Carbon TerraVault III
Class VI Permit Application
Narrative Report

Submitted to:

U.S. Environmental Protection Agency Region 9
San Francisco, CA

Prepared by:

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ATTACHMENT A: NARRATIVE REPORT
[40 CFR 146.82(a)]
CTV III

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Document Version History

Version	Revision Date	File Name	Description of Change
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2	8/4/2022	Att A - Narrative_CTV III V2	
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7	8/20/2025	Att A – CTV III Narrative_V7_RtC	Response to May 19, 2025 EPA Comments

1. Project Background and Contact Information

Carbon TerraVault Holdings LLC (CTV), a wholly owned subsidiary of California Resources Corporation (CRC), proposes to construct and operate six carbon dioxide (CO_2) geologic sequestration wells at CTV III located in San Joaquin County, California. This application was prepared in accordance with the U.S. Environmental Protection Agency's (EPA's) Class VI, in Title 40 of the Code of Federal Regulations (40 CFR 146.81) under the Safe Drinking Water Act (SDWA). CTV is not requesting an injection depth waiver or aquifer exemption expansion.

CTV will obtain the required authorizations from applicable local and state agencies, including the associated environmental review process under the California Environmental Quality Act. **Appendix A1** outlines potential local, state and federal permits and authorizations. Federal act considerations and additional consultation, which includes the Endangered Species Act, the National Historic Preservation Act and consultations with Tribes in the Area of Review (AoR), are presented in the Federal Acts and Consultation attachment.

CTV forecasts the potential CO_2 stored in the Mokelumne River Formation at an average rate of 2.5 million tonnes annually for 28 years. CTV estimates storage for the project area is up to 70.7 million metric tons (MMT) of CO_2.

CTV is planning to construct a carbon capture and sequestration "hub" project (i.e., a project that collects CO2 from multiple sources over time and injects the CO2 stream(s) via Class VI Underground Injection Control (UIC)-permitted injection well(s)). Therefore, CTV is currently considering multiple sources of anthropogenic CO2 for the project. Potential sources include capture from existing and potential future industrial sources pre and post combustion, in the Sacramento Valley area, as well as Direct Air Capture (DAC).

The Carbon TerraVault III (CTV III) storage site is located in the Sacramento Valley, 15 miles southeast of the Rio Vista Field near Stockton, California (**Figure A-1**) within the southern Sacramento Basin. The project will consist of six injectors, surface facilities, and monitoring wells. This supporting documentation applies to the six injection wells.

CTV will actively communicate project details and submitted regulatory documents to County and State agencies:

- Geologic Energy Management Division (CalGEM)
  Central District
  Chris Jones: (661) 401-0246
- CA Assembly District 13
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  District 3 Supervisor –Tom Patti
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  Stockton, CA 95202
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2. Site Characterization

2.1 Regional Geology, Hydrogeology, and Local Structural Geology [40 CFR 146.82(a)(3)(vi)]

2.1.1 Geologic History

The CTV III storage site is located 15 miles southeast of major gas field Rio Vista. Two smaller gas fields lie closer to the project area: McDonald Island to the north and the Union Island Gas Field to the east. The McDonald Island Gas Field was discovered first in June 1936 and the Union Island Gas Field was later discovered in 1972, both by Union Oil Company of California. The McDonald Island Field produced 184 billion cubic feet of gas (BCFG) from the Mokelumne River Formation (Downey, 2010). Although located in a region of prolific gas production, Victoria Island only contains a few exploration type wells and no hydrocarbon accumulations have been discovered in the project area (**Figure A-1**). The Mokelumne River Formation is the target reservoir.

2.1.2 Site Geology Overview

The CTV III project area lies within the Sacramento Basin in northern California (**Figure A-2**). The Sacramento Basin is the northern, asymmetric sub-basin of the larger Great Valley Forearc. This portion of the basin, which contains a steep western flank and a broad, shallow eastern flank, spans approximately 240 miles in length and 60 miles wide (Magoon, 1995).

Basin Structure

The Great Valley was developed during mid to late Mesozoic time. The advent of this development occurred under convergent-margin conditions via eastward, Farallon Plate subduction, of oceanic crust beneath the western edge of North America (Beyer, 1988). The convergent, continental margin that characterized central California during the Late Jurassic through Oligocene time was later replaced by a transform-margin tectonic system. This occurred as a result of the northward migration of the Mendocino Triple Junction (from Baja California to its present location off the coast of Oregon), located along California's coast (**Figure A-3**). Following this migrational event was the progressive cessation of both subduction and arc volcanism as the progradation of a transform fault system moved in as the primary tectonic environment (Graham, 1984). The major current day fault, the San Andreas, intersects most of the Franciscan subduction complex, which consists of the exterior region of the extinct convergent-margin system (Graham, 1984).

Basin Stratigraphy

The structural trough that developed subsequent to these tectonic events, which became named the Great Valley, became a depocenter for eroded sediment, and thereby currently contains a thick infilled sequence of sedimentary rocks. These sedimentary formations range in age from Jurassic to Holocene. The first deposits occurred as an ancient seaway and, through time, were built up by the erosion of the surrounding structures. The basin is constrained on the west by the Coast Range Thrust, on the north by the Klamath Mountains, on the east by the Cascade Range and Sierra Nevada, and the south by the Stockton Arch Fault (**Figure A-2**). To the west, the Coastal Range boundary was created by uplifted rocks of the Franciscan Assemblage (**Figure A-4**). The Sierra Nevada, which make up the eastern boundary, are a result of a chain of ancient volcanos.

Basin development is broken out into evolutionary stages at the end of each time-period of the arc-trench system, from Jurassic to Neogene, in **Figure A-5**. As previously stated, sediment infill began as an ancient seaway and was later sourced from the erosion of the surrounding structures. Sedimentary infill consists of Cretaceous-Paleogene fluvial, deltaic, shelf, and slope sediments. Due to the southward tilt of the basin, sedimentation thickens toward the southern end near the Stockton Arch fault which bounds a portion of the CTV III AoR as shown on **Figure A-1**, creating sequestration quality sandstones. The AoR was determined based on the critical pressure front boundary as determined by the methodology described in Section 3 of **Attachment B: AoR and Corrective Action Plan (Attachment B)**.

In the southern Sacramento Basin, the Mokelumne River Formation is a thick-bedded sandstone that creates the principal reservoir facies in the CTV III area. This area is a minor structural trap with a slight dip of about 2.8 degrees to the west, leaving the area mostly flat.

Submarine Canyons

Falling sea levels and tectonics caused the Paleogene Markley, Martinez, and Meganos submarine canyons to form throughout the Sacramento Basin (**Figure A-2**). The erosional events caused by these canyons played a large part in the current distribution and continuity of Upper Cretaceous and early Tertiary formations within the basin (Downey, 2010). The Late

Paleocene/Early Eocene Meganos canyon extends into the northwestern portion of the AoR. Trending in a northeast-southwest direction and cutting deeply into the Mokelumne River Formation sediments this erosional event spans approximately 25 to 30 miles from southern Sacramento County through northwestern San Joaquin County, and then westward into Contra Costa County. This event caused erosional troughs that were later filled in with fine-grained submarine fan deposits and transgressive deep-water shale due to renewed rising sea levels. This infilled sequence can be seen outcropping on the flanks of Mount Diablo, where it has a minimum thickness of 2,200 feet and serves as the primary trapping mechanism for the Brentwood Oil Field (Downey, 2010).

2.1.3 Geological Sequence

Figure A-6 is a schematic representing the local stratigraphy of CTV III, highlighting the area east of the Midland Fault and west of the Stockton Arch fault. The injection zone is shown in red as the Mokelumne River Formation. The six chosen injection wells will inject CO_2 into the Cretaceous-aged Mokelumne River Formation, east of the Meganos Canyon. The average injection depth is approximately -6,975 feet true vertical depth below sea level (TVDSS).

Following its deposition, the Mokelumne River Formation was buried under the Capay Shale, which carries throughout most of its distribution. This formation serves as the upper confining zone for the Mokelumne River reservoir due to its low permeability, thickness, and regional continuity that spans beyond the AoR (**Figure A-7**). Above the Capay Shale are the Domengine Sandstone and Nortonville Shale.

2.2 Maps and Cross Sections of the AoR [40 CFR 146.82(a)(2), 146.82(a)(3)(i)]

As required by 40 CFR 146.82(a)(2), **Figure A-8** is a summary map of the oil and gas wells, water wells, State- or EPA-approved subsurface cleanup sites, and surface features in the project area and the AoR. AoR delineation is presented in Section 3 of **Attachment B**. **Tables A-1**, **A-2**, **and A-3** list the oil and gas wells, California Department of Water Resources (DWR) Well Completion Report (WCR) water wells, and California State Water Resources Control Board Groundwater Ambient Monitoring Assessment Program (GAMA) water wells within the project AoR, respectively. WCR wells with location data are indexed on **Figure A-8**.

2.2.1 Data

To date, 57 wells have been drilled to various depths within the project AoR. An extensive database of wells in this field, seismic coverage, core and reservoir performance data such as production and pressure give an adequate description of the reservoir (**Figure A-9**).

Well data are used in conjunction with three-dimensional (3D) and two-dimensional (2D) seismic to define the structure and stratigraphy of the injection zone and confining layers (**Figure A-10**). **Figure A-11** shows outlines of the seismic data used and the area for the structural framework that was built from these seismic surveys. The 3D data in this area were merged using industry standard pre-stack time migration in 2013, allowing for a seamless interpretation across the seismic datasets. The 2D data used for this model were tied to this 3D merge in both phase and time to create a standardized datum for mapping purposes. The following layers were mapped across the 2D and 3D data:

- A shallow marker to aid in controlling the structure of the velocity field
- The approximate base of the Valley Springs Formation, which is unconformable with the Eocene strata below
- Domengine
- Mokelumne River
- H&T Shale
- Winters
- Forbes

The top of the Cretaceous Forbes Formation was used as the base of this structural model due to the depth and imaging of Basement not being sufficient to create a reliable and accurate surface. Interpretation of these layers began with a series of well ties at well locations shown in **Figure A-11**. These well ties create an accurate relationship between well data, which are in depth, and the seismic data, which are in time. The layers listed above were then mapped in time and gridded on a 550- by 550-foot cell basis. Alongside this mapping was the interpretation of any faulting in the area, which is discussed further in the Faults and Fracture section of this document.

The gridded time maps and a subset of the highest quality well ties and associated velocity data are then used to create a 3D velocity model. This model is guided between well control by the time horizons and is iterated to create an accurate and smooth function. The velocity model is used to convert both the gridded time horizons and interpreted faults into the depth domain. The result is a series of depth grids of the layers listed above which are then used in the next step of this process.

The depth horizons are the basis of a framework which uses conformance relationships to create a series of depth grids that are controlled by formation well tops picked on well logs. The grids are used as structural control between these well tops to incorporate the detailed mapping of the seismic data. These grids incorporate the thickness of zones from well control and the formation strike, dip, and any fault offset from the seismic interpretation. The framework is set up to create the following depth grids for input in to the geologic and plume growth models:

- Nortonville Shale
- Domengine
- Domengine Top Sand
- Capay Shale
- Mokelumne River Formation
- H&T Shale

- Winters
- Delta Shale
- Delta Shale Base

2.2.2 Site Stratigraphy

Major stratigraphic intervals within the field, from oldest to youngest, include the H&T Shale (L. Cretaceous), Mokelumne River Formation (L. Cretaceous-E. Paleocene), Capay Shale (E. Eocene), Domengine Sandstone (L. Eocene), and Nortonville Shale (L. Eocene) (**Figure A-12**). Of these formations, the regional upper seal rock that partitions the reservoir consists of the Capay Shale. Also shown in **Figure A-12** is the basin-wide unconformity separating overlying Paleocene and younger beds from Cretaceous rocks. This unconformity resides above the Mokelumne River Formation at the base of the Capay Shale, creating a seal between reservoir and underground source of drinking water (USDW). During Paleogene time, marine and deltaic deposits continued in the basin until the activity of the Stockton Arch began to separate Sacramento Basin from the San Joaquin basin in late Paleogene time (Downey, 2010).

H&T Shale

The H&T Shale acts as a conformable contact to the Mokelumne River Formation. Moving southwest, the H&T thickens and contains a facies change with the upper marine shale as the Starkey section progressively adds, creating a thicker shale (Downey, 2010).

Mokelumne River Formation

The Mokelumne River Formation sandstones are great reservoir quality sands with trap types that include fault truncations, stratigraphic traps and unconformity traps sealed by intervening shales, as well as overlying Meganos submarine canyon mudstone infill (Downey, 2006). Deposited as a fluvial-deltaic sequence, this sandstone was sourced by the Sierra Nevada terrain to the east and prograded west-southwestward into the forearch basin. This formation truncates to the north by the post-Cretaceous angular unconformity until it pinches out in southern Yolo and Sutter counties (Downey, 2006). These large sands can be locally eroded or completely absent due to the downcutting by the Meganos submarine canyons, which are located along the west side of the AoR. In the northwestern portion of Sacramento County, the sandstone is as shallow as 2,000 feet and deepens to over 10,500 feet moving to south-central Solano County. Thickness in this area ranges from hundreds of feet thick, separated by thin shales, to 2,500 feet thick (Downey, 2010). Within the project AoR, thickness ranges from 368 to 2,995 feet and varies in depth from 3,546 to 7,581 feet true vertical depth (TVD) (**Figure A-13).**

Six injectors were chosen to inject into the Mokelumne River sandstone. Injectors for this project are shown in **Figure A-14**.

Capay Shale (Upper Confining Zone)

The Capay Shale provides upper confinement to the Mokelumne River Formation as it spans across the basin as a major regional flooding surface. This Eocene-aged formation was deposited as a transgressive surface blanketing the shelf with shales. East of the Midland fault zone, the Martinez Shale has been stripped by erosion, and the Mokelumne River Formation is unconformable overlain by the Capay Shale. Due to its low permeability, this formation acts as a seal to the Mokelumne River Formation injection zone and is a vertical barrier to any CO_2, from reaching the USDW, if any migration were to occur.

Domengine Sandstone (Monitoring Zone)

The Domengine Formation is approximately 800 to 1,200 feet thick on the north flank of Mt. Diablo (Nilsen, 1975). Prograding across the Capay Shelf in early-middle Eocene, this formation is characterized by interbedded sandstones, shales, and coals. This sand ranges from medium- to coarse-grained silty mudstone and fine sandstone, and onlaps the Capay Shale. It is separated from the Capay by a regional unconformity that progressively truncates older units until the Domengine rests on Cretaceous rocks, moving west. The Domengine consists of an upper and lower portion. The lower member is made up of fluvial and estuarine sandstones. Regionally the lower member is separated from the upper member by an extensive surface of transgression and change in depositional style. This formation acts as a monitoring zone for injection into the Mokelumne River Formation.

Nortonville Shale

Above the Domengine Sandstone is the Nortonville Shale, which is separated by a widespread surface of transgression. The Nortonville Shale is a mudstone member of the Kreyenhagen Formation. It is approximately 500 feet on the north flank of Mt. Diablo and is considered the upper portion of the Domengine Sandstone (Nilsen, 1975). Overlying the Domengine Sandstone, this shale acts as a seal throughout most of the southern Sacramento and northern San Joaquin Basins.

Marine Strata (Markley to Valley Springs)

The upper Paleogene and Neogene sequence begin with the Valley Springs Formation, which represents fluvial deposits that blanket the entire southern Sacramento Basin. The unconformity at the base of the Valley Springs marks a widespread Oligocene regression and separates the more deformed Mesozoic and lower Paleogene strata below from the less deformed uppermost Paleogene and Neogene strata above. The Upper Markley Formation contains water with total dissolved solids (TDS) concentrations of approximately 3,000 to 10,000 milligrams per liter (mg/L), and is the lowermost USDW in the AoR (**Figure A-12**). The USDWs are discussed in Section 2.7 of this document.

2.2.3 Map of the Area of Review

As required by 40 CFR 146.82(a)(2), **Figure A-15** shows surface bodies of water, surface features, transportation infrastructure, political boundaries, and cities. Major water bodies in the area are Discovery Bay, Clifton Court Forebay, Victoria Canals, Grant Line Canal, and the Indian Slough. The project area is in San Joaquin, Contra Costa, and Alameda Counties. This figure does not show the surface trace of known and suspected faults because there are no known surface faults in the AoR. There are also no known mines or quarries in the AoR. **Figure A-16** indicates the locations of State- or EPA-approved subsurface cleanup sites. This cleanup site information was obtained from the State Water Resources Control Board's GeoTracker database, which contains records for sites that impact, or have the potential to impact, groundwater quality. Water wells within and adjacent to the AoR are discussed in Section 2.7.7 of this document.

2.3 Faults and Fractures [40 CFR 146.82(a)(3)(ii)]

2.3.1 Overview

A combination of 3D and 2D seismic, along with well control and published data, were used to define faulting within the area (**Figure A-11**). The project area is bound on the east, south, and west sides by faulting, with the boundaries to the north and northeast open (**Figure A-17**). There is one normal fault within the CO_2 plume boundary that transects the injection zone.

2.3.2 Fault Sealing

An Allan diagram, shale gouge ratio (SGR), and shale smear factor (SSF) analysis were completed for each fault to demonstrate the sealing nature of the project area faults. Allan diagrams display across fault juxtaposition along a mapped fault plane, SGR is a fault seal algorithm used to estimate the sealing potential of a fault-zone, and SSF calculates the likelihood of intact shale smears within the fault plane (Yielding et al, 2010).

The SGR calculation takes stratigraphic thickness, throw, and clay volume into consideration using the following equation:

$$SGR = \frac{\sum(Vcl \times \Delta z)}{throw} \times 100\% \qquad \text{(Eq-1)}$$

where Vcl is the clay volume content, Δz is the stratigraphic layer thickness, and $throw$ is the offset of the layer of interest. SGR values can vary vertically and laterally along a fault as stratigraphic changes occur (Freeman et al., 1998). SGR values greater than 20 percent imply there is a high chance of fault zone seal (Yielding et al, 2010).

The SSF calculation takes shale layer throw and thickness into consideration using the following equation:

$$SSF = \frac{throw}{thickness} \qquad \text{(Eq-2)}$$

Where $throw$ is the offset of a single shale bed and $thickness$ is the thickness of the shale bed. SSF values can vary laterally along a fault as stratigraphic thickness or changes in offset occur. Small values of SSF, generally less than 4-5, imply a high probability of continuous smear. (Yielding et al, 2010).

Normal Fault within CO_2 Boundary

As discussed in Section 2.2.1, the normal fault within the CO_2 boundary was characterized using 3D seismic data. In the nearby Victoria Islands Farms 1 (04077206780000) well, the thickness of the upper confining zone (Capay Shale) is approximately 220 feet. The geologic model shows an average Capay Shale thickness of 210 feet within the CO_2 plume boundary. The normal fault within this boundary is interpreted as having 100 feet of offset in the uppermost Mokelumne River Formation. This offset is not large enough to completely offset the Capay Shale against another formation. **Figure A-18** shows a schematic cross-section across this fault based upon the seismic interpretation.

An Allan diagram, SGR, and shale smear factor (SSF) analysis were completed to demonstrate the sealing nature of the Capay Shale. The Allan diagram is shown in **Figure A-19a**. The Allan diagram was generated using 7 different cross section locations along the length of the fault, each approximately 0.25 mile from the other. As shown in the figure, the Capay Shale has an overlap ranging from 98 to 198 feet along the length of the fault. This overlap shows there is adequate thickness of the confining zone within the area of the CO_2 plume.

As displayed and mentioned above, the fault does not have a large enough offset to completely offset the Capay against another formation, therefore the SGR only varies vertically and not laterally as only a portion of a single layer has moved past a given reference point. **Figure A-19b** displays an example of the SGR calculation for the top and bottom of the Capay at Cross Section location D-D', which is the same as cross section location A-A' in **Figure A-18**. The stratigraphic thickness and throw values were calculated using the Allan diagram. The Vcl values were averaged from 6 wells within the vicinity of the normal fault; WOODWARD_ISLAND_UNIT_20-1 (040130027400), SALYER_A_1 (040770042300), BORDEN_1 (040770042500), VICTORIA_ISLAND_FARMS_1 (040772067800), TURNER_1 (040770030700), and CALPAK_10-3 (040770030500). The well locations and Vcl values are displayed in **Figures A-19b**. **Figure A-19c** displays an example of the SSF calculation for the Capay Shale at cross section location D-D'. Since the Capay Shale maintains overlap across the length of the normal fault there is only a single SSF value for the Normal fault.

The SGR analysis results in values of 29 percent for the top of Capay Shale and 47 percent for the bottom of Capay Shale. Both of these values are larger than the 20 percent threshold which shows a high likelihood of fault sealing capability. The SSF analysis results in a value of 1 across the length of the fault, which supports a continuous shale smear along the fault. Both SGR and SSF values support that the fault through the Capay Shale is sealing (Yielding et al., 2010).

As discussed in Section 2.4, mineralogy data for the Capay Shale shows the confining zone to be clay rich and therefore should provide a vertical seal to the Mokelumne River Formation within the fault zone. Additionally, site-specific mineralogy data for the Capay Shale will be collected during preoperational testing to confirm the clay rich nature of the zone. Furthermore, the Domengine sands above the Capay Shale will be monitored as part of the monitoring and testing plan.

Midland Fault

The Midland Fault is located in the western portion of the project area and bounds the western portion of the AoR (**Figure A-17**). The Midland Fault is a west-side-down normal fault that strikes northwest and dips towards the west. This fault was active in the late Cretaceous-Eocene time (Unruh et al., 2009). This movement created the Rio Vista sub-basin, which has become a developed natural gas field, approximately 12 to 15 miles north of the CTV III area. At Rio

Vista, there is gas production on either side of the Midland Fault, with the Midland acting as a seal for trapped hydrocarbons in structural closures. On the eastern side of the Midland Fault at Rio Vista, natural gas has been trapped in three-way closures against the fault at two levels within the Mokelumne River Formation. These Mokelumne River Formation sands include the Midland Sand, which had an initial pressure gradient of approximately 0.46 pounds per square inch per foot (psi/ft), and the M-5 Sand with an initial pressure gradient around 0.44 psi/ft, both at 4,500 feet or greater. The deeper Winters Formation produces from both sides of the Midland Fault at Rio Vista, with pressure gradients ranging from 0.49 to 0.53 psi/ft. Unruh et al. (2009) interpret that the southern end of the Midland fault was later reactivated as a reverse fault in the late Cenozoic modern transpressional tectonic setting. The trace of the fault was created using the work of Downey and Clinkenbeard (2010) and confirmed on 2D seismic data licensed by CRC/CTV.

An Allan diagram, SGR, and SSF analysis were completed to demonstrate the sealing nature of the Midland Fault. The Allan diagram is shown in **Figure A-20a**. The Allan diagram displays the fault plane within the 'representative fault surfaces boundary' shown in the figure, and is based on a well cross-section centered on well PAGANO_2-4 (040130022700), where stratigraphic data is considered to be reliable. North of the of the representative Allan diagram, along the Midland Fault, the Mokelumne sands thin due to erosion from the Meganos Canyon (**Figure A-13**). This erosion acts to increase the volume of shale in the area due to shale infill of the canyon, thus increasing the sealing capacity of the Midland Fault north of the Allan Diagram. Structural offset along the fault is expected to be consistent in the area west of the Plume Boundary. This consistent offset is displayed in the Allan diagram (**Figure A-20a)**. The Mokelumne Formation on the hanging wall side of the fault (injection zone) is partially juxtaposed against the H&T Shale on the footwall side of the fault. Since the fault does not have a large enough offset to completely offset the Mokelumne Formation against another formation, the SGR values only vary vertically. **Figure A-20b** displays the SGR calculation for the top and bottom of the Mokelumne Formation (injection zone) using the Δz of the layer that moved past a given point, and the Vcl of the layer to which it is juxtaposed. $throw$ was calculated using the offset for both the top and bottom of the Mokelumne Formation. These stratigraphic thickness and throw values were calculated using the Allan diagram. The Vcl values were averaged from 3 wells; PAGANO_2-4 (040130022700), PERRY_1 (040132002500), and NGC_PHILLIPS_CHRISTENSEN_1 (040132023100). The well locations and Vcl values are displayed in **Figure A-20b**. **Figure A-20c** displays the SSF calculation for the Capay offset which demonstrates the vertical sealing nature of the Midland Fault above the Mokelumne injection zone.

The SGR analysis results in values of 30 percent for the top of the Mokelumne Formation and 43 percent for the bottom of Mokelumne Formation. Both of these values are larger than the 20 percent threshold which shows a high likelihood of fault sealing capability. The SSF analysis results in a value of 2, which supports a continuous shale smear along the fault zone above the Mokelumne injection zone. Both the SGR and SSF values, along with the sealing nature of the fault to the north at Rio Vista, support that the fault is sealing, therefore the Midland fault is considered a closed and sealing boundary in the model.

Stockton Fault

The Stockton Fault is located in the eastern portion of the project area and bounds a portion of the eastern side of the AoR (**Figure A-17**). The trace and offset of this fault are well defined and characterized by the 3D seismic data and well control in the nearby Union Island Gas Field. This thrust fault is associated with Post-Eocene/Pre-Miocene movement and production from the Union Island Gas Field is from a fault-related trap in the footwall. The trace of the Stockton Fault interpreted from the 3D seismic data agrees with the Fault Activity Map from the California Geologic Survey (https://maps.conservation.ca.gov/cgs/fam/).

An Allan diagram, SGR, and SSF analysis were completed to demonstrate the sealing nature of this fault. The Stockton Fault Allan diagram is shown in **Figure A-21a** and was generated from four cross sections, A-A' through D-D'. The Allan diagram is expected to be representative of the Stockton Fault along the entire length of the southeastern model boundary as shown in the figure. As seen in the Allan diagram, the Mokelumne Formation on the footwall side of the fault (injection zone) is partially juxtaposed against the H&T Shale on the hanging wall side of the fault. Since the fault does not have a large enough offset to completely offset the Moke against another formation, the SGR values only vary vertically along the length of the fault. **Figure A-21b** displays example SGR calculations for the top and bottom of the Mokelumne Formation (injection zone) at cross sections B-B' and C-C' using the Δz of the layer that moved past a given point, and the Vcl of the layer to which it is juxtaposed. $throw$ was calculated using the offset for both the top and bottom of the Mokelumne Formation. These stratigraphic thicknesses and throw values were calculated using the Allan diagram. The Vcl value for the Mokelumne Formation and H&T Shale were averaged from 4 wells; Yamada_Brothers_2, Ohlendorf_Unit_1_1, Marchini_M-1, and Phillip_Bronich_A_1. Well locations are displayed in **Figure A-21a**, and Vcl values are displayed in **Figure A-21b**. **Figure A-21c** displays the example SSF calculations for the Capay Shale (confining zone) offset for cross sections B-B' and C-C'.

The SGR analysis results in values of 27 percent for the top of the Mokelumne Formation and 40 percent for the bottom of the Mokelumne Formation which shows a high likelihood of fault sealing capability. The SSF calculation results in values ranging from 1 to 7.5 along the length of the fault as the throw of the Capay varies. Some values are above the threshold of 4-5, however, the likelihood of intact clay smear is still present. The SSF values are calculated using the Capay Shale as the main shale layer however interbedded shales within the Mokelumne River Formation also add additional shale smearing along the fault plane. The SGR and SSF values, along with the known sealing nature of the fault based on production at the nearby Union Island Gas Field, support that the fault is sealing, therefore the Stockton fault is considered a closed and sealing boundary in the model.

West Tracy Fault

The West Tracy Thrust Fault is located in the southern portion of the project area and bounds the southwestern portion of the AoR (**Figure A-17**). This fault is drawn through a mix of 3D and 2D seismic data and is interpreted to connect to the Midland and Stockton Faults through the review of published work. Unruh and Hitchcock (2015) reviewed additional 2D seismic data along with other ancillary data and concluded that the West Tracy Fault was probably active between the Eocene and Miocene with later reactivation during late Cenozoic transpression. This blind reverse fault has steeply dipping strata in the south-west hanging wall and may have ruptured the surface near Byron, CA. Their interpretation also connects the West Tracy Fault to the Midland fault at its western junction. Their work was a more detailed description following that of Unruh and Krug (2007). In both publications, the eastern end of the West Tracy Fault is somewhat connected to the Vernalis Fault that runs east-west to the east of the project area. Our analysis suggests the West Tracy Fault is better connected to the trace of the Stockton Fault given the strike of the faults in the region. This would agree with the fault trace drawn by Downey and Clinkenbeard (2010). There are no established hydrocarbon fields along the West Tracy Fault that demonstrate fault seal. Due to the sealing nature of the other sub-regional faults in the area, including the Vernalis Fault to the east that seals hydrocarbons at the Vernalis Gas Field, the West Tracy Fault is considered to be sealing.

An Allan diagram, SGR, and SSF analysis were completed to demonstrate the sealing nature of this fault. The West Tracy fault Allan diagram is shown in **Figure A-22a.** The Allan diagram is based on a single well cross section centered between wells WICO_BANKHEAD_1 (04077003130000) and SOUZA_1 (04077205500000), where stratigraphic data is considered to be reliable. The offset displayed in the Allan diagram is based on the seismic interpretation and Mokelumne Formation identified in well SOUZA_1 on the hanging wall (southwest side) of the fault for additional constraint. The Allan diagram is expected to be representative of the West Tracy Fault along the entire length of the southwestern model boundary as shown in the figure. Where covered by the 3D seismic and supported by the available 2D seismic data the fault shows consistently large offset upon which the Allan diagram is based. As seen in the Allan diagram, the Mokelumne Formation on the footwall side of the fault (injection zone) is fully juxtaposed against the H&T Shale on the hanging wall side of the fault. **Figure A-22b** displays the SGR calculations for the top and bottom of the Mokelumne Formation (injection zone) using the Δz of the layer that moved past a given point, and the Vcl of the layer to which it is juxtaposed. $throw$ was calculated using the offset for both the top and bottom of the Moke Formation. The stratigraphic thickness and throw values were calculated using the Allan diagram. The Vcl value for the Mokelumne Formation and H&T Shale were averaged from 2 wells; WICO_BANKHEAD_1 and SOUZA_1. Well locations and Vcl values are displayed in **Figure A-22b**. **Figure A-22c** displays the SSF calculation for the H&T Shale offset. The H&T Shale was used for the SSF calculation since the Mokelumne Formation (injection zone) is juxtaposed against and below the top of the hanging wall H&T Shale.

The SGR analysis results in values of 31 percent for the top of the Mokelumne Formation and 42 percent for the bottom of Mokelumne Formation. Both of these values are larger than the 20 percent threshold which shows a high likelihood of fault sealing capability. The SSF analysis results in a value of 1, which supports a continuous shale smear along the fault zone next to and above the Mokelumne injection zone. The SGR and SSF values, along with the sealing nature of the other sub-regional faults in the area provides evidence that the West Tracy fault is sealing, therefore, it is considered a closed and sealing boundary in the model.

Fault Pressure

None of the three bounding faults in the vicinity of the project area come in contact with the CO_2 plume boundary; therefore, only the pressure front is considered. Our modeling has the Mokelumne River Formation under-pressured across the AoR relative to hydrostatic. In this case, the pressure increase associated with CO_2 injection is seen to increase pressure of the Mokelumne River Formation back to pressures that are documented at other locations along these fault traces within the project area. **Figure A-23** shows the locations of four pseudo wells where pressures are extracted from the model to calculate the pressures that will be seen across the injection life of this project. The locations for the pseudo wells were chosen to match the highest predicted pressure relative to the fault trace within the pressure front. **Table A-4** shows the average initial, maximum (28 years after initial injection), and 100 years post injection pressure at these locations. An average pressure increase is provided, and these numbers are averages across the Mokelumne River Formation. Given that other formations around these faults, including equivalent Mokelumne River units, have held back hydrocarbons at similar as well as higher pressures above hydrostatic, we believe this to be a safe standard for fault stability. Additional analysis and discussion around the stability of these faults in relation to the modeled pressure increases are provided in Section 2.5.3 Fault Reactivation. The natural seismic history of this area is discussed in the Section 2.6 Seismic History section of this document, and Attachments C and I of this application detail the seismicity monitoring plan for this injection site. The Mokelumne River Formation pressure will be confirmed in pre-operational testing.

2.4 Injection and Confining Zone Details [40 CFR 146.82(a)(3)(iii)]

2.4.1 Mineralogy

No quantitative mineralogy information exists within the AoR boundary. Mineralogy data will be acquired across all the zones of interest as part of pre-operational testing. Several wells outside the AoR have mineralogy over the respective formations of interest, and those data are presented below.

Mokelumne River Formation

The Speckman_Decarli_1 well and Citizen_Green_1 well located outside of the AoR in Roberts Island and King Island gas fields, respectively, have x-ray diffraction (XRD) data for the Mokelumne River Formation (see **Figure A-24** for well locations). Reservoir sand from nine samples within these wells average 33.6% quartz, 47.6% plagioclase and potassium feldspar, and 18% total clay (see **Table A-5**). The primary clay minerals are kaolinite and mixed layer illite/smectite. Calcite and dolomite were not detected in any of the samples.

Capay Shale

Mineralogy data are available for the Capay Shale from three wells in the Rio Vista Field (RVGU_209, RVGU_248, and Wilcox_20). RVGU_209 has FTIR data, while the other two wells have XRD data. Nine samples show an average of 29% total clay, with mixed layer illite/smectite being the dominant species, with kaolinite and chlorite still prevalent. They also contain 32% quartz, 39% plagioclase and potassium feldspar, minimal pyrite, and less than 1% calcite and dolomite.

H&T Shale

Mineralogy data are available for the H&T Shale from the Speckman_Decarli_1 well. Nine samples show an average of 46% total clay, with mixed layer illite/smectite being the dominant species, with kaolinite and chlorite still prevalent. They also contain 23 percent quartz, 29 percent plagioclase and potassium feldspar, 2% pyrite, and 1% calcite and dolomite.

2.4.2 Porosity and Permeability

Mokelumne River Formation

Wireline log data were acquired with measurements that include but are not limited to spontaneous potential, natural gamma ray, borehole caliper, compressional sonic, resistivity, neutron porosity, and bulk density.

Formation porosity is determined one of two ways: from bulk density using 2.65 grams per cubic centimeter (g/cc) matrix density as calibrated from core grain density and core porosity data, or from compressional sonic using 55.5 microsecond per foot (µsec/ft) matrix slowness and the Raymer-Hunt equation.

Volume of clay is determined by spontaneous potential and is calibrated to core data.

Log-derived permeability is determined by applying a core-based transform that uses capillary pressure porosity and permeability along with clay values from XRD or FTIR data. A total of 13 core data points from two wells, RVGU_209 and RVGU_248 (see **Figure A-24** for well locations), were used to develop a permeability transform. An example of the transform from core data is illustrated in **Figure A-25**.

Comparison of the permeability transform to log generated permeability (Timur-Coates method) from a nuclear magnetic resonance (NMR) log in the Citizen_Green_1 well in King Island Gas Field is almost 1:1 and matches rotary sidewall core permeability over the Capay-Mokelumne River Formation interval (**Figure A-26**). See **Figure A-24** for location of Citizen_Green_1 well.

In the well Ohlendorf_Unit_1_1, for the Mokelumne River Formation, the porosity ranges from 1.5% to 34% with a mean of 26.5% (**Figure A-27**). The permeability ranges from 0.003 to 697 millidarcies (mD) with a log mean of 68 mD (**Figure A-28**).

A log plot for the Ohlendorf_Unit_1_1 is included in **Figure A-29**.

The average porosity for the Mokelumne River Formation is 27.0%, based on 18 wells with porosity logs and 30,487 individual logging data points. See **Figure A-30** for locations of wells used for porosity and permeability averaging.

The geometric average permeability for the Mokelumne River Formation is 75.4 mD, based on 18 wells with porosity logs and 30,073 individual logging data points. A total of 50 core data points from 5 wells (Citizen_Green_1, Enea_Capital_3, PG&E_Test_Injection_Withdrawl_Well_1, Speckman_Decarli_1, and Whiskey_Slough_1A-E (see **Figure A-30** for well locations) are from the Mokelumne Formation. Porosity and permeability from these core data agree with the log averages (see **Table A-6**).

Capay Shale

The average porosity of the upper confining zone (Capay Shale) is 29.3%, based on 17 wells with porosity logs and 10,044 individual logging data points.

The geometric average permeability of the upper confining zone (Capay Shale) is 0.34 mD, based on the Citizen_Green_1 well NMR permeability from the Timur-Coates method (see **Figure A-24** for well location).

H&T Shale

The average porosity of the lower confining zone (H&T Shale) is 21.4%, based on 16 wells with porosity logs and 31,279 individual logging data points.

The geometric average permeability of the lower confining zone (H&T Shale) is 0.49 mD, based on 16 wells with porosity logs and 30,853 individual logging data points.

2.4.3 Injection Zone and Confining Zone Capillary Pressure

Capillary pressure is the difference across the interface of two immiscible fluids. Capillary entry pressure is the minimum pressure required for an injected phase to overcome capillary and interfacial forces and enter the pore space containing the wetting phase.

No capillary pressure data were available for the Capay Shale. These data will be acquired as part of pre-operational testing.

Capillary pressure data were available for the Mokelumne River Formation (injection zone) from the Citizen_Green_1 well outside the project area in the King Island Gas Field. Two sidewall core samples were collected from the injection zone using mercury-injection capillary pressure (MICP). The raw data was downloaded from the NETL EDX server, and required a closure correction (Shafer & Neasham, 2000). Using the XRD data (**Table A-5**), the mercury injection pressures and saturations were then corrected for clay bound water using the methodology prescribed in Juhasz, 1979. The corrected air-mercury capillary pressure was then converted to reservoir conditions of CO_2-brine using the equation below (Lohr & Hackley, 2018).

$$P_{CO_2-Brine} = P_{Hg-Air} \frac{\sigma_{CO_2-Brine} \cos \theta_{CO_2-Brine}}{\sigma_{Hg-Air} \cos \theta_{Hg-Air}} \qquad (1)$$

An interfacial tension (IFT) of 480 dynes per centimeter (dynes/cm) was used for air-mercury and 30 dynes/cm was used for CO_2-brine. The cosine of contact angles of 0.766 and 0.875 degrees were also used for air-mercury and CO_2-brine, respectively. The values of IFT and contact angles for CO_2-brine were based on published studies (Chiquet et al., 2009; Haeri et al., 2020). Refer to **Figure A-31** for final CO_2-brine corrected curves for the two samples.

For computational modeling purposes, capillary pressure data obtained in the similar geologic age and setting Winters Formation in the nearby Union Island Gas field were used in addition to the Citizen_Green_1 data. As discussed in **Attachment B**, Section 2.2.2, a sensitivity analysis (Case 11) was run using the Citizen_Green_1 capillary pressure data. Results indicated negligible changes to the AoR, CO_2 plume, and pressure field. Therefore, the Winters Formation data from Sonol_Securities_5 are adequate for modeling purposes until site- and zone-specific data can be obtained as part of the pre-operational testing program. **Figure A-32** shows the capillary pressure data used for the computational modeling.

The report DOE-PGE-00194-4 cites caprock threshold pressure tests that were performed on samples from the upper confining zone in the King Island gas field. A delta pressure was held across three separate core samples, none of which showed any brine production at the highest delta pressure of 2,000 psi. As stated in the report, "These results support a conclusion that the upper confining zone is an impermeable seal at reservoir conditions" (Medeiros, et al., 2018).

2.4.4 Depth and Thickness

Depths and thickness of the Mokelumne River Formation reservoir and Capay confining zone (**Table A-7**) are determined by structural and isopach maps (**Figure A-33**) based on well data (wireline logs). Variability of the thickness and depth measurements is due to:

- Structural variability within the Mokelumne River and Capay Formations is caused by the Meganos submarine canyon erosional event.
- The Capay Shale remains consistent throughout the AoR both structurally and stratigraphically.
- Thickness variability within the Mokelumne River Formation is due to the Meganos submarine canyon erosion.

2.4.5 Structure Maps

Structure maps are provided to indicate a depth to reservoir adequate for supercritical-state injection.

2.4.6 Isopach Maps

Spontaneous potential (SP) logs from surrounding gas wells were used to identify sandstones. Negative millivolt (mV) deflections on these logs, relative to a baseline response in the enclosing shales, define the sandstones. These logs were baseline shifted to 0 mV. Due to the log vintage variability, there is an effect on quality which creates a degree of subjectivity within the gross sand; however, this will not have a material impact on the maps.

In addition to well log data, site specific depth and thickness information for the Mokelumne River Formation reservoir and Capay confining zone are also available from seismic data (**Figure A-11**). The coverage of the 3D and 2D seismic data and the well control in the structural model area provide confidence in the thickness and continuity of the injection and confining zones. Based on the computational modeling results discussed in **Attachment B**, the structural variability in the thickness and depth of either the Capay Shale or the Mokelumne River Formation sandstone resulting from the Meganos submarine canyon erosional event, do not impact confinement. CTV will use thickness and depth shown when determining operating parameters and assessing project geomechanics.

2.5 Geomechanical and Petrophysical Information [40 CFR 146.82(a)(3)(iv)]

2.5.1 Caprock Ductility

Ductility and the unconfined compressive strength (UCS) of shale are two properties used to describe geomechanical behavior. Ductility refers to how much a rock can be distorted before it fractures, while the UCS is a reference to the resistance of a rock to distortion or fracture. Ductility generally decreases as compressive strength increases.

Ductility and rock strength calculations were performed based on the methodology and equations from Ingram & Urai (1999) and Ingram et al. (1997). Brittleness is determined by comparing the log derived UCS vs. an empirically derived UCS for a normally consolidated rock (UCS_{NC}).

$$\log UCS = -6.36 + 2.45 \log\left(0.86V_p - 1172\right) \quad (1)$$

$$\sigma' = OB_{pres} - P_p \quad (2)$$

$$UCS_{NC} = 0.5\sigma' \quad (3)$$

$$BRI = \frac{UCS}{UCS_{NC}} \quad (4)$$

Units for the UCS equation are UCS in megapascals (MPa) and V_p (compressional velocity) in meters per second (m/s). OB_{pres} is overburden pressure, P_p is pore pressure, σ' is effective overburden stress, and *BRI* is brittleness index.

If the value of BRI is less than 2, empirical observation shows that the risk of embrittlement is lessened, and the confining zone is sufficiently ductile to accommodate large amounts of strain without undergoing brittle failure. However, if BRI is greater than 2, the "risk of development of an open fracture network cutting the whole seal depends on more factors than local seal strength and therefore the BRI criterion is likely to be conservative, so that a seal classified as brittle may still retain hydrocarbons" (Ingram & Urai, 1999).

Capay Shale

Within the project area, six wells had compressional sonic and bulk density data over the Capay Shale to calculate ductility, comprising 3,769 individual logging data points (see pink squares in **Figure A-24**). A total of 15 wells had compressional sonic data over the Capay Shale to calculate UCS, comprising 9,413 individual logging data points (see black circles in **Figure A-24**). The average ductility of the confining zone based on the mean value is 1.50. The average rock strength of the confining zone, as determined by the log derived UCS equation above, is 2,091 psi.

An example calculation for the well Ohlendorf_Unit_1_1 is shown below (**Figure A-34**). UCS_CCS_VP is the UCS based on the compressional velocity, UCS_NC is the UCS for a normally consolidated rock, and BRI is the calculated brittleness using this method. Brittleness less than 2 (representing ductile rock) is shaded red.

Within the Capay Shale, the brittleness calculation drops to a value less than 2. Additionally, the Nortonville Shale above the Capay Shale has a brittleness value less than 2. As a result of the Capay Shale ductility, there are no fractures that will act as conduits for fluid migration from the Mokelumne River Formation.

2.5.2 Stress Field

The stress of a rock can be expressed as three principal stresses. Formation fracturing will occur when the pore pressure exceeds the least of the stresses. In this circumstance, fractures will propagate in the direction perpendicular to the least principal stress (**Figure A-35**).

Stress orientations in the Sacramento Basin have been studied using both earthquake focal mechanisms and borehole breakouts (Snee and Zoback, 2020; Mount and Suppe, 1992). The azimuth of maximum principal horizontal stress (S_{Hmax}) was estimated at N40ºE ± 10º by Mount and Suppe (1992). Data from the World Stress Map 2016 release (Heidbach et al., 2016) show an average S_{Hmax} azimuth of N37.4ºE once several far field earthquakes with radically different S_{Hmax} orientations are removed (**Figure A-36**), which is consistent with Mount and Suppe (1992). The earthquakes in the area indicate a strike-slip/reverse faulting regime.

In the project AoR, there is one well with site-specific Mokelumne River Formation fracture pressure or fracture gradient data (Yamada_Line_Well_1, see **Figure A-37** for well location and **Table A-8** for well data). To gather additional site-specific data, a Mokelumne River Formation step rate test will be conducted per the pre-operational testing plan. In addition, several wells in the project vicinity have formation integrity tests (FITs), step-rate tests (SRTs), and leak off tests (LOTs) for the Mokelumne River Formation and H&T Shale. Two wells recorded minimum fracture gradients of 0.75-0.76 psi/ft based on FIT in the Mokelumne River Formation (Galli_1 and Yamada_Line_Well_1, see **Figure A-37** for well locations and **Table A-8** for well data), and one well recorded a fracture gradient of 0.822 psi/ft based on an SRT in the King Island field. For the computational simulation modeling and well performance modeling, a fracture gradient of 0.76 psi/ft was assumed for now.

In the project AoR, there are no site-specific Capay Shale fracture pressure or fracture gradient data. A Capay Shale mini-frac will be conducted per the pre-operational testing plan. In the interim, CTV is assuming that the Capay Shale will have a similar fracture gradient as the Mokelumne River Formation.

The overburden stress gradient in the reservoir and confining zone is 0.91 psi/ft. The overburden gradient was calculated by integrating density logs from seven wells. The method for calculating the overburden gradient integrates the density logs using methodology laid out in Fjaer et al. (2008):

$$\sigma_v = \int_0^D \rho(z) g \, dz \qquad (5)$$

where ρ is the density of the sediments, g is the acceleration due to gravity, D is the depth of interest, z is the vertical depth interval, and σ_v is the vertical stress. This calculation was completed using the "Overburden Gradient Calculation" module in the software Interactive Petrophysics 5.1.0. **Figure A-38** displays the overburden gradient calculation inputs and outputs from the software. See **Table A-9** for a list of the wells used for overburden stress gradient calculations.

No data currently exist for the pore pressure of the confining zone. This will be determined as part of the pre-operational testing plan.

2.5.3 Fault Reactivation

The stability of the faults within and bounding the CTV III project area were analyzed using Mohr coulomb criteria. Four faults were studied: The Stockton Arch Fault on the eastern boundary of the project area, the West Tracy Fault on the southern boundary of the project area, the Midland Fault on the western boundary of the project area, and the normal fault within the CO_2 plume. The input parameters for the Mohr Circle are shown in **Table A-10** and can be referenced in Sections 2.3.1 and 2.5.2. The reference depth for all calculations was set to 6,900 feet TVD. The maximum horizontal stress gradient was determined using data from Lund-Snee and Zoback (2020). The maximum horizontal stress direction is 37.4º as stated in Section 2.5.2. Fault strike and dip were averaged over each fault's contact with the project AoR. The coefficient of friction was assumed to be 0.6 and the faults were prescribed a cohesive strength of 0 psi. Based on Mohr circle analysis, all of the faults are currently far from failure and will continue to be stable even after CO_2 injection has ceased (**Figure A-39**). Analysis by Mohr circle shows that the required pore pressure increase to reactivate any of the faults is over 1,800 psi above present day conditions (**Figure A-40** and **Table A-11**). This equates to a reservoir pressure of over 4,700 psi (equivalent to 0.68 psi/ft at the reference depth of 6,900 feet TVD), far above the expected final pressure gradients after CO_2 injection has ceased. Pressure gradients in the CTV III project area along the three bounding faults (West Tracy, Midland, and Stockton Arch) are only expected to increase to approximately 0.45 psi/ft, and to 0.464 psi/ft for the normal fault in the plume (**Table A-4**). This pressure gradient is very similar to the discovery pressure of the Mokelumne River Formation in Rio Vista Gas Field, where the Mokelumne River gas reservoir is trapped against the Midland Fault (Section 2.3.1). In deeper reservoirs in direct contact with both the Midland and Stockton Arch faults in the project vicinity, discovery pressures approached 0.49 to 0.53 psi/ft (Section 2.3.1). The fact that these faults held natural gas reservoirs with these pressure gradients for long periods of geologic time helps to reinforce the Mohr circle explanation of these faults being stable at higher reservoir pressures.

2.6 Seismic History [40 CFR 146.82(a)(3)(v)]

2.6.1 Seismic Data

As discussed in prior sections, 3D seismic, along with 2D seismic and well data, were used to create depth surfaces for the major faults within the project area. The traces of these faults agree with published work—for example, the Fault Activity Map created by the California Geologic Survey (CGS) shown in **Figure A-41**. CGS categorizes the Midland Fault as a Quarternary Fault of undifferentiated age, and the Stockton Fault as Pre-Quaternary. CGS does not display a trace for the West Tracy Fault, likely due to the limited public information available to document its presence. As discussed in Unruh and Hitchcock (2015), seismic reflection data from the hydrocarbon industry are needed to map this fault. Further discussion on the timing on each of the faults is provided in the Faults and Fractures section of this document.

The U.S. Geological Survey (USGS) provides an earthquake catalog tool (https://earthquake.usgs.gov/earthquakes/search/) that can be used to search for recent seismicity that could be associated with faults in the area for movement. A search was made for earthquakes in the greater vicinity of the project area from 1850 to modern day with events of a magnitude greater than three. **Figure A-42** shows the results of this search. **Table A-12** summarizes some of the data taken from them. Events were cut down to include those only in the vicinity of the faults mapped for this project and events associated with the Marsh Creek Fault system to the west are removed from the data table. In response to an EPA request, event 1, with a magnitude of 2.9, was added to **Table A-12**.

Figure A-43 combines the events from the USGS catalog with the mapped faults in the project area including the West Tracy Fault. Events 17, 11 and 10 were likely associated with the Black Butte–Midway Fault system southwest of the project area. Events 5 and 10 are substantially deeper than the sedimentary section and coincide with the trace of the Vernalis Fault; both faults are shown on the CGS Fault Activity Map (**Figure A-41**). Events 6 and 7 have no clear relationship to any mapped fault system, were one day apart, and relatively deep (both greater than 7.5 km as estimated by the USGS catalog). Event 2, west of the AoR occurring in 2018, is close to the Davis Fault on the west side of Brentwood. There are no mapped faults nearby event 16, significantly away from the AoR.

Event 9 appears to be isolated from the fault zones at a depth of 6 km. Reviewing the 3D seismic data in that area there may be a structural feature at the level of seismic basement, but it is not well imaged. The event does not continue into the shallower sediments that are thousands of feet deeper than the proposed injection zone. Similar can be said for event 14, another deep (6 km) event that is outside of the AoR.

For the Stockton Fault, event numbers 3 and 8 are clearly related to the fault trace. Event 8 was a significant distance from the AoR and event 3 was significantly deeper (14.55 km) than the proposed injection zone. Finally, events 1, 4, 13, and 15 are in closest proximity to the Midland Fault. Event 15 appears to align with the Rio Vista Fault, a mapped fault by the CGS that may be a splay of the Midland Fault and to the north of the CTV III AoR. Event 13 is interpreted to be at a significant depth (14.95 km) away from the injection zone and far beneath the sedimentary section of the basin. Event 1 and 4 are likely the most concerning; event 1 happened in 2024, around 7,200 feet (2.2 km), at the approximate level of the Injection zone, and event 4 happened in 2002, at the approximate seismic basement level, which is interpreted to be around 16,000 feet (4.88 km). The average depth of prior seismic events in the region based on these data (**Table A-12**) is approximately 9.3 km, far deeper than the proposed injection zone and sedimentary section.

Given the history of seismicity in the region, minimizing pressure on the mapped faults is a key part of CTV III. Our modeling shows the Mokelumne River Formation to be under-pressured across the AoR, which will be confirmed in pre-operational testing. The Faults and Fractures section of this document provides further information on the expected pressures seen at these faults and discusses the gradients relative to other geologic zones along them. As stated previously, given that other formations around these faults have held back hydrocarbons at pressures above hydrostatic, we believe this to be a safe standard for fault stability. This is presented along with Mohr coulomb failure criteria analysis in Section 2.5.3 Fault Reactivation.

Lund-Snee and Zoback (2020) published updated maps for crustal stress estimates across North America. **Figure A-44** shows a modified image from that work highlighting the CTV III area. This work agrees with previous estimates of maximum horizontal stress in the region of approximately N40°E in a strike-slip to reverse stress regime (Mount and Suppe, 1992) and is consistent with World Stress map data for the area (Heidbach et al., 2016). Attachments C and I of this application discuss the seismicity monitoring plan for this injection site.

2.6.2 Seismic Hazard Mitigation

CTV III is in an area of historical seismicity, but no events have impacted surrounding oil and gas reservoirs and infrastructure, such as at the nearby Union Island Gas Field. This document defines the confining zone, beginning with the Capay Shale, that separates the Mokelumne River Formation injection interval from USDW.

The following is a summary of CTVs seismic hazard mitigation for CTV III:

The project has a geologic system capable of receiving and containing the volumes of CO_2 proposed to be injected

- Extensive historical operations in the area across multiple geologic formations, including Mokelumne River Formation at Rio Vista, provide valuable experience to understand operating conditions such as injection volumes and reservoir containment. The strategy to limit the injected CO_2 to keep the maximum pressures seen at faults to at or below levels they have been exposed to from other and equivalent zones will mitigate the potential for induced seismic events and endangerment of the USDW.
- There are no faults or fractures identified in the AoR that will impact the confinement of CO_2 injectate. The bounding faults of the project AoR and the small normal fault within the CO_2 plume are not vertically transmissive, and therefore do not diminish the sealing effectiveness of the Capay Shale Upper Confining Zone.

Will be operated and monitored in a manner that will limit risk of endangerment to USDWs, including risks associated with induced seismic events

- Injection pressure will be lower than the fracture gradient of the sequestration reservoir with a safety factor (90% of the fracture gradient).
- Injection and monitoring well pressure monitoring will ensure that pressures are beneath the fracture pressure of the sequestration reservoir and confining zone. Injection pressure will be lower than the fracture gradients of the sequestration reservoir and confining zone with a safety factor (90% of the fracture gradients)
- A seismic monitoring program will be designed to detect events lower than seismic events that can be felt. This will ensure that operations can be modified with early warning events, before a felt seismic event.

Will be operated and monitored in a way that in the unlikely event of an induced event, risks will be quickly addressed and mitigated

- Via monitoring and surveillance practices (pressure and seismic monitoring program), CTV personnel will be notified of events that are considered an early warning sign. Early warning signs will be addressed to ensure that more significant events do not occur.
- CTV will establish a central control center to ensure that personnel have access to the continuous data being acquired during operations.

Minimizing potential for induced seismicity and separating any events from natural to induced

- Pressure will be monitored in each injector and sequestration monitoring well to ensure that pressure does not exceed the fracture pressure of the reservoir or confining zone.
- Seismic monitoring program will be installed pre-injection for a period to monitor for any baseline seismicity that is not being resolved by current monitoring programs.
- Average depth of prior seismic hazard in the region based on reviewed historical seismicity has been approximately 9.3 km, significantly deeper than the proposed injection zone.

2.7 Hydrologic and Hydrogeologic Information [40 CFR 146.82(a)(3)(vi), 146.82(a)(5)]

The California Department of Water Resources has defined 515 groundwater basins and subbasins with the state. The AoR spans the East Contra Costa Subbasin (Subbasin NO. 5-22.19) and the Tracy Subbasin (Subbasin No. 5-22.15). These subbasins lie in the northwestern portion of the San Joaquin Valley Groundwater Basin. **Figure A-45** shows the AoR, Tracy and East Contra Costa Subbasins, and the surrounding areas. The Tracy Subbasin encompasses an area of about 238,429 acres (370 square miles) in San Joaquin and Alameda Counties (GEI, 2021). The East Contra Costa Subbasin encompasses an area of 107,596 acres (168 square miles) in the eastern portion of Contra Costa County (LSCE, 2021).

2.7.1 Hydrologic Information

Major surface water bodies within the Tracy and East Contra Costa Subbasins consist of the San Joaquin, Old, and Middle Rivers. **Figure A-45** shows the locations of these surface water bodies. The San Joaquin River makes up almost the entire eastern boundary of the Tracy Subbasin and it feeds water into the SWP Clifton Court Forebay, which is located just west of the Tracy Subbasin.

Two major pump stations pump water out of the Old River from the Clifton Court Forebay into two large canals: the California Aqueduct and the Delta-Mendota Canal. These large canals traverse the southwestern portion of the Tracy Subbasin, and transport water from the Delta to other agricultural and urban water suppliers in the San Joaquin Valley and southern California. In addition to the major natural waterways there is a large network of irrigation canals, which convey surface water to agricultural properties.

2.7.2 Base of Fresh Water and Base of USDWs

The owner or operator of a proposed Class VI injection well must define the general vertical and lateral limits of all USDWs and their positions relative to the injection zone and confining zones. The intent of this information is to demonstrate the relationship between the proposed injection formation and any USDWs, and it will support an understanding of the water resources near the proposed injection wells. A USDW is defined as an aquifer or its portion that supplies any public water system; or that contains a sufficient quantity of ground water to supply a public water system; and currently supplies drinking water for human consumption; or contains less than 10,000 mg/L TDS; and is not an exempted aquifer.

Base of Fresh Water

The base of fresh water (BFW) helps define the aquifers that are used for public water supply. Local water agencies in the Tracy Subbasin have participated in various studies to comply with the 2014 Sustainable Groundwater Management Act (SGMA). Luhdorff & Scalmanini (2016) performed a study that focused on the geologic history of freshwater sediments from which groundwater is extracted for beneficial uses as defined and regulated under SGMA.

Few groundwater wells exist in the Tracy Subbasin because surface water is the source for irrigation use within delta islands. Groundwater usage is limited to eastern Contra Costa County and the Tracy area to the south. In most of western San Joaquin County in the Delta the fresh groundwater aquifers are limited to relatively shallow depths of 500 to 700 feet below ground surface (bgs) in the Contra Costa County area, and to 1,600 feet bgs in the Tracy area (Luhdorff & Scalmanini, 2016).

Luhdorff & Scalmanini (1999) performed a study of over 500 well logs in eastern Contra Costa County groundwater for five water agencies. The focus of this study was the uppermost 500 feet, where most water wells were completed. Subsequently, Luhdorff & Scalmanini (2016) examined logs for the nature of geologic units at greater depths to better define the BFW. The top of the geophysical logs tended to be at 800 feet or greater depths. These logs generally show fine-grained geologic units with few sand beds. The depth to BFW was difficult to discern in available geophysical logs because of the lack of sand beds. The elevation of the BFW determined from logs is displayed in **Figure A-46** (Luhdorff & Scalmanini, 2016). Contour lines of one hundred feet were drawn, but are variable based on well control.

Calculation of Base of USDW

CRC has used geophysical logs to investigate the USDWs and the base of the USDWs. The calculation of salinity from 41 wells used by CRC is a four-step process (see **Table A-13** for list of wells and **Figure A-47** for well locations):

1. Convert measured density or sonic to formation porosity, using the following equation:

$$POR = \frac{(Rhom - RHOB)}{(Rhom - Rhof)} \quad (6)$$

where POR = formation porosity

Rhom = formation matrix density, g/cc; 2.65 g/cc is used for sandstones

RHOB = calibrated bulk density taken from well log measurements (g/cc)

Rhof = fluid density (g/cc); 1.00 g/cc is used for water-filled porosity

The equation to convert measured sonic slowness to porosity is:

$$POR = -1\left(\frac{\Delta tma}{2\Delta tf} - 1\right) - \sqrt{\left(\frac{\Delta tma}{2\Delta tf} - 1\right)^2 + \frac{\Delta tma}{\Delta tlog} - 1} \quad (7)$$

where POR = formation porosity

Δtma = formation matrix slowness (µs/ft); 55.5 µs/ft is used for sandstones

Δtf = fluid slowness (µs/ft); 189 µs/ft is used for water-filled porosity

Δtlog = formation compressional slowness from well log measurements (µs/ft)

2. Calculate apparent water resistivity using the Archie equation:

$$Rwah = \frac{POR^m R_t}{a} \quad (8)$$

where Rwah = apparent water resistivity (ohm-m)

POR = formation porosity

m = the cementation factor; 2 is the standard value

R_t = deep reading resistivity taken from well log measurements (ohm-m)

a = the archie constant; 1 is the standard value

3. Correct apparent water resistivity to a standard temperature of 75°F:

$$Rwahc = Rwah\frac{TEMP + 6.77}{75 + 6.77} \quad (9)$$

where Rwahc = apparent water resistivity (ohm-m), corrected to surface temperature
TEMP = downhole temperature based on temperature gradient (°F)

4. Convert temperature-corrected apparent water resistivity to salinity (Davis 1988):

$$SAL\_a\_EPA = \frac{5500}{Rwahc} \quad (10)$$

where SALa_EPA = salinity from corrected Rwahc (parts per million [ppm])

The BFW and the USDW are shown on the geologic Cross Section A-A' (**Figure A-12**). **Figure A-48** displays a plan-view map of the base USDW elevation. The BFW and base of the lowermost USDW are at measure depths of approximately 1,100 feet and 2,500 feet, respectively.

2.7.3 Formations with USDWs

Formations with USDWs, from youngest to oldest, include alluvium, flood basin and intertidal deposits, alluvial fan deposits, older alluvium, Modesto Formation, Los Banos Alluvium, Tulare Formation, and fanglomerates. These formations, except for the Tulare Formation, are shown on **Figure A-45**. The Tulare Formation is not exposed at ground surface. The cumulative thickness of these formations increases from about 330 feet near the Coast Range foothills to about 2,000 feet just north of Tracy. Information regarding the water-bearing units and groundwater conditions was taken from several sources (Hotchkiss and Balding, 1971; Bertoldi et al., 1991; Davis et al., 1959) and sorted to agree with more recent geologic map compilation (Wagner et al., 1991).

Alluvium

The Alluvium (Q) includes sediments deposited in the channels of active streams as well as overbank deposits and terraces of those streams. They consist of unconsolidated silt, sand, and gravel. Sand and gravel zones in the younger alluvium are highly permeable and yield significant quantities of water to wells. The thickness of the younger alluvium in the Tracy Subbasin is less than 100 feet (DWR, 2006).

Flood Basin and Intertidal Deposits

The flood basin deposits (Dos Palos Alluvium [Qdp]) and intertidal deposits (Qi) are in the Delta portions of the subbasins. These sediments consist of peaty mud, clay, silt, sand, and organic materials. Stream-channel deposits of coarse sand and gravel are also included in this unit. The flood basin deposits have low permeability and generally yield low quantities of water to wells due to their fine-grained nature. Flood basin deposits generally contain poor quality groundwater with occasional zones of fresh water. The maximum thickness of the unit is about 1,400 feet (DWR, 2006).

Alluvial Fan Deposits

Along the southern margin of the Tracy Subbasin, in the non-Delta uplands areas of the Subbasin are fan deposits (Qf) from the Coast Ranges. These deposits consist of loosely to moderately compacted sand, silt, and gravel deposited in alluvial fans during the Pliocene and Pleistocene ages. The fan deposits likely interfinger with the flood basin deposits. The thickness of these fans is about 150 feet (DWR, 2006).

Modesto Formation

The Modesto Formation (Qm) is located along the east side of the San Joaquin River and is slightly older that the alluvial fan deposits. The formation consists of granitic sands over stratified silts and sands. Near the southern margin of the Tracy Subbasin, there are small occurrences of Los Banos Alluvium (Qlb) and Older Alluvium (Qo) that are of similar age as the Modesto Formation (GEI, 2021).

Tulare Formation

The Tulare Formation is Pleistocene in age and consists of semi-consolidated, poorly sorted, discontinuous deposits of clay, silt, sand, and gravel. The Tulare Formation is not exposed at ground surface in the Tracy Subbasin. The Tulare Formation sand and gravel deposits are moderately permeable, and most of the larger agricultural, municipal, and industrial supply wells extract water from this formation. Wells completed in the Tulare Formation can produce up to 3,000 gallons per minute (gpm). The thickness of the Tulare Formation is about 1,400 feet (GEI 2021).

Within the Tulare Formation is the Corcoran Clay, one of the largest lakebed deposits in the San Joaquin Valley. The clay is about 60 to 100 feet thick. **Figure A-49** shows the lateral extent and structure of the Corcoran Clay (Faunt, 2012). The Corcoran Clay is interpreted to be absent in most of the Delta Area of the Tracy Subbasin and to the north. The extent of the Corcoran Clay is not fully characterized to the west and north (Page, 1986) due to the lack of deep wells. Geologic sections indicate that the clay likely continues to the west (GEI, 2007).

Marine Strata (Upper Markley Formation)

The upper Paleogene and Neogene sequence begin with the Valley Springs Formation, which represents fluvial deposits that blanket the entire southern Sacramento Basin. The unconformity at the base of the Valley Springs marks a widespread Oligocene regression and separates the more deformed Mesozoic and lower Paleogene strata below from the less deformed uppermost Paleogene and Neogene strata above. The Upper Markley Formation contains approximately 3,000 to 10,000 mg/L TDS water and is the lowermost USDW in the AoR (**Figure A-12**).

2.7.4 Geologic Cross Sections Illustrating Formations with USDWs

Geologic sections, as shown on **Figure A-45**, span from the southern end of the East Contra Costa subbasin and the length of the Tracy Subbasin to illustrate the relationship of the geologic units. The geologic sections were originally prepared for the Tracy Subbasin Groundwater Management Plan (GEI, 2007) and were modified for the Tracy Subbasin GSP (GEI, 2021) to reflect additional information obtained since 2007. Lithologic information from well logs was normalized and digitized to generally conform with the Unified Soil Classification System (USCS). Lithology and well screens from groundwater monitoring wells constructed since the sections were created were also added to the geologic sections. The soil profiles show the subsurface relationships and location of the formations and coarse-grained sediments that comprise the principal aquifers. The cross sections show the sediment types, the approximate base of freshwater, and the estimated contact between the Tulare Formation sediments and younger formations. The cross sections also illustrate the location and extent of the Corcoran Clay (GEI, 2021).

Geologic cross section B-B' (**Figure A-50)** runs northwest-southeast through the non-Delta and Delta portions of the East Contra Costa and Tracy Subbasins. The Subbasins generally have low-permeability clays and silts (shown in brown color) near surface and permeable sediments (sands and gravels shown in light blue) scattered throughout the profile. Continuous layers of sand and gravels, other than one at the top of the Corcoran Clay have not been identified. The lack of continuous layers of sand and gravels is likely due to the nature of the river channels, and flood deposits associated with these types of sediments. The Corcoran Clay (or its equivalent) seems to extend to the northwest and into the East Contra Costa Subbasin. In the southern non-Delta portion of the Tracy Subbasin, fine-grained sediments are more prevalent. Based upon groundwater levels and water quality information, the shallow aquifer is likely unconfined and separated from the deeper confined aquifer (GEI 2021).

Geologic cross section C-C' (**Figure A-51**) runs a northeast-southwest orientation across the Delta area. This geologic section illustrates the types of sediments, the estimated BFW, and the possible location of the Corcoran Clay (or its equivalent). Where the clay location is uncertain, no wells were present that penetrated deep enough to confirm its presence or absence. The BFW varies throughout the Subbasin and is shown on the sections. It is as shallow as -400 feet mean sea level (msl) to as much as -2,000 feet msl (GEI, 2021).

2.7.5 Principal Aquifers

The Tracy Subbasin has two principal aquifers that are separated by the Corcoran Clay. Where the clay is absent, which is the condition within most of the Delta area, only the Upper Aquifer is present. The Upper and Lower Aquifers combine where the Corcoran Clay is absent, near the southwestern portion of the subbasin adjacent to the foothills. In this area, the aquifers would be unconfined and are the Upper Aquifer. The Upper and Lower Aquifers also merge north of the Old River in the northern part of the Subbasin (GEI 2021).

Upper Aquifer

The Upper Aquifer is used by domestic, community water systems and for agriculture. The Upper aquifer also supports native vegetation where groundwater levels are less than 30 feet bgs (GEI, 2021). The Upper Aquifer is an unconfined to semi-confined aquifer. It is present above the Corcoran Clay and where the clay is absent. The Upper aquifer exists in the alluvial fan deposits, intertidal deposits, Modesto Formation, flood basin deposits, and the upper portions of the Tulare Formation.

There are multiple coarse-grained sediment layers that make up the unconfined aquifer; however, the water levels are generally similar. Generally, the aquifer confinement tends to increase with depth becoming semi-confined. There is also typically a downward gradient in the aquifers (Hotchkiss and Balding, 1971) in the non-Delta areas; the gradient ranges from a few feet bgs to as much as 70 feet bgs. The groundwater levels in the Upper Aquifer are usually 10 to 30 feet higher than in the Lower Aquifer. The groundwater levels in the Delta area are typically at sea level and artesian flowing wells are common in the center of the islands (Hydrofocus, 2015).

The hydraulic characteristics of the unconfined aquifer are highly variable. USGS estimated horizontal hydraulic conductivity values for organic sediments ranging from 0.0098 feet per day (ft/d) to 133.86 ft/d (Hydrofocus, 2015). Wells in the unconfined aquifer produce 6 to 5,300 gpm. The transmissivity of the unconfined aquifers ranges from 600 gallons per day per foot (gpd/ft) to more than 2,300 gpd/ft. The storativity is about 0.05 (GEI, 2021).

Water quality in the Upper Aquifer is mostly transitional, with no single predominant anion. Most waters are characterized as sulfate bicarbonate and chloride bicarbonate type (Hotchkiss and Balding, 1971). The TDS of these transitional water ranges from 400 to 4,200 mg/L. Nitrate is generally high in the Upper aquifer in the non-Delta portions of the Subbasin. Nitrate is generally low in the Delta portions of the Subbasin (GEI, 2021).

Lower Aquifer

The Lower Aquifer is typically used by community water systems (City of Tracy) and agriculture. The Lower Aquifer is mainly comprised of the lower portions of the Tulare Formation below the Corcoran Clay and extends to the BFW. The clay is present in the southern third of the Tracy Subbasin; the clay's extent to the west and north is uncertain and has been estimated to have a vertical permeability ranging from 0.01 to 0.007 ft/d (Burow et al., 2004).

The groundwater levels are generally deeper than water levels in the Upper Aquifer (Hotchkiss and Balding 1971). Groundwater levels in the confined aquifer are about -25 to -75 feet msl. The groundwater levels are normally 60 to 200 feet above the top of the Corcoran Clay.

Wells in the Lower Aquifer produce about 700 to 2,500 gpm. The transmissivity typically ranges from 12,000 to 37,000 gpd/ft, but can be 120,000 gpd/ft. The storage coefficient or storativity has been measured to be 0.0001 (Padre, 2004).

Water quality in the Lower Aquifer in the western portions are chloride type water but mostly transitional type of sulfate chloride near the valley margins and sulfate bicarbonate and bicarbonate sulfate near the San Joaquin River (Hotchkiss and Balding, 1971). In general, the TDS ranges from 400 to 1,600 mg/L. Nitrate is typically low in the Lower Aquifer. Wells completed below the Corcoran Clay sometimes have elevated levels of sulfate and TDS above the drinking water maximum contaminant levels (MCLs). Only at one deep location, east of Tracy, are chloride levels elevated (GEI, 2021).

2.7.6 Potentiometric Maps

The Tracy Subbasin GSP (GEI, 2021) evaluated groundwater level measurements in over 226 wells, which have been reported to DWR's CASGEM or Water Data Library systems. To evaluate groundwater levels, the GSP only used wells with known total depths and construction details so that the wells were assigned to a principal aquifer. To supplement data from these wells, additional monitoring wells were located that were being used for other regulatory programs.

The East Contra Costa Subbasin GSP (LSCE, 2021) used groundwater level measurements from 2012 and 2018 to develop groundwater elevation maps for the shallow (Upper) unconfined deep zone (Lower Aquifer). The groundwater elevation contours presented in **Figure A-53** represent the Spring 2018 groundwater levels presented in the East Contra Costa Subbasin GSP (LSCE, 2021) and the Fall 2019 groundwater levels presented in the Tracy Subbasin GSP (GEI, 2021).

Upper Aquifer

Groundwater elevations in the Delta area are typically below sea level because the ground surface in the islands have subsided to below sea level; the drains within the island keep groundwater levels bgs to allow for farming. **Figure A-52** shows a schematic profile for groundwater surfaces that are expected at the islands. Although each island has distinct groundwater elevations, there are similar hydraulics on all islands. Groundwater elevations are higher near the island edges (adjacent to waterways) and deepen equivalent with the deepest land surface and drain. Groundwater elevations in the islands are managed by the elevations of the drains and canals. There is very little, if any, pumping of wells for agriculture. Because drains and canals control the groundwater elevations, groundwater contours are not developed/monitored for the Delta islands (GEI, 2021).

In the non-Delta areas west of the San Joaquin River, groundwater contours for the Upper Aquifer indicate groundwater elevations are highest near the Coast Ranges and decrease toward the Delta (**Figure A-53**). Flow directions indicate that recharge areas are present along the foothills and that groundwater discharges into the Old River and/or Tom Paine Slough (**Figure A-53**). Groundwater gradients in the non-Delta portions of the Subbasin are the steepest, at approximately 0.008 ft/ft. East of the San Joaquin River, near Lathrop, the river recharges the Upper Aquifer and flows toward a pumping depression near Stockton. Groundwater contours at the southeastern edge of the Subbasin are perpendicular to the Stanislaus-San Joaquin County line, suggesting that there is no flow in the Upper Aquifer between the subbasins, other than the areas of the Delta Mendota Subbasin north of the County line, where water apparently flows into and out of both subbasins.

Lower Aquifer

The Corcoran Clay extends throughout the non-Delta areas and only slightly into the Delta area, at Union Island. Groundwater contours for the Lower Aquifer in the Tracy Subbasin were developed using data from the CASGEM monitoring wells that are constructed below the Corcoran Clay and supplemented by data from municipal wells (**Figure A-54**). Groundwater monitoring well data were used from the adjacent Delta Mendota Subbasin (GEI, 2021).

Groundwater contours for the Lower Aquifer in the East Contra Costa Subbasin were obtained from wells with known construction in the Lower Aquifer and composite wells constructed in both the Upper and Lower Aquifers (LSCE, 2021).

Groundwater elevation contours in the Lower Aquifer imply groundwater is entering the Tracy subbasin from the south (Delta Mendota Subbasin) and from the east (Eastern San Joaquin Subbasin) and entering the East Contra Costa Subbasin from the west. Pumping in the vicinity of the City of Tracy has apparently modified this overall regional flow, resulting in a pumping depression towards the City of Tracy. The groundwater levels are expected to be at sea level near the northern edge of the Corcoran Clay extent (GEI, 2021).

The groundwater gradient in fall 2019 from the Delta Mendota and the Eastern San Joaquin subbasins is estimated to be 0.0009 ft/ft into the Tracy Subbasin. Due to the pumping depression, the gradient increases around the City of Tracy. The gradient near the western edge of the subbasin cannot be determined to the lack of monitoring wells constructed below the Corcoran Clay (GEI, 2021).

2.7.7 Water Supply Wells

The California State Water Resources Control Board Groundwater Ambient Monitoring Assessment Program (GAMA), and the Department of Water Resources (DWR) public databases were searched to identify any water supply wells within a 1-mile radius of the AoR. A total of 386 water supply wells were identified from the GAMA database within 1 mile of the AoR. A map of well locations is shown in **Figure A-55**. The water wells within the 1-mile buffer from the DWR database are listed in **Table A-14a** and the water wells identified from the GAMA database are listed in **Table A-14b**. The water wells within the project AoR are indexed in the summary map (**Figure A-8**) and listed in **Tables A-2** and **A-3**.

Groundwater in the Subbasin is used for municipal, industrial, irrigation, domestic, stock watering, frost protection, and other purposes. The number of water wells is based on well logs filed and contained within public records may not reflect the actual number of active wells because many of the wells contained in files may have been destroyed and others may not have been recorded.

There are many more wells in the non-Delta areas, south of the Old River, than in the Delta area of the Subbasin. The depths of wells are generally deeper in the non-Delta portion of the Subbasin as compared to the Delta portion of the Subbasin. Typically, the domestic wells are constructed to shallower depths than the production wells. The municipal wells are generally constructed deeper than either the domestic or production wells (GEI, 2021). The known water well depths and other information are included in the attached **Table A-2**. Some well depths are unknown, but all water supply wells completion intervals are expected to be much shallower than the injection zone.

2.8 Geochemistry [40 CFR 146.82(a)(6)]

2.8.1 Formation Geochemistry

Mokelumne River Formation

As noted in the mineralogy section (Section 2.4.1).

Capay Shale

As noted in the mineralogy section (Section 2.4.1).

H&T Shale

As noted in the mineralogy section (Section 2.4.1).

2.8.2 Fluid Geochemistry

The Mokelumne River Formation contains only saline water within the AoR. No water samples from the Mokelumne River Formation exist within the AoR, so samples from the Rio Vista Gas Field and King Island/PGE Gas Field have been used (see **Figure A-37** for well locations).

The well Midland_Fee_Water_Injection_1 was sampled in 1980 in the Rio Vista Gas Field. The measurement of TDS for the sample is 13,889.4 mg/L. The complete water chemistry is shown in **Figure A-56**.

The well Piacentine_2-27 was sampled in 2013 in the King Island/PGE Gas Field. The measurement of TDS for the sample is 14,000 mg/L. The complete water chemistry is shown in **Figure A-57**.

Salinity calculations were also performed on logs from wells within the AoR, and these showed TDS in the Mokelumne River Formation of approximately 14,000 to 16,000 ppm. A 10% uncertainty was applied to the measured water sample TDS, which resulted in a TDS of 15,500 ppm being used for the computational model. Formation fluid properties at reservoir conditions are shown in **Table A-15**.

No gas is present in the Mokelumne River Formation within the boundaries of the AoR, so no hydrocarbon analysis is available.

2.8.3 Fluid-Rock Reactions

Mokelumne River Formation

Mineralogy and formation fluid interactions have been assessed for the Mokelumne River Formation. The following applies to potential reactions associated with the CO_2 injectate:

- The Mokelumne River Formation has a negligible quantity of carbonate minerals and is instead dominated by quartz and feldspar. These minerals are stable in the presence of CO_2 and carbonic acid and any dissolution or changes that occur will be on grain surfaces.
- The water within the Mokelumne River Formation contains minimal calcium and magnesium cations, which would be expected to react with the CO_2 to form calcium-bearing minerals in the pore space.

Capay Shale

There is no fluid geochemistry analysis for the Capay Shale. Given the low permeability of the rock and the low carbonate content, the Capay Shale is not expected to be impacted by the CO_2 injectate.

H&T Shale

There is no fluid geochemistry analysis for the H&T Shale. Given the low permeability of the rock and the low carbonate content, the H&T Shale is not expected to be impacted by the CO_2 injectate.

Geochemical Modeling

Geochemical modeling for the injectate streams, detailed in Section 7.2 of this document, was conducted using the USGS geochemical modeling software PHREEQC (ph-REdox-Equilibrium) to understand the potential interactions of the injectates with the injection zone and upper confining zone formation mineralogy and fluids. The model was set up using the formation fluid data referenced in Section 2.8.2, and the injection zone and upper confining zone mineralogy data referenced in Section 2.4.1.

Geochemical modeling indicates that for either composition, minimal amounts of minerals will dissolve and precipitate, with expected net change in molar mass of 1.5 to 2%, and as such the formation and formation fluids are compatible with the proposed injectates.

Details of the modeling methodology and results can be found in **Appendix 3: CTV III Geochemical Modeling**.

CTV will review and confirm the geochemical modeling results at pre-operational testing based on injectate sampling to ensure that they are consistent with the model inputs.

2.9 Other Information (Including Surface Air and/or Soil Gas Data, if Applicable)

No additional information to add.

2.10 Site Suitability [40 CFR 146.83]

Sufficient data from both wells and seismic demonstrate the integrity through lateral continuity of the reservoir as well as the confining zone. Regional mapping completed by West Coast Regional Carbon Sequestration Partnership (WESTCARB), CGS, and the National Energy and Technology Lab (NETL) support our local stratigraphy, both indicating lateral continuity and regional thickness across the AoR (Downey, 2010). This study covers formations with sequestration and seal potential from southern Sutter County down to the Stockton Arch Fault San Joaquin County, encompassing an area far beyond the AoR presented in **Attachment B**.

The vertical confinement and laterally continuous reservoir, described in Section 2.2.2, will compensate for the CO_2 due to it being located within an open system. The Capay Shale is a continuous shale, as described in Section 2.2.2, and will guide the lateral dispersion of CO_2

across the AoR (**Figure A-58**). Surrounding oil and gas fields in the area demonstrate adequate seal capacity in the upper confining zone and surrounding faults. Corrosion resistant alloy (CRA) will be used for completion of the injection and monitoring wells, inhibiting any reaction between CO_2 and wellbores.

Thickness maps and petrophysics demonstrate confinement based on the upper confining zones laterally continuity, low permeability and thickness. A minor fault does extend within the CO_2 plume; however, thickness maps support an adequate seal across this offset. Pressures along bounding faults will be estimated using computational modeling and in-zone monitoring wells to mitigate the possibility of fault reactivation.

Due to the regional continuity and low permeability of the upper confining zone (Capay Shale), no secondary confinement is necessary; however, another shale barrier does exist above the Domengine Formation monitoring sand. This creates another impermeable zone of confinement separating the injection zone from the USDW.

CTV's estimates storage for the project area is up to 70.7 million metric tons (MMT) of CO_2. This value was arrived at through computational modeling as described below.

As discussed in **Attachment B**, a dynamic model was generated for each target injection zone with data from the static model (structure, porosity, absolute permeability, net to gross ratio, facies), special core analysis (relative permeability and capillary pressure), pressure, volume, temperature (PVT) analysis (fluid PVT), geochemical analysis (water salinity). Injector locations are based on geologic interpretation, petrophysical properties, and economic optimization. Injection rates were analyzed with flexibility to handle offset well failure during the project period. Injectors were also designed with a maximum allowable injection pressure limit. To assure storage site safety during the injection period, reservoir pressure was also controlled by critical pressure. Dynamic model results predicted a storage volume of 70.6 MMT at 28 years, using six CO_2 injection wells.

3. AoR and Corrective Action

CTV's AoR and Corrective Action plan pursuant to 40 CFR 146.82(a)(4), 40 CFR 146.82(a)(13) and 146.84(b), and 40 CFR 146.84(c) describes the process, software, and results to establish the AoR, and the wells that require corrective action.

AoR and Corrective Action GSDT Submissions
GSDT Module: AoR and Corrective Action ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT:

☒ Tabulation of all wells within AoR that penetrate confining zone ***[40 CFR 146.82(a)(4)]***

☒ AoR and Corrective Action Plan *[40 CFR 146.82(a)(13) and 146.84(b)]*

☒ Computational modeling details ***[40 CFR 146.84(c)]***

4. Financial Responsibility

CTV's Financial Responsibility demonstration pursuant to 140 CFR 146.82(a)(14) and 40 CFR 146.85 is met with a line of credit for Injection Well Plugging and Post-Injection Site Care and Site Closure and insurance to cover Emergency and Remedial Responses.

Financial Responsibility GSDT Submissions
GSDT Module: Financial Responsibility Demonstration ***Tab(s):*** Cost Estimate tab and all applicable financial instrument tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Demonstration of financial responsibility ***[40 CFR 146.82(a)(14) and 146.85]***

5. Injection and Monitoring Well Construction

CTV plans to drill six new injectors for the CTV III storage project. New injection wells C1, C2, E1, E2, W1, and W2 are planned and designed specifically for CO_2 sequestration purposes. These wells will target selective intervals within the injection zone to optimize plume development and injection conformance. Additionally, three new monitoring wells are required to support the storage project. M1 and M2 will be injection zone monitoring wells, and D1 will be an above-zone monitoring well. Two USDW monitoring wells, US1 and US2, will also be constructed prior to injection. **Figure A-59** shows the locations of the new wells.

All planned new wells will be constructed with components that are compatible with the injectate and formation fluids encountered such that corrosion rates and cumulative corrosion over the duration of the project are acceptable. The proposed well materials will be confirmed based on actual CO_2 composition such that material strength is sufficient to withstand all loads encountered throughout the life of the well with an acceptable safety factor incorporated into the design. Casing points will be verified by trained geologists using real-time drilling data such as logging while drilling (LWD) and mud logs to ensure non-endangerment of USDWs. Due to the depth of the base of USDW, an intermediate casing string will be used to isolate the USDW. Cementing design, additives, and placement procedures will be sufficient to ensure isolation of the injection zone and protection of USDW using cementing materials that are compatible with injectate, formation fluids, and subsurface pressure and temperature conditions.

Appendix C-1: Injection and Monitoring Well Schematics provides casing diagram figures for all injection and monitoring wells with construction specifications and anticipated completion details in graphical and/or tabular format.

Injection wells will have wellhead equipment sufficient to shut off injection at surface. The project does not anticipate risk factors that warrant downhole shut-off devices, such as high temperature, high pressure, presence of hydrogen sulfide, proximity to populated areas, or high likelihood of damage to the wellhead.

5.1 Proposed Stimulation Program [40 CFR 146.82(a)(9)]

There are no proposed stimulation programs currently.

5.2 Construction Procedures [40 CFR 146.82(a)(12)]

Injection and monitoring wells will be drilled during pre-operational testing, and no abnormal drilling and completion challenges are anticipated. The drilling histories of nearby wells provide key information to drilling professionals and identify the expected conditions to be encountered. The wells will be constructed with objectives to achieve target CO_2 injection rates, to prevent migration of fluids out of the injection zone, to protect the shallow formations, and to allow for monitoring, as described by the following:

- Well designs will be sufficient to withstand all anticipated load cases including safety factors.
- Multiple cemented casing strings will protect shallow USDW-bearing zones from contacting injection fluid.
- All casing strings will be cemented in place with volume sufficient to place cement to surface using industry-proven recommended practices for slurry design and placement
- Cement bond logging (CBL) will be used to verify presence of cement in the production casing annulus through and above the confining layer.
- Mechanical integrity testing (MIT) will be performed on the tubing and the tubing/casing annulus.
- Upper completion design enables monitoring devices to be installed downhole, cased hole logs to be acquired and MIT to be conducted.
- All wellhead equipment and downhole tubulars will be designed to accommodate the dimensions necessary for deployment of monitoring equipment such as wireline-conveyed logging tools and sampling devices.

- Realtime surface monitoring equipment with remote connectivity to a centralized facility and alarms provides continual awareness to potential anomalous injection conditions.
- Annular fluid (packer fluid) density and additives to mitigate corrosion provide additional protection against mechanical or chemical failure of production casing and upper completion equipment.

Well materials used will be compatible with the CO_2 injectate and will limit corrosion.

- Wellhead: stainless steel or other corrosion resistant alloy.
- Casing: 13Cr L-80 or other corrosion resistant alloy in specified sections of production string (i.e., flow-wetted casing).
- Cement: Portland cement has been used extensively in enhanced oil recovery (EOR) injectors. Data acquired from existing wells supports that the materials are compatible with CO_2 where good cement bond between formation and casing exists.
- Tubing: 13Cr L-80 or other corrosion resistant alloy.
- Packer: corrosion resistant alloy and hardened elastomer.

Well materials follow the following standards:

- API Spec 5CT / ISO 11960 – Specification for Casing and Tubing
- API Spec 5CRA / ISO 13680 – Specification for Corrosion-Resistant Alloy Seamless Tubes for use as Casing, Tubing, and Coupling Stock
- API Spec 10A / ISO 10426-1 – Cements and Materials for Cementing
- API Spec 11D1 / ISO 14310 – Downhole Equipment – Packers and Bridge Plugs
- API Spec 6A / ISO 10423 – Specification for Wellhead and Tree Equipment

As required by §146.86(b)(1), casing and tubing material sizes, thicknesses, and grades were selected by evaluating the proposed well design internal pressures, external pressures, and axial loads that the well will be expected to withstand throughout construction and operations. Temperature effects under static or dynamic conditions, based on load scenario, have been incorporated into the modelling results. The design results indicate the materials selected have strengths sufficient to withstand all worst-case load scenarios and include industry-standard safety factors.

CTV will confirm that the properties of the CO_2 stream are consistent with design assumptions based on pre-op injectate sampling.

5.2.1 Casing and Cementing

Well-specific casing diagrams including casing specifications are presented in **Appendix C-1: Injection and Monitoring Well Schematics** to meet the requirements of 40 CFR 146.86(b)(1)(iv). These specifications allow for the safe operation at bottomhole injection conditions not to exceed the maximum injection pressures specified in **Appendix 4: Operational Procedures**.

The injection zone pressure is neither significantly depleted nor over-pressured, and the temperature is approximately 151°F. These conditions are not extreme, and standard cementing and casing best practices are sufficient to ensure successful placement and isolation. Industry standard practices and procedures for designing and placing primary cement in the casing annuli will be used to ensure mechanical integrity of cement and casing. Staged cementing is not an anticipated requirement.

Surface casing will be designed to protect the base of fresh water at a depth of around 400 feet TVD. Casing is planned to be set at 600 feet. Class G portland cement—an API grade cement—meets API standard specifications for this application. Accelerator additives will be used to speed up the thickening time of the cement, lost circulation additive may be used as macro plugging material, and extender additives may be used to protect shallow formations by reducing the weight of cement.

The intermediate casing will be set at a depth sufficient to cover the USDW. The depth to the base of USDW is expected to be encountered at approximately 2,541 feet TVD. Casing will be set or below 2,550 feet TVD to ensure protection of the USDW. Class G portland cement will be circulated to surface with retarding additives (depending on pump time) to decrease the speed of cement hydration as well as friction reducer additives to improve upon the flow properties of the cement slurry. Anti-foam additives, fluid loss additives, lost circulation material, dispersants, and extenders may also be considered based on industry best practices for slurry design to ensure effective placement of cement.

The long casing string will be set 120 feet into the H&T Shale. A combination of Class G portland lead slurry and Class G portland tail slurry with CO_2 resistant additives will be used to cement the long string. The tail slurry will be circulated from TD into the confining layer. The lead slurry will provide isolation of the long string casing in and above the confining layer to surface. Anti-foam additives, fluid loss additives, lost circulation material, dispersants, and extenders may also be considered based on industry best practices for slurry design to ensure effective placement of cement, along with considering the addition of silica flour for strength retrogression.

Operational parameters acquired throughout the pressure pumping operation will be used to compare modeled versus actual pressure and rate. The presence of circulated cement at surface will also be a primary indicator of effective cement placement. Cement evaluation logging will be conducted to confirm cement placement and isolation.

5.2.2 Tubing and Packer

The information in the tables provided in **Appendix C-1: Injection and Monitoring Well Schematics** is representative of completion equipment that will be used and meets the requirements at 40 CFR 146.86(c). Tubing and packer selection and specifications will be determined during pre-operational testing and will be sufficient to withstand all load scenarios considering internal pressure, external pressure, axial loading, and temperature effects.

5.2.3 Annular Fluid

4% KCl completion fluid treated with corrosion inhibitor and biocide will be circulated in the tubing/casing annulus at the time of tubing installation. The corrosion inhibitor and biocide additives will be compatible with the wellbore environment and bottomhole temperatures to prevent internal corrosion of the 7-inch casing and external corrosion of the tubing.

5.2.4 Injectate and Formation Fluid Properties

CTV is planning to construct a carbon capture and sequestration "hub" project (i.e., a project that collects CO_2 from multiple sources over time and injects the CO_2 stream(s) via a Class VI UIC permitted injection well(s)). Therefore, CTV is currently considering multiple sources of anthropogenic CO_2 for the project. CO_2 will be sourced from multiple sources pre and post combustion that will be located in proximity to the storage site, direct air capture and other CO_2 sources in the project area. Minor constituents associated with the CO_2 stream may include, for example, water content (<25 lb/mmscf), oxygen, hydrogen sulfide (H_2S), and SO_x compounds. The CO_2 stream will be sampled at the transfer point from the source and analyzed according to the analytical methods described in Table 4 of the QASP and Table 1 of **Attachment C: Testing and Monitoring Plan (Attachment C)**.

The anticipated injection temperature at the wellhead is 90 to 130°F.

The Injectate 1 and Injectate 2 compositions and properties are detailed in Section 7.2.

No corrosion is expected in the absence of free phase water provided that the entrained water is kept in solution with the CO_2. This is ensured by the <25 lb/mmscf injectate specification limit, and this specification will be a condition of custody transfer at the capture facility. For transport through pipelines, which typically use standard alloy pipeline materials, this specification is critical to the mechanical integrity of the pipeline network, and out of specification product will be immediately rejected. Therefore, all product transported through pipeline to the injection wellhead is expected to be dry-phase CO_2 with no free-phase water present.

Injectate water solubility will vary with depth and time as temperature and pressures change. The water specification is conservative to ensure water solubility across super-critical operating ranges. CRA tubing will be used in the injection wells to mitigate any potential corrosion impact should free-phase water from the reservoir become present in the wellbore, such as during shut-in events when formation liquids, if present, could backflow into the wellbore. CTV may further optimize the maximum water content specification prior to injection based on technical analysis.

Geochemical analysis and properties of the connate formation water has been provided in Section 2.8. Water geochemistry representative of the project area does not indicate corrosiveness to standard cement and casing materials. A formation water analysis will be obtained during pre-operational testing and reviewed to ensure compatibility with well construction materials.

5.2.5 Alarms and Shut-Off Devices

As described in the Testing and Monitoring Plan, injection wells will be configured with real-time injection rate, injection pressure, and annular pressure monitoring and alarms. The Operating Procedures plan details the maximum injection rate and pressure thresholds for alarms and shut-off devices.

A surface shut-off valve will be installed on the wellhead and configured with automation and communication to the Central Control Facility (CCF). The valve will be used by the CCF operator remotely to respond to an emergency by shutting in the well. The valve will be configured to automatically shut-in the well if tubing or annular alarm thresholds are exceeded.

The project does not anticipate risk factors that warrant downhole shut-off devices, such as high temperature, high pressure, presence of hydrogen sulfide, proximity to populated areas, or high likelihood of damage to the wellhead.

6. Pre-Operational Logging and Testing

CTV has attached a pre-operational logging and testing plan pursuant to 40 CFR 146.82(a)(8) and 40 CFR 146.87.

Pre-Operational Logging and Testing GSDT Submissions
GSDT Module: Pre-Operational Testing ***Tab(s):*** Welcome tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Proposed pre-operational testing program ***[40 CFR 146.82(a)(8) and 146.87]***

7. Well Operation

7.1 Operational Procedures [40 CFR 146.82(a)(10)]

CTV has provided detailed operational procedures for each injection well. These procedures and parameters are provided for all injectors in the Operational Procedures document attached with this application.

7.2 Proposed Carbon Dioxide Stream [40 CFR 146.82(a)(7)(iii) and (iv)]

CTV is planning to construct a carbon capture and sequestration "hub" project (i.e., a project that collects CO_2 from multiple sources over time and injects the CO_2 stream(s) via a Class VI UIC permitted injection well(s)). Therefore, CTV is currently considering multiple sources of anthropogenic CO_2 for the project. CO_2 will be sourced from both pre and post combustion sources that will be located in proximity to the storage site, direct air capture and other CO_2 sources in the project area. CTV would expect the CO_2 stream will be sampled at the transfer point from the source and analyzed according to the analytical methods described in Table 4 of the QASP and Table 1 of **Attachment C**. Should the injectate not meet the minimum requirements, it will be rejected.

The anticipated injection temperature at the wellhead is 90 to 130°F.

For the purposes of geochemical modeling, CO_2 plume modeling, AoR determination, and well design, two major types of Injectate compositions were considered based on the source:

- Injectate 1: A potential injectate stream composition from a direct air capture (DAC) or a pre-combustion source (such as a blue hydrogen facility) or a post-combustion source (such as a natural gas fired power plant or steam generator). The primary impurity in the injectate is nitrogen.
- Injectate 2: A potential injectate stream composition from a biofuel capture source (such as a biodiesel plant that produces biodiesel from a biologic source feedstock) or from an oil and gas refinery. The primary impurity in the injectate is light end hydrocarbons (methane and ethane).

The compositions for these two injectates are shown in **Table A-16**, and are based on engineering design studies and literature.

For geochemical and plume modeling scenarios, these injectate compositions were simplified to a 4-component system, shown in **Table A-17**, and then normalized for use in the modeling. The 4-component simplified compositions cover 99.9% by mass of Injectates 1 and 2 and cover particular impurities of concern (H_2S and SO_2). The estimated properties of the injectates at downhole conditions are specified in **Table A-18**.

No corrosion is expected in the absence of free-phase water provided that the entrained water is kept in solution with the CO_2. This is ensured by the <25 lb/mmscf injectate specification limit, and this specification will be a condition of custody transfer at the capture facility. For transport through pipelines, which typically use standard alloy pipeline materials, this specification is critical to the mechanical integrity of the pipeline network, and out of specification product will be immediately rejected. Therefore, all product transported through pipeline to the injection wellhead is expected to be dry-phase CO_2 with no free-phase water present.

Injectate water solubility will vary with depth and time as temperature and pressures change. The water specification is conservative to ensure water solubility across super-critical operating ranges. CRA tubing will be used in the injection wells to mitigate any potential corrosion impact should free-phase water from the reservoir become present in the wellbore, such as during shut-in events when formation liquids, if present, could backflow into the wellbore. CTV may further optimize the maximum water content specification prior to injection based on technical analysis.

8. Testing and Monitoring

CTV's Testing and Monitoring plan pursuant to 40 CFR 146.82 (a) (15) and 40 CFR 146.90 describes the strategies for testing and monitoring to ensure protection of the USDW, injection well mechanical integrity, and plume monitoring.

Testing and Monitoring GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Testing and Monitoring tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Testing and Monitoring Plan [40 CFR 146.82(a)(15) and 146.90]

9. Injection Well Plugging

CTV's Injection Well Plugging Plan pursuant to 40 CFR 146.92 describes the process, materials and methodology for injection well plugging.

Injection Well Plugging GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Injection Well Plugging tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Injection Well Plugging Plan [40 CFR 146.82(a)(16) and 146.92(b)]

10. Post-Injection Site Care (PISC) and Site Closure

CTV has developed a Post-Injection Site Care and Site Closure plan pursuant to 40 CFR 146.93 (a) to define post-injection testing and monitoring.

PISC and Site Closure GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** PISC and Site Closure tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ PISC and Site Closure Plan [40 CFR 146.82(a)(17) and 146.93(a)]
GSDT Module: Alternative PISC Timeframe Demonstration ***Tab(s):*** All tabs (only if an alternative PISC timeframe is requested) Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Alternative PISC timeframe demonstration ***[40 CFR 146.82(a)(18) and 146.93(c)]***

11. Emergency and Remedial Response

CTV's Emergency and Remedial Response plan pursuant to 40 CFR 164.94 describes the process and response to emergencies to ensure USDW protection.

Emergency and Remedial Response GSDT Submissions
GSDT Module: Project Plan Submissions ***Tab(s):*** Emergency and Remedial Response tab Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☒ Emergency and Remedial Response Plan *[40 CFR 146.82(a)(19) and 146.94(a)]*

12. Injection Depth Waiver and Aquifer Exemption Expansion

No depth waiver or Aquifer Exemption expansion is being requested as part of this application

Injection Depth Waiver and Aquifer Exemption Expansion GSDT Submissions
GSDT Module: Injection Depth Waivers and Aquifer Exemption Expansions ***Tab(s):*** All applicable tabs Please use the checkbox(es) to verify the following information was submitted to the GSDT: ☐ Injection Depth Waiver supplemental report ***[40 CFR 146.82(d) and 146.95(a)]*** ☐ Aquifer exemption expansion request and data ***[40 CFR 146.4(d) and 144.7(d)]***

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Figures

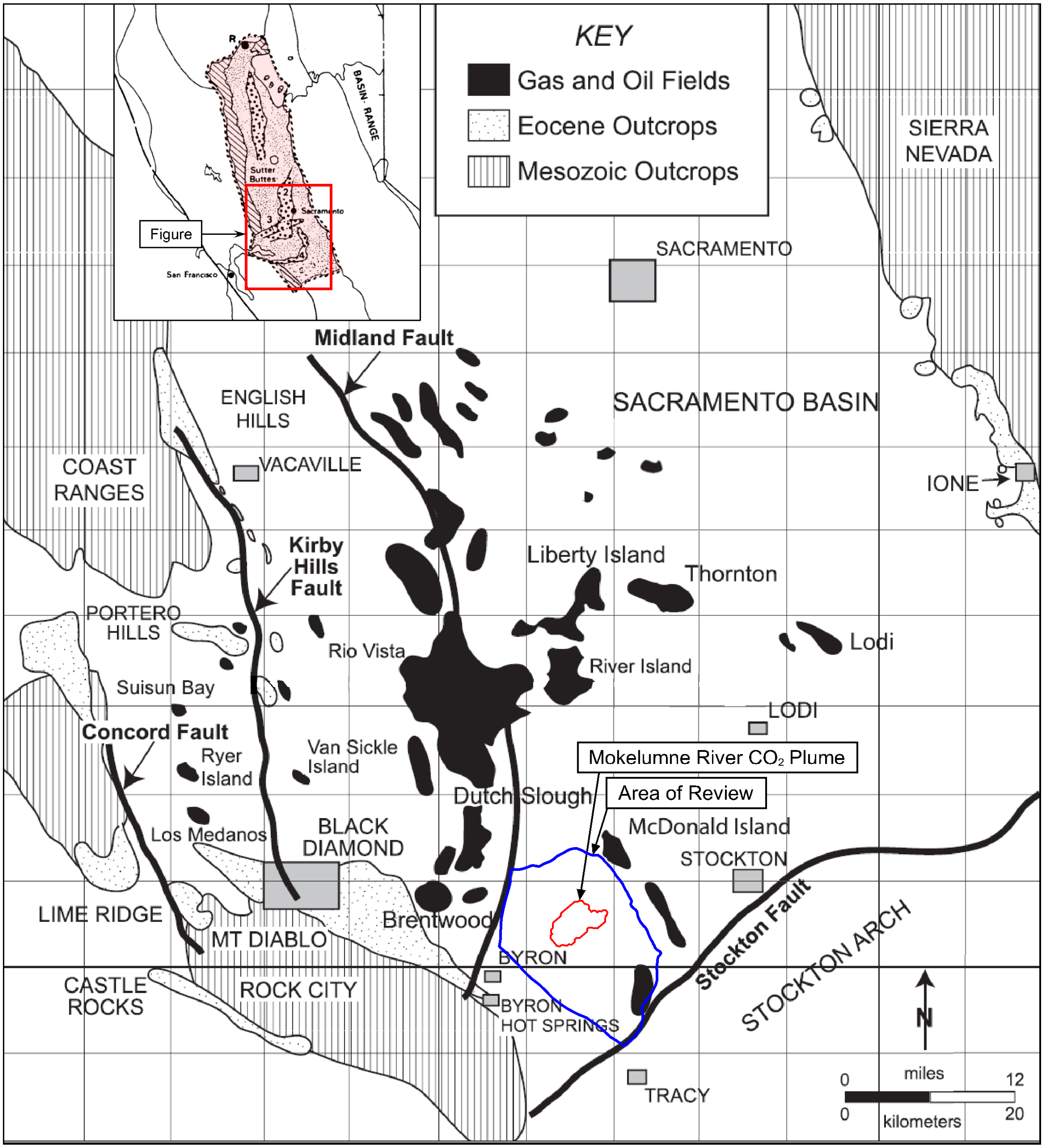


Figure A-1. **Location map of the project area with the proposed injection Area of Review (AoR) shown in blue, and the CO_2 plume shown in red, in relation to the Sacramento Basin.**

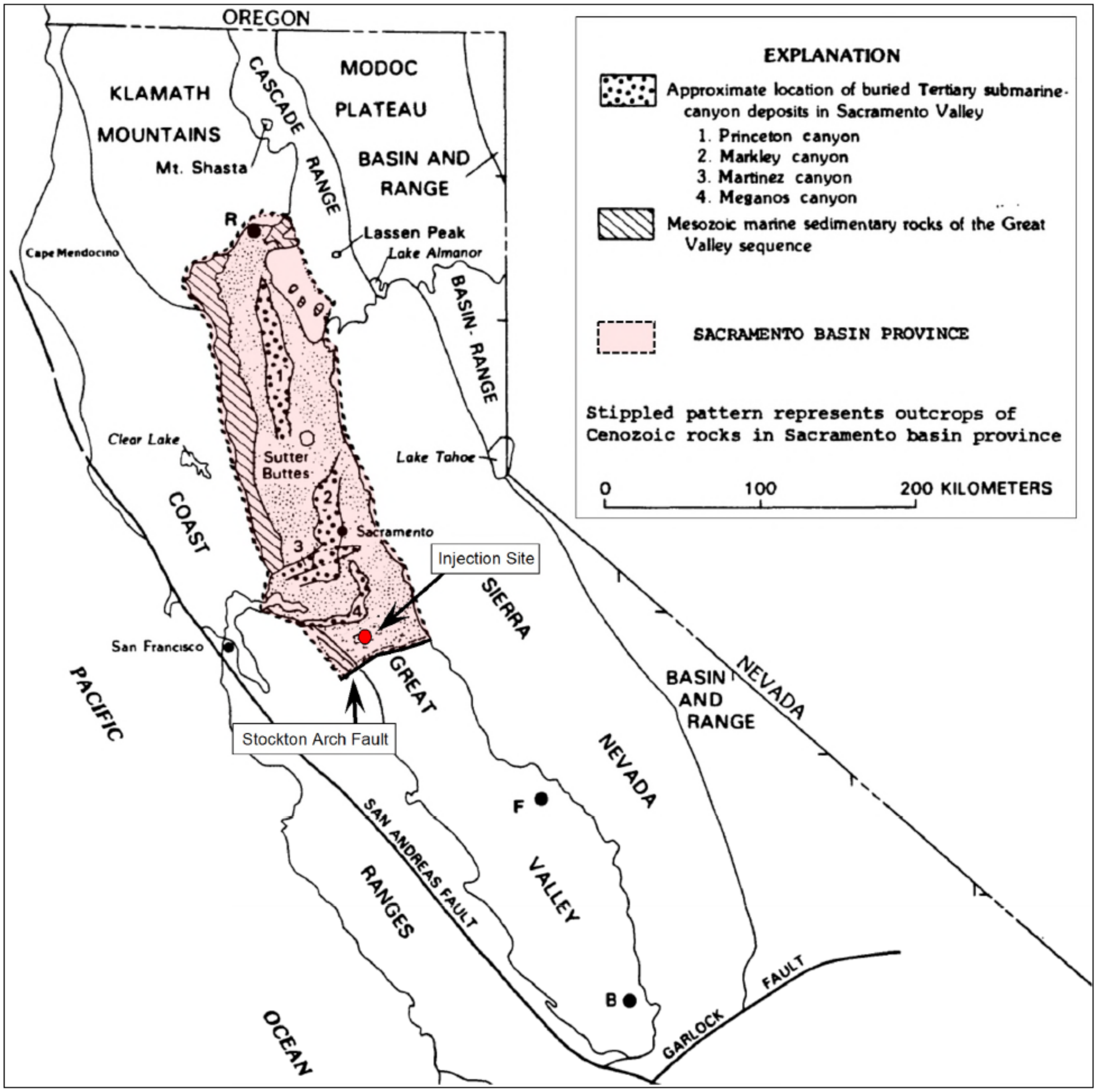


Figure A-2. Location map of California modified from Beyer (1988) and Sullivan (2012). The Sacramento Basin regional study area is outlined by a dashed black line. B – Bakersfield; F – Fresno; R – Redding.

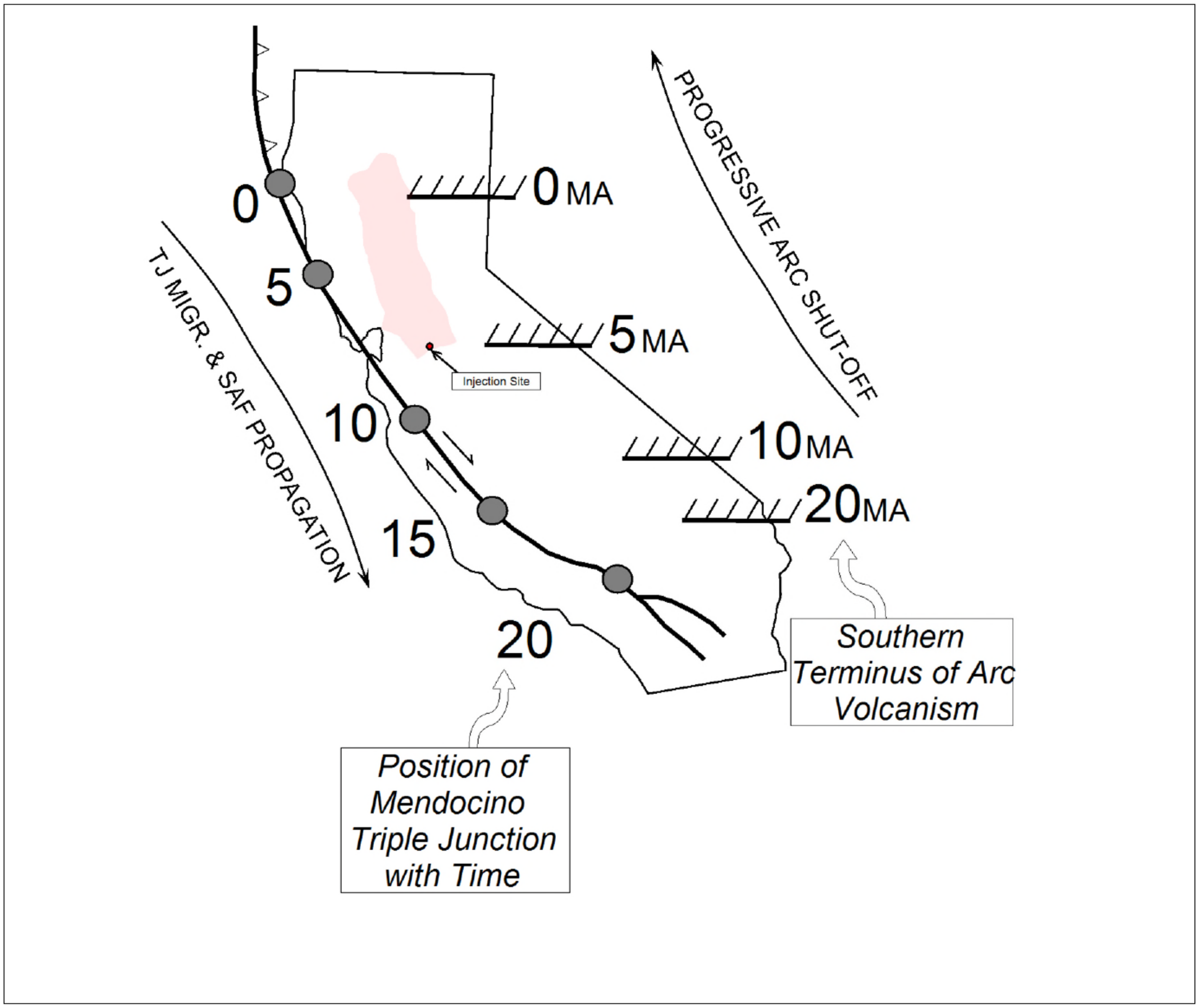


Figure A-3. Migrational position of the Mendocino triple junction (connection point of the Gorda, North American, and Pacific plates) on the west and migrational position of Sierran arc volcanism in the east (Graham, 1984). The figure indicates space-time relations of major continental-margin tectonic events in California during Miocene.

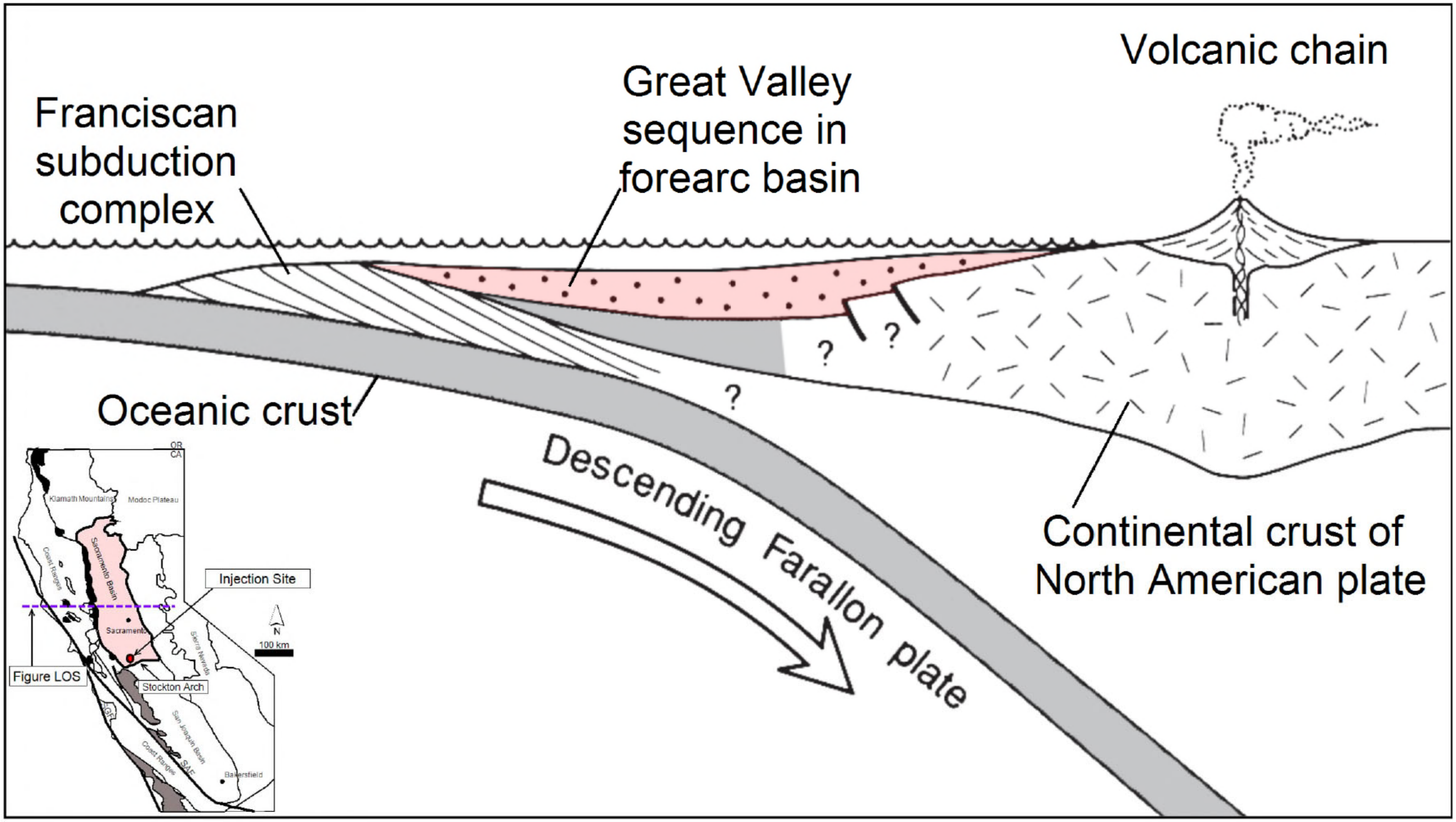


Figure A-4. **Schematic west to east cross section of California, highlighting the Sacramento Basin, as a continental margin during late Mesozoic. The oceanic Farallon plate was forced below the west coast of the North American continental plate.**

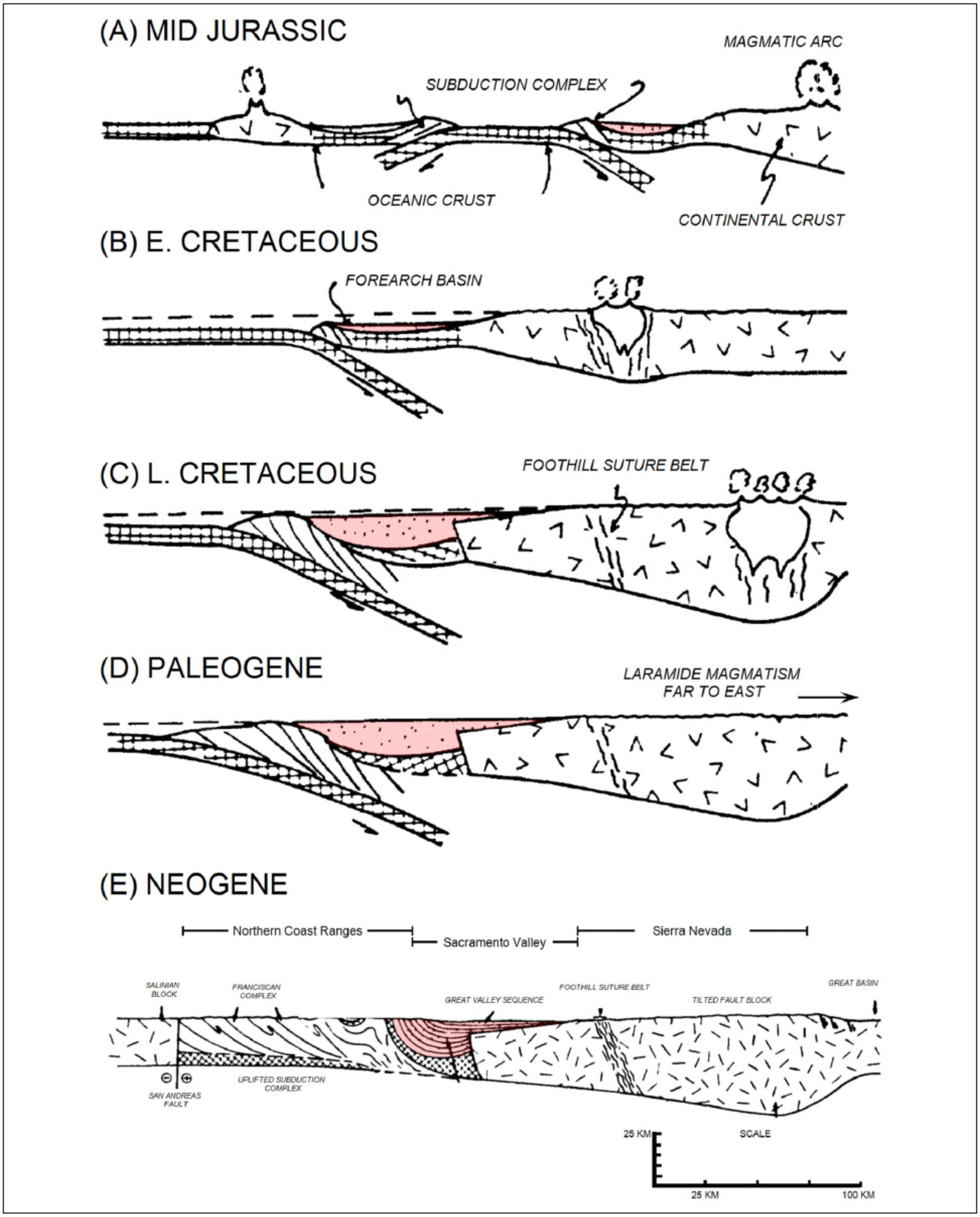


Figure A-5. Evolutionary stages showing the history of the arc-trench system of California from Jurassic (A) to Neogene (E) (modified from Beyer, 1988).

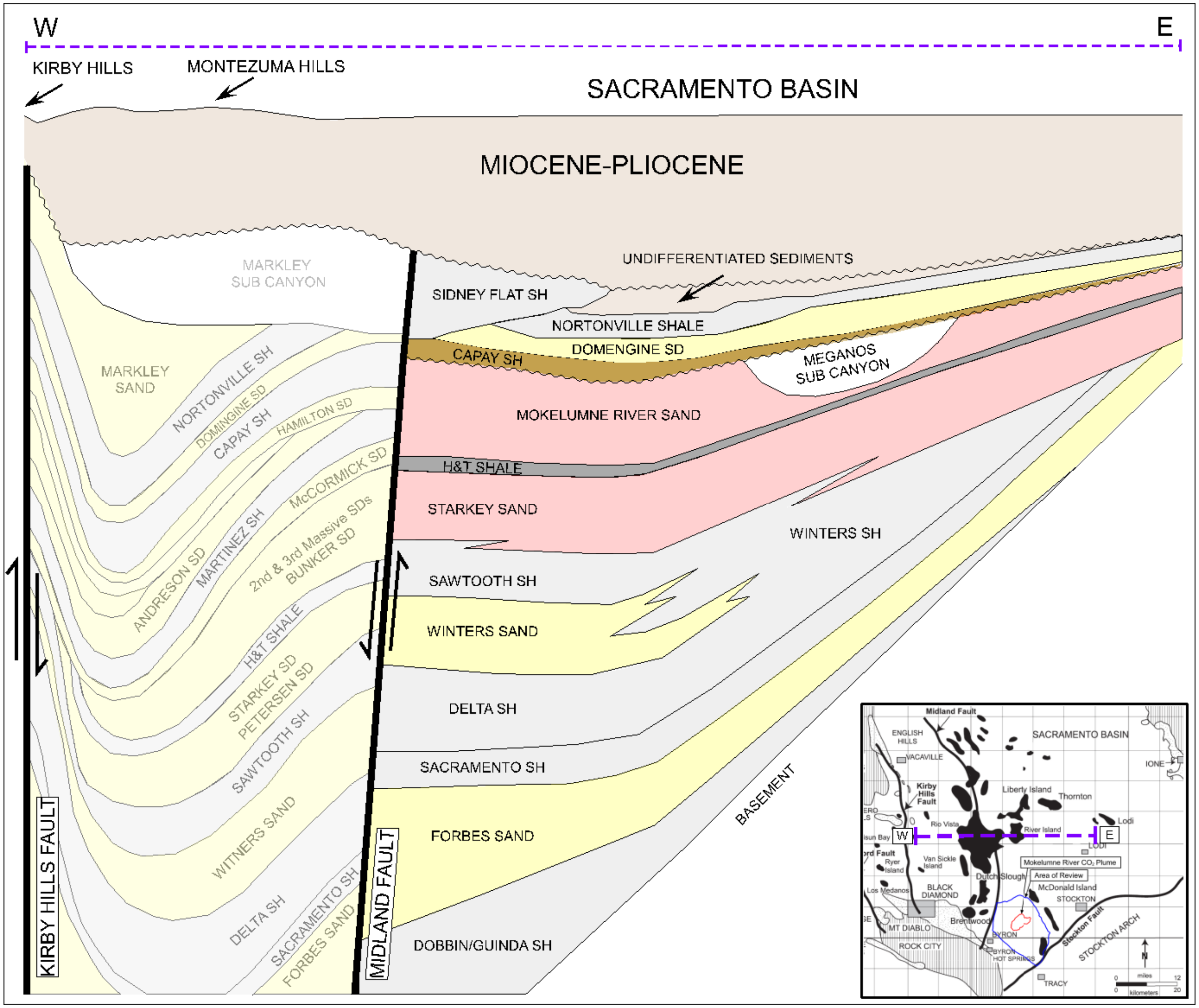


Figure A-6. Schematic west to east cross section in the Sacramento basin.

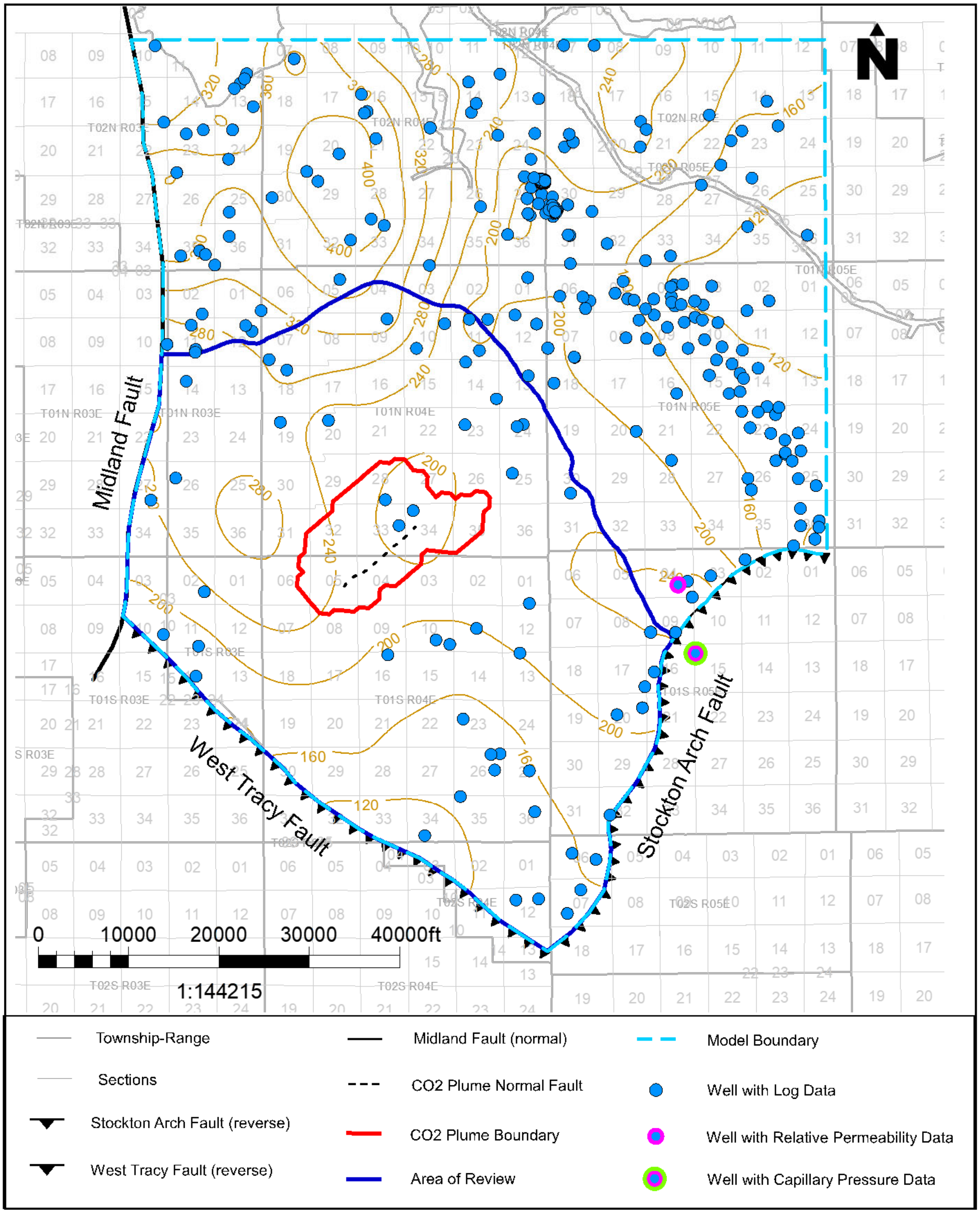


Figure A-7. Capay Shale isopach map for the greater Victoria Island area. Wells shown as blue dots on the map penetrate the Capay Shale and have open-hole logs.

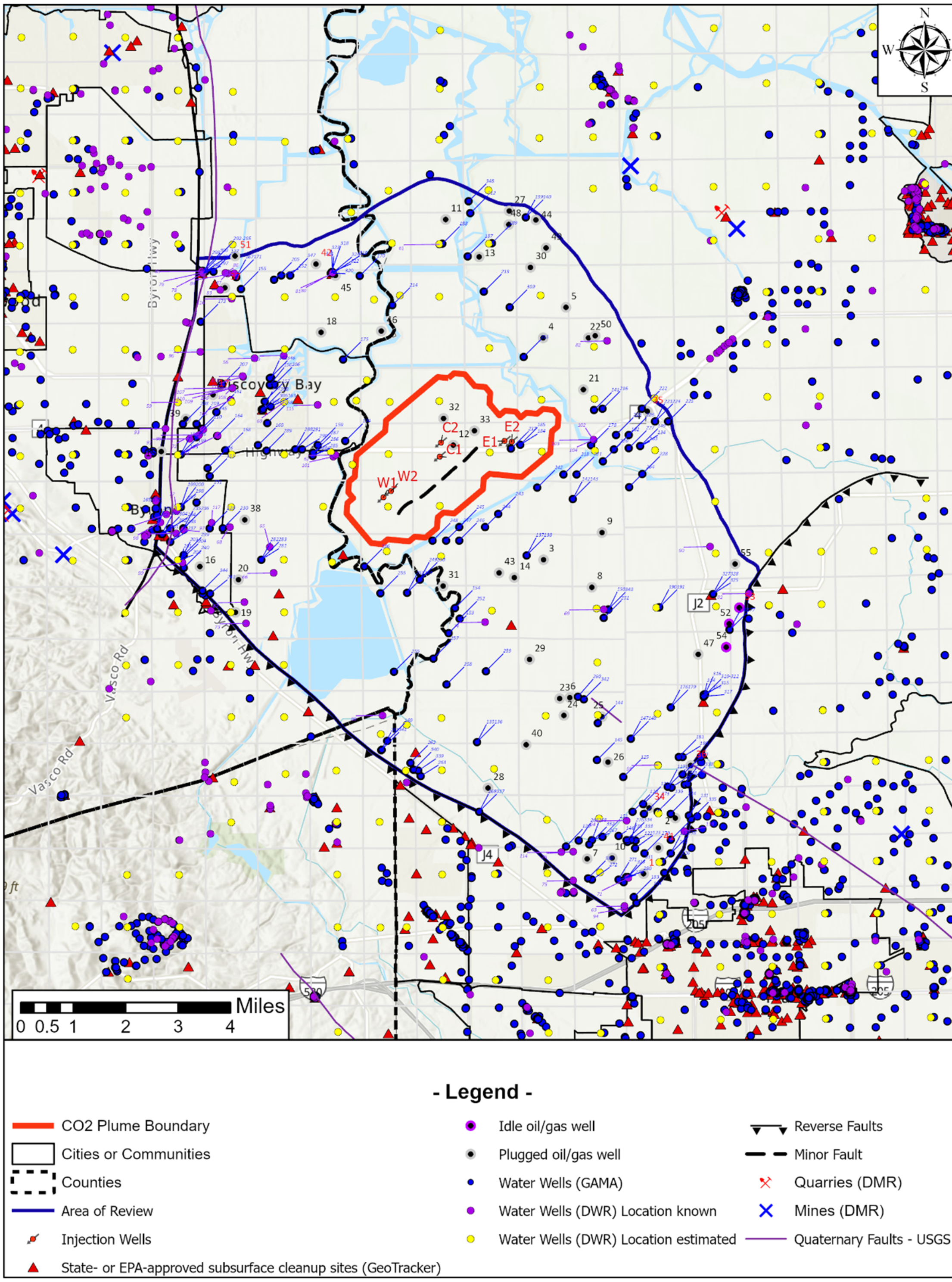


Figure A-8. Summary map of the oil or gas wells, water wells, State- or EPA-approved subsurface cleanup sites, and surface features in the project area. Water wells from California Division of Drinking Water (DWR) and Groundwater Ambient Monitoring and Assessment (GAMA) program. No known tribal lands are identified near the AoR.

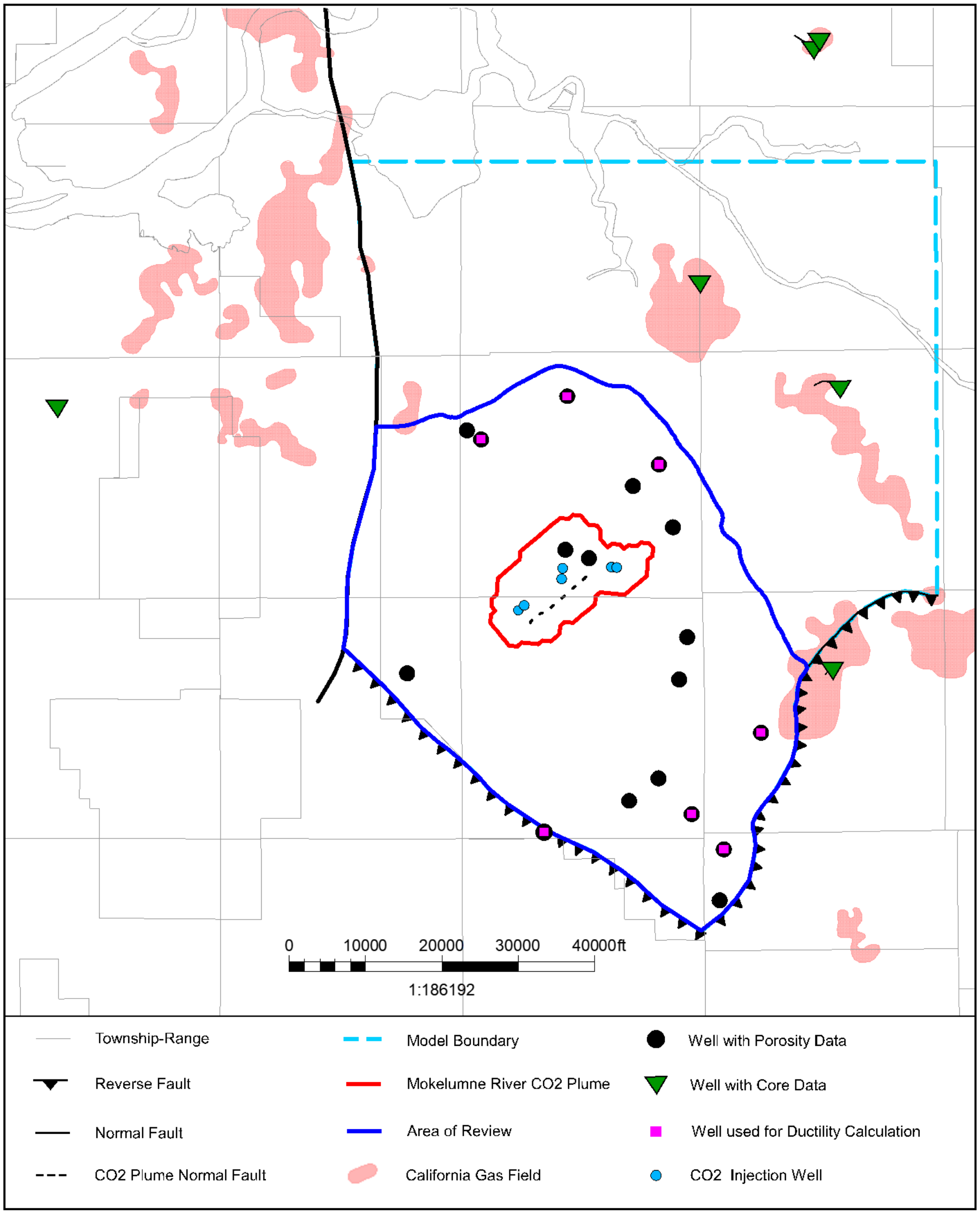


Figure A-9. Wells drilled in the project area with porosity data are shown in black. Wells with core are shown in green, and wells used for ductility calculation are shown in pink.

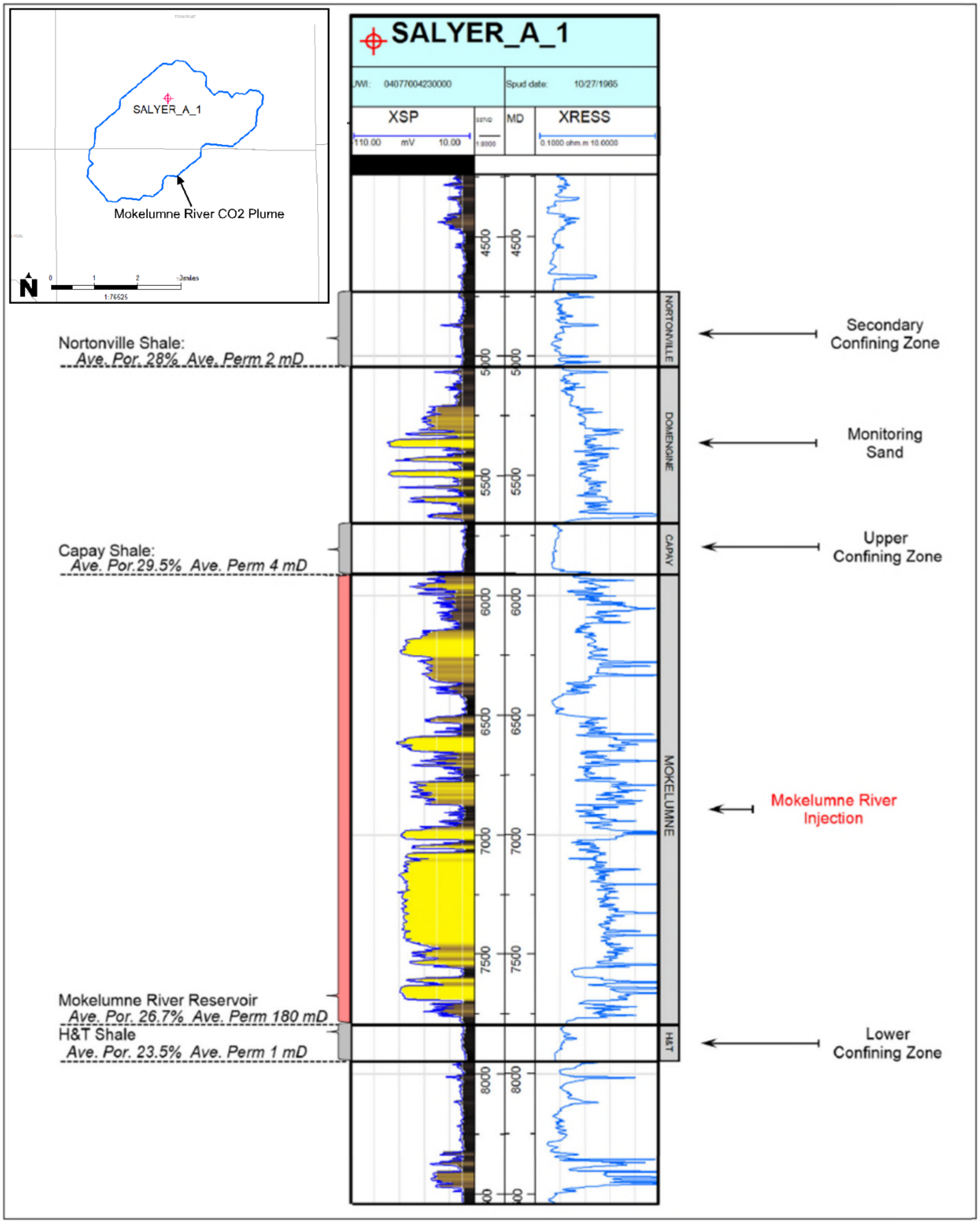


Figure A-10. Type well taken from within the AoR boundary showing confining and injection zone average rock properties.

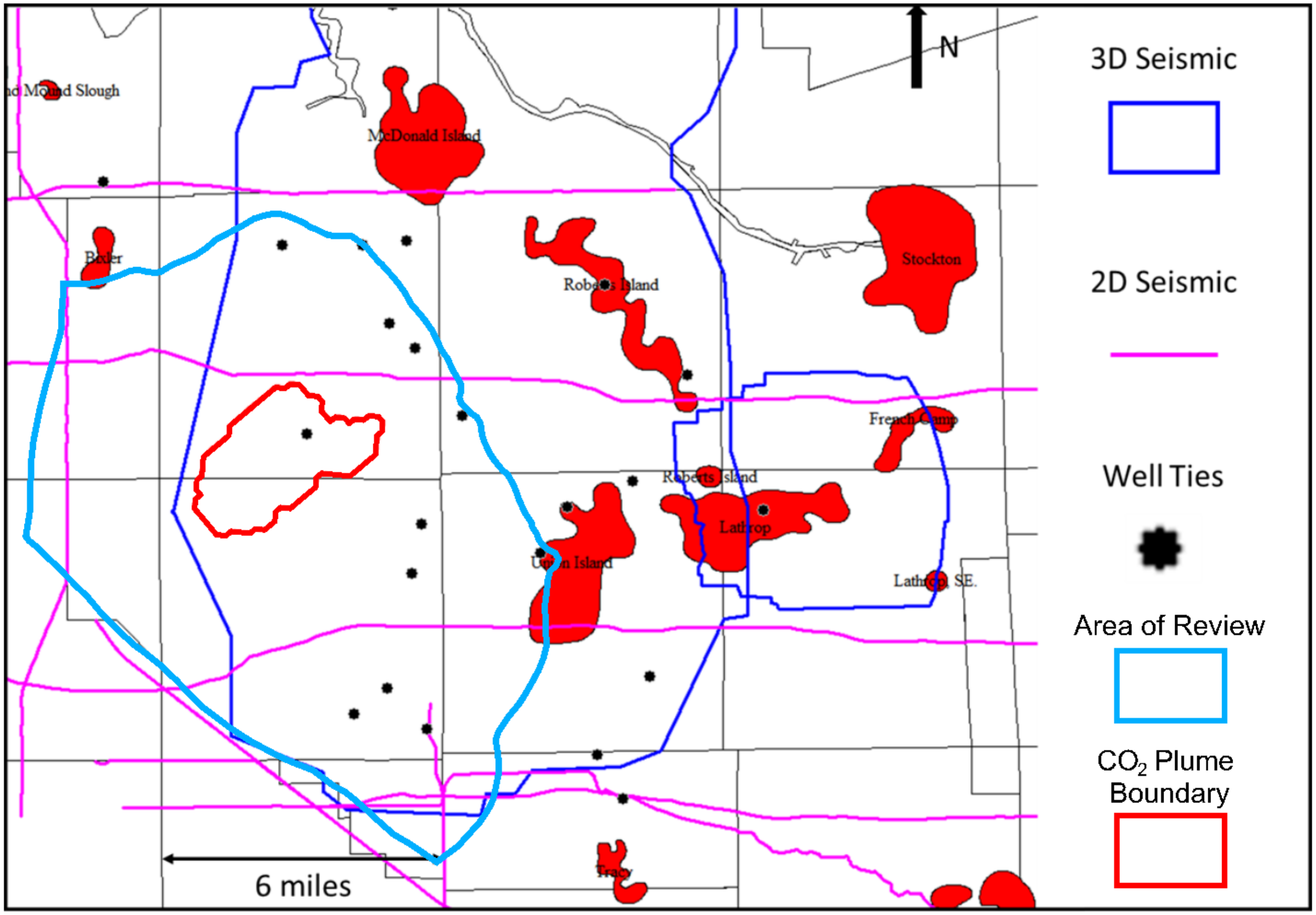


Figure A-11. Summary map and area of seismic data used to build structural model. The 3D surveys were acquired in 1998 and reprocessed in 2013. The 2D seismic were acquired between 1980 and 1985. California gas fields are shown for reference.

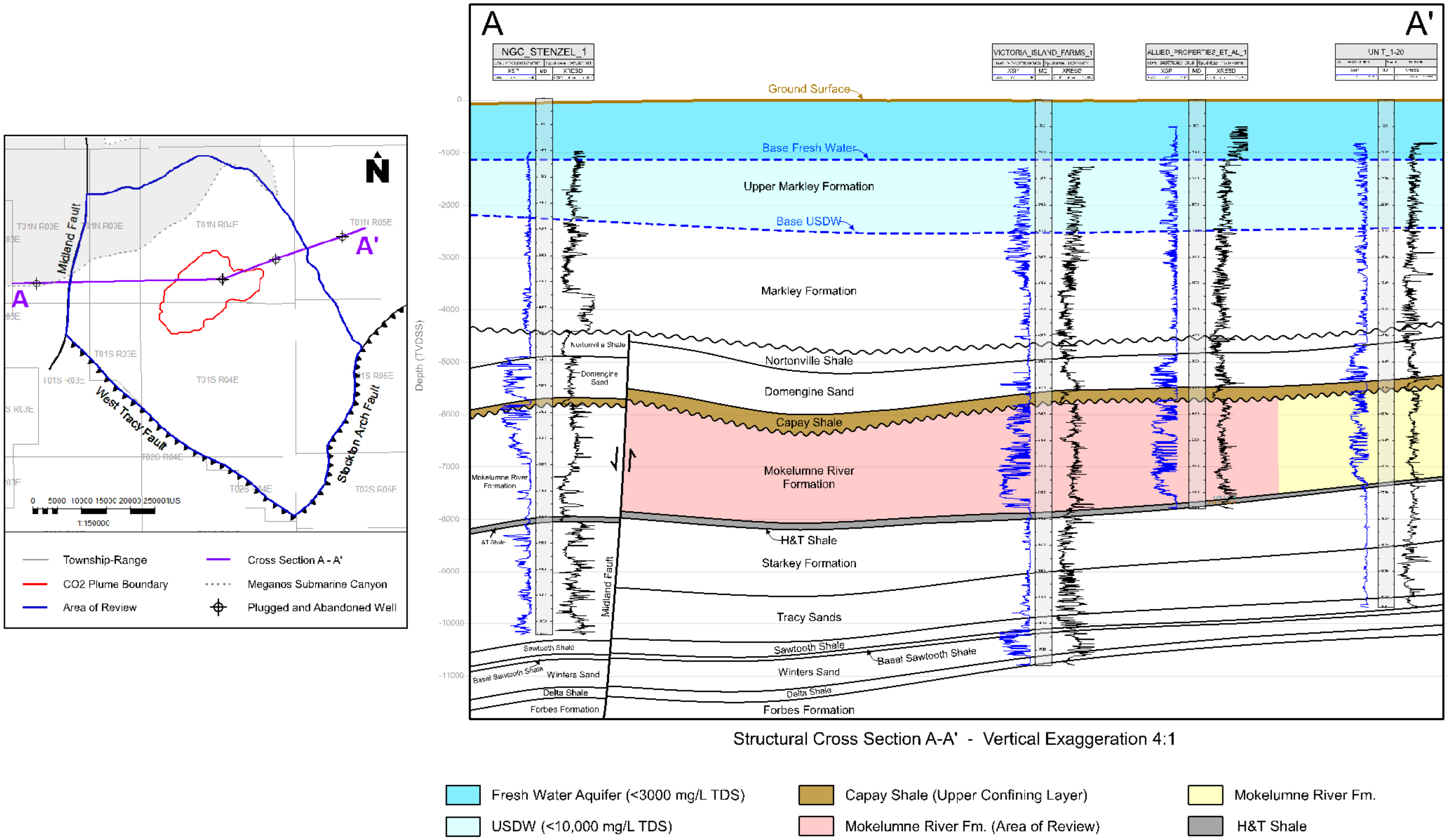


Figure A-12. Cross section showing stratigraphy and lateral continuity of major formations across the project area.

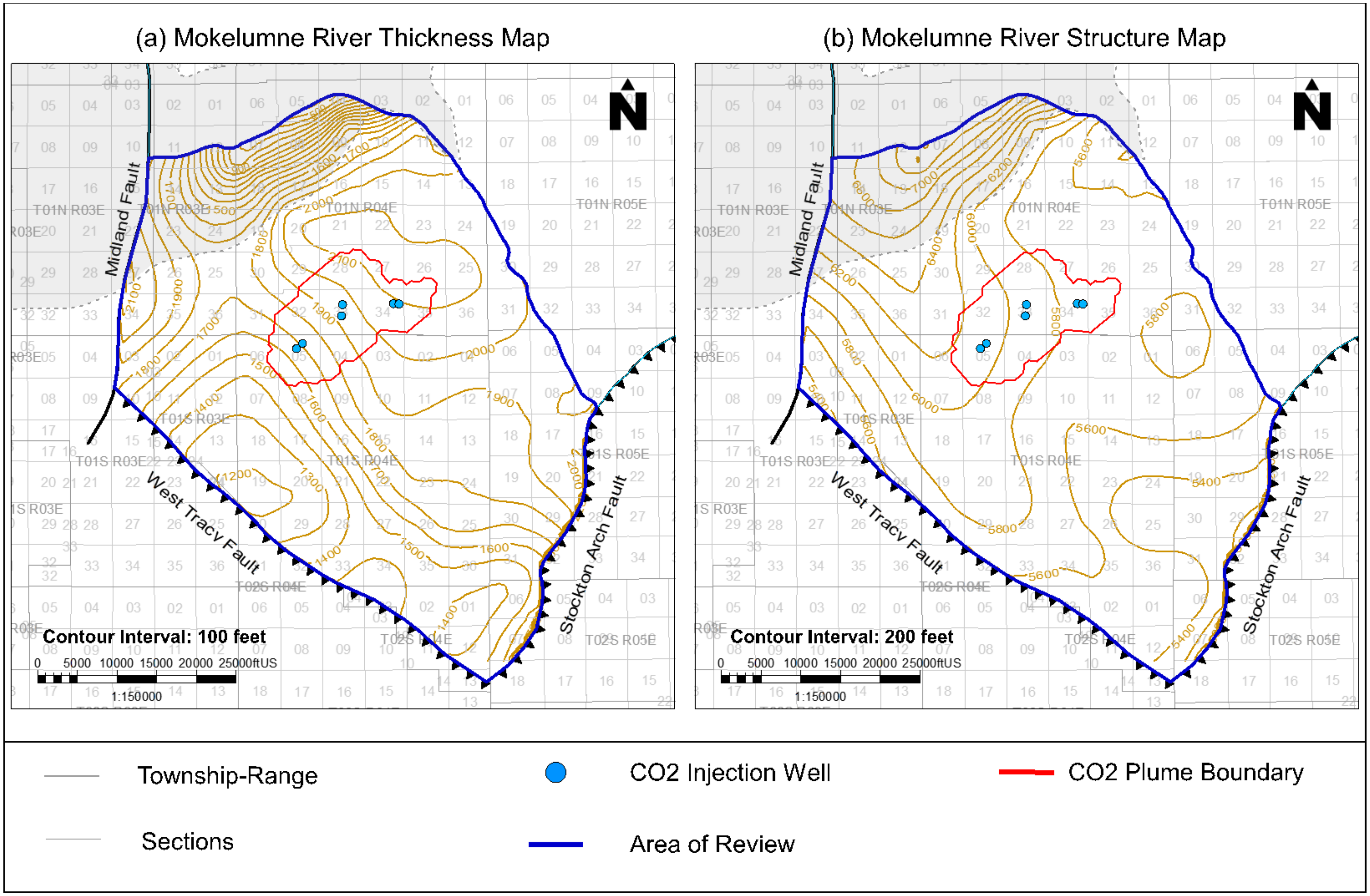


Figure A-13. (a) Mokelumne River Formation thickness map. (b) Mokelumne River Formation structure map

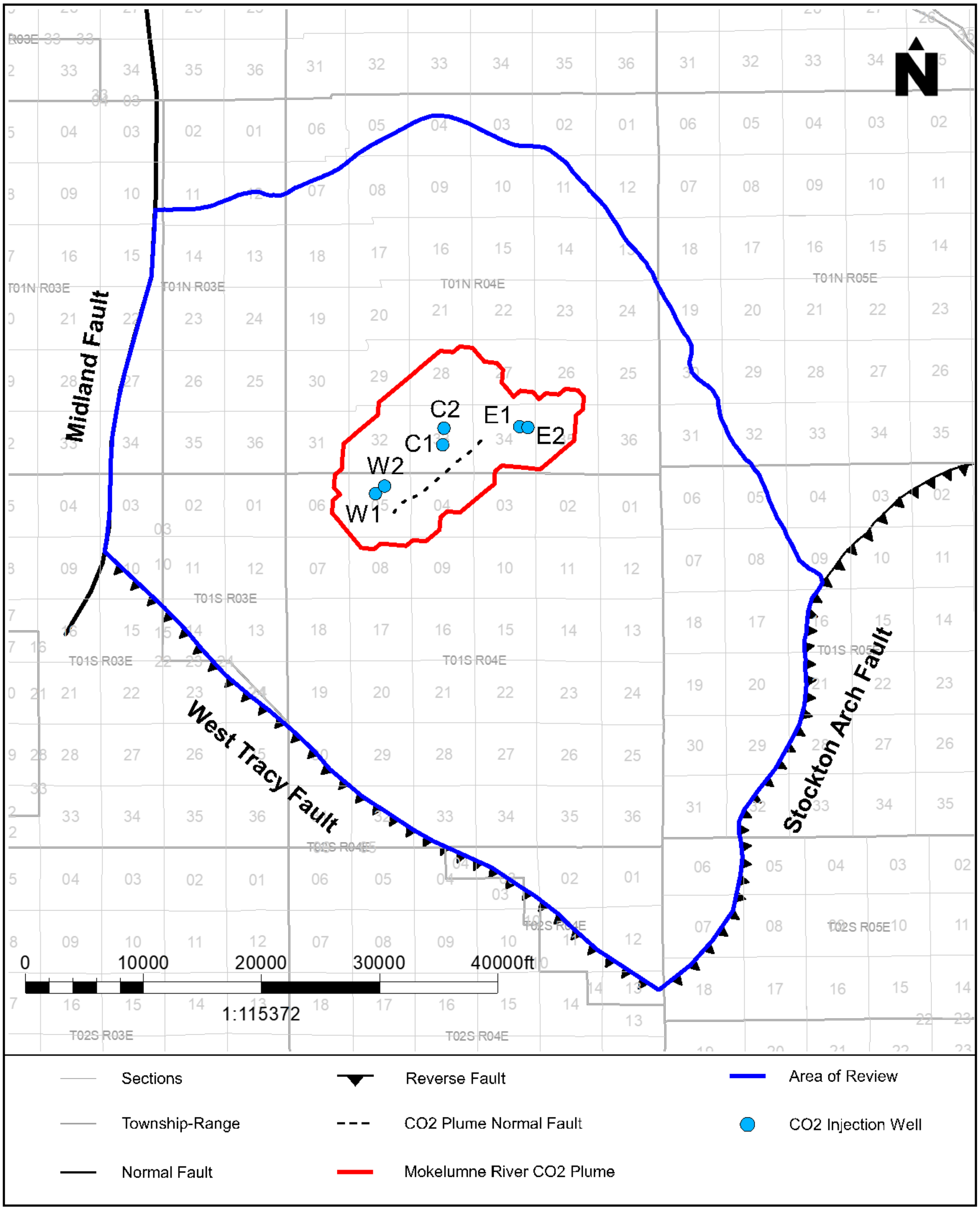


Figure A-14. Injection well location map for the project area. The three groups of injection wells (W1 & W2, C1 & C2, E1 & E2) are approximately 7,000 feet apart.

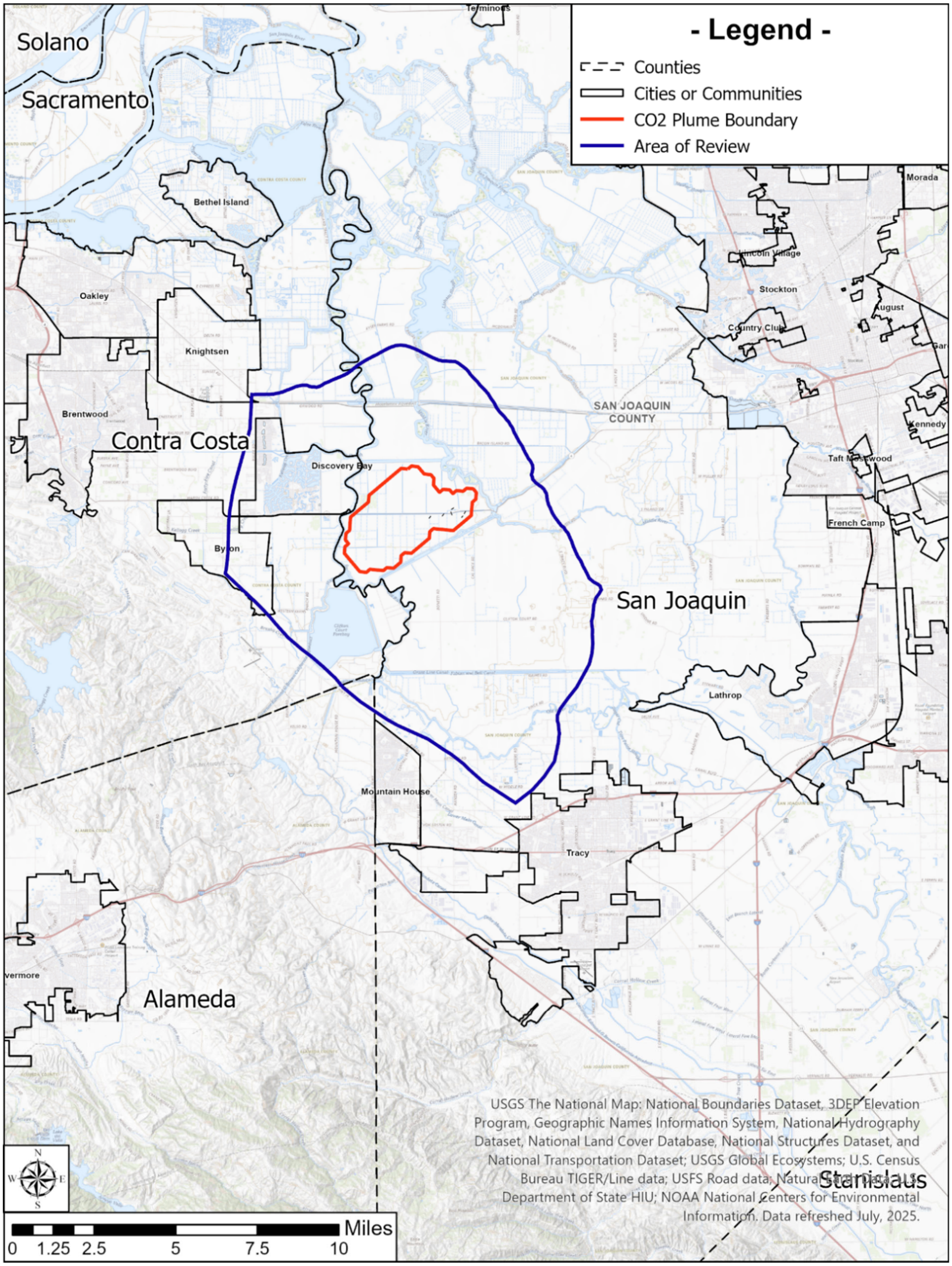


Figure A-15. Surface features and the AoR.

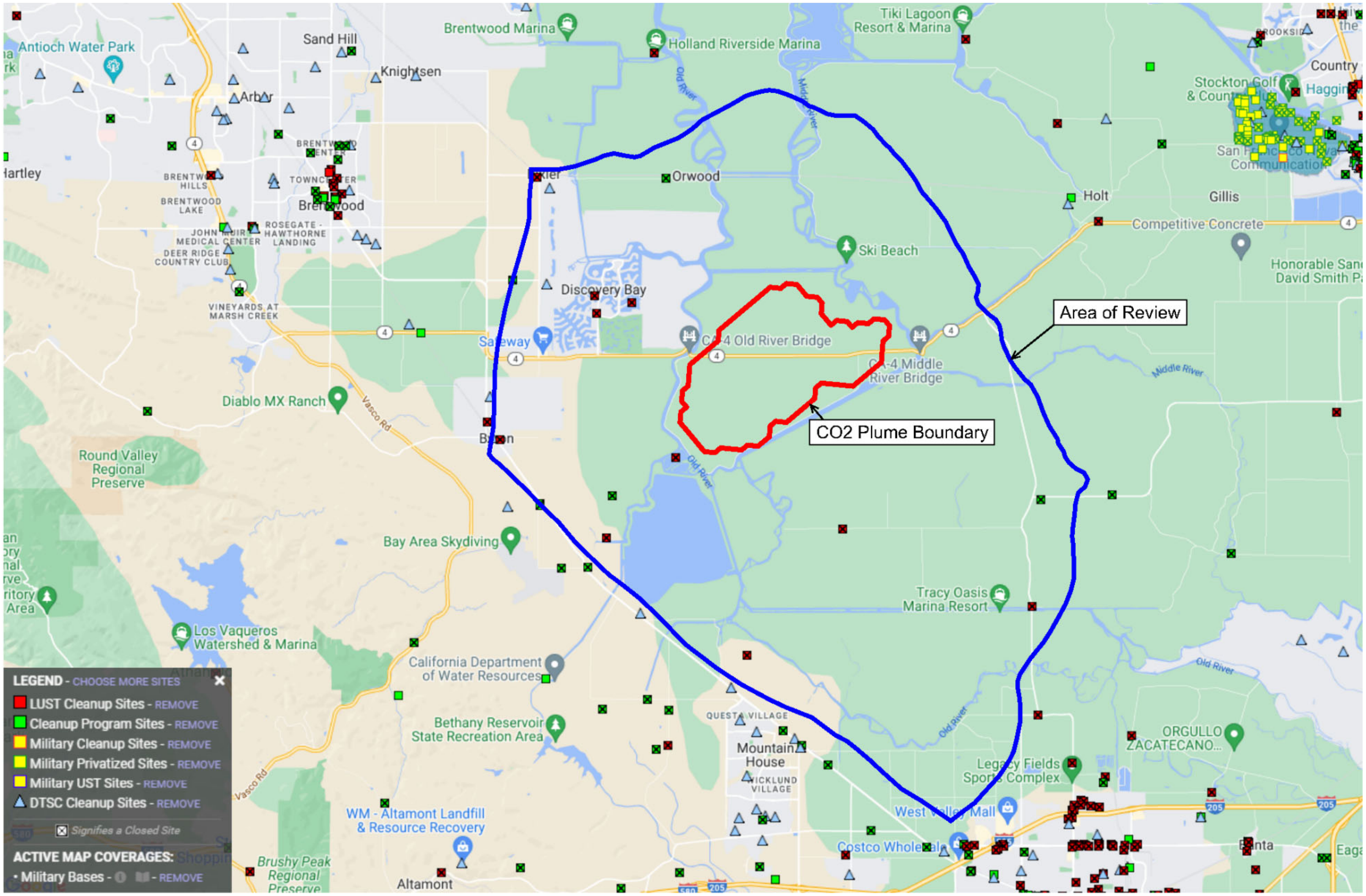


Figure A-16. State or EPA subsurface cleanup sites.

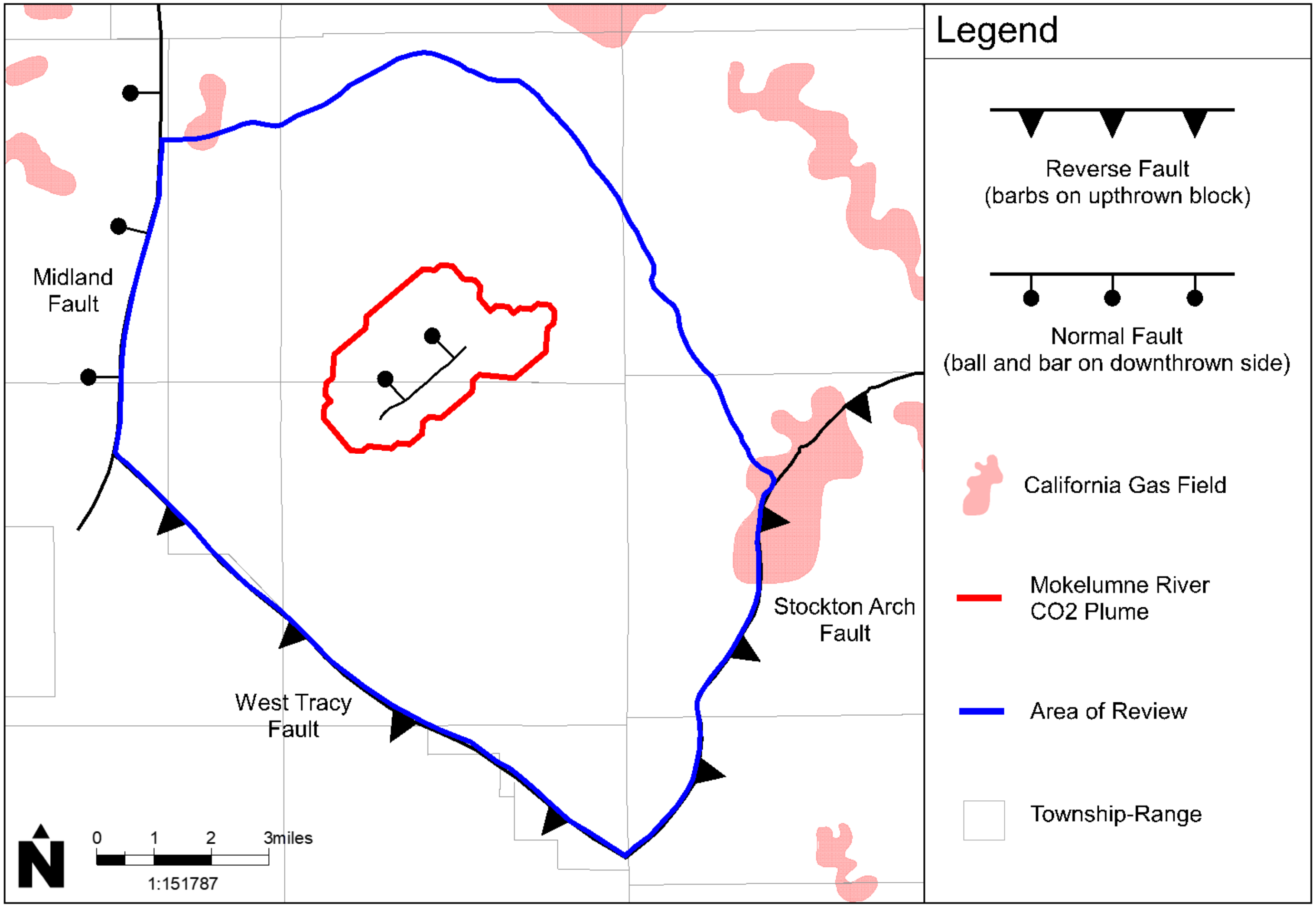


Figure A-17. Faults interpreted from seismic, well, and published data that intersect the project area.

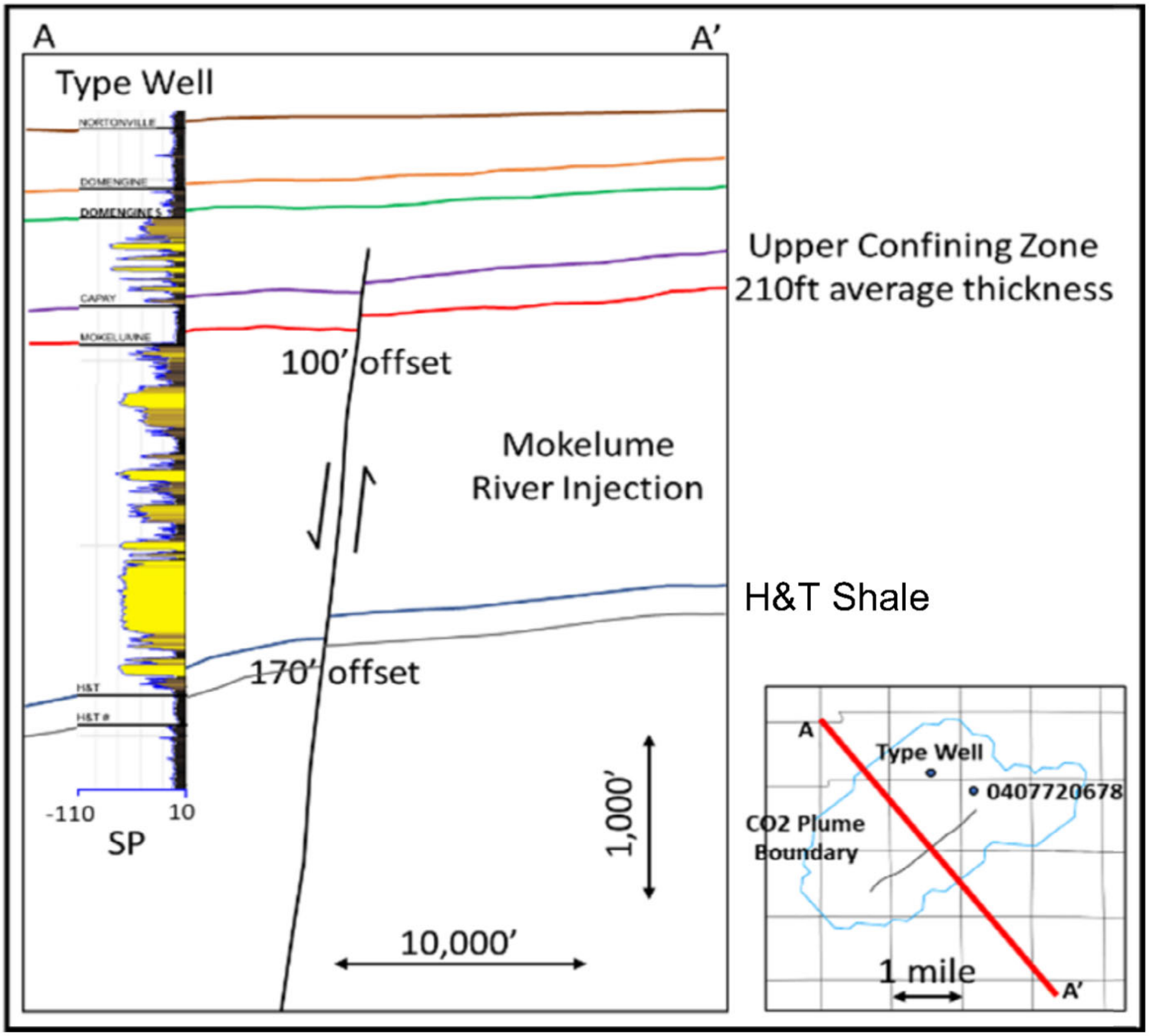


Figure A-18. **Schematic cross-section across the normal fault within the CO_2 plume boundary. Properties of the Capay Shale will be confirmed in pre-operational testing and this fault will be monitored during injection in the Domengine sands above.**

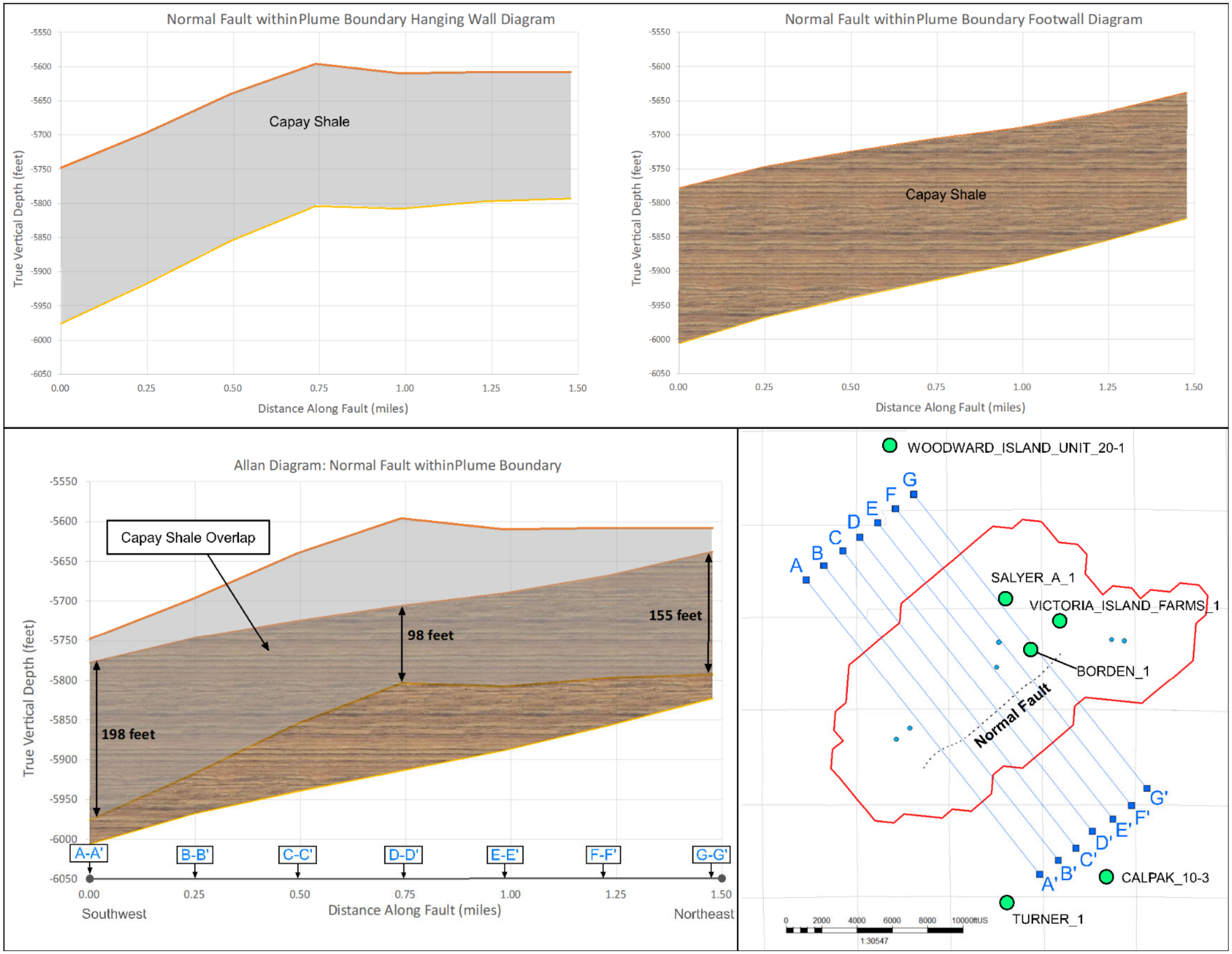
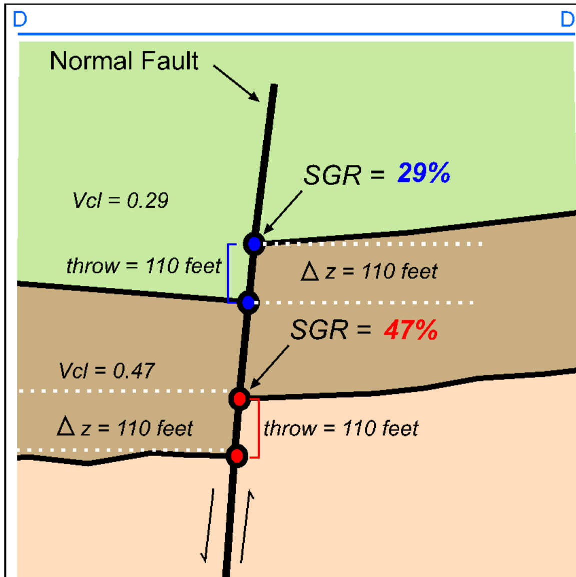


Figure A-19a. **Allan diagram for the normal fault within the CO_2 plume boundary.**



$$SGR = \frac{\Sigma(Vcl \times \Delta z)}{throw} \times 100\%$$

Top of Capay SGR Calculation:

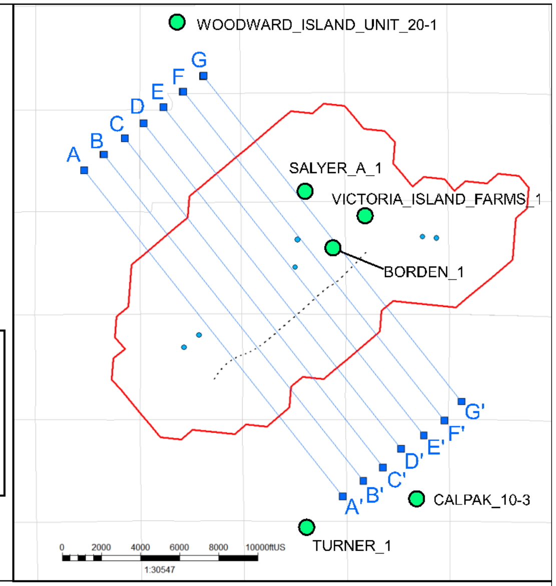
$$SGR = \left(\frac{0.29 \times 110\ feet}{110\ feet}\right) \times 100\%$$

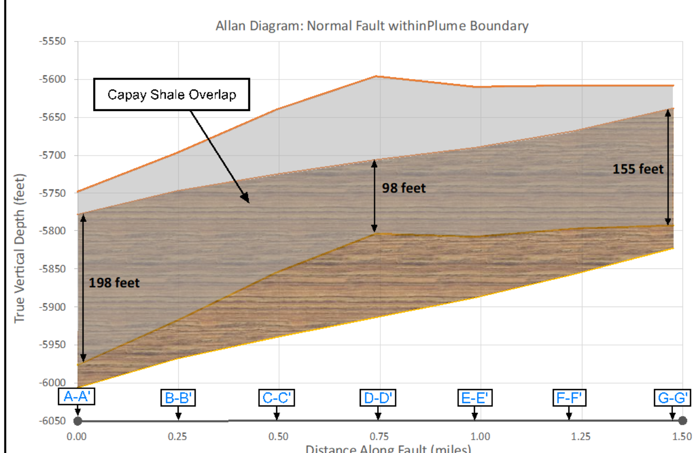
SGR = 29%

Bottom of Capay SGR Calculation:

$$SGR = \left(\frac{0.47 \times 110\ feet}{110\ feet}\right) \times 100\%$$

SGR = 47%



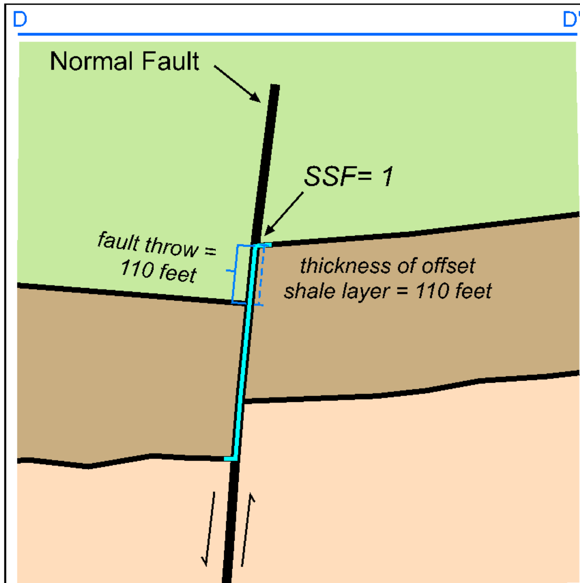


Clay Volumne		
Well	Domengine	Capay
SALYER_A_1	0.32	0.49
CALPAK_10-3	0.25	0.49
BORDEN_1	0.32	0.48
TURNER_1	0.28	0.42
VICTORIA_ISLAND_FARMS_1	0.33	0.49
WOODWARD_ISLAND_UNIT_20-1	0.22	0.47
Formation Average	**0.29**	**0.47**

Domengine
Capay Shale
Mokelumne (Injection Zone)

Cross Section ID	Distance (miles)	Domengine Formation Thickness Moved Past Reference Point	Capay Formation Thickness Moved Past Reference Point	Capay Formation Throw	SGR		SSF
					Top of Capay	Bottom of Capay	Capay
A-A'	0.00	30	30	30	29	47	1
B-B'	0.25	50	50	50	29	47	1
C-C'	0.49	85	85	85	29	47	1
D-D'	0.74	110	110	110	29	47	1
E-E'	0.98	80	80	80	29	47	1
F-F'	1.23	60	60	60	29	47	1
G-G'	1.48	30	30	30	29	47	1

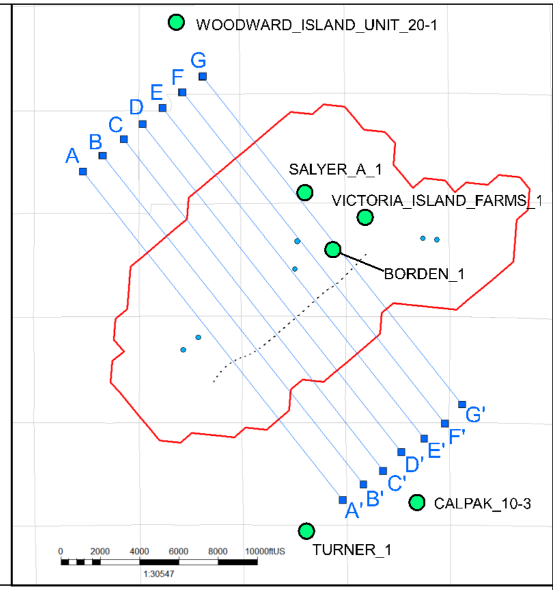
Figure A-19b. Shale Gouge Ratio Calculation Example for the normal fault within the CO_2 plume boundary.

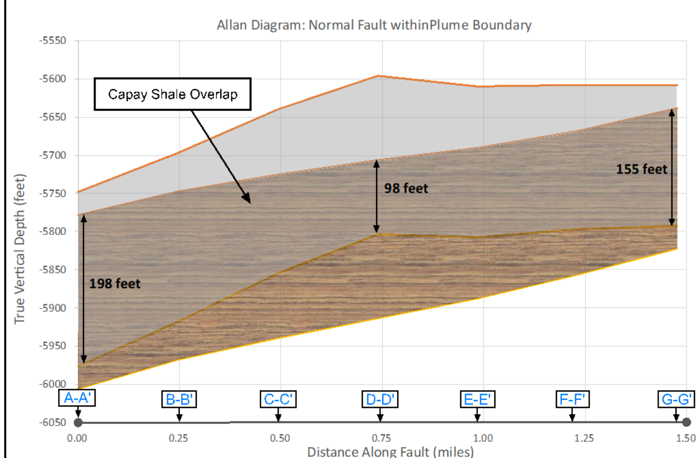


$$SSF = \frac{throw}{thickness}$$

$$SSF = \frac{110\ feet}{110\ feet}$$

$$\boldsymbol{SSF = 1}$$





Clay Volumne		
Well	Domengine	Capay
SALYER_A_1	0.32	0.49
CALPAK_10-3	0.25	0.49
BORDEN_1	0.32	0.48
TURNER_1	0.28	0.42
VICTORIA_ISLAND_FARMS_1	0.33	0.49
WOODWARD_ISLAND_UNIT_20-1	0.22	0.47
Formation Average	**0.29**	**0.47**

Domengine
Capay Shale
Mokelumne (Injection Zone)

Cross Section ID	Distance (miles)	Domengine Formation Thickness Moved Past Reference Point	Capay Formation Thickness Moved Past Reference Point	Capay Formation Throw	SGR		SSF
					Top of Capay	Bottom of Capay	Capay
A-A'	0.00	30	30	30	29	47	1
B-B'	0.25	50	50	50	29	47	1
C-C'	0.49	85	85	85	29	47	1
D-D'	0.74	110	110	110	29	47	1
E-E'	0.98	80	80	80	29	47	1
F-F'	1.23	60	60	60	29	47	1
G-G'	1.48	30	30	30	29	47	1

Figure A-19c. Shale Smear Factor Calculation Example for the normal fault within the CO_2 plume boundary.

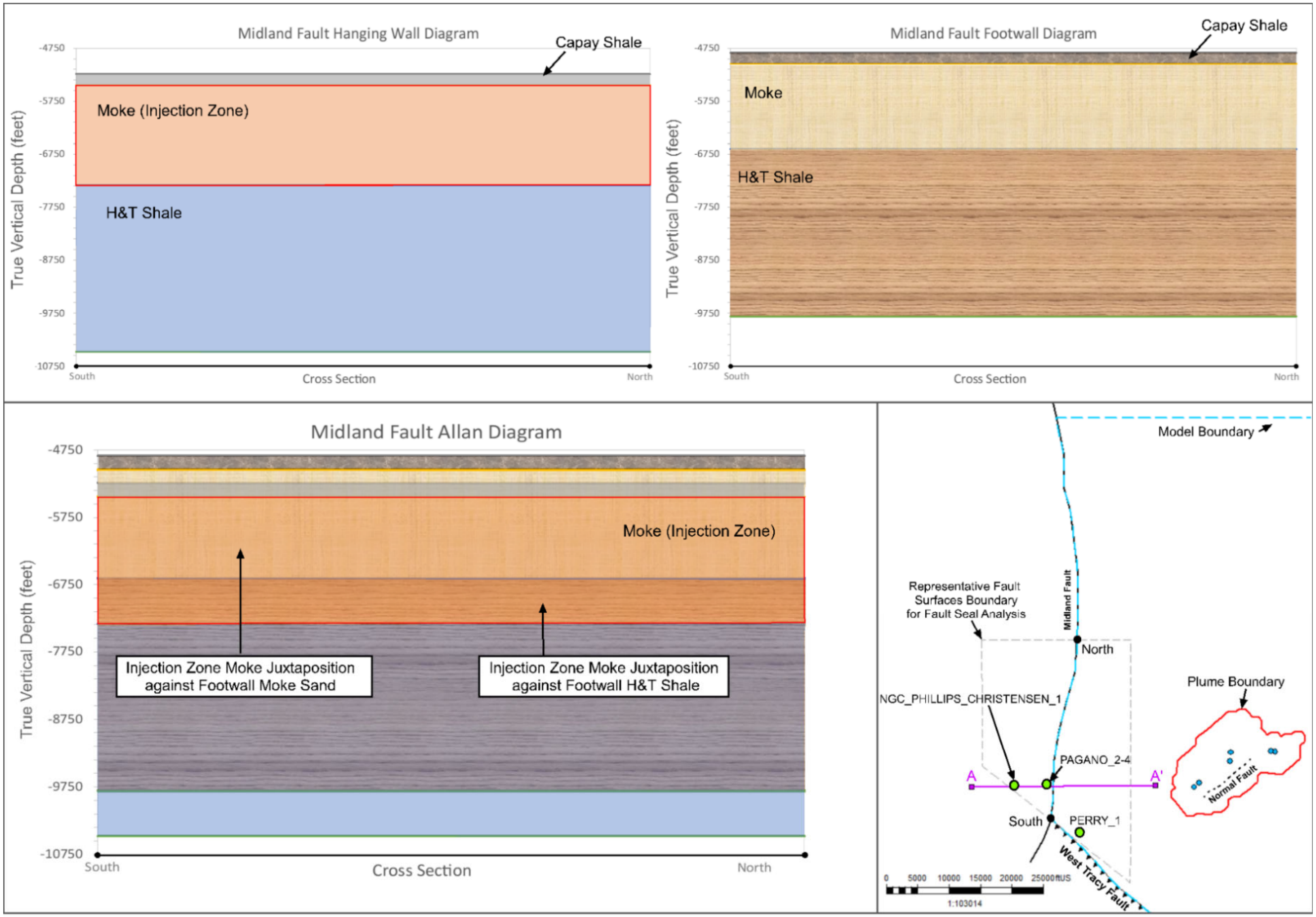
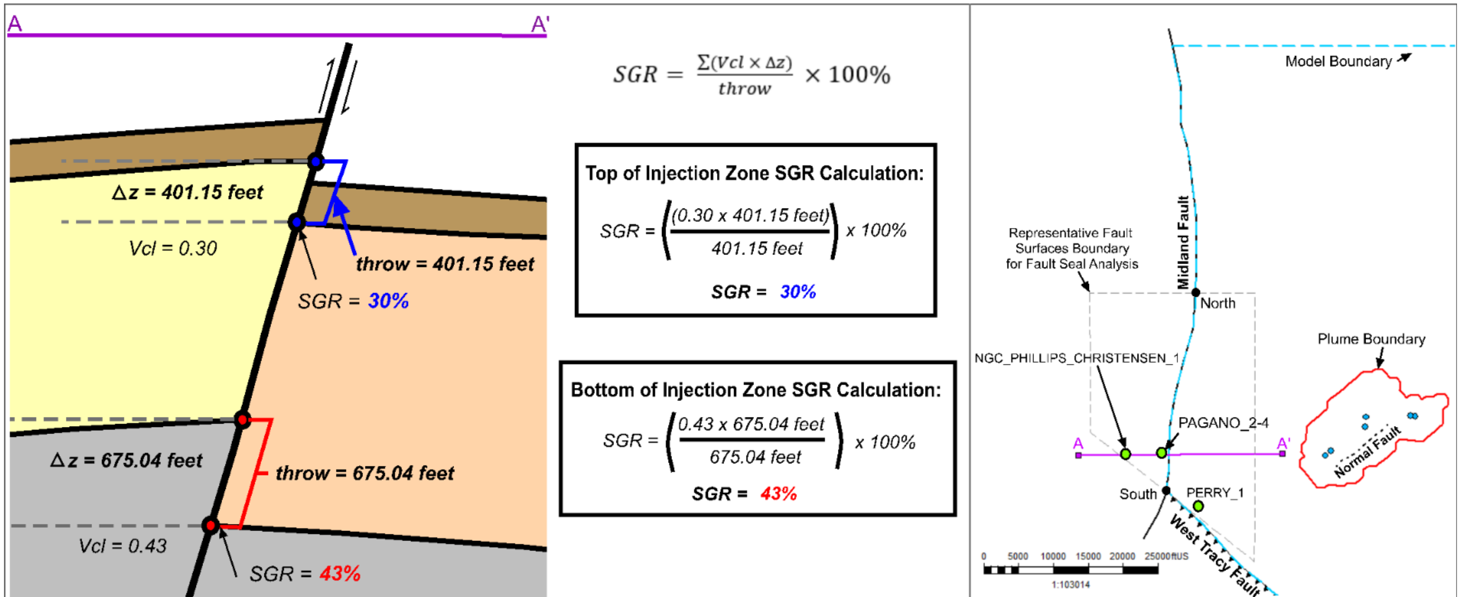
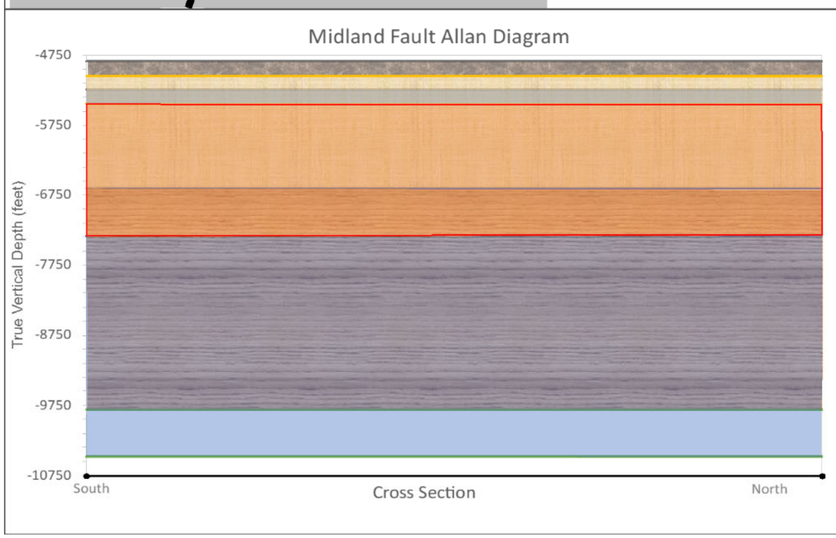


Figure A-20a. Allan diagram for the Midland Fault.





Shale Gouge Ratio	
Top of Moke	30%
Bottom of Moke	43%

Clay Volume			
Well	Capay	Mokelumne	H&T Shale
PAGANO_2-4	--	0.33	--
PERRRY_1	0.49	0.32	0.44
NGC PHILLIPS CHRISTENSEN_1	0.49	0.25	0.41
Formation Average	**0.49**	**0.30**	**0.43**

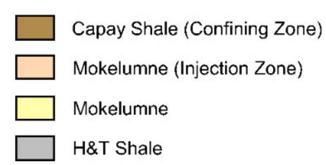
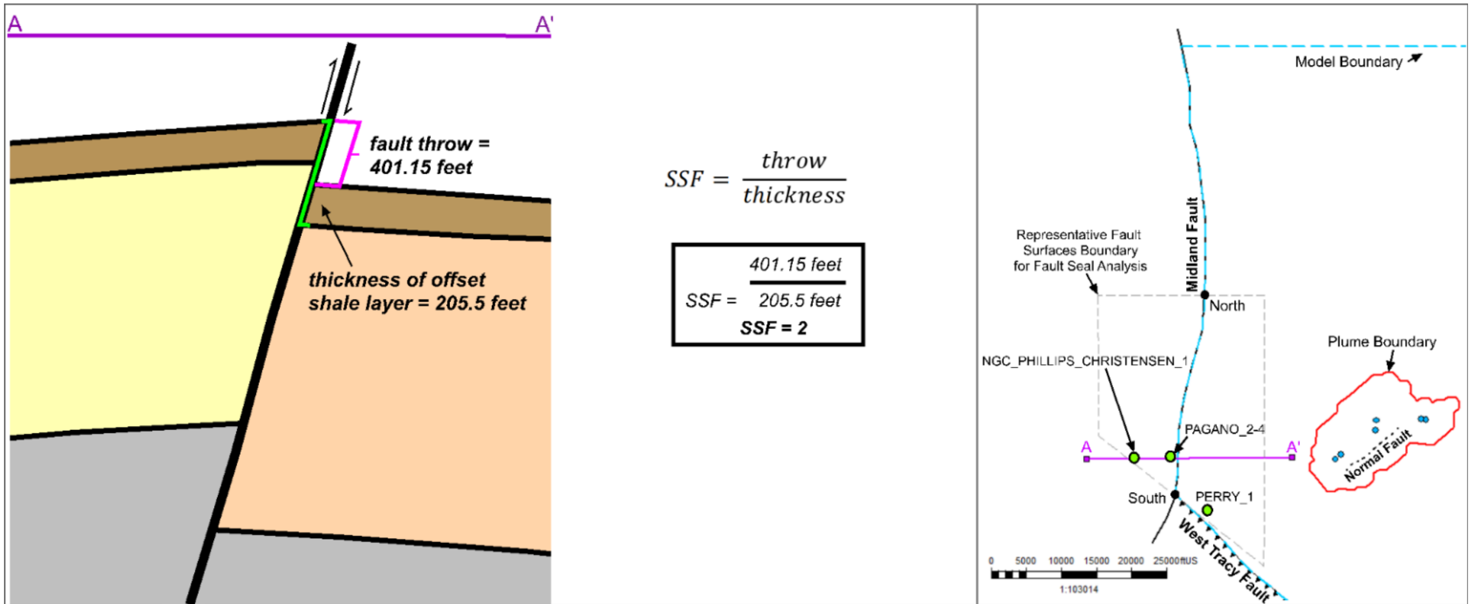
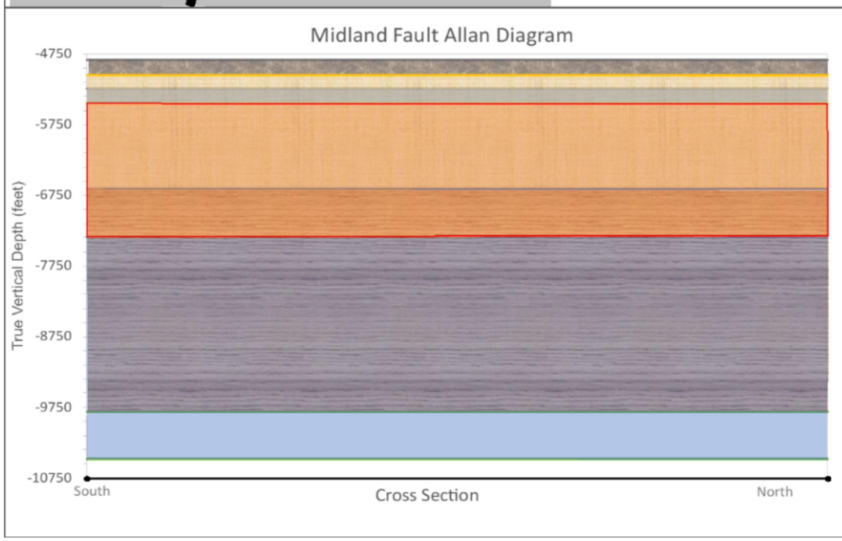


Figure A-20b. Shale Gouge Ratio Calculation for the Midland Fault.





Shale Smear Factor	
Capay	2

Clay Volumne			
Well	Capay	Mokelumne	H&T Shale
PAGANO_2-4	--	0.33	--
PERRRY_1	0.49	0.32	0.44
NGC PHILLIPS CHRISTENSEN_1	0.49	0.25	0.41
Formation Average	**0.49**	**0.30**	**0.43**

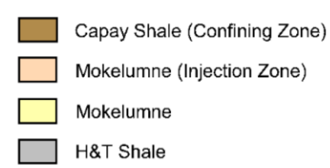


Figure A-20c. Shale Smear Factor Calculation for the Midland Fault.

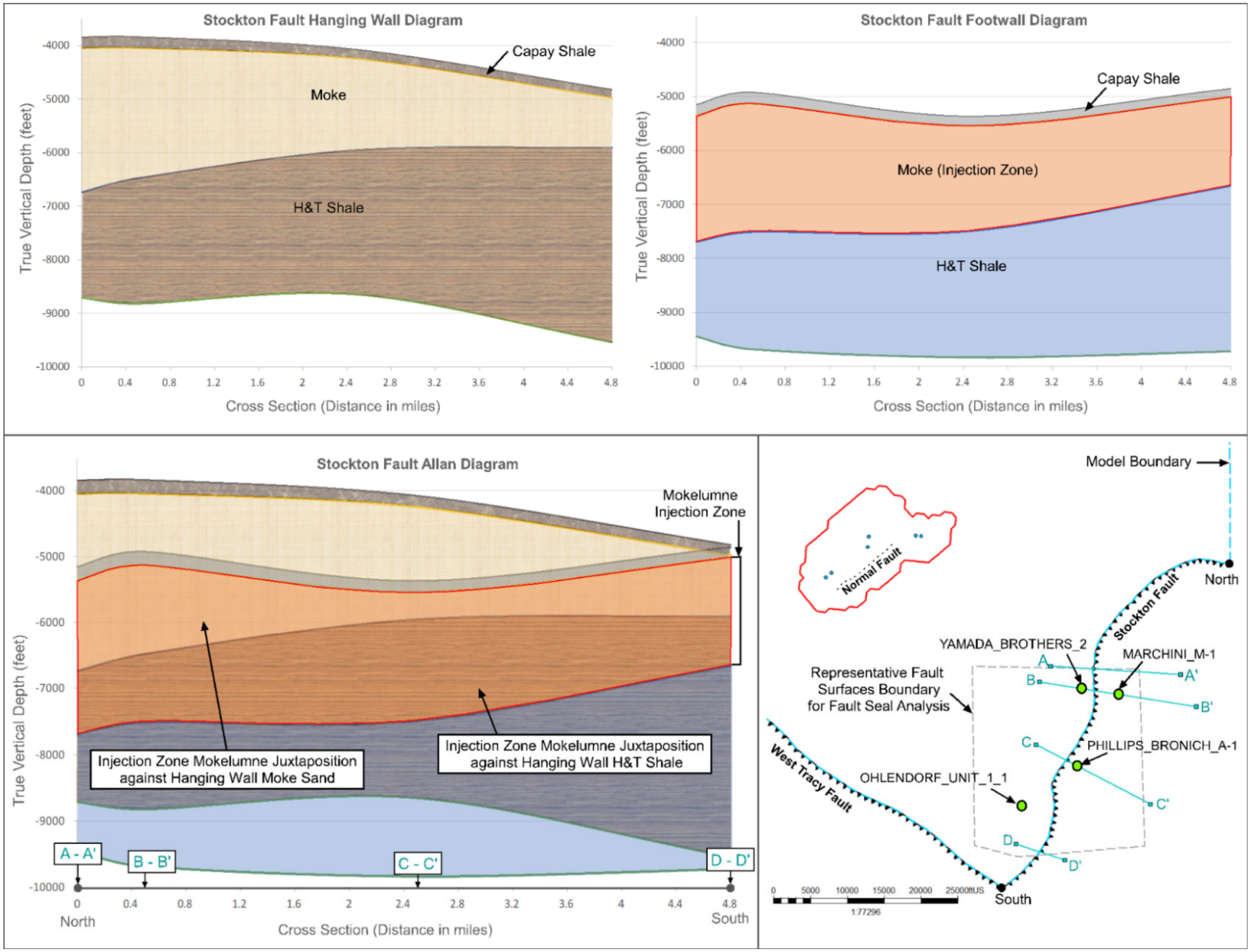
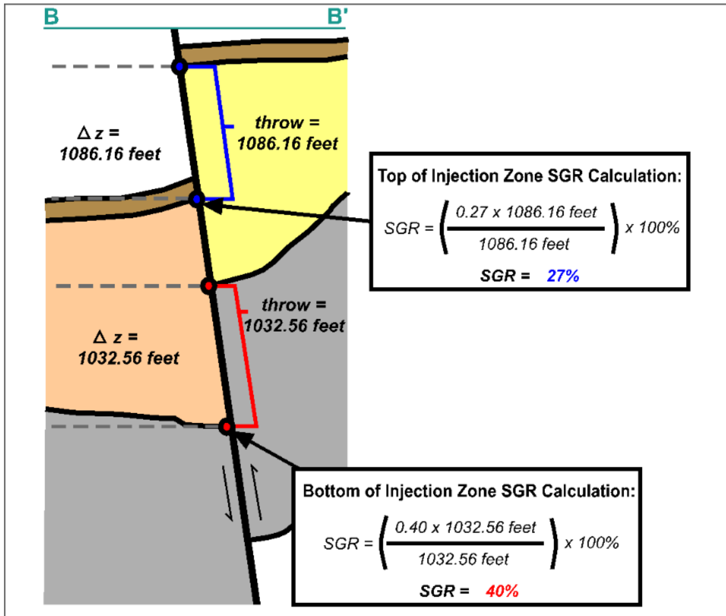
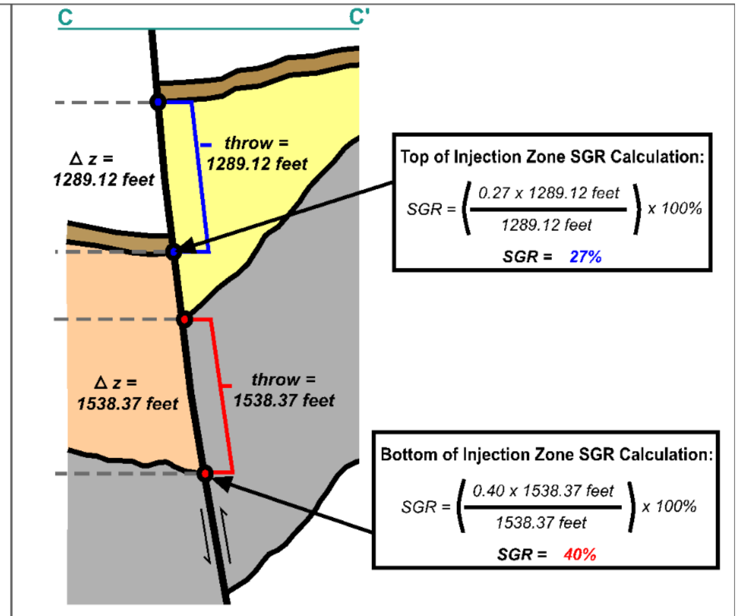
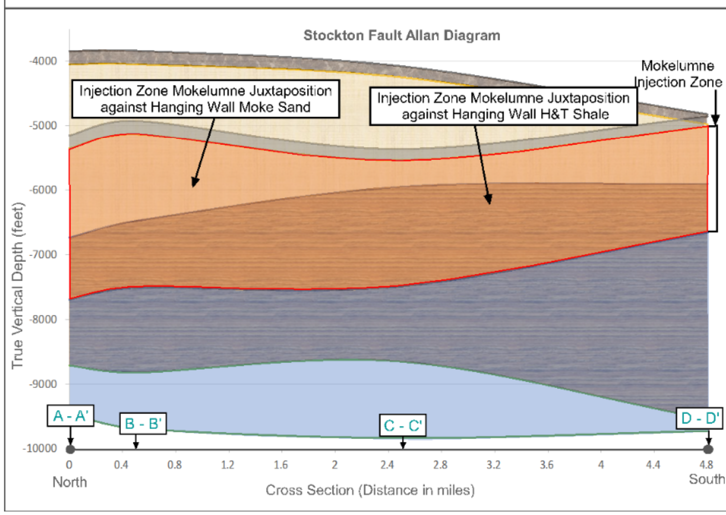


Figure A-21a. Allan diagram for the Stockton Fault.

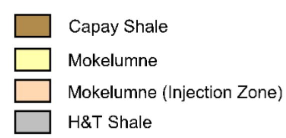






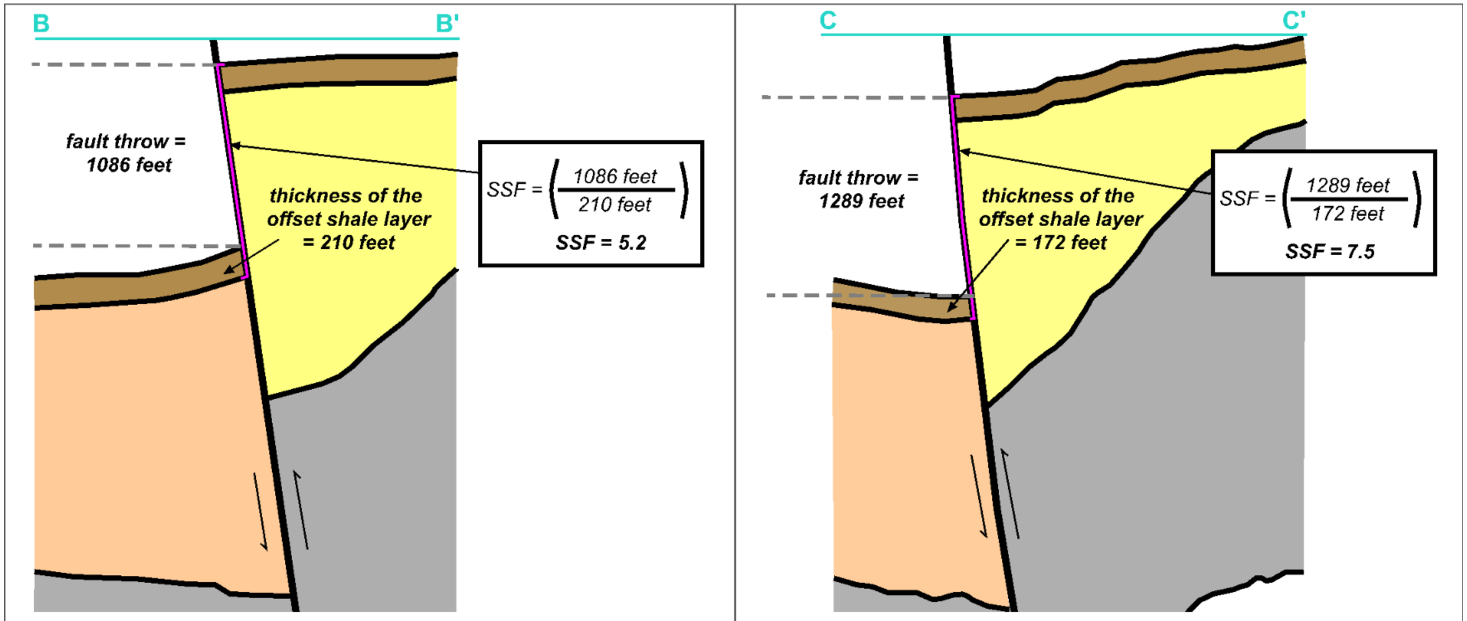
Clay Volume					
Well	Hanging Wall		Footwall		Average
	Yamada_Brothers_2	Ohlendorf_Unit_1_1	Marchini_M-1	Phillip_Bronich_A_1	Clay Volume
Moke	0.28	0.21	0.30	0.28	**0.27**
H&T	0.42	0.39	0.41	0.39	**0.40**

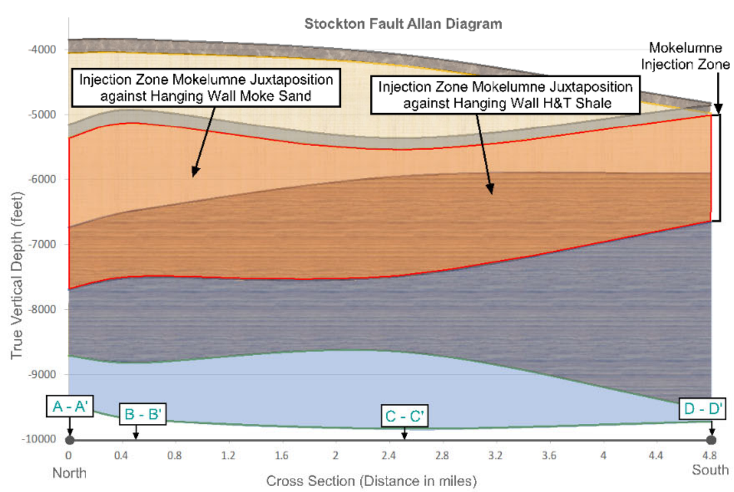
Shale Gouge Ratio				
Cross Section ID	A-A'	B-B'	C-C'	D-D'
Distance (Miles)	0	0.5	2.5	4.8
Top of Moke	27%	27%	27%	27%
Bottom of Moke	40%	40%	40%	40%



$$SGR = \frac{\Sigma(Vcl \times \Delta z)}{throw} \times 100\%$$

Figure A-21b. Example Shale Gouge Ratio Calculations for the Stockton Fault.





$$SSF = \frac{throw}{thickness}$$

Shale Smear Factor (SSF)				
Cross Section ID	A-A'	B-B'	C-C'	D-D'
Distance (Miles)	0	0.5	2.5	4.8
Capay Shale	**6.4**	**5.2**	**7.5**	**1.0**

Capay Shale
Mokelumne
Mokelumne (Injection Zone)
H&T Shale

Figure A-21c. Example Shale Smear Factor Calculations for the Stockton Fault.

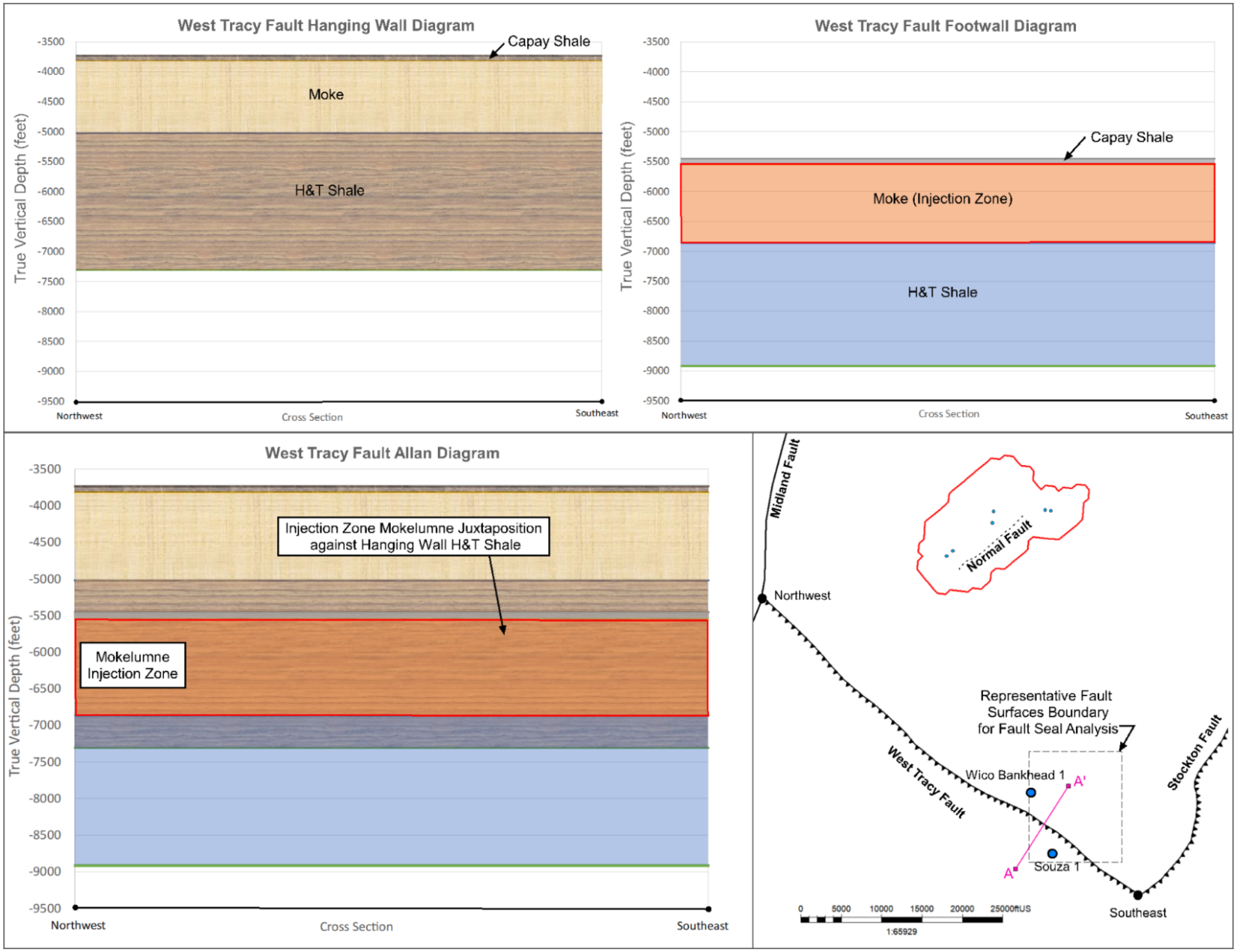
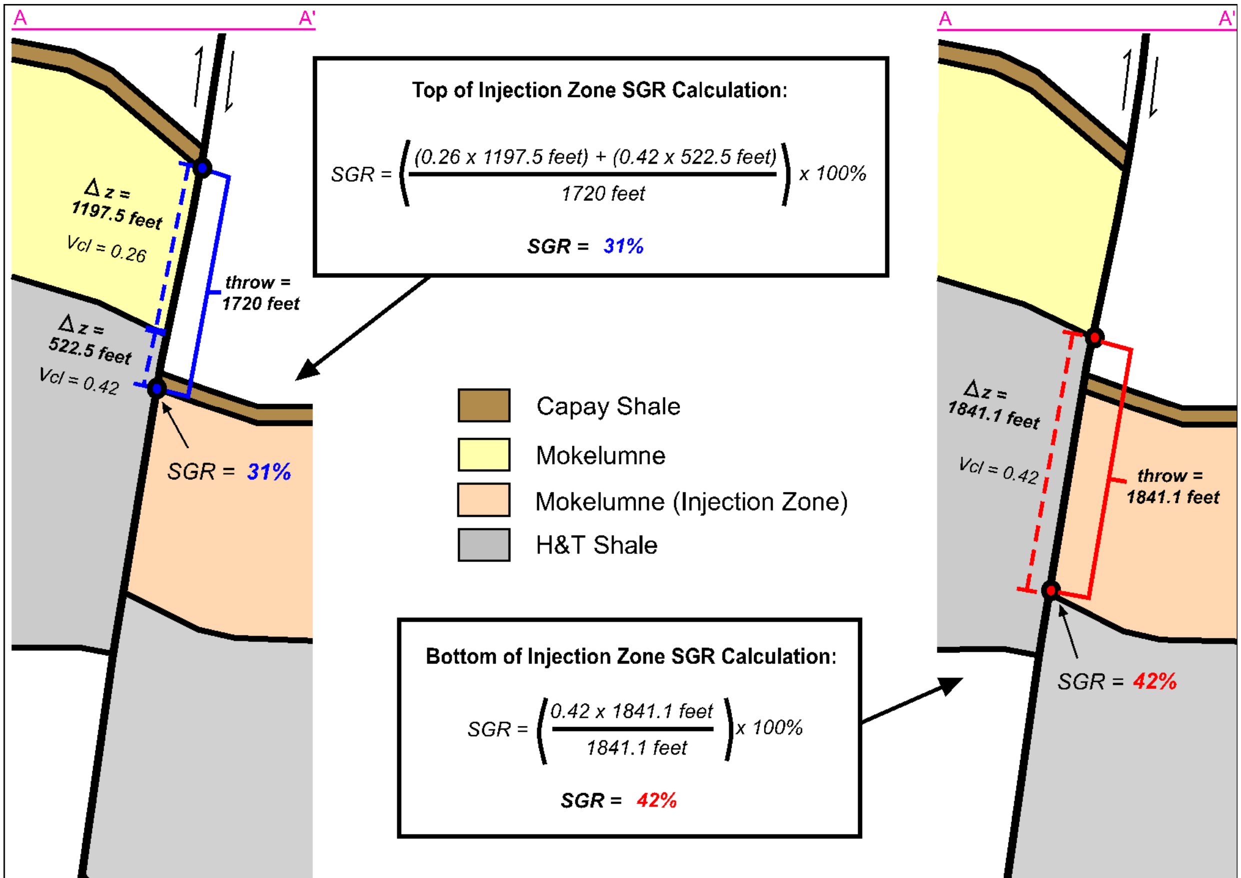
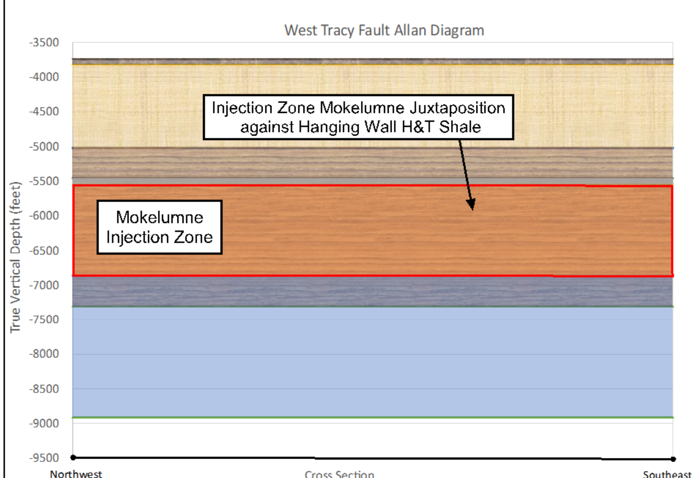
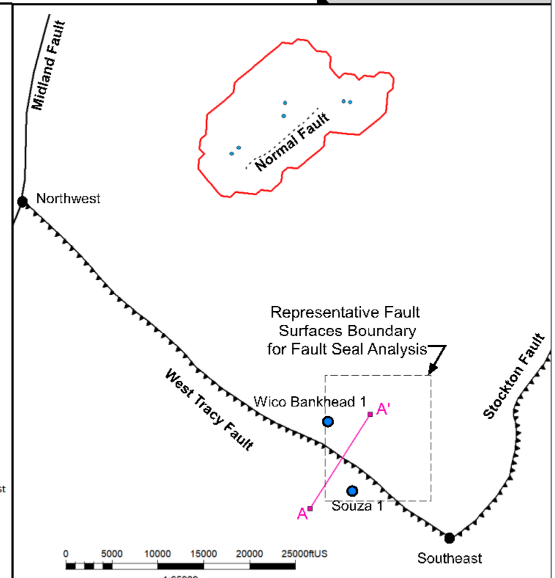


Figure A-22a. Allan diagram for the West Tracy Fault.







$$SGR = \frac{\Sigma(Vcl \times \Delta z)}{throw} \times 100\%$$

Shale Gouge Ratio	
Top of Moke	31%
Bottom of Moke	42%

Clay Volume			
Well	Footwall	Hanging Wall	Average
	Wico Bankhead 1	Souza 1	
Moke	0.23	0.28	**0.26**
H&T	0.41	0.42	**0.42**

Figure A-22b. Shale Gouge Ratio Calculations for the West Tracy Fault.

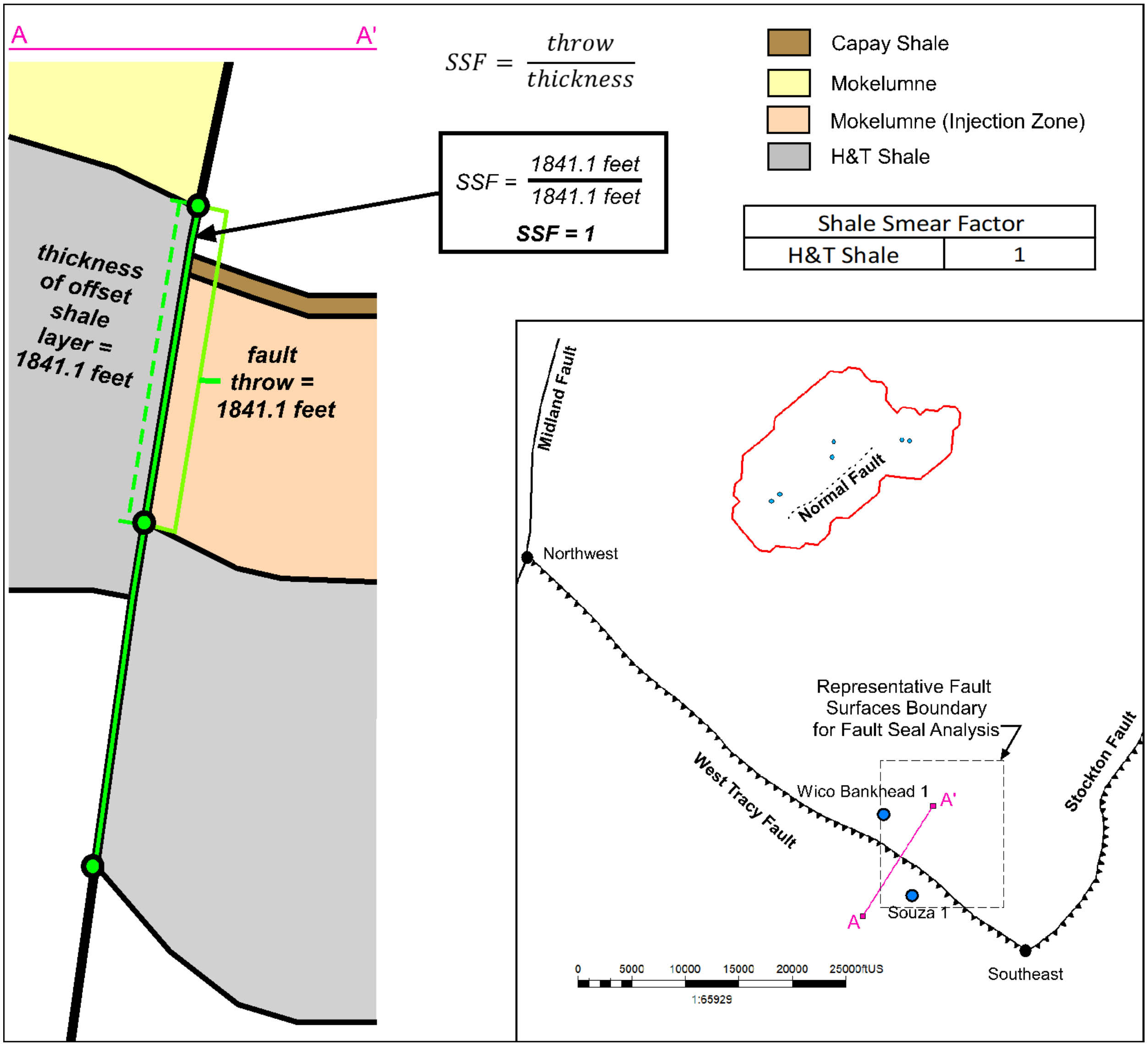


Figure A-22c. Shale Smear Factor Calculation for the West Tracy Fault.

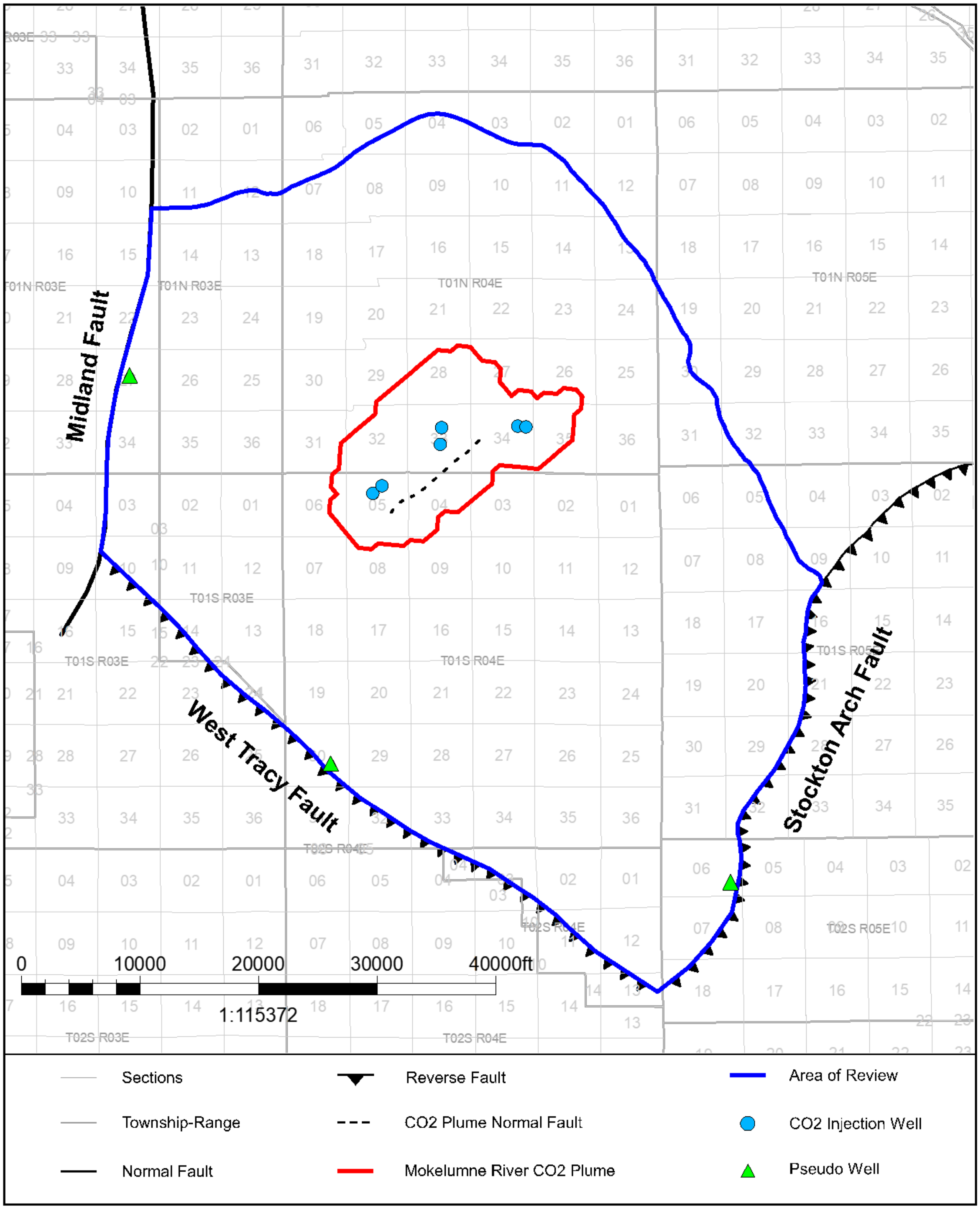


Figure A-23. Green triangles show pseudo well locations at central areas along the normal fault located in the CO_2 plume and the three bounding faults relative to the project area. Pressure data were extracted from the plume model to capture the expected pressure values at each location. Average of these results are presented in Table A-4.

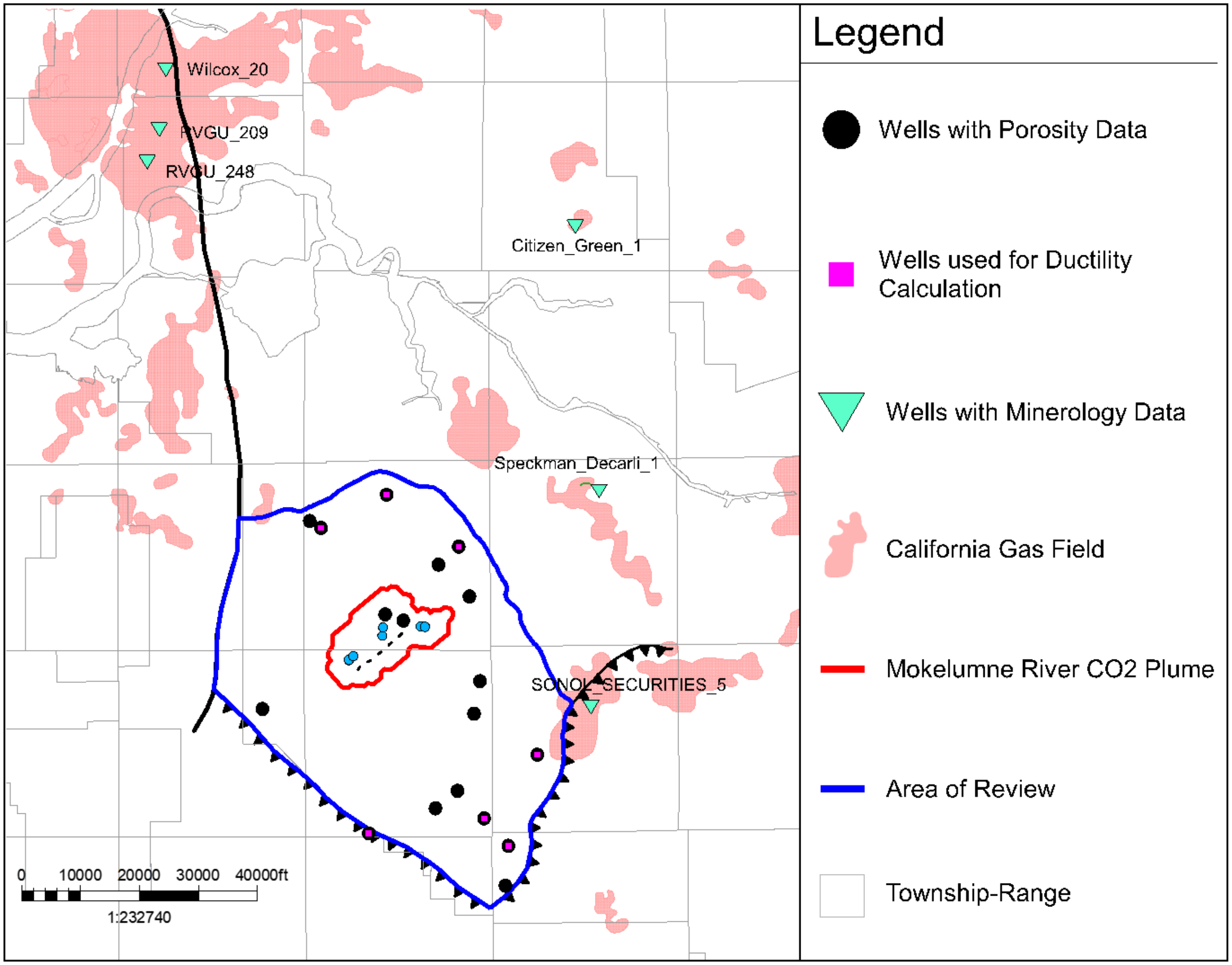


Figure A-24. Map showing location of wells with mineralogy data relative to the AoR.

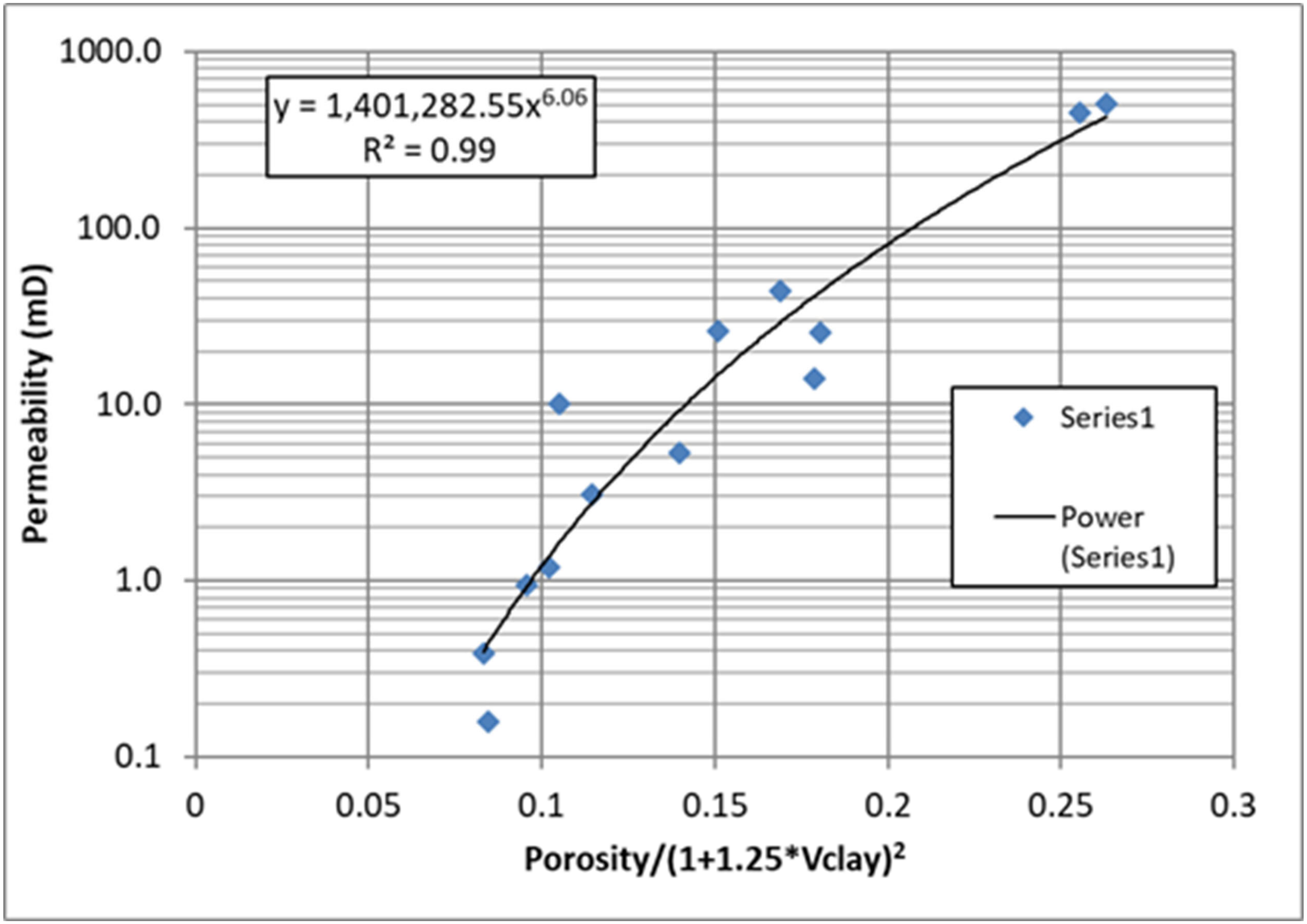


Figure A-25. Permeability transform for Sacramento basin zones.

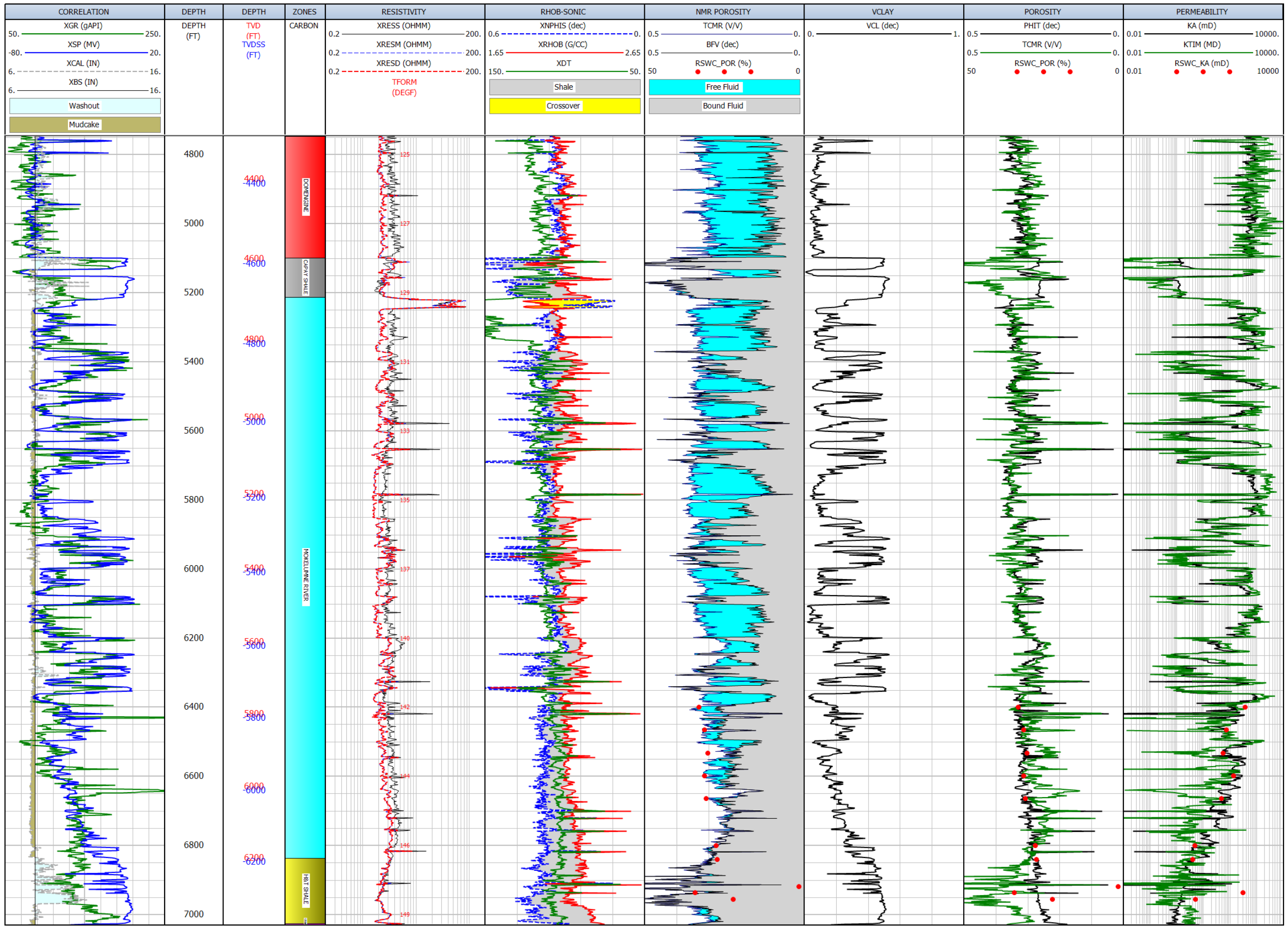


Figure A-26. Example log from the Citizen_Green_1 well in King Island Gas Field. The last track shows a comparison of the permeability calculated from the transform (black) shown in Figure A-20 to permeability calculated from an NMR log (green) and rotary sidewall core permeability (red dots). Track 1: Correlation and caliper logs. Track 2: Measured depth. Track 3: Vertical depth and vertical subsea depth. Track 4: Zones. Track 5: Resistivity. Track 6: Compressional sonic, density, and neutron logs. Track 7: NMR total porosity and bound fluid. Track 8: Volume of clay. Track 9: Porosity calculated from sonic and NMR total porosity (green). Track 10: Permeability calculated using transform and NMR Timur-Coates permeability.

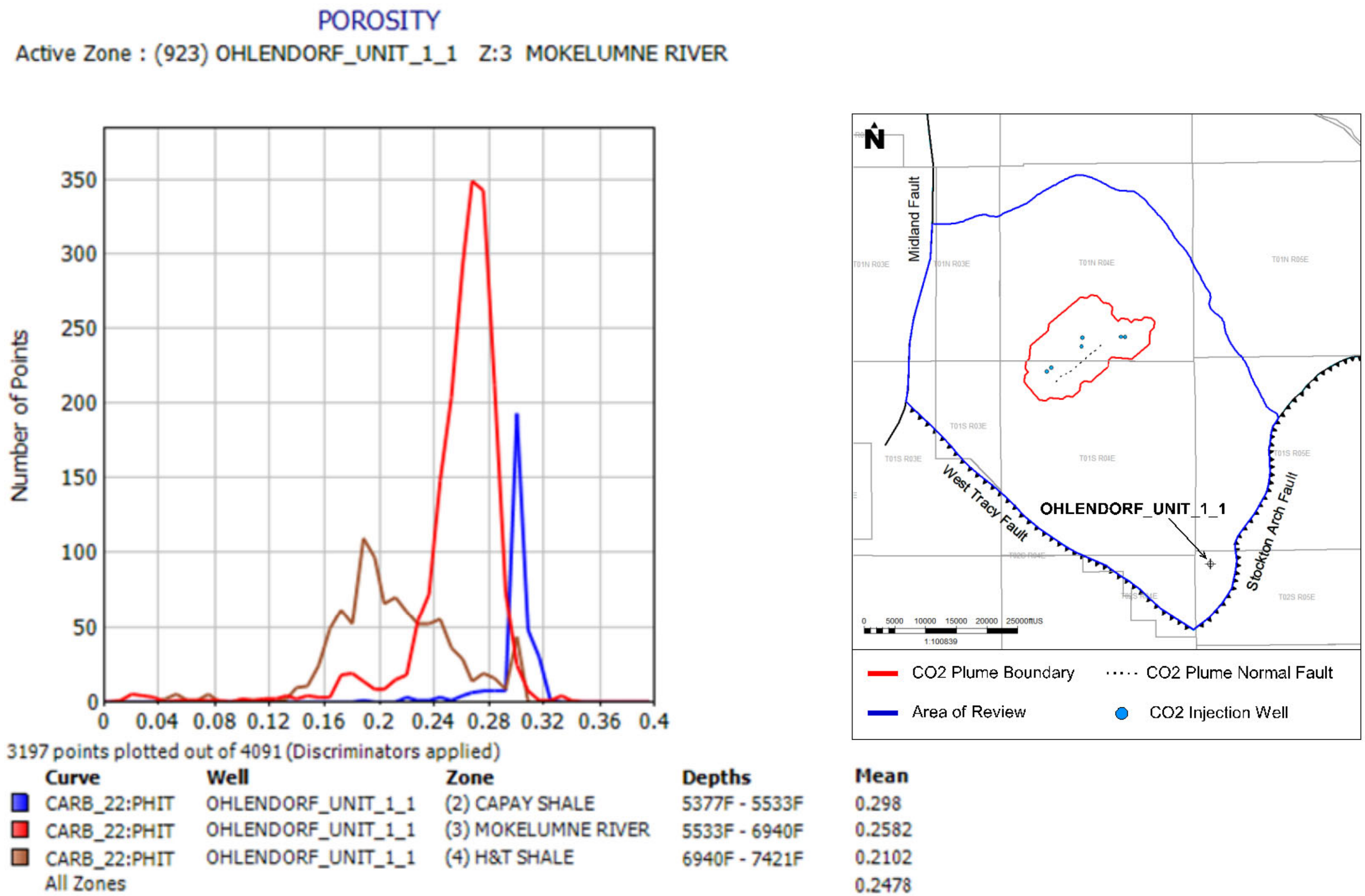
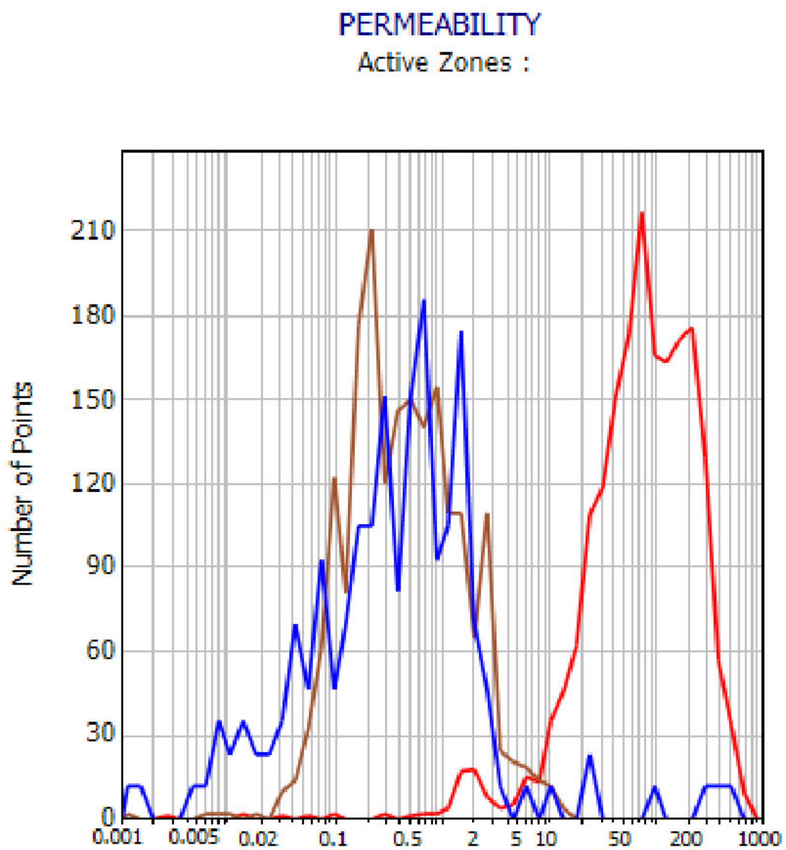


Figure A-27. Porosity histogram for well Ohlendorf_Unit_1_1. In the histogram, blue represents the Capay Shale, red the Mokelumne River Formation, and brown the H&T Shale. For the two shale intervals, only data with VCL>0.25 is shown, and for the Mokelumne River Formation only data with VCL≤0.25 is shown.



3024 points plotted out of 4006 (Discriminators applied)

Curve	Well	Zone	Depths	Mean
CARB_22:KA	OHLENDORF_UNIT_1_1	(4) MOKELUMNE RIVER	5533F - 6940F	68.3724
CARB_22:KA	OHLENDORF_UNIT_1_1	(5) H&T SHALE	6940F - 7421F	0.4405
EDIT:KTIM	CITIZEN_GREEN_1	(4) CAPAY SHALE	5098.5F - 5212F	0.3357
All Zones				10.5918

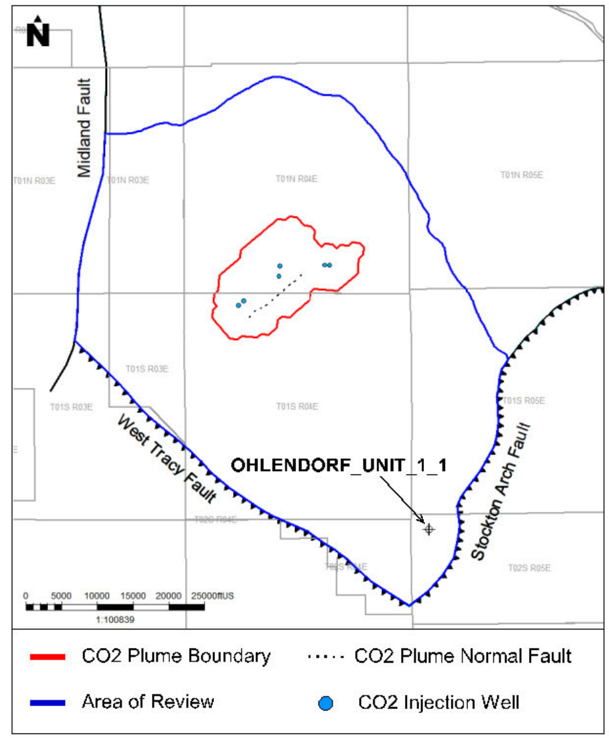


Figure A-28. Permeability histogram for wells Ohlendorf_Unit_1_1 and Citizen_Green_1. In the histogram, blue represents the Capay Shale, red the Mokelumne River Formation, and brown the H&T Shale. For the two shale intervals, only data with VCL>0.25 is shown, and for the Mokelumne River Formation only data with VCL≤0.25 is shown.

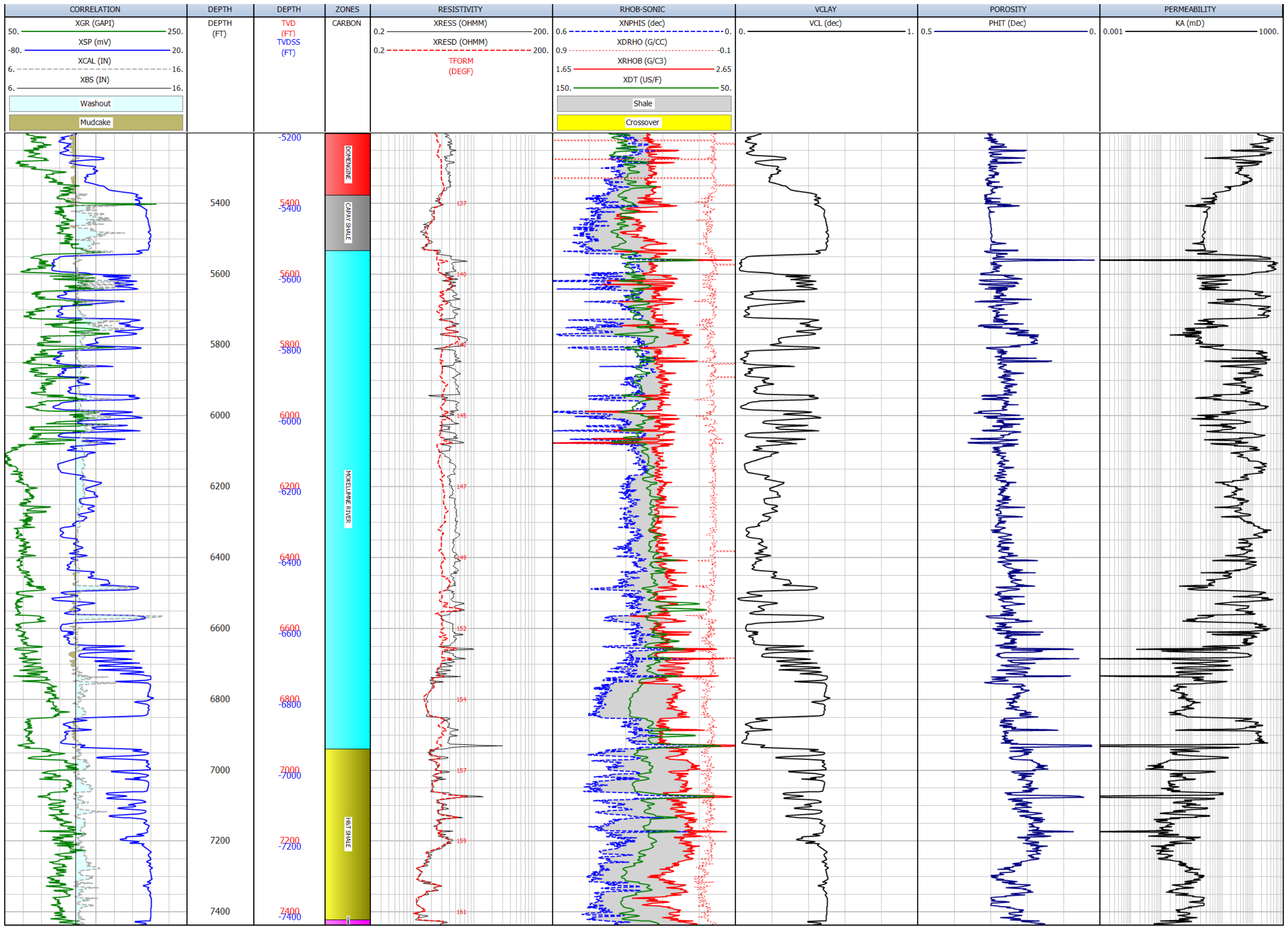


Figure A-29. Log plot for well Ohlendorf_Unit_1_1, showing the log curves used as inputs into calculations of clay volume, porosity and permeability, and their outputs. Track 1: Correlation and caliper logs. Track 2: Measured depth. Track 3: Vertical depth and vertical subsea depth. Track 4: Zones. Track 5: Resistivity. Track 6: Compressional sonic, neutron, and density logs. Track 7: Volume of clay. Track 8: Porosity calculated from log curves. Track 9: Permeability calculated using transform. See Figure A-30 for well location.

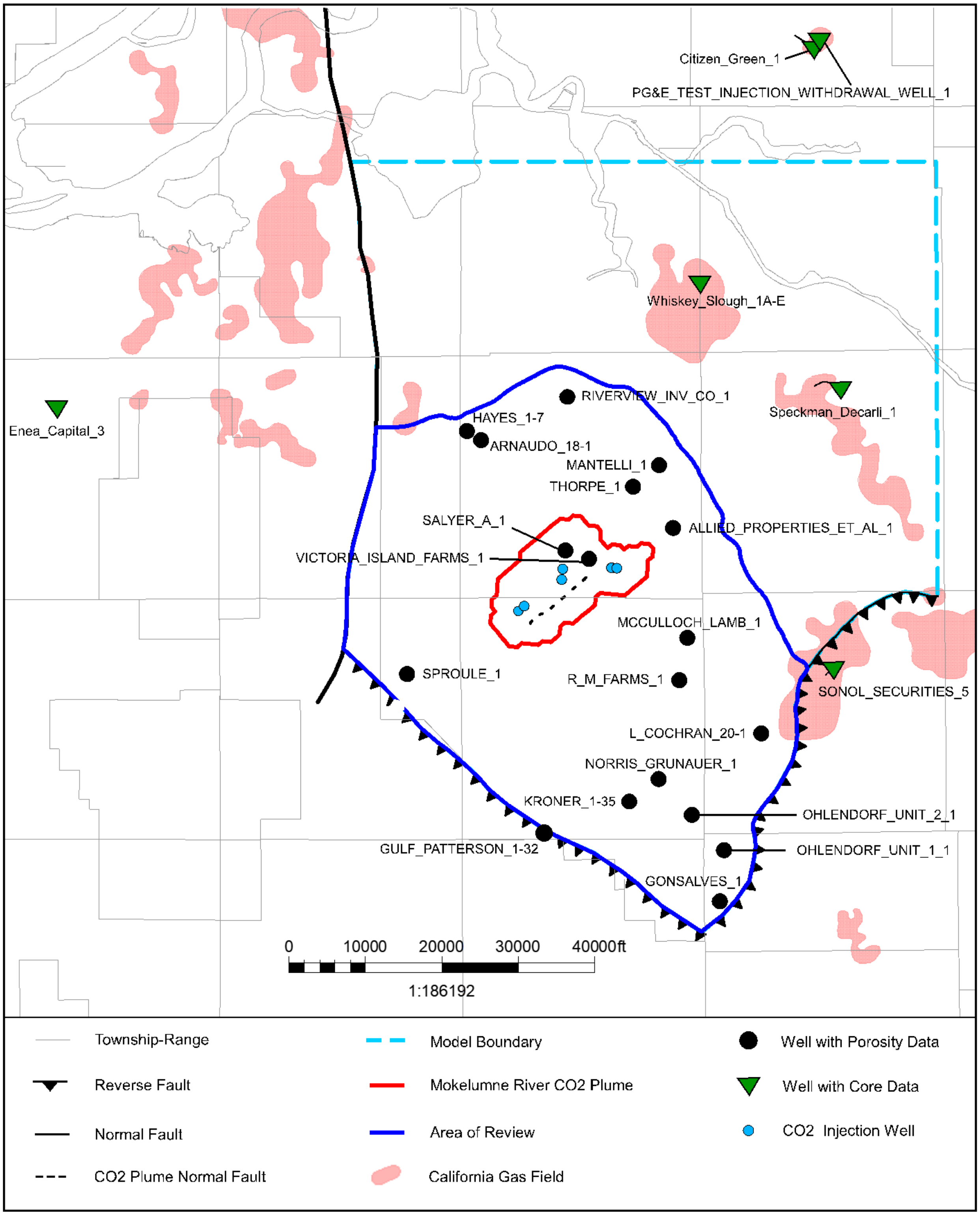


Figure A-30. Map of wells with porosity and permeability data.

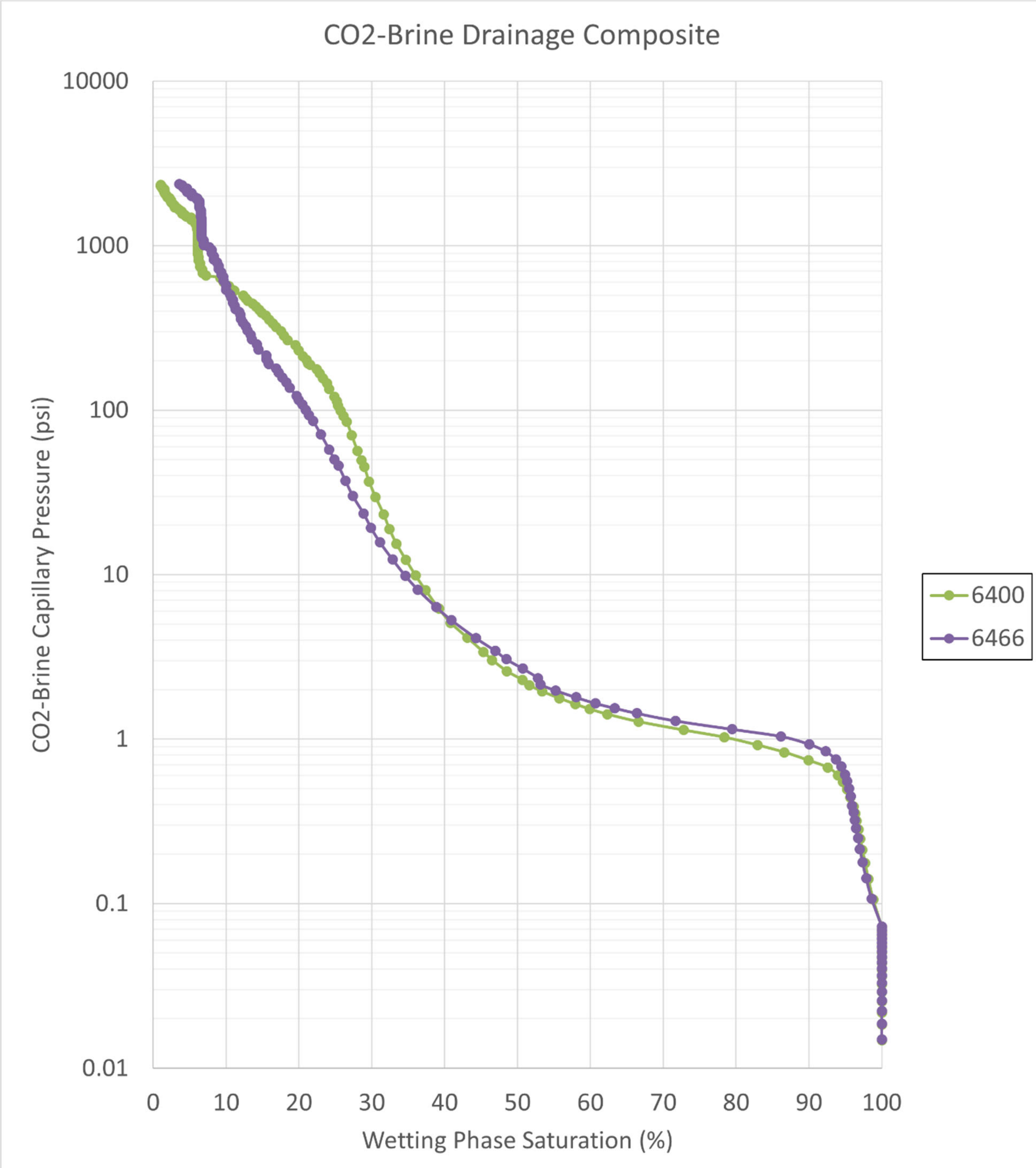


Figure A-31. Capillary pressure versus wetting phase saturation for core data from the Citizen_Green_1 well. Samples are labeled by their depth.

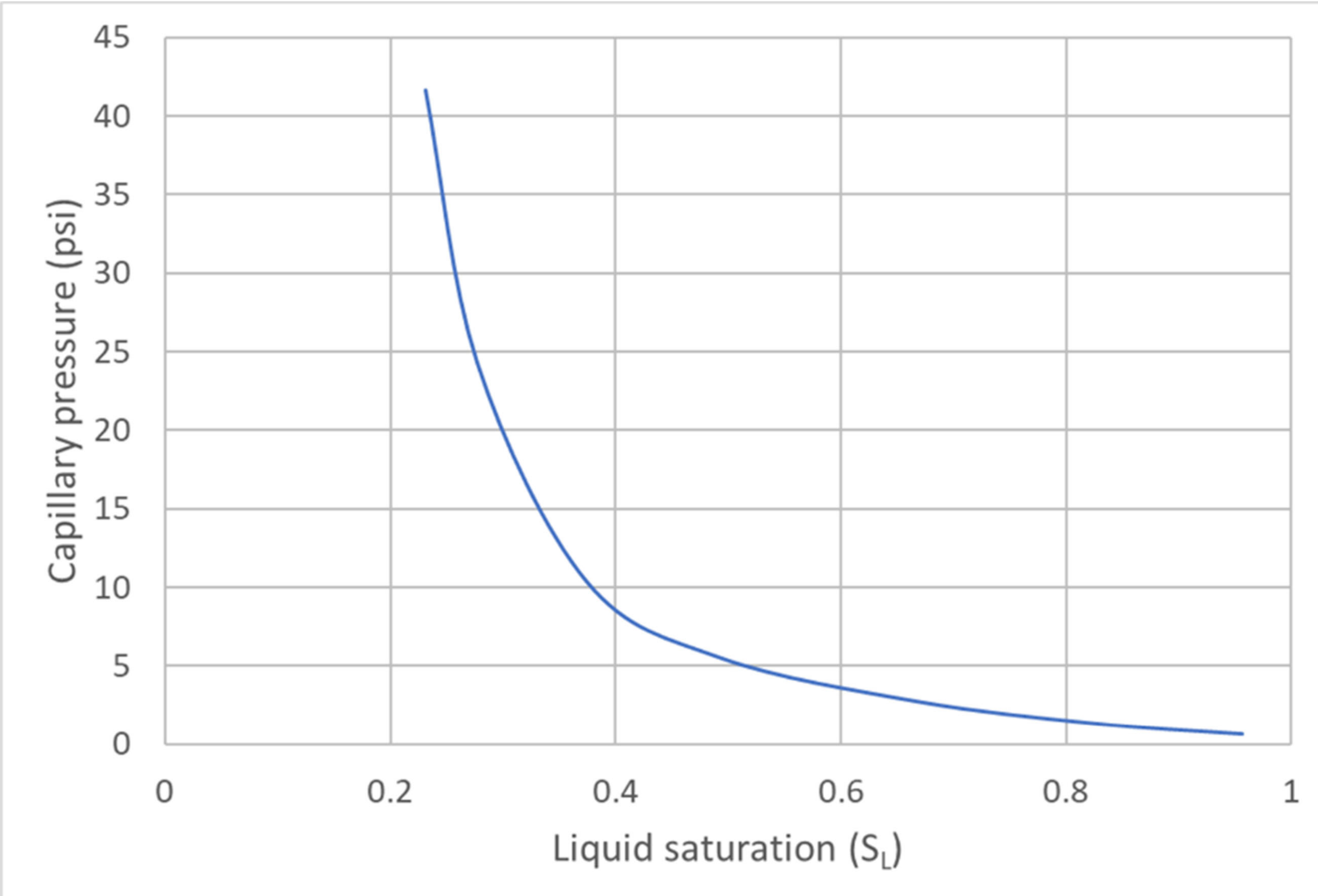


Figure A-32. Injection zone capillary pressure used for computational modeling.

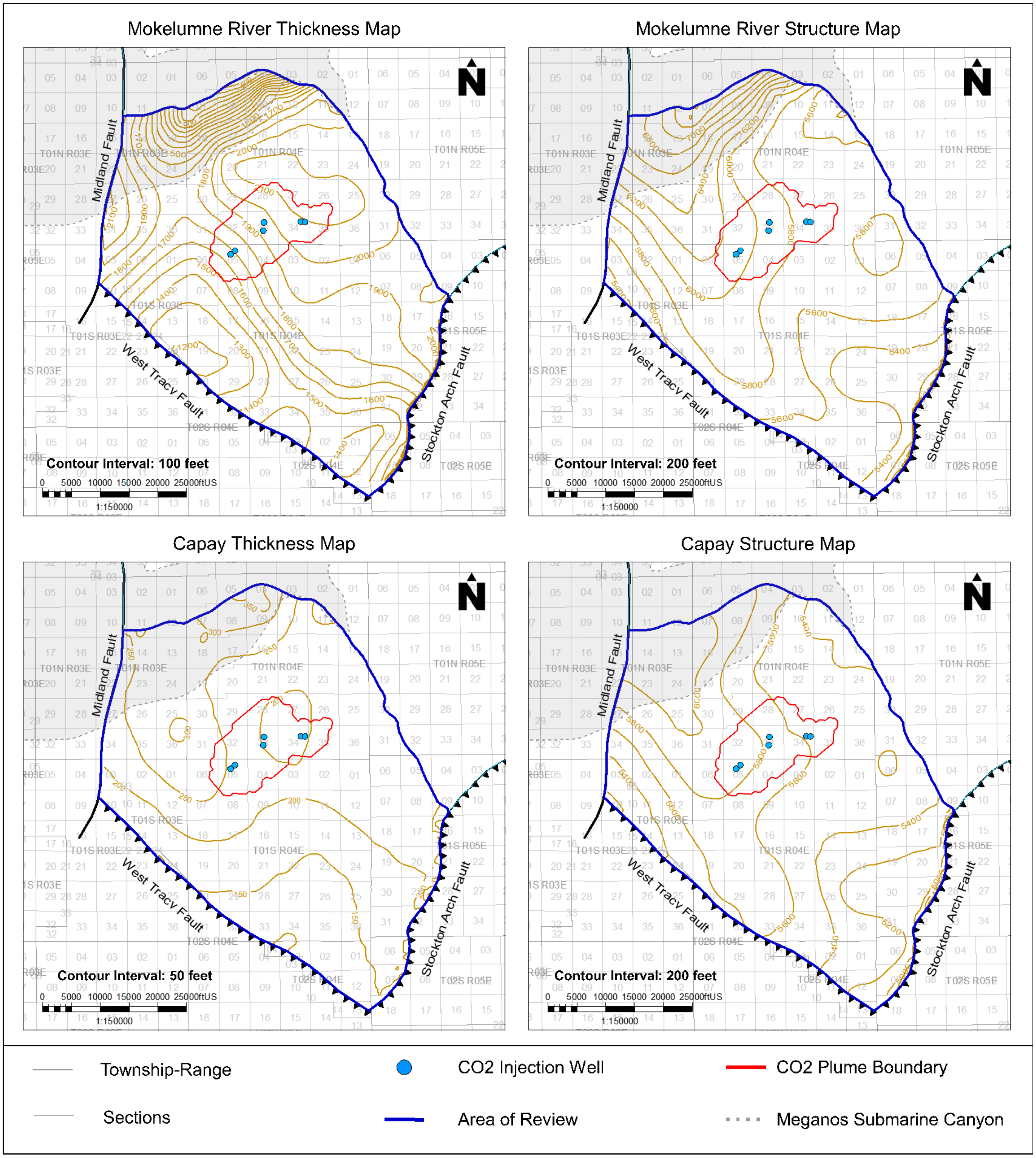


Figure A-33. Thickness and structure maps for the Mokelumne River and Capay Shale Formations within the AoR.

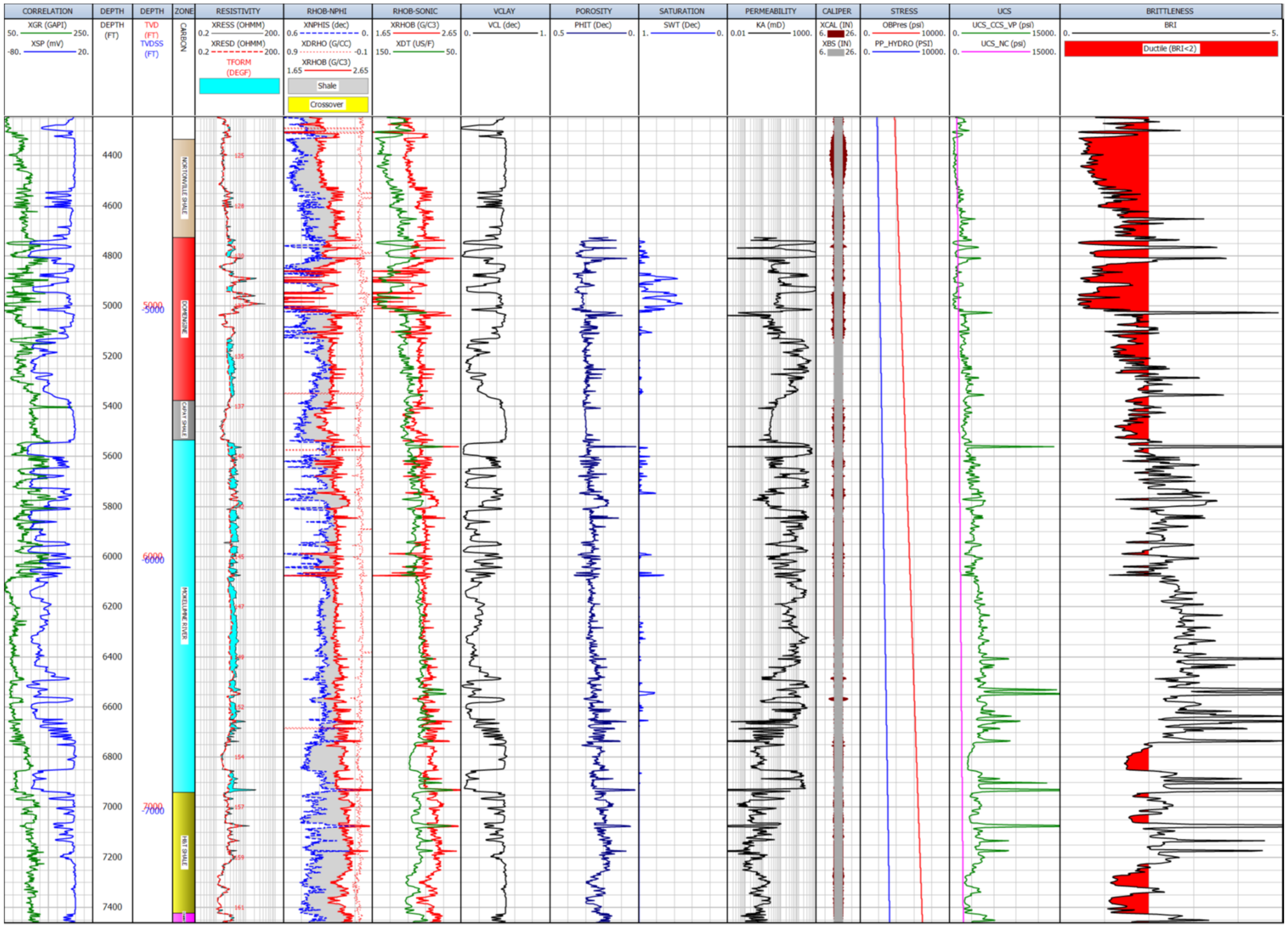


Figure A-34. Unconfined compressive strength and ductility calculations for well Ohlendorf_Unit_1_1. The Capay Shale ductility is less than two, as is the shallower Nortonville Shale. Track 1: Correlation logs. Track 2: Measured depth. Track 3: Vertical depth and vertical subsea depth. Track 4: Zones. Track 5: Resistivity. Track 6: Density and neutron logs. Track 7: Density and compressional sonic logs. Track 8: Volume of clay. Track 9: Porosity calculated from sonic and density. Track 10: Water saturation. Track 11: Permeability. Track 12: Caliper. Track 13: Overburden pressure and hydrostatic pore pressure. Track 14: UCS and UCS_NC. Track 15: Brittleness. See Figure A-30 for well location.

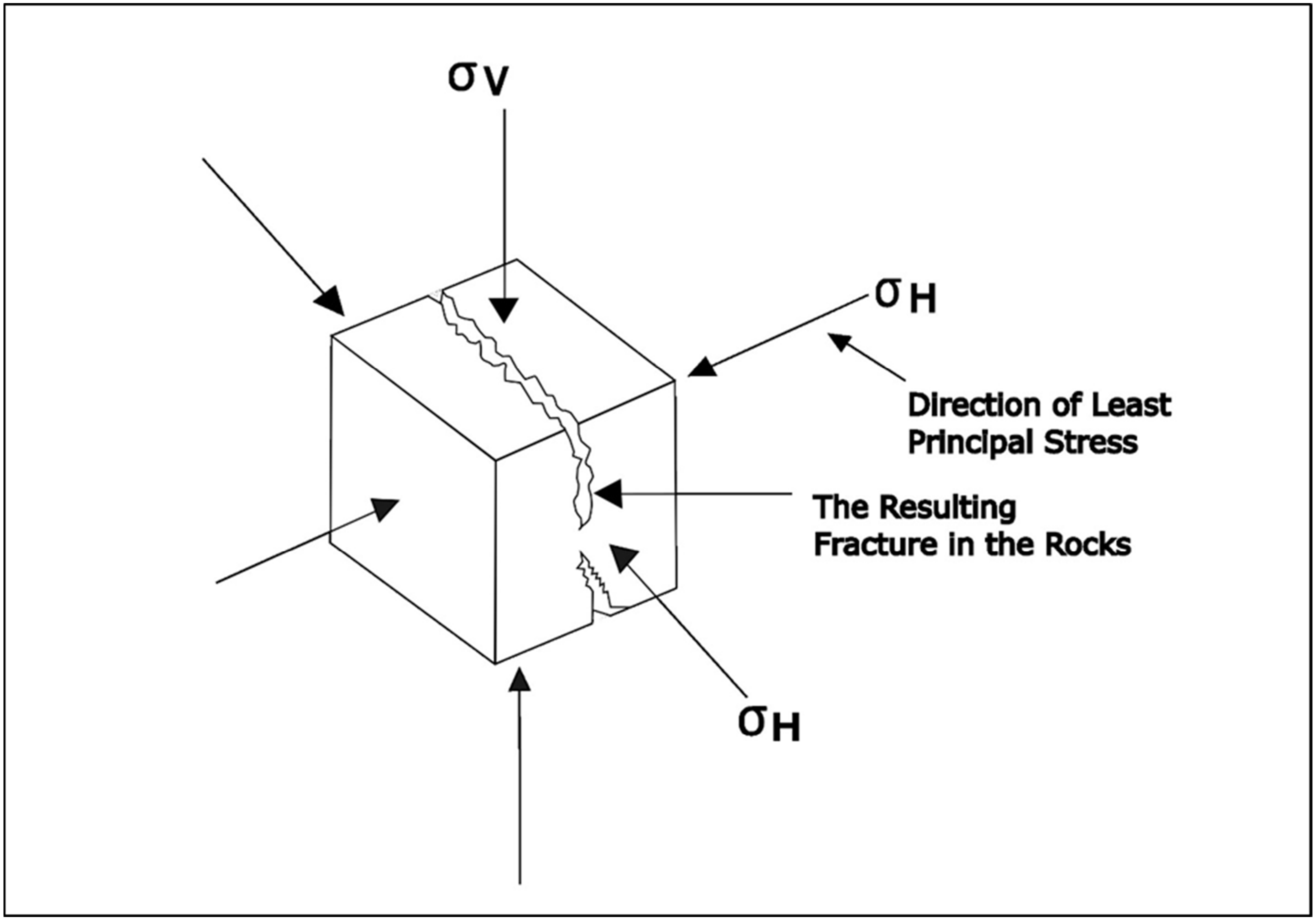


Figure A-35. Stress diagram showing the three principal stresses and the fracturing that will occur perpendicular to the minimum principal stress.

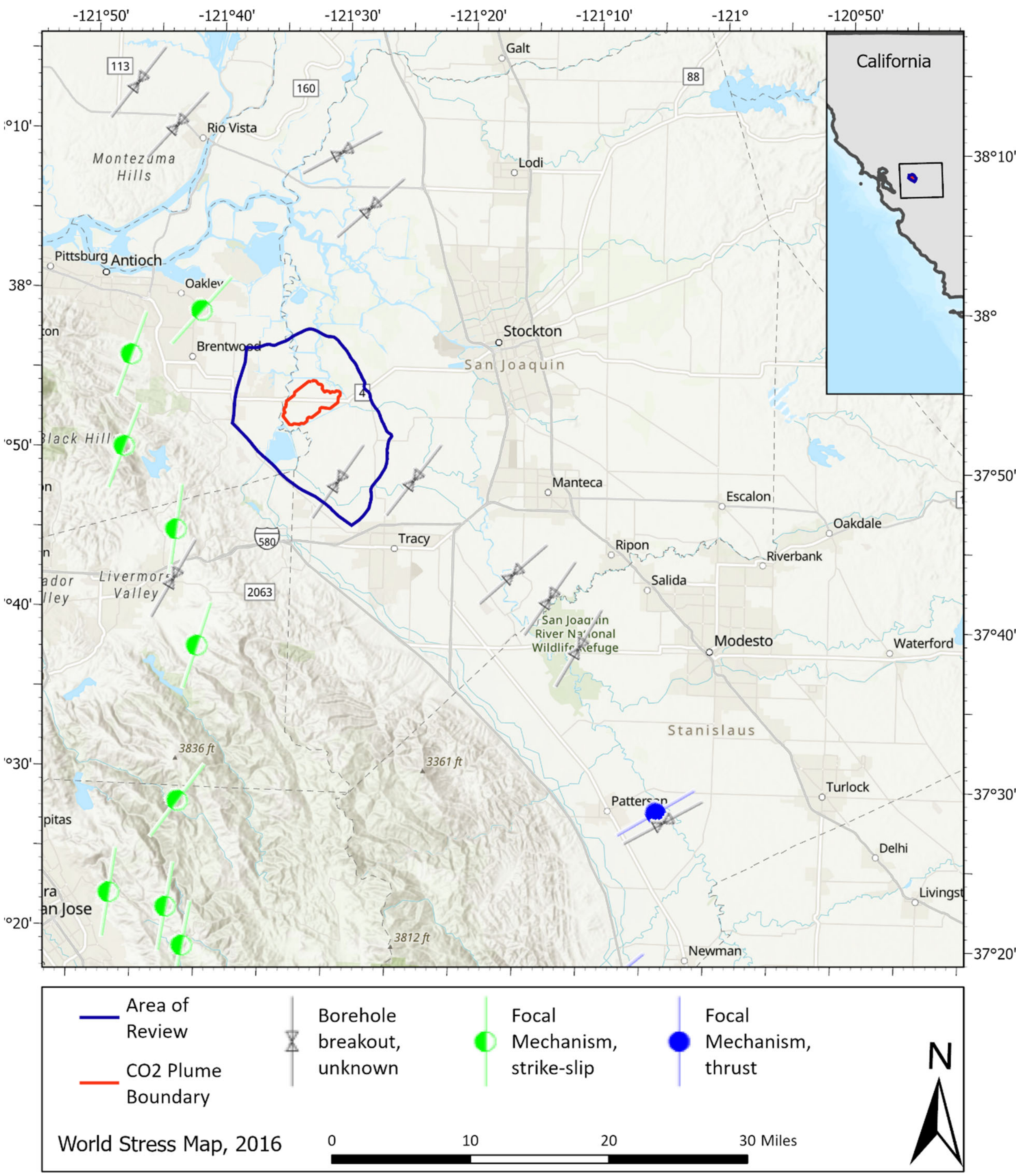


Figure A-36. World Stress Map output showing S_{Hmax} azimuth indicators and earthquake faulting styles in the Sacramento Basin (Heidbach et al., 2016). The background is topography.

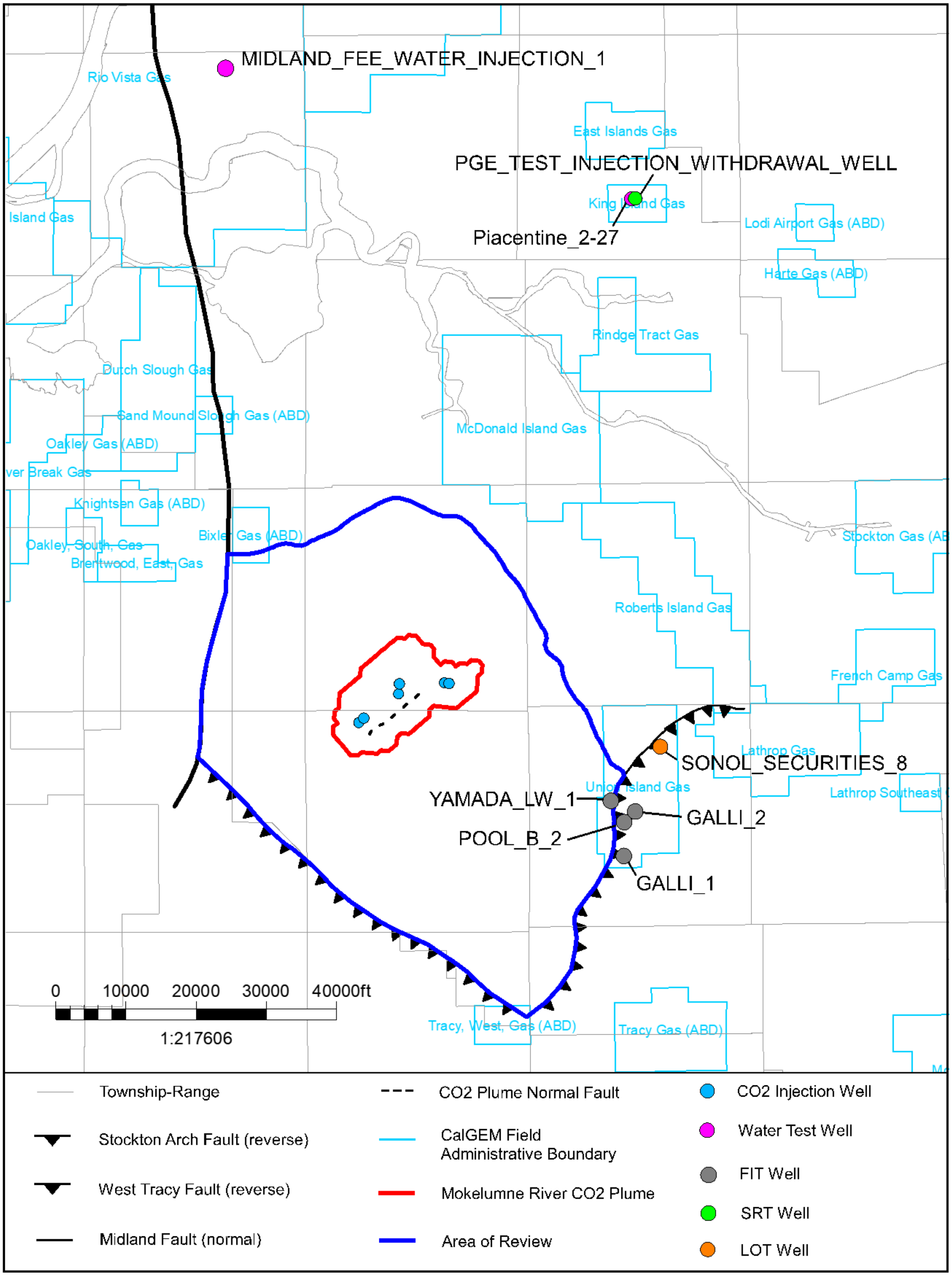


Figure A-37. Map showing the locations of wells with water tests, formation integrity tests (FITs), step rate tests (SRTs), and leak off tests (LOTs).

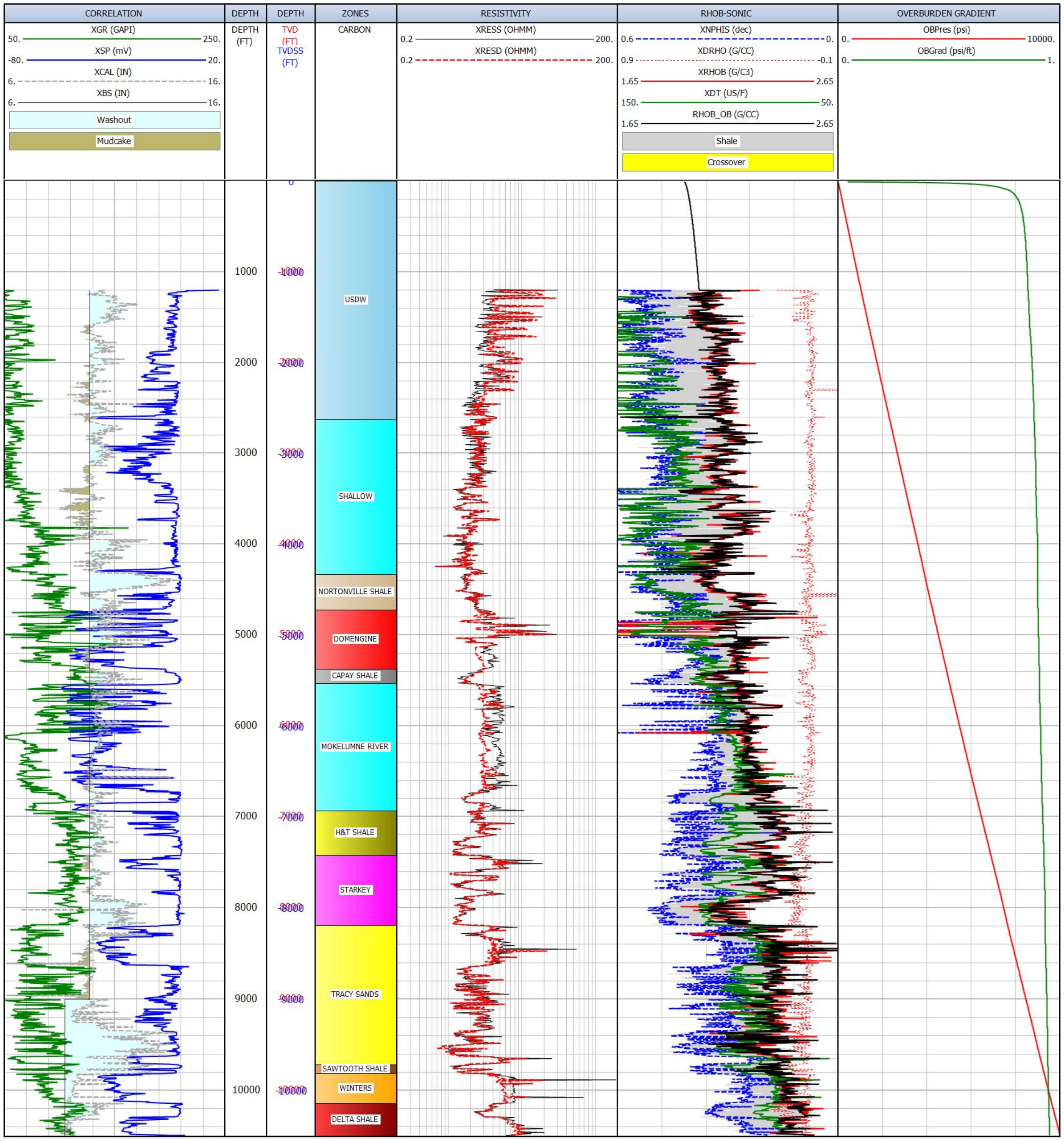


Figure A-38. Overburden gradient calculation for the Ohlendorf_Unit_1_1 (04077203480000). Track 1: Correlation logs and caliper log. Track 2: Measured depth. Track 3: Vertical depth and vertical subsea depth. Track 4: Zones. Track 5: Resistivity. Track 6: Density, neutron, and compressional sonic logs. The black curve shows the merged density curve with the shallow density trend as determined from nearby shallow density logs that was used for the overburden calculation. Track 7: Overburden pressure (red) and overburden gradient (green).

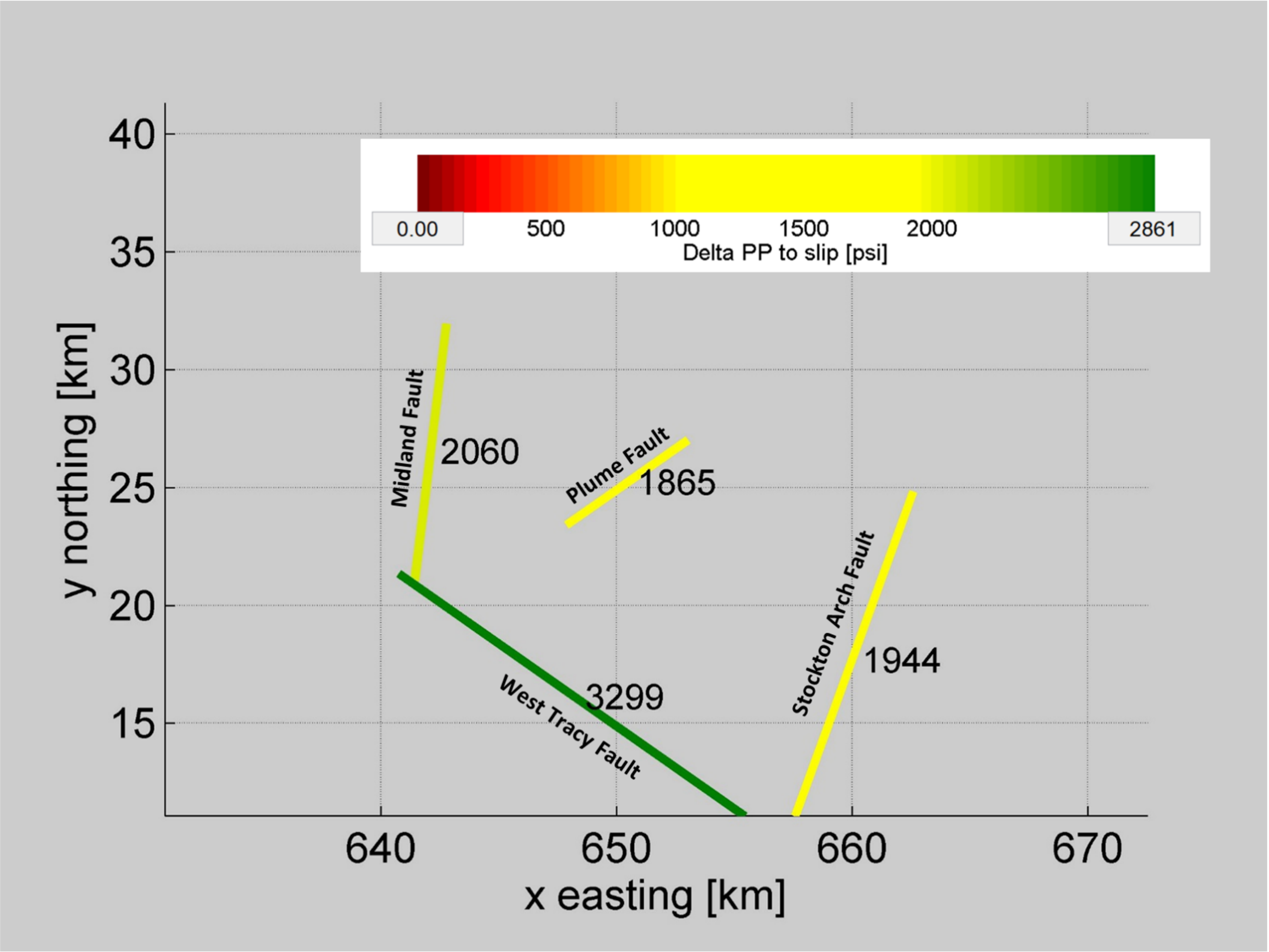


Figure A-39. Map showing the four modeled faults. The numbers on the plot next to each fault represent the necessary increase in pore pressure above present-day conditions to cause failure on that fault segment.

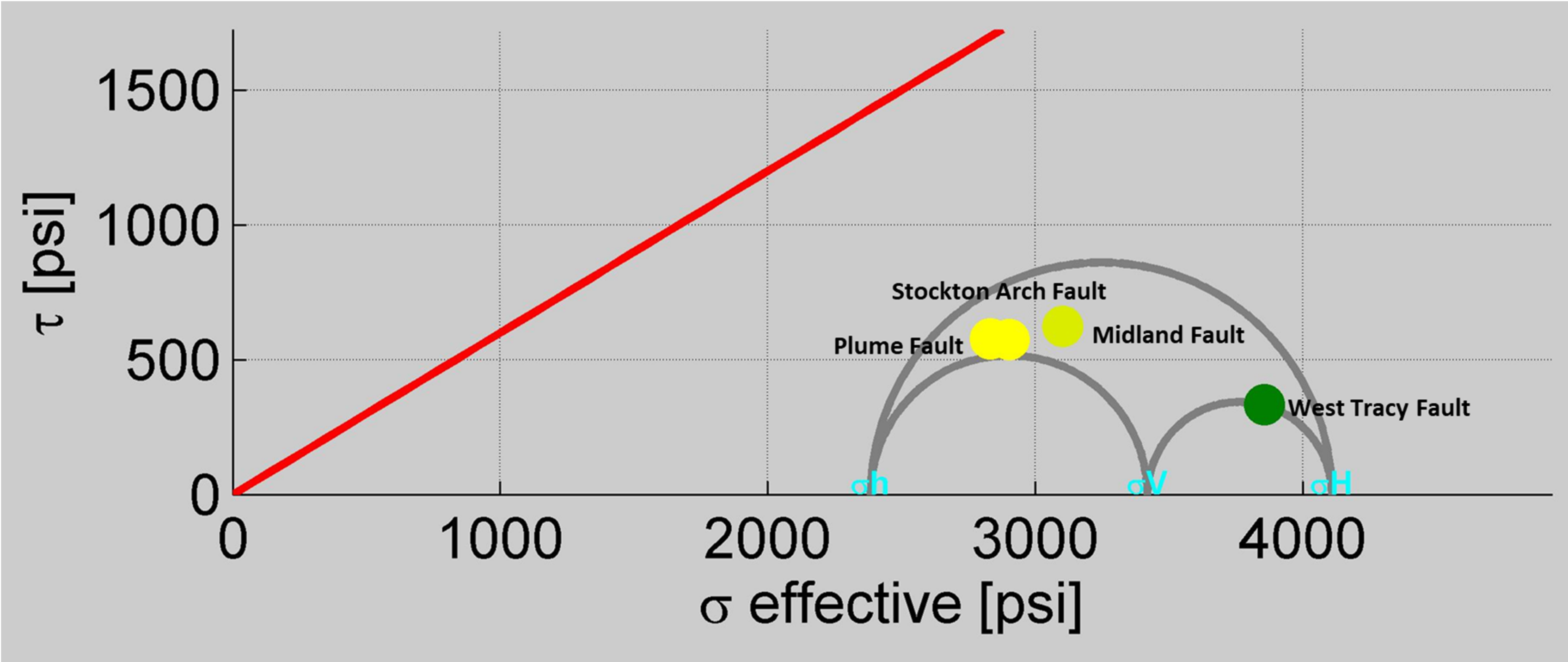


Figure A-40. Mohr circle of the Mokelumne River Formation at present-day conditions. The effective normal stress (x-axis) and shear stress (y-axis) on the four modeled faults are represented by the yellow and green dots. The red line represents the Mohr coulomb failure surface assuming a coefficient of friction of 0.6 and a fault cohesion of 0 psi.

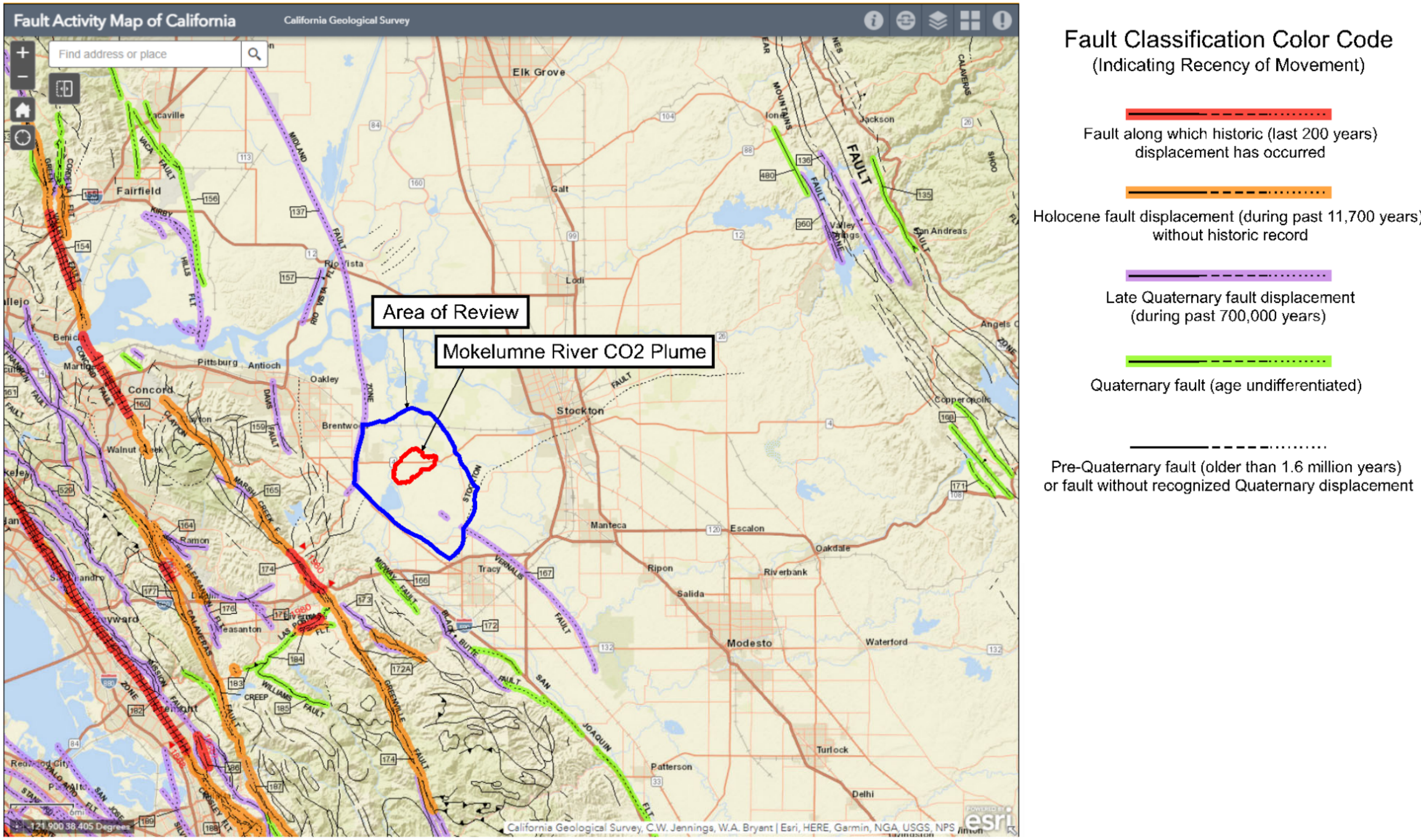


Figure A-41. Fault Activity Map from the California Geologic Survey. Fault traces shown agree with the interpretation of CRC/CTV. The Stockton Arch Fault is considered Pre-Quaternary associated with Post-Eocene/Pre-Miocene movement. The Midland Fault was active in the late Cretaceous-Eocene time; however, the southern end of the Midland fault has been interpreted as reactivated as a reverse fault in the late Cenozoic transpressional tectonic setting.

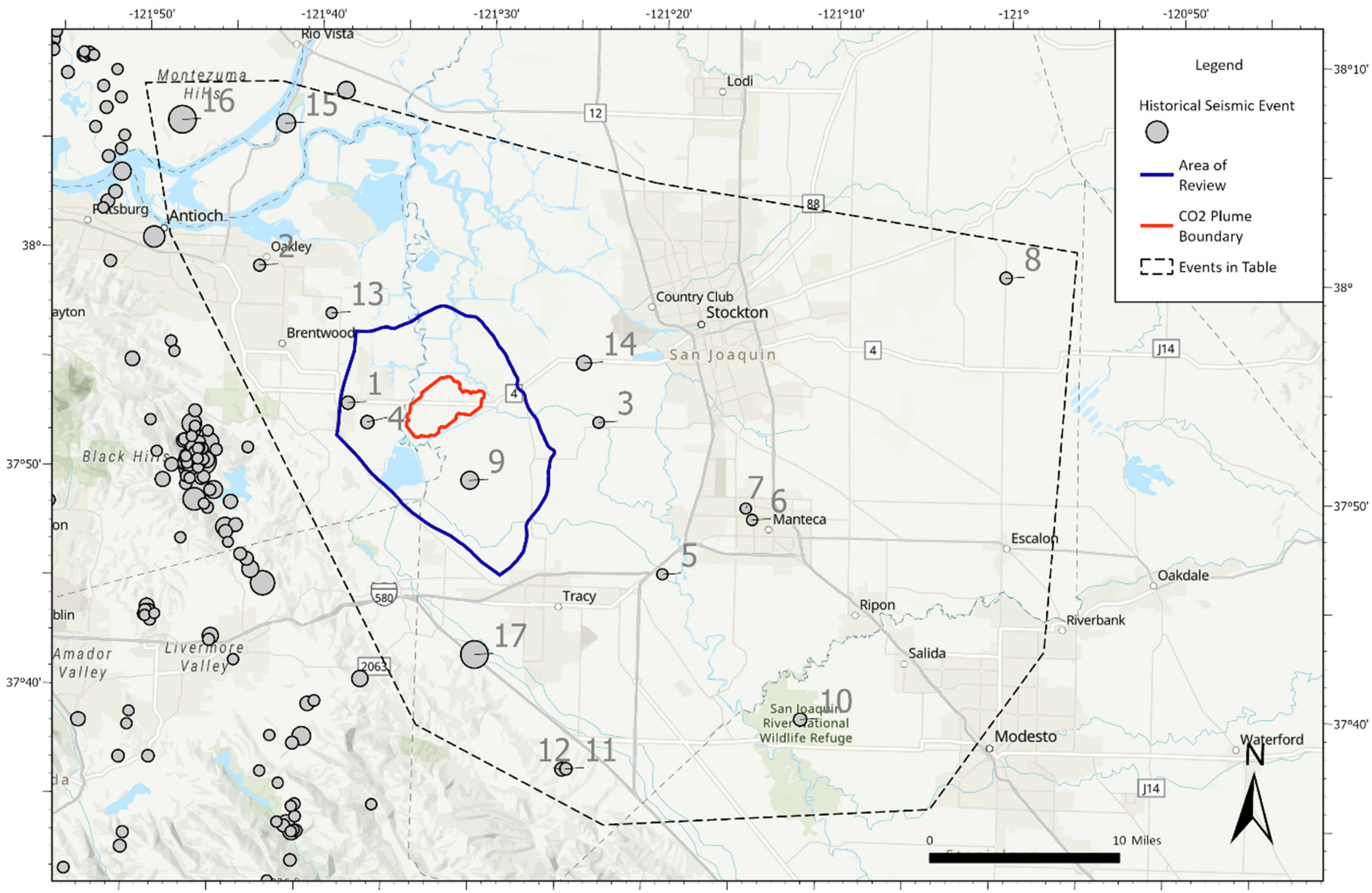


Figure A-42 **Historical earthquakes from the USGS catalog tool for the greater area. Data from these events are compiled in Table A-12 in chronological order associated with events 1 through 17 on the map. Events are sized by magnitude and those to the west are removed due to their association with a different fault trend.**

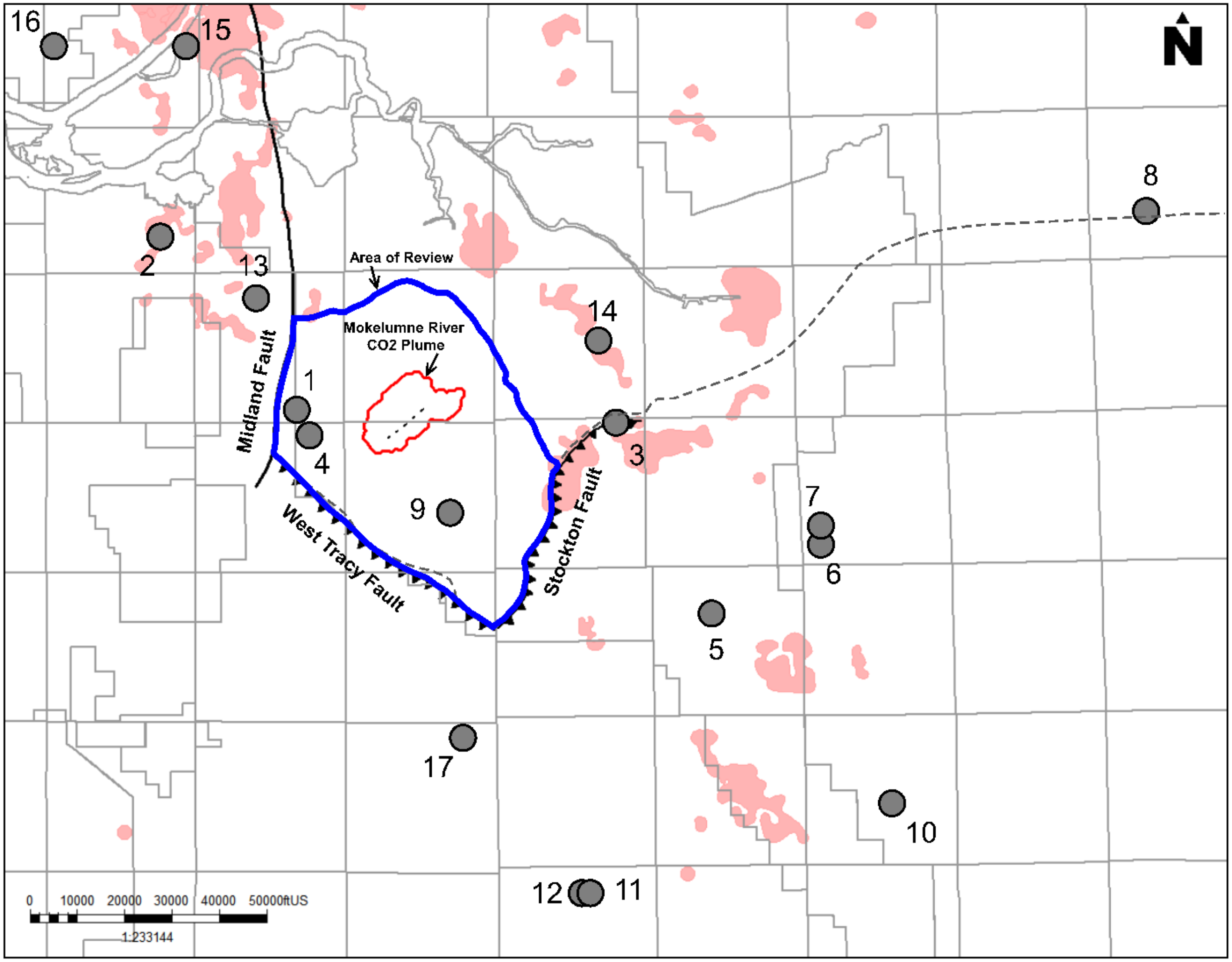


Figure A-43. Summary map of event locations from the USGS catalog relative to the mapped faults near the AoR of CTV III. California Gas Fields are shown in light red for reference.

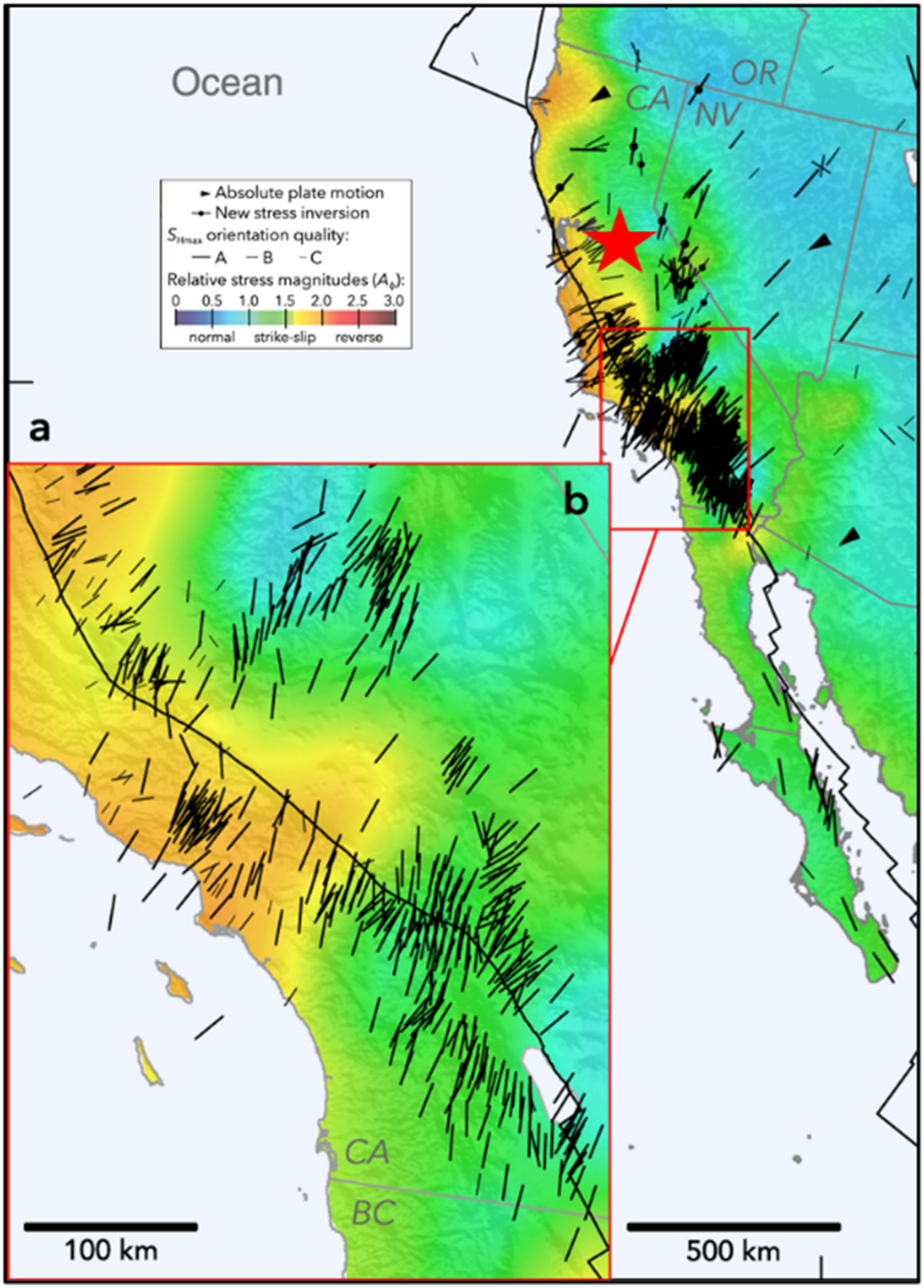
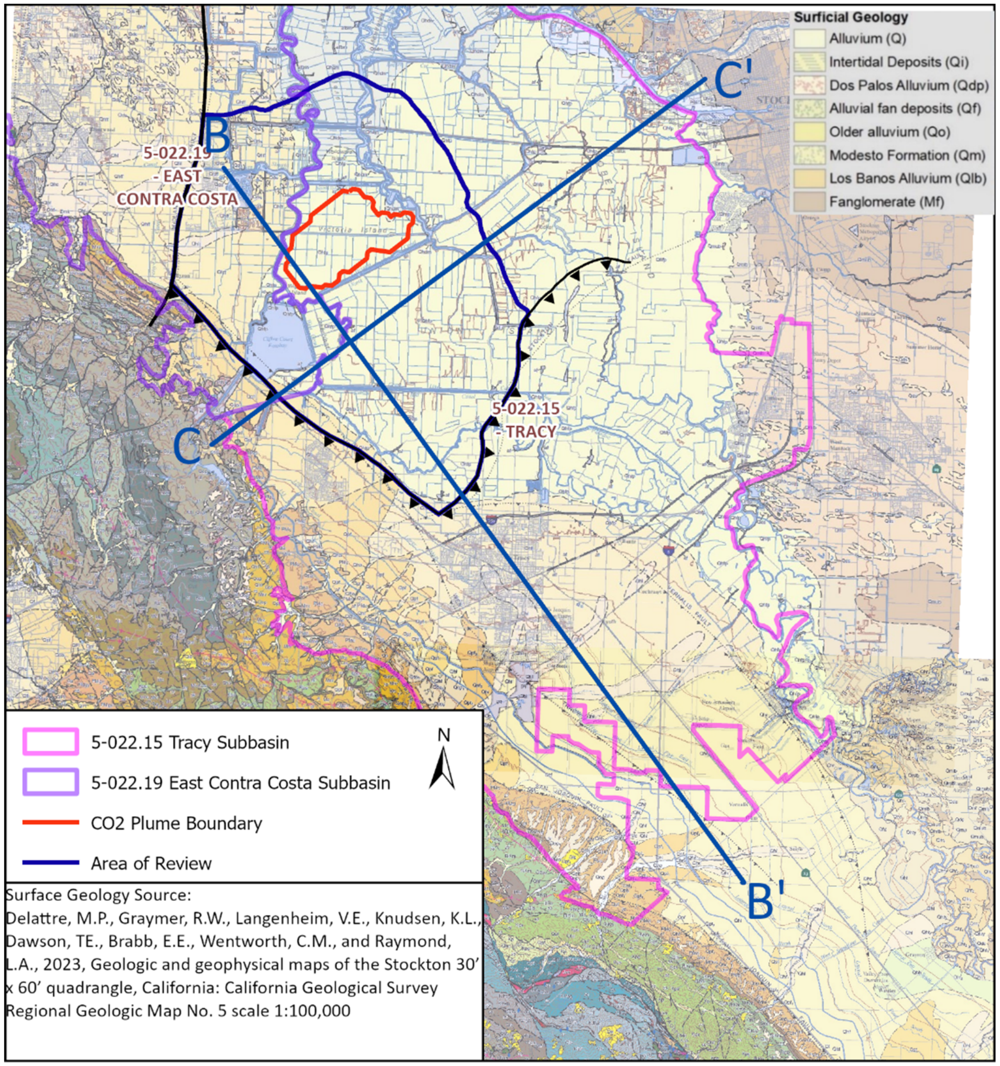


Figure A-44. Image modified from Lund-Snee and Zoback (2020) showing relative stress magnitudes across California. Red star indicates the CTV III site area.



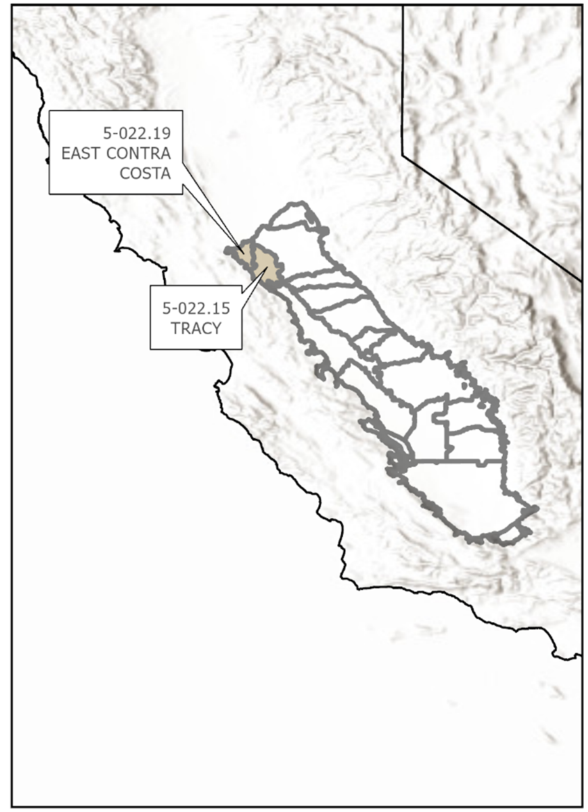


Figure A-45. Tracy Subbasin, surface geology (Delattre et al., 2023), and cross section index map for Figures A-50 and A-51.

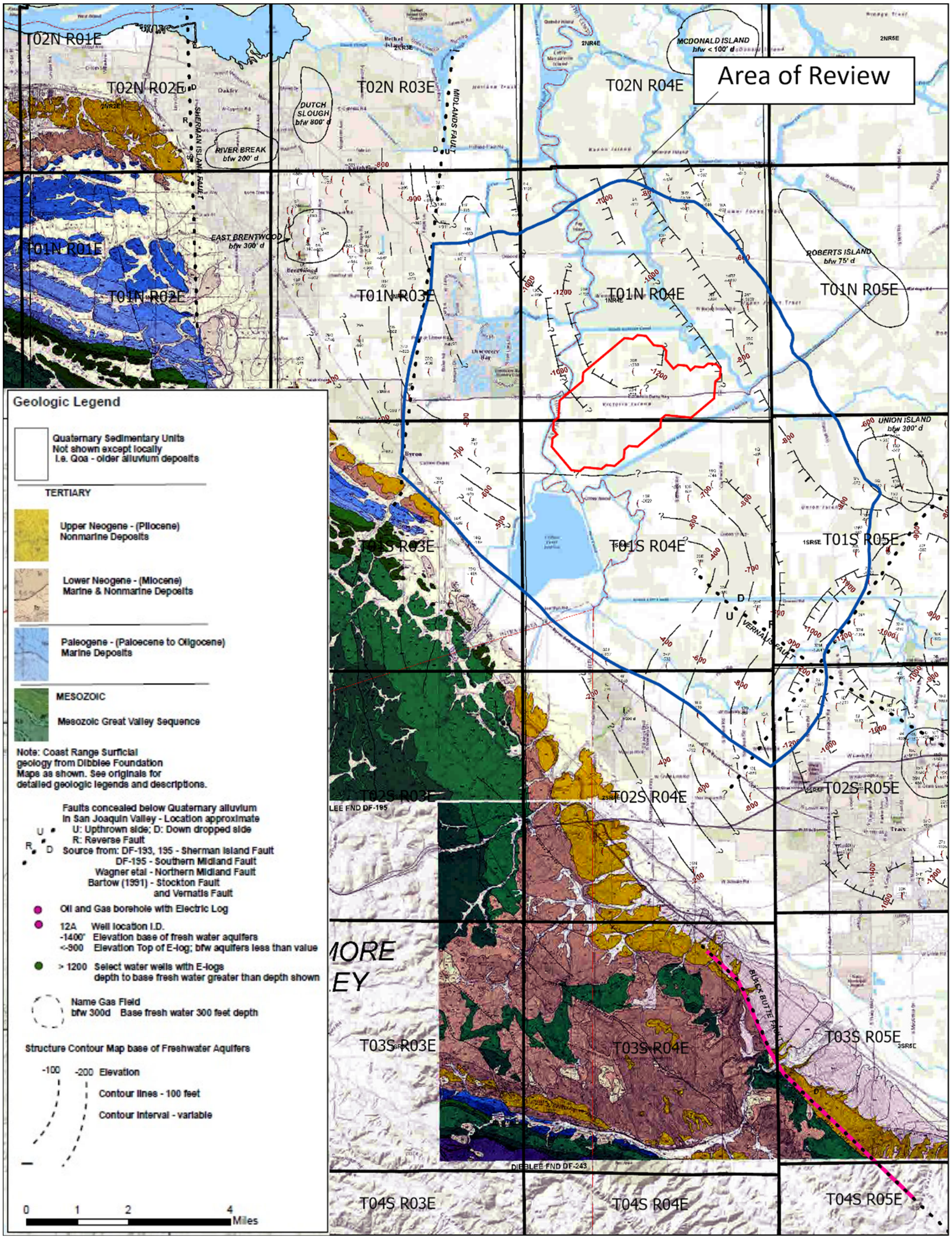
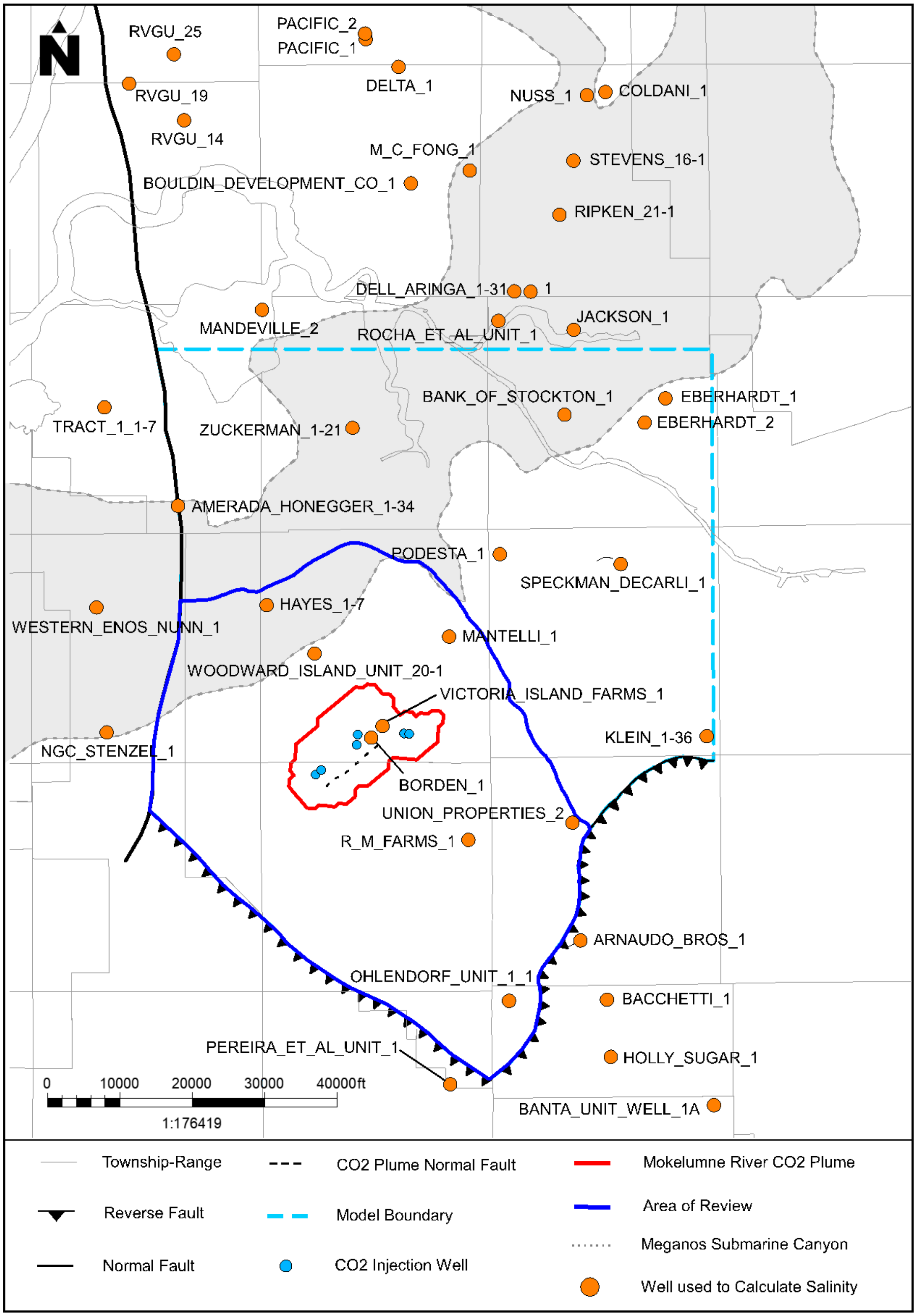
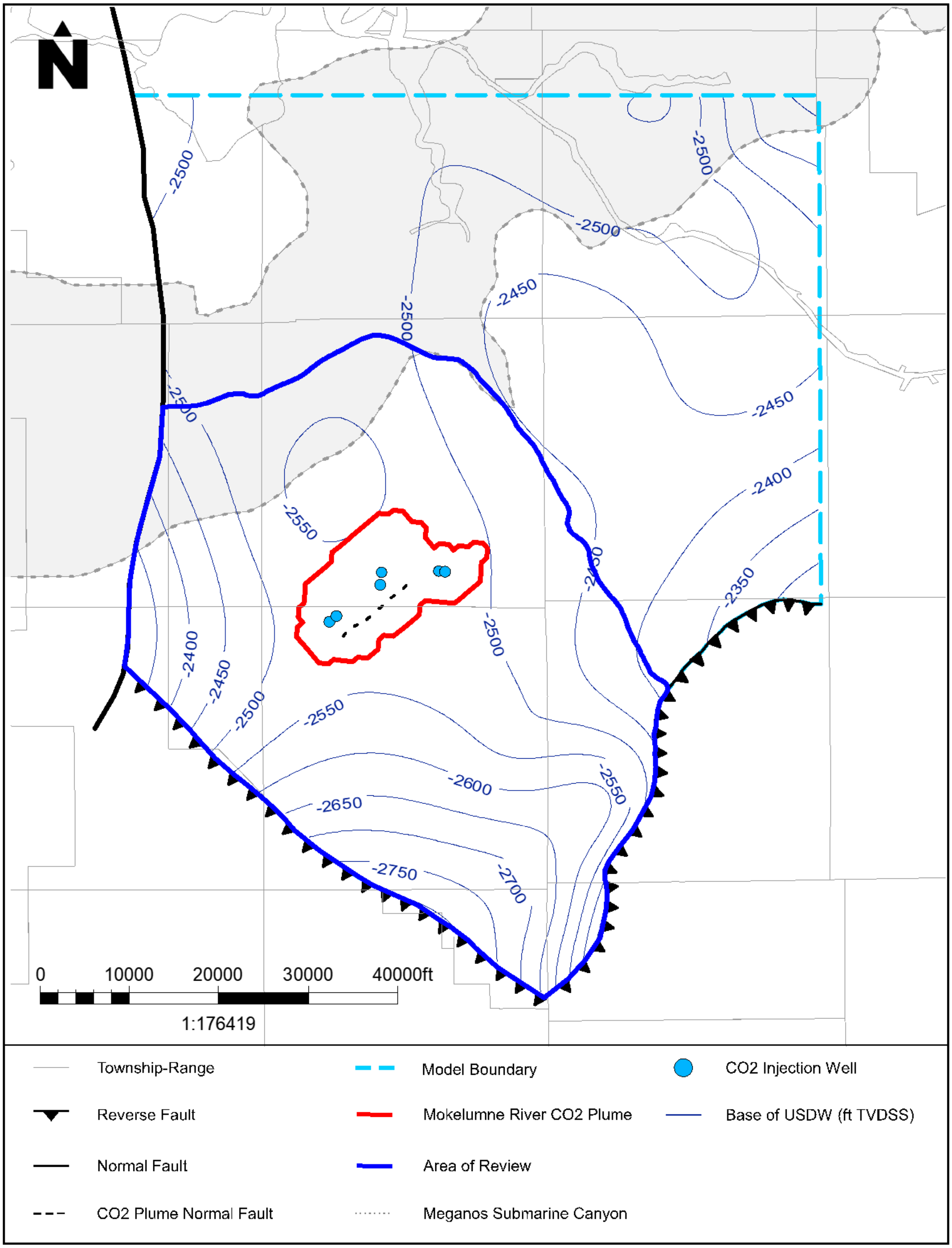


Figure A-46. Geologic map and base of fresh water (Luhdorff & Scalmanini, 2016).



FigureA-47. Map of wells used to calculate salinity.



FigureA-48. Base of lowermost USDW map in project vicinity.

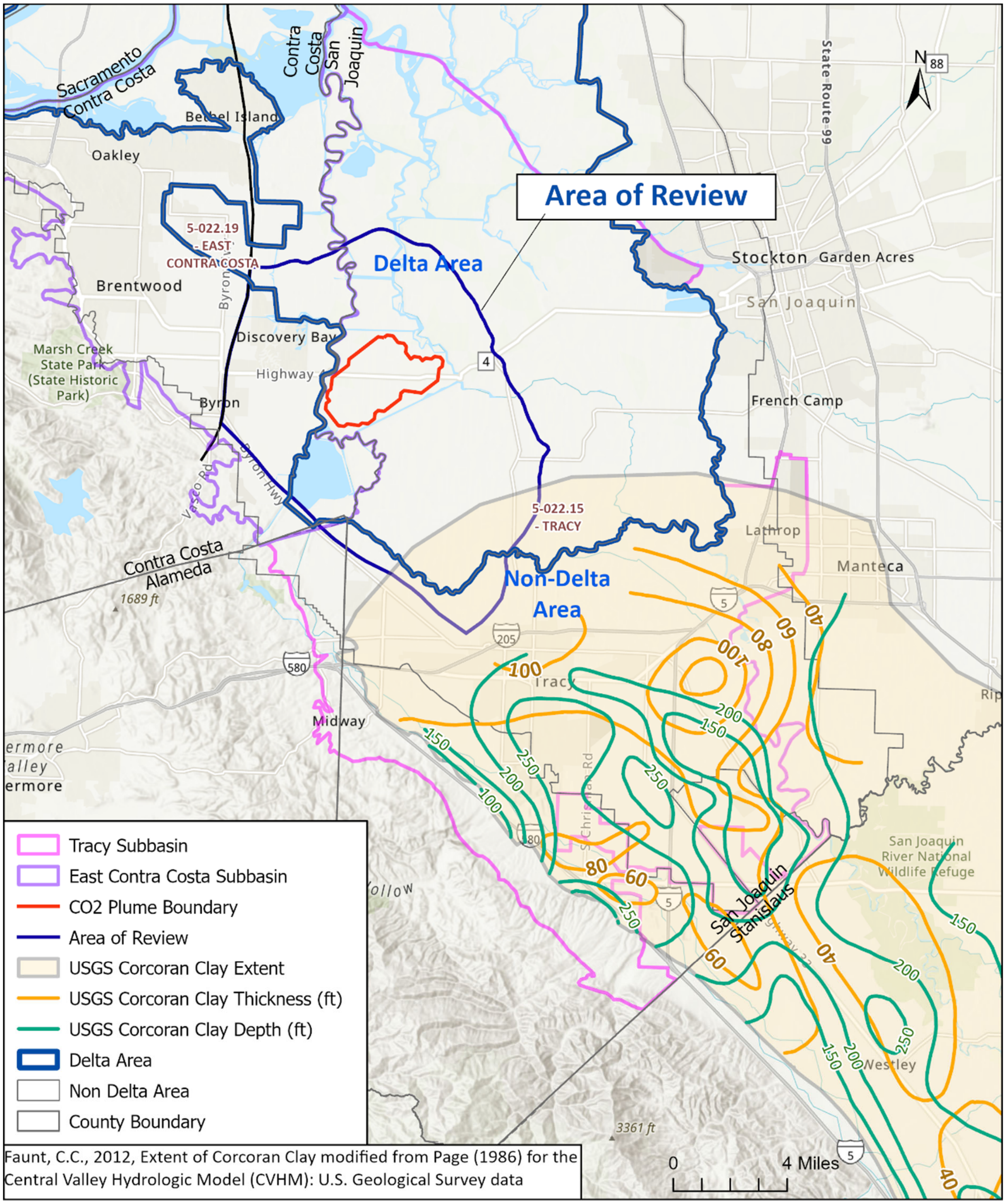


Figure A-49. Estimated Corcoran Clay thickness and extent (Faunt, 2012).

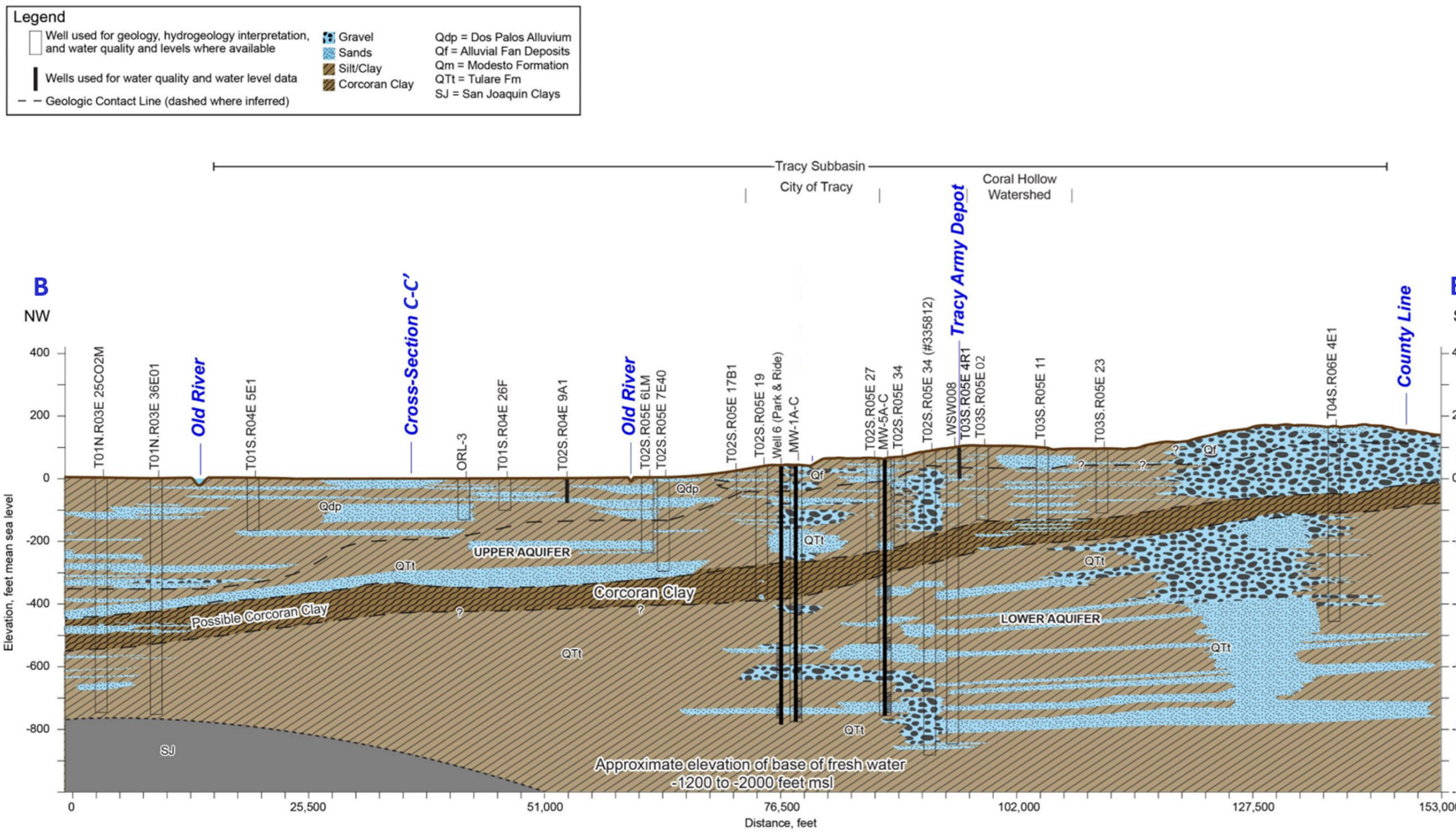


Figure A-50. Geologic cross section B-B'. Figure modified from the Tracy GSP (GEI, 2021).

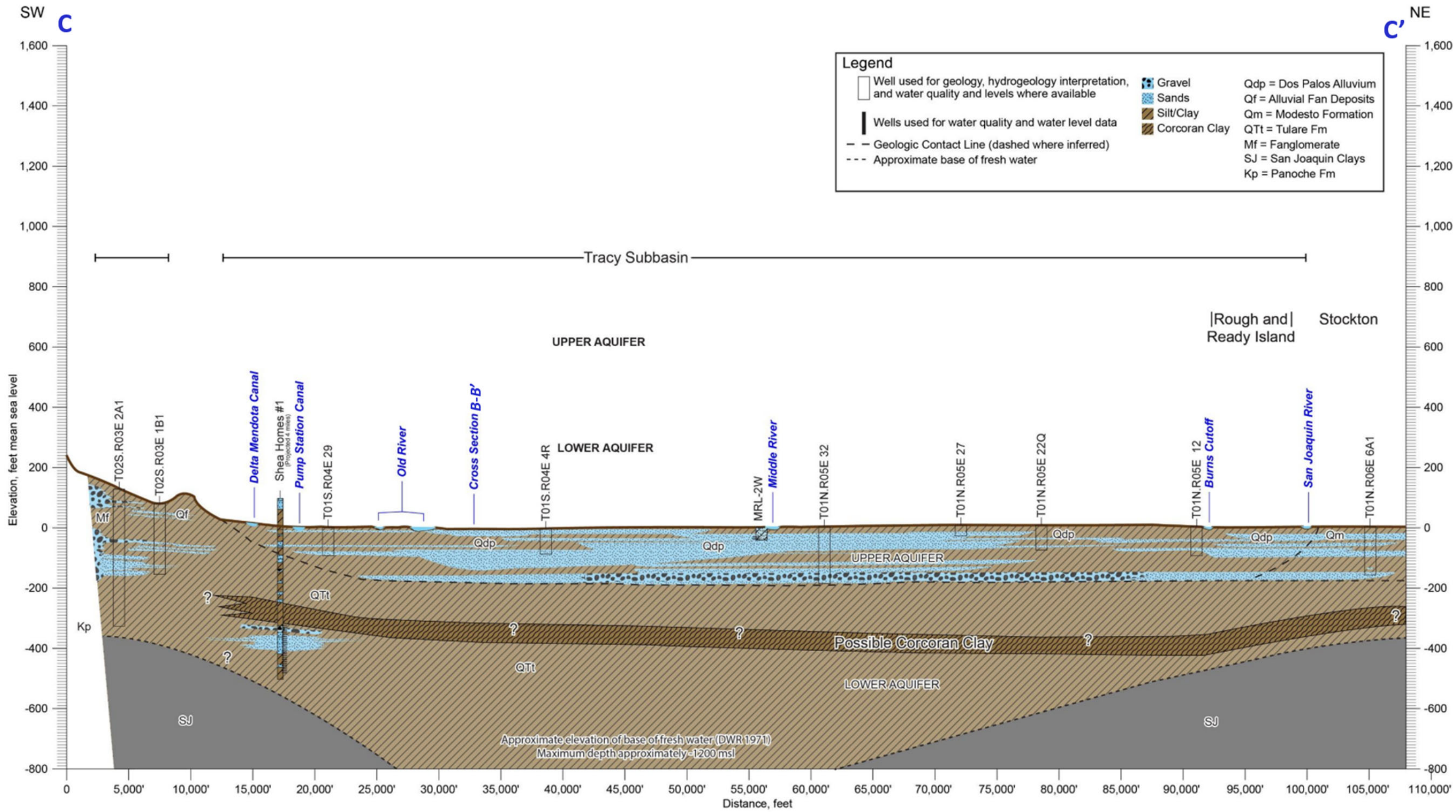
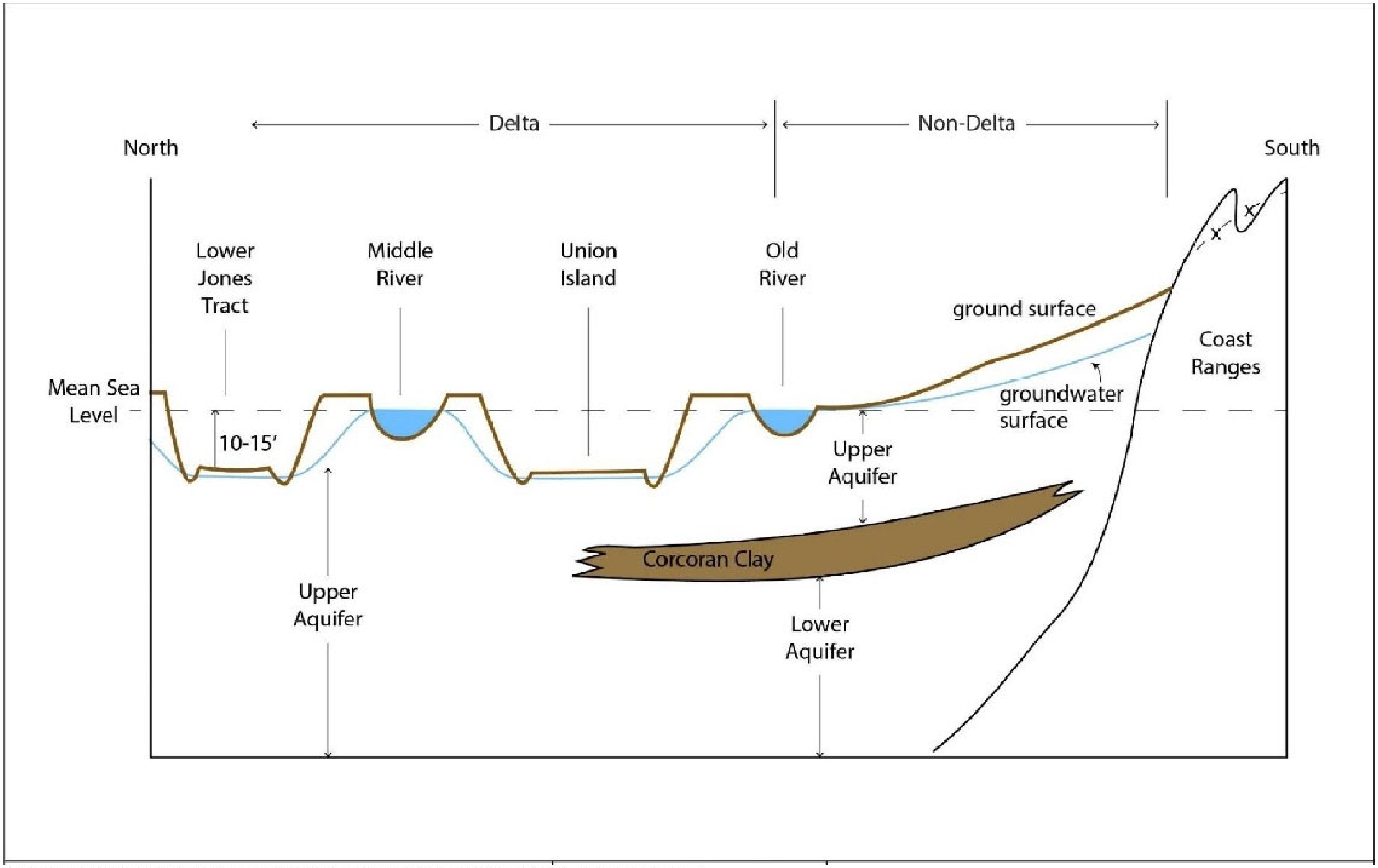


Figure A-51. Geologic cross section C-C'. Figure modified from the Tracy GSP (GEI, 2021).



Modified from: GEI Consultants, Inc.; Tracy Subbasin Groundwater Sustainability Plan. November 1, 2021.

Figure A-52. Principal aquifer schematic profile.

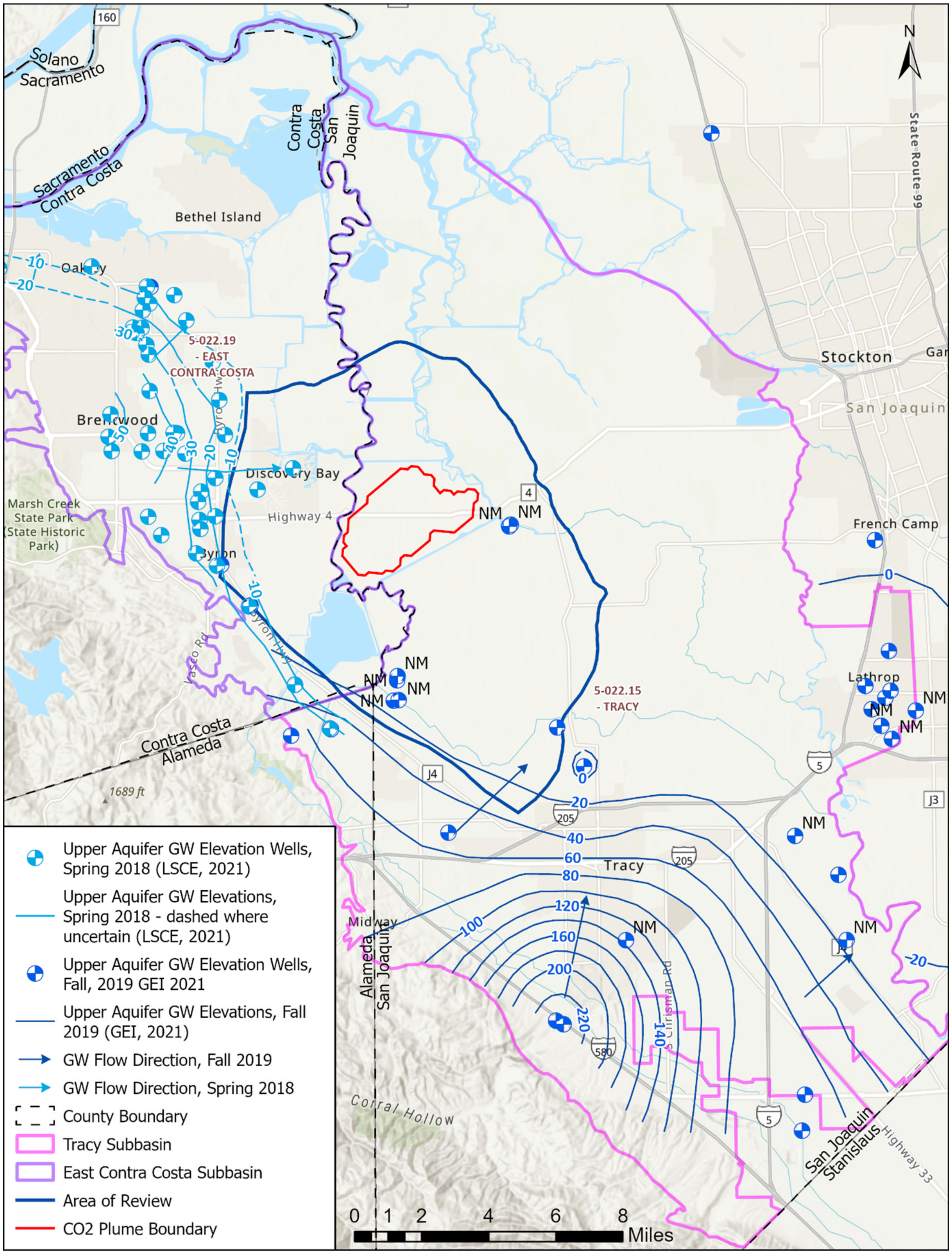


Figure A-53. Upper Aquifer groundwater elevations, East Contra Costa Subbasin Spring, 2018 (LSCE, 2021) and Tracy Subbasin, Fall 2019 (GEI, 2021).

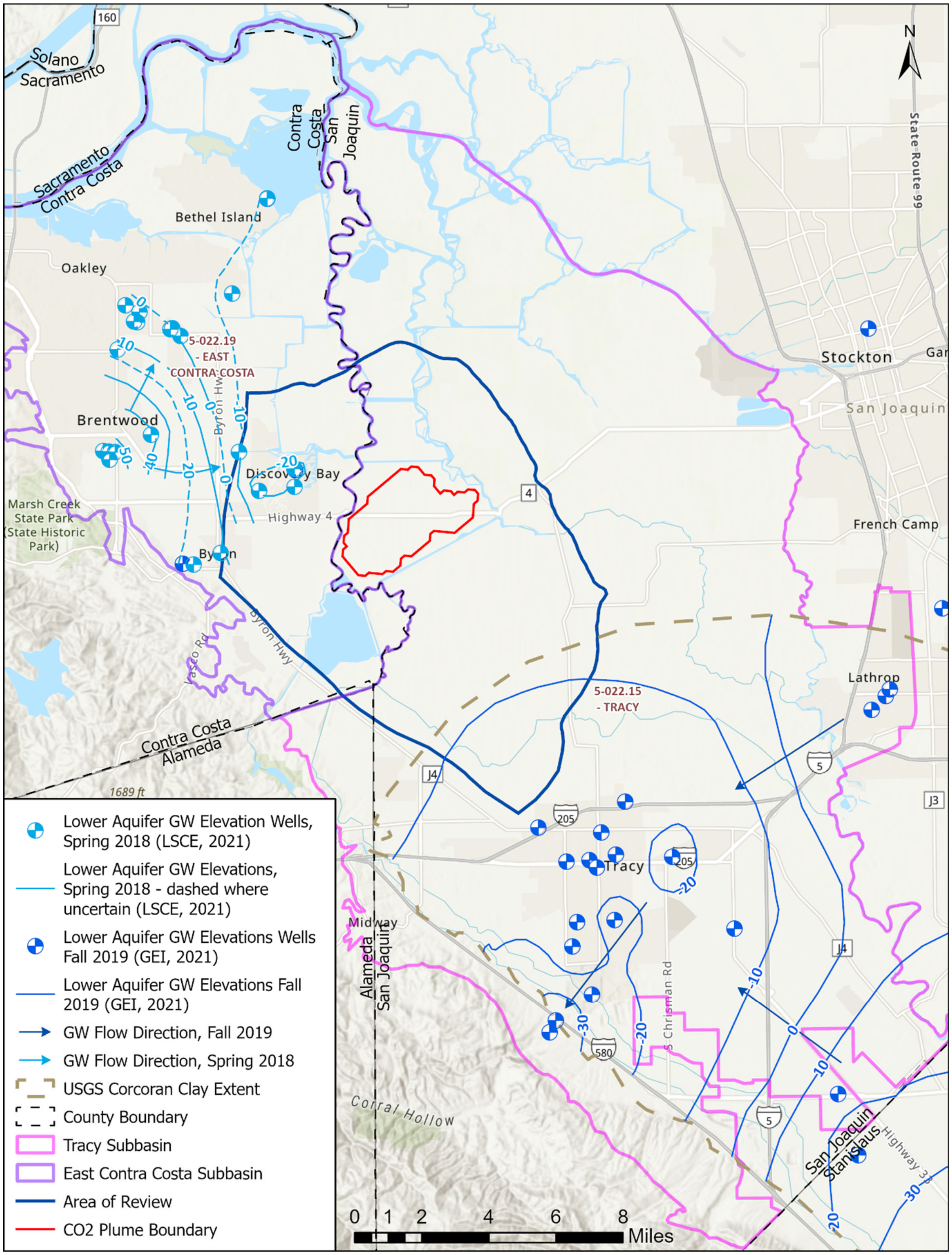


Figure A-54. Lower Aquifer groundwater elevations, East Contra Costa Subbasin Spring, 2018 (LSCE, 2021) and Tracy Subbasin, Fall 2019 (GEI, 2021).

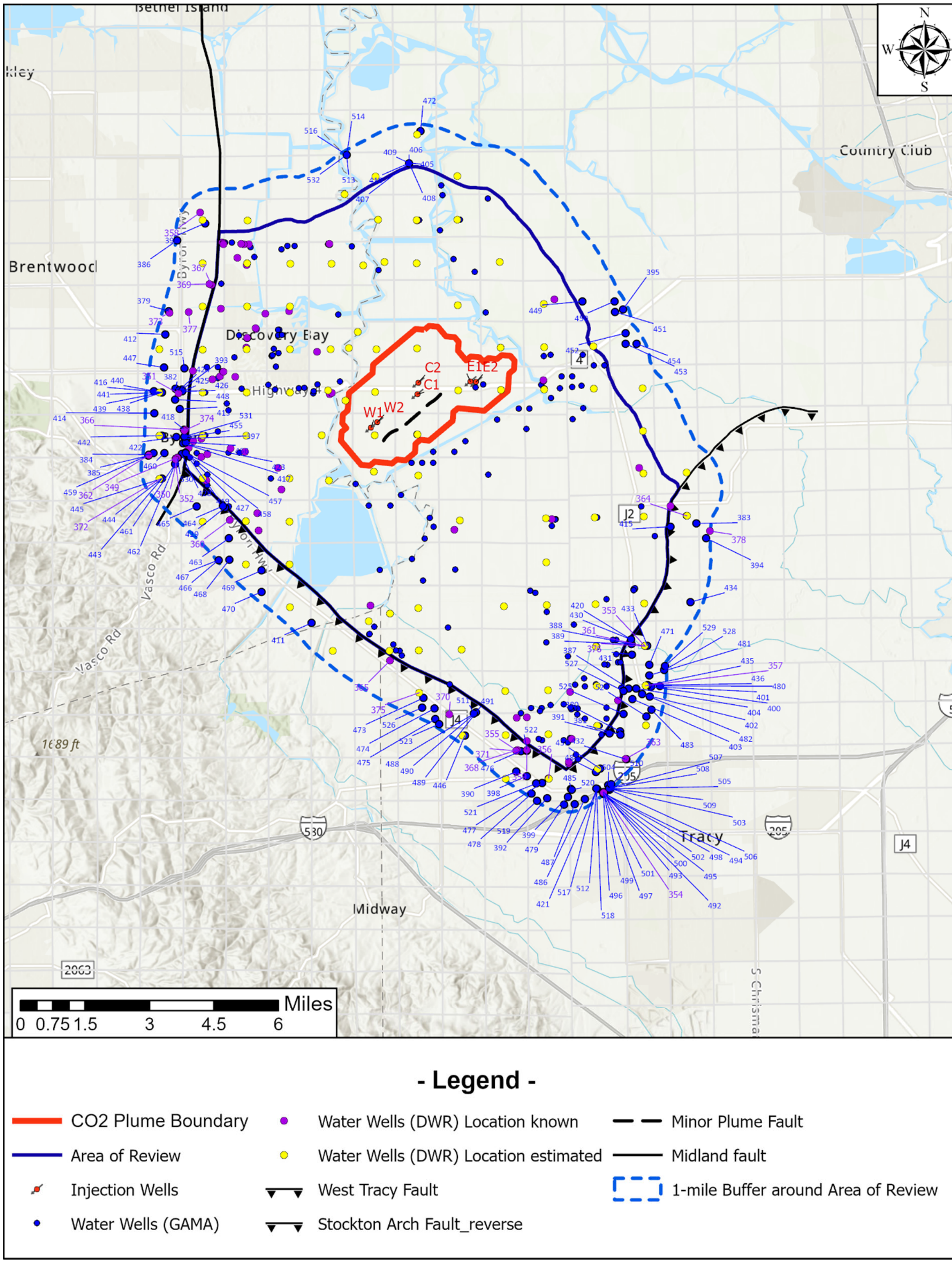


Figure A-55. Water well location map for water wells within a 1 mile buffer of the AoR. Refer to Figure A-8 and Tables A-2 and A-3 for water wells within the AoR.

GEOCHEM AL ANALYSIS OF WA ER Pro-391

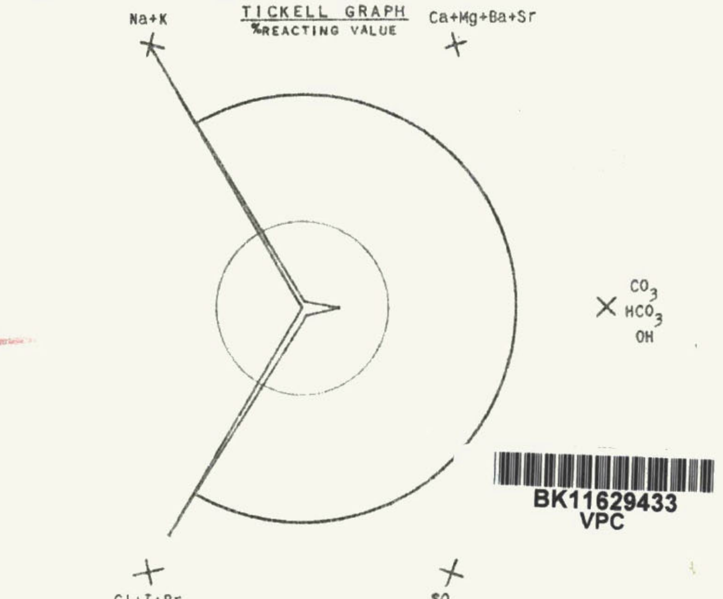
DATE OF REPORT	June 4, 1980	WELL NO.	Midland Fee WI-1, Sec. 3
DATE OF SAMPLING	No date	COMPANY	Chevron USA
SAMPLED BY	Operator	FIELD	Rio Vista, 3N/3E
LABORATORY NO.	32-8W-48	ZONE	
ANALYST	Yamada	SAMPLE SOURCE	

RADICALS		PARTS PER MILLION MILLIGRAMS PER LITER	REACTING VALUE EQUIVALENTS PER MILLION	REACTING VALUE PERCENT
SODIUM	Na	5053.6	219.82	48.73
CALCIUM	Ca	61.5	3.07	0.68
MAGNESIUM	Mg	8.9	0.73	0.16
BARIUM	Ba			
STRONTIUM	Sr			
POTASSIUM	K	75	1.92	0.43
SULPHATE	SO_4	294.9	6.14	1.36
CHLORIDE	Cl	6867.2	193.70	42.94
CARBONATE	CO_3	58.8	1.96	0.44
BICARBONATE	HCO_3	1448.5	23.74	5.26
HYDROXIDE	OH			
IODIDE	I			
SILICA	SiO_2	12.8		
IRON, ALUMINA	R_2O_3	8.2		
TOTAL		13889.4	451.08	100.00

GROUP	CHEMICAL CHARACTER	MISCELLANEOUS		
ALKALIS	PRIMARY SALINITY	BORON	77.2	PPM
EARTHS	SECONDARY SALINITY	HYDROGEN SULFIDE	Absent	
STRONG ACIDS	PRIMARY ALKALINITY	EQUIVALENT SALT	12000	PPM
WEAK ACIDS	SECONDARY ALKALINITY	RESISTIVITY @ 77°F	0.470	O.M.
Ca/EARTHS		CHLORINITY	11320	PPM
CHLORIDE SALINITY		SPECIFIC GRAVITY	1.0100	
SULPHATE SALINITY	CARBONATE/CHLORIDE	pH	8.32	

REMARKS

TICKELL GRAPH
%REACTING VALUE



ARC REPRESENTS "CONCENTRATION OF SOLIDS IN NORMAL SEA WATER"

D. F. Moran
G. C. Cates
1-C Laboratory

PRO-391 (REV. 7-71)
PRINTED IN U.S.A.

SIGNED: R. M. Yamada

Figure A-56. Water geochemistry for the Midland_Fee_Water_Injection_1 well.

ZALCO LABORATORIES, INC.
Analytical & Consulting Services

4309 Armour Avenue
Bakersfield, California 93308

(661) 395-0539
FAX (661) 395-3069

Core Laboratories
3437 Landco Dr
Bakersfield CA 93308

Laboratory No: 1304060-01
Date Received: 4/5/2013
Date Reported: 4/9/2013

Attention: Larry Kunkel

Sample Identification: Chamber 1507
Sampled by: Date: 3/26/2013 Time:
Report Notes:

COMPLETE GEOCHEM ANALYSIS

pH	7.68	Specific Gravity @ 60 F...	1.009
Electrical Conductivity (EC)	21.3	Resistivity	0.4695
(millimhos/cm @ 25 C)		(ohm meters @ 25 C)	

Constituents	mg/L	meq/L	Reacting %
Calcium, Ca	430	21	4.72
Magnesium, Mg	130	11	2.35
Sodium, Na	4300	190	41.14
Potassium, K	33	0.84	0.19
Iron, Fe (total)	< 1.0	0	0
Alkalinity as:			
Hydroxide, OH	0	0	0
Carbonate, CO3	0	0	0
Bicarbonate, HCO3	150	2.5	0.54
Chloride, Cl	8200	230	50.86
Sulfate, SO4	42	0.87	0.19
Sulfide, S	< 1.0		
Boron, B	9.6		
Barium, Ba	3.2		
Silica, SiO2	< 40		
Strontium, Sr	15		
Totals (Sum)	13200	456	100

Total Dissolved Solids, (Gravimetric)	14000		
Calculated Hardness, CaCO3	1600		
Total Alkalinity, CaCO3	150		
Sodium Chloride, (total)	13000		
		Primary Salinity	82.66
		Secondary Salinity	14.14
		Total Salinity	96.8
Cation/Anion Balance, %	3.0%		
Sodium, Na (Calculated), mg/L	4635.12	Primary Alkalinity	0
Langelier Scale Index	1.13	Secondary Alkalinity	0
Stiff/Davis Stability Index	1.11	Total Alkalinity	0

Laboratory Authorization

Figure A-57. Water geochemistry for the Piacentine_2-27 well.

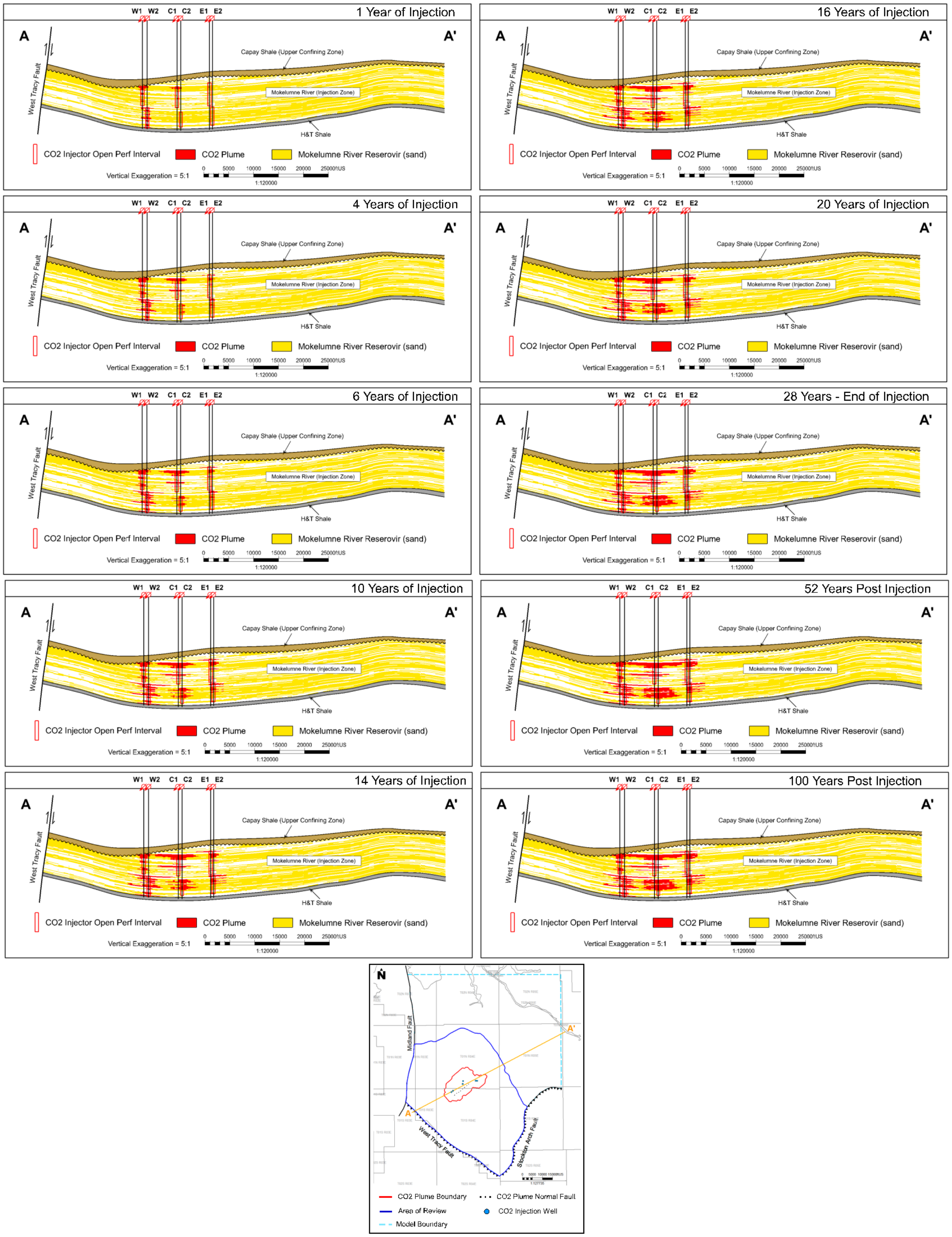


Figure A-58. Proximity of CO_2 to the West Tracy Fault, lateral dispersion of CO_2 throughout time and confinement under the overlying Capay Shale through time.

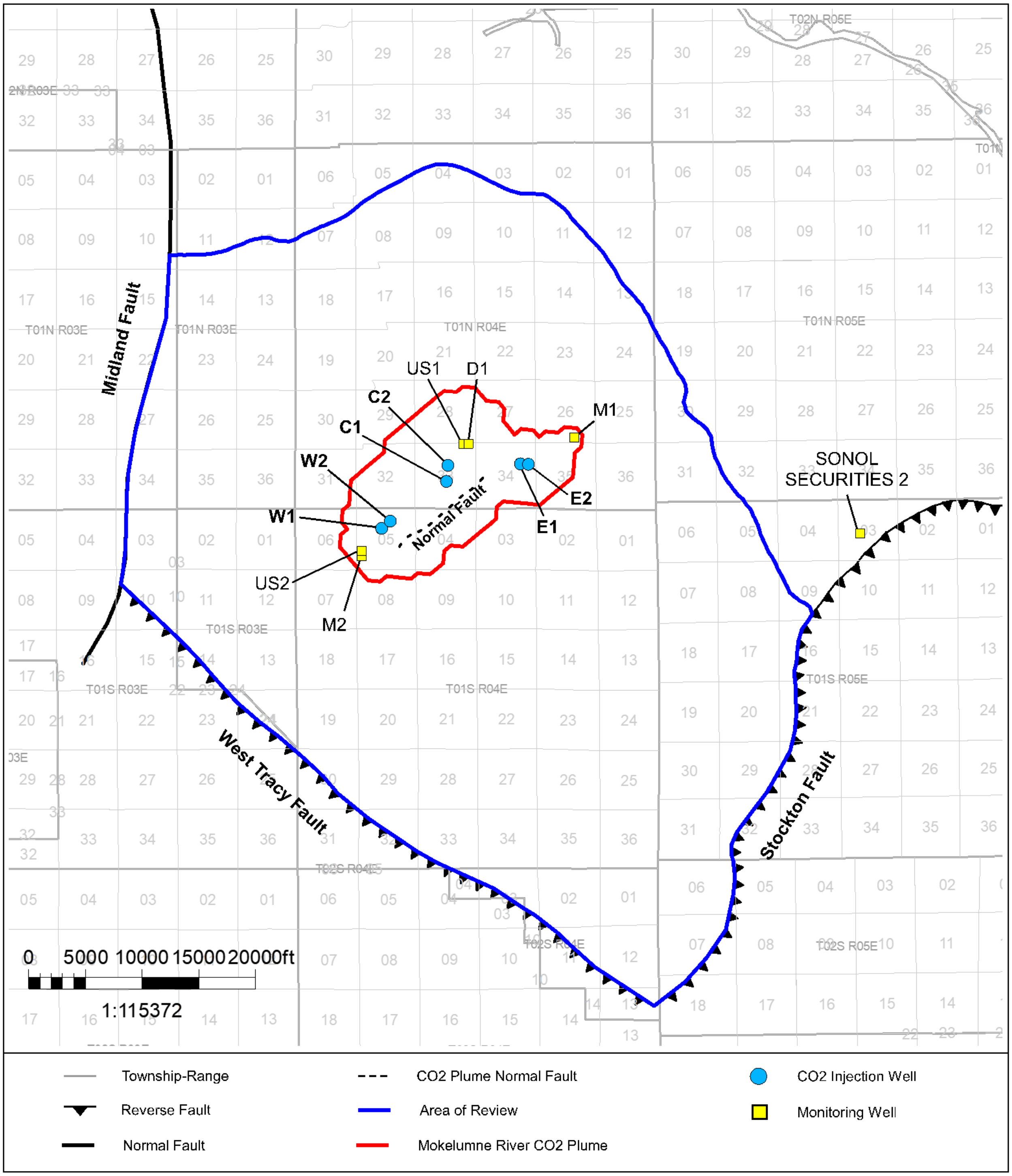


Figure A-59. Map showing the locations of injection wells and monitoring wells.

Tables

Table A-1. Oil and Gas Wells in Project AoR Reference List based on CalGEM Data Displayed in Figure A-8.

Number	API-12	Well Number	Operator Name	Lease Name	Well Status	Well Type	Well Type Label
1	040772055800	1	Dekalb Energy Co.	Gonsalves	DH	Dry Hole	DH
2	040770034000	1	Chevron U.S.A. Inc.	Hall	DH	Dry Hole	DH
3	040772000900	1	Richard S. Rheem, Operator	Calpack	DH	Dry Hole	DH
4	040770042100	1	W. B. Osborn, Jr.	Thorpe	DH	Dry Hole	DH
5	040772014500	1	Arco Western Energy Co.	Mantelli	DH	Dry Hole	DH
6	040770031100	1	Venoco, LLC	Hackel Ferguson	DH	Dry Hole	DH
7	040772014700	1	Norris Oil Company	Dusina	DH	Dry Hole	DH
8	040772068100	1	ABA Energy Corporation	R & M Farms	DG	Dry Gas	DG
9	040770030600	1	UMC Petroleum Corp.	McCulloch Lamb	DH	Dry Hole	DH
10	040772008700	1	The Termo Company	Getty-Dusina	DH	Dry Hole	DH
11	040772049500	1	Oryx Energy Company	Riverview Inv. Co.	DH	Dry Hole	DH
12	040770042500	1	California Resources Production Corporation	Lease by California Resources Production Corporation	DH	Dry Hole	DH
13	040770041800	1	S. M. Reynolds, Opr.	Signal-Allied Properties	DH	Dry Hole	DH
14	040770030400	1	Amerada Hess Corp.	Calif. Packing Corp.	DH	Dry Hole	DH
15	040132002300	1	Great Yellowstone Corp.	Sakata	DH	Dry Hole	DH
16	040132002500	1	Great Yellowstone Corp.	Perry	DH	Dry Hole	DH
17	040132010600	1	Lawrence Barker, Jr	Rosa	DH	Dry Hole	DH
18	040130027300	1	Santa Fe Minerals	Dalton Farms	DH	Dry Hole	DH
19	040130023200	1	Chevron U.S.A. Inc.	Sproule	DH	Dry Hole	DH
20	040130023100	1	Helm Co. & Robert Sumpf	Sproule	DH	Dry Hole	DH
21	040770000100	1	UMC Petroleum Corp.	Allied Properties et al	DH	Dry Hole	DH
22	040770042200	1	Chevron U.S.A. Inc.	Pacific States	DH	Dry Hole	DH
23	040770031200	1	Marathon Oil Company	Wm. C. Ferguson	DH	Dry Hole	DH
24	040772016700	1	Argo Petroleum Corp.	Norris-Grunauer	DH	Dry Hole	DH
25	040770031000	1	Phillips Petroleum Company	HOC Shell-Sorensen	DH	Dry Hole	DH
26	040772035900	1	Hunnicutt & Camp Drilling Co.	Ohlendorf Unit 2	DH	Dry Hole	DH
27	040770041700	1	Marathon Oil Company	Pacific States	DH	Dry Hole	DH
28	040770031300	1	Exxon Mobil Corporation	Wico-Bankhead	DH	Dry Hole	DH
29	040770030900	1	Brazos Oil and Gas Company	California Packing Corp.	DH	Dry Hole	DH
30	040770042000	1	S. I. Corp.	Allied Properties	DH	Dry Hole	DH

Table A-1 (cont.). Oil and Gas Wells in Project AoR Reference List based on CalGEM Data Displayed in Figure A-8.

Number	API-12	Well Number	Operator Name	Lease Name	Well Status	Well Type	Well Type Label
31	040770030700	1	Franco Western Oil Company	Turner	DH	Dry Hole	DH
32	040770042300	1	Phillips Petroleum Company	Salyer A	DH	Dry Hole	DH
33	040772067800	1	ABA Energy Corporation	Victoria Island Farms	DG	Dry Gas	DG
34	040772034800	1	Hunnicutt & Camp Drilling Co.	Ohlendorf Unit 1	DH	Dry Hole	DH
35	040770043400	1	UMC Petroleum Corp.	McCulloch-MacCallum	DH	Dry Hole	DH
36	040770032100	1	Mobil Oil Corporation	Pescadero	DH	Dry Hole	DH
37	040132036100	1-14	Sunset Exploration, Inc.	Bixler	DG	Dry Gas	DG
38	040130022600	1-2	Tesoro Petroleum Corp.	Sproule	DH	Dry Hole	DH
39	040132021700	1-27	Hamilton Brothers Oil Company	Bigelow	DH	Dry Hole	DH
40	040772037400	1-35	Arco Western Energy Co.	Kroner	DH	Dry Hole	DH
41	040772041700	1-7	Hamilton Brothers Oil Company	Borges	DH	Dry Hole	DH
42	040132027600	1-7	Quintana Petroleum Corporation	Hayes	DH	Dry Hole	DH
43	040770030500	10-3	Franco Western Oil Company	Calpak	DH	Dry Hole	DH
44	040772042100	11-31	Argo Petroleum Corp.	Lower Jones Tract	DH	Dry Hole	DH
45	040132031000	18-1	EOG Resources, Inc.	Arnaudo	DH	Dry Hole	DH
46	040130027400	20-1	Reynolds & Carver	Woodward Island Unit	DH	Dry Hole	DH
47	040772041000	20-1	TXO Production Corp.	L. Cochran	DH	Dry Hole	DH
	040772041001	20-1	TXO Production Corp.	L. Cochran	DH	Dry Hole	DH
48	040772037200	21X-11	Dekalb Energy Co.	Lower Jones	DH	Dry Hole	DH
	040772037201	21X-11	Dekalb Energy Co.	Lower Jones	DH	Dry Hole	DH
49	040770041900	4-11	Shell Western E&P Inc.	A.P.	DH	Dry Hole	DH
50	040772032900	B-1	Hilliard Oil & Gas, Inc.	Allied Properties	DH	Dry Hole	DH
51	040132034600	1A	Royale Energy, Inc.	Bloomfield	DG	Dry Gas	DG
52	040772025400	1	California Resources Production Corporation	Phillips Yamada Bros.	DG	Dry Gas	DG
53	040772028900	1	California Resources Production Corporation	Yamada L.W.	DG	Dry Gas	DG
54	040772026900	2	California Resources Production Corporation	Yamada Brothers	DG	Dry Gas	DG
55	040772032200	2	California Resources Production Corporation	Union Properties	DG	Dry Gas	DG

Table A-2. Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
56	WCR0059805	37.91571	-121.60533	756733A-K	Unknown	Production or Monitoring	01N	03E	23	8/27/2004	0	0	265
57	WCR0213698	37.872728	-121.636257	937701	Unknown	Production or Monitoring	01S	03E	3	12/6/2006	0	475	575
58	WCR1968-000424	37.802778	-121.465278	47178	Water Supply Domestic	Production or Monitoring	01S	05E	31	3/29/1968	85	80	85
59	WCR1980-000802	37.90369	-121.63214	148890	Unknown	Drill and Destroy	01N	03E	27	5/6/1980	0		
60	WCR1985-003624	37.903611	-121.595	181517	Water Supply Public	Production or Monitoring	01N	03E	25	10/11/1985	750		
61	WCR1991-007104	37.946944	-121.540556	374425	Water Supply Domestic	Production or Monitoring	01N	04E	9	1/31/1991	302	167	182
62	WCR1993-005494	37.888889	-121.577222	496700	Cathodic Protection	Production or Monitoring	01N	04E	31	6/30/1993	100	50	100
63	WCR1999-006675	37.763889	-121.477222	814171	Water Supply Domestic	Production or Monitoring	02S	04E	13	5/11/1999	250	230	250
64	WCR2004-004600	37.7875	-121.476389	725540	Water Supply Domestic	Production or Monitoring	02S	05E	6	7/13/2004	310	237	257
65	WCR2008-001912	37.863611	-121.600278	e0078476	Monitoring	Production or Monitoring	01S	03E	12	8/27/2008	600		
66	WCR2008-001914	37.856389	-121.598889	e0078477b	Monitoring	Production or Monitoring	01S	03E	12	8/27/2008	340	90	110
67	WCR2008-001916	37.848333	-121.609167	e0078478	Monitoring	Production or Monitoring	01S	03E	14	8/27/2008	510		
68	WCR2009-000010	37.869167	-121.614167	926986	Unknown	Destruction	01S	03E	2	2/25/2009	0		
69	WCR2011-006188	37.845833	-121.483889	e0141180	Unknown	Destruction	01S	04E	13	10/12/2011	0		
70	WCR2013-000043	37.894444	-121.618333	954530	Water Supply Public	Production or Monitoring	01N	03E	35	11/1/2013	360	282	336
71	WCR2013-005505	37.771667	-121.475833	e0169248	Water Supply Domestic	Production or Monitoring	02S	05E	7	1/19/2013	385	230	270
72	WCR2013-006460	37.896111	-121.623333	e0191118	Unknown	Destruction	01N	03E	34	10/4/2013	0		
73	WCR2014-000069	37.8425	-121.608611	955263	Unknown	Destruction	01S	03E	14	3/10/2014	0		
74	WCR2014-015672	37.8425	-121.525278	955263	Unknown	Destruction	02S	03E	1	3/10/2014	0		
75	WCR2015-011863	37.771	-121.495	E0264260	Monitoring	Production or Monitoring	02S	04E	11	2/24/2015	25	5	25
76	WCR2015-011865	37.779	-121.495	E0264257	Monitoring	Production or Monitoring	02S	04E	11	2/24/2015	25	5	25
77	WCR2016-005768	37.873611	-121.632778	e0226485	Water Supply Domestic	Production or Monitoring	01S	03E	3	9/30/2013	340		
78	WCR2016-009339	37.939209	-121.623166	E0333000	Unknown	Destruction	01N	03E	15	12/20/2016	0		
79	WCR2016-009340	37.93943	-121.623136	E0332999	Unknown	Destruction	01N	03E	15	12/20/2016	0		
80	WCR2016-009701	37.939168	-121.577959	E0331260	Unknown	Destruction	01N	04E	7	12/6/2016	15		
81	WCR2016-009704	37.939063	-121.577878	E0331256	Unknown	Destruction	01N	04E	7	12/6/2016	20		
82	WCR2016-010764	37.92	-121.482222	E0326566	Water Supply Domestic	Production or Monitoring	01N	04E	24	10/19/2016	80	58	68
83	WCR2018-008961	37.934684	-121.617146		Water Supply Domestic	Production or Monitoring	01N	03E	14	8/9/2018	206	186	206
84	WCR2018-012164	37.939179	-121.612218	E0369773	Water Supply Domestic	Production or Monitoring	01N	03E	14	5/16/2018	360	340	360
85	WCR2019-004339	37.939825	-121.623575		Cathodic Protection	Production or Monitoring	01N	03E	15	1/31/2019	300		
86	WCR2019-008673	37.939283	-121.615411		Water Supply Domestic	Production or Monitoring	01N	03E	14	6/21/2019	295	275	295
87	WCR2019-008920	37.939232	-121.614494		Water Supply Public	Production or Monitoring	01N	03E	14	6/27/2019	318	258	318
88	WCR2019-013456	37.867431	-121.632849		Water Supply Domestic	Production or Monitoring	01S	03E	3	9/20/2019	230	190	230
89	WCR2019-014408	37.816942	-121.561217		Water Supply Domestic	Destruction	01S	04E	29	10/10/2019	100		
90	WCR2020-000218	37.863005	-121.446613		Water Supply Domestic	Production or Monitoring	01S	05E	8	12/13/2019	300	260	300
91	WCR2020-002859	37.893538	-121.627992		Water Supply Domestic	Production or Monitoring	01N	03E	34	2/7/2020	245	225	245
92	WCR2020-010134	37.850039	-121.433269		Water Supply Domestic	Production or Monitoring	01S	05E	16	7/22/2020	80	60	80
93	WCR2020-012760	37.896449	-121.63639		Water Supply Domestic	Production or Monitoring	01N	03E	34	8/26/2020	215	175	215
94	WCR2020-017363	37.763246	-121.477199		Water Supply Domestic	Production or Monitoring	02S	04E	13	12/19/2020	260	200	260
95	WCR2021-012470	37.894653	-121.624819		Water Supply Domestic	Production or Monitoring	01N	03E	34	9/27/2021	160	90	150
96	WCR2021-014297	37.917522	-121.624266		Monitoring	Production or Monitoring	01N	03E	22	10/20/2021	35	20	35
97	WCR2022-000597	37.868323	-121.630278		Water Supply Domestic	Production or Monitoring	01S	03E	3	8/6/2021	600	180	600
98	WCR2022-003308	37.870541	-121.638286		Water Supply Domestic	Production or Monitoring	01S	03E	3	2/19/2022	200		
99	WCR2022-004487	37.859378	-121.630771		Water Supply Domestic	Production or Monitoring	01S	03E	10	4/12/2022	170	150	170
100	WCR2022-005525	37.91646	-121.595137		Monitoring	Production or Monitoring	01N	03E	24	9/13/2021	30	20	30
101	WCR2022-005532	37.88847	-121.57797		Monitoring	Production or Monitoring	01N	04E	31	11/5/2021	30	20	30

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
102	WCR2022-008497	37.892623	-121.487109		Water Supply Domestic	Production or Monitoring	01N	04E	36	1/24/2022	80	60	80
103	WCR2022-008644	37.892743	-121.487163		Water Supply Irrigation - Agriculture	Destruction	01N	04E	36	7/13/2022	76		
104	WCR2022-008645	37.892789	-121.487071		Water Supply Irrigation - Agriculture	Destruction	01N	04E	36	7/13/2022	71		
105	WCR2023-008109	37.904278	-121.613607		Water Supply Domestic	Production or Monitoring	01N	03E	26	6/22/2023	365	265	355
106	WCR2023-008409	37.907549	-121.613051		Dewatering	Destruction	01N	03E	26	7/3/2023	0		
107	WCR2023-008410	37.907589	-121.613079		Dewatering	Destruction	01N	03E	26	7/3/2023	0		
108	WCR2023-008411	37.907599	-121.613189		Dewatering	Destruction	01N	03E	26	7/3/2023	50		
109	WCR2023-008414	37.907599	-121.613189		Dewatering	Destruction	01N	03E	26	7/3/2023	50		
110	WCR2023-008418	37.907405	-121.613202		Dewatering	Destruction	01N	03E	26	7/3/2023	50		
111	WCR2023-010486	37.91062	-121.609355		Dewatering	Destruction	01N	03E	26	8/30/2023	40		
112	WCR2023-010489	37.910778	-121.609435		Dewatering	Destruction	01N	03E	26	8/30/2023	40		
113	WCR2024-004122	37.784511	-121.456224		Water Supply Domestic	Production or Monitoring	02S	05E	6	5/8/2024	240	200	240
114	WCR2024-007600	37.77889	-121.4992		Monitoring	Destruction	02S	04E	11	6/13/2022	0		
115	WCR2024-008875	37.902768	-121.583378		Monitoring	Production or Monitoring	01N	04E	30	9/12/2024	415	280	410
116	WCR2024-011288	37.932202	-121.613239		Cathodic Protection	Production or Monitoring	01N	03E	14	10/8/2024	200	104	200
117	WCR2025-003269	37.870279	-121.620448		Water Supply Domestic	Production or Monitoring	01S	03E	2	3/25/2025	240	115	235
NA	WCR1975-000009	37.889722	-121.486667	110576	Water Supply Domestic	Production or Monitoring	01N	04E	36	3/5/1975	98	87	97
NA	WCR1988-004747	37.87465	-121.63233	273847	Water Supply Domestic	Production or Monitoring	01S	03E	3	10/25/1988	65		
NA	WCR2004-005012	37.9182	-121.61316	756733a	Other	Production or Monitoring	01N	03E	23	8/27/2004	265		
NA	WCR0263297	37.88968	-121.48668		Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1995-005387	37.8601	-121.63239	556601	Unknown	Destruction	01S	03E	10	1/17/1995	0		
NA	WCR1994-003379	37.87465	-121.63233	494818	Water Supply Domestic	Production or Monitoring	01S	03E	3	6/29/1994	65	55	62
NA	WCR1990-002246	37.87465	-121.63233	291699	Water Supply Domestic	Production or Monitoring	01S	03E	3	6/26/1990	125	30	100
NA	WCR1988-001773	37.87465	-121.63233	200388	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/16/1988	307		
NA	WCR2000-000746	37.90359	-121.59496	525985	Unknown	Destruction	01N	03E	25	8/15/2000	0		
NA	WCR1999-003936	37.90365	-121.61332	715747	Unknown	Destruction	01N	03E	26	9/9/1999	0		
NA	WCR1999-002461	37.93249	-121.54071	716004	Unknown	Destruction	01N	04E	16	6/24/1999	0		
NA	WCR1974-000848	37.87549	-121.44486	98960	Water Supply Domestic	Production or Monitoring	01S	05E	5	3/6/1974	70	57	67
NA	WCR1987-008471	37.84561	-121.61393	65481	Water Supply Domestic	Production or Monitoring	01S	03E	14	8/20/1987	62		
NA	WCR2003-008760	37.90359	-121.59496	e013490	Monitoring	Production or Monitoring	01N	03E	25	8/28/2003	22	5	22
NA	WCR0307475	37.90369	-121.63214	83927	Water Supply Domestic	Production or Monitoring	01N	03E	27		110	100	110
NA	WCR1956-000052	37.86116	-121.4448	21463	Water Supply Domestic	Production or Monitoring	01S	05E	8	6/7/1956	32		
NA	WCR0316802	37.94729	-121.55719		Unknown	Production or Monitoring	01N	04E	8		0		
NA	WCR2000-002706	37.87465	-121.63233	725270	Monitoring	Production or Monitoring	01S	03E	3	5/10/2000	240	50	80
NA	WCR2004-005019	37.9182	-121.61316	756733h	Other	Production or Monitoring	01N	03E	23	8/27/2004	265		
NA	WCR1999-005520	37.93272	-121.61299	811681	Water Supply Domestic	Production or Monitoring	01N	03E	14	3/19/1999	340	300	320
NA	WCR0073360	37.88917	-121.63225	89358	Water Supply Domestic	Production or Monitoring	01N	03E	34		51	41	51
NA	WCR0010948	37.87465	-121.63233	81503	Water Supply Domestic	Production or Monitoring	01S	03E	3		65	45	65
NA	WCR0230159	37.88968	-121.48668	E0093949	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1991-010559	37.88914	-121.61347	422955	Water Supply Public	Production or Monitoring	01N	03E	35	3/12/1991	370	264	350
NA	WCR0064122	37.87467	-121.54096		Unknown	Production or Monitoring	01S	04E	4		0		
NA	WCR2007-001620	37.88917	-121.63225	945607	Unknown	Destruction	01N	03E	34	12/28/2007	0		
NA	WCR0167002	37.90369	-121.63214	98934	Water Supply Domestic	Production or Monitoring	01N	03E	27		97	87	97
NA	WCR2008-003968	37.90369	-121.63214	e0082176	Unknown	Destruction	01N	03E	27	9/9/2008	0		
NA	WCR1993-006116	37.88968	-121.48668	495172	Water Supply Domestic	Production or Monitoring	01N	04E	36	7/12/1993	107	55	75
NA	WCR1997-007104	37.88978	-121.57877	e068429	Monitoring	Production or Monitoring	01N	04E	31	11/19/1997	20	10	20

Table A-2 (cont.). **Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.**

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR2000-002656	37.87465	-121.63233	725237	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/31/2000	320	272	300
NA	WCR2008-003967	37.90369	-121.63214	e0082175	Unknown	Destruction	01N	03E	27	9/12/2008	0		
NA	WCR1981-000061	37.81725	-121.44463	77028	Water Supply Domestic	Production or Monitoring	01S	05E	29	7/3/1981	80		
NA	WCR0060950	37.87465	-121.63233	E0097821	Unknown	Production or Monitoring	01S	03E	3		0		
NA	WCR0299057	37.83127	-121.48622	E0145633	Unknown	Production or Monitoring	01S	04E	24		0		
NA	WCR2000-002771	37.87465	-121.63233	725354	Water Supply Domestic	Production or Monitoring	01S	03E	3	9/14/2000	200	123	143
NA	WCR0046304	37.81608	-121.54074	E068062	Unknown	Production or Monitoring	01S	04E	28		0		
NA	WCR1983-001681	37.8601	-121.63239	233856	Water Supply Domestic	Production or Monitoring	01S	03E	10	4/7/1983	98		
NA	WCR2007-002330	37.87465	-121.63233	725666	Unknown	Destruction	01S	03E	3	2/22/2007	0		
NA	WCR1988-006407	37.90369	-121.63214	262353	Water Supply Domestic	Production or Monitoring	01N	03E	27	4/4/1988	140		
NA	WCR1998-006119	37.87458	-121.61364	811671	Water Supply Domestic	Production or Monitoring	01S	03E	2	10/30/1998	200	105	145
NA	WCR1951-000491	37.91849	-121.48671	39-994	Water Supply Domestic	Production or Monitoring	01N	04E	24	2/22/1951	41	36	39
NA	WCR0014898	37.93272	-121.61299	E0106578	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR1981-003910	37.94712	-121.52328	97934	Water Supply Domestic	Production or Monitoring	01N	04E	10	2/26/1981	48		
NA	WCR2005-005528	37.81608	-121.54074	e068061	Monitoring	Production or Monitoring	01S	04E	28	4/28/2005	90	74	89
NA	WCR0008513	37.86001	-121.59533	E0078477A-C	Monitoring	Production or Monitoring	01S	03E	12	8/27/2008	340	0	90
NA	WCR0159643	37.87465	-121.63233	148864	Water Supply Domestic	Production or Monitoring	01S	03E	3	11/19/1979	180	160	180
NA	WCR1994-005963	37.88914	-121.61347	567860	Water Supply Irrigation - Agriculture	Production or Monitoring	01N	03E	35	9/22/1994	320	280	300
NA	WCR1997-005684	37.8601	-121.63239	532779	Water Supply Domestic	Production or Monitoring	01S	03E	10	10/1/1997	180	145	165
NA	WCR2003-001347	37.87465	-121.63233	725487	Unknown	Destruction	01S	03E	3	12/15/2003	0		
NA	WCR2000-002738	37.87465	-121.63233	725293	Unknown	Destruction	01S	03E	3	10/27/2000	0		
NA	WCR1993-001181	37.88905	-121.59508	410439	Water Supply Domestic	Production or Monitoring	01N	03E	36	4/15/1993	400	240	300
NA	WCR2009-000025	37.86083	-121.54049	927011	Monitoring	Production or Monitoring	01S	04E	9	1/12/2009	53	48	53
NA	WCR1982-000252	37.8601	-121.63239	226590	Water Supply Domestic	Production or Monitoring	01S	03E	10	2/12/1982	275		
NA	WCR2000-002692	37.87465	-121.63233	725246	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/1/2000	100	80	100
NA	WCR1983-001680	37.8601	-121.63239	233855	Unknown	Production or Monitoring	01S	03E	10	3/1/1983	135		
NA	WCR2001-001966	37.78785	-121.5041	716750	Water Supply Domestic	Production or Monitoring	02S	04E	2	6/12/2001	450	400	440
NA	WCR0203942	37.80269	-121.4653	718665A-B	Unknown	Destruction	01S	05E	31		0		
NA	WCR1974-000273	37.77322	-121.4858	122603	Water Supply Domestic	Production or Monitoring	02S	04E	12	4/11/1974	140	75	85
NA	WCR2005-004519	37.78943	-121.46519	725546	Unknown	Destruction	02S	05E	6	2/3/2005	0		
NA	WCR1984-001121	37.77322	-121.4858	153759	Water Supply Domestic	Production or Monitoring	02S	04E	12	12/18/1984	323		
NA	WCR2001-003181	37.78785	-121.5041	733064	Water Supply Domestic	Production or Monitoring	02S	04E	2	3/31/2001	250	225	245
NA	WCR1990-005852	37.77597	-121.46509	325343	Water Supply Domestic	Production or Monitoring	02S	05E	7	1/2/1990	170		
NA	WCR2011-004028	37.78943	-121.46519	e0136121	Water Supply Domestic	Production or Monitoring	02S	05E	6	8/11/2011	265	235	255
NA	WCR1984-003291	37.80198	-121.52246	219028	Water Supply Domestic	Production or Monitoring	01S	04E	34	5/16/1984	120		
NA	WCR1975-000055	37.78943	-121.46519	111903A	Water Supply Domestic	Production or Monitoring	02S	05E	6	10/21/1975	111	90	100
NA	WCR1993-007271	37.78943	-121.46519	569726	Water Supply Domestic	Production or Monitoring	02S	05E	6	10/14/1993	240	218	230
NA	WCR1984-003293	37.77597	-121.46509	219473	Unknown	Production or Monitoring	02S	05E	7	7/17/1984	220		
NA	WCR1997-001663	37.78943	-121.46519	476356	Water Supply Domestic	Production or Monitoring	02S	05E	6	5/21/1997	184	158	184
NA	WCR2001-001761	37.87465	-121.63233	725361	Unknown	Destruction	01S	03E	3	4/2/2001	0		
NA	WCR0174554	37.88968	-121.48668	E068063	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1999-002362	37.93249	-121.54071	715982	Unknown	Destruction	01N	04E	16	5/24/1999	0		
NA	WCR1973-000677	37.77597	-121.46509	89373	Water Supply Domestic	Production or Monitoring	02S	05E	7	10/9/1973	97	75	85
NA	WCR2000-006174	37.78807	-121.48587	782972	Unknown	Destruction	02S	04E	1	10/6/2000	0		
NA	WCR1986-002159	37.93272	-121.61299	180386	Unknown	Production or Monitoring	01N	03E	14	6/5/1986	320		
NA	WCR0292271	37.88917	-121.63225	89016	Water Supply Domestic	Production or Monitoring	01N	03E	34		110	100	110

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0084220	37.88917	-121.63225	81180	Unknown	Production or Monitoring	01N	03E	34		0		
NA	WCR1999-002462	37.93249	-121.54071	716005	Unknown	Destruction	01N	04E	16	5/24/1999	0		
NA	WCR1986-003528	37.77597	-121.46509	191162	Water Supply Domestic	Production or Monitoring	02S	05E	7	5/22/1986	185		
NA	WCR1999-002585	37.81725	-121.44463	715079	Water Supply Domestic	Production or Monitoring	01S	05E	29	9/16/1999	67	40	60
NA	WCR2000-000748	37.90359	-121.59496	525987	Unknown	Destruction	01N	03E	25	8/15/2000	0		
NA	WCR1979-000440	37.91813	-121.59481	60063	Water Supply Domestic	Production or Monitoring	01N	03E	24	7/25/1979	166		
NA	WCR0108611	37.78943	-121.46519	76874	Water Supply Domestic	Production or Monitoring	02S	05E	6		190	170	190
NA	WCR0285316	37.81677	-121.4861		Unknown	Production or Monitoring	01S	04E	25		0		
NA	WCR0056072	37.84561	-121.61393	96656	Water Supply Domestic	Production or Monitoring	01S	03E	14	11/21/1980	60	30	60
NA	WCR1981-003103	37.90359	-121.59496	71676	Water Supply Public	Production or Monitoring	01N	03E	25	2/26/1981	360		
NA	WCR2005-004588	37.9182	-121.61316	725626	Unknown	Destruction	01N	03E	23	12/28/2005	0		
NA	WCR0312376	37.93257	-121.59467	E0145299	Unknown	Production or Monitoring	01N	03E	13		0		
NA	WCR0218620	37.81701	-121.46538	83148	Water Supply Domestic	Production or Monitoring	01S	05E	30		96	76	96
NA	WCR1999-005290	37.87465	-121.63233	811689	Water Supply Domestic	Production or Monitoring	01S	03E	3	5/19/1999	300	116	136
NA	WCR1971-000364	37.90359	-121.59496	40075A	Water Supply Domestic	Production or Monitoring	01N	03E	25	5/25/1971	365		
NA	WCR1988-006669	37.94701	-121.54063	288411	Monitoring	Production or Monitoring	01N	04E	9	7/5/1988	71		
NA	WCR0274305	37.94712	-121.52328		Unknown	Production or Monitoring	01N	04E	10		0		
NA	WCR2002-006510	37.77597	-121.46509	800963	Water Supply Domestic	Production or Monitoring	02S	05E	7	8/30/2002	205	180	200
NA	WCR1975-000032	37.88979	-121.46568	111226	Water Supply Domestic	Production or Monitoring	01N	05E	31	2/20/1975	126	100	120
NA	WCR0158008	37.90369	-121.63214	E0082177	Unknown	Production or Monitoring	01N	03E	27		0		
NA	WCR2000-002530	37.90369	-121.63214	725231	Unknown	Destruction	01N	03E	27	2/24/2000	0		
NA	WCR0042197	37.78943	-121.46519	E0136121	Unknown	Production or Monitoring	02S	05E	6		0		
NA	WCR2006-004249	37.87465	-121.63233	e041927	Water Supply Domestic	Production or Monitoring	01S	03E	3	7/19/2006	305	285	305
NA	WCR2000-002691	37.87465	-121.63233	725245	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/15/2000	130	95	115
NA	WCR2003-001348	37.88917	-121.63225	725488	Dewatering	Production or Monitoring	01N	03E	34	12/19/2003	220	165	185
NA	WCR1986-007552	37.81725	-121.44463	61498	Water Supply Domestic	Production or Monitoring	01S	05E	29	6/2/1986	90		
NA	WCR0045685	37.80198	-121.52246		Unknown	Production or Monitoring	01S	04E	34		0		
NA	WCR0226592	37.88905	-121.59508	E0186183	Unknown	Production or Monitoring	01N	03E	36		0		
NA	WCR1988-002626	37.87465	-121.63233	244118	Water Supply Public	Production or Monitoring	01S	03E	3	12/24/1988	500		
NA	WCR2002-005721	37.88917	-121.63225	788582	Water Supply Domestic	Production or Monitoring	01N	03E	34	10/18/2002	300	190	270
NA	WCR1998-001776	37.88917	-121.63225	520808	Water Supply Domestic	Production or Monitoring	01N	03E	34	8/19/1998	340	245	265
NA	WCR0136018	37.88917	-121.63225	E061424	Unknown	Production or Monitoring	01N	03E	34		0		
NA	WCR2000-000478	37.93272	-121.61299	474452	Test Well	Production or Monitoring	01N	03E	14	1/25/2000	345	245	315
NA	WCR2000-002528	37.87465	-121.63233	725228	Water Supply Domestic	Production or Monitoring	01S	03E	3	2/4/2000	390	330	340
NA	WCR1998-001830	37.88917	-121.63225	520779	Water Supply Domestic	Production or Monitoring	01N	03E	34	4/23/1998	300	193	223
NA	WCR1999-002436	37.93249	-121.54071	715996	Unknown	Destruction	01N	04E	16	5/20/1999	0		
NA	WCR2000-007726	37.77322	-121.4858	819747	Water Supply Domestic	Production or Monitoring	02S	04E	12	5/9/2000	437	220	240
NA	WCR1998-000982	37.78807	-121.48587	511684	Water Supply Domestic	Production or Monitoring	02S	04E	1	5/25/1998	310	285	310
NA	WCR1955-000705	37.78943	-121.46519	34132	Water Supply Domestic	Production or Monitoring	02S	05E	6	6/7/1955	137	127	137
NA	WCR0061642	37.93272	-121.61299	E0106580	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR1999-002443	37.93249	-121.54071	716003	Unknown	Destruction	01N	04E	16	5/24/1999	0		
NA	WCR0089723	37.81428	-121.55283	71432	Water Supply Domestic	Production or Monitoring	01S	04E	29		95	75	95
NA	WCR0246977	37.87465	-121.63233	148809	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/13/1979	58	38	58
NA	WCR2000-007214	37.90365	-121.61332	812176	Unknown	Destruction	01N	03E	26	5/30/2000	0		
NA	WCR1988-006473	37.90365	-121.61332	262382	Water Supply Domestic	Production or Monitoring	01N	03E	26	7/14/1988	239		
NA	WCR1982-002977	37.78807	-121.48587	245950	Water Supply Domestic	Production or Monitoring	02S	04E	1	9/9/1982	100		

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0075749	37.93272	-121.61299	E0106579	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR1986-005993	37.93257	-121.59467	195407	Water Supply Domestic	Production or Monitoring	01N	03E	13	9/22/1986	320		
NA	WCR1980-004332	37.81701	-121.46538	83148	Unknown	Production or Monitoring	01S	05E	30	9/1/1980	128		
NA	WCR2005-007978	37.84561	-121.61393	e027683	Monitoring	Production or Monitoring	01S	03E	14	6/9/2005	26	6	26
NA	WCR0048869	37.88968	-121.48668	E068054	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR0040225	37.84547	-121.59537	21466	Unknown	Production or Monitoring	01S	03E	13		0		
NA	WCR2009-000026	37.86083	-121.54049	927012	Monitoring	Production or Monitoring	01S	04E	9	1/12/2009	53	48	53
NA	WCR0040222	37.87458	-121.61364	149813	Unknown	Production or Monitoring	01S	03E	2		0		
NA	WCR1988-006474	37.87465	-121.63233	262383	Water Supply Domestic	Production or Monitoring	01S	03E	3	7/26/1988	200		
NA	WCR0010949	37.87465	-121.63233	99786	Water Supply Domestic	Production or Monitoring	01S	03E	3		111	97	111
NA	WCR2004-004667	37.90369	-121.63214	725514	Water Supply Domestic	Production or Monitoring	01N	03E	27	6/1/2004	200	160	180
NA	WCR0124422	37.90365	-121.61332	E032020	Unknown	Production or Monitoring	01N	03E	26		0		
NA	WCR1981-003891	37.93272	-121.61299	96098	Water Supply Domestic	Production or Monitoring	01N	03E	14	4/24/1981	260		
NA	WCR1982-001054	37.87465	-121.63233	233802	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	3	2/24/1982	380		
NA	WCR0188052	37.88944	-121.52333		Unknown	Production or Monitoring	01N	04E	34		0		
NA	WCR1991-007102	37.90411	-121.46565	374423	Water Supply Irrigation - Agriculture	Production or Monitoring	01N	05E	30	1/10/1991	300		
NA	WCR0098088	37.93272	-121.61299	E0106587	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR1982-002985	37.81701	-121.46538	247357	Water Supply Domestic	Production or Monitoring	01S	05E	30	6/14/1982	77		
NA	WCR1971-000365	37.90359	-121.59496	40075B	Water Supply Domestic	Production or Monitoring	01N	03E	25	5/25/1971	355		
NA	WCR0230203	37.78943	-121.46519	E0098488	Unknown	Production or Monitoring	02S	05E	6		0		
NA	WCR1973-000682	37.77322	-121.4858	89394	Water Supply Domestic	Production or Monitoring	02S	04E	12	11/7/1973	170	158	168
NA	WCR1989-005360	37.90369	-121.63214	303990	Water Supply Domestic	Production or Monitoring	01N	03E	27	4/23/1989	280		
NA	WCR1994-005954	37.93181	-121.56349	567845	Water Supply Public	Production or Monitoring	01N	04E	17	7/1/1994	400	347	367
NA	WCR2000-002529	37.87465	-121.63233	725229	Water Supply Domestic	Production or Monitoring	01S	03E	3	1/4/2000	390		
NA	WCR2001-001736	37.90369	-121.63214	725355	Water Supply Domestic	Production or Monitoring	01N	03E	27	6/13/2001	360	120	140
NA	WCR2005-006393	37.90365	-121.61332	e032020	Water Supply Domestic	Production or Monitoring	01N	03E	26	10/28/2005	290	255	275
NA	WCR1987-005720	37.90369	-121.63214	253463	Water Supply Domestic	Production or Monitoring	01N	03E	27	12/8/1987	160		
NA	WCR1994-005243	37.78943	-121.46519	560751	Water Supply Domestic	Production or Monitoring	02S	05E	6	11/14/1994	235	201	221
NA	WCR2006-002692	37.87465	-121.63233	725636	Water Supply Domestic	Production or Monitoring	01S	03E	3	5/2/2006	140	100	120
NA	WCR1999-007608	37.90355	-121.57765	e068423	Monitoring	Production or Monitoring	01N	04E	30	5/12/1999	20	20	
NA	WCR2004-005042	37.9182	-121.61316	756733k	Other	Production or Monitoring	01N	03E	23	8/27/2004	265		
NA	WCR1999-002360	37.93249	-121.54071	715980	Unknown	Destruction	01N	04E	16	5/20/1999	0		
NA	WCR2003-001368	37.87465	-121.63233	725474	Water Supply Domestic	Production or Monitoring	01S	03E	3	7/9/2003	240	51	58
NA	WCR2001-001632	37.88956	-121.50521	726677	Monitoring	Production or Monitoring	01N	04E	35	8/28/2001	500		
NA	WCR1953-000335	37.904	-121.4867	39-995	Water Supply Domestic	Production or Monitoring	01N	04E	25		93		
NA	WCR2007-004543	37.80166	-121.55324	e061653	Monitoring	Production or Monitoring	01S	04E	32	8/2/2007	20	9	19
NA	WCR2009-000028	37.86083	-121.54049	927015	Monitoring	Production or Monitoring	01S	04E	9	1/13/2009	53	48	53
NA	WCR2003-001400	37.90359	-121.59496	719876C	Unknown	Destruction	01N	03E	25	2/14/2003	0		
NA	WCR1954-000761	37.9329	-121.55442	39-992	Water Supply Domestic	Production or Monitoring	01N	04E	17	3/2/1954	234		
NA	WCR0167027	37.8601	-121.63239	83978	Water Supply Domestic	Production or Monitoring	01S	03E	10		77	67	77
NA	WCR1997-005215	37.87465	-121.63233	533096	Water Supply Domestic	Production or Monitoring	01S	03E	3	11/7/1997	205	100	170
NA	WCR2009-005476	37.87465	-121.63233	e0097820	Water Supply Public	Production or Monitoring	01S	03E	3	7/30/2009	700	180	560
NA	WCR2009-001570	37.88968	-121.48668	e0093953	Unknown	Destruction	01N	04E	36	6/22/2009	0		
NA	WCR0225444	37.88968	-121.48668	E068052	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR0307468	37.93272	-121.61299	47158	Water Supply Domestic	Production or Monitoring	01N	03E	14	3/9/1957	0	95	100
NA	WCR1973-000670	37.77322	-121.4858	89306	Water Supply Domestic	Production or Monitoring	02S	04E	12	8/23/1973	130	73	83

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0108610	37.78943	-121.46519		Unknown	Production or Monitoring	02S	05E	6		0		
NA	WCR2003-003518	37.80269	-121.4653	788623	Water Supply Domestic	Production or Monitoring	01S	05E	31	5/29/2003	220	165	185
NA	WCR1994-005075	37.88914	-121.61347	556002	Unknown	Destruction	01N	03E	35	10/17/1994	0		
NA	WCR2000-007216	37.90365	-121.61332	812178	Unknown	Destruction	01N	03E	26	6/5/2000	0		
NA	WCR1978-001522	37.84654	-121.44475	128682	Water Supply Domestic	Production or Monitoring	01S	05E	17	5/19/1978	98	48	98
NA	WCR2006-003382	37.88968	-121.48668	e068052	Vapor Extraction	Production or Monitoring	01N	04E	36		21	10	20
NA	WCR1989-011927	37.90369	-121.63214	326952	Water Supply Domestic	Production or Monitoring	01N	03E	27	12/11/1989	220		
NA	WCR1984-003033	37.8601	-121.63239	225035	Unknown	Production or Monitoring	01S	03E	10	8/1/1984	420		
NA	WCR1987-008532	37.77322	-121.4858	65046	Water Supply Domestic	Production or Monitoring	02S	04E	12	2/27/1987	190		
NA	WCR1993-002747	37.8601	-121.63239	416845	Water Supply Domestic	Production or Monitoring	01S	03E	10	12/9/1993	160	135	155
NA	WCR1986-004196	37.87465	-121.63233	187131	Water Supply Domestic	Production or Monitoring	01S	03E	3	8/8/1986	232		
NA	WCR0325934	37.90369	-121.63214	E0082176	Unknown	Production or Monitoring	01N	03E	27		0		
NA	WCR2002-001497	37.90369	-121.63214	749483	Unknown	Destruction	01N	03E	27	9/16/2002	0		
NA	WCR0106022	37.80269	-121.4653		Unknown	Production or Monitoring	01S	05E	31		0		
NA	WCR0267942	37.81608	-121.54074	E068061	Unknown	Production or Monitoring	01S	04E	28		0		
NA	WCR2016-008639	37.83096	-121.59554	E0351235	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	24	9/29/2016	200	160	180
NA	WCR2009-000949	37.86083	-121.54049	944667	Unknown	Destruction	01S	04E	9	9/23/2009	0		
NA	WCR0279729	37.88917	-121.63225	E0191118	Unknown	Production or Monitoring	01N	03E	34		0		
NA	WCR1994-005078	37.88914	-121.61347	556005	Unknown	Destruction	01N	03E	35	10/21/1994	0		
NA	WCR0193704	37.86001	-121.59533	55297	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	12	9/23/1960	312	156	168
NA	WCR0163076	37.88968	-121.48668	97932	Water Supply Domestic	Production or Monitoring	01N	04E	36	2/3/1981	90	80	90
NA	WCR2000-002086	37.90369	-121.63214	725220	Water Supply Domestic	Production or Monitoring	01N	03E	27	2/1/2000	360	310	330
NA	WCR2004-004593	37.90365	-121.61332	725533	Unknown	Destruction	01N	03E	26	8/6/2004	0		
NA	WCR0043512	37.84561	-121.61393	E072696	Unknown	Production or Monitoring	01S	03E	14		0		
NA	WCR0047169	37.84566	-121.52294		Unknown	Production or Monitoring	01S	04E	15		0		
NA	WCR1984-003018	37.87465	-121.63233	225015	Water Supply Domestic	Production or Monitoring	01S	03E	3	5/24/1984	300		
NA	WCR1997-007106	37.87463	-121.58162	e068440	Monitoring	Production or Monitoring	01S	04E	6	8/8/1997	20	7	18
NA	WCR0153591	37.84561	-121.61393	94126	Test Well	Production or Monitoring	01S	03E	14	6/5/1964	0		
NA	WCR0137315	37.87458	-121.61364	76851	Water Supply Domestic	Production or Monitoring	01S	03E	2		130	110	130
NA	WCR2000-002705	37.87465	-121.63233	725269	Monitoring	Production or Monitoring	01S	03E	3	5/3/2000	340	234	254
NA	WCR2006-002719	37.87465	-121.63233	725706	Water Supply Domestic	Production or Monitoring	01S	03E	3	6/28/2006	360	285	305
NA	WCR2007-004347	37.88917	-121.63225	e061424	Unknown	Destruction	01N	03E	34	9/13/2007	0		
NA	WCR1985-001279	37.77322	-121.4858	153783	Water Supply Domestic	Production or Monitoring	02S	04E	12	2/27/1985	185		
NA	WCR0172562	37.80166	-121.55324		Unknown	Production or Monitoring	01S	04E	32		0		
NA	WCR0008134	37.84609	-121.48636	E0141180	Unknown	Production or Monitoring	01S	04E	13		0		
NA	WCR1996-004086	37.78943	-121.46519	500631	Water Supply Domestic	Production or Monitoring	02S	05E	6	5/21/1996	235	210	230
NA	WCR2010-001102	37.84561	-121.61393	725794	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	14	7/15/2010	75	55	75
NA	WCR1956-000061	37.9329	-121.55442	21465	Water Supply Domestic	Production or Monitoring	01N	04E	17	11/30/1956	186		
NA	WCR0004144	37.81654	-121.50441		Unknown	Production or Monitoring	01S	04E	26		0		
NA	WCR1990-005476	37.87465	-121.63233	323248	Water Supply Domestic	Production or Monitoring	01S	03E	3	1/9/1990	360	310	350
NA	WCR1997-007111	37.88978	-121.57877	e068445	Monitoring	Production or Monitoring	01N	04E	31	8/8/1997	20	10	20
NA	WCR1986-007079	37.90359	-121.59496	247476	Unknown	Destruction	01N	03E	25	7/1/1986	0		
NA	WCR0316821	37.84654	-121.44475		Unknown	Production or Monitoring	01S	05E	17		0		
NA	WCR0132398	37.87465	-121.63233	E032045	Unknown	Production or Monitoring	01S	03E	3		0		
NA	WCR2004-004599	37.90365	-121.61332	725539	Unknown	Destruction	01N	03E	26	8/6/2004	0		
NA	WCR2009-005597	37.78943	-121.46519	e0098488	Unknown	Destruction	02S	05E	6	9/2/2009	0		

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0070688	37.81175	-121.56185		Unknown	Production or Monitoring	01S	04E	29		0		
NA	WCR0187754	37.78785	-121.5041		Unknown	Production or Monitoring	02S	04E	2		0		
NA	WCR1979-000017	37.77597	-121.46509	53745	Water Supply Domestic	Production or Monitoring	02S	05E	7	9/11/1979	125	75	95
NA	WCR2008-004853	37.84561	-121.61393	e072697	Unknown	Destruction	01S	03E	14	1/15/2008	0		
NA	WCR1988-001772	37.87465	-121.63233	200384	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/3/1988	65		
NA	WCR0008514	37.84561	-121.61393	E0078478	Unknown	Production or Monitoring	01S	03E	14		0		
NA	WCR0188078	37.84632	-121.46553		Unknown	Production or Monitoring	01S	05E	18		0		
NA	WCR2007-007549	37.87465	-121.63233	e059846	Water Supply Domestic	Production or Monitoring	01S	03E	3	8/27/2007	310	275	295
NA	WCR2007-000784	37.88917	-121.63225	937725	Water Supply Domestic	Production or Monitoring	01N	03E	34	6/4/2007	165	130	145
NA	WCR1982-001070	37.88914	-121.61347	233813	Water Supply Domestic	Production or Monitoring	01N	03E	35	4/22/1982	120		
NA	WCR0159575	37.93272	-121.61299	E066090	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR1976-000792	37.77322	-121.4858	157663	Water Supply Domestic	Production or Monitoring	02S	04E	12	6/25/1976	113	86	102
NA	WCR1980-000515	37.78807	-121.48587	96292	Water Supply Domestic	Production or Monitoring	02S	04E	1	10/14/1980	312		
NA	WCR0050439	37.87465	-121.63233	E023644	Unknown	Production or Monitoring	01S	03E	3		0		
NA	WCR0124683	37.90359	-121.59496	719876A-C	Unknown	Destruction	01N	03E	25	2/14/2003	0		
NA	WCR1985-003414	37.90369	-121.63214	180348	Water Supply Domestic	Production or Monitoring	01N	03E	27	9/12/1985	300		
NA	WCR0045633	37.93249	-121.54071	214652	Water Supply Domestic	Production or Monitoring	01N	04E	16	4/18/1956	100	90	97
NA	WCR0173869	37.81725	-121.44463	61498	Water Supply Domestic	Production or Monitoring	01S	05E	29		90	55	85
NA	WCR1987-008433	37.87465	-121.63233	65467	Monitoring	Production or Monitoring	01S	03E	3	7/1/1987	20		
NA	WCR0103238	37.81608	-121.54074	E068059	Unknown	Production or Monitoring	01S	04E	28		0		
NA	WCR1990-004605	37.88917	-121.63225	327408	Water Supply Domestic	Production or Monitoring	01N	03E	34	3/23/1990	240	192	212
NA	WCR1989-011982	37.90369	-121.63214	323225	Water Supply Domestic	Production or Monitoring	01N	03E	27	9/29/1989	360		
NA	WCR2005-006640	37.77597	-121.46509	e028437	Water Supply Domestic	Production or Monitoring	02S	05E	7		175	150	170
NA	WCR2006-003384	37.81608	-121.54074	e068056	Vapor Extraction	Production or Monitoring	01S	04E	28	2/21/2006	21	10	20
NA	WCR2002-009078	37.90369	-121.63214	e051518	Water Supply Domestic	Production or Monitoring	01N	03E	27	3/15/2002	283	165	215
NA	WCR0159647	37.8601	-121.63239	87187	Water Supply Domestic	Production or Monitoring	01S	03E	10		55	35	55
NA	WCR2004-004658	37.88917	-121.63225	725503	Unknown	Destruction	01N	03E	34	3/11/2004	0		
NA	WCR2009-001569	37.88968	-121.48668	e0093949	Unknown	Destruction	01N	04E	36	6/22/2009	0		
NA	WCR1990-006831	37.77597	-121.46509	340917	Water Supply Domestic	Production or Monitoring	02S	05E	7	3/30/1990	280		
NA	WCR1996-000463	37.87465	-121.63233	419602	Unknown	Production or Monitoring	01S	03E	3	10/22/1996	580	330	540
NA	WCR1982-001459	37.93247	-121.57708	233846	Water Supply Domestic	Production or Monitoring	01N	04E	18	11/4/1982	380		
NA	WCR1998-006121	37.87465	-121.63233	811674	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	3	12/18/1998	340	283	330
NA	WCR1984-001136	37.77597	-121.46509	154228	Water Supply Domestic	Production or Monitoring	02S	05E	7	10/1/1984	190		
NA	WCR0307498	37.8601	-121.63239	60027	Water Supply Domestic	Production or Monitoring	01S	03E	10	11/2/1978	0	40	80
NA	WCR0286975	37.80174	-121.54069	1097125	Water Supply Domestic	Destruction	01S	04E	33	11/18/2005	0		
NA	WCR2009-000921	37.86083	-121.54049	944665	Unknown	Destruction	01S	04E	9	9/23/2009	0		
NA	WCR2007-004346	37.88917	-121.63225	e061418	Water Supply Domestic	Production or Monitoring	01N	03E	34	9/13/2007	220	191	211
NA	WCR0314077	37.88968	-121.48668	E0093956	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR0056052	37.90369	-121.63214	146824	Water Supply Domestic	Production or Monitoring	01N	03E	27		94	84	94
NA	WCR1992-003515	37.87458	-121.61364	410400	Water Supply Domestic	Production or Monitoring	01S	03E	2	7/9/1992	340		
NA	WCR0082192	37.87465	-121.63233	65472	Water Supply Domestic	Production or Monitoring	01S	03E	3	7/16/1987	95	75	95
NA	WCR2003-001661	37.90369	-121.63214	749495	Water Supply Domestic	Production or Monitoring	01N	03E	27	3/5/2003	320	278	298
NA	WCR1956-000051	37.93249	-121.54071	21462	Water Supply Domestic	Production or Monitoring	01N	04E	16	4/18/1956	100	90	97
NA	WCR2008-000549	37.84547	-121.59537	930600	Unknown	Destruction	01S	03E	13	10/30/2008	0		
NA	WCR1990-004604	37.88917	-121.63225	327407	Water Supply Domestic	Production or Monitoring	01N	03E	34	3/21/1990	220	180	210
NA	WCR1991-002128	37.88917	-121.63225	327461	Water Supply Domestic	Production or Monitoring	01N	03E	34	2/21/1991	220	190	210

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR2001-009395	37.93273	-121.50535	782093	Water Supply Domestic	Production or Monitoring	01N	04E	14	9/4/2001	0		
NA	WCR0079361	37.77597	-121.46509	76528	Unknown	Production or Monitoring	02S	05E	7		0		
NA	WCR0146326	37.90369	-121.63214	E0082175	Unknown	Production or Monitoring	01N	03E	27		0		
NA	WCR0047145	37.9039	-121.50526		Unknown	Production or Monitoring	01N	04E	26		0		
NA	WCR2004-003725	37.86083	-121.54049	944666	Unknown	Destruction	01S	04E	9	9/23/2004	0		
NA	WCR1980-003377	37.87465	-121.63233	81503	Unknown	Production or Monitoring	01S	03E	3	7/1/1980	240		
NA	WCR2008-003097	37.90359	-121.59496	e0087165	Monitoring	Production or Monitoring	01N	03E	25	11/5/2008	440	200	240
NA	WCR1986-001378	37.93272	-121.61299	180363	Water Supply Domestic	Production or Monitoring	01N	03E	14	2/4/1986	220		
NA	WCR1995-006235	37.8601	-121.63239	567878	Water Supply Domestic	Production or Monitoring	01S	03E	10	1/18/1995	120	66	86
NA	WCR1987-005905	37.88917	-121.63225	252801	Water Supply Domestic	Production or Monitoring	01N	03E	34	8/31/1987	215		
NA	WCR2008-003098	37.90359	-121.59496	e0087170	Monitoring	Production or Monitoring	01N	03E	25	11/5/2008	440	280	340
NA	WCR0184123	37.77597	-121.46509	E028437	Unknown	Production or Monitoring	02S	05E	7		0		
NA	WCR1979-001433	37.84632	-121.46553	137336	Water Supply Domestic	Production or Monitoring	01S	05E	18	3/13/1979	90		
NA	WCR1993-005493	37.88968	-121.48668	496696	Cathodic Protection	Production or Monitoring	01N	04E	36	6/29/1993	100		
NA	WCR2001-001674	37.90369	-121.63214	725308	Unknown	Destruction	01N	03E	27	1/25/2001	0		
NA	WCR1998-006330	37.77597	-121.46509	814143	Water Supply Domestic	Production or Monitoring	02S	05E	7	12/2/1998	250	225	245
NA	WCR2008-000925	37.8622	-121.55952	942083	Water Supply Public	Production or Monitoring	01S	04E	8	3/25/2008	160	50	80
NA	WCR0118174	37.81725	-121.44463		Unknown	Production or Monitoring	01S	05E	29		0		
NA	WCR1994-005077	37.88914	-121.61347	556004	Unknown	Destruction	01N	03E	35	10/17/1994	0		
NA	WCR2003-001399	37.90359	-121.59496	719876B	Unknown	Destruction	01N	03E	25	2/14/2003	0		
NA	WCR2009-007051	37.93272	-121.61299	e0106582	Monitoring	Production or Monitoring	01N	03E	14	12/1/2009	22	7	22
NA	WCR2009-007052	37.93272	-121.61299	e0106583	Monitoring	Production or Monitoring	01N	03E	14	9/1/2009	32	7	32
NA	WCR1995-006629	37.78785	-121.5041	580228	Water Supply Domestic	Production or Monitoring	02S	04E	2	10/6/1995	250	90	110
NA	WCR0188051	37.88622	-121.57134	125371	Water Supply Domestic	Production or Monitoring	01N	04E	31		108	98	108
NA	WCR1999-002442	37.93249	-121.54071	716002	Unknown	Destruction	01N	04E	16	5/24/1999	0		
NA	WCR0142293	37.80166	-121.55324	E061654	Unknown	Production or Monitoring	01S	04E	32		0		
NA	WCR0237623	37.88917	-121.63225	E0191114	Unknown	Production or Monitoring	01N	03E	34		0		
NA	WCR0271617	37.88956	-121.50521		Unknown	Production or Monitoring	01N	04E	35		0		
NA	WCR0047146	37.90369	-121.54086		Unknown	Production or Monitoring	01N	04E	28		0		
NA	WCR1989-004340	37.78943	-121.46519	287278	Water Supply Domestic	Production or Monitoring	02S	05E	6	3/22/1989	210		
NA	WCR1985-001635	37.81725	-121.44463	150861	Water Supply Domestic	Production or Monitoring	01S	05E	29	8/28/1985	172		
NA	WCR0218262	37.91849	-121.48671		Unknown	Production or Monitoring	01N	04E	24		0		
NA	WCR0027109	37.87465	-121.63233	E0146019	Unknown	Production or Monitoring	01S	03E	3		0		
NA	WCR1975-000097	37.78807	-121.48587	111932	Water Supply Domestic	Production or Monitoring	02S	04E	1	12/29/1975	81	70	80
NA	WCR0185274	37.81608	-121.54074	E068060	Unknown	Production or Monitoring	01S	04E	28		0		
NA	WCR1993-002746	37.8601	-121.63239	416844	Unknown	Destruction	01S	03E	10	12/9/1993	0		
NA	WCR0192144	37.87549	-121.44486		Unknown	Production or Monitoring	01S	05E	5		0		
NA	WCR2000-000477	37.93272	-121.61299	474451	Monitoring	Production or Monitoring	01N	03E	14	1/12/2000	510	245	315
NA	WCR2006-003386	37.88968	-121.48668	e068063	Monitoring	Production or Monitoring	01N	04E	36	4/28/2006	21	10	20
NA	WCR2007-001769	37.80269	-121.4653	966591	Water Supply Domestic	Production or Monitoring	01S	05E	31	8/10/2007	290	260	280
NA	WCR2004-008588	37.87465	-121.63233	e018942	Water Supply Domestic	Production or Monitoring	01S	03E	3	12/3/2004	317	250	310
NA	WCR0240195	37.87465	-121.63233	81520	Water Supply Domestic	Production or Monitoring	01S	03E	3		85	65	85
NA	WCR1966-000267	37.94729	-121.55719	44975	Water Supply Domestic	Production or Monitoring	01N	04E	8	7/21/1966	174	169	174
NA	WCR1997-006859	37.87465	-121.63233	576799	Water Supply Domestic	Production or Monitoring	01S	03E	3	3/19/1997	130	68	80
NA	WCR2008-004852	37.84561	-121.61393	e072696	Unknown	Destruction	01S	03E	14	4/15/2008	0		
NA	WCR1987-005249	37.77597	-121.46509	252851	Water Supply Domestic	Production or Monitoring	02S	05E	7	11/2/1987	200		

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR2000-002688	37.87465	-121.63233	725242	Unknown	Destruction	01S	03E	3	5/5/2000	0		
NA	WCR0007675	37.93272	-121.61299	E0106583	Unknown	Production or Monitoring	01N	03E	14		0		
NA	WCR0103521	37.90359	-121.59496	E013488	Unknown	Production or Monitoring	01N	03E	25		0		
NA	WCR0296962	37.77322	-121.4858	87190	Unknown	Production or Monitoring	02S	04E	12		0		
NA	WCR0316437	37.78943	-121.46519	111903	Unknown	Production or Monitoring	02S	05E	6		0		
NA	WCR1952-000292	37.84609	-121.48636	39-1172	Water Supply Domestic	Production or Monitoring	01S	04E	13	4/30/1952	89	66	74
NA	WCR2004-000558	37.87465	-121.63233	915644	Water Supply Domestic	Production or Monitoring	01S	03E	3		400	245	285
NA	WCR2009-000499	37.80269	-121.4653	944758	Water Supply Domestic	Production or Monitoring	01S	05E	31	5/11/2009	100	80	100
NA	WCR1979-000973	37.77322	-121.4858	86175	Water Supply Domestic	Production or Monitoring	02S	04E	12	6/20/1979	142	115	130
NA	WCR1988-001771	37.87465	-121.63233	200382	Water Supply Domestic	Production or Monitoring	01S	03E	3	2/29/1988	145		
NA	WCR1997-004479	37.87465	-121.63233	520425	Unknown	Destruction	01S	03E	3	5/2/1997	0		
NA	WCR1995-005023	37.84561	-121.61393	556626	Water Supply Domestic	Production or Monitoring	01S	03E	14	6/9/1995	140	55	85
NA	WCR2000-002733	37.87465	-121.63233	725287	Water Supply Domestic	Production or Monitoring	01S	03E	3	9/22/2000	260	80	100
NA	WCR2009-007035	37.93272	-121.61299	e0106578	Monitoring	Production or Monitoring	01N	03E	14	8/31/2009	22	7	22
NA	WCR2009-005551	37.78943	-121.46519	e0098479	Water Supply Domestic	Production or Monitoring	02S	05E	6	9/3/2009	250	130	200
NA	WCR0274259	37.904	-121.4867		Unknown	Production or Monitoring	01N	04E	25		0		
NA	WCR1979-001328	37.80166	-121.55324	98322	Water Supply Domestic	Production or Monitoring	01S	04E	32	7/6/1979	160	140	160
NA	WCR1985-004905	37.77322	-121.4858	189627	Water Supply Domestic	Production or Monitoring	02S	04E	12	11/8/1985	240		
NA	WCR1999-002361	37.93249	-121.54071	715981	Unknown	Destruction	01N	04E	16	5/20/1999	0		
NA	WCR2009-007034	37.93272	-121.61299	e0106569	Monitoring	Production or Monitoring	01N	03E	14	8/31/2009	22	7	22
NA	WCR2008-000050	37.84547	-121.59537	927018	Monitoring	Production or Monitoring	01S	03E	13	10/31/2008	30	20	30
NA	WCR2009-000950	37.86083	-121.54049	944668	Unknown	Destruction	01S	04E	9	9/22/2009	0		
NA	WCR1997-007107	37.85929	-121.57857	e068441	Monitoring	Production or Monitoring	01S	04E	7	9/1/1997	20	8	19
NA	WCR2009-001571	37.88968	-121.48668	e0093954	Unknown	Destruction	01N	04E	36	6/21/2009	0		
NA	WCR0134423	37.88903	-121.55869		Unknown	Production or Monitoring	01N	04E	32		0		
NA	WCR2005-005525	37.88968	-121.48668	e068053a	Vapor Extraction	Production or Monitoring	01N	04E	36	4/28/2005	83	61	81
NA	WCR0288111	37.88968	-121.48668	E0093957	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR0213236	37.88968	-121.48668	E0093953	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1997-007105	37.88978	-121.57877	e068430	Monitoring	Production or Monitoring	01N	04E	31	8/6/1997	22	8	20
NA	WCR0049866	37.88968	-121.48668	E0093955	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1952-000309	37.91827	-121.5233	39-993	Water Supply Domestic	Production or Monitoring	01N	04E	22	3/25/1952	95	74	78
NA	WCR2009-000027	37.86083	-121.54049	927013	Monitoring	Production or Monitoring	01S	04E	9	1/11/2009	53	48	53
NA	WCR1997-007101	37.90355	-121.57765	e068426	Monitoring	Production or Monitoring	01N	04E	30	11/16/1997	20	10	20
NA	WCR1993-005492	37.88622	-121.57134	496695	Cathodic Protection	Production or Monitoring	01N	04E	31	6/27/1993	100	50	100
NA	WCR2009-000920	37.86083	-121.54049	944664	Unknown	Destruction	01S	04E	9	9/22/2009	0		
NA	WCR2009-001572	37.88968	-121.48668	e0093955	Unknown	Destruction	01N	04E	36	6/21/2009	0		
NA	WCR0316801	37.90393	-121.56984		Unknown	Production or Monitoring	01N	04E	30		0		
NA	WCR1954-000752	37.87451	-121.55893	39-1171	Water Supply Domestic	Production or Monitoring	01S	04E	5	5/3/1954	170		
NA	WCR1993-000001	37.88978	-121.57877	464744	Water Supply Domestic	Modification or Repair/Production or Monitoring	01N	04E	31	9/9/1993	100	80	100
NA	WCR2009-001574	37.88968	-121.48668	e0093957	Unknown	Destruction	01N	04E	36	6/21/2009	0		
NA	WCR2009-000023	37.86083	-121.54049	927008	Monitoring	Production or Monitoring	01S	04E	9	1/8/2009	46	41	46
NA	WCR1997-007102	37.90945	-121.5661	e068427	Monitoring	Production or Monitoring	01N	04E	29	9/17/1997	20	10	20
NA	WCR1997-007108	37.87463	-121.58162	e068442	Monitoring	Production or Monitoring	01S	04E	6	9/1/1997	22	10	20
NA	WCR1996-003147	37.88978	-121.57877	476286	Water Supply Domestic	Production or Monitoring	01N	04E	31	11/3/1996	120	100	120
NA	WCR2009-000024	37.86083	-121.54049	927010	Monitoring	Production or Monitoring	01S	04E	9	1/8/2009	53	48	53
NA	WCR1999-007606	37.90945	-121.5661	e068421	Monitoring	Production or Monitoring	01N	04E	29	5/11/1999	20	10	

Table A-2 (cont.). Water Well Reference List based on DWR WCR Data Displayed in Figure A-8. Wells with no Map Index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR1997-007109	37.85929	-121.57857	e068443	Monitoring	Production or Monitoring	01S	04E	7	9/2/1997	20	8	20
NA	WCR0118173	37.87451	-121.55893		Unknown	Production or Monitoring	01S	04E	5		0		
NA	WCR1978-001486	37.874722	-121.540833	121039	Water Supply Domestic	Production or Monitoring	01S	04E	4	2/13/1978	85	65	85
NA	WCR0158677	37.88968	-121.48668	E0093954	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1997-007103	37.88978	-121.57877	e068428	Monitoring	Production or Monitoring	01N	04E	31	11/17/1997	20	10	20
NA	WCR2009-001573	37.88968	-121.48668	e0093956	Unknown	Destruction	01N	04E	36	6/21/2009	0		
NA	WCR0086914	37.88968	-121.48668	E068053A	Unknown	Production or Monitoring	01N	04E	36		0		
NA	WCR1981-003908	37.88968	-121.48668	97932	Unknown	Production or Monitoring	01N	04E	36	2/2/1981	90		
NA	WCR1997-007110	37.87463	-121.58162	e068444	Monitoring	Production or Monitoring	01S	04E	6	8/18/1997	20	8	18
NA	WCR0108952	37.90348	-121.55819		Unknown	Production or Monitoring	01N	04E	29		0		
NA	WCR1999-007607	37.90355	-121.57765	e068422	Monitoring	Production or Monitoring	01N	04E	30	5/11/1999	20	10	20
NA	WCR2005-005526	37.88968	-121.48668	e068054	Vapor Extraction	Production or Monitoring	01N	04E	36	5/26/2005	35	14	34
NA	WCR0079885	37.88622	-121.57134		Unknown	Production or Monitoring	01N	04E	31		0		

Notes:
Blank cells in the table signify no data available
NA = not applicable
bgs = below ground surface

Table A-3. Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
118	WB_ILRP	Domestic	GeoTracker	AGW080018171-WELL18061	37.796558	-121.460629
119	WB_ILRP	Domestic	GeoTracker	AGW080018172-WELL18083	37.796746	-121.461887
120	WB_ILRP	Domestic	GeoTracker	AGW080018323-18881WELL	37.789918	-121.474247
121	WB_ILRP	Domestic	GeoTracker	AGW080018324-13199WELL	37.792029	-121.470476
122	WB_ILRP	Domestic	GeoTracker	AGW080018875-19644	37.781927	-121.473294
123	WB_ILRP	Domestic	GeoTracker	AGW080018876-13428	37.779868	-121.473394
124	WB_ILRP	Domestic	GeoTracker	AGW080018877-21566	37.7647	-121.473172
125	WB_ILRP	Domestic	GeoTracker	AGW080018938-GALLIWELL	37.799528	-121.477364
126	WB_ILRP	Domestic	GeoTracker	AGW080019448-MAIN	37.772969	-121.46323
127	WB_ILRP	Domestic	GeoTracker	AGW080020200-PALM_TRACT	37.93973	-121.61948
128	WB_ILRP	Domestic	GeoTracker	AGW080020278-FESTICH	37.796746	-121.461887
129	WB_ILRP	Domestic	GeoTracker	AGW080020279-HARDIE	37.780447	-121.497438
130	WB_ILRP	Domestic	GeoTracker	AGW080020280-PLATTI	37.800121	-121.456692
131	WB_ILRP	Domestic	GeoTracker	AGW080020281-MARTIN	37.788767	-121.454639
132	WB_ILRP	Domestic	GeoTracker	AGW080020286-NORTHCUTT	37.778376	-121.461032
133	WB_ILRP	Domestic	GeoTracker	AGW080020590-SHOP	37.890913	-121.470825
134	WB_ILRP	Domestic	GeoTracker	AGW080020591-RIVERHOUSE	37.890913	-121.470825
135	WB_ILRP	Domestic	GeoTracker	AGW080020861-MARCOS	37.809445	-121.528294
136	WB_ILRP	Domestic	GeoTracker	AGW080020862-SHOP	37.809445	-121.528294
137	WB_ILRP	Domestic	GeoTracker	AGW080020878-CLIFTON	37.860941	-121.510683
138	WB_ILRP	Domestic	GeoTracker	AGW080020879-CAL PACK	37.860941	-121.510683
139	WB_ILRP	Domestic	GeoTracker	AGW080020979-SHOP	37.954287	-121.510394
140	WB_ILRP	Domestic	GeoTracker	AGW080020980-SILOS	37.954287	-121.510394
141	WB_ILRP	Domestic	GeoTracker	AGW080021151-HDQTERWELL	37.900955	-121.486899
142	WB_ILRP	Domestic	GeoTracker	AGW080021186-CRWELLWEST	37.876359	-121.494488
143	WB_ILRP	Domestic	GeoTracker	AGW080021187-CRWELLEAST	37.876359	-121.494488
144	WB_ILRP	Domestic	GeoTracker	AGW080021345-BUNKHOUSE	37.814508	-121.486243
145	WB_ILRP	Domestic	GeoTracker	AGW080021351-MAIN STONE	37.804261	-121.486498
146	WB_ILRP	Domestic	GeoTracker	AGW080021355-J COSTA	37.783326	-121.479166
147	WB_ILRP	Domestic	GeoTracker	AGW080021356-SHOP WELL	37.810138	-121.474619
148	WB_ILRP	Domestic	GeoTracker	AGW080021357-DOM WELL	37.810138	-121.474619
149	WB_ILRP	Domestic	GeoTracker	AGW080022118-BALTAZAR	37.890913	-121.470825
150	WB_ILRP	Domestic	GeoTracker	AGW080023810-R&M_N_D1	37.845848	-121.482203
151	WB_ILRP	Domestic	GeoTracker	AGW080023811-SOARES_D1	37.783102	-121.484742
152	WB_ILRP	Domestic	GeoTracker	AGW080023812-ADOBE_D1	37.938519	-121.595819
153	WB_ILRP	Domestic	GeoTracker	AGW080023813-LUND_D1	37.839549	-121.538007
154	WB_ILRP	Domestic	GeoTracker	AGW080024605-WMD_D1	37.846447	-121.535785

Table A-3 (cont.). Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
155	DDW	Municipal	DDW	CA0707545_001_001	37.934872	-121.609948
156	DDW	Municipal	DDW	CA0710009_001_001	37.908333	-121.6
157	DDW	Municipal	DDW	CA0710009_002_002	37.903779	-121.601863
158	DDW	Municipal	DDW	CA0710009_003_003	37.897833	-121.600917
159	DDW	Municipal	DDW	CA0710009_004_004	37.891667	-121.583333
160	DDW	Municipal	DDW	CA0710009_005_005	37.891667	-121.604167
161	DDW	Municipal	DDW	CA0710009_007_007	37.90095	-121.618619
162	DDW	Municipal	DDW	CA0710009_008_008	37.910276	-121.599494
163	DDW	Municipal	DDW	CA0710009_016_016	37.902313	-121.599776
164	DDW	Municipal	DDW	CA0710009_017_017	37.894299	-121.618395
165	DDW	Municipal	DDW	CA0900112_001_001	37.868889	-121.639639
166	DDW	Municipal	DDW	CA3900713_001_001	37.84	-121.44
167	DDW	Municipal	DDW	CA0707545_002_002	37.938171	-121.611577
168	DDW	Municipal	DDW	CA0710009_006_006	37.890398	-121.615564
169	DDW	Municipal	DDW	CA0105002_001_001	37.809915	-121.559597
170	DDW	Municipal	DDW	CA0706018_001_001	37.93834	-121.568438
171	DDW	Municipal	DDW	CA0707550_001_001	37.938167	-121.611556
172	DDW	Municipal	DDW	CA0707564_001_001	37.868888	-121.639638
173	DDW	Municipal	DDW	CA0707915_001_001	37.925907	-121.624071
174	DDW	Municipal	DDW	CA0708006_001_001	37.892723	-121.573742
175	DDW	Municipal	DDW	CA0708006_002_002	37.915266	-121.574373
176	DDW	Municipal	DDW	CA3601013_001_001	37.818722	-121.460778
177	DDW	Municipal	DDW	CA3900583_001_001	37.84	-121.44
178	DDW	Municipal	DDW	CA3900593_001_001	37.891215	-121.488002
179	DDW	Municipal	DDW	CA3900998_001_001	37.818722	-121.460777
180	DDW	Municipal	DDW	CA3901106_002_002	37.805	-121.456666
181	DDW	Municipal	DDW	CA3901106_008_008	37.804969	-121.458072
182	DDW	Municipal	DDW	CA3901355_001_001	37.89	-121.48
183	DDW	Municipal	DDW	CA3901406_001_001	37.766333	-121.474027
184	DDW	Municipal	DDW	CA3901430_001_001	37.891449	-121.512766
185	DDW	Municipal	DDW	CA3901449_001_001	37.891449	-121.512766
186	DDW	Municipal	DDW	CA3901472_001_001	37.858063	-121.567269
187	DDW	Municipal	DDW	CA3901484_001_001	37.943625	-121.530755
188	DPR	Domestic	DPR	77831	37.947084	-121.539569
189	DPR	Domestic	DPR	77832	37.947199	-121.522214
190	DPR	Domestic	DPR	77955	37.846388	-121.464467
191	DPR	Domestic	DPR	77956	37.846388	-121.464467

**Table A-3 (cont.).	Water Well Reference List based on Data from GAMA Displayed in Figure A-8.**

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
192	DPR	Domestic	DPR	81521	37.776037	-121.464031
193	DPR	Domestic	DPR	91928	37.889242	-121.631188
194	DPR	Domestic	DPR	91929	37.889242	-121.631188
195	DPR	Domestic	DPR	91930	37.889242	-121.631188
196	DPR	Domestic	DPR	91931	37.889242	-121.631188
197	DPR	Domestic	DPR	91935	37.874726	-121.631266
198	DPR	Domestic	DPR	91936	37.874726	-121.631266
199	DPR	Domestic	DPR	91938	37.874726	-121.631266
200	DPR	Domestic	DPR	91939	37.874726	-121.631266
201	DPR	Domestic	DPR	91948	37.860176	-121.631331
202	DPR	Domestic	DPR	91949	37.860176	-121.631331
203	DPR	Domestic	DPR	91950	37.860176	-121.631331
204	DPR	Domestic	DPR	91951	37.860176	-121.631331
205	DWR	Other	WDL	01N03E13C001M	37.9374	-121.5983
206	DWR	Other	WDL	01N03E25C001M	37.9085	-121.5983
207	DWR	Other	WDL	01N03E26C002M	37.9085	-121.6166
208	DWR	Other	WDL	01N03E27Q003M	37.8977	-121.6303
209	DWR	Other	WDL	01N03E27R001M	37.8977	-121.6257
210	DWR	Other	WDL	01N03E34A001M	37.894	-121.6257
211	DWR	Other	WDL	01N03E35N001M	37.8832	-121.6212
212	DWR	Other	WDL	01N04E03N001M	37.9555	-121.5297
213	DWR	Other	WDL	01N04E15F001M	37.9338	-121.5251
214	DWR	Other	WDL	01N04E17K001M	37.9302	-121.5571
215	DWR	Other	WDL	01N04E23M001M	37.9157	-121.5114
216	DWR	Other	WDL	01N04E25K001M	37.9013	-121.4839
217	DWR	Other	WDL	01N04E34H001M	37.8904	-121.5159
218	DWR	Other	WDL	01N04E35R001M	37.8832	-121.4976
219	DWR	Other	WDL	01N04E36A001M	37.894	-121.4793
220	DWR	Other	WDL	01N04E36K003M	37.8868	-121.4839
221	DWR	Other	WDL	01N04E36N001M	37.8832	-121.4931
222	DWR	Other	WDL	01N05E30L001M	37.9013	-121.4702
223	DWR	Other	WDL	01N05E30Q001M	37.8977	-121.4656
224	DWR	Other	WDL	01N05E30Q003M	37.8977	-121.4656
225	DWR	Other	WDL	01N05E30R002M	37.8977	-121.461
226	DWR	Other	WDL	01N05E31D001M	37.894	-121.4748
227	DWR	Other	WDL	01N05E31E001M	37.8904	-121.4748
228	DWR	Other	WDL	01N05E31P001M	37.8832	-121.4702

Table A-3 (cont.). Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
229	DWR	Other	WDL	01S03E02N001M	37.8688	-121.6212
230	DWR	Other	WDL	01S03E02P001M	37.8688	-121.6166
231	DWR	Other	WDL	01S03E03H001M	37.876	-121.6257
232	DWR	Other	WDL	01S03E03N002M	37.8688	-121.6395
233	DWR	Other	WDL	01S03E03N003M	37.8688	-121.6395
234	DWR	Other	WDL	01S03E03P001M	37.8688	-121.6349
235	DWR	Other	WDL	01S03E03Q001M	37.8688	-121.6303
236	DWR	Other	WDL	01S03E03Q002M	37.8688	-121.6303
237	DWR	Other	WDL	01S03E10C001M	37.8651	-121.6349
238	DWR	Other	WDL	01S03E10C002M	37.8651	-121.6349
239	DWR	Other	WDL	01S03E10G001M	37.8615	-121.6303
240	DWR	Other	WDL	01S03E10K001M	37.8579	-121.6303
241	DWR	Other	WDL	01S03E14D001M	37.8507	-121.6212
242	DWR	Other	WDL	01S04E02C001M	37.8796	-121.5068
243	DWR	Other	WDL	01S04E03K001M	37.8724	-121.5205
244	DWR	Other	WDL	01S04E03P002M	37.8688	-121.5251
245	DWR	Other	WDL	01S04E04R001M	37.8688	-121.5342
246	DWR	Other	WDL	01S04E09A001M	37.8651	-121.5342
247	DWR	Other	WDL	01S04E09B001M	37.8651	-121.5388
248	DWR	Other	WDL	01S04E09C001M	37.8651	-121.5434
249	DWR	Other	WDL	01S04E09N001M	37.8543	-121.548
250	DWR	Other	WDL	01S04E09N002M	37.8543	-121.548
251	DWR	Other	WDL	01S04E13K003M	37.8435	-121.4839
252	DWR	Other	WDL	01S04E16J001M	37.8435	-121.5342
253	DWR	Other	WDL	01S04E17A001M	37.8507	-121.5525
254	DWR	Other	WDL	01S04E17A002M	37.8507	-121.5525
255	DWR	Other	WDL	01S04E17C001M	37.8507	-121.5617
256	DWR	Other	WDL	01S04E20K001M	37.829	-121.5571
257	DWR	Other	WDL	01S04E21F001M	37.8326	-121.5434
258	DWR	Other	WDL	01S04E21Q001M	37.8254	-121.5388
259	DWR	Other	WDL	01S04E22L001M	37.829	-121.5251
260	DWR	Other	WDL	01S04E25D001M	37.8218	-121.4931
261	DWR	Other	WDL	01S04E32C001M	37.8073	-121.5617
262	DWR	Other	WDL	01S04E32H001M	37.8038	-121.5516
263	DWR	Other	WDL	01S04E33M001M	37.8001	-121.548
264	DWR	Other	WDL	01S05E06D001M	37.8796	-121.4748
265	DWR	Other	WDL	01S05E31R002M	37.7974	-121.4561

Table A-3 (cont.). Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
266	DWR	Other	WDL	02S04E01N001M	37.7821	-121.4931
267	DWR	Other	WDL	02S04E01P001M	37.7821	-121.4885
268	DWR	Other	WDL	02S04E01P002M	37.7821	-121.4885
269	DWR	Other	WDL	02S04E03E002M	37.7902	-121.5277
270	DWR	Other	WDL	02S04E12J001M	37.7712	-121.4793
271	DWR	Other	WDL	02S04E12J080M	37.7712	-121.4793
272	DWR	Other	WDL	02S04E12L001M	37.7712	-121.4885
273	DWR	Other	WDL	02S05E06F001M	37.7893	-121.4702
274	DWR	Other	WDL	02S05E06H001M	37.7893	-121.461
275	DWR	Other	WDL	02S05E06N002M	37.7821	-121.4748
276	DWR	Other	WDL	02S05E06N003M	37.7821	-121.4748
277	DWR	Other	WDL	02S05E06R001M	37.7821	-121.461
278	DWR	Other	WDL	02S05E07A001M	37.7784	-121.461
279	DWR	Other	WDL	02S05E07C001M	37.7784	-121.4702
280	DWR	Other	WDL	02S05E07M001M	37.7719	-121.4766
281	DWR	Other	WDL	Byron Ranch MW-1	37.860111	-121.603222
282	DWR	Other	WDL	Byron Ranch MW-2	37.860111	-121.603222
283	DWR	Other	WDL	Byron Ranch MW-3	37.860111	-121.603222
284	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-EFF 001-EB	37.888776	-121.585135
285	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-EFF 001-FB	37.888776	-121.585135
286	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-INF 001-EB	37.889503	-121.584943
287	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-INF 001-FB	37.889503	-121.584943
288	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-RGW-001-FB	37.890486	-121.59126
289	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-RGW-002-FB	37.89014	-121.601251
290	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-RGW-003-FB	37.890545	-121.588823
291	WB_CLEANUP	Monitoring	GeoTracker	NPD100051501-RGW-004-FB	37.890456	-121.591191
292	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-EW-1	37.93957	-121.62309
293	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-EW-2	37.939574	-121.622866
294	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-EW-3	37.939666	-121.622947
295	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-1	37.939516	-121.623319
296	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-2	37.93943	-121.623136
297	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-3	37.939209	-121.623166
298	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-4	37.93943	-121.622867
299	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-5	37.939716	-121.622369
300	WB_CLEANUP	Monitoring	GeoTracker	T0601300775-MW-6	37.939977	-121.623253
301	WB_CLEANUP	Monitoring	GeoTracker	T0601330032-MW1	37.867216	-121.637895
302	WB_CLEANUP	Monitoring	GeoTracker	T0601330032-MW2	37.867313	-121.638009

Table A-3 (cont.). Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
303	WB_CLEANUP	Monitoring	GeoTracker	T0601330032-MW3	37.867352	-121.637862
304	WB_CLEANUP	Monitoring	GeoTracker	T0601330032-MW4	37.867275	-121.637791
305	WB_CLEANUP	Monitoring	GeoTracker	T0601376629-MW1	37.901546	-121.602796
306	WB_CLEANUP	Monitoring	GeoTracker	T0601376629-MW2	37.901357	-121.602637
307	WB_CLEANUP	Monitoring	GeoTracker	T0601376629-MW3	37.901711	-121.602549
308	WB_CLEANUP	Monitoring	GeoTracker	T0601376629-MW4	37.901608	-121.602387
309	WB_CLEANUP	Monitoring	GeoTracker	T0604100033-MW-2	37.92951	-121.516156
310	WB_CLEANUP	Domestic	GeoTracker	T0607700643-DW1	37.821632	-121.449186
311	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW1	37.82194	-121.448846
312	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW2	37.822129	-121.44903
313	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW3	37.822165	-121.448711
314	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW4	37.821921	-121.449087
315	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW5	37.822155	-121.44924
316	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW6	37.822314	-121.448703
317	WB_CLEANUP	Monitoring	GeoTracker	T0607700643-MW7	37.821691	-121.449155
318	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-1	37.939064	-121.578456
319	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-2	37.939063	-121.577878
320	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-3	37.939166	-121.578188
321	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-4	37.939168	-121.577959
322	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-5	37.939403	-121.578284
323	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-6	37.939404	-121.577865
324	WB_CLEANUP	Monitoring	GeoTracker	T10000003258-MW-7	37.939064	-121.578109
325	GAMA_SP-STUDY	Municipal	LLNL	102669	37.849972	-121.445778
326	GAMA_USGS	Municipal	USGS	S17-SJV13	37.8854	-121.6219
327	GAMA_USGS	Municipal	USGS	TRCY-07	37.849972	-121.445778
328	USGS_NWIS	Other	NWIS	USGS-375000121260001	37.849972	-121.445778
329	USGS_NWIS	Other	NWIS	USGS-374614121283501	37.770484	-121.477447
330	USGS_NWIS	Other	NWIS	USGS-374618121292001	37.771595	-121.489947
331	USGS_NWIS	Other	NWIS	USGS-374619121283001	37.771873	-121.476058
332	USGS_NWIS	Other	NWIS	USGS-374652121291801	37.781039	-121.489392
333	USGS_NWIS	Other	NWIS	USGS-374654121283001	37.781595	-121.476058
334	USGS_NWIS	Other	NWIS	USGS-374656121283101	37.782151	-121.476336
335	USGS_NWIS	Other	NWIS	USGS-374716121271001	37.787706	-121.453835
336	USGS_NWIS	Other	NWIS	USGS-374724121275201	37.789928	-121.465502
337	USGS_NWIS	Other	NWIS	USGS-374725121313601	37.790206	-121.527726
338	USGS_NWIS	Other	NWIS	USGS-374751121271401	37.797428	-121.454947
339	USGS_NWIS	Other	NWIS	USGS-374806121325201	37.801594	-121.548838

Table A-3 (cont.). Water Well Reference List based on Data from GAMA Displayed in Figure A-8.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
340	USGS_NWIS	Other	NWIS	USGS-374807121325801	37.801872	-121.550504
341	USGS_NWIS	Other	NWIS	USGS-374827121333801	37.807427	-121.561616
342	USGS_NWIS	Other	NWIS	USGS-374916121292401	37.821038	-121.491059
343	USGS_NWIS	Other	NWIS	USGS-375045121285301	37.84576	-121.482448
344	USGS_NWIS	Other	NWIS	USGS-375106121372201	37.851593	-121.62384
345	USGS_NWIS	Other	NWIS	USGS-375347121372201	37.896314	-121.62384
346	USGS_NWIS	Other	NWIS	USGS-375437121355601	37.910202	-121.599951
347	USGS_NWIS	Other	NWIS	USGS-375619121353001	37.938535	-121.592729
348	USGS_NWIS	Other	NWIS	USGS-375732121314501	37.958812	-121.530229

WB_ILRP = Integrated Lands Regulatory Program
DDW = Division of Drinking Water (State Water Resources)
NWIS = National Water Information Ssytem
DRP = Department of Pesticide Regulation
USGS = United States Geological Survey
WB_CLEANUP = Water Board Clean up
WDL = Water Data Library
DWR = Department of Water Resources

Table A-4. Results of Pressures Extracted from Modeling at the Pseudo Well Locations Shown in Figure A-23.

Well Location	Depth Range (feet TVD)	Initial Pressure Average	Max Pressure Average	100 Years Post Injection Pressure Average	Delta Pressure Average (psi)
Normal Fault in Plume	5,904 to 7,791	2,871 psi / 0.419 psi/ft	3,177 psi / 0.464 psi/ft	2,883 psi / 0.421 psi/ft	306
Midland Fault	6,285 to 7,955	2,928 psi / 0.411 psi/ft	3,182 psi / 0.447 psi/ft	2,939 psi / 0.413 psi/ft	254
West Tracy Fault	5,622 to 7,122	2,633 psi / 0.413 psi/ft	2,868 psi / 0.450 psi/ft	2,646 psi / 0.415 psi/ft	235
Stockton Arch Fault	5,280 to 6,831	2,490 psi / 0.411 psi/ft	2,704 psi / 0.447 psi/ft	2,502 psi / 0.413 psi/ft	214

Maximum pressure is 28 years after initial injection starts. Pressure averages are shown in both absolute and gradient formats for the injection zone.

Table A-5. Formation Mineralogy from XRD and FTIR in Four Wells.

Well	Zone	Depth (ft)	Quartz	Plagioclase	K-Feldspar	Albite	Andesine	Labradorite	Calcite	Dolomite	Amphibole	Glauconite	Apatite	Pyrite	Kaolinite	Chlorite	Illite & Mica	Smectite	MXL I/S	Total Clay
Wilcox_20	Capay	4622.0	42.2	18.7	10.7				0.0	0.0				0.6	9.4	3.4	4.5		10.5	27.8
Wilcox_20	Capay	4905.0	34.9	20.7	10.2				0.7	0.0				1.1	15.2	5.8	5.8		5.5	32.3
RVGU_209	Capay	4442.5	26.0	25.0	17.0				1.0	0.0					5.0	3.0			23.0	31.0
RVGU_209	Capay	4480.5	26.0	23.0	20.0				0.0	0.0					0.0	6.0			25.0	31.0
RVGU_209	Capay	4476.5	30.0	23.0	18.0				0.0	0.0					5.0	9.0			15.0	29.0
RVGU_209	Capay	4454.5	30.0	29.0	15.0				0.0	0.0					2.0	6.0			18.0	26.0
RVGU_209	Capay	4498.5	34.0	26.0	19.0				0.0	0.0					1.0	2.0			18.0	21.0
RVGU_209	Capay	4500.5	28.0	19.0	19.0				0.0	0.0					0.0	12.0			22.0	34.0
RVGU_248	Capay	4425.5	35.0	25.0	15.0										5.0	5.0	5.0	10.0		25.0
Citizen_Green_1	Mokelumne	5247.0	27.8		16.2	34.0	0.0	0.0			0.0		0.8	0.0	3.6	17.0	0.0	1.1		21.7
Citizen_Green_1	Mokelumne	5249.0	17.0		32.7	6.5	0.0	0.0			0.0			0.0	34.9	0.0	8.4	0.5		43.8
Citizen_Green_1	Mokelumne	6400.0	40.3		17.1	0.0	3.6	29.2			0.2			0.0	5.2	4.0	0.4	0.0		9.6
Citizen_Green_1	Mokelumne	6466.0	36.3		12.6	0.2	0.0	36.6			0.6			0.7	2.7	5.4	5.0	0.0		13.0
Citizen_Green_1	Mokelumne	6532.0	34.2		24.1	0.0	31.0	0.0			1.1			0.5	2.9	2.0	4.2			9.1
Citizen_Green_1	Mokelumne	6598.0	33.9		22.0	0.0	34.5	0.0			0.2			0.2	3.6	5.4	0.1	0.0		9.2
Speckman_Decarli_1	Mokelumne	6987.0	35.0	18.0	17.0				0.0	0.0		3.0		0.0	10.0	4.0			13.0	27.0
Speckman_Decarli_1	Mokelumne	6989.0	26.0	21.0	15.0				0.0	0.0		0.0		0.0	12.0	8.0			18.0	38.0
Speckman_Decarli_1	Mokelumne	6991.0	39.0	25.0	19.0				0.0	0.0		1.0		0.0	3.0	2.0			11.0	16.0
Speckman_Decarli_1	Mokelumne	7000.0	28.0	26.0	17.0				0.0	0.0		2.0		0.0	10.0	4.0			13.0	27.0
Speckman_Decarli_1	Mokelumne	7002.0	20.0	17.0	14.0				0.0	0.0		0.0		0.0	19.0	8.0			22.0	49.0
Speckman_Decarli_1	Mokelumne	7006.0	28.0	30.0	15.0				0.0	0.0		2.0		0.0	8.0	6.0			11.0	25.0
Speckman_Decarli_1	H&T Shale	8828.0	23.0	21.0	9.0				3.0	0.0		0.0		1.0	12.0	5.0			26.0	43.0
Speckman_Decarli_1	H&T Shale	8830.0	30.0	17.0	11.0				0.0	0.0		0.0		4.0	3.4	14.4	6.1	14.1		38.0
Speckman_Decarli_1	H&T Shale	8909.0	20.0	20.0	13.0				0.0	0.0		2.0		2.0	5.0	3.0			35.0	43.0
Speckman_Decarli_1	H&T Shale	8937.0	20.0	12.0	8.0				0.0	0.0		0.0		2.0	14.0	6.0			38.0	58.0
Speckman_Decarli_1	H&T Shale	8939.0	24.0	18.0	11.0				1.0	0.0		0.0		3.0	3.0	15.5	7.7	16.8		43.0
Speckman_Decarli_1	H&T Shale	8940.0	23.0	29.0	12.0				0.0	0.0		0.0		0.0	4.0	5.0			27.0	36.0
Speckman_Decarli_1	H&T Shale	8942.0	23.0	15.0	10.0				0.0	0.0		0.0		2.0	12.0	5.0			33.0	50.0
Speckman_Decarli_1	H&T Shale	9439.0	20.0	14.0	9.0				0.0	0.0		0.0		1.0	0.0	5.0			51.0	56.0
Speckman_Decarli_1	H&T Shale	9441.0	21.0	19.0	12.0				2.0	0.0		0.0		3.0	0.0	0.0			43.0	43.0

Table A-6. Core Samples Within the Mokelumne Formation

UWI	Well	Field	Depth (feet)	Porosity (percent)	Permeability Horizontal (mD)	Permeability Vertical (mD)	Grain Density (g/cc)	Description
0407720688	Citizen_Green_1	King Island	6400	33	367.1		2.68	
0407720688	Citizen_Green_1	King Island	6466	31.3	71.9		2.68	
0407720688	Citizen_Green_1	King Island	6532	30.3	54.8		2.7	
0407720688	Citizen_Green_1	King Island	6598	31.3	135.5		2.67	
0407720688	Citizen_Green_1	King Island	6664	30.8	46.4		2.66	
0407720688	Citizen_Green_1	King Island	6800	27.7	4.8		2.65	
0401320269	Enea_Capital_3	Brentwood	4567	26.8	220			
0401320269	Enea_Capital_3	Brentwood	4602	25.1	190			
0401320269	Enea_Capital_3	Brentwood	4620	30	240			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4713		112			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4754	8.6	9.2			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4765	31.4	141.5			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4771	31.6	42.1			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4794	32	225.4			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4810	30.9	159.1			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4817		118.2			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4821		31.5			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4830		119			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4840		194.6			
040772073900	PG&E_TEST_INJECTION_WITHDRAWAL_WELL_1	King Island	4846		1029.3			
0407720649	Speckman_Decarli_1	Roberts Island	6916	28.5	1159		2.63	Sst gry vf-fgr sslty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6917	30.2	1608		2.62	Sst gry vf-fgr sslty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6918	26.3	375		2.62	Sst gry vf-fgr vslty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6987	28.7	22.7		2.64	Sst gry vf-fgr vslty cly no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6989	29.2	21.2		2.63	Sst gry vf-fgr vslty cly incl carb incl no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6991	32.2	18.2		2.63	Sst gry vf-fgr slty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6992	29.5	297		2.62	Sst gry vf-fgr slty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6993	28.4	132		2.65	Sst gry vf-fgr vslty cly carb lam no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	6994	29.9	200		2.65	Sst gry vf-fgr slty scly carb incl no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7000	31.6	33.3		2.65	Sst gry vfgr vslty scly carb incl no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7001	27.1	16.8		2.63	Sst gry vfgr vslty scly carb incl no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7002	28.5	16.2		2.62	Sst gry vfgr vslty vcly carb no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7003	29.7	137		2.64	Sst gry vf-fgr slty scly no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7004	31	108		2.65	Sst gry vfgr slty no stn no flu
0407720649	Speckman_Decarli_1	Roberts Island	7006	31.1	54.3		2.64	Sst gry vfgr slty carb lam no stn no flu
0407720536	Whiskey_Slough_1A-E	McDonald Island	5442	29.3	16.8	14	2.69	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5446.1	30.3	43.5	24.3	2.69	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5447.6	33.5	799.3	552.4	2.66	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5449.8	34.2	1126.8	1056.8	2.64	

**Table A-6 (cont.).	Core Samples Within the Mokelumne Formation**

UWI	Well	Field	Depth (feet)	Porosity (percent)	Permeability Horizontal (mD)	Permeability Vertical (mD)	Grain Density (g/cc)	Description
0407720536	Whiskey_Slough_1A-E	McDonald Island	5452.7	33.7	1172	990	2.64	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5455.6	34	1765.1	1221.1	2.64	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5457.5	30.3	667.6	380.6	2.66	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5460.2	33.7	1089.2	991.5	2.63	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5463.1	35	1802.4	1925.9	2.64	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5466.1	35.4	1156.5	1125.1	2.63	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5469.1	34.9	1922.9	1212.8	2.64	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5472.1	35.5	1565.9	891.1	2.65	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5474.9	34	1084.7	731.1	2.67	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5476.5	34.5	1397.4	1108.8	2.63	
0407720536	Whiskey_Slough_1A-E	McDonald Island	5543.8	30.6	86.1	23.5	2.69	

Notes:
mD = millidarcy
g/cc = grams per cubic centimeter

Table A-7. Capay Shale and Mokelumne River Formation Gross Thickness and Depth within the Area of Review (AoR).

Zone	Property	Low	High	Mean
Upper Confining Zone: Capay Shale	Thickness (feet)	94	364	210
	Depth (feet TVD)	3,696	6,179	5,459
Reservoir: Mokelumne River Formation	Thickness (feet)	368	2,995	1,716
	Depth (feet TVD)	4,195	7,406	5,839

Table A-8. Wells with Data for Fracture Gradient Determination.

UWI	Well	Field	Zone	Date	Test Type	Depth	Fracture Gradient
04077207390000	PGE Test Inj/withdrawal well 1	King Island	Mokelumne	10/28/2014	SRT	4,748	0.822
04077202890000	Yamada_Line_Well_1	Union Island	Mokelumne	10/23/1976	FIT	6,042	0.76
04077202780000	Galli_1	Union Island	Mokelumne	5/26/1976	FIT	6,207	0.75
04077203600000	Sonol_Securities_8	Union Island	H&T Shale	9/14/1980	LOT	5,504	0.809
04077202870000	Galli_2	Union Island	H&T Shale	9/1/1976	FIT	6,178	0.76
04077202850000	Pool_B_2	Union Island	H&T Shale	7/29/1976	FIT	6,186	0.76

FIT = formation integrity test; SRT = step rate test; LOT = leak off tests

Table A-9. Wells used for Overburden Calculation.

Well Name	UWI
L_COCHRAN_20_1	04077204100000
OHLENDORF_UNIT_1_1	04077203480000
GULF_PATTERSON_1_32	04077204480000
OHLENDORF_UNIT_2_1	04077203590000
RIVERVIEW_INV_CO_1	04077204950000
ARNAUDO_18-1	04013203100000
MANTELLI_1	04077201450000

Table A-10. Input Parameters used in Mohr Circle Calculation.

Parameter	Present-Day Conditions
Reference Depth (feet TVD)	6,900
Pore Pressure (psi)	2,860
Overburden Stress Gradient (psi/ft)	0.91
Minimum Horizontal Stress Gradient (psi/ft)	0.76
Maximum Horizontal Stress Gradient (psi/ft)	1.01
Coefficient of Friction	0.6
Fault Cohesion (psi)	0

Table A-11. Modeled Fault Orientations and Expected Pressure Increases.

Fault	Strike	Dip (RHR)	Delta Pressure to Slip (psi)	Delta Pressure Average (psi)	Delta Pressure Maximum (psi)
Normal fault in plume	235	55	1,865	306	420
Midland Fault	187	47	2,060	254	348
West Tracy Fault	125	53	3,299	235	279
Stockton Arch Fault	20	50	1,944	214	261

Based on simulation modeling compared to the required pressure increase necessary to cause slip on the faults based on Mohr Coulomb analysis. The delta pressure to slip is the calculated pressure increase above present-day conditions from Mohr coulomb analysis that would cause each fault to slip. The delta pressure average and maximum are the actual pressure increases expected to be seen at each fault based on reservoir simulation.

Table A-12. Data from USGS Earthquake Catalog for Faults in the Region of CTV III.

#	Date	Latitude	Longitude	Depth (km)	Magnitude	Last Updated	Location
1	3/1/2024	37.891167	-121.619833	2.2	2.9	3/1/2024	3 km SW of Discovery Bay, California
2	6/22/2018	37.991167	-121.7205	10.4	3.2	7/9/2021	1 km SW of Oakley, CA
3	10/15/2010	37.880333	-121.388	14.6	3.1	1/23/2017	9 km WSW of Taft Mosswood, California
4	9/29/2002	37.8745	-121.611	4.3	3.4	2/12/2020	2 km ENE of Byron, California
5	2/10/1992	37.766	-121.322	14.6	3.1	2/9/2016	8 km SSW of Lathrop, California
6	2/4/1991	37.809667	-121.2375	7.7	3.1	12/18/2016	2 km NW of Manteca, California
7	2/3/1991	37.818333	-121.243667	9.4	3.1	12/18/2016	2 km E of Lathrop, California
8	1/27/1980	38.00	-121.00	6.0	3.3	4/2/2016	8 km ESE of Linden, California
9	8/6/1979	37.832667	-121.5105	6.0	4.3	4/1/2016	6 km NNE of Mountain House, California
10	2/2/1979	37.65833	-121.185	18.0	3.5	4/1/2016	10 km WSW of Salida, California
11	10/6/1976	37.61483	-121.409	2.9	3.3	12/15/2016	13 km S of Tracy, California
12	9/5/1976	37.6145	-121.413	6.5	3.5	12/15/2016	13 km S of Tracy, California
13	6/9/1975	37.95667	-121.649	15.0	3.1	12/15/2016	2 km SE of knightsen, California
14	2/2/1944	37.92517	-121.404	6.0	3.8	1/28/2016	7 km SW of Country Club, California
15	2/14/1909	38.10	-121.70	--	4.5	6/4/2018	7 km S of Rio Vista, California
16	05/19/1889	38.10	-121.80	--	6.0	2/16/2021	North of Antioch, California
17	7/15/1866	37.70	-121.50	--	6.0	1/30/2021	Southwest of Stockton, California

Table A-13. Wells used for Salinity Calculation to Generate USDW Surface

UWI	Name
04077203560000	1
04013000010000	AMERADA_HONEGGER_1-34
04077206240000	ARNAUDO_BROS_1
04077201380000	BACCHETTI_1
04077206270000	BANK_OF_STOCKTON_1
04077203440000	BANTA_UNIT_WELL_1A
04077004250000	BORDEN_1
04077202170000	BOULDIN_DEVELOPMENT_CO_1
04077206660000	COLDANI_1
04077204860000	DELL_ARINGA_1-31
04077202760000	DELTA_1
04077206260000	EBERHARDT_1
04077206450000	EBERHARDT_2
04013202760000	HAYES_1-7
04077206010000	HOLLY_SUGAR_1
04077206300000	JACKSON_1
04077206330000	KLEIN_1-36
04077205070000	M_C_FONG_1
04077205590000	MANDEVILLE_2
04077201450000	MANTELLI_1
04013201780000	NGC_STENZEL_1
04077206650000	NUSS_1
04077203480000	OHLENDORF_UNIT_1_1
04077206440000	PACIFIC_1
04077206960000	PACIFIC_2
04077203710000	PEREIRA_ET_AL_UNIT_1
04077200280000	PODESTA_1
04077206810000	R_M_FARMS_1
04077205660000	RIPKEN_21-1
04077203350000	ROCHA_ET_AL_UNIT_1
04067000510000	RVGU_14
04067000760000	RVGU_19
04067001040000	RVGU_25
04077206490000	SPECKMAN_DECARLI_1
04077205120000	STEVENS_16-1
04013200820000	TRACT_1_1-7
04077203220000	UNION_PROPERTIES_2
04077206780000	VICTORIA_ISLAND_FARMS_1
04013201560000	WESTERN_ENOS_NUNN_1
04013002740000	WOODWARD_ISLAND_UNIT_20-1
04077201570000	ZUCKERMAN_1-21

Table A-14a. Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
349	WCR2013-002388	37.866944	-121.643889	e0187175	Unknown	Destruction	01S	03E	9	9/6/2013	0		
350	WCR2016-011249	37.867222	-121.643056	E0324172	Water Supply Domestic	Production or Monitoring	01S	03E	9	8/26/2016	180	60	180
351	WCR2013-005727	37.888889	-121.6425	e0189511	Water Supply Domestic	Production or Monitoring	01N	03E	33	9/5/2013	250	180	200
352	WCR2013-002387	37.866667	-121.643889	e0187172	Water Supply Domestic	Production or Monitoring	01S	03E	9	9/6/2013	195	170	190
353	WCR1996-002806	37.802778	-121.444444	468080	Water Supply Domestic	Production or Monitoring	01S	05E	32	5/25/1996	285		
354	WCR2013-005920	37.753333	-121.4625	e0177520	Unknown	Destruction	02S	05E	19	3/7/2013	0		
355	WCR2024-007594	37.76782	-121.49928		Monitoring	Destruction	02S	04E	11	6/13/2022	0		
356	WCR1978-000242	37.758333	-121.485833	60003	Water Supply Domestic	Production or Monitoring	02S	04E	13	8/19/1978	240	196	226
357	WCR1995-003405	37.789444	-121.444444	550166	Unknown	Destruction	02S	05E	5	8/3/1995	0	225	245
358	WCR0142176	37.949962	-121.6329	725684	Water Supply Domestic	Production or Monitoring	01N	03E	10	10/20/2006	155	115	155
359	WCR2015-011862	37.768	-121.495	E0264262	Monitoring	Production or Monitoring	02S	04E	11	2/24/2015	25	5	25
360	WCR2020-004322	37.846111	-121.620833		Water Supply Domestic	Destruction	01S	03E	14	5/24/2018	0		
361	WCR1993-006048	37.802778	-121.444444	495161	Water Supply Domestic	Production or Monitoring	01S	05E	32	6/23/1993	300	55	75
362	WCR2016-015774	37.868056	-121.655278	E0301293	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	4	12/16/2016	800	80	790
363	WCR2012-002877	37.764722	-121.453056	e0165168	Unknown	Destruction	02S	05E	17	11/9/2012	0		
364	WCR1988-007184	37.846667	-121.426389	284293	Water Supply Domestic	Production or Monitoring	01S	05E	16	9/16/1988	230		
365	WCR2024-012391	37.79838	-121.552958		Monitoring	Production or Monitoring	01S	04E	32	11/15/2024	835	100	825
366	WCR2012-001698	37.876667	-121.639722	e0146019	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	03E	3	1/17/2012	400	120	360
367	WCR2018-004466	37.925555	-121.628291		Cathodic Protection	Production or Monitoring	01N	03E	15	4/27/2017	300	101	300
368	WCR2015-011861	37.768	-121.499	E0264264	Monitoring	Production or Monitoring	02S	04E	11	2/23/2015	25	5	25
369	WCR2013-006723	37.925833	-121.629167	e0175194	Water Supply Domestic	Production or Monitoring	01N	03E	15	3/23/2013	205	115	155
370	WCR2019-013460	37.780169	-121.52793		Water Supply Domestic	Production or Monitoring	02S	04E	10	9/16/2019	250	210	250
371	WCR2022-014127	37.767721	-121.499433		Monitoring	Destruction	02S	04E	11	6/13/2022	0		
372	WCR1989-003841	37.86	-121.650556	291597	Water Supply Domestic	Production or Monitoring	01S	03E	9	8/1/1989	95		
373	WCR2014-000676	37.916111	-121.646111	e0227096	Water Supply Domestic	Production or Monitoring	01N	03E	21	8/13/2014	316	180	310
374	WCR2009-005477	37.876389	-121.64	e0097821	Water Supply Public	Production or Monitoring	01S	03E	3	7/30/2009	700	180	560
375	WCR1983-003501	37.7875	-121.540556	249212	Water Supply Domestic	Production or Monitoring	02S	04E	4	12/12/1983	170		
376	WCR1990-012756	37.802778	-121.444444	370467	Water Supply Domestic	Production or Monitoring	01S	05E	32	11/7/1990	300		
377	WCR2018-004039	37.916307	-121.638035		Water Supply Domestic	Production or Monitoring	01N	03E	22	5/1/2018	360		
378	WCR2020-006687	37.841486	-121.416503		Water Supply Domestic	Production or Monitoring	01S	05E	15	5/20/2020	100	80	100
NA	WCR1980-000811	37.88919	-121.65061	148899	Water Supply Domestic	Production or Monitoring	01N	03E	33	6/18/1980	176		
NA	WCR1980-000800	37.90376	-121.6505	148888	Water Supply Domestic	Production or Monitoring	01N	03E	28	4/16/1980	175		
NA	WCR0240196	37.87462	-121.65064	60041	Water Supply Domestic	Production or Monitoring	01S	03E	4	2/27/1979	118	60	118
NA	WCR0210369	37.90376	-121.6505	65480	Water Supply Domestic	Production or Monitoring	01N	03E	28	8/19/1987	240	220	240
NA	WCR0040208	37.90376	-121.6505	89963	Water Supply Domestic	Production or Monitoring	01N	03E	28		85	75	85
NA	WCR1994-001404	37.81661	-121.5955	415166	Monitoring	Production or Monitoring	01S	03E	25	7/14/1994	21		
NA	WCR2001-001739	37.93281	-121.6319	725358	Water Supply Domestic	Production or Monitoring	01N	03E	15	5/9/2001	240	178	218

Table A-14a (cont.). Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0047147	37.96181	-121.55819		Unknown	Production or Monitoring	01N	04E	5		0		
NA	WCR1988-006413	37.81661	-121.5955	262361	Water Supply Domestic	Production or Monitoring	01S	03E	25	4/25/1988	108		
NA	WCR1985-003415	37.87462	-121.65064	180349	Water Supply Domestic	Production or Monitoring	01S	03E	4	9/5/1985	140		
NA	WCR0079944	37.84674	-121.42627		Unknown	Production or Monitoring	01S	05E	16		0		
NA	WCR1978-001365	37.95591	-121.57127	129412	Water Supply Domestic	Production or Monitoring	01N	04E	6	4/11/1978	185	175	185
NA	WCR0167028	37.83109	-121.61401	89322	Water Supply Domestic	Production or Monitoring	01S	03E	23		243	223	243
NA	WCR2005-004568	37.90376	-121.6505	725600	Unknown	Destruction	01N	03E	28	7/22/2005	0	175	215
NA	WCR2002-006513	37.87462	-121.65064	800966A	Unknown	Destruction	01S	03E	4	10/30/2002	0		
NA	WCR1989-012335	37.88919	-121.65061	325331	Water Supply Domestic	Production or Monitoring	01N	03E	33	11/20/1989	140		
NA	WCR1986-002150	37.94732	-121.63181	180375	Water Supply Domestic	Production or Monitoring	01N	03E	10	4/29/1986	160		
NA	WCR1991-007097	37.75821	-121.48573	375590	Water Supply Domestic	Production or Monitoring	02S	04E	13	5/24/1991	320		
NA	WCR1996-004078	37.75823	-121.50405	500605	Water Supply Domestic	Production or Monitoring	02S	04E	14	7/18/1996	485	420	460
NA	WCR0159105	37.80289	-121.44456	E046336	Unknown	Production or Monitoring	01S	05E	32		0		
NA	WCR2001-000948	37.75823	-121.50405	716724	Water Supply Domestic	Production or Monitoring	02S	04E	14	1/9/2001	375	330	350
NA	WCR1974-000861	37.75823	-121.50405	99436	Water Supply Domestic	Production or Monitoring	02S	04E	14	9/23/1974	425	395	415
NA	WCR0045658	37.78745	-121.54066		Unknown	Production or Monitoring	02S	04E	4		0		
NA	WCR1992-000013	37.80177	-121.57738	01-520H	Unknown	Destruction	01S	04E	31	10/1/1992	0		
NA	WCR1988-001484	37.75823	-121.50405	176739	Unknown	Production or Monitoring	02S	04E	14		115		
NA	WCR1991-012626	37.76146	-121.46495	488263	Water Supply Domestic	Production or Monitoring	02S	05E	18	11/22/1991	220	150	170
NA	WCR1977-001180	37.75823	-121.50405	22695	Water Supply Domestic	Production or Monitoring	02S	04E	14	3/4/1977	114	104	114
NA	WCR1995-005865	37.76146	-121.46495	560776	Unknown	Destruction	02S	05E	18	2/15/1995	0		
NA	WCR1992-009652	37.75823	-121.50405	488336	Water Supply Domestic	Production or Monitoring	02S	04E	14	6/15/1992	155	120	130
NA	WCR1999-004616	37.76146	-121.46495	730805	Water Supply Domestic	Production or Monitoring	02S	05E	18	11/1/1999	470	410	430
NA	WCR0286452	37.76146	-121.46495	158858	Water Supply Domestic	Production or Monitoring	02S	05E	18		142	132	142
NA	WCR2006-002287	37.78745	-121.54066	1097423	Unknown	Destruction	02S	04E	4	11/15/2006	0		
NA	WCR1991-006255	37.96181	-121.55819	374968	Water Supply Domestic	Production or Monitoring	01N	04E	5	4/12/1991	375	35	50
NA	WCR1994-000068	37.80177	-121.57738	01-558J	Monitoring	Production or Monitoring	01S	04E	31	6/23/1994	20		
NA	WCR1991-004853	37.83109	-121.61401	358921	Cathodic Protection	Production or Monitoring	01S	03E	23	12/3/1991	115		
NA	WCR1974-000864	37.77294	-121.52233	99450	Water Supply Domestic	Production or Monitoring	02S	04E	10	10/16/1974	280	85	117
NA	WCR1979-001050	37.80289	-121.44456	83773	Water Supply Domestic	Production or Monitoring	01S	05E	32	11/26/1979	115	100	115
NA	WCR1975-000098	37.84674	-121.42627	111941	Water Supply Domestic	Production or Monitoring	01S	05E	16	12/2/1975	482	258	278
NA	WCR2008-006672	37.88919	-121.65061	e071177	Water Supply Domestic	Production or Monitoring	01N	03E	33	3/26/2008	440	386	406
NA	WCR2001-001718	37.91825	-121.63201	725331	Water Supply Domestic	Production or Monitoring	01N	03E	22	4/13/2001	240	177	197
NA	WCR0023281	37.84561	-121.6324	81199	Unknown	Production or Monitoring	01S	03E	15		0		
NA	WCR1991-012412	37.77596	-121.44434	478694	Monitoring	Production or Monitoring	02S	05E	8	11/18/1991	24	12	22
NA	WCR1990-004612	37.94732	-121.63181	327417	Water Supply Domestic	Production or Monitoring	01N	03E	10	4/26/1990	160	118	138
NA	WCR0018215	37.77294	-121.52233		Unknown	Production or Monitoring	02S	04E	10		0		

Table A-14a (cont.). Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR0193705	37.83109	-121.61401	98327	Water Supply Domestic	Production or Monitoring	01S	03E	23		60	50	60
NA	WCR2007-002334	37.87462	-121.65064	725673	Water Supply Domestic	Production or Monitoring	01S	03E	4	1/12/2007	220	130	150
NA	WCR0042215	37.76146	-121.46495	E0128834	Unknown	Production or Monitoring	02S	05E	18		0		
NA	WCR0259856	37.76146	-121.46495	46938	Water Supply Domestic	Production or Monitoring	02S	05E	18		218	203	218
NA	WCR0045689	37.80289	-121.44456		Unknown	Production or Monitoring	01S	05E	32		0		
NA	WCR2002-001194	37.81661	-121.5955	725398	Water Supply Domestic	Production or Monitoring	01S	03E	25	5/1/2002	300	70	90
NA	WCR1992-006628	37.91825	-121.63201	426743	Cathodic Protection	Production or Monitoring	01N	03E	22	9/5/1992	325		
NA	WCR1982-001055	37.91825	-121.63201	233803	Water Supply Domestic	Production or Monitoring	01N	03E	22	3/2/1982	160		
NA	WCR1983-001442	37.86008	-121.65068	233896	Water Supply Domestic	Production or Monitoring	01S	03E	9	10/18/1983	120		
NA	WCR1994-001403	37.81661	-121.5955	415164	Monitoring	Production or Monitoring	01S	03E	25	7/14/1994	21		
NA	WCR1990-004698	37.94723	-121.6128	327438	Water Supply Domestic	Production or Monitoring	01N	03E	11	8/17/1990	276	256	276
NA	WCR1986-002167	37.94732	-121.63181	180396	Water Supply Domestic	Production or Monitoring	01N	03E	10	7/19/1986	240		
NA	WCR0191687	37.94732	-121.63181	E028434	Unknown	Production or Monitoring	01N	03E	10		0		
NA	WCR1986-005994	37.94732	-121.63181	195408	Water Supply Domestic	Production or Monitoring	01N	03E	10	9/12/1986	200		
NA	WCR0244645	37.76146	-121.46495	111879	Water Supply Domestic	Production or Monitoring	02S	05E	18		84	72	84
NA	WCR1991-007102	37.90411	-121.46565	374423	Water Supply Irrigation - Agriculture	Production or Monitoring	01N	05E	30	1/10/1991	300		
NA	WCR1989-008134	37.91825	-121.63201	303764	Unknown	Production or Monitoring	01N	03E	22	3/2/1989	240		
NA	WCR1990-006213	37.76146	-121.46495	344946	Water Supply Domestic	Production or Monitoring	02S	05E	18	8/4/1990	245		
NA	WCR2011-004906	37.76146	-121.46495	e0128833	Unknown	Destruction	02S	05E	18	4/13/2011	0		
NA	WCR1996-003122	37.94723	-121.6128	476242	Unknown	Destruction	01N	03E	11	2/9/1996	0		
NA	WCR0210368	37.90376	-121.6505	99422	Water Supply Domestic	Production or Monitoring	01N	03E	28		45	35	45
NA	WCR1986-007028	37.87462	-121.65064	237653	Water Supply Domestic	Production or Monitoring	01S	03E	4	5/12/1986	120		
NA	WCR0000357	37.83109	-121.61401	146809	Water Supply Domestic	Production or Monitoring	01S	03E	23		175	40	50
NA	WCR2002-006512	37.87462	-121.65064	800966	Water Supply Domestic	Production or Monitoring	01S	03E	4	10/30/2002	160	140	160
NA	WCR2005-004569	37.90376	-121.6505	725601	Water Supply Domestic	Production or Monitoring	01N	03E	28	7/14/2005	240	170	218
NA	WCR0098744	37.94732	-121.63181	146834	Water Supply Domestic	Production or Monitoring	01N	03E	10		62	52	62
NA	WCR2001-001727	37.93281	-121.6319	725342	Water Supply Domestic	Production or Monitoring	01N	03E	15	7/27/2001	290	232	272
NA	WCR1999-003485	37.94732	-121.63181	715714	Water Supply Domestic	Production or Monitoring	01N	03E	10	5/25/1999	175	132	152
NA	WCR1998-001782	37.88919	-121.65061	520814	Water Supply Domestic	Production or Monitoring	01N	03E	33	9/2/1998	200	155	175
NA	WCR0132166	37.93281	-121.6319		Unknown	Production or Monitoring	01N	03E	15		0		
NA	WCR0326341	37.76146	-121.46495	21225	Water Supply Domestic	Production or Monitoring	02S	05E	18	12/14/1976	100	85	100
NA	WCR1996-001461	37.78951	-121.44446	460951	Unknown	Destruction	02S	05E	5	2/19/1996	0		
NA	WCR2004-002814	37.81661	-121.5955	926609	Unknown	Destruction	01S	03E	25	4/6/2004	0		
NA	WCR1991-012413	37.77596	-121.44434	478695	Monitoring	Production or Monitoring	02S	05E	8	11/18/1991	30	18	28
NA	WCR1990-000575	37.80177	-121.57738	01-462R	Monitoring	Production or Monitoring	01S	04E	31	8/30/1990	28		
NA	WCR0006916	37.78951	-121.44446	E046632	Monitoring	Modification or Repair	02S	05E	5	9/14/2006	20		
NA	WCR1988-002631	37.77294	-121.52233	252897	Water Supply Domestic	Production or Monitoring	02S	04E	10	1/19/1988	300		

Table A-14a (cont.). Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR1997-006855	37.78951	-121.44446	576785	Unknown	Destruction	02S	05E	5	1/15/1997	0		
NA	WCR0049855	37.76146	-121.46495	730776A-B	Unknown	Destruction	02S	05E	18	4/10/2000	0		
NA	WCR1951-000470	37.84674	-121.42627	39-1178	Water Supply Domestic	Production or Monitoring	01S	05E	16	3/21/1951	36	33	36
NA	WCR0117382	37.77596	-121.44434		Unknown	Production or Monitoring	02S	05E	8		0		
NA	WCR1994-001251	37.93281	-121.6319	416842	Unknown	Destruction	01N	03E	15	1/21/1994	0		
NA	WCR1979-000020	37.78951	-121.44446	54326	Water Supply Domestic	Production or Monitoring	02S	05E	5	10/9/1979	130	100	130
NA	WCR1986-003131	37.80289	-121.44456	191171	Water Supply Domestic	Production or Monitoring	01S	05E	32	5/31/1986	295		
NA	WCR1951-000478	37.78951	-121.44446	39-605	Water Supply Domestic	Production or Monitoring	02S	05E	5	12/21/1951	45		
NA	WCR2007-004009	37.83109	-121.61401	e064074	Water Supply Domestic	Production or Monitoring	01S	03E	23	10/2/2007	40	30	40
NA	WCR2005-006639	37.94732	-121.63181	e028434	Water Supply Domestic	Production or Monitoring	01N	03E	10		250	210	230
NA	WCR1987-005878	37.84674	-121.42627	251137	Water Supply Irrigation - Agriculture	Production or Monitoring	01S	05E	16	6/3/1987	98		
NA	WCR2000-002526	37.94732	-121.63181	725226	Water Supply Domestic	Production or Monitoring	01N	03E	10	1/7/2000	315	280	300
NA	WCR0185792	37.93281	-121.6319	E0175194	Unknown	Production or Monitoring	01N	03E	15		0		
NA	WCR1991-009979	37.94732	-121.63181	427837	Unknown	Destruction	01N	03E	10	12/9/1991	0		
NA	WCR1993-002749	37.93281	-121.6319	416848	Water Supply Domestic	Production or Monitoring	01N	03E	15	12/3/1993	275	255	275
NA	WCR2003-001687	37.91825	-121.63201	749451	Water Supply Domestic	Production or Monitoring	01N	03E	22	5/2/2003	240	70	190
NA	WCR1981-000499	37.80289	-121.44456	226894	Water Supply Domestic	Production or Monitoring	01S	05E	32	9/14/1981	253		
NA	WCR2006-002717	37.91825	-121.63201	725704	Unknown	Destruction	01N	03E	22	8/10/2006	0		
NA	WCR2004-002392	37.76146	-121.46495	926791	Water Supply Domestic	Production or Monitoring	02S	05E	18		220	165	185
NA	WCR1988-002644	37.77306	-121.50403	252930	Water Supply Domestic	Production or Monitoring	02S	04E	11	3/9/1988	220		
NA	WCR2002-001197	37.90376	-121.6505	725401	Water Supply Domestic	Production or Monitoring	01N	03E	28	5/7/2002	240	60	120
NA	WCR1991-007100	37.78951	-121.44446	375595	Water Supply Domestic	Production or Monitoring	02S	05E	5	4/23/1991	245		
NA	WCR2000-004637	37.76146	-121.46495	730776A	Unknown	Destruction	02S	05E	18	4/10/2000	0		
NA	WCR1992-003489	37.91825	-121.63201	411347	Cathodic Protection	Production or Monitoring	01N	03E	22	9/8/1992	225		
NA	WCR1995-005394	37.87462	-121.65064	556610	Unknown	Destruction	01S	03E	4	3/17/1995	0		
NA	WCR1953-000313	37.88991	-121.44487	39-1015	Water Supply Industrial	Production or Monitoring	01N	05E	32		81		
NA	WCR1995-003408	37.77306	-121.50403	550169	Water Supply Domestic	Production or Monitoring	02S	04E	11	8/3/1995	503	444	470
NA	WCR1993-001185	37.83109	-121.61401	410444	Water Supply Domestic	Production or Monitoring	01S	03E	23	5/13/1993	200	50	90
NA	WCR2006-003520	37.84674	-121.42627	e0938241	Water Supply Domestic	Production or Monitoring	01S	05E	16	11/8/2006	50	30	40
NA	WCR1973-000671	37.77306	-121.50403	89308	Water Supply Domestic	Production or Monitoring	02S	04E	11	8/29/1973	200	90	110
NA	WCR1996-001439	37.78951	-121.44446	460974	Water Supply Domestic	Production or Monitoring	02S	05E	5	1/22/1996	235	201	231
NA	WCR2001-001824	37.93281	-121.6319	717732	Monitoring	Production or Monitoring	01N	03E	15	5/2/2001	430	270	320
NA	WCR2006-000888	37.91825	-121.63201	937682	Water Supply Domestic	Production or Monitoring	01N	03E	22	6/16/2006	300	260	300
NA	WCR1981-000489	37.78951	-121.44446	226867	Water Supply Domestic	Production or Monitoring	02S	05E	5	7/18/1981	280		
NA	WCR1776-000539	37.80289	-121.44456	39-1183	Unknown	Production or Monitoring	01S	05E	32		119		
NA	WCR1991-009974	37.94732	-121.63181	427822	Water Supply Domestic	Production or Monitoring	01N	03E	10	11/14/1991	320	265	285
NA	WCR1979-001330	37.77306	-121.50403	98329	Water Supply Domestic	Production or Monitoring	02S	04E	11	7/11/1979	170	70	110

Table A-14a (cont.). Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR1984-002976	37.76146	-121.46495	219030	Water Supply Domestic	Production or Monitoring	02S	05E	18	5/29/1984	170		
NA	WCR1954-000381	37.84674	-121.42627	21451	Water Supply Domestic	Production or Monitoring	01S	05E	16	5/21/1954	39	36	39
NA	WCR1987-004289	37.87462	-121.65064	195442	Water Supply Domestic	Production or Monitoring	01S	03E	4	3/31/1987	100		
NA	WCR1987-001738	37.76146	-121.46495	17712	Monitoring	Production or Monitoring	02S	05E	18	10/27/1987	275		
NA	WCR2009-000341	37.76146	-121.46495	960020	Unknown	Destruction	02S	05E	18	1/30/2009	0		
NA	WCR1988-004092	37.78951	-121.44446	250523	Water Supply Domestic	Production or Monitoring	02S	05E	5	7/14/1988	232		
NA	WCR1999-003926	37.94732	-121.63181	715734	Water Supply Domestic	Production or Monitoring	01N	03E	10	8/17/1999	200	137	157
NA	WCR1985-002142	37.94732	-121.63181	180361	Water Supply Domestic	Production or Monitoring	01N	03E	10	12/12/1985	160		
NA	WCR1980-000522	37.76146	-121.46495	96273	Water Supply Domestic	Production or Monitoring	02S	05E	18	8/30/1980	180		
NA	WCR2000-002764	37.91825	-121.63201	725320	Water Supply Domestic	Production or Monitoring	01N	03E	22	12/1/2000	220	177	197
NA	WCR2009-001372	37.86008	-121.65068	e0082213	Water Supply Domestic	Production or Monitoring	01S	03E	9	6/26/2009	200	150	170
NA	WCR2004-004831	37.90376	-121.6505	749498	Water Supply Domestic	Production or Monitoring	01N	03E	28	3/17/2004	18	140	160
NA	WCR0117257	37.94732	-121.63181	E071311	Unknown	Production or Monitoring	01N	03E	10		0		
NA	WCR0187747	37.76146	-121.46495	10976	Water Supply Domestic	Production or Monitoring	02S	05E	18	5/25/1954	148	123	140
NA	WCR1979-002264	37.80289	-121.44456	83773	Water Supply Domestic	Production or Monitoring	01S	05E	32	11/26/1979	115		
NA	WCR2001-001729	37.91825	-121.63201	725344	Water Supply Domestic	Production or Monitoring	01N	03E	22	7/11/2001	300	257	277
NA	WCR1998-004997	37.93281	-121.6319	703030	Cathodic Protection	Production or Monitoring	01N	03E	15	11/18/1998	300	198	300
NA	WCR0310574	37.91825	-121.63201	122201	Water Supply Domestic	Production or Monitoring	01N	03E	22	9/21/1977	780		
NA	WCR1990-004627	37.94732	-121.63181	327434	Water Supply Domestic	Production or Monitoring	01N	03E	10	8/2/1990	180	115	135
NA	WCR1973-000657	37.78951	-121.44446	83960	Water Supply Domestic	Production or Monitoring	02S	05E	5	4/17/1973	240	211	231
NA	WCR2003-001329	37.88919	-121.65061	725469	Water Supply Domestic	Production or Monitoring	01N	03E	33	9/10/2003	240	94	177
NA	WCR1982-001456	37.87462	-121.65064	233842	Water Supply Domestic	Production or Monitoring	01S	03E	4	9/30/1982	140		
NA	WCR2000-004638	37.76146	-121.46495	730776B	Unknown	Destruction	02S	05E	18	4/10/2000	0		
NA	WCR0084234	37.86008	-121.65068	105893	Water Supply Domestic	Production or Monitoring	01S	03E	9	6/30/1978	0	54	74
NA	WCR2009-001373	37.86008	-121.65068	e0082214	Unknown	Destruction	01S	03E	9	6/26/2009	0		
NA	WCR1997-002082	37.94732	-121.63181	520729	Water Supply Domestic	Production or Monitoring	01N	03E	10	2/20/1997	157	125	150
NA	WCR0102439	37.76146	-121.46495	E074943	Unknown	Production or Monitoring	02S	05E	18		0		
NA	WCR2001-000607	37.83109	-121.61401	533145	Water Supply Domestic	Production or Monitoring	01S	03E	23	11/29/2001	260	60	260
NA	WCR2003-003057	37.88919	-121.65061	791005	Water Supply Domestic	Production or Monitoring	01N	03E	33	6/4/2003	310	115	135
NA	WCR0018202	37.76146	-121.46495	98323	Water Supply Domestic	Production or Monitoring	02S	05E	18		126	119	126
NA	WCR0266573	37.90376	-121.6505	145639	Water Supply Domestic	Production or Monitoring	01N	03E	28		115	35	42
NA	WCR1953-000317	37.86132	-121.42633	39-1173	Water Supply Domestic	Production or Monitoring	01S	05E	9	5/1/1953	35		
NA	WCR1990-000578	37.80177	-121.57738	01-462U	Monitoring	Production or Monitoring	01S	04E	31	8/29/1990	23		
NA	WCR1991-009980	37.83109	-121.61401	427838	Water Supply Domestic	Production or Monitoring	01S	03E	23	12/23/1991	60	20	40
NA	WCR0073374	37.86008	-121.65068	105875	Water Supply Domestic	Production or Monitoring	01S	03E	9	4/7/1978	136	75	135
NA	WCR1988-003468	37.87462	-121.65064	253474	Water Supply Domestic	Production or Monitoring	01S	03E	4	3/16/1988	180		
NA	WCR1994-001276	37.93281	-121.6319	416840	Water Supply Domestic	Production or Monitoring	01N	03E	15	1/7/1994	220	71	91

Table A-14a (cont.). Water Supply Well Information for DWR Water Wells Within the 1-Mile Buffer of the Area of Review. Wells with no map index are estimated at centroid of section.

Map Index	WCR Number	Latitude	Longitude	Legacy Log Number	Planned Use	Type of Permit	Township	Range	Section	Date Work Ended	Completion Depth (feet bgs)	Top Perforation (feet bgs)	Bottom Perforation (feet bgs)
NA	WCR2008-001080	37.76146	-121.46495	946804	Monitoring	Production or Monitoring	02S	05E	18	8/15/2008	17	7	17
NA	WCR2007-004263	37.88919	-121.65061	e059689	Water Supply Domestic	Production or Monitoring	01N	03E	33	8/9/2007	240	170	230
NA	WCR0056055	37.88919	-121.65061	47913	Unknown	Production or Monitoring	01N	03E	33		0		
NA	WCR0266574	37.88919	-121.65061	89359	Water Supply Domestic	Production or Monitoring	01N	03E	33		100	91	100
NA	WCR1954-000750	37.88991	-121.44487	39-1014	Unknown	Production or Monitoring	01N	05E	32	1/1/1954	26		
NA	WCR1986-002160	37.94732	-121.63181	180387	Water Supply Domestic	Production or Monitoring	01N	03E	10	6/10/1986	180		
NA	WCR1953-000337	37.96188	-121.52326	39-989	Water Supply Domestic	Production or Monitoring	01N	04E	3	12/12/1953	158		
NA	WCR2005-004589	37.90376	-121.6505	725627	Unknown	Destruction	01N	03E	28	12/29/2005	0		
NA	WCR2007-004599	37.91825	-121.63201	e061805	Water Supply Domestic	Production or Monitoring	01N	03E	22	7/27/2007	210	175	200
NA	WCR2007-002332	37.90376	-121.6505	725671	Water Supply Domestic	Production or Monitoring	01N	03E	28	2/6/2007	280	220	260
NA	WCR0046004	37.97589	-121.54039	44954	Water Supply Domestic	Production or Monitoring	02N	04E	33	2/15/1966	115	109	115
NA	WCR1953-000338	37.96188	-121.52326	39-990	Water Supply Domestic	Production or Monitoring	01N	04E	3	5/18/1953	188		
NA	WCR0263328	37.96188	-121.52326		Unknown	Production or Monitoring	01N	04E	3		0		
NA	WCR0134760	37.97589	-121.54039		Unknown	Production or Monitoring	02N	04E	33		0		

Notes:
Blank cells in the table signify no data available
NA = not applicable
bgs = below ground surface

Table A-14b. Water Supply Well Information for GAMA Water Wells Within the 1-Mile Buffer of the Area of Review.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
379	WB_ILRP	Domestic	GeoTracker	AGW080017538-11660WELL	37.91675	-121.6465
380	WB_ILRP	Domestic	GeoTracker	AGW080018202-TRUESDELL	37.774067	-121.455327
381	WB_ILRP	Domestic	GeoTracker	AGW080018203-KEENEY	37.772925	-121.455145
382	WB_ILRP	Domestic	GeoTracker	AGW080018495-RAYLYN 1	37.89058	-121.64366
383	WB_ILRP	Domestic	GeoTracker	AGW080018610-RANCHWELL1	37.844099	-121.422379
384	WB_ILRP	Domestic	GeoTracker	AGW080018655-WELL HOUSE	37.8683	-121.65519
385	WB_ILRP	Domestic	GeoTracker	AGW080018798-LEWISRANCH	37.86796	-121.6553
386	WB_ILRP	Domestic	GeoTracker	AGW080018999-DRNKNGWELL	37.940622	-121.642733
387	WB_ILRP	Domestic	GeoTracker	AGW080019773-GABBERTWEL	37.788565	-121.451647
388	WB_ILRP	Domestic	GeoTracker	AGW080019800-WELL#1	37.80353	-121.4502
389	WB_ILRP	Domestic	GeoTracker	AGW080019801-WELL#2	37.803553	-121.4502
390	WB_ILRP	Domestic	GeoTracker	AGW080020232-GRANTLINE	37.760629	-121.499484
391	WB_ILRP	Domestic	GeoTracker	AGW080020287-PHELPS	37.773383	-121.459775
392	WB_ILRP	Domestic	GeoTracker	AGW080020317-G2-D	37.751661	-121.486496
393	WB_ILRP	Domestic	GeoTracker	AGW080020421-HOUSE WELL	37.890219	-121.640968
394	WB_ILRP	Domestic	GeoTracker	AGW080020866-PACKNGSHED	37.839119	-121.418216
395	WB_ILRP	Domestic	GeoTracker	AGW080020981-VOLPI	37.916465	-121.453053
396	WB_ILRP	Domestic	GeoTracker	AGW080021061-WELL#1	37.9463	-121.6309
397	WB_ILRP	Domestic	GeoTracker	AGW080021062-3120WELL	37.87368	-121.63938
398	WB_ILRP	Domestic	GeoTracker	AGW080021254-14821WELL	37.759141	-121.495145
399	WB_ILRP	Domestic	GeoTracker	AGW080021255-3388WELL	37.752035	-121.477599
400	WB_ILRP	Domestic	GeoTracker	AGW080021346-EMP HOUSE	37.789047	-121.44213
401	WB_ILRP	Domestic	GeoTracker	AGW080021347-SHED	37.789047	-121.44213
402	WB_ILRP	Domestic	GeoTracker	AGW080021349-CHERYL	37.786578	-121.445911
403	WB_ILRP	Domestic	GeoTracker	AGW080021350-SANDY	37.784969	-121.449972
404	WB_ILRP	Domestic	GeoTracker	AGW080021352-M SERPA	37.788518	-121.448286
405	WB_ILRP	Domestic	GeoTracker	AGW080021490-SHOP	37.966309	-121.543772
406	WB_ILRP	Domestic	GeoTracker	AGW080021491-OLD WELL	37.966309	-121.543772
407	WB_ILRP	Domestic	GeoTracker	AGW080021492-NEW WELL	37.966309	-121.543772
408	WB_ILRP	Domestic	GeoTracker	AGW080021493-SHOP	37.966309	-121.543772
409	WB_ILRP	Domestic	GeoTracker	AGW080021494-OLDWELL	37.966309	-121.543772
410	WB_ILRP	Domestic	GeoTracker	AGW080021495-NEWWELL	37.966309	-121.543772
411	WB_ILRP	Domestic	GeoTracker	AGW080021610-BYRON	37.811181	-121.586272
412	WB_ILRP	Domestic	GeoTracker	AGW080021616-FHFKITCHEN	37.908889	-121.647958
413	WB_ILRP	Domestic	GeoTracker	AGW080022473-13900WELL	37.88358	-121.64204
414	WB_ILRP	Domestic	GeoTracker	AGW080022474-2401WELL	37.88231	-121.65278
415	WB_ILRP	Domestic	GeoTracker	AGW080024238-9922	37.84308	-121.433419

Table A-14b (cont.). Water Supply Well Information for GAMA Water Wells Within the 1-Mile Buffer of the Area of Review.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
416	WB_ILRP	Domestic	GeoTracker	AGW080024753-R4R	37.889618	-121.652857
417	DDW	Municipal	DDW	CA0706022_001_001	37.872023	-121.640592
418	DDW	Municipal	DDW	CA0706029_001_001	37.876694	-121.640111
419	DDW	Municipal	DDW	CA0900112_001_001	37.868889	-121.639639
420	DDW	Municipal	DDW	CA3901035_001_001	37.805066	-121.450392
421	DDW	Municipal	DDW	CA3910011_032_032	37.754682	-121.465249
422	DDW	Municipal	DDW	CA0707598_001_001	37.874137	-121.643476
423	DDW	Municipal	DDW	CA0706027_003_003	37.872023	-121.640592
424	DDW	Municipal	DDW	CA0706031_001_001	37.88987	-121.642344
425	DDW	Municipal	DDW	CA0706049_001_001	37.889643	-121.640885
426	DDW	Municipal	DDW	CA0706049_002_002	37.889643	-121.640885
427	DDW	Municipal	DDW	CA0707564_001_001	37.868888	-121.639638
428	DDW	Municipal	DDW	CA0707580_001_001	37.868416	-121.641222
429	DDW	Municipal	DDW	CA0707595_001_001	37.85032	-121.622765
430	DDW	Municipal	DDW	CA3901015_001_001	37.805066	-121.450392
431	DDW	Municipal	DDW	CA3901057_001_001	37.8	-121.45
432	DDW	Municipal	DDW	CA3902191_001_001	37.764586	-121.452762
433	DPR	Municipal	DPR	104129	37.80296	-121.443507
434	DPR	Domestic	DPR	77958	37.817541	-121.425074
435	DPR	Domestic	DPR	81519	37.789581	-121.4434
436	DPR	Domestic	DPR	81520	37.789581	-121.4434
437	DPR	Domestic	DPR	81530	37.761527	-121.463896
438	DPR	Domestic	DPR	91923	37.889267	-121.649548
439	DPR	Domestic	DPR	91924	37.889267	-121.649548
440	DPR	Domestic	DPR	91926	37.889267	-121.649548
441	DPR	Domestic	DPR	91927	37.889267	-121.649548
442	DPR	Domestic	DPR	91941	37.874696	-121.649576
443	DPR	Domestic	DPR	91945	37.860154	-121.649613
444	DPR	Domestic	DPR	91946	37.860154	-121.649613
445	DPR	Domestic	DPR	91947	37.860154	-121.649613
446	DPR	Domestic	DPR	98472	37.77301	-121.521273
447	DWR	Other	WDL	01N03E28Q001M	37.8977	-121.6486
448	DWR	Other	WDL	01N03E33J001M	37.8868	-121.644
449	DWR	Other	WDL	01N05E19F001M	37.9193	-121.4702
450	DWR	Other	WDL	01N05E20E001M	37.9193	-121.4565
451	DWR	Other	WDL	01N05E20M001M	37.9157	-121.4565
452	DWR	Other	WDL	01N05E29C002M	37.9085	-121.4519

Table A-14b (cont.). Water Supply Well Information for GAMA Water Wells Within the 1-Mile Buffer of the Area of Review.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
453	DWR	Other	WDL	01N05E29F001M	37.9049	-121.4519
454	DWR	Other	WDL	01N05E29G001M	37.9049	-121.4473
455	DWR	Other	WDL	01S03E03M001M	37.8741	-121.64
456	DWR	Other	WDL	01S03E03M002M	37.8724	-121.6395
457	DWR	Other	WDL	01S03E03N002M	37.8688	-121.6395
458	DWR	Other	WDL	01S03E03N003M	37.8688	-121.6395
459	DWR	Other	WDL	01S03E04P001M	37.8688	-121.6532
460	DWR	Other	WDL	01S03E04Q001M	37.8688	-121.6486
461	DWR	Other	WDL	01S03E09A001M	37.8651	-121.644
462	DWR	Other	WDL	01S03E09A002M	37.8651	-121.644
463	DWR	Other	WDL	01S03E14N001M	37.8399	-121.6212
464	DWR	Other	WDL	01S03E15A001M	37.8508	-121.6238
465	DWR	Other	WDL	01S03E15C001M	37.8507	-121.6349
466	DWR	Other	WDL	01S03E22H001M	37.8326	-121.6257
467	DWR	Other	WDL	01S03E22H002M	37.8326	-121.6257
468	DWR	Other	WDL	01S03E23E001M	37.8326	-121.6212
469	DWR	Other	WDL	01S03E23J001M	37.829	-121.6074
470	DWR	Other	WDL	01S03E26A001M	37.8218	-121.6074
471	DWR	Other	WDL	01S05E32R001M	37.7965	-121.4427
472	DWR	Other	WDL	02N04E33G002M	37.9771	-121.5388
473	DWR	Other	WDL	02S04E04K001M	37.7857	-121.5388
474	DWR	Other	WDL	02S04E04R001M	37.7821	-121.5342
475	DWR	Other	WDL	02S04E09A001M	37.7785	-121.5338
476	DWR	Other	WDL	02S04E11R001M	37.7676	-121.4976
477	DWR	Other	WDL	02S04E13L001M	37.7568	-121.4885
478	DWR	Other	WDL	02S04E13N001M	37.7532	-121.4931
479	DWR	Other	WDL	02S04E24A080M	37.7495	-121.4793
480	DWR	Other	WDL	02S05E04E001M	37.7893	-121.4382
481	DWR	Other	WDL	02S05E05A001M	37.7929	-121.4427
482	DWR	Other	WDL	02S05E05J001M	37.7857	-121.4427
483	DWR	Other	WDL	02S05E08B001M	37.7813	-121.4419
484	DWR	Other	WDL	02S05E18G001M	37.7604	-121.4656
485	DWR	Other	WDL	02S05E18N001M	37.7547	-121.4763
486	DWR	Other	WDL	02S05E19C001M	37.7513	-121.4705
487	DWR	Other	WDL	02S05E19D001M	37.7495	-121.4748
488	DWR	Other	WDL	MW-201A S	37.780729	-121.516452
489	DWR	Other	WDL	MW-201B MS	37.780729	-121.516452

Table A-14b (cont.). Water Supply Well Information for GAMA Water Wells Within the 1-Mile Buffer of the Area of Review.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
490	DWR	Other	WDL	MW-201C MD	37.780729	-121.516452
491	DWR	Other	WDL	MW-201D D	37.780729	-121.516452
492	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW1	37.753	-121.462459
493	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW10	37.753533	-121.462324
494	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW11	37.753026	-121.462247
495	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW2	37.753129	-121.462466
496	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW3	37.753099	-121.462562
497	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW4	37.753194	-121.462508
498	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW5	37.753319	-121.462515
499	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW6	37.753183	-121.462368
500	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW7	37.75317	-121.462398
501	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW8	37.753373	-121.462369
502	WB_CLEANUP	Monitoring	GeoTracker	T0607700797-MW9	37.753485	-121.462633
503	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-1	37.7547	-121.459909
504	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-10	37.755949	-121.460489
505	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-2	37.754718	-121.459604
506	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-4	37.754404	-121.45994
507	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-5	37.75504	-121.459685
508	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-6	37.754905	-121.459939
509	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-7	37.754745	-121.460097
510	WB_CLEANUP	Monitoring	GeoTracker	T0607724298-MW-9	37.756239	-121.459177
511	WB_CLEANUP	Monitoring	GeoTracker	WDR100046414-FIELD BLANK	37.78031	-121.51736
512	GAMA_SP-STUDY	Municipal	LLNL	102529	37.754861	-121.465472
513	GAMA_SP-STUDY	Municipal	LLNL	109547	37.969194	-121.570361
514	GAMA_SP-STUDY	Municipal	LLNL	110770	37.969194	-121.570361
515	GAMA_USGS	Municipal	USGS	S17-SJV12	37.8973	-121.6399
516	GAMA_USGS	Domestic	USGS	TRCY-10	37.969196	-121.570358
517	GAMA_USGS	Municipal	USGS	TRCYFP-03	37.75486	-121.465469
518	USGS_NWIS	Other	NWIS	USGS-374500121270001	37.754861	-121.465472
519	USGS_NWIS	Other	NWIS	USGS-374503121292301	37.750763	-121.49078
520	USGS_NWIS	Other	NWIS	USGS-374516121283001	37.754373	-121.476057
521	USGS_NWIS	Other	NWIS	USGS-374524121292401	37.756596	-121.491058
522	USGS_NWIS	Other	NWIS	USGS-374604121293801	37.767707	-121.494947
523	USGS_NWIS	Other	NWIS	USGS-374637121315201	37.776873	-121.53217
524	USGS_NWIS	Other	NWIS	USGS-374645121263501	37.779095	-121.444113
525	USGS_NWIS	Other	NWIS	USGS-374648121271001	37.779928	-121.453835

Table A-14b (cont.). Water Supply Well Information for GAMA Water Wells Within the 1-Mile Buffer of the Area of Review.

Map Index	Database Name	Planned Use	Source	Well ID	Latitude	Longitude
526	USGS_NWIS	Other	NWIS	USGS-374657121321801	37.782428	-121.539393
527	USGS_NWIS	Other	NWIS	USGS-374716121271001	37.787706	-121.453835
528	USGS_NWIS	Other	NWIS	USGS-374741121260701	37.79465	-121.436335
529	USGS_NWIS	Other	NWIS	USGS-374746121260601	37.796039	-121.436057
530	USGS_NWIS	Other	NWIS	USGS-375202121383101	37.867148	-121.643007
531	USGS_NWIS	Other	NWIS	USGS-375228121382001	37.87437	-121.639951
532	USGS_NWIS	Other	NWIS	USGS-375800121340001	37.969194	-121.570361

Table A-15. Injection Zone Formation Fluid Properties at Reservoir Conditions

Formation Fluid Property	Estimated Value/Range
Density, g/cm^3	0.99981
Viscosity, cp	0.486
TDS, ppm	~14,000-16,000

Table A-16. Injectate Compositions

Component	Injectate 1	Injectate 2
	Mass%	Mass%
CO_2	99.213%	99.884%
H_2	0.051%	0.006%
N_2	0.643%	0.001%
H_2O	0.021%	0.000%
CO	0.029%	0.001%
Ar	0.031%	0.000%
O_2	0.004%	0.000%
SO_2+SO_3	0.003%	0.000%
H_2S	0.001%	0.014%
CH_4	0.004%	0.039%
NO_x	0.002%	0.000%
NH_3	0.000%	0.000%
C_2H_6	0.000%	0.053%
Ethylene	0.000%	0.002%
Total	**100.00%**	**100.00%**

Table A-17. Simplified 4-Component Composition for Injectate 1 and Injectate 2

Injectate 1	
Component	Mass%
CO_2	99.213%
N_2	0.643%
SO_2+SO_3	0.003%
H_2S	0.001%

Injectate 2	
Component	Mass%
CO_2	99.884%
CH_4	0.039%
C_2H_6	0.053%
H_2S	0.014%

Table A-18. Injectate Properties Range over Project Life at Downhole Conditions for Injectate 1 and Injectate 2

Injectate Property at Downhole Conditions	Injectate 1	Injectate 2
Viscosity, cp	0.054	0.056
Density, lb/ft^3	41.39	42.56
Compressibility factor, Z	0.464	0.453