Pittsburg Plain Groundwater Basin Groundwater Management Plan

October 2012

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CONSULTING ENGINEERS

Pittsburg Plain Groundwater Basin Groundwater Management Plan

Prepared For
City of Pittsburg, CA

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Executive Summary

This Groundwater Management Plan (Plan) has been prepared by the City of Pittsburg (City) to manage and protect groundwater resources within the City and the underlying groundwater basin. The City is a local public agency that supplies water to customers within its service area. As a result of Assembly Bill (AB) 3030, the California Water Code (CWC) Section 10750 et seq. provides local agencies with the authority to adopt and implement groundwater management plans. The CWC was subsequently amended in 2002 as a result of Senate Bill (SB) 1938 and again in 2011 by passage of AB 359. Both amendments detail components required in a groundwater management plan to enable the local agency to be eligible for public funding for groundwater projects from funds provided by the DWR. On May 7, 2012 and in accordance with the requirements of the CWC, the City of Pittsburg City Council adopted a resolution of intent to prepare a groundwater management plan. This document embodies that Plan.

The primary objective of this Plan is to provide a long-term strategy to maintain the quality, reliability, and sustainability of groundwater resources within the Pittsburg Plain Groundwater Basin (Basin). To accomplish this, the City intends to manage groundwater conjunctively with its surface water resources and support Basin Management Objectives (BMOs) directed toward the sustainability and optimal use of groundwater supplies. Each BMO presented in this Plan is accompanied by action items that address specific concerns and basin-wide interests, as formulated in coordination with a Groundwater Management Technical Advisory Committee (Technical Committee).

The Pittsburg Plain Groundwater Basin (DWR Basin Number 2-4) is located along the southern shore of Suisun Bay. It is bounded by Suisun Bay to the north, the Tracy Subbasin (DWR Subbasin 5-22.15) to the east, and the Clayton Valley Groundwater Basin (DWR Basin 2-5) to the west (**Figure ES-1)** and includes the overlying City of Pittsburg and Bay Point census-defined place (CDP). The Basin consists of mild sloping alluvial plains ranging from sea level to +100 feet elevation. The primary water-bearing units of the Basin are alluvium deposits ranging from Pleistocene to Recent in age. Characterization of the Basin hydrogeologic setting is limited to the area around the City. Aquifer units beneath the City consist of north-dipping sand and gravel material under confined to semi-confined conditions. To the south, a deeper zone, where most of the Basin groundwater production occurs, is close to the ground surface and appears to interbed with the sandy clay surface layer. Recharge to the deeper zone is interpreted to occur in the hills along the southern portion of the Basin where the primary aquifer units outcrop at the land surface. Similar hydrogeologic conditions are expected in the western portion of the Basin near Bay Point, though the ability to characterize the hydrogeology of this portion of the Basin is limited by a lack of data. Groundwater flow appears to be generally to the north-northeast toward the Suisun Bay, which defines the northern border of the Basin.

Surface water supplied by Contra Costa Water District (CCWD) via the Contra Costa Canal is the primary source of water in the Basin. Groundwater extraction in the Pittsburg Plain Groundwater Basin serves local domestic, municipal, and industrial water needs. Both the City of Pittsburg and Bay Point conjunctively manage groundwater and surface water as a means for increasing the reliability of available resources and reducing costs to users. Groundwater

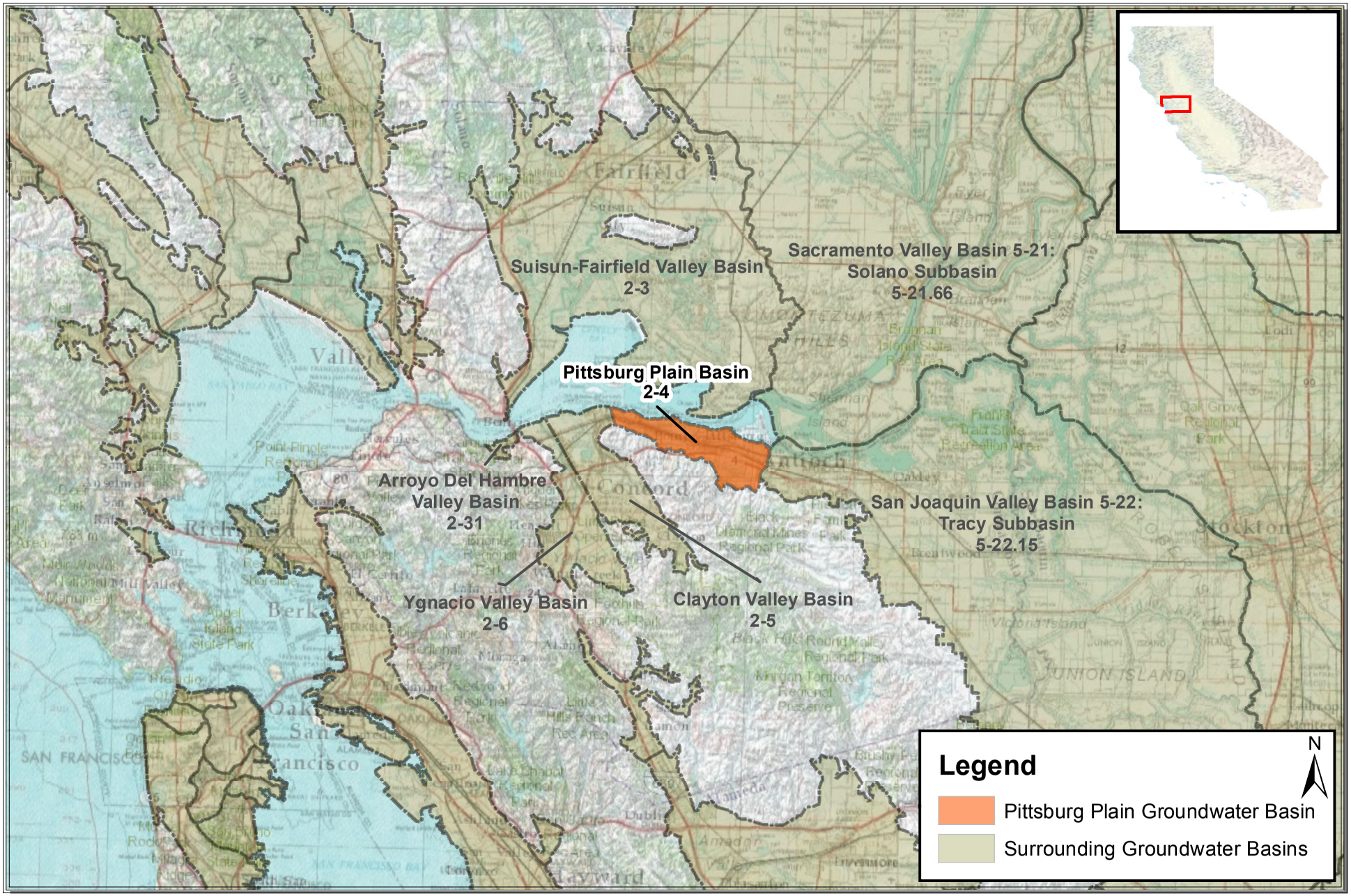

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Figure ES-1
Pittsburg Plain Groundwater Basin and Surrounding Basins

accounts for 5 to 15 percent (approximately 1,500 to 2,000 acre-feet/year) of the City's water supply and 8 to 10 percent (approximately 240 to 270 acre-feet/year) of water demand of the Bay Point system. Other groundwater pumping within the Basin serves industrial and small-scale domestic use. The City of Pittsburg is the largest groundwater pumper in the Basin.

Due to a lack of historic groundwater pumping and water level monitoring, there is a limited ability to use water level records to draw conclusions about groundwater trends within the Basin. However, the City recognizes the importance of groundwater monitoring in avoiding adverse impacts to groundwater resources and initiated a monitoring program in late 2008 to monitor both water levels and quality in wells around the City. The wells used for this program include active production wells and the monitoring wells drilled during exploratory activities in siting the new production well. The City's participation in DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) Program as a designated monitoring entity facilitates the City's efforts to take an active role in managing and protecting groundwater resources within the Basin.

TDS, chloride, iron, and manganese are among the constituents monitored as part of the groundwater monitoring program adopted by the City of Pittsburg. Current water quality monitoring by both the City and Bay Point focuses on the deeper aquifer units (> 150 feet below ground surface) that form the primary production zone(s). Water quality within the Basin is highly variable with average TDS concentrations between 600 and 1,200 mg/L. Average chloride concentrations in the deeper zone are between about 115 and 250 mg/L and average nitrate (as N) concentrations are between 1 and 3 mg/L. Manganese levels encountered in the City's production wells exceed the state secondary Maximum Constituent Level (MCL) of 0.050 mg/L. Groundwater pumped from the City's wells is blended with surface water from the Contra Costa Canal and then treated at the City's Water Treatment Plant (WTP). Groundwater pumped by Bay Point undergoes a similar process. Water delivered to customers meets all requirements set by the California Department of Public Health.

Groundwater management involves coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects to other resources. Although groundwater conditions in the Basin are considered favorable at current utilization, there are several areas that may require changes in future groundwater management. These include:

- Identification of sustainable pumpage limits from municipal wells;
- Preservation of groundwater quality;
- Prevention of land subsidence.

This Plan seeks to maintain the quality, reliability, and sustainability of the Basin water supply for current and future beneficial uses including agricultural, industrial, and municipal supplies. To accomplish these purposes, the City supports the following Basin Management Objectives (BMOs) and associated components:

BMO 1: Ongoing Groundwater Monitoring and Reporting

BMO 2: Preservation of Groundwater Quality

BMO 3: Avoidance of Overdraft

BMO 4: Preservation of Interrelated Surface Water and Groundwater Resources

To accomplish these BMOs, this Plan incorporates a number of components that are divided into five categories: (1) Monitoring Program, (2) Water Resource Sustainability, (3) Groundwater Resource Protection, (4) Agency Coordination and Public Outreach, and (5) Plan Implementation and Updates. A summary of Plan categories and associated components are presented in **Table ES - 1**.

Table ES-1
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
CATEGORY 1: MONITORING PROGRAM			
1A. Elements of Monitoring Program			
• Implement the groundwater monitoring program detailed in **Appendix E**.	X		X
1B. Evaluation and Reporting of Monitoring			
• Maintain clear records from all monitoring activities.	X		
• Prepare an annual monitoring report describing conditions as reflected by trends of monitored parameters.	X		
• Make the annual report available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.	X		
CATEGORY 2: WATER RESOURCE SUSTAINABILITY			
2A. Maintaining Stable Groundwater Levels			
• Continue monitoring of groundwater levels discussed under Component 1A to ensure that progressive groundwater level declines do not occur.	X		X
2B. Water Conservation			
• Continue to implement and promote water conservation programs within the Basin.			X
2C. Implementation of Conjunctive Water Management			
• The City will continue to identify management strategies to optimize conjunctive use of groundwater and surface water. This may require coordination with other agencies involved with regional water supply planning.			X
2D. Integration of Recycled Water			
• As applicable, seek opportunities with DDSD to use recycled water.			X
CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3A. Well Construction and Destruction Policies			
• Comply with the County's well construction and destruction policies and state permitting requirements as stipulated by the CDPH.			X
3B. Management and Mitigation of Contaminated Groundwater			
• Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.		X	
• Employ BMPs to limit potential sources of contamination in the environment.	X		X
• Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.		X	

Table ES-1 (continued)
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
• Identify locations of point sources of contamination.			X
• Identify major non-point sources of contamination.		X	
• To the extent that it affects water supply, seek to avoid and/or mitigate potential impacts on groundwater quality resulting from point or non-point sources of contamination.		X	
• Groundwater contamination induced by City pumping will be avoided and/or mitigated to the extent that it adversely affects the water supply.			X
3C. Long-Term Salt and Nutrient Management			
• Identify potential salt and nutrient loading within the basin and develop actions to minimize/mitigate impacts.		X	
• Identify trends in groundwater levels/quality, which may indicate saline intrusion or the potential for saline intrusion to occur.	X		X
• Identify trends in groundwater quality, which may indicate degradation of groundwater quality.	X		X
• Manage the City's use of recycled water and fertilizers in identified recharge areas.	X		X
3D. Identification and Management of Recharge Areas and Wellhead Protection Areas			
• Identify and employ wellhead protection measures to ensure long-term sustainability of groundwater quality in the basin.	X		
• Use DWSAP information, including delineation of source area and protection zones.			X
• Employ deeper seals, as warranted, for municipal supply wells to conservatively isolate and protect aquifers used for drinking water sources.	X		
• Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.			X
CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH			
4A. Continuation of Local, State, and Federal Agency Relationships			
• Continue working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.			X
• Pursue grant opportunities in cooperation with ECWMA to fund basin management activities and regional water projects.			X

Table ES-1 (continued)
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
4B. Public Outreach			
• Continue public involvement process with the City Council, providing periodic updates on water resources management activities by the City.			X
• Continue public outreach. Public notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.			X
• Continue to engage the public in future Plan updates.			X
4C. Water Awareness Education			
• Continue water awareness education programs.			X
CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES			
5A. Plan Implementation and Reporting			
• Make information and reports available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.			X
• Provide copies of adopted Plan, and related reports, to ECWMA members, Golden State Water, and the Contra Costa County Department of Environmental Health.	X		
• Support the IRWMP, including implementation of priority objectives of the IRWMP.		X	
• Prepare annual groundwater management reports.			X
5B. Provisions to Update the Groundwater Management Plan			
• Review and update plan every five years or more often as needed.			X

1. Short-term actions are items to be completed within two years.
2. Long-term actions are items expected to require more than two years.
3. Continuing are items that are ongoing groundwater management activities.

1.0 Introduction

This Groundwater Management Plan (Plan) has been prepared by the City of Pittsburg (City) as part of a regional effort to manage and protect groundwater resources within the eastern portion of Contra Costa County. This Plan is intended to provide a summary of current efforts to manage groundwater resources within the Pittsburg Plain Groundwater Basin (Basin) (Basin Number 2-4), shown in **Figure 1-1**, establish Basin Management Objectives (BMOs), and define specific management strategies ("components") for accomplishing the designated BMOs. The primary objective of this effort is to provide a long-term strategy for sustainable groundwater resource management within the Basin to meet current and future water demand.

1.1. OVERVIEW

1.1.1. Pittsburg Plain Groundwater Basin (Basin Number 2-4)

The Pittsburg Plain Groundwater Basin (Basin Number 2-4), as defined by the Department of Water Resources (DWR) Bulletin 118, 2003 Update (DWR, 2004), is shown on **Figure 1-1**. DWR's basins and subbasins are generally defined using boundaries to groundwater flow and the presence of water-bearing geologic units. These groundwater basins are not confined within geopolitical boundaries, and DWR-designated "basin" or "subbasin" labels do not necessarily correlate to county or city borders.

The Basin is located along the south shore of Suisun Bay and is bounded by Suisun Bay to the north, the Tracy Subbasin (DWR Subbasin 5-22.15) to the east, and the Clayton Valley Groundwater Basin (DWR Basin 2-5) to the west. It is within the drainage basins of Kirker Creek and Willow Creek, both of which drain into Suisun Bay. The Pittsburg Plain Groundwater Basin includes the overlying City of Pittsburg and Bay Point census-defined place (CDP).

The Basin consists of mild sloping alluvial plains ranging in elevation from sea level to 100 feet. The primary water bearing units of the Basin are alluvium deposits ranging from Pleistocene (10,000 to 1.2 million years ago) to Recent in age. These units consist of highly lenticular sand and gravel deposits and beds of blue and yellow clay (DWR, 2004). Recharge generally occurs in the hills along the southern portion of the basin where the primary aquifer units approach/intersect land surface. Groundwater flow is generally to the north-northeast, discharging to Suisun Bay. Descriptions of the hydrogeologic setting are limited; the City of Pittsburg's recent groundwater exploration projects provide the majority of available geologic information.

1.1.2. City of Pittsburg

The City of Pittsburg is located approximately 40 miles northeast of San Francisco, along the southern edge of the Suisun Bay/Sacramento-San Joaquin Delta (Delta) shoreline in eastern Contra Costa County. The City was originally established in 1839 as a 10,000-acre land grant from the government of Mexico. After a series of changes in name and identity, the City became

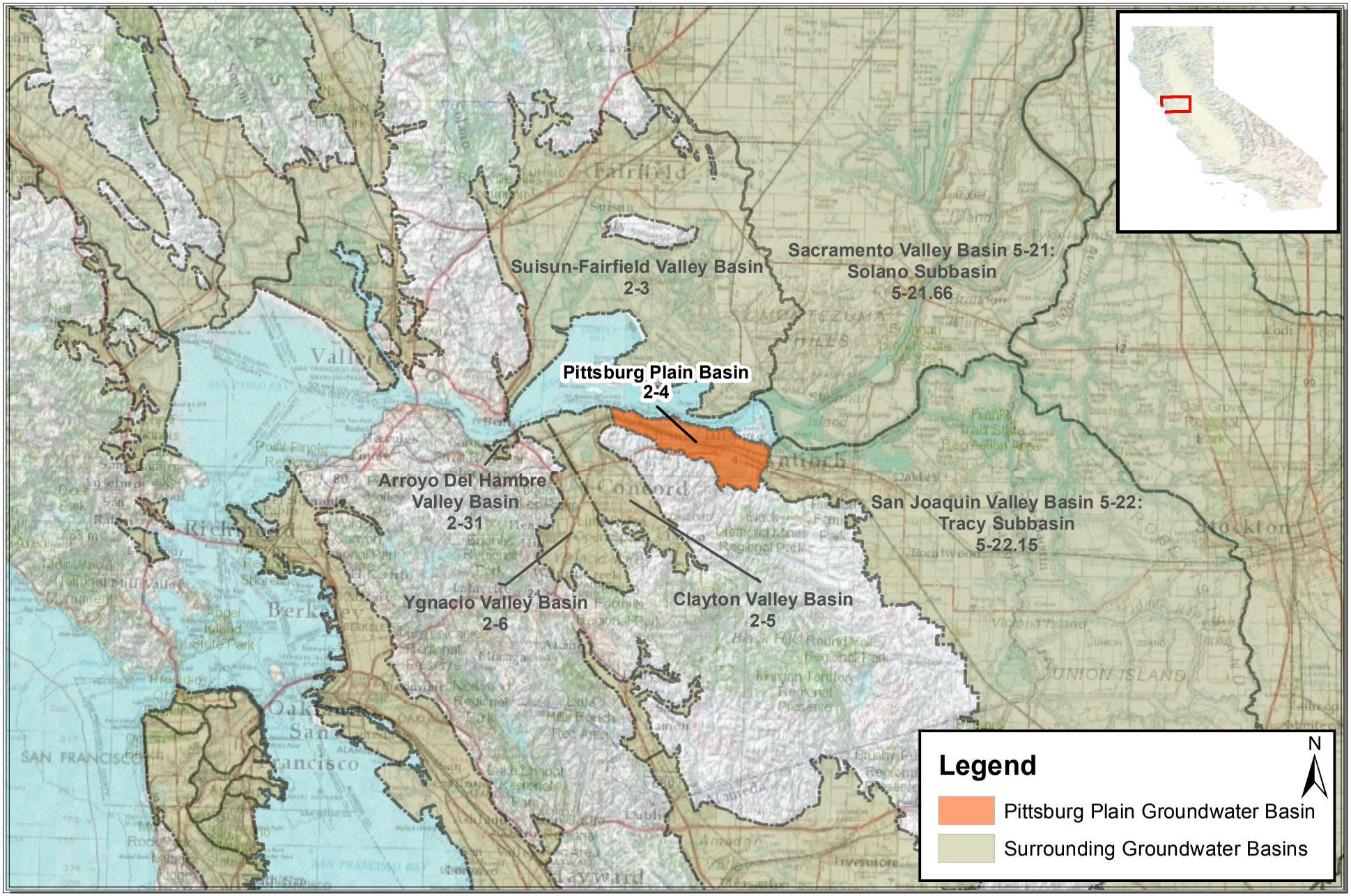

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Figure 1-1
Pittsburg Plain Groundwater Basin and Surrounding Basins

an important industrial area, first in coal and then in steel, ultimately establishing itself as the "City of Pittsburg" in 1911. Through the 1940s and 1950s, Pittsburg became a significant commercial and industrial center for the county and greater San Francisco Bay (Bay) Area (Pittsburg, 2001). The 1970s and 1980s saw rapid population growth and its development as a bedroom community for other parts of the county. Despite some fluctuations in growth, it remains the second largest industrial center in the county, with a population of 65,000 people (RMC, 2011).

1.1.3. Authority for Groundwater Management

City of Pittsburg is the local public agency that provides water service to customers within its service area. As a result of Assembly Bill (AB) 3030, the California Water Code (CWC) Section 10750 et seq. provides local agencies with the authority to adopt and implement groundwater management plans. As described further below, the CWC was subsequently amended in 2002 as a result of Senate Bill (SB) 1938 and again in 2011 by passage of AB 359. Both amendments detail components required in a groundwater management plan to enable the agency to be eligible for public funding for groundwater projects from funds provided by the DWR.

On May 7, 2012, the City of Pittsburg City Council voted to adopt a resolution of intention to prepare a groundwater management plan, in accordance with the requirements of the CWC (see **Appendix A**). This document embodies that Plan.

1.1.4. Plan Purpose

The primary objective of this Plan is to provide a long-term strategy to maintain the quality, reliability, and sustainability of groundwater resources within the Basin. To accomplish this, the City of Pittsburg intends to manage groundwater conjunctively with its surface water resources and support BMOs directed toward the sustainability and optimization of groundwater supplies. Each BMO presented in this Plan is accompanied by action items that address specific concerns and basin-wide interests, as formulated in coordination with a Groundwater Management Technical Advisory Committee (Technical Committee).

The Technical Committee is an advisory panel consisting of parties interested in groundwater management within the Basin and preparation of the Plan. Their role is to provide direction and technical review throughout the process of preparing the Plan. The Technical Committee assembled for this Plan consists of Walter Pease (City of Pittsburg) and Mike Yeraka (Diablo Water District). Additional direction and technical review was provided by representatives from Contra Costa Water District (CCWD) and Golden State Water Company (GSWC), in coordination with the Technical Committee members. Committee recommendations build on additional water management efforts in the Basin and greater eastern Contra Costa County region.

1.2. OVERVIEW OF REGIONAL WATER RESOURCE PLANNING

Eastern Contra Costa County water entities have collaborated on issues of water resource planning and management, dating back to 1995 with the formation of the East County Water Management Association (ECWMA). ECWMA operates as the official "Regional Water Management Group" and is composed of eleven public agencies that function as water purveyors in the eastern portion of Contra Costa County. In addition to the City of Pittsburg, these member agencies include: City of Antioch, City of Brentwood, Byron-Bethany Irrigation District, Town of Discovery Bay, Contra Costa County Water Agency, CCWD, Delta Diablo Sanitation District, Diablo Water District (DDSD), East Contra Costa Irrigation District, and Ironhouse Sanitation District.

The association was originally formed to conduct the East County Water Supply Management Study (CH2M Hill, 1996). The purpose of the study was to create a long-term plan to address future water management, with a focus on specific implementation actions to ensure reliable, cost-effective supplies in the region through 2040. Anticipated urbanization in the eastern portion of the county is expected to bring about increased water demand, and this study proposes actions to mitigate the resulting strain on water resources, treatment, and infrastructure.

In 2005, ECWMA members collaborated to prepare the East Contra Costa County Functionally Equivalent Integrated Regional Water Management Plan (FEIRWMP). This document united aspects from several existing regional management plans, including the 1996 water supply management study, each covering various facets of water resource management in the area. Recently, ECWMA received DWR planning grant funds to update its FEIRWMP to a fully functioning Integrated Regional Water Management Plan (IRWMP). The City supports implementation of the IRWMP and is participating in the IRWMP Update, which is expected to be completed in 2013. As part of the IRWMP Update, a number of regional BMOs have been defined which are not necessarily associated with groundwater management within the Basin. BMOs outlined in this Plan have been compared to, and are congruous with those for the IRWMP Update.

As is the case for the City of Pittsburg, the primary source of water for all ECWMA agencies is surface water delivered by CCWD. Many of the ECWMA agencies supplement this supply with groundwater and/or recycled water.

1.3. CITY OF PITTSBURG WATER SUPPLIES

The City's Water Service Area consists of approximately 15.6 square miles (10,000 acres) within City limits (RMC, 2011). Two trailer parks (Bella Vista and Riverview mobile home parks), Ambrose Park, and the businesses on Pittsburg Antioch Highway, east of Loveridge, are within City limits but are supplied by private wells. With the exception of these groundwater users, the City's water service area and limits are generally the same. The City's primary source of water is surface water supplied by Contra Costa Water District (CCWD) via the Contra Costa Canal. The source of water purchased through CCWD is Central Valley Project (CVP) water, which is

pumped from the Sacramento-San Joaquin Delta and governed by the U.S. Department of the Interior, Bureau of Reclamation (USBR). CCWD has a contract with the USBR for 195,000 acre-feet/year to supply its entire service area through 2045. Of this amount, the City of Pittsburg is entitled, through a contractual agreement with CCWD, to as much water as will meet its needs, barring a drought event or other adverse conditions. The volume of this supply is not defined, though in practice accounts for approximately 85 to 95 percent of total supply (RMC, 2011). In the event of a drought or other adverse conditions, this supply is subject to restriction. In addition to its surface water supply, the City operates two groundwater wells (Bodega and Rossmoor production wells) located within City limits which provide the remaining 5 to 15 percent of total supply (or approximately 1,500 to 2,000 acre-feet/year). These wells are intended to supplement the City's surface water supply and provide an emergency supply in the event that surface water resources are temporarily unavailable.

All water received into the system first passes through the City's Water Treatment Plant (WTP). Raw surface water and groundwater are blended prior to treatment at the plant to achieve the best water quality possible. The WTP has a design capacity of 32 million gallons per day (MGD). The plant currently processes between 6 and 18 MGD (AKEL, 2010). According to the City's 2010 Urban Water Management Plan (UWMP) (RMC, 2011), the design capacity of this facility is sufficient to meet the projected maximum day demand of 30.5 MGD.

In addition to the Contra Costa Canal, two groundwater production wells, and WTP, the City's water system consists of 211 miles of transmission and distribution pipelines, eight storage reservoirs, and numerous booster pump stations and pressure reducing valves (PRVs) (AKEL, 2010). The storage reservoirs range in capacity from 1.0 to 5.0 million gallons (MG) and have a total combined capacity of 19.25 MG.

The City of Pittsburg UWMP (RMC, 2011) contains projections of growth rates for population and water supply and demand through 2035. City growth is limited by the amount of open, developable lands. The average annual population growth rate is projected to be about 1.7 percent, with population reaching approximately 100,000 by 2035. Water use is expected to increase with population growth over this period, though efforts are in place to reduce water use in the City to help ensure that urban water use continues to meet a statewide goal of reducing urban potable per capita water use by 20 percent in 2020 (Water Conservation Bill of 2009).

1.4. LEGISLATION RELATED TO GROUNDWATER MANAGEMENT PLANS

In 1992, legislation known as Assembly Bill AB 3030 was passed by the State Legislature, which encouraged existing local public agencies to adopt plans to manage groundwater resources within their jurisdictions. AB 3030 is comprised of sections 10750-10756 of the California Water Code (CWC Section 10750 et seq.) and identifies twelve technical components that may be included in the plan, and can be found in CWC Section 10753. This section of the CWC also outlines the procedures to be followed by the agency during the process of developing a groundwater management plan. The twelve technical components recommended for inclusion in the plan are:

1. Control of saline water intrusion.
2. Identification and management of wellhead protection areas and recharge areas.
3. Regulation of the migration of contaminated groundwater.
4. Administration of a well abandonment and well destruction program.
5. Mitigation of conditions of overdraft.
6. Replacement of groundwater extracted by water producers.
7. Monitoring of groundwater levels and storage.
8. Facilitating conjunctive use operations.
9. Identification of well construction policies.
10. Construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
11. Development of relationships with state and federal regulatory agencies.
12. Review of land use plans and coordination with land use planning agencies to assess activities, that create a reasonable risk of groundwater contamination.

In 2002, Senate Bill SB 1938 was signed into law as an addition to CWC Section 10750 et seq., which dictates the implementation of management plans. This SB 1938 requires the development and implementation of a groundwater management plan as a prerequisite for obtaining funding assistance for groundwater projects from funds administered by DWR. It also specifies required components to be included as part of the plan. The management plan must delineate BMOs for the groundwater basin, which includes discussion of monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping. Monitoring protocols must be designed to detect changes in the aforementioned attributes. The plan also must include means to allow for collaboration with nearby entities whose service area overlies the groundwater basin, as well as participation by interested parties in the development of the plan. Another requirement of SB 1938 is to include mapping of the groundwater basin, as defined in DWR's Bulletin 118. While SB 1938 did not alter the previously detailed twelve technical components, it did add the following provisions:

- The local agency, in preparing a groundwater management plan, will make available to the public a written statement describing how interested parties may participate in

developing the plan. For that purpose, the local agency may appoint, and consult with, a technical advisory committee consisting of interested parties.

- To qualify for funding assistance for groundwater projects, for funds administered by DWR, a local agency must accomplish all of the following relative to groundwater management (CWC 10753.7(a)):
    - Prepare and implement a groundwater management plan that includes BMOs for the groundwater basin that is subject to the plan.
    - Include groundwater management components that address monitoring and management of water levels, groundwater quality degradation, inelastic land subsidence, and changes in surface flows and quality that either affect groundwater or are affected by groundwater pumping.
    - Include provisions to cooperatively work with other public (and presumably private) entities whose service area or boundary overlies the groundwater basin.
    - Include mapping of the groundwater basin, as defined in DWR's Bulletin 118, and the boundaries of the local agency subject to the plan, plus the boundaries of other local agencies that overlie the basin.
    - Adopt monitoring protocols designed to detect changes in groundwater levels, groundwater quality, inelastic land subsidence (for basins where subsidence has been identified as a potential problem), and flow and quality of surface water that either directly affect groundwater, or are directly affected by groundwater pumping.

In 2011, CWC Section 10750 et seq. was again amended by the passage of AB 359 to require a map identifying recharge areas for the groundwater basin to be included as part of the groundwater management plan. "Recharge area," as defined in CWC 10750 et seq., means "the area that supplies water to an aquifer in a groundwater basin and includes multiple wellhead protection areas."

The City has prepared this Plan to be compliant with the AB 3030, SB 1938, and AB 359 requirements as part of its interest in developing and sustaining a reliable water supply. To ensure the reliability of groundwater to meet existing and projected demands, the components of local groundwater management planning already implemented include a monitoring program, analysis of groundwater conditions and quality, and conjunctive use of local groundwater with imported surface water supplies.

1.5. PREPARATION AND ORGANIZATION OF GROUNDWATER MANAGEMENT PLAN

This Plan is organized to: (1) provide an overview of regional and local water supplies; (2) describe existing groundwater conditions; (3) discuss land subsidence, (4) identify areas of concern with respect to groundwater use; and (5) present a set of groundwater management objectives and components, which collectively form the Plan.

2.0 Summary of Water Supplies

2.1. WATER SUPPLIERS IN THE PITTSBURG PLAIN GROUNDWATER BASIN

In addition to the City of Pittsburg, other local agencies that supply or use water in the Pittsburg Plain Groundwater Basin include Golden State Water Company (GSWC), which supplies the Bay Point area, and DDSD which provides recycled water for irrigation and industrial uses in the Basin. A brief overview of the sources for each agency is presented below.

Bay Point

GSWC serves the residents and businesses of Bay Point, formerly known as West Pittsburg. Before 2009, GSWC received both raw and treated surface water from CCWD via the Contra Costa Canal for its Bay Point System. Raw surface water was treated at GSWC's Hill Street Treatment Facility before being served. In 2009 GSWC began purchasing only treated surface water from CCWD which is delivered through a Hill Street Plant treated water connection. GSWC does not have plans to use its Hill Street Treatment Facility for drinking water treatment in the future.

GSWC also operates three groundwater wells in the Basin with a combined capacity of 263 acre-feet/year (0.235 MGD). Between 2005 and 2010 GSWC's Bay Point System pumped an average of 240 acre-feet/year with a maximum volume of 270 acre-feet/ year pumped in 2006 and 2007. On average, groundwater from these wells accounts for 8 to 10 percent of the total water supply for the Bay Point System. The remaining demand is met using treated surface water supplied by CCWD.

The Bay Point System maintains an emergency interconnection with the City of Pittsburg. Bay Point does not currently have a recycled water supply nor are there any plans in place to provide recycled water to the Bay Point System.

Delta Diablo Sanitation District

The Delta Diablo Wastewater Treatment Plant (WWTP) collects an estimated 14,700 acre-feet of wastewater per year from the cities of Antioch and Pittsburg, as well as the unincorporated county area of Bay Point (RMC, 2011). Approximately 42 percent of the wastewater received undergoes tertiary treatment at DDSD's Recycled Water Facility before being distributed for irrigation and industrial uses. The largest users of recycled water from DDSD are the Delta and Los Medanos Energy Centers which use the water for cooling. In 2010, the Los Medanos Energy Center used 3,080 acre-feet and the Delta Energy Center used 3,192 acre-feet of recycled water (RMC, 2011). Approximately 2,240 acre-feet of this water was returned to the WWTP following use for treatment and discharge.

The City of Pittsburg has used recycled water for irrigation purposes (parks and road median landscaping) since the early 1990s (RMC, 2011). Since then, the City has continued to expand its use of recycled water, most recently adding the Delta View Golf Course and Marina Walk Park to DDSD's recycled water system. In 2011, the City used 561 acre-feet of recycled water for irrigation purposes. DDSD has plans to expand recycled water use to the City's Parkside Elementary School and Pittsburg High School.

2.2. CITY OF PITTSBURG SOURCES OF SUPPLY

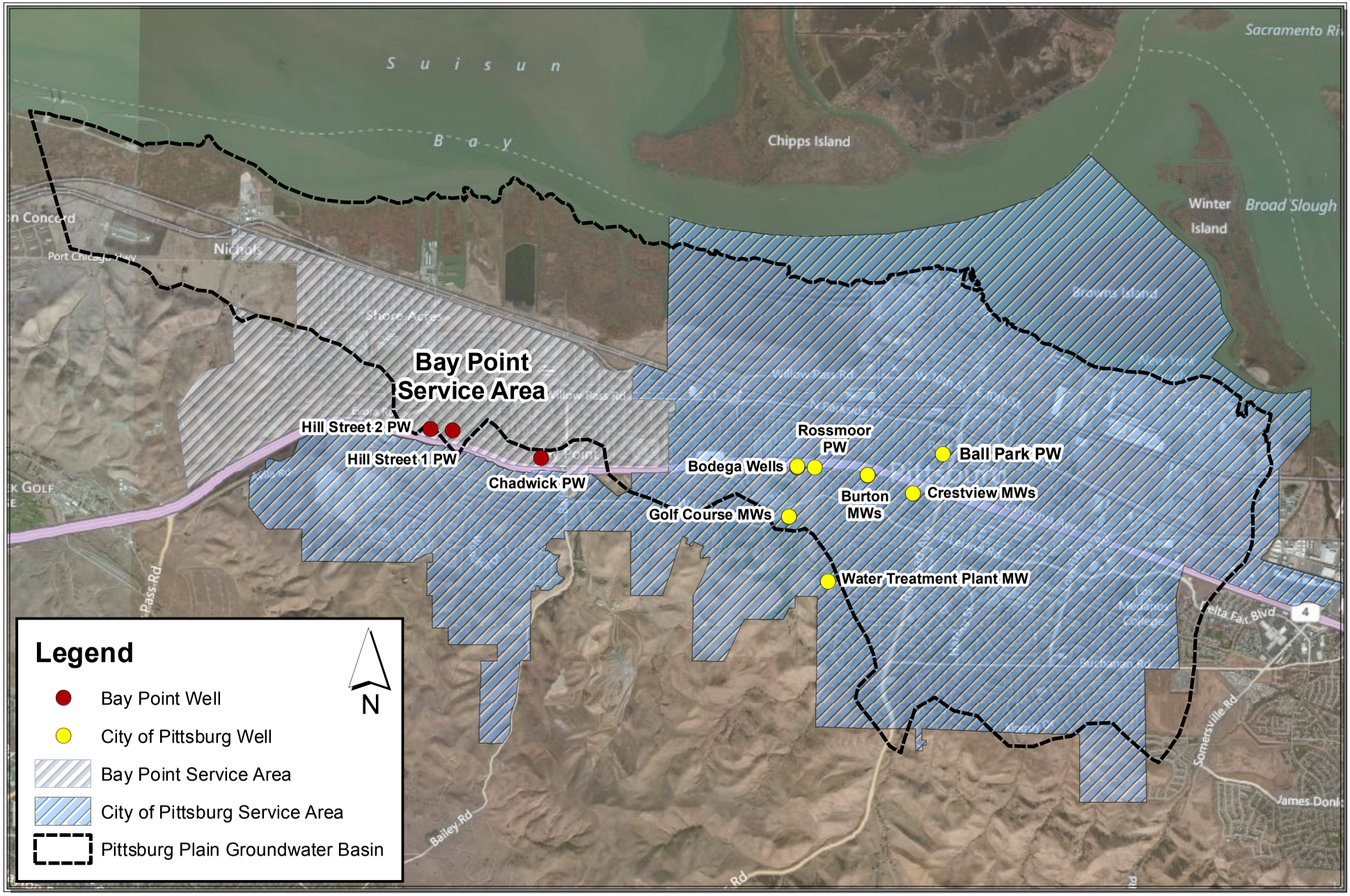
The City of Pittsburg uses surface water and groundwater supplies to meet demands within City limits. The City purchases raw Central Valley Project (CVP) surface water from CCWD, which accounts for 85 to 95 percent of the City's total supply. The remaining 5 to 15 percent of water is supplied by two groundwater wells (Bodega and Rossmoor Production Wells) located in the central portion of the City (**Figure 2-1**). Raw surface water and groundwater are blended prior to treatment in the City's WTP.

From 2005 through 2011, the City's average water demand, not including recycled water demand, was 10,070 acre-feet/year. For this same time period, total water demand has ranged from 8,791 (2010) to 11,605 (2007) acre-feet/year. Of the total water demand, an average of 1,595 acre-feet/year (approximately 16 percent) has been supplied by the City's groundwater wells. Groundwater production ranged from 1,060 (2009) to 2,092 (2007) acre-feet per year. The relatively smaller amount of water produced in 2009 was the result of the Ball Park Well being removed from production in November 2008 and its replacement with the Bodega Well which came online in January 2010. The City's groundwater wells not only supplement current water demand, but provide a local water source that can be used to increase supply reliability, especially in the case of drought or an emergency.

The City's two original groundwater wells, the Ball Park and Rossmoor production wells, were constructed in 1991. As noted above, the Ball Park Production Well was found to have high levels of total dissolved solids (TDS), which limited production from this well. The well was permanently taken out of service in November 2008, but has functioned as a monitoring well since then. The City destroyed the Ball Park Production Well in September 2012 and plans to replace it with a dedicated multi-completion monitoring well (pending availability of funds) which would act as a sentinel for potential saline intrusion from Suisun Bay (LSCE, 2012a).

The Rossmoor Production Well continues to be a key source of water for the City, though it has experienced severe biofouling issues over the past decade. Well rehabilitations were performed in 2001, 2004, 2009, and 2010. While the biofouling has led to a drop in flow rate, specific capacity appears unchanged. In 2011, a video log was completed and holes were found in the well casing. Noting the potential loss in the structural integrity of the well, a new pump was installed to maintain production while options to mitigate the well's structural and biofouling issues are considered.

In 2009, after an evaluation of many candidate well sites, the Bodega Well was constructed near the Rossmoor Production Well site (**Figure 2-1**). This well came into operation in January 2010



0 0.5 1 2 3 4 Miles

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LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 2-1
Service Areas and Wells
Pittsburg Plain Groundwater Basin

and can operate at flow rates up to 2 MGD, or 1,400 gallons per minute (gpm). The Bodega Well provided 1,097 acre-feet of water in its first year in operation (2010), and 1,437 acre-feet in 2011.

The City continues to plan for future development and increasing demand in the coming years. In accounting for such development, there are nine proposed new storage reservoirs, 10 proposed booster pumps, and 26 miles of additional distribution and transmission lines to be added to the system. Though the City will need to maintain and improve its current groundwater production facilities, the City does not plan on increasing the volume of groundwater it pumps (RMC, 2011). The City is implementing initiatives toward conservation and water recycling that will help offset increased demand for surface water from CCWD.

2.3. OTHER GROUNDWATER PUMPING

Additional groundwater pumping within the Basin serves both domestic and industrial water demand. Within the City limits, the Bella Vista and Riverview Mobile Home Parks are known to pump groundwater for domestic use. Between the two mobile home parks there are a total of 79 units for which groundwater would be pumped. Assuming a daily demand of 120 gallons per unit (based on average indoor residential water use within California (ConSol, 2010), groundwater production for these two mobile home parks would be approximately 3.5 MG per year, or approximately10 acre-feet per year. There is also a history in the region of domestic groundwater pumping, which was a precursor to the existing water system. These domestic wells were very shallow, mostly completed around 100 feet in depth. Most of these wells have been abandoned. While not all are known to have been properly abandoned, it is assumed that very few, if any, are still operating. At this time, additional groundwater pumping for domestic use is considered insignificant.

Outside of the City of Pittsburg and Bay Point water systems some groundwater is pumped for industrial use. These facilities are generally located along the Bay Front where groundwater becomes more saline and may not be useable as drinking water. The volume of groundwater pumped by these private industrial wells is not known.

2.4. CONJUNCTIVE USE AND WATER MANAGEMENT

Both the City of Pittsburg and Bay Point conjunctively manage groundwater and surface water as a means for increasing the reliability of available resources and reducing costs to users. The City is committed to conjunctive management of groundwater, surface water, and recycled water supplies as part of its overall water supply strategy. Under a strategy to conjunctively use groundwater, its contract surface water supply, and recycled water, the City will achieve diversification of its sources and gain flexibility and reliability in meeting future operational needs. This Plan encompasses a strategy and management actions to ensure sustained conjunctive use of the three sources of supply.

3.0 Groundwater, Land Subsidence, and Areas of Concern

3.1. GROUNDWATER

3.1.1. Introduction

Groundwater extraction in the Pittsburg Plain Groundwater Basin serves domestic, municipal, and industrial water needs. Historically, many residences were supplied by small-capacity domestic wells, generally completed less than 100 feet below ground surface (bgs). Municipal wells in the area are typically 100 to 200 feet deep, reflecting the extent of favorable aquifer materials for these types of wells. Industrial wells are still used at some facilities primarily located along the Bay Front near Suisun Bay. Well depths and typical completion intervals for these wells are not known.

From 2004 through 2009, the City of Pittsburg conducted an investigation of candidate well sites for municipal use and drilled exploratory test holes at four locations. Monitoring wells were completed at each site and are now part of the City's groundwater monitoring program. Geologic cross sections and groundwater monitoring data collected as part of this investigation are presented in the City's 2009 Annual Groundwater Monitoring Report (LSCE, 2009). The City has continued to report on groundwater conditions within the City's service area in subsequent annual reports (2010 and 2011 calendar years). Elements of these reports as they pertain to this Plan are presented in this chapter.

3.1.2. Geologic Setting

The Pittsburg Plain Groundwater Basin is located along the eastern edge of the Coastal Range Geologic Province bordering the Great Valley Province to the east. The regional geology of the area consists of north- to northwest-trending mountain ranges and intervening valleys that are characteristic of the Coast Range Province (URS, 2006). These ranges include the Mendocino Range north of the San Francisco Bay, the Santa Cruz Range west of the Bay, and the Diablo Range east of the Bay. The San Andreas Fault Zone lies to west and represents a major boundary that divides the North American Plate and the Pacific Plate.

In the Coast Ranges, the geology consists of strongly deformed (faulted and folded) Mesozoic (pre-63 million years ago) marine sedimentary rocks of the Franciscan and Complex and Great Valley sequence. Along the northeastern edge of the Coast Range occur slightly less deformed Tertiary (Eocene to Miocene, 55 million to 5 million years ago) marine sedimentary rocks. These marine rocks primarily consist of sandstone, mudstone, and shale, with lesser quantities of chert and limestone, and represent portions of the former oceanic crust that were scraped off the subducting Pacific Plate and accreted to the North American Plate. Tertiary marine sedimentary rocks are exposed in low hills near the City and extend east below the San Joaquin Valley.

The Basin is located at the northeastern end of the Diablo Range, which extends from the Delta south along the western side of the San Joaquin Valley. The Diablo Range consists of Mesozoic Great Valley Sequence rocks thrust over Franciscan basement rocks. Within the Basin Tertiary and older marine rocks are overlain by Pliocene (5.3 million to 1.6 million years ago) to Holocene (600,000 years to present) non-marine sedimentary units and alluvium. These deposits are largely unconsolidated beds of gravel, sand, silt, and clay becoming weakly consolidated with increasing age and burial depth.

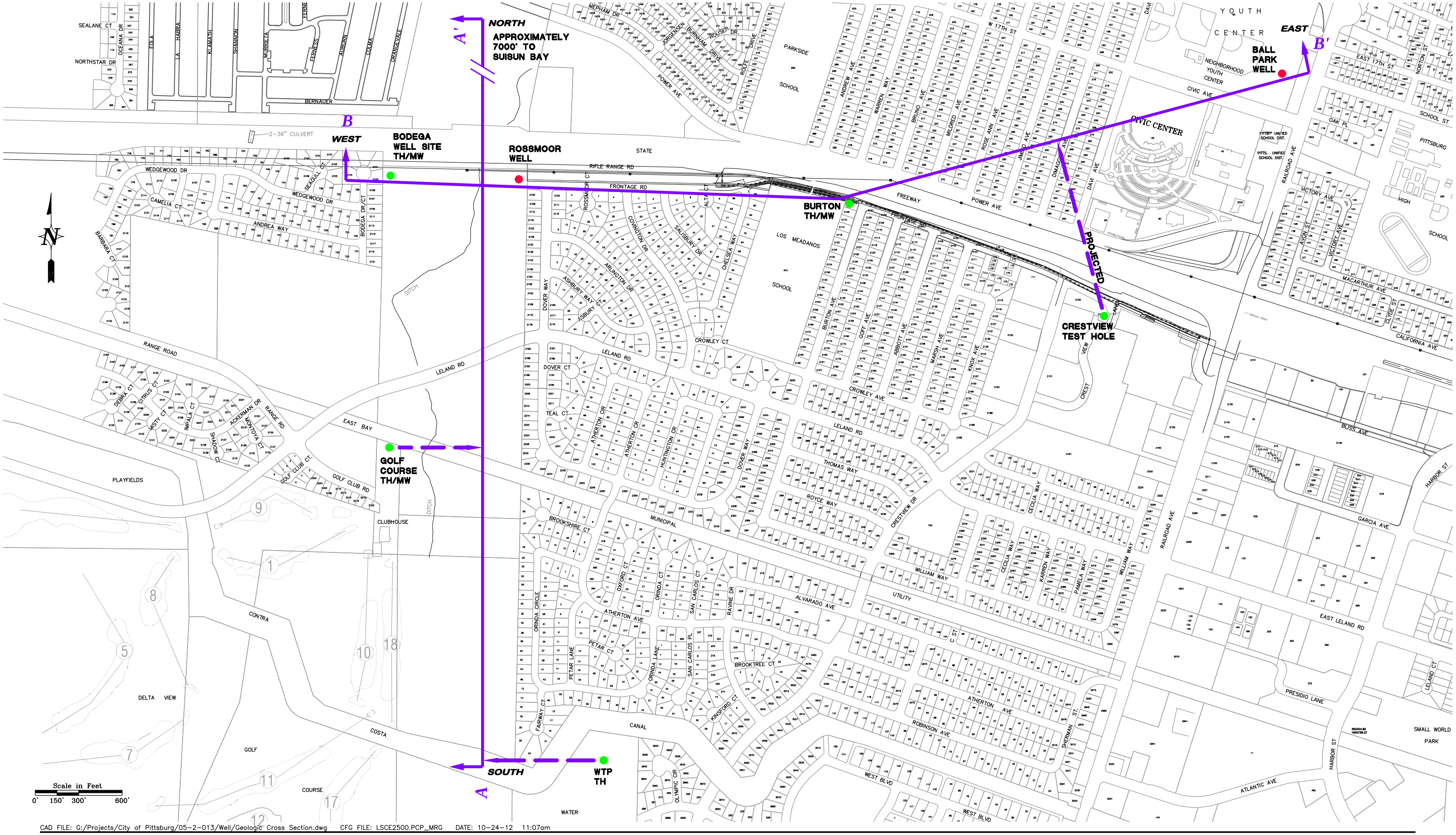
3.1.3. Hydrogeology

The Basin consists of mild sloping alluvial plains ranging in elevation from sea level to 100 feet. The primary water-bearing units of the Basin are alluvium deposits ranging from Pleistocene to Recent in age. These units consist of lenticular sand and gravel deposits and beds of blue and yellow clay (DWR, 2004). Recharge is interpreted to occur in the hills along the southern portion of the Basin where the primary aquifer units approach/intersect land surface. Groundwater flow is generally to the north-northeast, discharging to Suisun Bay, which forms the northern border of the Basin. Descriptions of the hydrogeologic setting are limited and the City's recent groundwater exploration project has provided the majority of available geologic information to date.

In 2004, the City initiated a project to evaluate candidate well sites for municipal supply, ultimately leading to the construction of the Bodega pump station in 2009. As part of this investigation, the City drilled numerous exploratory test holes, installing monitoring well clusters in each, to delineate potential completion targets for a new supply well. Sites evaluated for the new well project included the Delta View Golf Course Test Hole and Monitoring Well (TH/MW), Bodega TH/MW, Burton TH/MW, and Crestview TH/MW.

3.1.3.1. Representative Cross Sections for City of Pittsburg

Luhdorff and Scalmanini, Consulting Engineers (LSCE) examined the hydrogeologic setting of the Basin as part of the City's 2009 Annual Report (LSCE, 2009). Geophysical data and lithologic descriptions from test holes and existing production wells were combined with water level data to characterize the primary aquifer units of the Basin. **Figure 3-1** shows the locations of two geologic cross sections created as part of this study (**Figures 3-2 and 3-3).** LSCE describes three distinct aquifer units consisting of sand and gravel material, classified here as upper, middle, and lower units. These units range from confined to semi-confined and stretch east-west from the Ball Park Production Well in the City's downtown area to the Bodega site just south of Highway 4. The upper and middle units appear to thin and then disappear as they extend southward, suggesting a lack of correlation to formations encountered in the Golf Course Test Hole. The lower unit continues to the Golf Course Test Hole, though it moves closer to the ground surface as it extends southward, eventually ostensibly continuing upward and mixing with the sandy clay surface layer. Thus, the edges of the confined sand and gravel units occur somewhere between the Bodega/Rossmoor sites and just beyond the golf course. Though wells



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LUHDORFF & SCALMANINI
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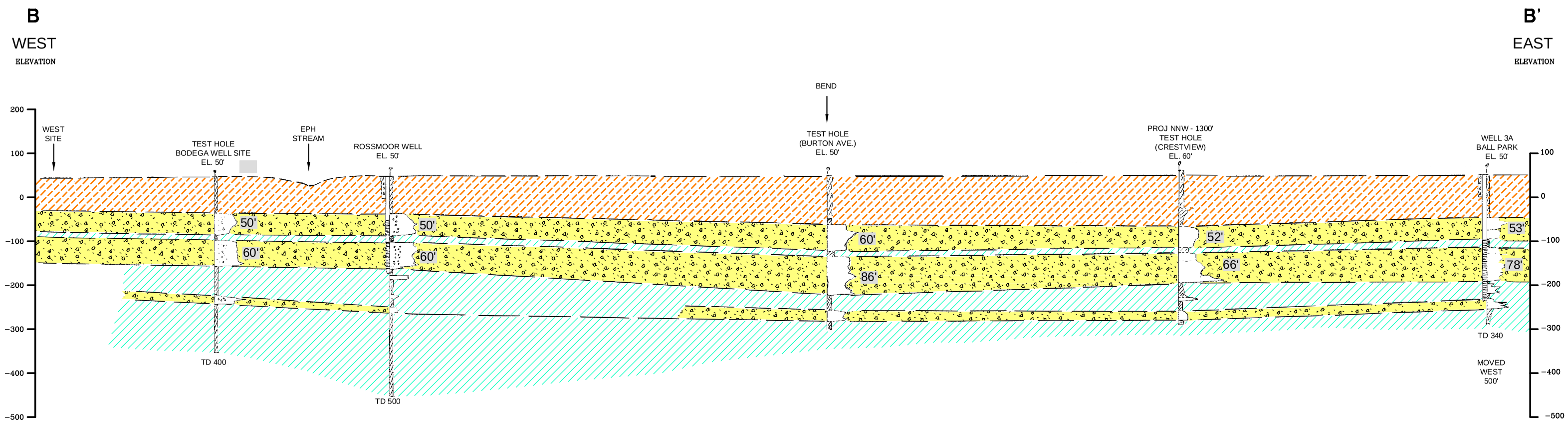
Figure 3-1
Cross Section Location Map
City of Pittsburg



LEGEND

ELECTRICAL LOG

CLAY

SANDS & GRAVELS

CROSS SECTION LITHOLOGY

SAND AND GRAVEL

CLAY

CLAY WITH THIN SANDS

Scale in Feet
0' 125' 250' 500'
Vertical Exag. 2.5X

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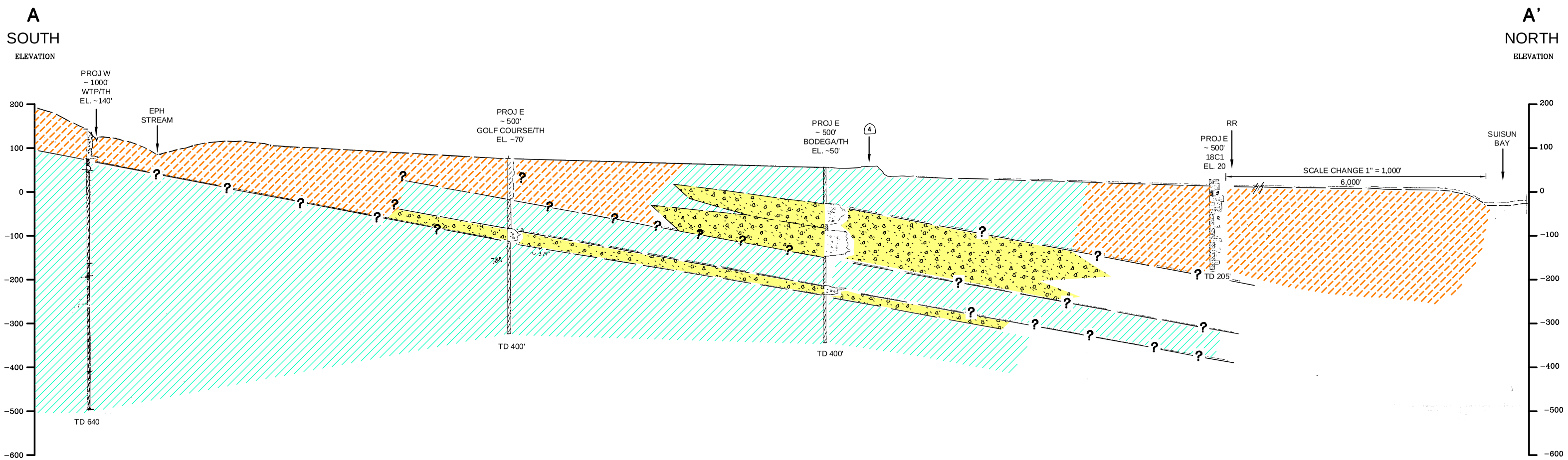
Figure 3-2
Geologic Cross Section West-East
City of Pittsburg



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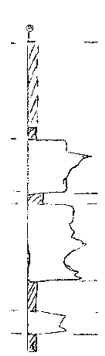

ELECTRICAL LOG

CLAY

SANDS & GRAVELS

CROSS SECTION LITHOLOGY

SAND AND GRAVEL

CLAY

CLAY WITH THIN SANDS

Scale in Feet

0' 125' 250' 500'

Vertical Exag. 2.5X

CAD FILE: G:/Projects/City of Pittsburg/05-2-013/Well/Cross Section South-North.DWG CFG FILE: LSCE2500.PCP_MRG DATE: 09-10-09 1:59pm

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Figure 3-3
Geologic Cross Section South-North
City of Pittsburg

completed in these sand and gravel units exhibit favorable yields, the high TDS content of the groundwater in some areas limits groundwater production (LSCE, 2009) for municipal use.

Similar conditions are expected in the western portion of the Basin near Bay Point, though no effort to characterize the hydrogeology of this portion of the Basin has been conducted to this point.

3.1.3.2. Identification of Groundwater Recharge Areas

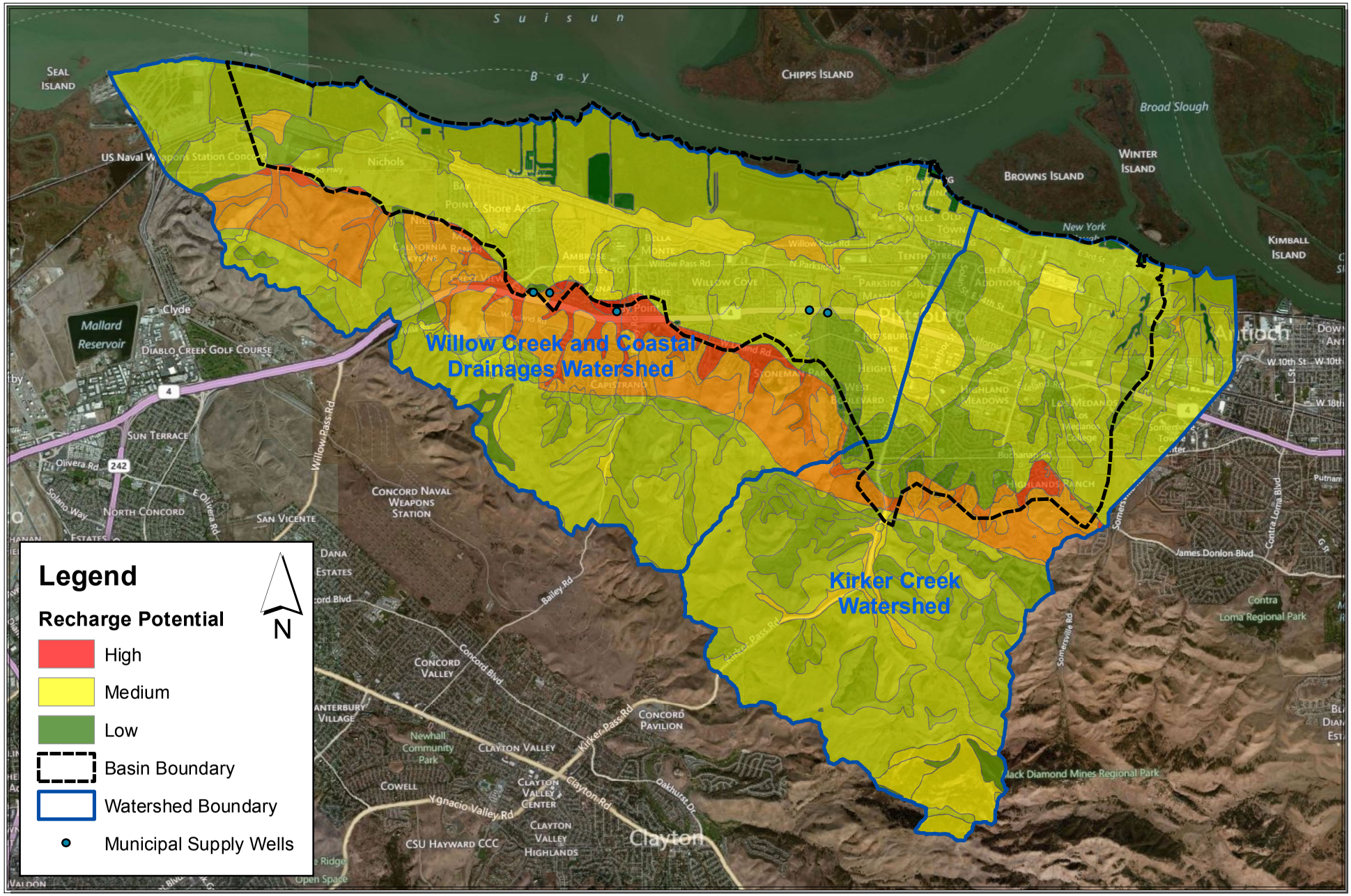
Groundwater resources within the Basin receive recharge from precipitation that falls in the Kirker Creek Watershed and Willow Creek and Coastal Drainages Watershed (**Figure 3-4**). These two watersheds encompass the Basin and the hills south of the Basin which drain into the Basin. Average annual precipitation ranges from 12 inches per year near Suisun Bay to 20 inches per year at the highest elevations of the southern hills. Precipitation may enter the groundwater system as direct infiltration from land surface during storm events, or percolate from the many small creeks which drain the two watersheds. The purpose of this analysis is to determine where in the Basin and surrounding watershed the greatest quantity of recharge is likely to occur. Slope of the land surface, soil permeability, and the character of underlying geologic units are the primary factors controlling the relative volume of groundwater recharge which may occur in various parts of the Basin. Each of these factors is discussed below.

Slope of the Land Surface

The quantity of precipitation which passes through the unsaturated overlying soils to the saturated groundwater table is strongly affected by the time resides on land surface. While evapotranspiration and soil saturation affect the residence time of available water, these factors are assumed to be constant throughout the study area and relatively minor in comparison to the slope of the land surface. Precipitation which falls on steep slopes will tend to flow across land surface (runoff) or slightly below land surface (interflow) to the lowest point, providing relatively little time for infiltration to occur. In contrast, precipitation which falls on flat, or nearly flat land will have more time to infiltrate, allowing for a greater fraction to reach the water table. Similarly, water flowing in creeks which flow across relatively flat land will have more time to infiltrate than water in the steep creeks and drainages in hills.

Soil Permeability

Soil permeability, or the rate at which a specified soil is able to transmit water, can be a significant factor in determining the volume of water that will reach the water table as groundwater recharge. Highly permeable soils are able to transmit water more quickly through the subsurface, allowing for larger volumes of water to become groundwater before it flows away as runoff, is evaporated, or taken up by plants. Permeability of soils is most often measured in a laboratory using samples collected in the field. Where specific permeability values are not available, the permeability of a soil can be



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LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Figure 3-4
Groundwater Recharge Potential
Pittsburg Plain Groundwater Basin

determined from the texture of sediments that make up the soil. For example, a soil rich in silt and clay would be expected to have a lower permeability than a sandy soil. Both soil texture and presented permeability values were considered for this analysis, as described below.

Underlying Geologic Units

No matter how flat an area may be, or how permeable the overlying soils are, if the underlying geologic units restrict the movement of water through the subsurface, groundwater recharge will be limited. The geology of the Basin and contributing watersheds can be divided into three main areas: (1) the bedrock dominated upper watershed (in the hills), (2) the bay mud and alluvium dominated flat lands that make up the majority of the Basin as designated by DWR, and (3) the highly permeable transition zone between the two.

The upper watershed areas are predominantly Tertiary marine sedimentary rocks which have been folded and uplifted to form the hills. In general, the consolidated nature of these rocks limits the rate at which water can be transmitted to the subsurface. The exception to this is secondary porosity along bedding plains and fractures where water is able to move more rapidly. Flow paths through these more permeable surfaces likely transmit infiltrated water from the hills to the creeks and alluvium of the lower portion of the watershed where it is able to enter the groundwater system of the Basin.

The lower watershed area consists of the relatively flat (0 to 9 percent slope) portion of the Basin/watersheds the geology consists of alluvium eroded from the southern hills and bay muds deposited during periods of relatively high water levels in the Delta/Bay. This system is predominantly fine-grained with interspersed meandering coarse-grained channel deposits which fine from the hills toward the Delta. The majority of domestic wells, which were more prevalent in the Basin historically, are likely completed in these channel deposits. Precipitation and runoff in the lower watershed area likely provides limited recharge to the uppermost aquifer units in the Basin, though deep infiltration to the lower confined units is unlikely. Infiltration is further limited by the relatively high water levels (near land surface) approaching the shoreline.

The Pliocene Tehama Formation outcrops at the foot of the southern hills, marking the transition from the upper to lower watershed areas. The Tehama Formation is the first non-marine unit in the geologic sequence and consists of semi-consolidated to unconsolidated interbedded clay, silt, sand, and gravel. On the California State Geologic Map (DMG, 2010) this unit is mapped as a conglomerate within the Plan area. The Tehama Formation dips to the north at approximately 30 degrees (measured on the consolidated underlying rocks) diving under the Quaternary alluvial deposits described above. Due to its relatively coarse-grained nature, precipitation that falls on the outcropping Tehama Formation, or flows over it as runoff, is likely to infiltrate and enter the groundwater system. Municipal production wells within the Basin are likely completed in the coarse grained units of this formation.

The groundwater recharge potential of different portions of the Basin and contributing watersheds was evaluated by considering the three factors described above individually and collectively. To do this, electronic versions of the Contra Costa County Soils map (USDA, 2004) and California State Geologic Map (CGS, 2010) were combined/analyzed in GIS. As noted above, both textural descriptions and permeability values were available for most soil classes from the US Department of Agriculture soil survey (2004). Where permeability values were not available, the relative permeability was inferred from units having a similar texture. Where the slope of the land surface was not included in the soil descriptions, slope was inferred from surrounding units and mapped topographic contours. Descriptions of individual geologic units accompanying the State Geologic Map (CGS, 2010) and other geologic mapping efforts for the area (Dibblee, 1980; Graymer et al., 2006), and available geologic cross sections (LSCE, 2009) were used to determine the relative permeability and potential for being an aquifer, and to correlate these units into the subsurface.

Following a review soil and rock properties, a ranking schedule was formulated for each of the factors described above, slope, soil permeability, and underlying geologic unit, with the greatest number of points representing the greatest groundwater recharge potential. The number of points available under each factor was weighted to emphasize the underlying geology (0 to 10 points) and slope (0 to 6 points), respectively, with permeability (1 to 5 points) given a lesser weighting due to the generally low permeability values of soils in the Plan area. The ranking criteria are presented below (**Table 3-1**). The overall groundwater recharge potential for various polygons (a combined area representing a single soil unit overlying a single geologic unit) was determined by totaling the points assigned for each factor. The results are presented in **Figure 3-4** where red areas have the greatest recharge potential and dark green areas have the least. As expected, the greatest recharge potential occurs where soils of a relatively high permeability (0.01 to 0.08 centimeters per day, or cm/d) are situated on hills and in valleys with a relatively low slope (0 to 30 percent) overlying the Tehama formation.

Table 3-1. Groundwater Recharge Area Designation Point Schedule

Underlying Geologic Unit		Slope of Land Surface		Soil Permeability	
Unit	**Points**	**Slope**	**Points**	**Permeability**	**Points**
Tehama Fm.	10	0-2%	6	< 0.01	1
Tert. Marine Sedimentary	4	2-5%	5	0.01 – 0.08	3
Quaternary Alluvium	1	5-9%	4	> 0.08	5
Not Defined	0	10-30%	3		
		30-50%	2		
		50-75%	1		
		> 75%	0		

3.1.4. Groundwater Levels

Due to a lack of historic groundwater pumping and water level monitoring, there is a limited ability to use water level records to draw strong conclusions about groundwater trends within the Basin. However, the City recognizes the importance of groundwater monitoring in avoiding adverse impacts to the aquifer and initiated a monitoring program in late 2008 to monitor both water levels and quality in wells around the city. The wells used for this program include current production wells and the monitoring wells drilled during the exploratory activities in siting the new Bodega Production Well (**Figure 2-1**). The City's ongoing participation in DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) Program as a designated monitoring entity further facilitates the City's efforts to take an active role in managing and protecting groundwater resources within the Basin.

The most extensive record of water level monitoring is for the Rossmoor Production Well, with monitoring dating from 2001. Attached hydrographs (**Appendix B**) show water level fluctuations of all wells over this time period. As shown, water levels fluctuate between +2 and +10 feet elevation (North American Datum 88) over the 10 year span, but remain above sea level. Groundwater elevation contours indicate a flow direction toward Suisun Bay.

3.1.5. Groundwater Quality

Groundwater quality data for the City and Bay Point are summarized in **Appendix C**. Groundwater pumped from the City wells is blended with surface water from the Contra Costa Canal and then treated at the City's WTP. Water delivered to customers meets all requirements set by the California Department of Public Health (CDPH). Groundwater blending is limited by the TDS content as well as elevated levels of manganese. The groundwater monitoring program adopted by the City of Pittsburg beginning in late 2008 monitors TDS, chloride, iron, and manganese, among other constituents.

The City's Ball Park Production Well was abandoned due to TDS levels of 1,500 milligrams per liter (mg/L). Manganese levels encountered in Rossmoor and Bodega wells are consistently 2 to 3 times the state secondary Maximum Constituent Level (MCL) of 0.050 mg/L. Water quality analyses of samples from piezometers of different depths in the dedicated monitoring wells give further insight into water quality characteristics by depth. As mentioned, the Basin is characterized as having three distinct aquifer units, the upper, middle, and lower units. The shallow piezometers, completed in the upper unit above 150 feet, show somewhat better water quality than piezometers completed in the middle zone.

3.2. LAND SUBSIDENCE

Land subsidence in the context of this Plan is the lowering of the ground surface through compaction of compressible, fine-grained strata caused by pumping from unconsolidated, interbedded aquifer-aquitard systems. Compaction can be fully reversible (elastic) or permanent (inelastic). Elastic compaction and expansion generally occur in response to seasonal

groundwater level fluctuations. Inelastic compaction is most likely to occur when groundwater levels reach new historic lows during the summer or do not recover fully during the winter. Subsidence avoidance is generally accomplished through management of groundwater pumping so that water levels do not decline on a long-term or permanent basis below either historic levels, or those levels that would cause dewatering of aquitards. Though subsidence has not historically been observed in the Pittsburg Plain Groundwater Basin, the City seeks to avoid land subsidence resulting from groundwater pumping by maintaining current groundwater levels.

In eastern Contra Costa County and elsewhere in the Delta, there has been significant land subsidence (more than 20 feet in some areas) that was not related to extraction of groundwater or other fluids. Construction of levees around the Delta islands and the dewatering of soils for agricultural production increased the exposure of organic (peat) soils to oxygen, which caused subsidence due to microbial oxidation of the peat soils (Blodgett et al., 1990). Another factor is that the natural delivery of sediments from the upper watershed to the Delta has been interrupted by the construction of upstream dams and island levees, so there is less sediment available to counteract the effect of peat soil dewatering. The rate of subsidence in the Delta has been 0.4 to 0.6 inch per year, and ground surface elevations in the central Delta islands are currently 10 to 25 feet below sea level (DWR, 2006).

Historically, land subsidence was monitored along transects using periodic spirit level surveys conducted by the U.S. Geological Survey and the National Geodetic Survey (NGS). In the mid-1980s, a transition was made from spirit level surveys to global positioning system (GPS) surveys. Like spirit level transects, GPS monitoring of subsidence relies on periodic resurveying of a network of monuments, though in some cases (discussed below) permanent GPS stations are constructed which provide continuous elevation data. The accuracy of GPS surveys has gradually improved and is currently on the order of plus or minus 1 centimeter.

The City does not monitor land subsidence within its area of influence, but land subsidence in Contra Costa County is monitored by various entities, including DWR and the Plate Boundary Observatory (PBO). Regional land subsidence monitoring has included non-instrumented GPS monuments, continuous GPS monitoring stations, and a 2007-2008 Delta-wide aerial Light Detection and Ranging (LiDAR) survey; there are no extensometers in Contra Costa County.

GPS monitoring locations in eastern Contra Costa County are shown on **Figure 3-5**. The Delta non-instrumented GPS network consists of about 120 monuments, including two monuments in eastern Contra Costa County. This network was initially surveyed in 1997 and resurveyed in 2002, but funding has not been available to process the data from the 2002 resurvey. PBO's geodetic observatory network consists of over 1,100 GPS receivers, in addition to a number of other devices, which record plate boundary deformation resulting from the constant motion of the Pacific and North American tectonic plates in the western United States (UNAVCO, 2012). Three of these continuous GPS monitoring stations are located in eastern Contra Costa County, with Station P248 located in the hills south of the City. DWR, as part of its Delta Risk Management Strategy (DRMS) study, has undertaken an effort to periodically obtain LiDAR data for the entire Delta of sufficient accuracy to generate 1-foot contours of elevation. Interim data products from the first survey (2007-2008) are currently available in the public domain,

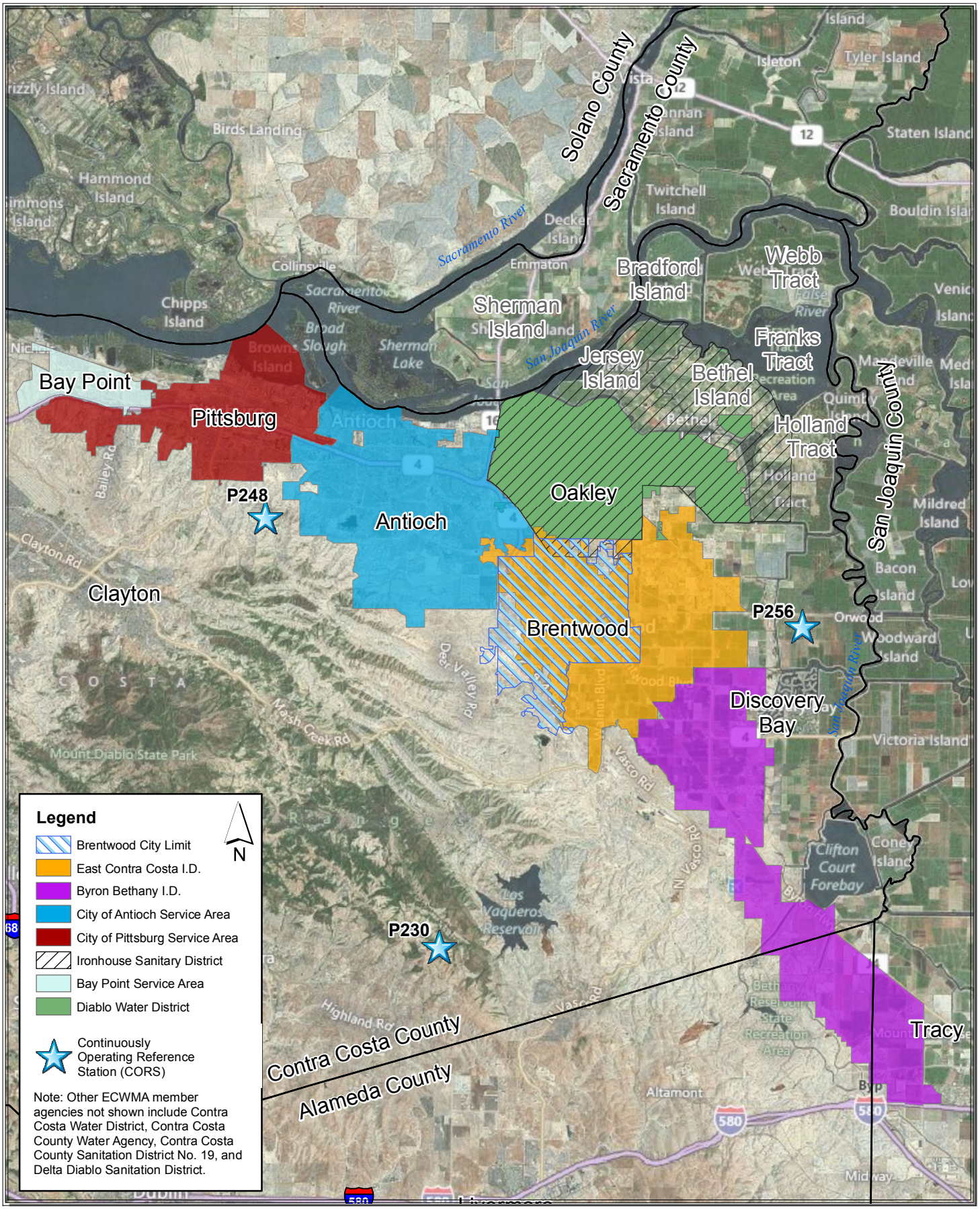

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Figure 3-5
Land Subsidence Monitoring Locations

though the release of a final, revised product (which will also be made available in the public domain) is currently suspended pending issues with the state's financial situation (Dudas, 2010). This data, along with subsequent surveys could be used to identify areas of concern.

At present, stable groundwater conditions suggest that land subsidence is not a critical concern in the Basin. The City will periodically assess subsidence data relevant to the Plan using other sources such as those cited above to evaluate the station of subsidence in the region.

3.3. AREAS OF CONCERN

Although groundwater conditions in the Basin are considered favorable for past and current utilization, there are several areas of concern that may require changes in future groundwater management. These include:

- Sustainable pumpage from municipal wells;
- Preservation of groundwater quality;
- Prevention of land subsidence.

3.3.1. Sustainable Pumpage

Groundwater production beyond the safe-yield of the Basin could result in chronic water level declines, inelastic subsidence, and/or intrusion of saline water from the Delta in to the fresh water aquifer. Also, localized over-pumping or pumping near saline waters could produce conditions that would limit future groundwater extractions/usability. For these reasons, it is essential that groundwater pumping within the Basin remain within the sustainable limits of the Basin.

To ensure the sustainability of its groundwater extractions, the City has expanded its overall understanding of groundwater conditions in the Basin by installing strategically located TH/MWs and creating a monitoring program to monitor/evaluate aquifer response to groundwater pumping. Available groundwater monitoring data presented in annual groundwater conditions reports prepared by the City since 2009 suggest current groundwater production by the City is within the sustainable yield of the Basin (LSCE, 2011). The City has plans to expand its current monitoring network (as funding becomes available), though it does not plan on increasing the volume of groundwater it produces to meet future demand (RMC, 2011). Only very limited groundwater monitoring occurs in the western portion of the Basin near Bay Point. This Plan includes a component to continue monitoring and reporting on groundwater levels.

3.3.2. Preservation of Groundwater Quality

It is recognized that groundwater quality varies throughout the Basin and that there are may be contamination concerns resulting from municipal, industrial, and agricultural activities. These contamination concerns are addressed largely through meeting the state Drinking Water Source Assessment and Protection (DWSAP) program requirements, while the issue of other naturally

occurring constituents is addressed through project design and monitoring of pumping influences. Some native constituents of concern include TDS, iron, and manganese as they affect the City's ability to achieve its blending objectives. Since there are no hydraulic barriers between areas of "poor" versus "good" groundwater quality, there is a risk that groundwater pumping could induce migration of "poor" quality waters resulting in groundwater degradation. For this reason, the City will design future wells to avoid adverse and widespread pumping influences (through use of deep annual seals, selective screen intervals, and proper well spacing, for example) and monitoring of key wells for indications of potential adverse conditions. This approach is embodied in this Plan.

3.3.3. Land Subsidence

As indicated in the previous section, land subsidence monitoring data are limited in the eastern portion of Contra Costa County. However, there are no data to indicate that subsidence has occurred to a significant degree due to groundwater extraction. In addition, the conditions that would lead to subsidence (i.e., permanent dewatering or declining groundwater levels) are not evident within the Basin. Ongoing conjunctive use of groundwater and surface water within the Basin provide a basis for impact avoidance. This strategy is embodied in this Plan.

4.0 Groundwater Management Plan Objectives and Components

4.1. GROUNDWATER MANAGEMENT GOAL

Groundwater management involves ongoing coordinated actions related to groundwater withdrawal, replenishment, and protection to achieve long-term sustainability of the resource without detrimental effects on other resources. This Plan seeks to maintain the quality, reliability, and sustainability of the Basin water supply for current and future beneficial uses including agricultural, industrial, and municipal supplies. To accomplish these purposes, the City will support four specific BMOs. The Plan sets forth a framework and related actions to accomplish the BMOs.

4.2. BASIN MANAGEMENT OBJECTIVES

BMO 1: Ongoing Groundwater Monitoring and Reporting
A program to monitor and report groundwater levels, groundwater quality, and pumpage was initiated by the City of Pittsburg in late 2008 as part of development of an additional groundwater source to serve conjunctively with its surface water source to meet overall municipal supply needs. The purpose of the City's monitoring program is to provide information to enable decision-makers to operate the City's wells in a way that would not induce adverse impacts. Land subsidence, surface water flow, and surface water quality have been of secondary concern, and monitoring for those components will be developed in the future, as applicable. Currently, groundwater monitoring is limited to the City of Pittsburg service area (**Figure 2-1**) which is considered representative of the overall basin. However, expansion of the monitoring network will be evaluated and implemented as needed, to ensure that the scope of monitoring is comprehensive throughout the groundwater basin.

The monitoring and reporting program specifically seeks to inform water supply operations so that undesirable effects such as chronic groundwater level declines, groundwater quality degradation (including saline intrusion), and significant inelastic land subsidence are avoided. The City's monitoring program (and any others that may be added to the basin in the future) will be reevaluated periodically to determine whether the location, depth, and frequency of monitoring are adequate and that all BMOs are being met. Results from individual monitoring programs in eastern Contra Costa County will be made available to other interested agencies in the region, aiding effective groundwater resource management and accomplishment of regional BMOs as outlined in the East Contra Costa County IRWMP Update.

The City's ongoing participation in DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) Program as a designated monitoring entity further facilitates regional coordination and provides a means for public outreach and transparency.

BMO 2: Preservation of Groundwater Quality
The purpose of this objective is to outline actions necessary to maintain groundwater quality for beneficial uses within the Basin. It includes wellhead and recharge area protection, monitoring and management of recycled water use within the basin, and actions to avoid saline intrusion, salt accumulation, and/or mobility of naturally occurring constituents. Also included in this BMO will be the active identification and mitigation of any groundwater contamination problems through cooperation with responsible parties or through independent action if timely response by responsible parties is not forthcoming and the other management objectives are thereby impacted or constrained.

BMO 3: Avoidance of Overdraft
It is important that groundwater pumpage in the Pittsburg Plain Groundwater Basin not exceed the sustainable yield of the basin to avoid chronic water level declines that lead to sustained overdraft conditions, significant inelastic land subsidence, or saline intrusion from the Delta. This objective will be continuously evaluated through interpretation of groundwater level and pumpage data collected as part of the City's existing monitoring program. In the long-term, sustainable yield for the basin will be quantified as a benchmark for overdraft avoidance.

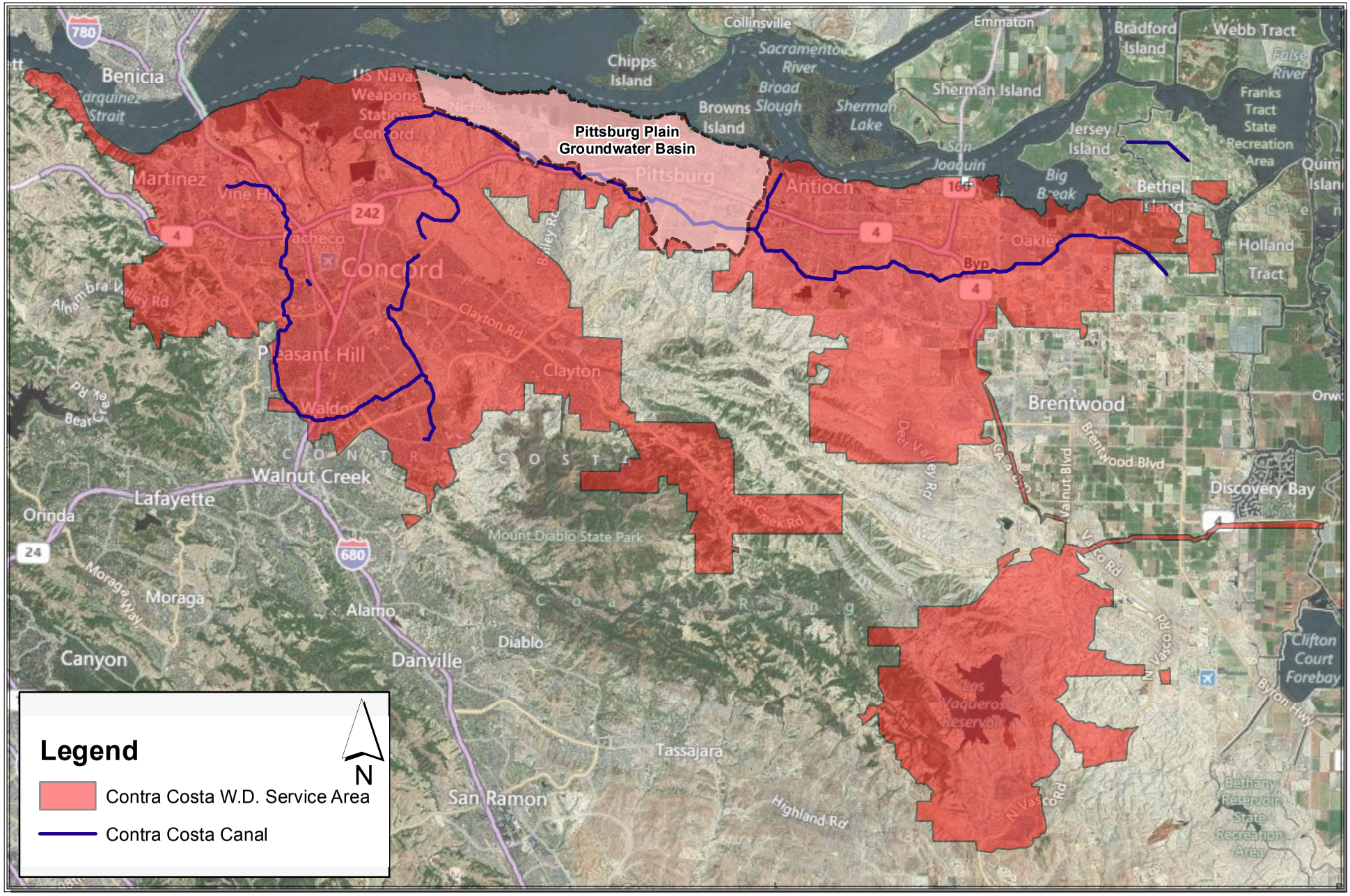
BMO 4: Preservation of Interrelated Surface Water and Groundwater Resources
Several entities within and around the Pittsburg Plain Groundwater Basin, including the City of Pittsburg and Bay Point CDP, utilize surface water purchased from Contra Costa Water District and delivered via the Contra Costa Canal (**Figure 4-1)**. Both the City of Pittsburg and GSWC, which operates the Bay Point System, conjunctively use surface water and groundwater. Within the basin, there are plans to continue to utilize groundwater resources and expand the use of recycled water (RMC, 2011). This management objective is concerned with non-degradation of surface water flows or quality as a result of groundwater management practices. In addition to being classified as a separate BMO, conjunctive use is one of the primary means of accomplishing BMOs 2 and 3.

4.3. PLAN CATEGORIES AND COMPONENTS

To accomplish the BMOs discussed above, this Plan incorporates a number of components that are divided into five categories: (1) Monitoring Program, (2) Water Resource Sustainability, (3) Groundwater Resource Protection, (4) Agency Coordination and Public Outreach, and (5) Plan Implementation and Updates. Each of the Plan categories and associated components are described below.

COMPONENT CATEGORY 1: MONITORING PROGRAM

Groundwater use by the City of Pittsburg is limited primarily by its high dissolved mineral content and manganese. In accordance with a water system permit through the CDPH (2009), the City may extract groundwater from approved supply wells, blend groundwater with the City's



Path: X:\2011 Job Files\11-053\GIS\Figure 1-2 CCWD Area.mxd

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Figure 4-1
Contra Costa Water District Service Area

surface water source, and treat the blended stream at the City's WTP so long as TDS of the finished water remains below 500 mg/L. The City initiated a groundwater monitoring program in late 2008 to collect and interpret data on groundwater conditions in relation to the City's well production. The monitoring program is intended to support groundwater management and provide necessary information to ensure that well operations do not induce adverse environmental impacts.

The monitoring network consists of two existing production wells and nine dedicated monitoring wells (**Appendix B**). As summarized below, the City's monitoring program includes three elements: (1) groundwater levels, (2) groundwater quality, and (3) groundwater pumpage. A fourth element, monitoring of land subsidence, is part of a regional monitoring program and will not be conducted by the City. Another element, monitoring of surface water flows and quality in the Delta, is conducted by various other agencies, including DWR. The City's pumping does not directly affect surface flows or quality and, accordingly, the City does not anticipate the need to directly or independently monitor surface water other than the quality of surface water delivered by CCWD to the City.

The City of Pittsburg is a groundwater monitoring entity in DWR's CASGEM Program. As such, the City of Pittsburg manages the collection and reporting of groundwater levels for the Pittsburg Plain Groundwater Basin. The City's CASGEM Monitoring Plan is provided in **Appendix D**.

Component 1A: Elements of Monitoring Program

The City's groundwater monitoring program is summarized in **Appendix E**. Well construction data for wells monitored under this Plan are contained in **Appendix F**.

Groundwater Levels

The primary focus of the City's current groundwater monitoring program is to provide information necessary to ensure that well operations do not induce chronic groundwater level declines or undesirable effects such as saline intrusion from Suisun Bay. Manual water level measurements are made monthly in the City's two active production wells (Bodega and Rossmoor), and nine designated monitoring wells (**Appendix F**). The City destroyed the Ball Park production well in September 2012 and plans to replace it with a monitoring well cluster (as funding becomes available). As part of the City's CASGEM Monitoring Plan, static water levels are measured in the spring and fall after a 24-hour shutdown period and reported to DWR. In addition to the City's monitoring network, DWR monitors an active industrial well in the Basin. Water level data for this well is available online in DWR's Water Data Library (http://www.water.ca.gov/waterdatalibrary).

Groundwater Quality

Local groundwater typically has high concentrations of dissolved minerals relative to the City's surface water supplies and high levels of iron and manganese (**Appendix C**). All

are secondary drinking water parameters that are not a health concern. Through blending, the City's delivered water meets all primary and secondary standards as regulated under the CDPH Drinking Water Program. Groundwater quality sampling of production wells for general minerals, inorganic chemicals, and organic parameters is conducted every three years as required for all public water supply systems. Monitoring of water quality in the City's monitoring wells was performed at the time of construction in 2006 and again in 2011. Future monitoring of water quality in the City's monitoring wells will occur every two to three years.

Groundwater Pumpage

Listed in **Table 4-1** below is the production for each of the City's wells since 2008. In November 2008, the Ball Park Production Well was taken off-line and in 2010, the Bodega Production Well was brought online. As the City's groundwater monitoring baseline is developed, future reports will track trends in groundwater levels and quality as a function of pumping.

Table 4-1. Annual Groundwater Production by the City of Pittsburg (ac-ft/yr)

Production Well	2008	2009	2010	2011
Ball Park	662	0	0	0
Rossmoor	992	899	483	477
Bodega	-	-	1,097	1,292
Total (ac-ft)	1,654	899	1,580	1,769

Table 4-2 lists total groundwater pumping for the Bay Point System from 2005 to 2010, as presented in the 2010 Bay Point water System UWMP (Kennedy/Jenks, 2010).

Table 4-2. Annual Groundwater Production for the Bay Point System (ac-ft/yr)

	2005	2006	2007	2008	2009	2010	2011
Total (ac-ft)	193	270	270	255	222	235	248

Land Subsidence

As discussed in Section 3.2, land subsidence has occurred historically in the Delta, including some areas in eastern Contra Costa County. Reclamation of Delta islands by the construction of levees and dewatering of soils provided new, highly productive land for agricultural production. Compaction and microbial oxidation of organic-rich (peat) soils resulting from farming activity are the predominant causes of land subsidence in the Delta.

The City of Pittsburg does not monitor land subsidence within its area of influence, but land subsidence in Contra Costa County is monitored by various entities, including DWR

and the Plate Boundary Observatory (PBO). Regional land subsidence monitoring has included non-instrumented GPS monuments, continuous GPS monitoring stations, and a 2007-08 Delta-wide aerial Light Detection and Ranging (LiDAR) survey; there are no extensometers in Contra Costa County.

GPS monitoring locations in eastern Contra Costa County are shown on **Figure 3-5**. The Delta non-instrumented GPS network consists of about 120 monuments, including two monuments in eastern Contra Costa County. This network was initially surveyed in 1997 and resurveyed in 2002, but funding has not been available to process the data from the 2002 resurvey. PBO's geodetic observatory network consists of over 1,100 GPS receivers, in addition to a number of other devices, which record plate boundary deformation resulting from the constant motion of the Pacific and North American tectonic plates in the western United States (UNAVCO, 2012). Three of these continuous GPS monitoring stations are located in eastern Contra Costa County, with Station P248 located in the hills south of the City of Pittsburg. DWR, as part of its Delta Risk Management Strategy (DRMS) study, has undertaken an effort to periodically obtain LiDAR data for the entire Delta of sufficient accuracy to generate 1-foot contours of elevation. Interim data products from the first survey (2007-2008) are currently available in the public domain, though the release of a final, revised product (which will also be made available in the public domain) is currently suspended pending issues with the state's financial situation (Dudas, 2010). This data, along with subsequent surveys could be used to identify areas of concern.

At present, stable groundwater conditions suggest that land subsidence is not a critical concern in the Basin. The City will periodically assess subsidence data using sources such as those cited above.

Surface Water Flows and Quality

Surface water flows and quality in the Delta are monitored by various agencies including DWR. The City has no plans to conduct additional monitoring at this time.

As required by CDPH, GWSC and the City of Pittsburg monitor the quality of surface water delivered by CCWD on a quarterly basis. Both raw and treated surface waters are sampled at the City's WTP and analyzed for nitrate, general mineral, general physical, inorganic, and organic constituents in accordance with its water supply permit under the CDPH drinking water program.

Component 1A Actions

- Continue the groundwater monitoring program detailed in **Appendix E**.
- Make available groundwater monitoring data to other agencies to aid in integrated water resource management and accomplishment of BMOs.

Component 1B: Evaluation and Reporting of Monitoring Data

Groundwater level, quality, and production data collected as part of the City's groundwater monitoring program are currently entered into a database to aid data management, interpretation, and reporting. New data will continue to be entered into the database and routinely reviewed to check for any significant changes in groundwater conditions. Groundwater levels for the City's designated monitoring wells will continue to be reported as part of the DWR CASGEM Program as outlined in the City's CASGEM Monitoring Plan. As new monitoring locations and water level data become available they will be added the CASGEM Monitoring Plan and reporting as appropriate. Annual summary reports, which present and discuss monitoring data, are currently prepared as part of the City's monitoring program. It is recommended as part of this Plan that the City continue to prepare these annual reports.

Component 1B Actions

- Maintain clear records from all monitoring and well construction/destruction activities.
- Prepare an annual report describing conditions as reflected by trends of monitored parameters.
- Make the annual report available to other agencies to aid in integrated water resource management and accomplishment of BMOs.

COMPONENT CATEGORY 2: WATER RESOURCE SUSTAINABILITY

Component 2A: Maintain Stable Groundwater Levels

Accomplishment of BMO 3, Avoidance of Overdraft, requires that chronic groundwater level declines be avoided. Groundwater levels in the basin have historically been stable because the majority of water demand is met by surface water. Seasonal water level fluctuations occur, though monitoring data show water level recovery during the winter months, and monitoring wells located at distance from the Rossmoor and Bodega wells remain above sea level, a requirement to avoid intrusion from the Delta (BMO 2).

Static groundwater levels in the Bodega and Rossmoor Production Wells will be obtained in the spring and fall of each year following a 24-hour shutdown period. Monthly readings at all locations will continue to aid in evaluating and distinguishing pumping effects from hydrologic factors.

Component 2A Actions

- Continue monitoring of groundwater levels discussed under Component 1A to ensure that chronic groundwater level declines do not occur.

Component 2B: Water Conservation

Water conservation measures and related public education measures have generally been developed in California to achieve the following goals:

- Meet legal mandates;
- Reduce average annual potable water demands;
- Reduce water demands during peak seasons; and
- Meet drought restrictions.

Both the City of Pittsburg and GSWC are signatories of the Memorandum of Understanding regarding Urban Water Conservation in California (MOU) and are therefore members of the California Urban Water Conservation Council (CUWCC). As members of the CUWCC, these entities file Best Management Practice (BMP) reports with the CUWCC. Both entities have up to date BMP reports which satisfy all CUWCC requirements and are available on the CUWCC's website (dnn.cuwcc.org).

As described in the 2010 UWMP for each entity, the City and GSWC collaborate with CCWD to implement various water conservation programs within their respective spheres of influence. As a regional wholesale provider, CCWD developed and now operates an ongoing Water Conservation Program on behalf of retail water agencies and their customers. The benefits of providing water conservation programs on a regional basis include economy of scale, assurance of a consistent message to the public, and assistance in obtaining grant funding for program implementation.

Since its inception in 1988, CCWD's Water Conservation Program has evolved and expanded, and its objective of reducing long-term water demand in an environmentally responsible and cost-effective manner has remained consistent (RMC, 2011). The Water Conservation Program's long-term goal is to reduce water demand within its service areas by 8,000 acre-feet in the Year 2040, not including savings resulting from activities not directly associated with CCWD. Total savings resulting from CCWD's efforts (direct and indirect) across its entire service area are estimated to be 23,700 acre-feet per year by 2035. Over the years, the Conservation Program has included showerhead distribution, rebates for ultra-low flow and high efficiency toilets, a high efficiency clothes washer rebate, and single family home surveys. The Water Conservation Program now provides rebates for numerous devices and surveys for all customer classes available throughout the CCWD wholesale and retail service areas.

The CUWCC's MOU identifies fourteen demand management measures (DMMs) required for compliance. The following table lists these DMMs and the status of their implementation within the City of Pittsburg. A similar table for the Bay Point System is available in the Bay Point 2010 UWMP (Kennedy/Jenks, 2010).

Implementation of Demand Management Measures

Demand Management Measure	Conservation Program	Status
1. Residential Water Audits	Conducted single-/multi-family home surveys.	In Progress
2. Residential Plumbing Fixture Retrofits	Conservation shower heads provided to > 80% of City's residential service area.	Implemented
3. Water System Delivery Audits, Leak Detection, and Repair	Water system audit program in place, goal to audit > 90% of residential users in service area.	Implemented
4. Metering with Commodity Prices	Implementing new and retrofitted metering connections.	Implemented
5. Large Landscape Conservation	The City's programs include CIMIS-controlled irrigation systems, recycled water use, conversion of grass fields to synthetic turf, and participation in CCWD's Cash for Grass program.	In Progress
6. High Efficiency Washing Machine Rebate	Rebate program currently operating and periodically updated.	Implemented
7. Public Information	The City participates in CCWD's promotion of water conservation through a variety of media outlets.	Implemented
8. School Education	Participates in Water Education Program (WEP) for students.	Implemented
9. Commercial, Industrial, and Institutional Water Conservation	City offers a CII survey program to provide rebates and incentives for water conservation.	In Progress
10. Wholesale Agency Program	*Not Applicable*	*Not Applicable*
11. Conservation Pricing	The City has implemented conservation pricing.	Implemented
12. Conservation Coordinator	The City has filled this position.	Implemented
13. Water Waste Prohibition	The City has restrictions and penalties in place.	Implemented
14. Residential High Efficiency Toilet (HET) Replacement Program	Rebates are offered at the time of purchase for HET replacement.	Implemented

Communication tools used by CCWD and the City to encourage water conservation are outlined in the UWMP (RMC, 2011) under public information programs (DMM-G) and school education (DMM-H). These DMMs are discussed below under Component 4B (Public Outreach) and Component 4C (Water Awareness Education).

Component 2B Actions

- Continue to implement and promote water conservation programs within the Basin.

Component 2C: Implementation of Conjunctive Water Management

In areas where both surface water and groundwater supplies are available, water purveyors like the City of Pittsburg and GSWC can utilize those supplies conjunctively to increase overall supply and reliability to their water systems. Presently, the City of Pittsburg obtains approximately 85 to 95 percent of its water supply from CCWD. CCWD provides untreated surface water pumped from the Sacramento-San Joaquin Delta to the City via the Contra Costa Canal. The remaining 5 to 15 percent of the City's water supply is pumped from two groundwater wells (Rossmoor and Bodega production wells) located within the City. The City's public water system operating permit requires that the TDS concentration of water served (a mix of groundwater and surface water) be less than 500 mg/L, the state's secondary drinking water standard, thus limiting the volume of relatively higher TDS groundwater which can be utilized. Blending also mitigates high iron and manganese concentrations in groundwater.

On average, Bay Point obtains 90 to 92 percent of its water supply from CCWD as treated surface water. The remaining 8 to 10 percent of its water supply is provided by three groundwater wells (Hill Street No. 1, Hill Street No. 2, and Chadwick Well No. 3) located within Bay Point.

Though conjunctive water management has been a part of overall supply management in the Basin for more than 20 years, it has not previously been a priority because surface water supplies have been sufficient to meet demands. Implementation of conjunctive use strategies may become important in future years as part of a regional strategy to address Delta water quality and supply issues. Neither Bay Point nor the City of Pittsburg plan to increase the volume of groundwater they produce.

Component 2C Actions

- The City will continue to identify management strategies to optimize conjunctive use of groundwater and surface water. This may require coordination with other agencies involved with regional water supply planning.

Component 2D: Integration of Recycled Water

Wastewater treatment and collection systems in the Pittsburg Plain Groundwater Basin are owned and operated by the DDSD. According to the City of Pittsburg UWMP, the DDSD Wastewater Treatment Plant (WWTP) collects roughly 14,700 acre-feet of wastewater annually, with 42 percent used for recycled water supply and the remainder discharged through an outfall to the Delta at New York Slough (RMC, 2011). All wastewater undergoes both secondary and partial tertiary treatment at the DDSD's WWTP. Water distributed via the DDSD's recycled water system undergoes final tertiary treatment at the DDSD's Recycled Water facility prior to distribution.

Most of the recycled water use (approximately 93 percent in 2010) is for cooling water at the Los Medanos and Delta Energy Facilities. Within the City, recycled water is used for irrigation at the City's Central Park, City Park, City Hall, Stoneman Park North, Delta View Golf Course, and along the 8th Street, Columbia, and Santa Fe corridors. In 2011, non-industrial recycled water use accounted for 475 acre-feet, or roughly 5 percent, of the City's total demand. A sharp increase in recycled water use by the City occurred in 2010 with the implementation of recycled water use at the Delta View Golf Course (largest non-industrial user of recycled water). In 2011, the Delta View Golf Course accounted for approximately 78% (369 acre-feet) of all non-industrial recycled water use by the City. The City has also expanded recycled water use for irrigation at Marina Walk Park. DDSD has plans to expand recycled water use for irrigation to Parkside Elementary School and Pittsburg High School.

In the City's UWMP under "Encouraging and Optimizing Recycled Water Use," the following mechanisms are identified for encouraging recycled water use:

- Securing funding from local, state, and federal agencies to offset capital costs;
- Ongoing coordination with CCWD and DDSD;
- Promoting partnerships to encourage regional and local water recycling projects;
- Urging regulatory agencies to streamline regulatory requirements;
- Supporting research that addresses public concerns on recycled water use, develops new technology for cost reduction, and assesses health effects to protect the public.

The City does not currently have plans to utilize financial incentives for recycled water use, though such an action may be considered to promote the implementation of further recycled water use. Recycled water is not currently available in the Bay Point service area.

Component 2D Actions

- As applicable, seek opportunities with DDSD to use recycled water.

COMPONENT CATEGORY 3: GROUNDWATER RESOURCE PROTECTION

Component 3A: Well Construction and Destruction Policies

BMO 2, Preservation of Groundwater Quality, requires that all wells be properly constructed and maintained during their operational lives and properly destroyed after their useful lives so that they do not adversely affect groundwater quality. This component is included in the Plan to support well construction and destruction policies, and to participate in their implementation, particularly with regard to surface and inter-aquifer well sealing and proper well destruction, which are critical in the management of a multiple aquifer system.

Contra Costa County adopted well construction ordinances in 1981 and 1985 and these are included in **Appendix G**. These ordinances establish requirements for well construction permits, specify minimum setbacks from septic tanks and other potential hazards, and

reference specific requirements of the California State Well Standards summarized in DWR Bulletin 74-81 (DWR, 1981). The state well standards were updated in Bulletin 74-90 (DWR, 1990). Both the state well standards and the county's ordinances require a minimum 50-foot annular seal for drinking water wells for sanitation protection and specify procedures for installation of the annular seal.

The state well standards and the county ordinances also establish requirements for destruction of abandoned wells. These procedures are intended to ensure that abandoned wells cannot act as conduits for infiltration of surface drainage to shallow aquifers or movement of groundwater from shallow to deeper zones.

The Environmental Health Division of the Contra Costa County Health Services is responsible for well construction and destruction permits in Contra Costa County, and the permit guidelines and application form are included in **Appendix G**. The well permit application includes a list of construction information to be verified by the county's Inspector at the time of construction.

Permitting of municipal supply wells is also within the purview of CDPH. CDPH has specified procedures for siting and permitting new well sources under Title 22 of the California Code of Regulations (see Section 64560 et seq., **Appendix H**). The state also requires a source assessment and protection survey under the Drinking Water Source Assessment and Protection (DWSAP) Program to comply with federal law concerning source protection.

The 1986 amendments to the federal Safe Drinking Water Act (SDWA) established requirements for new Wellhead Protection Programs (WPP) to protect groundwater that supplies drinking water wells for public water systems. Each state was required to prepare a WPP and submit it to the U.S. Environmental Protection Agency (EPA) by June 19, 1989. However, California did not develop an active statewide WPP at that time. Subsequently, in 1996, reauthorization of the SDWA established a related program called the Source Water Assessment Program. In 1999, CDPH developed the DWSAP Program, which was approved by EPA. The overall objective of the DWSAP Program is to ensure that the quality of drinking water sources is protected. In California, the DWSAP Program satisfies the mandates of both the 1986 and 1996 SDWA amendments.

The California DWSAP Program includes delineation of Groundwater Protection Zones surrounding an existing or proposed drinking water source where contaminants have the potential to migrate and reach that source. The program includes preparation of an inventory of Possible Contaminating Activities (PCAs) that may lead to the release of contaminants within these zones. The activities, referred to in the DWSAP Program as Potentially Contaminating Activities, include such land uses as gas stations and dry cleaners, as well as many other land uses. Known contaminant plumes regulated by local, state, and federal agencies are also included. The Groundwater Protection Zones, which are determined based on local hydrogeological conditions and also well operation and construction parameters, represent the approximate area from which groundwater may be withdrawn during 2, 5, and

10-year time periods. These zones also represent the area in which contaminants released to groundwater could migrate and potentially affect the groundwater extracted by wells located within the designated zones. The DWSAP Program evaluation also includes a risk or vulnerability ranking based on a combined numerical score that results from points assigned to various evaluations conducted as part of the DWSAP process. This ranking provides a relative indication of the potential susceptibility of drinking water sources to contamination.

The DWSAP Program encompasses the following steps that will be performed for each candidate well:

- Identify the proposed well point using coordinates derived from global positioning system equipment.

- Delineate Groundwater Protection Zones using proposed or actual well construction features and the Modified Calculated Fixed Radius method. This step requires input of anticipated or actual well capacity, which will range from 0.25 to 1.0 MGD.

- Complete Physical Barrier Effectiveness checklist using available information on local geology and surface features.
- Complete Well Data Sheet.

- Complete Possible Contaminating Activities (PCA) Inventory Form using information from a neighborhood survey, a database search from Environmental Data Resources Inc. (EDR), a review of data available on the State Water Resources Control Board's (SWRCB) GeoTracker website, and review of Regional Water Quality Control Board (RWQCB) agency files.

- Rank PCAs by vulnerability score.

- Create a zone delineation map showing the well location and protection zones based on average well discharge volumes and groundwater flow directions.

The DWSAP report lists results from database searches within the calculated wellhead protection zones including the EDR database, the SWRCB GeoTracker website, and RWQCB agency files. A neighborhood survey is conducted to verify existing conditions (e.g., land use) and identify activities that may cause the groundwater source to be considered vulnerable, but which may not be associated with an existing contamination site.

Component 3A Actions

- Comply with the County's well construction and destruction policies and state permitting requirements as stipulated by the CDPH.

Component 3B: Management and Mitigation of Contaminated Groundwater

Beneficial use of groundwater within the Pittsburg Plain Groundwater Basin is, in some cases, constrained by naturally occurring groundwater quality constituents. Local groundwater typically has concentrations of dissolved minerals and high levels of iron and manganese that exceed secondary MCLs under the CDPH Drinking Water Program. These constituents do not pose a risk to human health and through blending, delivered water within the City's water system meets all primary and secondary standards as regulated under the CDPH Drinking Water Program.

The Contra Costa County Environmental Health Division has local oversight for groundwater protection through the Underground Storage Tank (UST) and Hazardous Materials programs. The UST regulations provide groundwater protection through annual integrity testing and stringent tank requirements.

Component 3B Actions

- Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.
- Employ BMPs to limit potential sources of contamination in the environment.
- Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.
- Identify locations of point sources of contamination.
- Identify major non-point sources of contamination.
- To the extent that it affects water supply, seek to avoid and/or mitigate potential impacts on groundwater quality resulting from point or non-point sources of contamination.
- Groundwater contamination induced by City pumping will be avoided and/or mitigated to the extent that it adversely affects the water supply.

Component 3C: Long-Term Salt and Nutrient Management

Salt and nutrient management within the Pittsburg Plain Groundwater Basin is essential in fulfilling the purpose of this Plan, which is to maintain the quality, reliability, and sustainability of water supplies for beneficial uses within the basin, including agricultural, industrial, and municipal supplies. Groundwater production within the basin is limited by naturally high TDS, iron, and manganese concentrations observed in the City's monitoring and production wells. Through blending, the City's finished water meets all primary and secondary standards as regulated under the CDPH Drinking Water Program. By managing salt and nutrient loading at land surface and avoiding saline intrusion from the Delta, the City will preserve groundwater quality (BMO 2) and safeguard future groundwater supplies. Salts and nutrients in groundwater come from many natural sources and human activities. Among these are:

- Concentration of salts at land surface from evaporation of applied water;
- Application of agricultural/municipal/domestic fertilizers;
- Saline intrusion;
- Household chemicals and human waste;
- Dissolution of natural salts in soils/bedrock;
- Industrial waste.

In conjunction with this Plan, a salt and nutrient management program summary has been developed for the Basin to identify salt and nutrient sources, summarize existing programs for groundwater quality monitoring, summarize existing groundwater quality data, evaluate the potential for groundwater degradation, and perform an anti-degradation analysis. Results for each element of this program are presented in the Basin Salt and Nutrient Management Program Summary (LSCE, 2012b).

As part of an ongoing effort to ensure that groundwater production does not result in degraded water quality, such as by inducing saline intrusion from the Delta, the City monitors groundwater levels and quality, and operates its production wells at a sustainable level for which undesirable effects do not arise. Groundwater levels in monitoring wells located near the City's Production Wells (Bodega and Rossmoor) have remained above sea level, a requirement to avoid intrusion from the Delta. Where elevated TDS has been observed at the City's former Ball Park Production Well, the City has destroyed that well and plans to replace itl with a dedicated multiple-completion monitoring well (when funding becomes available) which will act as a sentinel for identifying any saline intrusion before it can reach the City's active production wells, should this occur. The potential for groundwater pumping within the Bay Point service area to induce saline intrusion has not yet been evaluated.

Component 3C Actions

- Identify potential salt and nutrient loading within the basin and develop actions to minimize/mitigate impacts.
- Identify trends in groundwater levels/quality, which may indicate saline intrusion or the potential for saline intrusion to occur.
- Identify trends in groundwater quality which may indicate degradation of groundwater quality.
- Manage the City's use of recycled water and fertilizers in identified recharge areas.

Component 3D: Identification and Management of Recharge Areas and Wellhead Protection Areas

The state DWSAP Program described under Component 3B is used to identify Groundwater Protection Zones surrounding an existing or proposed drinking water source where contaminants have the potential to migrate and reach that source. CDPH is responsible for

conducting DWSAP assessments for systems existing before the adoption of the California program, but has encouraged purveyors to perform their own assessments. Assessments for existing systems were due to be completed by May 2003. The results of the DWSAP assessments can be used as a planning tool to assess land use development in the vicinity of water sources. The DWSAP analyses prepared for water sources in the Basin will be reviewed at least every five years and updated as appropriate. The collective DWSAP information can also be integrated with other management activities, including siting of new wells, land use policies, and the county's well construction ordinance.

In 2011, passage of AB 359 amended CWC 10750 et seq. to require a map identifying recharge areas, as defined for the groundwater basin, to be included in a groundwater management plan. "Recharge area" as defined in CWC 10750 et seq. means "the area that supplies water to an aquifer in a groundwater basin and includes multiple wellhead protection areas." A map of recharge areas within the Pittsburg Plain Groundwater Basin is provided as **Figure 3-4** and further described in section 3.1.4.3 "Identification of Recharge Areas" in this Plan.

This Plan component is included to incorporate the DWSAP Program and a working knowledge of basin recharge areas as tools to assist in accomplishing BMOs identified in this Plan.

Component 3D Actions

- Identify and employ wellhead protection measures to ensure long-term sustainability of groundwater quality in the basin.
- Use DWSAP information, including delineation of source area and protection zones.
- Employ deeper seals, as warranted, for municipal supply wells to conservatively isolate and protect aquifers used for drinking water sources.
- Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.

COMPONENT CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH

Component 4A: Continuation of Local, State, and Federal Agency Relationships

The City of Pittsburg has long-established working relationships with local and state agencies that will serve many purposes of this Plan. ECWMA is comprised of eleven local water and wastewater agencies in eastern Contra Costa County, including the City, and several other member agencies that currently use groundwater or plan to use groundwater in the future. The City works closely with its wholesale supplier of surface water, CCWD, which is also an ECWMA member. The availability of surface water resources is key to meeting the City's future water demands.

ECWMA member agencies participated in the preparation of the eastern Contra Costa County FEIRWMP consisting of existing local and regional planning documents, which was completed in July 2005. The preparation of this Groundwater Management Plan is part of an

update to the FEIRWMP into a Proposition-84-compliant IRWMP that addresses revised water management goals and objectives for the region, and meets all state requirements. The updated IRWMP is expected to be completed by 2013.

The City has a historical and ongoing working relationship with local agencies to manage supplies to effectively meet water demands within the available yields of imported surface water and local groundwater. The City formally presented and solicited comment on its intent to prepare a groundwater management plan with ECWMA and other local agencies operating within the groundwater basin (Golden State Water and the Contra Costa County Department of Environmental Health) in April 2012.

ECWMA member agencies that received a draft Plan for review include:

- Diablo Water District
- Delta Diablo Sanitation District
- Contra Costa Water District

The above agencies represent an advisory group to the City for this Plan and will continue to be solicited for input on Plan updates and to receive annual reports on groundwater conditions. Representatives from the City of Pittsburg and Diablo Water District participated in three meetings on the content of the Plan and reviewed the draft Plan.

This Plan component is included to formalize the historical local and state agency working relationships as part of comprehensively managing local groundwater, in concert with imported surface water and local recycled water, to accomplish all the management objectives for the basin.

Component 4A Actions

- Continue working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.
- Pursue grant opportunities in cooperation with ECWMA to fund basin management activities and regional water projects.

Component 4B: Public Outreach

The purpose of this Plan is to maintain the quality, reliability, and sustainability of the basin water supply for the citizens and businesses of the City of Pittsburg and surrounding area. To accomplish this, the Plan components describe how the City intends to manage its water resources in support of four BMOs directed toward the sustainability of groundwater supplies. As the City is managing its water resources as a service to the local citizenry, it is committed to engaging the public in awareness of the Plan's purpose and objectives, and active involvement in Plan implementation. Accordingly, the City has prepared this Plan with the required public notices and hearings on its intention to prepare and adopt a plan per the CWC (see **Appendix A**).

Public outreach tools used by CCWD and the City to encourage water conservation are outlined in the UWMP (RMC, 2011) under DMM-7. The City's public information program includes publications, website pages, presentations, booths at community events, direct mail pieces, newsletters, newspaper ads, and water education programs used to promote water conservation.

Component 4B Actions

- Continue public involvement process with the City Council, providing periodic updates on water resources management activities by the City.
- Continue public outreach. Public notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.
- Continue to engage the public in future Plan updates.

Component 4C: Water Awareness Education

The City is committed to implementing water awareness programs as discussed in the 2010 UWMP (RMC, 2011). School educational programs directed toward water conservation are handled primarily by CCWD, which provides an extensive Water Education Program to schools within the City's service area. The UWMP states that the current school education program reaches over 30,000 students, teachers, and parents each year within the CCWD service area.

Component 4C Actions

- Continue water awareness education programs.

COMPONENT CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES

Component 5A: Plan Implementation and Reporting

Table 4-3 summarizes the action items discussed under each Plan component and the implementation schedule for each item. Action items planned to be completed within two years are labeled "short-term" actions, and items expected to require more than two years to complete are labeled "long-term" actions. Action items that represent on-going groundwater management activities conducted by the City are labeled "continuing" actions.

The FEIRWMP adopted by ECWMA in 2005 identifies and prioritizes regional water-related actions for the eastern Contra Costa County agencies, including the City. Highest priority actions identified in the IRWMP include quantifying countywide water demand and supply, increasing opportunities for conjunctive use, increasing the use of groundwater as part of conjunctive use operations, and implementation of water use efficiency programs (CDM, 2005). The City supports implementation of the IRWMP and is participating in the IRWMP Update, which is expected to be completed in 2013.

Since 2009, the City has prepared annual groundwater monitoring reports to describe the status of management actions performed, and/or recommended, including monitoring and other cooperative activities with other entities in the county and state or federal agencies. These annual reports include summaries of monitoring data collected during the previous year, including groundwater condition (groundwater levels, quality, and production) and will be expanded to include land subsidence data. The reports include summaries of long-term trends and evaluation of water level recovery during the winter months. The reports also summarize current water requirements, use of local groundwater and imported surface water from CCWD to meet those requirements, and other appropriate details about water requirements and supplies.

Component 5A Actions

- Make information and reports available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.
- Provide copies of adopted Plan, and related reports, to ECWMA members, Golden State Water, and the Contra Costa County Department of Environmental Health.
- Support the IRWMP, including implementation of priority objectives of the IRWMP.
- Prepare annual groundwater management reports.

Component 5B: Provisions to Update the Groundwater Management Plan

The components of this Plan reflect the current understanding of the occurrence of groundwater in the Pittsburg Plain Groundwater Basin and specific problems or areas of concern about that resource. The Plan components are designed to achieve specified objectives to utilize local groundwater for regular water supply while both protecting and preserving groundwater quantity and quality. While the Plan provides a framework for present and future actions, new data will be developed as a result of Plan implementation. That new data could identify conditions that will require modifications to currently definable management actions. As a result, this Plan is intended to be a flexible document that can be updated to modify existing components and/or incorporate new components as appropriate, to recognize and respond to future groundwater conditions.

Review and update of this Plan would initially occur within five years. Subsequent future updates would be similarly scheduled. ECWMA members would be apprised of future updates to the Plan to ensure that the Plan is consistent with regional BMOs. The City will also conduct outreach to encourage public participation in future Plan updates.

Component 5B Actions

- Review and update Plan every five years, or more often, as needed.

Table 4-3
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
CATEGORY 1: MONITORING PROGRAM			
1A. Elements of Monitoring Program			
• Implement the groundwater monitoring program detailed in **Appendix E**.	X		X
1B. Evaluation and Reporting of Monitoring			
• Maintain clear records from all monitoring activities.	X		
• Prepare an annual monitoring report describing conditions as reflected by trends of monitored parameters.	X		
• Make the annual report available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.	X		
CATEGORY 2: WATER RESOURCE SUSTAINABILITY			
2A. Maintaining Stable Groundwater Levels			
• Continue monitoring of groundwater levels discussed under Component 1A to ensure that progressive groundwater level declines do not occur.	X		X
2B. Water Conservation			
• Continue to implement and promote water conservation programs within the Basin.			X
2C. Implementation of Conjunctive Water Management			
• The City will continue to identify management strategies to optimize conjunctive use of groundwater and surface water. This may require coordination with other agencies involved with regional water supply planning.			X
2D. Integration of Recycled Water			
• As applicable, seek opportunities with DDSD to use recycled water.			X
CATEGORY 3: GROUNDWATER RESOURCE PROTECTION			
3A. Well Construction and Destruction Policies			
• Comply with the County's well construction and destruction policies and state permitting requirements as stipulated by the CDPH.			X
3B. Management and Mitigation of Contaminated Groundwater			
• Identify short and longer-term water quality trends and actions needed to sustain a supply of good quality groundwater.		X	
• Employ BMPs to limit potential sources of contamination in the environment.	X		X
• Coordinate with the County Environmental Health Services Division and other land use/regulatory agencies to develop a method for identifying contamination concerns and mitigating public water supply contamination.		X	

Table 4-3 (continued)
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
• Identify locations of point sources of contamination.			X
• Identify major non-point sources of contamination.		X	
• To the extent that it affects water supply, seek to avoid and/or mitigate potential impacts on groundwater quality resulting from point or non-point sources of contamination.		X	
• Groundwater contamination induced by City pumping will be avoided and/or mitigated to the extent that it adversely affects the water supply.			X
3C. Long-Term Salt and Nutrient Management			
• Identify potential salt and nutrient loading within the basin and develop actions to minimize/mitigate impacts.		X	
• Identify trends in groundwater levels/quality, which may indicate saline intrusion or the potential for saline intrusion to occur.	X		X
• Identify trends in groundwater quality, which may indicate degradation of groundwater quality.	X		X
• Manage the City's use of recycled water and fertilizers in identified recharge areas.	X		X
3D. Identification and Management of Recharge Areas and Wellhead Protection Areas			
• Identify and employ wellhead protection measures to ensure long-term sustainability of groundwater quality in the basin.	X		
• Use DWSAP information, including delineation of source area and protection zones.			X
• Employ deeper seals, as warranted, for municipal supply wells to conservatively isolate and protect aquifers used for drinking water sources.	X		
• Promote recharge area protection to mitigate impacts of urban infrastructure and sources of groundwater contamination that could reduce recharge potential.			X
CATEGORY 4: AGENCY COORDINATION AND PUBLIC OUTREACH			
4A. Continuation of Local, State, and Federal Agency Relationships			
• Continue working relationships with local, state, and federal agencies (regulatory and other) to achieve broader local and regional benefits.			X
• Pursue grant opportunities in cooperation with ECWMA to fund basin management activities and regional water projects.			X

Table 4-3 (continued)
Pittsburg Plain Groundwater Management Plan Action Items

Plan Components and Action Items	Short-term[1]	Long-term[2]	Continuing[3]
4B. Public Outreach			
• Continue public involvement process with the City Council, providing periodic updates on water resources management activities by the City.			X
• Continue public outreach. Public notices will include contact information so that interested parties can request additional information, ask questions, or provide comments on water resources management activities.			X
• Continue to engage the public in future Plan updates.			X
4C. Water Awareness Education			
• Continue water awareness education programs.			X
CATEGORY 5: PLAN IMPLEMENTATION AND UPDATES			
5A. Plan Implementation and Reporting			
• Make information and reports available to other agencies to aid in effective groundwater resource management and accomplishment of BMOs.			X
• Provide copies of adopted Plan, and related reports, to ECWMA members, Golden State Water, and the Contra Costa County Department of Environmental Health.	X		
• Support the IRWMP, including implementation of priority objectives of the IRWMP.		X	
• Prepare annual groundwater management reports.			X
5B. Provisions to Update the Groundwater Management Plan			
• Review and update plan every five years or more often as needed.			X

1. Short-term actions are items to be completed within two years.
2. Long-term actions are items expected to require more than two years.
3. Continuing are items that are ongoing groundwater management activities.

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APPENDIX A

Resolutions and Public Notices

BEFORE THE CITY COUNCIL OF THE CITY OF PITTSBURG

In the Matter of:

Resolution of Intention to Prepare)
a Groundwater Management Plan)

RESOLUTION NO. 12-11810

The Pittsburg City Council DOES RESOLVE as follows:

WHEREAS, the City of Pittsburg operates a Water System distributes potable water to approximately 17,500 residential, commercial, industrial, and institutional customers; and

WHEREAS, the City has two wells located in the Pittsburg Groundwater Basin; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq., permits the adoption and implementation of Groundwater management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the City is an authorized local agency and may therefore adopt and implement such a Groundwater Management Plan; and

WHEREAS, a Groundwater Management Plan will further efforts to protect and provide a safe sufficient, and reliable groundwater supply to citizens and business within the City's boundaries, will facilitate collection of information to further understand groundwater basin conditions and evaluate additional policies and programs for protection of the groundwater resources in the designated plan area; and

WHEREAS, the State of California has provided Proposition 84 Planning Grant funding in the amount of $78,000 for development of the Groundwater Management Plan; and

WHEREAS, it is the City's intent to prepare a Groundwater Management Plan for the purpose of implementing the plan and establishing a groundwater management programs, in accordance with California Water Code, Part 2.75 of Division 6, subject to final approval of the City Council and the public hearing and notification provisions of Water Code Section 10753 et seq. A copy of this resolution shall be published in a paper of general circulation in Contra Costa County at least two times to give public notice of its adoption and the intent to prepare a Groundwater Management Plan.

NOW, THEREFORE, the City Council finds and determines as follows:

Section 1. The recitals set forth above are true and correct statements and are hereby incorporated.

Section 2. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED by the City Council of the City of Pittsburg at a regular meeting on the 7th day of May, 2012, by the following vote:

AYES:	Casey, Evola, Longmire, Parent, Johnson
NOES:	None
ABSTAINED:	None
ABSENT:	None

Ben Johnson

Ben Johnson, Mayor

ATTEST:

Alice E. Evenson

Alice E. Evenson, City Clerk

CITY OF PITTSBURG PUBLIC NOTICE OF ADOPTION OF A RESOLUTION TO PREPARE A GROUNDWATER MANAGEMENT PLAN

NOTICE OF ADOPTED RESOLUTION

Notice is hereby given that the City of Pittsburg City Council adopted a Resolution to Prepare a Groundwater Management Plan pursuant to California Water Code, Part 2.75 of Division 6, Section 10750, et seq. The Resolution of Intention was adopted upon conclusion of the Public Hearing held on May 7, 2012, in the City Council Chambers located at the Pittsburg Civic Center, 65 Civic Avenue Pittsburg, CA. Additional information, together with a copy of the adopted resolution, may be obtained by contacting the City at 925-252-6966.

Dated: May 11, 2012

ECT#4436380

May 14, 21, 2012

BEFORE THE CITY COUNCIL OF THE CITY OF PITTSBURG

In the Matter of:

Resolution Authorizing Adoption of A Groundwater Management Plan	))	RESOLUTION NO. 12-11907

The Pittsburg City Council DOES RESOLVE as follows:

WHEREAS, the City of Pittsburg operates a Water System which distributes potable water to approximately 17,500 residential, commercial, industrial, and institutional customers; and

WHEREAS, the City has two wells located in the Pittsburg Plain Groundwater Basin; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq., permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the City is an authorized local agency and may therefore adopt and implement such a Groundwater Management Plan; and

WHEREAS, a Groundwater Management Plan will further the City's efforts to protect and provide a safe, sufficient, and reliable groundwater supply to citizens and businesses within the City's boundaries, will facilitate collection of information to further understand groundwater basin conditions and evaluate additional policies and programs for protection of the groundwater resources in the Plan area; and

WHEREAS, the State of California has provided Proposition 84 Planning Grant funding in the amount of $78,000 for the development of the Groundwater Management Plan; and

WHEREAS, California Water Code, Part 2.75 of Division 6, Section 10750, et seq. requires an entity to adopt a Groundwater Management Plan no later than two years after passing said Resolution of Intent; and

WHEREAS, on May 7, 2012, the City Council approved Resolution 12-11810 to declare its intention to prepare a groundwater management plan, in accordance with the requirements of the California Water Code; and

WHEREAS, a Public Hearing was held on May 7, 2012, to take public comments on the City's intent to prepare a groundwater management plan; and

WHEREAS, there were no public comments; and

WHEREAS, prior to the Public Hearing a Notice of the Public Hearing to adopt a Groundwater Management Plan was published two times in a newspaper of general circulation in Contra Costa County; and

WHEREAS, a Public Hearing was held on December 17, 2012, to determine whether to adopt a Groundwater Management Plan; and

WHEREAS, less than 50% of the District's assessed property owners protested the draft Plan; and

WHEREAS, the City has prepared a Groundwater Management Plan for the purpose of implementing the plan and establishing a groundwater management program, in accordance with California Water Code, Part 2.75 of Division 6; and

WHEREAS, the Groundwater Management Plan meets the final approval provisions of the City Council and the public hearing and notification provisions of Water Code Section 10753 et seq. A copy of this resolution shall be published in a paper of general circulation in Contra Costa County at least two times to give public notice of its adoption and the adoption of the City's Groundwater Management Plan.

NOW, THEREFORE, the City Council finds and determines as follows:

Section 1. The recitals set forth above are true and correct statements and are hereby incorporated.

Section 2. The City Council does hereby authorize the adoption of the City's Groundwater Management Plan.

Section 3. This Resolution shall take effect immediately upon its adoption.

PASSED AND ADOPTED by the City Council of the City of Pittsburg at a regular meeting on the 17th day of December, 2012, by the following vote:

AYES:	Casey, Evola, Johnson, Longmire, Parent
NOES:	None
ABSTAINED:	None
ABSENT:	None

Nancy L. Parent, Mayor

ATTEST:

Alice E. Evenson, City Clerk

East County Times

1700 Cavallo Road
Antioch, CA 94509
(925) 779-7115

PITTSBURG, CITY OF
FINANCE DEPT-A/P,65 CIVIC AVENUE
PITTSBURG CA 94565-3814

PROOF OF PUBLICATION

FILE NO. Walter Pease

In the matter of

East County Times

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter.

I am the Principal Legal Clerk of the East County Times, a newspaper of general circulation, printed and published at 2640 Shadelands Drive in the City of Walnut Creek, County of Contra Costa, 94598

And which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Contra Costa, State of California, under the date of January 6, 1919. Case Number 8268.

The notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

12/23/2012, 12/30/2012

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Executed at Walnut Creek, California.
On this 31th day of December, 2012.

Anna Dan

Signature

Legal No. **0004721648**

Legal Notice
Notice of Groundwater Management Plan Adoption

Notice is hereby given that the City Council of the City of Pittsburg held a public hearing December 17, 2012 in considering the adoption of a Groundwater Management Plan (GMP) for the Pittsburg Plain Groundwater Basin. The City is a local public agency within the Pittsburg Plain Groundwater Basin that provides water service to customers within its service area. The California Water Code (CWC) Section 10750 et seq. provides local agencies with the authority to adopt and implement groundwater management plans.

Following the public hearing and consideration by the members of the City Council, the Pittsburg Plain Groundwater Basin Groundwater Management Plan was formally adopted by a unanimous vote. Additional information and a copy of the City's GMP may be obtained by contacting the City at 925-252-6966.

Dated: December 19, 2012

ECT# 4721648
Dec. 23, 30, 2012

East County Times

1700 Cavallo Road
Antioch, CA 94509
(925) 779-7115

PITTSBURG, CITY OF
FINANCE DEPT-A/P,65 CIVIC AVENUE
PITTSBURG CA 94565-3814

PROOF OF PUBLICATION

FILE NO. PHN 12-17-12

In the matter of

East County Times

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above-entitled matter.

I am the Principal Legal Clerk of the East County Times, a newspaper of general circulation, printed and published at 2640 Shadelands Drive in the City of Walnut Creek, County of Contra Costa, 94598

And which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Contra Costa, State of California, under the date of January 6, 1919. Case Number 8268.

The notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

12/3/2012, 12/10/2012

I certify (or declare) under the penalty of perjury that the foregoing is true and correct.

Executed at Walnut Creek, California.
On this 10th day of December, 2012.

Signature

Legal No. **0004698264**

CITY OF PITTSBURG NOTICE OF PUBLIC HEARING TO CONSIDER ADOPTION OF A GROUNDWATER MANAGEMENT PLAN

**Legal Notice
Notice of
Public Hearing**

Notice is hereby given that the City Council of the City of Pittsburg will hold a public hearing December 17, 2012 to consider adopting a Groundwater Management Plan (GMP) for the Pittsburg Plain Groundwater Basin. The City is a local public agency that provides water service to customers within its service area. The California Water Code (CWC) Section 10750 et seq. provides local agencies with the authority to adopt and implement groundwater management plans.

The purpose of the GMP is to maintain a reliable and sustainable water supply for the City of Pittsburg and other groundwater users within the groundwater basin. The GMP describes groundwater management objectives directed toward the sustainability of groundwater and surface water supplies. To accomplish these objectives, the GMP sets forth five categories that identify actions to implement the GMP. Included among the actions is continued local groundwater monitoring to track overall groundwater conditions within the City's service area and in the Basin.

Hearing Date: December 17, 2012 at 7:00 pm in the City Council Chambers located at the Pittsburg Civic Center, 65 Civic Avenue, Pittsburg, CA. Additional information and a copy of the City's GMP may be obtained by contacting Walter Pease, Director of Water Utilities by telephone at 925-252-6966, or through e-mail at WPease@ci.pittsburg.ca.us

**ECT#4698264
Dec. 3, 10, 2012**

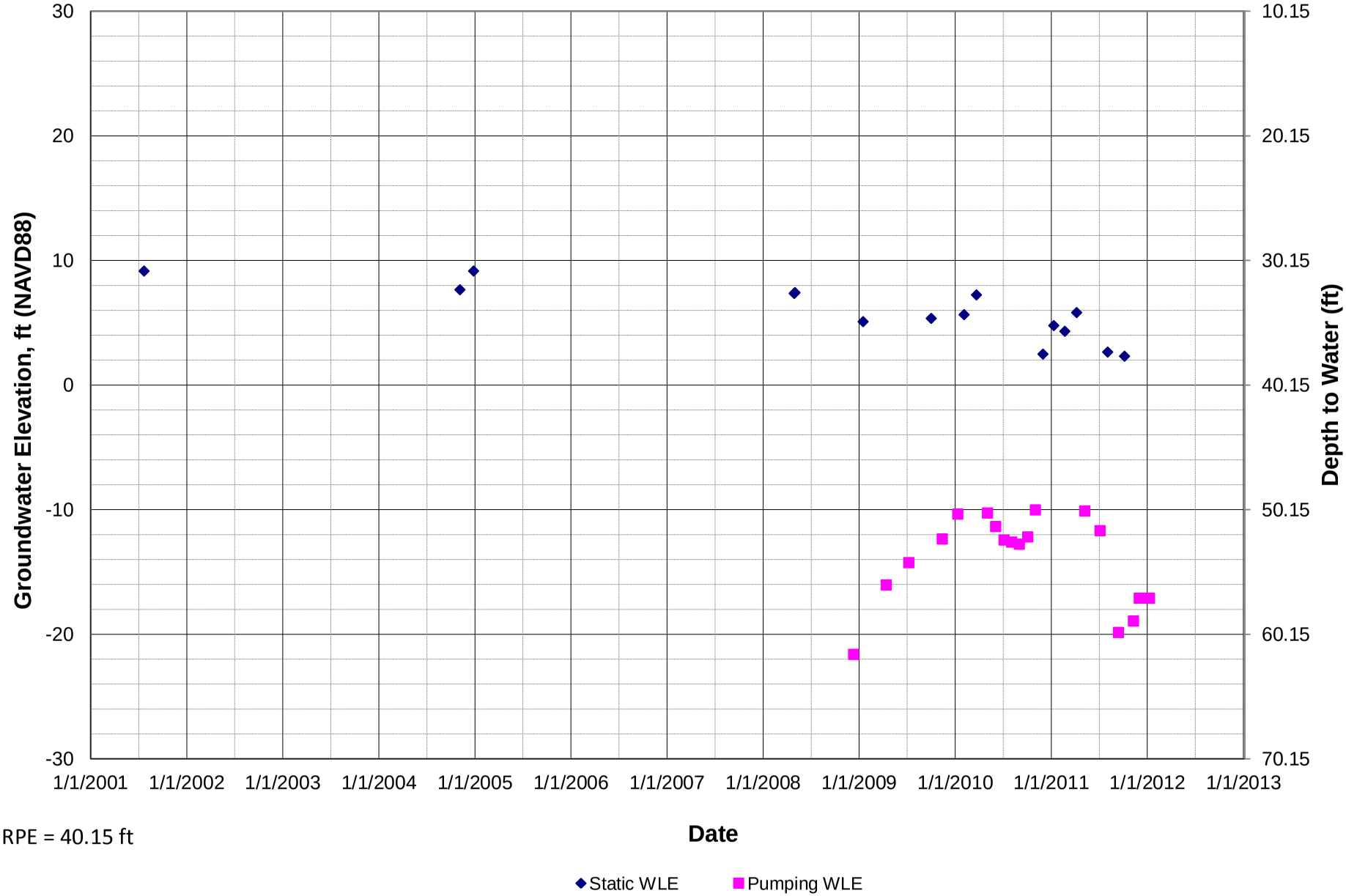
APPENDIX B

Groundwater Monitoring Networks

Path: X:\2008 Job Files\08-093\GIS\Pittsburg Well Location Map.mxd

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

City of Pittsburg
Well Location Map
Groundwater Monitoring Program
August 2010



RPE = 40.15 ft

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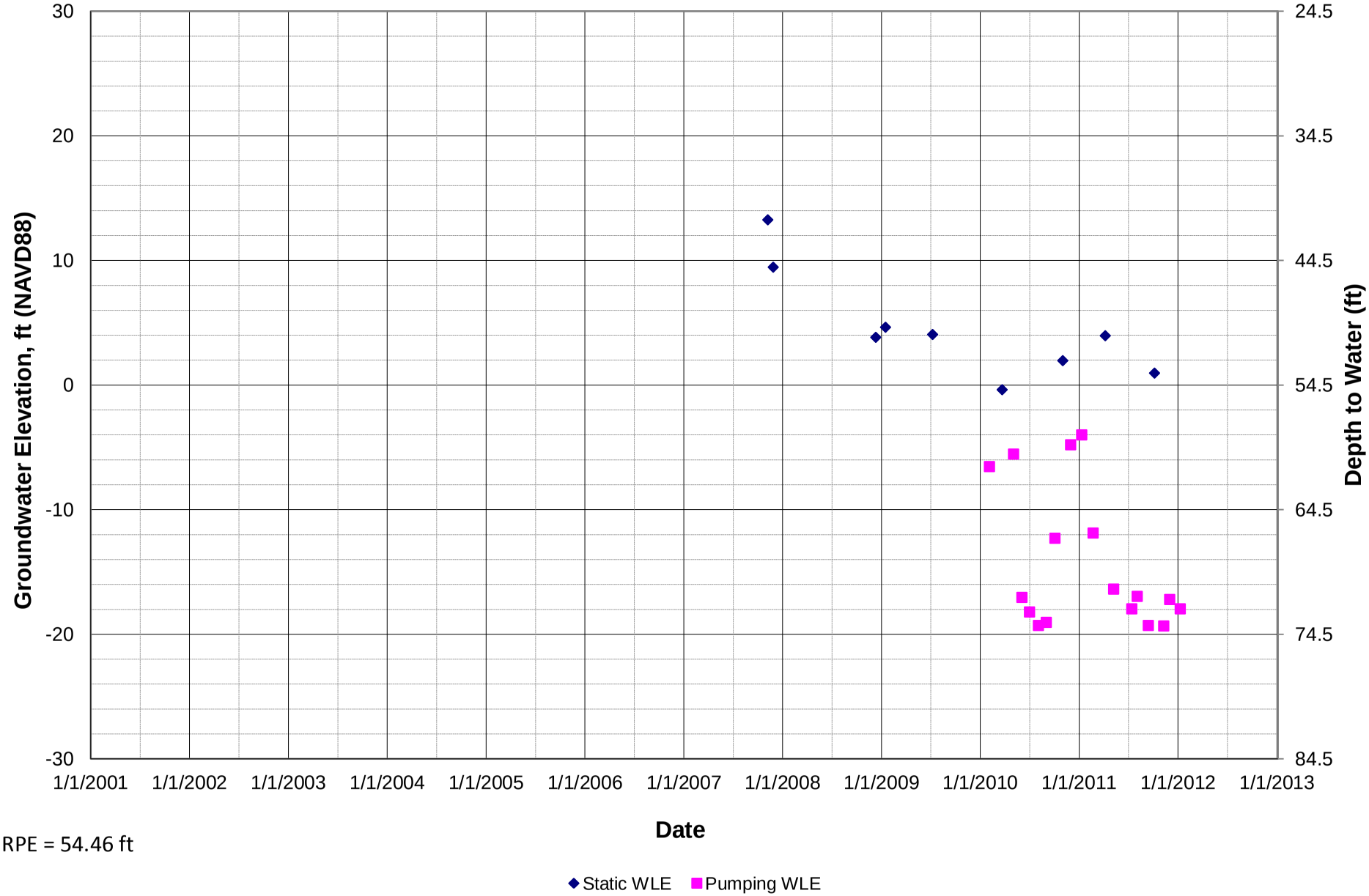
LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Rossmoor Production Well

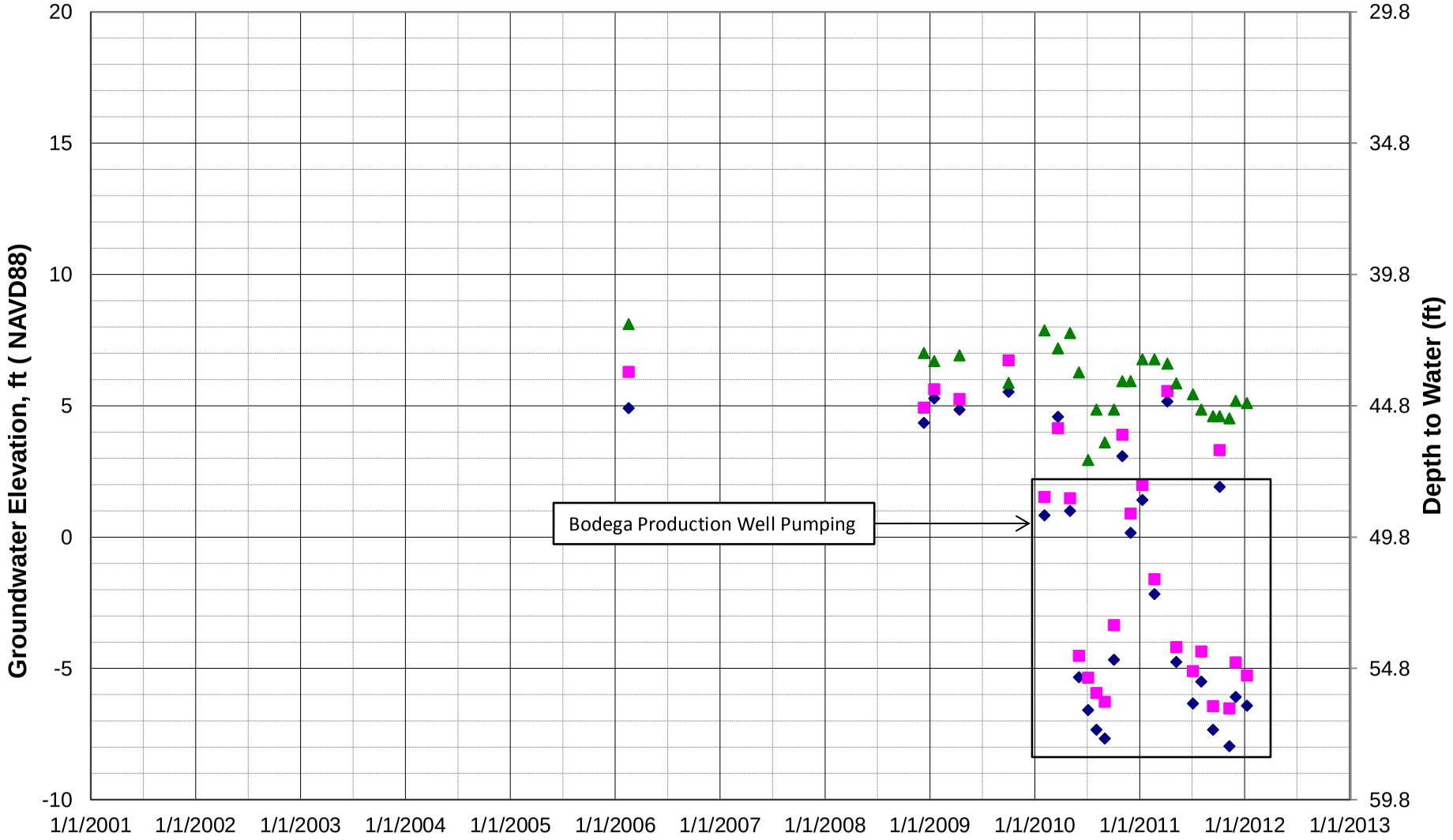


RPE = 54.46 ft

Y:\Tom Elson\tri\Hydrographs\Hydrographs.xls\GWE PWs

LUHDORFF & SCALMANINI CONSULTING ENGINEERS

Bodega Production Well



MW-120 RPE = 49.83 ft
MW-190 RPE = 49.73 ft
MW-290 RPE = 49.77 ft

Date

◆ MW-120 WLE ■ MW-190 WLE ▲ MW-290 WLE

Y:\Tom Elson\tri\Hydrographs\Hydrographs.xls\GWE Inter

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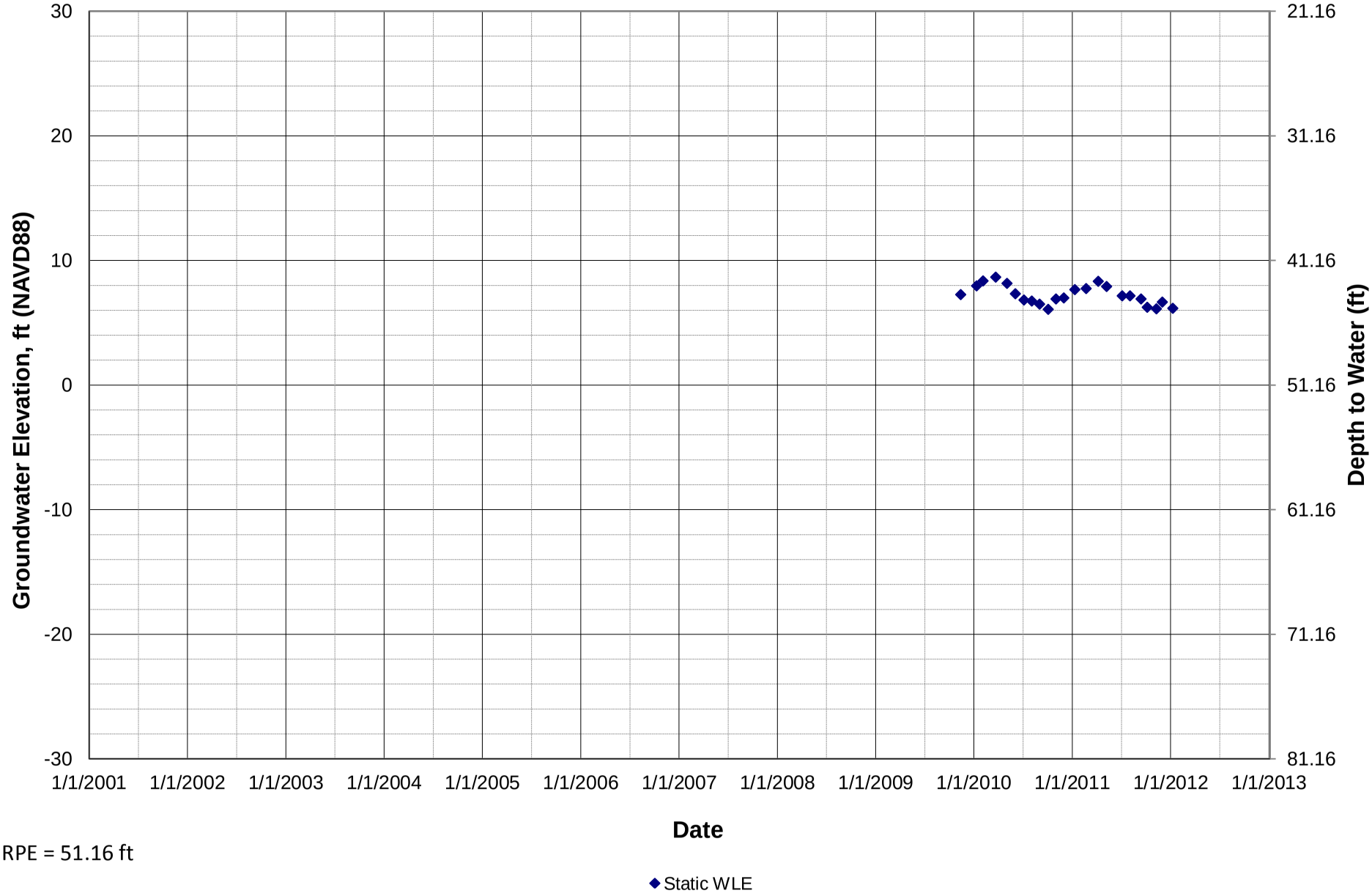
Bodega Monitoring Well



RPE = 51.16 ft

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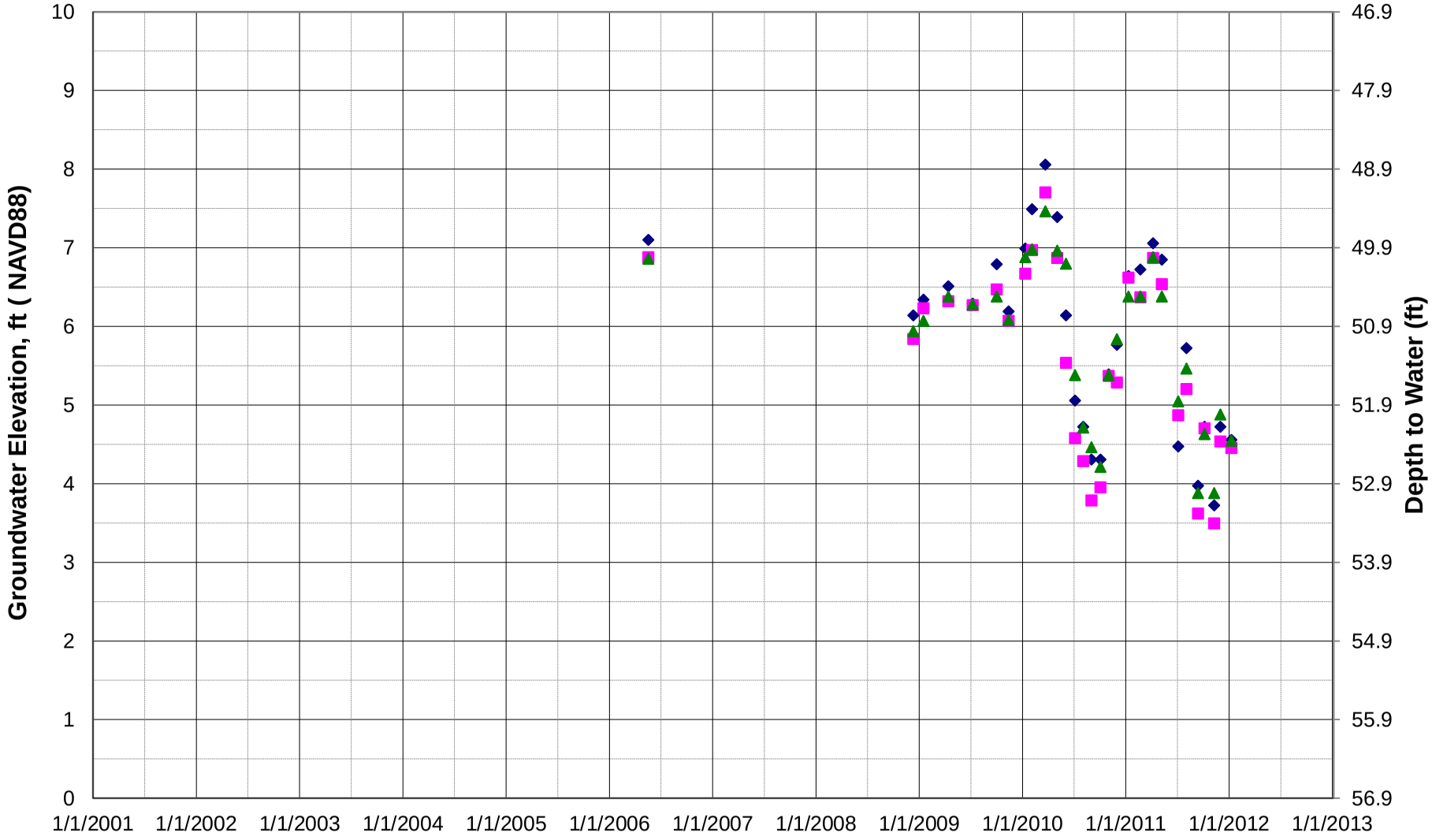
Ball Park Former Production Well



MW-150 RPE = 56.89 ft
MW-230 RPE = 56.87 ft
MW-330 RPE = 56.88 ft

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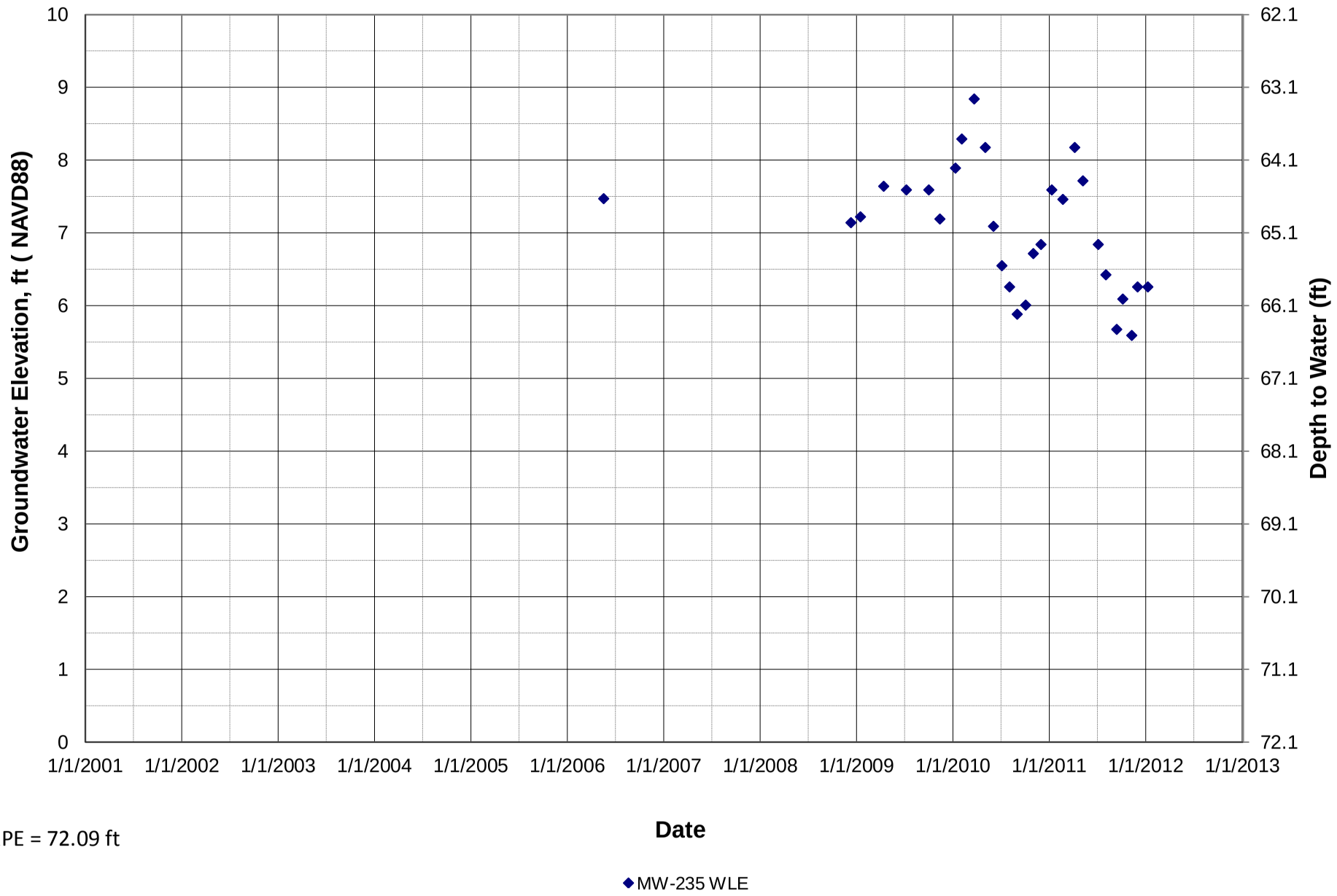
Burton Monitoring Well



RPE = 72.09 ft

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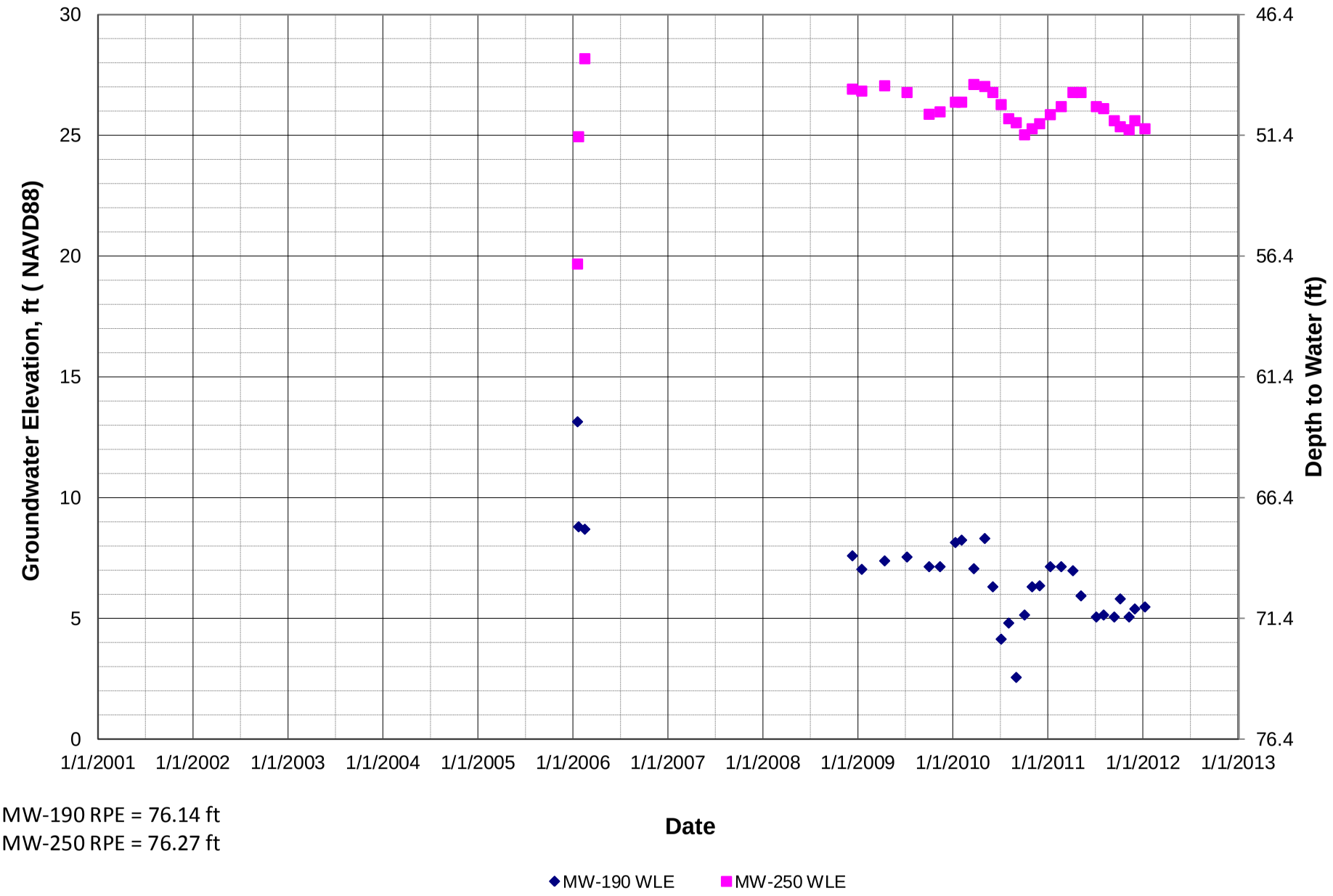
Crestview Monitoring Well



MW-190 RPE = 76.14 ft
MW-250 RPE = 76.27 ft

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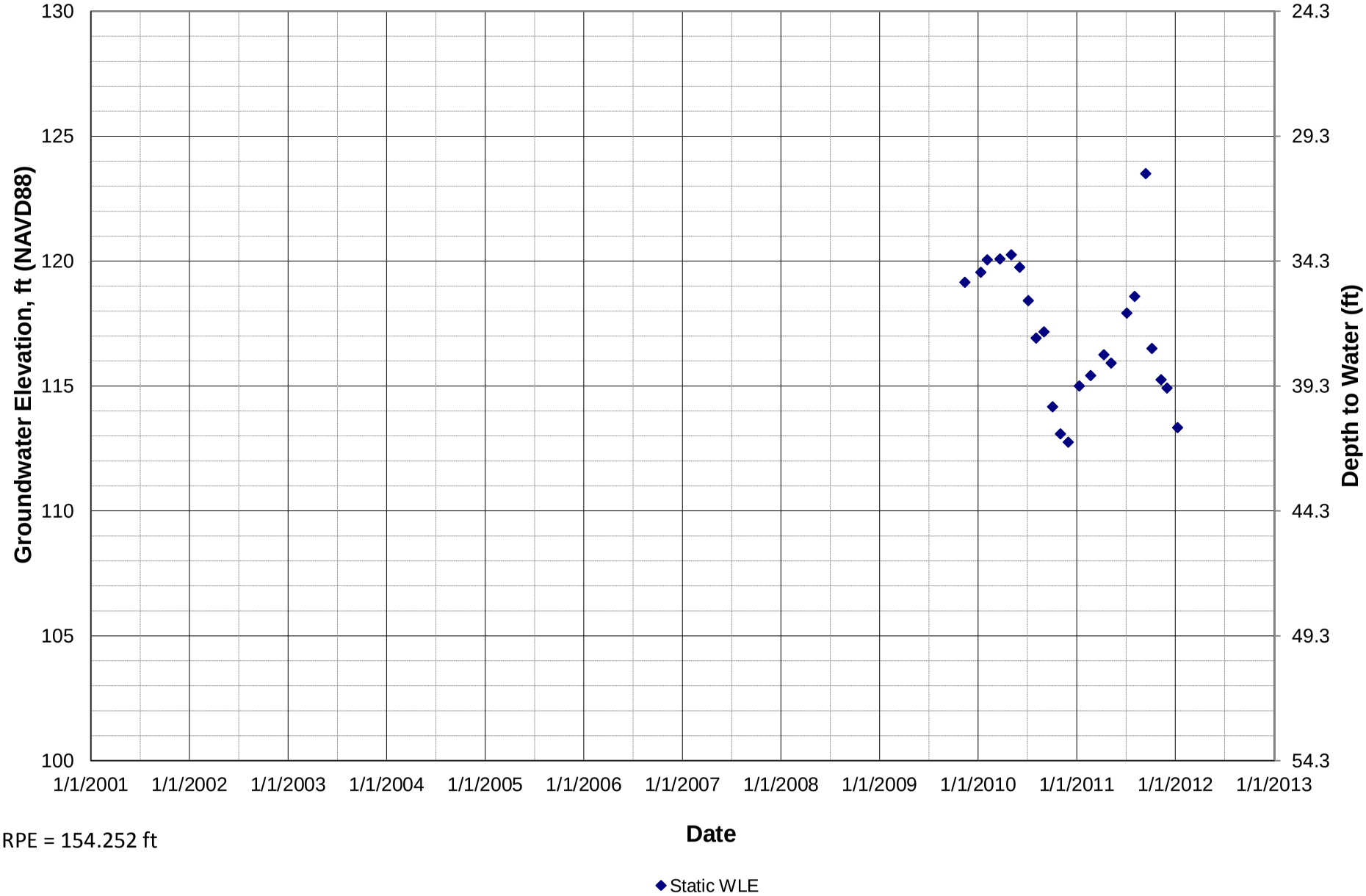
Golf Course Monitoring Well



RPE = 154.252 ft

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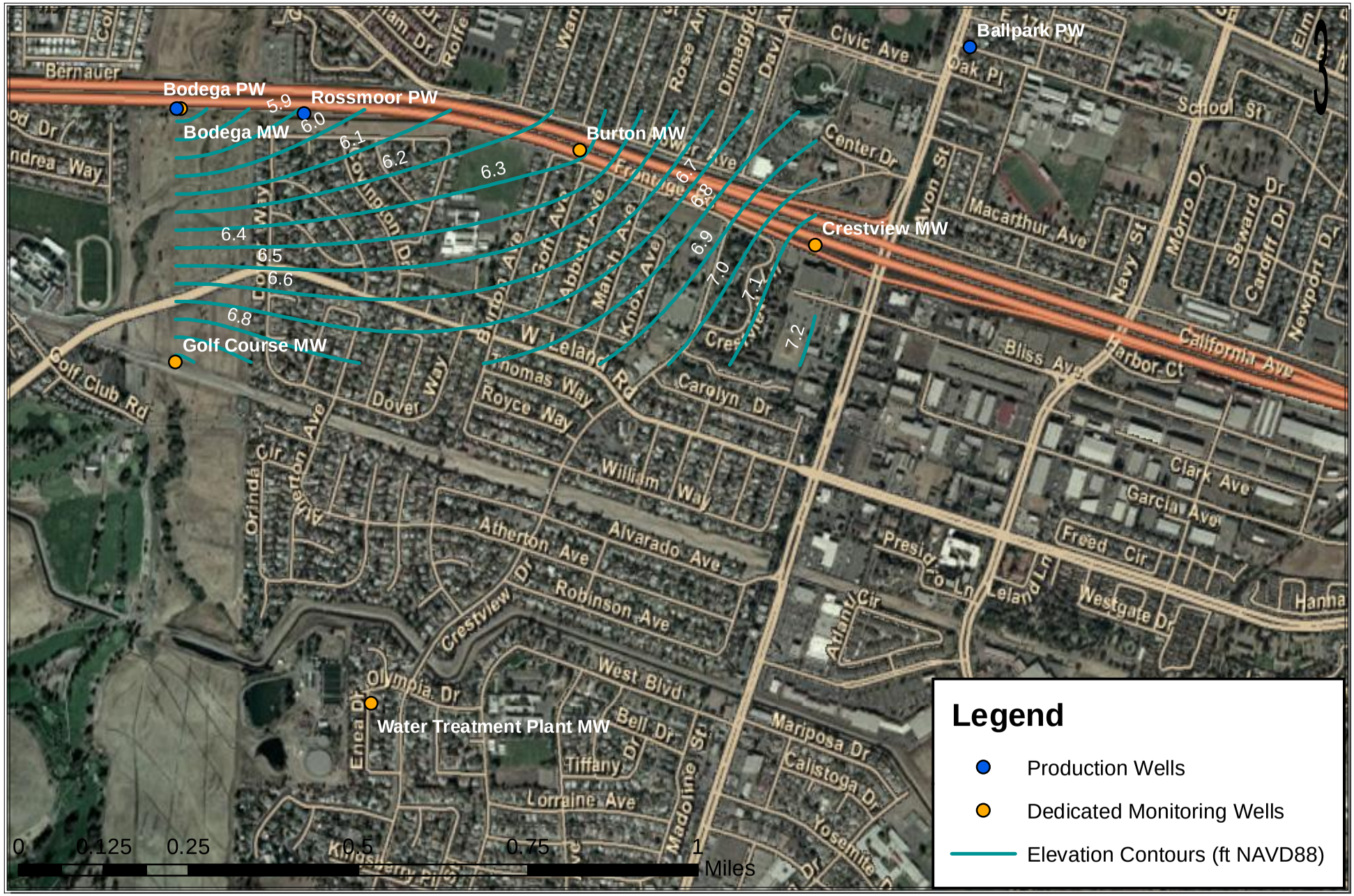
Water Treatment Plant Well



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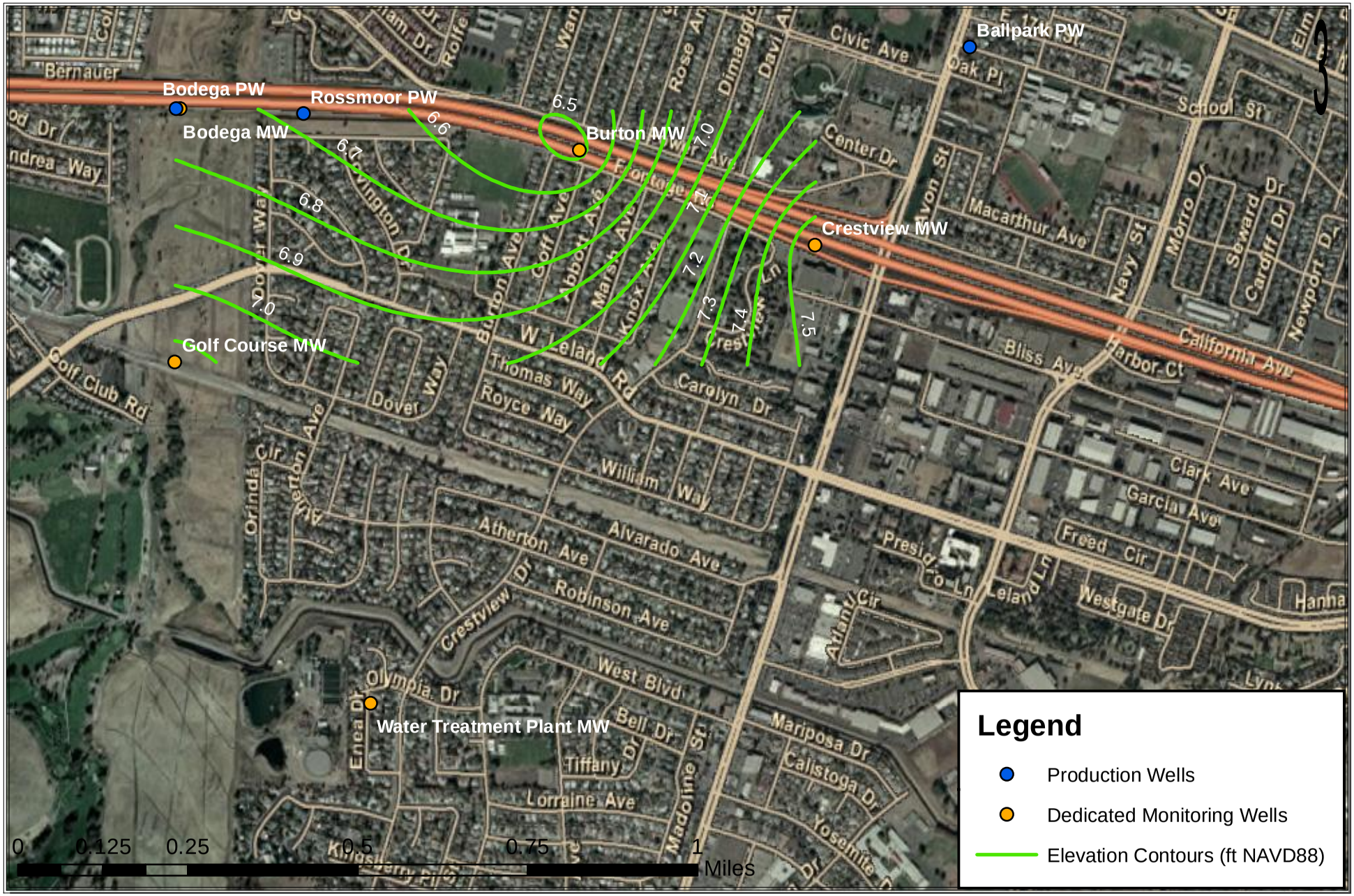
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

City of Pittsburg
Contours of Equal Groundwater Elevation
Winter 2008 (1/16/08)



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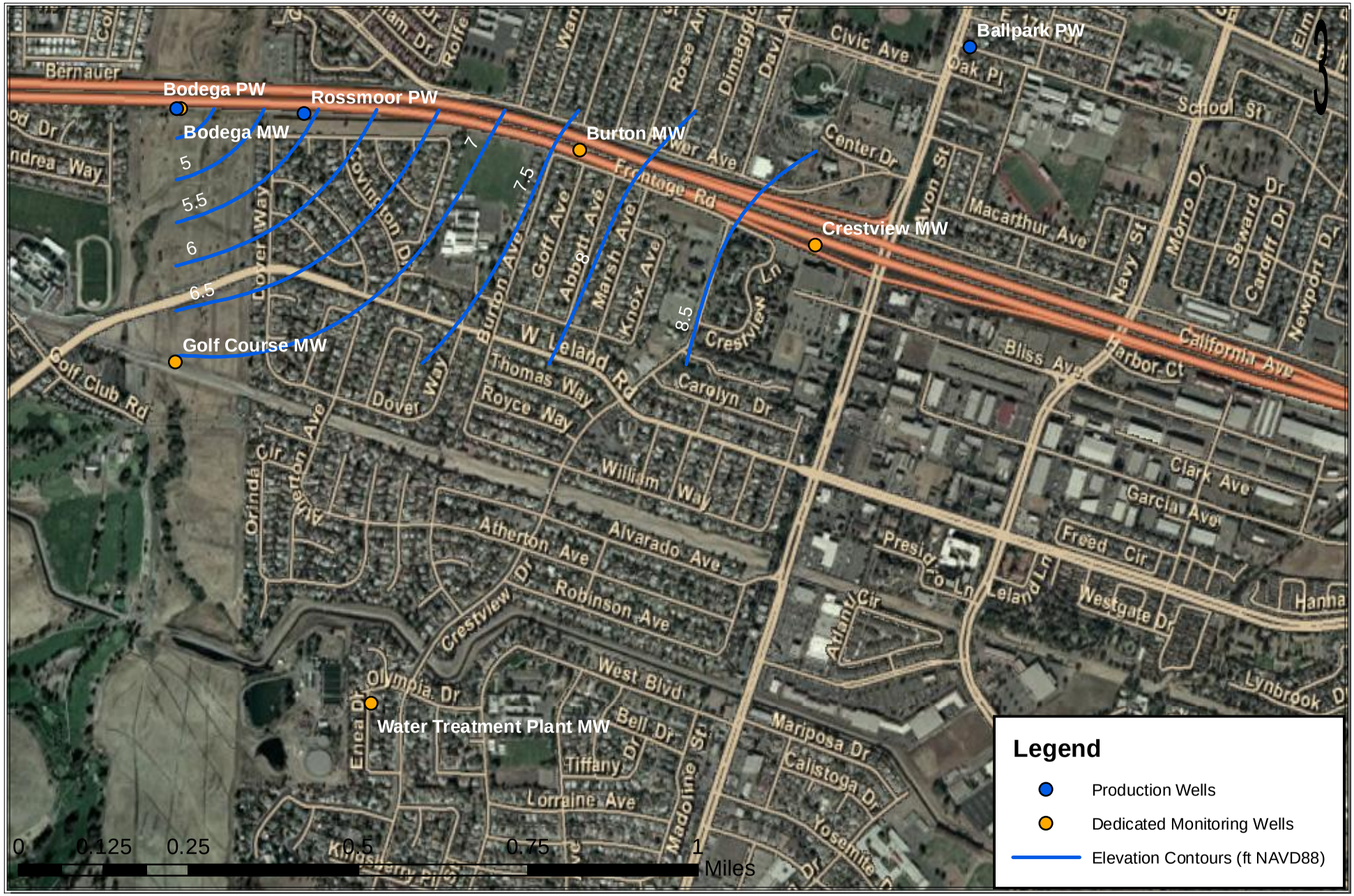
LUHDORFF & SCALMANINI CONSULTING ENGINEERS

City of Pittsburg
Contours of Equal Groundwater Elevation
Fall 2009



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LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

City of Pittsburg
Contours of Equal Groundwater Elevation
Spring 2010 (3/23/10)

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CONSULTING ENGINEERS

City of Pittsburg
Contours of Equal Groundwater Elevation
Fall 2010 (October)

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LUHDORFF & SCALMANINI
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City of Pittsburg
Contours of Equal Groundwater Elevation
Spring 2011 (April)

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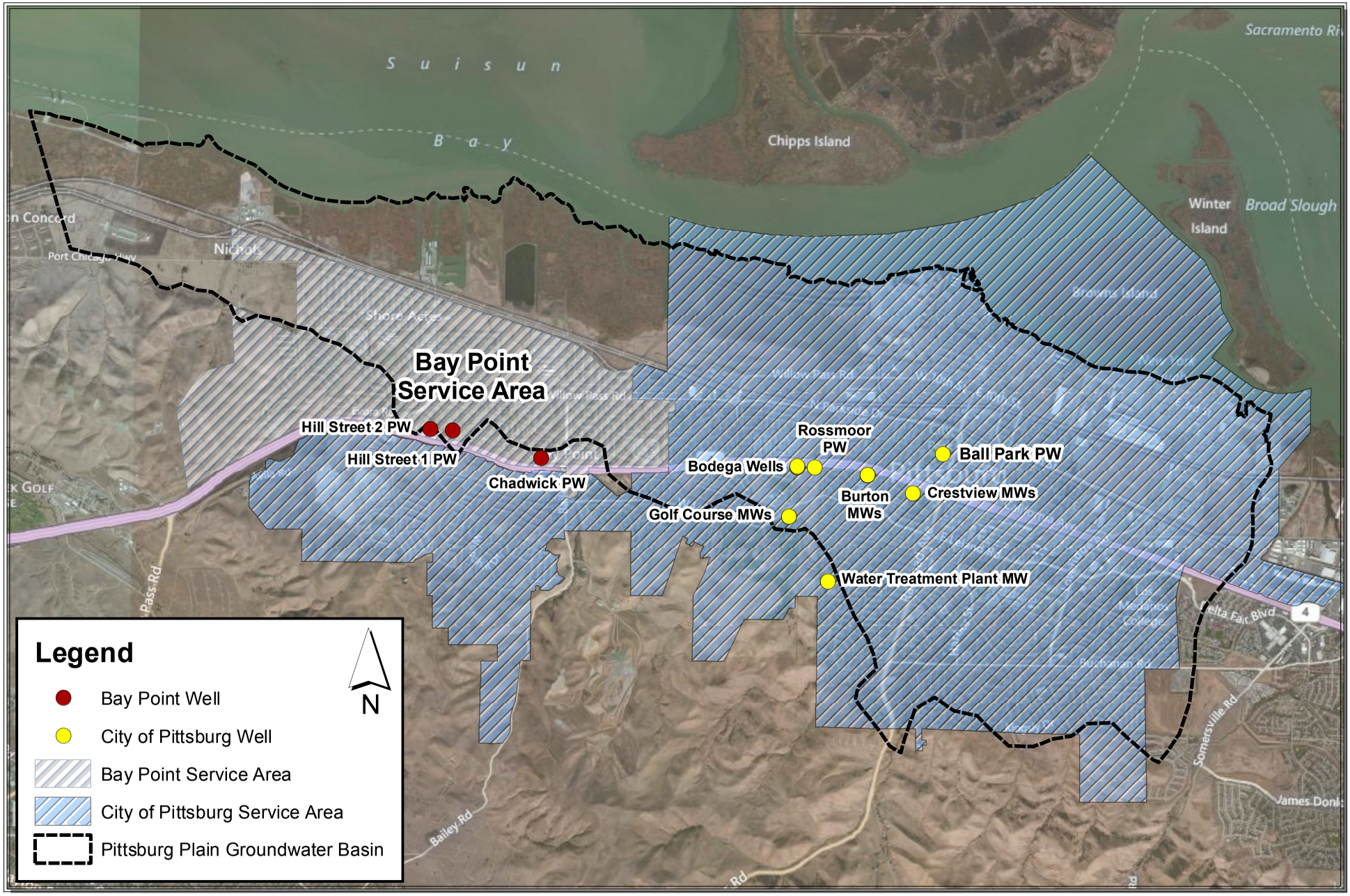
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

City of Pittsburg
Contours of Equal Groundwater Elevation
Fall 2011 (October)



0 0.5 1 2 3 4 Miles

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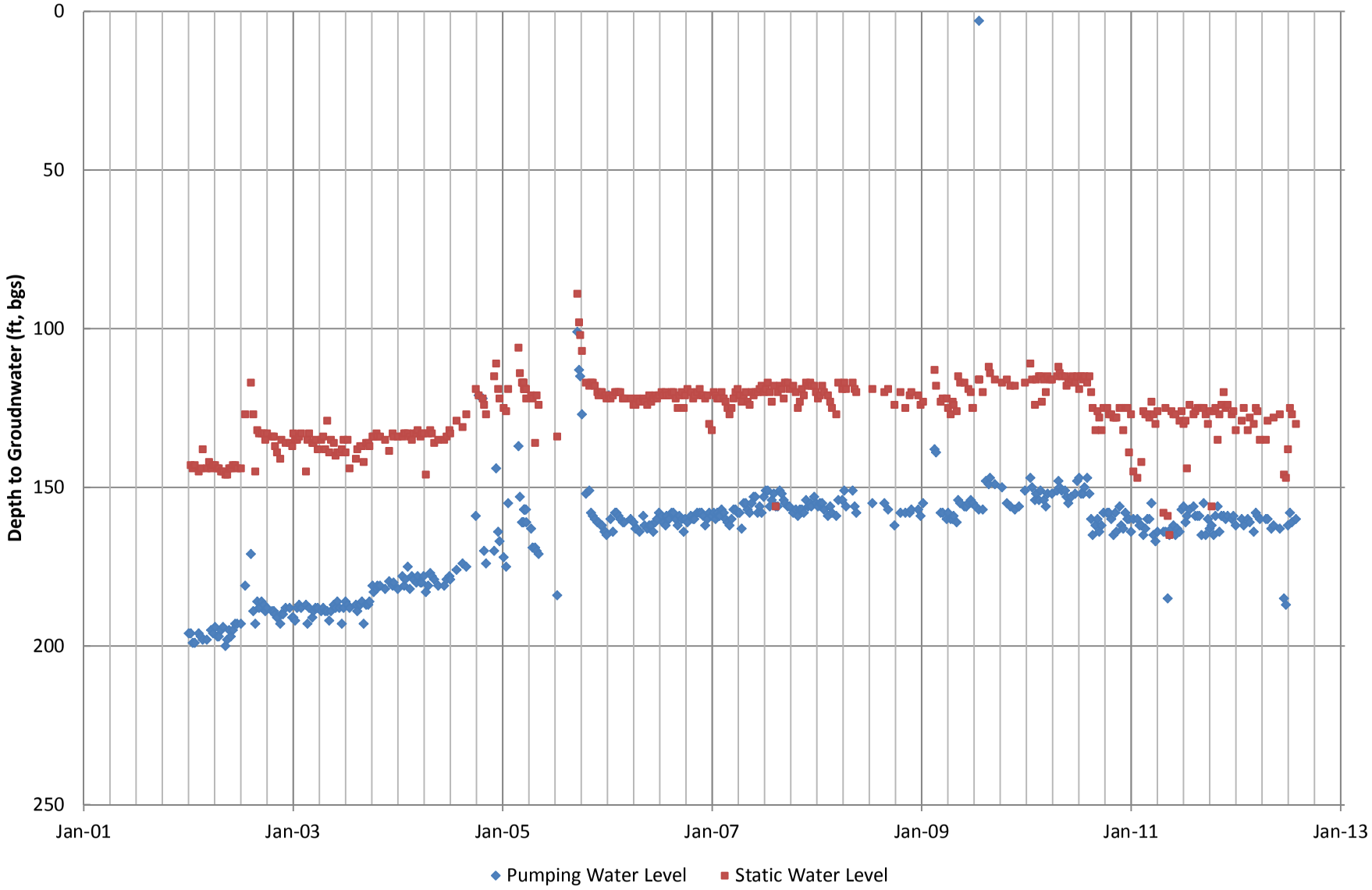
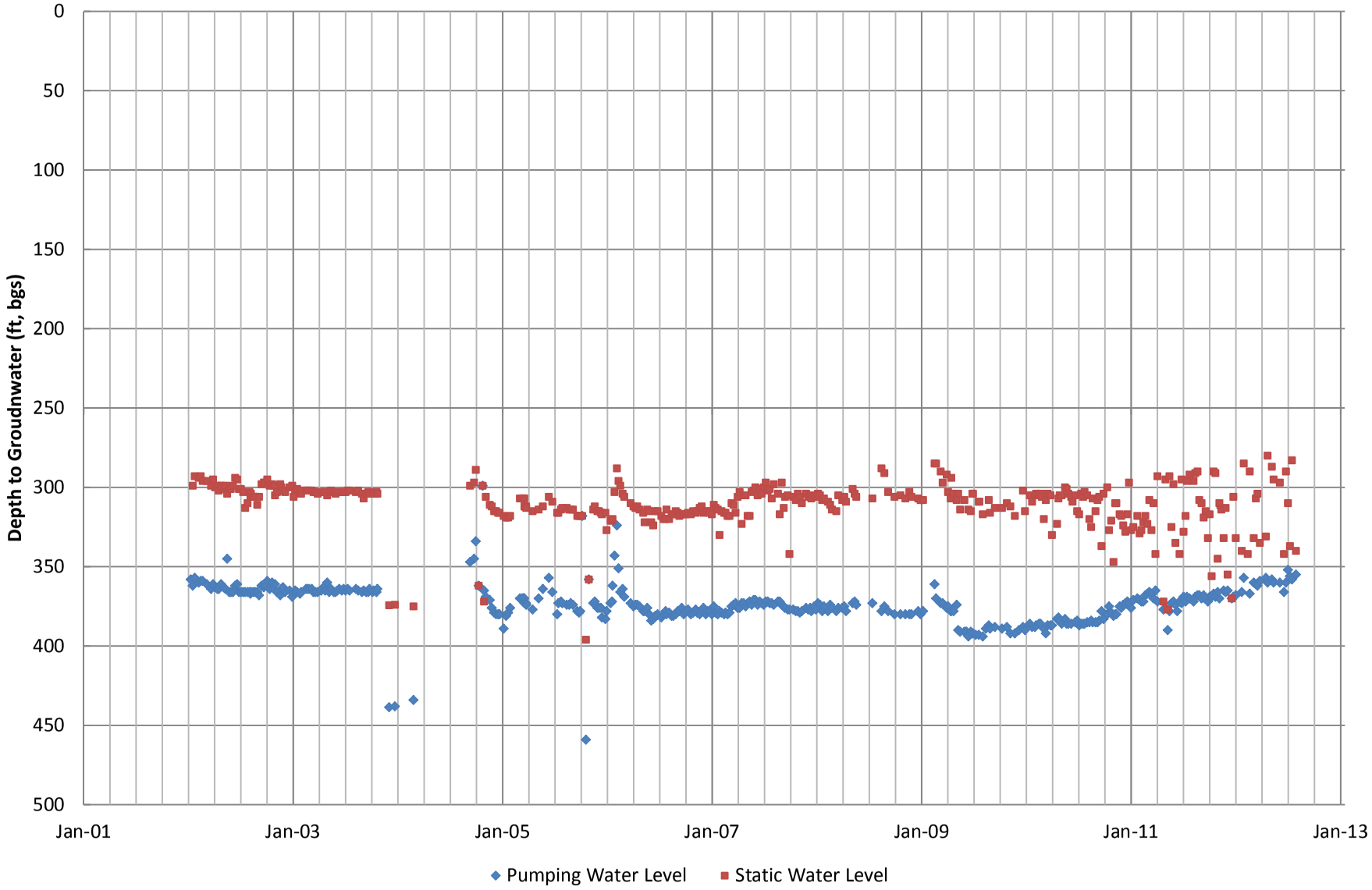
Service Areas and Wells
Pittsburg Plain Groundwater Basin

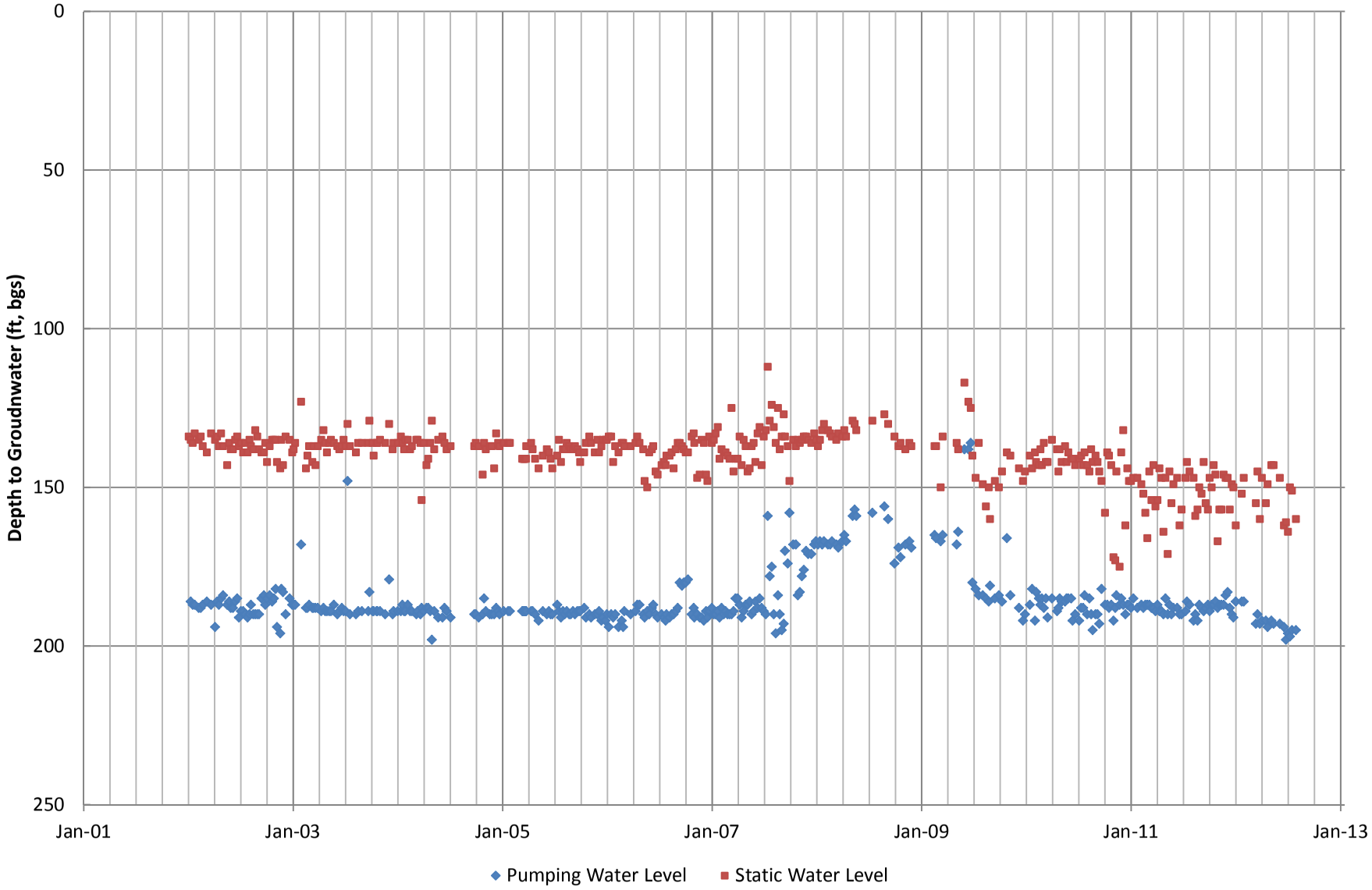
GSWC
Hill Street Well No. 1



GSWC
Hill Street Well No. 2



GSWC
Chadwick Well No. 3



APPENDIX C

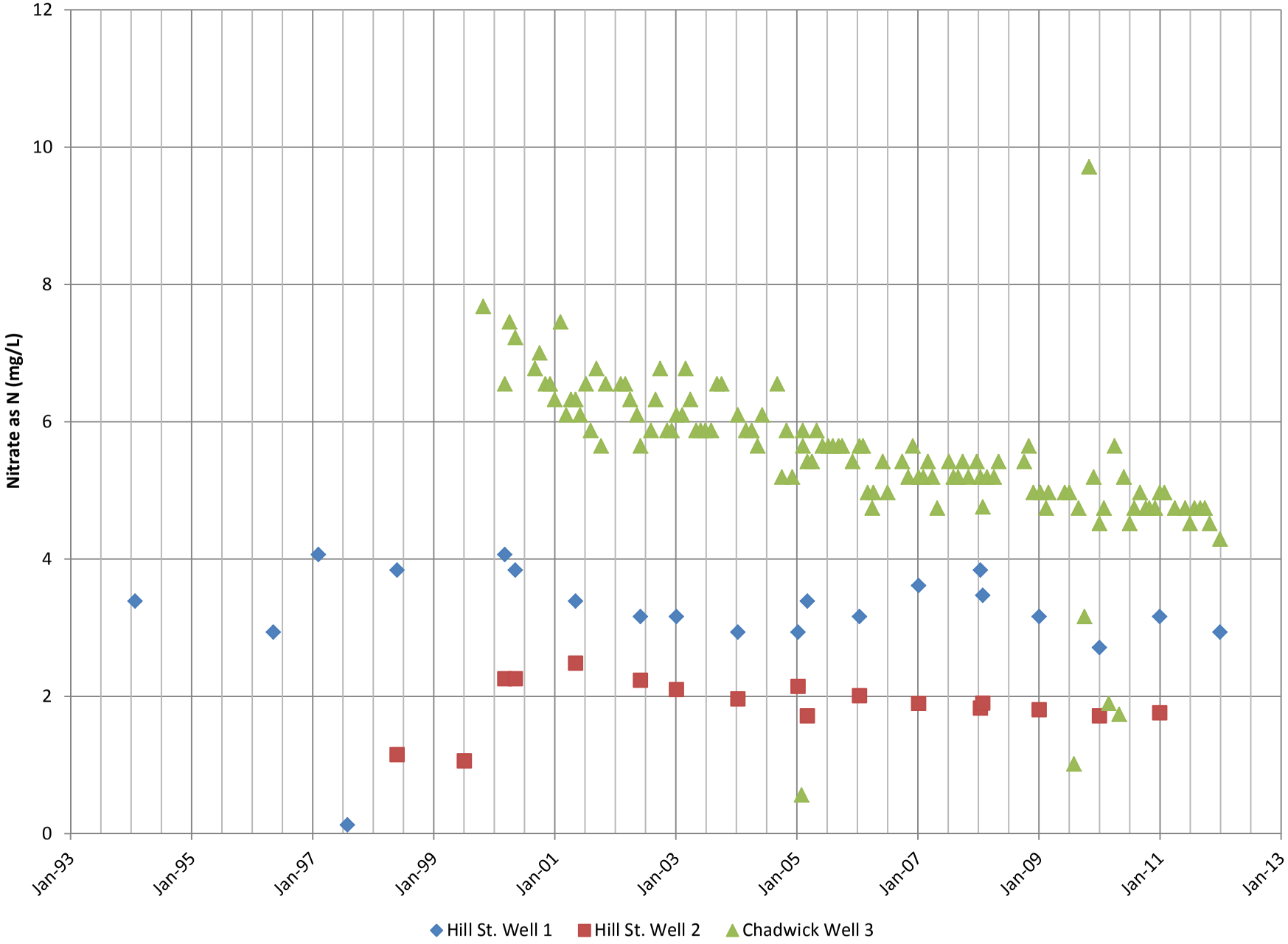
Water Quality Data for City of Pittsburg and Bay Point CDP

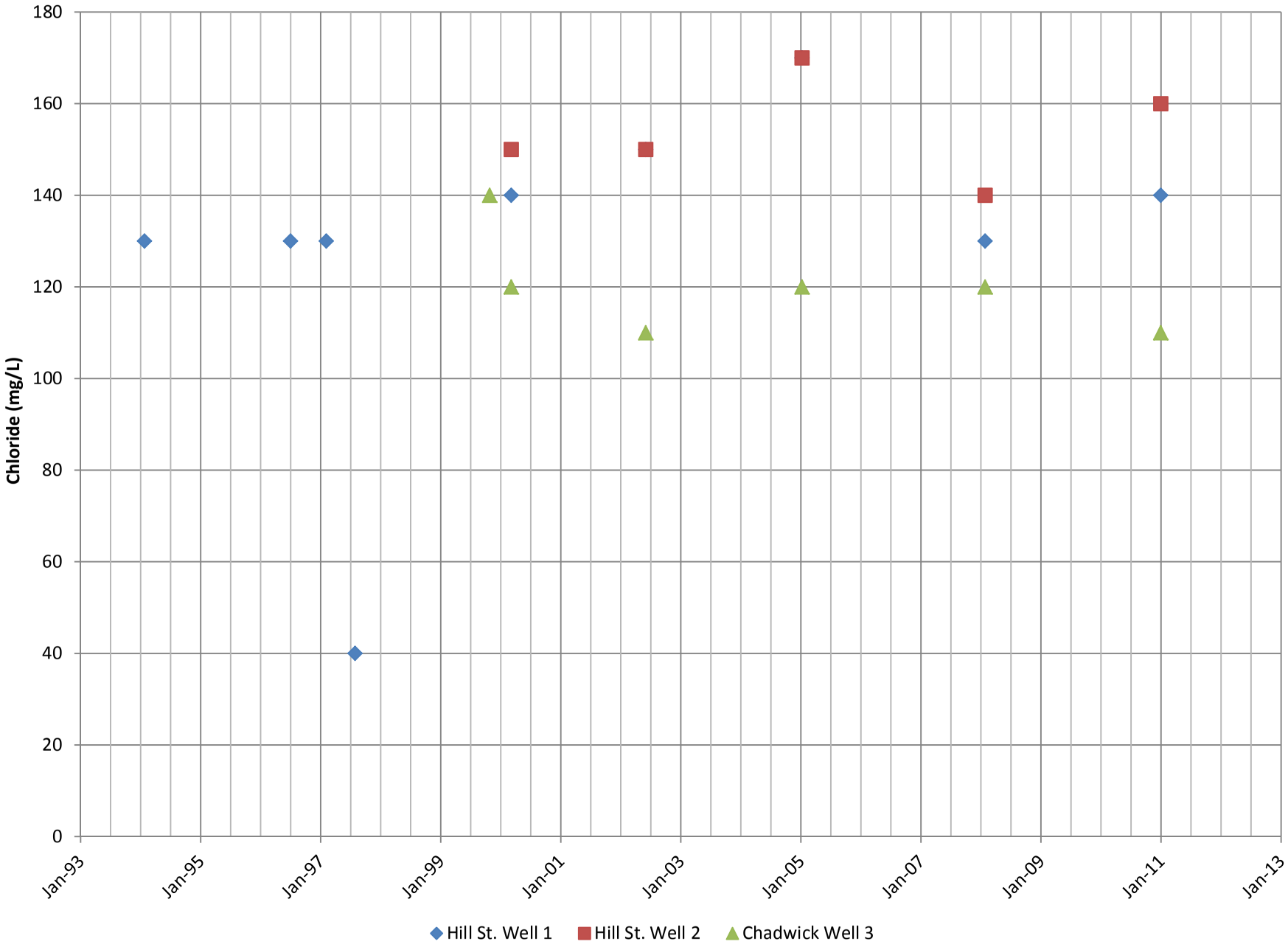
Production Wells
Groundwater Quality
Concentration of Selected Constituents (mg/L)

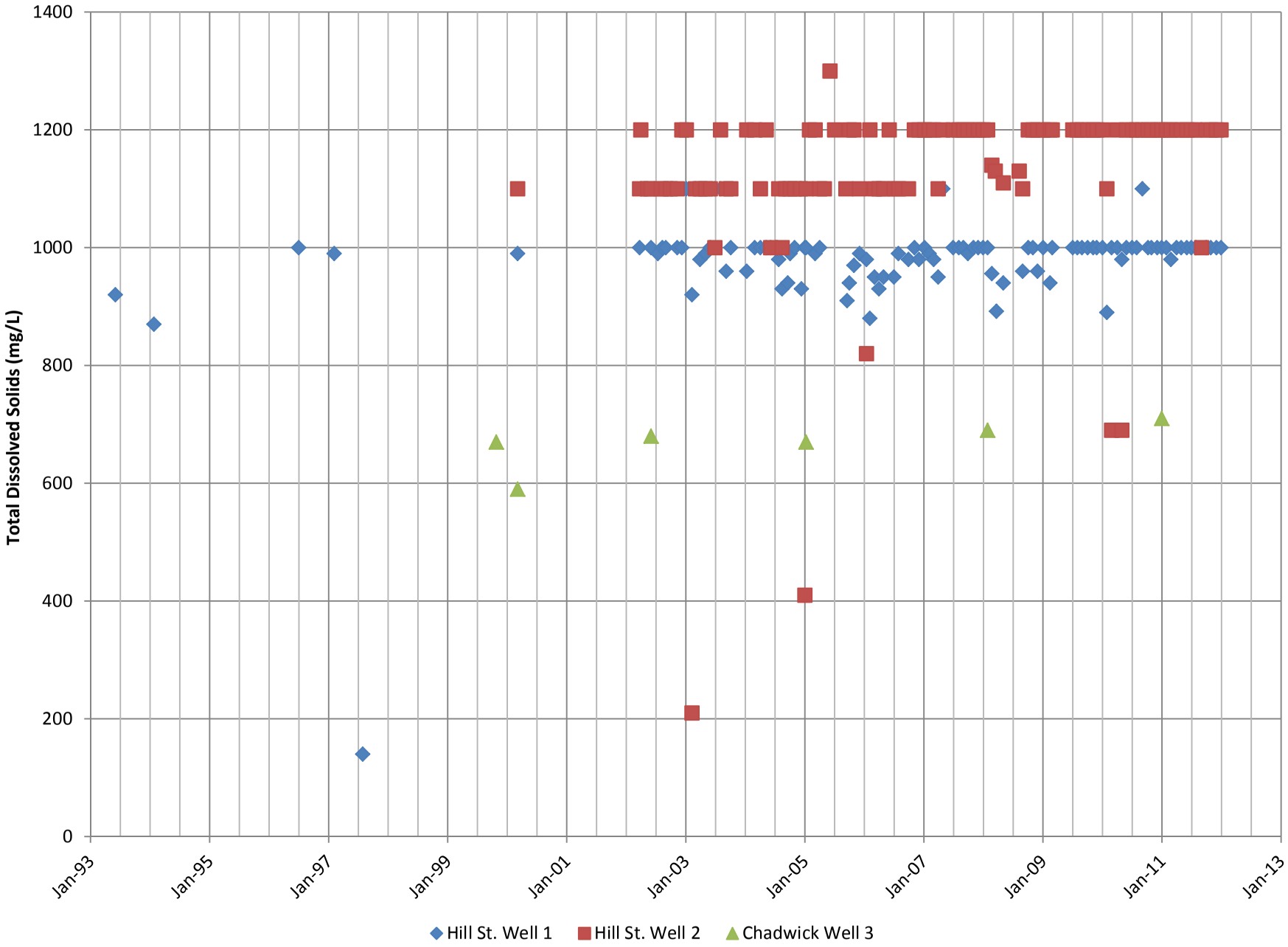
Ball Park Well	TDS	Hardness	Cl	Mn	Fe	
05/20/92	1,500	550	100	0.460	1.200	
11/20/02	1,300	460	100	0.400	1.200	
07/22/04	1,200	420	93	0.360	0.880	
Rossmoor Well						
11/20/02	620	350	120	0.110	0.170	
07/23/04	640	340	110	0.090	0.110	
07/14/09	760	350	120	0.130	0.350	STORET
10/06/10	740	385	130	-	-	STORET
02/07/11	-	-	-	0.140	0.320	STORET
07/06/11	850	347	130	0.150	0.270	STORET
Bodega Well						
11/08/07	620	-	-	0.170	0.930	
01/27/10	-	-	-	-	0.370	STORET
10/06/10	560	275	100	-	-	STORET
02/07/11	-	-	-	0.160	0.340	STORET
07/06/11	650	277	110	0.180	0.400	STORET

Monitoring Wells
Groundwater Quality
Concentration of Selected Constituents (mg/L)

	TDS	Hardness	Cl	Mn	Fe
Bodega MW					
MW-120					
02/17/06	454	223	89.6	0.120	<0.100
02/22/11	470	250	110	<0.010	<0.100
MW-190					
02/17/06	498	246	76.8	0.270	<0.100
02/22/11	820	340	93	0.260	0.230
MW-295					
02/17/06	748	332	113	0.085	<0.100
02/22/11	790	290	120	<0.010	<0.100
Burton MW					
MW-150					
05/19/06	1,058	449	129	0.710	<0.100
02/22/11	MW Not Accessible				
MW-230					
05/19/06	1,314	521	53.9	0.720	0.340
02/22/11	MW Not Accessible				
MW-330					
05/19/06	2,790	885	188	0.340	<0.100
02/22/11	MW Not Accessible				
Crestview MW					
MW-235					
05/19/06	1,480	602	219	0.490	<0.100
02/22/11	1,600	670	180	<0.010	<0.100
Golf Course MW					
MW-190					
02/16/06	680	340	179	0.280	<0.100
02/23/11	610	270	140	<0.010	<0.100
MW-250					
02/16/06	452	230	59.2	0.540	0.044
02/23/11	530	210	57	<0.010	0.250


Nitrate as N (mg/L)
12
10
8
6
4
2
0
Jan-93
Jan-95
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Hill St. Well 1
Hill St. Well 2
Chadwick Well 3


Chloride (mg/L)
180
160
140
120
100
80
60
40
20
0
Jan-93
Jan-95
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Hill St. Well 1
Hill St. Well 2
Chadwick Well 3


Total Dissolved Solids (mg/L)
1400
1200
1000
800
600
400
200
0
Jan-93
Jan-95
Jan-97
Jan-99
Jan-01
Jan-03
Jan-05
Jan-07
Jan-09
Jan-11
Jan-13
Hill St. Well 1
Hill St. Well 2
Chadwick Well 3

APPENDIX D

CASGEM Groundwater Elevation Monitoring Plan

CITY OF PITTSBURG
WATER UTILITIES DEPARTMENT
CASGEM Groundwater Elevation Monitoring Plan

December, 2011

LUHDORFF & SCALMANINI
CONSULTING ENGINEERS

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1.2 CASGEM Program and Existing Monitoring Programs 1
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Table 2 CASGEM Water Level Data
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Figure 1 Pittsburg Plain Groundwater Basin
Figure 2 CASGEM Well Location Map for Pittsburg

Appendix A City of Pittsburg CASGEM Well Table
Appendix B Water Level Data Sheet

1.0 INTRODUCTION

1.1 CASGEM Goal

In November 2009, Senate Bill SBX7-6 mandated that the groundwater elevations in all basins and subbasins in California be regularly and systematically monitored with the goal of demonstrating seasonal and long-term trends in groundwater elevations. In accordance with the mandate, the California Department of Water Resources (DWR) developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program. DWR is facilitating the statewide program which began with the opportunity for local entities to apply to DWR to assume the function of regularly and systematically collecting and reporting groundwater level data for the above purpose. These entities are referred to as Monitoring Entities. The legislature added a key aspect to SBX7-6 which was to make certain elements of the groundwater level information available to the public.

1.2 CASGEM Program and Existing Monitoring Programs

Wells designated for inclusion in the CASGEM program are for purposes of measuring groundwater levels on a semi-annual or more frequent basis that are representative of groundwater conditions in the state's groundwater basins and subbasins. The wells selected by a designated Monitoring Entity may be a subset of other wells monitored by that entity and need not be inclusive of the designated entity's entire monitoring network. Thus, the CASGEM program complements other pre-existing programs that have been developed throughout California by water districts, agencies, municipalities, counties, and others for purposes of understanding, managing, and sustaining groundwater resources.

In late 2008, the City of Pittsburg implemented a Groundwater Monitoring Program (LSCE, 2009). The program aims to collect and interpret data on groundwater conditions (i.e., seasonal and long-term groundwater level and quality trends) in relation to the City's well production, which is a supplemental source for its water system. Ultimately, the monitoring program is intended to support groundwater management and ensure that well operations do not induce adverse environmental impacts.

1.3 Previous Groundwater Investigations

Since 1995, regional water management for the East Contra Costa County Region has been facilitated by the East County Water Management Agency (ECWMA), a consortium of 11 member agencies (including the City of Pittsburg) with a broad range of water management-related responsibilities within the region. The ECWMA was originally formed to develop the East County Water Management Study, a long-term water management plan outlining specific implementation actions required to ensure cost-effective reliable water supplies for the Region through 2040. In 2005, the ECWMA developed a "Functionally Equivalent" Integrated Regional Water Management Plan (FEIRWMP) which tied together several existing regional management plans covering various aspects of water management for the Region (RMC, 2010). The groundwater management section of the FEIRWMP is somewhat limited, consisting of a groundwater investigation conducted in 1998 aimed at using existing data to better characterize

groundwater supplies. Recently, ECWMA submitted an application and received planning grant funds from DWR to update its FEIRWMP to a fully functioning IRWMP. The new IRWMP will include a more complete characterization of the East County groundwater basins and plans to develop conjunctive use programs to protect against overdraft. As part of this effort, ECWMA will also develop a comprehensive Pittsburg Plain Groundwater Management Plan for managing and monitoring groundwater in the Pittsburg Plain Basin.

As part of the Groundwater Monitoring Program started by the City of Pittsburg in 2008, annual monitoring reports have been prepared since 2009 (LSCE 2009; 2010; 2011). These reports include groundwater monitoring data for that year and a discussion of trends in groundwater levels and quality.

1.4 City of Pittsburg Monitoring Entity

In December, 2010, the City of Pittsburg applied to DWR to become the Monitoring Entity for the Pittsburg Plain Groundwater Basin (**Figure 1**), taking on responsibility of monitoring and reporting groundwater elevations for purposes of the CASGEM program. Following confirmation of DWR's acceptance of the City as the Monitoring Entity, the City proceeded to identify the wells to be included in the monitoring program network and to prepare this CASGEM Monitoring Plan (Plan), as required by DWR.

This Plan contains the recommended components outlined by DWR, including a summary of the geology and groundwater resources of the Pittsburg Plain Groundwater Basin, proposed monitoring network, field methods, and monitoring schedule.

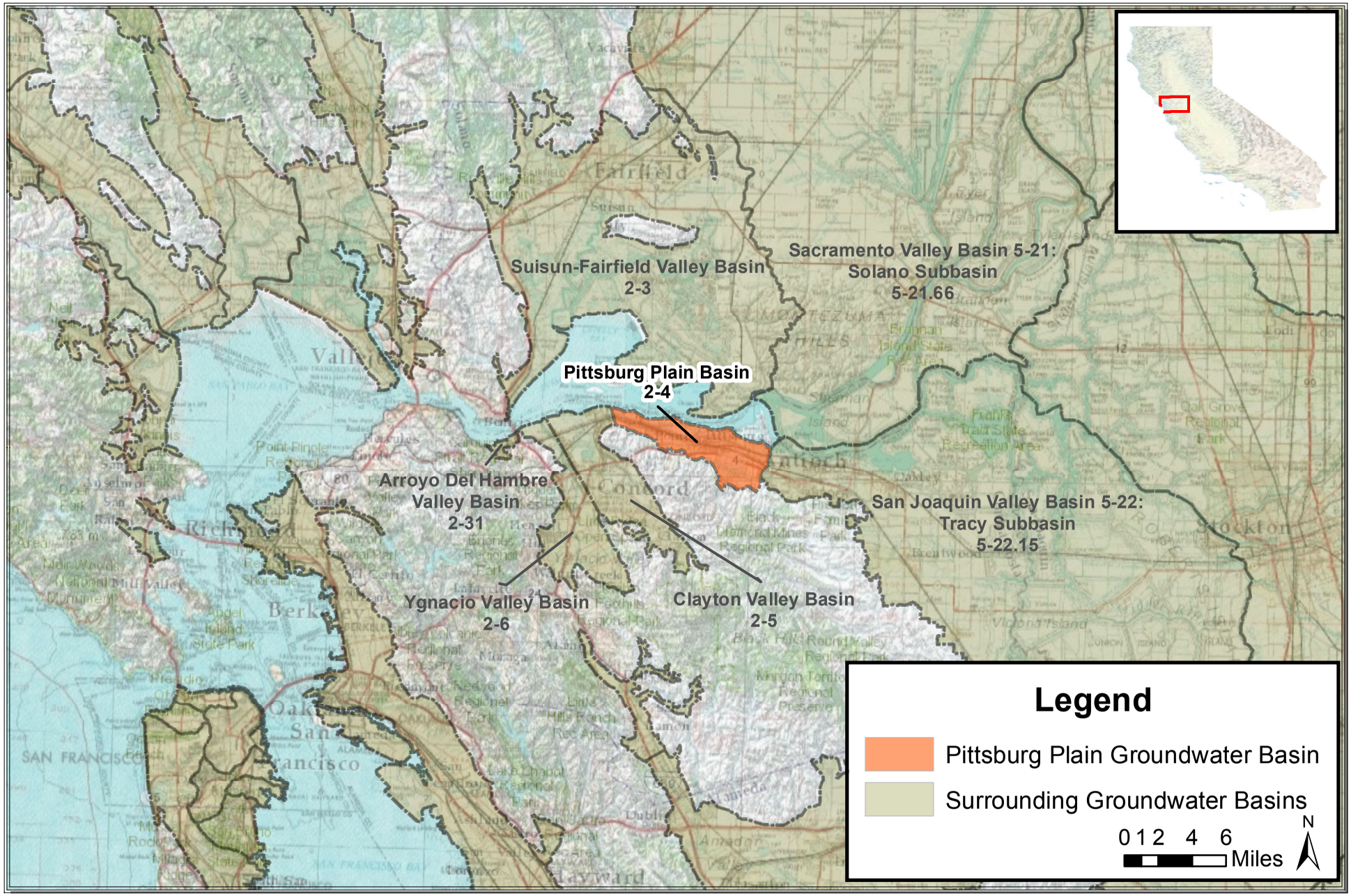
2.0 CITY OF PITTSBURG AREA

2.1 Pittsburg Plain Groundwater Basin

The City of Pittsburg overlies the Pittsburg Plain Groundwater Basin described in California Department of Water Resources Bulletin 118 – 2003 Update (DWR, 2004). DWR's basins and subbasins are generally defined based on boundaries to groundwater flow and the presence of water-bearing geologic units. These groundwater basins are not confined within political boundaries, and DWR-designated "basin" or "subbasin" labels do not necessarily correlate to county or city borders. The Pittsburg Plain Groundwater Basin (DWR Basin 2-4) is located along the south shore of Suisun Bay and is bounded by Suisun Bay to the north, the Tracy Subbasin (DWR Subbasin 5-22.15) to the east, and the Clayton Valley Groundwater Basin (DWR Basin 2-5) to the west. It is within the drainage basins of Kirker Creek and Willow Creek, both of which drain into Suisun Bay. The Pittsburg Plain Groundwater Basin includes the overlying cities of Pittsburg, West Pittsburg, and Shore Acres (DWR, 2004).

2.2 Hydrogeologic Conditions

The Pittsburg Plain Groundwater Basin consists of mild sloping alluvial plains ranging in elevation from sea level to 100 feet. The primary water bearing units of the Pittsburg Plain Groundwater Basin are alluvium deposits ranging from Pleistocene to Recent in age. These units



Path: X:\2011 Job Files\11-116\GIS\Figure 1 Pittsburg Groundwater Basin JH REV.mxd

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Figure 1
Pittsburg Plain Groundwater Basin and Surrounding Basins

consist of highly lenticular sand and gravel deposits and beds of blue and yellow clay (DWR, 2004). Recharge generally occurs in the hills along the southern portion of the basin where the primary aquifer units approach/intersect land surface. Groundwater flow is generally to the north-northeast, discharging to Suisun Bay which forms the northern border of the basin. Descriptions of the hydrogeologic setting are limited; the City's recent groundwater exploration projects provide the majority of available geologic information.

In 2004, the City initiated a project to evaluate candidate well sites (**Figure 2**), ultimately leading to the construction of the Bodega pump station in 2009. As part of this investigation, the City drilled numerous exploratory test holes, installing monitoring well clusters in each, to delineate potential completion targets for a new supply well. Sites evaluated for the new well project included the Delta View Golf Course Test Hole and Monitoring Well (TH/MW), Bodega TH/MW, Burton TH/MW, and Crestview TH/MW.

Luhdorff and Scalmanini, Consulting Engineers (LSCE) examined the hydrogeologic setting of the basin as part of the City's 2009 Annual Report (LSCE, 2009). Geophysical data and lithologic descriptions from the test holes and existing production wells were combined with recent water level data to characterize the primary aquifer units of the basin. LSCE describes three distinct aquifer units consisting of sand and gravel material, described here as upper, middle, and lower units. These units range from confined to semi-confined and stretch east-west from the Ball Park Well in the City's downtown area to the Bodega site just south of Highway 4. The upper and middle units appear to narrow and then disappear as they extend southward, suggesting a lack of correlation to formations encountered in the Golf Course Test Hole. The lower unit continues to the Golf Course Test Hole, though it moves closer to the ground surface as it extends southward, eventually ostensibly continuing upward and mixing with the sandy clay surface layer. Thus, the edges of the confined sand and gravel units occur somewhere between the Bodega/Rossmoor sites and just beyond the golf course. Though wells completed in these sand and gravel units exhibit favorable yields, the high total dissolved solids (TDS) content of the groundwater in some areas limits groundwater production (LSCE, 2009).

3.0 Current Groundwater Monitoring and Conditions

3.1 Groundwater Level Monitoring

Groundwater monitoring in the Basin began with the Rossmoor production well in 2001, expanding to include the Ballpark and Bodega production wells and Bodega, Burton, Crestview, and Golf Course monitoring wells between 2006 and 2008. Significant gaps exist in early monitoring data, though a consistent monitoring schedule was established as part of the City's groundwater monitoring program initiated in 2008. The groundwater monitoring program includes bi-annual (spring and fall) groundwater level monitoring in three production wells and ten designated monitoring wells (four sites). As part of this program, reference point elevations and horizontal coordinates were established for each well using Topcon HyperXT Global Positioning System (GPS) equipment.

Path: X:\2011 Job Files\11-116\GIS\Figure 2 Pittsburg Well Location Map.mxd

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Figure 2
City of Pittsburg
CASGEM Well Location Map

3.2 Current Groundwater Conditions

The historic baseline for groundwater levels in all wells is limited. The longest record available is for the Rossmoor well, with groundwater levels varying between 2 and 10 feet above sea level (asl) from 2001 to 2011. The records for other wells, though shorter by comparison, indicate similar and stable conditions. Water levels in the other wells range from 0 to 10 feet with the exception of Golf Course MW-250, completed in the lower aquifer, where water levels range from 19 to 27 feet. Pumping at the production wells influence water levels at adjacent monitoring wells, though water levels recover quickly when pumping ceases. To date, water levels have remained above sea level, a key concern to avoid intrusion from the Delta. No adverse environmental effects have been noted (LSCE, 2011).

Due to the infrequency of groundwater level measurements prior to 2008, long-term trends in the basin are not well understood. The monitoring program results to date provide a baseline for evaluating future changes to groundwater levels, including changes induced by pumping. In the future, it will be important to discern trends in static water levels and determine whether pumping induces a gradient for intrusion of bay water. At present, pumping does not appear to have significantly reduced the gradient for groundwater flow toward Suisun Bay.

4.0 CASGEM MONITORING NETWORK AND PROGRAM

4.1 Selected CASGEM Wells

The City of Pittsburg CASGEM well network consists of nine dedicated monitoring wells. A map of the well network is presented in **Figure 2**. Several of these wells are nested wells (i.e., multiple piezometers of differing depths in a single borehole). **Table 1** provides a list of wells in the CASGEM monitoring network with the well's location and a brief summary of construction information. A more detailed description of each well is provided in **Appendix A**.

Table 1 – City of Pittsburg Monitoring CASGEM Monitoring Wells

Well Name	Screen Interval (ft)	Total Depth (ft)	Easting	Northing	RPE (ft, msl)	Date of Construction
Bodega MW-120	100-110	120	6155624.923	2196786.749	49.83	Feb, 2007
Bodega MW-190	170-180	190	6155624.601	2196786.903	49.73	Feb, 2007
Bodega MW-290	275-285	295	6155624.868	2196787.198	49.77	Feb, 2007
Burton MW-150	130-140	150	6158730.474	2196479.922	56.89	Feb, 2007
Burton MW-230	210-220	230	6158730.539	2196479.450	56.87	Feb, 2007
Burton MW-330	310-320	330	6158730.839	2196479.580	56.88	Feb, 2007
Crestview MW-235	215-225	235	6160567.136	2195750.379	72.09	Feb, 2007
Golf Course MW-190	170-180	190	6155592.524	2194817.493	76.14	Feb, 2007
Golf Course MW-250	230-240	250	6155592.748	2194817.261	76.27	Feb, 2007

Notes:
1. Horizontal Coordinates are State Plane Zone 3, NAD83 in feet.
2. Elevation Datum is NAVD88 in feet.

4.2 Field Methods

4.2.1 Reference Points

GPS was used to establish reference points at all of the monitoring wells sites. Both the horizontal locations and the vertical elevations of the wells were surveyed and recorded using a Topcon HyperXT on January 16, 2009 (LSCE, 2009). The approximate accuracy of the measurements is better than 0.1 foot in the horizontal and vertical directions.

4.2.2 Procedure for Measuring Depth to Water in Monitoring Wells

The purpose of depth to water measurements is to obtain an accurate dated and timed measurement of the static depth to water in a well. This can then be converted into a water level elevation in reference to a commonly used reference datum (e.g., NAVD 1988). In this context, static means that the water level in the well is not influenced by pumping of the well. The production wells will be shut off for a minimum of 24 hours prior to depth to water measurements.

For comparability, measurements will be obtained according to a schedule designed to capture times of both highest and lowest seasonal groundwater elevations. Based on historic trends, measurements will be taken in April and October to capture seasonal highs and lows. All groundwater level measurements will be obtained on the same day, taken consecutively and without delay within the shortest reasonable time, to ensure comparability between wells. The following procedure outlines the steps of taking a depth to water reading using an electric sounder:

- Turn on water level indicator signaling device and check battery by pressing the test button.
- Remove access plug or well cap from the well cover and lower probe (electric sounder) into the well.
- When probe hits water a loud “beep” will sound and signal light will turn red.
- Retract slightly until the tone stops.
- Slowly lower the probe until the tone sounds.
- Note depth measurement at rim (i.e., the surveyed reference point for water level readings) of well to the nearest 0.01 foot and rewind probe completely out of well.
- Remove excess water, lower probe into well again and repeat measurement.
- If difference is within ±0.02 foot of first measurement, record measurement.
- If difference is greater, repeat the same procedure until three consecutive measurements are recorded within ± 0.02 foot.
- Rewind and remove probe from well and replace the access plug or well cap in the well cover.
- Clean and dry the measuring device/probe and continue to next well.

For each well measurement, the following information should be recorded:

1. Name of field technician
2. Unique identification of well
3. Time of measurement
4. Depth to water
5. Any other pertinent comments (e.g., sounder hangs up at 33 feet, thus no measurement; or: fifth measurement of ~55.68 feet in a row…residual water in end cap?; etc.)

4.3 Monitoring Schedule

Under the City's Groundwater Monitoring Plan, all wells have been measured bi-annually at a minimum, in the spring (April) and fall (October) of each year. Past hydrographs depicting more frequent measurements show that these months generally represent the seasonal high and low groundwater elevations. The CASGEM wells will continue to be monitored on this bi-annual basis.

4.4 CASGEM Data Management and Submittal

As part of the City's Groundwater Monitoring Program, a central database was established as a repository for well construction data and groundwater level measurements. All data collected will be checked and input into the database in a systematic manner to ensure accuracy and consistency. To aid in consistent reporting, a data sheet was developed for ongoing field measurements by City staff. An example sheet is provided in **Appendix B**. Under the CASGEM Plan, data will be periodically reviewed and interpreted and then submitted online to DWR on or before Jan 1st and July 1st of each year.

Per DWR's CASGEM program reporting requirements, the following information for each of the designated wells (**Table 2**) will be included in each of the biannual submissions:

- Well name
- Well identification number
- Measurement date
- Measurement time (PST/PDT with military time/24 hour format)
- Reference point elevation of the well (feet) using NAVD88 vertical datum
- Ground surface elevation datum at the well (feet) using NAVD88 vertical datum
- Depth to water below reference point (feet)
- Groundwater elevation (feet)
- Method and accuracy of measuring water depth
- Measuring agency identification (City of Pittsburg as the Monitoring Entity)
- Comments about measurement, if applicable

Table 2: CASGEM Water Level Data
October 2011

Well Name	Well I.D. Number	Measurement Date	Measurement Time	RP Elevation (feet)	GS Elevation (feet)	Depth to Water below RP (feet)	Water Level Elevation (feet)	Measurement Method	Measurement Accuracy (feet)	Measuring Agency I.D.	Comments
Bodega MW-120		10/7/2011		49.83		47.9	1.9	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Bodega MW-190		10/7/2011		49.73		46.4	3.3	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Bodega MW-290		10/7/2011		49.77		45.2	4.6	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Burton MW-150		10/7/2011		56.89		52.2	4.7	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Burton MW-230		10/7/2011		56.87		52.2	4.7	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Burton MW-330		10/7/2011		56.88		52.3	4.6	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Crestview MW-235		10/7/2011		72.09		66.0	6.1	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Golf Course MW-190		10/7/2011		76.14		70.3	5.8	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	
Golf Course MW-250		10/7/2011		76.27		50.9	25.4	Electric Sounder	0.1	City of Pittsburg Monitoring Entity	

5.0 Monitoring Plan Rationale

5.1 Well Selection and Basin Coverage

All dedicated monitoring wells within the basin that are currently included in the City's Groundwater Monitoring Program are also included in the CASGEM network. In recognition that the current monitoring network is confined to a relatively small portion of the basin, a search of other existing potential monitoring wells was performed. Seven additional wells (**Table 3**) were identified in the Water Data Library (http://www.water.ca.gov/waterdatalibrary), an online database of groundwater data maintained by DWR. Of these wells, four were destroyed and two were discontinued due to access issues. The one remaining well, which is presently monitored by DWR, is an active industrial well. The decision was made not to include this well as part of the City's CASGEM monitoring network in an effort to ensure that only static water levels are reported.

Table 3 – Additional Potential Monitoring Wells Identified Within the Pittsburg Plain Groundwater Basin

Well Name	Period of Record	Well Type	Well Status
02N01E15P001M	April 1969 – April 1979	Undetermined	Discontinued
02N01W11L001M	April 1969 – December 2011	Industrial	Active
02N01W12P001M	April 1969 – March 1976	Undetermined	Discontinued
02N01E15N001M	April 1969 – March 1974	Undetermined	Destroyed
02N01E18D001M	April 1969 – May 1996	Industrial	Destroyed
02N01W11R001M	January 1967 – March 1977	Undetermined	Destroyed
02N01W04Q001M	April 1969 – March 1982	Undetermined	Destroyed

Though groundwater monitoring is confined to a relatively small portion of the Pittsburg Plain Groundwater Basin, groundwater extraction is contained within the monitored area, and the hydrogeologic setting appears to be consistent throughout the basin. For this reason, the currently proposed CASGEM monitoring network should be sufficient to provide monitoring data representative of conditions for the basin. As part of the City's Groundwater Monitoring Program, groundwater levels and quality will continue to be monitored and reported annually. Significant efforts have been made to locate additional monitoring wells in other portions of the basin, acknowledging that data gaps may exist in the northern and western portions of the basin due to the geographic centrality of the existing network wells. The City will periodically review the adequacy of the monitoring network and continue to look for additional monitoring locations in areas of data gaps to add to the program as funding permits.

5.2 Additional Wells

In recent years, the City of Pittsburg's Ball Park production well has been idle, allowing for its use as a designated monitoring well. The City is currently in the process of abandoning this well. It will be replaced with nested monitoring wells completed in each of the three primary aquifer units. As these three piezometers become available, they will be added the CASGEM monitoring network.

6.0 References

California Department of Water Resources (DWR), Pittsburg Plain Groundwater Basin, California's Groundwater, Bulletin 118, 2004.

Luhdorff & Scalmanini, Consulting Engineers (LSCE). 2009. Report on Groundwater Monitoring Program. Memorandum for City of Pittsburg.

Luhdorff & Scalmanini, Consulting Engineers (LSCE). 2010. Status Report on Groundwater Monitoring Program. Memorandum for City of Pittsburg.

Luhdorff & Scalmanini, Consulting Engineers (LSCE). 2011. Status Report on Groundwater Monitoring Program. Memorandum for City of Pittsburg.

RMC Water and Environment (RMC). 2010. East Contra Costa County Region: Proposition 84 Round 1 Planning Grant Application Work Plan.

APPENDIX A

Appendix A
City of Pittsburg CASGEM Well Table

Local Well Designation	State Well Number	RP Elevation	RP Description	GS Elevation	Measurement Method	Measurement Accuracy	Well Use	Well Status	Latitude [N]	Longitude [W]	Coordinates Method	Coordinates Accuracy	Well Completion Type	Total Well Depth	Well Completion Report #	Associated Basin	Associated Basin Portion	Well Location Desc	Additional Comments	Is Voluntary Well	County	Screen Interval 1 Top	Screen Interval 1 Bottom
Bodega MW-120		49.83	top of casing		GPS	0.1 ft.	Observation	Active	38.020	121.910	GPS	1 ft.	Part of a nested/multi-completion well	120	e052847	2-4-Pittsburg Plain	N/A	South of Highway 4and ~200 feet East of E		No	Contra Costa	100	110
Bodega MW-190		49.73	top of casing		GPS	0.1 ft.	Observation	Active	38.020	121.910	GPS	1 ft.	Part of a nested/multi-completion well	190	e052847	2-4-Pittsburg Plain	N/A	South of Highway 4and ~200 feet East of E		No	Contra Costa	170	180
Bodega MW-290		49.77	top of casing		GPS	0.1 ft.	Observation	Active	38.020	121.910	GPS	1 ft.	Part of a nested/multi-completion well	295	e052847	2-4-Pittsburg Plain	N/A	South of Highway 4and ~200 feet East of E		No	Contra Costa	275	285
Burton MW-150		56.89	top of casing		GPS	0.1 ft.	Observation	Active	38.019	121.899	GPS	1 ft.	Part of a nested/multi-completion well	150	e040284	2-4-Pittsburg Plain	N/A	from intersection of Burton Ave and Front		No	Contra Costa	130	140
Burton MW-230		56.87	top of casing		GPS	0.1 ft.	Observation	Active	38.019	121.899	GPS	1 ft.	Part of a nested/multi-completion well	230	e040284	2-4-Pittsburg Plain	N/A	from intersection of Burton Ave and Front		No	Contra Costa	210	220
Burton MW-330		56.88	top of casing		GPS	0.1 ft.	Observation	Active	38.019	121.899	GPS	1 ft.	Part of a nested/multi-completion well	330	e040284	2-4-Pittsburg Plain	N/A	from intersection of Burton Ave and Front		No	Contra Costa	310	320
Crestview MW-235		72.09	top of casing		GPS	0.1 ft.	Observation	Active	38.017	121.892	GPS	1 ft.	Single Well	235	e040285	2-4-Pittsburg Plain	N/A	st side of street, ~150 feet south of Highwa		No	Contra Costa	215	225
Golf Course MW-190		76.14	top of casing		GPS	0.1 ft.	Observation	Active	38.014	121.910	GPS	1 ft.	Part of a nested/multi-completion well	190	e052849	2-4-Pittsburg Plain	N/A	section of Golf Club Road and W. Leland Ro		No	Contra Costa	170	180
Golf Course MW-250		76.27	top of casing		GPS	0.1 ft.	Observation	Active	38.014	121.910	GPS	1 ft.	Part of a nested/multi-completion well	250	e052849	2-4-Pittsburg Plain	N/A	section of Golf Club Road and W. Leland Ro		No	Contra Costa	230	240

APPENDIX B

City of Pittsburg
Groundwater Level Monitoring

Date: _____

Well Name	Time	Depth-to-Water feet	Comments
Bodega MW-120			
Bodega MW-190			
Bodega MW-290			
Burton MW-150			
Burton MW-230			
Burton MW-330			
Crestview MW-235			
Golf Course MW-190			
Golf Course MW-250			

NAME _____

APPENDIX E

Current Groundwater Monitoring Program

MEMORANDUM

January 27, 2012
File No. 10-2-025

TO: Walter Pease
City of Pittsburg

FROM: Tom Elson

SUBJECT: STATUS REPORT ON GROUNDWATER MONITORING THROUGH 2011

This memorandum reports on groundwater monitoring in the City of Pittsburg through 2011. Other reports on groundwater monitoring were submitted in 2009 and 2010. The current report follows the format of the preceding submittals and includes a discussion of the City's CASGEM monitoring for the state Department of Water Resources and its interrelationship with the currently established monitoring protocol.

Background

The City of Pittsburg meets about 90 percent of its water demand with raw surface water purchased from Contra Costa Water District with the balance met by groundwater. Groundwater use is limited primarily by its higher dissolved mineral content. In accordance with a water system permit through the California Department of Public Health (CDPH), groundwater can be extracted from approved supply wells, blended with the City's surface water source, and treated at the City's Water Treatment Plant. The City monitors water quality at the plant to ensure that the delivered product meets all drinking water standards.

Hydrogeologic Setting

In the initial 2009 report on the City's groundwater monitoring program (LSCE, 2009), geologic cross-sections were presented that delineate the completion zones in the City's production wells. The cross-sections were constructed using information from well completion reports for the City's Rossmoor and Ball Park wells and data from several exploratory test holes and monitoring wells installed as part of the Bodega well project. Since the 2009 report, no new drilling activities have been conducted by the City.

Groundwater Monitoring Program

As authorized by the City, LSCE initiated groundwater monitoring in late 2008. The monitoring network consists of existing production wells and dedicated monitoring wells. A form for water level readings by City personnel is used to record field data, which is then entered into a database. LSCE surveyed reference point elevations with GPS equipment and provided training on water level measurement and reporting conducted by the City. Wells in the monitoring network are shown on the attached **Well Location Map**.

Sources of information used in the monitoring program are presented in the following table:

Source	Description
Well Data	**Table 1** lists the monitored wells, construction features, and coordinates.
Water Quality	Water quality is evaluated periodically. For production wells, water quality data is obtained according to CDPH monitoring. For monitoring wells, initial water quality testing was performed in 2006. In February 2011, the monitoring wells were sampled and tested again. Summary tables for selected constituents and lab reports for 2011 testing are included in this report.
Groundwater Levels	Groundwater level data are collected monthly by the City. The data are presented on hydrographs in this report.
Groundwater Pumping	Groundwater pumping is tracked through the City's records of water use and presented in a table in this report.

Monitoring Results

Monitoring results for the current report include the following:

Water Quality

The City blends groundwater with its surface water supply source to provide safe and reliable drinking water in accordance with its water system permit. Local groundwater typically has high concentrations of dissolved minerals and high levels of iron and manganese. All are secondary drinking water parameters that are not a health concern. Through blending, the City's delivered water meets all primary and secondary standards as regulated under the CDPH Drinking Water Program.

Summary tables of selected water quality constituents for production wells and monitoring wells are attached and discussed below. Recognizing the proximity of the City's groundwater source to the Delta, the focus on water quality is with dissolved minerals, hardness, and chlorides to give warning of possible influences from brackish to saline waters. Manganese and iron appear to be consistently elevated, though iron less so. These metals are secondary drinking water constituents and their presence is mitigated through blending with surface water.

Production Wells

Groundwater quality from the Ball Park Well exhibits significantly higher dissolved mineral content compared to the Rossmoor and Bodega wells. Although there appeared to be a decline in total dissolved solids (TDS) between 1992 and 2004 (from 1,500 to 1,200 mg/L), the groundwater quality from the Ball Park Well limits its use as a supply source. The well was taken out of service in 2008 and the City plans to destroy it in accordance with county requirements.

The Rossmoor and Bodega wells exhibit similar quality, which is consistent with their proximity to each other and strong correlation between their completions. TDS in the Rossmoor increased from 620 to 850 mg/L between 2002 and 2011, though hardness and

chloride concentrations remained essentially constant. TDS from the Bodega Well appears to be more constant but only three measurements are available from 2007 to 2011. Manganese occurs in groundwater in the Rossmoor and Bodega wells at about 2 to 3 times the secondary maximum contaminant level (MCL) of 0.050 mg/L. Iron is nearer the MCL (0.300 mg/L), and it is noted that the test results for the Bodega monitoring wells have all been below the MCL.

The higher TDS from the Rossmoor Well should continue to be evaluated and, based on variations with depth seen in the Bodega monitoring wells, the trend may be a result of more water being contributed from the deeper zone. The reason for this may be related to the history of severe biofouling, which is a factor considered in a recommendation to replace the well, as discussed below.

Monitoring Wells

Bodega MW – Groundwater samples from the three piezometers in the Bodega MW show somewhat better quality in the shallowest completion (MW-120), which corresponds to the uppermost screens in the Rossmoor and Bodega production wells. The TDS in the middle completion (MW-190), corresponding to the lower screens in the production wells, may explain the increase in TDS noted above in the Rossmoor well and bears further attention in the future. Manganese and iron are highly variable with manganese consistently above the MCL.

Burton and Crestview MWs – The Burton site could not be accessed for the 2011 testing due to obstructions by the adjacent resident. Samples from 2006 indicate that water quality at this site is very poor with TDS higher than the Ball Park Well. The Crestview MW has one completion, which corresponds to the lower screens in the Rossmoor and Bodega wells. The TDS has ranged from 1,480 to 1,600 mg/L in samples collected from 2006 to 2011. The Crestview and Burton sites were not considered candidates for water supply wells due to poor water quality.

Golf Course MW – The Golf Course MWs may not correspond to completion zones in the Rossmoor and Bodega wells. The shallow piezometer (MW-190) is correlated to zones that occur deeper than the screened intervals in the production wells. Some variations in water quality are apparent in the 2006 and 2011 data, but are a minor concern at present.

Well Hydrographs

Updated hydrographs for program monitoring wells are attached and discussed below. The time scale on all the hydrographs corresponds to the period of record for the Rossmoor water level data, which has the longest available record dating to 2001.

Rossmoor Production Well – The static groundwater level in this well has ranged from 30 to 35 feet below ground surface (BGS), corresponding to +2 to +10 feet elevation over the

period of record. Pumping levels range from 50 to 60 feet bgs. Due to the infrequency of static readings up to 2009, conclusions regarding a trend in water levels is uncertain. Integration of precipitation departure curves in future reports will aid in interpreting trends in this well.

Bodega Production Well and Monitoring Well – Recent measurements in the Bodega Well are influenced by its operation, and it is recommended below under Conclusions and Recommendations that at least one reading in the spring and one in the fall be conducted with the well shut off for 24 hours. Pumping has little influence on water levels in a deeper zone encountered at the site and completed in the MW-290 monitoring well.

Ball Park Well – Sounding of the Ball Park well indicates static levels of approximately 42 to 45 feet bgs, corresponding to +6 to +9 feet elevation. This well is out of service and may be replaced with a dedicated monitoring well in the future.

Burton Monitoring Well – Static levels in this well occur at about 50 feet bgs, corresponding to +4 and +9 feet elevation. During the summer and fall, water levels dropped to the lower levels, likely in response to pumping from the Rossmoor and Bodega wells. The readings indicate that groundwater elevations remain above sea level for the period of record.

Crestview Monitoring Well – Behavior of the static levels in this monitoring well are very consistent with the Burton MWs. Static levels occur at about 65 feet bgs and elevation ranges between +5.5 and +9 feet with seasonal fluctuations. The readings indicate that groundwater elevations remain above sea level for the period of record.

Golf Course Monitoring Well – Static levels in MW-190, located at the City's Delta View Golf Course, occur at about 70 feet bgs and elevation ranges between approximately +4 and +9 feet. This monitoring well is up-gradient of the Rossmoor and Bodega sites and groundwater elevations appear stable for the period of record. A deep piezometer at the site indicates higher groundwater elevations, between +25 and +27.5 feet elevation, which likely reflect conditions in another aquifer system that is distinct from aquifers completed in the City's production wells. Fluctuations in water levels appear to reflect seasonal wet and dry cycles.

Water Treatment Plant Well – Water elevations at this site appear stable for the period of record and are significantly higher than at any other site at approximately +113 to +121 feet elevation. A hydrogeologic connection between this well and the City's production wells is considered unlikely based on a geologic evaluation that was part of developing a new source of supply at the Bodega site.

Contour Maps of Equal Groundwater Elevation

Groundwater measurements were used to construct contour maps of equal groundwater elevation for five periods: winter 2008; fall 2009; spring 2010; fall 2010; spring 2011; and fall 2011 (see

attached groundwater elevation contour maps). The maps were constructed using data for wells completed similar to the Rossmoor and Bodega production wells and include those sites plus measurements from the Burton and Crestview monitoring wells. In winter 2008 and fall 2009, groundwater elevations indicate flow generally to the north in the direction of the Delta. In spring 2010, there is a shift in flow direction to the west that is likely caused by increased groundwater pumping at the new Bodega well station, which was commissioned in late 2009. This change is still apparent in fall 2010 through fall 2011. Groundwater elevations are uniformly above sea level and there is no indication that the City's pumping is causing adverse impacts. However, the effects of the new pumping at the Bodega site should continue to be a focus of subsequent reports.

Status of City Production Wells

Ball Park Well – The Ball Park Well was constructed in 1991, but had limited use due to high TDS. The well was taken out of service in November 2008 but is used as a monitoring location under the subject monitoring program. The City is considering destroying the Ball Park well as there are no plans to restore it to service due to water quality. Because the location provides useful monitoring data, it has been recommended in a separate proposal by LSCE to replace the well with a dedicated monitoring well of similar design and construction as the Bodega MW.

Rossmoor Well – The Rossmoor Well was constructed in 1991 and has experienced severe biofouling problems since at least 2001. Rehabilitation work was performed in 2001, 2004, 2009, and 2010. The rehabilitations in 2009 and 2010 were designed as preventative measures to optimize production from the well in the high demand summer months. Although the flow rate declined, it was felt that the pump life was extended by the treatments. Despite the severity of the biofouling on pump components, the well specific capacity appears unchanged from historic levels.

In 2011, another rehabilitation and pump change was planned to provide a reliable flow during peak months. The pump components were found to be severely clogged consistent with past experience. A video log was also conducted and revealed the presence of holes in the casing. Because of the holes, the rehabilitation program was modified and a new pump having the same characteristics as the previous equipment was installed as a stopgap measure while the City considers options to address the structural and biofouling problems. The 2011 video log plus photos of the pump removed in 2011 are attached to this report, for reference.

Options for Rossmoor are limited by an inability to implement structural modifications such as patches or inner liners. The former may be risky because of deteriorated conditions evident in the 2011 video log and the latter would reduce the size of pump that could be used in the well. Considering the age, history, and construction features, LSCE has recommended replacement as the option that provides the most reliability in the future. Given the cost of surface water versus groundwater pumping, the economics for replacing the well is attractive. LSCE is submitting a scope and budget for replacement separate from this report.

Bodega Well – The Bodega well station was constructed in 2009, and a water system permit amendment to add the well as a new source to the City's system was approved by CDPH in late 2009. The well was placed into service in January 2010 and is equipped to operate at flow rates up to 1,400 gpm with a variable frequency drive.

Groundwater Use

Listed in the table below is the production for each of the City's wells. In November 2008, the Ball Park well was taken off-line and in 2010, the Bodega well was brought online. As the City's groundwater monitoring baseline is developed, future reports will track trends in groundwater levels and quality as a function of use patterns evident from the pumping records.

	2008	2009	2010	2011 (Jan-July)
Ball Park	662	0	0	0
Rossmoor	992	899	483	172
Bodega	-	-	1097	772
Total (ac-ft)	1,654	899	1,580	944

Conclusions and Recommendations

This is the third groundwater monitoring report prepared for the City. It follows the format established in the 2009 report and it is recommended that it be prepared annually to address key questions concerning the City's use of local groundwater:

- Is the current extent of groundwater pumping sustainable?
- Can more groundwater be used for water supply?
- Are there any adverse trends in groundwater levels or water quality attributable to pumping?

As the monitoring program was initiated prior to commissioning of the Bodega well station, subsequent monitoring reports should seek to identify effects of new pumping from that source, if any. Key monitoring locations to meet this objective are the Crestview and Burton sites where water levels appear stable at elevations between +4 and +9 feet elevation with seasonal fluctuations.

In addition to the above, the following conclusions and recommendations are based on observations made over the current reporting period:

Groundwater Levels

The historic baseline for groundwater levels in all wells is limited. The longest record is available for the Rossmoor well with static groundwater levels varying between +2 and +10 feet elevation from 2001 to 2011. The record for other wells, though shorter by comparison, indicate stable conditions, and monitoring wells located at distance from the Rossmoor and Bodega wells remain above sea level, a requirement to repel intrusion from the Delta.

Static groundwater levels in the Bodega and Rossmoor wells should be obtained on or about

April 1 and October 1 each year after a 24-hour shut-down period to ensure that static readings are obtained in the spring and fall. Monthly readings at all locations should continue to aid in evaluating and distinguishing pumping effects from hydrologic factors.

Groundwater Elevation Contour Maps
Groundwater contours for wells completed in the same zone as the City's production wells indicate that groundwater flow direction is likely influenced by new pumping at the Bodega well. However, static groundwater elevations are above sea level and appear stable in nearby monitored wells.

Water Quality
Water quality for production wells is based on monitoring performed under CDPH permit requirements. LSCE recommends continued monitoring of the City's production wells in accordance with CDPH requirements. Additionally, LSCE recommends monitoring the water quality of the City's monitoring wells about every two to three years.

Rossmoor Well
The options for addressing the well condition are discussed above under the section on status of the City's production wells. LSCE recommends consideration of well replacement due to age and construction features that limit the City's ability to aggressively rehabilitate the well. The holes in the casing that were observed in the 2011 video log indicate that the structure may have limited remaining life. LSCE is preparing recommendations for replacing the well under separate cover.

Ball Park Well
LSCE has submitted a recommended program to destroy the Ball Park well and replace it with a dedicated multiple-completion monitoring well.

SBx7 6 California Groundwater Elevation Monitoring - CASGEM
New state legislation under SBx7 6 provides incentives for water entities in the form of grant funding to participate in a statewide reporting program. The program is concerned only with reporting groundwater elevations and does not include measurements from public supply wells (as a matter of security). The City of Pittsburg applied to be the lead entity for the Pittsburg Plain Groundwater Basin and a groundwater monitoring plan was completed and submitted to the state in December 2011. The plan integrates groundwater level monitoring that is part of the program described in this report. As such, the City's water level monitoring will serve CASGEM program reporting for the state, plus its own water resource management needs. It should be noted that CASGEM does not provide for interpretation of groundwater conditions in the manner presented in the current and previous monitoring reports.

Previous Reports: LSCE, Report on Groundwater Monitoring Program, September 11, 2009
LSCE, Status Report on Groundwater Monitoring Program, August 28, 2010

APPENDIX F

Well Construction Information

Well Name	Screen Interval	Upper Seal Depth	Total Depth or Depth of Lower Seal
Bodega MW-120	100-110	82	132
Bodega MW-190	170-180	150	202
Bodega MW-295	275-285	260	305
Bodega PW	110-135 145-205	76	225
Ball Park PW	150-285	50	285
Crestview MW	215-225	193	252
Burton MW-150	130-140	117	165
Burton MW-230	210-220	185	270
Burton MW-330	310-320	290	340
Golf Course MW-190	170-180	150	195
Golf Course MW-250	230-240	210	260
Rossmoor PW	150-210	50	210
Hill St PW #1	115-140 230-280	50	300
Hill St PW #2	60-500	50	500
Chadwick PW #3	50-300	50	300

MW = Moniotring Well Piezometer
PW = Production Well

APPENDIX G

Contra Costa County Well Construction Ordinance and Permit Guidelines

LEGAL NOTICE

FILED
JUN 11, 1985
PHIL BATCHELOR
CLERK BOARD OF SUPERVISORS
CONTRA COSTA CO.
By ..... Deputy

LEGAL NOTICE

LEGAL NOTICE

Proposed regulations of the Contra Costa County Health Officer governing installation of a small water system, and an individual water system, for domestic use pursuant to Chapter 414-4 of the Ordinance Code of Contra Costa County.

Adopted by: William Walker MD
William Walker, M.D.
Health Officer
Contra Costa County

June 26, 1985
Effective Date

June 12, 1985
Date

These regulations were filed with the Clerk of the Board of Supervisors and posted in the Department of Health Services on June 12, 1985.

These regulations are to make more certain specific sections of the Contra Costa County Ordinance Code. Not all of the ordinance sections are described in these regulations as parts of the ordinance require no further explanation. Ordinance text is not reprinted herein.

414-4.20 GENERAL

1. Application for all proposed Subdivisions (Major and/or Minor) must comply with the following:

   a. Each parcel must have an "on site" producing well having a minimum yield of three (3) gallons per minute with a bacterial and chemical quality in compliance with the State standards for a pure, wholesome and potable water supply. (Title 22, Section 64433). If the chemical analysis exceeds the State standards for "maximum contaminant

levels" for water potability, a statement must be attached and "run with the property deed" advising of these levels

-or-

b. Have verifiable water availability data from adjacent parcels presented by the applicant or knowledge of the same, known by this Division concerning water quality and quantity per (a) above

-and-

Have a statement that "attaches and runs with the deed" indicating that a water well shall be installed on the subject parcel complying with the general requirements stated above prior to obtaining a Building Department permit for construction.

c. In addition to the above, a hydro-geological evaluation may be required in known or suspected water short areas. This will include seasonal as well as yearly variations.

(1) The purpose for requesting hydrogeological evaluations is to determine the total projected numbers of dwelling units that can be supplied with drinking water from existing aquifers. The two primary circumstances that would generally require hydrogeological evaluations are:

(1.1) Where a proposed major subdivision contemplating the addition of large numbers of dwelling units on individual wells would substantially increase the density within an existing drainage basin. Hydrogeological data relevant to recharge of aquifers and projected yield

would become essential not only to support approval of large major subdivisions under these circumstances, but also to ensure that the water supplies serving existing structures would not be depleted by the proposed increased demand.

(1.2) In those cases where density is increasing in particular drainage basins due to the build out of previously approved subdivisions using individual wells for water supplies and existing well yields begin to evidence declines due to the increased demand. In these circumstances, or in water short basins, hydrogeological studies would be appropriate as a condition for subsequent development to provide sufficient data to protect existing uses and assure sufficient yield for proposed uses. Specific reasons will be stated in support of requested hydrogeological evaluations in each case.

414-1.202 APPROVED WATER SUPPLY SYSTEM

The requirements of Titles 17 and 22 of the California Administrative Code apply to small water systems and individual systems are not subject to these requirements.

414-1.204 LICENSED WELL DRILLER

The class of license required shall be determined by the State of California licensing agency. The Health Officer shall refer any inquiries regarding the licensing requirements to the licensing agency in writing. The decision of the licensing agency shall be the sole criteria for the Health Officer's acceptance or rejection of any license.

414-1.206 ABANDONED WELL

The Health Officer shall maintain a log of all known abandoned or inactive wells. The owner of the well shall be required annually to declare his intentions to use the well again or the well shall be permanently abandoned.

414-1.208 SMALL WATER SYSTEMS

Fees for applications to construct a small water system are an amount equal to three times the annual license fee for the proposed system plus individual permit fees for any new well(s) included as part of the proposed system. The charge that is based on the annual license fee shall be considered as a deposit to cover the Health Officer's costs of plan checking and making construction inspections. Any money remaining in the deposit fund on completion of construction shall be refunded to the applicant.

414-1.210 SMALL WATER SYSTEM - APPROVED SOURCES

The Health Officer's approval or denial of the water source shall be based on laboratory analysis of the water. If the water does not meet the requirements for domestic water, the applicant or operator shall provide water from an alternate source meeting the requirements or install treatment facilities acceptable to the Health Officer.

414-1.212 SMALL WATER SYSTEM - DISTRIBUTION

(d) Backflow protection. Backflow protection devices shall be installed when the property has an auxiliary source of water. Any other sources of real or potential backflow from auxiliary water sources or other contaminants shall be eliminated as directed by the Health Officer.

(f) Location of pipes. Water mains shall not be installed in the same trench as sanitary sewers. Water lines from buildings to the water meter or street main may be installed in the same trench as the house sewer when the sewer is constructed of material approved for use under the building. The standards adopted by the State Department of Health Services for separation of water mains and sewers, and the Uniform Plumbing Code Regulations for building sewer and water lines are adopted as a part of these regulations.

414-1.214 INDIVIDUAL WATER SYSTEMS

Chemical - physical analysis of the water may be required when there is evidence the water may not be suitable for domestic use. If tests indicate the water contains contaminants that pose a direct and immediate hazard to health, the water will not be approved for domestic use. When the water contains secondary constituents in excess of recommended standards, the Health Officer shall notify the property owner in writing but use of the water as a source of supply for an individual system may not be disapproved.

414-1.216 QUANTITY

Yield tests shall be required when there is no historical evidence to document well yield. Yield tests shall include the rate of water discharged and measurements of drawdown in the well.

On low yield wells where recharge and discharge reach equilibrium within thirty minutes of the beginning of the test, the rate of discharge shall be measured for four hours and be accompanied by hourly measurements of drawdown to verify the static or dynamic level of water in the well column does not fluctuate.

High yield wells are defined as those wells that will sustain a yield of at least twice the minimum quantity required for the proposed property development. On high yield wells, where recharge and discharge do not reach equilibrium until one hour after the beginning of the test, measurement of pump discharge may be limited to one hour after equilibrium is reached with a minimum of two measurements of drawdown at 30 minute intervals. Yield tests shall be reported on a form provided by the Health Officer. See attached Exhibit "B".

Other methods of determining well yield may be accepted when the production requirements for the well are signifcantly less than the probable yield of the well as determined by a bailer test or historical data of the area where the well is located. The historical data must be acceptable to the Health Officer. The data must also be supported by a pump test for the specific well being evaluated. The pump test shall be for a minimum of two hours and the volume discharged shall be reported to the Health Officer.

414-1.218 WELLS - PERMIT REQUIRED

(a) The applicant for a permit shall specify who will perform the basic well construction which includes drilling, casing, sealing the annular space and providing a secure cover or cap for the well. The applicant shall also specify the party responsible for well development which includes yield tests and water quality analysis if required by the Health Officer and installation of the pump, sanitary seal, and concrete platform.

(b) The Health Officer shall provide permit cards that will allow for signoff or approval of the two phases of well installation described in the preceding. The Health Officer shall maintain a log of permits issued and investigate each application 12 months after issuance of a permit if the party responsible for Phase 2 has not requested a final inspection during the 12 months following permit issuance. See the attached Exhibit "A".

(c) A copy of the Department of Water Resources reporting form will be acceptable to meet the requirement for certification of the protection of the aquifers penetrated during construction of the well. The DWR form is required prior to the signoff of Phase I - Construction. The Department of Health Services shall submit copies of yield tests (pump tests) when completed prior to final approval of well permit (Phase II) upon receipt to DWR, when required by that state agency.

414-1.220 WELLS-SITE

No well shall be located any closer to the areas identified below except on written approval of the Health Officer. Other hazards will be evaluated and well setback requirements will be established by the Health Officer as needed.

With the exception of property lines, all distances are upslope from the well:	Private Wells	Public Wells
Property Line (unsewered area)	50 feet	50 feet
Septic Tank	100 feet	100 feet
Sewer Lines	50 feet	50 feet
Stream, Ditch, or Drainage Channel	50 feet	50 feet
Subsurface Leaching Device	100 feet	100 feet
Livestock Area	25 feet	25 feet

414-1.222 WELLS - PROTECTION

1. No additives shall be used in drilling mud that have not been approved by the State Department of Health Services. Chlorination of wells shall be done as described in Appendix C, Department of Water Resources Bulletin 74-81.
2. All well casings shall be new and meet the following requirements:
   a. Well casing shall be strong enough to resist the forces imposed on it during installation and service life.

b. Additives to accelerate the curing of cement shall not be used when thermoplastic casing is used.

c. Bentonite (up to 8 percent) shall be added to cement seals to reduce the heat of hydration when thermoplastic casing is used.

d. All casing shall meet the conditions described in Section 12, State of California, Department of Water Resources, Bulletin 74-81.

3. Sealing of the annular space shall be performed in strict compliance with the requirements described in Section 9, California Department of Resources Bulletin 74-81. The Health Officer shall be notified at least 24 hours in advance of the installation of the seal. The seal shall be placed in one continuous mass starting from the bottom of the space to be grouted and continuing upward. The depth of the seal shall be as described below:

a. All wells shall be sealed to prevent contamination from surface sources. The minimum depth of the seal for this purpose shall be fifty (50) feet. For wells drilled to a shallow depth, where a (50) foot seal is not possible, the Health Officer shall determine the depth of the seal after consultation with the driller and a review of all pertinent information.

b. All wells shall be sealed to prevent the interchange of water between aquifers when this interchange would result in degradation of the quality of water in one or more aquifers. One example is where high nitrate levels have been identified in the more shallow aquifers.

c. Wells installed in areas where the producing aquifer or strata is not overlain with impervious material, shall be sealed to the producing aquifer. This requirement is particularly applicable to, but may not be limited to, delta peat/sand formations.

4. A completed copy of the latest revision of DWR Form 188, submitted to the Health Officer, shall serve as the driller's certification of the protection of the aquifers penetrated during drilling and completion of the well.

414-1.224 ABANDONMENT OF WELLS

a. Temporary abandonment (inactive).

The well must have no defects which will allow the degradation or contamination of the water quality in the well or in the water bearing formations penetrated by the well.

The top of the casing shall be securely capped.

The well shall be marked so it can be clearly seen.

The area around the well shall be kept clear of brush or debris.

b. Permanent abandonment.

All wells shall be destroyed in such a way that they will not act as a conduit for the infiltration of surface drainage or shallow depth groundwaters into groundwater aquifers. Shallow depth groundwater is water that is found above the first usable aquifer.

1. Obstructions shall be removed, if possible, prior to filling the hole. If the obstruction is hardware, and cannot be removed, a tremie pipe will have to be passed below the obstruction to place sealing material to the full depth of the well.
2. The casing shall be perforated, as necessary, to seal any annular space or voids.
3. In dug wells, as much of the lining as possible shall be removed prior to filling the well.
4. Wells shall be filled from the bottom up. The method used shall not allow for free fall, dilution or separation of the sealing material.

5. All wells shall be filled so as to prevent interaquifer flow through the well or around the outside of the casing. The casing shall be perforated to its full depth.

6. Special care must be exercised in wells having a significant producing flow. In such cases, the casing must be perforated opposite the area to be sealed and the sealing material forced into the surrounding formation under pressure.

7. Gravel packed wells shall be sealed so as to force the sealing material into the gravel pack under pressure.

8. The person sealing the well shall verify that the volume of material placed in the hole is at least equal to the volume of the empty hole.

9. Sealing materials used shall be impervious. Acceptable materials include:

   a. Bentonite

   b. Neat cement- one bag of cement to 5 to 7 gallons of water.

   c. Cement grout - two parts of sand and one part of Portland cement to 5 to 7 gallons of water.

   d. Concrete - the mixture shall contain a minimum five sacks of Portland cement per cubic yard.

10. Native soils shall not be used as sealing material.

11. Materials containing organic matter shall not be used.

12. All abandoned wells shall have a hole excavated around the well casing to a depth of six feet. The well casing shall be removed to this depth and the sealing material shall be allowed to spill over and provide a cap at least one foot thick over the cut end of the casing.

13. If there is an annular space between the casing and the hole, the upper 50 feet of casing must be removed. If this is not possible, the casing must be ripped from a depth of 50 feet for a distance of five feet upward. The ripped portion shall then be filled by pressure grouting to form a grout plug in the annular space. The casing shall then be ripped above the grout plug and pressure grouting repeated until grout returns to the surface in the area between the drilled hole and the well casing.

414-1.226 ENFORCEMENT - PUBLICATION OF REGULATIONS

The Health Officer shall distribute copies of proposed changes in regulations to the drilling industry and other interested parties requesting notification in writing. Copies of proposed regulations shall be mailed to the requesting parties thirty (30) days prior to filing the regulations with the Clerk of the Board of Supervisors. The letter transmitting the proposed regulations to the well drilling industry shall indicate the date the regulations will be filed with the Clerk of the Board.

414-1.228 WATER WELL DRILLERS - REPORTING FORM

The Health Officer shall provide the well drilling industry with reporting forms that may be used to report violations of the water supply ordinance and Health Officer's regulations. The use of these forms is not mandated by these regulations. See the attached Exhibit "C".

EXHIBIT "A"

WELL PERMIT

Contra Costa County Health Services Department

Date of Permit: _____ Permit Expires: _____

Basic Well Construction (Phase 1)

Drilling _____

Casing _____

Sealing _____

Capping _____

DWR _____

Well Development (Phase 2)

Yield Test _____

Water Quality Analysis _____

Pump Installation _____

Sanitary Seal _____

Concrete Platform _____

The inspector shall note N.A. (not applicable) for items not required for this installation.

EXHIBIT "C"

To: WELL DRILLERS

Re: Groundwater Sources

The Contra Costa County Water Supply Ordinance strongly emphasizes the need for protection of the County's groundwater sources from degradation that could result from inadequately constructed, defective, or improperly abandoned wells. To assure appropriate surveillance of the construction and abandonment of water wells requires the support of the well drilling industry and other concerned citizens. The lower portion of this form can be used to report your concerns and any incidents involving wells that you feel should be investigated by Health Services staff to assure protection of groundwater supplies.

East-Central County
To: Contra Costa County Health Services
Environmental Health Division
1111 Ward Street
Martinez, CA 94553

West County
To: Richmond Health Center
Environmental Health Division
100 - 38th Street
Richmond, CA 94805

1. Date and nature of problem observed:

_____

_____

_____

2. Exact location of incident:

_____

_____

3. Your name, address and phone number:

_____

_____

(It is not necessary that you complete Item 3. This information is necessary if you desire a report describing the results of the staff investigation.)

EXHIBIT "B"

WATER WELL PUMP TEST REPORT

Contra Costa County Health Services Department

Name of Well Permit Applicant: _____

Name of Property Owner: _____

Parcel Number: _____

Mailing Address: _____

Date of Test: _____

Time Test Was Started: _____

Time Required to Reach Equilibrium
Between Recharge and Discharge: _____

Total Time Pump Test Was Continued
After Equilibrium Was Reached: _____

Drawdown Measurements Including Distance to Water Level and Time of Day:

	Time	Drawdown
1.		
2.		
3.		
4.		
5.		
6.		

Ordinance Code of Contra Costa County, California

Title 4. Division 414

Approved Water Supply Systems

Effective Date: August 1981

CHAPTER 414-4 APPROVED WATER SUPPLY SYSTEMS

ARTICLE 414-4.2 GENERAL

414-4.201 GENERAL. WATER SUPPLY SYSTEM – APPROVAL REQUIRED. Any person proposing to subdivide or develop any property needing water for domestic purposes shall demonstrate an approved water supply and obtain written approval from the health officer for such development.

414-4.202 PURPOSE AND DISCLAIMER. This chapter is enacted to provide for the protection of the County's groundwater sources from degradation that could result from inadequately constructed, defective, or improperly abandoned wells, to provide for regulation of small water systems in accordance with federal standards as mandated by the State, and to require submission of tentative subdivision maps and building permit applications to the Health officer for him to review the availability of an approved water supply prior to the recordation of final maps and issuance of building permits. Notwithstanding the foregoing, by enacting this chapter, the County of Contra Costa neither assumes or undertakes any obligations or responsibilities of any kind to assure, guarantee, preserve, or otherwise guard the adequacy, potability, or any other qualitative or quantitative feature of the County's groundwater sources in any manner whatsoever, and no cause of action against the County, its agents, directors, or employees shall be deemed to accrue under any theory whatsoever on the basis of the enactment of this chapter or any subsequent amendment thereto.

414-4.203 DEFINITIONS. As used in this chapter, the following words and phrases shall have the meanings given in this chapter:

414-4.205 APPROVED WATER SUPPLY SYSTEM means any system, approved by the health officer, or the California Department of Health Services, as meeting the requirements of Titles 17 and 22, the California Administrative Code.

414-4.207 CROSS-CONNECTION means any actual or potential unprotected connection as defined in Title 17, California Administrative Code.

414-4.209 CUSTOMER SYSTEM includes those parts of the facilities beyond the termination of the utility system which are used to convey water to points of use.

414-4.211 DISTRIBUTION SYSTEM includes the facilities and conduits used for the delivery of water from the source to the customer's system.

414-4.213 FURNISH OR SUPPLY has its usual meaning, except that it does not include furnishing or supplying water to a user for domestic purposes other than for human consumption if the user receives the water, by pipe or otherwise, directly from an open irrigation canal system; nevertheless, it does include furnishing or supplying water to any small water system, connected by an integrated pipe system owned and operated by the supplier.

414-4.215 HEALTH OFFICER, unless otherwise modified, means the health officer of this County, his/her medical deputies, his/her Environmental Health Inspectors, and his/her other duly authorized representatives.

414-4.217 INDIVIDUAL WATER SYSTEM means an approved water source and system of piping designed to provide water for domestic use and which serves (a) one single family residence; or (b) two single family residences on one parcel; or (c) one structure serving less than 25 persons more than 60 calendar days per year.

414-4.219 SITE EVALUATION means the investigation of a lot or subdivision to determine the feasibility of using an individual water system or a small water system.

414-4.221 SMALL WATER SYSTEM means a system which furnishes water for domestic purposes to from two through one hundred ninety-nine service connections and shall include "Public Water Systems" as defined in California Health and Safety Code Section 4010.1 and its applicable regulations under Title 22 of the California Administrative Code. Two single family residences on one parcel shall not be considered a small water system.

414-4.223 SOURCE FACILITIES include all components of the facilities used in the production, treatment, storage, and delivery of water to the distribution system.

414-4.225 WATER SOURCE means a source of water supply for any water system, including, without limitation, wells, springs, ponds, lakes, surface streams, irrigation ditches or canals, and potable water obtained from other sources including large public water systems.

414-4.227 USER means any person using water for domestic purposes, except any person processing water or selling, serving, hauling, furnishing, or supplying water to the public in any manner.

414-4.229 UTILITY SYSTEM means a water system consisting of source facilities, treatment facilities, and distribution system, and includes all other facilities of the water system under the complete control of the supplier, up to the point where the customer's system begins.

414-4.231 WELL means any well, public or private, including without limitation, wells serving County and State small water systems, individual domestic use wells, industrial wells, agricultural wells, recharge or injection wells, air conditioning wells, horizontal wells, permanent test wells, dewatering wells and cathodic protection wells.

414-4.233 LICENSED WELL DRILLER means a person licensed in accordance with the provisions of the Contractors License Law (Chapter 9, Division 3, of the Business and Professional Code) to drill water wells.

414-4.235 WELL DRILLING means the act(s) by any person, including without limitation, the property owner and/or licensed well driller, to dig, drill, bore, excavate, or drive a well.

414-4.237 DOMESTIC USE means water that is intended for human consumption. The terms *domestic purposes* and *human consumption* mean the same as domestic use when they appear in this chapter.

414-4.239 ABANDONED WELL means a well which has not been used for a period of one year, unless the owner has declared his intention to use the well again. Wells that are to be used again shall be adequately protected, and marked, and the area around the well shall be kept clear.

414-4.241 SUBDIVISION MAPS

(a) *Tentative Maps.* Pursuant to Title 9, a copy of any submitted tentative subdivision map shall be forwarded to, and filed with the health officer for investigation of domestic water supply. The tentative map shall show proposed provisions for sewage disposal, source of approved water supply, number of lots, the size of each lot, and contour lines at intervals of five (5) feet or less.

(b) *Health Officer Approval.* The health officer shall review the filed tentative map for compliance with this chapter and in a timely manner report his conclusions thereon, together with any conditions recommended to insure such compliance, to the planning department and advisory agency.

(c) *Final and Parcel Maps.* Final and parcel maps shall not be recorded unless the conditions recommended by the health officer and established by the advisory agency on approval of the tentative map have been satisfied.

ARTICLE 414-4.4 SMALL WATER SYSTEMS

414-4.401 SMALL WATER SYSTEMS – PERMIT REQUIRED

(a) Every person proposing to install, construct, and/or operate a small water system shall first apply to the health officer for approval of the water source and utility system. The application shall be accompanied by complete plans and specifications with appropriate fees.

(b) The health officer shall approve, conditionally approve, or deny the application on the basis of compliance with this chapter and the health officer's regulations.

(c) Upon approval of the completed installation of the water system by the health officer, he shall issue a water supply permit and a public health license to operate the system.

414-4.403 SMALL WATER SYSTEM – INVESTIGATION, SITE EVALUATION. Upon receipt of an application for the construction or operation of a small water system the health officer shall make the necessary investigation and/or site evaluation of the proposed or existing system and all other circumstances and conditions the health officer deems material. The health officer may order repairs, alterations, or additions to the proposed or existing system to insure that the water furnished or supplied shall at all times meet the requirements of Sections 414-4.413, 414-4.415 and 414-4.417 herein. The health officer may require any permit holder or applicant to make a complete report on the condition and operation of the small water system owned, operated, or contracted for by the permit holder or applicant.

414-4.405 SMALL WATER SYSTEM – BACK-FLOW PREVENTION. Every person furnishing or supplying water to users shall prevent water from unapproved sources, or any substance, from entering the small water system.

414-4.407 SMALL WATER SYSTEM – DESIGN AND CONSTRUCTION. All small water systems shall be designed and constructed so as to comply with applicable A.W.W.A. Standards and generally accepted engineering practices.

414-4.409 SMALL WATER SYSTEM – APPROVED SOURCES REQUIRED. All water sources for small water systems shall comply with the requirements of Title 22, the California Administrative Code and may be used only after approval of the health officer.

414-4.411 SMALL WATER SYSTEM – DISTRIBUTION RESERVOIRS. Distribution reservoirs shall be adequately protected against contamination. Adequately ventilated housing may be required by the health officer to protect the facilities from the elements and unauthorized entry.

414-4.413 SMALL WATER SYSTEM – DISTRIBUTION SYSTEM.

(a) *Pressure-Quantity.* The distribution system shall be of adequate size and designed in conjunction with related facilities to maintain a minimum water pressure of twenty (20) pounds per square inch at every point during periods of maximum normal demand. The quantity of water delivered to the distribution system shall be sufficient to supply adequately, dependably, and safely the total requirements of all users under maximum consumption.

(b) *Flushing.* Dead-end runs shall be provided with means of flushing, and shall be flushed frequently enough to assure that the water will be kept safe, wholesome, and potable for human consumption. The design of the small water systems shall provide for elimination of dead-end runs wherever practicable.

(c) *Materials.* Materials used in the distribution system shall be able to withstand with ample safety factors, all internal and external forces to which they may be subjected.

(d) *Back-flow protection.* Each service connection from an approved water supply system shall be protected against backflow of water from a non-approved system.

(e) *Fire hydrants.* Fire hydrants shall conform to requirements of local authority.

(f) *Location of pipes.* No water pipe shall be laid in the same trench with sanitary sewers.

(g) *Disinfection of pipes.* All pipes or conduits, or parts, newly constructed or repaired before being placed in service, shall be completely disinfected in accordance with American Water Works Association Procedures for Disinfecting Water Mains.

(h) *Marking of pipes.* Where the premises contain dual or multiple water systems and piping, the exposed portions of pipes shall be painted, branded, or marked at sufficient intervals to distinguish the pipes which carry water safe for human consumption.

414-4.415 SMALL WATER SYSTEM – OPERATION AND MAINTENANCE.

(a) *Personnel.* All personnel responsible for operation and maintenance shall have sufficient experience and training to qualify them properly their duties. When water is treated the water system shall be operated by personnel having special skills in the appropriate areas and acceptable to the health officer.

(b) *Maps and Records.* Complete and current maps of the utility system shall be maintained. Complete and current records shall be kept showing results of bacteriological and chemical analyses of water and other data required by the health officer.

(c) *Maintenance.* Facilities and equipment of the utility shall be kept clean and in good working condition. Leaks shall be repaired as soon as practicable. Proper equipment, tools, and repair parts shall be available in good condition for all types of emergency repairs.

414-4.417 SMALL WATER SYSTEMS – QUALITY, QUANTITY.

(a) *Quality.* All water systems shall meet the primary Drinking Water Standards contained in Title 22 of the California Administrative Code. The secondary Drinking Water Standards contained in Title 22 of the California Administrative Code shall be met by all public water systems, subject to any current waivers or other authorized exception. All examinations of water required by this ordinance shall be performed by a laboratory approved by the California Department of Health Services.

(b) *Quantity.* Sufficient water shall be available from the water sources and distribution reservoirs to supply adequately, dependably and safely the total requirements of all users under maximum daily demand conditions. Requirements for a small water system shall be determined from the total source capacity, total storage volume and the total number of service connections. The procedures for determining quantity shall be in accordance with the specifications contained in Division 4, Chapter 16, Article 2, Title 22 of the California Administrative Code.

ARTICLE 414-4.6 INDIVIDUAL WATER SYSTEMS

414-4.601 INDIVIDUAL WATER SYSTEM – QUALITY, QUANTITY.

A. Quality:

1. *Bacteriological.* The water from an individual system, installed for domestic use, shall be examined by the health officer on completion of the system. Subsequent testing shall be performed by a laboratory approved by the California Department of Health Services and at the expense of the owner of the individual water system. The water tested shall be bacteriologically acceptable for domestic use.

2. *Chemical.* An analysis for specific organic or inorganic chemical constituents in the water may be required when there is evidence that such constituents may be present and which are considered by the health officer to be a risk to human health.

3. *Physical.* Tests for odor, color, turbidity, pH or other physical properties of the water may be required when there is evidence the water may not be acceptable or potable for human consumption.

B. Quantity:

Applications for building permits or certificates of occupancy for a structure requiring an individual water supply system, shall prior to their issuance be submitted to the health officer for review to determine if the water supply source will provide minimum of quantities in accordance with the following:

1. *Wells.* Sustained yield or pumping tests may be required by the health officer. The well yield shall be determined from pumping tests or historical data acceptable to the health officer. The well or wells shall yield a minimum three (3) gallons per minute and minimum storage capacity of one thousand (1000) gallons in a storage tank shall be provided. No storage is required if the well yield is five (5) gallons per minute or greater. Sustained yield tests, when required, shall be conducted in accordance with the procedures described in Title 22, Section 64563 of the California Administrative Code.

2. *Other surface sources.* Yields and required storage capacity shall meet the same minimum requirements as for wells. Adequate documentation that the surface sources are perennial shall be provided.

C. Director of Building Inspection:

When the building inspection director is advised by the health officer that it has not been demonstrated that a water source exists complying with this chapter and that such lack is a danger to or likely to cause public health problems, he may withhold issuance of the requested building permit or certificate for a structure.

414-4.603 INDIVIDUAL WATER SYSTEM – LOT AREA, VARIANCES.

(a) *Lot Area.* The health officer shall require each structure that needs both an individual water system and an individual sewage disposal system to be on a lot whose area, exclusive of natural impediment and surface and underground easements, is at least forty-thousand (40,000) square feet.

(b) *Variances.* The health officer may grant variances from Subsection (a) when he finds the following conditions to be met:

1. The lot otherwise will comply with the requirements of this Division and the health officer's regulations; and

2. The variance will neither create, nor contribute to the creation of a public nuisance.

414-4.605 INDIVIDUAL WATER SYSTEM – INVESTIGATION, SITE EVALUATION. The health officer shall make the necessary investigation and/or site evaluation of the proposed development and all other circumstances and approve, or deny the proposed development on the basis of compliance with this chapter and corresponding regulations.

ARTICLE 414-4.8 WELLS

414-4.801 WELLS – PERMIT REQUIRED.

(a) Every person proposed to dig, drill, bore, or drive any water well, or rebore, deepen, cut new perforations in, or seal the aquifers of any existing well, before commencing work, shall apply to the health officer for approval of the well site and method of installation and construction and for a permit to do the work. If a well driller is hired it is his responsibility to see that a permit is obtained. The application shall be on forms furnished by the health officer and shall contain the information he may require.

(b) The permit shall expire on the one hundred eightieth (180) calendar day after date of issuance if the work has not been started and reasonable progress toward completion is not maintained, but the health officer may extend the expiration date when delay is warranted.

(c) The health officer shall approve, conditionally approve, or deny the application and issue or withhold the permit accordingly, on the basis of compliance with this chapter and his regulations.

(d) Upon completion of the drilling, repairs, alterations, or additions of the well and before a final approval of the well for use, a log of the well shall be submitted to the health officer. Where minor or insignificant repairs, alterations or additions are made, the health officer may waive the requirement for a log.

414-4.803 WELLS – REPAIRS, ALTERATIONS OR ADDITIONS. The health officer may order repairs, alterations, or additions to the existing source or system to insure that the water furnished or supplied shall at all times be pure, wholesome and potable and without danger to human health.

414-4.805 WELLS – SITE. The site of every well shall be adequately drained and located a safe distance from any sources of pollution or contamination; this distance is dependent upon the character of the soil, location of pollution sources, and slope of the ground.

414-4.807 WELLS – PROTECTION.

(a) Adequate means shall be provided to protect the well from contamination during construction, reconstruction, or alteration. Newly constructed or repaired wells and necessary distribution systems shall be adequately chlorinated following construction or repair work.

(b) Surface construction which protect the well from contamination shall be provided when determined necessary by the health officer.

(c) The health officer shall be notified at least twenty-four (24) hours in advance of the installation of the seal of the annular space between the casing and excavation. All wells shall be sealed in accordance with the procedures outlined in Part 2, Section Nine of California Department of Resources Bulletin Number 74. All wells shall be sealed to the depth of the first impervious soil formation in addition to all other requirements of Bulletin Number 74.

(d) The well driller shall complete a certification of the protection of the underground aquifers he has penetrated during drilling and competition of the well. The certification shall be made on a form provided by the health officer and shall be signed by the well driller under penalty of perjury and shall indicate the contractor or driller license number. The work performed in the protection of the underground aquifers shall be done in conformance with California Department of Water Resources Bulletin Number 74, found well drilling practice, current published data or other references documented with the certification.

414-4.809 WELLS – ABANDONED. To prevent the contamination of ground waters and other dangers, every person wholly or partially responsible for abandoning a well or having entire or partial right of ownership or possession of the land or premises on which an abandoned well is situated shall destroy the well as specified in Part III, Section 23 of the State of California, Department of Water Resources, Bulletin Number 74.

ARTICLE 414-4.10 ENFORCEMENT

414-4.1001 ENFORCEMENT – PROHIBITIONS.

(a) No person subdividing and/or developing any property needing water for domestic use shall so use the property until he has demonstrated an approved water supply.

(b) No person shall drill a water well whether for domestic use, irrigation, agricultural or other purposes, without first applying for and receiving a valid, unrevoked, unsuspended permit to do so from the health officer.

(c) No person shall drill, reconstruct, repair or destroy a well for hire unless he is licensed well driller.

(d) No person shall operate a small water system without filing a written application with the health officer and receiving and possessing a valid, unrevoked, unsuspended water supply permit and public health license.

(e) No person shall maintain a cross-connection with a small water system operated for domestic use.

(f) No person shall supply water for domestic use until the results of the tests required by the health officer of bacteriological, chemical and physical analyses, performed by a laboratory certified by the State Department of Health Services, are submitted to the health officer and show that the water meets state safe drinking water quality standards and all other criteria established by the health officer through his regulations.

(g) No person shall modify, add to, or change an approved water supply system without the prior written approval of the health officer.

414-4.1003 ENFORCEMENT – PUBLICATION OF REGULATIONS. The health officer may make and publish regulations to make more detailed or specific the provisions of the chapter. These regulations shall become effective two (2) weeks after filing with the clerk of the Board of Supervisors and posting in the County Health Department. The health officer shall be responsible for the execution of this chapter.

414-5.1005 ENFORCEMENT – RIGHT OF ENTRY. To enforce this chapter, the health officer may enter and inspect any premises, operations or work regulated hereby, at reasonable times and with such notice to the owner, occupant, operator, applicant, licensee, or permittee, as is reasonable and practicable under the circumstances. In conducting such inspections the health officer is authorized to proceed pursuant to the Code of Civil Procedure Sections 1822.50 and following.

414-4.1007 ENFORCEMENT – NUISANCE ABATEMENT. Any installation made or condition existing in violation or this chapter or of standards or regulations established under Section 414-4.1003 is declared to be a public nuisance, and its maintenance, operation, and existence may be abated in a civil action.

(a) *Notice; Hearing.* Except in instances of necessity or emergency, when the health officer declares a public nuisance, he shall promptly so notify the owner of the property by certified mail to the owner's address on the assessment roll. The notice shall state the condition and reason for the declaration, and shall also state that the owner of the property has thirty (30) days after the mailing of the notice within which to abate the nuisance, failing which the health officer may have the nuisance abated and the owner shall be liable for the cost thereof. The notice shall also state that if owner objects to the health officer's declaration, the owner may request a hearing before the health officer to determine whether a public nuisance exists. The notice shall further indicate that the request for the hearing must be received by the health officer prior to the expiration of the time set for abatement, and the hearing shall be held within thirty (30) days after the request is received by the health officer. County abatement is suspended by the filing of a request for hearing, pending the final decision of the health officer.

(b) *Costs.* If the health officer has a nuisance abated, the health officer shall promptly so notify the property owner, including a statement of costs and of the owner's rights to a hearing thereon. The notice mailing and the time period for hearing requests and hearing shall be those in subsection (a). Upon fixing the costs (after hearing or in absence of request therefore), the health officer shall proceed according to law to impose the costs on and collect them from the property

owner and/or the property. These procedures do not affect the county's right to collect these costs from any other person responsible therefore under law.

414-4.1009 ENFORCEMENT – EMERGENCY ACTION. Where the health officer, makes a written finding that the public health is endangered by some act, omission, or condition regulated by this chapter, in connection with any premises or operation licensed under this chapter, the health officer may order the immediate cessation of the act, abatement of the condition, or action to correct the condition. The health officer may order the temporary emergency suspension of the applicable permit and its removal from the person or premises, and the health officer may post notice of this action in a conspicuous place. Emergency suspension, as distinct from any other action authorized by law, is effective for a period of five days, including the first day on which the permit is suspended. During that period, any activity regulated by this chapter is unlawful. At the end of that period, or sooner if a finding is made that the public health is no longer endangered, the permit becomes valid again unless a hearing is ordered.

414-4.1011 ENFORCEMENT – PERMIT SUSPENSION. Where a written complaint is filed with the health officer that some applicable law or regulation is being violated by any person, premises or operation required to be licensed under this chapter, the health officer may order a hearing, and after hearing may suspend the permit for not more than ninety (90) days, or until the health officer is assured of compliance with applicable laws or regulations, whichever is less, and the health officer may post notice of this action in a conspicuous place. At the end of the period, or when the health officer is satisfied of compliance, the permit becomes valid again. During that period any activity regulated by this chapter is unlawful.

414-4.1013 ENFORCEMENT – PERMIT REVOCATION. A permit maybe revoked and confiscated if it has been suspended once and if violations of this chapter or other applicable laws or regulations or acts or omissions endangering the public health continue, or if the health officer or one of the health officer's medical deputies makes a written finding that correction of the situation is impracticable and that public health is endangered thereby. The health officer may post notice of this action in a conspicuous place.

414-4.1015 ENFORCEMENT – HEARINGS. In cases of hearings under Section 414-4.1011, notice must be written and delivered to the person involved or in charge of the premises or operation at least forty-eight (48) hours before the hearing. Other hearings ordered by the health officer must be preceded by written notice, personally delivered or mailed to the person to whom the permit was issued at the latest address on file with the health officer not less than five (5) nor more than fifteen (15) days before the hearing date. These hearing shall be in the main office of the County Health Department, unless some other location is specified in the notice. These hearings shall be conducted by the health officer or one of the health officer's medical deputies, and may not be continued or postponed for longer than ten (10) days from the original date without consent of the permittee.

414-4.1017 ENFORCEMENT – APPEALS.

(a) A person objecting to or disagreeing with any decision made pursuant to Sections 414-4.403 and 414-4.605, and /or the pertinent regulations thereto, may appeal the decision to the health officer. All requests for this appeal hearing shall be in writing and must received by the health officer within ten (10) days after notice of the decision was mailed. All requests for the appeal hearing must be accompanied by the appropriate fee. A hearing on the appeal shall be held within fifteen (15) days after the request for appeal is received by the health officer.

(b) Appeals may be taken from the results of any hearing held pursuant to Sections 414-4.109, 414-4.1011, 414-4.1013, 414-4.1015 and Subsection (a) to the Board of Supervisors by a written notice of appeal stating fully the matters or action appealed from and the grounds for the appeal. The notice shall be filed with the clerk of the Board within fifteen (15) days of the action appealed from. The Board shall then schedule the appeal for a hearing within thirty (30) days of the filing of the notice of appeal.

414-4.1019 ENFORCEMENT – PENALTIES. Any person violating this chapter or regulations issued hereunder, by failing to submit plans, obtain necessary inspections and approvals, or pay fees, or by commencing or continuing construction or remodeling in violation hereof, shall pay triple the appropriate fee as a penalty and remain subject to other applicable penalties and enforcement procedures authorized by the state law and/or this code.

414-4.1021 ENFORCEMENT – OTHER REQUIREMENTS. A permit or license issued under this chapter does not relieve the permittee or licensee from compliance with applicable federal, state, or local laws and regulations or other required permits or licenses.

414-4.1023 GUARANTEE OF PERFORMANCE.

(a) *Performance Bond.* Prior to the issuance of a permit, the applicant shall post with the health officer a cash deposit or bond guaranteeing compliance with the terms of this Chapter and the applicable permit, such bond to be in an amount deemed necessary by the health officer to remedy improper work but not in excess of five thousand dollars ($5,000.00).

(b) *Continuous Performance Bond.* In lieu of furnishing a separate bond for each permit as provided above, a licensed contractor may deposit with the health officer a surety bond or cash deposit in the amount of five thousand dollars ($5,000.00), which bond or cash deposit shall be available to the county to remedy any improper work done by the contractor pursuant to any permit issued under this chapter.

ARTICLE 414-4.12 FEES

414-4.1201 GENERAL. The following non-refundable fees shall be paid to health officer at the time of filing for or requesting an investigation, test, inspection or permit required by this Chapter. No fees are required when the health officer receives from the applicant a written statement by a district or city governing body indicating that an approved domestic water supply is available and adequate to handle the additional volume of water required for the proposed improvement.

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ENVIRONMENTAL AND GEOTECHNICAL WELLS AND SOIL BORINGS

Introduction

This handout is intended as a general guideline for processing permits for environmental and geotechnical wells and soil borings. This includes, but is not limited to, cone penetrometers, inclinometers, piezometers, extraction wells, recovery wells, monitoring wells, temporary wells, hydropunch soil borings and soil borings drilled for geotechnical purposes (whether or not groundwater is encountered). It is not intended as a substitute for familiarity with applicable laws and regulations.

Well Permits

A permit is required to construct or destroy an environmental or geotechnical well or soil boring. Each well or boring requires a separate permit. Permit applications are available from Contra Costa Environmental Health. Permits are non-transferable and valid for six months.

Well Drillers

Contra Costa County requires that any well work be performed by a licensed well contractor (C-57 licensee) who has proof of Worker's Compensation Insurance and a $5,000 performance bond on file with the Environmental Health office.

Permit Processing

1. Well permit applications should be filled out as completely as possible to facilitate permit processing. The applications should include proposed well construction, a detailed map or plot plan and be accompanied with the appropriate permit fees. The information provided will be used to determine the suitability of the well site(s) and proposed method of work. If necessary, a site visit may be conducted to verify that the well locations are acceptable. The map or plot plan should indicate distances between the proposed wells/borings from structures and/or known or potential sources of contamination.

2. Applications for well destructions should include a copy of the Well Completion Report for the well construction, if available.

Construction and Destruction

Once the permit has been issued the authorized work can begin. A copy of the approved permit and map should be kept at the job site for reference.

Upon the setting of the well, Contra Costa Environmental Health will inspect the installation of the annular seal. Generally, annular seal depths should be a minimum of 10 feet to 50 feet, depending on the depth of the well. The seal material must be cement or concrete in accordance with Bulletin 74-81 or an approved bentonite that is specifically formulated as an annular sealing material and mixed to the manufacturer's specifications. If bentonite is used, the final two feet must be an approved cement or concrete mixture. Contact this office for a list of approved materials.

The seal material must be tremmied when using bentonite or sealing annular spaces or cavities 30 feet or greater in depth or in the presence of water. The placement of sealing material for borings, hydropunch sampling, cone penetrometer testing and well destructions will be inspected. For well destructions the top fifty (50) feet of casing must first be removed.

The geologist and/or the well contractor are responsible for contacting Contra Costa Environmental Health to schedule inspection appointments. The greater the advance notice the more likely a mutually convenient appointment time can be arranged. 24 hours notice with confirmation verbally or in writing with the respective specialist is necessary to schedule field inspections.

Final Approval

After Contra Costa Environmental Health has approved the installation of an annular seal or the destruction of a well, a Well Completion Report (DWR form 188) signed by the responsible geologist or well driller must be submitted to this office. A boring log is required for borings, hydropunch sampling and cone penetrometer testing.

Upon satisfactory inspection of work and approval of the reports, final approval of the wells/borings will be granted.

INITIAL APPROVED _____
☐ CONDITIONS

Well System

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WELL PERMIT APPLICATION

Type of Work:
- ☐ New Well (69) _____
- ☐ Repair (69)
- ☐ Abandonment (68)
- ☐ CPT / Inclinometer (01)
- ☐ Soil Boring (01)
- ☐ Piezometer w/ casing (67)
- ☐ Piezometer w/o casing (66)
- ☐ Flow Test (99)

Proposed Use:
- ☐ Domestic
- ☐ Public / Small Water System
- ☐ Agricultural
- ☐ Industrial
- ☐ Monitoring
- ☐ Other _____

Sewage Disposal (off-site):
- ☐ Septic System
- ☐ Sewer System _____

(ATTACH PLOT PLAN – For instructions see "The Well Permit Process" handout)

PLEASE PRINT CLEARLY. *REQUIRED FIELDS MUST BE COMPLETED.

*Legal Owner's Name		
*Owner Address		
*City/ State/ Zip	Country	Owner Telephone
*Owner Billing Address (if different from above)		
*Site Name (if different from owner address)	*Assessor's Parcel #	Subdivision/Minor Subdivision #
*Site Address (if different from owner address)		Lot/Parcel #
*Contractor's Name	*License #	*Site Telephone
*Contractor's Mailing Address		*Contact Person's Telephone
*Consultant/Mailing Address		*Consultant's Telephone

*Construction/Destruction Specifications

Diameter of well casing _____ Casing Material _____ Gauge _____ Annular seal depth (50 feet minimum) _____

# of Soil Borings _____ Borehole Diameter _____ Boring Depth (b.g.s.*) _____

Gravel/Sand packed ☐ Yes ☐ No Conductor casing ☐ Yes ☐ No Depth _____ Diameter_____

Type of material for annular seal/destruction (specify mix or product): ☐ Bentonite ☐ Concrete ☐ Cement

Method of drilling/destruction/Other: _____

Variance ☐ Yes ☐ No (Required for water well seals less than 50 feet b.g.s./monitoring well seals less than 10 feet b.g.s.)
*b.g.s. = below ground surface

Performance Bond Requirement. (Contra Costa County Ordinance, Title 4 Health and Safety, Article 414-4.10; Section 414-4.1023 (a))
Prior to the issuance of a permit, the applicant shall post with the health officer a cash deposit or bond guaranteeing compliance with the terms of this chapter and the applicable permit, such bond to be in an amount deemed necessary by the health officer to remedy improper work but not in excess of five thousand dollars.

I hereby certify that the above information and submitted plans are true and correct and that the proposed work will comply with all permit conditions and applicable laws and regulations. I agree to obtain all required inspections, maintain a copy of the approved permit and plans at the job site until final approval, and obtain written authorization prior to deviating from the approved permit or plans, or placing the well in service. The issuance of this permit by Contra Costa Environmental Health Division does not guarantee a satisfactory and an indefinite operation of any well system.

_____ _____
Signature of Contractor (C–57 Licensee) Date

FOR OFFICE USE ONLY

Facility ID#:	PR#:	P/E#: 43 ____	Census Tract:	REHS:
Amount Due: $ _____ Amount Paid: $ _____		Receipt #:	Received By:	
Check #: / CASH / Credit Card: ☐ MC ☐ VISA		Date Received:	Supervisor:	

FOR OFFICIAL USE ONLY

WELL WORKBOOK

APN: _____/_____/_____ SUBDIVISION/MINOR SUBDIVISION #: _____ LOT/PARCEL #: _____

Type of Work: ❑ New Well ❑ Repair ❑ Abandonment ❑ Soil Boring ❑ Piezometer ❑ Inclinometer
❑ Cone Penetrometer (CPT) ❑ Other _____

Proposed Use: ❑ Domestic ❑ Public ❑ Agriculture ❑ Industrial ❑ Monitoring
❑ Small Water System* ❑ Cathodic ❑ Dewatering
❑ Other _____

***Small Water System Type:** ❑ Well ❑ Reservoir ❑ Distribution System ❑ Treatment Facility

GPS: Longitude _____ Latitude _____

Well Variance Granted: ❑ Approved ❑ Denied ❑ Not Applicable

❑ WELL CONSTRUCTION INSPECTION _____ (Inspector's Initial)

Total Depth _____ feet Bore Hole Diameter _____inches Well Casing Diameter _____inches
Gravel/Sand Pack Depth _____feet Annular Seal Depth _____feet
Conductor Casing Depth _____feet Conductor Casing Diameter _____feet
Static Water Level _____feet ❑ Unknown Static Water Level
Annular Seal Material _____

All "Depths" are below ground surface (bgs).

❑ WELL DESTRUCTION INSPECTION _____ (Inspector's Initial)

Number of Wells _____ Method of Destruction: ❑ Overdrilling ❑ Perforation
Type of Casing: ❑ PVC ❑ Steel ❑ Other _____
Type of Well: ❑ Cable Driven ❑ Gravel/Sand With Annular Seal ❑ Monitoring ❑ Cathodic
❑ Other _____
Well Diameter _____feet Depth of Well _____feet
Depth of Seal _____feet Sealing Material _____
Well Casing (bgs) _____feet Casing Diameter _____feet
Seal Material Quantity/Mix _____

All "Depths" are below ground surface (bgs).

❑ SOIL BORINGS INSPECTION _____ (Inspector's Initial)

Parcel Use: ❑ Vacant ❑ Contaminated ❑ Industrial ❑ Commercial ❑ Other _____
Number of Borings _____ Diameter of Boreholes _____inches Boring Depth _____feet
Depth of Seal _____feet Static Water Level _____feet
Seal Material Quantity/Mix _____

All "Depths" are below ground surface (bgs).

❑ MONITORING WELL INSPECTION _____ (Inspector's Initial)

Number of Monitoring Wells on Parcel: _____ Duration of Wells: _____Months or _____years
Depth of Well: _____feet Depth of Gravel/Sand Pack _____feet Depth of Seal _____feet
If more than one well, give the number of wells with in each depth range:
Number of Wells _____ at Well Depth _____feet Number of Wells _____ at Well Depth _____feet
Number of Wells _____ at Well Depth _____feet Number of Wells _____ at Well Depth _____feet
Conductor Casing Depth _____feet Conductor Casing Diameter _____feet
Static Water Level _____feet ❑ Unknown Static Water Level
Seal Material Quantity/Mix _____

All "Depths" are below ground surface (bgs).

❑ WELL FLOW TEST OBSERVATION _____ (Inspector's Initial)

Well Depth _____feet Water Level (Before Test) _____feet
Flow Test Start Time _____ a.m./p.m. Stabilized Water Level _____feet at _____ a.m./p.m. start time
End of Flow Test _____ a.m./p.m. Final Water Level _____feet Recovery Time _____
Flow Rate (Last hour average) _____g.p.m.

❑ WATER QUALITY _____ (Inspector's Initial)

Bacteriological Test: ❑ Positive ❑ Negative

Chemical Analysis: Specify _____ ❑ Acceptable ❑ Not Acceptable

Well Final Approval by: _____ Date: _____

PLACE OR ATTACH
PLOT PLAN
HEALTH AND SAFETY PLAN

CONDITIONS

FIELD NOTES

ILLUSTRATION

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ANNULAR SEAL AND WELL DESTRUCTION MATERIALS

BENTONITE

Material/Manufacturer	Mixture (Ration)	Notes on Usage
BENSEAL/Baroid Drilling Products	50 lbs/20 gallons water	Must be used with Aqua-Grout Catalyst. Amount of catalyst depends on desired set time. Do not use a centrifugal pump for mixing.
VOLCLAY GROUT/CETCO, Inc.	50 lbs/23 gallons water	No initiator necessary. Mix with Venturi type jet hopper or commercial grout mixer.
ENVIROPLUG GROUT/WYO-BEN, Inc.	50 lbs/14 gallons water	Slurry will resemble "pancake batter" with small lumps. Double diaphragm pump recommended for mixing.

BENTONITE CHIPS – currently only authorized for use below the interval to be sealed.

Bentonite Notes:

1. The bentonite slurry must be mixed on-site from the original manufacturer's packaging.
2. Bentonite slurries must be pumped from the bottom up through a tremie pipe or hose.
3. Water used to mix bentonite slurry must be of potable quality.
4. Allow seal to settle for at least 24 hours before installing well slab.
5. Cannot be used in areas of heavy petroleum product contamination or high salt concentration.

CONCRETE/CEMENT

Neat Cement	94 lbs Portland cement/ 4 ½ - 6 ½ gal water	Will be fairly thick mixture.
Sand Cement	188 lbs (max) sand/94 lbs Portland Cement/7gallons water	Equivalent to "10.3 sack" mix.
Concrete	6 sacks Portland cement per cubic yard (Class A concrete) 5 sacks Portland cement per cubic yard (Class B concrete) 8 sacks Portland cement per cubic yard with 3/8" aggregate. Note: May require special cement pumping equipment.	

Concrete/Cement Notes:

1. Additives may be used in cement/concrete if approved by Contra Costa Environmental Health. Additives include bentonite (up to 5% by volume) and hydrated lime (up to 10% by volume). Additives must meet ASTM C494: "Standard Specification for Chemical Admixtures for Concrete". Mix bentonite in water before adding cement/concrete.
2. Cement must meet ASTM C150, "Standard Specification for Portland Cement".
3. Cement or concrete must be from "Ready-Mix" Company with weight slip or mixed on-site from original manufacturer's packaging.
4. Water used to mix cement/concrete must be of potable quality.
5. The size of any aggregate must be less than 1/5 the radial thickness of the annular seal. Aggregate must meet ASTM C33 "Standard Specification for Concrete Aggregate".

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THE WELL PERMIT PROCESS

In order to protect our groundwater resources state and local governments have established minimum standards for well constructions and destructions. These standards are necessary for public health protection and to preserve the quality of underground waters for current and future users.

A permit from the Environmental Health Division is required to construct, reconstruct or destroy a well within Contra Costa County. Wells include water wells, monitoring wells, cathodic protection wells and soil borings. State and local regulations require that any well work be performed by a licensed well contractor(C-57 license) who has proof of worker's compensation insurance and a performance bond on file with the Division.

The following is a chronological summary of the permit process:

I. Application, Plot Plan and Permit Fee

To apply for a well permit, submit a completed application, plot plan and permit fee to Contra Costa Environmental Health. Application forms are available at the Environmental Health office. If you have any questions about completing the application or preparing an acceptable plot plan, please contact our office for assistance.

The application and plot plan are used to determine the suitability of the well site and proposed method of work. Of special concern is the location of the well in relation to the possible sources of contamination and items a minimum setback distance. Both the subject and surrounding properties are considered when reviewing items requiring setbacks.

The plot plan must show the well location, property lines, sewer lines, septic systems, animal enclosures, fuel tanks, other potential contamination sources and features associated with a minimum separation distance (see attachment).

NOTE: For well destruction permit applications, the plot plan only needs to show the well location in relation to some fixed reference points (i.e. property lines or structures). If the well log is available, please submit it with the destruction permit application.

II. Site Review

If deemed necessary, Environmental Health will conduct a site visit to verify that the well location is acceptable.

III. Permit Processing

After sufficient information has been provided, Environmental Health will review the proposal to determine if it complies with applicable laws and regulations. Based on this review a permit will be issued, denied, or modification requested. If approved, a copy of the permit will be sent to the well contractor and property owner.

IV. Construction and Destruction

Once the permit has been issued the authorized work can begin. A copy of the approved permit and plot plan must be kept somewhere on the job site. This is to ensure that it is available for reference by the work crew should questions arise.

Upon completion of the well Contra Costa Environmental Health will inspect the installation of the annular seal. For well destructions the placement of sealing material will be inspected. The well contractor is responsible for contacting this Division to schedule inspection appointments. The greater the advance notice the more likely a mutually convenient appointment time can be arranged.

V. Final Construction Approval

After the annular seal has been installed the following must be completed prior to receiving final construction approval and placing the well into service:

1. Inspection of the well slab and surface construction features. After these have been installed contact Environmental Health arrange for an inspection.

2. Water analysis for coliform bacteria by a state certified laboratory. The laboratory performing the analysis must collect and transport the sample and verify that raw untreated well water was collected. Arrange for the laboratory to submit copies of all analyses results to Contra Costa Environmental Health. A list of state certified laboratories is available from our office.

   NOTE: This requirement is not necessary for monitoring wells.

3. Other water analyses if required by Contra Costa Environmental Health. You will be notified in writing of any additional water testing requirements other than for coliform bacteria.

4. Pump test if required by Contra Costa Environmental Health. You will be notified in writing if a test for sustained yield of the well is necessary.

5. Submittal of Well Driller's Report. The well contractor must submit a copy of the report to Contra Costa Environmental Health, the well owner, and the State Department of Water Resources.

VI. Final Destruction Approval

After the well has been destroyed the well contractor must submit a copy of the Well Driller's Report to Contra Costa Environmental Health, the well owner and the State Department of Water Resources prior to receiving final destruction approval.

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WELL DESTRUCTION GUIDELINES

In order to protect groundwater resources for current and future users, the elimination of abandoned, unused or defective wells is necessary. State and local regulations govern the procedure for eliminating these wells. These requirements are applicable to abandoned wells, test holes, dry holes, cone petronometers, hydropunches and soil borings. A permit from Contra Costa Environmental Health is required to destroy a well in Contra Costa County. The law requires that such work be performed by a licensed, insured and bonded well contractor (C-57 license). **NOTE:** There is no permit fee required to destroy an existing water well if a new well is drilled. The following is a chronological summary of the destruction process:

1. Application, Plot Plan and Permit Fee
   To apply for a well destruction permit, submit a completed application, plot plan, and permit fee to Contra Costa Environmental Health. Application forms are available at the Division's office. Instructions for preparing the plot plan are on the reverse side of the application. If you have any questions about completing the application or preparing any acceptable plot plan, please contact this office for assistance.

2. Permit Processing
   Environmental Health staff will review the permit application and if acceptable a permit will be issued.

3. Destruction Procedure
   Once the permit has been issued the authorized work can begin. A copy of the approved permit must be kept somewhere on the job site. This is to ensure that it is available for reference by the work crew should questions arise:

   A general outline of the process is as follows:

   a. Remove any obstructions from the well.
   b. Perforate or remove the well casing to the bottom of the well.
   c. Excavate around the casing to a depth of 6 feet.
   d. Place approved sealing material in the well extending from the bottom to the surface. Environmental Health staff will inspect this stage of the work. The well contractor is responsible for contacting Contra Costa Environmental Health to schedule inspection appointments. The greater the advance notice, the more likely a mutually convenient inspection appointment can be arranged.

   NOTE: Some well destructions will require deeper perforations and depth of sealing material.

4. Final Approval
   Upon satisfactory completion of the work permitted and submittal of a Well Completion Report (DWR 188 form) a final destruction approval will be given.

APPENDIX H

Title 22 of the California Code of Regulations (Section 64560)

TITLE 22 CODE OF REGULATIONS
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 16. CALIFORNIA WATERWORKS STANDARDS

Article3. Water Sources
§64560. New Well Siting, Construction, and Permit Application.

(a) To receive a new or amended domestic water supply permit for a proposed well, the water system shall provide the following information to the Department in the technical report as part of its permit application:

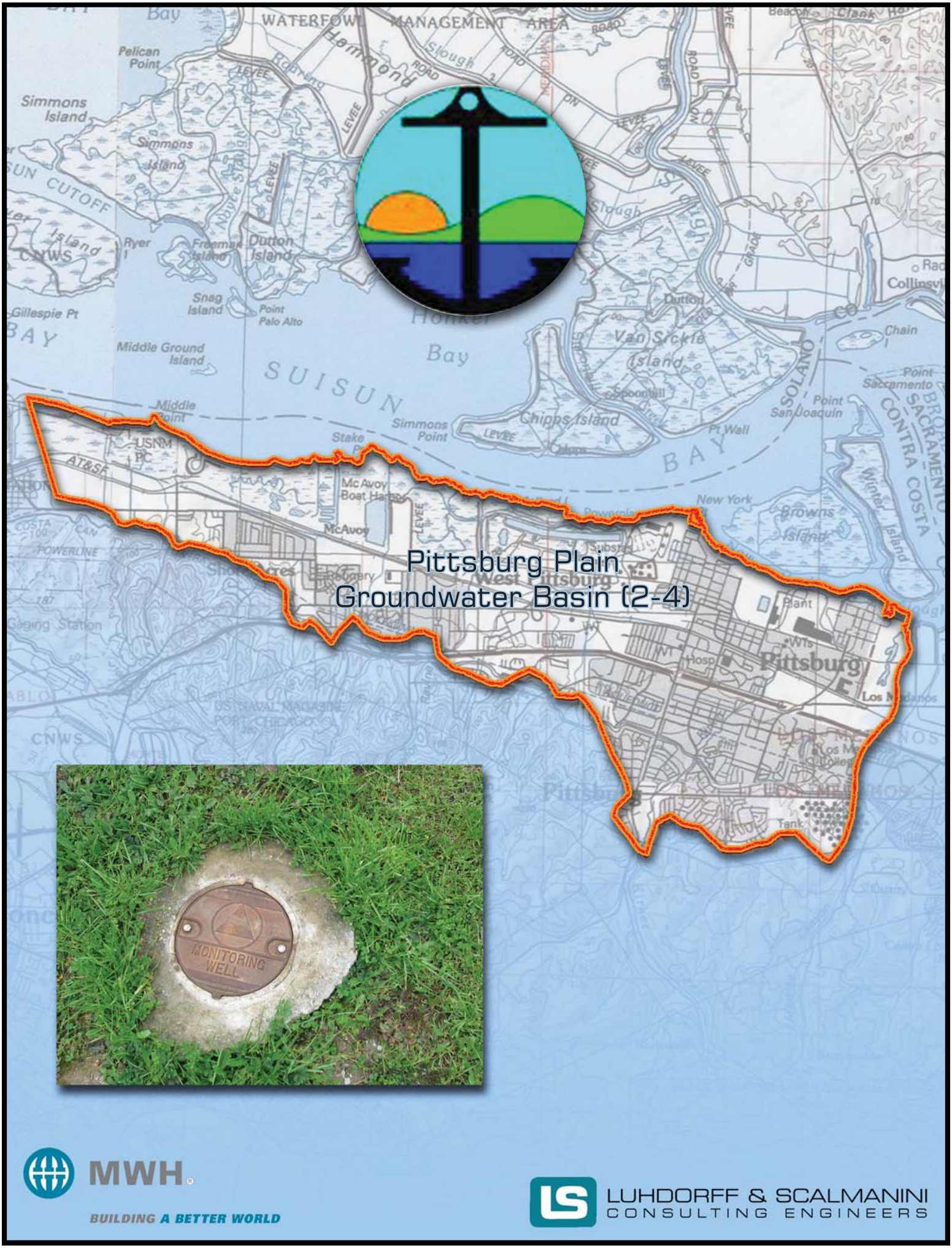
(1) A source water assessment as defined in Section 63000.84 for the proposed site;
(2) Documentation demonstrating that a well site control zone with a 50-foot radius around the site can be established for protecting the source from vandalism, tampering, or other threats at the site by water system ownership, easement, zoning, lease, or an alternative approach approved by the Department based on its potential effectiveness in providing protection of the source from contamination;
(3) Design plans and specifications for the well; and
(4) Documentation required for compliance with the California Environmental Quality Act (CEQA).

(b) After the Department has provided written or oral approval of the initial permit amendment application and the water system has constructed the well, the water system shall submit the following additional materials for its permit application:

(1) A copy of the well construction permit if required by the county or local agency;
(2) Department of Water Resources well completion report;
(3) A copy of any pump tests required by the Department;
(4) Results of all required water quality analyses; and
(5) As-built plans.

(c) Each new public water supply well shall:

(1) As a minimum, be constructed in accordance with the community water system well requirements in California Department of Water Resources Bulletins 74-81 and 74-90, which are hereby incorporated by reference;
(2) Be constructed in accordance with American Water Works Association (AWWA) Standard A100-06 (Water Wells), which is hereby incorporated by reference;
(3) Be installed such that:
    (A) All equipment is accessible for operation, maintenance, and removal;
    (B) Protection is provided against flooding;
    (C) The wellhead terminates a minimum of 18 inches above the finished grade;
    (D) Wellhead and electrical controls are not installed in vaults;
    (E) The well is equipped with:
        1. Fittings and electrical connections to enable chlorination facilities to be readily installed;
        2. A non-threaded down-turned sampling tap located on the discharge line between the wellhead and the check valve. Sampling taps used for obtaining samples for bacteriological analysis shall not have a screen, aerator, or other such appurtenance;
    (F) Provisions are made to allow the well to be pumped to waste with a waste discharge line that is protected against backflow.


Pittsburg Plain
Groundwater Basin (2-4)
MONITORING WELL
MWH
BUILDING A BETTER WORLD
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS