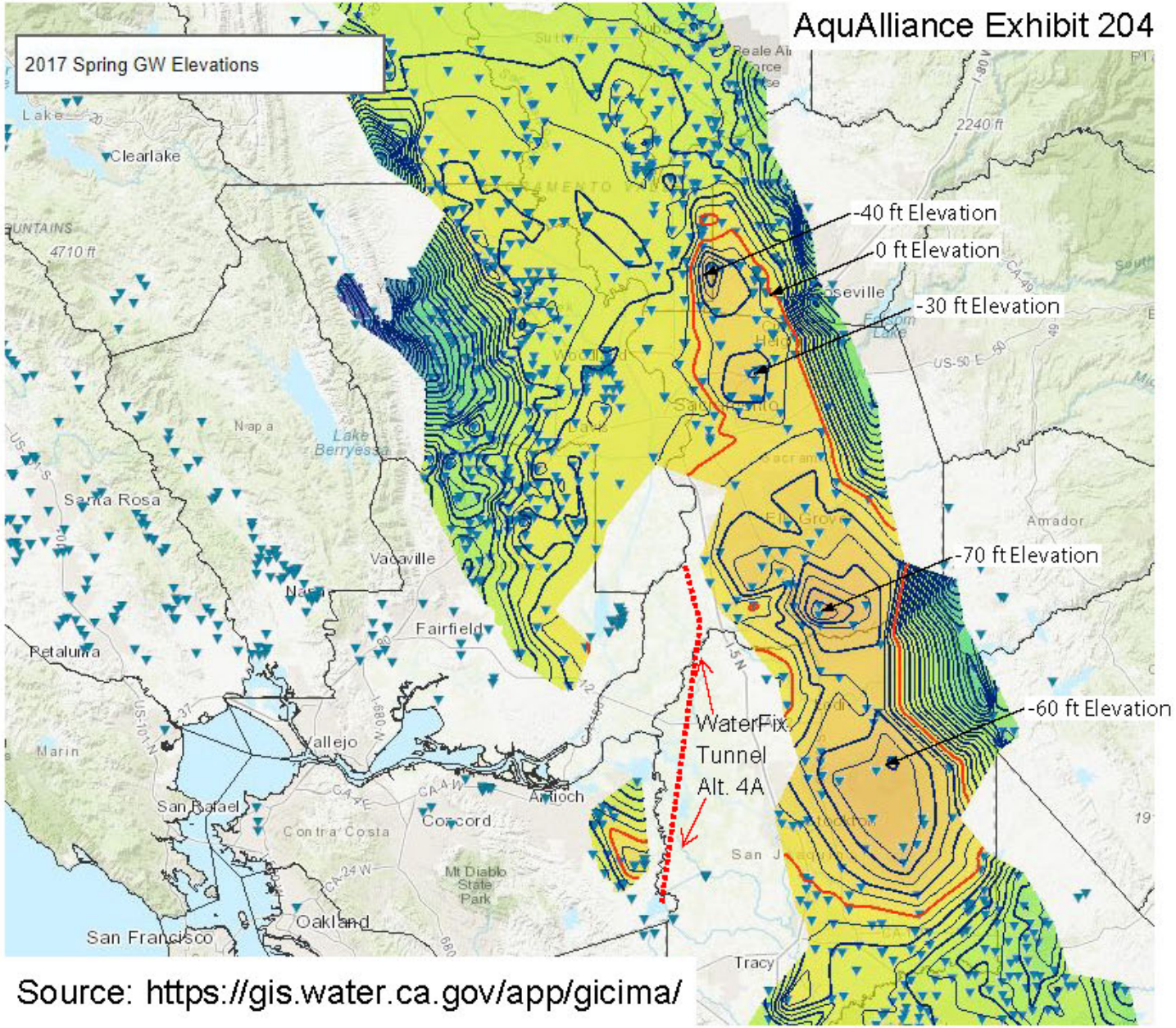
Hearing on the Matter of
California Department of Water Resources and
United States Bureau of Reclamation
Request for a Change in Point of Diversion for
California WaterFix – Part 2

Testimony of Kit H. Custis

On Behalf of AquAlliance

November 2017



Source: https://gis.water.ca.gov/app/gicima/

WaterFix Tunnel Alt. 4A

AquAlliance Exhibit 205

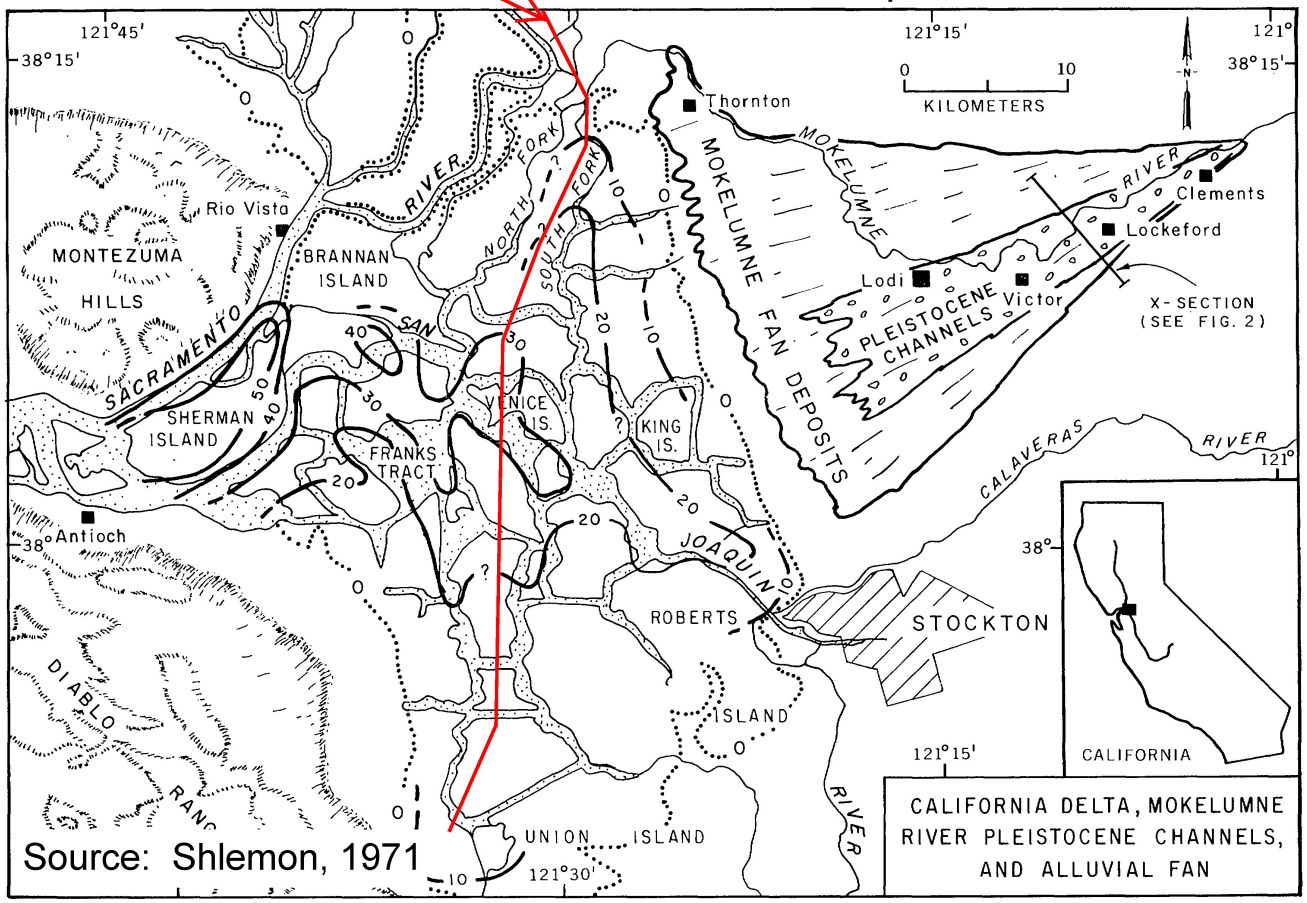


FIG. 1. The California Delta and the Mokelumne Alluvial Fan. Buried Pleistocene Mokelumne River channels extend from terraces near Clements southwestward toward the Delta. The base of Delta peat (below mean sea level) is shown by contours (in feet); present sea level is indicated by the dotted line.

AquAlliance Exhibit 208B

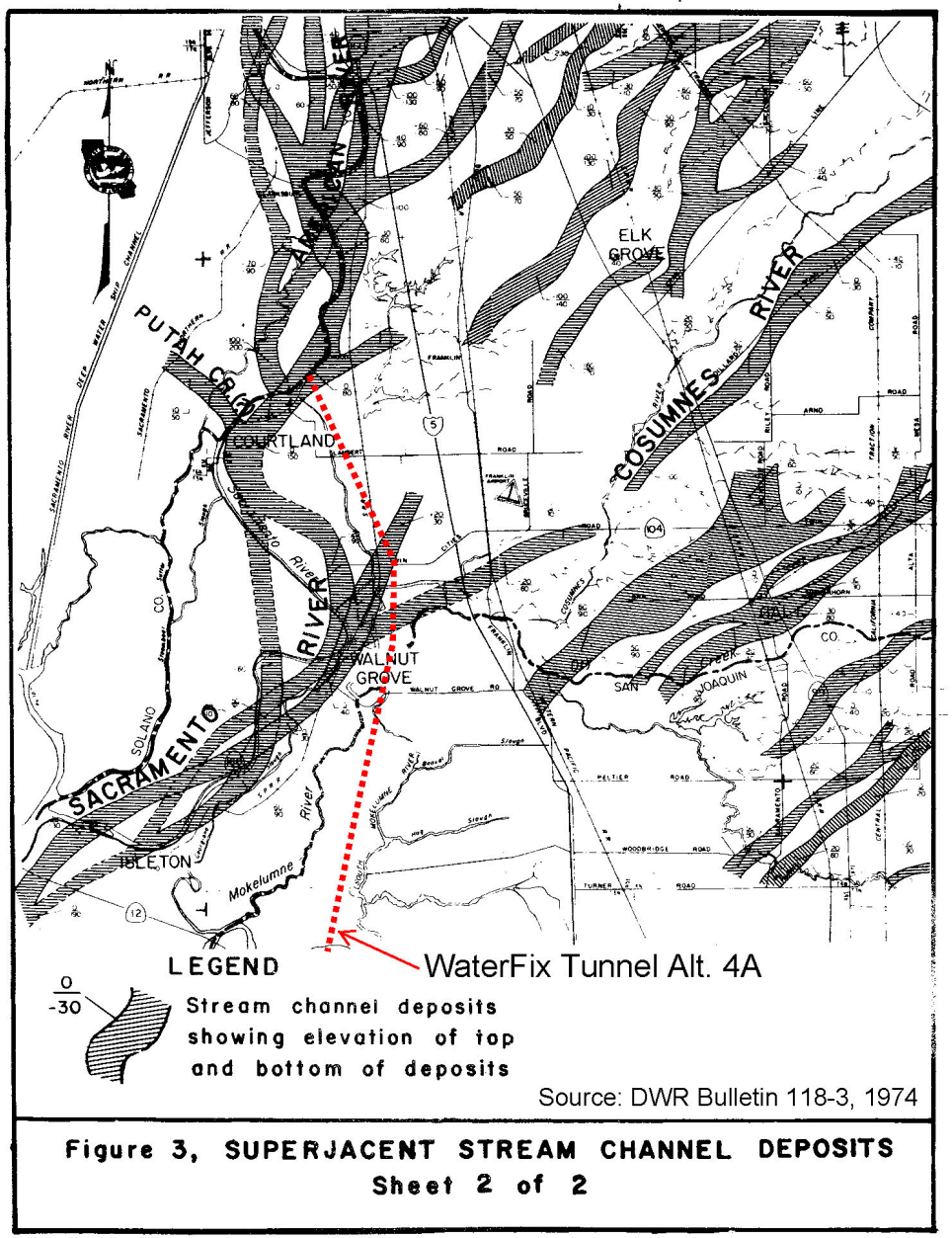


Figure 3, SUPERJACENT STREAM CHANNEL DEPOSITS
Sheet 2 of 2

people of the past 5,000 years. Too late to observe a stream at the site of the Bay, some of these people may nevertheless have deduced its former presence; perhaps, like Gilbert and Lawson, they read ancient history from soggy middens and drowned topography.

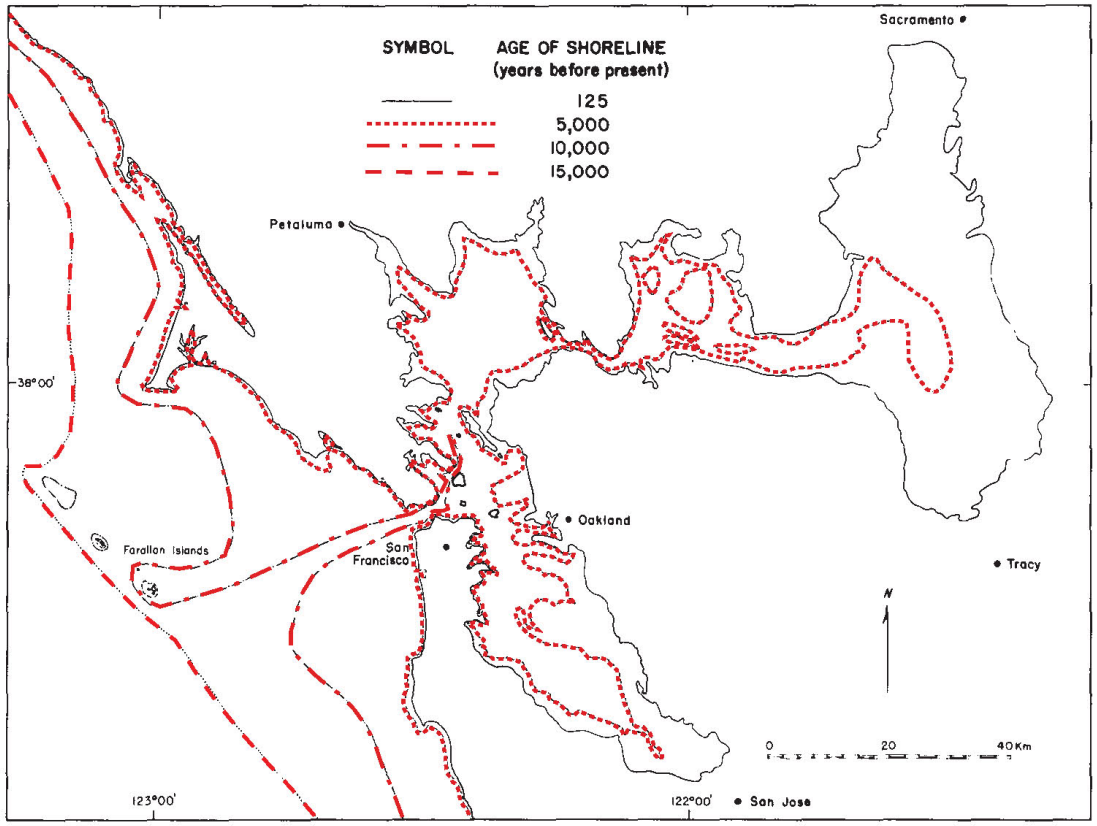


Fig. 6. Approximate high-tide shorelines near San Francisco during the past 15,000 years. The 125-year-old shoreline, based on compilations by Gilbert (1917:76) and Nichols and Wright (1971), denotes the landward edge of tidal marshes before human encroachment or, where no marsh was present, the high-water line circa 1850. Locations of older shorelines are estimated by projecting sea levels of the past 15,000 years onto the land surface inundated by the growing estuary during this time. We assume the following sea levels, expressed relative to present mean sea level (Fig. 5; Flint 1971:321): 5,000 years ago, -8 m; 10,000 years ago, -55 m; and 15,000 years

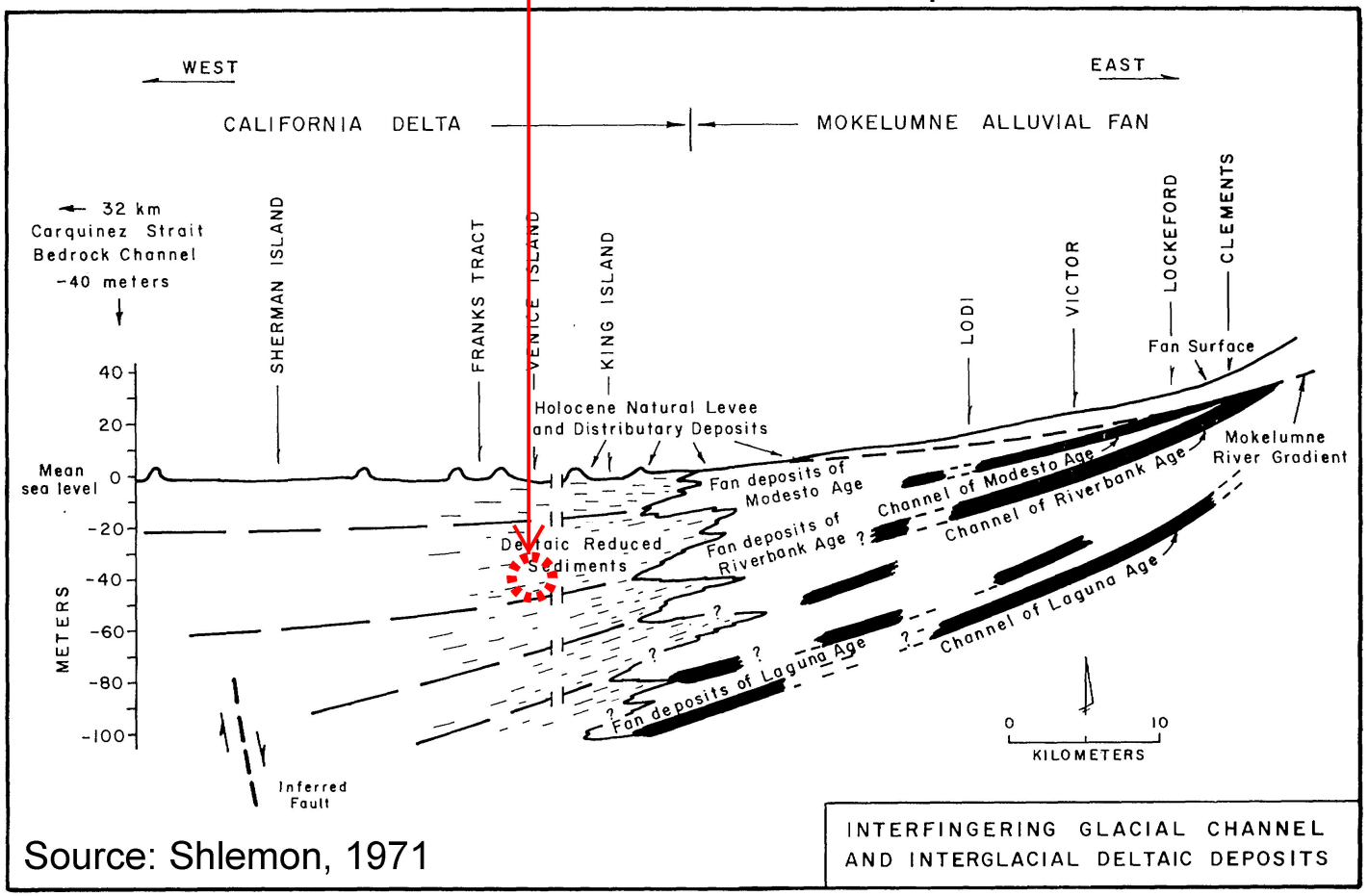


FIG. 3. Generalized geologic section showing interfingering of California Delta and Mokelumne Fan sediments. Gravel-filled channels are identified in well logs. An inferred early Quaternary fault possibly offsetting deltaic sediments is shown under Sherman Island.

AquAlliance Exhibit 209A

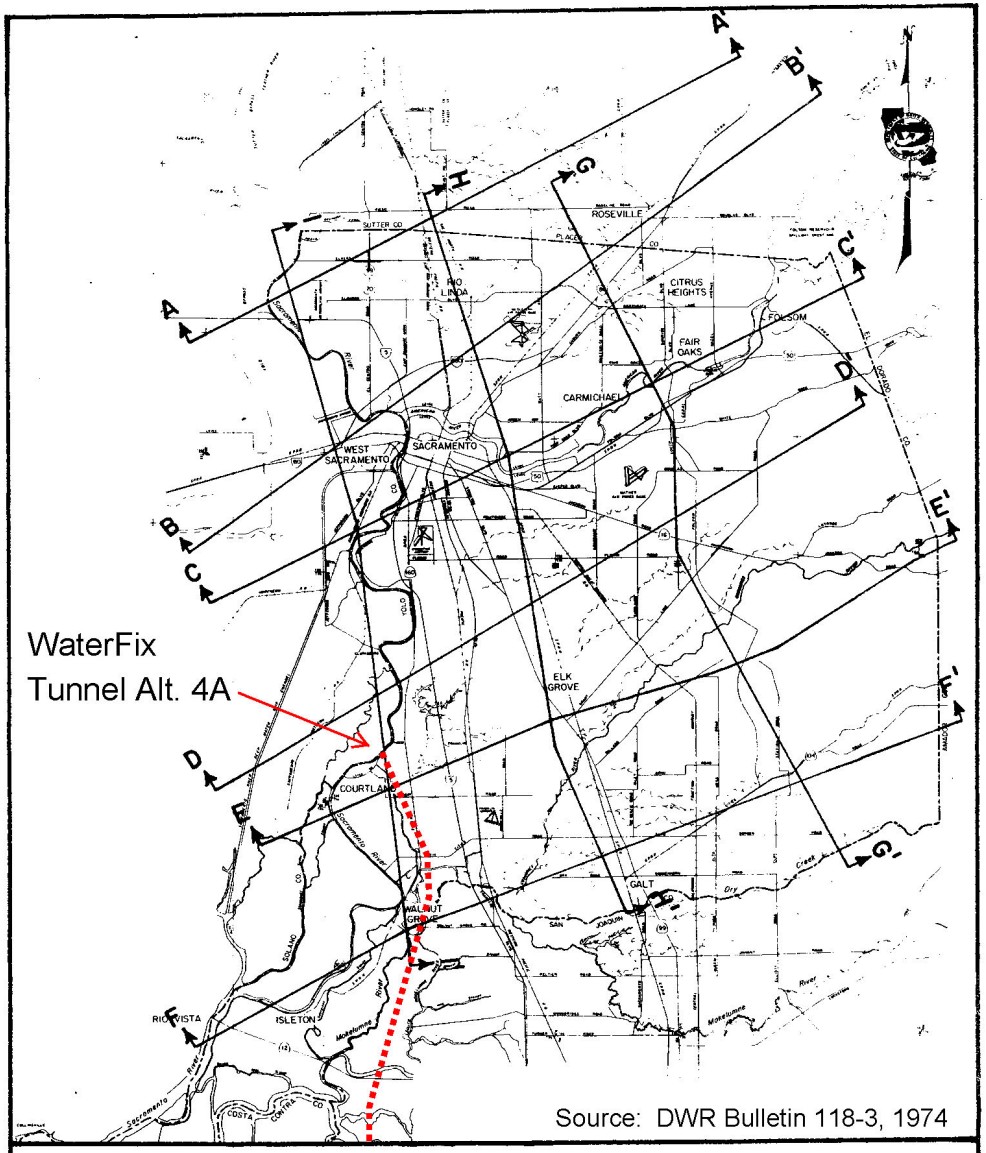
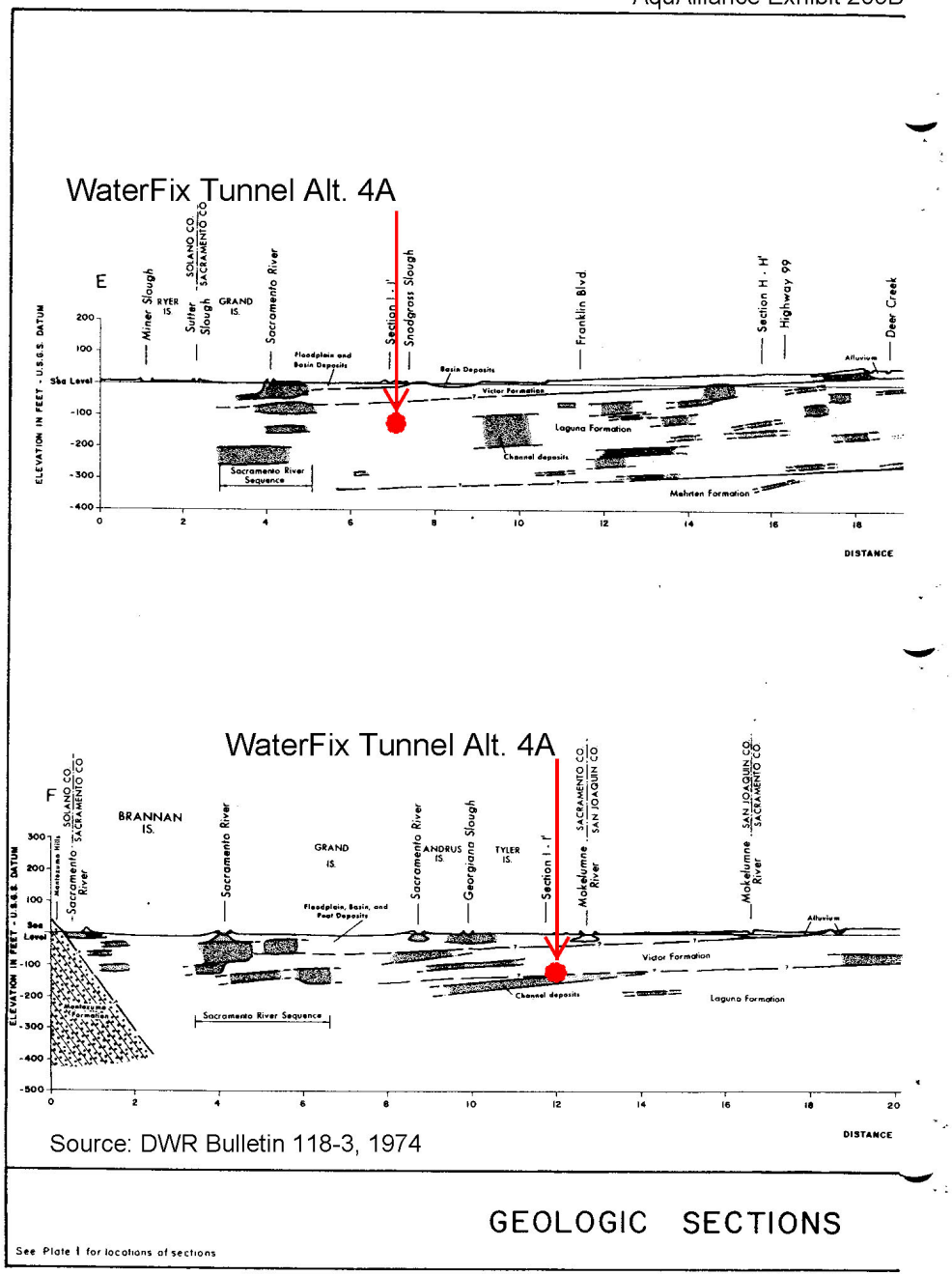


Figure 4, GEOLOGIC SECTIONS-SACRAMENTO COUNTY INDEX SHEET

AquAlliance Exhibit 209B



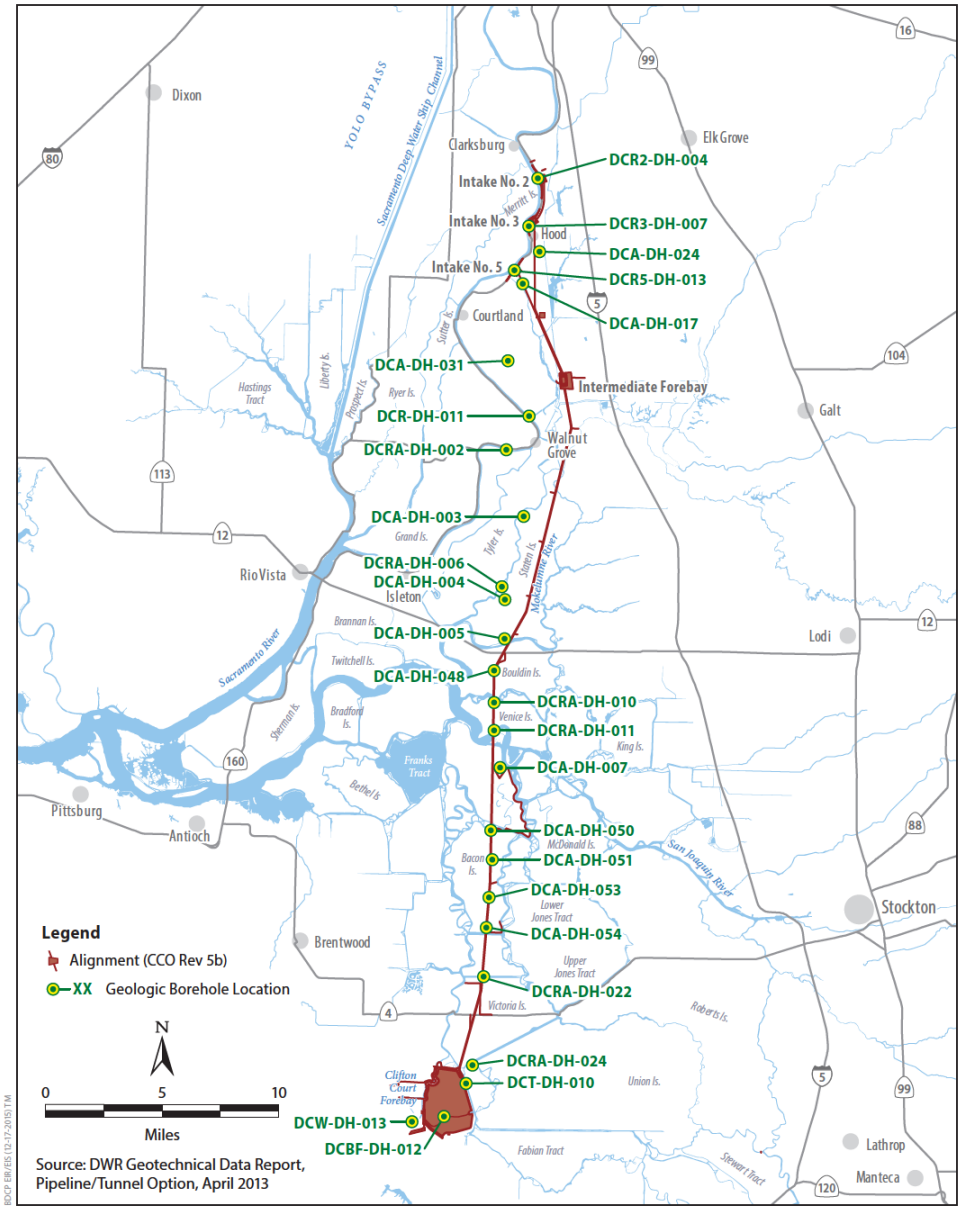
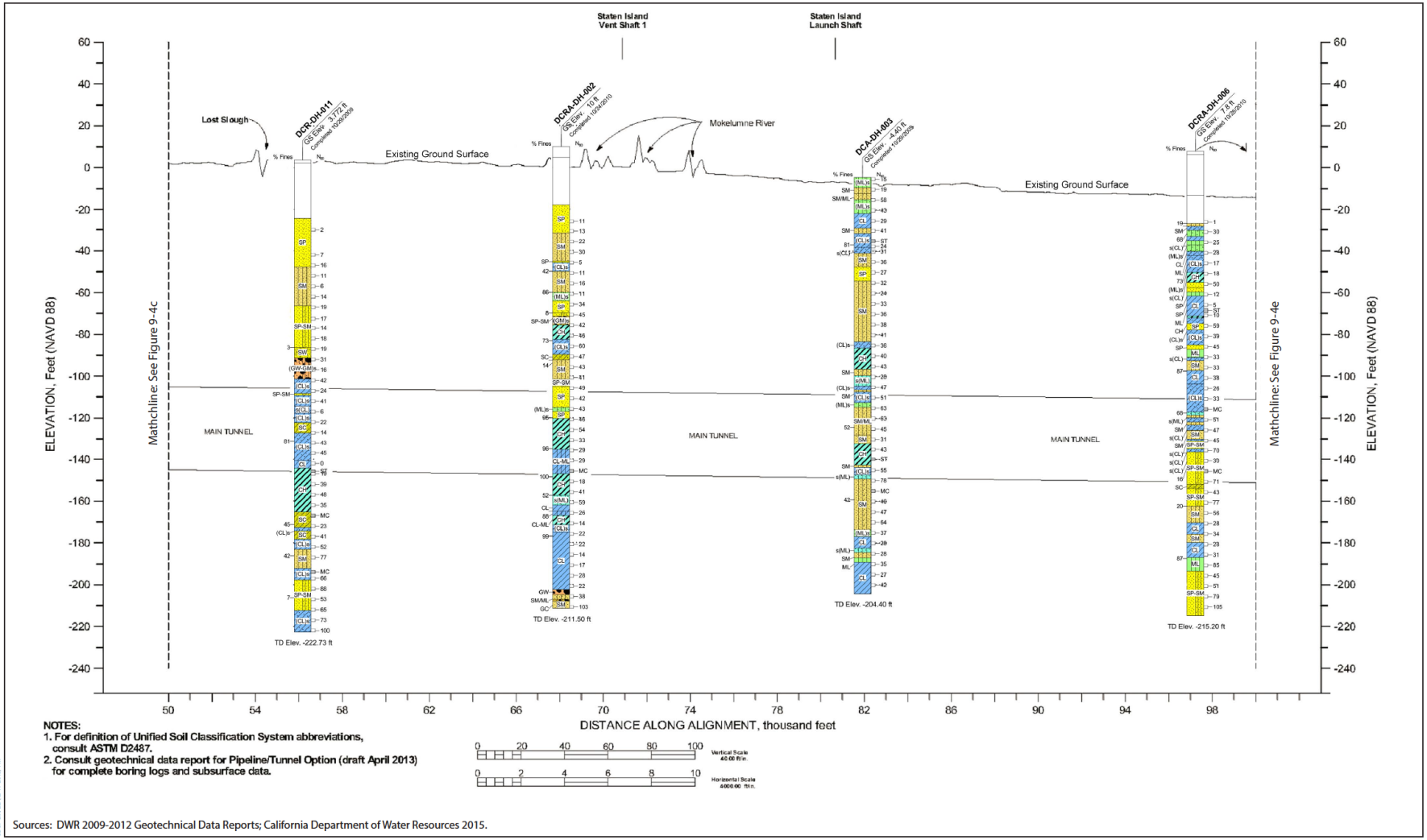


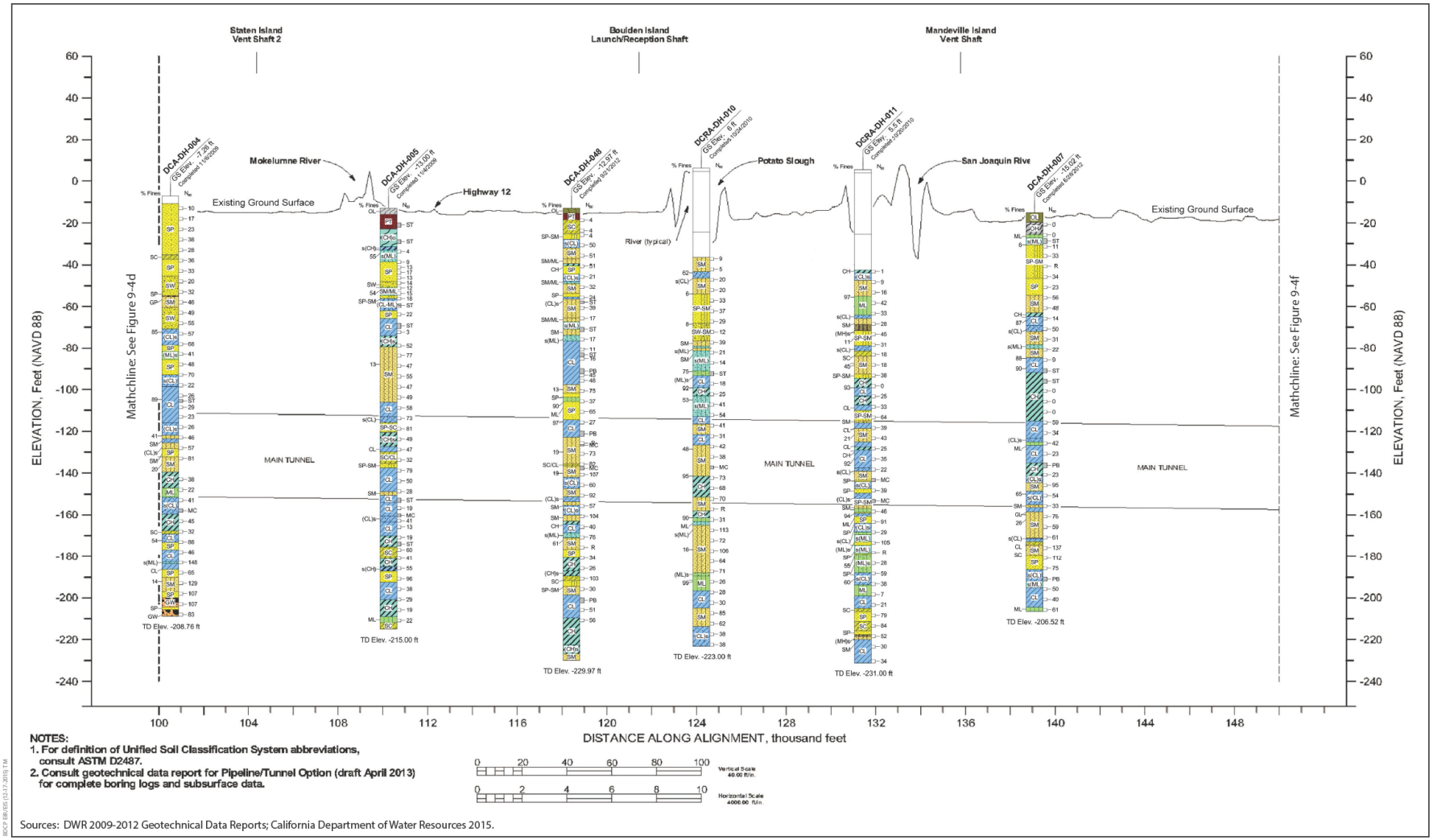
Figure 9-4a
Geologic Borehole Locations



NOTES:
1. For definition of Unified Soil Classification System abbreviations, consult ASTM D2487.
2. Consult geotechnical data report for Pipeline/Tunnel Option (draft April 2013) for complete boring logs and subsurface data.

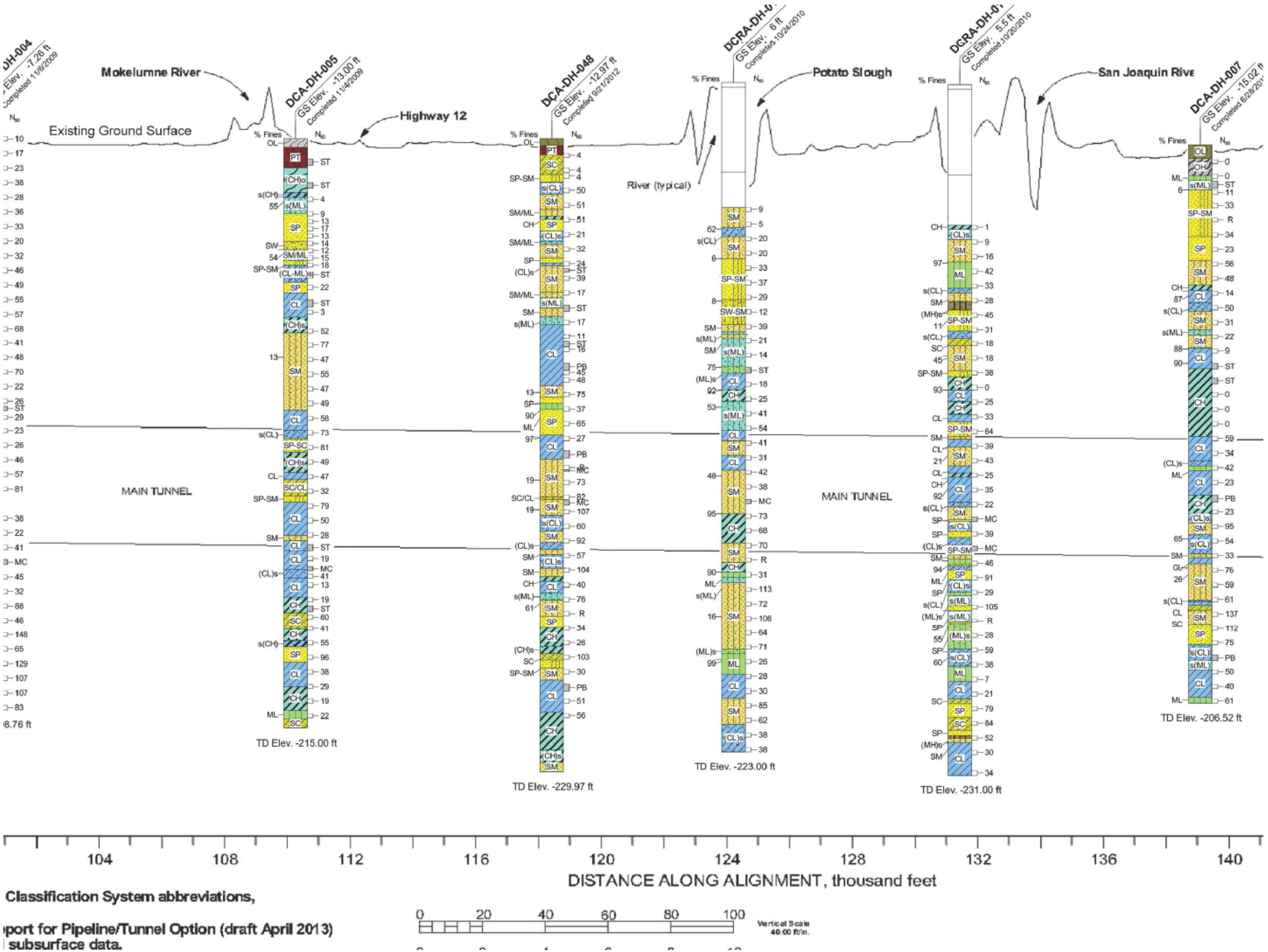
Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

Figure 9-4d
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



Sources: DWR 2009-2012 Geotechnical Data Reports; California Department of Water Resources 2015.

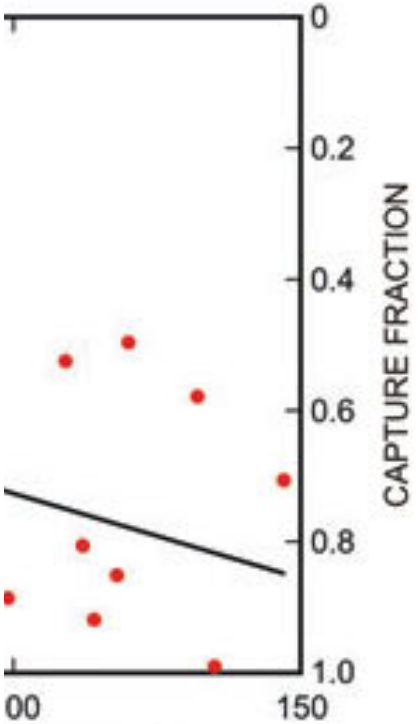
Figure 9-4e
Geologic Borehole Logs in the Vicinity of Proposed Tunnels



Classification System abbreviations,

port for Pipeline/Tunnel Option (draft April 2013)
subsurface data.

AquAlliance Exhibit 213



annual precipitation and capture fractions owing a best-fit linear).

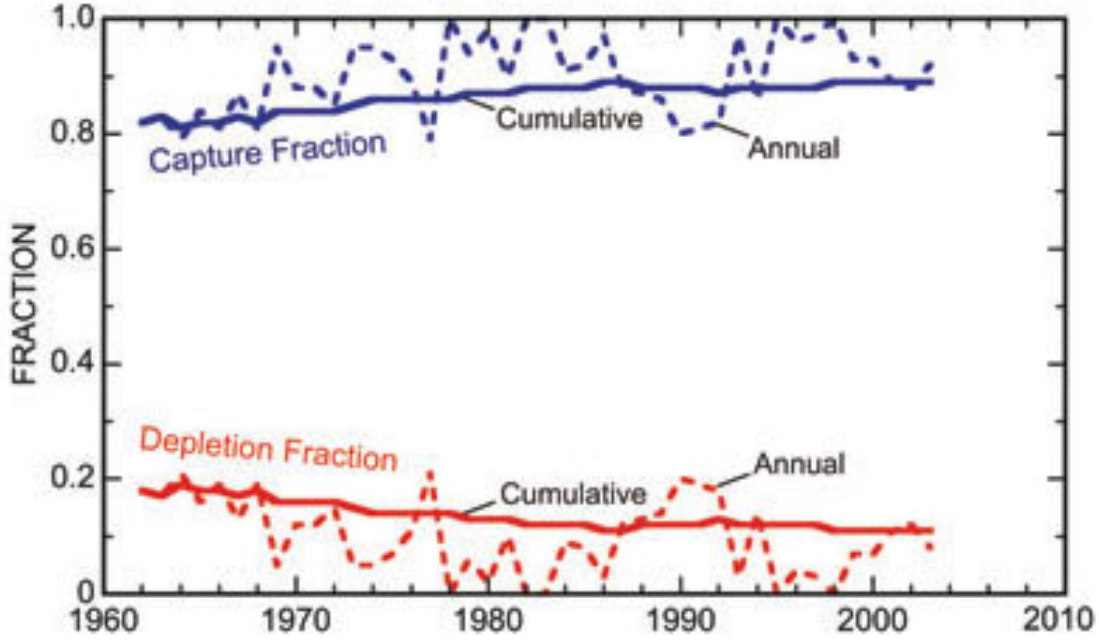
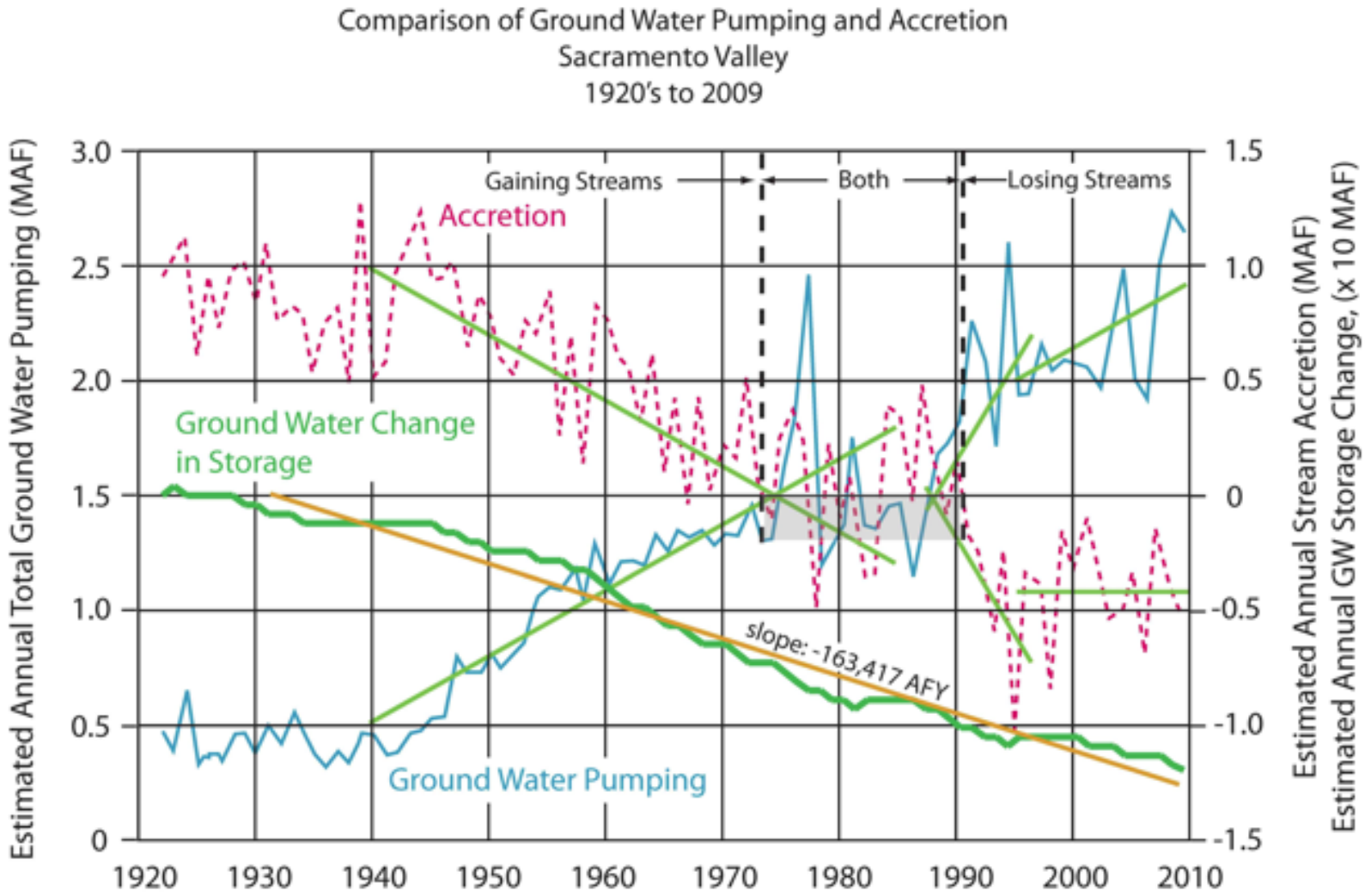


Figure 14. Results of water budget calculations of the Central Valley, California, calibrated groundwater-flow model (Faunt et al. 2009b), showing storage depletion (red) and capture (blue) fractions (solid lines for cumulative fractions; dashed lines for annual rates).

and 0.82, respectively. But over the 42-year simulation period, the fractional rates did not change greatly, as

AquAlliance Exhibit 18



Changes in Accretion, Ground Water Pumping and Ground Water Storage

1. 1920's: ~+953 TAFY accretion with ~+451 TAFY gw pumping = ~ 1,400 TAFY loss in gw storage
2. Late 1960's to Early 1970's: first zero accretion occurs with ~1,300 to ~1,500 TAFY gw pumping
3. 1920' to 2009: ~ +953 TAFY accretion to ~ - 445 TAFY accretion = ~ 1,400 TAFY difference
4. Slope of Accretion 1940 to mid-1970's ~ -27,000 AFY; late 1980's to mid-1990's ~ - 85,000 AFY; ratio ~ 3X
5. 1940 to mid-1970s' and late 1980's to mid 1990's slopes of ground water pumping increases are mirror images of slopes of accretion losses
6. Mid -1990's to 2010 groundwater pumping slope is similar to 1940 to mid-1970's, but accretion slope is flat.
7. Ground water change in storage ~ 12 to 14 MAF 1922 to 2009 (Figure 35, C2VSim User's Manual v. 3.02-CG, v. R374, June 2013,

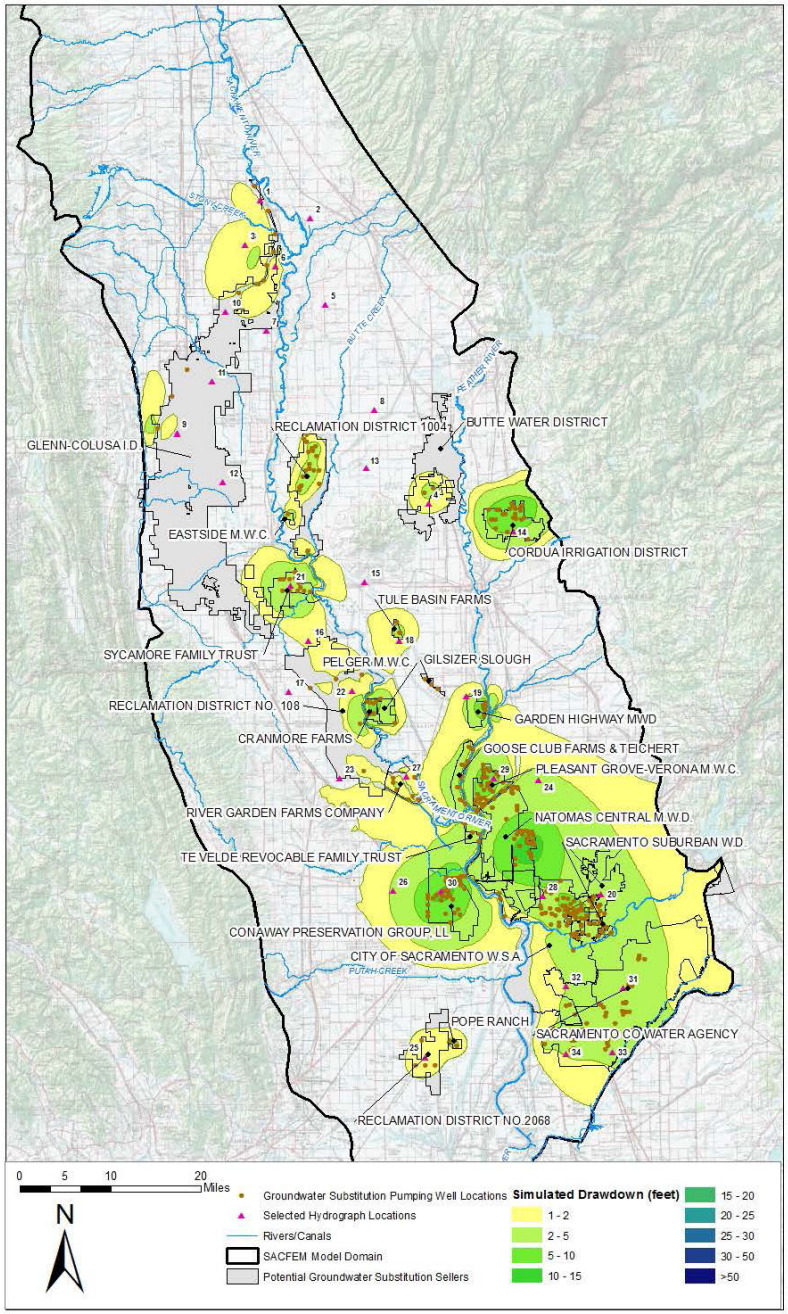
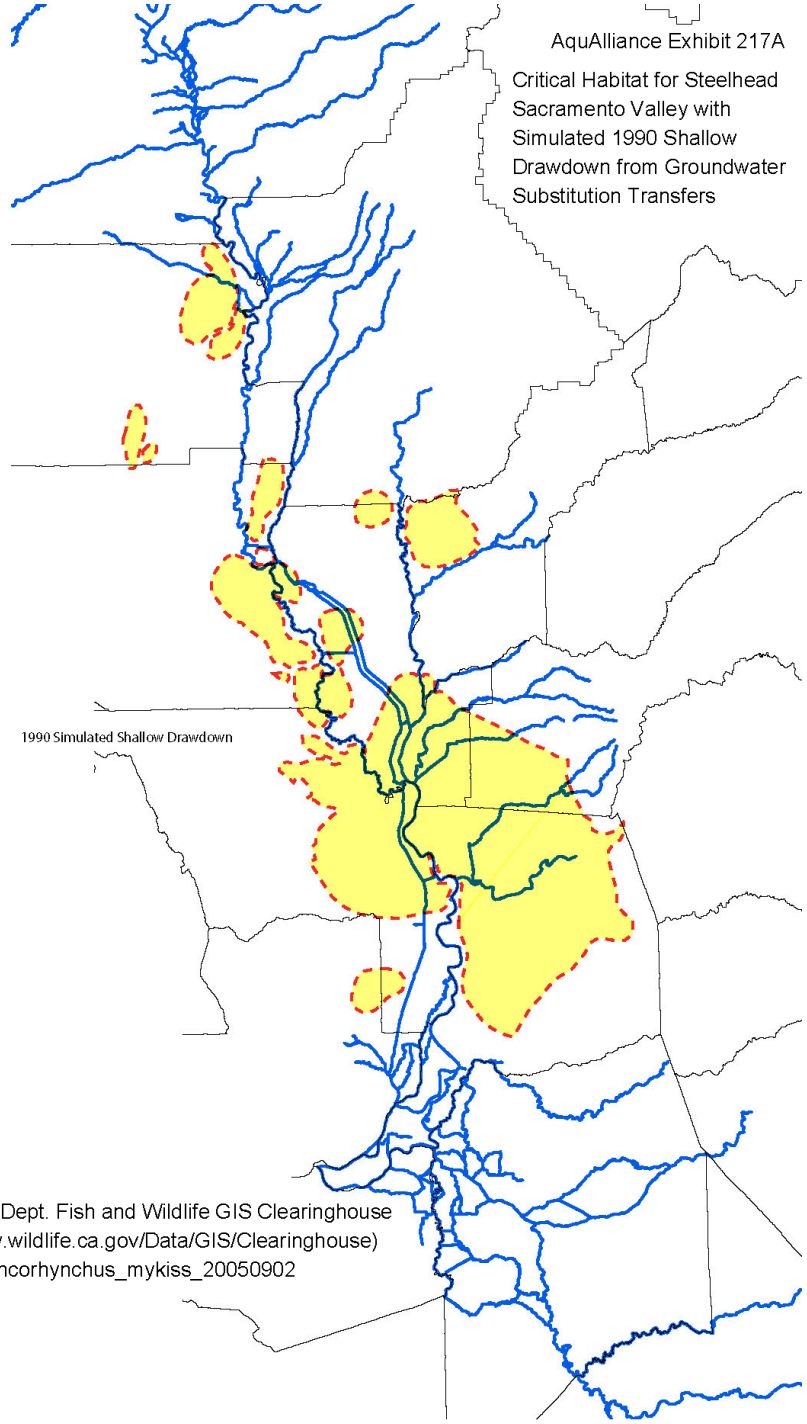


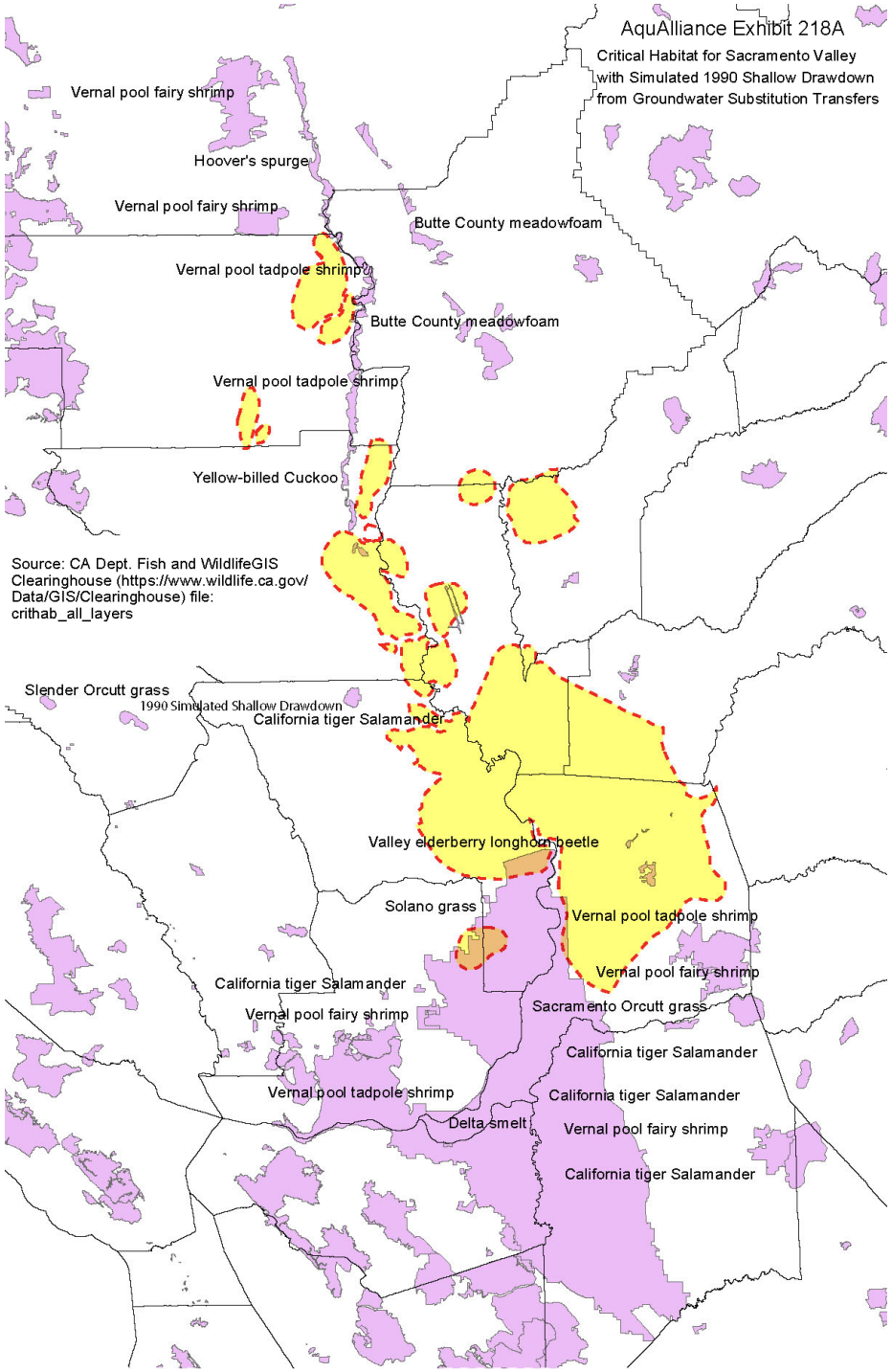
Figure 3.3-29. Simulated Change in Water Table Elevations (Aquifer Depth up to Approximately 35 feet), Based on September 1990 Hydrologic Conditions

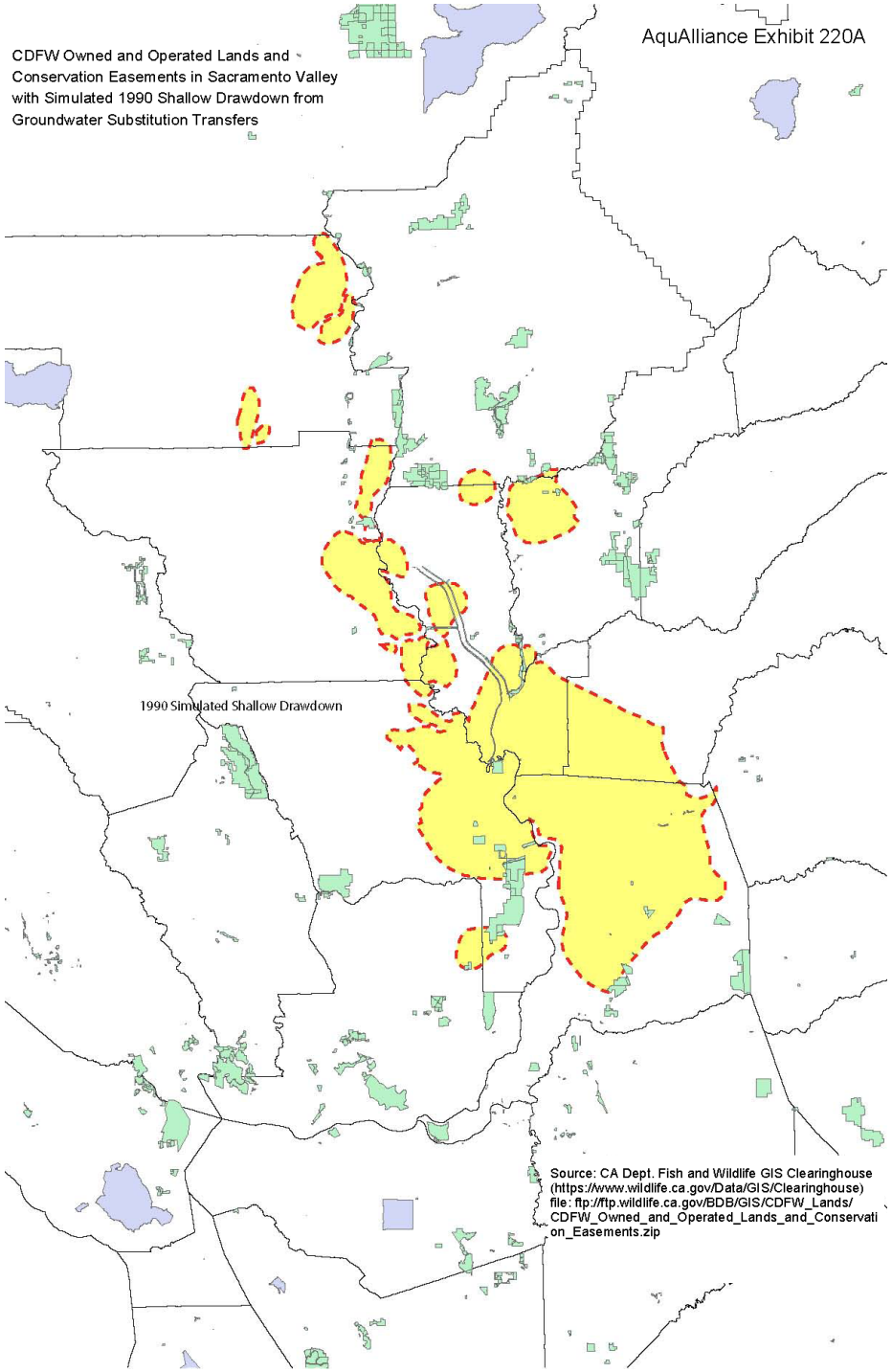
AquAlliance Exhibit 217A

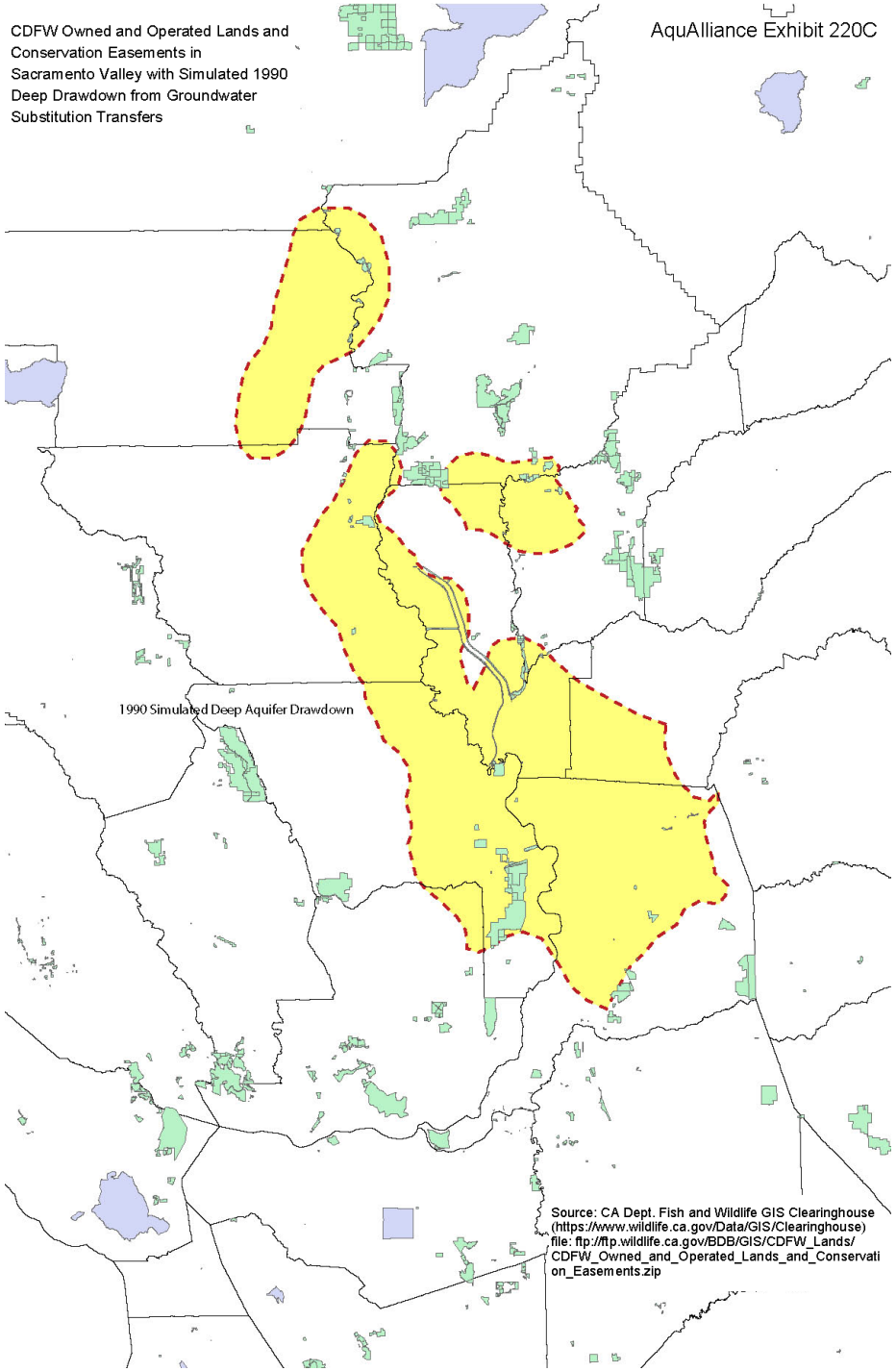
Critical Habitat for Steelhead
Sacramento Valley with
Simulated 1990 Shallow
Drawdown from Groundwater
Substitution Transfers

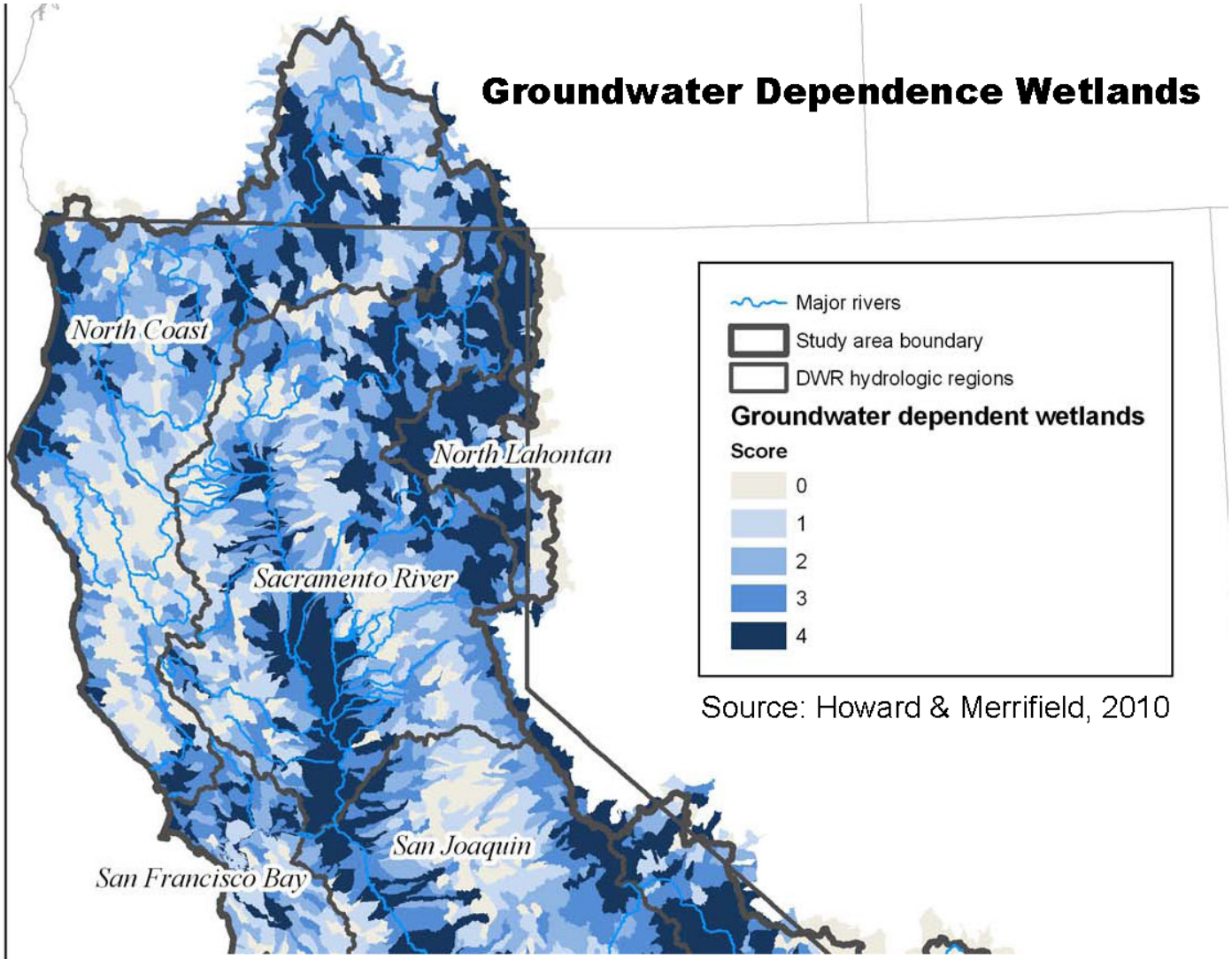


Source: CA Dept. Fish and Wildlife GIS Clearinghouse
(https://www.wildlife.ca.gov/Data/GIS/Clearinghouse)
file: FCH_Oncorhynchus_mykiss_20050902

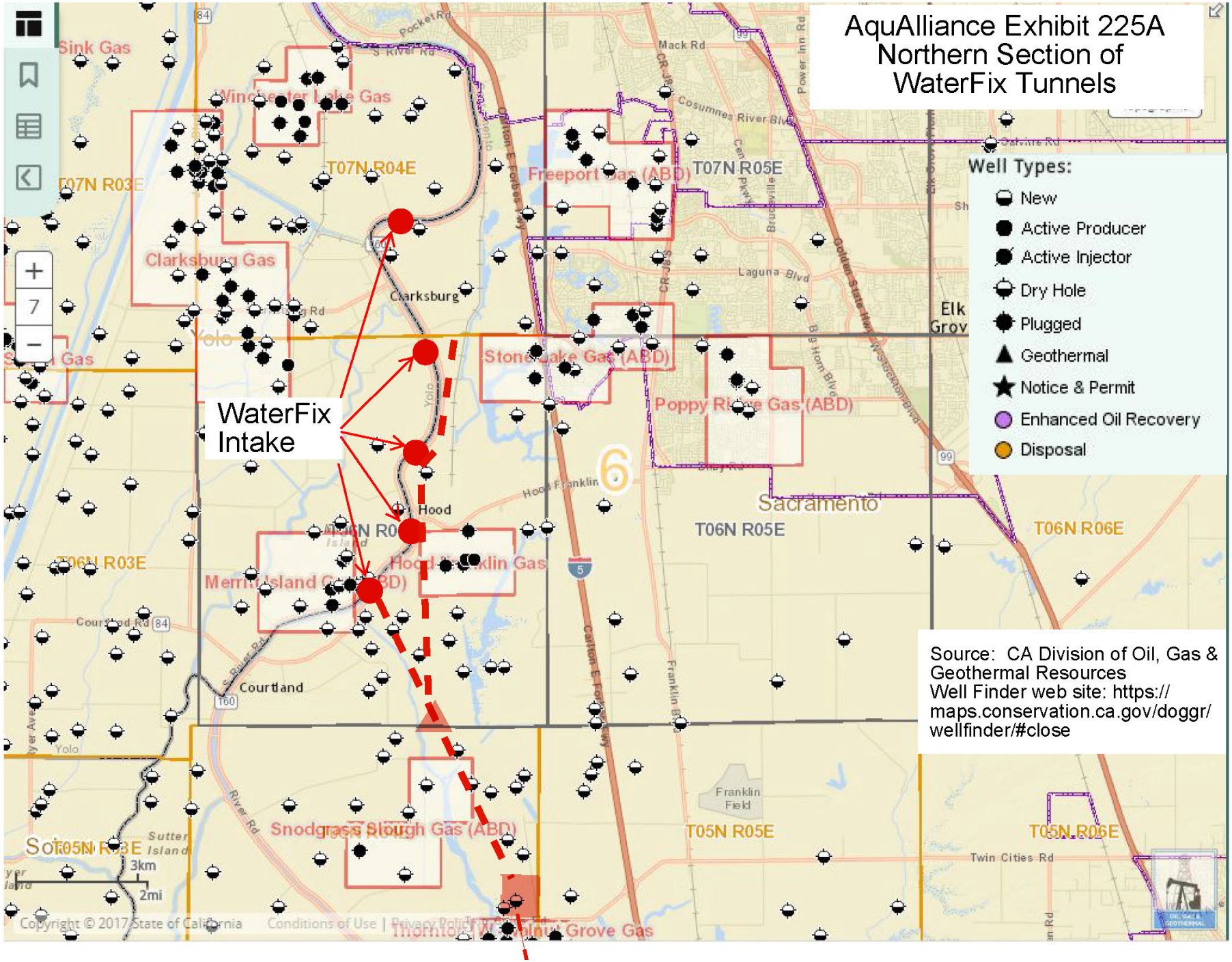

AquAlliance Exhibit 218A
Critical Habitat for Sacramento Valley
with Simulated 1990 Shallow Drawdown
from Groundwater Substitution Transfers
Vernal pool fairy shrimp
Hoover's spurge
Vernal pool fairy shrimp
Butte County meadowfoam
Vernal pool tadpole shrimp
Butte County meadowfoam
Vernal pool tadpole shrimp
Yellow-billed Cuckoo
Source: CA Dept. Fish and WildlifeGIS Clearinghouse (https://www.wildlife.ca.gov/Data/GIS/Clearinghouse) file: crithab_all_layers
Slender Orcutt grass
1990 Simulated Shallow Drawdown
California tiger Salamander
Valley elderberry longhorn beetle
Solano grass
Vernal pool tadpole shrimp
Vernal pool fairy shrimp
California tiger Salamander
Vernal pool fairy shrimp
Sacramento Orcutt grass
California tiger Salamander
Vernal pool tadpole shrimp
California tiger Salamander
Delta smelt
Vernal pool fairy shrimp
California tiger Salamander

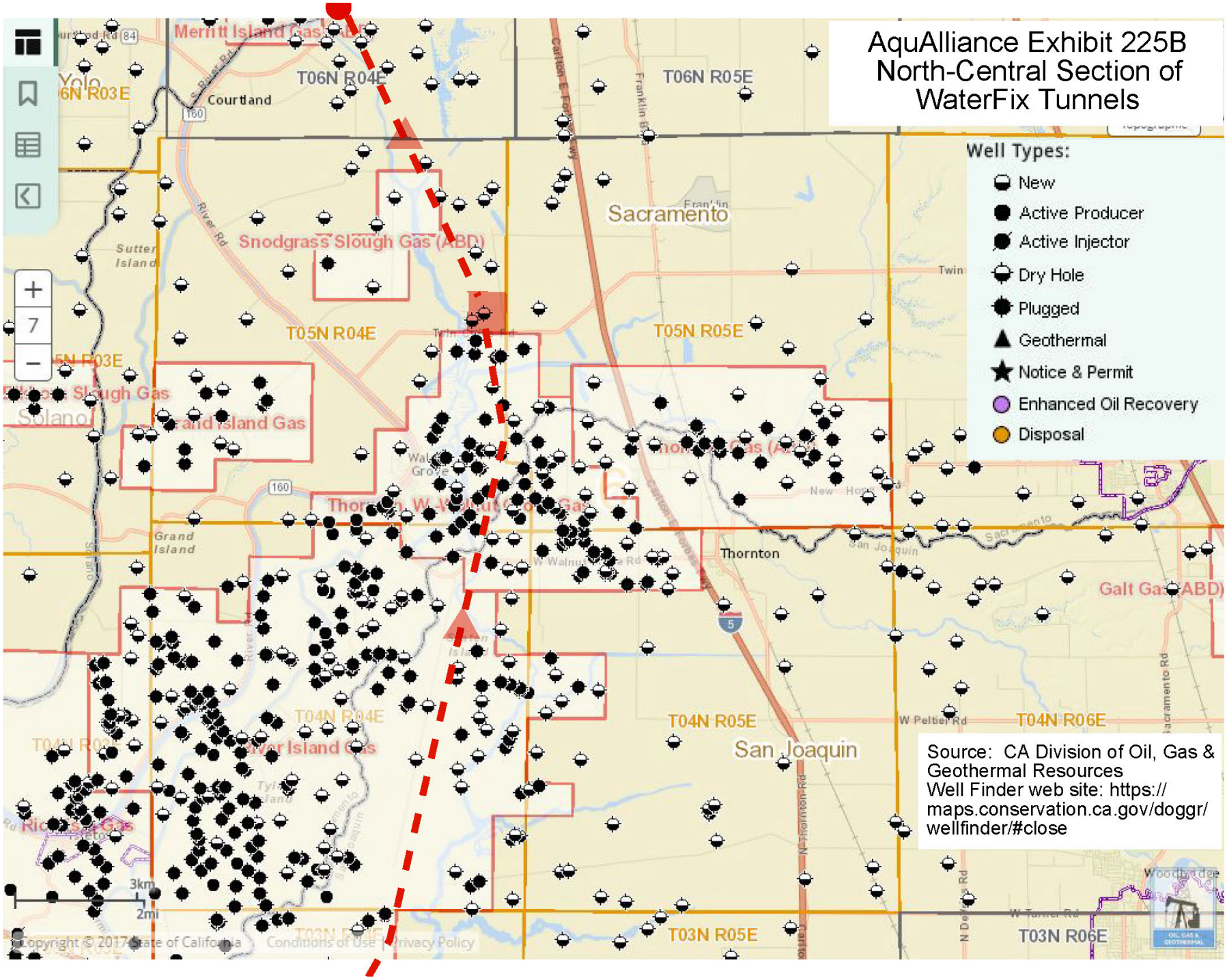

AquAlliance Exhibit 220A
CDFW Owned and Operated Lands and Conservation Easements in Sacramento Valley with Simulated 1990 Shallow Drawdown from Groundwater Substitution Transfers
1990 Simulated Shallow Drawdown
Source: CA Dept. Fish and Wildlife GIS Clearinghouse (https://www.wildlife.ca.gov/Data/GIS/Clearinghouse) file: ftp://ftp.wildlife.ca.gov/BDB/GIS/CDFW_Lands/CDFW_Owned_and_Operated_Lands_and_Conservation_Easements.zip


CDFW Owned and Operated Lands and Conservation Easements in Sacramento Valley with Simulated 1990 Deep Drawdown from Groundwater Substitution Transfers
AquAlliance Exhibit 220C
1990 Simulated Deep Aquifer Drawdown
Source: CA Dept. Fish and Wildlife GIS Clearinghouse (https://www.wildlife.ca.gov/Data/GIS/Clearinghouse) file: ftp://ftp.wildlife.ca.gov/BDB/GIS/CDFW_Lands/CDFW_Owned_and_Operated_Lands_and_Conservation_Easements.zip



Map of density of groundwater dependent wetlands and vegetation alliances in California. Map represents of density of groundwater dependent wetlands and vegetation alliances per HUC12 unit. HUCs were ranked as quartiles as follows: 1 = (.0475–1.97 ha/1,000ha); 2 = (1.99–7.842 ha/1,000ha); 3 = (7.844–24.808/1,000ha); 4 = 24.81–81. 080 ha/1,000 ha.


AquAlliance Exhibit 225A
Northern Section of
WaterFix Tunnels
WaterFix
Intake
Well Types:
New
Active Producer
Active Injector
Dry Hole
Plugged
Geothermal
Notice & Permit
Enhanced Oil Recovery
Disposal
Source: CA Division of Oil, Gas & Geothermal Resources
Well Finder web site: https://maps.conservation.ca.gov/doggr/wellfinder/#close
Sink Gas
Winchester Lake Gas
T07N R04E
T07N R03E
T07N R05E
Freeport Gas (ABD)
Clarksburg Gas
Clarksburg
Stone Lake Gas (ABD)
Poppy Ridge Gas (ABD)
Elk Grove
Sacramento
T06N R05E
T06N R06E
T06N R03E
Hood
Hood Franklin Gas
Courtland
Snodgrass Slough Gas (ABD)
T05N R05E
T05N R06E
Franklin Field
Twin Cities Rd
Thornton West Walnut Grove Gas
Copyright © 2017 State of California
Conditions of Use | Privacy Policy


AquAlliance Exhibit 225B
North-Central Section of
WaterFix Tunnels
Well Types:
New
Active Producer
Active Injector
Dry Hole
Plugged
Geothermal
Notice & Permit
Enhanced Oil Recovery
Disposal
Source: CA Division of Oil, Gas & Geothermal Resources
Well Finder web site: https://maps.conservation.ca.gov/doggr/wellfinder/#close
T06N R04E
T06N R05E
T05N R04E
T05N R05E
T04N R04E
T04N R05E
T04N R06E
T03N R05E
T03N R06E
Courtland
Sacramento
Thornton
San Joaquin
Snodgrass Slough Gas (ABD)
Merritt Island Gas (ABD)
Galt Gas (ABD)
Copyright © 2017 State of California Conditions of Use | Privacy Policy