APPENDIX B

Groundwater Resources Impact Assessment

Groundwater Resources Impact Assessment

Crows Landing Industrial Business Park
Stanislaus County, California

October 31, 2016

Prepared for:

Stanislaus County
Division of Public Works
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Stanislaus County
Striving to be the Best

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LIST OF ACRONYMS AND ABBREVIATIONS

AFY	acre-feet per year
amsl	above mean sea level
bgs	below ground surface
CEQA	California Environmental Quality Act
CLIBP	Crows Landing Industrial Business Park
CVP	Central Valley Project
DMGS	Delta-Mendota Groundwater Subbasin
DPWD	Del Puerto Water District
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ft/day	foot per day
GDE	groundwater-dependent ecosystem
gpd/ft^2	gallon per day per square foot
gpm	gallon per minute
gpm/ft	gallon per minute per foot
GSP	Groundwater Sustainability Plan
JJ&A	Jacobson James & Associates, Inc.
KDSA	Kenneth D. Schmidt and Associates
LID	Low Impact Development
MCL	Maximum Contaminant Level
MM	Mitigation Measure
NASA	National Aeronautics and Space Administration
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan

1.0 INTRODUCTION

1.1 Background

Stanislaus County proposes rezoning of the former National Aeronautics and Space Administration (NASA) Crows Landing Air Facility to construct the Crows Landing Industrial Business Park (CLIBP), located in Stanislaus County south of Patterson, California (the Project). The CLIBP proposes to use groundwater as a water supply during construction and operation. This Groundwater Resources Impact Assessment Report has been prepared by Jacobson James & Associates, Inc. (JJ&A) on behalf of the Stanislaus County Department of Public Works, to provide information regarding groundwater resources that will be incorporated into the environmental analysis of the proposed Project under the California Environmental Quality Act (CEQA). Specifically, this report describes the affected groundwater resources environment, the groundwater resources demand and development activities associated with the proposed CLIBP, and the methods and results of a groundwater resources impact assessment for the proposed Project. The information contained in this report will be incorporated into the Environmental Impact Report (EIR) prepared for the Project.

1.2 Organization

This report includes the following sections:

- Chapter 1, *Introduction*, which identifies the background, purpose and scope of the study.
- Chapter 2, *Project Description*, which provides a brief overview of the proposed Project and discusses the anticipated water demand and proposed groundwater supply development activities.
- Chapter 3, *Project Setting*, which provides an overview of the project setting, with a particular focus on hydrogeology and groundwater resources.
- Chapter 4, *Drawdown Evaluation*, which presents the methods and results of an evaluation of the proposed groundwater extraction on groundwater levels and flow.
- Chapter 5, *Groundwater Resources Impact Analysis*, which presents a reasoned analysis of the potential impacts of the proposed groundwater supply development associated with the project on the environment.
- Chapter 6, *References*, which includes a list of documents cited in this report.

2.0 PROJECT DESCRIPTION

2.1 Project Overview

CLIBP is a conceptually planned development that encompasses the reuse of the former Crows Landing Air Facility, which was decommissioned by NASA in the late 1990s. The proposed CLIBP location is shown on Figure 2.1.1, and includes approximately 1,528 acres of land (hereinafter the Site). The proposed CLIBP layout is shown on Figure 2.1.2. The CLIBP is planned to include aviation, multimodal transportation, industrial and commercial facilities, which are proposed to be constructed on 1,261 developable acres in three phases:

- Phase 1 will be developed between 2017 and 2026, and includes construction of approximately 810 acres of aviation, multimodal, industrial and commercial facilities;
- Phase 2 will be developed from 2027 to 2036, and consists of construction of an additional 177 acres of multimodal, industrial and commercial facilities; and
- Phase 3 will be developed between 2037 and 2046, and includes construction of the final 274 acres of multimodal, industrial and commercial facilities.

2.2 Water Demand and Supply Development

A Water Supply Assessment and Water Supply Feasibility Study were prepared for the CLIBP by AECOM (AECOM, 2016a; AECOM and VVH Consulting Engineers, 2016). The water demand for the CLIBP will include potable, irrigation, fire water, and other non-potable water needs, and is proposed to be supplied from a combination of existing and new groundwater supply wells at the Site. As discussed further in Section 3.4, the groundwater resources beneath the Site that are available for supply development include a shallow unconfined aquifer that is separated from a deeper confined aquifer by a relatively impermeable regional aquitard layer referred to as the Corcoran Clay.

Table 2.2.1 below summarizes the projected water demand as the CLIBP is developed over time. The demand is presented as the estimated total at full buildout of each development phase. The project will develop a non-potable water supply using combination of the existing irrigation wells that derive water from both the shallow and deep aquifer, and new non-potable supply wells installed into the shallow aquifer beneath the Site. The project potable water supply will be developed using new wells installed into the confined aquifer beneath the Site.

Table 2.2.1 Project Groundwater Demand and Supply

Time Period	Annual Groundwater Demand at Completion of Each Buildout Phase (acre-feet/year [AFY])		
	Phase 1 2017 to 2026	**Phase 2 2027 to 2036**	**Phase 3 2037 to 2046**
Estimated Total Potable Demand	739	1,036	1,496
Estimated Total Non-Potable Demand	818	1,014	1,323
Estimated Total Project Demand	**1,557**	**2,053**	**2,819**
Potable Supply from New Confined Aquifer Wells	739	1,036	1,496
Non-Potable Supply from Existing Wells	818	834	834
Non-Potable Supply from New Shallow Aquifer Wells	0	183	489

The Project non-potable water supply will be developed as follows:

- As discussed further in Section 3.4.4 and summarized in Table 3.4.2, the three existing wells at the Site have historically been pumped at an average rate of approximately 834 acre-feet per year (AFY). It is assumed that the existing wells will be capable of supporting groundwater extraction at their historical annual extraction volumes when pumped year round. If the existing wells fail to supply the assumed 834 AFY, they would be supplemented, as needed, through the installation of new wells of similar construction.
- Any non-potable Project water demand in excess of 834 AFY is assumed to be supplied using new shallow aquifer wells that are installed at the Site.
- Optimal locations for the new shallow aquifer wells will be selected based on performance of the existing wells, groundwater level monitoring data developed during project operation, and additional water supply development studies, as needed.
- Shallow groundwater demand in excess of the historical average shallow aquifer extraction rate (183 AFY at Phase 2 buildout and 489 AFY at Phase 3 buildout) will be offset by an equivalent volume of increased recharge relative to current conditions, such that the net groundwater extraction rate from the shallow aquifer does not increase above historical levels. This increased shallow aquifer recharge will be derived from a combination of the following sources:[1]
    - Discharge from Little Salado Creek and Marshall Drain will be captured and recharged at facilities constructed for the CLIBP. A long, linear stormwater retention/detention basin

[1] Mitigation Measure (MM) Water-04, described in Section 5.6.4, requires that a Recharge Enhancement Plan be prepared that describes how the Project will achieve sufficient recharge to fully offset any additional groundwater demand on the shallow aquifer imposed by the Project.

will be constructed on the north side of the Site by widening approximately 4,000 feet of Little Salado Creek and Marshall Drain from the current width of approximately 15 feet to over 250 feet, and modifying the streambed to increase its permeability (AECOM, 2016b). The basin will be designed for retention of 200 acre-feet (the estimated runoff volume of a 2-year storm event) and detention of an additional 180 acre-feet. Based on the available information, it is reasonable to expect that several hundred acre-feet per year of groundwater can be recharged to the shallow aquifer in these facilities compared to current conditions.[2]

- Developments within the CLIBP will be required to implement Low Impact Development (LID) standards that promote on-Site stormwater retention and recharge (AECOM, 2016c). Design Goal D-25 requires that all stormwater be retained on the individual lease holds (parcels) to be developed at the CLIBP. This will result in additional recharge relative to the current condition.[3]
- Developments within the CLIBP will be required to employ landscape planting strategies and xeriscape designs to decrease non-potable water demand. The non-potable water demand estimate presented in Table 2.2.1 is based on conservative default development assumptions in Stanislaus County (AECOM, 2016a; AECOM and VVH Consulting Engineers, 2016), and does not consider the implementation of xeriscape planting standards. It is reasonable to assume that landscaping associated with project buildout using these methods can result in a non-potable water demand reduction of several hundred acre-feet, which may be considered net *in lieu* recharge to the shallow aquifer.

The CLIBP potable water supply is assumed to be developed as follows:

- It is assumed that the new water supply wells will be installed into the confined aquifer underlying the Corcoran Clay at the approximate locations shown on Figure 2.1.1. The potable supply wells will be constructed to pump water from the full usable depth of this aquifer. On a preliminary

[2] For perspective, the Little Salado Creek watershed occupies an area of approximately 10.8 square miles and has an average annual discharge of approximately 874 AFY (AECOM, 2016b). The reported discharge in Marshall Drain ranged from 1,147 to 2,731 AFY between 2005 and 2011 (Summers Engineering, 2013), and includes discharge from Little Salado Creek and local agricultural drainage, minus any existing recharge. Recharge from streams is proportional to streambed conductance, which is the product of the streambed thickness and width, times its vertical hydraulic conductivity. The proposed construction of the project retention/detention basin will increase the streambed width by at least an order of magnitude, and modify the bed of the basin to increase its permeability. It is reasonable to assume that construction and maintenance of the basin can increase its conductance by approximately two orders of magnitude, increasing the recharge through the basin by approximately 100-fold relative to the existing condition.

[3] Based on a screening-level evaluation using the U.S. Environmental Protection Agency (EPA) National Stormwater Calculator (EPA, 2014) presented in in Appendix A, it is anticipated that application of LID elements in site-specific construction can capture and infiltrate up to approximately 200 AFY of stormwater relative to Project buildout without parcel-specific LID elements. A detailed analysis relative to current conditions has not been performed, so the amount of recharge compared to current conditions may be different; however, the analysis indicates that significant recharge can be achieved through the implementation of LID elements.

basis, screen intervals are assumed to extend from approximately 320 to 870 feet below ground surface (bgs).

- Groundwater extracted from the confined aquifer for potable use will be treated to meet applicable water quality standards.

2.3 Applicable Regulations

The Site is not located in an adjudicated basin or in a special act district that regulates the extraction of groundwater. The Project would be able to supply groundwater for beneficial use on the properties to be developed in the business park under an appropriative groundwater right. No new entitlements would be required.

Development of groundwater resources to support the Project must comply with the Stanislaus County Groundwater Ordinance adopted in November 2014 (Chapter 9.37 of the Stanislaus County Code), which codifies requirements, prohibitions, and exemptions for permitting new wells with the intent of supporting sustainable groundwater extraction. In addition, the Project will have to comply with the requirements of a Groundwater Sustainability Plan (GSP) that will be adopted for the area by 2020 under California's new Sustainable Groundwater Management Act (SGMA). Stanislaus County's Groundwater Ordinance is deliberately aligned with the requirements of SGMA. Under the Ordinance, unless otherwise exempt, an applicant that wishes to install a new groundwater well must first provide substantial evidence the well is not unsustainably extracting groundwater as defined in the Ordinance and in SGMA. The County has determined that the CLIBP is not exempt from these requirements. The Ordinance and SGMA define unsustainable extraction as causing undesirable results, which are defined as meaning one or more of the following:

a. Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.

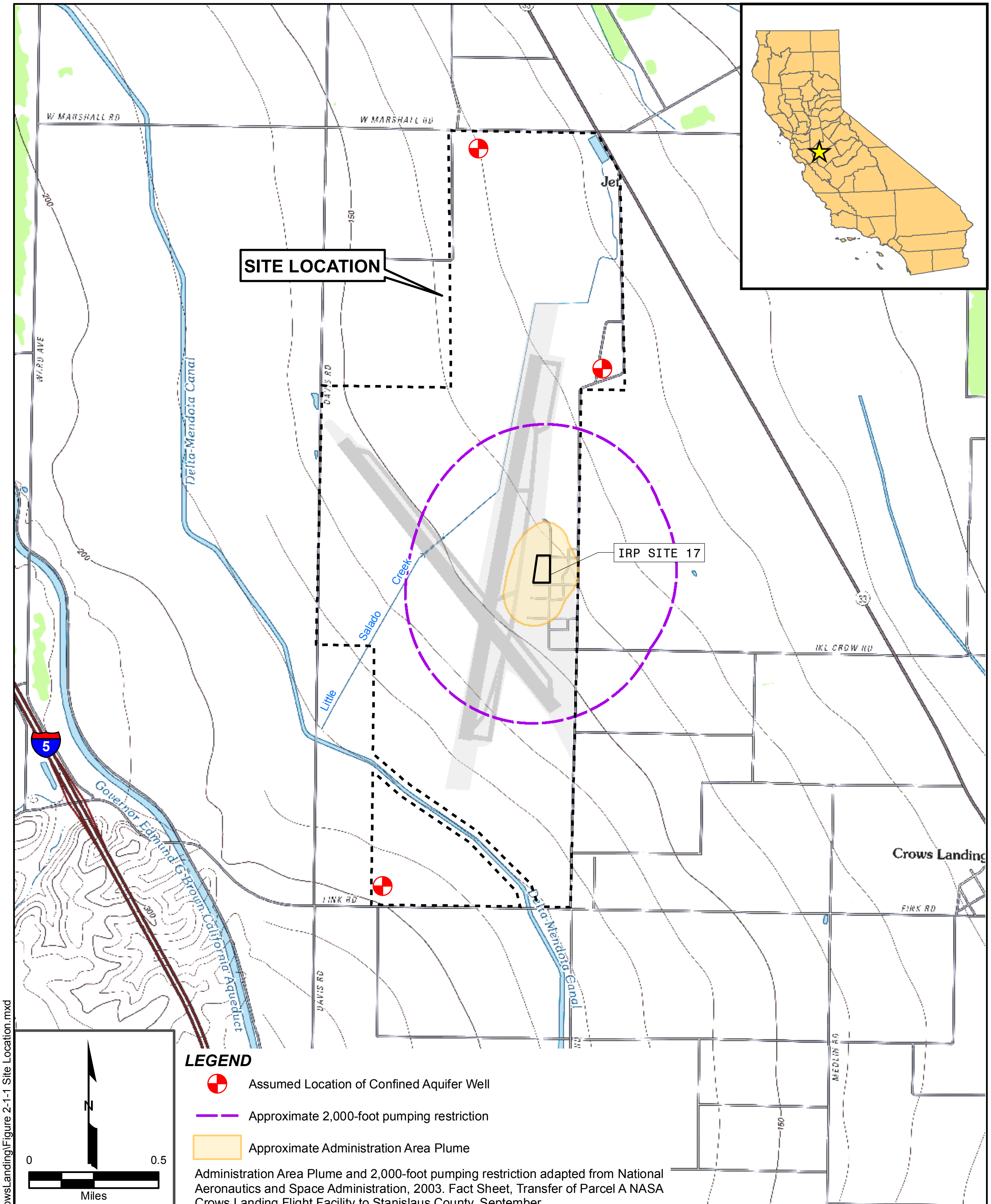
b. Significant and unreasonable reduction of groundwater storage.

c. Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.

d. Significant and unreasonable land subsidence that substantially interferes with surface land uses.

e. Surface water depletions that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Prior to issuing a permit to construct a new groundwater supply well, the County must review information provided by the applicant and make a determination whether it constitutes substantial evidence that the proposed groundwater extraction will not cause or contribute to one or more of the above undesirable results. To that end, it should be noted that the undesirable results listed above are aligned with questions contained in Appendix G of the State CEQA Guidelines, which are evaluated in Section 5.0 of this report. As such, this report fulfills the substantial evidence requirement for demonstrating compliance with the sustainable groundwater management requirements in the Stanislaus County Groundwater Ordinance.



LEGEND

- Assumed Location of Confined Aquifer Well
- Approximate 2,000-foot pumping restriction
- Approximate Administration Area Plume

Administration Area Plume and 2,000-foot pumping restriction adapted from National Aeronautics and Space Administration, 2003. Fact Sheet, Transfer of Parcel A NASA Crows Landing Flight Facility to Stanislaus County. September

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TITLE: **SITE MAP**	DATE: 8/2/16
LOCATION: *CROWS LANDING INDUSTRIAL BUSINESS PARK STANISLAUS COUNTY, CALIFORNIA*	FIGURE: **2.1.1**

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 2-1-1 Site Location.mxd

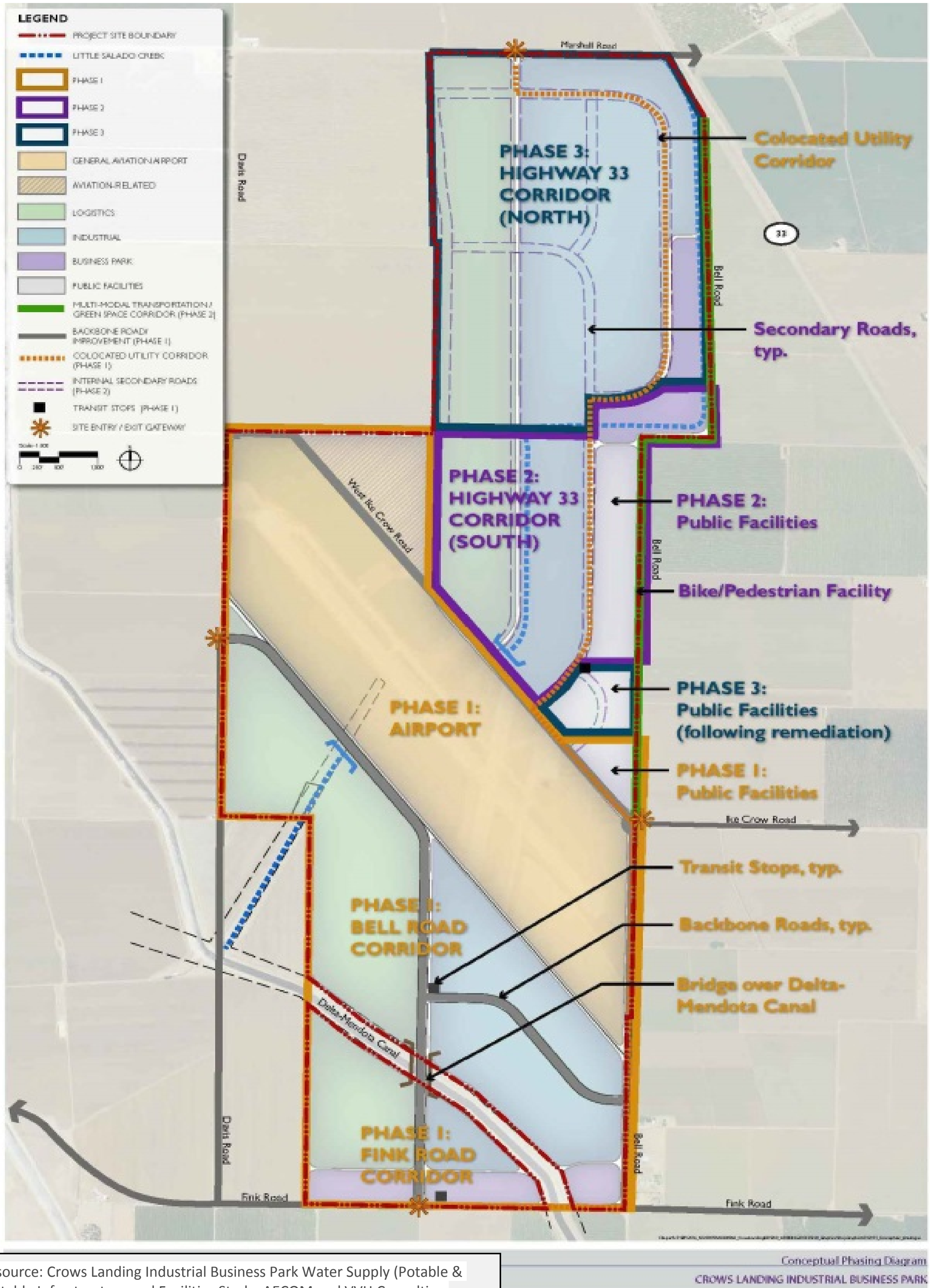


Figure source: Crows Landing Industrial Business Park Water Supply (Potable & Non-Potable Infrastructure and Facilities Study. AECOM and VVH Consulting Engineers, updated February 17, 2016.

JACOBSON | JAMES & associates, inc	TITLE: ***PROPOSED FACILITY LAYOUT***	DATE: 07/28/16
	LOCATION: *Crows Landing Industrial Business Park Stanislaus County, California*	FIGURE: **2.1.2**

3.0 PROJECT SETTING

3.1 Existing Site Conditions and Topography

The Site is located in a predominantly agricultural area of rural Stanislaus County. It is located east of Interstate 5, west of State Route 33, south of the City of Patterson, and approximately 1 mile west of the unincorporated community of Crows Landing. It is bounded on the east by Bell Road, on the south by Fink Road, on the west by Davis Road, and on the north by Marshall Road and State Route 33. The Delta-Mendota Canal traverses the southern portion of the Site in a northwest/southeast direction. The Site is occupied by abandoned runways, taxiways, buildings and other facilities associated with the former Crows Landing airfield, surrounded by approximately 1,200 acres of cultivated agricultural land. Paved and unpaved access roads traverse the Site

Physiographically, the Site is located on the San Joaquin Valley floor, approximately 1 to 2 miles east of the Diablo Range, and 4 to 6 miles west of the San Joaquin River. The western margin of the valley consists of low hills and dissected alluvial fans at the foot of the Diablo Range. A short distance to the east, elevations drop off into alluvial and flood plains associated with the San Joaquin River. The Delta-Mendota Canal and California Aqueduct run along the western margin of the valley. The Site slopes gently to the northeast from a high elevation of approximately 180 feet above mean sea level (amsl) near the southwest Site corner to approximately 110 feet amsl near the intersection of State Route 33 and Marshall Road.

3.2 Climate

The area has a “Mediterranean” climate characterized by hot, dry summers and short, wet winters, and averages over 260 sunny days per year. The average annual precipitation at the Modesto meteorological station is just over 13 inches per year, with 88 percent of the precipitation occurring between November and April (Turlock Irrigation District, 2012; Sperling’s Best Places, 2016).

Much of California, including the Central Valley, has experienced unprecedented drought conditions over the last four years. As a result, water conservation measures have been mandated, delivery of surface water from the state and federal water systems has been curtailed, and reliance on groundwater resources for agricultural uses has increased.

3.3 Surface Hydrology

Drainage in the Site vicinity is generally toward the northeast, from streams draining the Diablo Range and along the natural slope of the valley floor toward the San Joaquin River. Drainage from the agricultural fields and airfield areas of the site is routed to Little Salado Creek, which traverses the Site in a northeasterly direction. Little Salado Creek is an ephemeral stream that drains the eastern slope of the Diablo Range, and discharges to Marshall Drain near the northeast corner of the Site. Marshall Drain transitions to an underground pipe near the intersection of Marshall Road and State Route 33. The average annual discharge on Little Salado Creek is estimated to be approximately 874 AFY (AECOM and VVH Consulting Engineers, 2016).

The dissected alluvial terrace deposits west of the Site at the base of the coast range generally do not contain shallow groundwater; however, due to their coarse grained nature, they are considered potentially important for groundwater recharge. When sufficient runoff occurs, it eventually drains to the San Joaquin River, approximately 4 to 6 miles east of the Site.

3.4 Hydrogeology

The Site is located in the Delta-Mendota Groundwater Subbasin (DMGS) of the San Joaquin Valley Groundwater Basin. Within Stanislaus County, the DMGS is bounded to the east by the San Joaquin River and to the west by low-permeability bedrock of the Coast Ranges that is associated with Tertiary and older marine formations. The subbasin extends southward from the northern boundary of Stanislaus County along the west side of San Joaquin Valley for approximately 80 miles, and crosses a total of four counties, encompassing an area of approximately 747,000 acres. The total estimate storage capacity of the DMGS is 30,400,000 acre feet to a depth of 300 feet, and 81,800,000 acre feet to the base of fresh groundwater (California Department of Water Resources [DWR], 2006).

Groundwater in the DMGS occurs in the Tulare Formation and overlying Quaternary and Holocene alluvium, terrace deposits and flood basin deposits. The Tulare Formation extends to a depth of over 1,000 feet, and includes beds, lenses, and tongues of clay, sand, and gravel that have been alternately deposited in oxidizing and reducing environments. It also includes a number of lacustrine clay units (DWR, 2013), the most prominent of which is known as the Corcoran Clay and acts as a regional aquitard that divides the basin fresh water deposits into an upper aquifer system that is unconfined to semi-confined, and a lower aquifer system that is confined (DWR, 2013). The Corcoran Clay is reported to occur at depths between approximately 200 and 250 feet near the Project Site, and extends from near the western margin of the subbasin to beneath the San Joaquin River. Groundwater production wells are completed in both the unconfined and confined aquifer systems; however, most high-capacity wells extend into the confined aquifer system. Domestic wells in the area are generally completed in the unconfined aquifer system.

As of 2006 (before the current drought), urban and agricultural groundwater extraction was estimated to be 508,000 AFY for the DMGS (DWR, 2006). An operational yield study by the City of Patterson estimated that the city could pump up to 12,000 AFY without significantly impacting the use of groundwater resources in the area surrounding Patterson's sphere of influence (RMC, 2016). The City of Newman pumped approximately 4,200 acre-feet of water in 2012 (Kenneth D. Schmidt and Associates [KDSA], 2013).

3.4.1 Groundwater Levels and Flow

The freshwater aquifers that are important to this study comprise approximately the upper 950 feet of sediments in this area. Groundwater levels are reported to range from approximately 30 to 50 feet bgs, and groundwater flow is generally toward the northeast, toward the San Joaquin River (DWR, 2016b). The reach of the San Joaquin River near the Site is hydraulically connected to the local shallow aquifer system

(State Water Resources Control Board [SWRCB], 2015); however, based on the depth to groundwater near the Site, it is unlikely that surface water resources and groundwater-dependent ecosystems (GDEs) in this area are connected to a regional groundwater table.

Groundwater elevation contour maps for the confined aquifer in the Site vicinity from 2011 to spring 2016 are provided as Appendix B. The contour maps show a groundwater ridge or mound persists opposite Little Salado, Salado, and Orestimba Creeks, which suggests recharge occurs along the mountain front. The contour maps show that in recent years, cones of depression have formed northwest and south of the Site, and locally influence the groundwater flow direction. The cones of depression appear most pronounced in the groundwater elevation contour maps from 2014 through 2016, particularly in the fall. This timing coincides with reductions of Central Valley Project (CVP) and State Water Project (SWP) surface water deliveries to local water providers in response to historic drought conditions (see Table 3.4.2). The cone of depression to the south is located northwest of Newman, near the northern portion of the Eastin Water District, which derives its water supply entirely from groundwater. A trend toward conversion of crop land to orchards in this area, as well as surrounding areas served by Del Puerto Water District (DPWD), was observed based on review of aerial imagery from the last 10 years (Google Earth, 2016). As such, this cone of depression may relate to an increase in pumping from the confined aquifer in response to increasing demand as the orchards matured, coupled with hardened demand that was not met from surface water deliveries.

The cone of depression to the northwest of the Site is consistent with reported groundwater pumping from the confined aquifer northwest of Patterson for irrigation purposes. Hydrogeologic conditions in this area are described in a report for the Arambel Business Park (KDSA, 2013). Groundwater pumping for irrigation from confined aquifer wells northwest of Patterson reportedly influence the groundwater flow direction (i.e., create drawdown in the confined aquifer). Most recharge in this area is associated with CVP surface water deliveries, as recharge from west side streams and rainfall is generally small. In 2010, more than half of the water applied for irrigation in this vicinity was from surface water deliveries, with the rest of the demand met from groundwater pumping. Curtailment of surface water deliveries in recent years due to drought conditions may have led to increased pumping from the confined aquifer to meet agricultural demand, while reducing a significant source of groundwater recharge. These conditions may explain the cone of depression observed northwest of the Site.

Groundwater hydrographs for several wells near the Site that are reported or assumed to be screened within the confined aquifer and for which long term hydrographs were retrieved from the DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) website and are shown on Figure 3.4.1 (DWR, 2016d). Analysis of long terms hydrographs in the region south of the Site indicates that groundwater levels in the area were generally lowest in the 1940's and 1950's, increased during the 1960's and 1970's when surface water became available from the state and federal water projects, and decreased through the 1990's and 2000's, when surface water deliveries began to be curtailed for environmental reasons. Shorter term trends were identified related to periods of above or below normal precipitation. The two wells located south of the Site, near the cone of depression northwest of Newman, show a recent decreasing trend that may relate to current drought conditions and increased groundwater pumping to replace curtailment of surface water deliveries. It is noteworthy that current groundwater levels in the well with the longest period of record (State Well No. 06S08E29J001M) are approximately 40 feet above their historical low level in October 1952. Groundwater levels in State Well No.'s 07S08D14D001M and 06S08E34M001M are at their historical low levels; however, water level data are not available for these wells prior to October 1958 and March 1959, respectively, and prior water levels could have been lower.

The hydrographs for State Well No.'s 06S08E20D002M and 06S08E09E001M span the period from 2011 to the present. In general, these hydrographs suggest that groundwater levels near the Site recovery quickly after pumping ceases, as evidenced by relatively consistent water elevations by season (see State Well No. 06S08E09E001M on Figure 3.4.1). Water levels near the Site have overall been stable over the period of record (since 2011), which indicates recent pumping rates near the Site have been sustainable on an annual basis, even during the drought.

3.4.2 Aquifer Properties

DWR has estimated the average specific yield of the water-bearing sediments in the DMGS as 11.8 percent (DWR, 2006). The permeability of the shallow groundwater-bearing strata in the Site vicinity is reported by local drillers to be variable (Ward, personal communication, 2016). The rancher that currently farms the land at the Site uses three production wells (Wheeler, personal communication, 2016). Two of these wells are completed in the shallow aquifer system overlying the Corcoran Clay, to a depth of approximately 210 feet bgs. One of these shallow wells has not been a reliable groundwater producer, and the yield from this well has reportedly decreased over time. When it was originally rehabilitated by the current user and placed back into service, it reportedly produced groundwater at a rate of approximately 900 gallons per minute (gpm) at the beginning of the irrigation season, decreasing to approximately 450 gpm by the end of the irrigation season. However, the yield from this well has reportedly decreased from year to year, and in 2015, this well reportedly did not produce a significant amount of groundwater. The second shallow well is reliably pumped continually throughout the irrigation season; however, the well yield typically decreases from approximately 1,400 gpm at the beginning of the season to approximately 400 gpm at the end of the season. The third existing well at the Site is completed to a depth of approximately 495 feet bgs, with two screened intervals. This well has consistently produced groundwater at a rate of approximately 900 gpm throughout the irrigation season, suggesting that most or all of the groundwater pumped from this well is derived from the confined aquifer below the Corcoran Clay. The rancher that currently farms the land indicated that the water quality from this well is distinct from the other two shallow wells, and contains more boron. This observation would be consistent with most of the water from this well coming from the confined aquifer.

Estimated transmissivities are available for seven wells near Patterson to the north of the Site, and seven wells near Newman, southwest of the Site (KDSA, 2010 and 2013). These 14 wells are reportedly screened entire within the confined aquifer, or in the confined and shallow aquifer ("composite" wells). In addition, specific capacity tests for two nearby confined aquifer wells were evaluated by Stanislaus County

Department of Environmental Resources and the results provided to JJ&A. An evaluation of aquifer parameters based on these tests is presented in Table 3.4.1. The estimated hydraulic conductivity for the confined and composite aquifers ranged from 13 to 117 feet per day (ft/day), with a geometric mean of 45 ft/day and a 10th percentile value of 17 ft/ day. By comparison, results from a 72-hour pumping test Patterson City Well No. 7 yielded an average hydraulic conductivity for the confined aquifer of 40 feet/day (KDSA, 2013).

The vertical hydraulic conductivity of the Corcoran Clay near the site is not known, but a reasonable range based on the literature is approximately 6.2 E-04 to 3.0 E-06 ft/day (USGS, 2009; USGS, 2004).

The storativity of the confined aquifer from the Patterson City Well No. 7 pumping test was 0.0003 (KDSA, 2013). This is similar to the results of a pumping test conducted by Kleinfelder at a similar location approximately 12 miles to the north, which was 0.0001 (Kleinfelder, 2016).

Table 3.4.1 Aquifer Properties Estimated from Specific Capacity Tests

Well	Screen Aquifer	Screen Interval Span (feet)	Reported Specific Capacity (gpm/ft)	Estimated Transmissivity (gpd/ft^2)	Estimated K for Screen Interval Span (ft/day)
Patterson City Well 2	Composite	190	42	71,400	50
Patterson City Well 4	Composite	225	19	32,300	19
Patterson City Well 5	Confined	175	42	84,000	64
Patterson City Well 6	Composite	130	15	25,500	26
Patterson City Well 7	Confined	267	21	42,000	21
Patterson City Well 8	Confined	140	59	118,000	113
Patterson City Well 11	Confined	220	45	90,000	55
Newman City Well 2	Composite	247	77	130,900	71
Newman City Well 3	Composite	270	65.1	110,670	55
Newman City Well 4	Composite	322	77.8	132,260	55
Newman City Well 13	Composite	315	92.1	156,570	66
Newman City Well 36	Composite	303	32.9	55,930	25
Newman City Well 42	Composite	301	64.2	109,140	48
Newman City Well 53	Composite	300	51.3	87,210	39
6S/8E-6Q (WCR#788583)	Confined	180	20.9	41,800	31
6S/8E-21R(WCR#82200)	Confined	190	9.4	18,800	13

3.4.3 Groundwater Quality

Generally, groundwater quality in the basin is suitable for most urban and agricultural uses, with primary constituents of concern consisting of total dissolved solids (TDS), nitrate, boron, chloride, and organic compounds (DWR, 2003). Areas of high TDS concentrations are primarily found in the western region of the valley, due to the recharge of streamflow originating from the marine sediments in the nearby Coast

Ranges, while high concentrations of boron are typically found in the valley trough as the results of salts, due to evaporation and poor drainage (DWR, 2003). Sulfate and boron concentrations vary in both the shallow and confined aquifers, with slightly higher boron concentrations in the confined aquifer; there is little difference in arsenic concentrations between the shallow and confined aquifers. Nitrate, nitrite, hexavalent chromium, and 1,2,3-trichloropropane have been detected at concentrations above the Maximum Contaminant Levels (MCL) in groundwater from the Crows Landing Community Services District area surrounding the Site (AECOM and VVH Consulting Engineers, 2016).

The Navy maintains a 2,000 foot pumping restriction at the Crows Landing Air Facility around a contamination plume known as the IRP Site 17 Administration Area Plume (see Figure 2.1.1) (AECOM and VVH Consulting Engineers, 2016). The contamination plume is the result of underground fuel storage tanks, used for the former facility, and includes benzene and other volatile organic compounds. The plume contaminants appear to be limited to the shallow aquifer, above the Corcoran Clay.

3.4.4 Groundwater Budget and Existing Groundwater Demand

Development of a complete groundwater budget and demand inventory is beyond the scope of this study; however, the following information is pertinent to this analysis. DWR has listed the DMGS as being in a state of overdraft, though groundwater levels in the vicinity of the Site are generally stable (Section 3.4.1). A study of groundwater level trends from 1993 to 2008 found that groundwater levels in northern portions of the DMGS were generally hydrologically balanced (AECOM, 2011). The study found minimal apparent net change in groundwater elevations, which were interpreted as equilibrium between use and recharge. However, consistent declines in groundwater levels in certain localized areas (including an area west of Newman), may be indicative of a developing local overdraft condition. This is consistent with groundwater elevation contours and hydrographs for the Site vicinity, as discussed in Section 3.4.1.

Land use overlying the DMGS near the Site is primarily agricultural, with local agricultural water demand served by surface-water deliveries from DPWD, supplemented by groundwater extraction. Municipal water demand for the Cities of Patterson and Newman, as well as the community of Crows Landing, is met using groundwater. Demand forecasts are available for the City of Patterson from the 2015 update to its Urban Water Management Plan (UWMP) (RMC, 2016). The demand is projected to increase from 6,376 AFY in 2020 to 11,801 AFY in 2040. Similar proportional increases in demand may also be expected in the communities of Newman and Crows Landing if they follow similar population and development trends. However, it is important to note that increased municipal demand would be expected to be offset by a corresponding decrease in agricultural demand associated with conversion of agricultural land to municipal use.

Groundwater demand for agricultural production at the Site has historically been met through a combination of groundwater pumping and surface deliveries from DPWD. Information regarding the total applied water volumes and groundwater pumpage for on-Site wells for the last five years was provided by the rancher that farms the property and is summarized in Table 3.4.2, below.

Table 3.4.2 Historical Site Groundwater Pumpage and Surface Water Deliveries

Year	Volume of Groundwater Extracted (acre-feet) [1]			Volume of Surface Water Delivered (acre-feet) [2]	Percent of CVP Contract Allotment Available [2]	Total Applied Water (acre-feet)
	Deep Well	Shallow Wells	Total			
2012	380	560	940	1,629	40%	2,569
2013	402	448	850	424	20%	1,274
2014	390	212	602	158	0%	760
2015	564	378	942	0	0%	942
Average	434	400	834	553	15%	1,386

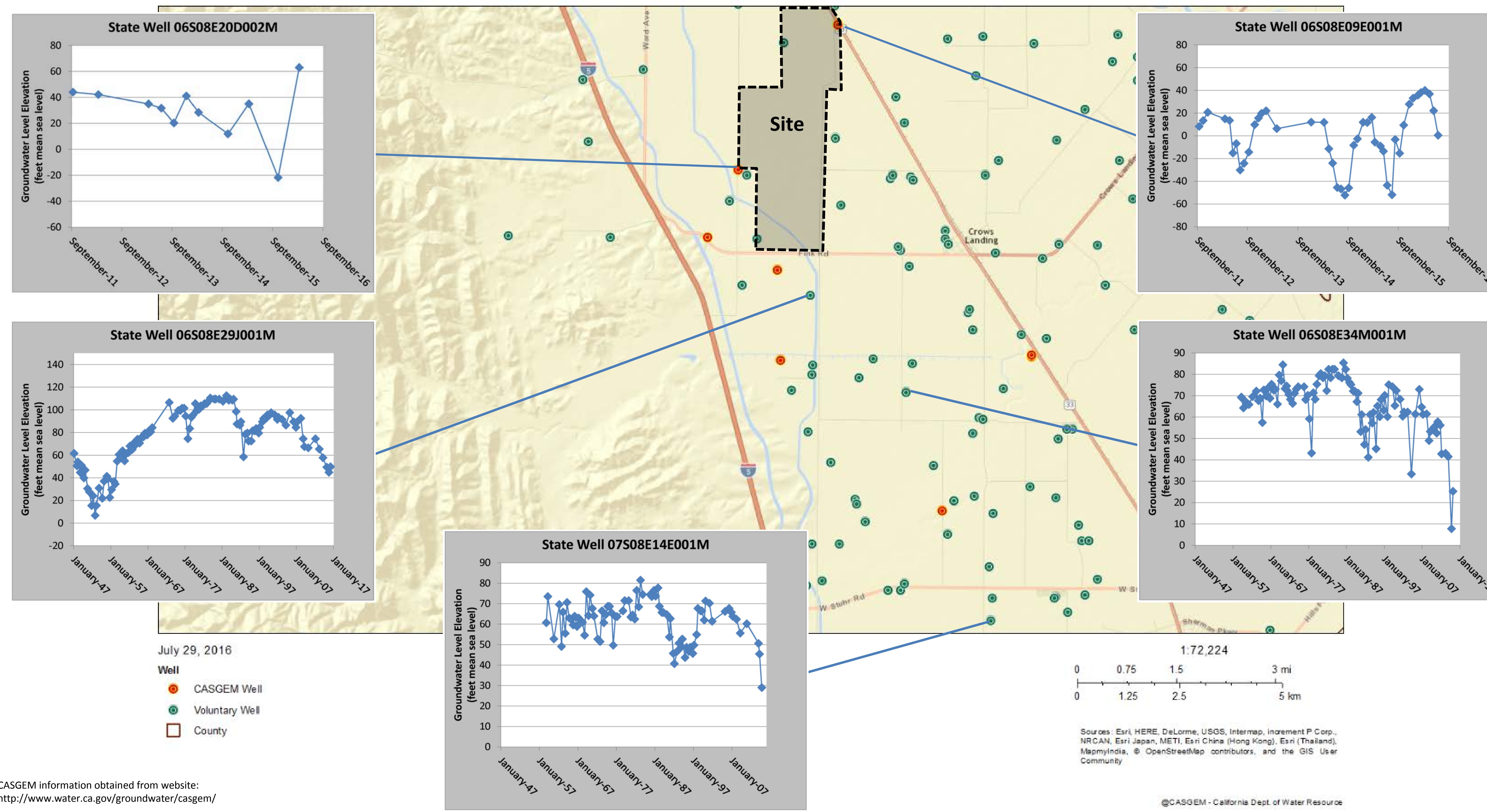
1. Based on information reported in AECOM, 2016 or data provided by Wheeler, 2016. Where confliciting data were provided, extraction volumes reported in AECOM, 2016 were utilized and divided among the wells in proportion to reported pumping rates.

2. Taken from Water Use Statements from Del Puerto Water District provided by Wheeler, 2016.

3.5 Subsidence

Land subsidence can occur when compressible clays are depressurized as a result of groundwater extraction, triggering water to flow from the clays into the surrounding aquifer, and ultimately consolidation of the clay under pressure from the overlying sediments. This can happen especially in confined aquifer conditions such as below the Corcoran Clay, where the head loss resulting from groundwater extraction is greater than in unconfined aquifers. The process of subsidence is reversible when granular aquifer materials compress and expand under changing pressure conditions, but irrecoverable when clay frameworks are compressed and reoriented. Irrecoverable subsidence results in decreased storage capacity within the aquifer. In general, most subsidence occurs when an aquifer is initially depressurized, but can continue for months, or even years, after clays slowly dewater and adjust to the new pressure regime. If groundwater levels subsequently recover, subsidence generally does not resume (or does not progress as rapidly), until groundwater levels fall below historical low levels.

DWR has included the DMGS on the list of critically overdrafted basins, largely due to overdraft and subsidence reported outside Stanislaus County to the south (DWR, 2016a); nevertheless DWR has designated the entire DMGS as having a high potential for future subsidence (DWR, 2016b). The Bureau of Reclamation, in cooperation with DWR, monitors a geodetic survey network of triangulated elevation monitoring of benchmarks in the area surrounding the San Joaquin River from Fresno to Patterson, including locations along the Delta-Mendota Canal (U.S. Bureau of Reclamation [USBOR], 2014). Survey data from this program indicate a subsidence rate of 0 to 0.15 feet (0 to 1.8 inches) per year from December 2011 to December 2015 near the Site, including areas surrounding Patterson and Newman (USBOR, 2016). More rapid short-term subsidence rates were reported from December 2012 through December 2013, ranging from 0.15 to 0.3 feet per year (USBOR, 2014). This is generally consistent with DWR's report of 1 to 2.5 inches of subsidence from 2005 to the present at continuous survey station P259, located near the northeast corner of the Site at the intersection of Marshall Road and State Highway 33 (DWR, 2016b).



CASGEM information obtained from website:
http://www.water.ca.gov/groundwater/casgem/

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Crows Landing Industrial Business Park
Stanislaus County, California

PROJECT NO.	DATE	DRAWN BY	APPR. BY
STANCO.001	7/28/16	JH	MT

FIGURE 3.4.1

Hydrographs for Confined Aquifer Wells Located Near the Site

4.0 EVALUATION OF HYDROGEOLOGIC EFFECTS

To evaluate the potential effects of the CLIBP on groundwater resources, an analytical groundwater modeling study was performed to assess the potential impacts of pumping on groundwater levels at the Site and in the surrounding area under a range of scenarios that bracket the current uncertainty regarding aquifer conditions. The analytical modeling study was based on the conceptual understanding described in Section 4.1, and implemented as described in Section 4.2. The results are presented in Section 4.3.

4.1 Conceptual Understanding

The modeling study is based on the following working conceptual understanding of groundwater occurrence and flow in the vicinity of the Site:

- Bedrock of the Diablo Range, located approximately 1 to 2 miles west of the Site, forms a no-flow boundary for the alluvial aquifers underlying the DMGS.
- In the Site area, groundwater occurs in a two-aquifer system, including an upper unconfined aquifer and a lower confined aquifer. These two aquifers are separated by the Corcoran Clay, a regionally extensive aquitard that occurs at a depth of approximately 250 feet bgs, with an average thickness of approximately 70 feet, based on data provided by Stanislaus County.
- The base of freshwater aquifers in this area is reported to occur at an elevation of approximately 800 feet below sea level (approximately 950 feet bgs) (Page, 1973). The confined aquifer system available for development by the CLIBP is therefore assumed to extend from approximately 320 to 870 feet bgs, for a total thickness of approximately 550 feet.
- Mountain front recharge occurs near the western edge of the subbasin, where streams draining the Diablo Range emerge onto small alluvial fans at the edge of the valley. The Corcoran Clay may be absent or discontinuous in this area (AECOM, 2011), so it is possible that some recharge percolates directly into the confined aquifer in this area.
- Regional groundwater flow is toward the northeast, away from the Diablo Range and toward the San Joaquin River, approximately 4 to 6 miles east of the Site (see Appendix B). This flow pattern has been locally disrupted by cones of depression located north and south of Site vicinity, which have expanded since 2013 during drought conditions.
- In the vicinity of the Site, groundwater levels have consistently recovered each year after the irrigation season, and a recurrent groundwater mound at the mountain front near Little Salado Creek and Salado Creek suggests a persistent inflow of recharge from this area restores groundwater levels and the prevalent flow direction in this area (see Figure 3.4.1 and Appendix B). This suggests that groundwater recharge and discharge are generally balanced in this area.
- Groundwater levels along the mountain front west of the Site are reported to be approximately 110 feet bgs near Crow Creek (southwest of the Site), and decreasing to approximately 30 feet bgs near

Del Puerto Creek (northwest of the Site),where a cone of depression appears to have formed during recent drought years (see Appendix B).

- Groundwater levels near the San Joaquin River are generally close to the elevation of the river, suggesting that this reach of the river is hydraulically connected with the shallow aquifer. Groundwater contours near the river suggest that shallow groundwater is discharging to the river, especially in the area to the southeast of the Site.
- Transmissivity data from municipal wells in Patterson and Newman that are screened within the confined aquifer indicate the lateral hydraulic conductivity ranges from 19 to 113 ft/day (see Table 3.4.1). Hydraulic conductivity calculations based on these data indicate a mean of 47 ft/day, a geometric mean of 41 ft/day, and a 10^{th} percentile of 17 ft/day. The hydraulic conductivity is assumed to be the same in the shallow and confined aquifers.
- Pumping test data from Patterson City Well No. 7 and an irrigation well located in a similar setting approximately 12 miles to the north indicate the storativity of the confined aquifer ranges from 0.0001 (Kleinfelder, 2016) to 0.0003 (KDSA, 2013). The storativity in the Corcoran Clay is assumed to be the same as for the confined aquifer. The storativity in the shallow aquifer near the Site is not known, but a reasonable value based on our experience is approximately 0.04.
- DWR (2006) estimated the specific yield for the DMGS to be 11.8; this value was used for the shallow and confined aquifers.
- The vertical hydraulic conductivity of the Corcoran Clay near the site is not known, but a reasonable range based on the literature is approximately 1.0 E-04 to 3.0 E-06 ft/day (USGS 2004 and 2009).

4.2 Analytical Drawdown Model

4.2.1 Approach

An analytical model was constructed to evaluate the reasonable range of drawdown that could occur from groundwater extraction related to development of the CLIBP. The model was constructed using the AnAqSim modeling code (Fitts Geosolutions, 2016), a three-dimensional (multi-layer) analytical element modeling code capable of simulating groundwater flow to wells under confined, unconfined, or semi-confined aquifer conditions. AnAqSim is able to simulate a variety of boundary conditions (e.g., no-flow, constant flux, variable flux, general head, and constant head), line or area sources and sinks (e.g., rivers and recharge), and flow barriers. AnAqSim can be used to simulate transient conditions as a result of pumping from single or multiple wells at constant or varying rates, and calculates the head and discharge as functions of location and time across a designated model grid or at designated points.

Four modeling scenarios were developed using a superposition approach to simulate drawdown under a reasonable range of conditions. Superposition or impact modeling is a robust modeling approach which focuses on evaluation of drawdown as opposed to actual hydraulic head, and allows the modeler to focus more on the evaluation of the changes introduced by a project, rather than the simulation of past or future groundwater levels (Reilly, Franke and Bennett, 1987). The use of superposition modeling in hydrogeologic literature is well established and this approach has been widely used to evaluate the impacts of water supply pumping.

For each of the modeling scenarios, a baseline model was constructed to simulate a set of aquifer conditions representing reasonable end point assumptions. The model was then run in transient mode with simulated pumping from the project wells, and resulting water level surface was subtracted from the baseline to evaluate the drawdown induced by the project at the end of Phase 1, Phase 2 and Phase 3 of the Project. The model inputs and supporting rationale are discussed below and summarized in Table 4.2.1. The model domain and boundaries are shown graphically in Figure 4.2.1, and model layering is shown in Figure 4.2.2.

Model Domain and Layering. For this evaluation, a model domain was established that measures approximately 75,000 by 50,000 feet that is approximately centered on the Site. The model domain was divided into two subdomains. The eastern subdomain includes three layers representing the shallow unconfined aquifer, the Corcoran Clay, and the lower confined aquifer. The western subdomain consists of a narrow strip on the west side of the model domain (the "forebay"), which was constructed as a single layer separated from the rest of the model domain by an inter-domain boundary; the forebay represents mountain-front sediments where the Corcoran Clay may or may not be present as a confining layer. The San Joaquin River was incorporated into the model with a direct connection to the shallow aquifer subdomain. Spatially-variable area sink/source polygons were constructed to model groundwater recharge around the San Joaquin River and groundwater extraction from the three assumed new confined aquifer wells at the CLIBP. This approach was selected because the software and domain configuration allow for modeling of drawdown in any of the subdomains (the focus is on the confined aquifer) at different phases of Project buildout with the ability to vary aquifer characteristics and boundary conditions that bracket the current uncertainty regarding aquifer conditions.

Boundary Conditions. General head boundaries were simulated on north, east, and south the east sides of the model domain. General head conditions were selected based on groundwater elevations from contour maps for the project vicinity (Appendix B). The western boundary of the model domain was simulated in two different ways to bracket the current uncertainty regarding the persistence of the Corcoran Clay in this area (see Figure 4.2.2):

- In Scenarios 1 and 2, the western boundary of the forebay was defined as a no-flow boundary along the mountain front, with surface recharge to the forebay. For these scenarios, the forebay subdomain was extended to a depth of 300 feet bgs, and water was allowed to flow laterally directly from the forebay into the Corcoran Clay and the lower confined aquifer (direct recharge condition).
- In Scenarios 3 and 4, the western boundary of the forebay was defined as a constant head boundary, with the assigned heads based on average historical groundwater elevations along the western margin of the basin over the last five years (Appendix B). For these scenarios, the depth of the forebay subdomain was identical to the shallow aquifer depth, and lateral groundwater flow was allowed from the forebay only into the shallow aquifer. Under these scenarios, the only path

by which mountain front recharge may enter the lower confined aquifer is via percolation through the Corcoran Clay (no direct recharge condition).

Line Sinks. The San Joaquin River was simulated as a line sink with direct connection to the shallow aquifer. The river stage was set based data from USGS gaging stations "SMN" (San Joaquin River above the Merced River near Newman) and SCL (San Joaquin River near Crows Landing) (DWR, 2016c).

Aquifer Characteristics. The aquifer was modeled as a 3-layer domain with the Corcoran Clay as a leaky confining layer. Aquifer transmissivity and storativity, and confining layer vertical hydraulic conductivity, were assigned a reasonable range of values based on the information discussed in Section 3, as summarized in Table 4.2.1, below. Assigned values for horizontal hydraulic conductivity ranged from a maximum of 40 ft/day (the value derived from the City of Patterson pumping test) to 17 ft/day (the 10th percentile hydraulic conductivity derived from the analysis of specific capacity data presented in Table 3.4.1).

Pumping. Pumping was simulated to occur from three wells installed as shown on Figure 4.2.1. Pumping was assumed to be equally distributed among the three wells. Pumping was modeled to occur only in the confined aquifer over a thickness of 550 feet, encompassing the sediments extending vertically from the base of the Corcoran Clay to approximately 80 feet above the reported base of fresh water. The total pumping for each project development phase was based upon the net increase in potable groundwater demand at the end of each buildout phase, compared with the pre-development condition, as summarized in Table 4.2.1, below.

Table 4.2.1 Analytical Model Input Parameters

Model Input Parameter		Input Data Value				Data Source
		Shallow Aquifer	Corcoran Clay	Confined Aquifer	Forebay	
Aquifer Thickness (feet)		250	70	550	250 to 400	Section 3.4
Storativity		0.04	0.0001 to 0.0003	0.0001 to 0.0003	0.004	Section 3.4.2
Specific Yield		11.8	0.0001 to 0.0003	11.8	11.8	Section 3.4.2
Hydraulic Conductivity, Horizontal (ft/day)		17 to 40	0.0003 to 0.001	17 to 40	17 to 40	Table 3.2.1
Hydraulic Conductivity, Vertical (ft/day)		1	0.000003 to 0.0001	1	1	Fetter, 1994
Net Pumping Rate (AFY)	Phase 1 (2017 to 2026)	0	0	739	NA	Table 2.2.1
	Phase 2 (2027 to 2036)	0	0	1,036	NA	Table 2.2.1
	Phase 3 (2037 to 2046)	0	0	1,496	NA	Table 2.2.1

4.2.2 Model Inputs

The analytic element model's input parameters are summarized in the Table 4.2.1 above. The model assumes all pumping is from the confined aquifer to meet the increased demand for potable water, and that there is no net increase in groundwater demand from the shallow aquifer.

4.2.3 Model Scenarios

As with any predictive modeling study, uncertainty in the model inputs will affect the reliability of the results. Therefore, four modeling scenarios were developed in order to address a reasonable range of possible outcomes, thus bracketing the likely effects of the Project. These scenarios are described in Table 4.2.2, below. For each scenario, drawdown is evaluated at the full buildout of each construction phase (i.e., after 10, 20, and 30 years).

4.2.2 Analytical Modeling Scenarios

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Direct Recharge to Confined Aquifer from Forebay	✓	✓		
No Direct Recharge to Confined Aquifer from Forebay			✓	✓
Best Case Aquifer Parameters[1]	✓		✓	
Worst Case Aquifer Parameters[2]		✓		✓

[1] Confined aquifer storativity of 0.0003 and horizontal hydraulic conductivity of 40 ft/day; Corcoran Clay storativity and specific yield of 0.0003, horizontal hydraulic conductivity of 0.001 ft/day, and vertical hydraulic conductivity of 0.0001 ft/day.

[2] Confined aquifer storativity of 0.0001 and horizontal hydraulic conductivity of 17 ft/day; Corcoran Clay storativity of 0.0001, specific yield of 0.000003, horizontal hydraulic conductivity of 0.0003 ft/day, and vertical hydraulic conductivity of 0.000003 ft/day.

4.2.4 Assumptions and Limitations

This section presents hydrogeologic assumptions that are incorporated in the analytical element model.

- The aquifer layers have a uniform lateral and vertical hydraulic conductivities, and uniform specific yield and storativity. This is a typical simplifying assumption inherent in many models, and is appropriate as long as the objective is to model the general distribution of impacts under average conditions.
- The potentiometric surface is approximated through the use of boundary conditions and is not calibrated. This is simplifying assumption used in many models that are designed to evaluate drawdown relative to a baseline condition using a superposition approach. The inherent limitation in this approach is that the model cannot be used to predict actual groundwater level elevations. In

addition, the modeled drawdown may be considered an approximation. The impact of these limitations is lessened through the use of range of boundary and aquifer conditions.

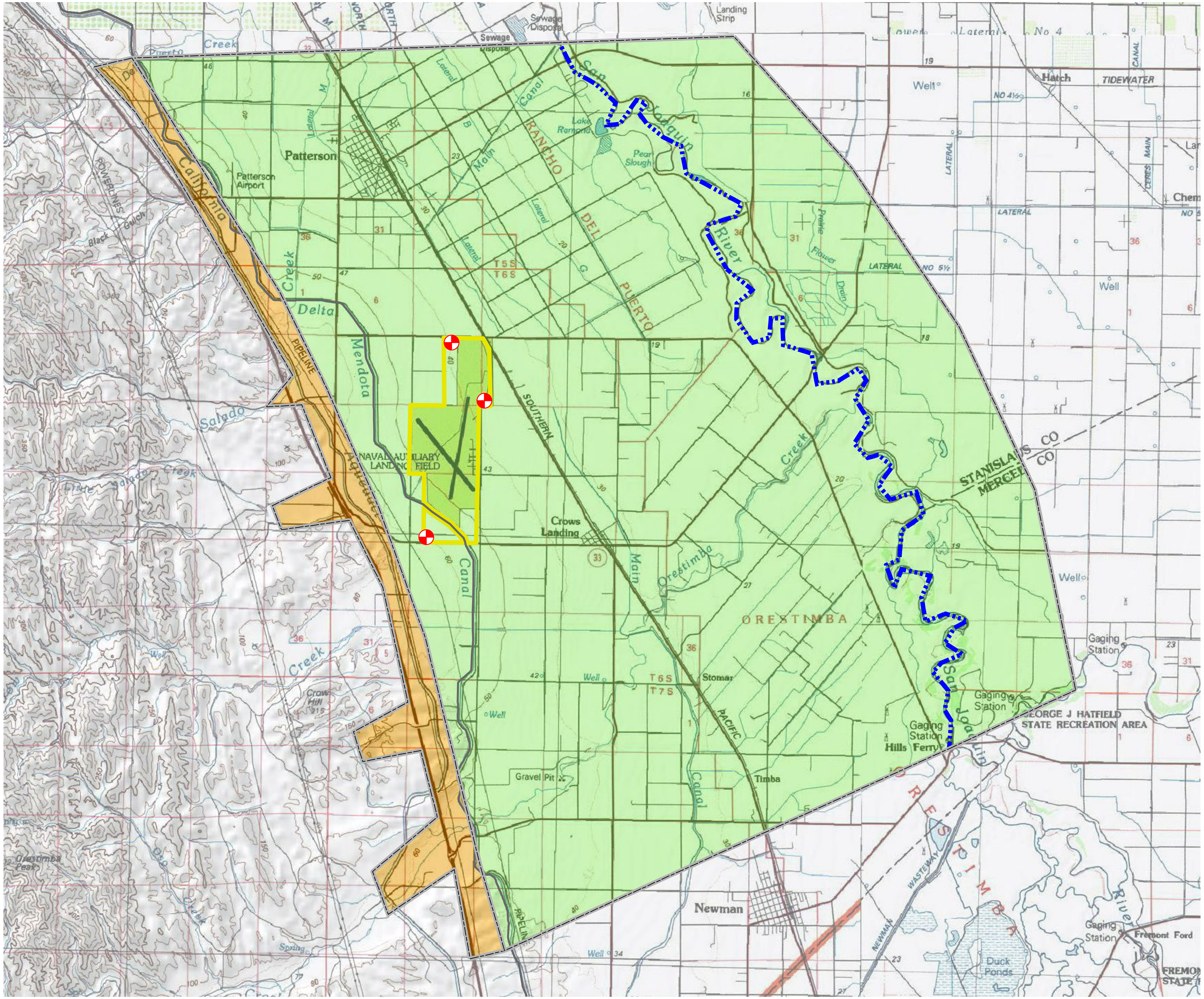
- Water is released from storage in the aquifers instantaneously, the pumping well is screened in, and receives water from, the full thickness of the aquifer, and the well is 100 percent efficient.
- Areal recharge and pumping discharge (with exception of the Project) are assumed to be balanced and are therefore neglected in the simulation. This assumption is supported by the generally stable groundwater levels in the Site vicinity.
- Mountain front recharge, underflow in, underflow out, and river discharge are balanced and simulated using boundary conditions, line sinks and areal flux in the forebay subdomain.

4.3 Results

The distribution of drawdown predicted for each of the four scenarios is shown at the buildout of Project Phase 1, 2 and 3 on Figures 4.3.1, 4.3.2, and 4.3.3, respectively, and key findings are summarized in Table 4.3.1. Predicted drawdown in the confined aquifer is greatest under Scenario 4 and least under Scenario 1. Predicted drawdown is more sensitive to the modeled difference in aquifer parameters than to the different recharge conditions that were evaluated. Key findings from the predictive modeling are summarized below:

- Drawdown is predicted to stabilize quickly for each stress period, generally within a year.
- The maximum predicted drawdown in the confined aquifer ranges from:
    - 2 feet (best case) to 7 feet (worst case) at completion of Phase 1 buildout;
    - 3 feet (best case) to 10 feet (worst case) at completion of Phase 2 buildout; and,
    - 4 feet (best case) to 14 feet (worst case) at completion of Phase 3 buildout
- The maximum predicted drawdown in the confined aquifer beneath the Delta-Mendota Canal ranges from:
    - 1 foot (best case) to 6 feet (worst case) at completion of Phase 1 buildout;
    - 2 feet (best case) to 9 feet (worst case) at completion of Phase 2 buildout; and,
    - 3 feet (best case) to 13 feet (worst case) at completion of Phase 3 buildout
- The predicted drawdown in the confined aquifer at completion of Phase 3 buildout ranges from 2 feet (best case) to 7 feet (worst case) near the city of Patterson and from approximately 1 foot (best case) to 4 feet (worst case) beneath the city of Newman. This suggests that drawdown related to Project pumping would contribute slightly to the cones of depression located near these cities. The depths of these cones of depression was approximately 50 to 60 feet below surrounding water level elevations in the fall of 2015 (Appendix B), and Project-related drawdown would add an additional 1 to 10 percent to this depth if the cones of depression persist until Phase 3 buildout. However, it is likely the cones of depression will recover at least partially during non-drought conditions.

- Predicted drawdown in the shallow aquifer from new pumping in the confined aquifer will be negligible.



LEGEND

- Assumed Location of Confined Aquifer Well
- Site location
- San Joaquin River Line Sink
- East Subdomain (Shallow Aquifer, Corcoran Clay and Confined Aquifer)
- West Subdomain (Forebay)

N

0 1.5

Miles

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TITLE

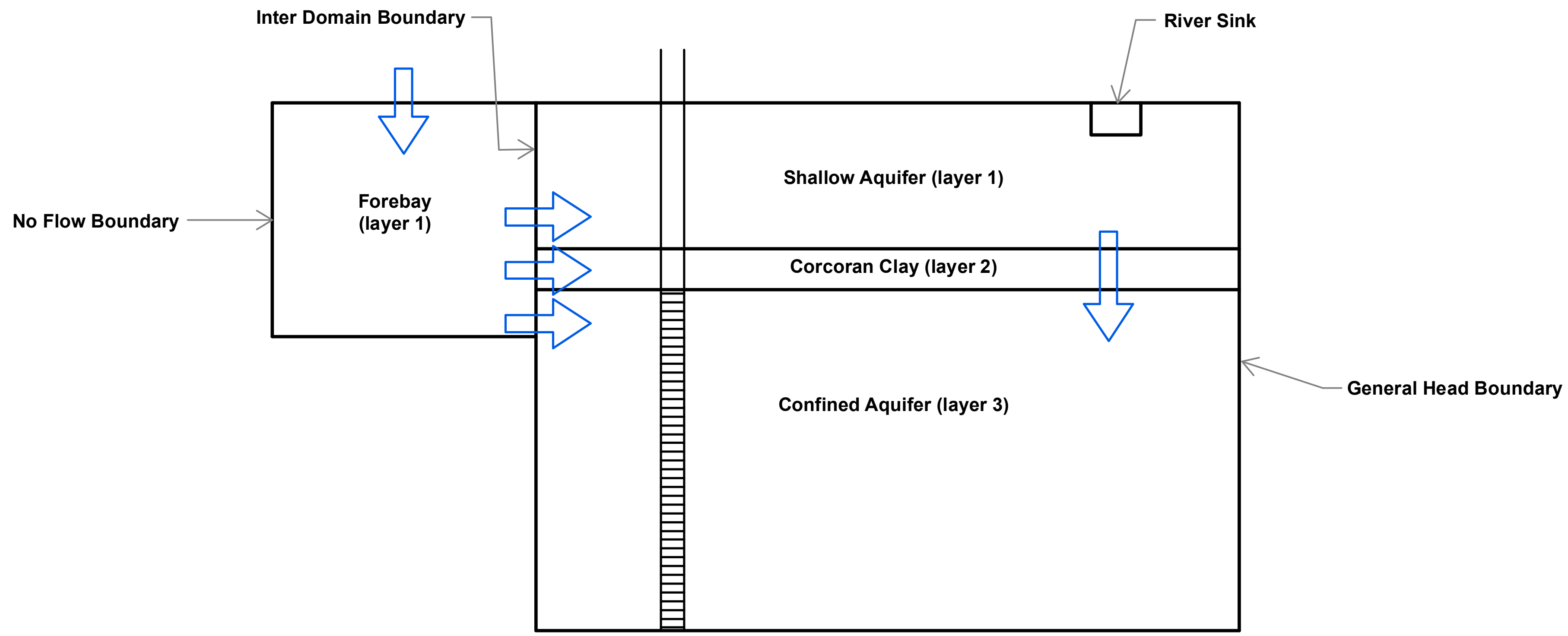
MODEL DOMAIN BOUNDARIES AND FEATURES

CROWS LANDING INDUSTRIAL BUSINESS PARK
STANISLAUS COUNTY, CALIFORNIA

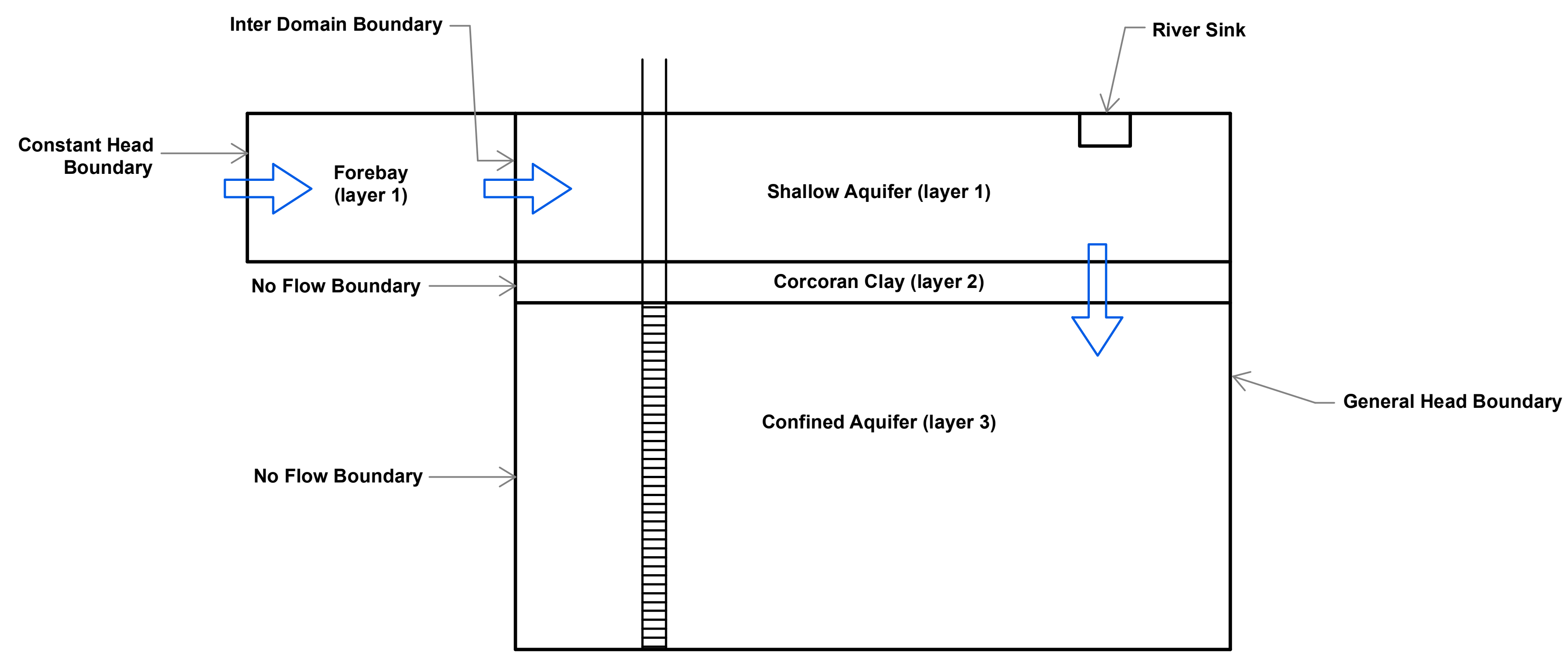
DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	JB	8/2/16	4.2.1

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 4-2-1 Model Domain and Features.mxd

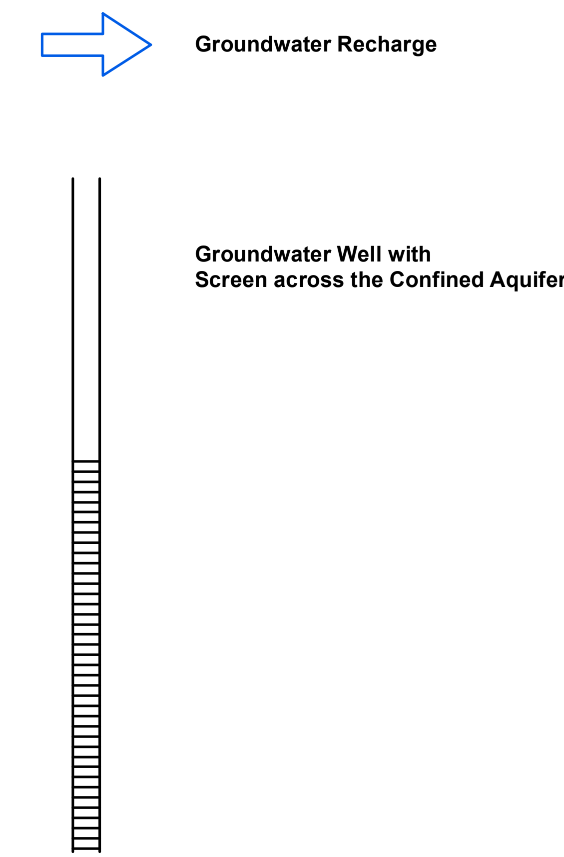
SCENARIOS 1 and 2



SCENARIOS 3 and 4



LEGEND



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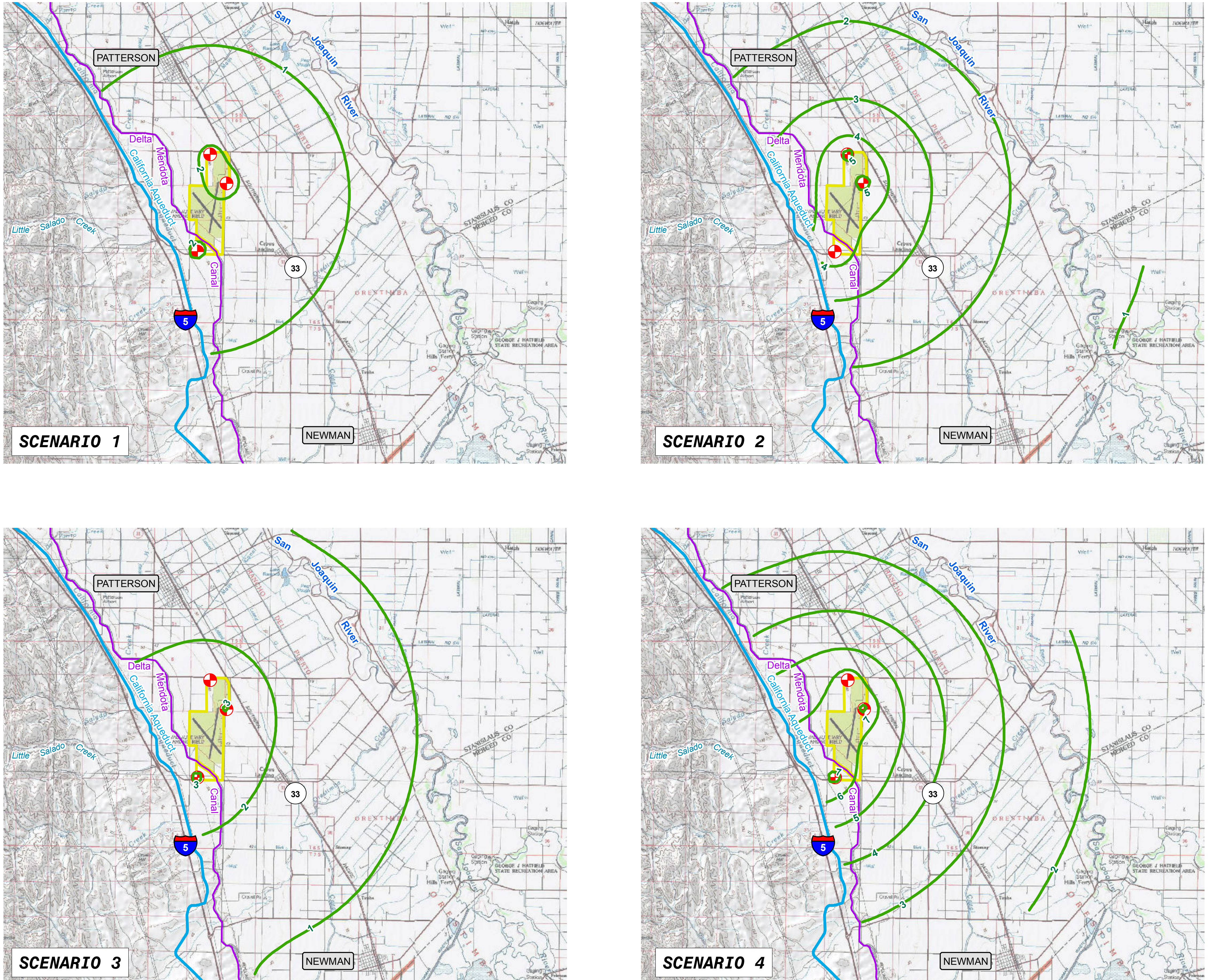
TITLE

CONCEPTUAL ILLUSTRATION OF MODEL CONSTRUCTION

CROWS LANDING INDUSTRIAL BUSINESS PARK
STANISLAUS COUNTY, CALIFORNIA

DRAWN BY	*APPROVED BY*	*DATE*	*FIGURE*
DPG	*JB*	*8/1/16*	**4.2.2**

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 4-2-2 Model Construction Concept.mxd



LEGEND

- Assumed Location of Confined Aquifer Well
- Contour for Predicted Groundwater Drawdown (1-foot intervals)
- Site Boundary

0 3 Miles

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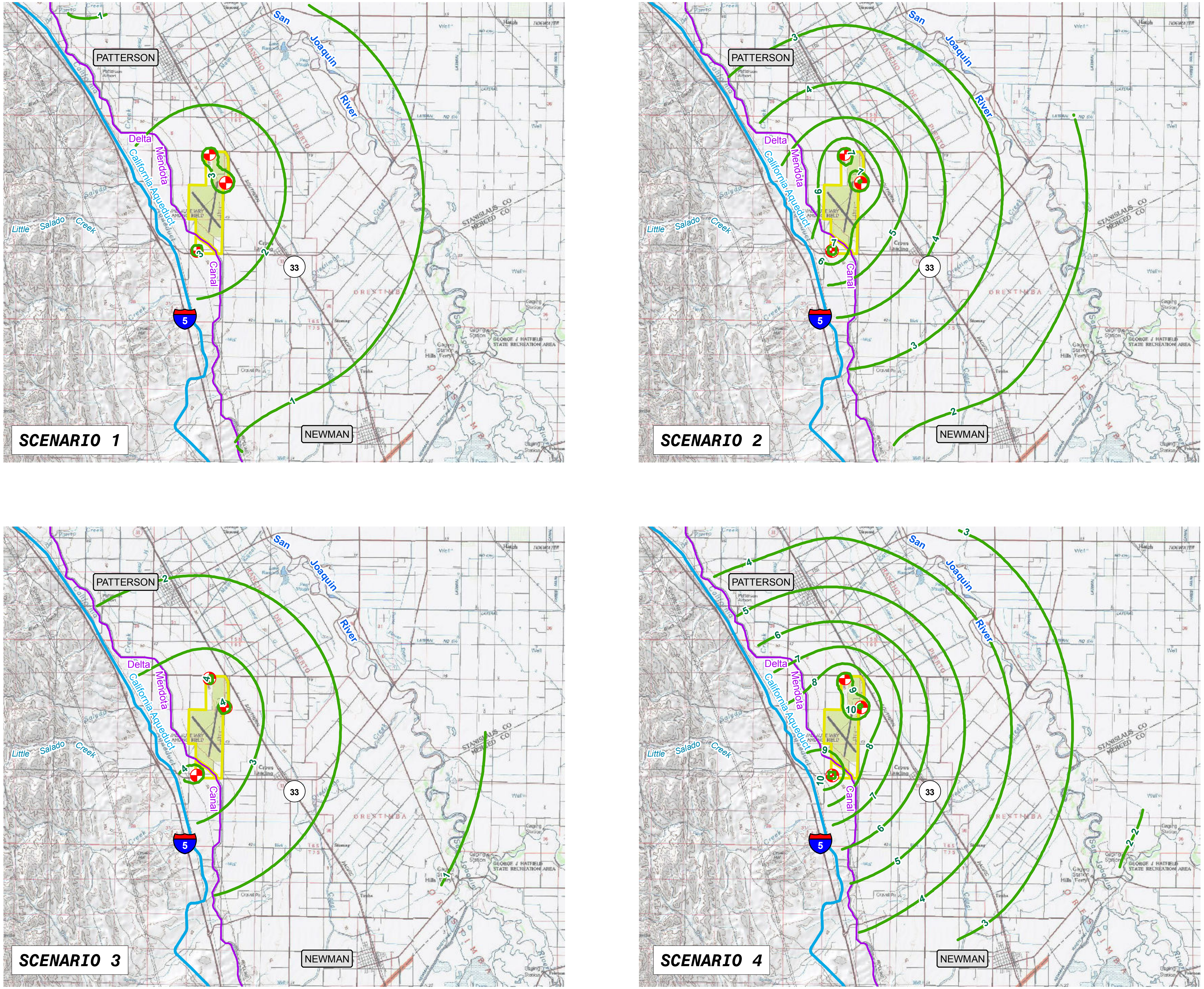
TITLE

PREDICTED DRAWDOWN IN THE CONFINED AQUIFER FOR SCENARIOS 1 THROUGH 4 END OF PHASE 1

CROWS LANDING INDUSTRIAL BUSINESS PARK STANISLAUS COUNTY, CALIFORNIA

DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	JB	8/1/16	4.3.1

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 4-3-1 Phase 1 Scenarios.mxd



LEGEND

Assumed Location of Confined Aquifer Well

Contour for Predicted Groundwater Drawdown (1-foot intervals)

Site Boundary

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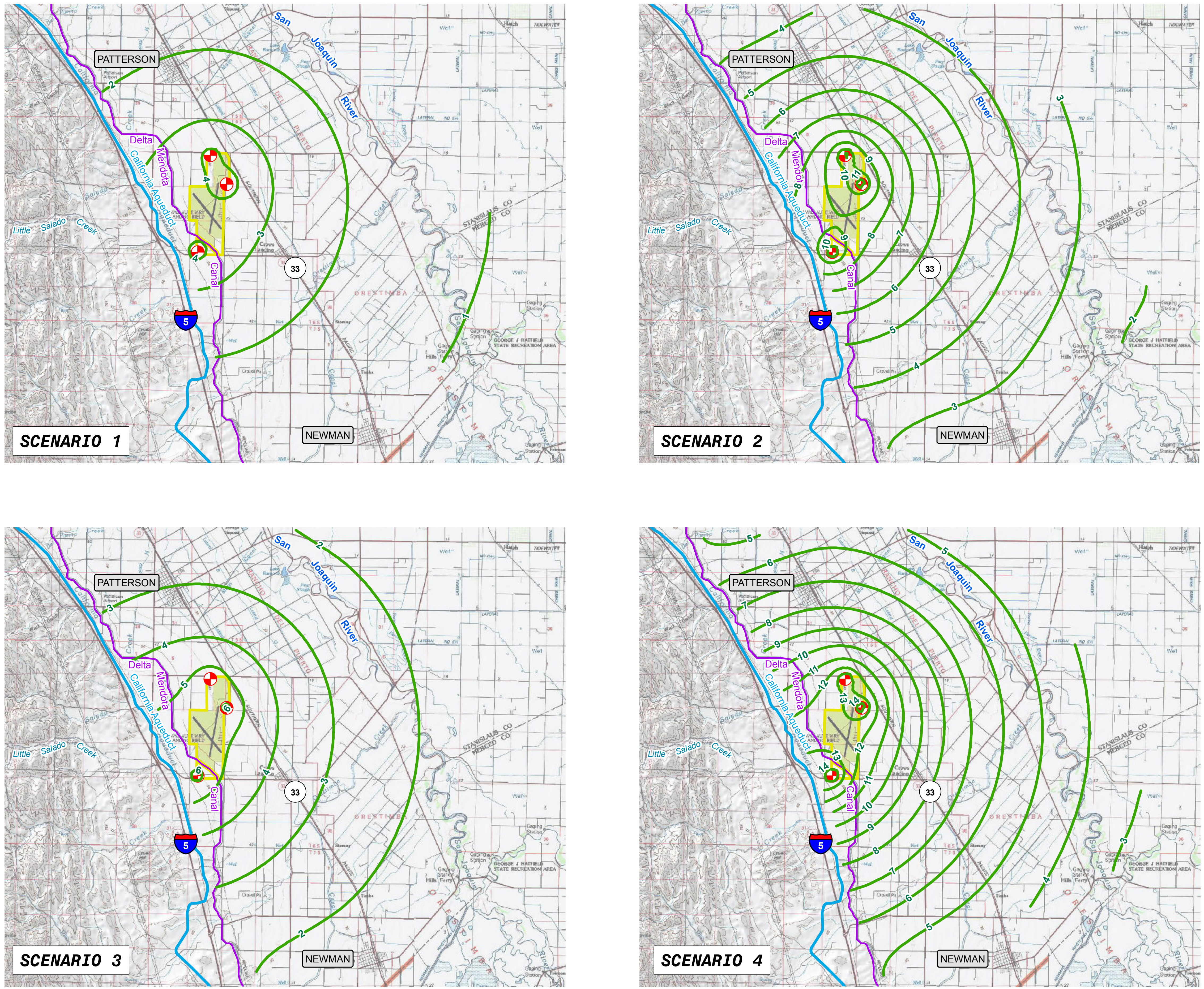
TITLE

PREDICTED DRAWDOWN IN THE CONFINED AQUIFER FOR SCENARIOS 1 THROUGH 4 END OF PHASE 2

CROWS LANDING INDUSTRIAL BUSINESS PARK
STANISLAUS COUNTY, CALIFORNIA

DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	JB	8/1/16	4.3.2

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 4-3-2 Phase 2 Scenarios.mxd



LEGEND

Assumed Location of Confined Aquifer Well

Contour for Predicted Groundwater Drawdown (1-foot intervals)

Site Boundary

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TITLE

PREDICTED DRAWDOWN IN THE CONFINED AQUIFER FOR SCENARIOS 1 THROUGH 4 END OF PHASE 3

CROWS LANDING INDUSTRIAL BUSINESS PARK
STANISLAUS COUNTY, CALIFORNIA

DRAWN BY	APPROVED BY	DATE	FIGURE
DPG	JB	8/1/16	**4.3.3**

Path: J:\GIS\StanislausCounty\CrowsLanding\Figure 4-3-3 Phase 3 Scenarios.mxd

5.0 IMPACT EVALUATION

This section presents an evaluation of the potential environmental impacts of the Project associated with groundwater resources. The impact evaluation is provided in the form of reasoned evaluations in answer to each of the applicable significance questions contained in Appendix G of the CEQA Guidelines, listed below. The questions are grouped by topic based on the "undesirable results" defined in the County Groundwater Ordinance and the California Water Code. As such, the evaluation also provides substantial evidence whether or not the proposed new wells to be installed for the Project comply with the prohibition against unsustainable extraction contained in the County Groundwater Ordinance. An additional section is added to discuss water supplies and entitlements, which are a topic under CEQA that is not included in the Groundwater Ordinance.

5.1 Groundwater-Dependent Ecosystems

Question IV(a): Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Question IV(b): Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFG or USFWS?

Question IV(c): Would the project have a substantial adverse effect on a federally protected wetlands as defined by Section 404 of the Clean Water Act (including marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Groundwater near the site occurs at depths of at least 30 feet or more beneath the ground surface, so wetlands identified in the Site vicinity are not connected to the regional water table. Further east, wetlands and riparian vegetation near the San Joaquin River may be groundwater connected; however, pumping from the confined aquifer is predicted to produce negligible drawdown in this area. The project will not result in any net increase in groundwater demand from the shallow aquifer, and it is unlikely that localized drawdown around shallow aquifer pumping wells will extend as far as the San Joaquin River. As such, impacts to GDEs will be less than significant. A groundwater monitoring program will be implemented to assess project drawdown in the shallow and confined aquifer near the Site, and will be used to assess changes to the shallow aquifer well field operation to avoid excessive drawdown in any particular area (see Section 5.6). This program will further reduce the less than significant impacts to GDEs.

5.2 Water Quality

Question IX(a): Would the project violate any water quality standards or waste discharge requirements?

Question IX(f): Would the project otherwise substantially degrade water quality?

The Project includes operation of existing and new groundwater wells in both the shallow and confined aquifers beneath the Site. New wells completed in the confined aquifer will be completed above the base of fresh water and separated from the existing hydrocarbon plume in the shallow aquifer by the Corcoran Clay. Therefore, Project pumping from the confined aquifer will not draw from areas where water is known to have low quality, and will not interfere with shallow aquifer remediation efforts. Pumping from the shallow aquifer to meet non-potable Project water demand will occur outside of the 2,000-foot pumping restriction around the IRP Site 17 contamination plume to avoid capture of contaminated water or interference with remediation efforts. No degradation of irrigation water has been reported over time, which indicates that infiltration of applied groundwater does not substantially degrade groundwater quality, and poor quality water is not being drawn into the area. New wells installed for the Project will not be cross screened across the Corcoran Clay, and so will not create a conduit between zones of varying water quality. The existing cross screened irrigation well will be actively pumped as part of the project, and therefore will not serve as a conduit for water exchange between the shallow and confined aquifers. Based on these considerations, no significant impacts are anticipated.

5.3 Subsidence

Question VI(c): Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

DWR has designated the entire DMGS as having a high potential for future subsidence, and between 1 and 2.5 inches of subsidence have been reported since 2005 at continuous monitoring station P259 along State Route 33 near the northeast corner of the Site (DWR, 2016b). The DWR and Bureau of Reclamation have undertaken a joint subsidence monitoring program in support of the San Joaquin River Restoration Program that includes a geodetic control network of monitoring stations that spans the Site (USBOR, 2014). Surveying conducted in support of this program indicates that the average subsidence rate near the Site has been in the range of 0 to 0.15 feet per year between December 2011 and December 2015 (USBOR. 2016). Surveys conducted between December 2012 and December 2013 indicate slightly accelerated short term subsidence rates during that time period between 0.15 and 0.3 feet per year (USBOR, 2014). Nevertheless, the total amount of subsidence recorded near the Project site (1 to 2.5 inches) is not likely to cause damage to, or interfere with the proper functioning of, surface infrastructure.

As discussed in Section 3.5, subsidence in the San Joaquin Valley has occurred mainly when compressible clays are dewatered as a result of drawdown in the confined aquifer system beneath the Corcoran Clay to below historical low levels. Long term hydrographs are not available for any of the wells at the Site; however, as discussed in Section 3.4.1 and shown on Figure 3.4.1, several wells with long terms hydrograph data are located in the region south of the Site near the City of Newman (DWR, 2016d). Current groundwater levels in the well with the longest period of record (State Well No. 06S08E29J001M) are approximately 40 feet above their historical low level in October 1952. Conversely, groundwater levels in State Well No.'s 07S08D14D001M and 06S08E34M001M are at their lowest recorded levels; however, water level data are not available for these wells prior to October 1958 and March 1959, respectively, so it is not known whether the current groundwater level elevations at these wells represents the historical low at these locations.

Based on the above, it is possible that drawdown induced by the Project near the Delta-Mendota Canal (3 feet [best case] to 13 feet [worst case] at the end of Phase 3 buildout) could lower groundwater levels to near or below historical low levels. Some subsidence could be induced as a result; however, given the limited amount of drawdown predicted and that only 1 to 2.5 inches of subsidence has been reported near the Site to date, the likelihood of subsidence that substantially interferes with surface land uses and infrastructure is judged to be small. Nevertheless, Mitigation Measure (MM) Water-01 is proposed to monitor for active subsidence and make adjustments to the groundwater extraction program, if needed (see Section 5.6). With implementation of MM Water-01, impacts will be less than significant.

5.4 Chronic Drawdown and Diminution of Supply

Question IX(b): Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Operation of the potable water production wells for the Projects will result in groundwater level drawdown in the confined aquifer in the region around the Site, and will result in interference drawdown to existing supply wells completed in this aquifer. Regional drawdown, if it represents a substantial fraction of the overall available drawdown or groundwater in storage in an aquifer system, can result in less groundwater being available for future supply, insufficient availability of groundwater during dry periods, or a general increase in groundwater supply development costs. Interference drawdown is a more localized effect that can decrease well yield and, in extreme cases, cause wells to go dry. The wells potentially most vulnerable to interference drawdown are domestic wells, which are generally shallower than municipal, industrial and irrigation wells that are completed to greater depths and have greater pumping capacities. In the Site vicinity, domestic wells tend to be completed in the shallow aquifer; whereas, higher capacity production wells are completed in either the shallow or the confined aquifer (or both).

The worst case predicted Project-induced drawdown in the confined aquifer at full build-out is approximately 13 feet. This is less than 10 percent of the available drawdown above the top of the confined aquifer, and is unlikely to result in a significant depletion in regional supplies. For perspective, urban and agricultural groundwater extraction was estimated to be 508,000 AFY for the DMGS (DWR, 2006). An operational yield study by the City of Patterson estimated that the city could pump up to 12,000 AFY without significantly impacting the use of groundwater resources in the area surrounding Patterson's sphere of influence (RMC, 2016). The City of Newman pumped approximately 4,200 acre-feet of water in 2012 (KDSA, 2013). A drawdown of less than 20 feet would not be expected to result in a significant diminution in the yield in a production well, as it typically represents less than 10 percent of the available drawdown. Drawdown in the shallow aquifer from pumping in the confined aquifer is expected to be negligible. The Project will not result in any net increase in groundwater demand from the shallow aquifer; however, if shallow Project wells located near the Site boundary are pumped excessively, nearby existing off-site domestic wells could experience drawdown in excess of 5 feet, which could potentially result in a significant diminution in yield in a very shallow well. MM Water-02 is proposed to place new shallow wells at least 250 feet from the nearest Site boundary. In addition, in order to prevent potential adverse effects to domestic wells, MM Water-03 is proposed to implement a groundwater level monitoring program and curtail pumping of nearby Project wells if drawdown in excess of 5 feet is observed near an existing domestic well. (See Section 5.6 for a description of these mitigation measures.)

Development of the Project will include retention of stormwater such that off Site stormwater flows do not increase above pre-development flows. The majority of this retention will occur as a result of water infiltration in the retention basins to be constructed on the northeast side of the CLIBP. In addition, the Project will require implementation of LID performance standards for stormwater capture and recharge at each developed parcel in order to maintain the existing groundwater balance in the shallow aquifer.

Based on the above information, with implementation of MM Water-02 and MM Water-03, Project impacts to groundwater supplies, aquifer volume, and lowering of the groundwater table will be less than significant.

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

Predictive modeling indicates that drawdown associated with Project pumping from the confined aquifer will contribute incrementally to the cones of depression observed to the northwest and south of the Site. The Project-related drawdown at the off-Site cones of depression is predicted to range from less than 1 foot (best case) to 6 feet (worst case) at completion of Phase 3 buildout. These cones of depression appear to be associated with increased extraction during recent drought conditions and curtailment of surface water deliveries, and have groundwater levels that are up to about 50 to 60 feet lower than the surrounding groundwater levels. Thus, the project would contribute about 1 to 10 percent of the depth of these cones of depression as of the end of 2015. However, long-term well hydrographs indicate that water levels have historically rebounded relatively quickly when stresses are relieved (i.e., when drought conditions end or demand is met by surface water deliveries), so it is likely that these cones of depression will recover at least partly during non-drought conditions. Subsidence and other undesirable results have not been reported in the vicinity of these cones of depression.

Municipal groundwater demand by the City of Patterson is projected to increase from 6,376 AFY in 2020 to 11,801 AFY in 2040 (RMC, 2016). Proportionally similar increases in urban demand may be expected by the City of Newman and the community of Crows Landing, assuming they experience similar urban growth. These increases in urban demand will be offset by decreased agricultural demand as land use is changed from agricultural to urban to accommodate the population growth on which the water demand forecasts are built. In addition, these communities will be required to comply with a GSP adopted under SGMA to assure the sustainable management of local groundwater supplies by 2040. The communities of Patterson and Newman are currently considering becoming Groundwater Sustainability Agencies that will implement and enforce the GSP within their jurisdiction.

Based on these considerations, the groundwater resources impacts associated with the Project will be less than cumulatively considerable.

5.5 Water Supply and Entitlements

Question XVII(d): Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Based on the above analyses, adequate groundwater supplies are available for Project use in the shallow and confined aquifers beneath the Site without causing or contributing to undesirable results as defined in the County Groundwater Ordinance, SGMA, and the California Water Code. As such, the proposed groundwater extraction would comply with these regulations. In addition, the Site is not located in an adjudicated basin, or in a special act district that regulates the extraction of groundwater. The Project would be able to supply groundwater for beneficial use on the properties to be developed in the business park under an appropriative groundwater right. No new entitlements would be required, and the Project would therefore have no impact.

5.6 Proposed Mitigation Measures

This section identifies mitigation measures to reduce potentially significant impacts associated with the Project to less than significant levels.

5.6.1 MM Water-01 – Subsidence Monitoring

The objective of MM Water-01 is to prevent subsidence associated with the Project. The Project shall include installation and semi-annual monitoring of three subsidence monuments at the Site. The exact construction, placement, and monitoring methodology shall be defined in a subsidence monitoring plan to be prepared for County approval before Project implementation. It is advised that one monument be placed near the Delta-Mendota Canal and/or the California Aqueduct, for which subsidence may be of particular concern. The monitoring entity shall report the subsidence monitoring activities and findings semi-annually to Stanislaus County for each year in July and January. If subsidence in excess of 2 inches is measured at a monument, an investigation shall be undertaken to determine the source of the subsidence and whether changes need to be made to the water supply pumping program to arrest further subsidence that could be damaging to infrastructure.

5.6.2 MM Water-02 – Well Setbacks

The objective of MM Water-02 is to prevent interference drawdown to off-Site wells. Any new shallow groundwater extraction well shall be placed at least 250 feet inside of the nearest Site boundary to minimize potential drawdown effects on shallow aquifer wells located on nearby properties. A well permit application shall be prepared by the applicant for County approval to identify the new well(s) purpose, location(s), and construction details before the wells are constructed.

5.6.3 MM Water-03 – Groundwater Level Monitoring

The objective of MM Water-03 is to assess and verify the amount of drawdown induced by Project pumping, and to prevent potential interference drawdown to shallow off-Site wells that could damage the wells or significantly decrease their yield. A groundwater monitoring plan that outlines the monitoring wells network and procedures for the groundwater level monitoring program shall be prepared by the applicant for County approval before Project implementation. Groundwater levels shall be measured monthly to the nearest 0.1 foot bgs in the shallow and confined aquifers at the locations identified in the groundwater monitoring plan, and the length of time in days since the well was last operated shall also be noted. Groundwater level monitoring shall commence at least one prior to Project implementation to establish Site baseline conditions. The extent and frequency of the monitoring program shall be evaluated every five years. If Project-induced drawdown is observed in the shallow aquifer near an existing off-Site domestic well, groundwater extraction from the shallow Project well(s) located closest to the potentially-effected off site well shall be curtailed and moved to more distant wells until groundwater levels recover and Project-induced drawdown is maintained at less than 5 feet. If Project-induced drawdown in the confined aquifer measured during Phase 1 of Project exceeds the worst case predicted drawdown, a revised drawdown analysis shall be prepared, and a pumping plan shall be developed for implementation during Phase 2 and Phase 3 of the Project that prevents groundwater levels from falling below the maximum predicted worst case drawdowns at the end of Phase 3. The monitoring entity shall report the groundwater monitoring activities, findings and any corrective actions taken to Stanislaus County for each year by January 31 of the following year.

5.6.4 MM Water-04 – Recharge Enhancement Plan

The objective of MM Water-04 is to prepare a plan that describes how the Project will enhance groundwater recharge, such that any increase in Project groundwater demand on the shallow aquifer will be fully offset. The plan shall be prepared by the applicant for County approval before Project implementation. After County approval, the plan shall be implemented, including submittal of annual reports to the County by January 31 of the following year that document the amount of groundwater extracted from the shallow aquifer and the amount of recharge achieved. The plan must account for and offset any increase in the net groundwater demand, including increases resulting from development of the Project non-potable water supply and cessation of agricultural pumping and irrigation. The enhanced recharge is expected to be derived from recharge of water in the Project stormwater retention/detention basin, implementation of LID design standards for developed of parcels in the CLIBP that increase stormwater retention and recharge, and decreased non-potable water demand through the use of xeriscape landscape designs. The plan shall include design details and describe maintenance activities, and shall include supporting calculations or modeling to demonstrate that its implementation will result in sufficient recharge.

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APPENDIX A

EVALUATION OF POTENTIAL STORMWATER CAPTURE EFFICIENCY FROM LOW IMPACT DEVELOPMENT STANDARDS

Appendix A: Evaluation of Potential Stormwater Capture Efficiency from Low Impact Development Standards

A screening level desktop study was performed to evaluate potential stormwater capture efficiency from Low Impact Development (LID) standards using the U.S. Environmental Protection Agency's (EPA) National Stormwater Calculator (SWC) software[1]. The study was performed as a superposition model to evaluate potential increases in capture and infiltration of surface runoff with LID elements compared with a baseline condition (buildout of the Project with no LID elements, but with required stormwater retention using a retention pond in the northeast portion of the Site). Attachment A-1 shows the SWC summary reports for both the baseline and LID implementation conditions. The basis for key assumptions and inputs are summarized below:

- The calculated storm water capture applies to additional capture that may be achieved at individual development sites through the implementation of LID elements, such as retention ponds, permeable pavements, street planters, vegetated swales, and disconnection. It is assumed that the stormwater retention basin to be constructed in the northeast portion of the Site will have sufficient infiltration capacity to maintain pre-development recharge rates.
- The site area was defined as 1 acre so that runoff calculations could be scaled appropriately based on the size of development by Project phase.
- The soil was assigned "moderately high" runoff potential (clay loam type) based on soil survey data accessed by the SWC.
- The soil was assigned a drainage rate of 0.6 feet per day based on the mean saturated hydraulic conductivity at the Site[2].
- The topography was assigned a flat (2%) slope.
- Precipitation was assigned as 11.53 inches per year based on average rainfall data at Newman from 1970 to 2006 (as accessed by the SWC).
- Evaporation was assigned as 0.22 inches per day based on data at Newman from 1970 to 2006 (as accessed by the SWC).
- The SWC default climate change scenario was applied for the near term scenario (2020 through 2049).
- Land cover (at buildout) was estimated to be 75% impervious surface based on visual review of typical recent commercial projects in the County, with the remaining 25% assigned as "lawn' to simulate landscaping
- Conceptual LID elements[3] were assigned as follows:

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[1] EPA, 2016. National Stormwater Calculator Desktop Application. Version 1.1.0.2.

[2] University of California Davis and U.S. Department of Agriculture Natural Resources Conservation Service, 2016. California Soil Properties Soil Properties App. http://casoilresource.lawr.ucdavis.edu/ca-soil-properties/. Accessed July 31.

- The baseline condition did not include any LID elements.
- The LID implementation condition assumed the Project impervious surfaces consisted of: 20% permeable pavement; 10% infiltration basins; 10% disconnection (directing runoff from impervious areas such as roofs or parking lots onto pervious surfaces rather than into storm drains); and 2% street planters.

Based on the inputs described above, the SWC estimated that 2.89 inches (0.24 foot) per year of runoff per acre would be captured for local infiltration with LID implementation compared with the baseline condition with no local LID elements (Project detention basin only). The volume of additional runoff that could be captured with LID implementation at buildout of Phases 1, 2, and 3 is estimated to be 146, 178, and 228 AFY, respectively, as summarized in the table below.

Estimated Additional Annual Surface Runoff Capture Compared with the Baseline (No LID) Condition

Timeframe	Additional Surface Runoff Capture (AFY)
Additional Capture by Buildout Phase	
Phase 1 (810 acres developed)	146
Phase 2 (177 acres developed)	32
Phase 3 (274 acres developed)	49
Cumulative Additional Capture at Phased Buildout	
Phase 1 (810 acres developed)	146
Phase 2 (987 acres developed)	178
Phase 3 (1,261 acres developed)	228

[3] Specific LID elements would be determined during Project design.

National Stormwater Calculator Report

Site Description

Crows Landing Industrial Business Park

Parameter	Current Scenario	Baseline Scenario
Site Area (acres)	1	1
Hydrologic Soil Group	C	C
Hydraulic Conductivity (in/hr)	0.6	0.6
Surface Slope (%)	2	2
Precip. Data Source	NEWMAN	NEWMAN
Evap. Data Source	NEWMAN	NEWMAN
Climate Change Scenario	None	None
% Forest	0	0
% Meadow	0	0
% Lawn	25	25
% Desert	0	0
% Impervious	75	75
Years Analyzed	20	20
Ignore Consecutive Wet Days	False	False
Wet Day Threshold (inches)	0.10	0.10

LID Control	Current Scenario	Baseline Scenario
Disconnection	10 / 100	0
Rain Harvesting	0	0
Rain Gardens	0	0
Green Roofs	0	0
Street Planters	2 / 6	0
Infiltration Basins	10 / 5	0
Porous Pavement	20 / 100	0

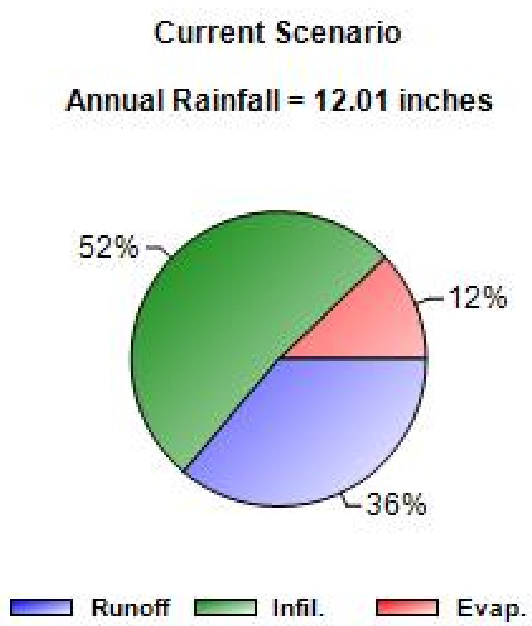
% of impervious area treated / % of treated area used for LID

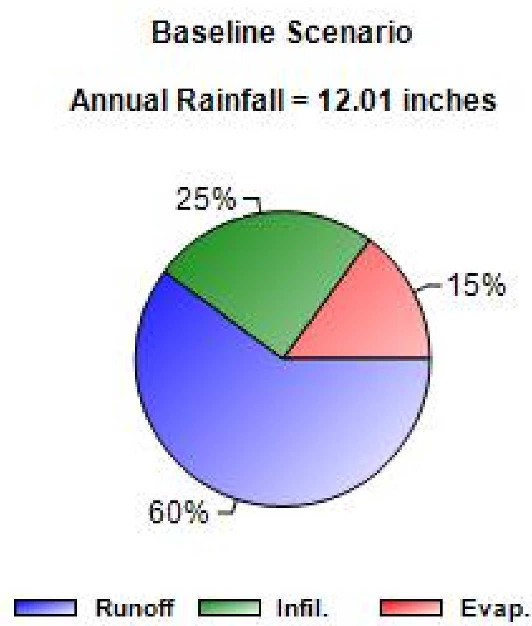
National Stormwater Calculator Report

Summary Results

Crows Landing Industrial Business Park

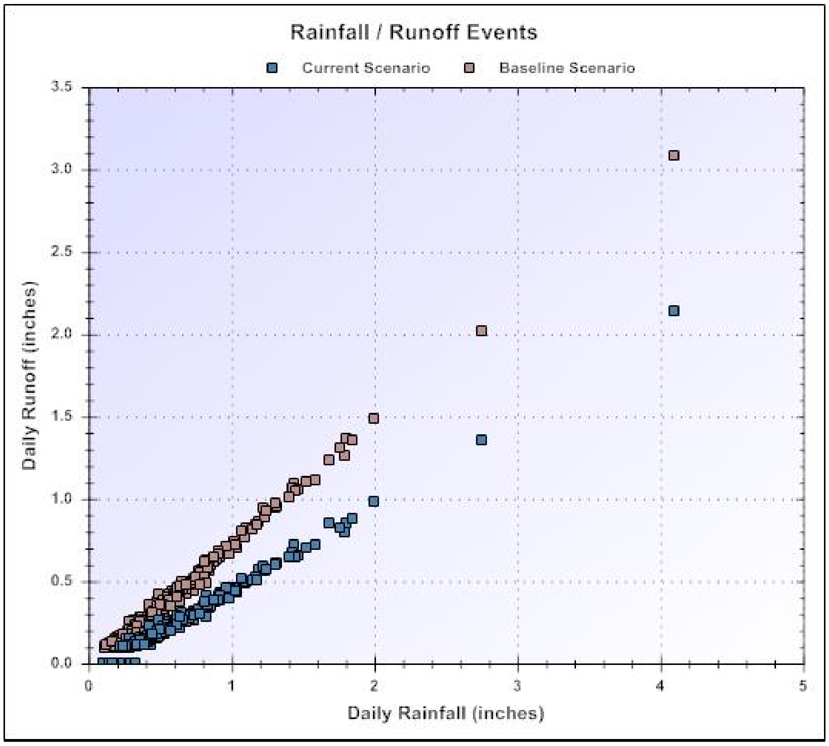
Statistic	Current Scenario	Baseline Scenario
Average Annual Rainfall (inches)	12.01	12.01
Average Annual Runoff (inches)	4.35	7.24
Days per Year With Rainfall	29.68	29.63
Days per Year with Runoff	13.79	19.64
Percent of Wet Days Retained	53.54	33.73
Smallest Rainfall w/ Runoff (inches)	0.22	0.10
Largest Rainfall w/o Runoff (inches)	0.33	0.23
Max. Rainfall Retained (inches)	1.96	1.02

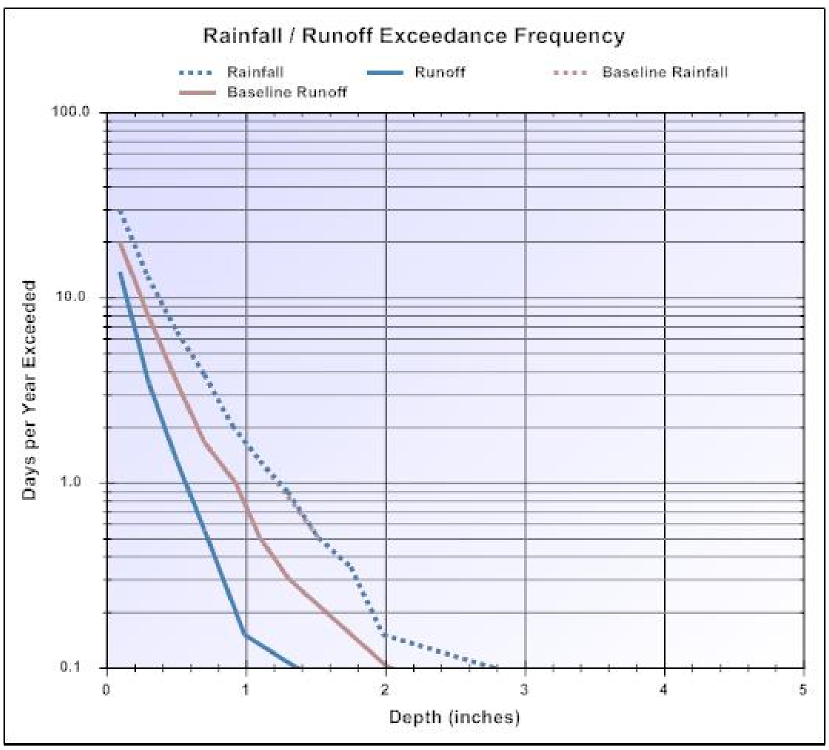




National Stormwater Calculator Report

Crows Landing Industrial Business Park





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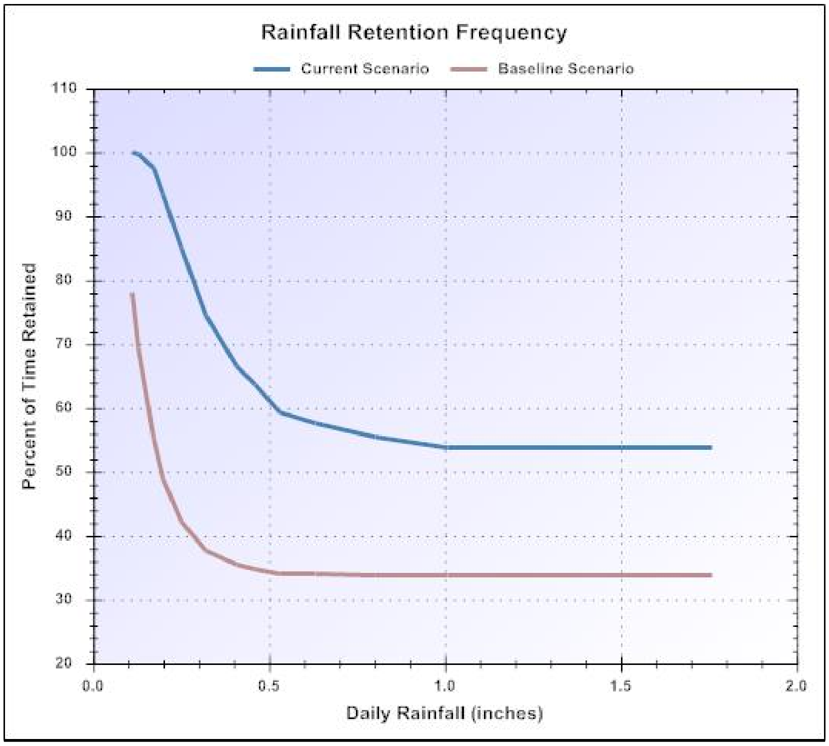
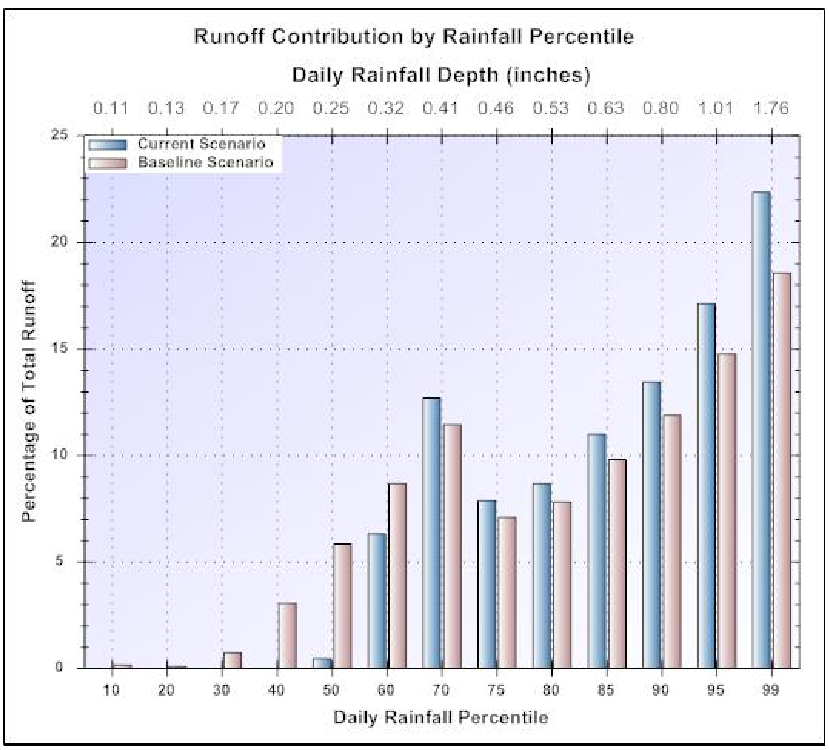
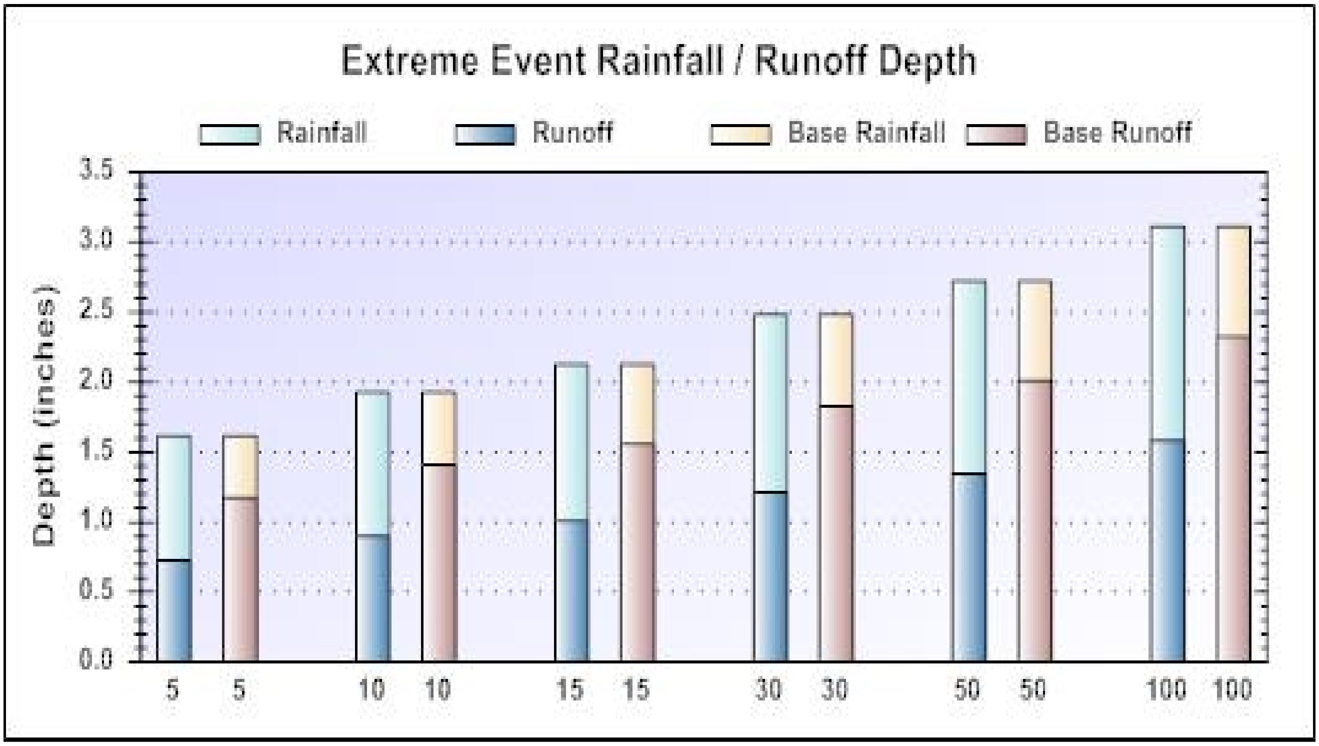
Crows Landing Industrial Business Park

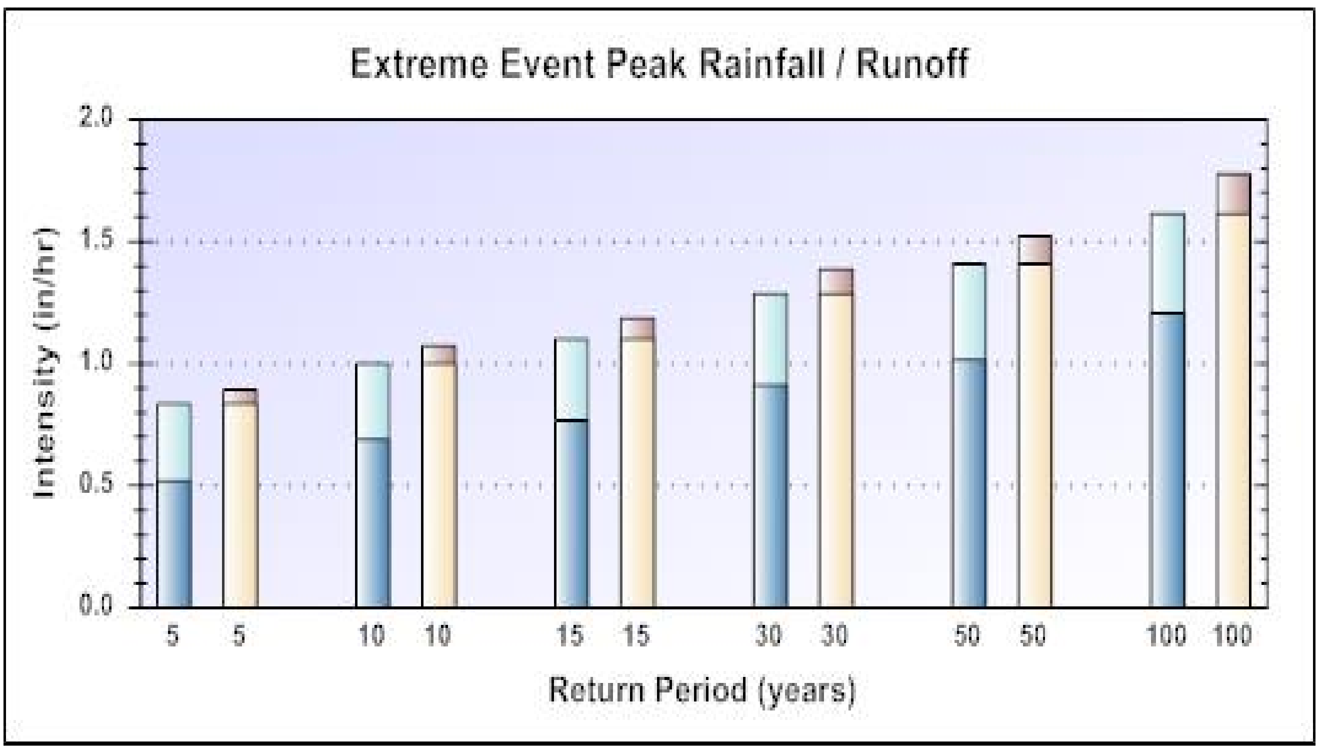




National Stormwater Calculator Report

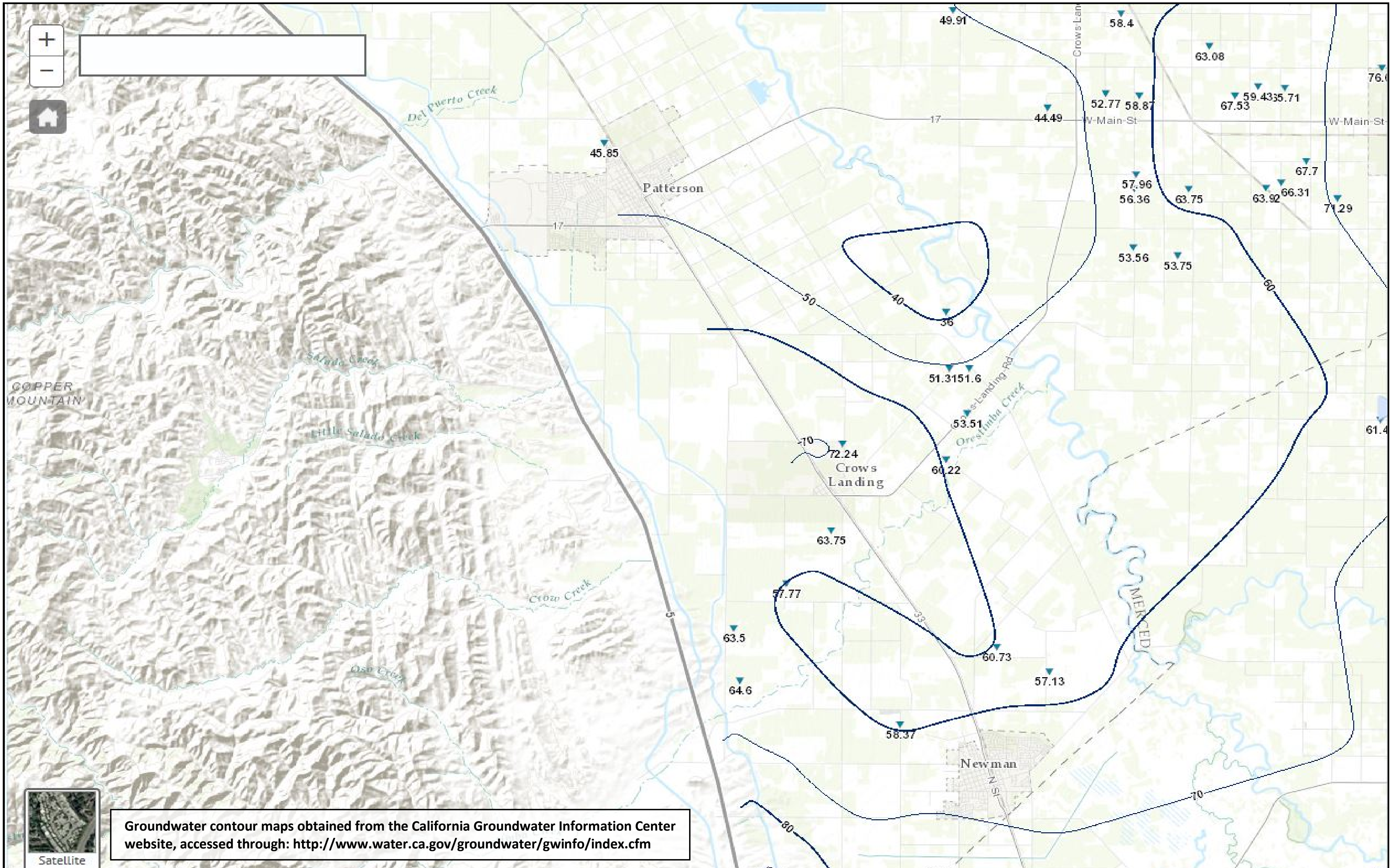
Crows Landing Industrial Business Park





APPENDIX B

GROUNDWATER ELEVATION CONTOUR MAPS FROM THE DWR GROUNDWATER INFORMATION CENTER INTERACTIVE MAPPING APPLICATION



JACOBSON | JAMES & associates, inc	Crows Landing Industrial Business Park Stanislaus County, California				FIGURE B-1 **Groundwater Elevation Map for the Confined Aquifer, Spring 2011**
	PROJECT NO.	DATE	DRAWN BY	APPR. BY	
	STANCO.001	7/28/16	TC	JB	

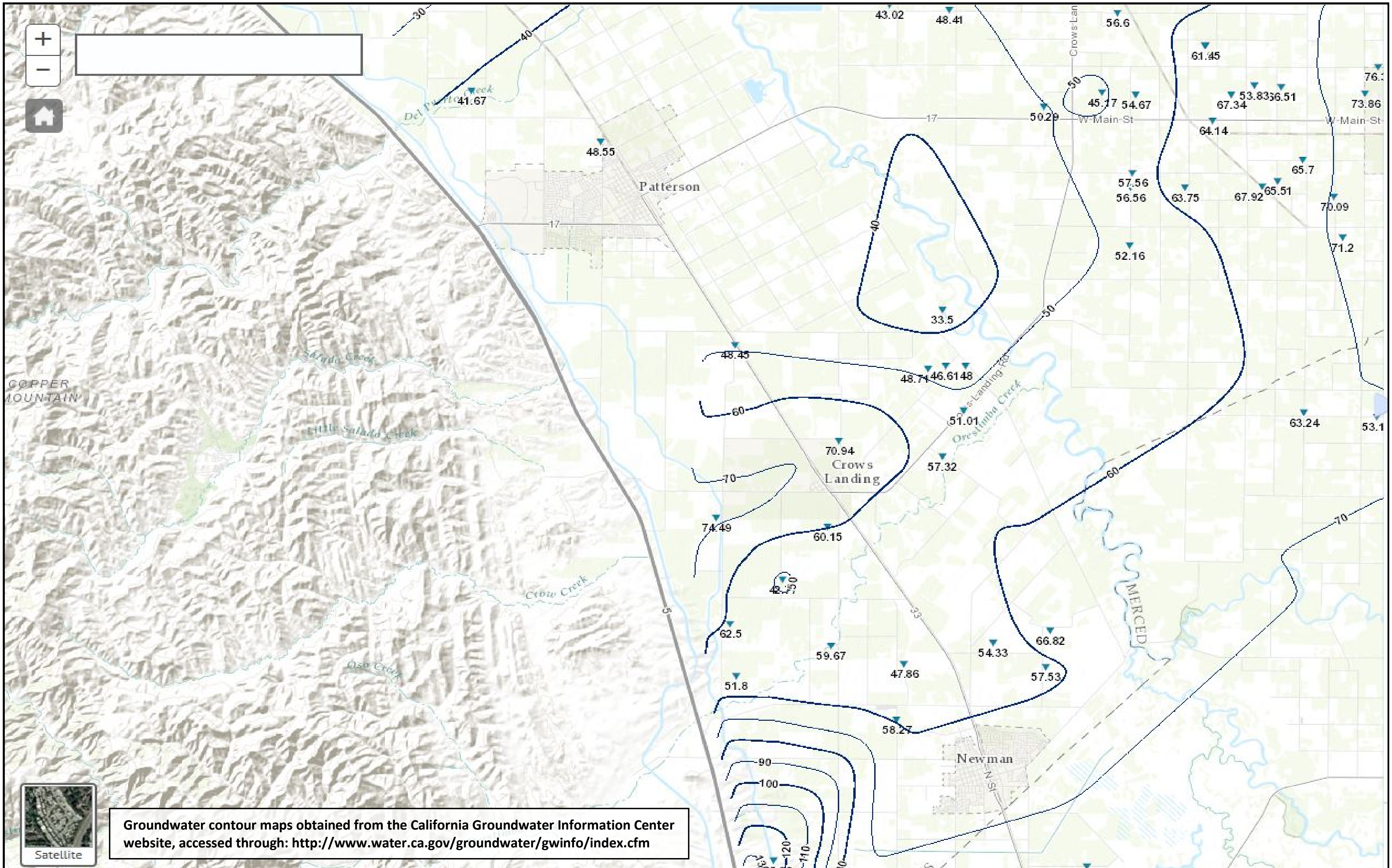


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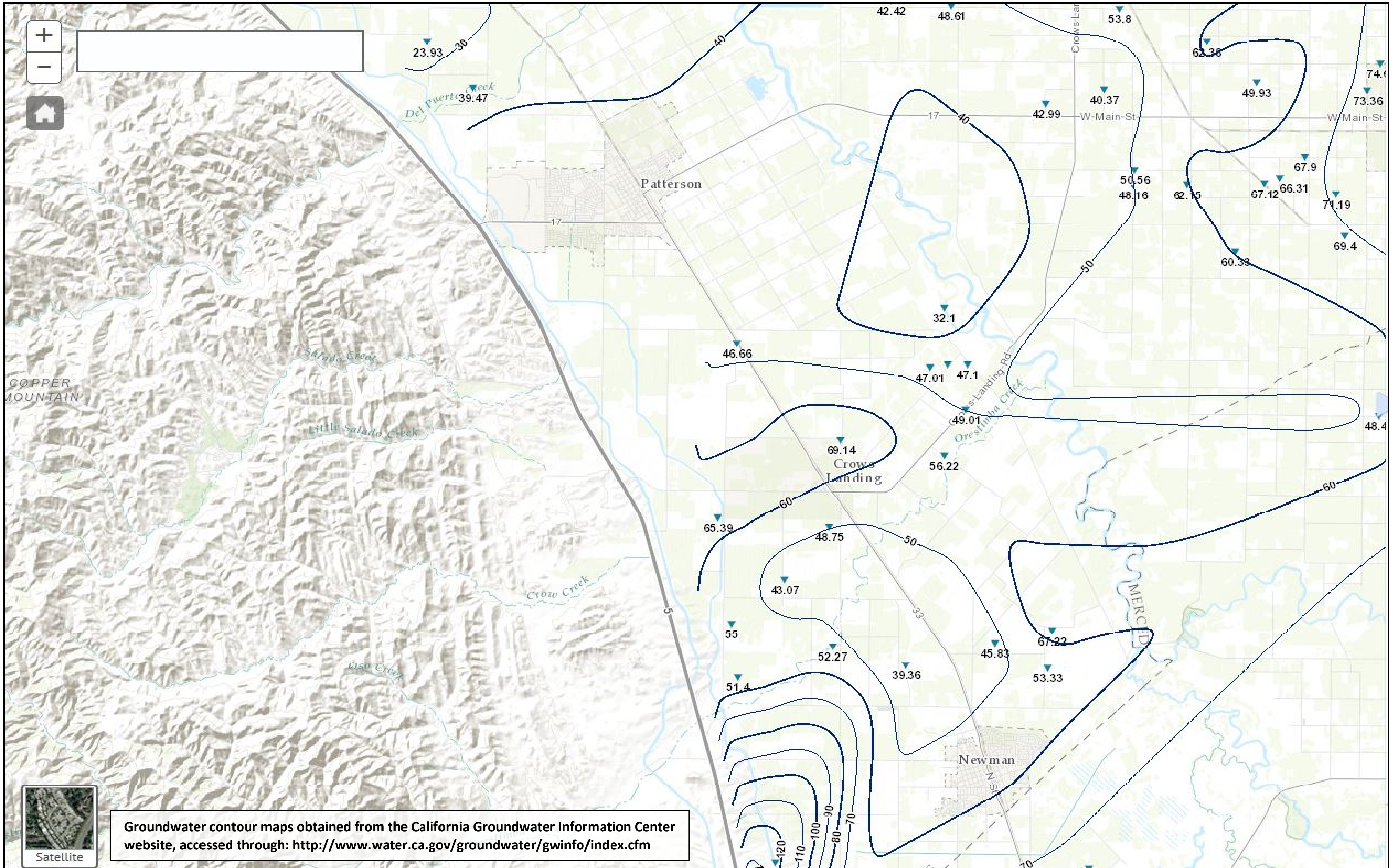
FIGURE B-2

Groundwater Elevation Map for the Confined Aquifer, Spring 2012



Groundwater contour maps obtained from the California Groundwater Information Center website, accessed through: http://www.water.ca.gov/groundwater/gwinfo/index.cfm

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FIGURE B-3

Groundwater Elevation Map for the Confined Aquifer, Spring 2013

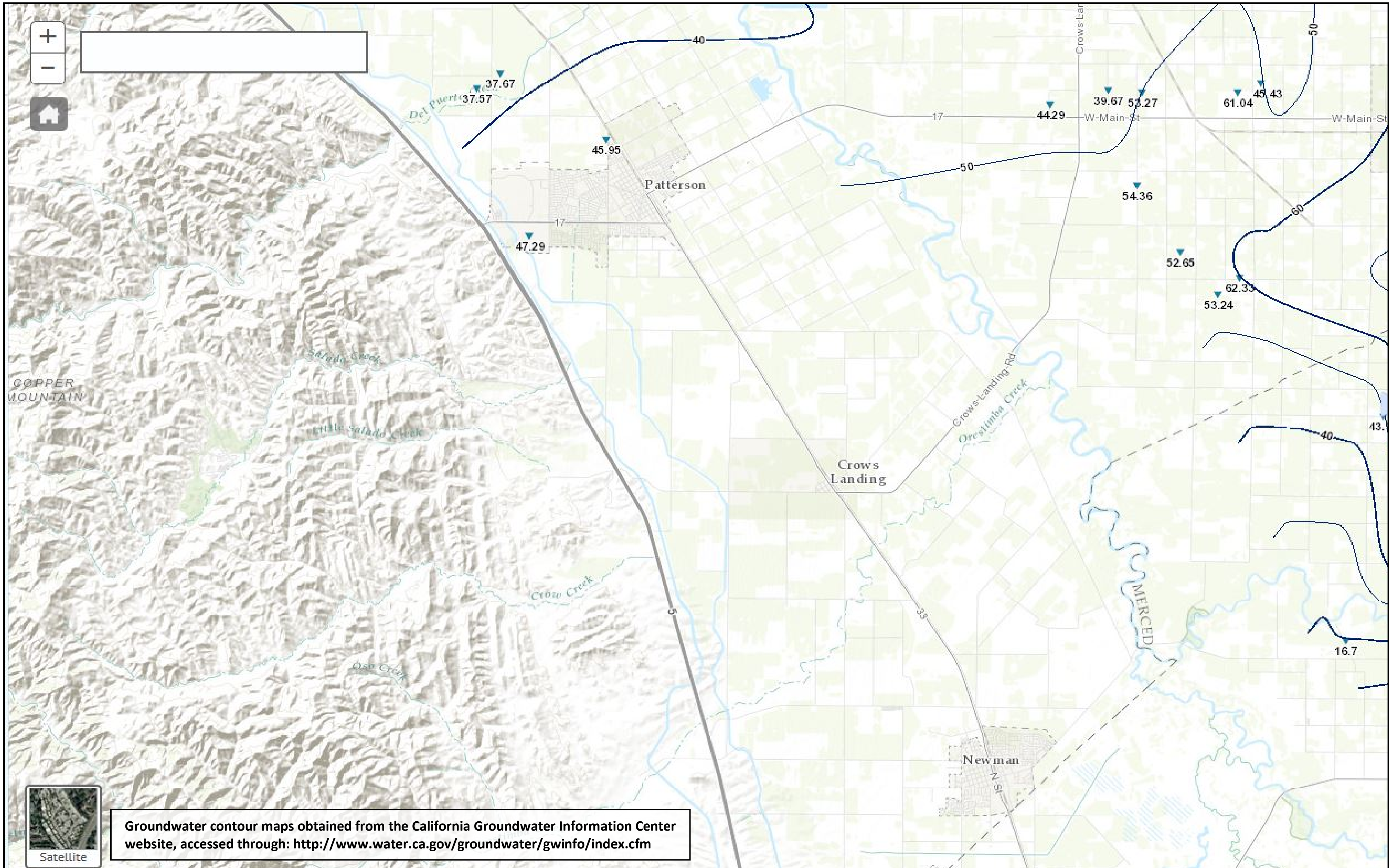

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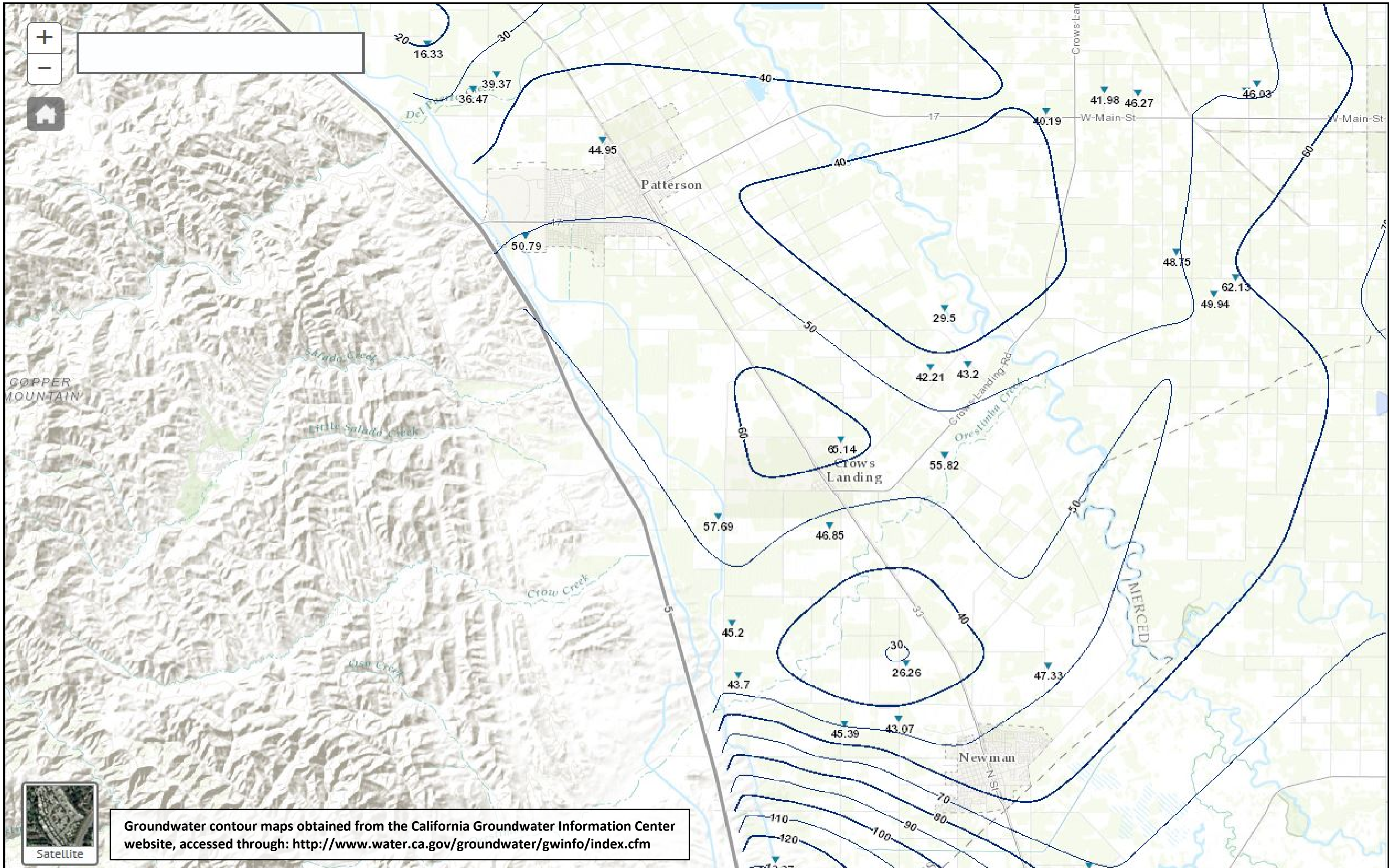
FIGURE B-4

Groundwater Elevation Map for the Confined Aquifer, Fall 2013



Groundwater contour maps obtained from the California Groundwater Information Center website, accessed through: http://www.water.ca.gov/groundwater/gwinfo/index.cfm

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FIGURE B-5

Groundwater Elevation Map for the Confined Aquifer, Spring 2014

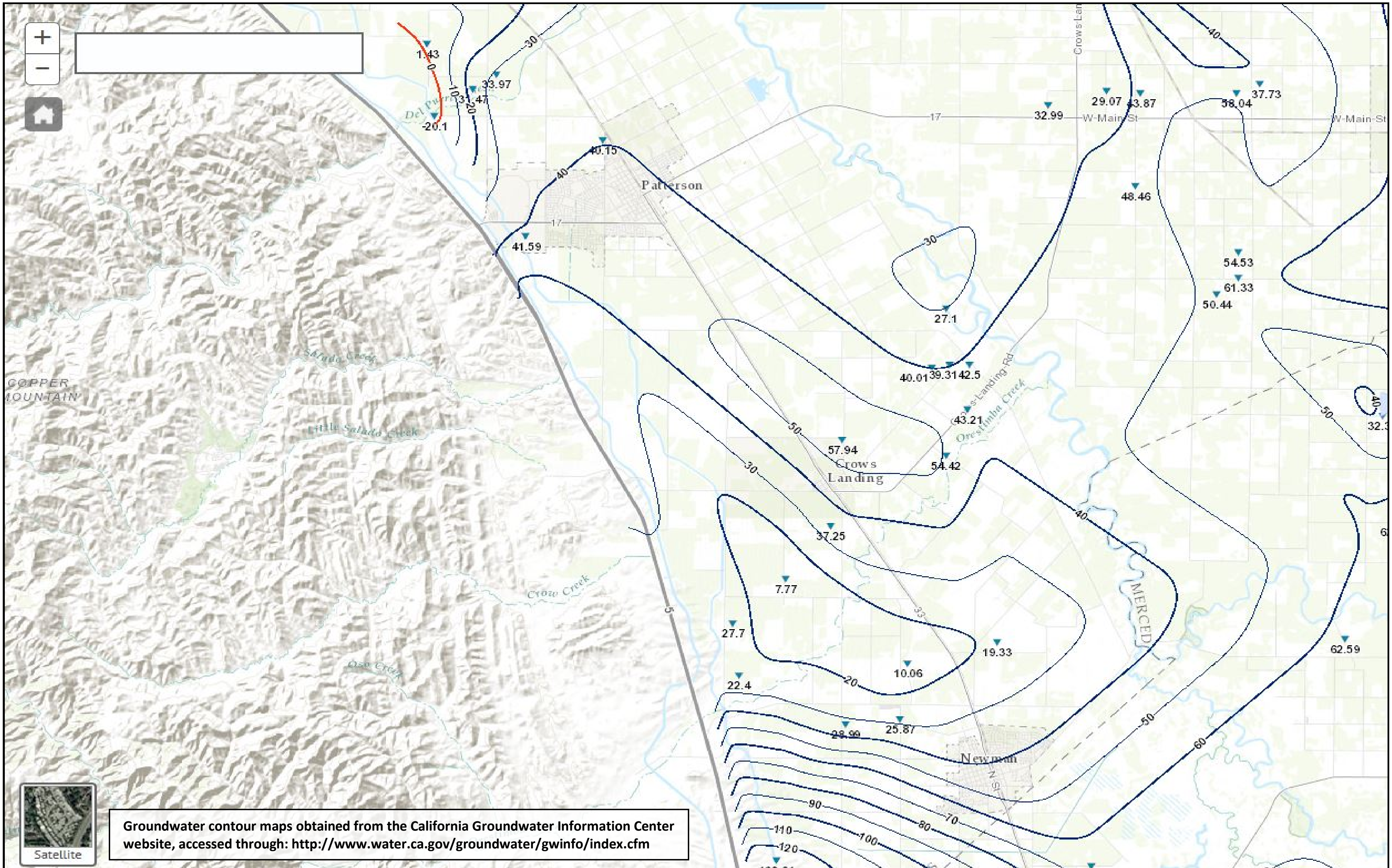

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FIGURE B-6

Groundwater Elevation Map for the Confined Aquifer, Fall 2014

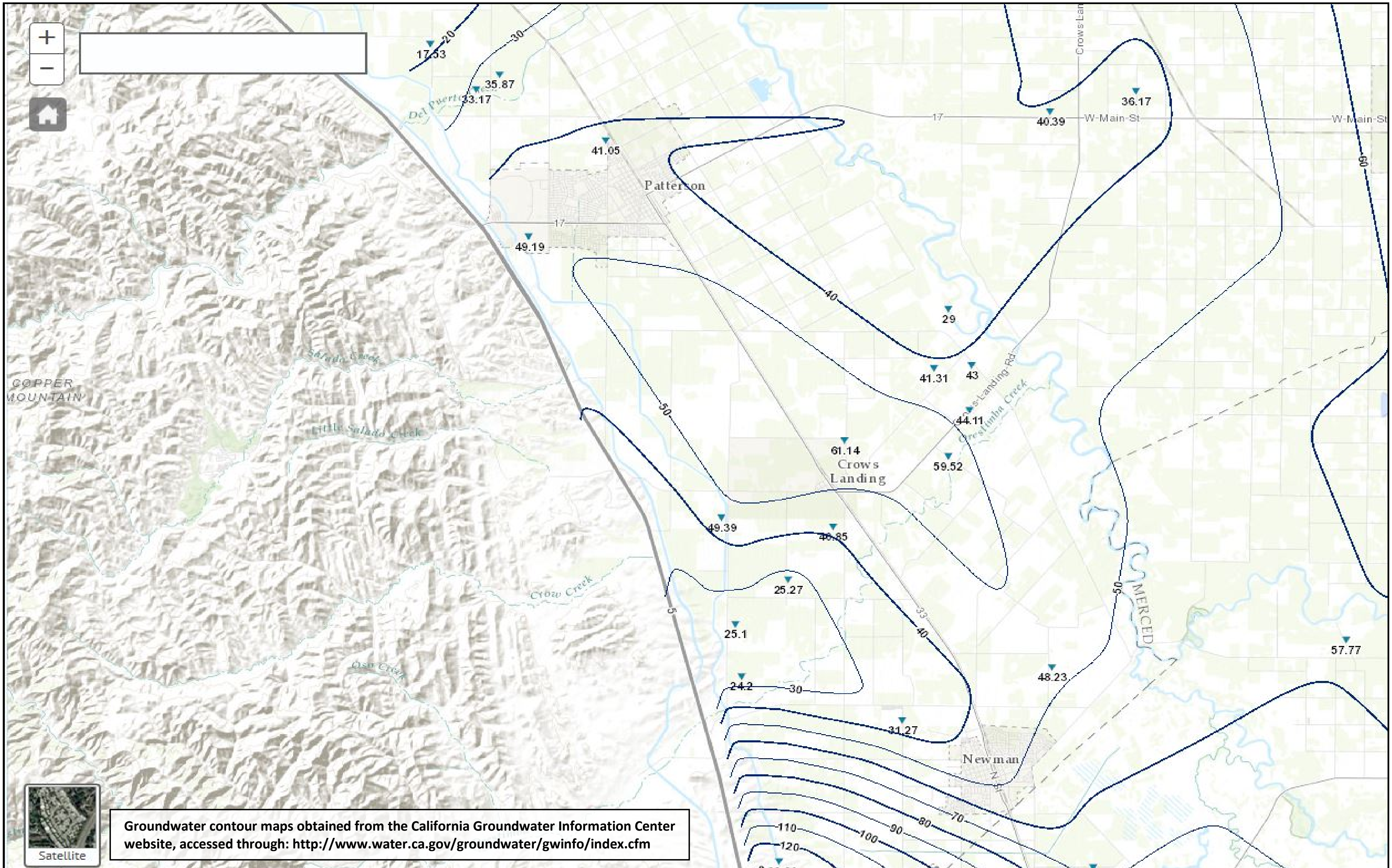

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FIGURE B-7

Groundwater Elevation Map for the Confined Aquifer, Spring 2015

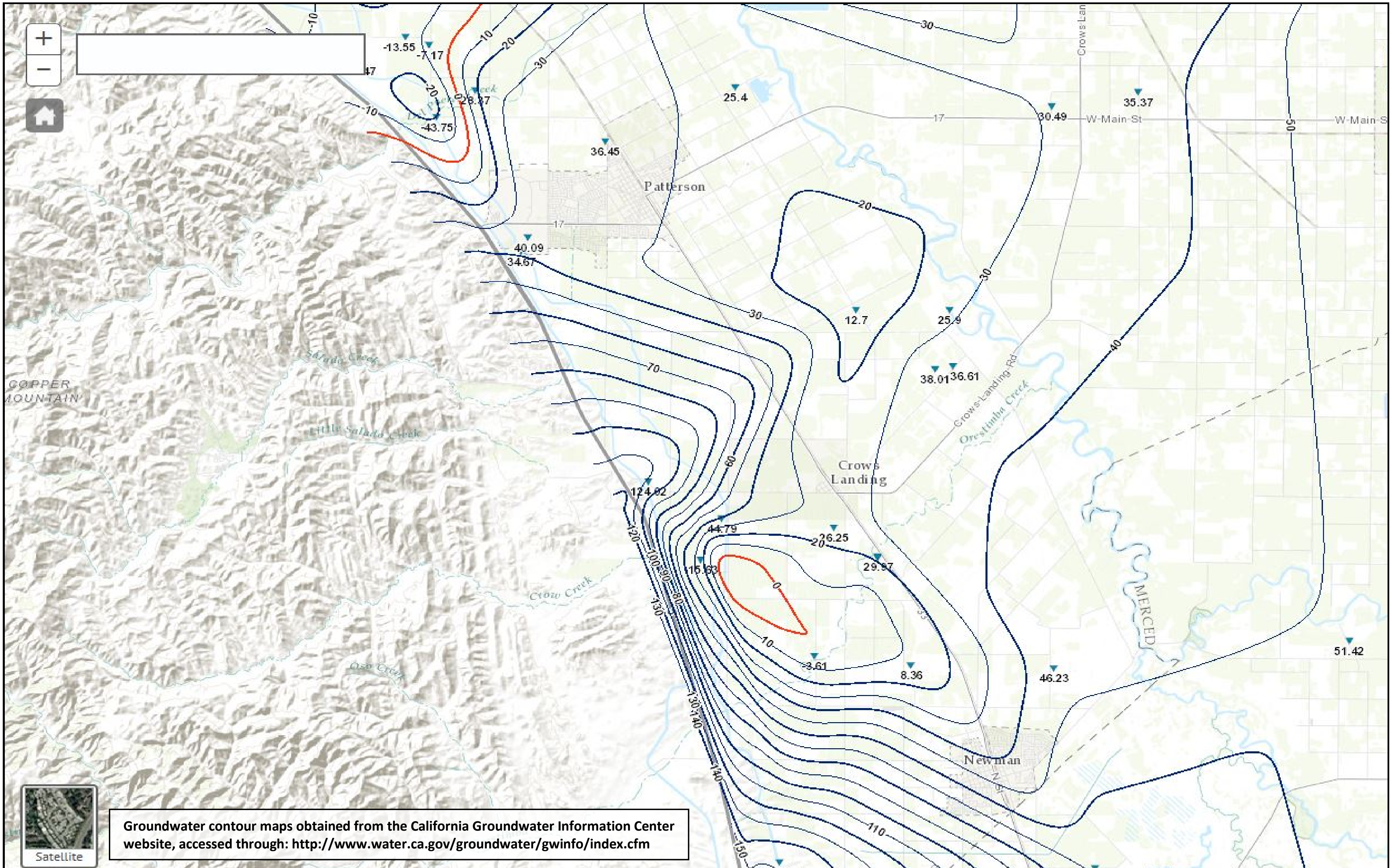

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FIGURE B-8

Groundwater Elevation Map for the Confined Aquifer, Fall 2015

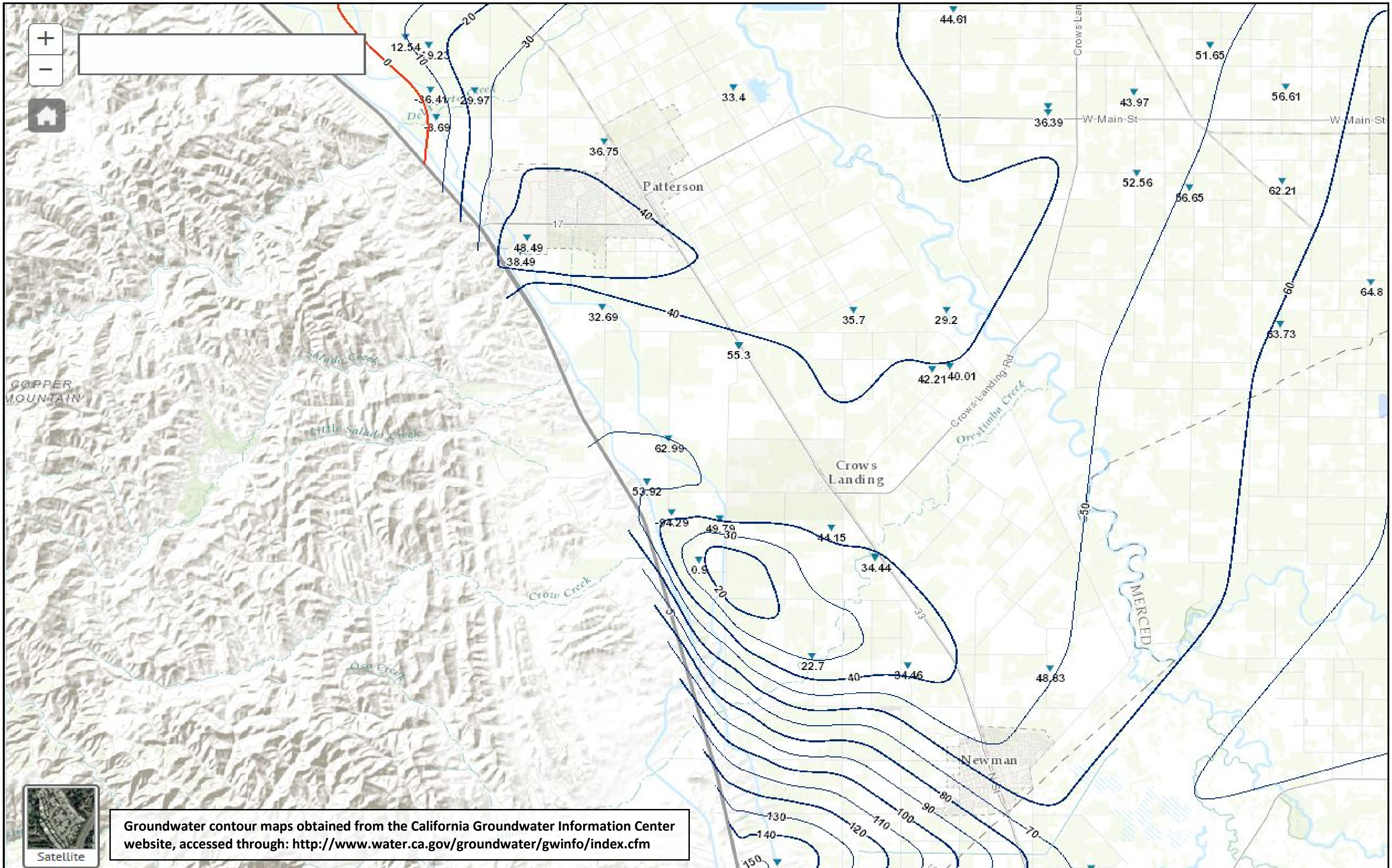

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FIGURE B-9

Groundwater Elevation Map for the Confined Aquifer, Spring 2016