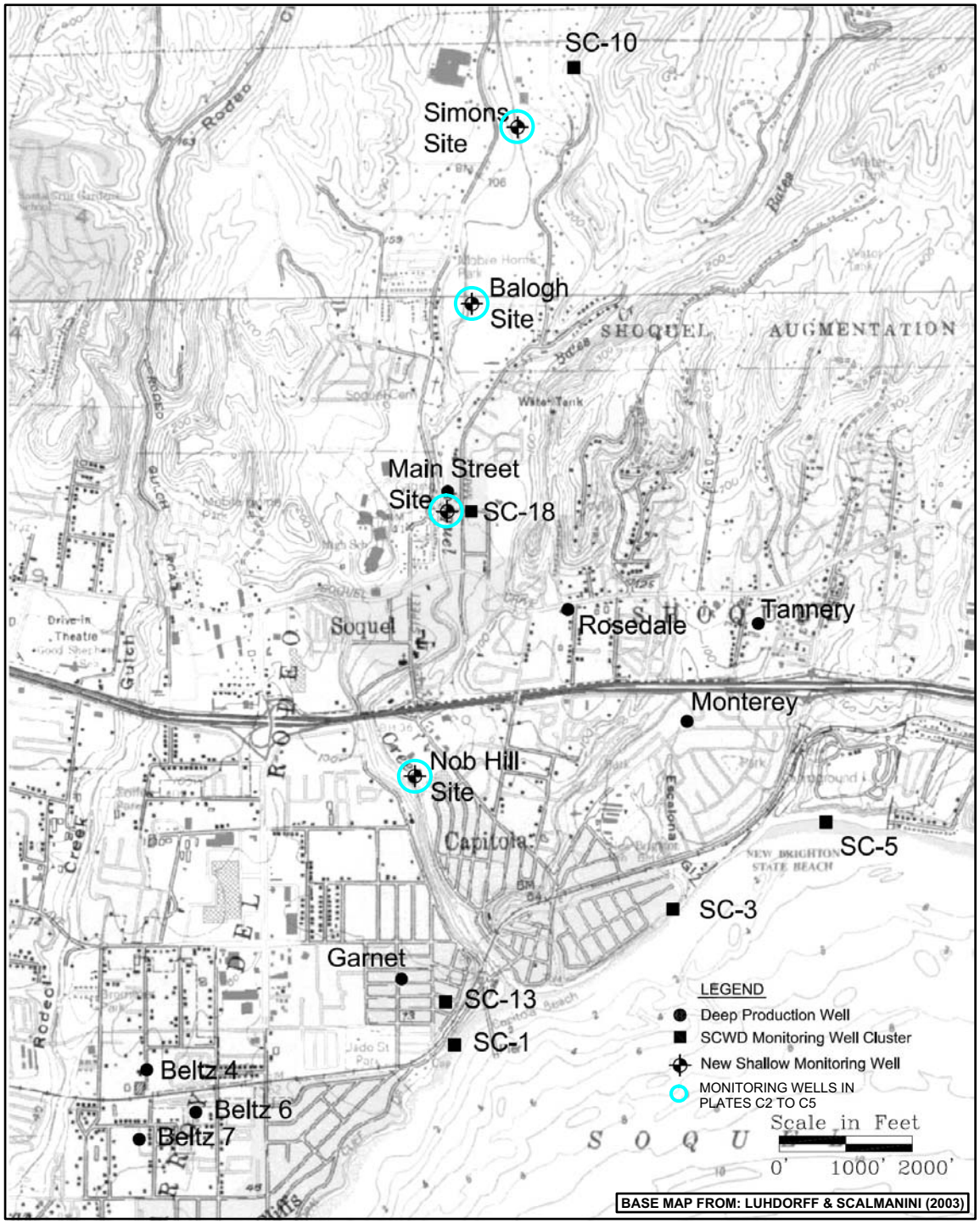
PLATE B13



CUMULATIVE PROPOSED PROJECTS (CITY AND SQCWD)
NOVEMBER 15TH, CHANGE IN PURISIMA B ZONE WATER LEVELS
Beltz Well No. 12 Well Interference
and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

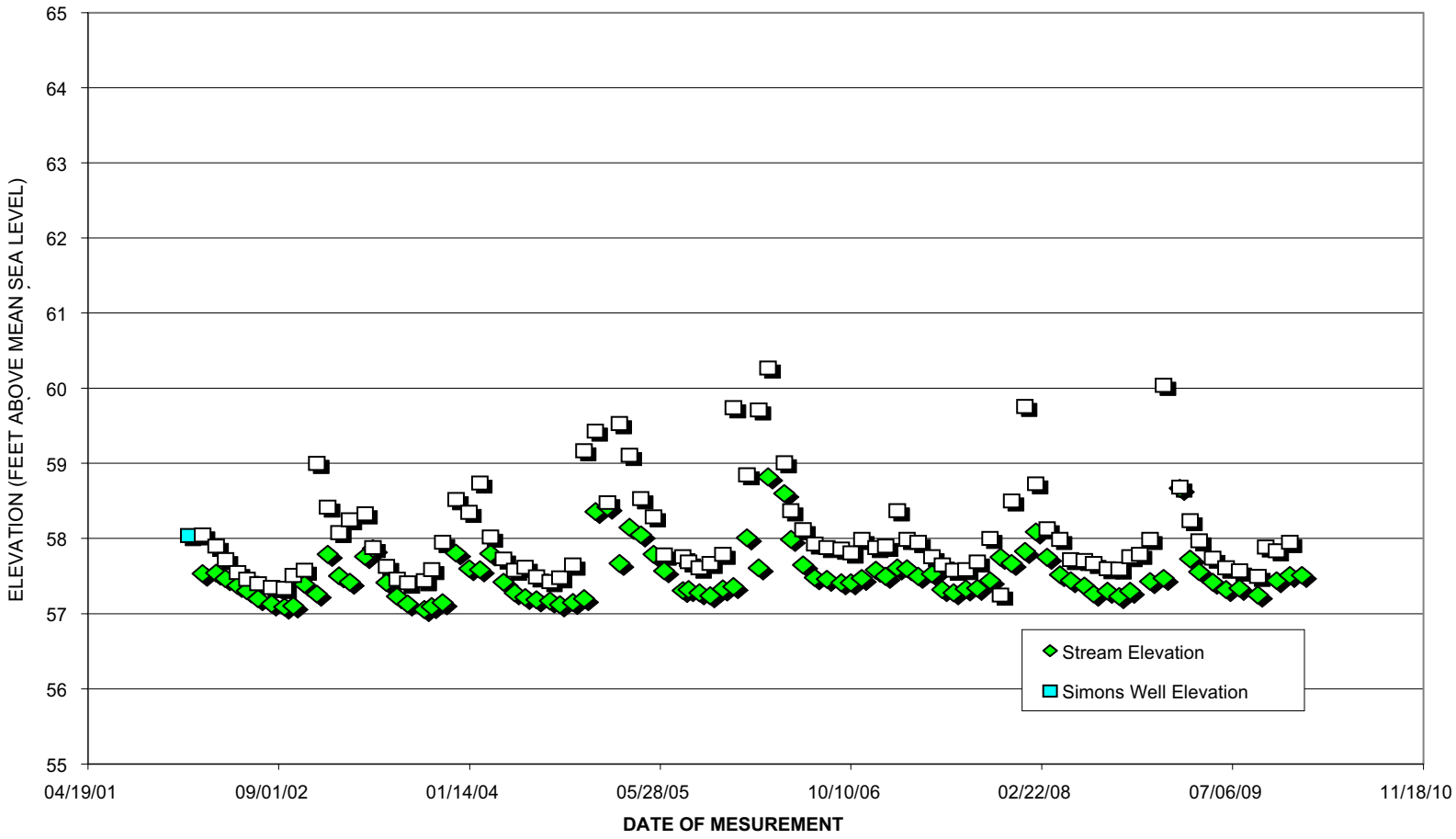
PLATE B14

APPENDIX C
SOQUEL CREEK MONITORING WELL DATA



SOQUEL CREEK MONITORING WELL LOCATION MAP
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C1

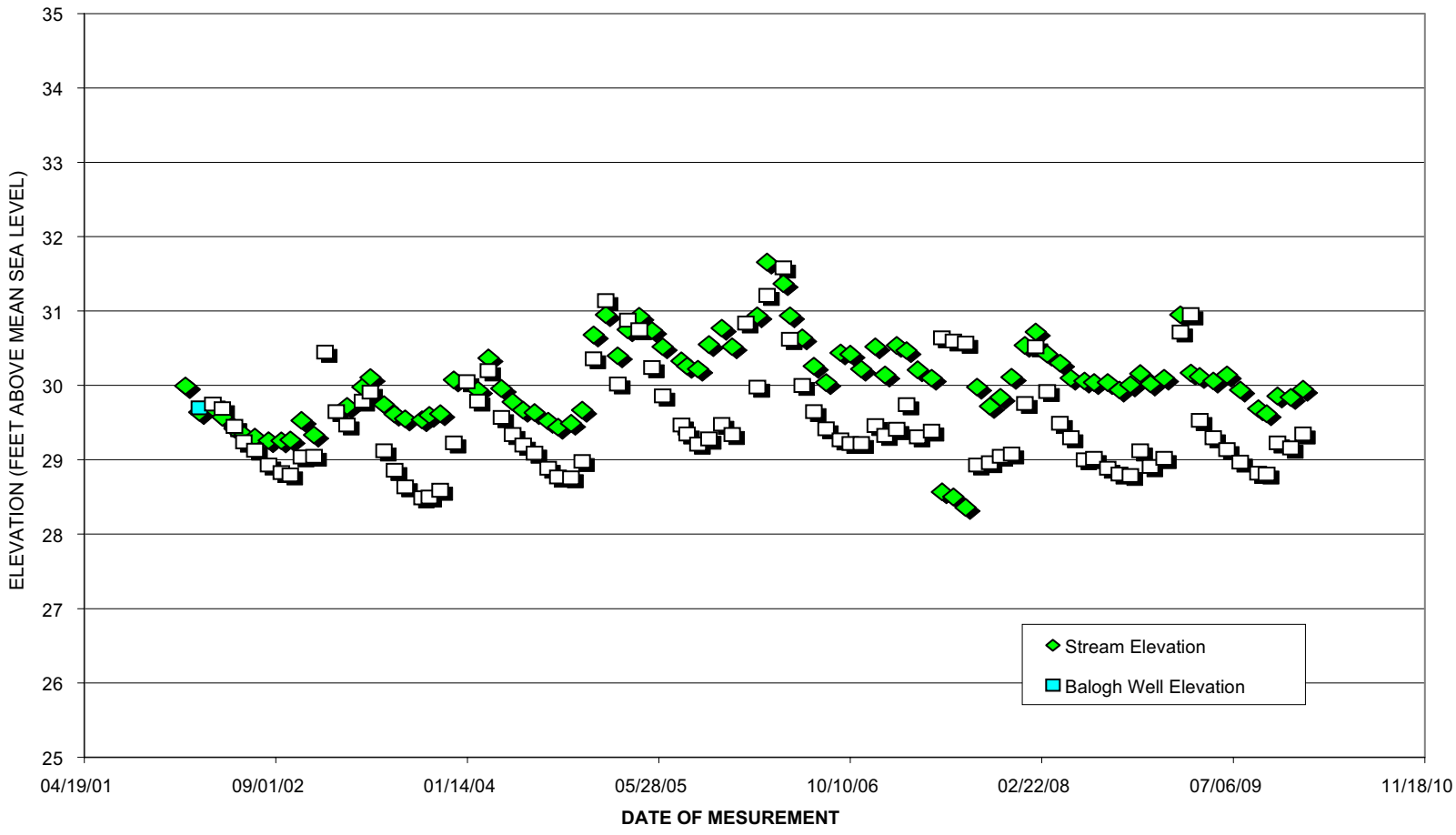


SIMONS MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C2

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

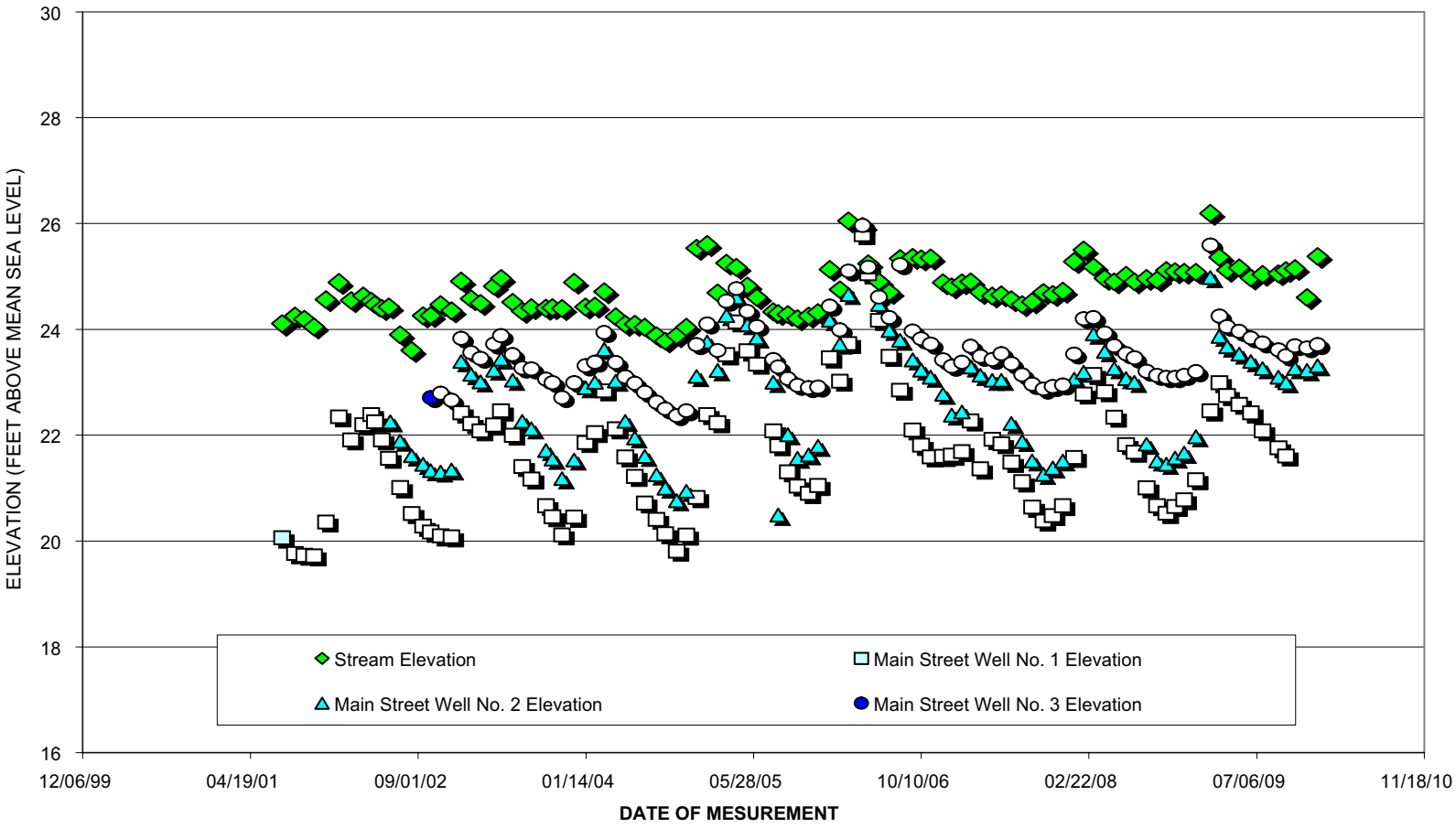


BALOGH MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C3

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

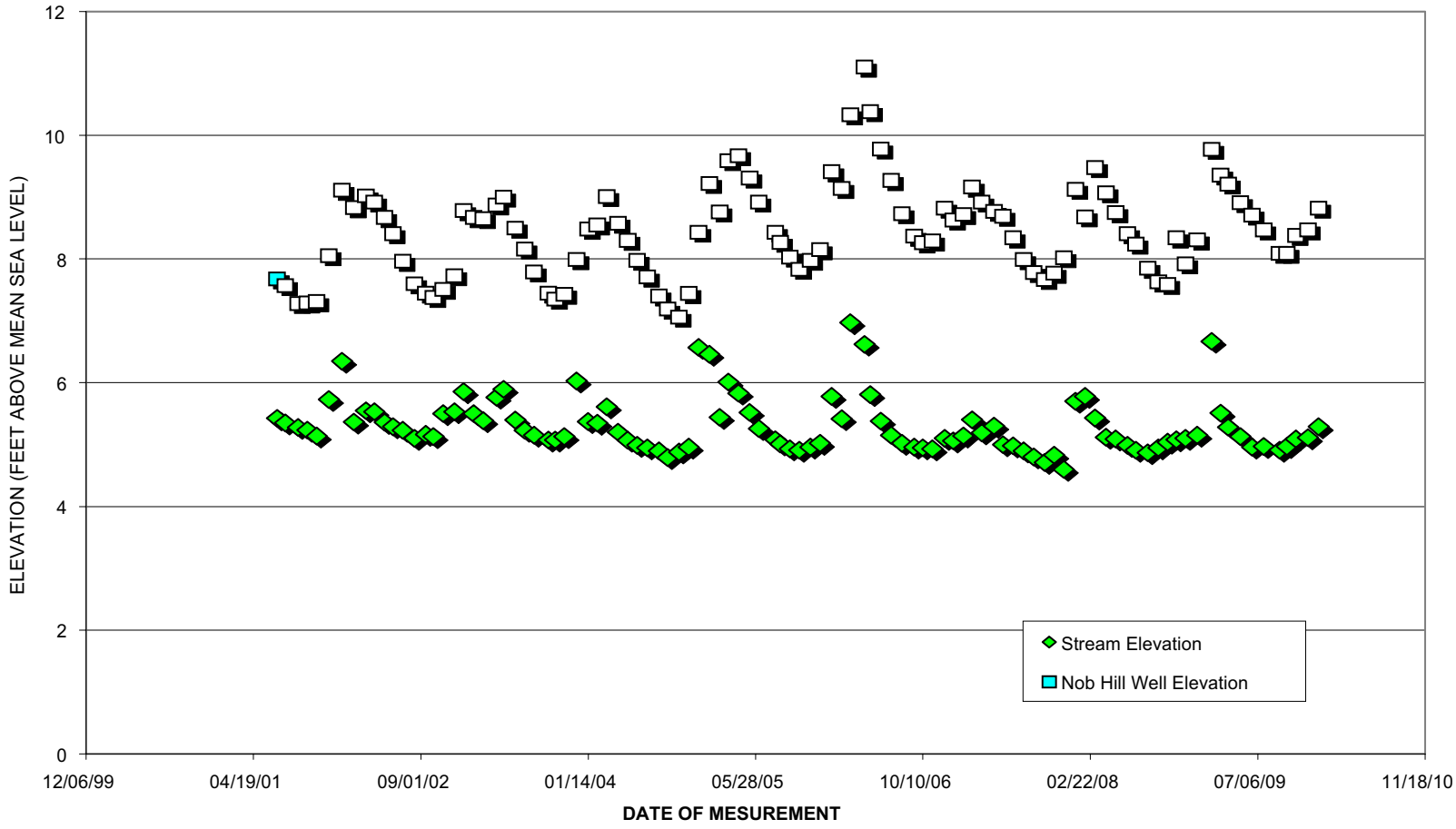


MAIN STREET MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C4

June 2011
Project No. 01-010-06D

HOPKINS GROUNDWATER CONSULTANTS



NOB HILL MONITORING SITE WATER LEVEL DATA
Beltz Well No. 12
Well Interference and Streamflow Impact Analysis
City of Santa Cruz
Santa Cruz, California

PLATE C5

June 2011
Project No. 01-010-06D

HOPKINS
GROUNDWATER
CONSULTANTS

APPENDIX D
PHOTOGRAPHIC DOCUMENTATION OF CREEK SAMPLE STATION CONDITIONS

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 1 (SOQUEL AVENUE)

STATION NO. 1 - UPSTREAM VIEW

STATION NO. 1 - DOWNSTREAM VIEW

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 2 (PORTER AVENUE)

STATION NO. 2 - UPSTREAM VIEW

STATION NO. 2 - DOWNSTREAM VIEW

SOQUEL CREEK - SEDIMENT SAMPLE STATION NO. 3

STATION NO. 3 - UPSTREAM VIEW

STATION NO. 3 - DOWNSTREAM VIEW

RODEO GULCH CREEK - SEDIMENT SAMPLE STATION NO. 4 (SOQUEL AVENUE)

STATION NO. 4 - DOWNSTREAM VIEW

RODEO GULCH CREEK - SEDIMENT SAMPLE STATION NO. 5 (COFFEE LANE PARK)

STATION NO. 5 - DOWNSTREAM VIEW

APPENDIX E
STREAMFLOW IMPACT ESTIMATIONS

TABLE E 1.1 PRODUCTION SCENARIO[1]
(MAY 18-BEFORE BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.45	3	-451	-0.0052
8(A)	0.601	500	20	10,000	3	3.435	3	-436	-0.0050
9(A)	0.601	500	20	10,000	3	3.426	3	-427	-0.0049
10(A)	0.601	500	20	10,000	3	3.41	3	-411	-0.0048
11(A)	0.601	500	20	10,000	3	3.37	3	-371	-0.0043
12(A)	0.601	500	20	10,000	3	3.335	3	-336	-0.0039
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								-2,430	-0.028
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								335	0.004
							TOTAL	-2,095	-0.024

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B3

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 1.2 PRODUCTION SCENARIO[1]
(SEPTEMBER 30-END OF BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	2.21	3	791	0.0092
8(A)	0.601	500	20	10,000	3	2.07	3	932	0.0108
9(A)	0.601	500	20	10,000	3	1.91	3	1,092	0.0126
10(A)	0.601	500	20	10,000	3	1.756	3	1,246	0.0144
11(A)	0.601	500	20	10,000	3	1.78	3	1,222	0.0141
12(A)	0.601	500	20	10,000	3	1.87	3	1,132	0.0131
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								6,415	0.074
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								335	0.004
							TOTAL	6,750	0.078

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B3

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 1.3 PRODUCTION SCENARIO[1]
(NOVEMBER 15-END OF BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.3	3	-301	-0.0035
8(A)	0.601	500	20	10,000	3	3.29	3	-290	-0.0034
9(A)	0.601	500	20	10,000	3	3.28	3	-280	-0.0032
10(A)	0.601	500	20	10,000	3	3.25	3	-250	-0.0029
11(A)	0.601	500	20	10,000	3	3.2	3	-200	-0.0023
12(A)	0.601	500	20	10,000	3	3.17	3	-170	-0.0020
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								-1,492	-0.017
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								335	0.004
							TOTAL	-1,158	-0.013

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B3

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 2.1 PRODUCTION SCENARIO[1]
(MAY 18-BEFORE BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.68	3	-681	-0.0079
8(A)	0.601	500	20	10,000	3	3.34	3	-341	-0.0039
9(A)	0.601	500	20	10,000	3	2.88	3	120	0.0014
10(A)	0.601	500	20	10,000	3	2.397	3	604	0.0070
11(A)	0.601	500	20	10,000	3	2.33	3	671	0.0078
12(A)	0.601	500	20	10,000	3	2.54	3	461	0.0053
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								834	0.010
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								293	0.003
							TOTAL	1,127	0.013

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B4
[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL
[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 2.2 PRODUCTION SCENARIO[1]
(SEPTEMBER 30-END OF BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.53	3	-531	-0.0061
8(A)	0.601	500	20	10,000	3	3.12	3	-120	-0.0014
9(A)	0.601	500	20	10,000	3	2.68	3	321	0.0037
10(A)	0.601	500	20	10,000	3	2.18	3	821	0.0095
11(A)	0.601	500	20	10,000	3	2.12	3	881	0.0102
12(A)	0.601	500	20	10,000	3	2.367	3	634	0.0073
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								2,006	0.023
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								293	0.003
							TOTAL	2,299	0.027

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B4
[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL
[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 2.3 PRODUCTION SCENARIO[1]
(NOVEMBER 15-END OF BELTZ WELLFIELD PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.5	3	-501	-0.0058
8(A)	0.601	500	20	10,000	3	3.1	3	-100	-0.0012
9(A)	0.601	500	20	10,000	3	2.64	3	361	0.0042
10(A)	0.601	500	20	10,000	3	2.14	3	861	0.0100
11(A)	0.601	500	20	10,000	3	2.05	3	952	0.0110
12(A)	0.601	500	20	10,000	3	2.33	3	671	0.0078
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								2,244	0.026
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								293	0.003
							TOTAL	2,536	0.029

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B4
[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL
[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 3.1 PRODUCTION SCENARIO[1]
(MAY 18-BEFORE BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	4.1	3	-1,102	-0.0128
8(A)	0.601	500	20	10,000	3	3.74	3	-741	-0.0086
9(A)	0.601	500	20	10,000	3	3.3	3	-301	-0.0035
10(A)	0.601	500	20	10,000	3	2.8	3	200	0.0023
11(A)	0.601	500	20	10,000	3	2.7	3	301	0.0035
12(A)	0.601	500	20	10,000	3	2.9	3	100	0.0012
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								-1,543	-0.018
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								554	0.006
							TOTAL	-988	-0.011

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B5

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 3.2 PRODUCTION SCENARIO[1]
(SEPTEMBER 30-END OF BELTZ WELL NO. 12 PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	2.76	3	240	0.0028
8(A)	0.601	500	20	10,000	3	2.2	3	801	0.0093
9(A)	0.601	500	20	10,000	3	1.6	3	1,402	0.0162
10(A)	0.601	500	20	10,000	3	0.92	3	2,083	0.0241
11(A)	0.601	500	20	10,000	3	0.89	3	2,114	0.0245
12(A)	0.601	500	20	10,000	3	1.22	3	1,783	0.0206
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								8,424	0.098
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								554	0.006
							TOTAL	8,978	0.104

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B5

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

TABLE E 3.3 PRODUCTION SCENARIO[1]
(NOVEMBER 15-END OF BELTZ WELLFIELD PRODUCTION CYCLE)

REACH NO. (ZONE)	K (FEET/DAY)	L (FEET)	W (FEET)	L&W (SQ. FEET)	H_{CREEK} (FEET)	$H_{AQUIFER}$ (FEET)	b_c (FEET)	Q_{CREEK}[2,3] (Ft^3/DAY)	Q_{CREEK}[2,3] (CFS)
7(A)	0.601	500	20	10,000	3	3.8	3	-801	-0.0093
8(A)	0.601	500	20	10,000	3	3.38	3	-381	-0.0044
9(A)	0.601	500	20	10,000	3	2.92	3	80	0.0009
10(A)	0.601	500	20	10,000	3	2.38	3	621	0.0072
11(A)	0.601	500	20	10,000	3	2.272	3	729	0.0084
12(A)	0.601	500	20	10,000	3	2.47	3	531	0.0061
TOTAL REDUCTION TO CREEK FLOW IN A ZONE								779	0.009
TOTAL REDUCTION TO CREEK FLOW IN B ZONE AS CALCULATED BY MODEL								554	0.006
							TOTAL	1,334	0.015

[1] - WELL PRODUCTION DISTRIBUTION PRESENTED IN TABLE B5

[2] - CREEK BED MATERIAL ESTIMATED AT 50 PERCENT IMPERMEABLE MATERIAL

[3] - NEGATIVE NUMBERS INDICATE A REDUCTION IN LOSS OF STREAM FLOWS

APPENDIX F
PERCENT STREAMFLOW REDUCTION IN CRITICALLY DRY YEARS

FLOW IMPACT ANALYSIS TABLES

TABLE F1

Soquel Creek Flow Impact Assessment
34 days from the start of pumping season (approx. May 18)

Impact from Beltz 12						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**6.99**	7.30	0.024	7.32	0.3%
multiple Cr. Dry	1977	**2.29**	2.39	0.024	2.41	1.0%
	1990	**3.77**	3.94	0.024	3.96	0.6%

Cumulative Impacts						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**6.99**	7.30	0.011	7.31	0.2%
multiple Cr. Dry	1977	**2.29**	2.39	0.011	2.40	0.5%
	1990	**3.77**	3.94	0.011	3.95	0.3%

USGS Watershed	40.2	sq-miles from USGS website
Outlet Watershed	42.0	sq-miles
USGS Precipitation	1.0	
Outlet Precipitation	1.0	

	Creek Discharge (USGS gauge 11160000)		
	2007	**1977**	**1990**
12-May	7.0	3.0	4.0
13-May	7.1	2.8	3.9
14-May	7.2	2.3	3.9
15-May	7.2	2.1	3.7
16-May	7.0	2.0	3.6
17-May	6.8	1.8	3.7
18-May	6.6	2.0	3.6
Average	7.0	2.3	3.8

[1] Flow estimates at USGS gage No. 11160000.
[2] Prorated flow using SWRCB-DWR, 2006 method.
[3] Streamflow reduction values from Appendix E.
[4] Prorated outlet discharge minus cumulative streamflow reduction estimated in Appendix E.

TABLE F2

Soquel Creek Flow Impact Assessment
169 days from the start of pumping season (approx. Sep30)

Impact from Beltz 12						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**1.51**	1.58	-0.078	1.50	-4.9%
multiple Cr. Dry	1977	**1.06**	1.11	-0.078	1.03	-7.1%
	1990	**1.46**	1.52	-0.078	1.44	-5.1%

Cumulative Impacts						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**1.51**	1.58	-0.104	1.48	-6.6%
multiple Cr. Dry	1977	**1.06**	1.11	-0.104	1.00	-9.4%
	1990	**1.46**	1.52	-0.104	1.42	-6.8%

USGS Watershed	40.2	sq-miles from USGS website
Outlet Watershed	42.0	sq-miles
USGS Precipitation	1.0	
Outlet Precipitation	1.0	

	Creek Discharge During Last Week of Beltz 12 Pumping Season (USGS gauge 11160000)		
	2007	**1977**	**1990**
24-Sep	1.9	0.99	1.8
25-Sep	1.5	0.92	1.7
26-Sep	1.3	0.83	1.5
27-Sep	1.3	0.87	1.4
28-Sep	1.5	1.20	1.3
29-Sep	1.7	1.40	1.3
30-Sep	1.4	1.20	1.2
Average	1.5	1.06	1.5

[1] Flow estimates at USGS gage No. 11160000.
[2] Prorated flow using SWRCB-DWR, 2006 method.
[3] Streamflow reduction values from Appendix E.
[4] Prorated outlet discharge minus cumulative streamflow reduction estimated in Appendix E.

TABLE F3

Soquel Creek Flow Impact Assessment
215 days from the start of pumping season (approx. Nov15)

Impact from Beltz 12						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**3.46**	3.61	0.013	3.62	0.4%
multiple Cr. Dry	1977	**1.29**	1.34	0.013	1.36	1.0%
	1990	**1.30**	1.36	0.013	1.37	1.0%

Cumulative Impacts						
Water Year	Representative Year - Scenario	Stream Flow (cfs)		Change in Stream Flow [3] (cfs)	Stream Outlet Impacted Flow [4] (cfs)	Percent Change in Outlet Flow
		Avg. USGS gauge 11160000 [1]	Calculated Outlet [2]			
single Cr. Dry	2007	**3.46**	3.61	-0.015	3.60	-0.4%
multiple Cr. Dry	1977	**1.29**	1.34	-0.015	1.33	-1.1%
	1990	**1.30**	1.36	-0.015	1.34	-1.1%

USGS Watershed	40.2	sq-miles from USGS website
Outlet Watershed	42.0	sq-miles
USGS Precipitation	1.0	
Outlet Precipitation	1.0	

	Creek Discharge During Last Week of Beltz 8,9,&10 Pumping Season (USGS gauge 11160000)		
	2007	**1977**	**1990**
9-Nov	2.9	1.3	1.2
10-Nov	3.2	1.3	1.3
11-Nov	5.2	1.3	1.3
12-Nov	3.9	1.3	1.3
13-Nov	3.1	1.3	1.3
14-Nov	2.9	1.2	1.3
15-Nov	3.0	1.3	1.4
Average	3.5	1.3	1.3

[1] Flow estimates at USGS gage No. 11160000.
[2] Prorated flow using SWRCB-DWR, 2006 method.
[3] Streamflow reduction values from Appendix E.
[4] Prorated outlet discharge minus cumulative streamflow reduction estimated in Appendix E.

TABLE F4

Summary of Soquel Creek Outlet Daily Streamflow Discharge Analysis[1]						
Representative Critically Dry Years-Scenarios	USGS Gage Discharge[2] (cfs)	Prorated Outlet Discharge[3] (cfs)	Beltz Well 12 Impacts		Cumulative Impacts	
			Stream Outlet Impacted Flow[4] (cfs)	Percent Change in Outlet Flow	Stream Outlet Impacted Flow[4] (cfs)	Percent Change in Outlet Flow
May-77	**2.29**	2.39	2.41	1.0%	2.40	0.5%
Sep-77	**1.06**	1.11	1.03	-7.1%	1.00	-9.4%
Nov-77	**1.29**	1.34	1.36	1.0%	1.33	-1.1%
May-90	**3.77**	3.94	3.96	0.6%	3.95	0.3%
Sep-90	**1.46**	1.52	1.44	-5.1%	1.42	-6.8%
Nov-90	**1.30**	1.36	1.37	1.0%	1.34	-1.1%
May-07	**6.99**	7.30	7.32	0.3%	7.31	0.2%
Sep-07	**1.51**	1.58	1.50	-4.9%	1.48	-6.6%
Nov-07	**3.46**	3.61	3.62	0.4%	3.60	-0.4%

1 Discharge = selected daily mean discharge for representative w ater year and scenario.

2 Flow estimates at USGS gage No. 11160000.

3 Prorated flow using SWRCB-DWR, 2006 method.

4 Prorated outlet discharge minus cumulative streamflow reduction estimated in Appedix E.

USGS STREAM GAGE DATA FOR CRITICALLY DRY YEARS 1977, 1990, AND 2007

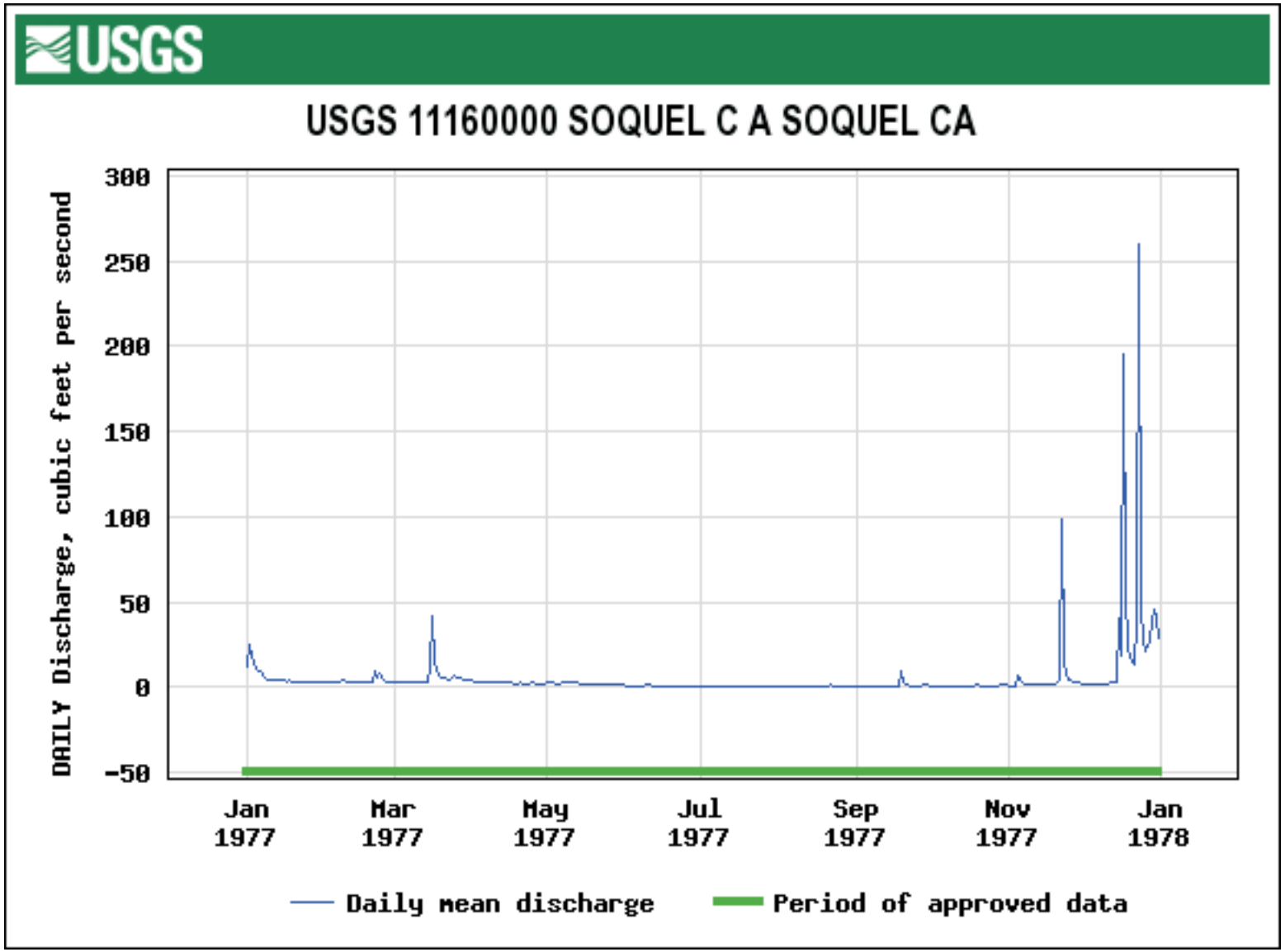

USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
300
250
200
150
100
50
0
-50
Jan 1977
Mar 1977
May 1977
Jul 1977
Sep 1977
Nov 1977
Jan 1978
Daily mean discharge
Period of approved data

PLATE F1

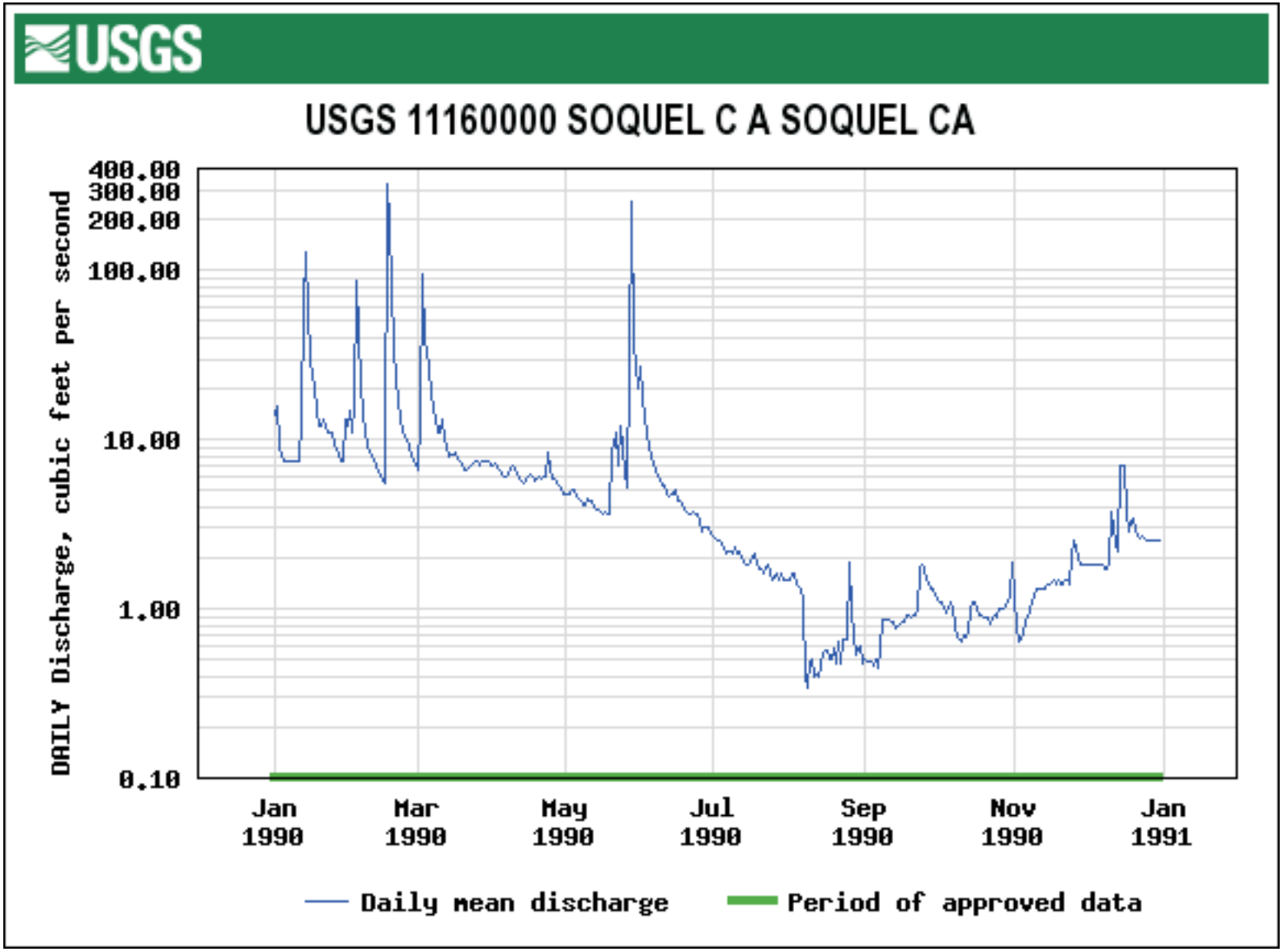

USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
400.00
300.00
200.00
100.00
10.00
1.00
0.10
Jan 1990
Mar 1990
May 1990
Jul 1990
Sep 1990
Nov 1990
Jan 1991
Daily mean discharge
Period of approved data

PLATE F2

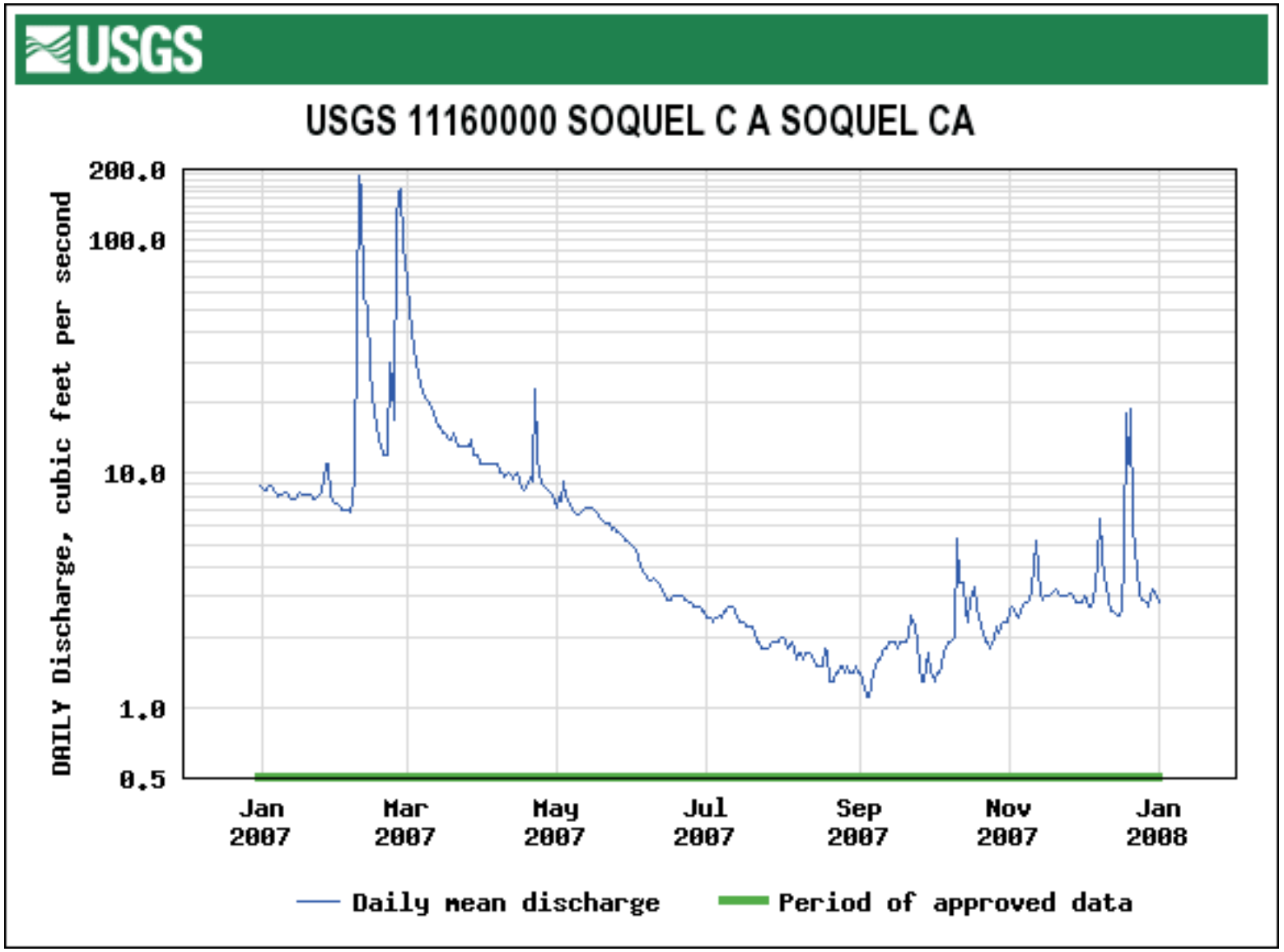

USGS
USGS 11160000 SOQUEL C A SOQUEL CA
DAILY Discharge, cubic feet per second
200.0
100.0
10.0
1.0
0.5
Jan 2007
Mar 2007
May 2007
Jul 2007
Sep 2007
Nov 2007
Jan 2008
Daily mean discharge
Period of approved data

PLATE F3