for nitrate and other constituents is focused on domestic wells (see **Sections 2.4.4**, **6.6.2.1.1**, **6.6.2.2**, and **7.1.4**); access to well data will be coordinated through the Valley Water Collaborative, which is implementing the NCP in the Modesto Subbasin. Outreach and well registration activities being applied in other subbasins will also be considered for the Modesto Subbasin.

9.6. CLOSING

The GSP implementation activities are designed to identify and document steps for successful implementation. Collectively, the sustainable management criteria, monitoring networks, and projects and management actions are anticipated to achieve the Modesto Subbasin sustainability goal. Although it is recognized that more information and actions will be needed over time, the GSAs will incorporate an adaptive management approach to prioritize activities based on best available information and document those activities and data through continued outreach and annual reporting.

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10. REFERENCES

Ayers, R.S., and Westcot, D.W., 1994, Water Quality for Agriculture, Chapter 4: Toxicity Problems, Food and Agriculture Organization (FAO) of the United Nations, FAO Irrigation and Drainage Paper, 29 Rev.1, https://www.fao.org/3/t0234e/T0234E05.htm#ch4.

Bartow, A., 1991, The Cenozoic Evolution of the San Joaquin Valley, California, U.S. Geological Survey Professional Paper 1501, https://pubs.usgs.gov/pp/1501/report.pdf.

Bauder, T.A., Waskom, P.L., Sutherland, P.L., Davis, J.G., 2014, Irrigation Water Quality Criteria, Irrigation Water Quality Criteria, Fact Sheet No. 0506, Crop Series / Irrigation, Colorado State University Extension, https://extension.colostate.edu/docs/pubs/crops/00506.pdf

Belitz, K., Dubrovsky, N.M., Burow, K.R., Jurgens, B., and Johnson, T., 2003, Framework for a ground-water quality monitoring and assessment program for California: U.S. Geological Survey Water-Resources Investigations Report 03-4166, 78 p, http://pubs.usgs.gov/wri/wri034166/.

Bookman-Edmonston, 2005, Integrated Regional Groundwater Management Plan for the Modesto Subbasin, Stanislaus and Tuolumne Rivers Groundwater Basin Association, June, https://www.mid.org/water/irgmp/default.html.

Burow, K.R., Shelton, J.L., Hevesi, J.A., and Weissmann, G.S., 2004, Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2004-5232, https://pubs.usgs.gov/sir/2004/5232/sir_2004-5232.pdf .

Burton, C.A., Shelton, J.L., and Belitz, Kenneth, 2012, Status and understanding of groundwater quality in the two southern San Joaquin Valley study units, 2005–2006—California GAMA Priority Basin Project: U.S. Geological Survey Scientific Investigations Report 2011–5218, 150 p, https://pubs.usgs.gov/sir/2011/5218/.

California Data Exchange Center (CDEC), 2018, Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices, http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST.

California Department of Health Services, 1999, MCL Evaluation for 1,2-dibromo-3-chloropropane (DBCP), Division of Drinking Water and Environmental Management, Final Draft, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/mclreview/DBCP-MCLevaluation.pdf.

California Department of Water Resources (DWR), 2003. California's Groundwater, Bulletin 118 Update 2003, October, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/Statewide-Reports/Bulletin_118_Update_2003.pdf .

California Department of Water Resources (DWR), 2006, San Joaquin Valley Groundwater Basin, Turlock Subbasin, California's Groundwater Bulletin 118, Groundwater Basin Descriptions, updated January 20, 2006, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Bulletin-118/Files/2003-Basin-Descriptions/5_022_03_TurlockSubbasin.pdf

California Department of Water Resources (DWR), 2010, California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting, December 2010, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/CASGEM/Files/CASGEM-Procedures-for-Monitoring-Entity-Reporting-Final-121610_ay_19.pdf.

California Department of Water Resources (DWR) , 2016a. Best Management Practices for the Sustainable Management of Groundwater Water Budget, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-4-Water-Budget_ay_19.pdf.

California Department of Water Resources (DWR), 2016b, Best Management Practices for the Sustainable Management of Groundwater, Monitoring Networks and Identification of Data Gaps, December, https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents.

California Department of Water Resources (DWR), 2016c, Best Management Practices for the Sustainable Management of Groundwater, Monitoring Protocols, Standards, and Sites, December, https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents.

California Department of Water Resources (DWR), 2017, Draft Best Management Practices for the Sustainable Management of Groundwater, Sustainable Management Criteria, November, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents/Files/BMP-6-Sustainable-Management-Criteria-DRAFT_ay_19.pdf

California Department of Water Resources (DWR), 2018a, Draft 2018 Basin Prioritization Results, May 18, https://water.ca.gov/-/media/DWR-Website/Web-

Pages/Programs/Groundwater-Management/Basin-Prioritization/Files/2018-SGMA-Basin-Prioritization-Process-and-Results-Document_ay_19.pdf .

California Department of Water Resources (DWR), 2018b, Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development, https://groundwaterexchange.org/wp-content/uploads/2020/09/Climate-Change-Guidance_Final_ay_19.pdf.

California Department of Water Resources (DWR), 2018c, SGMA Climate Change Resources, https://data.cnra.ca.gov/dataset/sgma-climate-change-resources.

California Department of Water Resources (DWR), 2018d, Summary of the "Natural Communities Commonly Associated with Groundwater" Dataset and Online Web Viewer, April, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Statewide-Reports/Natural-Communities-Dataset-Summary-Document_ay_19.pdf.

California Department of Water Resources (DWR), 2019a, SGMA 2019 Basin Prioritization, https://www.emwd.org/sites/default/files/file-attachments/sgma_basin_prioritization_2019_results.pdf?1559164669.

California Department of Water Resources (DWR), 2019b, SGMA Data Viewer, https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer

California Department of Water Resources (DWR), 2020, Draft Handbook for Water Budget Development, February, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Water-Budget-Handbook.pdf.

California Department of Water Resources (DWR) Water Management Planning Tool, 2018, https://gis.water.ca.gov/app/boundaries/.

California Department of Water Resources Well Completion Report Map Application, 2021, https://www.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37.

CH2M Hill, 2005, OID Water Resources Plan, Summary Report, November.

City of Modesto, 2008, Final Urban Area General Plan, October 14, https://www.modestogov.com/DocumentCenter/View/6625/Chapter-I-Introduction-to-the-Modesto-Urban-Area-General-Plan.

City of Riverbank, 2009, City of Riverbank General Plan, 2002-2025, https://www.riverbank.org/DocumentCenter/View/236/2005-2025-Riverbank-General-Plan-Adopted-April-2009-.

County of Stanislaus, 2016, Stanislaus County General Plan 2015, Adopted August 23, http://www.stancounty.com/bos/agenda/2016/20160823/PH910_Attach2_ExC_Part1.pdf.

Creely, S., and Force, E.R., 2007, Type Region of the Ione Formation (Eocene), Central California: Stratigraphy, Paleography, and Relation to Auriferous Gravels, USGS Open-File Report 2006-1378, https://pubs.usgs.gov/of/2006/1378/.

Dale, R.H., French, J.J., and Gordon, G.V., 1966, Ground-Water Geology and Hydrology of the Kern River Alluvial-Fan Area, California, USGS Open-File Report, June 20, https://pubs.er.usgs.gov/publication/ofr6621.

Davids Engineering, Inc., 2016, 2015 Agricultural Water Management Plan, Oakdale Irrigation District, March, https://www.oakdaleirrigation.com/files/52c08212b/OID+2015+AWMP.pdf.

East San Joaquin Water Quality Coalition (ESJWQC), 2018, https://www.esjcoalition.org/about/

East San Joaquin Water Quality Coalition (ESJWQC), 2020 Member Annual Report, https://www.esjcoalition.org/pdf/2020ESJAnnual.pdf.

EDAW, Inc., 2001, Master Plan, Tuolumne River Regional Park, prepared for the Joint Powers Authority: City of Modesto, City of Ceres, Stanislaus County, December, https://www.modestogov.com/DocumentCenter/View/12181/Tuolumne-River-Regional-Park-Master-Plan-Printable-PDF.

Environmental Defense Fund (EDF), 2021, Advancing Strategic Land Repurposing and Groundwater Sustainability in California, March.

ESA, 2013, Oakdale 2030 General Plan, prepared for The City of Oakdale, Adopted August 8, https://drive.google.com/file/d/0B8bSmVI_fyceWjJTS2g4c2ZvaFU/view?resourcekey=0-IVT_NlY3ccqT5LriVADa5w.

Faunt, C.C., Sneed, M., Traum, J., Brandt, J.T., 2015, Water Availability and Land Subsidence in the Central Valley, California, USA, Hydrogeol J, November 15, https://link.springer.com/content/pdf/10.1007/s10040-015-1339-x.pdf.

Friant Water Authority (FWA), 2018, A Path Forward to Repair the Friant-Kern Canal, November 19, https://friantwater.org/waterline/2018/11/19/a-path-forward-to-repair-the-friant-kern-canal.

Galloway, D., Jones, D.R., Ingebritsen, S.E., 1999, Land Subsidence in the United States, U.S. Geological Survey Circular 1182, https://pubs.usgs.gov/circ/1999/1182/report.pdf.

Grattan, S, 2002, Irrigation water salinity and crop production. Farm Water Quality Planning, https://anrcatalog.ucanr.edu/pdf/8066.pdf.

Gurdak, J.J., and Qi, S.L., 2012, Vulnerability of recently recharged groundwater in principal aquifers of the United States to nitrate contamination, Environmental Science and Technology, 46, pgs. 6004-6012, doi:10.1021/es300688b.

Izbicki, J.A., Stamos, C.L., Metzger, L.F., Halford, K.J., Kulp, T.R., and Bennett, G.L., 2008, Source, distribution, and management of arsenic in water from wells, eastern San Joaquin ground-water subbasin, California: U.S. Geological Survey Open-File Report 2008–1272, 8 p., https://pubs.usgs.gov/of/2008/1272/pdf/ofr20081272.pdf.

Jacobson James & Associates, Inc (JJ&A), 2017, Technical Memorandum, Stanislaus County Hydrologic Model: Development and Forecast Modeling, Stanislaus County, December 20.

Jacobson James & Associates, Inc. (JJ&A) and Formation Environmental, 2019, Draft remedial investigation feasibility study workplan, City of Modesto Well Field RIFS, Prepared for City of Modesto Utilities Department by JJ&A and Formation Environmental, April 26, 2019.

Jurgens, B.C., Burow, K.R., Dalgish, B.A., and Shelton, J.L., 2008, Hydrogeology, water chemistry, and factors affecting the transport of contaminants in the zone of contribution of a public-supply well in Modesto, eastern San Joaquin Valley, California: U.S. Geological Survey Scientific Investigations Report 2008-5156, 78 p., https://pubs.usgs.gov/sir/2008/5156/.

Jurgens, B.C., Fram, M.S., Belitz, K., Burow, K.R., and Landon, M.K., 2009, Effects of Groundwater Development on Uranium: Central Valley, California, USA: Groundwater 48(6), 10.1111/j.1745-6584.2009.00635.x, pages 913-928, https://ca.water.usgs.gov/pubs/2010/JurgensEtAl2010.pdf.

KSN Inc., 2016, City of Riverbank 2015 Urban Water Management Plan, Final, October 17.

Landon, M.K., Belitz, K., Jurgens, B.C., Kulongoski, J.T., and Johnson, T.D., Status and understanding of groundwater quality in the Central–Eastside San Joaquin Basin, 2006: California GAMA Priority Basin project. Scientific Investigations Report (SIR) 2009–5266, https://pubs.er.usgs.gov/publication/sir20095266.

Lankford, B., Closas, A., Dalton, J., Gunn, E.L., Hess, T., Knox, J.W., Van Der Kooij, S., Lautze, J., Molden, D., Orr, S. and Pittock, J., 2020, A scale-based framework to understand the

promises, pitfalls and paradoxes of irrigation efficiency to meet major water challenges. *Global Environmental Change*, *65*, p.102182.

Luhdorff & Scalmanini Consulting Engineers (LSCE), James Borchers, and Michael Carpenter, 2014, Report of Findings: Land Subsidence from Groundwater Use in California, April, https://cawaterlibrary.net/wp-content/uploads/2017/04/1397858208-SUBSIDENCEFULLREPORT_FINAL.pdf.

Marchand, D.E., 1980, Preliminary Geologic Maps Showing Quaternary Deposits of the Ceres, Denair and Montpelier 7 ½ Quadrangles, Stanislaus and Merced Counties, California, United States Department of the Interior Geological Survey Open-file report 80-607, https://pubs.er.usgs.gov/publication/ofr80607.

MCR Engineering, 2015, City of Oakdale Urban Water Management Plan, 2010 Update, July.

Modesto Irrigation District (MID), 2021,Historical Season Rainfall, https://www.mid.org/weather/historical.jsp.

Moran, T. and Belin, A., 2019, A Guide to Water Quality Requirements Under the Sustainable Groundwater Management Act, Stanford Water in the West, Spring, https://stacks.stanford.edu/file/druid:dw122nb4780/A%20Guide%20to%20Water%20Quality%20Requirements%20under%20SGMA.pdf#:~:text=WATER%20IN%20THE%20WEST%20A%20Guide%20to%20Water,develop%20minimum%20thresholds%20that%20address%20water%20quality%20degradation.

Page, R.W. and Balding, G.O., 1973, Geology and Quality of Water in the Modesto-Merced Area, San Joaquin Valley, California, with a Brief Section on Hydrology, U.S. Geological Survey, prepared in cooperation with the California Department of Water Resources. Water-Resources Investigation 6-73, September, https://pubs.usgs.gov/wri/1973/0006/report.pdf.

Page, R.W., 1973, Base of Fresh Ground Water (Approximately 3,000 Micromhos in the San Joaquin Valley, California, USGS Hydrologic Investigations Atlas HA-489, https://pubs.er.usgs.gov/publication/ha489.

Page, R. W., 1977, Guide for Data Collection to Calibrate a Predictive Digital Ground-water Model of the Unconfined Aquifer in and Near the City of Modesto, California: U.S. Geologic Survey Water-Resources Investigations report, 76-41, 46 pg, https://pubs.usgs.gov/wri/1976/0041/report.pdf.

Phillips, S.P., Rewis, D.L., Traum, J.A., 2015, Hydrologic Model of the Modesto Region, California, 1960-2004, U.S. Geological Survey Scientific Investigations Report (SIR) 2015-5045, https://doi.org/10.3133/sir20155045.

PRISM Climate Group, 2021, PRISM Climate Data https://prism.oregonstate.edu/.

Provost & Pritchard, 2015, Agricultural Water Management Plan, 2015 Update for the Modesto Irrigation District, December, https://www.mid.org/water/irrigation/documents/MID2015AWMPFinal.pdf.

Shelton, J.L., Pimentel, I., Fram, M.S., and Belitz, K., 2008, Ground-Water Quality Data in the Kern County Subbasin Study Unit, 2006—Results from the California GAMA Program, U.S. Geological Survey in cooperation with the California State Water Resources Control Board, USGS Data Series 337, 75 p., http://pubs.usgs.gov/ds/337/.

Smith, R., Knight, R., and Fendorf, S., 2018, Overpumping leads to California groundwater arsenic threat, Nature Communications 9(1), December, https://www.nature.com/articles/s41467-018-04475-3.pdf.

Soil Survey Staff, 2003, Soil Service Geographic Database(SSURGO), Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey, https://websoilsurvey.nrcs.usda.gov/.

State Water Resources Control Board, State of California (SWRCB), 2017, Groundwater Information Sheet – Tetrachloroethylene (PCE), Division of Water Quality, GAMA Program, 8 p., https://www.waterboards.ca.gov/water_issues/programs/gama/docs/coc_pce.pdf.

State Water Resources Control Board, State of California (SWRCB), 2018, Order WQ 2018-002, In the Matter of Review of Waste Discharge Requirements General Order No. R5-2012-0116 for Growers Within the Eastern San Joaquin River Watershed that are Members of the Third-Party Group, Issued by the California Regional Water Quality Control Board, Central Valley Region, SWRC/OCC Files A-2239(a)-(c), https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2018/wqo2018_0002_with_data_fig1_2_appendix_a.pdf.

State Water Resources Control Board, State of California (SWRCB), 2019, 1,2,3-Trichloropropane, https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.html.

State Water Resources Control Board, State of California (SWRCB), 2021, GeoTracker Online Database, https://geotracker.waterboards.ca.gov/.

Stollenwerk, K.G., 2003, Geochemical processes controlling transport of arsenic in groundwater, a review of adsorption, in Welch, A.H., and Stollenwerk, K.G., eds., Arsenic in groundwater—geochemistry and occurrence: Boston, Kluwer Academic Publishers, 488 p., https://pubs.er.usgs.gov/publication/70198531.

The Nature Conservancy, 2018, Groundwater Dependent Ecosystems under the Sustainable Groundwater Management Act, Guidance for Preparing Groundwater Sustainability Plans, January, https://www.scienceforconservation.org/assets/downloads/GDEsUnderSGMA.pdf.

The Nature Conservancy (TNC), 2019, Identifying GDEs under SGMA, Best Practices for using the NC Dataset, July.

Todd Groundwater (Todd), 2016, Groundwater Characterization and Recharge Study, June.

Towill, Inc. (Towill), 2021, InSAR Data Accuracy for California Groundwater Basins, CGPS Data Comparative Analysis, January 2015 to October 2020, https://data.cnra.ca.gov/dataset/tre-altamira-insar-subsidence/resource/a1949b59-2435-4e5d-bb29-7a8d432454f5

Viers, J.H., Liptzin, D., Rosenstock, T.S., Jensen, V.B., Hollander, A.D., McNally, A., King, A.M., Kourakos, G., Lopez, E.M., De La Mora, N., Fryjoff-Hung, A., Dzurella, K.N., Canada, H.E., Laybourne, S., McKenney, C., Darby, J., Quinn, J.F. & Harter, T., 2012, Nitrogen Sources and Loading to Groundwater, Technical Report 2 in: Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater, Report for the State Water Resources Control Board Report to the Legislature, Center for Watershed Sciences, University of California, Davis, July, https://ucanr.edu/sites/groundwaternitrate/files/139110.pdf.

Wagner, D.L., Bortugno, E.J., and McJunking, R.D., 1991, Geologic Map of the San Francisco-San Jose Quadrangle, California, 1:250,000, https://ngmdb.usgs.gov/Prodesc/proddesc_519.htm.

Waterford Planning Department, 2007, City of Waterford General Plan Update Vision 2025, June 21, https://www.cityofwaterford.org/v5/wp-content/uploads/2018/07/General-Plan-Final.pdf.

Welch, A.H., Oremland, R.S., Davis, J.A., and Watkins, S.A., 2006, Arsenic in groundwater—A review of current knowledge and relation to the CALFED solution area with recommendations for needed research: San Francisco Estuary and Watershed Science, v. 4, no. 2, Article 4, 32 p, https://escholarship.org/uc/item/8342704q.

Welch, A.H., Westjohn, D.B., Helsel, D.R., and Wanty, R.B., 2000, Arsenic in ground water of the United States—Occurrence and geochemistry: Ground Water, v. 38, no. 4, p. 589–604.

West Yost Associates, 2011, City of Modesto & Modesto Irrigation District Joint 2010 Urban Water Management Plan, May, https://www.mid.org/water/uwmp/uwdp.html.

West Yost Associates, 2016a, City of Modesto 2015 Urban Water Management Plan, June, https://www.modestogov.com/DocumentCenter/View/4608/City-of-Modesto-Final-2015-UWMP-PDF.

West Yost Associates, 2016b, City of Turlock 2015 Urban Water Management Plan, June, https://www.cityofturlock.org/_pdf/files/2015UWMP-PublicDraft.pdf.

West Yost Associates, 2021, Joint 2020 Urban Water Management Plan, City of Modesto 2020 & Modesto Irrigation District, June, https://www.mid.org/water/uwmp/uwmp_2020/R418CityofModestoMIDFinal2020UWMP111021.pdf.

Woodard & Curran (W&C) and Provost & Pritchard (P&P), 2019, Northern and Central Delta-Mendota Regions, Groundwater Sustainability Plan, November, http://sldmwa.org/NDCP_Temporary/DM_NorthCentral_Adopted_GSP.pdf.

Woodard & Curran (W&C), 2019, Merced Groundwater Subbasin Groundwater Sustainability Plan, November, http://mercedsgma.org/assets/pdf/gsp-sections/Merced-Subbasin-GSP-no-appendices_2019-11-12.pdf.

WRIME, 2007, Recharge Characterization for Stanislaus and Tuolumne Rivers Groundwater Basin Association, Memorandum, May 2.

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Modesto Subbasin

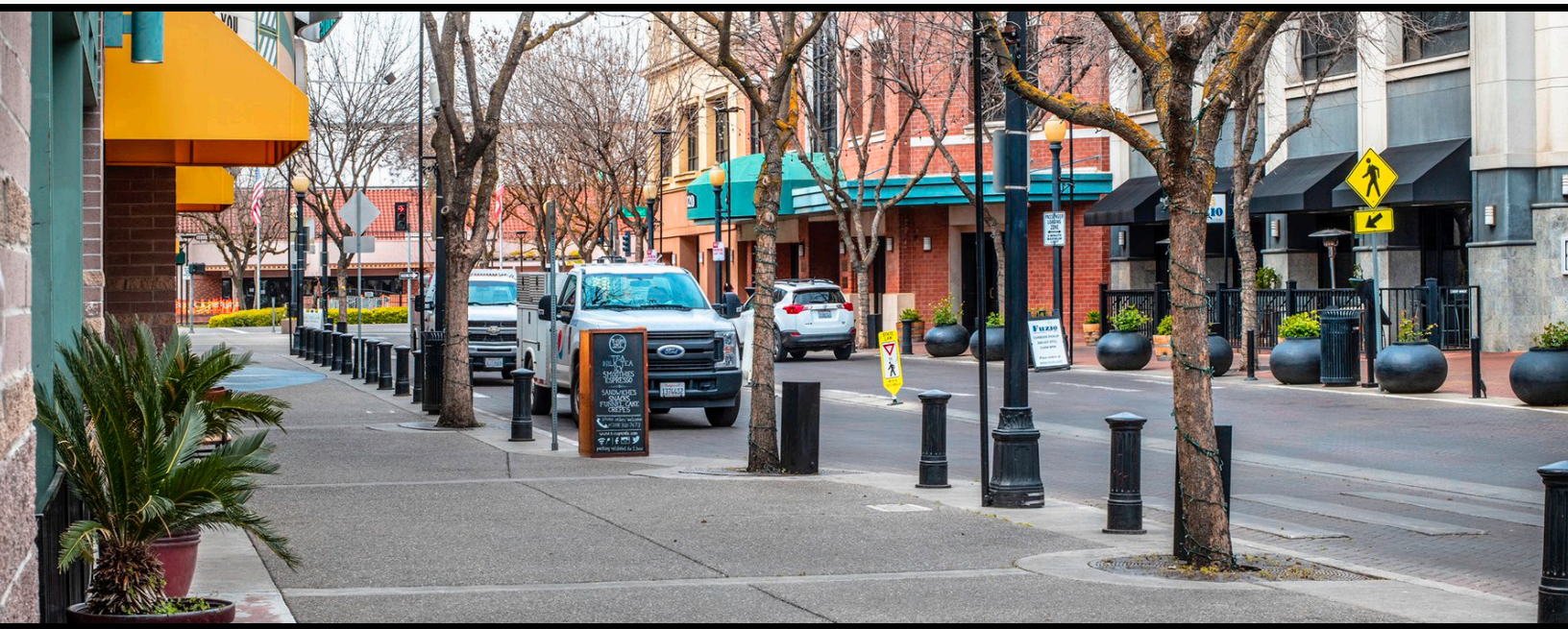
Groundwater Sustainability Plan

Appendices

Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) Groundwater Sustainability Agency

&

County of Tuolumne Groundwater Sustainability Agency



Appendix A

Notice of Intent to Prepare a GSP

Stanislaus and Tuolumne Rivers Groundwater Basin Association
Groundwater Sustainability Agency
1231 11th Street ● Modesto, CA 95354
Phone: (209) 526-7564 ● Fax: (209) 526-7352
E-mail: John.Davids@mid.org

March 14, 2018

Mr. Trevor Joseph
California Department of Water Resources
901 P Street, Room 201
P.O. Box 942836
Sacramento, CA 94236-0001

Re: Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency - Notification of Intent to Develop a Groundwater Sustainability Plan

Dear Mr. Joseph,

Pursuant to California Water Code Section 10727.8 and California Code of Regulations, Title 23, Section 353.6, the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA) hereby notifies the Department of Water Resources (DWR) of its intent to develop a Groundwater Sustainability Plan (GSP) for the Modesto Sub-basin (Sub-basin) in cooperation with other Groundwater Sustainability Agencies within the Sub-basin. The action of the STRGBA GSA authorizing the submission of this initial notification is attached.

The public may participate in the development of the GSP for the Sub-basin by attending the STRGBA GSA's monthly meetings held at the Modesto Irrigation District's offices – 1231 11th Street, Modesto, California 95354. A schedule of upcoming meetings, meeting agendas, meeting minutes and information on the GSP development process are available on the STRGBA GSA website at: www.strgba.org.

The STRGBA GSA looks forward to working collaboratively with the public and DWR staff to develop and implement the GSP for the Sub-basin. Should you have any questions or concerns regarding the information noted herein, please feel free to contact me at (209) 526-7564.

Sincerely,

John B. Davids, P.E.
STRGBA GSA Coordinator

Enclosure: STRGBA GSA February 14, 2018 Meeting Minutes

Stanislaus and Tuolumne Rivers Groundwater Basin Association
Groundwater Sustainability Agency
1231 11th Street ● Modesto, CA 95354
Phone: (209) 526-7564 ● Fax: (209) 526-7352
E-mail: John.Davids@mid.org

cc: Administration Files
Stanislaus County Board of Supervisors
City of Modesto City Council
City of Oakdale City Council
City of Riverbank City Council
City of Waterford City Council
Modesto Irrigation District Board of Directors
Oakdale Irrigation District Board of Directors

Attachment B

STRGBA Member Resolutions and Proofs of Publication of Notice

MODESTO CITY COUNCIL
RESOLUTION NO. 2017-30

RESOLUTION AUTHORIZING THE GROUNDWATER SUSTAINABILITY AGENCY MEMORANDUM OF UNDERSTANDING, AND AUTHORIZING THE CITY MANAGER, OR HIS DESIGNEE, TO EXECUTE THE MEMORANDUM OF UNDERSTANDING, AND PREPARE AND SUBMIT NOTICE OF THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY'S ELECTION TO BE THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO SUB-BASIN TO DEPARTMENT OF WATER RESOURCES

WHEREAS, in September of 2014, Governor Edmund G. Brown signed into law, the Sustainable Groundwater Management Act of 2014 (SGMA), which changed the method for groundwater management, and

WHEREAS, SGMA is a comprehensive three bill package that sets the framework for statewide sustainable groundwater management by local agencies, and

WHEREAS, SGMA requires the formation of Groundwater Sustainable Agencies (GSA) and the preparation of Groundwater Sustainability Plans (GSP) with a focus on long-term sustainability, and

WHEREAS, formation of a GSA must occur no later than June 30, 2017, and development and adoption of a GSP must be adopted no later than January 31, 2022, for high and medium priority basins not currently in critical overdraft, and

WHEREAS, the Modesto Sub-basin (designated basin number 5-22.02 in DWR's CASGEM groundwater basin system) is designated as a high-priority basin, and

WHEREAS, SGMA authorizes a local agency, or a combination of local agencies, overlying a groundwater basin to form a GSA, and

WHEREAS, multi-agency GSAs may be formed through either a Memorandum of Understanding (MOU) or other legal agreement, and

WHEREAS, the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) member agencies are all local agencies, pursuant to SGMA's definition, and

WHEREAS, the STRGBA member agencies include the cities of Oakdale, Riverbank, Modesto, and Waterford; Stanislaus County; Oakdale Irrigation District; and Modesto Irrigation District, and

WHEREAS, since its inception in 1994, STRGBA has provided a forum for local agencies to work cooperatively to provide for coordinated planning in the pursuit of effective and sustainable management of the Modesto Sub-basin, and

WHEREAS, the STRGBA member agencies believe that the sustainable management of the Modesto Sub-basin pursuant to SGMA may best be achieved through the cooperation of the Member Agencies operating through the GSA MOU, and

WHEREAS, SGMA requires formal procedures be followed to become a GSA, and

WHEREAS, each of the local agencies electing to be a GSA must hold a noticed public hearing to receive public comment on the local agency's decision to become the GSA for the Basin, and

WHEREAS, at the conclusion of this public hearing, it is anticipated that the governing board for each local agency will authorize the execution of the **attached** GSA MOU and adopt the **attached** resolution forming the GSA for the Basin,

NOW, THEREFORE, BE IT RESOLVED by the Council of the City of Modesto that it hereby authorizing the Groundwater Sustainability Agency Memorandum of Understanding, and authorizing the City Manager, or his designee, to execute the Memorandum of Understanding, and prepare and submit notice of the Stanislaus and

Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency's election to be the Groundwater Sustainability Agency for the Modesto Sub-basin to Department of Water Resources.

BE IT FURTHER RESOLVED that the City Manager, or his designee, is hereby authorized to execute said Memorandum of Understanding on behalf of the City, and prepare and submit notice of the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency's election to be the Groundwater Sustainability Agency for the Modesto Sub-basin to Department of Water Resources.

The foregoing resolution was introduced at a regular meeting of the Council of the City of Modesto held on the 24th day of January, 2017, by Councilmember Ridenour, who moved its adoption, which motion being duly seconded by Councilmember Grewal, was upon roll call carried and the resolution adopted by the following vote:

AYES:	Councilmembers:	Ah You, Grewal, Kenoyer, Madrigal, Ridenour, Zoslocki, Mayor Brandvold
NOES:	Councilmembers:	None
ABSENT:	Councilmembers:	None

ATTEST: _____
STEPHANIE LOPEZ, City Clerk

(SEAL)

APPROVED AS TO FORM:

By: _____
ADAM U. LINDGREN, City Attorney

DECLARATION OF PUBLICATION (C.C.P. S2015.5)

COUNTY OF STANISLAUS STATE OF CALIFORNIA

I am a citizen of the United States and a resident Of the County aforesaid; I am over the age of Eighteen years, and not a party to or interested In the above entitle matter. I am a printer and Principal clerk of the publisher of THE MODESTO BEE, printed in the City of MODESTO, County of STANISLAUS, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of STANISLAUS, State of California, Under the date of February 25, 1951, Action No. 46453; that the notice of which the annexed is a printed copy, has been published in each issue there of on the following dates, to wit:

Jan 09, 2017, Jan 16, 2017

I certify (or declare) under penalty of perjury That the foregoing is true and correct and that This declaration was executed at

MODESTO, California on

January 16th, 2017

(By Electronic Facsimile Signature)

Cynthia A. Hamilton

PUBLIC NOTICE

Notice is hereby given that, pursuant to Water Code section 10723, City of Modesto will hold a public hearing during a regular meeting on Tuesday, January 24, 2017 at 5:30 P.M., in the City of Modesto Council Chambers, Basement Level, located at 1010 10th Street, Modesto, to determine whether the City of Modesto will authorize the execution of the MEMORANDUM OF UNDERSTANDING FORMING THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY and participate in the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) election to become a groundwater sustainability agency for the Modesto Groundwater Sub-Basin. Written comments may be submitted to City of Modesto at Attn: Miguel Alvarez, 1010 10th Street, Suite 4500, Modesto, CA 95353. During the hearing, City of Modesto will allow oral comments and will receive additional written comments until the STRGBA elects to be a groundwater sustainability agency.

Pub Dates 1/9/17 & 1/16/17

CASE NO. 10262602 key 86002

IN THE CITY COUNCIL
OF THE CITY OF OAKDALE
STATE OF CALIFORNIA
CITY COUNCIL RESOLUTION 2017-001

A RESOLUTION OF THE CITY OF OAKDALE CITY COUNCIL AUTHORIZING THE CITY MANAGER TO EXECUTE A MEMORANDUM OF UNDERSTANDING TO FORM THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY AND TO PREPARE AND SUBMIT NOTICE OF THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY'S ELECTION TO BE THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO SUB-BASIN (DESIGNATED BASIN NUMBER 5-22.02 IN THE CALIFORNIA DEPARTMENT OF WATER RESOURCES' CASGEM GROUNDWATER BASIN SYSTEM) TO THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

THE CITY OF OAKDALE CITY COUNCIL DOES HEREBY RESOLVE THAT:

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and,

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and,

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources' CASGEM groundwater basin system) ("Basin"), by June 30, 2017; and,

WHEREAS, SGMA permits a combination of local agencies to form a groundwater sustainability agency ("GSA") through a Memorandum of Understanding ("MOU"); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford, and the Modesto Irrigation District ("MOU Agencies") are all local agencies, as SGMA defines that term; and,

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies' creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRGBA") in 1994, which was created to ensure coordinated and effective management of the Basin; and,

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and,

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and,

WHEREAS, notice of a hearing on the MOU Agencies' decision to form a GSA for the Basin ("Notice") has been published in the Oakdale Leader as provided by law; and,

WHEREAS, on this day, the City Council of the City of Oakdale held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("GSA MOU") (attached hereto as Exhibit A) to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA ("STRGBA GSA") for the Basin; and,

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and,

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

NOW, THEREFORE, BE IT RESOLVED by the **CITY COUNCIL** of the **CITY OF OAKDALE**:

1. All the recitals in this resolution are true and correct and the City of Oakdale so finds, determines and represents.

2. The City Clerk of the City of Oakdale is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the City of Oakdale, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The City of Oakdale hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin.

4. Within thirty (30) days of the date of this resolution, the City of Oakdale City Manager is directed to provide notice of the City of Oakdale to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies' combined jurisdiction. A copy of a map of the management area is attached as Exhibit B.

6. This resolution shall take effect immediately upon passage and adoption.

CITY OF OAKDALE
City Council Resolution 2017-001

THE FOREGOING RESOLUTION IS HEREBY ADOPTED THIS 17th DAY OF JANUARY, 2017, by the following vote:

AYES:	COUNCIL MEMBERS:	Bairos, Dunlop, McCarty, Murdoch and Paul	(5)
NOES:	COUNCIL MEMBERS:	None	(0)
ABSENT:	COUNCIL MEMBERS:	None	(0)
ABSTAINED:	COUNCIL MEMBERS:	None	(0)

SIGNED:

Pat Paul, Mayor

ATTEST:

Kathy Teixeira, CMC
City Clerk

I, KATHY TEIXEIRA, City Clerk of the City of Oakdale, DO HEREBY CERTIFY that foregoing Resolution 2017-001 was duly passed and adopted by the City Council of the City of Oakdale at a regular meeting held on the 17th day of January 2017.

IN WITNESS WHEREOF, I have hereby set my hand and affixed the seal of the City of Oakdale this 25th day of January 2017.

KATHY TEIXEIRA, CMC
CITY CLERK

PROOF OF PUBLICATION

(2015.5 C. C. P.)

STATE OF CALIFORNIA,

County of Stanislaus

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE OAKDALE LEADER, 122 South Third Avenue, Oakdale, California, a newspaper of general circulation, published in Oakdale, California in the City of Oakdale, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

January 4, 11, in the year 2017

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

Dated at Oakdale,

This 11th day of January 2017.

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication of

PUBLIC HEARING (STRGBA)

PUBLIC NOTICE
NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that pursuant to California Water Code section 10723 the City of Oakdale City Council will hold a public hearing during a regular meeting on Tuesday, January 17, 2017, in the Council Chambers, 277 North Second Avenue, at 7:00 p.m. or as soon thereafter to determine whether City Council will authorize the execution of the MEMORANDUM OF UNDERSTANDING FORMING THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY and participate in the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) election to become a groundwater sustainability agency for the Modesto Groundwater Sub-Basin. Written comments may be submitted to City of Oakdale, Public Services Department, Attn: Michael Renfrow, 455 South Fifth Avenue Oakdale, CA 95361 prior to the hearing. During the hearing, Oakdale City Council will accept public testimony and will receive additional written comments until the STRGBA elects to be a groundwater sustainability agency. If a challenge to the above application is made in court, persons may be limited to raising only those issues they or someone else raised at the Public Hearing described in the notice, or in written correspondence delivered to the City Council.

If you have any questions, please call the Public Services Department at 845-3600, or stop by the office at 455 South Fifth Avenue.

BY ORDER OF THE OAKDALE CITY COUNCIL
KATHY TEIXEIRA, CMC
City Clerk
DATED: December 22, 2016
January 4, 11, 2017
OL #17-001

CITY OF RIVERBANK

RESOLUTION NO. 2017-005

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIVERBANK, CALIFORNIA, AUTHORIZING AND DIRECTING THE EXCUTION OF A MEMORANDUM OF UNDERSTANDING FORMING THE STANISLAUS AND TOLOUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and,

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and,

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources CASGEM groundwater basin system(("Basin"), by June 30, 2017; and,

WHEREAS, SGMA permits a combination of local agencies to form a groundwater sustainability agency ("GSA") through a Memorandum of Understanding ("MOU"); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, City of Riverbank, the City of Oakdale, the City of Modesto, the City of Waterford, and the Modesto Irrigation District ("MOU Agencies") are all local agencies, as SGMA defines that term; and

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRGBA") in 1994, which was created to ensure coordinated and effective management of the Basin; and

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and

WHEREAS, notice of a hearing on the MOU Agencies decision to form a GSA for the Basin ("Notice") has been published in the Riverbank News as provided by law; and

WHEREAS, on this day, the City of Riverbank City Council held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("GSA MOU") (attached here to as Exhibit A) to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA ("STRGBA GSA") for the Basin; and

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan; and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b) (5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Riverbank hereby declares that:

1. All the recitals in this resolution are true and correct and the City of Riverbank City Council so finds, determines and represents.

2. The City Clerk of the City of Riverbank is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the City of Riverbank, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The City of Riverbank hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin.

4. Within thirty (30) days of the date of this resolution, the City of Riverbank City Manager is directed to provide notice of City of Riverbank's to enter into the GSA MOU Agencies to form the GSA for the Basin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies combined jurisdiction. A copy of a map of the management area is attached as **Exhibit B.**

6. This resolution shall take effect immediately upon passage and adoption.

PASSED AND ADOPTED by the City Council of the City of Riverbank at a regular meeting held on the 24th day of January 24, 2017; motioned by Councilmember District 4 Darlene Barber-Martinez, seconded by Vice Mayor Leanne Jones Cruz, and upon roll call was carried by the following City Council vote of *4-0:

AYES: **Barber-Martinez, Campbell, Jones Cruz, and Mayor O'Brien**
NAYS: **None**
ABSENT: **None**
ABSTAINED: **None**

ATTEST:

Annabelle H. Aguilar, CMC
City Clerk

APPROVED:

Richard D. O'Brien
Mayor

Attachments: MOU and Exhibit B - Management Area Map

*Councilmember District 2 Cindy Fosi, recused herself.

CERTIFICATION
I hereby certify the foregoing is a true and correct copy of the original document on file in the office of the City Clerk of the City of Riverbank.

CITY CLERK

DATED 02/01/2017

PROOF OF PUBLICATION

(2015.5 C. C. P.)

STATE OF CALIFORNIA,

County of Stanislaus

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE RIVERBANK NEWS, 122 South Third Ave, Oakdale, California, a newspaper of general circulation, published in Riverbank, California in the City of Riverbank, County of Stanislaus, and which newspaper has been adjudged a Newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the Notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

January 11, in the year 2017

I certify or declare under penalty of perjury that the Foregoing is true and correct.

Dated at Riverbank, California

This 11th day of January 2017.

Signature

This space is for the County Clerk's Filing Stamp

Proof of Publication of

PUBLIC NOTICE
GSA/SGMA

PUBLIC NOTICE
NOTICE OF PUBLIC HEARING
City of Riverbank City Council

NOTICE IS HEREBY GIVEN that the City Council of the City of Riverbank will hold a public hearing on Tuesday, January 24, 2017, in the City Hall Council Chambers, 6707 Third Street, Suite B, Riverbank, California, at 6:00 p.m. or soon thereafter to consider and review the following matter: Whether the City Council of the City of Riverbank should elect to become a Groundwater Sustainability Agency (GSA) under the Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.) for the portion of the Modesto Sub-basin designated basin number 5-22.02 in the California Dept. of Water Resources groundwater basin system within the City of Riverbank's service area. ALL INTERESTED PARTIES are invited to attend the public hearing on January 24, 2017, at the time and place specified above to express opinions or submit evidence for or against the subject matter being considered. Written comments submitted to the City Clerk at 6707 Third Street, Suite A, Riverbank, California, 95367 or cityclerk@riverbank.org will be accepted by the City Clerk up to 5:00 p.m. on said date. Oral comments will be received by the City Council prior to the close of the Public Hearing. Any public materials of the subject matter will be made available for review at the City Clerk's office and (when technologically possible) at www.riverbank.org upon distribution to a majority of the City Council, (typically 72 hours prior to the meeting). In compliance with ADA, any person requiring special assistance to participate in the meeting should notify the Administration Dept. at (209) 863-7122 or cityclerk@riverbank.org at least 72 hours prior to the meeting. For questions regarding the proposed subject matter contact Michael Riddell, Public Works Superintendent at (209) 869-7128 or mriddle@riverbank.org, or contact the City Clerk at (209) 863-7198. Published this 11th day of January, 2017 /s/ Annabelle H. Aguilar, CMC, City Clerk, City of Riverbank

January 11, 2017
RN #17-003

WATERFORD CITY COUNCIL
RESOLUTION 2017-02

A RESOLUTION OF THE CITY COUNCIIL OF THE CITY OF WATERFORD AUTHORIZING AND DIRECTING THE EXECUTION OF A MEMORANDUM OF UNDERSTANDING FORMING THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO SUB-BASIN

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources' CASGEM groundwater basin system) ("Basin"), by June 30, 2017; and

WHEREAS, SGMA permits a combination of local agencies to form a groundwater sustainability agency ("GSA") through a Memorandum of Understanding ("MOU"); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford, and the Modesto Irrigation District ("MOU Agencies") are all local agencies, as SGMA defines that term; and

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies' creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRGBA") in 1994, which was created to ensure coordinated and effective management of the Basin; and

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and

WHEREAS, notice of a hearing on the MOU Agencies' decision to form a GSA for the Basin ("Notice") has been published in the Waterford News as provided by law; and

WHEREAS, a courtesy copy of the Notice was also mailed to the Tuolumne County Board of Supervisors; and

WHEREAS, on this day, the City Council of the City of Waterford held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("GSA MOU") (attached hereto as Exhibit A) to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA ("STRGBA GSA") for the Basin; and

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

THEREFORE, BE IT RESOLVED by the City Council of the Waterford, as follows:

1. All the recitals in this resolution are true and correct and the Waterford City Council so finds, determines and represents.

2. The City Clerk of the City of Waterford is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the City of Waterford, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The Waterford City Council hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin.

4. Within thirty (30) days of the date of this resolution, the Waterford City Manager is directed to provide notice of the City of Waterford's intent to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies' combined jurisdiction. A copy of a map of the management area is attached as Exhibit B.

6. This resolution shall take effect immediately upon passage and adoption.

WE, THE UNDERSIGNED, do hereby certify that the above and foregoing Resolution No. 2017-02 was duly adopted and passed by the City Council of the City of Waterford at a regularly scheduled meeting held on the 19th day of January, 2017, by the following vote:

AYES: 4 Van Winkle, Aldaco, Krause, Whitfield

NOES: 0

ABSENT: 1 Powell

City of Waterford

DocuSigned by:
C29072A7DE70453...
Michael Van Winkle, Mayor

ATTEST:

DocuSigned by:
Lori Martin
0E40B251B23D4F2...
Lori Martin, City Clerk

Approved as to Form:

DocuSigned by:
Corbett Browning
Corbett J. Browning, City Attorney

Affidavit of Publication

STATE OF CALIFORNIA }ss.
County of Stanislaus

Lisa Freitas

Here-un-to being first duly sworn, deposes and says that all time hereinafter mentioned he/she was a citizen of the United States over the age of twenty-one (21) years, and doing business in said county, not interested in the matter of the attached publication, and is competent to testify in said matter, that he/she was at and during all said time the principal clerk to the printer and publisher of the

WATERFORD NEWS

a legal newspaper of general circulation published weekly in Waterford in said County of Stanislaus, State of California: that said

WATERFORD NEWS

is and was at all times herein mentioned, a newspaper of general circulation as that term is defined by Section 6000 of the Government Code, and as provided by said section and so adjudicated by Decree No. 41155 by the Superior Court of Stanislaus County, State of California, is published for the dissemination of local and telegraphic news and intelligence of a general character, have a bonafide subscription list of paying subscribers, and is not devoted to the interest, or published for the entertainment or instruction of a particular class, profession, trade, calling, race of denomination: or for the entertainment and instruction of any number of such classes, professions, trades, callings, races or denominations: that at all times said newspaper has been established, in Waterford; in said County and State, at regular intervals for more than one year preceding the first publication of the notice herein mentioned, that said notice was set in type not smaller than nonpareil and was preceded with words printed in blackface type not smaller than nonpareil, describing and expressing in general terms, the purport and character of the notice intended to be given

Legal # 2381

PUBLIC HEARING NOTICE

Publish Dates: 01-03-2017 & 01-10-2017

of which named annexed is a printed copy, was published and printed in said

WATERFORD NEWS

at least 2 TIMES, commencing on the 3RD Day of JANUARY 2017 and ending on the 10TH of JANUARY 2017 the days inclusive, and as often during said time as said newspaper was regularly issued, to wit:

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.
Dated this 10TH day of JANUARY 2017

Lisa Freitas

PRINCIPAL CLERK OF THE PRINTER

Legal # 2381
PUBLIC HEARING NOTICE

Notice is hereby given that, pursuant to Water Code section 10723, the City Council of the City of Waterfod will hold a public hearing during a regular meeting on January 19, 2017, in the City Council Chambers located at 101 E Street, Waterford, CA to determine whether the City Council will authorize the execution of the MEMORANDUM OF UNDERSTANDING FORMING THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY and participate in the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) election to become a groundwater sustainability agency for the Modesto Groundwater Sub-Basin. Written comments may be submitted to City of Waterford ,Attn: Lori Martin, City Clerk, PO Box 199 / 101 E Street, Waterford, CA 95386. During the hearing, the City Council will allow oral comments and will receive additional written comments until the STRGBA elects to be a groundwater sustainability agency.
Publish dates: 01-03 & 01-10-2017

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
STATE OF CALIFORNIA

2017-69

Date: February 14, 2017

On motion of Supervisor Withrow Seconded by Supervisor Olsen
and approved by the following vote,
Ayes: Supervisors: Olsen, Withrow, Monteith, DeMartini and Chairman Chiesa
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

Item # 9:05 a.m.

THE FOLLOWING RESOLUTION WAS ADOPTED:

A RESOLUTION OF THE BOARD OF SUPERVISORS OF STANISLAUS COUNTY AUTHORIZING AND DIRECTING THE EXECUTION OF A MEMORANDUM OF UNDERSTANDING FORMING THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO GROUNDWATER SUBBASIN

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources' CASGEM groundwater basin system) ("Basin"), by June 30, 2017; and

WHEREAS, SGMA permits a combination of local agencies to form a groundwater sustainability agency ("GSA") through a Memorandum of Understanding ("MOU"); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford, and the Modesto Irrigation District ("MOU Agencies") are all local agencies, as SGMA defines that term; and

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies' creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRGBA") in 1994, which was created to ensure coordinated and effective management of the Basin; and

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and

WHEREAS, notice of a hearing on the MOU Agencies' decision to form a GSA for the Basin ("Notice") has been published in the Modesto Bee as provided by law; and

WHEREAS, a courtesy copy of the Notice was also mailed to the Tuolumne County Board of Supervisors; and

WHEREAS, on this day, the Board of Supervisors of Stanislaus County ("Board of Supervisors") held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("GSA MOU") to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA ("STRGBA GSA") for the Basin; and

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

THEREFORE, BE IT RESOLVED by the Board of Supervisors of Stanislaus County, as follows:

1. All the recitals in this resolution are true and correct and the Board of Supervisors so finds, determines and represents.

2. The Clerk of the Board of Supervisors is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the Board of Supervisors, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The Board of Supervisors hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Modesto Groundwater Subbasin.

4. Within thirty (30) days of the date of this resolution, the Board of Supervisors Chairman is directed to provide notice of the Stanislaus County Board of Supervisors intention to enter into the GSA MOU with the MOU Agencies to form the GSA for the Modesto Groundwater Subbasin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies' combined jurisdiction.

6. This resolution shall take effect immediately upon passage and adoption.

FEB 14 2017

I hereby certify that the foregoing is a full, true and correct copy of the Original entered in the Minutes of the Board of Supervisors.
ELIZABETH A. KING
Clerk of the Board of Supervisors of the County of Stanislaus, State of California
By Theresa Gonzalez

BOARD OF SUPERVISORS * STANISLAUS COUNTY CAL *

ATTEST: ELIZABETH A. KING, Clerk
Stanislaus County Board of Supervisors,
State of California
Elizabeth A. King

File No. **GSA-1-1**

DECLARATION OF PUBLICATION (C.C.P. S2015.5)

COUNTY OF STANISLAUS STATE OF CALIFORNIA

I am a citizen of the United States and a resident Of the County aforesaid; I am over the age of Eighteen years, and not a party to or interested In the above entitle matter. I am a printer and Principal clerk of the publisher of THE MODESTO BEE, printed in the City of MODESTO, County of STANISLAUS, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of STANISLAUS, State of California, Under the date of February 25, 1951, Action No. 46453; that the notice of which the annexed is a printed copy, has been published in each issue there of on the following dates, to wit:

Jan 30, 2017, Feb 06, 2017

I certify (or declare) under penalty of perjury That the foregoing is true and correct and that This declaration was executed at

MODESTO, California on

February 6th, 2017

(By Electronic Facsimile Signature)

Cynthia A. Walkenhorst

STANISLAUS COUNTY
NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on Tuesday, February 14, 2017, at 9:05 a.m., or as soon thereafter as the matter may be heard, the Stanislaus County Board of Supervisors will meet in the Basement Chambers, 1010 10th Street, Modesto, CA, pursuant to California Water Code Section 10723, to consider approval of the of the "Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) Groundwater Sustainability Agency" for the Modesto Groundwater Subbasin.

NOTICE IS FURTHER GIVEN that at the said time and place, interested persons will be given the opportunity to be heard. Written comments may be submitted to Stanislaus County at Attn: Walter Ward, Water Resources Manager, 3800 Cornucopia Way, Suite C, Modesto, CA, or at wward@envres.org.

BY ORDER OF THE BOARD OF SUPERVISORS. DATED: January 24, 2017. ATTEST: ELIZABETH A. KING, Clerk of the Board of Supervisors of the County of Stanislaus, State of California. BY: Pam Villarreal, Assistant Clerk.

Pub Dates Jan 30, Feb 6, 2017

CASE NO. 10117916 key 86102

RESOLUTION NO. 2017-04
AUTHORIZING AND DIRECTING THE EXECUTION OF A MEMORANDUM OF UNDERSTANDING FORMING THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO SUB-BASIN

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 (SGMA), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires that a Groundwater Sustainability Agency (GSA) be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources' CASGEM groundwater basin system) (Basin), by June 30, 2017; and

WHEREAS, SGMA permits a combination of local agencies to form a GSA through a Memorandum of Understanding (MOU); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford, and the Modesto Irrigation District (MOU Agencies) are all local agencies, as SGMA defines that term; and

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies' creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) in 1994, which was created to ensure coordinated and effective management of the Basin; and

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and

WHEREAS, notice of a hearing on the MOU Agencies' decision to form a GSA for the Basin (Notice) has been published in the Modesto Bee as provided by law; and

WHEREAS, on this day, the Modesto Irrigation District (MID) held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (GSA MOU) (attached hereto as Exhibit A) to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA (STRGBA GSA) for the Basin; and

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan (Sustainability Plan); and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

THEREFORE, BE IT RESOLVED, by the Board of Directors of the Modesto Irrigation District, as follows:

1. All the recitals in this resolution are true and correct and the MID so finds, determines and represents.

2. The Board Secretary of the MID is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the MID, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The MID hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin.

4. Within thirty (30) days of the date of this resolution, the MID General Manager is directed to provide notice of MID's intent to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin (Notice of GSA Election) to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies' combined jurisdiction. A copy of a map of the management area is attached as Exhibit B.

6. This resolution shall take effect immediately upon passage and adoption.

Moved by Director Wenger, seconded by Director Campbell, that the foregoing resolution be adopted.

The following vote was had:
Ayes: Directors Blom, Byrd, Campbell, Mensinger, Wenger
Noes: Director None
Absent: Director None
The President declared the resolution adopted.

o0o

I, Heliane Burns, Assistant Secretary to the Board of Directors of the Modesto Irrigation District, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at a special meeting of said Board of Directors held the twenty fourth day of January 2017.

Assistant Secretary to the Board of
Directors of the Modesto Irrigation District

CHRISTOPHER WINTERFELDT cwinterfeldt@modbee.com

Water rushed through Dry Creek while staying within its banks in Kewin Park at the La Loma Avenue overpass on Monday in Modesto.

FROM PAGE 1A

STORM

cast shows it peaking at just under 52 feet Wednesday, then receding through Saturday. Turlock Irrigation District records showed it flowing at 5,693 cubic feet per second midmorning Monday.

Dry Creek, notorious for flooding, has stayed to its banks this season. But American Legion Post 74, located at 1001 S. Santa Cruz Ave., just north of Legion Park on the Tuolumne, is taking no chances. The threat of flooding led the veterans service organization to move most of its equipment out of the building and into storage. Consequently, its monthly dinner, scheduled for Tuesday, and monthly breakfast, scheduled for Sunday, have been canceled.

In the January 1997 flooding, "the small hall was completely submerged and the large hall was flooded all the way to the roof," said Becky Crow, Post 74 adjutant. "In light of that, we thought it was prudent to get as much out as we could, given the weather forecast by Saturday morning."

In advance of the storm that moved through the region Saturday through Monday, the weather service issued a forecast saying Modesto could get 3 to 4 inches of rain. But according to Modesto Irrigation District measurements, 0.79 inches fell downtown Saturday, 0.77 Sunday and 0.18 in the early hours Monday.

The bull's eye of the storm tracked farther north than expected, Clapp said.

This next storm will be maybe two-thirds the strength of the last, he said. The weather service forecast says Sonora can expect 2 to 3 inches of precipitation, and Yosemite 3 to 4 inches.

The service's snow forecast through Wednesday is broken down by routes. Along Highway 4, Arnold could get 6 to 8 inches, and Bear Valley 48 to 60. Along Highway 108, Twain Harte could get 3 to 4 inches, Mi-Wuk Village 8 to 12, and Strawberry, 36 to 48. And on Highway 120, the area of Big Oak Flat Road is looking at 8 to 12 inches.

Wind could be a big issue in this storm. The weather service says strong winds from the south could bring gusts of 50 mph or more in lower elevations, 65 mph or more at higher elevations. It warns the gusts could lead to falling trees and branches, downed power lines and moderate-size power failures. Again, though, Clapp said the strongest winds are likely to be felt north of Modesto, in Stockton and Sacramento.

To report a power failure to MID, call 209-526-8222, day or night. To report one to Turlock Irrigation District, call the 24-hour service line at 209-883-8301.

Tuesday will bring a 90 percent chance of rain, the weather services says, with thunderstorms also possible after 4 p.m. The high should be near 56 degrees. The chance of precipitation Tuesday night rises to 100 percent, again with up to half an inch possible.

On Wednesday, there's a 40 percent chance of showers, mainly before 4 p.m. Otherwise, the day should be partly sunny, with a high near 56. The chance of rain Wednesday night is 60 percent – mainly after 10 p.m.

There's a 50 percent chance of showers Thursday, which otherwise will be partly sunny, with a high near 53.

Deke Farrow: 209-578-2327

Flood watch vs. warning

Flood warning: Take action! A flood warning is issued when the hazardous weather event is imminent or already happening. A flood warning is issued when flooding is imminent or occurring.

Flood watch: Be prepared. A flood watch is issued when conditions are favorable for a specific hazardous weather event to occur. A flood watch is issued when conditions are favorable for flooding. It does not mean flooding will occur, but it is possible.

Source: National Weather Service

FROM PAGE 1A

SUPERVISOR

homes for foster youth," Olsen said. "Group homes are going away. We want to make sure every foster child has a nurturing, loving home."

By pushing through a 2015 bill, the former legislator played a key role in ending a tax inequity that caused the county to lose an estimated $72 million over 35 years. The county now keeps an extra $6 million a year, and Olsen wants to use some of that as seed money for projects developed by Focus on Prevention.

The county's 10-year prevention initiative aims to tackle problems with homelessness, family dysfunction, troubled youths and crime recidivism.

While serving on the Modesto council, Olsen often grilled staff members about the costs of projects and government administration. She vowed to emphasize fiscal accountability as a county leader.

Olsen raised some eyebrows when she waited until late in the filing period last year to announce she would run for District 1 supervisor. Within a half-hour of announcing her candidacy, O'Brien announced he would not run and endorsed Olsen, creating the impression of an easy transition from one Republican to another. A filing period extension left only four days for others to decide whether to challenge Olsen, a well-funded political veteran, and no one did.

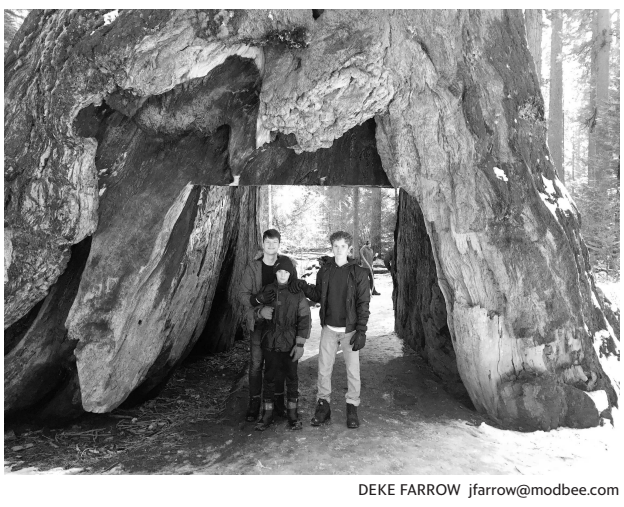
Olsen defended her timing, saying she didn't have much advance notice that O'Brien was going to step down. "When I announced I was not going to run for state Senate, I thought I was going to take a break from public service" and devote time to family life, she said.

Olsen will stay involved with state politics as the recently appointed vice chairwoman of the California Republican Party. She said her party responsibilities will require her attendance at three weekend conventions in the next two years, and "beyond that the schedule is up to me," she said.

Olsen planned to fly Monday night to San Diego to speak with Republicans there and then return to Modesto for the county's swearing-in ceremony Tuesday morning. "The goal is to elect more Republicans to improve the quality of life in California," Olsen said. "One-party dominance is not good for any state in our nation."

Ken Carlson: 209-578-2321

> "WE NEED TO OPERATE WITH GOOD DATA AND SOUND SCIENCE WHEN WE ARE MAKING DECISIONS ON WATER MANAGEMENT.
>
> ***Kristin Olsen***



DEKE FARROW jfarrow@modbee.com

Visitors to Calaveras Big Trees State Park in Arnold stand in the tunnel of the Pioneer Cabin Tree on Dec. 29.

FROM PAGE 1A

TREE

Tree in Yosemite National Park was carved, the owners of the North Grove responded by doing the same. The Pioneer Cabin Tree was chosen because of its wide base – about 22 feet in diameter. It had the widest trunk in the park's North Grove, said California State Parks Supervising Ranger Tony Tealdi. It also was chosen because its trunk already had a hole from fire damage, Tealdi said. The sequoias don't heal themselves after damage like that, they send all their nutrients to the treetop, he said.

The tree reportedly fell about 2 p.m. Sunday. Though the park was open, there were no witnesses to it, Tealdi said. People working in the visitors center didn't hear or feel a thing when the giant toppled, he said. Park docent Jim Allday of Arnold was taking a walk on the trail and made the discovery.

The tree fell onto the trail, and because the wood of sequoias easily splits, the top shattered as it hit the ground, Tealdi said. There's no estimate on how tall the roughly 2,000-year-old tree was.

The tree did not snap where the tunnel was carved, but rather uprooted. The North Grove trail is closed as environmental scientists assess the tree, Tealdi said. The trail will be rerouted because the Pioneer Cabin Tree will be left where it lies.

"You have to look at the life cycle of these trees," he said. "... At this point in time, the next part of its life cycle is on the ground, as a habitat for animals and insects. It's still a producing factor in nature – it also helps with greenhouse gases."

The park remains open with about 25 campsites available. It got nearly 8 inches of rain over the weekend, Tealdi said, and about 6 inches of snow already on the ground is melting with the rainfall. There is standing water throughout the trail.

The Pioneer Cabin Tree's shallow root system, combined with the inundation from the rain, likely contributed to its fall.

The loss of the tree has made news internationally. Tealdi said he's received calls from Russian media and the BBC. "It's a sad day, and we've seen goosebumps thinking about that tree that went down," Tealdi said, "but it is part of the life cycle."

For updates on the North Grove Trail, Tealdi suggested people check in at parks.ca.gov.

For more, visit the Facebook pages of Calaveras Big Trees State Park and the Calaveras Big Trees Association.

The Sacramento Bee and news services contributed to this report.

Deke Farrow: 209-578-2327

AROUND THE REGION

MODESTO

What: Modesto Kiwanis meeting
When: Tuesday, 11:30 a.m.
Where: Famiglia Bistro, 2501 McHenry Ave.
Info: The Modesto Kiwanis invites the public to its weekly lunch meeting. This week's special guest is Nancy Salmeron, who will discuss personnel development and entrepreneurship. Lunch is $15; reservation is needed. Seating is limited. For more information or to make a reservation, contact Anthony at 209-985-3473 or anthony.btr@gmail.com.

What: Modesto Parkinson's Support Group
When: Wednesday, 1:30 to 3:30 p.m.
Where: Trinity Presbyterian Church, 1600 Carver Road
Info: The Modesto Parkinson's Support Group will be holding its monthly meeting for caregivers and those with the Parkinson's disease.

What: Latino Emergency Council meeting
When: Friday, 8:15 to 9:15 a.m.
Where: El Concilio Community Center, 1314 H St.
Info: The El Concilio Community Center invites the public to its monthly morning meeting. The guest is Modesto Irrigation District spokeswoman Melissa Williams. She will discuss the impact the weather has had on the Modesto area. The meeting is free to attend; come early, because seating is limited. For more information, contact Dale Butler 209-613-1058.

TURLOCK

What: Turlock Chamber of Commerce mixer
When: Tuesday, 5 to 7 p.m.
Where: VaraniSmile Dentistry, 527 E. Olive Ave.
Info: Join the Turlock Chamber of Commerce and VaraniSmile Dentistry in an evening of networking with the community. The event is free to attend. For more information, call 209-632-2221 or visit www.turlockchamber.com.

Send Region items to Region, The Modesto Bee, P.O. Box 5256, Modesto 95352; call 209-578-2330; fax 209-578-2207; or email region@modbee.com.

25 YEARS AGO: Increased evening and weekend bus service was on top of the list for Stanislaus County. At a meeting where bus riders voiced their concerns, the Stanislaus Area Association of Governments also considered increased service for the disabled. The hearing was a small step in securing an estimated $8.2 million in transportation funds for the following year. The suggestions from the public included the use of international symbols to make transit signs more understandable to the illiterate and those who don't speak English.

LAW & ORDER

OLD ICE-MAKING PLANT IN RIVERBANK BURNS AGAIN

Stanislaus Consolidated Fire Protection District crews spent about an hour battling a small blaze at a one-time ice-making plant in Riverbank early Monday. "It wasn't much of a fire, just hard to access," Battalion Chief Eric DeHart said of the blaze in the 5800 block of Terminal Avenue. Because the report of the fire at the vacant site went out as a commercial structure fire, it drew a large response: five engines and two trucks. But two to three crews were released from the scene almost immediately, DeHart said. The fire was reported about 12:40 a.m. The mostly concrete building burned in the mid-'90s and a couple of times since, DeHart said. The building is attractive to transients seeking shelter. Earlier fires caused the roof to collapse, which created lean-tos, of sorts, which offer protection from the outside elements, he said. Without knowing for sure, DeHart said, this blaze likely was a warming fire that got out of control. No one was found at the scene and there are no known injuries. Crews did what they could from the ground, then put up ladders and used hoses from above. They battled the fire from outside because entering the collapsed interior would have put firefighters at risk. The building once served as an ice-making facility for the Burlington Northern Santa Fe Railway. The railroad has a switchyard adjacent to the plant.

TURLOCK MAN ARRESTED IN ROAD-RAGE INCIDENT

A Turlock man was arrested on suspicion of making criminal threats Sunday afternoon after Tuolumne County sheriff's deputies responded to a reported road-rage incident near the Dodge Ridge ski area. The road in the area was backed up and many cars were passing illegally, the Sheriff's Office said in a post on Facebook. Tony Alahverdi was trying to pass, but another motorist was in the way, the post said. Alahverdi, 36, pointed a firearm and threatened to kill the motorist, the Sheriff's Office said. The driver spotted the 2016 gray Toyota Tundra pickup near Dodge Ridge lodge and gave the Sheriff's Office its description and license plate number. The California Highway Patrol located and stopped the truck after Alahverdi left the area. Deputies arrived, searched the truck and found a handgun. Alahverdi was taken to the Tuolumne County jail.

SETTING IT STRAIGHT

We want to make sure the information in this paper is accurate. Please call mistakes to our attention, so we may correct them.

Local News.....578-2330
City Desk.....578-2327
Work & Money...578-2343
Features.....578-2312
Sports.....578-2300

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Hackathon returns to test programmers

Bee Staff Reports

The third annual Valley Hackathon – a 24-hour competition for programmers – will be held Friday in downtown Modesto.

More than 100 programmers are expected to turn out, competing in teams of one to four participants to build a software project in just a day. Each will be judged by a panel on how complete, viable, aesthetically pleasing and technical it is.

Competitors can register right up until check-in begins at 5 p.m. Friday. As of Monday, there were 81 participants.

The top 10 teams will present their hacks in the event's finals. Prejudging will take place during the final hour of the programming time.

The event was begun to harness interest and talent in technology within the Central Valley, but has grown to draw entrants from as far away as the Bay Area, Sacramento and Fresno, organizers say. Participation in the Valley Hackathon has increased from 22 participants in 2015 to 63 last year.

"The Central Valley's economy is seeing a big shift right now," said David White, chief executive officer of Opportunity Stanislaus, one of the event's sponsoring organizations, in a news release. "We see hackathons as a sort of pipeline for talent in the technology sector and believe that events like the Valley Hackathon will be instrumental in creating connections for this community, as well as nurturing the innovative ideas such an event creates. This is a fun event in and of itself but it's also a piece in the larger puzzle that is a local revolution of sorts."

Other sponsors include Inventaweb, the Alliance Small Business Development Center, Oportun and California Community Colleges.

The free event draws some amazing talent, organizers say, but the hackathon also is for beginning programmers and designers. The minimum age to compete is 18.

"Though 24 hours is not a ton of time, we have been very impressed by the complexity of the projects," said Phillip Lan, Valley Hackathon organizer and head of business development for Hearst Digital. "We've seen everything from a program designed to sample soil moisture to software that scanned movie reviews to create viewing suggestions to users based on their current mood, so competitors will want to be sure their project is both inventive and interesting."

The winning teams will walk away with more than $5,000 in prize money

Other draws include chair massages, free meals, snacks and energy drinks and a Lego competition with its own separate kitty.

This year's hackathon has a "Star Wars" theme and a prize for the best team "Star Wars" cosplay.

The event will be at Redeemer Church, at 820 H St. Check-in is at 5 p.m., orientation at 6, and the competition begins at 6:30. To learn more, visit www.valleyhackathon.com.

More rain and snow in the forecast for Valley, foothills

Bee Staff Reports

Rain is expected to return to the Modesto area Wednesday afternoon and could stick around beyond the weekend, according to the National Weather Service.

After patchy fog in the morning, Tuesday should be mostly sunny, with a high near 54. Clouds will gather in the night.

Wednesday brings an 80 percent chance of rain, mainly after 4 p.m., and the high is expected to be near 58. The chance of rain increases to 90 percent Wednesday night.

There's a 60 percent chance of showers Thursday, which otherwise will be mostly cloudy, with a high near 57. Rain is likely Thursday night, the weather service predicts.

Weather service meteorologists say Friday also will bring rain, and a high near 54.

There's a chance of showers Saturday, and rain is likely Sunday. The high both days is expected to be near 54.

The first storm system passing through will be Wednesday and Thursday. Modesto is expected to receive 1 to 2 inches of rain, while Sonora and Yosemite National Park could get 2 to 3 inches.

Snow levels Wednesday should be at 5,000 to 6,000 feet, lowering to 3,000 to 4,000 feet Thursday. The weather service says Tioga Pass could get 18 to 24 inches of snow, while the Sonora, Ebbetts and Carson passes all could see 24 to 30 inches.

The second system should bring its heaviest precipitation Friday, with lingering showers Saturday. No estimate of amounts for Modesto and Sonora has been provided by the weather service.

Snow level will be down to 3,000 feet Friday, lowering to perhaps 2,000 feet by Saturday morning and during a third storm system expected to be here Sunday through Monday.

"None of these storms appear to be as strong or wet as last week's storms," the weather service said in a report issued Monday morning. "However, with soils still saturated and rivers and streams still running high, any additional rainfall will bring localized flooding concerns."

For updates on conditions and problems locally, follow the Stanislaus County Office of Emergency Services at StanEmergency on Facebook and Twitter.

OAKDALE IRRIGATION DISTRICT
RESOLUTION NO. 2017-08

A RESOLUTION AUTHORIZING AND DIRECTING THE EXECUTION OF A MEMORANDUM OF UNDERSTANDING FORMING THE GROUNDWATER SUSTAINABILITY AGENCY FOR THE MODESTO SUB-BASIN

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 ("SGMA"), which authorizes local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires that a GSA be formed for all basins designated by the Department of Water Resources as a high-priority basin, such as the Modesto Sub-basin (designated basin number 5-22.02 in the California Department of Water Resources' CASGEM groundwater basin system) ("Basin"), by June 30, 2017; and

WHEREAS, SGMA permits a combination of local agencies to form a groundwater sustainability agency ("GSA") through a Memorandum of Understanding ("MOU"); and

WHEREAS, the County of Stanislaus, the Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford, and the Modesto Irrigation District ("MOU Agencies") are all local agencies, as SGMA defines that term; and

WHEREAS, the MOU Agencies are committed to sustainable management of the Basin's groundwater resources as shown by, among other actions, the MOU Agencies' creation of the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRGBA") in 1994, which was created to ensure coordinated and effective management of the Basin; and

WHEREAS, the MOU Agencies each exercise jurisdiction upon lands overlying the Basin and are all committed to the sustainable management of the Basin's groundwater resources; and

WHEREAS, the MOU Agencies have determined that the sustainable management of the Basin pursuant to SGMA may best be achieved through the cooperation of the MOU Agencies operating through an MOU; and

WHEREAS, notice of a hearing on the MOU Agencies' decision to form a GSA for the Basin ("Notice") has been published in the Oakdale Leader as provided by law; and

WHEREAS, on this day, the OAKDALE IRRIGATION DISTRICT ("OID") held a public hearing to consider whether it should enter into the Memorandum of Understanding Forming the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("GSA MOU") (attached hereto as Exhibit A) to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA ("STRGBA GSA") for the Basin; and

2500

WHEREAS, it would be in the best interests of the MOU Agencies to form the GSA for the Basin, and to begin the process of preparing a groundwater sustainability plan ("Sustainability Plan"); and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5), including organization and administrative activities of government, because there would be no direct or indirect physical change in the environment.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Oakdale Irrigation District as follows:

1. All the recitals in this resolution are true and correct and the OID so finds, determines and represents.

2. The Secretary of the OID is hereby authorized and directed to attest the signature of the authorized signatory, and to affix and attest the seal of the OID, as may be required or appropriate in connection with the execution and delivery of the GSA MOU.

3. The OID hereby elects to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin.

4. Within thirty (30) days of the date of this resolution, the OID General Manager is directed to provide notice of OID's intent to enter into the GSA MOU with the MOU Agencies to form the GSA for the Basin ("Notice of GSA Election") to the California Department of Water Resources in the manner required by law.

5. One of the elements of the Notice of GSA Election is the boundaries of the area of the Basin or the portion of the Basin that the MOU Agencies intend to manage. Until further action of the MOU Agencies, the boundaries of the GSA shall be the boundaries of the portion of the Basin within the MOU Agencies' combined jurisdiction. A copy of a map of the management area is attached as Exhibit B.

6. This resolution shall take effect immediately upon passage and adoption.

Upon Motion of Director Santos, seconded by Director Altieri, and duly submitted to the Board for its consideration, the above-titled Resolution was adopted this 18th day of January, 2017.

OAKDALE IRRIGATION DISTRICT

Steve Webb
President

Steve Knell, P.E.
Secretary

I HEREBY CERTIFY that the foregoing is a true and correct copy of the original on file with the Oakdale Irrigation District.

OAKDALE IRRIGATION DISTRICT

Steve Knell, P.E.
General Manager/Secretary

PROOF OF PUBLICATION

(2015.5 C. C. P.)

STATE OF CALIFORNIA,

County of Stanislaus

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE OAKDALE LEADER, 122 South Third Avenue, Oakdale, California, a newspaper of general circulation, published in Oakdale, California in the City of Oakdale, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

December 28, 2016 and January 4, in the year 2017

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

Dated at Oakdale,

This 4th day of January 2017.

Signature

RECEIVED

JAN 27 2017

OAKDALE ID

This space is for the County Clerk's Filing Stamp

Proof of Publication of

PUBLIC NOTICE
(STRGBA) MEETING

OID
OAKDALE IRRIGATION DISTRICT

PUBLIC NOTICE

Notice is hereby given that, pursuant to Water Code section 10723, Oakdale Irrigation District (OID) will hold a public hearing during a regular meeting on Wednesday, January 18, 2016, at 1205 East F Street, Oakdale, CA 95361, to determine whether OID will authorize the execution of the MEMORANDUM OF UNDERSTANDING FORMING THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY and participate in the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) election to become a Groundwater Sustainability Agency under the Sustainable Groundwater Management Act (California Water Code, Section 10720 et seq.) for the Modesto Groundwater Subbasin (Groundwater Subbasin Number: 5-22.02). Written comments may be submitted to OID at Attn: Eric Thorburn, 1205 East F Street, Oakdale, CA 95361. During the hearing, OID will invite oral comments to be heard and will receive additional written comments until the STRGBA elects to be a Groundwater Sustainability Agency.

Attachment C

Filed: May 16 2017

No. 63-17

By:

Clerk of the Board of Supervisors

RESOLUTION

OF THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE ESTABLISHING THE COUNTY OF TUOLUMNE AS A GROUNDWATER SUSTAINABILTY AGENCY PURSUANT TO THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the California Legislature has adopted, and the Governor has signed into law, the Sustainable Groundwater Management Act of 2014 (SGMA), which authorizes and requires local agencies to manage groundwater in a sustainable fashion; and

WHEREAS, the legislative intent of SGMA is to provide for sustainable management of groundwater basins, to enhance local management of groundwater, to establish minimum standards for sustainable groundwater management, and to provide local groundwater agencies with the authority and the technical and financial assistance necessary to sustainably manage groundwater; and

WHEREAS, SGMA requires that a Groundwater Sustainability Agency (GSA) be formed by June 30, 2017, for all basins designated by the California Department of Water Resources (DWR) CASGEM basin priority system as a high-priority or medium-priority basin; and

WHEREAS, the Modesto Sub-basin (Basin No. 5-22.02 in DWR Bulletin 118) (Basin) has been designated a high-priority basin by DWR; and

WHEREAS, Water Code Section 10724 establishes a presumption that a County shall be a GSA for areas of a high- or medium-priority basin that are not within the management area of a GSA; and

WHEREAS, Tuolumne County exercises jurisdiction upon lands overlying the portions of the Basin that are currently unmanaged, and is committed to the sustainable management of the Basin's groundwater resources and to working cooperatively with other GSAs, entities, and stakeholders within the Basin to implement SGMA; and

WHEREAS, notice of a hearing on Tuolumne County's decision to form a GSA for the Basin has been published in the Union Democrat as required by Water Code Section 10723; and

WHEREAS, each property owner in Tuolumne County within a half mile of the Basin boundary was also notified by mail of Tuolumne County's decision to form a GSA and the subsequent public hearing; and

WHEREAS, on this day, the Board of Supervisors of Tuolumne County held a public hearing to consider whether it should form the Tuolumne GSA; and

WHEREAS, SGMA requires a local agency to inform DWR within 30 days of deciding to become a GSA of its decision and intent to undertake sustainable groundwater management and to submit required documentation pursuant to Water Code Section 10723.8, and also to maintain a list of interested persons pursuant to Water Code Section 10723.4; and

WHEREAS, adoption of this resolution does not constitute a "project" under California Environmental Quality Act Guidelines Section 15378(b)(5) because it involves organizational and administrative activities of government that will not result in direct or indirect physical change in the environment.

NOW, THEREFORE BE IT RESOLVED by the Board of Supervisors of Tuolumne County, as follows:

1. The Board of Supervisors herby elects to form the Tuolumne Groundwater Sustainability Agency for the portions of the Modesto Groundwater Sub-basin (Bulletin 118 No. 5-22.02) underlying Tuolumne County's jurisdiction.

2. Within thirty (30) days of the date of this resolution, the Board of Supervisors Chair or her designee is directed to provide to DWR a copy of this resolution, information about the boundaries of the GSA and Basin areas to be managed, and all other notification documentation required to become a GSA and to otherwise comply with the requirements of Water Code Section 10723.8.

3. The County Administrator or his designee shall maintain a list of interested parties pursuant to Water Code Section 10723.4.

4. This resolution shall take effect immediately upon passage and adoption.

ADOPTED BY THE BOARD OF SUPERVISORS OF THE COUNTY OF TUOLUMNE ON MAY 16, 2017

AYES: 1st Dist. Brennan
2nd Dist. Hunvelt
3rd Dist. Royce
4th Dist. absent
5th Dist. Rodgers

NOES: ____ Dist. ____
____ Dist. ____
ABSENT: 4th Dist. Gray
____ Dist. ____
ABSTAIN: ____ Dist. ____

Steve Brennan
CHAIR OF THE BOARD OF SUPERVISORS

ATTEST: _____
Clerk of the Board of Supervisors

No. 63-17

I hereby certify that according to the provisions of Government Code Section 25103, delivery of this document has been made.

ALICIA L. JAMAR
Clerk of the Board

By: _____

COOPERATION AGREEMENT

BETWEEN COUNTY OF STANISLAUS AND COUNTY OF TUOLUMNE

This Cooperation Agreement ("Agreement") is entered into as of May 8, 2018, by and between the County of Stanislaus ("Stanislaus") and the County of Tuolumne ("Tuolumne") (each a "Party" and collectively, the "Parties"), both of which are political subdivisions of California, for the purpose of ensuring compliance with the Sustainable Groundwater Management Act within the Modesto Sub-basin (Basin No. 5-022.02) ("Basin").

RECITALS

A. In 2014, California enacted the Sustainable Groundwater Management Act ("Act"). The Act requires the formation of groundwater sustainability agencies ("GSA") and the adoption of groundwater sustainability plans ("GSP"), or an alternative that complies with the Act, for all groundwater basins designated as medium-priority or high-priority by the Department of Water Resources ("DWR").

B. The Act further provides that groundwater basins designated as medium-priority or high-priority, but which are not in critical overdraft, must be managed under a GSP by January 31, 2022.

C. DWR has designated the Basin as a high-priority groundwater basin that is not in critical overdraft.

D. Stanislaus overlies the portion of the Basin in Stanislaus County. Stanislaus has executed a memorandum of understanding with Oakdale Irrigation District, the City of Oakdale, the City of Riverbank, the City of Modesto, the City of Waterford and Modesto Irrigation District to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency ("STRGBA GSA"). The STRGBA GSA's purpose is ensuring compliance with the Act for the portion of the Basin within the member agencies' collective jurisdiction – more generally, the portion of the Basin in Stanislaus County.

E. Tuolumne overlies the portion of the Basin in Tuolumne County. Tuolumne formed the Tuolumne Groundwater Sustainability Agency ("Tuolumne GSA") to ensure compliance with the Act for the portion of the Basin in Tuolumne County.

F. Collectively, the STRGBA GSA and the Tuolumne GSA cover the entirety of the Basin.

G. The Act provides that where multiple GSAs cover a basin, the GSAs may choose to adopt a single GSP for the entirety of the basin, which is implemented by each of the basin's GSAs. (Wat. Code § 10727(b)(2).)

H. GSAs must comply with all applicable provisions contained in the GSP Emergency Regulations adopted by the California Water Commission on May 18, 2016 ("GSP Regulations") (23 Cal. Code Regs., § 350 et seq.).

I. Tuolumne has expressed its desire to work collaboratively with the STRGBA in GSP development, avoiding standalone GSPs for the same Basin. Tuolumne and Stanislaus intend that any GSP adopted by the STRGBA GSA encompass the entirety of the Basin, including the portion governed by the Tuolumne GSA. As such, Tuolumne will take the

necessary actions and provide the required information to Stanislaus to ensure a GSP developed, adopted and implemented by the STRGBA GSA encompasses the Tuolumne GSA portion of the Basin and thereby covers the entirety of the Basin.

J. In exchange, Stanislaus has agreed to provide Tuolumne with the support and services needed to adopt the GSP prepared by the STRGBA GSA and satisfy its ongoing obligations under the Act.

K. The Parties seek to memorialize this Agreement and manage their cooperation pursuant to the terms below.

ARTICLE 1

RIGHTS AND RESPONSIBILITIES

1.1 Tuolumne's Responsibilities. Tuolumne, acting as the Tuolumne GSA, shall exercise its good faith and best efforts to take all necessary actions to help to effect the timely adoption of a GSP for the entire Basin and satisfy its ongoing obligations under the Act, including the implementation and enforcement of the GSP. Tuolumne shall cooperate to the fullest extent practical with Stanislaus' efforts, through the STRGBA GSA, to develop and implement the GSP for the entire Basin. Such cooperation shall include, but not be limited to, the prompt delivery of all necessary data and information to prepare the GSP and the taking of all necessary actions to review, adopt and implement the GSP. Tuolumne shall further ensure the timely filing of annual reports and documents as required by the Act.

1.2 Stanislaus' Responsibilities. Stanislaus shall provide the necessary support to Tuolumne in order for the Tuolumne GSA to adopt the GSP for the entire Basin, and satisfy Stanislaus' ongoing obligations under the Act, including the implementation and enforcement of the GSP. Stanislaus shall support Tuolumne by:

a. ensuring, to the maximum extent possible, that the interests of the Tuolumne County portion of the Basin are included in any GSP developed by the STRGBA GSA;

b. ensuring that DWR receives the necessary initial notification indicating the intent to develop a GSP for the Basin, pursuant to Water Code, section 10727.8 and Title 23 of the California Code of Regulations, section 353.6;

c. assisting the STRGBA GSA in drafting the GSP in compliance with the Act and with the GSP Regulations and drafting all necessary documents for the adoption of the GSP, which shall include the Tuolumne GSA area;

d. complying with all public notification and stakeholder participation requirements in the Act, including, but not limited to, Water Code sections 10723.2, 10723.4, 10727.8 and 10728.4 and all relevant provisions in the GSP Regulations and assisting the Tuolumne GSA in all such public notification and stakeholder participation requirements, including noticing and holding a public hearing regarding the adoption of the GSP; and

e. assisting the Tuolumne GSA in satisfying any other ongoing obligations under the Act and the GSP Regulations, including implementation of the GSP and annual reporting requirements.

1.3 Cooperation. The Parties shall, whenever and as often as reasonably requested to do so by the other Party, execute, acknowledge, and deliver or cause to be executed, acknowledged, and delivered any and all documents and instruments as may be necessary, expedient, or proper in the reasonable opinion of the requesting Party to carry out the intent and purposes of this Agreement.

1.4 Relationship of Parties. Except as otherwise provided in this Agreement, neither Party shall have any authority to bind or obligate the other Party to any agreements or undertakings. In their performance of their respective responsibilities arising out of this Agreement, the Parties are in no way forming an agency or employee relationship. Each Party retains the right to exercise full supervision and control of the manner and method in which it performs its responsibilities arising out of this Agreement, including full supervision and control over the employment, direction, compensation, and discharge of all persons assisting in the performance of responsibilities under this Agreement. With respect to each Party's employees, if any, and consultants, each Party shall be solely responsible for payment of wages, benefits, and other compensation, compliance with all occupational safety, welfare, and civil rights laws, tax withholding, and payment of employee taxes, whether federal, state, or local, and compliance with any and all other laws regulating employment. The Parties acknowledge that nothing in SGMA shall be construed as authorizing a local agency to make a binding determination of the water rights of any person or entity, and that nothing in SGMA or a GSP shall be interpreted as superseding the land use authority of cities and counties. The Parties intend that this Agreement shall not limit or interfere with either Party's rights or authority over its own jurisdiction and internal matters, including, but not limited to, a Party's police powers, land use powers, other powers, or legal rights to surface water supplies, groundwater supplies, and any other water management facilities and operations.

1.5 GSP Review. The Parties agree that it is desirable for all entities responsible for approving and implementing the GSP within the Basin to fully support the adopted GSP. Accordingly, the Parties agree that Stanislaus shall strive to ensure that Tuolumne be given ample opportunity to provide input on provisions relevant to Tuolumne within the draft GSP developed by the STRGBA GSA prior the STRGBA GSA's adoption of the GSP. To the extent reasonably feasible, Stanislaus shall assist in incorporating into the draft GSP any recommended changes or additions made by Tuolumne prior to its adoption by the STRGBA GSA. To the extent any Tuolumne recommendations for changes or additions are not included in the draft GSP, Stanislaus shall provide to Tuolumne a written explanation documenting the reason or reasons why the recommendations were not included.

1.6 Cost-Sharing and Contracting. If the Parties determine that cost-sharing is required for any contract or expenditure made pursuant to this Agreement, any cost-sharing allocations shall be agreed to in writing by the Parties in advance of executing any contracts with consultants, vendors or other contractors. Such written approval for cost-sharing shall be subject to any necessary approvals required by a Party's governing Board or designee pursuant to that Party's contract approval procedures. Any such contracts shall be drafted in a manner that reflects that consultants, vendors or contractors hired to perform work under this Agreement are working on behalf of both Parties and will be expected to work with the Parties on a collective basis and with each Party on an individual basis as needed. Such contracts shall be made to be enforceable by both Parties. Additionally, the contracts shall include appropriate indemnity and insurance provisions as required in Section 3.2.

In the event a Party to this Agreement acts as the official contracting agency and executes a contract on behalf of both Parties (the "Contracting Party"), the Contracting Party:

a. shall comply with all applicable local, state and federal laws including, without limitation, the California Public Contract Code and the California Labor Code;

b. shall provide to the other Party a reasonable opportunity to review any bids received and to review and provide input on any draft contract prior to its execution;

c. shall not approve any change orders that increase the cost of the original contract by more than 10 percent without prior consultation and written consent of the other Party;

d. shall, in advance of executing a contract involving cost-sharing by the Parties, establish a mutually agreeable understanding with the other Party about invoicing and payment procedures related to such a contract;

e. shall provide diligent oversight of the work conducted by any contractor, vendor or consultant under a contract executed pursuant to this Agreement; and

f. shall maintain complete, accurate, and clearly identifiable records with respect to all contracts executed and provide to the other Party access to all records, documents, reports, conclusions and other information related in any way to any contract executed on behalf of both Parties pursuant to this Agreement.

1.7 . Dispute Resolution. The Parties desire to informally resolve all disputes and controversies related to this Agreement, whenever possible, at the least possible level of formality and cost. If informal resolution of a dispute or controversy cannot be achieved, the Parties agree to neutral facilitation or mediation of the dispute as a next step prior to commencement of legal action. The cost of mediation shall be shared equally between the Parties. The choice of the mediator shall be voluntarily agreed upon by the Parties, or if such agreement cannot be reached, appointed by the Superior Court of Stanislaus or Tuolumne Counties upon motion for appointment of a neutral mediator. If the mediation process fails to provide a final resolution to the raised controversy, either Party may pursue any judicial or administrative remedies otherwise available. However, notwithstanding this Section 1.5, a Party may seek injunctive or other interlocutory judicial relief prior to completion of the mediation if necessary to avoid irreparable damage or to preserve the status quo.

ARTICLE 2

TERM

2.1 Term. This Agreement shall commence on May 8, 2018 ("Effective Date") and remain in full force and effect until it is terminated by either Party.

2.2 Termination of Agreement. In its sole discretion and upon ninety (90) days' written notice, either Party may terminate this Agreement at any time the Party deems necessary. Termination shall not relieve the terminating Party from its obligations that accrued prior to termination.

ARTICLE 3

INDEMNITY AND INSURANCE

3.1 Mutual Indemnification and Protection. Except as otherwise described herein, each Party (the "Indemnifying Party") covenants and agrees to indemnify and to hold harmless the other Party and its successors and assigns (the "Indemnified Party") for, from and against any and all third party claims, liabilities and expenses (including, but not limited to, reasonable attorneys' fees, court costs, expert witness fees and other litigation-related expenses) which may be claimed or asserted against the Indemnified Party on account of the exercise by the Indemnifying Party of the rights granted to it under this Agreement; provided, however, in no event shall the Indemnifying Party be responsible to the Indemnified Party for any claims, liabilities or expenses that may be claimed or asserted against the Indemnified Party relating to the gross negligent or willful misconduct of the Indemnified Party or any of its employees, directors, officers, trustors, trustees, agents, affiliates, personal representatives, successors or assigns. This indemnification provision shall apply to "active" as well as "passive" negligence but does not apply to either Party's "sole negligence" or "willful misconduct" within the meaning of Civil Code Section 2782. The provisions of this Section 3.1 will survive termination of this Agreement and shall not be restricted to insurance proceeds, if any, received by the Parties or their directors, officials, officers, employees, agents or volunteers.

3.2 Third-Party Agreements. Each Party shall include within any third party contract entered into in furtherance of this Agreement, provisions requiring the contractor, consultant or vendor to (a) indemnify, defend and hold harmless the other non-contracting Party and its officials, officers, employees and agents to the same extent as the contracting Party is indemnified, and (b) provide insurance coverage to the other non-contracting Party and its officials, officers, employees and agents equivalent to the coverage provided to the contracting Party. Without limiting the foregoing and to the extent the following policies are required by the contract, the non-contracting Party and its officials, officers, employees and agents shall: (1) be named as additional insureds and provided coverage on a primary and non-contributory basis on the contractor, consultant or vendor's policies of commercial general liability and business automobile liability insurance and (2) be included in any waiver of subrogation endorsements issued on the commercial general liability, business liability and workers' compensation/employer's liability policies.

ARTICLE 4

GENERAL PROVISIONS.

4.1 Notices. Any notice under this Agreement shall be deemed sufficient if given by one Party to the other in writing and: delivered in person; transmitted by electronic mail or facsimile (with acknowledgement of receipt provided by the receiving Party); or, by mailing the same by United States mail (postage prepaid, registered or certified, return receipt requested) or by Federal Express or other similar overnight delivery service, to the Party to whom the notice is directed at the address of such Party as follows:

If to Stanislaus:

County of Stanislaus
Attn: Department of Environmental Resources
3800 Cornucopia Way, Suite C

Modesto, CA 95358

If to Tuolumne:

County of Tuolumne
Attn: County Administrator's Office
2 S. Green St.
Sonora, CA 95370

Any communication given by mail shall be deemed delivered two (2) business days after such mailing date, and any written communication given by overnight delivery service shall be deemed delivered one (1) business day after the dispatch date. Either Party may change its address by giving the other Party notice of its new address pursuant to this Section 4.1.

4.2 Assignability. The Parties may not assign all or any part of this Agreement without advance written consent of each Party's governing board.

4.3 Waiver. No waiver by any Party of any of the provisions shall be effective unless explicitly stated in writing and executed by the Party so waiving. Except as provided in the preceding sentence, no action taken pursuant to this Agreement, including, without limitation, any investigation by or on behalf of any Party, shall be deemed to constitute a waiver by the Party taking such action of compliance with any representations, warranties, covenants, or agreements contained in this Agreement, and in any documents delivered or to be delivered pursuant to this Agreement. The waiver by any Party of a breach of any provision of this Agreement shall not operate or be construed as a waiver of any subsequent breach. No waiver of any of the provisions of this Agreement shall be deemed, or shall constitute, a waiver of any other provision, whether or not similar, nor shall any waiver constitute a continuing waiver.

4.4 Headings. The section headings contained in this Agreement are for convenience and reference only and shall not affect the meaning or interpretation of this Agreement.

4.5 Severability. If any term, provision, covenant or condition of this Agreement shall be or become illegal, null, void or unenforceable, the remaining provisions of this Agreement shall remain in full force and effect, and shall not be affected, impaired or invalidated. The term, provision, covenant or condition that is so invalidated, voided or held to be unenforceable, shall be modified or changed by the Parties to the extent possible to carry out the intentions and directives set forth in this Agreement.

4.6 Governing Law. This Agreement shall be governed by, and interpreted in accordance with, the laws of the State of California.

4.7 Parties in Interest. Nothing in this Agreement, whether expressed or implied, is intended to confer any rights or remedies under or by reason of this Agreement on any persons other than the Parties to it and their respective successors and assigns, nor is anything in this Agreement intended to relieve or discharge the obligation or liability of any third persons to any party to this Agreement, nor shall any provision give any third persons any right of subrogation or action against any party to this Agreement.

4.8 Attorney Fees. Each Party shall bear its own legal costs, fees and expenses in any dispute between the Parties arising out of this Agreement.

4.9 Good Faith. The Parties agree to exercise their best efforts and utmost good faith to effectuate all the terms and conditions of this Agreement and to execute such further instruments or documents as are necessary or appropriate to effectuate all of the terms and conditions of this Agreement.

4.10 Construction. The provisions of this Agreement should be liberally construed to effectuate its purposes. The language of all parts of this Agreement shall be construed simply according to its plain meaning and shall not be construed for or against either Party, as each Party has participated in the drafting of this document and had the opportunity to have their counsel review it. Whenever the context and construction so requires, all words used in the singular shall be deemed to be used in the plural, all masculine shall include the feminine and neuter, and vice versa.

4.11 Entire Agreement. This Agreement contains the entire understanding and agreement of the Parties, and supersedes all prior agreements and understandings, oral and written, between the Parties concerning the subject matter of this Agreement. There have been no binding promises, representations, agreements, warranties or undertakings by any of the Parties, either oral or written, of any character or nature, except as stated in this Agreement. This Agreement may only be altered, amended or modified, in whole or in part, by a written agreement executed by the Parties to this Agreement and by no other means. Each Party waives its future right to claim, contest or assert that this Agreement was modified, canceled, superseded or changed by any oral agreement, course of conduct, waiver or estoppels.

4.12 Counterparts. This Agreement may be executed in any number of counterparts, each of which shall be deemed to be an original, but all of which shall constitute one and the same instrument.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year and at the place first written above.

COUNTY OF TUOLUMNE 4/17/18 Evan Royce for By: John Gray, Chair Board of Supervisors	COUNTY OF STANISLAUS By: Jim DeMartini, Chair, Board of Supervisors
APPROVED AS TO LEGAL FORM: Sarah Carrillo By: Sarah Carrillo, County Counsel	APPROVED AS TO LEGAL FORM: By: Thomas E. Boze, Assistant County Counsel
ATTEST: By: Alicia Jamar, Chief Deputy Clerk of the Board	ATTEST: Elizabeth A. King By: Elizabeth A. King, Clerk of the Board

Appendix B

Adoption of GSP

D R A F T

RESOLUTION NO. 2022-03

RESOLUTION ADOPTING THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN (GSP) AND AUTHORIZING THE STRGBA GSA PLAN MANAGER TO SUBMIT THE GSP TO DWR BY JANUARY 31, 2022.

WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRBGA) for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin;; and

WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA; and

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act (SGMA) "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727); and

WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02); and

WHEREAS, the STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.); and

WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017; and

WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin; and

WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4

WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and responded to comments on the Modesto Subbasin GSP; and

WHEREAS, all seven STRGBA GSA member agencies have held public hearings, adopted the draft GSP and authorized the Plan Manager to submit the final GSP to DWR; and

WHEREAS, the final Modesto Subbasin GSP is incorporated in its entirety by reference hereto this resolution.

NOW, THEREFORE, THE GOVERNING BODY OF THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY DOES HEREBY ADOPT THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZES THE STRGBA GSA PLAN MANAGER TO SUBMIT THE MODESTO SUBBASIN GSP TO DWR BY JANUARY 31, 2022.

AGENDA REPORT

GSA Meeting Date: January 31, 2022

Subject:	Modesto Subbasin Groundwater Sustainability Plan
Recommended Action:	Resolution adopting the Modesto Subbasin Groundwater Sustainability Plan (GSP) and authorizing the STRGBA GSA Plan Manager to submit the GSP to DWR by January 31, 2022.
Background and Discussion:	In April 1994, the Modesto Irrigation District along with Oakdale Irrigation District, Stanislaus County and the Cities of Modesto, Oakdale, and Riverbank executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRBGA) for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin. In July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA. In August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act (SGMA) "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)). SGMA requires sustainable management through the development of groundwater sustainability plans (GSP), which can be a single plan developed by one or more groundwater sustainability agency (GSA) or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727). SGMA also requires a GSA to manage groundwater in all basins designated by the Department of Water Resources (DWR) as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02). The STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA. The STRGBA GSA also has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.). On February 28, 2017, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin along with Tuolumne County GSA. The STRGBA GSA has since then worked with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin. On August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4. On November 15, 2021, the STRGBA GSA and Tuolumne County GSA released the completed draft of the Modesto Subbasin GSP for public review and comment. The STRGBA GSA and Tuolumne County GSA have subsequently

	received, reviewed, and incorporated public comments into the final document where appropriate. All seven STRGBA GSA member agencies (MID, OID, Stanislaus County, Cities of Modesto, Oakdale, Riverbank, and Waterford) have held public hearings, adopted the draft GSP and authorized the Plan Manager to submit the final GSP to DWR by January 31, 2022. The final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution.
Alternatives, Pros and Cons of Each Alternative:	1. Do Nothing – Cons: Does not comply with State law, not eligible for DWR grant funding, liable for costs associated with DWR engagement of 3rd party to prepare plan; Pros: No staff time or consultant costs. 2. Approve GSP – Cons: Staff time and consultant costs; Pros: Complies with State law, eligible for DWR grant funding, demonstrates unified long-term water resource planning with other STRGBA GSA member agencies..
Concurrence:	The GSP has been prepared in accordance with the requirements of the Sustainable Groundwater Management Act of 2014, and Water Code, § 10727. All seven STRGBA GSA member agencies have adopted the final draft of the GSP.
Fiscal Impact:	In July 2018, the STRGBA GSA member agencies entered into a cost share agreement for the preparation of the GSP for the Modesto Subbasin. In August 2017, City awarded a contract to Todd Groundwater to prepare the GSP for a total cost of $1,616,226 inclusive of a 10% contingency. Subsequently, the City of Modesto applied for and was awarded a $1,000,000 grant from DWR to help defray the plan preparation costs. The seven STRGBA GSA member agencies along with the Tuolumne County GSA agreed to each pay approximately 12.5% (1/8) of the unfunded balance, or $77,028, to cover their share of the GSP development.
Recommendation:	Resolution adopting the Modesto Subbasin Groundwater Sustainability Plan (GSP) and authorizing the STRGBA GSA Plan Manager to submit the GSP to DWR by January 31, 2022.

AGENDA REPORT

Attachments: Supporting documents attached:

☒ Resolution ☐ Presentation ☐ Other supporting docs ☐ None attached

Note: Original contracts and agreements are housed in the GSA Secretary's Office, phone (209) 526-7360.

Presenter	GSA Chairman
Gordon J. Enas	Eric Thorburn
Gordon Enas, P.E.	Eric Thorburn, P.E.
1/25/22	1/25/22
Date Signed	Date Signed

MODESTO CITY COUNCIL
RESOLUTION NO. 2021-512

RESOLUTION APPROVING THE ADOPTION OF THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZING THE STANISLAUS AND TUOLUMNE RIVERS GROUNDWATER SUSTAINABILITY ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY TO SUBMIT THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN TO THE DEPARTMENT OF WATER RESOURCES

WHEREAS, in September of 2014, Governor Edmund G. Brown signed into law the Sustainable Groundwater Management Act of 2014 (SGMA), which changed groundwater management in California. SGMA is a comprehensive package of legislation that sets the framework for statewide sustainable groundwater management and declares that such authority be given to local public agencies that have either water supply, land use authority, or both, and

WHEREAS, SGMA requires the formation of Groundwater Sustainability Agencies (GSAs) made up of local public agencies, and

WHEREAS, GSAs are the local agencies responsible for the development and implementation of the Groundwater Sustainability Plans (GSPs), ultimately aimed at ensuring groundwater sustainability over a 20-year implementation period, and

WHEREAS, the City of Modesto overlies the Modesto Subbasin and the Turlock Subbasin, which are designated as high priority, non-critically overdrafted groundwater basins by the State. The regulatory deadline for the completion of the GSPs for the Modesto Subbasin and Turlock Subbasin is January 31, 2022, and

WHEREAS, on January 24, 2017, by Resolution No. 2017-30, Council authorized a Groundwater Sustainability Agency Memorandum of Understanding with the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) member agencies and approved the formation of the Stanislaus and Tuolumne Rivers

Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA). The STRGBA GSA was officially formed on February 16, 2017. The STRGBA GSA is a partnership consisting of the cities of Modesto, Oakdale, Riverbank and Waterford; the Oakdale Irrigation District, Modesto Irrigation District and Stanislaus County, and

WHEREAS, due to the structure of the Memorandum of Understanding governing the administration of the STRGBA GSA, all member agencies must approve and adopt the Modesto Subbasin GSP by their respective governing bodies. All member agencies of the STRGBA GSA and the Tuolumne County GSA, will be taking action to approve and adopt the Modesto Subbasin GSP, and

WHEREAS, this proposed action is in compliance with State legislation known as the "Sustainable Groundwater Management Act" which mandates the adoption of a Groundwater Sustainability Plan for groundwater basins categorized as high priority, but not in a condition of critical overdraft, by January 31, 2022, and

WHEREAS, failure to adopt such GSP would result in the groundwater resources of the basin being subject to regulation by the State of California Water Resources Control Board.

NOW, THEREFORE, BE IT RESOLVED by the Council of the City of Modesto that it hereby approves the adoption of the Modesto Subbasin Groundwater Sustainability Plan and authorizes the Stanislaus and Tuolumne Rivers Groundwater Sustainability Association Groundwater Sustainability Agency to submit the Modesto Subbasin Groundwater Sustainability Plan to the Department of Water Resources.

The foregoing resolution was introduced at a regular meeting of the Council of the City of Modesto held on the 14th day of December, 2021, by Councilmember Madrigal, who moved its adoption, which motion being duly seconded by Councilmember Wright, was upon roll call carried and the resolution adopted by the following vote:

AYES:	Councilmembers:	Escutia-Braaton, Kenoyer, Madrigal, Ricci, Wright, Zoslocki, Mayor Zwahlen
NOES:	Councilmembers:	None
ABSENT:	Councilmembers:	None

ATTEST: _____
DANA SANCHEZ, Interim City Clerk

(SEAL)

APPROVED AS TO FORM:

BY: _____
JOSE M. SANCHEZ, City Attorney

CITY OF RIVERBANK

RESOLUTION NO. 2021-114

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIVERBANK, CALIFORNIA, ADOPTING THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRBGA") for the purpose of coordinating planning and management activities in the Modesto Subbasin; and

WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA; and

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinate plans within a basin or subbasin (Wat. Code, § 10727); and

WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02); and

WHEREAS, the STRGBA GSA was formed on February 16, 2017 for the purposes of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 *et seq.*); and

WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017; and

WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin; and

WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code Section 10728.4; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment;

WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and responded to comments on the Modesto Subbasin GSP; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA released the final Modesto Subbasin GSP which is incorporated in its entirety by reference hereto this resolution as **Exhibit A**; and

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Riverbank declares as follows:

1. The City of Riverbank hereby approves and adopts the final Modesto Subbasin GSP as drafted.
2. The City of Riverbank authorizes the Modesto Sub basin Plan Manager and consultants to take such other actions as may be reasonably necessary to submit the Modesto Subbasin GSP to DWR by January 31, 2022, and implement the purpose of this Resolution.

PASSED AND ADOPTED by the City Council of the City of Riverbank at a regular meeting held on the 14th day of December, 2021; motioned by Councilmember District 3 Cal Campbell, seconded by Vice Mayor (CM-D1) Luis Uribe, and upon roll call was carried by the following City Council vote of 5-0:

AYES: **Barber-Martinez, Campbell, Hernandez, Uribe, and Mayor O'Brien**
NAYS: **None**
ABSENT: **None**
ABSTAINED: **None**

ATTEST:

Annabelle H. Aguilar, CMC
City Clerk

APPROVED:

Richard D. O'Brien
Mayor

Attachment: https://www.strgba.org/Home/GSP

IN THE CITY COUNCIL
OF THE CITY OF OAKDALE
STATE OF CALIFORNIA
CITY COUNCIL RESOLUTION 2022-004

RESOLUTION OF THE CITY OF OAKDALE CITY COUNCIL ADOPTING THE FINAL STAFF VERSION OF THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN (GSP) AND AUTHORIZING THE STANISLAUS & TUOLUMNE RIVERS GROUNDWATER BASIN ASSOCIATION GROUNDWATER SUSTAINABILITY AGENCY (STRGBA GSP) TO SUBMIT THE FINAL MODESTO SUBBASIN GSP TO DEPARTMENT OF WATER RESOURCES (DWR) BY JANUARY 31, 2022

THE CITY OF OAKDALE CITY COUNCIL DOES HEREBY RESOLVE THAT:

WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRBGA") for the purpose of coordinating planning and management activities in the Modesto Subbasin; and

WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA; and

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinate plans within a basin or subbasin (Wat. Code, § 10727); and

WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02); and

WHEREAS, the STRGBA GSA was formed on February 16, 2017 for the purposes of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.); and

WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017; and

WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin; and

WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code Section 10728.4; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and responded to comments on the Modesto Subbasin GSP; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA released the final Modesto Subbasin GSP on November 15, 2021, which is attached to this resolution as Exhibit A; and

WHEREAS, there is no fiscal impact associated with the adoption of the Modesto Subbasin Groundwater Sustainability Plan. However, there will be costs associated with implementing the GSP over the coming decades. These costs, once determined, will be subject to future City budget considerations and City Council approval; and

WHEREAS, in the course of Department of Water Resources (DWR) review, it may be required to edit the final version presented to the Oakdale City Council at the January 18, 2022 meeting. City of Oakdale Staff, the STRGBA GSA and consultant team will finalize the GSP by making non-substantive revisions to the final Modesto Subbasin GSP presented on January 18, 2022; and

WHEREAS, the final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution as Attachment B: https://www.strgba.org/Home/GSP; and

WHEREAS, Staff recommends that the City Council adopt the Resolution adopting the final staff version of the Modesto Subbasin Groundwater Sustainability Plan (GSP) and authorizing the Stanislaus & Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA) to submit the final Modesto Subbasin GSP to Department of Water Resources (DWR) by January 31, 2022.

NOW, THEREFORE, BE IT RESOLVED that the **CITY COUNCIL** hereby adopts the final staff version of the Modesto Subbasin Groundwater Sustainability Plan (GSP) and authorizes the Stanislaus & Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA) to submit the final Modesto Subbasin GSP to Department of Water Resources (DWR) by January 31, 2022.

THE FOREGOING RESOLUTION IS HEREBY ADOPTED THIS 18th DAY OF JANUARY, 2022, by the following vote:

AYES:	COUNCIL MEMBERS:	C. Smith, Haney, Bairos	(3)
NOES:	COUNCIL MEMBERS:	None	(0)
ABSENT:	COUNCIL MEMBERS:	F. Smith	(1)
ABSTAINED:	COUNCIL MEMBERS:	None	(0)

SIGNED:

Cherilyn Bairos, Mayor

ATTEST:

Rouzé Roberts, City Clerk

WATERFORD CITY COUNCIL
RESOLUTION #2021-64

RESOLUTION ADOPTING THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZING THE SUBMISSION TO THE DEPARTMENT OF WATER RESOURCES

WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRBGA") for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin; and

WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA; and

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727); and

WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02); and

WHEREAS, the STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 *et seq*.); and

WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017; and

WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin; and

WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and will respond to comments on the Modesto Subbasin GSP; and

WHEREAS, the final staff version of the Modesto Subbasin GSP was presented to the Waterford City Council on December 16, 2021; and

WHEREAS, the City of Waterford understands its staff and consultant team will finalize the GSP by making non-substantive revisions to the final Modesto Subbasin GSP presented on December 16, 2021; and

WHEREAS, the final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Waterford hereby finds as follows:

1. The City of Waterford hereby approves and adopts the final staff version of the Modesto Subbasin GSP.

2. The City of Waterford authorizes the Modesto Subbasin Plan Manager and consultants to take such actions as may be reasonably necessary to:

   a. finalize the staff version of the Modesto Subbasin GSP, barring any substantive changes to the document;

   b. submit the final Modesto Subbasin GSP to DWR by January 31, 2022; or

   c. implement the purpose of this Resolution.

The foregoing Resolution was passed and adopted by the City Council of the City of Waterford, County of Stanislaus, State of California, at a regular meeting thereof held on December 16, 2021, by the following vote:

AYES: Aldaco, Kitchens, Talbott
NOES: None
ABSTAIN: None
ABSENT: Ewing, Hilton

City of Waterford,

DocuSigned by:
Jose M Aldaco
6504969EAF3E4B2...

Jose Aldaco, Mayor

ATTEST:

DocuSigned by:
Patricia Krause
0E40B251B23D4F2...

Patricia Krause, CMC, City Clerk

APPROVED AS TO FORM:

DocuSigned by:
Corbett Browning
F2D1FA69CB4B4A7...

Corbett J. Browning, City Attorney

RESOLUTION 2021-68

ADOPTING THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZING THE SUBMISSION TO THE DEPARTMENT OF WATER RESOURCES

WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRBGA) for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin; and

WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA; and

WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act (SGMA) "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d)); and

WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727); and

WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02); and

WHEREAS, the STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA; and

WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.); and

WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017; and

WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin; and

WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment; and

WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and will respond to comments on the Modesto Subbasin GSP; and

WHEREAS, the Modesto Irrigation District understands its staff and consultant team will finalize the GSP by making non-substantive revisions to the final Modesto Subbasin GSP presented on December 14, 2021; and

WHEREAS, the final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution.

BE IT RESOLVED, That the Board of Directors of the Modesto Irrigation District hereby approves and adopts the final staff version of the Modesto Subbasin GSP and authorizes the Modesto Subbasin Plan Manager and consultants to take such actions as may be reasonably necessary to finalize the staff version of the Modesto Subbasin GSP, barring any substantive changes to the document, and submit the final Modesto Subbasin GSP to DWR by January 31, 2022.

Moved by Director Blom, seconded by Director Byrd, that the foregoing resolution be adopted.

The following roll call vote was had:
Ayes: Directors Blom, Byrd, Campbell, Gilman and Mensinger
Noes: Director None
Absent: Director None
The President declared the resolution adopted.

o0o

I, Angela Cartisano, Board Secretary of the Modesto Irrigation District, do hereby CERTIFY that the foregoing is a full, true and correct copy of a resolution duly adopted at a regular meeting of said Board of Directors held the fourteenth day of December 2021.

Board Secretary of the
Modesto Irrigation District

OAKDALE IRRIGATION DISTRICT
RESOLUTION NO. 2021-29

RESOLUTION ADOPTING THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZING THE SUBMISSION TO THE DEPARTMENT OF WATER RESOURCES

A. **WHEREAS**, in April 1994 the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRBGA") for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin;

B. **WHEREAS**, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA;

C. **WHEREAS,** in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d));

D. **WHEREAS**, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727);

E. **WHEREAS**, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02);

F. **WHEREAS**, the STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA;

G. **WHEREAS**, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 *et seq.*);

H. **WHEREAS**, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017;

I. **WHEREAS**, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin;

J. **WHEREAS**, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4;

K. **WHEREAS,** the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment;

L. **WHEREAS**, the STRGBA GSA and Tuolumne County GSA reviewed and will respond to comments on the Modesto Subbasin GSP;

M. **WHEREAS**, the final staff version of the Modesto Subbasin GSP was presented to the Board of Directors on December 14, 2021;

N. **WHEREAS**, the Oakdale Irrigation District understands its staff and consultant team will finalize the GSP by making non-substantive revisions to the final Modesto Subbasin GSP presented on December 14, 2021;

O. **WHEREAS**, the final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Oakdale Irrigation District finds as follows:

1. Oakdale Irrigation District hereby approves and adopts the final staff version of the Modesto Subbasin GSP.

2. Oakdale Irrigation District authorizes the Modesto Subbasin Plan Manager and consultants to take such actions as may be reasonably necessary to:

   a. finalize the staff version of the Modesto Subbasin GSP, barring any substantive changes to the document;

   b. submit the final Modesto Subbasin GSP to DWR by January 31, 2022; or

   c. implement the purpose of this Resolution.

Upon motion of Director Doornenbal, seconded by Director Tobias, and duly submitted to the Board for its consideration, the above-titled Resolution was adopted this 14th day of December, 2021.

OAKDALE IRRIGATION DISTRICT

Thomas D. Orvis, President
Board of Directors

Steve Knell, P.E.
General Manager/Secretary

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
BOARD ACTION SUMMARY

DEPT: Environmental Resources

BOARD AGENDA:6.B.2
AGENDA DATE: August 31, 2021

SUBJECT:
Approval to Set a Public Hearing on December 7, 2021, at the 9:00 a.m. Meeting to Consider Adoption of the Modesto Groundwater Subbasin Groundwater Sustainability Plan

BOARD ACTION AS FOLLOWS: **RESOLUTION NO. 2021-0400**

On motion of Supervisor Grewal **Seconded by Supervisor** B. Condit
and approved by the following vote,
Ayes: Supervisors: B. Condit, Withrow, Grewal, C. Condit, and Chairman Chiesa
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

1) X **Approved as recommended**
2) _____ **Denied**
3) _____ **Approved as amended**
4) _____ **Other:**

MOTION:

ATTEST: KELLY RODRIGUEZ, Assistant Clerk of the Board of Supervisors

File No.

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
AGENDA ITEM

DEPT: Environmental Resources BOARD AGENDA:6.B.2
AGENDA DATE: August 31, 2021

CONSENT: ☑

CEO CONCURRENCE: YES 4/5 Vote Required: No

SUBJECT:

Approval to Set a Public Hearing on December 7, 2021, at the 9:00 a.m. Meeting to Consider Adoption of the Modesto Groundwater Subbasin Groundwater Sustainability Plan

STAFF RECOMMENDATION:

1. Set a public hearing on December 7, 2021, at the 9:00 a.m. meeting for consideration of adoption of the Modesto Groundwater Subbasin Groundwater Sustainability Plan.

DISCUSSION:

In September of 2014, Governor Edmund G. Brown signed into law the Sustainable Groundwater Management Act of 2014 (SGMA), which changed the landscape of groundwater management in California. SGMA is a comprehensive package of legislation that sets the framework for statewide sustainable groundwater management and declares that such authority be given to local public agencies that have either water supply or land use authority, or both.

SGMA requires, among many other items, the formation of Groundwater Sustainability Agency‘s (GSAs) made up of local public agencies. SGMA empowers these GSAs to use a number of management tools to achieve “sustainability” in the affected groundwater basins, including authorities required in order to manage groundwater in a sustainable manner. GSAs are the local agencies responsible for the development and implementation of the Groundwater Sustainability Plans (GSPs), ultimately aimed at ensuring groundwater sustainability over a 20 year implementation period. GSPs are focused on the development and implementation of long-term groundwater sustainability programs, plans and practices over a 50 year planning horizon.

There are four groundwater subbasins underlying Stanislaus County, in whole or in part. These basins include the following:

1. Eastern San Joaquin Groundwater Subbasin
2. Modesto Groundwater Subbasin
3. Turlock Groundwater Subbasin
4. Delta-Mendota Groundwater Subbasin

The Delta-Mendota Groundwater Subbasin and the Eastern San Joaquin Groundwater Subbasin have been designated by the California Department of Water Resources to be in a condition of "critical overdraft." Pursuant to SGMA, groundwater subbasins in this category were required to develop and adopt GSPs by January 31, 2020. The Stanislaus County Board of Supervisors adopted both of these GSPs on December 10, 2019. The regulatory deadline for the completion of the GSPs for the Modesto Groundwater Subbasin and the Turlock Groundwater Subbasin, categorized as high priority, is January 31, 2022.

The formation deadline for creating the GSAs was June 30, 2017. On February 14, 2017, the Board of Supervisors approved the adoption of a Memorandum of Understanding creating the Stanislaus & Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA); a partnership consisting of the cities of Modesto, Oakdale, Riverbank and Waterford; Oakdale Irrigation District, Modesto Irrigation District and Stanislaus County.

Additionally, in May 2017, the Tuolumne County Board of Supervisors elected to become a Groundwater Sustainability Agency (GSA) for that area of the Modesto Groundwater Subbasin that falls within Tuolumne County's political jurisdiction. The remainder of the Modesto Groundwater Subbasin lies wholly within Stanislaus County. Furthermore, Tuolumne County and Stanislaus County entered into a Cooperation Agreement on May 8, 2018 regarding preparation of the GSP. This agreement recognized the status of Tuolumne County as an independent GSA with jurisdiction over specific lands lying within the Modesto Groundwater Subbasin and yet allowed for these lands to be integrated into a single, basin-wide GSP in full compliance with SGMA regulations.

The GSP that has been developed for the Modesto Groundwater Subbasin includes the following main chapters:

1. Administrative Information
2. Plan Area
3. Notice and Communication
4. Basin Setting
5. Water Budgets
6. Sustainable Management Criteria
7. Monitoring Networks
8. Projects and Management Actions
9. References

In addition to the regularly scheduled and publically noticed meetings of the committee groups preparing the draft Modesto Groundwater Subbasin GSP, "Office Hours" or public working sessions have been conducted on: March 25, 2021, May 28, 2021 and August 9, 2021.

As the formal adoption date of the GSP approaches into the fall months, additional public outreach meetings pertaining to the elements of the plan will be held.

Todd Groundwater, the name of the consultant firm preparing the Modesto Groundwater Subbasin GSP, will also be making a presentation regarding the GSP to the Stanislaus County Water Advisory Committee on September 29, 2021. This is a meeting that is open to the public.

Pursuant to California Water Code Section 10728.4, Adoption or Amendment of a Plan following Public Hearing, a GSA must take the following action:

"A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment. The groundwater sustainability agency shall review and consider comments from any city or county that receives notice pursuant to this section and shall consult with a city or county that requests consultation within 30 days of receipt of the notice. Nothing in this section is intended to preclude an agency and a city or county from otherwise consulting or commenting regarding the adoption or amendment of a plan."

This notice has been prepared and delivered to all of the principal parties involved in this matter. In the case of the STRGBA GSA, this requirement is routine in that all of the cities within the footprint of the GSP are member agencies of the STRGBA GSA, including Stanislaus County.

Furthermore, pursuant to California Water Code Section 10728.6, Division 13 (commencing with Section 21000) of the Public Resources Code, the provisions of the California Environmental Quality Act do not apply to the preparation and adoption of plans pursuant to SGMA.

Due to the structure of the MOU governing the administration of the STRGBA GSA, all member agencies must approve and adopt the Modesto Groundwater Subbasin GSP by their respective governing bodies. All member agencies, including Tuolumne County, will be taking action to approve and adopt the Modesto Groundwater Subbasin GSP.

A hard copy of the Public Draft of the Modesto Groundwater Sustainability Plan may be reviewed at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, in Modesto. All documents pertaining to the Modesto Groundwater Subbasin GSP may also be found at the following electronic address: https://www.strgba.org/.

POLICY ISSUE:

This proposed action is in compliance with State legislation known as the "Sustainable Groundwater Management Act" which mandates the adoption of a Groundwater Sustainability Plan (GSP) for groundwater basins categorized as high priority, but not in a condition of critical overdraft, by January 31, 2022. Failure to adopt such GSP would result in the groundwater resources of the basin being subject to regulation by the State of California Water Resources Control Board.

FISCAL IMPACT:

There is no fiscal impact associated with the adoption of the Modesto Subbasin Groundwater Sustainability Plan. However, there will be costs associated with implementing the GSP over the coming decades. These costs, once determined, will be subject to future County budget considerations and Board approval.

BOARD OF SUPERVISORS' PRIORITY:

Approval of these actions are consistent with the Board's *priority of Supporting Strong and Safe Neighborhoods, Supporting Community Health, Developing a Healthy Economy and Delivering Community Infrastructure* by ensuring a coordinated approach towards regional groundwater resources management.

STAFFING IMPACT:

Existing Department of Environmental Resources staff will continue to oversee the work associated with this item.

CONTACT PERSON:

Patrick Cavanah, Interim Director, DER	209-525-6818
Walter Ward, Water Resources Manager	209-525-6710

ATTACHMENT(S):

1. Notice of Public Hearing Modesto Groundwater Subbasin

STANISLAUS COUNTY
NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on Tuesday, December 7, 2021, at 9:00 a.m., or as soon thereafter as the matter may be heard, the Stanislaus County Board of Supervisors will meet in the Basement Chambers, 1010 10th Street, Modesto, CA, pursuant to California Water Code Section 10728.4, to consider approval and adoption of the Modesto Groundwater Subbasin Groundwater Sustainability Plan.

NOTICE IS FURTHER GIVEN that at the said time and place, interested persons will be given the opportunity to be heard. Written comments may be submitted to Stanislaus County at Attn: Walter Ward, Water Resources Manager, 3800 Cornucopia Way, Suite C, Modesto, CA, or at wward@envres.org.

BY ORDER OF THE BOARD OF SUPERVISORS

DATED: August 31, 2021

ATTEST: ELIZABETH A. KING, Clerk
of the Board of Supervisors
of the County of Stanislaus,
State of California

BY: Kelly Rodriguez
Kelly Rodriguez, Assistant Clerk

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
BOARD ACTION SUMMARY

DEPT: Environmental Resources BOARD AGENDA:7.1
AGENDA DATE: December 7, 2021

SUBJECT:
Public Hearing to Consider Adoption of the Modesto Groundwater Sustainability Plan

BOARD ACTION AS FOLLOWS: **RESOLUTION NO. 2021-0592**

On motion of Supervisor Withrow **Seconded by Supervisor** C. Condit
and approved by the following vote,
Ayes: Supervisors: B. Condit, Withrow, Grewal, C. Condit, and Chairman Chiesa
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

1) **X** **Approved as recommended**
2) _____ **Denied**
3) _____ **Approved as amended**
4) _____ **Other:**

MOTION:

ATTEST: **ELIZABETH A. KING, Clerk of the Board of Supervisors** **File No.**

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
AGENDA ITEM

DEPT: Environmental Resources BOARD AGENDA:7.1
AGENDA DATE: December 7, 2021

CONSENT ☐

CEO CONCURRENCE: YES 4/5 Vote Required: No

SUBJECT:

Public Hearing to Consider Adoption of the Modesto Groundwater Sustainability Plan

STAFF RECOMMENDATION:

1. Conduct a public hearing to consider approval and adoption of the Modesto Groundwater Sustainability Plan.
2. Approve and adopt the resolution regading the Modesto Groundwater Sustainability Plan.
3. Authorize the Modesto Groundwater Sustainability Agency's, it's consultants, and the Plan Manager to take such other actions as may be reasonably necessary to submit the Modesto Groundwater Sustainability Plan to the California Department of Water Resources by January 31, 2022, and implement the purpose of this resolution.

DISCUSSION:

In September of 2014, Governor Edmund G. Brown signed into law the Sustainable Groundwater Management Act of 2014 (SGMA), which changed the landscape of groundwater management in California. SGMA is a comprehensive package of legislation that sets the framework for statewide sustainable groundwater management and declares that such authority be given to local public agencies that have either water supply or land use authority, or both.

SGMA requires, among many other items, the formation of Groundwater Sustainability Agency‘s (GSAs) made up of local public agencies. SGMA empowers these GSAs to use a number of management tools to achieve “sustainability” in the affected groundwater basins, including authorities required in order to manage groundwater in a sustainable manner. GSAs are the local agencies responsible for the development and implementation of the Groundwater Sustainability Plans (GSPs), ultimately aimed at ensuring groundwater sustainability over a 20 year implementation period. GSPs are focused on the development and implementation of long-term groundwater sustainability programs, plans and practices over a 50 year planning horizon.

There are four groundwater subbasins underlying Stanislaus County, in whole or in part. These basins include the following:

1. Eastern San Joaquin Groundwater Subbasin
2. Modesto Groundwater Subbasin

3. Turlock Groundwater Subbasin
4. Delta-Mendota Groundwater Subbasin

The Delta-Mendota Groundwater Subbasin and the Eastern San Joaquin Groundwater Subbasin are designated by the California Department of Water Resources as being in a condition of "critical overdraft." Pursuant to SGMA, groundwater subbasins in this category are required to develop and adopt GSPs by January 31, 2020. The Stanislaus County Board of Supervisors adopted both of these GSPs in December, 2019. The regulatory deadline for the completion of the GSPs for the Modesto Groundwater Subbasin and the Turlock Groundwater Subbasin is January 31, 2022.

The formation deadline for creating the GSAs was June 30, 2017. On February 28, 2017, the Board of Supervisors approved the adoption of a Memorandum of Understanding creating the Stanislaus & Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA); a partnership consisting of the cities of Modesto, Oakdale, Riverbank and Waterford; Oakdale Irrigation District, Modesto Irrigation District and Stanislaus County.

Additionally, in May 2017, the Tuolumne County Board of Supervisors elected to become a Groundwater Sustainability Agency (GSA) for that area of the Modesto Groundwater Subbasin that falls within Tuolumne County's political jurisdiction. The remainder of the Modesto Groundwater Subbasin lies wholly within Stanislaus County. Furthermore, Tuolumne County and Stanislaus County entered into a Cooperation Agreement on May 8, 2018 regarding preparation of the GSP. This agreement recognized the status of Tuolumne County as an independent GSA with jurisdiction over specific lands lying within the Modesto Groundwater Subbasin and yet allowed for these lands to be integrated into a single, basin-wide GSP (avoiding the need for a formal Coordination Agreement) in full compliance with SGMA regulations.

The GSP developed for the Modesto Groundwater Subbasin includes the following main chapters.

1. Administrative Information
2. Plan Area
3. Basin Setting
4. Notice and Communication
5. Water Budgets
6. Sustainable Management Criteria
7. Monitoring Networks
8. Projects and Management Actions
9. References

In addition to the regularly scheduled and publically noticed meetings of the committee groups preparing the draft Modesto Subbasin GSP, the following "Office Hours" or public working sessions have been conducted:

- March 25, 2021
- May 28, 2021
- August 9, 2021

Todd Groundwater, the principal consultant firm preparing the Modesto Groundwater Subbasin GSP, also made a presentation regarding the GSP to the Stanislaus County Water Advisory Committee on September 29, 2021. This presentation is located here:

http://www.stancounty.com/er/groundwater/pdf/wac/StanislausCountyWaterAdvisory092921.pdf

Pursuant to California Water Code Section 10728.4, Adoption or Amendment of Plan following Public Hearing, a GSA must take the following action:

"A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment. The groundwater sustainability agency shall review and consider comments from any city or county that receives notice pursuant to this section and shall consult with a city or county that requests consultation within 30 days of receipt of the notice. Nothing in this section is intended to preclude an agency and a city or county from otherwise consulting or commenting regarding the adoption or amendment of a plan."

This notice has been prepared and delivered to all of the principal parties involved in this matter. In the case of the STRGBA this requirement is routine in that all of the cities within the footprint of the GSP are member agencies of the STRGBA GSA, including Stanislaus County.

Furthermore, pursuant to California Water Code Section 10728.6, Division 13 (commencing with Section 21000) of the Public Resources Code, the provisions of the California Environmental Quality Act do not apply to the preparation and adoption of plans pursuant to SGMA.

Due to the structure of the MOU governing the administration of the STRGBA GSA, all member agencies must approve and adopt the Modesto Groundwater Subbasin GSP by their respective governing bodies. All member agencies, including Tuolumne County, will be taking action to approve and adopt the Modesto Groundwater Subbasin GSP.

A hard copy of the Public Draft of the Modesto Subbasin Groundwater Sustainability Plan may be reviewed at the Stanislaus County Department of Environmental Resources, 3800 Cornucopia Way, Suite C, in Modesto. All documents pertaining to the Modesto Groundwater Subbasin GSP may also be found at the following electronic address:

https://www.strgba.org/

POLICY ISSUE:

This proposed action is in compliance with State legislation known as the "Sustainable Groundwater Management Act" which mandates the adoption of a Groundwater Sustainability Plan (GSP) for groundwater basins categorized as high priority, but not in a condition of critical overdraft, by January 31, 2022. Failure to adopt such GSP would result in the groundwater resources of the basin being subject to regulation by the State of California Water Resources Control Board.

FISCAL IMPACT:

There is no fiscal impact associated with the adoption of the Modesto Subbasin Groundwater Sustainability Plan. However, there will be costs associated with implementing the GSP over the coming decades. These costs, once determined, will be subject to future County budget considerations and Board approval.

BOARD OF SUPERVISORS' PRIORITY:

Approval of these actions are consistent with the Board's priorities of *Supporting Strong and Safe Neighborhoods, Supporting Community Health, Developing a Healthy Economy, and Delivering Community Infrastructure* by ensuring a coordinated approach towards regional groundwater resources management.

STAFFING IMPACT:

Existing staff from the Department of Environmental Resources and other relevant County departments will continue to oversee the work associated with this item.

CONTACT PERSON:

Robert Kostlivy, Director, DER	209-525-6818
Walter Ward, Water Resources Manager	209-525-6710

ATTACHMENT(S):

1. Resolution

ORACLE ACCOUNT CODING STRIP
Single Supplier - Multiple Invoices

Shaded areas for A/P only

BATCH NAME	PREPARED Fay Tamez	DEPT: ENVIRONMENTAL RESOURCES
KEYED BY	DATE: 12/13/2021	PHONE: 525-6795
DATE		

SUPPLIER: MCCLATCHY **INVOICE DATE: VARIOUS** **TOTAL:** $101.64

SITE: 74253 - MI **TERMS: IMMED**

PAY ALONE
Y / N

LINE	PO #		INVOICE #	DATE	AMOUNT	FUND	ORG	ACCT	GL PROJ	LOCATION	MISC	OTHER	DESCRIPTION
1		P/F	82582	11/30/2021	$101.64	100	34301	62630	0	0	0	0	30440 - GW
2		P/F											
3		P/F											
4		P/F											
5		P/F											
6		P/F											
7		P/F											
8		P/F											

12/13/21 [signature]
DATE AUTHORIZED DEPARTMENTAL SIGNATURE

OK TO PAY OVERAGE

BUYER SIGNATURE

DATE AUDITOR APPROVING SIGNATURE (Exceeding $75,000)

REPORTABLE: Y or N **BOX #** **SITE NAME:** 74253

McClatchy

Beaufort Gazette
Belleville News-Democrat
Bellingham Herald
Bradenton Herald
Centre Daily Times
Charlotte Observer
Columbus Ledger-Enquirer
Fresno Bee
The Herald - Rock Hill
Herald Sun - Durham
Idaho Statesman
Island Packet
Kansas City Star
Lexington Herald-Leader
Merced Sun-Star
Miami Herald
el Nuevo Herald - Miami
Modesto Bee
Raleigh News & Observer
The Olympian
Sacramento Bee
Fort Worth Star-Telegram
The State - Columbia
Sun Herald - Biloxi
Sun News - Myrtle Beach
The News Tribune Tacoma
The Telegraph - Macon
San Luis Obispo Tribune
Tri-City Herald
Wichita Eagle

CO STAN ENVIRONMENTAL RESOURCE
Attn: Accounts Payable
3800 CORNUCOPIA WAY STE C
MODESTO, CA 95358

RECEIVED
STANISLAUS CO.
DEC 10 2021
ENVIRONMENTAL RESOURCES

INVOICE	
Invoice No.:	82582
Invoice Date:	11/30/2021
Due Date:	12/30/2021
Bill-To Account:	30440
Sales Rep:	Jane Durand

Dates	Order No.	Description	Product	Size	Billed Units	Times Run	Net Amount
11/21/2021 - 11/28/2021	153686	Print Legal Ad IPL0045135	MOD-The Modesto Bee Legal | Legals & Public Notices CLS	1 x 32 L	32 L	2	$101.64

Summary	
Amount Due:	$101.64

OK to Pay
UPW
12/10/21

Please Return This Portion With Your Payment (Thank You)

McClatchy Company LLC
PO Box 510150
Livonia MI 48151

INVOICE	
Invoice No.:	82582
Account No.:	30440
Account Name:	CO STAN ENVIRONMENTAL RESOURCE
Amount Due:	$101.64

Email questions to ssccreditandcollections@mcclatchy.com

3006000066 PRESORT PBPS001 <B>

CO STAN ENVIRONMENTAL RESOURCE
ATTN: ACCOUNTS PAYABLE
3800 CORNUCOPIA WAY STE C
MODESTO CA 95358-9494

McClatchy Company LLC
PO Box 510150
Livonia MI 48151

0000030440 0000082582 000010164 1

McClatchy

Beaufort Gazette
Belleville News-Democrat
Bellingham Herald
Bradenton Herald
Centre Daily Times
Charlotte Observer
Columbus Ledger-Enquirer
Fresno Bee
The Herald - Rock Hill
Herald Sun - Durham
Idaho Statesman
Island Packet
Kansas City Star
Lexington Herald-Leader
Merced Sun-Star
Miami Herald
el Nuevo Herald - Miami
Modesto Bee
Raleigh News & Observer
The Olympian
Sacramento Bee
Fort Worth Star-Telegram
The State - Columbia
Sun Herald - Biloxi
Sun News - Myrtle Beach
The News Tribune Tacoma
The Telegraph - Macon
San Luis Obispo Tribune
Tri-City Herald
Wichita Eagle

AFFIDAVIT OF PUBLICATION

Account #	Order Number	Identification	Order PO	Amount	Cols	Depth
30440	153686	Print Legal Ad - IPL0045135		$101.64	1	32 L

Attention: Julie Mendoza

CO STAN ENVIRONMENTAL RESOURCE
3800 CORNUCOPIA WAY STE C
MODESTO, CA 95358

STANISLAUS COUNTY NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that on Tuesday, December 7, 2021, at 9:00 a.m., or as soon thereafter as the matter may be heard, the Stanislaus County Board of Supervisors will meet in the Basement Chambers, 1010 10th Street, Modesto, CA, pursuant to California Water Code Section 10728.4, to consider approval and adoption of the Modesto Groundwater Subbasin Groundwater Sustainability Plan.

NOTICE IS FURTHER GIVEN that at the said time and place, interested persons will be given the opportunity to be heard. Written comments may be submitted to Stanislaus County at Attn: Walter Ward, Water Resources Manager, 3800 Cornucopia Way, Suite C, Modesto, CA, or at wward@envres.org.

BY ORDER OF THE BOARD OF SUPERVISORS
DATED: August 31, 2021
ATTEST:
ELIZABETH A. KING, Clerk of the Board of Supervisors of the County of Stanislaus, State of California
BY: /s/Kelly Rodriguez, Assistant Clerk
IPL0045135
Nov 21,28 2021

Declaration of Publication C.C.P. S2015.5

STATE OF CALIFORNIA)
) ss.
County of Stanislaus)

I am a citizen of the United States; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Modesto Bee, a newspaper of general circulation, printed and published in the city of Modesto, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Stanislaus, State of California, under the date of February 25, 1951 Action No. 46453 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

No. of Insertions: 2

Beginning Issue of: 11/21/2021

Ending Issue of: 11/28/2021

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Dallas, Texas on:

Date: 29th, day of November, 2021

Notary Public in and for the state of Texas, residing in Dallas County

AMANDA DAWN GRISHAM
My Notary ID # 132031326
Expires May 30, 2023

Extra charge for lost or duplicate affidavits.
Legal document please do not destroy!

THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
STATE OF CALIFORNIA

2021-0592

Date: December 7, 2021

On motion of Supervisor Withrow Seconded by Supervisor C. Condit
and approved by the following vote,
Ayes: Supervisors: B. Condit, Withrow, Grewal, C. Condit, and Chairman Chiesa
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

THE FOLLOWING RESOLUTION WAS ADOPTED: Item # 7.1

THE MODESTO SUBBASIN GROUNDWATER SUSTAINABILITY PLAN AND AUTHORIZING THE SUBMISSION TO THE DEPARTMENT OF WATER RESOURCES

A. WHEREAS, in April 1994, the City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, and County of Stanislaus executed a Memorandum of Understanding to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association ("STRBGA") for the purpose of coordinating planning and groundwater management activities in the Modesto Subbasin;

B. WHEREAS, in July 2015, the Memorandum of Understanding was amended to include the City of Waterford as a member agency of STRGBA;

C. WHEREAS, in August 2014, the California Legislature passed, and in September 2014 the Governor signed, legislation creating the Sustainable Groundwater Management Act ("SGMA") "to provide local groundwater sustainability agencies with the authority and technical and financial assistance necessary to sustainably manage groundwater" (Wat. Code, § 10720, (d));

D. WHEREAS, SGMA requires sustainable management through the development of groundwater sustainability plans ("GSP"), which can be a single plan developed by one or more groundwater sustainability agency ("GSA") or multiple coordinated plans within a basin or subbasin (Wat. Code, § 10727);

E. WHEREAS, SGMA requires a GSA to manage groundwater in all basins designated by the Department of Water Resources ("DWR") as a medium or high priority, including the Modesto Subbasin (designated basin number 5-022.02);

F. WHEREAS, the STRGBA GSA was formed on February 16, 2017, for the purpose of sustainably managing groundwater in the Modesto Subbasin, within its jurisdictional boundaries, pursuant to the requirements of SGMA;

G. WHEREAS, the STRGBA GSA has the authority to draft, adopt, and implement a GSP (Wat. Code, § 10725 et seq.);

H. WHEREAS, the STRGBA GSA submitted an Initial Notification to DWR to jointly develop a GSP for the Modesto Subbasin on February 28, 2017;

I. WHEREAS, the STRGBA GSA has coordinated with the Tuolumne County GSA to develop a single, coordinated GSP for the Modesto Subbasin;

J. WHEREAS, on August 10, 2021 the STRGBA GSA released the Notice of Intent to Adopt the GSP to cities and counties in the plan area pursuant to Water Code section 10728.4;

K. WHEREAS, the STRGBA GSA and Tuolumne County GSA developed the draft Modesto Subbasin GSP and released the draft Modesto Subbasin GSP chapters for public review and comment;

L. WHEREAS, the STRGBA GSA and Tuolumne County GSA reviewed and will respond to comments on the Modesto Subbasin GSP;

M. WHEREAS, the final staff version of the Modesto Subbasin GSP was presented to Stanislaus County on December 7, 2021;

N. WHEREAS, the Stanislaus County understands its staff and consultant team will finalize the GSP by making non-substantive revisions to the final Modesto Subbasin GSP presented on December 7, 2021;

O. WHEREAS, the final Modesto Subbasin GSP will be incorporated in its entirety by reference hereto this resolution.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of the Stanislaus County finds as follows:

1. Stanislaus County hereby approves and adopts the final staff version of the Modesto Subbasin GSP.

2. Stanislaus County authorizes the Modesto Subbasin Plan Manager and consultants to take such actions as many be reasonably necessary to:

   a. finalize the staff version of the Modesto Subbasin GSP, barring any substantive changes to the document;

   b. submit the final Modesto Subbasin GSP to DWR by January 31, 2022; or

   c. implement the purpose of this Resolution.

ATTEST: **ELIZABETH A. KING, Clerk**
Stanislaus County Board of Supervisors,
State of California

Elizabeth A King

File No.

Appendix C

C2VSimTM

The Turlock-Modesto Integrated Water Resources Model

Modesto Subbasin Documentation

C2VSimTM

The Turlock-Modesto Integrated Water Resources Model

A Refined Version of C2VSimFG for the Turlock & Modesto Subbasins

Modesto Subbasin Documentation

JANUARY 2022

C2VSIMTM

THE TURLOCK-MODESTO INTEGRATED WATER RESOURCES MODEL

A REFINED VERSION OF C2VSIMFG FOR THE TURLOCK & MODESTO SUBBASINS

MODESTO SUBBASIN DOCUMENTATION

JANUARY 2022

Stanislaus & Tuolumne Rivers Groundwater Basin Association
GROUNDWATER SUSTAINABILITY AGENCY

County of Tuolumne
Groundwater Sustainability Agency

Prepared by: Woodard & Curran, Inc.
In Association with: Todd Groundwater

Table of Contents

List of Tables

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List of Abbreviations

ASCE	American Society of Civil Engineers
EWRI	Environmental & Water Resources Institute
AWMP	Agriculture Water Management Plan
C2VSimFG	California Central Valley Simulation Model – Fine Grid
C2VSimTM	California Central Valley Simulation Model – Turlock & Modesto
Cal-SIMETAW	California Simulation of Evapotranspiration of Applied Water
CASGEM	California Statewide Groundwater Elevation Monitoring
CDEC	California Data Exchange Center
CIMIS	California Irrigation Management Information System
DWR	Department of Water Resources
eWRIMS	Electronic Water Rights Information Management System
ITRC	Irrigation Training and Research Center at Cal Poly, San Luis Obispo
METRIC	Mapping Evapotranspiration at High Resolution and Internalized Calibration
MID	Modesto Irrigation District
NDE	Non-District East
NDW	Non-District West
NASS	National Agricultural Statistics Service
NRCS	Natural Resource Conservation Service
OID	Oakdale Irrigation District
OSWCR	Online System for Well Completion Reports
SCS-CN	Soil Conservation Service Curve Number Method
SSURGO	Soil Survey Geographic Database
TID	Turlock Irrigation District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWMP	Urban Water Management Plan

1. INTRODUCTION

Water is a precious resource in the San Joaquin Valley, providing the underlying needs for cities and residents, agriculture, and ecosystems. However, water supply can fluctuate dramatically between drought and floods in the San Joaquin Valley due to variable hydrology. In years of little precipitation and snowmelt that results in reduced surface water supply, agricultural water users often turn to groundwater to meet their crop demands.

Due to an overreliance on groundwater in California, the Sustainable Groundwater Management Act (SGMA) was passed in 2014. SGMA requires that local agencies develop and implement plans to achieve sustainable groundwater management over the course of twenty years. As part of SGMA, Groundwater Sustainability Agencies (GSAs) need to quantify conditions in the subbasin under historical, current, and projected conditions.

The Turlock-Modesto Water Resources Model (C2VSimTM) is a fully integrated surface and groundwater flow model, based on the California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG). The Turlock-Modesto Model is a refined version of the state's regional model that reflects the local data including hydrology, hydrogeology, land use and cropping patterns, and water resources operations for the Turlock and Modesto Subbasins (Figure M1). These refinements are made to enable the model to support the development of groundwater sustainability plans for the respective subbasins. While the C2VSimTM model retains its Central Valley-wide simulation capabilities, the refinements are made specific to each subbasin, and, as such, the refinements to the model for each Subbasin are documented in a separate report.

This report describes the details of the refinements for the Modesto Subbasin, and describes the objectives, data refinements, calibration refinements, and results of the C2VSimTM model for the Modesto Subbasin. As this model was developed as a local refinement of C2VSimFG, the purpose of this report is to present the additional details that have gone into the refinement of the Modesto Subbasin. All details relating to the construction of the base C2VSimFG model are documented in the California Department of Water Resources (DWR) Report (DWR, 2020) and the reader is encouraged to consider this report as an addendum to the C2VSimFG documentation.

The report is outlined as follows:

- Section 1 Introduction
- Section 2 C2VSimFG in the Modesto Subbasin
- Section 3 Model Development
- Section 4 Model Calibration
- Section 5 Discussion
- Section 6 Summary & Recommendations

1.1 GOALS OF MODEL DEVELOPMENT

The objective of the Modesto Model's development and calibration is to have a robust, technically sound, publicly accepted analytical computer tool that simulates the details of the integrated land surface system; stream and river system; and groundwater hydrologic and hydrogeologic system in the model area for use in regional water management.

Specifically, SGMA requires that GSAs discuss historical, current, and projected water demands and supplies (Water Code §10727.2(a)(3)). These can be evaluated in the context of water budgets, which are a useful tool for understanding water availability. Water budgets allow water resource managers to quantify inflows, outflows, and changes in storage at both the local and regional scale. The preparation of a water budget allows water resource managers to check their understanding of regional water supplies, demands based on available data, and use that understanding to make management decisions such as investing in new water supplies, water conveyance infrastructure or reducing water demands. Water budget development can reveal data gaps and uncertainties in how much water is available. The Modesto Model goes beyond C2VSimFG to capture and represent local considerations and conditions.

It is challenging to represent the hydraulic system without an integrated model; surface water and groundwater are an integrated physical system that is used to meet water demands in the San Joaquin Valley. Particularly as monitoring of groundwater pumping, recharge, and subsurface flows is not widely possible. As a result, there is a need to represent the physical properties of the hydrologic system in an integrated way to enable estimation of the unknown water budget components. An integrated hydrologic model is designed for this purpose. This type of model simulates both surface water and groundwater flow, as well as the interactions between surface water and groundwater, while representing the known physical constraints of the area of interest. This coupling dynamically accounts for available water based on the limited information accessible and enforces both conservation of mass and momentum. Inclusion of both conservation of mass and momentum allows simulation of local effects related to the rate of movement of groundwater, which is important to sustainable groundwater management. Water budgets are considered for the historical period, existing conditions baseline, projected conditions baseline, and baseline under climate change and sustainable yield scenarios.

1.2 MODESTO SUBBASIN

The Modesto Subbasin located near the center of the California Central Valley within the San Joaquin River Valley. The Subbasin is predominantly located within Stanislaus County and extends slightly into Tuolumne County. It is bounded by the Tuolumne River and Turlock Subbasin to the south, the Stanislaus River and Eastern San Joaquin Subbasin to the north, the San Joaquin River and Delta Mendota Subbasin to the west, and the Sierra Nevada Mountains to the east. The Modesto Subbasin is Bulletin 118 number 5-022.02 as shown in Figure M2.

The Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA) is the governing sustainability agency of the Modesto Subbasin, whose member agencies include a variety of agricultural and urban water purveyors. Modesto Irrigation District (MID) and Oakdale Irrigation District (OID) are the major agricultural water purveyors within the subbasin. Urban municipalities within the Modesto Subbasin include the Cities of Modesto, Oakdale, Riverbank and Waterford. Unincorporated areas within the subbasin, commonly referred to in this document as Non-district East and Non-district West, are represented by and within the jurisdictional area of Stanislaus and Tuolumne Counties. Locations of member agencies are presented in Figure M3.

1.3 ACKNOWLEDGEMENTS

The C2VSimTM is developed in a collaborative environment with open and transparent process in compilation of data and information for the Subbasin, detailed assumptions including those on the land use, cropping patterns, water use, water supply, reservoir operations and surface water deliveries, irrigation practices, drainage conditions, hydrogeologic conditions, groundwater use, and other detailed features.

The following individuals had significant contributions in development of the model for the Modesto Subbasin:

- Gordon Enas Modesto Irrigation District
- Eric Thorburn Oakdale Irrigation District
- Emily Sheldon Oakdale Irrigation District
- Miguel Alvarez City of Modesto
- Walt Ward Stanislaus County
- John Davids Previously with Modesto Irrigation District
- Chad Tienken Previously with Modesto Irrigation District

The model development task was funded by the Department of Water Resources as part of the grant for groundwater sustainability plan development. Following DWR individuals played key role in the model development activities:

- Tyler Hatch DWR: Sustainable Groundwater Management Office
- Can Dogrul DWR: Bay Delta Office

The following consultants were engaged in development and calibration of the model, and/or development of the baseline conditions and application of the model for sustainable groundwater management in the Turlock Subbasin:

Woodard & Curran, Inc.

- Ali Taghavi Principal in Charge and Senior Oversight
- Dominick Amador Lead Modeler

Todd Groundwater (Prime Consultant)

- Phyllis Stanin GSP Project Manager
- Liz Elliott Hydrogeologic Conceptual Model

2. C2VSIMFG IN THE MODESTO SUBBASIN

The C2VSimTM model is a locally enhanced version of DWR's California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG). This version of the model was updated by DWR to support SGMA activities throughout the Central Valley at a regional scale (DWR, 2020). The decision to use a locally refined version of C2VSimFG for the Modesto Subbasin's GSP effort was made based on the high degree of regional calibration the model had already achieved, as well as consistency in methodology with groundwater planning efforts in surrounding subbasins.

Unless otherwise noted, the standard inputs to C2VSimFG were used directly in the Modesto Model.

2.1 MODEL FRAMEWORK

The Modesto Integrated Water Resources Model simulates the entire C2VSimFG model domain, including all C2VSimFG model features, with appropriate refinements in the Modesto Subbasin. The Modesto Model was originally based on the C2VSimFG BETA2 release but was later updated to reflect DWR updates made to the Modesto Subbasin. The base version of C2VSimFG version uses the IWFM-2015 code, includes hydrologic data from period of water years 1922-2015, and was calibrated from October 1973 through September 2015.

Although the C2VSimTM was originally based on the BETA2 release, and the C2VSimFG has since been released as version 1.1, the foundational model datasets, such as the grid, hydrologic and hydrogeologic data sets, and soil conditions have maintained consistency through the various model versions. Version 1.1 has refinements to the land and water use, as well as hydrologic and hydrogeologic parameters that were refined during C2VSimFG model calibration (DWR, 2020). As part of the model's refinements, these datasets and parameters were refined and over-written for the Modesto Subbasin. The details of data refinements and sources of data are presented in remaining sections of this report. The Modesto Model, thus, maintains consistency with C2VSimFG datasets and uses the most recent relevant information. Therefore, the Modesto Model is the latest and most defensible model available to address the integrated groundwater and surface water resources in the Modesto Subbasin.

In total, there are 32,537 elements in the entire model, covering an area of more than 20,000 square miles. Starting from the C2VSimFG model features and standard inputs, subsequent modifications and refinements were made to land surface parameters corresponding to model features within the Modesto and Turlock Subbasins. Although the model encompasses data refinements and calibration enhancements for the Turlock and Modesto Subbasins, this report documents the data and calibration refinements in the Modesto Subbasin portion of the model only, which is used to support the development of the Modesto Subbasin GSP. As such, this report refers to the model as the "Modesto Model". The refinements for the Turlock Subbasin are documented in a separate report.

2.1.1 Land Surface System

The IWFM modeling platform is configured to simulate water demand and exchanges between the land surface and groundwater system at each element level based on various land use types and crop categories (Dogrul et al., 2016). Land use information, soil characteristics, and various other root zone parameters were developed and specified as inputs to the Modesto Model as the basis for characterizing and simulating all land surface processes in the Modesto Subbasin. The data sources and approach used to specify these inputs are described in **Section 3.3: Land Surface System**.

2.1.2 Stream System

As described above, the Modesto Model encompasses the entire C2VSimFG model domain and, as such, includes all C2VSimFG surface water network features. A total of 110 stream reaches are simulated across the entire model domain, represented by 4,634 total stream nodes. More than 400 diversions are specified

to distribute water from these streams or from outside the model domain on elements across the entire model domain.

Surrounding the Modesto Subbasin, the Modesto Model dynamically simulates flow in the Stanislaus, Tuolumne, and San Joaquin Rivers. In addition to the three major rivers, the Modesto Model also accounts for recharge and runoff from local creeks and tributaries. Contributions to the Subbasin's groundwater system from the upper watersheds outside of the Subbasin boundary are captured as surface and subsurface flows from the small watershed package within IWFM (**Section 2.1.4**). On the other hand, recharge and runoff from watersheds that originate within the model area are estimated at the element level using the Natural Resource Conservation Service (NRCS) Curve Number Method (**Section 0**).

Streams along the boundary of the Modesto Subbasin and diversions to land within the Modesto Subbasin were reviewed and revised, as needed, in the Modesto Model. Diversions to the subbasin were adapted to accommodate the distribution and delivery of surface water by Modesto and Oakdale Irrigation Districts, along with riparian diverters. The data sources and methodologies used to specify these changes to the surface water network are described in **Section 0**.

2.1.3 Groundwater System

The Following section highlights the hydrogeologic analysis and structures within Modesto Subbasin. Additional detailed information relating to stratigraphy and the development of model layers are available in the C2VSimFG Documentation: *California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG) Development and Calibration Version 1.0* (DWR 2020).

2.1.3.1 Hydrogeologic Structure

The Modesto Subbasin lies predominately within the San Joaquin Valley, which forms the southern half of California's Central Valley, a large, northwest-southeast-trending sediment-filled basin underlain by the igneous and metamorphic bedrock of the Sierra Nevada batholiths and the east-dipping of marine sedimentary rocks of the Coast Ranges (Norris & Webb, 1990). Major water bearing formations in the San Joaquin Valley include the Valley Springs, Mehrten, Laguna, Turlock Lake, Etchegoin, San Joaquin, Tulare, Riverbank, Modesto, and Kern River Formations, seven of which are present in the Modesto Subbasin:

Valley Springs Formation
The Valley Springs Formation crops out discontinuously along the eastern flank of the Central Valley from just south of the Bear River to just north of the Chowchilla River. The Valley Springs is a mostly fluvial sequence consisting chiefly of sandy clay, quartz sand, rhyolitic ash, and siliceous gravel (Davis & Hall, 1959). The Valley Springs Formation ranges in thickness from 0 to about 450 feet in the San Joaquin Valley (DWR, 1978). The Valley Springs Formation is considered largely non-water-bearing due to its fine ash and clay matrix (ESJGA, 2019).

Mehrten Formation
The Mehrten Formation is considered the oldest significant fresh water-bearing formation within the Eastern San Joaquin Valley. The Mehrten Formation in the east-central portion of the Central Valley is comprised of sandstone composed of amphiboles, pyroxenes, and pebbles with lenticular bedding (Bartow & Doukas, 1979). The Mehrten Formation outcrops discontinuously along the eastern flank of the Valley and was laid down by streams carrying andesitic debris from the Sierra Nevada (Ferriz, 2001). It is typically between 700 and 1,200 feet thick. The black sands of the Mehrten Formation have moderate to high permeability and yield large quantities of fresh water to wells (Davis & Hall, 1959) (DWR, 1967).

Laguna Formation

The Laguna Formation is exposed in the eastern foothills in the northern portion of the San Joaquin Valley. The Laguna Formation is a sequence of predominantly non-volcanic, fine-grained, poorly bedded, somewhat-compacted continental sedimentary deposits that are typically tan to brown in color (Olmsted & Davis, 1961).

The Laguna Formation outcrops in the northeastern part of San Joaquin County and reaches a maximum thickness of 1,000 feet. The Laguna Formation is moderately permeable with some reportedly highly permeable coarse-grained fresh water-bearing zones.

Turlock Lake Formation
The Turlock Lake Formation consists of mostly fine sand, silt, and, in places, clay. The Turlock Lake Formation coarsens upward, with silt and clay at the bottom of the formation and more sand and gravel near the top of the formation (Marchand & Allwardt, 1981). The thickness of the Turlock Lake is variable and appears to increase toward the east, ranging from 160 to 1,000 feet thick. Near the valley axis, it is intercalated with the Tulare Formation, described below.

Tulare Formation
The Tulare Formation is made up of lenticular and generally poorly sorted clay, silt, sand, and gravel. It consists of interfingered sediments ranging in texture from clay to gravel (Hotchkiss & Balding, 1971). The Tulare Formation conformably overlies the San Joaquin Formation. In the southwestern part of the San Joaquin Valley, the exposed Tulare ranges in thickness from a few tens of feet to more than 4,000 feet (Wood & Dale, 1964).

The Tulare Formation includes alluvial fan deposits, deltaic deposits, flood plain deposits, and lake deposits. The lake deposits compose the Corcoran Clay (E-Clay) member of the Tulare Formation, a prominent aquitard present in the western portion of Turlock Subbasin. The Corcoran Clay separates the semi-confined Upper Tulare from the confined Lower Tulare Formation (Hotchkiss & Balding, 1971). The Corcoran Clay extends eastward into the Turlock Lake Formation and separates the semi-confined Upper Turlock Lake from the confined Lower Turlock Lake Formation.

Riverbank Formation
The Riverbank Formation consists primarily of arkosic sand with gravel lenses derived mainly from the interior Sierra Nevada, which forms at least three sets of terraces and coalescing alluvial fans along the eastern San Joaquin Valley (Marchand & Allwardt, 1981). The Riverbank Formation unconformably overlies the Laguna Formation and is typically between 65 and 260 feet thick (ESJGA, 2019).

Modesto Formation
The Modesto Formation is composed of arkosic gravels and sands with silt, which were deposited over top of late Riverbank alluvium as a series of coalescing alluvial fans extending continuously from the Kern River drainage on the south to the Sacramento River tributaries in the north. The total thickness of the Modesto deposits is reported to be 50 to 100 feet in eastern Stanislaus County, 130 feet along the Merced River, and about 65 feet along the Chowchilla River fan.

2.1.3.2 Model Layering and Initial Parameters

The Modesto Model layering is the same as the C2VSimFG stratigraphy, a detailed description of which is available within the C2VSimFG Model Report (DWR 2020). A developmental summary of model layering is described below. The C2VSimFG stratigraphy and initial parameters are based upon a Central Valley-wide texture model produced by DWR. It included a total of 10,444 well and boring logs and provided information about the three-dimensional distribution of coarse-grained and fine-grained materials within

the groundwater system. These texture distributions were then adopted as the initial aquifer parameters and stratigraphy by node and layer in the Modesto Model and were refined during calibration.

Based on the geologic information in the lithologic dataset, C2VSimFG is divided into four aquifer layers that were adopted in the Modesto Model. The top three layers represent freshwater aquifers while the bottom layer (Layer 4) corresponds to the saline layer where little to no pumping occurs. Information, as well as supporting source data, on each layer is provided as follows.

Ground Surface Elevation

Ground surface elevation is established for each Modesto Model groundwater node relative to mean sea level. The ground surface elevation for the Modesto Model was derived from the USGS National Elevation Dataset, using the 1/3 arc-second DEM.

Layer 1

Layer 1 represents the portion of the unconfined aquifer in which groundwater pumping occurs. Layer 1 thickness ranges from 24 feet to 587 feet in the Modesto Subbasin. Layer 1 represents the western-upper principal aquifer where the Corcoran Clay exists and is the unconfined section of the eastern-principal aquifer. Because of the relatively large thickness of this layer, locally perched aquifers are not simulated.

Layer 2 Aquitard

The Layer 2 aquitard, which falls between aquifer Layer 1 and Layer 2, represents the Corcoran, or E-Clay that separates the upper western principal aquifer from the lower western principal aquifer. Refinement of the C2VSimFG model grid in the Modesto Subbasin included the adoption of the Corcoran Clay depth and thickness as defined by the MERSTAN model. This characterization was made after evaluating well logs and lithological data in the region. It was determined that the MERSTAN model presents a more refined definition of the Corcoran Clay compared to the base-layering in C2VSimFG. This is primarily due localized nature of the model and its detailed analysis of the Modesto Subbasin.

The Corcoran Clay is the only confining layer explicitly modeled as an aquitard in the Modesto Model and pinches out in the eastern portion of the model. The Modesto Model simulates vertical movement of groundwater through an aquitard layer as an aquitard between the two aquifer layers, as opposed to a separate, intervening low conductivity aquifer layer. Both formulations have shown to be valid and relatively comparable.

Layer 2

Layer 2 generally represents the portion of the confined aquifer in which groundwater pumping occurs. In western areas of the Modesto Subbasin where the Corcoran Clay exists, Layer 2 represents the upper fraction of the western-lower principal aquifer where most of the groundwater production occurs. In the eastern-principal aquifer, Layer 2 is considered the lower-pumping zone where most of the production occurs. Layer 2 thickness ranges from roughly 50 feet to 544 feet in the Modesto Subbasin.

Layer 3

Layer 3 generally corresponds to the deeper, confined aquifer where little pumping occurs. The bottom of Layer 3 is defined in C2VSimFG as the base of fresh groundwater. Layer 3 thickness ranges from 50 to 586 feet in the Modesto Subbasin. The base of freshwater, or the bottom of Layer 3, was prepared by the DWR South Central Regional Office by reviewing the DOGGR electric logs and induction-electric logs to estimate the quality of water at a specific depth. (DWR, 2015; Olivera, 2016).

Layer 4

Layer 4 is bounded by the base of fresh groundwater at the top and by the basement complex (relatively impermeable igneous and metamorphic rocks and the Cretaceous Great Valley sequence) at the bottom. The bottom of Layer 4 represents the interface between the post-Eocene continental deposits and underlying, lower-permeability Cretaceous or Eocene deposits of marine origin. This layer contains primarily saline groundwater with concentrations defined as Total Dissolved Solids (TDS) of more than 3,000 parts per million. This layer is up to 2,250 feet thick in the Modesto Subbasin. Although there is little to no active pumping in layer 4 at this depth, inclusion of this layer in the model is important for several reasons: (i) a hydraulically defensible no-flow boundary condition is established at the bedrock; (ii) including the complete saturated thickness of the aquifer can facilitate simulation of interconnection between fresh water (Layers 1-3) and salt water (Layer 4) layers, and (iii) potential impacts of upward movement of groundwater due to pumping from deep wells in layer 3 can be simulated. The thickness of the aquifer was developed by Williamson et al. 1989 and included in USGS's Central Valley Regional Aquifer System Analysis (CV-RASA).

2.1.4 Small-Stream Watersheds

A significant portion of the water that flows through Modesto Subbasin originates in the rim watersheds up-gradient from the alluvial portion of the valley. Within the Modesto Model, these rim watersheds can be divided into two broad classes: gauged watersheds with specified inflows into the C2VSimFG stream network, which are described in **Section 3.4.2**, and ungauged watersheds whose outflow is dynamically calculated using the IWFM Small Watershed component, which are discussed below.

The land cover in these small watersheds is generally native vegetation. The watersheds receive precipitation and discharge surface water into small and intermittent streams that flow across the valley floor into larger streams and rivers, with a portion of this flow entering the aquifer as recharge. They also discharge a small amount of groundwater laterally into Modesto Subbasin aquifers. These monthly surface water discharge, recharge, and subsurface groundwater flow values from small watersheds are dynamically calculated in the Modesto Model.

The Modesto Model includes the same number of small watersheds as C2VSimFG and includes 14 small watersheds bounding the Subbasin to the east (**Figure M4**). The small watersheds were delineated using the USGS Watershed Boundary Dataset. The outer boundary of the small watersheds conforms to the HUC-12 boundaries, which were clipped to the C2VSimFG boundary. Surface flows from small watersheds are routed along specified groundwater nodes, with a user-defined maximum percolation rate to groundwater at each node, selected using the USGS NHD Flow Lines. Precipitation, which is further explained in **Section 3.3.1**, is defined for each small watershed and was developed using the same method as precipitation for the model elements. All subsurface inflows from the small watersheds are routed to the model's Layer 1. These assumptions were not changed between C2VSimFG and the Modesto Model.

The range of selected small watershed parameters are shown in Table 1. Root zone hydraulic conductivity, wilting point, field capacity, total porosity, and pore size distribution index for each watershed are like average root zone soil parameters of elements bordering the small watersheds. An average curve number of 60 was selected for all watersheds to represent the native vegetation coverage of the foothills based on NRCS runoff curve number descriptions in Technical Release 55 (TR-55).

Table 1: Average Small Watershed Root Zone Parameters near the Modesto Subbasin

ET Rate	Wilting Point	Field Capacity	Total Porosity	Pore Size Dist Index	Rooting Depth	Hyd. Cond.	Curve Number
1.64 in/mo	0.10	0.21	0.33	0.39 ft	6.20	0.39 ft/mo	60

3. MODEL DEVELOPMENT

3.1 SUMMARY OF INPUT DATA

IWFM model files and corresponding major data sources used in the development of the Modesto Model are presented in Table 2 along with the report sections where the model data and data sources are described.

Table 2: Modesto Model Input Data

Major Data Category	Minor Data Category	Data Source	Section
Hydrogeological Data	Geologic Stratification	C2VSimFG Local data	2.1.3
	Model Layering	C2VSimFG Local data	2.1.3
	Initial Parameters	C2VSimFG	2.1.3
	Small Watersheds	C2VSimFG	2.1.4
Land Surface Data	Precipitation	PRISM	3.3.1
	Land Use	DWR county surveys DWR statewide mapping USDA NASS CropScape Stanislaus County Parcel Maps	3.3.2
	Soil Properties	USDA NRCS SSURGO	3.3.3
	Evapotranspiration	C2VSimFG Cal-SIMETAW CIMIS ITRC METRIC	3.3.4
	Population	U.S. Census Bureau tract data Local UWMPs	3.3.5
	Per Capita Water Use	California Water Plan Local UWMPs	3.3.5
Stream Data	Stream Configuration	C2VSimFG	3.4.1
	Stream Inflow	USGS DWR CDEC Local data	3.4.2
	Surface Water Deliveries	C2VSimFG State Water Board eWRIMS Local data	0
	Calibration Gages	USGS DWR CDEC	3.4.4
Groundwater Data	Groundwater Pumping	IWFM estimates Local data	3.5.1
	Calibration Wells	DWR CASGEM & WDL Local data	3.5.2
	Initial Conditions	DWR CASGEM & WDL Local data	1.1.1
	Boundary Conditions	DWR SGMA Data Viewer DWR CASGEM & WDL Local data	3.5.4

3.2 SIMULATION PERIOD

The Modesto Model simulates historical conditions in the basin for the period of water years 1991 through 2015 (October 1, 1990 through September 30, 2015). Monthly data was used as model input, and the model simulation uses a monthly time step. Model output can be reported on a monthly or annual time increment, as needed. The Model's simulation period was selected to be representative of moderate to long term hydrologic conditions, while capturing a period of operations with relatively high degree of quality and resolution of data that is digitally available. Precipitation data for the Modesto Subbasin, discussed in Section 3.3.1, was used to identify hydrologic periods that are representative of wet and dry periods and long-term average conditions needed for analyses.

3.3 LAND SURFACE SYSTEM

The Modesto Water Resources Model is a fully integrated surface and groundwater flow model. Modeling surface processes include the quantification of agricultural and urban water demand, as well as dynamically simulating flows through the root and unsaturated zones of both developed and undeveloped lands. The process of simulating root-zone flow dynamics and operational water demand includes the integration of precipitation, land use, evapotranspiration, soil characteristics, and other parameters described in the following sections.

Data and model inputs used to characterize all land surface processes were carefully evaluated and refined for all areas within the Modesto Subbasin using federal, state, and local information. Where local information is unavailable, model inputs have been evaluated and refined using the best available information and professional standards of practice. Generally, more local information is available for member agencies of the STRGBA GSA, as they have developed and maintained a detailed water budget information throughout the historical period. Although less local information is available for the non-district agriculture and private domestic areas of the subbasin, the land surface processes for these areas have been simulated using all pertinent, available information, sound professional judgment, and standards of practice.

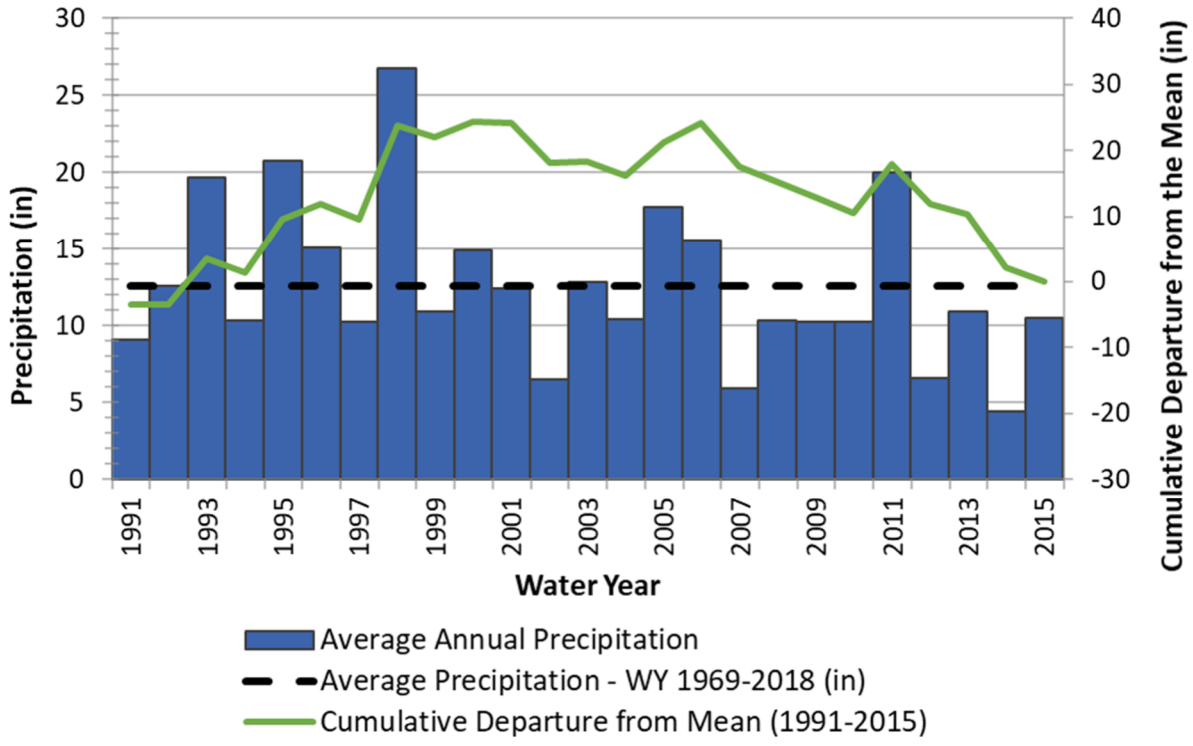
This section describes the data sources and methodologies used to specify model parameters and monthly time series data provided as inputs to the Modesto Model to simulate these land surface processes. Unless otherwise noted, other inputs to the C2VSimFG model were generally used directly in the Modesto Model.

3.3.1 Precipitation

Rainfall data for the model area was derived from the PRISM (Precipitation-Elevation Regressions on Independent Slopes Model) database used in the DWR's C2VSimFG and Cal-SIMETAW (California Simulation of Evapotranspiration of Applied Water) model. The database contains daily precipitation data from October 1, 1921, to September 30, 2018, on an 800-meter grid throughout the model area. The Modesto Model has monthly rainfall data defined for every model element to preserve the spatial distribution of precipitation. Each of the model elements was mapped to the nearest PRISM reference node and the resulting average annual precipitation is shown in Figure M5.

Figure 1 shows the annual rainfall in the Subbasin and the cumulative departure from mean, which is an indication of long-term rainfall trends in the area. For the 1991-2015 calibration period, the minimum precipitation was in 2014 with 4.4 inches, while the maximum occurred in 1998 with 26.7 inches, and the average annual precipitation over this period was 12.6 inches. Based on the San Joaquin Valley River Index, there were 3 critical, 5 dry, 5 below normal, 3 above normal, and 8 wet years.

Figure 1: Modesto Subbasin Average Annual Precipitation (1991-2015)



3.3.2 Land Use

The Modesto Model is an integrated water resources model and, as such, dynamically simulates water demand for each element within its domain. In conjunction with hydrology and soil properties, land use is a major dataset that drives water use and demands. The model divides all land use types into three primary water use sectors: native, urban, and agriculture. For each element and year simulated by the model, acreage is defined for each of 28 Land use classifications, 18 of which are represented in the Modesto Subbasin.

Spatial land use data, an example of which is shown below in Figure M6, were used to specify land use types and crop acreages for each model element for each year. The three major reference sources include DWR county land use surveys, DWR Statewide Crop Mapping, and CropScape. A summary of data sources and periods available are presented in Table 3 and a summary of the land use data represented in the Modesto Model is shown in Table 4 and Figure 2.

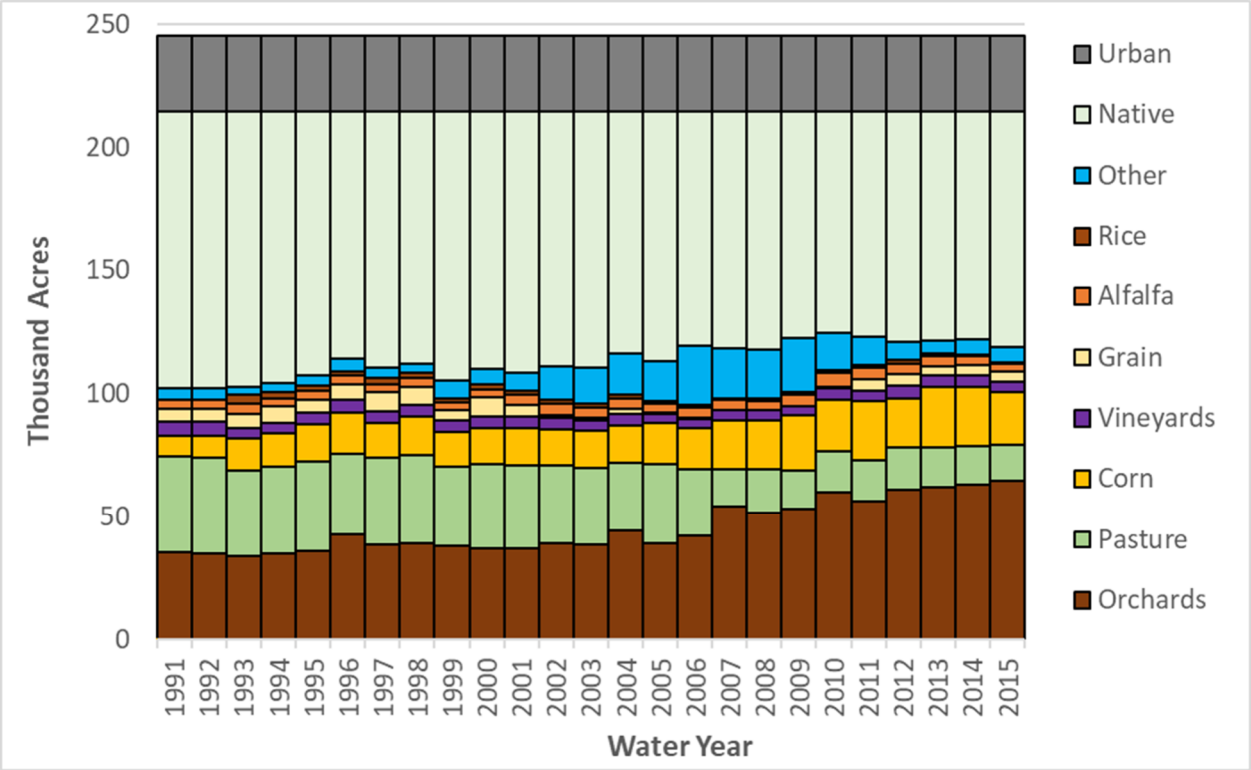
Table 3: Land Use Data Sources Available during the Historical Period (1991-2015).

Data Type	Data Source	Years Available (1991-2015)
Spatially distributed land use data	DWR County Land Use surveys (Stanislaus County)	1996, 2004, 2010
	Land IQ remote sensing-based land use identification	2014
	Stanislaus County Land Use Survey	2014
	CropScape: NASS Cropland Data Layer	2007-2015

Table 4: Summary of Land Use in the Modesto Subbasin.

Water Use Sector	Land Use Class	Land Use Code	Acreage 1991	Average Acreage 1991-2015	Acreage 2015
Agricultural	Alfalfa	AL	3,800	3,900	3,200
	Almonds & Pistachios	AP	18,400	29,400	47,300
	Citrus & Subtropical	CS	0	100	200
	Corn	CN	8,700	16,900	21,100
	Cucurbits	CU	900	300	200
	Dry Beans	DB	1,300	500	200
	Grain	GR	5,000	3,800	4,300
	Idle	ID	35,600	23,400	19,200
	Other Deciduous	OR	16,700	16,100	17,400
	Other Field	FL	1,300	6,500	1,700
	Other Truck	TR	1,100	3,100	3,500
	Pasture	PA	39,100	27,400	14,600
	Rice	RI	100	1,400	600
	Tomato	TP	0	200	600
	Vineyards	VI	5,700	4,500	4,200
Native	Native Vegetation	NV	69,600	69,900	69,100
	Riparian Vegetation	RV	7,200	7,100	7,100
Urban	Urban	UR	30,800	30,800	30,800
Total			245,300	245,300	245,300
Note: Average land use areas rounded to nearest 100 acres.					

Figure 2: Modesto Subbasin Land Use, 1991-2015



3.3.3 Soil Parameters

IWFM simulates water demands at the land surface and their interactions with the aquifer below using a soil-moisture balance. Flow through the root zone is primarily governed by soil properties, including wilting point, field capacity, porosity, pore size distribution index (λ), and saturated hydraulic conductivity.

Each element within the model domain is identified as one of the four hydrological soil groups showing in Figure M7 and is categorized according to their runoff potential and infiltration characteristics. The Natural Resource Conservation Service (NRCS) defines these hydrological soil groups as follows:

Group A – Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravelly or sandy textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group B – Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group C – Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand, and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group D – Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential.

Textural information and hydraulic parameters were developed for C2VSimFG using data available from the Soil Survey Geographic (SSURGO) database, a product of the United States Department of Agriculture's Natural Resources Conservation Service (USDA-NRCS). The Modesto Model uses representative values from SSURGO as the initial parameters, and refinements were made during the water budget calibration as described in **Section 4.2.1**.

3.3.4 Evapotranspiration

Evapotranspiration (ET) is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and transpiration from plants. Evapotranspiration is primary consumptive use of water in the agricultural, urban, and native sectors within the Modesto subbasin. Within the Modesto Model, every land use type and small-stream watersheds are assigned values for each timestep throughout the simulation period.

The ET values through September 2015 were adopted from C2VSimFG after validation and refinement based on published research, local data, and remote sensing. Base reference evapotranspiration and crop coefficient values were based on data from the DWR Water Use Efficiency Branch and included values from the Cal-SIMETAW model and local California Irrigation Management Information System (CIMIS) stations. During the calibration process, these values were refined based on the following sources:

Remote Sensing:

- Mapping Evapotranspiration at High Resolution and Internalized Calibration (METRIC), developed by the Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo
- Element level evapotranspiration summaries developed by Formation Environmental, LLC

State of California modeling efforts and resources:

- California Central Valley Groundwater-Surface Water Simulation Model (C2VSimFG)
- California Simulation of Evapotranspiration of Applied Water (Cal-SIMETAW)
- California Irrigation Management Information System (CIMIS)

Local Planning Documents:

- Modesto Irrigation District (MID) Agriculture Water Management Plan (AWMP)
- Oakdale Irrigation District (OID) Agriculture Water Management Plan (AWMP)

A comparative summary of the AWMPs to modeled ET is presented and described in **Section 4.2.1**, Land Surface System Calibration.

3.3.5 Urban Water Demand

Urban water demand in C2VSimFG is divided into the 105 zones that make up the combination of the California Water Plans' Detailed Analysis Units (DAU). During development of the Modesto Model, the C2VSimFG model was updated to utilize local data and improve the resolution operations throughout the subbasin. The new urban demand areas include the cities of Modesto, Oakdale, Riverbank, and Waterford, as well as two rural categories for private domestic demand on the east and west sides of the subbasin (**Figure M8**).

Population, per capita water use, and urban indoor water use fractions were the key urban inputs that were identified and refined for the development of the Modesto Model. Values for each of these parameters were taken from published Urban Water Management Plans (UWMPs) for each municipality and validated through analysis of their water supply data. Data for rural areas were based on estimated values from the California Water Plan. Average values for each population, per-capita water use and total urban demand is listed below in **Table 5**.

Table 5: Average Urban Demand Factors (1991-2015)

Urban Area	Average Population 1991-2015	Average Per-Capita Water Use 1991-2015	Average Urban Water Demand 1991-2015
Units	**-**	**Gallons x Day^{-1}**	**Acre-Feet**
City of Modesto	229,000	270	62,500
City of Oakdale	19,000	240	4,800
City of Riverbank	18,000	230	4,500
City of Waterford	7,000	220	1,700
Detailed Analysis Unit 206[1]	40,000	320	18,700
Detailed Analysis Unit 207[2]	12,000	310	5,200

Notes: Values are presented by service area and includes all sub-communities supplied by the agency.
[1] Detailed Analysis Unit 206/207 as described in this table includes the rural fraction of this DAU in the Modesto Subbasin and represents the western/eastern rural areas presented in **Figure M8**.

3.3.6 Other Land Surface Parameters

Below are operational parameters governing the procedures and management of agricultural, urban, and native flow dynamics throughout the land surface system.

Runoff Curve Number

The Modesto Model uses a modified version of the Soil Conservation Service (SCS) Curve Number (CN) method (USDA, 2004) to compute runoff of precipitation. Curve number is specified for a combination of land use type, soil type and management practice for each element and governs the infiltration and runoff of precipitation events. Initial curve number values were based on the USDA TR-55 publication Urban Hydrology for Small Watersheds (USDA, 1986) and were adjusted during calibration to account for the effects of a monthly time-step.

Effective Rooting Depth

The effective rooting depth is the depth from which vegetation can access moisture in the soil. Rooting depths were mapped from the C2VSimFG and compared to data from Cal-SIMETAW, ASCE-EWRI, and other local models. Rooting depths were found to be consistent with typical characteristics reported in the above resources and were unchanged. For all land use classes, rooting depths were assumed to remain constant, on average, over the duration of the monthly simulation.

Reuse and Return Flow Fractions

Surface water operations within the Modesto Subbasin include both operational spills and return flows as a necessary product on water conveyance. Fractions to represent return flow (i.e., irrigation flow returning to the stream system) and reuse (i.e., the fraction of applied irrigation water to be reused for irrigation) are based on data from C2VSimFG. All agricultural lands are assigned a 5% return flow and 1% reuse.

Unchanged Surface System Parameters

IWFM utilizes several other parameters, important to modeling surface layer processes and control flow through the root zone. These parameters, listed below, were not changed from the base version of the model and additional information on these features are available in the C2VSimFG Documentation: *California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG) Development and Calibration Version 1.0* (DWR 2020).

- Irrigation Period
- Initial Soil Moisture
- Target Soil Moisture
- Irrigation Timing
- Indoor Water Use Fraction
- Urban Pervious Area Fraction

3.4 SURFACE WATER SYSTEM

Surface water operations and supplies are a critical resource in the groundwater management and sustainability of the Modesto Subbasin. The Subbasin is located on the eastern side of the California Central Valley, between the Stanislaus and Tuolumne Rivers. Both rivers are regulated, and reservoir operations are managed by local irrigation districts.

3.4.1 Stream Configuration

Model hydrology throughout the Central Valley is simulated through a combination of 4,634 stream notes and 110 stream reaches. Each stream-node in C2VSimFG is dynamically simulated and governed by unique parametric values, including invert elevation, wetted perimeter, streambed conductance, and stage-discharge rating tables. Within the Modesto Subbasin, the stream system is comprised of 112 stream nodes

simulating the Stanislaus River, 113 stream nodes simulating the Tuolumne River, and 19 stream nodes simulating the San Joaquin River (Figure M9). Development of the Modesto Model included the adoption these parameters and additional details relating to their values and data sources can be referenced in the C2VSimFG Documentation: *California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG) Development and Calibration Version 1.0* (DWR 2020).

3.4.2 Stream Inflows

Stream inflow along the subbasin boundary to the east is provided by the operating agency and represents the flow downstream of the Goodwin Dam on the Stanislaus River and La Grange Dam on the Tuolumne River. In addition to reservoir releases, the river system dynamically simulates San Joaquin River inflows at the Modesto subbasin, as wells as operational spills, runoff, and return flow to the river system. Location of direct inflows to the river system are presented below in **Table 6**.

Table 6: Summary of Stream Inflows in the Modesto Subbasin (1991-2015)

Stream Reach	Inflow Location	Inflow Location (Stream Node)	Average Annual Inflow (TAF/year)
Tuolumne River	La Grange Dam Releases	1930	520,000
Stanislaus River	Goodwin Dam Releases	2056	742,000

3.4.3 Surface Water Supply

Historical surface water diversions for the simulation period were compiled from a combination of sources including gauged data, water rights reports, Urban Water Management Plans (UWMPs), and Agricultural Water Management Plans (AWMPs). Most of the surface water supply in the Modesto Subbasin is diverted from the Stanislaus River by Oakdale Irrigation District, and the Tuolumne River by Modesto Irrigation District, with smaller diversions available to riparian water rights holders. Spatial coverage of surface water delivery areas is shown in Figure M10.

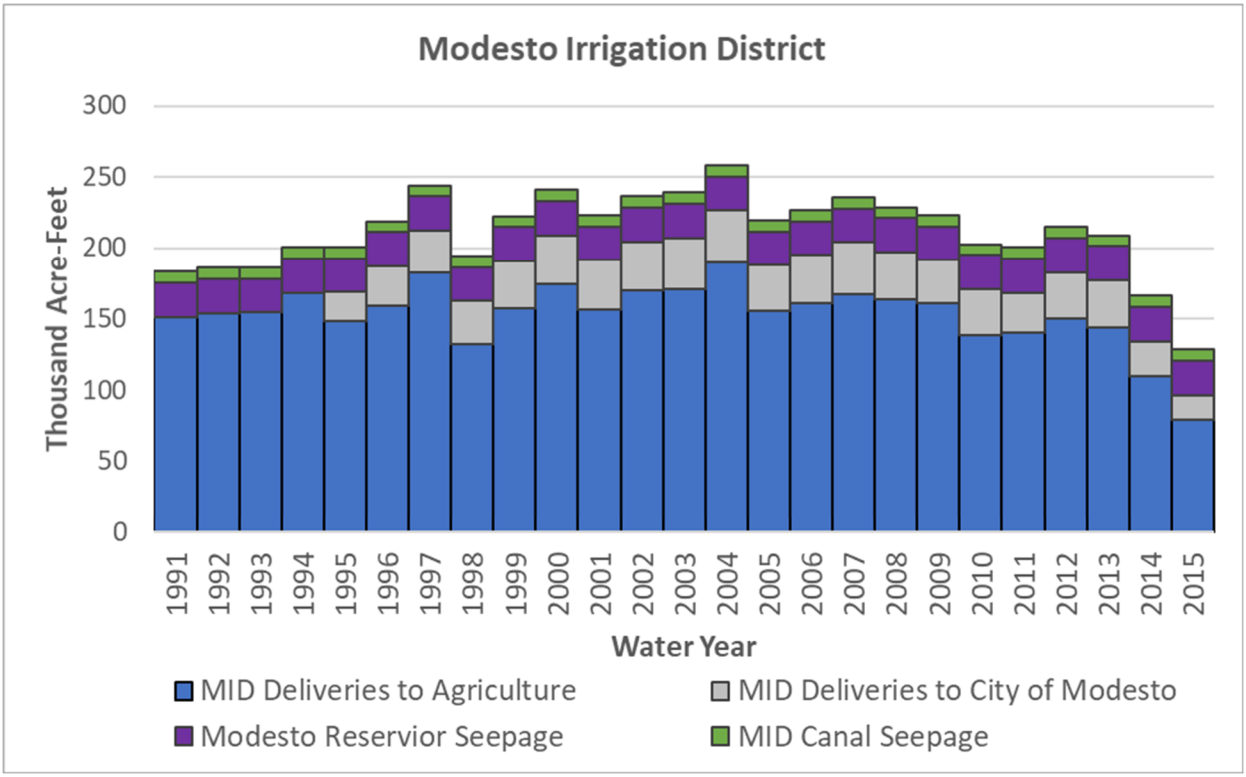
Total surface water supply to the Modesto Subbasin averages 337,000 AFY of deliveries to agricultural and municipal users throughout the 1991-2015 historical period. Of this, 311,000 is delivered to growers to meet agricultural demand and 26,000 is treated and delivered to the City of Modesto (30,000 acre-feet per year since its inception in 1994).

Modesto Irrigation District

Modesto Irrigation District provides surface water to nearly 104,000 acres of farmland in the Modesto Subbasin. Founded in 1887, Modesto Irrigation district hold pre-1914 water rights from the Tuolumne River Watershed. MID jointly operates the Don Pedro and La Grange Dam reservoir system with Turlock Irrigation District (TID) and diverts an average of nearly 300,000 AFY from the Tuolumne River Watershed for agricultural and urban use each year.

Throughout the 1991-2015 historical period, MID delivered an average of 154,000 acre-feet to agricultural users and 26,000 acre-feet of potable water to the City of Modesto. In addition to their direct deliveries, MID has provided beneficial recharge to the Subbasin through 24,000 acre-feet of seepage from Modesto Reservoir, and 8,000 acre-feet of seepage from their canal system. An annualized breakdown of MID surface water deliveries and recharge is presented in Figure 3.

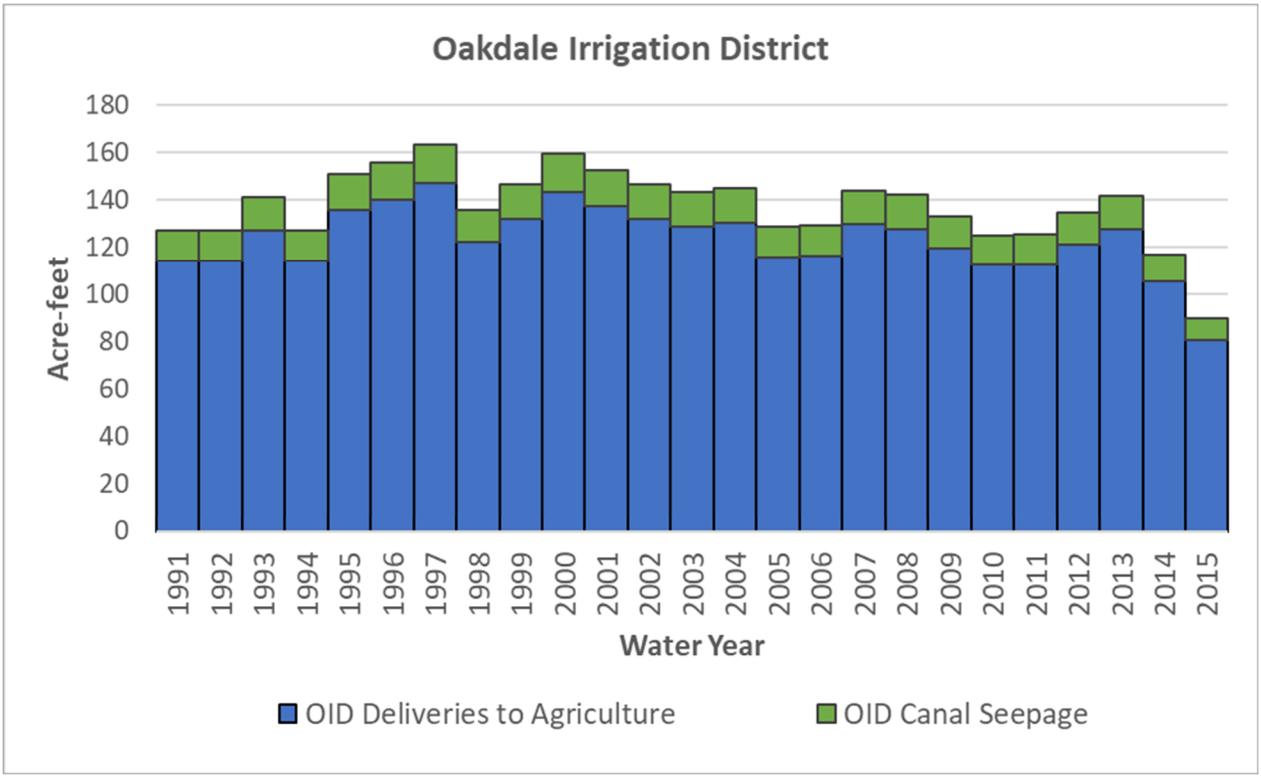
Figure 3: Modesto Irrigation District Surface Water Deliveries and Recharge



Oakdale Irrigation District

Oakdale Irrigation District (OID) was formed in 1909 and holds pre-1914 water rights, supplying over 67,000 acres of farmland with irrigation water. The district includes over 27,000 acres to the north of the Stanislaus River in the Eastern San Joaquin Subbasin, along with over 40,000 acres in the Modesto Subbasin. The district shares operational control of New Melones Reservoir with South San Joaquin Irrigation District (SSJID) and diverts up to 300,000 AFY Stanislaus River at Goodwin Dam. As shown in Figure 4, Oakdale Irrigation District delivered an average of 124,000 acre-feet and recharged and additional and 13,000 acre-feet of canal recharge the Modesto Subbasin during the historical simulation.

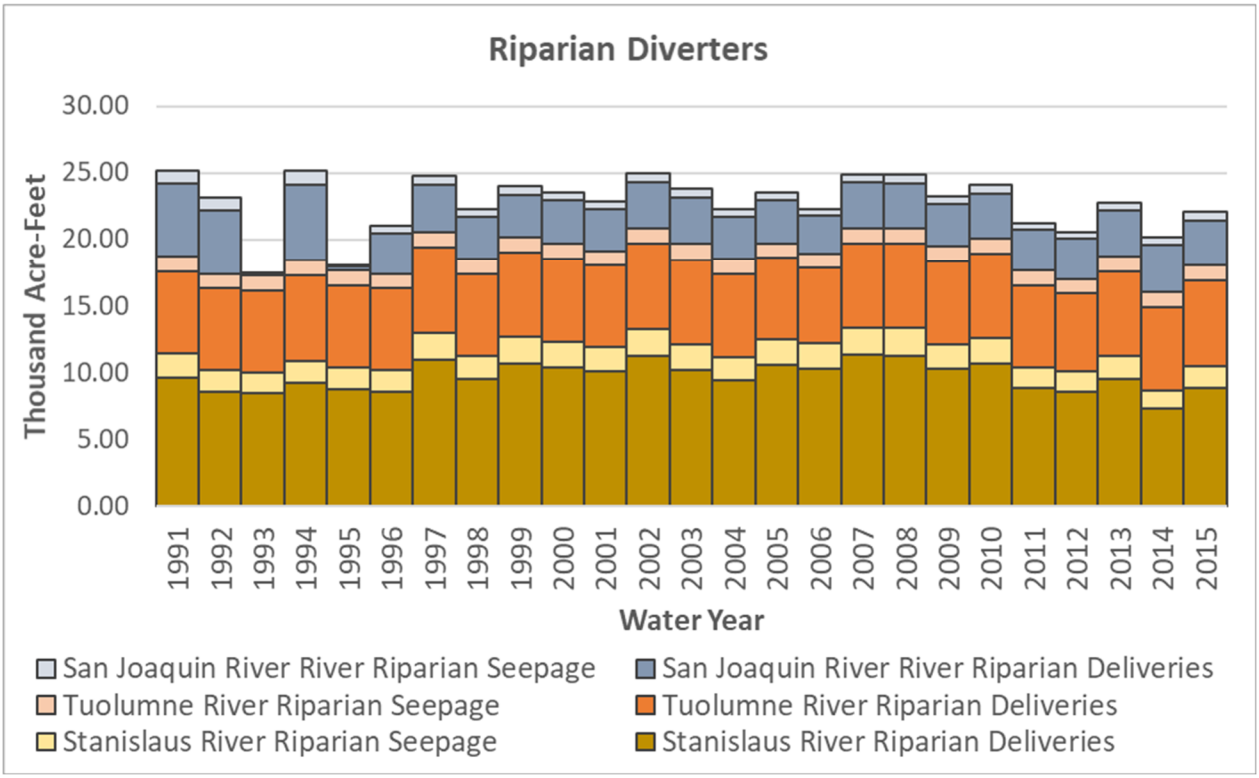
Figure 4: Oakdale Irrigation District Surface Water Deliveries and Recharge



Riparian Diverters

In addition to the Subbasin's main irrigation districts, there are multiple riparian diverters along each of the major rivers. A small amount of surface water supply is diverted by water right holders from these boundary waterways. Volumetric diversions of riparian water users were estimated based an agricultural demand and verified against water rights listed in the California State Water Resources Control Board Electronic Water Rights Information Management System (eWRIMS) database. Riparian surface water deliveries to the Modesto Subbasin were estimated to be approximately 19,200 AF each year, with 9,700 AF being diverted from the Stanislaus, 6,200 AF diverted from the Tuolumne, and 3,300 AF diverted from the San Joaquin Rivers. Conveyance Seepage from riparian diverters were estimated to be 1,800 AF, 1,100 AF and 600 AF for the Stanislaus, Tuolumne, and San Joaquin Rivers respectively. Riparian deliveries and conveyance recharge are shown below in Figure 5.

Figure 5: Modesto Subbasin Riparian Surface Water Deliveries and Recharge



3.4.4 Streamflow Monitoring Locations

The three dynamically simulated streams in the Modesto Subbasin are calibrated to achieve reasonable agreement between the simulated and observed streamflow at specific gaging stations. Calibrational stream gauges are selected to be representative of the conditions throughout the reach and are usually located at a downstream point along the river. Streamflow calibration of the Modesto Model is primarily performed by the adjustment of stream and aquifer parameters as outlined in **Section 4.3.2.** A list of the stream gauges used in the calibration of the Modesto Model is listed in **Table 7** and their spatial location is shown in **Figure M11**.

Table 7: Summary of Modesto Model Stream Calibration Gauges

Stream	Stream Node	Description	Station ID
Stanislaus River	2141	Stanislaus River at Ripon	USGS: 11303000
Tuolumne River	2005	Tuolumne River at Modesto	USGS: 11290000 CDEC: MOD
San Joaquin River	2182	San Joaquin River at Vernalis	USGS: 11303500 CDEC: VNS

3.5 GROUNDWATER SYSTEM

This section presents the source and analysis of input data used in the development of aquifer conditions for the Modesto Model. This includes spatial and temporal information for hydrologic, hydrogeologic,

water use, water supply, and operations data sets included in the model, as well as physical settings, parameters, and assumptions.

3.5.1 Groundwater Pumping

The Modesto Model divides groundwater pumping into (1) pumping by wells, which includes agency-operated wells, and (2) pumping by elements, representing private agricultural and domestic groundwater production. The division between the different types of pumping in IWFM predominantly relies on the availability of data. As an active member of model development, local water purveyors within the Modesto Subbasin provided well construction information and volumetric pumping data for integration into the model. In contrast, volumetric data from private well owners are largely unknown, and therefore are estimated by the Modesto Model based on publicly available information and water demand.

3.5.1.1 Agency Pumping

Pumping by wells is done when pumping data is specified for the characteristics of the well (geographical location, total depth, screen perforation depth, use), and a time-series for the historical pumping records. **Table 8** summarizes the data received and incorporated into the Modesto Model, the spatial breakdown of agency wells can be seen in Figure M12.

Agricultural Agencies – Both Modesto and Oakdale Irrigation Districts use pumping to supplement their surface water supplies and support deliveries to customers. Volumetric and construction data was provided by both agencies and verified against reported values in their AWMPs.

Urban Agencies - Municipal groundwater production in the Modesto Subbasin was based on records received directly from the four cities within the Modesto Subbasin and verified against their Urban Water Management Plans (UWMPs). Each water agency provided the location, depth, and monthly pumping time-series of their well facilities.

Table 8: Summary of Agency Wells in the Modesto Subbasin

Purveyor	Well Const.	Time Period of Data	Number of Wells[1]	Average Annual Pumping[2]
Modesto ID	yes	1990-2019	106	21,700
Oakdale ID	yes	1995-2017	33	4,900
City of Modesto	yes	1995-2018	155	37,300
City of Oakdale	yes	2001-2018	9	4,800
City of Riverbank	yes	2006-2018	10	4,500
City of Waterford	yes	2005-2018	8	1,700
Total Average Annual Pumping				74,500

Notes: [1] Due to the historical nature of the simulation, not all wells in the model are currently active
[2] All values represent the annual pumping, in acre-feet, over the 1991-2015 historical period.

3.5.1.2 Private Groundwater Pumping

Private groundwater pumping quantities on an individual well basis are largely unknown, and therefore they are estimated by the Modesto Model on an element basis. Water demands at each element are used to calculate pumping necessary to meet the demand.

The perforation interval, which dictates the layers a simulated well extracts water from, were assigned separately to the domestic (i.e., rural residential) and agricultural wells. Perforation intervals were compiled by DWR using data from the California Statewide Groundwater Elevation Monitoring (CASGEM) and the Online System for Well Completion Reports (OSWCR, pronounced "Oscar") databases. Simulated

perforation intervals were assigned as the 5th and 95th percentiles of the well perforation interval data for each township/range block. Additional information on how this data was developed is available in the C2VSimFG Documentation: *California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG) Development and Calibration Version 1.0* (DWR 2020).

Private Agricultural Pumping

The volume of the private agricultural pumping was estimated in the Modesto Model on an element basis as part of the root zone simulation. The volume of water needed to meet the agricultural demand of each specific element, is estimated after distributing any other specified agency water supply (surface water deliveries or agency-based groundwater supply).

Within Modesto and Oakdale Irrigation District boundaries, model-calculated private pumping volumes were validated through comparison with agency estimates of the total private pumping volume. In the Non-District East and West areas, root zone characteristics were calibrated to ensure that groundwater pumping, and crop consumptive use characteristics resulted in water demands appropriate to the irrigation systems and crop types known to occur throughout the Modesto Subbasin (see Section 4.2.1).

Private Urban and Domestic Pumping

Like the calculation of private groundwater pumping for agricultural use, private groundwater pumping for domestic use was calculated in the Modesto Model on an element basis as part of the root zone simulation. The volume of pumping in each element was calculated within the model as the additional volume of water necessary to meet urban demand within that element, after distributing any other specified, available water supplies.

3.5.2 Groundwater Monitoring Wells

Groundwater levels are calibrated to achieve acceptable agreement between the simulated and observed values (in this case, groundwater levels at the calibration wells). Within the Modesto Subbasin, over 500 wells were evaluated to be used as potential representative hydrograph locations (**Figure M13**). Data for these wells were obtained from DWR's CASGEM program, DWR's Water Data Library, and local monitoring data. After a review of the available observation data, a working set of 66 wells (**Figure M14**) was selected to be used as the primary, or representative wells for evaluation in the calibration process. The calibration wells were selected based on the following criteria

- The period of record
- Number of observations
- Temporal distribution of available data
- Spatial distribution
- Representative nature of the data
- Trends of nearby wells.

3.5.3 Initial Conditions

Groundwater heads for each model node and each layer at the beginning of the calibration simulation (October 1, 1990) were developed using local observation data, combined with DWR's CASGEM and WDL databases. The available 531 wells with data were analyzed for use in building the initial groundwater heads. Due to the availability of data in different wells, a hierarchy of data was used to compile sufficient coverage over the model domain for development of initial conditions:

- October 1990 where available
- Fall 1990 (September-November) where available
- Surrounding years data, averaged (Fall 1989 or Fall 1991)
- Surrounding years data, averaged (Fall 1988 or Fall 1992)
- Where all the above sources were unavailable, depth to water was extrapolated

Observation data was interpolated to develop a raster representing initial groundwater levels over the model domain. Due to the lack of construction information for many of the monitoring locations, the groundwater heads described above are used for all layers. The initial conditions for the Modesto Model representing October 1, 1990, are shown in **Figure M15** though **Figure M18**.

3.5.4 Boundary Conditions

Specified head boundary conditions define the subsurface inflow for the western and southern boundaries of the Modesto Subbasin. The Modesto Model utilizes boundary conditions for all active layers at groundwater nodes between one to two miles away from the subbasin boundaries Conditions in the Eastern San Joaquin and Delta-Mendota subbasins and were defined based on a combination of historical data available from observed groundwater elevations from DWR's CASGEM program, DWR's Water Data Library, groundwater contours from DWR's SGMA Data Viewer web application, and local monitoring data. The location of defined boundary nodes is shown in **Figure M19**.

3.5.5 Parametric Grid

Aquifer properties and flow dynamics in the Modesto Subbasin are governed by a set of characteristic parameters defined at representative locations known as parametric nodes. Parameters for the Modesto Model are defined at these locations and are integrated into the model's primary grid. The representative parametric nodes for the Modesto Model are shown in **Figure M20**. During the calibration process, refinements to aquifer parameters are performed by adjusting parameters at these locations.

4. MODEL CALIBRATION

The Modesto Model is an integrated water resources model developed to simulate the interconnected nature of the various components of the hydrologic system. The Modesto Model was calibrated to align simulated and observed records, including water budget components, surface water flow, and groundwater levels. The sources used during the calibration process include local knowledge, Agriculture Water Management Plans (AWMPs), Urban Water Management Plans UWMPs, other local planning efforts, observed groundwater levels and associated contours, and observed streamflow data.

Model calibration is an important part of model development, performed to meet the following principal objectives:

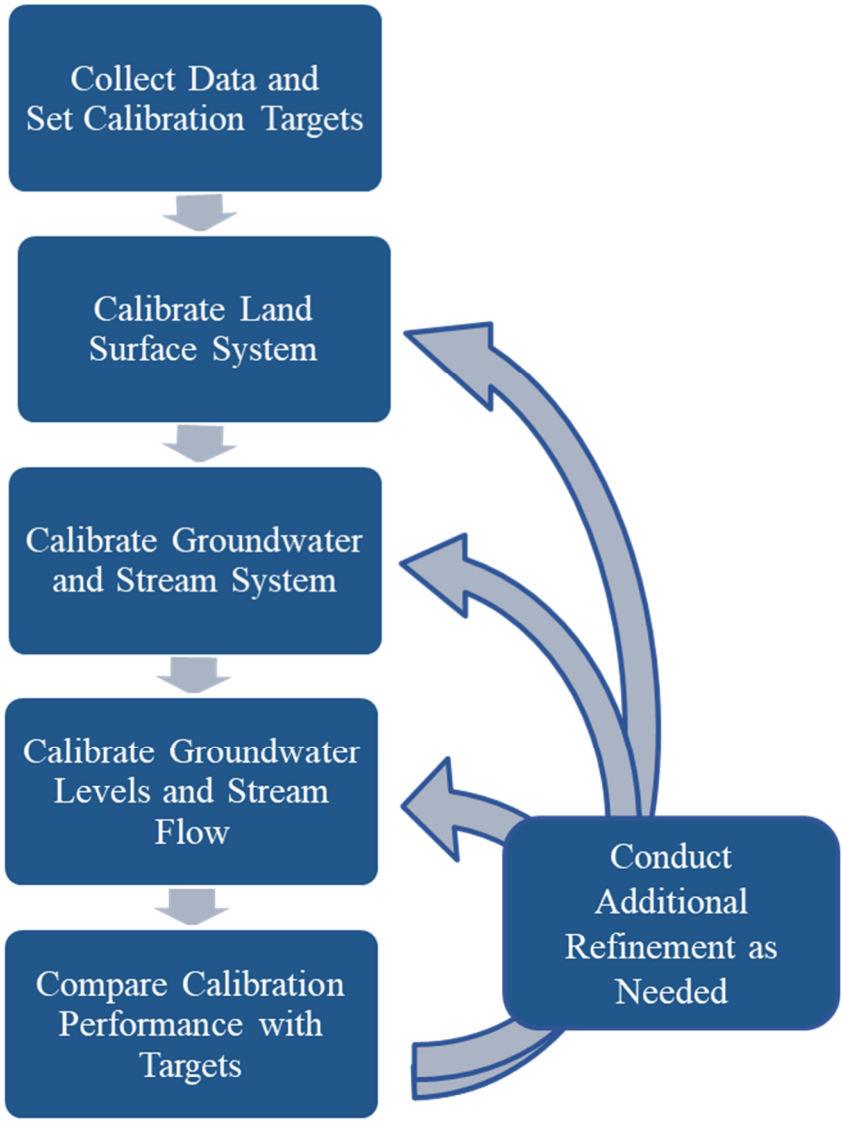
- Develop water budgets that properly represent each of the hydrologic systems modeled (i.e., land surface, stream, and groundwater system), across various geographic scales (i.e., Subbasin, GSA, and districts), and temporal timesteps (i.e., monthly, and annually).
- Represent the regional distribution of groundwater conditions, while optimizing the agreement between simulated results and observed values for short-term seasonal and long-term trends in groundwater levels at selected calibration wells.
- Represent appropriate level of stream-aquifer interaction by simulating the modeled streams in such a way as to optimize the agreement between simulated results and observed streamflow hydrographs at selected gaging stations.
- Properly represent the interbasin flows across between the Modesto Subbasin and its adjacent areas, the Turlock, Eastern San Joaquin, and Delta-Mendota Subbasins.

These objectives are achieved through careful review of the model input and adjusted model parameters. The model results also provide insight to key components of the groundwater basin including historical recharge, subsurface flows, and changes in groundwater storage.

4.1 CALIBRATION PROCESS AND METHODOLOGY

Model calibration begins after the data analysis and input data file development is complete. The calibration effort can be broken down into subsets that align with multiple packages within the IWFM platform. As an integrated hydrologic model, the results of each part of the simulation are interdependent on one another. The model calibration is a systematic process that is illustrated in **Figure 6** and includes the following steps.

Figure 6: Model Calibration Process



1) **Set Calibration Targets:** The first step in model calibration was the collection and refinement of data related to model calibration targets for the calibration period. Data related to model calibration was collected and refined for the calibration period. This process includes the systematic review of both published and observed information, as well the preparation of the statistical data for the evaluation of both local and regional calibration.

2) **Calibrate the Land Surface System:** In the second step, preliminary rootzone and land and water use budgets were established and verified. The calibration effort focused on soil hydraulic parameters, curve numbers, cropping and irrigation coefficients, urban water use specifications, deep percolation, runoff and return flow. Urban and agricultural demand, groundwater pumping, and surface water supply from water budgets were verified against available data from a combination of state and local resources.

3) **Calibrate the Groundwater and Stream Systems:** The third step was calibration of the groundwater and stream system budgets. The water budgets for the stream and aquifer systems are calibrated in tandem through the evaluation of both flow components and simulated hydrographs. Due to the interconnected nature of these systems, this process is often preformed iteratively, with step five as refinements to the system parameters or operational budgets affect both groundwater levels and stream flow.

4) **Calibrate Groundwater Levels and Stream Flow:** The fourth step calibrates groundwater levels by changing aquifer parameters with the use of a parameter grid and stream flow through a combination of land surface and stream-bed parameters. This step aims to obtain a reasonable match between the simulated groundwater levels and stream flows with recorded measurements. The iterative calibration process continues until the calibration goals are met.

5) **Compare Calibration Targets with Targets:** The final step in model calibration is to evaluate model sensitivity and uncertainty in context with the available data and knowledge of the Subbasin. This step includes review of the simulated water budgets and hydrographs in conjunction with the local technical advisory committee and stakeholders to evaluate model performance.

4.2 WATER BUDGET CALIBRATION

Water budget calibration ensures that the operational and hydrologic characteristics of the subbasin are accurately represented. The goal of the water budget analysis is to validate flow dynamics and develop a balanced system between supply and demand while describing the movement water such as rainfall, irrigation, streamflow, and subsurface flows. During the calibration process, model datasets and parameters are refined to better match local data at both a monthly and annual timescale. The Modesto Model water budget results are summarized in the following sections.

IWFM-2015 simulates all hydrologic processes and conditions at the node and element level. In total, the Modesto Subbasin contains 768 elements that cover approximately 245,900 acres. Elements range in size from approximately 17 acres to 1,391 acres, with an average size of 320 acres. IWFM can output data from an element or group of elements, representing processes involving water use, the rootzone, unsaturated zone, and groundwater systems. To support basin understanding, water budget development, and local management, elements are grouped into the four subareas listed below and shown in **Figure M21**: Modesto Subbasin Water Budget Areas.

The Modesto Area: The Modesto Irrigation District service area, including the Cities of Modesto and Waterford.

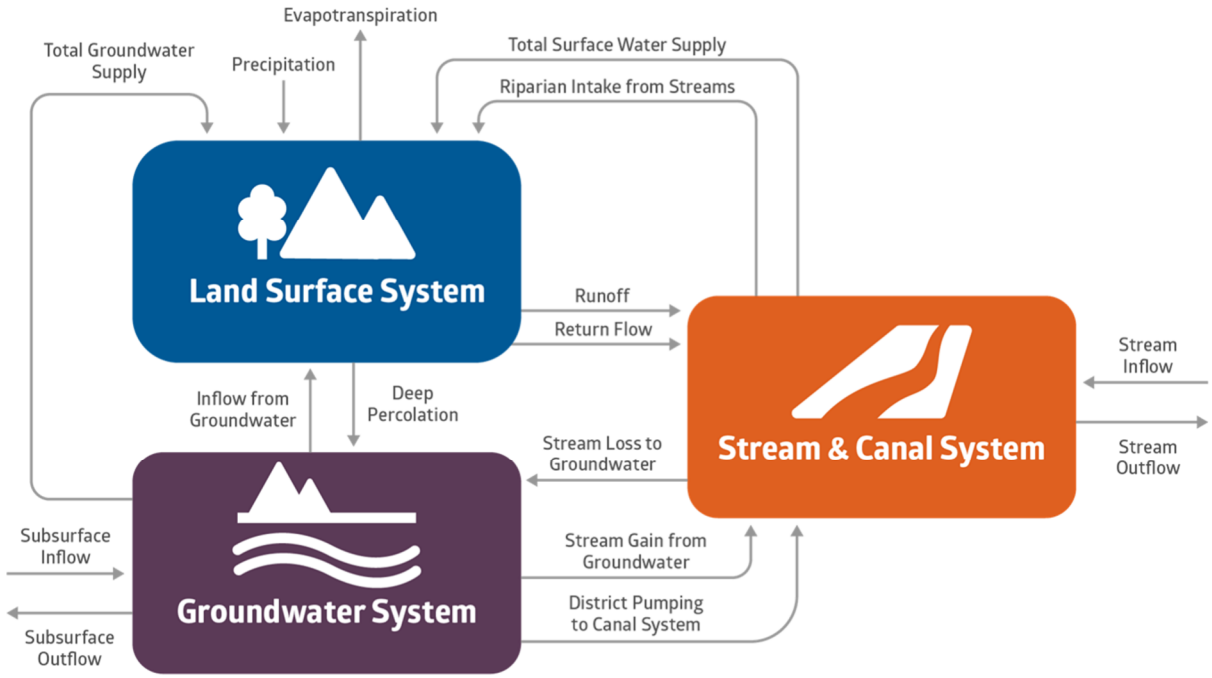
The Oakdale Area: The Oakdale Irrigation District service area including the City of Oakdale.

The Non-District West Area: The non-district areas in the western half of the subbasin, including the City of Riverbank.

The Non-District East Area: The non-district areas in the eastern half of the subbasin.

Water budgets in the Modesto Model were broken into three primary categories: land surface system (including the land and water use, root-zone, and unsaturated zone budgets), stream system and groundwater system. The interconnectivity of each of these systems are presented below in Figure 7, and a detailed description of the calibration process and results are described in Section 4.2.1 through 4.2.3.

Figure 7: Modesto Model Water Budget Flow Diagram



4.2.1 Land Surface System Calibration

Calibration of the land surface system includes the alignment of the IWFM land and water use and root-zone budgets with published reports, studies, and data. Calibration of these parameters include the validation and refinement to all model inputs, including hydrological and operational parameters along with soil flow properties.

The primary calibration target agricultural use in the Modesto Model was the Modesto and Oakdale Irrigation District Agriculture Water Management Plans (AWMPs). The Water Conservation Act of 2009 (SB x7-7) requires agricultural water suppliers serving more than 25,000 irrigated acres to develop a detailed analysis and water budgets of their systems These water budgets represent substantial efforts by each district to evaluate and quantify their operations related to surface water conveyance, on-farm irrigation, and drainage systems.

Data available from the local AEMPs also served as the foundation for the calibration of lands outside of both MID and OID. Since there is very little operational information for the non-district areas, calibration of agricultural demand for these lands was performed by developing statistical relationship between hydrologic soil type, crop type, and irrigation methodology. Combined with known land use and cropping patterns, extrapolation of these soil and operational parameters allowed for the development of reasonable estimates of agricultural demand throughout the subbasin.

As part of the calibration of the land and water use budget, root zone parameters are adjusted as needed to achieve reasonable estimates of agricultural demand and to develop the components of a balanced root zone budget. Land surface calibration serves as the foundation of the groundwater system as the demand estimated often translates directly to groundwater pumping, which is the primary stress on the groundwater system. To adjust agricultural demand, element-level root zone parameters, particularly the soil hydraulic conductivity and the pore size distribution index, were adjusted in accordance with the hydrologic soil group and subregion. The spatial distribution of these calibrated parameters is shown in **Figure M22** though

Figure M25, and highlights the calibrated soil parameter values specified for elements within the Modesto Subbasin. **Figure 8** and **Figure 9** shows a comparison of each of the major flow components in the Modesto Model and their respective AWMP budget item.

Table 9: Soil Textures and Corresponding Soil Parameters in the Modesto Subbasin

Hydrologic Soil Type	Average Parametric Value				
	Wilting Point (-)	Field Capacity (-)	Porosity (-)	PSDI (-)	K_{sat} (ft/d)
Type A	0.022	0.081	0.400	1.020	29.70
Type B	0.126	0.261	0.397	0.160	7.80
Type C	0.120	0.241	0.392	0.180	9.90
Type D	0.211	0.350	0.439	0.150	0.30
Weighted Average	0.115	0.226	0.406	0.398	12.68

Figure 8: Modesto Model Calibration of MID Land Surface Operations (1991-2015)

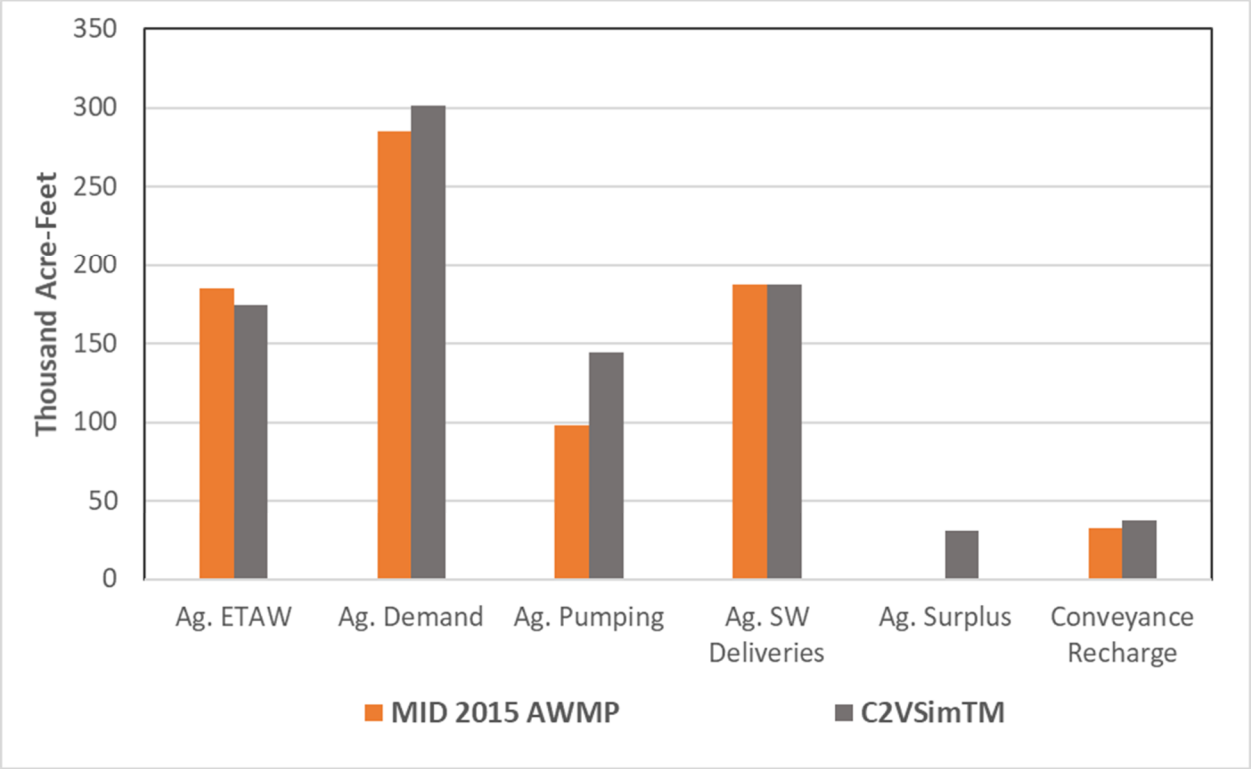
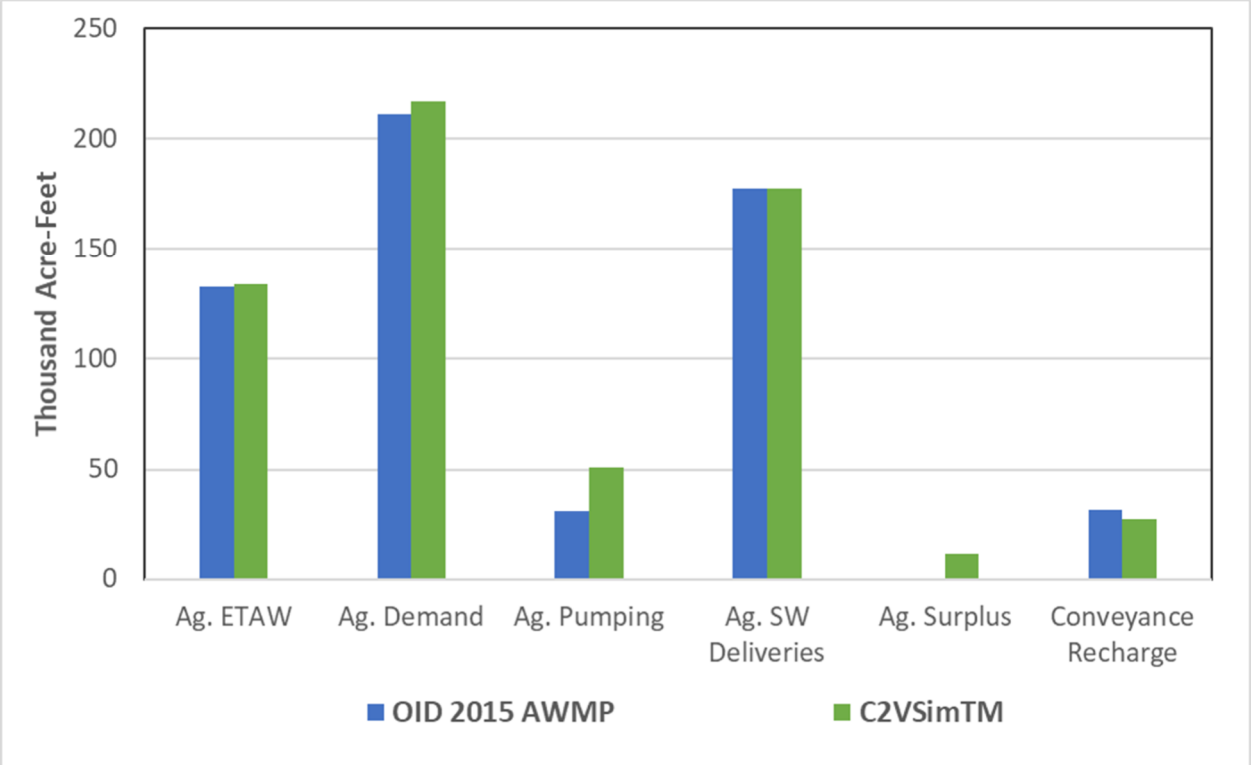


Figure 9: Modesto Model Calibration of OID Land Surface Operations (1991-2015)



Note: Comparison to the OID AWMP includes both the Modesto and Eastern San Joaquin Subbaisns

The land and water use budget represents the balance of the IWFM-calculated water demands with the water supplied for the urban and agricultural sectors. Both the agricultural and urban versions include the same components that make up the water balance:

- Water demand (either agricultural or urban)
- Surface water supply (including recycled water deliveries and pumping delivered as surface water)
- Groundwater supply (does not include pumping delivered as surface water)

In its entirety, the Modesto Subbasin has an agricultural supply requirement of approximately 513,000 AFY. During the historical calibration period, on average, the Modesto Subbasin's agricultural demand is met through an of 289,400 AFY of surface water and 223,600 AFY of groundwater production. Additionally, the urban water demand in the Modesto Subbasin has averaged 88,600 AFY, with 26,000 AFY coming from surface water, and 62,600 AFY coming from groundwater. The land and water use budgets are presented below in **Table 10, Figure 10,** and **Figure 11**.

Table 10: Summary of Modesto Model Land and Water Use Budget
(Average Annual for the Period WY 1991-2015; Units are in Acre-Feet per Year)

	Modesto Subbasin	Modesto Area	Oakdale Area	Non-District West	Non-District East
Agricultural Demand	513,000	281,200	149,700	34,600	47,500
Agricultural Surface Water Supply	289,300	146,200	123,900	19,200	0
Agricultural Groundwater Supply	223,700	135,000	25,800	15,400	47,500
Urban Demand	88,600	73,000	11,000	4,600	0
Urban Surface Water Supply	26,000	26,000	0	0	0
Urban Groundwater Supply	62,600	47,000	11,000	4,600	0
Note: Values represent volumes available to meet the water demand, as such surface water supplies represent the surface water delivered to the growers.					

Figure 10: Modesto Subbasin Annual Agricultural Land and Water Use Budget

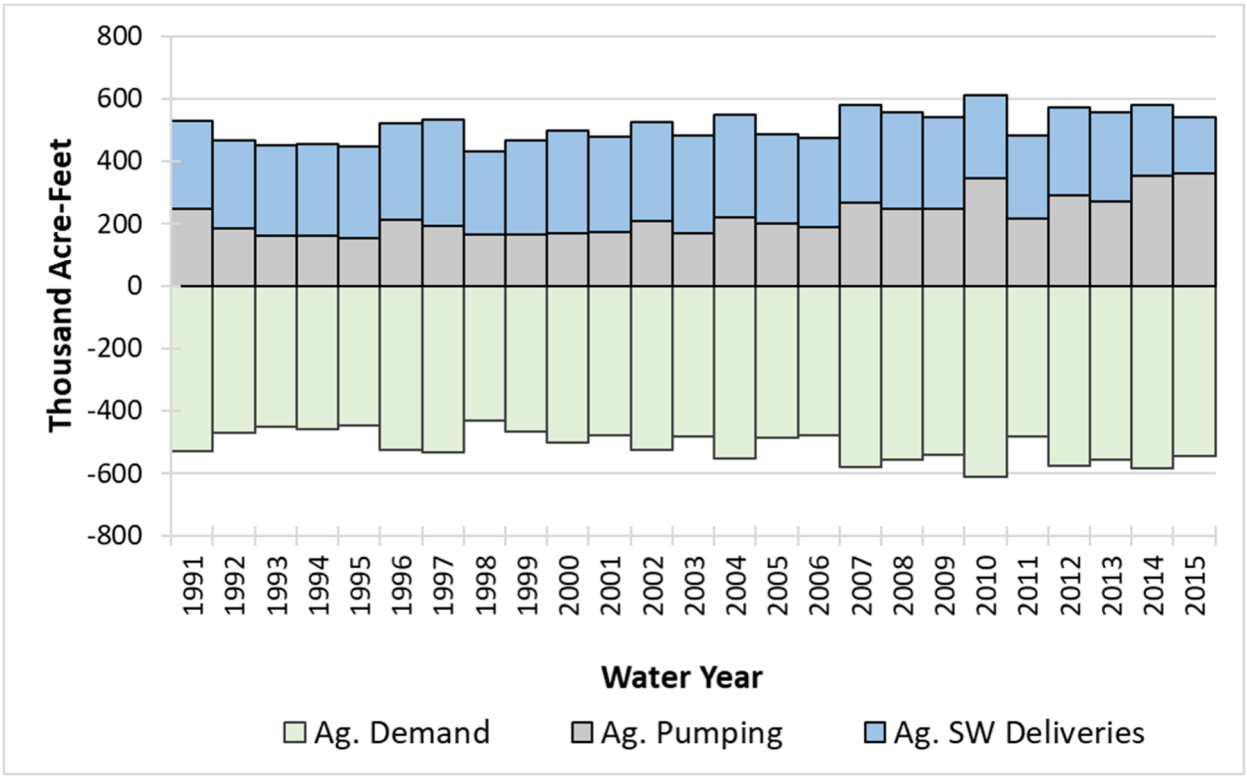
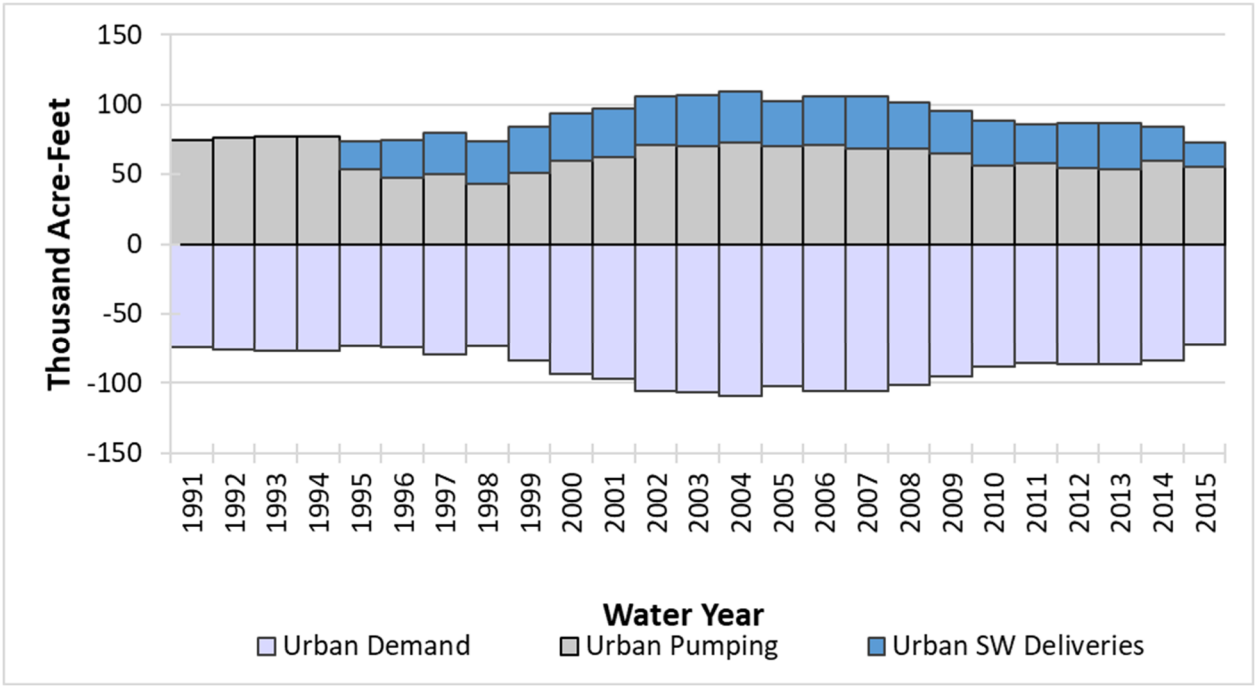


Figure 11: Modesto Subbasin Annual Urban Land and Water Use Budget



4.2.2 Groundwater System Calibration

Groundwater budgets provide a valuable evaluation tool and a means of validating the calibration process. The groundwater budget quantifies inflows and outflows from the groundwater system. The primary components of the groundwater budget, corresponding to the major hydrologic processes affecting groundwater flow in the model area, are:

- Inflows:
    - Deep percolation (from rainfall and applied water)
    - Gain from stream (recharge due to stream and river seepage)
    - Recharge (Modesto Reservoir seepage, conveyance losses, and other recharge facilities)
    - Boundary inflow (from outside the model area)
    - Subsurface inflow (from adjacent subbasins)
- Outflows:
    - Groundwater pumping (for both urban and agricultural use)
    - Loss to stream (outflow to streams and rivers)
    - Subsurface outflow (to adjacent subbasins)
- Change in aquifer storage

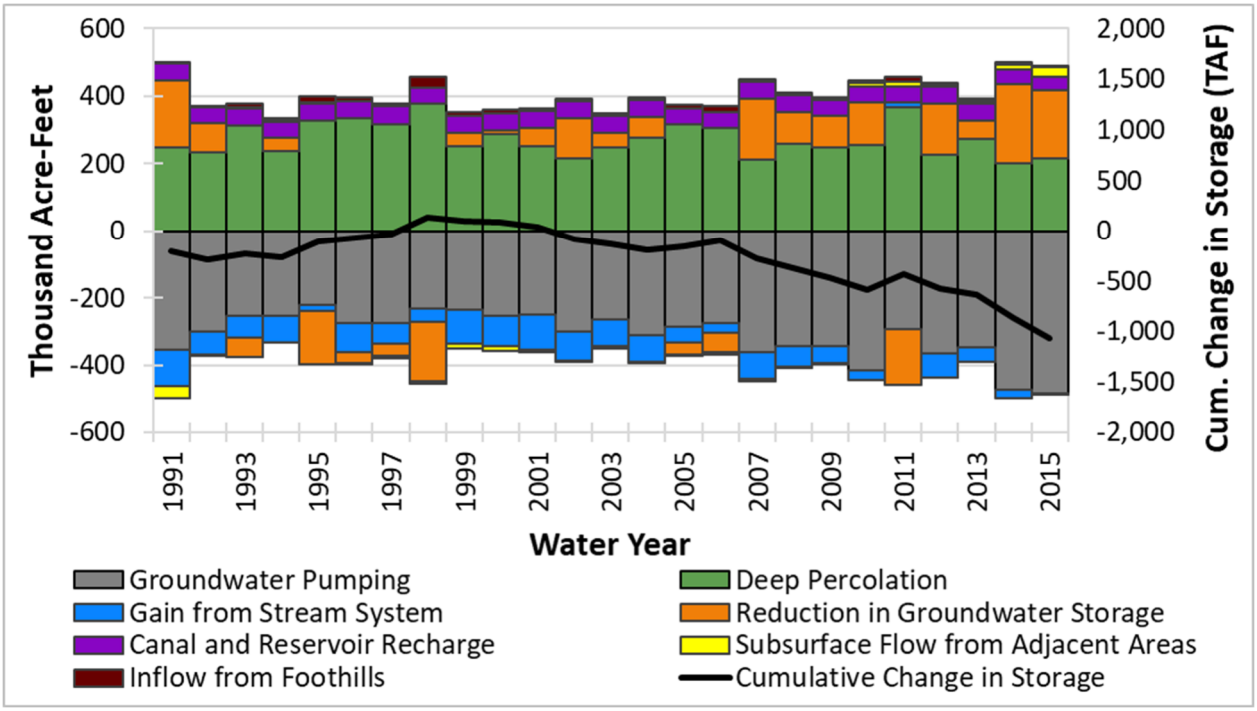
For the historical simulation of water years 1991-2015, the majority of Modesto Subbasin is irrigated agricultural land, and thus the main source of groundwater recharge is deep percolation of water from rain and applied irrigation water, which averages approximately 272,000 AFY. Seepage from canals and reservoirs are the second largest source of groundwater recharge in the Subbasin, totaling approximately 49,000 AFY. Modesto Subbasin also receives net groundwater inflows from neighboring subbasins in most years, gaining approximately 1,900 and 2,400 AFY from the Eastern San Joaquin and Turlock Subbasins, respectively, and losing approximately 2,300 AFY to the Delta-Mendota Subbasin.

Groundwater pumping to meet agricultural and urban demands is the largest source of outflow from Modesto Subbasin at an average of 311,100 AFY during the model period, as both agricultural and urban areas in the subbasin rely to a large part on groundwater supplies. Groundwater discharges to local rivers at an average rate of approximately 59,600 AFY, with 15,800 AF discharging to the Stanislaus River, 30,200 AF discharging to the Tuolumne River, and 13,600 AF discharging to the San Joaquin River. During the historical period modeled, total outflows from the groundwater in the Modesto Subbasin were greater than inflows to the Subbasin, leading to a long-term reduction in groundwater storage of over 1.5 million acre-feet or approximately 42,700 AFY of groundwater storage deficit. The groundwater budgets, including cumulative change in storage, are summarized in **Table 11** and annual values are shown in **Figure 12**.

Table 11: Modesto Subbasin Historical Groundwater Budget (1991-20015)

Groundwater Flow Component	Modesto Subbasin (1991-2015)
Deep Percolation	271,900
Canal and Reservoir Recharge	48,900
Subsurface Flow from Adjacent Areas	-2,000
Inflow from Foothills	9,200
Gain from Stream System	-59,600
Groundwater Pumping	-311,100
Reduction in Groundwater Storage	42,700

Figure 12: Modesto Subbasin Historical Groundwater Budget (1991-20015)



4.2.3 Stream Budget Calibration

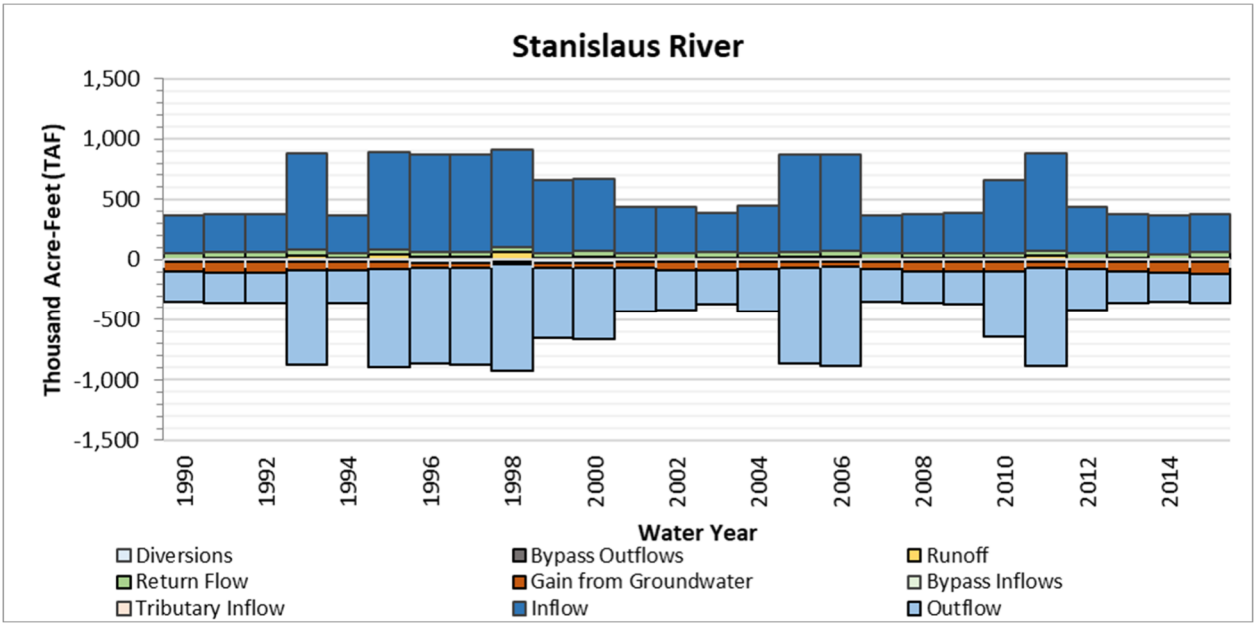
Calibration of the stream system is divided into streamflow and stream budget calibration. Stream budget calibration is principally a validation step during model calibration to ensure that the user-defined inflows and outflows are represented in model output. Within the Modesto model, these inflows and outflows principally include stream reach inflow, surface water diversions, agricultural and urban return flow, and runoff. Parameters controlling stream-aquifer interaction are then adjusted to ensure a reasonable representation while aligning simulated and observed stream flow and groundwater level hydrographs, which are discussed in more detail in **Section 4.3.2**.

A summary of inflows and outflows for each of the three major river is presented below:

Stanislaus River

The Modesto Model simulates the Stanislaus River along the northern boundary of the Modesto Subbasin, extending from just east of the Stanislaus-Tuolumne County line to the San Joaquin River confluence. The Stanislaus River exhibits gaining stream behavior in approximately 48% of years, with average net gains of 2,200 AFY from 1991 to 2015. Surface water diversions represent the Stanislaus River's largest non-discharge outflow, at an average rate of 29,100 AFY. Other major non-discharge outflows from the Stanislaus River include uptake by riparian vegetation, at an average of 17,400 AFY. Return flow and runoff provide the greatest secondary inflows to the Stanislaus River, at an average of approximately 34,500 and 17,600 AFY, respectively. An annualized presentation of the Stanislaus River water budget is presented below in **Figure 13**.

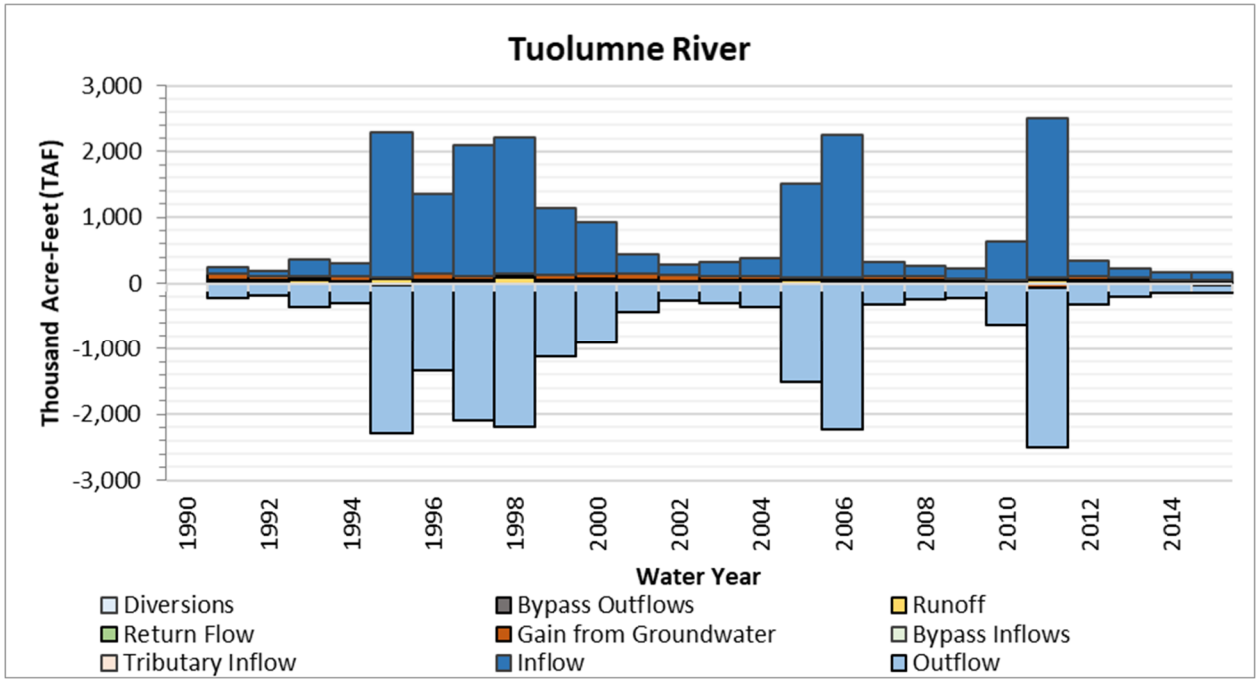
Figure 13: Stanislaus River Annual Stream Budget



Tuolumne River

The Modesto Model simulates flow from La Grange Dam at the head of the Tuolumne River to the River's confluence with the San Joaquin River. Inflow to the Tuolumne River are releases from La Grange, as reported by Turlock and Modesto Irrigation Districts. These releases result in average annual inflows of 741,600 AFY, with an overall range from 82,200 AF in the critically dry year 1992 to 2,431,700 AF in the wet year 2011. As the Modesto Model simulates the Tuolumne River downstream of La Grange Dam, MID and TID diversion are not included in the river's water budget. As such, the only diversions off this reach of the Tuolumne River average 10,300 AFY for riparian water users. The Tuolumne River flows, on average, receive 44,700 AFY of net-inflows from the groundwater system. The Tuolumne River also receives tributary, runoff, and return flows estimated at 57,200 AFY combined. On average, the Tuolumne River outflows to the San Joaquin River at an average of 819,200 AFY from WY 1991 to 2015. A graphical representation for the Tuolumne River water budget is show below in **Figure 14**.

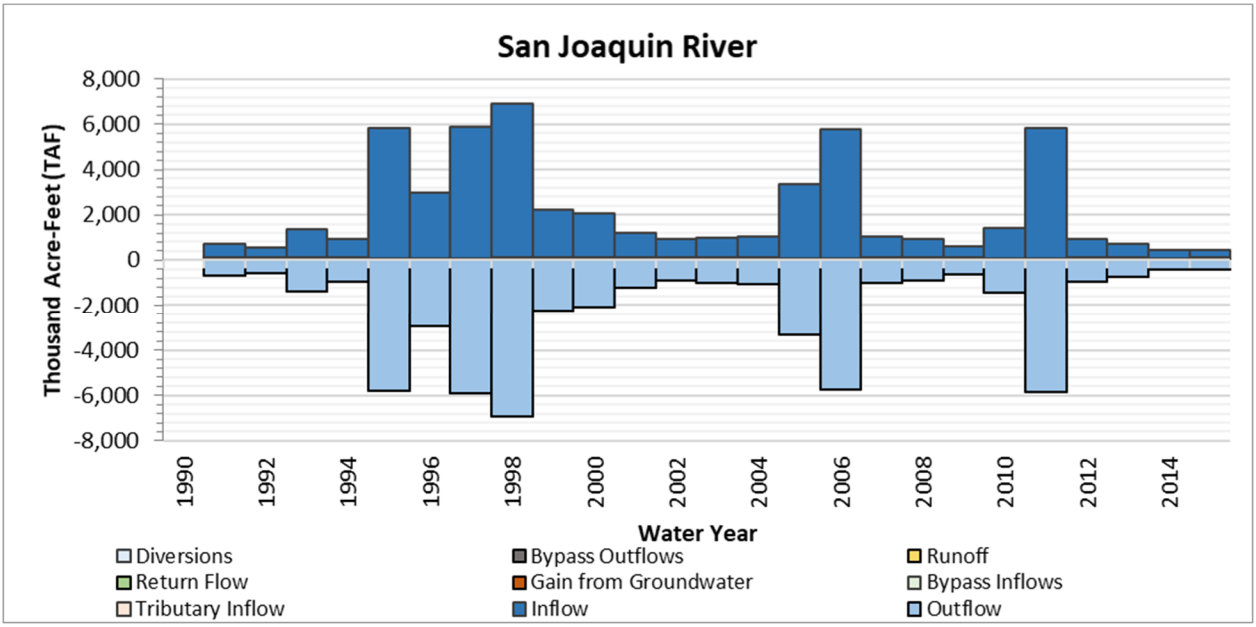
Figure 14: Tuolumne River Annual Stream Budget



San Joaquin River

The San Joaquin River is the second largest stream system in the Central Valley. The Modesto Subbasin is affected by the San Joaquin River from its confluence with the Tuolumne River to its confluence with the Stanislaus River. Within the Modesto Model domain, annual inflows to the San Joaquin River average 2,104,000 AFY, with a high of 6,816,300 AF reported in 1998 and a low of 339,200 AF reported in 2014. Average annual diversions from this reach of the San Joaquin River totaled 3,900 AFY, while riparian evapotranspiration averages 3,200 AFY. Along the Modesto Subbasin, the San Joaquin River receives average net inflows of 65,800 AFY from the groundwater system. Average annual tributary and runoff inflows to the San Joaquin River total approximately 35,700 AFY. Approximately an average of 2,198,800 AFY of water reaches the confluence of the Stanislaus River each year. Inflows and outflows for the San Joaquin River are shown in **Figure 15**.

Figure 15: San Joaquin River Annual Stream Budget



4.3 GROUNDWATER LEVELS AND STREAMFLOW CALIBRATION

After the water budgets are reasonably calibrated, the next step in the iterative process is attuning groundwater levels and streamflow. This step in the calibration process includes refining water budget components along with aquifer and streambed parameters to capture both the values and general trends throughout the subbasin over the simulation period.

4.3.1 Groundwater Level Calibration

The goal of this stage of calibration is to achieve a reasonable agreement between the simulated and observed groundwater levels at the calibration wells. The groundwater level calibration process included an iterative process of refining the water use budgets and adjusting system parameters to achieve a reasonable agreement between the simulated and observed groundwater levels at the calibration wells. As described in **Section 3.5.2**, 66 calibration wells selected as the primary indicator wells to represent the long-term conditions at both a local and regional scale. The selected calibration wells provide reliable historical data that has served as a fair representation of the conditions across the Subbasin.

The groundwater level calibration is performed in two stages:

- The initial calibration effort is focused on the regional scale to verify hydrogeological assumptions made during development and confirm the accuracy of water budgets and general groundwater flow vectors.
- The second stage of calibration of groundwater levels is to compare the simulated and observed groundwater level at each calibration well. This comparison provides information on the overall model performance during the simulation period. The simulated groundwater elevations at the 66 calibration wells were compared with corresponding observed values for long-term trends as well as seasonal fluctuations.

Calibration targets for the aquifer system focused on groundwater levels and were primarily driven by hydrologic conditions and land surface operations. To calibrate the model to observed groundwater levels, data from 66 wells throughout the Modesto Subbasin were compiled and analyzed for model input and use.

To minimize residuals between the simulated and observed groundwater levels, various aquifer parameters were adjusted with appropriate spatial distribution and interpolated to each of the model nodes. Aquifer parameter adjustments were limited to plausible value ranges established from available lithologic data. Calibration was performed in three steps. First, vertical conductivity of the upper aquitard unit (locally corresponding to the Corcoran Clay) was adjusted to reduce residuals. Then, the horizontal and vertical conductivities of the aquifer layers were modified. Lastly, the specific yield and specific storage values of the aquifers were adjusted until residuals between simulated and observed groundwater levels had been minimized. This is an iterative process and is implemented in a methodical way to obtain best fit with minimum deviation between the simulated and observed groundwater levels calibration observation wells.

The results of the groundwater level calibration indicate that the Modesto Model reasonably simulates the long-term responses under various hydrologic conditions. **Figure M14**, presented in **Section 3.5.2** shows the spatial location of the calibration wells used in the model, while **Figure 16** through **Figure 23** offer a cursory overview of the groundwater level calibration across the model domain, and Appendix A contains groundwater hydrographs at all calibration wells.

In addition to the detailed analysis at each of the calibration wells, groundwater level contours were developed to evaluate conditions and the model's behavior in areas that are not covered by the calibration wells. Examples of these contours are shown in **Figure M26** and **Figure M27** and represent conditions in Layers 1 and 2 at the end of the simulation period.

Figure 16: Modesto Calibration Well 1, Simulated and Observed

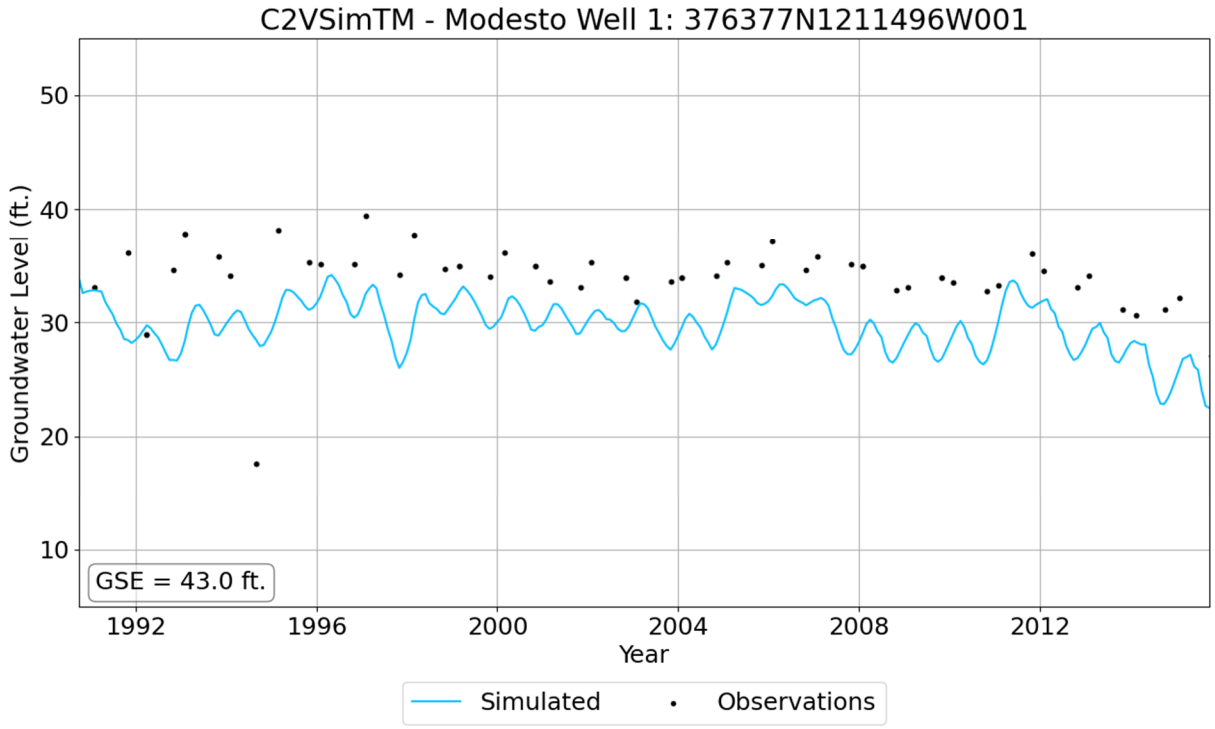


Figure 17: Modesto Calibration Well 21, Simulated and Observed

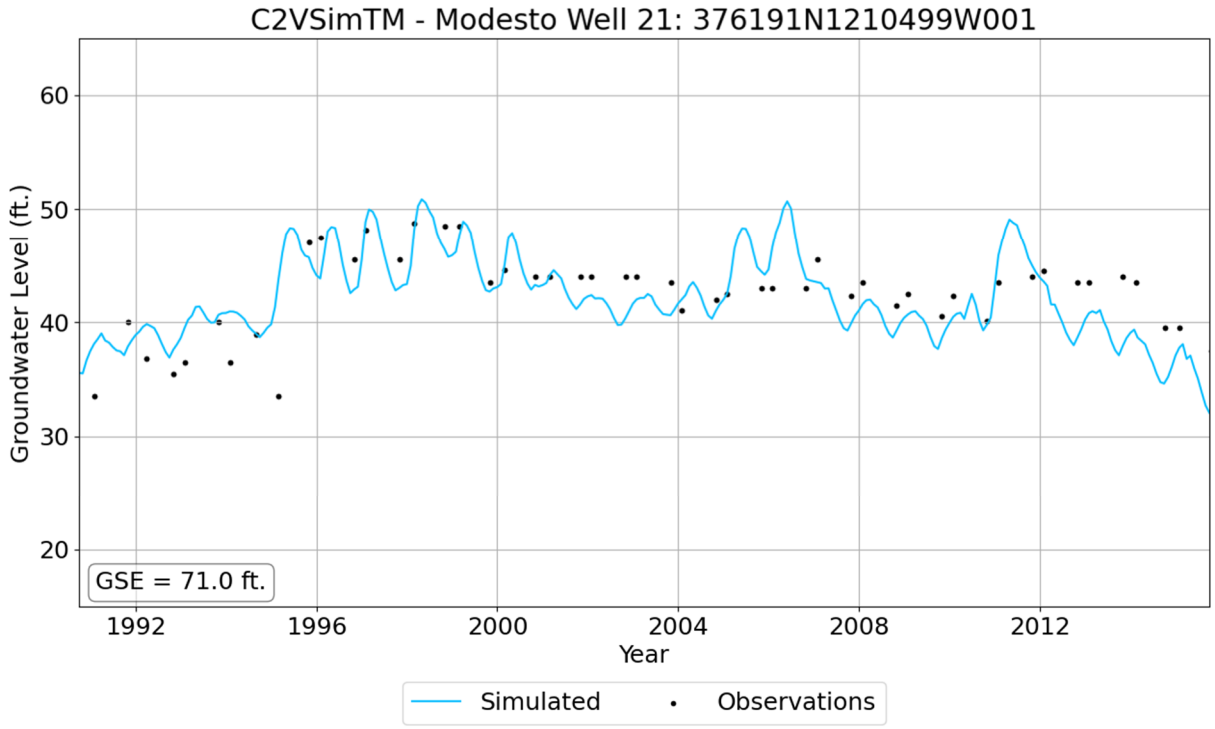


Figure 18: Modesto Calibration Well 27, Simulated and Observed

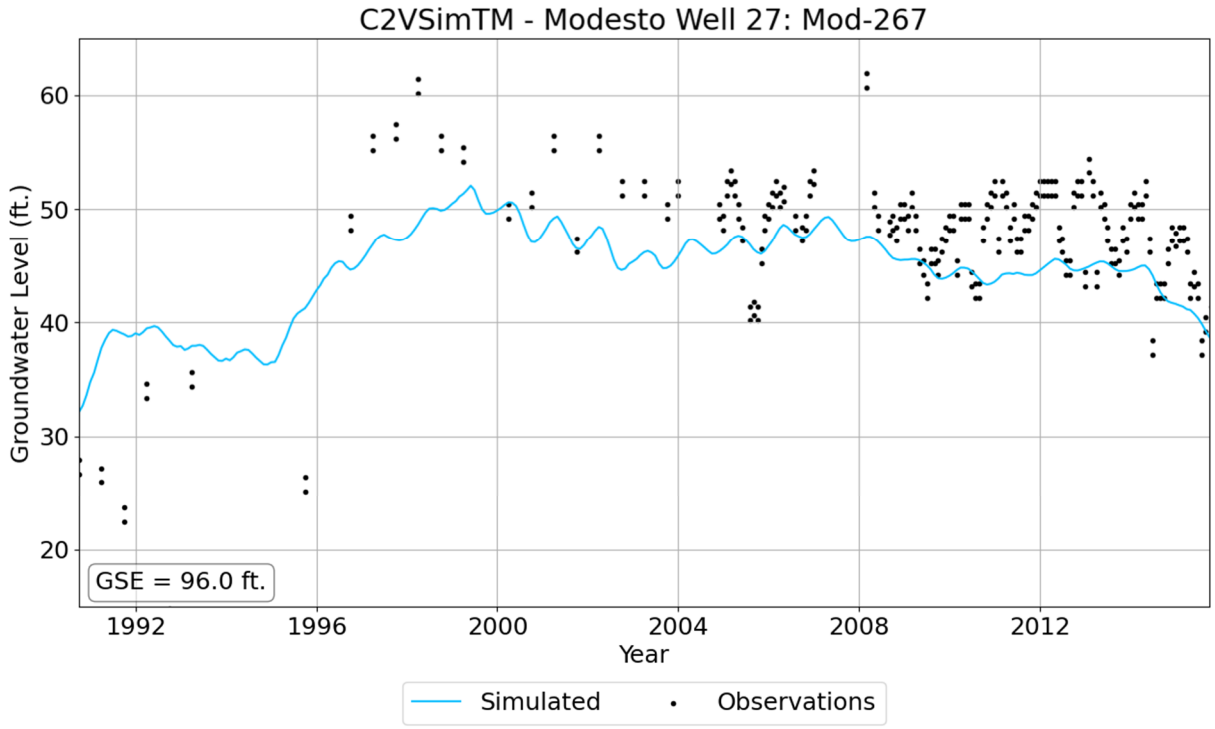


Figure 19: Modesto Calibration Well 43, Simulated and Observed

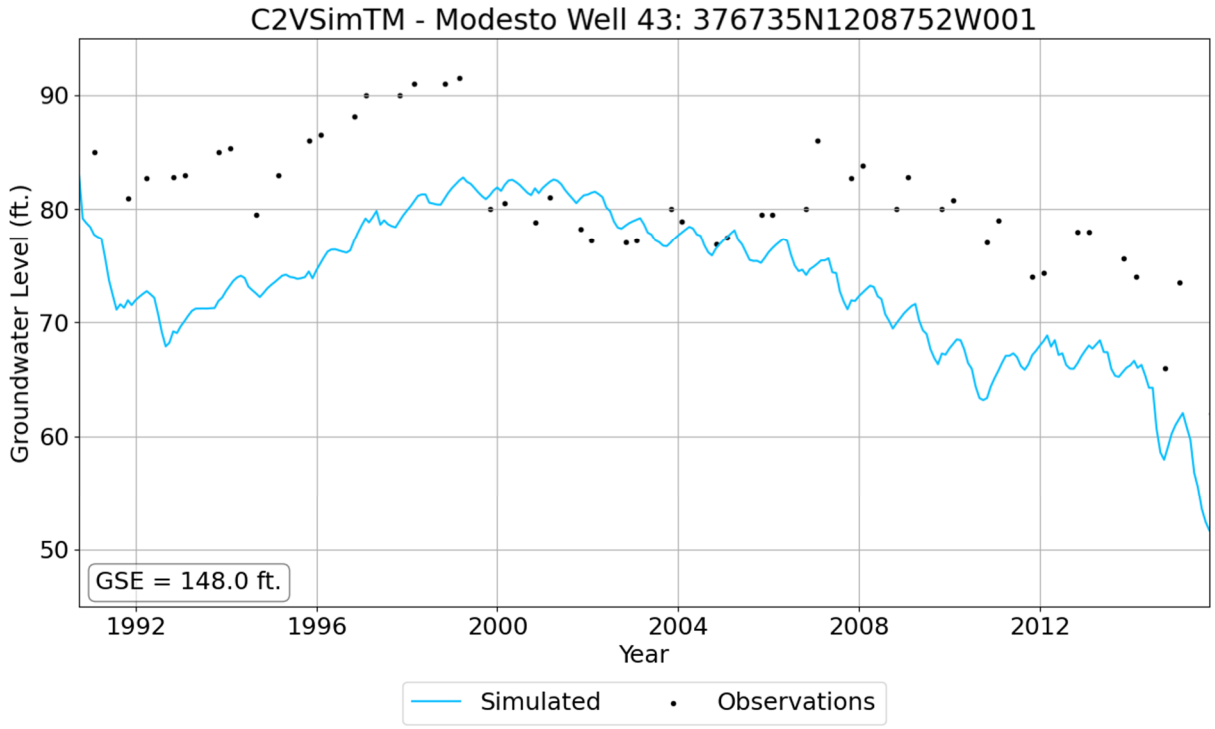


Figure 20: Modesto Calibration Well 45, Simulated and Observed

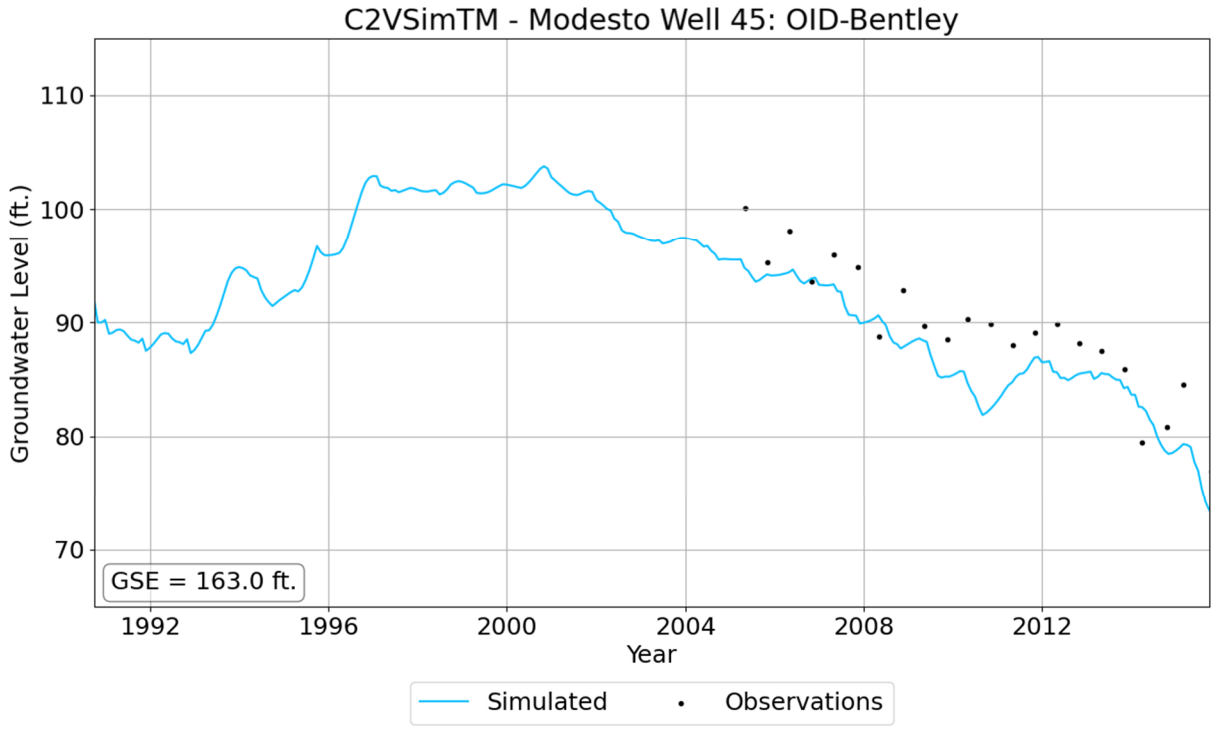


Figure 21: Modesto Calibration Well 55, Simulated and Observed

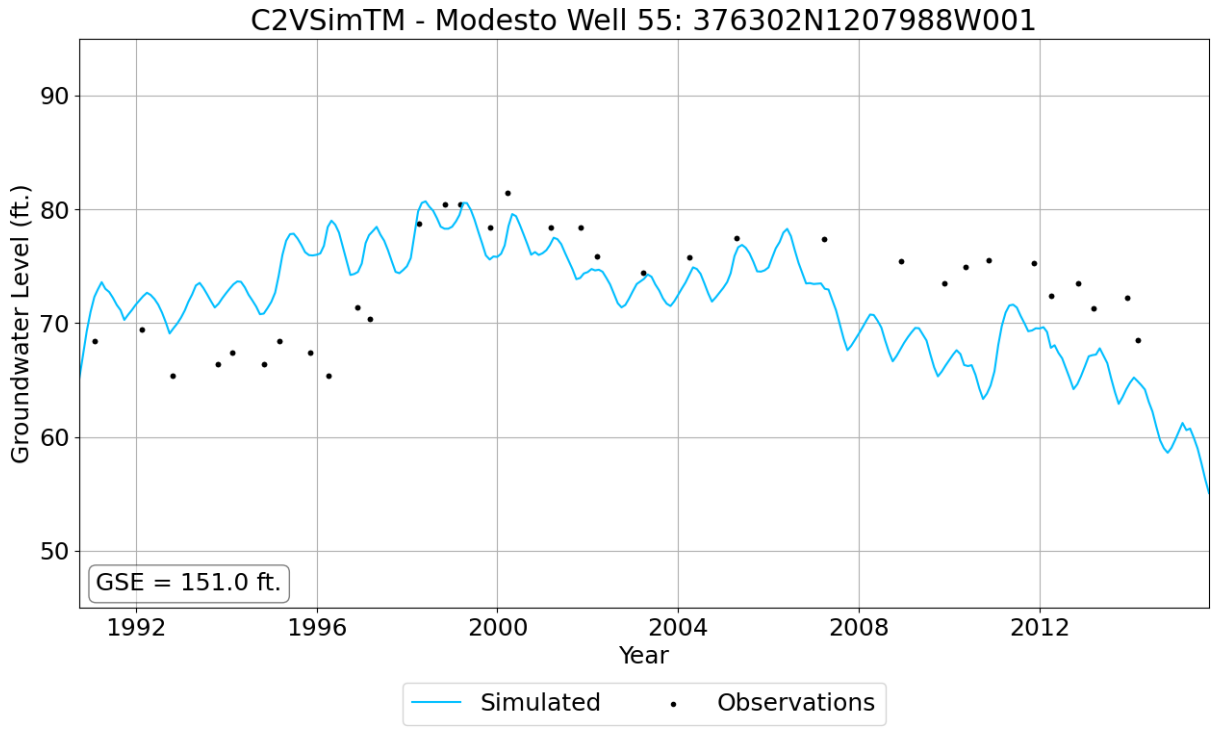


Figure 22: Modesto Calibration Well 64, Simulated and Observed

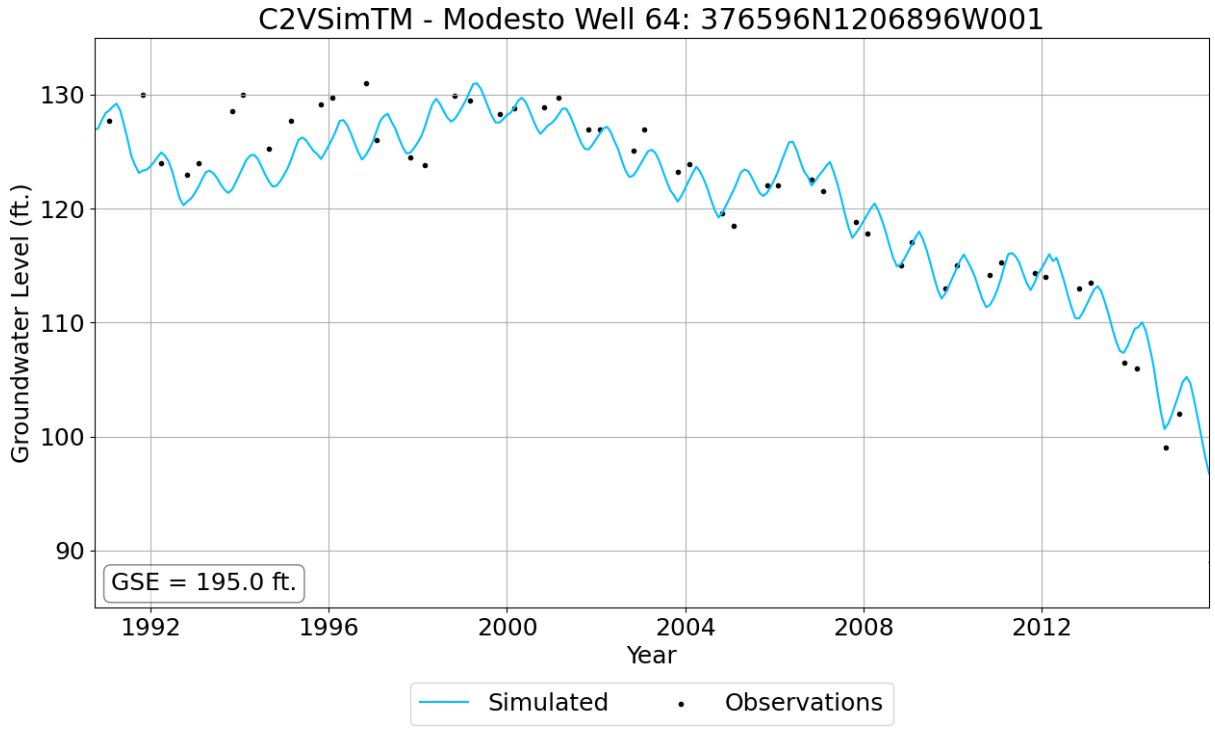
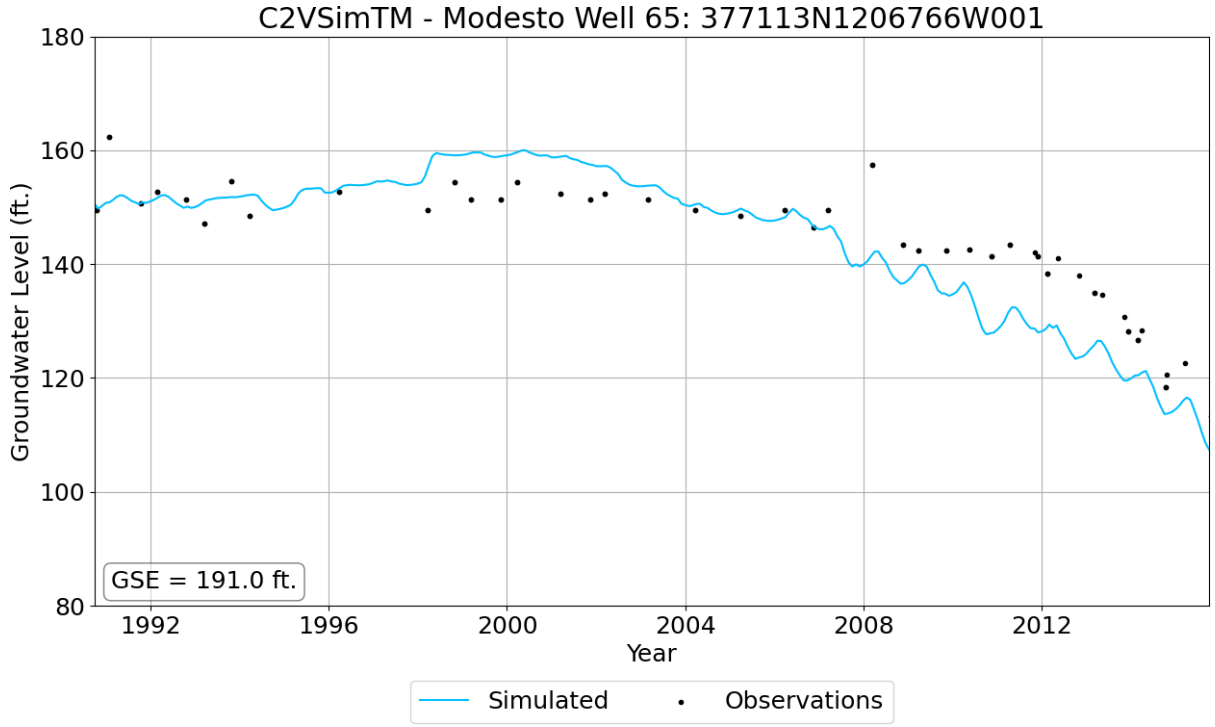


Figure 23: Modesto Calibration Well 65, Simulated and Observed



4.3.2 Stream Flow Calibration

Streamflow calibration included refinement of the streambed conductance originally from C2VSimFG. Simulated streamflow was compared with observed records, and exceedance charts were also used to evaluate the model performance when simulating variable conditions, particularly to check the quality of calibration under high and low flows at each gage location. Calibration results from each river's primary calibration wells are presented below in **Figure 24** though **Figure 29**.

Figure 24: Observed vs. Simulated Streamflow for the Stanislaus River

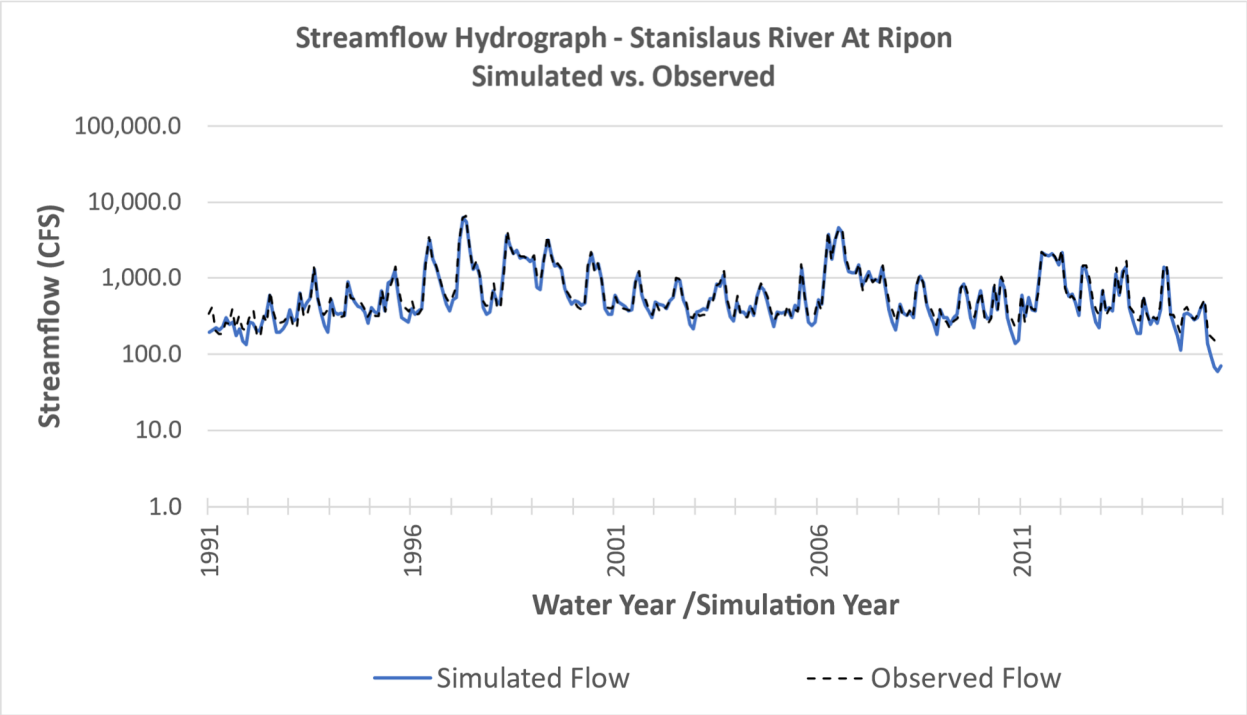


Figure 25: Streamflow Exceedance Probability for the Stanislaus River

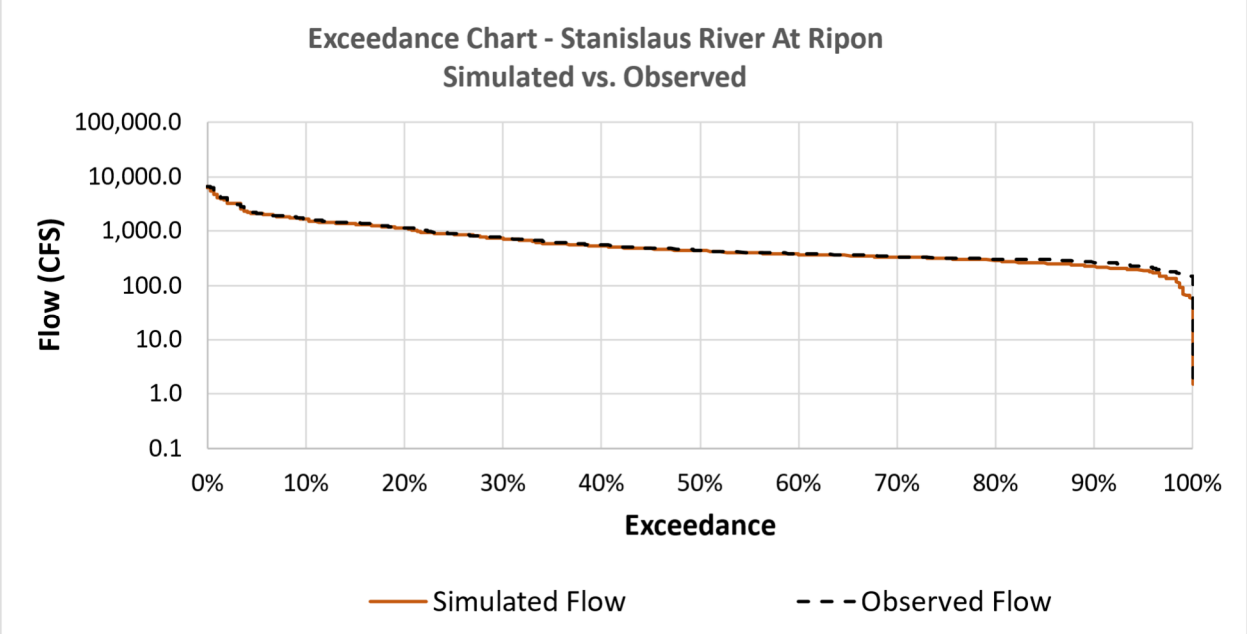


Figure 26: Observed vs. Simulated Streamflow for the Tuolumne River

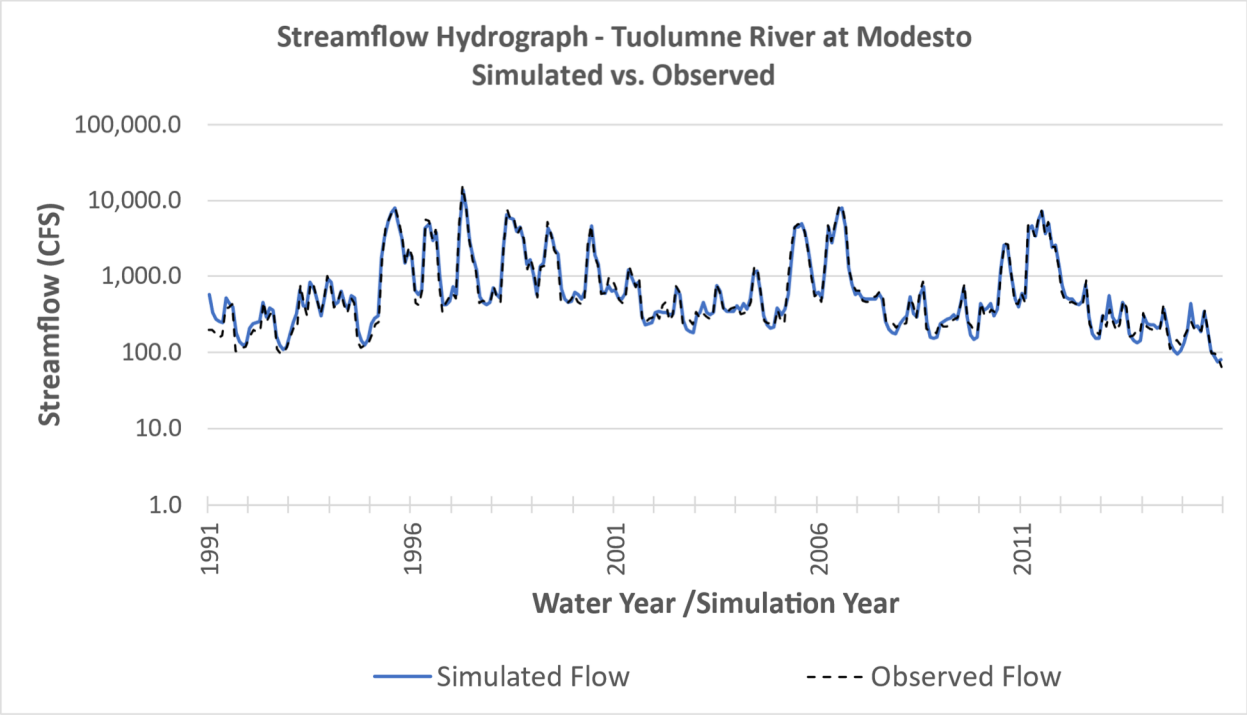


Figure 27: Streamflow Exceedance Probability for the Tuolumne River

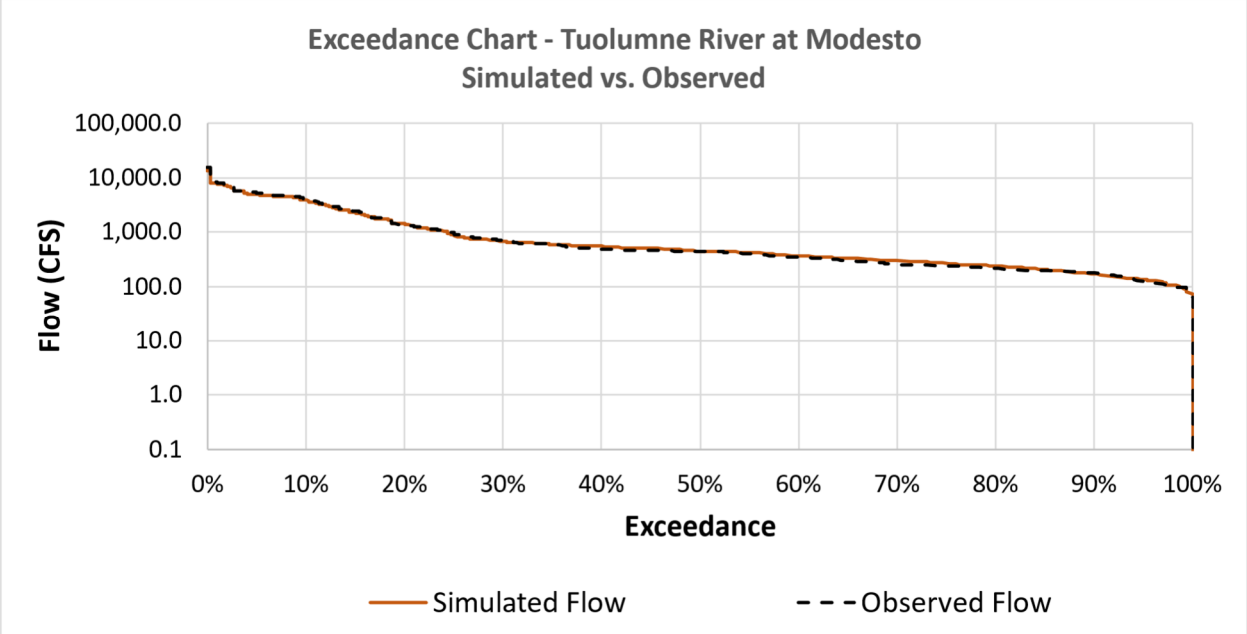


Figure 28: Observed vs. Simulated Streamflow for the San Joaquin River at Vernalis

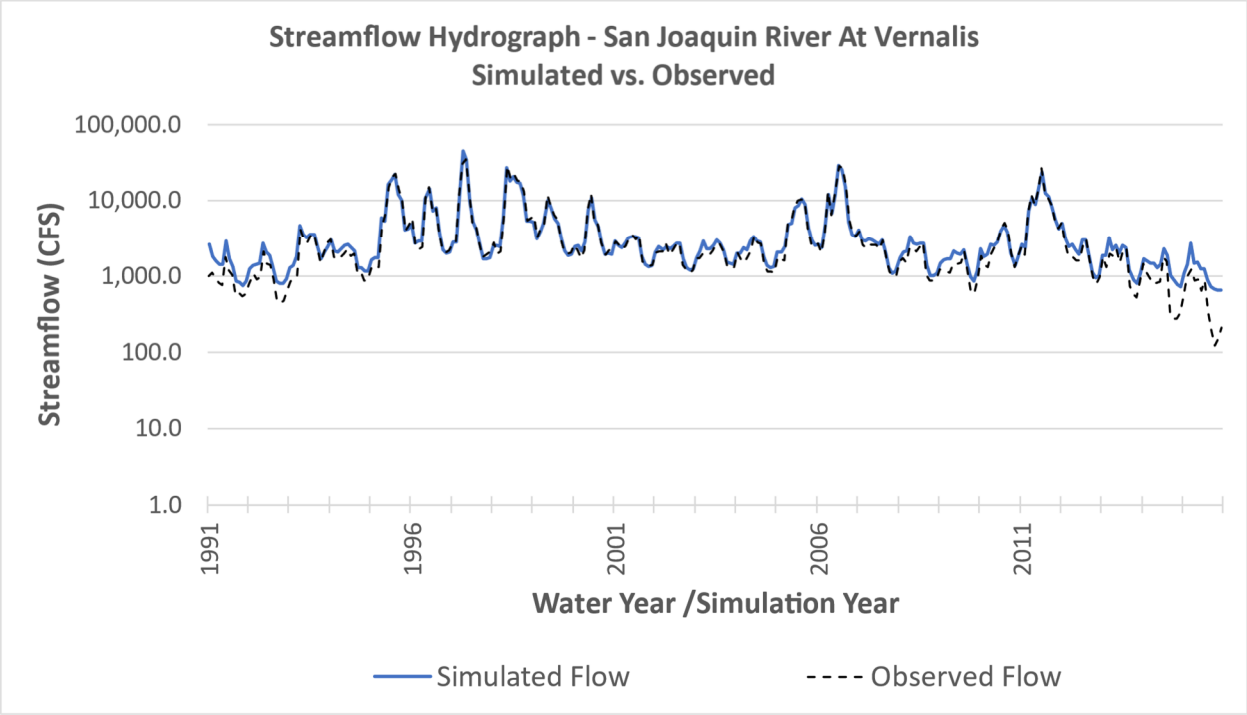
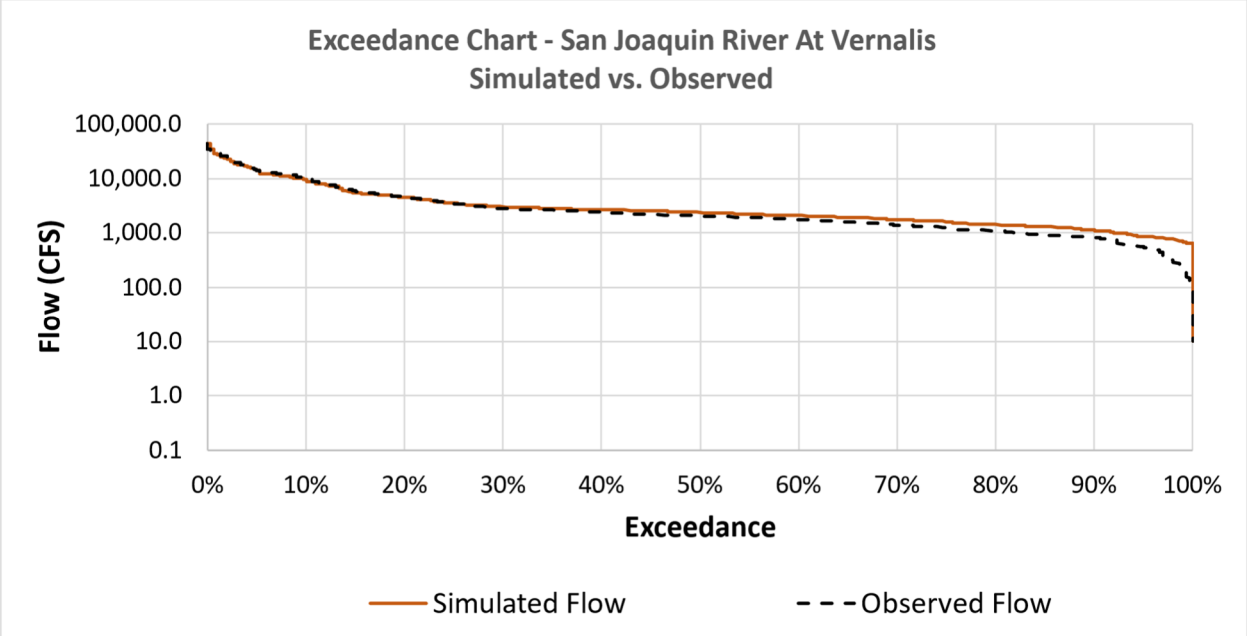


Figure 29: Streamflow Exceedance Probability for the San Joaquin River at Vernalis



4.4 MODEL PERFORMANCE

4.4.1 Final Calibration Parameters

The California Central Valley Groundwater-Surface Water Simulation Model (C2VSimFG) served as the basis of aquifer parameters within the Modesto Model. These parameters were adjusted throughout the calibration process such that water budgets, groundwater head, and streamflow of the simulated model were best aligned with the observed data. The parameters resulting from the calibration process are listed in the subsection below and summary of final stream and aquifer parameters in **Table 12** and **Table 13**.

Horizontal Hydraulic Conductivity (K_H) in the Modesto Model varies across the horizontal direction and across model layers. The fully calibrated values remain descriptive of the initial hydrogeologic analysis and range from 3.68 ft/day in Layer 4 to 100 ft/day in Layer 1. Values for the Unconfined Aquifer (Layer 1) average 63.01 ft/day while those in the confined, freshwater aquifers (Layers 2 and 3) average to 30.62 ft/day. The spatial distribution is represented in **Figure M28** through **Figure M31**.

Vertical Hydraulic Conductivity (K_V) facilitates the separation between each of the vertical layers simulated in the Modesto Model. Average values typically range from 1.43 ft/day in the unconfined aquifer to 0.51 ft/day in the lower layers. The maximum values range from 6.97 ft/day in Layer 1 to 2.31 ft/day in Layer 2, while the minimum values are in the 0.03-0.09 ft/day range.

Aquitard Vertical Hydraulic Conductivity (K_{AV}) is primarily a constraining factor across the Corcoran Clay. The vertical conductivity of the Corcoran aquitard is generally found to be between one-thousandth and one-ten-thousandth of the horizontal conductivity of the surrounding aquifer systems.

Specific Storage – Specific Storage (S_S) is used to represent the available storage at nodes in a confined aquifer, where the hydraulic head is above the top of the aquifer. Specific Storage is the unit volume of water released or taken into storage per unit change in head. All Layers presented a maximum value of 1.00E-04 ft^{-1}, with an average value ranging from 7.14E-05 ft^{-1} in Layer 1 to 7.96E-05 ft^{-1} in Layer 4.

Specific Yield – Specific Yield (S_Y) is representative of the available storage in an unconfined aquifer and defined as the unit volume of volume released from the aquifer per unit change in head due to gravity. All layers presented a maximum value of 0.2, and a minimum of 0.05, with an average ranging from 0.151 in Layer 1 to 0.144 in Layer 3.

Streambed Conductance (C_S) is represented in the Modesto Model as the product of streambed thickness and the streambed hydraulic conductivity. Due to the uncertainty related to the streambed thickness, C2VSimFG defines all streambed thicknesses as one foot so that the hydraulic conductivity input parameter (CSTRM) represents streambed conductance for each node. The maximum conductance values range from 1.9 day^{-1} in the San Joaquin River, to 2.8 day^{-1} in the Tuolumne River. The minimum values range from 1.3 day^{-1} in the Stanislaus River, to 1.7 day^{-1} in the San Joaquin River, while the average values are close to 1.8 day^{-1} for all rivers.

Table 12: Range of Aquifer Parameter Values

Data		Layer 1	Layer 2	Layer 3	Layer 4
Horizontal Hydraulic Conductivity (ft/day)	Maximum	100.00	66.64	94.16	84.98
	Average	63.01	31.52	29.73	33.11
	Minimum	12.45	7.77	4.96	3.68
Vertical Hydraulic Conductivity (ft/day)	Maximum	6.96	2.31	3.30	2.97
	Average	1.43	0.51	0.51	0.57
	Minimum	0.09	0.03	0.04	0.04
Aquitard Hydraulic Conductivity (ft/day)	Maximum		4.95E-02		
	Average		1.14E-02		
	Minimum		9.27E-04		
Specific Yield (unitless)	Maximum	0.200	0.200	0.200	0.200
	Average	0.151	0.145	0.144	0.145
	Minimum	0.050	0.050	0.050	0.050
Specific Storage (1/ft)	Maximum	1.00E-04	1.00E-04	1.00E-04	1.00E-04
	Average	7.14E-05	7.78E-05	7.91E-05	7.96E-05
	Minimum	1.74E-06	2.25E-06	2.49E-06	2.40E-06

Table 13: Range and Average of Streambed Conductance (C_S) by River

River	Average Conductance (day^{-1})	Minimum Conductance (day^{-1})	Maximum Conductance (day^{-1})
Stanislaus River	1.7	1.3	2.7
Tuolumne River	1.9	1.4	2.8
San Joaquin River	1.8	1.7	1.9

4.4.2 Measurement of Calibration Status

The Modesto Model's calibration was primarily assessed using two metrics: groundwater level trends and the correlation between simulated and observed groundwater levels. Qualitative methods included review of stream hydrographs, groundwater level hydrographs, residual maps, and the spatial and temporal distribution of trends therein. Quantitative measures included the calculation of statistical measures of error, residual scatter plots and histograms. Relative to the qualitative review of the hydrographs, the statistical analysis of model calibration described below, uses all 531 monitoring wells for a more complete analysis.

Statistics related to the differences between simulated and observed groundwater levels were evaluated relative to the American Standard Testing Method (ASTM) standard. The "Standard Guide for Calibrating a Groundwater Flow Model Application" (ASTM D5981) states that "the acceptable residual should be a small fraction of the head difference between the highest and lowest heads across the site." The residual is defined as the simulated head minus the observed head. An analysis of all calibration water levels within the model indicated the presence of a range in groundwater levels of 150 feet. Using 10 percent as the small fraction, the acceptable residual level would be 15 feet. The calibration exceeds that standard, as shown by the following statistics.

- 82.8% of observed groundwater levels are within +/- 10 feet of its respective simulated values
- 96.2% of observed groundwater levels are within +/- 15 feet of its respective simulated values
- 98.5% of observed groundwater levels are within +/- 20 feet of its respective simulated values

An additional comparison is provided by Rumbaugh and Rumbaugh, 2017, in which the quotient between the Root Mean Square Error (RMSE) and the Range is compared against a 10% threshold. For the hydrograph set used in the calibration, the RMSE was calculated at 7.72, while the range is of 154 feet, for which the quotient would be 5.01%, making the results acceptable, using unweighted head residuals.

The simulated vs observed scatter plot and residual histogram and for the Modesto Model is shown in **Figure 30** and **Figure 31**. In the Modesto Subbasin, simulated groundwater levels were on average lower than observed values by 2.29 feet, with a maximum absolute residual of 34.3 feet.

Simulated and observed groundwater elevation data and their residuals were plotted on scatterplots and assessed visually, as shown on **Figure 30**. The simulated-observed scatterplot shows that correlation between simulated and observed data is generally strong, and it maintains consistent variance throughout the data band.

The residual histogram is fairly balanced with over 80% of the readings being within 10 feet, although it does show the model has a leftward bias. The histogram also shows "thin-tailed" distribution, suggesting an overall low probability that the model would produce extreme outlier values. As shown on **Figure 31**, residuals greater than 20 feet have approximately a 1.4 percent probability of occurring, while residuals between 10 and 20 feet have approximately a 15.6 percent probability of occurring. 83 percent of the simulated groundwater levels are within 10 feet of observed levels.

Qualitative assessment was also performed on 66 select calibration wells spread throughout the subbasin. The hydrographs, presented in **Appendix A**, allow for review of temporal patterns that may not appear in the residuals.

Figure 30: Modesto Subbasin Simulated vs. Observed Scatter Plot

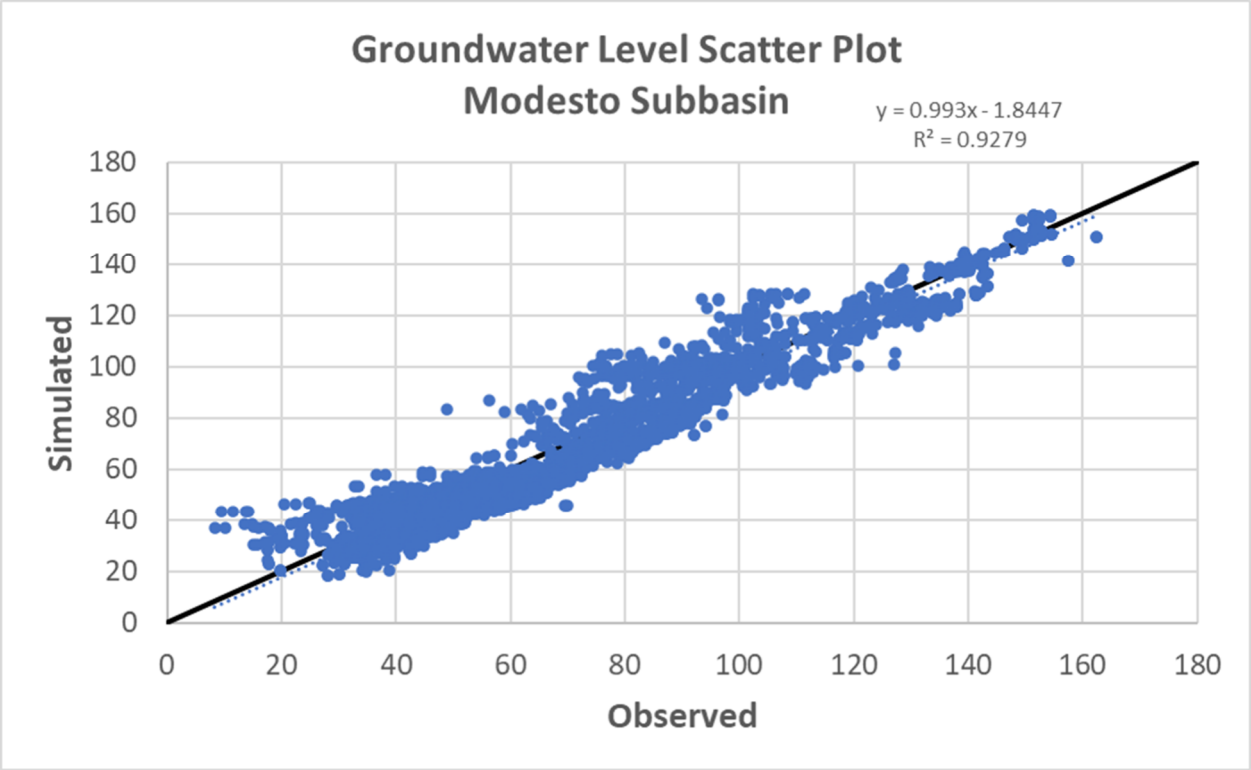
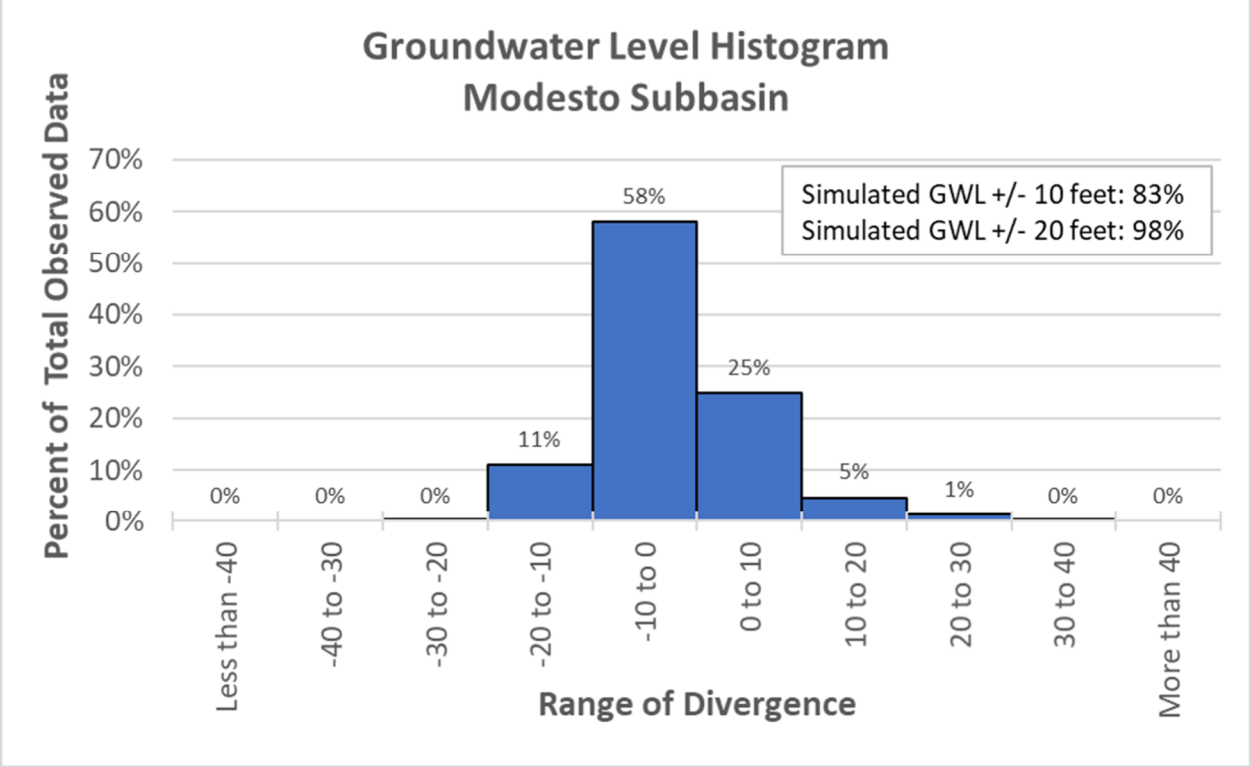


Figure 31: Modesto Subbasin Simulated vs. Observed Residual Histogram



5. DISCUSSION

5.1 MODEL FEATURES, STRENGTHS, AND LIMITATIONS

Modeling limitations are related to the simplifying assumptions made to produce a mathematical representation of a complex hydraulic system. It is not possible to develop a complete mathematical description of the physical world without introducing certain simplifying assumptions. These simplifying assumptions provide us with the Darcy's equation and the governing set of differential equations that are universally used in all groundwater models. As such, the model data sets, conceptual representation of the groundwater system, interaction with the surface water and land surface processes, and model calibration contain inherent limitations that are outlined as follows:

5.1.1 Spatial Extent and Resolution

The accuracy of the model simulation is a function of spatial resolution of the data, as well as spatial discretization of the finite elements. As the spatial data such as land use or soil conditions are mapped to the elements, the size of elements reflect the accuracy of the underlying data sets as mapped. Much of the spatial data has been reviewed and verified against available statewide and local data available. The model is calibrated to target levels based on the spatial resolution in the model. However, when using the model for local scale analysis and modeling, the experienced user is encouraged to perform further validation of the underlying spatial data prior to use of the model for analysis of projects or management actions.

Within the Modesto Subbasin, one modeling limitation is that the C2VSimFG framework includes four stratigraphic layers. While this is more than enough to estimate macro-scale aquifer dynamics, it can be difficult to evaluate perched or shallow groundwater levels, often associated with groundwater dependent ecosystems. Additionally, the average element grid size is approximately 0.5 miles, so the model can only represent water budgets at this scale.

5.1.2 Temporal Scale

The Modesto Model includes monthly hydrologic data for the period WY 1969-2018. The model is calibrated for the period WY 1991-2015. The monthly time step is a reasonable one for a regional model and reflects the resolution of much of the recorded and reported data. However, the monthly time step at times may pose limitations for simulation of some of the model features, such as streamflow during peak conditions. This is not of major concern as the regional model context and utilization of model for most long-term water supply planning needs is not affected by this limitation.

5.1.3 Land Use Data

Land use is one of the key data sets that affect water demand estimation as well as rainfall runoff, infiltration, and recharge conditions. This dataset was developed based on numerous DWR land use surveys, and local sources. This information was assembled, analyzed, and discrepancies were reconciled, which resulted in annual crop data by each model element. Mapping of land use data from various maps to element level within the model, and temporal interpolation of land use changes between years of available data, may introduce inaccuracies at a higher level of resolution. These inconsistencies may need to be considered in evaluation of land use conditions at smaller spatial scales, such as parcel level, and for years in between dates of source data.

5.1.4 Water Demand Estimates

Water demands in the model are estimated for both urban and agricultural entities. The urban demands are based on the reported water supply and demand data from the urban purveyors. The agricultural demand

estimates are based on respective model data sets and calibration of the model for each agricultural area. While care has been given to estimation of agricultural water use estimates, and the results have been shared and reviewed by the agricultural entities within the model area, inaccuracies in the source data or those mapped to the model may introduce inaccurate estimates in certain conditions.

5.1.5 Water Supply Data

The surface water delivery data set in the model is one of the most reliable data sets as it is provided by the purveyors. However, the exact location of these deliveries by the agricultural entities are subject to more uncertainty, which affects the model simulation results. Local entities are encouraged to review the surface water delivery data and provide feedback to the model developers as issues arise or inaccuracies are identified.

5.1.6 Groundwater Pumping Estimates

The Modesto Model includes both the location and a monthly timeseries of all groundwater wells operated by the various agricultural and urban agencies across the subbasin. The model also includes estimated monthly groundwater pumping of private agricultural and rural residential users by each model element. Private groundwater pumping is estimated as the balance of agricultural or urban demand estimates and surface water that is available to meet the demand for each element and at each model time step.

5.1.7 Water Budgets

The Modesto Model provides detailed water budgets at each model element, which, when aggregated, can provide water budgets for a selected geographic area representing the subbasin, water/irrigation district, a GSA, or other geographies. The model water budgets have been verified for major model regions against data and information available from local sources. Additionally, the subbasin-scale model water budgets have been reviewed and verified by the respective technical staff and/or representatives of the GSAs to check the accuracy and reliability of the water budgets for GSP use. When using the Modesto Model for more detailed analysis, the user is encouraged to verify the water budgets for reasonableness and consistency with local data and information.

5.1.8 Groundwater Flow and Levels

The Modesto Model has been calibrated against long-term groundwater trends and seasonal groundwater level changes at 66 wells throughout the model area. The calibration process included adjustments to model input data and/or parameters to ensure that reasonable water budgets are achieved for each zone, and long-term simulated groundwater levels match the observed levels within acceptable tolerances. Data gaps and inaccuracies in observation and reported groundwater levels may influence the quality of calibration. Further, lack of detailed well construction information in many of the calibration wells limited the ability to use data at those sites to properly calibrate the model with depth.

5.2 MODELING UNCERTAINTIES

A model is a numerical representation of physical process and inherently possesses uncertainties that affect the calibration, performance, and results of the model. Integrated hydrologic models are complex models that involve simulation of complex physical systems and interrelationships and require many different types of data, each of which may be available at different temporal and spatial scales. Uncertainties in the performance of an integrated hydrologic model can arise from uncertainties in how the physical processes are conceptualized and formulated, inaccuracies in the underlying data, calibration process and eventually the assumptions used in applications of the model to evaluate projects, including projections of future conditions. The following are additional details on each of these uncertainty categories.

5.2.1 Structural Uncertainties

First set of model uncertainties can arise due to the structural framework of the model, which can include:

Representation of Physical Features - To properly represent natural conditions, the physical and natural features need to be well understood so that they can be conceptualized in a simplified manner for development of theoretical formulations.

Theoretical Concepts and Representation of the Natural and Physical Systems - This type of uncertainty can be attributed to the conceptualization of the physical and natural systems in the form of mathematical functions and formulas that govern the movement of groundwater and surface water systems and the interrelation of these systems. These formulas are typically referred to as governing equations for each of the hydrologic or hydrogeologic features modeled.

Formulation, Code Development, Solution Techniques, and Assumptions - The governing equations are typically so complex that analytical solutions to these equations are either not available or are so simplified that they would add to the inaccuracies in the representation of complex hydrologic systems. Therefore, numerical solutions are employed, including finite element or finite difference techniques, which require their own set of assumptions. Computer software is used to implement the theoretical formulations.

Model Spatial and Temporal Resolution - The governing equations representing the natural and/or physical systems are either solved at two levels:

- **Lumped solution -** At this level, the formulation represents a lumped parameter system, and the solution will be for an aggregated system at the large scale. This aggregated and lumped scale can be both for the spatial and temporal scale of the problem. Lumped level solutions are typically employed in conditions where there is a lack of accurate information or where the system is small enough that further spatial or temporal breakdown of the system is not possible due to lack of data and information.

- **Distributed Solution -** At this level, the system is subdivided in further spatial resolution to take advantage of spatial variability in the data and information that is available at smaller scales. Additionally, the solution to the formulation of the system is also subdivided in smaller temporal scales, such as a monthly or daily time step, so that short-term and long-term variability in the data over time is properly represented in the solution.

5.2.2 Data Uncertainties

This category of uncertainty is related to the data and information that is used and employed in development of a model.

Data and Information Accuracy, Data Gaps, and Estimates - Collection and compilation of data for natural and physical systems, including precipitation, streamflow, land use, cropping patterns, population, water use, crop evapotranspiration, soil conditions, groundwater levels, streamflow, surface water use, groundwater pumping, infrastructure, facilities, and operations all include a certain level of inaccuracy and uncertainty. This uncertainty is exacerbated when data gaps and inconsistencies exist. The methodology used to identify and fill data gaps can introduce levels of uncertainty.

Data Spatial and Temporal Resolution - In addition to the above, the spatial and temporal resolution of data may contain inaccuracies and uncertainties that would affect the data that are used in the model.

5.2.3 Calibration Uncertainties

Estimates of Hydrologic and Hydrogeologic Parameters - Often, data and/or information for specific parameters that are used to represent the governing equations in the model may not be available. In these circumstances, the modeler uses professional judgement, or adopts conditions from similar areas, which may introduce uncertainties and inaccuracies in model simulations.

Calibration Approach, Target Characteristics, and Accuracy - Model calibration requires certain quality, consistency, and care, so that the model properly represents the natural and physical conditions observed in the field. In addition to the quality and uncertainties in data and methodologies, the approach employed, tools and techniques used, and experience and expertise of the model developer affects the quality of model calibration and accuracy of the results. Often, the calibration targets are prone to uncertainty or lack of information. For example, information on the depth of the screened interval, as well as pumping rate and depth at the well, whether the recorded groundwater level reflects static or pumping conditions, and whether a well is under the influence from other nearby wells or a nearby stream can have significant bearing on the approach and quality of the calibration.

5.2.4 Application Uncertainties

Assumptions and Project Applications, Including Data Projections and Forecasting Methods - It is imperative that model application be defined and considered in such a way that is supported by model calibration. Assumptions on a model application to analyze a particular project can often be generalized with little knowledge of the conditions. For example, significant uncertainties exist with respect to the following data, which can affect the quality and results of the model output for planning and policy making:

- Hydrologic conditions and rainfall patterns
- Land use and cropping patterns
- Population and water use
- Water supply conditions
- Climate change conditions

While modeling uncertainties need to be considered in use and application of models for evaluation of project conditions for potential impacts, benefits, and design of plans and facilities, the model should be considered a reasonably robust tool to support the major decisions, including GSPs, projects and management actions, and sustainability analysis.

6. SUMMARY & RECOMMENDATIONS

The Modesto Model is an integrated hydrologic model, which simulates land surface processes, groundwater flow, streamflow, and the interaction between these systems. The model includes a historical, hydrologic period of WY 1991-2015. The model, adapted from the DWR's C2VSimFG, has been refined to reflect local data, information, and conditions, and has been calibrated extensively to the local reported groundwater and streamflow conditions, making it an effective numerical analysis tool to evaluate the integrated groundwater and surface water system, including the water budgets and other groundwater sustainability criteria in the Modesto Subbasin.

Model results provide detailed water budgets that provide information on monthly and annual changes in agricultural and urban land use, surface water use and distribution, and groundwater pumping. Additionally, the model provides a robust analysis tool to evaluate the impacts of actions on the Modesto Subbasin's hydrologic system, including changes to the groundwater levels and trends and estimates of changes in groundwater storage. The results from the Modesto Model are used to better understand the Subbasin's hydrologic and hydrogeologic system and evaluate action that would result in groundwater sustainability under SGMA.

6.1 RECOMMENDATIONS

The Modesto Model, in its current state, is a defensible and well-established model for use in assessment of the water resources within the Modesto Subbasin under historical and projected conditions. However, development of the model and its application to the Modesto GSP have highlighted areas for additional study. Based on these findings, the following recommendations are to be considered for further refinement and enhancement of the Model:

Boundary Flow: The current boundary flows between the Modesto Subbasin and neighboring groundwater basins are dependent on a combination of the C2VSimFG calibration and limited groundwater data in the adjoining subbasins. It is recommended that the Subbasin continues to work with DWR along with the Eastern San Joaquin and Delta-Mendota Subbasins to further refine and verify the groundwater flows across these boundaries.

Stream-Aquifer Interaction: Sustainability conditions in the Modesto Subbasin rely heavily on the surface water systems of the Stanislaus, Tuolumne, and San Joaquin Rivers. These are critical features outlined in the GSP and it is recommended that future updates to the model include additional study and refinement along these water bodies. Such refinement could potentially include the evaluation of near-stream groundwater conditions, more detailed rating tables (particularly under low-flow conditions), and stream-bed parameters.

Inclusion of Local Creeks: Recharge and runoff of local tributaries are currently simulated through a combination of the small watershed and root-zone packages and their implementation of the TR-55 Curve Number Method. To support the projects outlined in the Modesto Subbasin GSP (e.g. Dry Creek Flood Mitigation, In-lieu and Direct Recharge Project) and to better quantify their natural contributions to the aquifer system, it may be beneficial to dynamically simulate these surface water features using the stream-package in IWFM. Inclusion of the local creeks would more accurately simulate recharge from these watersheds and courses. However, this requires a much higher resolution of the model grid, both spatially and vertically. This can be considered at a time that the GSAs would like to consider overhauling the model for future applications.

Update of Monitoring Network: As part of GSP development, the Modesto Subbasin developed a representative monitoring to evaluate conditions throughout the region and have adopted a Management Action to evaluate and improve the current wells available. It is recommended that the Modesto Model

be regularly updated with any additional data. The collection and integration of supplementary observations will support future refinement of the model and understanding of simulated conditions.

Data Gaps (Non-District Areas): To improve the representation of conditions throughout the subbasin, it is recommended that additional data be collected relating to geologic, hydrogeologic, and land surface operations. Model calibration should be improved upon collection of additional water use and groundwater level data from the representative monitoring wells throughout the eastern sections of the Subbasin.

Model update schedule: To keep the Modesto Model up-to-date and current for analysis of water resources and especially for supporting SGMA implementation, it is recommended that the model hydrology, land, and water use data be updated and used for preparation of the GSP Annual Reports on an annual basis. It is further recommended that the model be updated for other major data sets, as well as enhanced for additional features every 5 years. This 5-year update would include an update of the model calibration and would be developed for use in the 5-year GSP update.

7. REFERENCES

Bartow, J. A., & Doukas, M. P. (1979). *Preliminary geologic map of the southeastern border of the San Joaquin Valley, California* . U.S. Geological Survey Miscellaneous Field Studies Map MF-944, scale 1:125,000.

Davis, S., & Hall, F. (1959). *Water quality of eastern Stanislaus and northern Merced Counties, California.* Stanford University Publications, Geological Science 6(1).

Dogrul, E.C., Brush, C.F. and Kadir, T.N. 2016. Groundwater modeling in support of water resources management and planning under complex climate, regulatory, and economic stresses. Water, 8(12), p.592.

DWR. (1967). *Bulletin 146, San Joaquin County Investigation.* California Department of Water Resources.

DWR. (1978). *Evaluation of ground water resources: Sacramento Valley.* Sacramento, CA: California Department of Water Resources Bulleting 118-6.

DWR. (2015). Criteria for Approximating Base of Fresh Groundwater. California Department of Water Resources.

DWR. (2020) *California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG) Development and Calibration Version 1.0.* Sustainable Groundwater Management Office (SGMO) California Department of Water Resources (DWR). Available at: https://data.cnra.ca.gov/dataset/c2vsimfg-version-1-0/resource/4f904e97-a47b-4138-81df-9b74bd952948

ESJGA. (2019). *Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan.* Eastern San Joaquin Groundwater Authority

Ferriz, H. (2001). *Groundwater Resources of Northern California: An Overview.*

Hotchkiss, W. R., & Balding, G. O. (1971). Geology, hydrology, and water quality of the Tracy-Dos Palo area, San Joaquin Valley, California. U.S. Geological Survey Open-File Report 72-169. Retrieved August 28, 2019, Available at: https://doi.org/10.3133/ofr72169

Marchand, D. E., & Allwardt, A. (1981). *Late Cenozoic stratigraphic units, northeastern San Joaquin Valley, California.* U.S. Geological Survey Bulletin 1470.

Modesto, City of (2016) *2015 Urban Water Management Plan*. Prepared by West Yost Associates

Modesto Irrigation District. (2015) *Agriculture Water Management Plan: 2015 Update*, Prepared by Provost & Prichard

Norris, R. M., & Webb, R. W. (1990). *Geology of California (2nd edition).* New York: John Wiley & Sons.

Oakdale, City of (2018) *Urban Water Management Plan: 2015 Update*, Prepared by Shoreline Environmental Engineering

Oakdale Irrigation District (2016) *Agriculture Water Management Plan: 2015 Update*, Prepared by Shoreline Environmental Engineering

Olivera, C. (2016). Personal Communications. April 8, 2016, Conversation on Base of Fresh Water. (M. Cayar, Interviewer).

Olmsted, F. H., & Davis , G. H. (1961). *Geologic features and ground-water storage capacity of the Sacramento Valley, California.* Washington, DC: U.S. Geological Survey Water-Supply Paper 1497.

Rumbaugh, J.O. and Rumbaugh, D.B. (2017). *Guide to Using Groundwater Vistas, Version 7*, Environmental Simulations, Inc., pg 420.

United States Department of Agriculture (USDA). 1986. *Urban hydrology for small watersheds. Technical Release 55 (TR-55) (Second ed.)*. Natural Resources Conservation Service, Conservation Engineering Division.

Williamson, A. K., Prudic, D. E., & Swain, L. A. (1989). *Ground-water flow in the Central Valley, California.* Washington, DC: U.S. Geological Survey Professional Paper 1401-D.

Wood, P. R., & Dale, R. H. (1964). *Geology and groundwater features of the Edison-Maricopa area, Kern County, California.* Washington, DC: U.S. Geological Survey Water Supply Paper 1656.

MAPS

Figure M1: Locations of Modesto and Turlock Subbasins within C2VSimFG

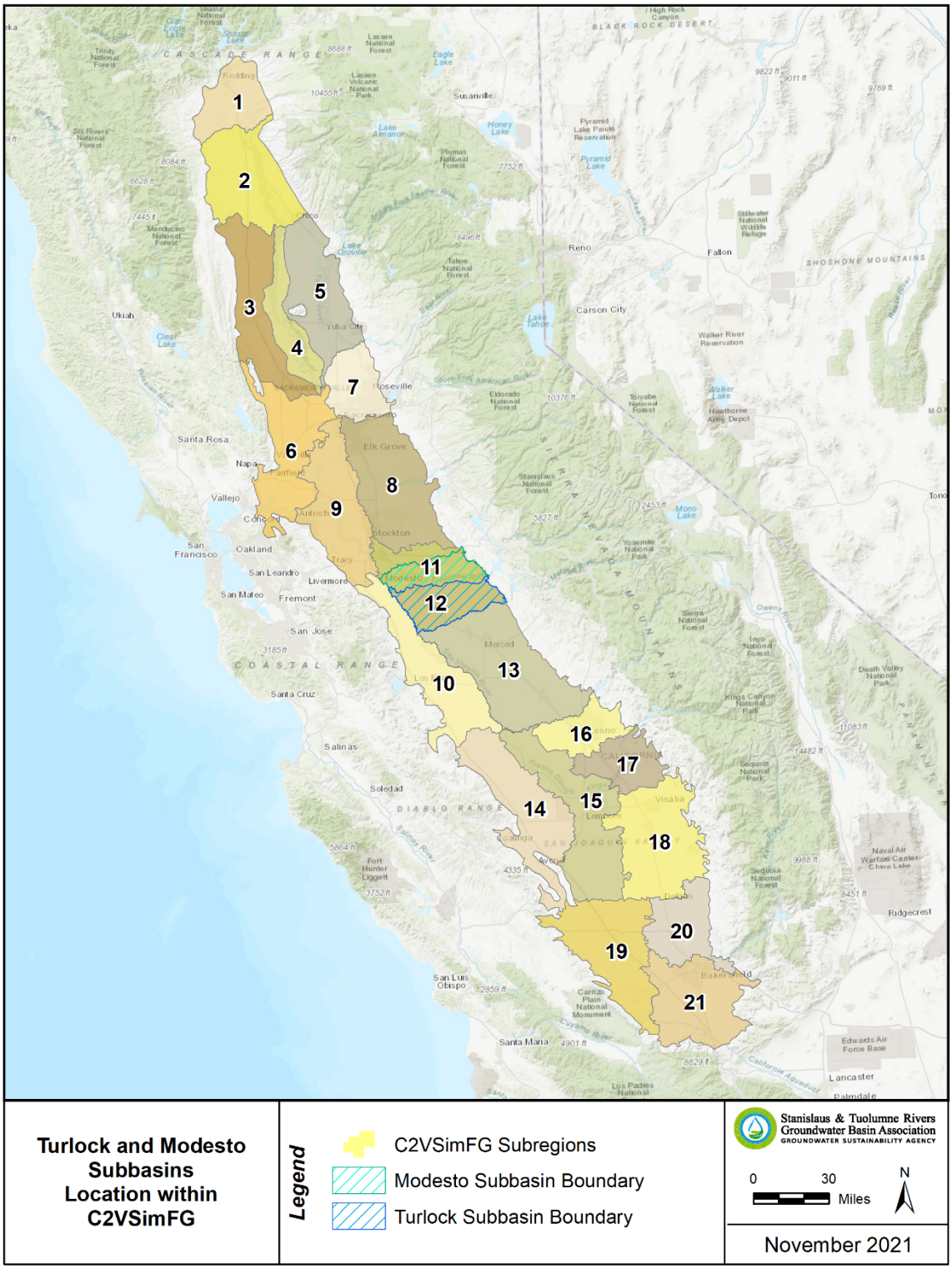


Figure M2: Modesto Subbasin

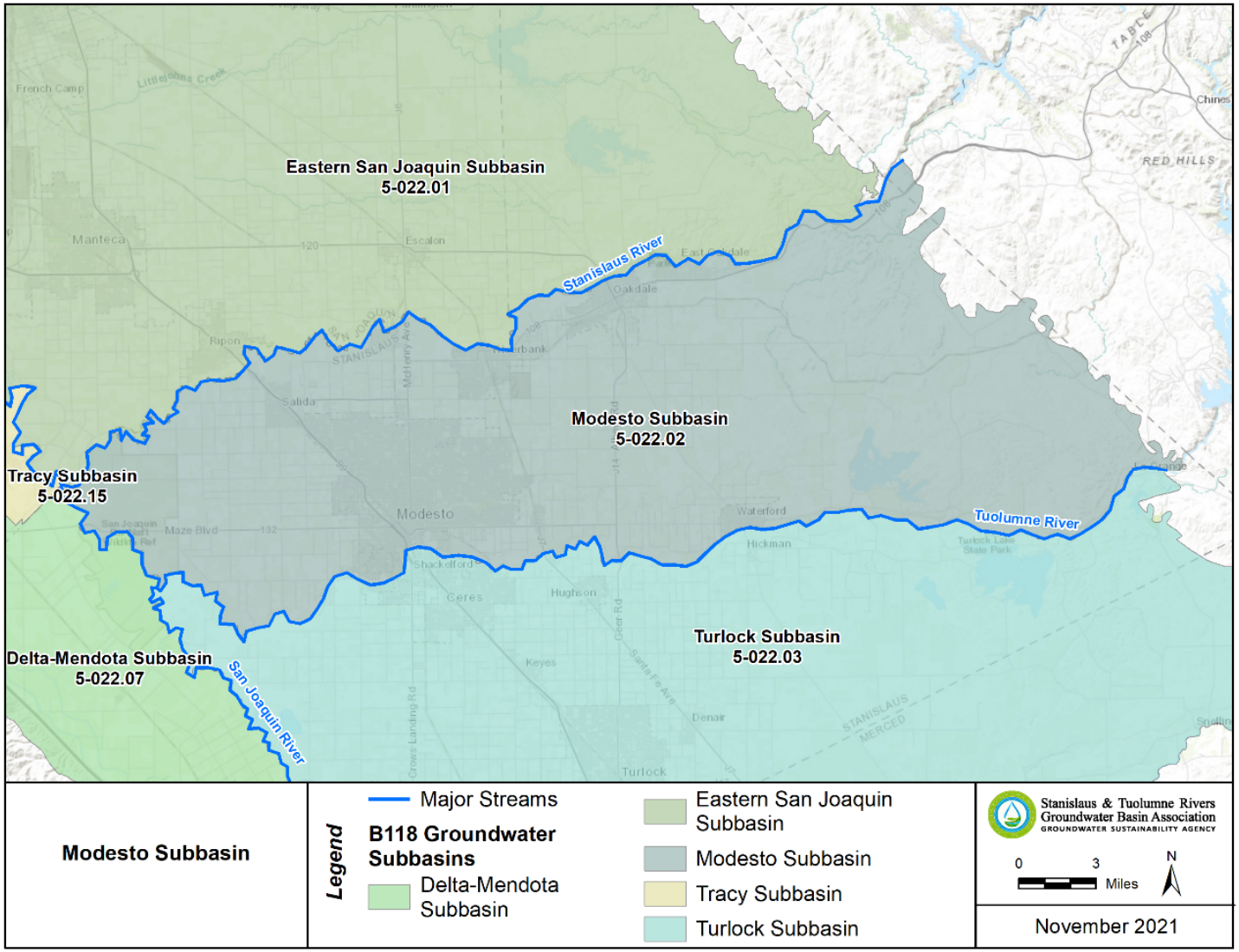


Figure M3: Modesto Subbasin Water Agencies

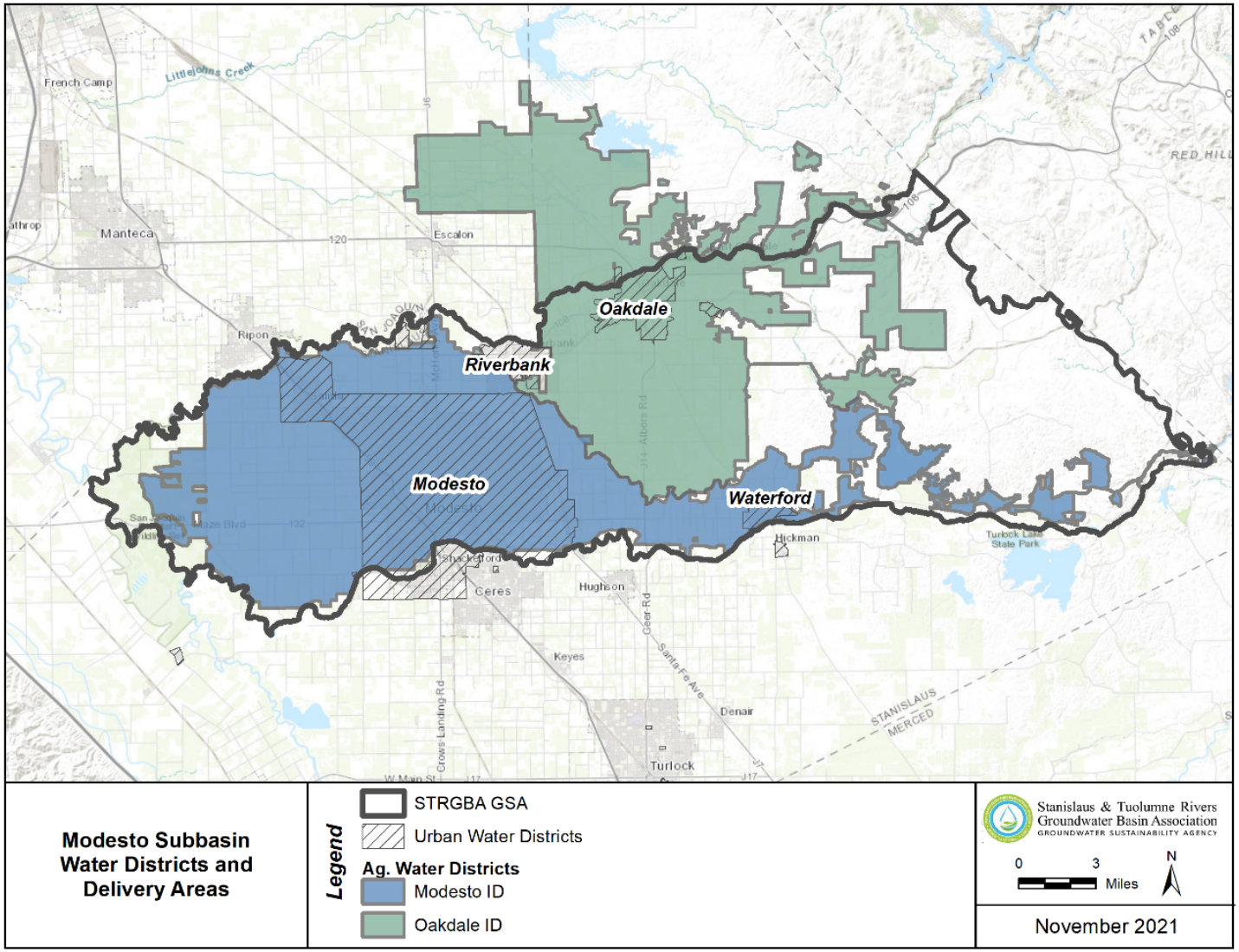


Figure M4: Modesto Subbasin Simulated Small Watersheds

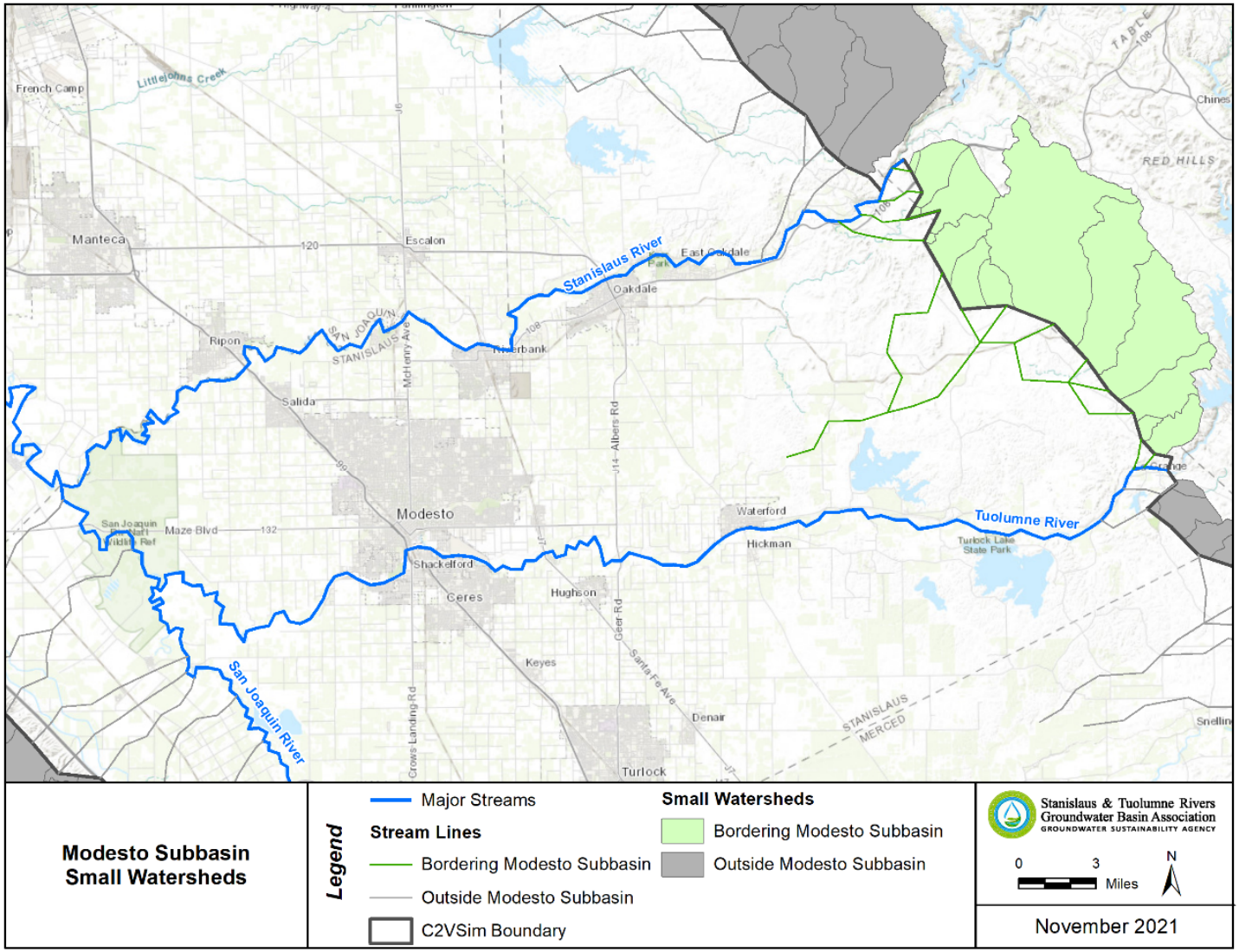


Figure M5: Modesto Subbasin Average Annual Precipitation

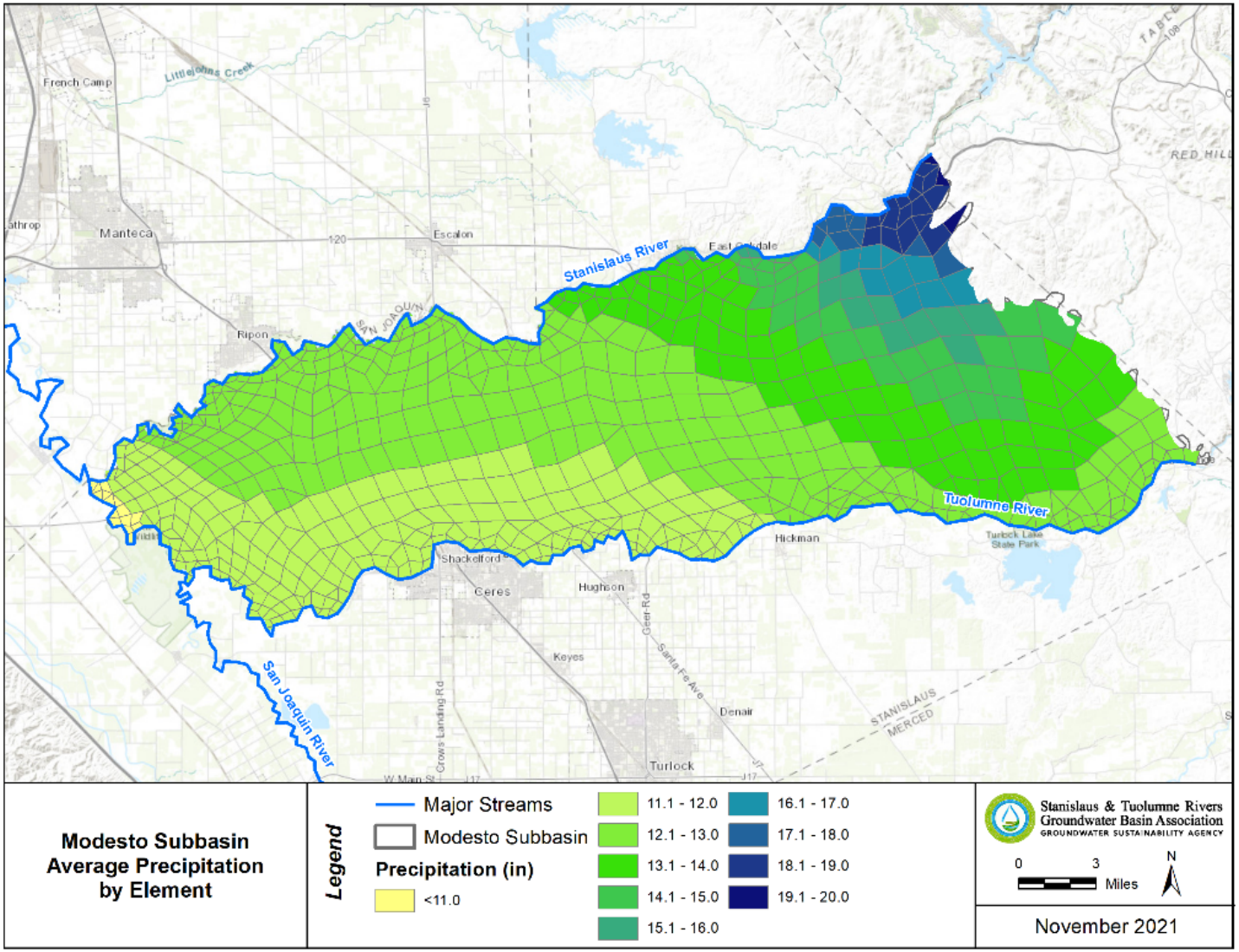


Figure M6: Modesto Subbasin Land Use, LandIQ 2014

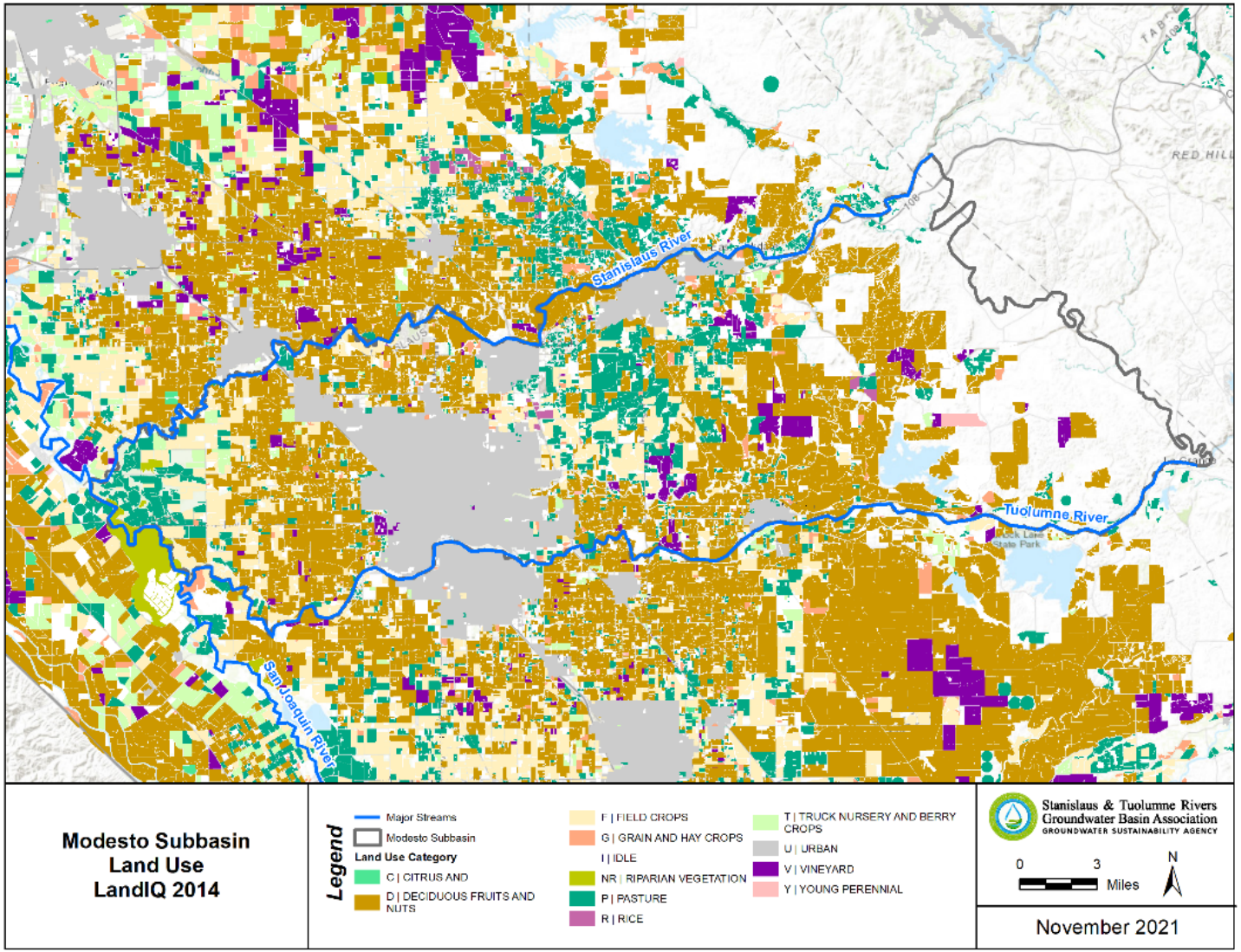


Figure M7: USDA Soil Hydrologic Groups

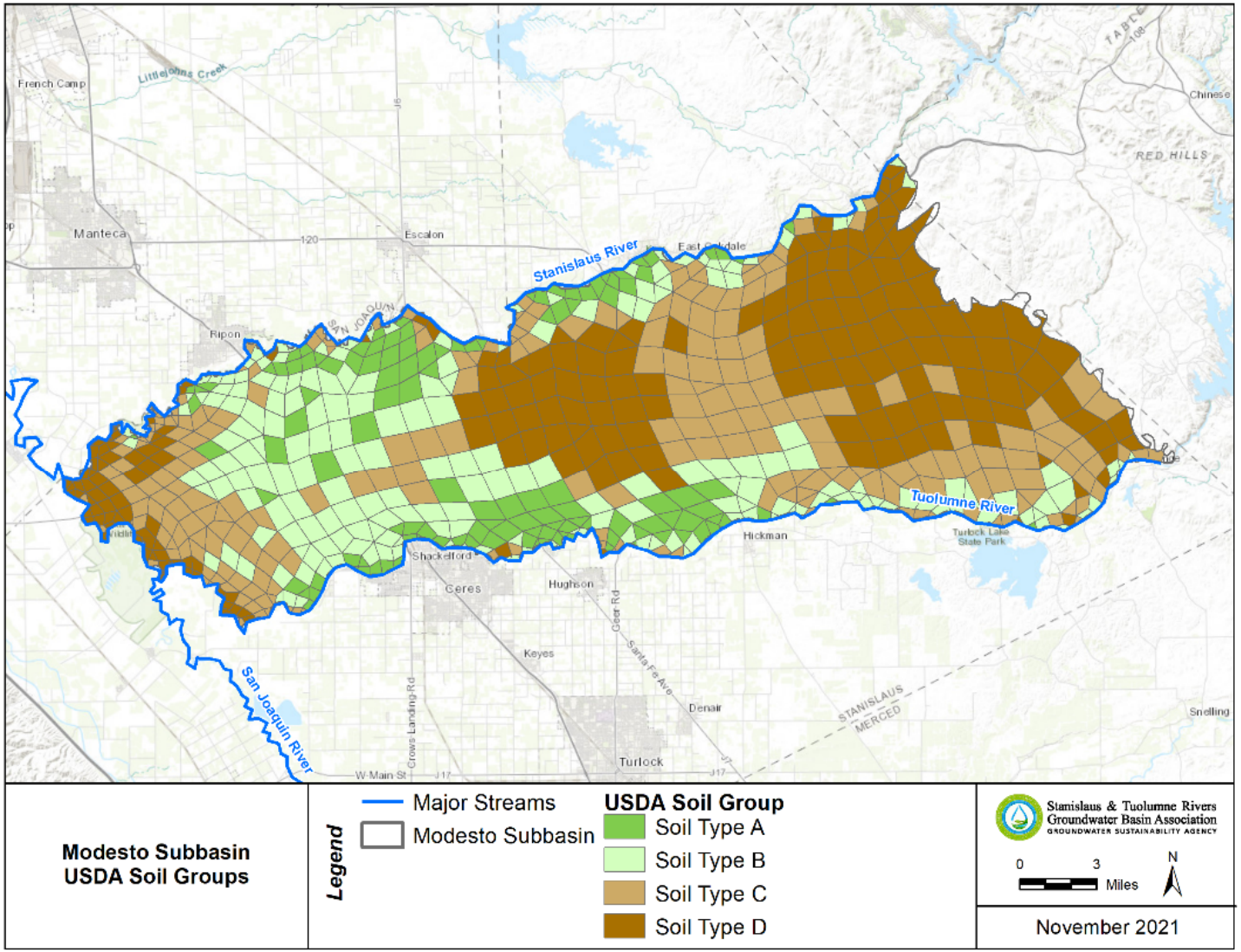


Figure M8: Modesto Model Urban Demand Areas

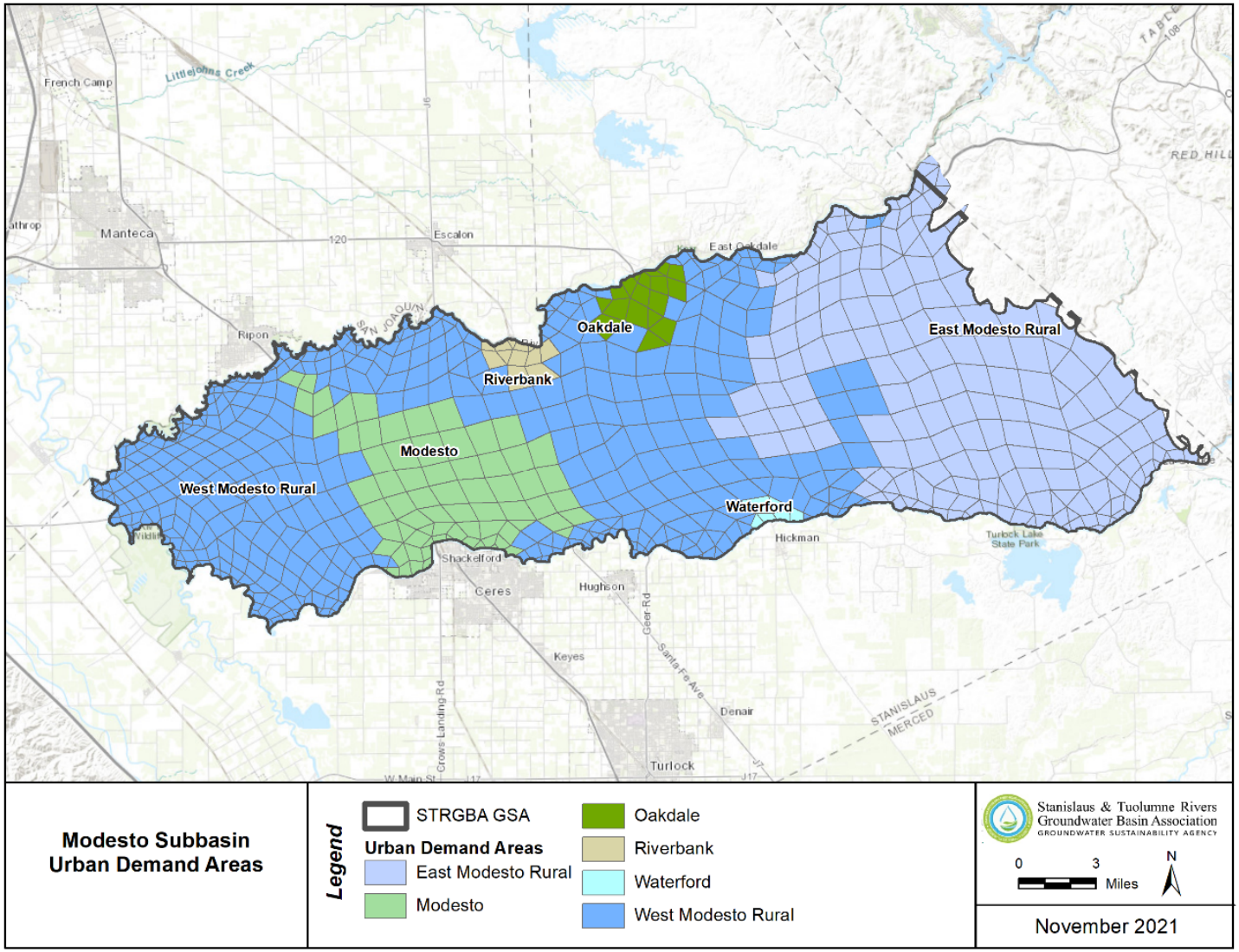


Figure M9: Modesto Model Stream Nodes and Reaches

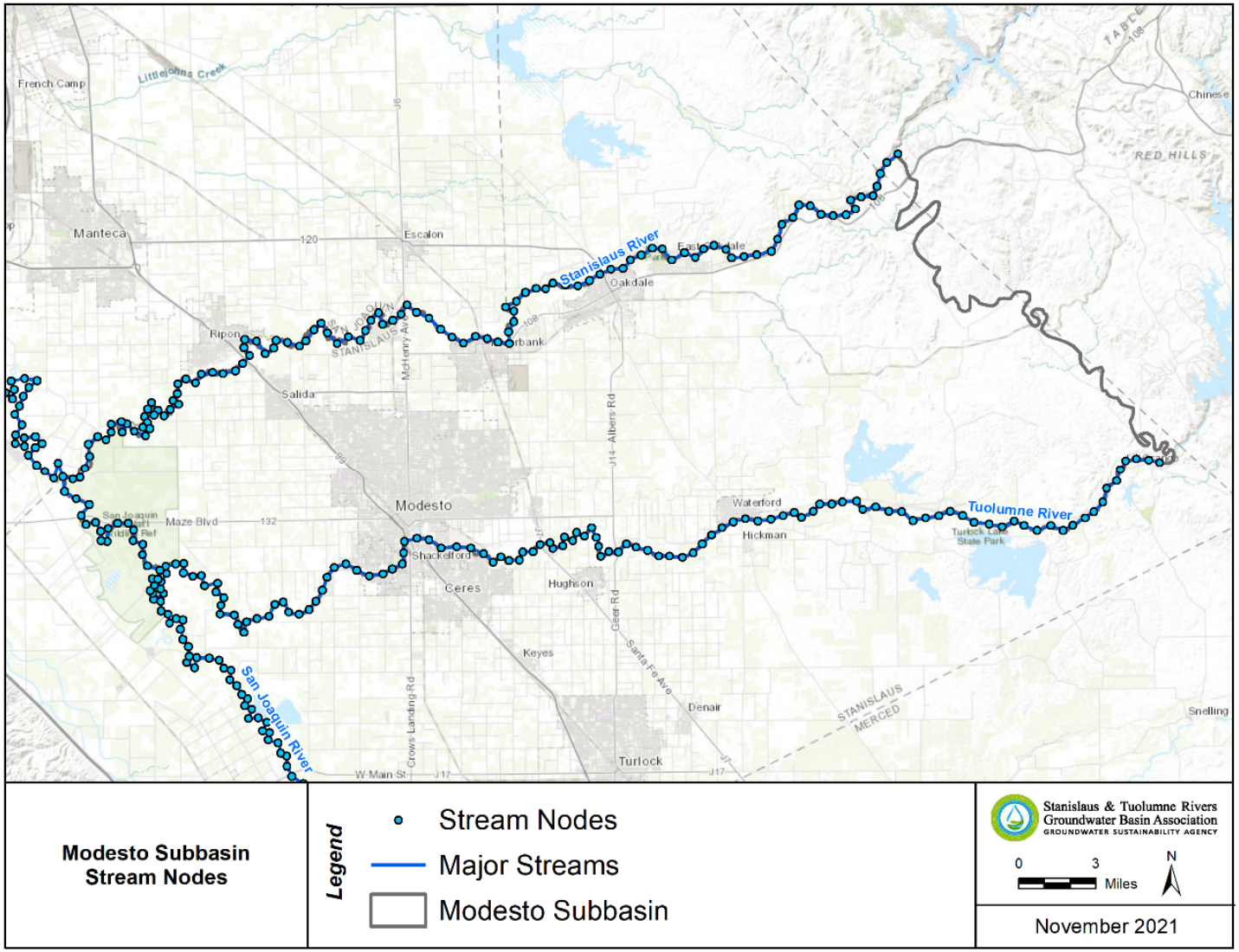


Figure M10: Modesto Model Surface Water Delivery Areas

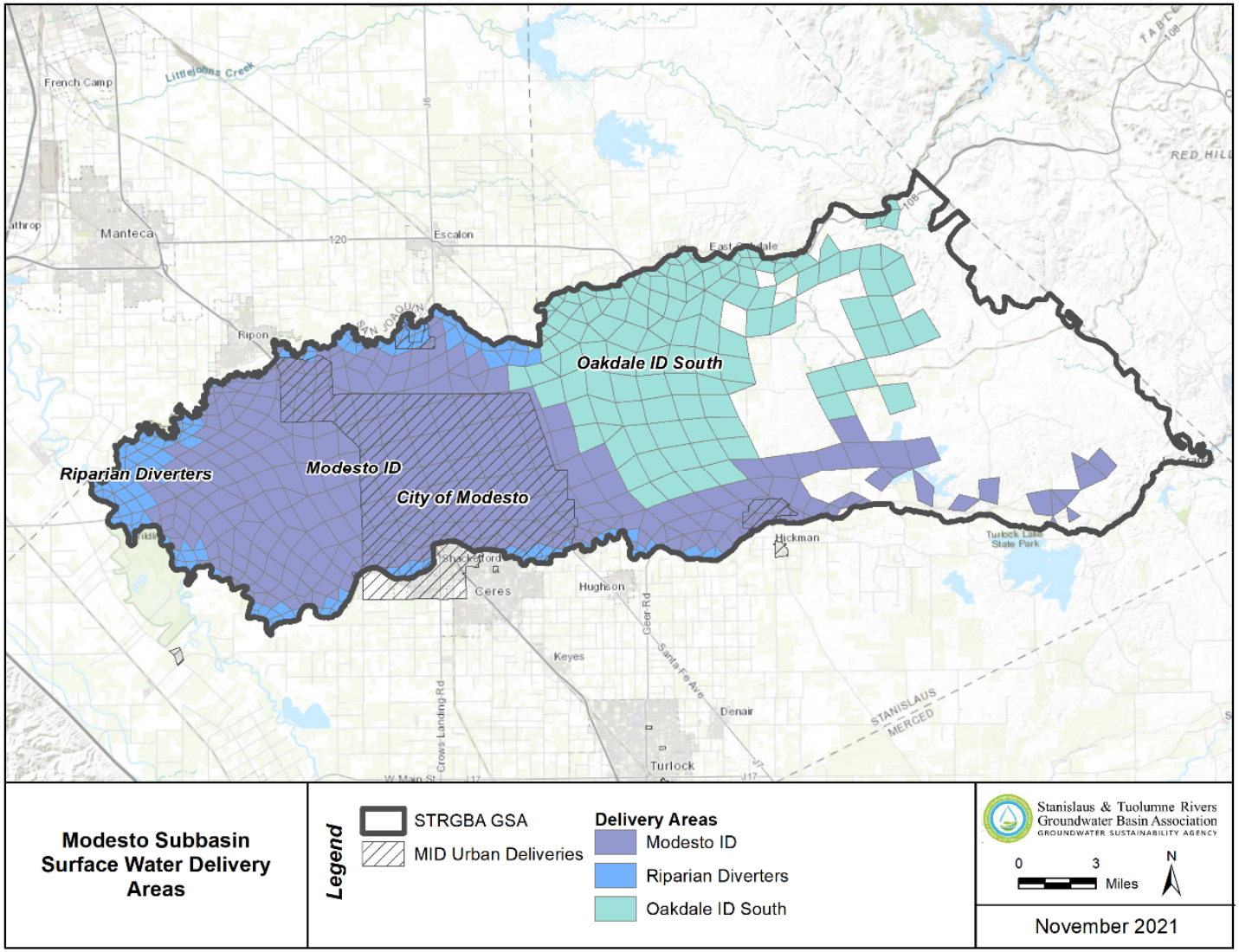


Figure M11. Stream Gauges location in the Modesto Model.

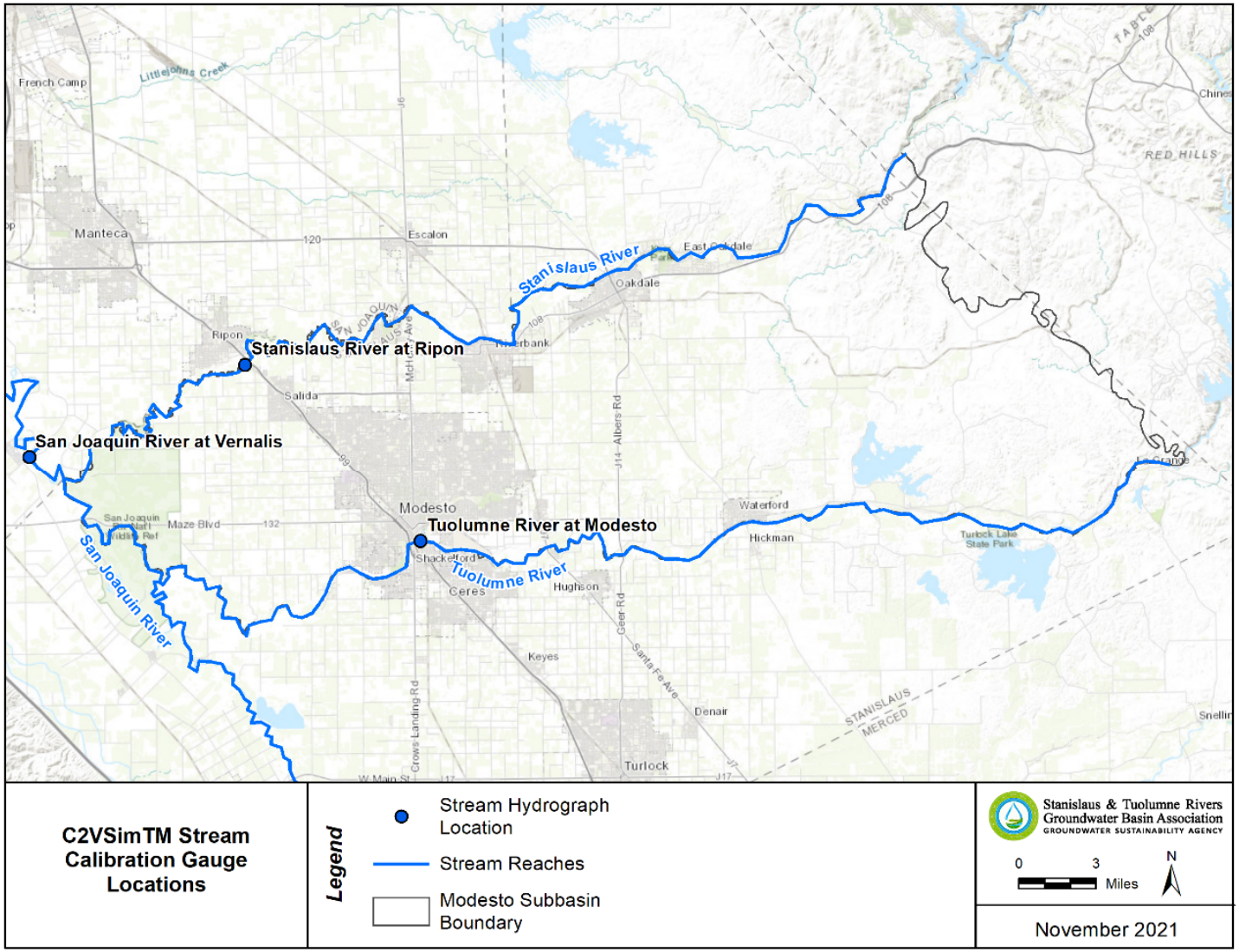


Figure M12: Modesto Model Agency Production Wells

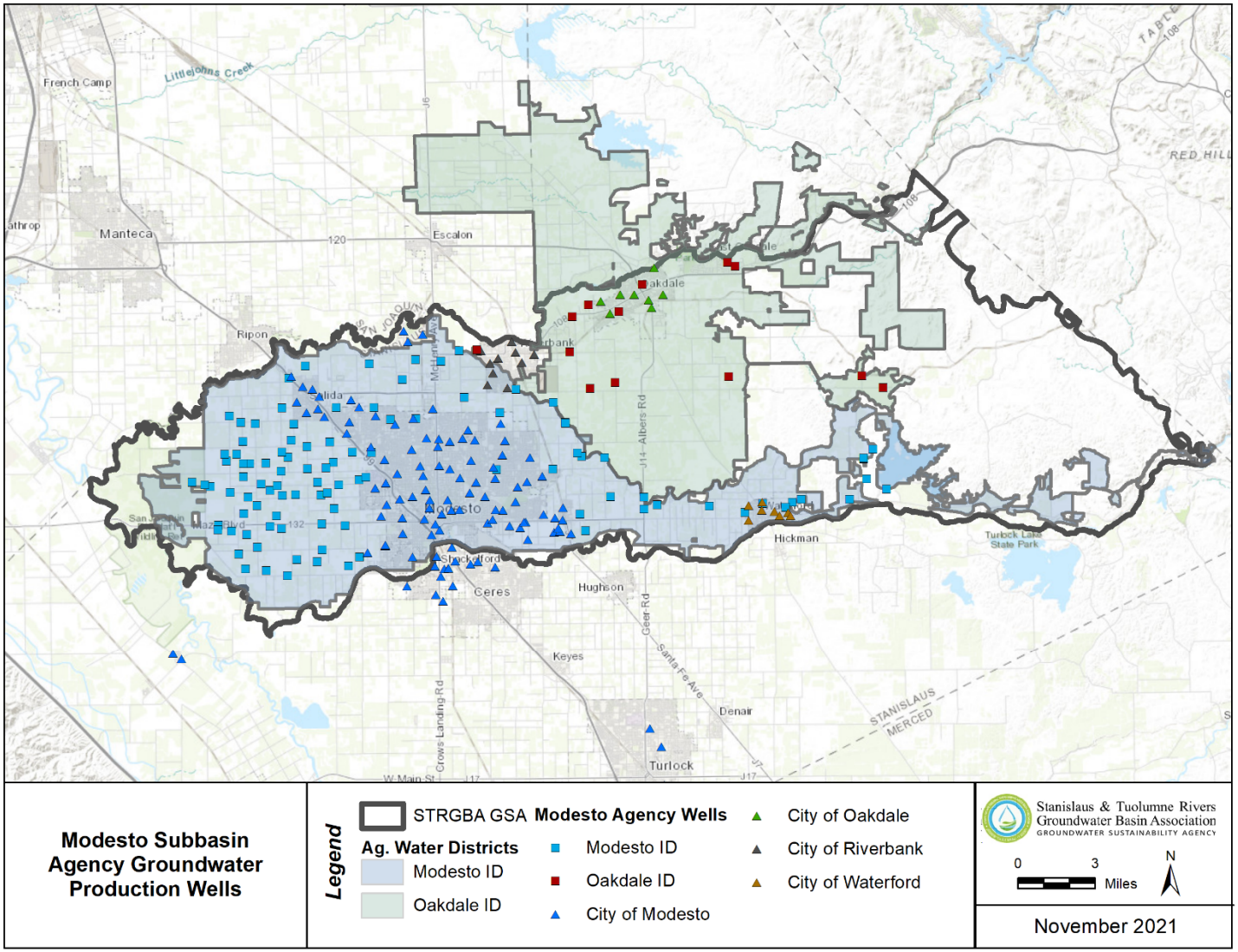


Figure M13: Modesto Model Monitoring Wells

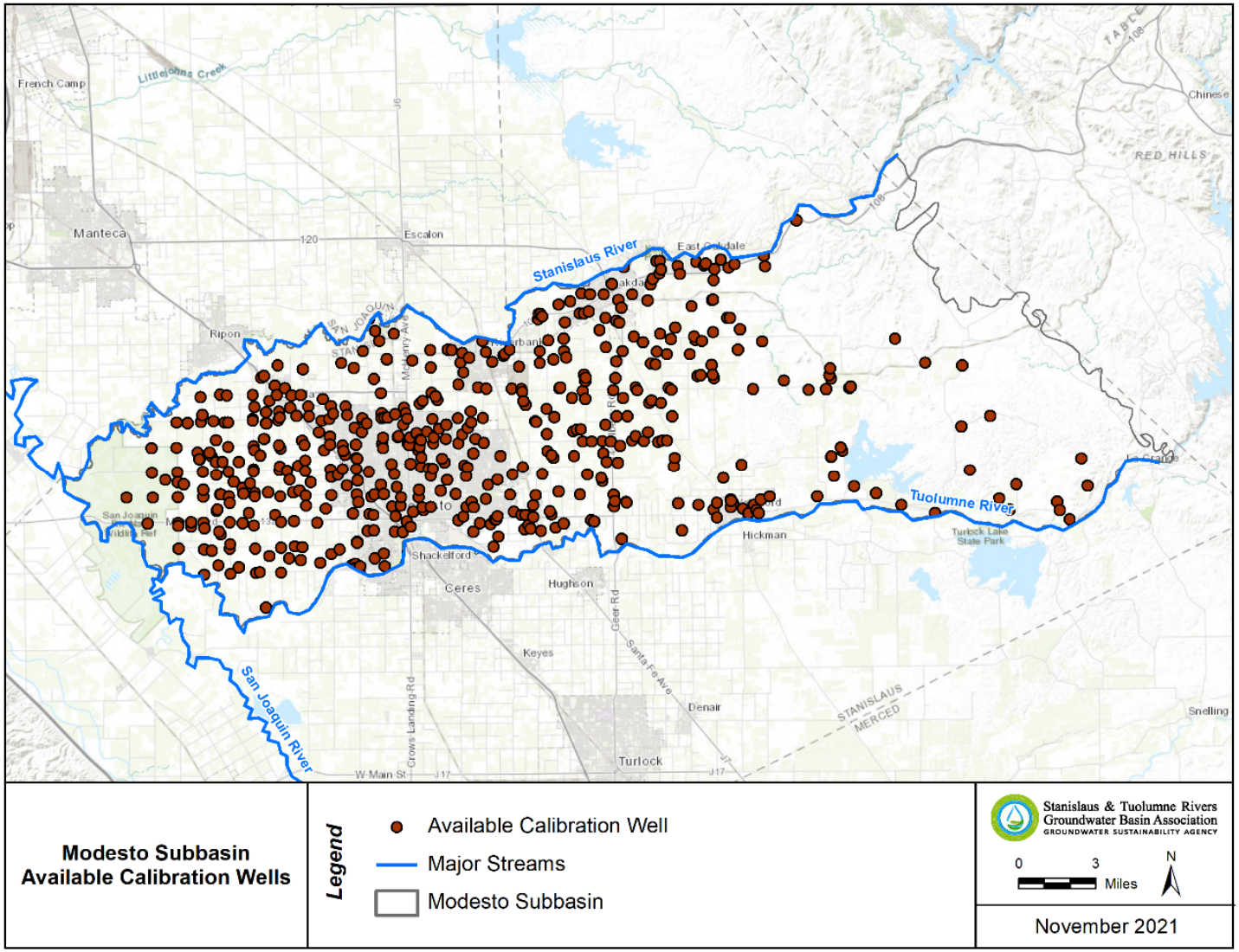


Figure M14: Modesto Model Calibration Wells

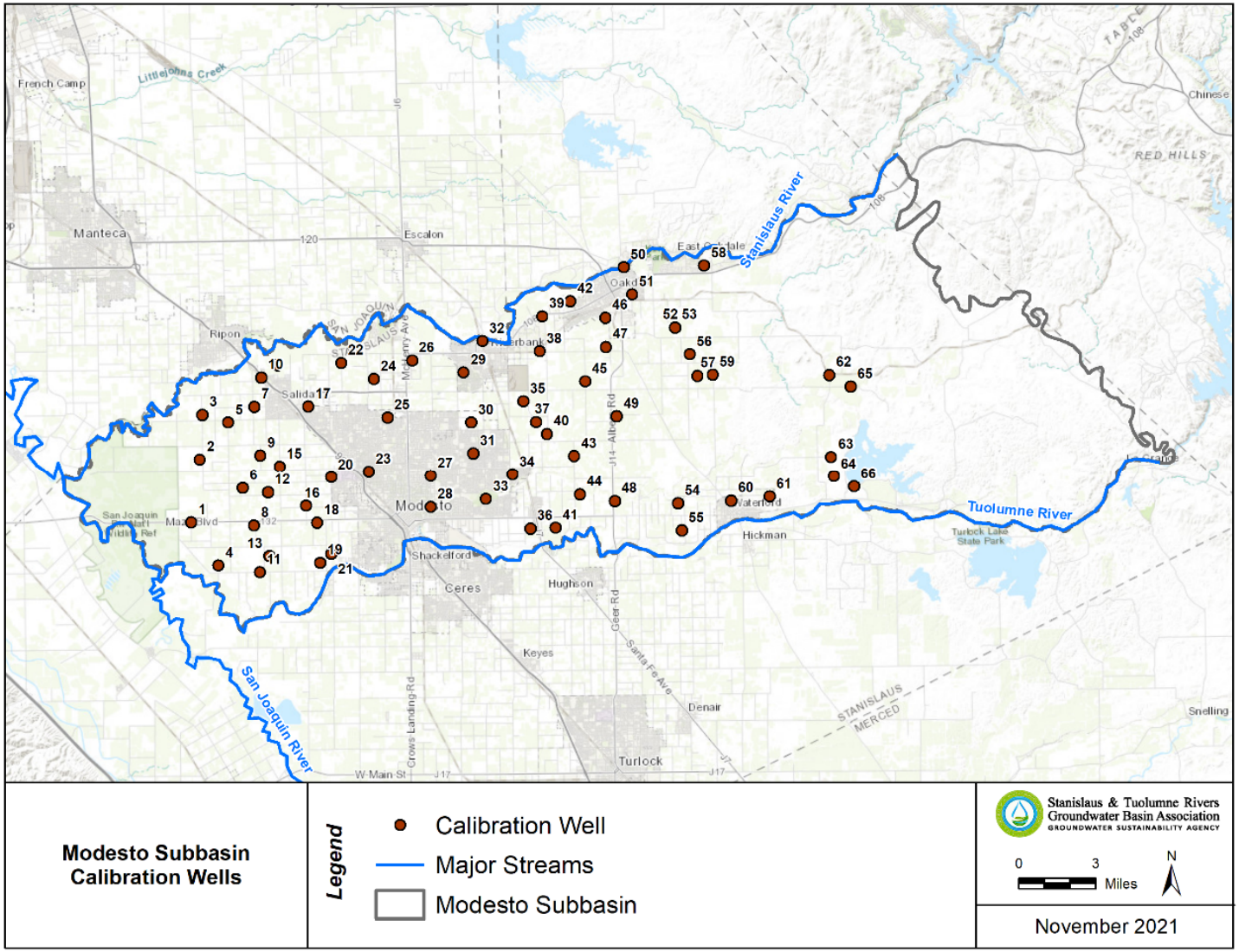


Figure M15: Initial Groundwater Heads for Layer 1

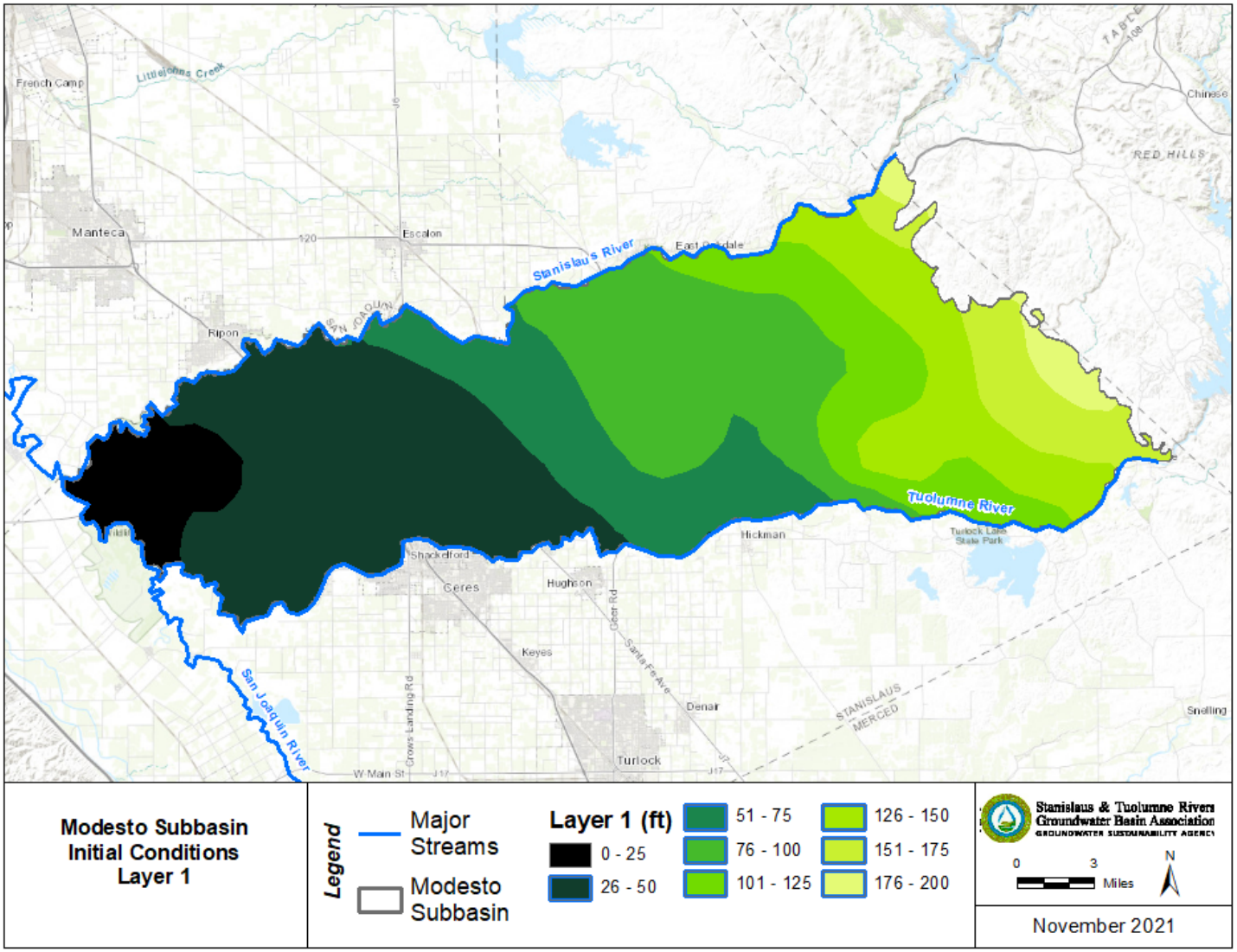


Figure M16: Initial Groundwater Heads for Layer 2

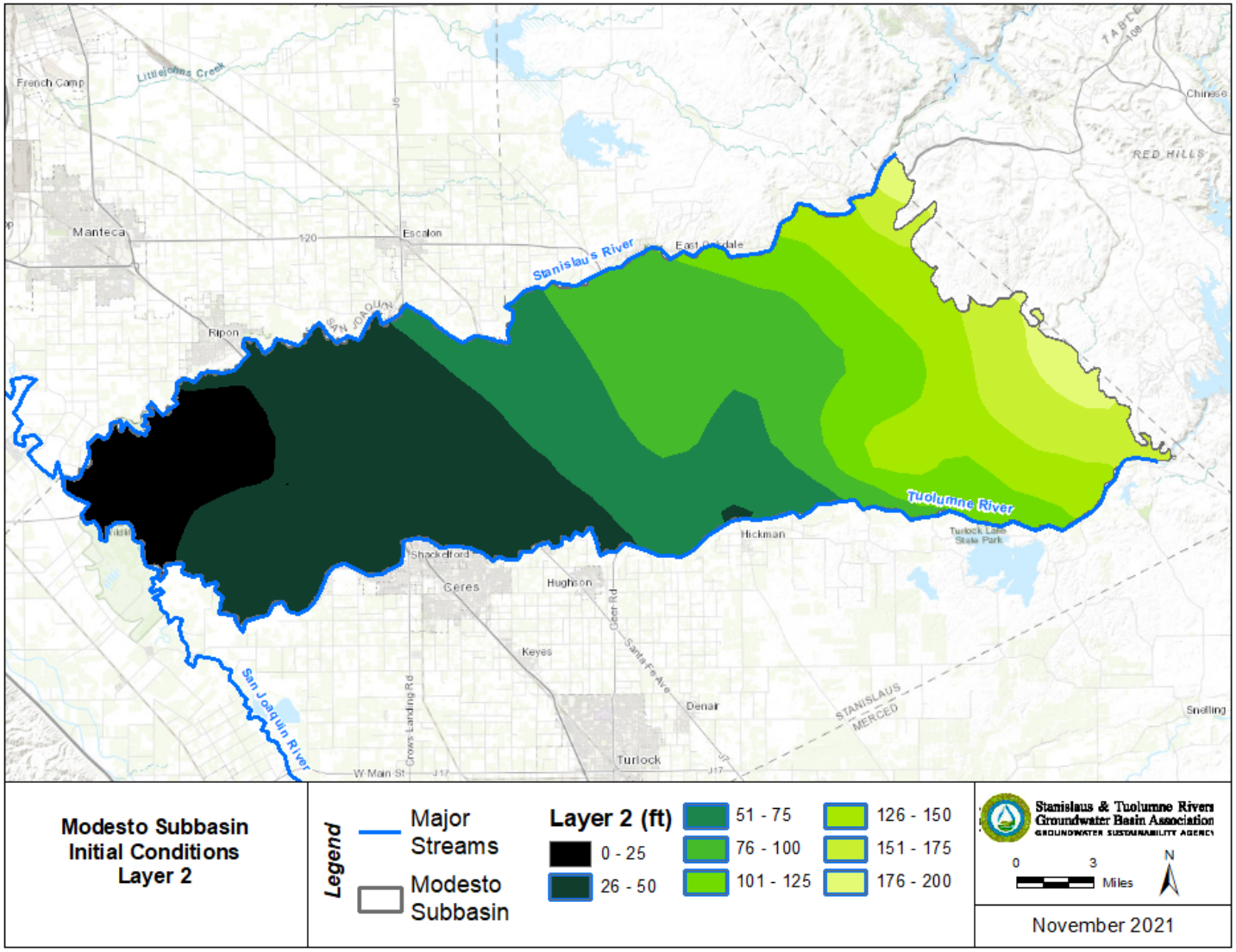


Figure M17: Initial Groundwater Heads for Layer 3

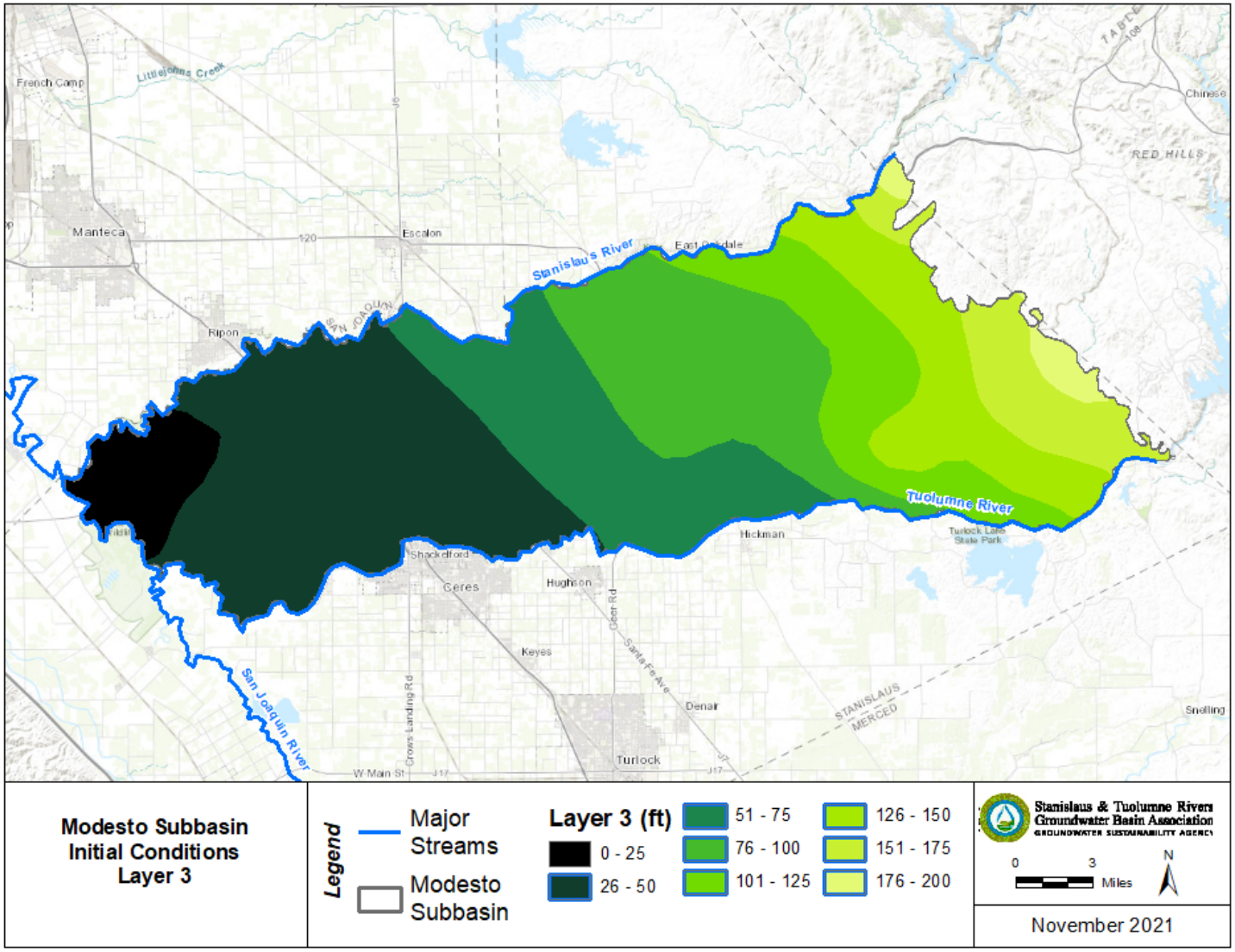


Figure M18: Initial Groundwater Heads for Layer 4

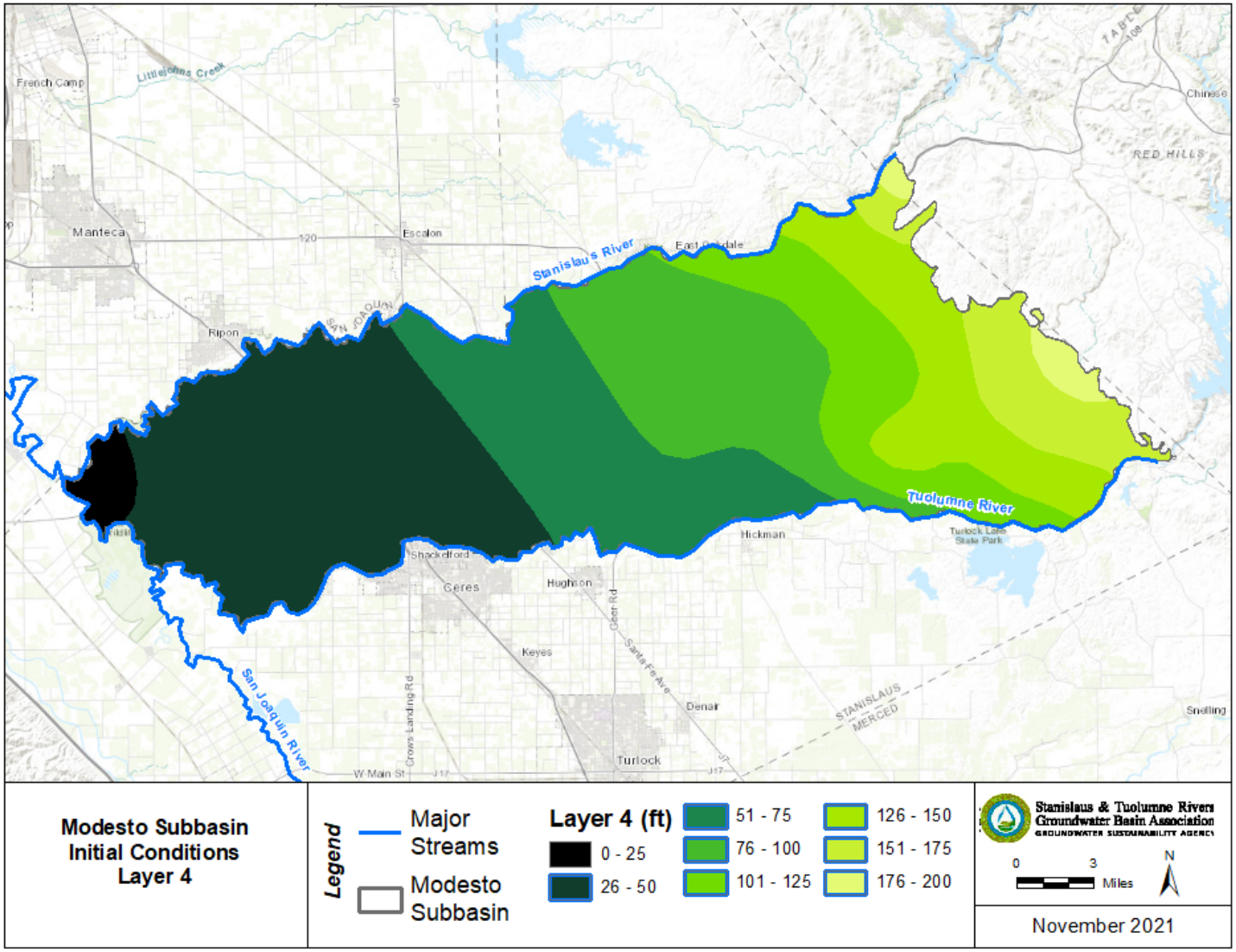


Figure M19: Modesto Model Boundary Conditions

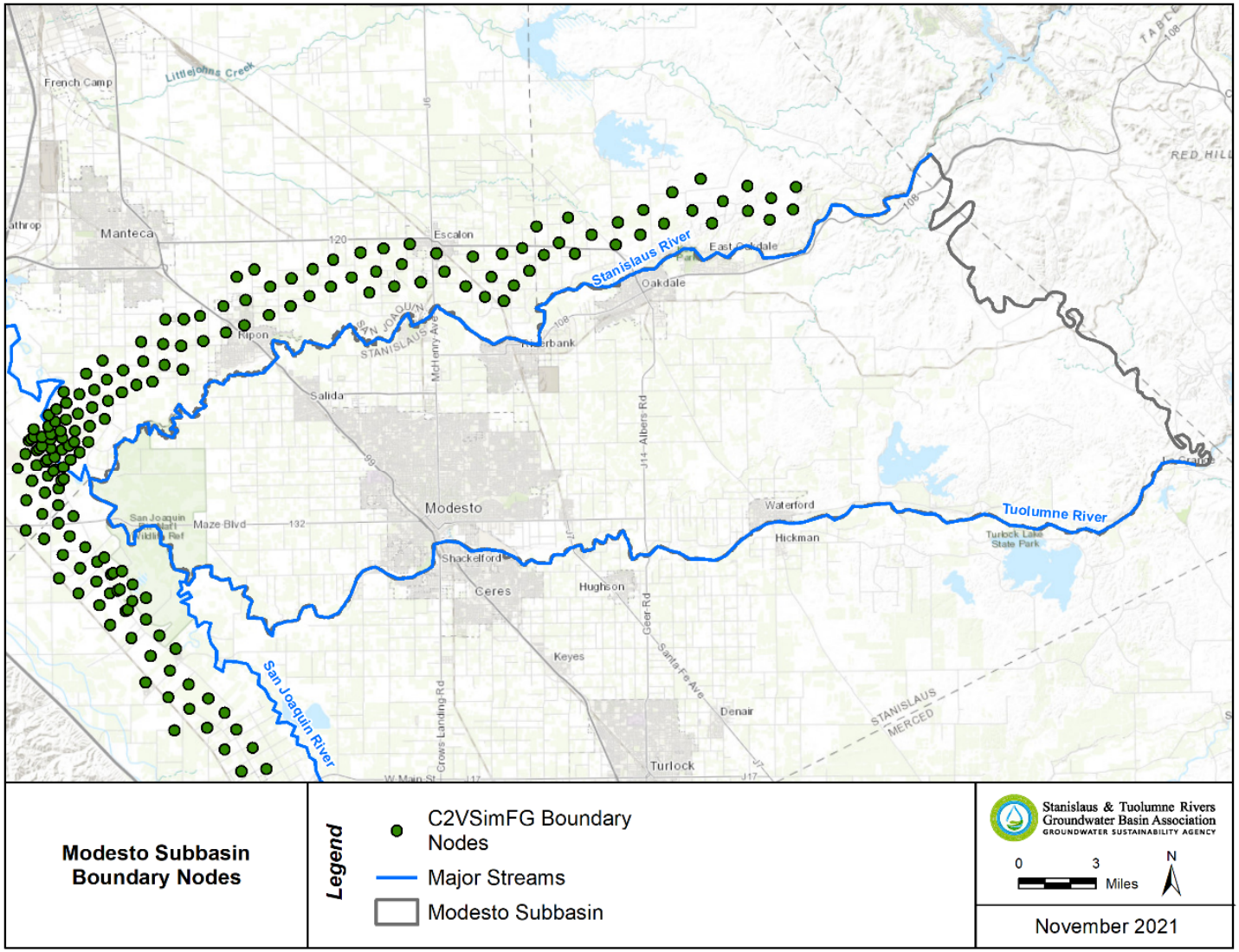


Figure M20: Modesto Model Parametric Grid

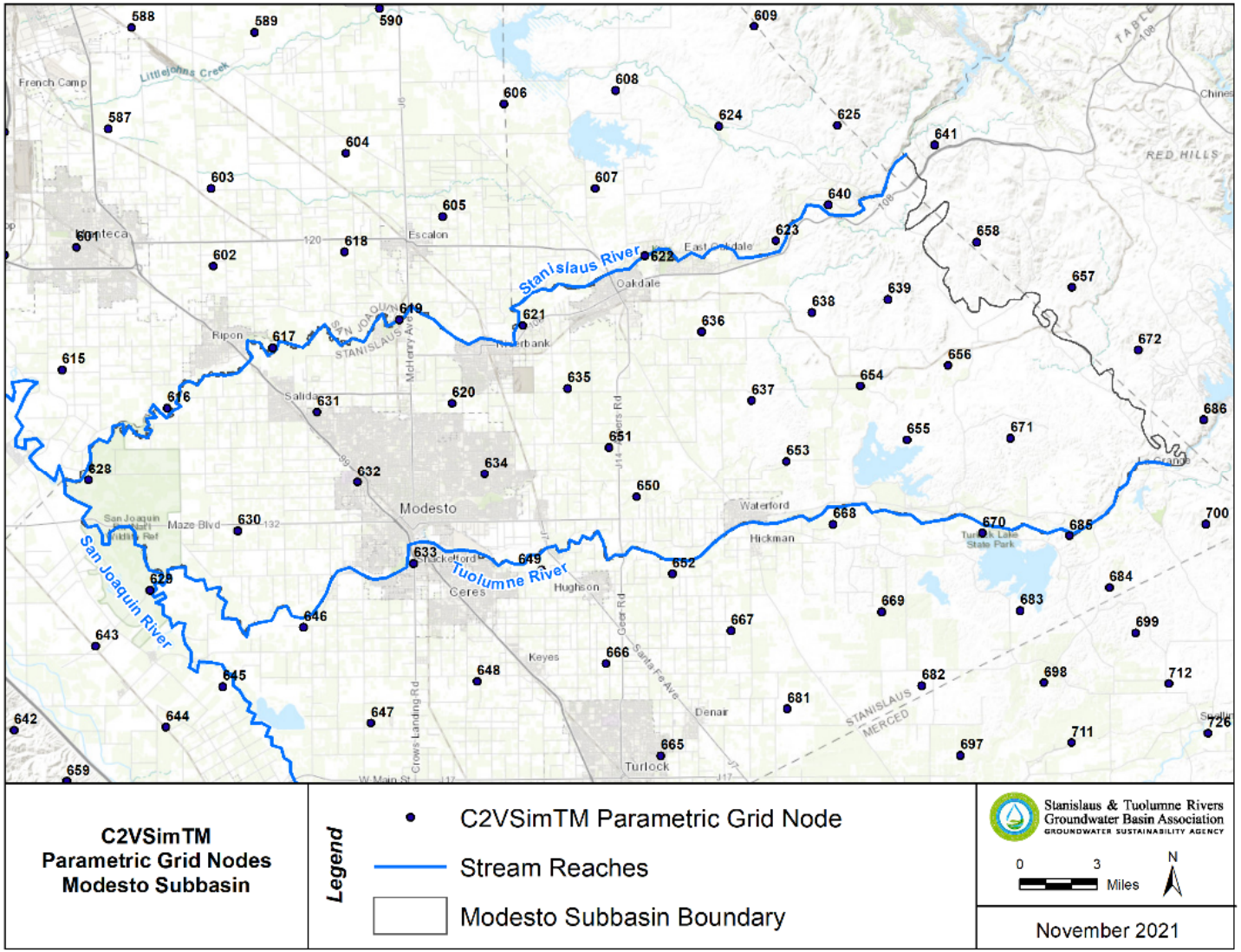


Figure M21: Modesto Subbasin Water Budget Areas

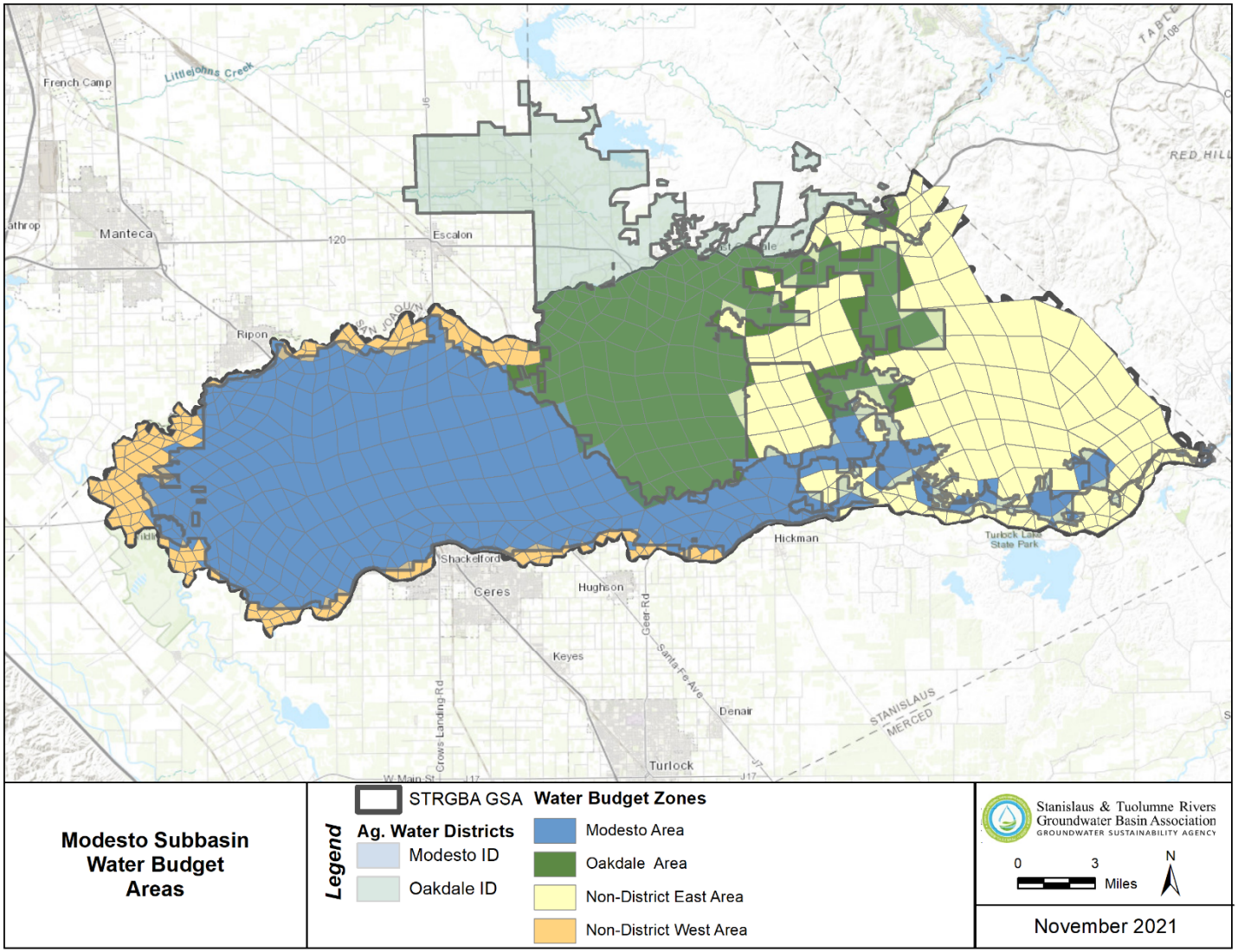


Figure M22:Modesto Model Parameters: Soil Field Capacity

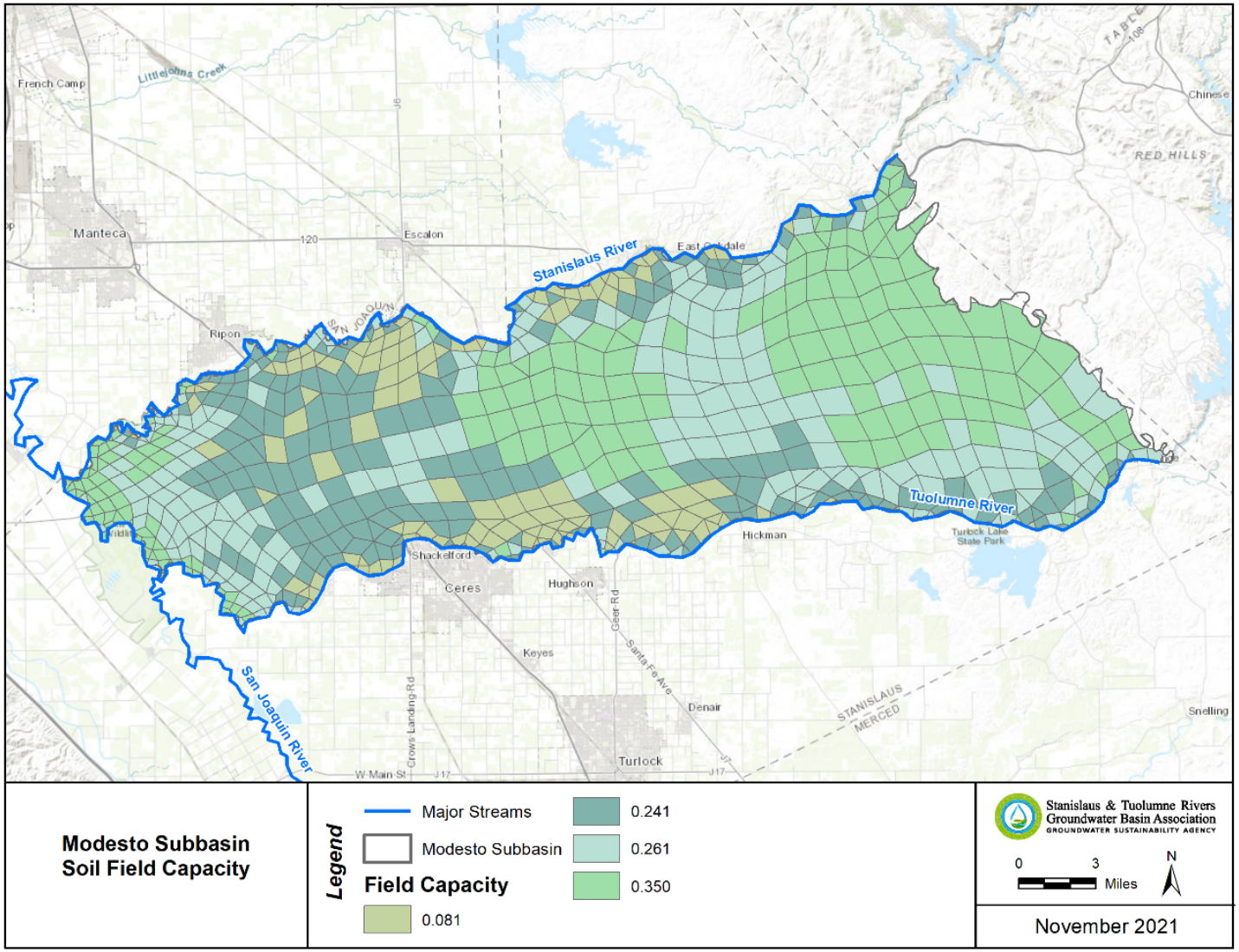


Figure M23:Modesto Model Parameters: Soil Wilting Point

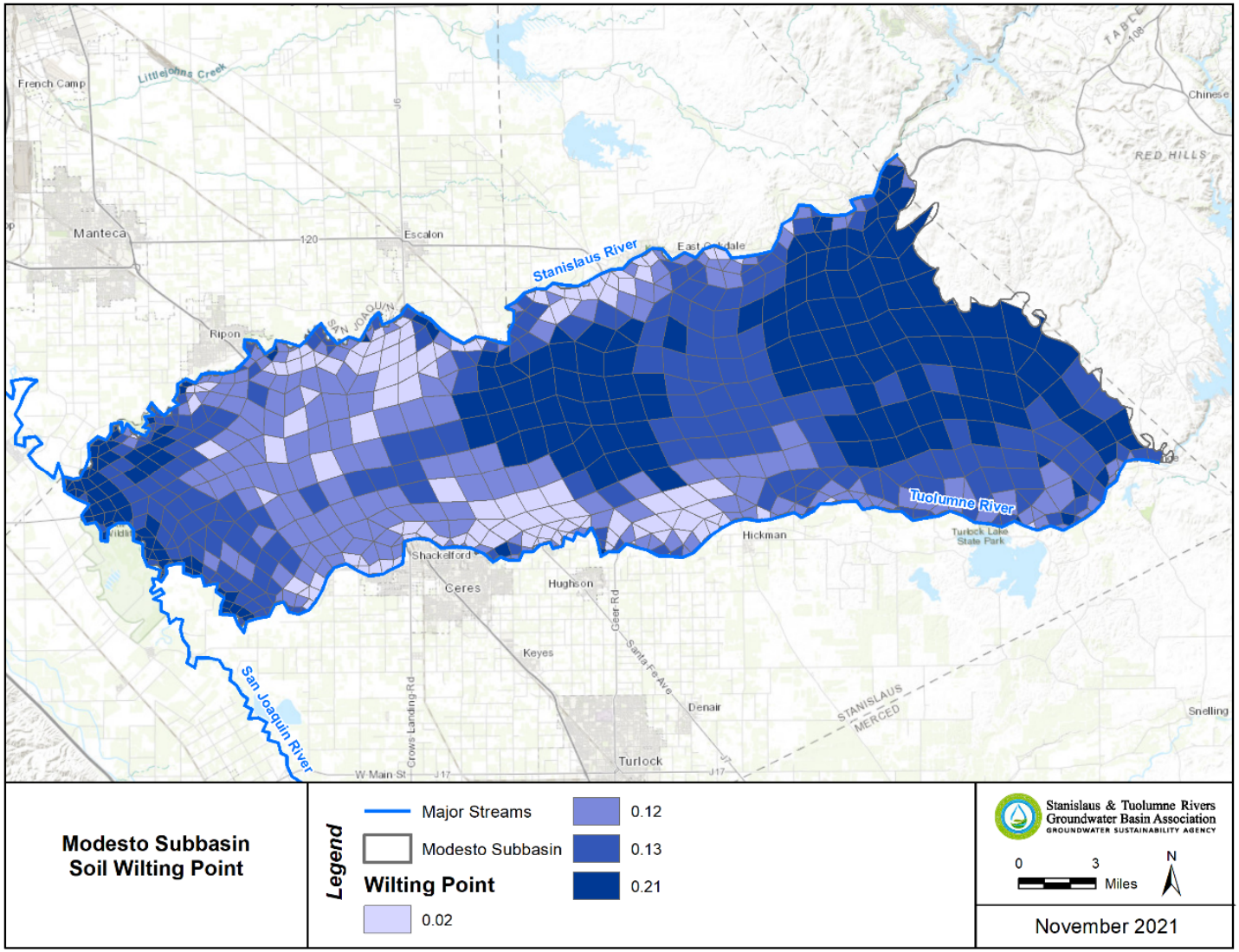


Figure M24:Modesto Model Parameters: Soil Hydraulic Conductivity

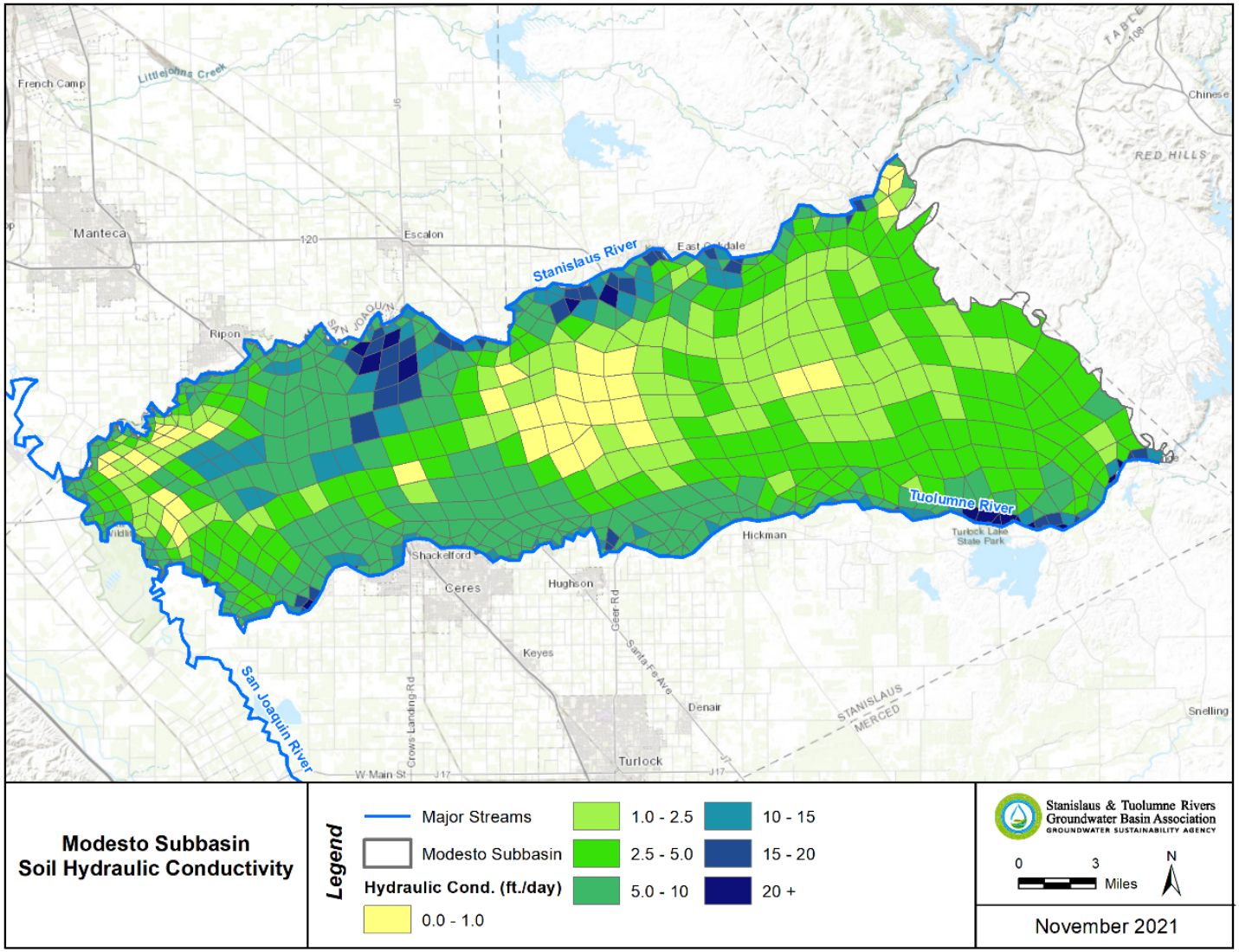


Figure M25:Modesto Model Parameters: Soil Porosity

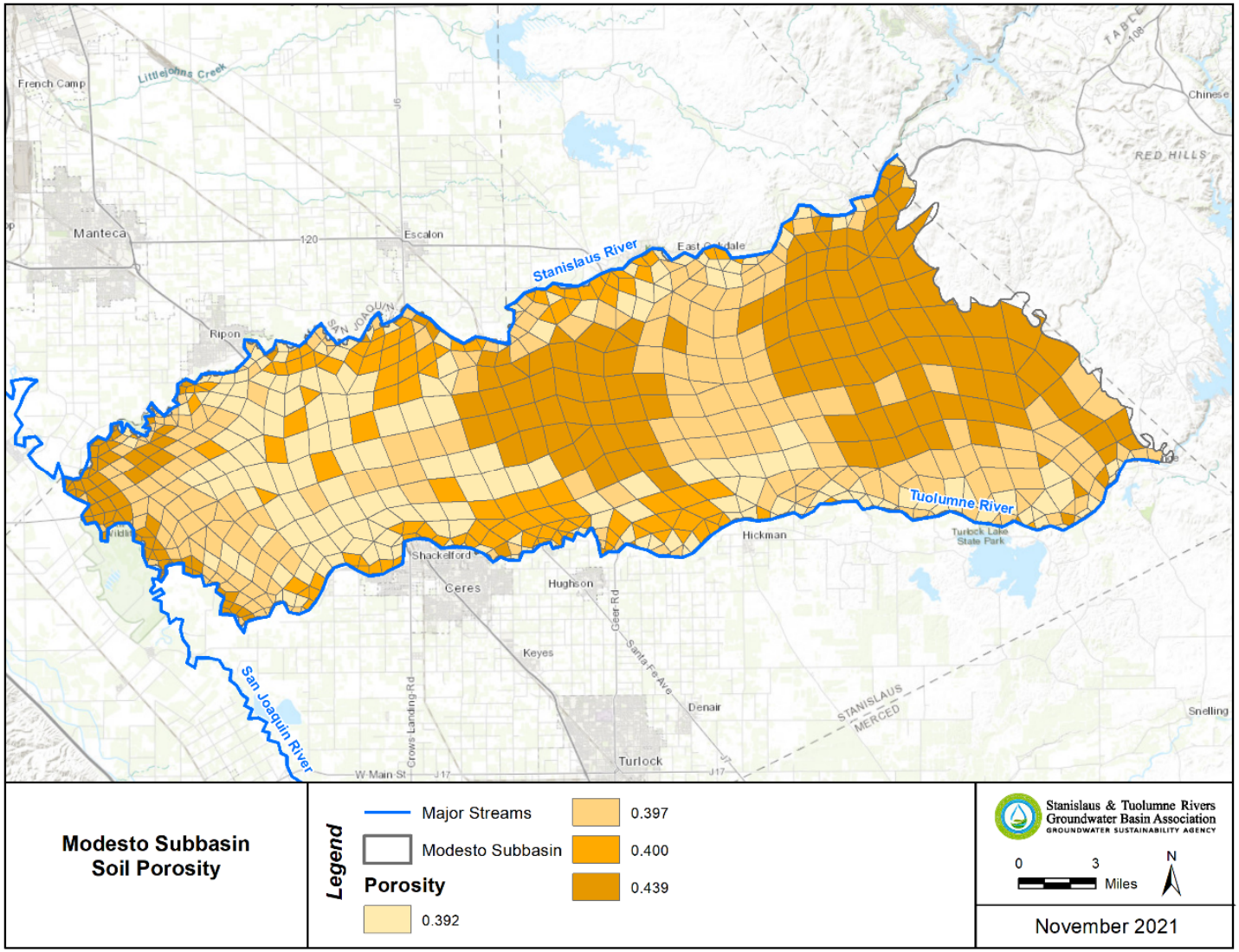


Figure M26. Groundwater Level Contours Layer 1 September 2015

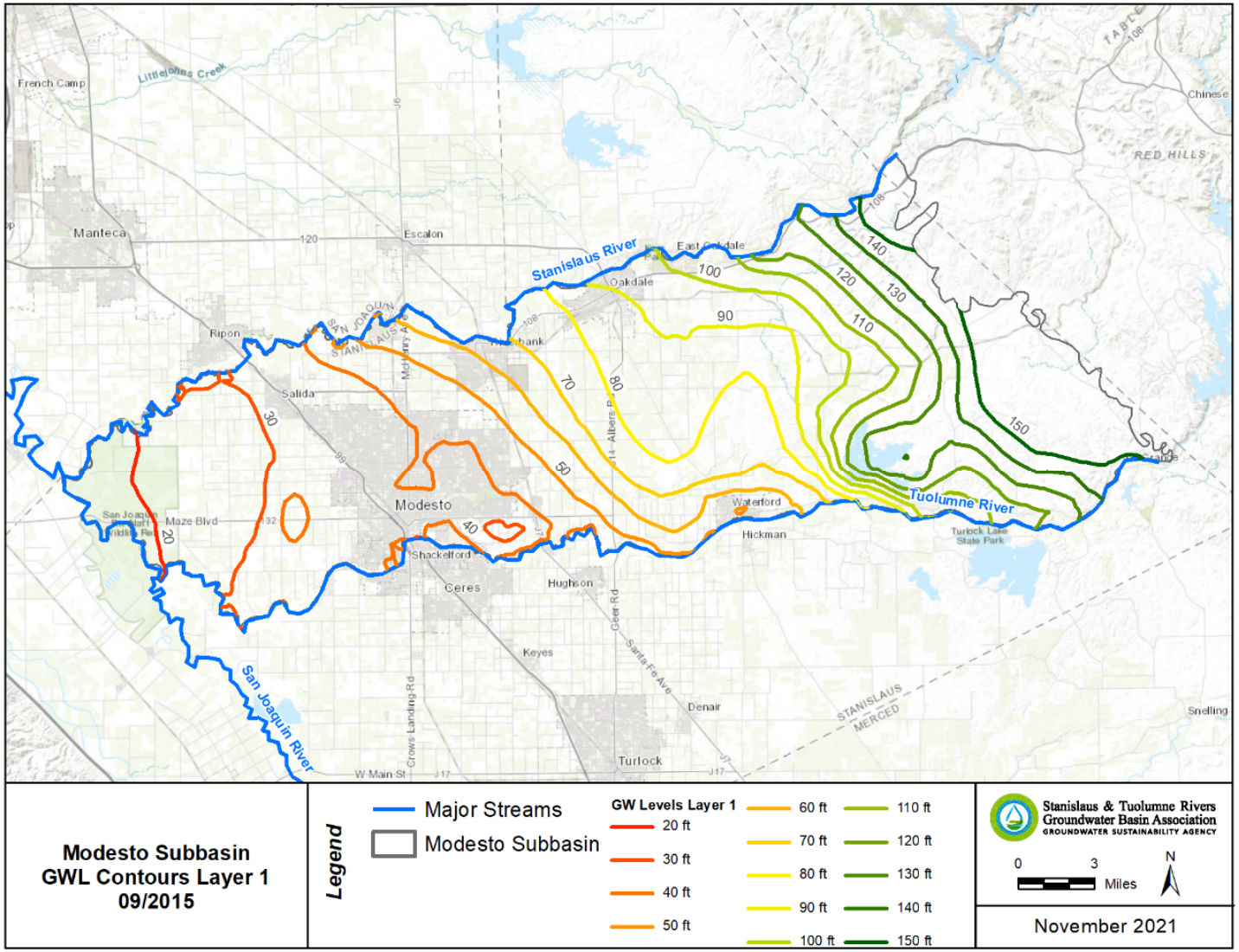


Figure M27. Groundwater Level Contours Layer 2 September 2015

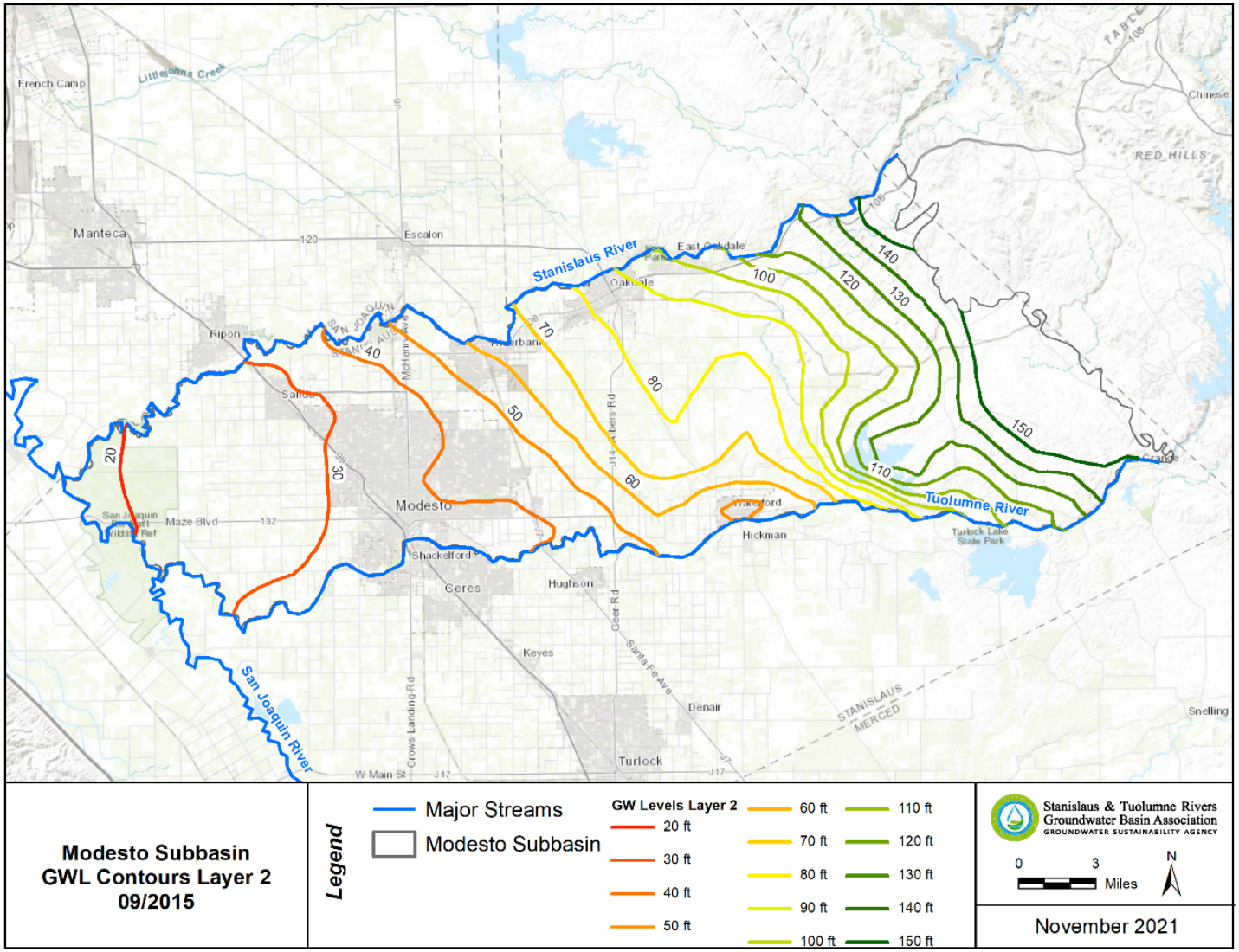


Figure M28: Calibrated Horizontal Hydraulic Conductivity of Layer 1

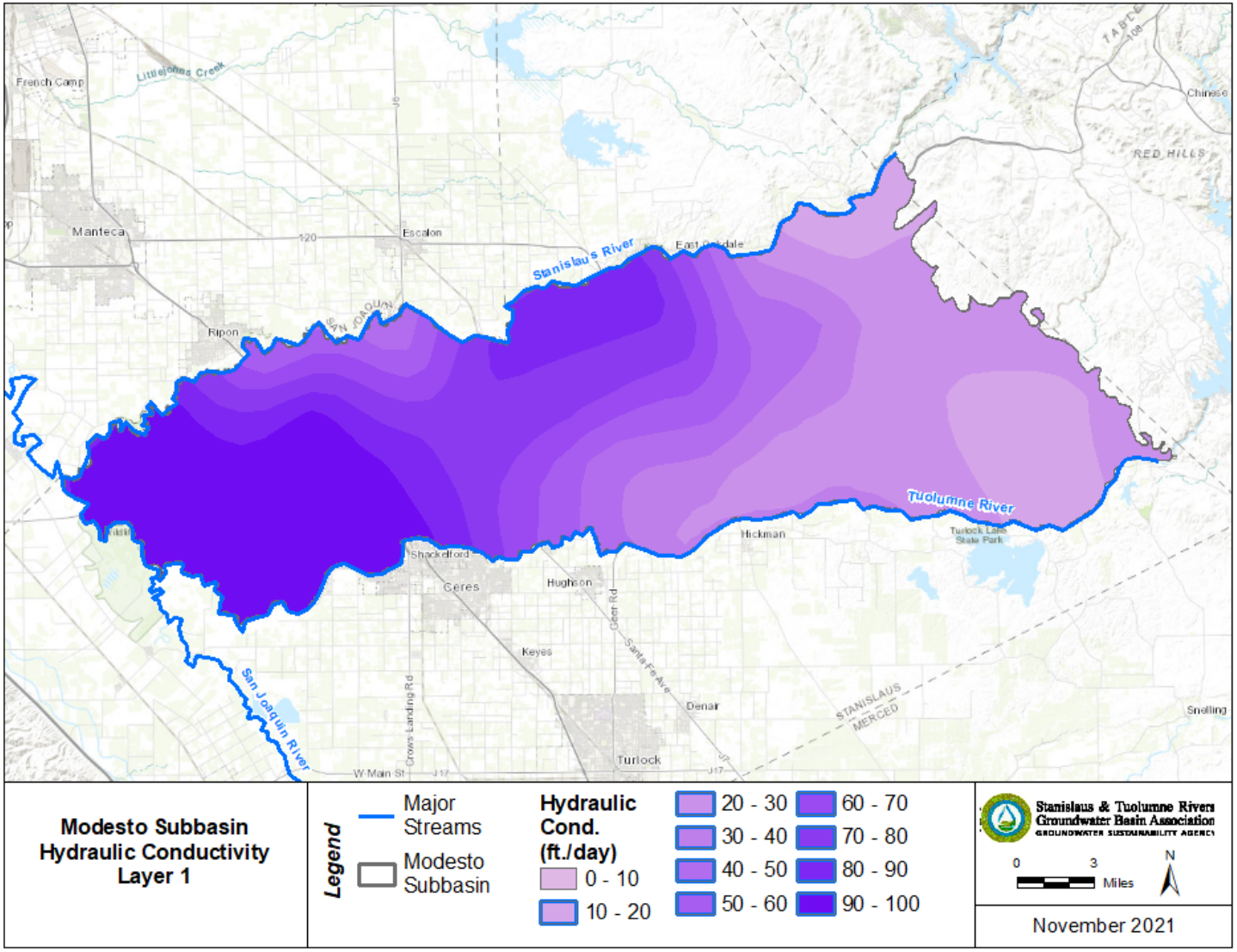


Figure M29: Calibrated Horizontal Hydraulic Conductivity of Layers 2

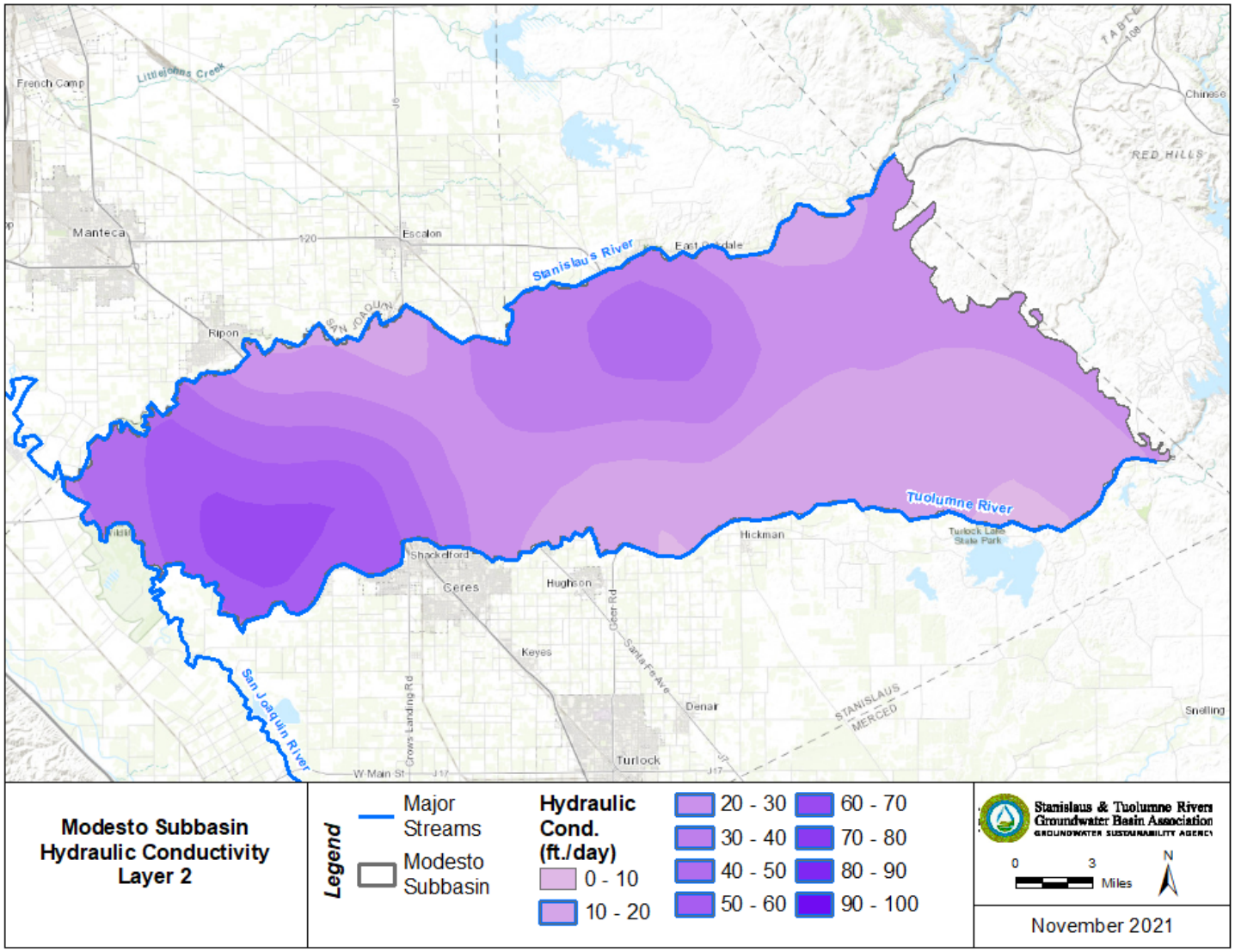


Figure M30: Calibrated Horizontal Hydraulic Conductivity of Layers 3

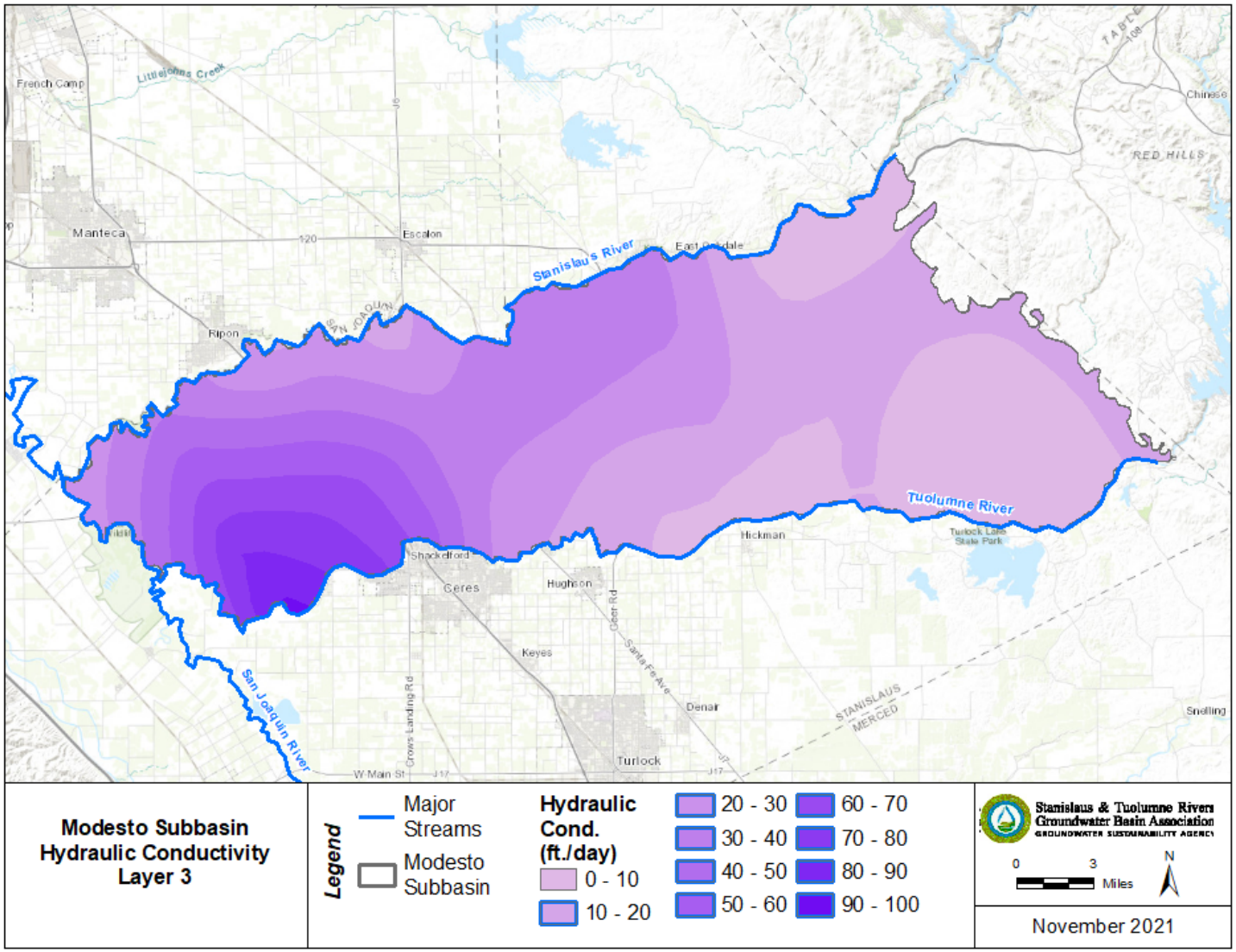
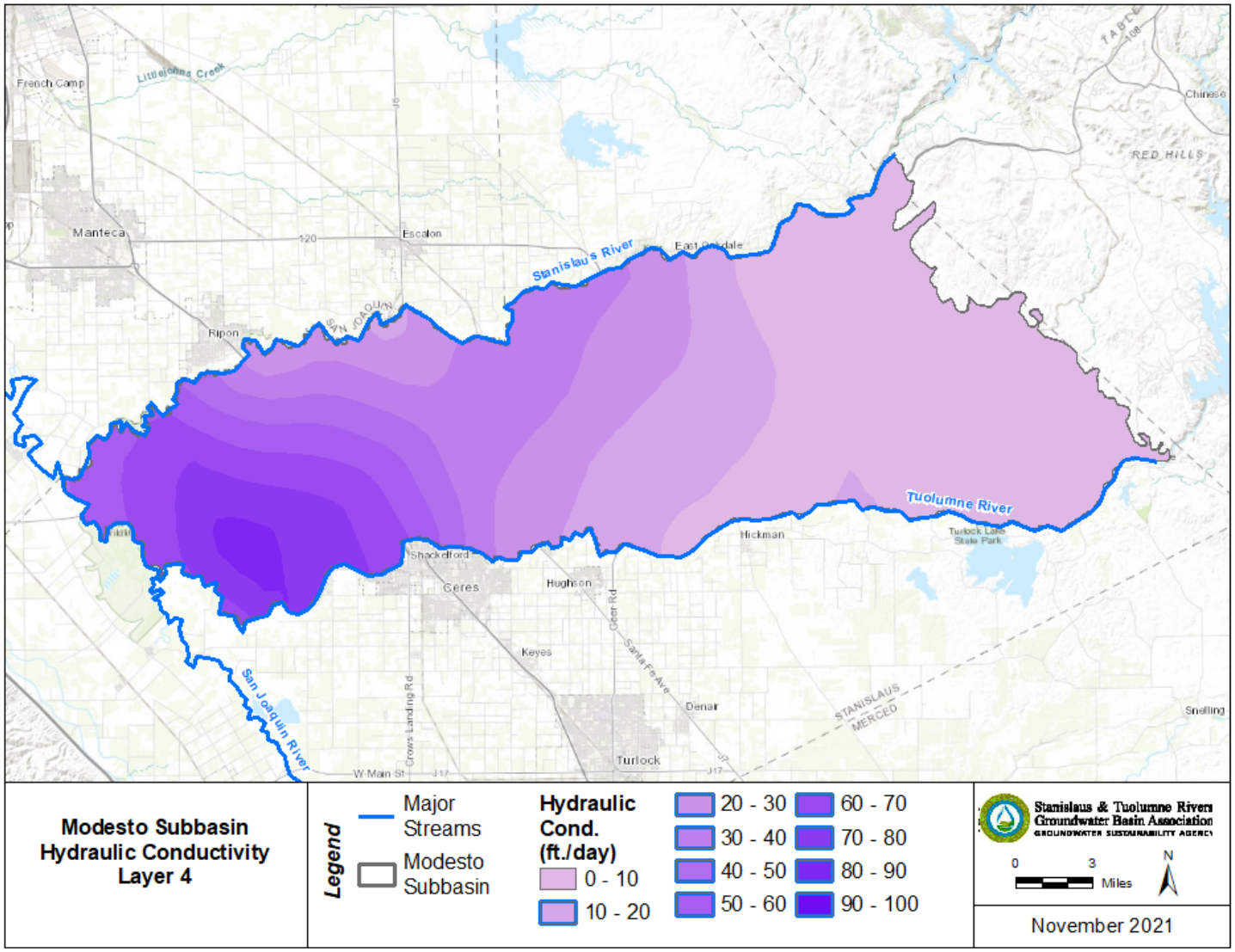
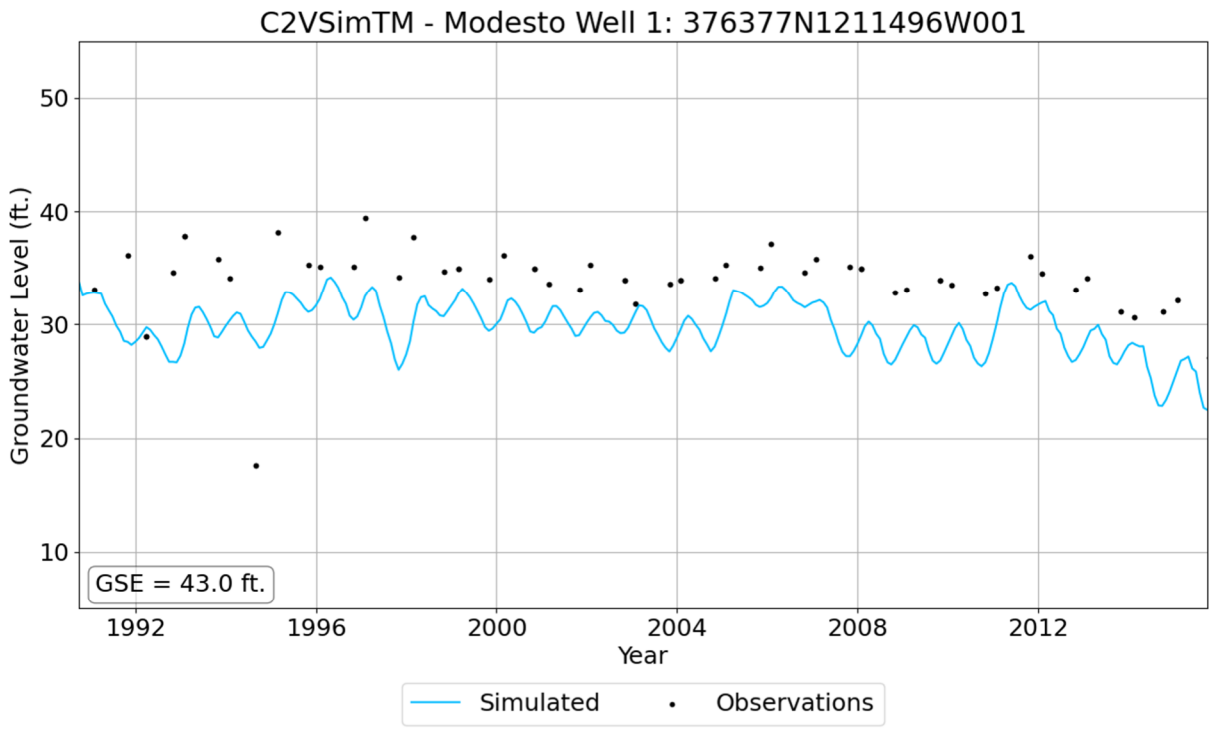
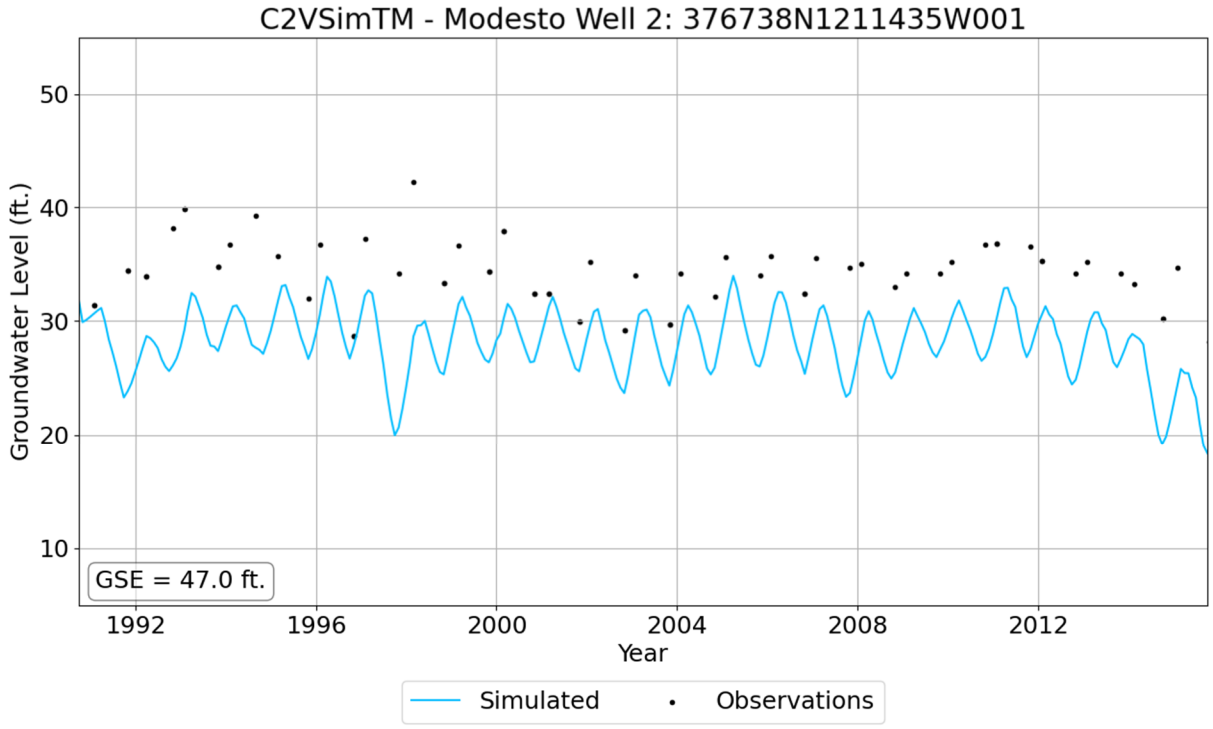


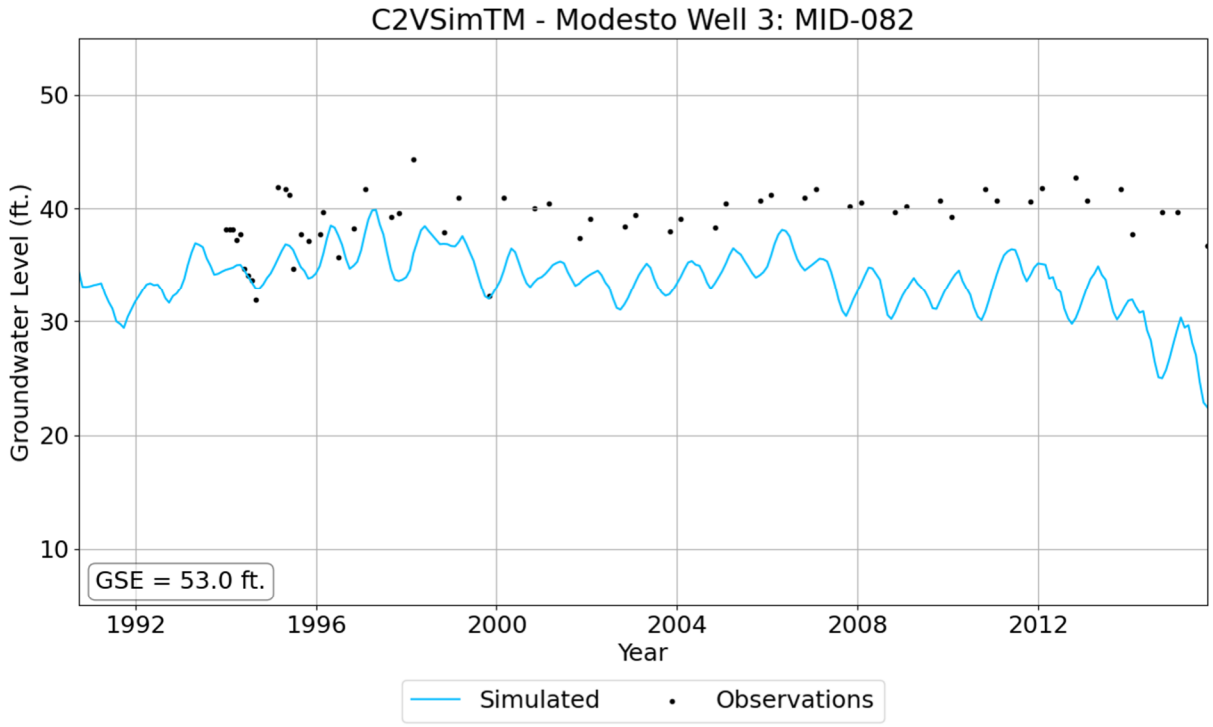
Figure M31: Calibrated Horizontal Hydraulic Conductivity of Layers 4

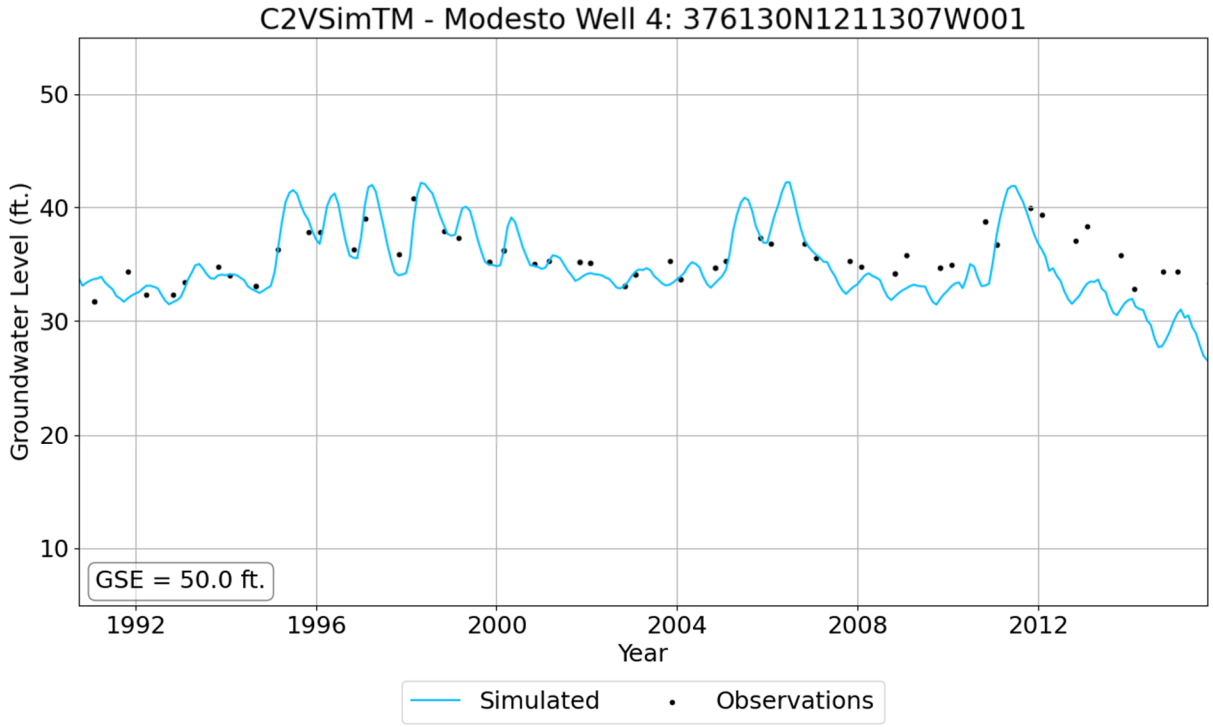


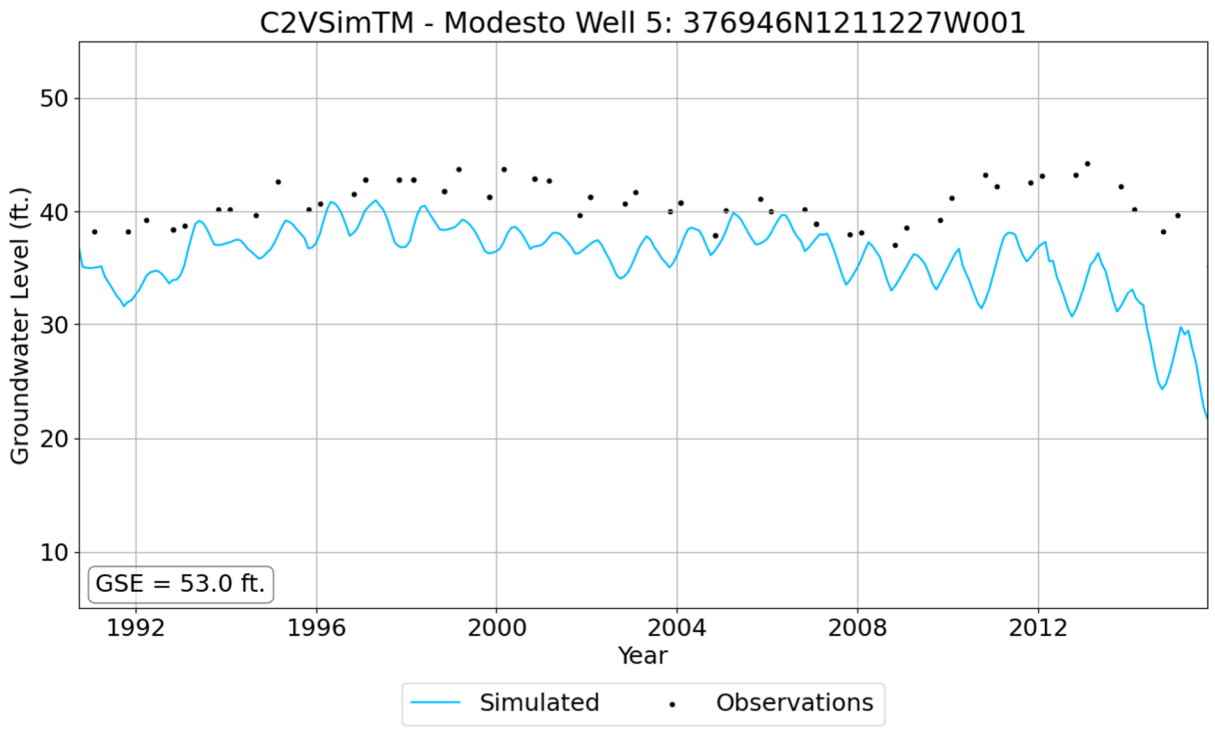
APPENDIX A: GROUNDWATER LEVEL HYDROGRAPHS

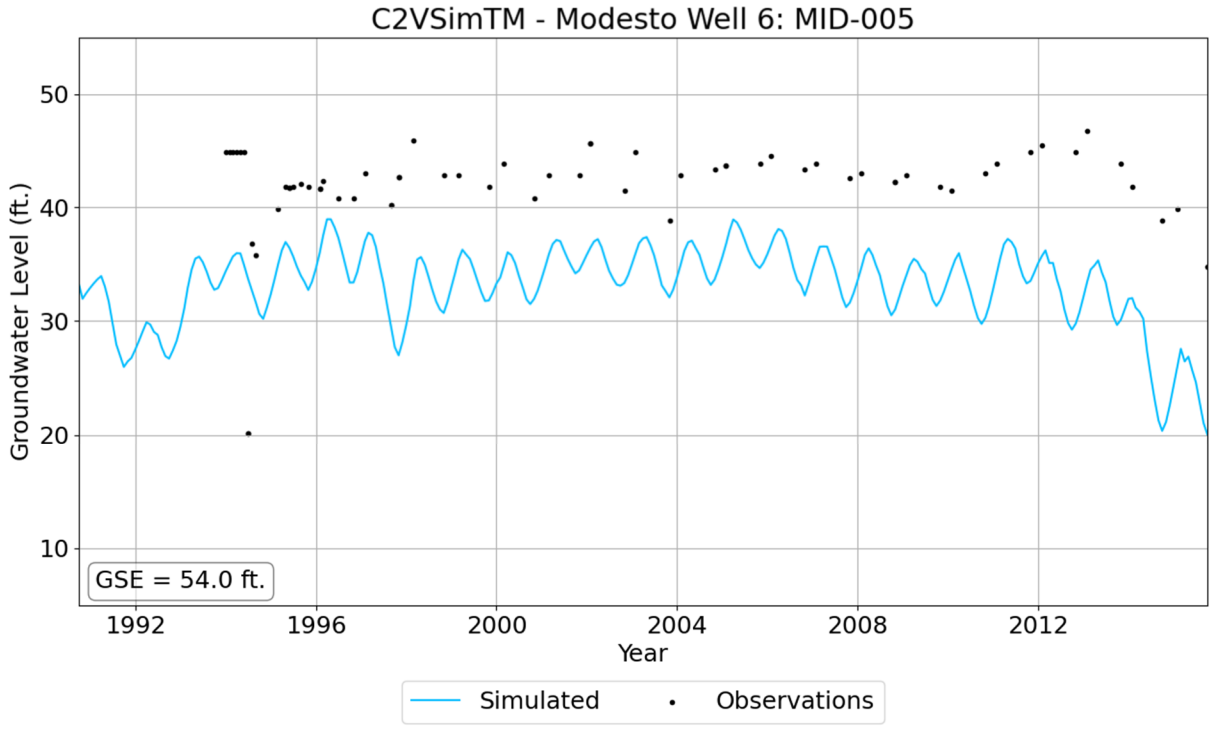

C2VSimTM - Modesto Well 1: 376377N1211496W001
Groundwater Level (ft.)
50
40
30
20
10
GSE = 43.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

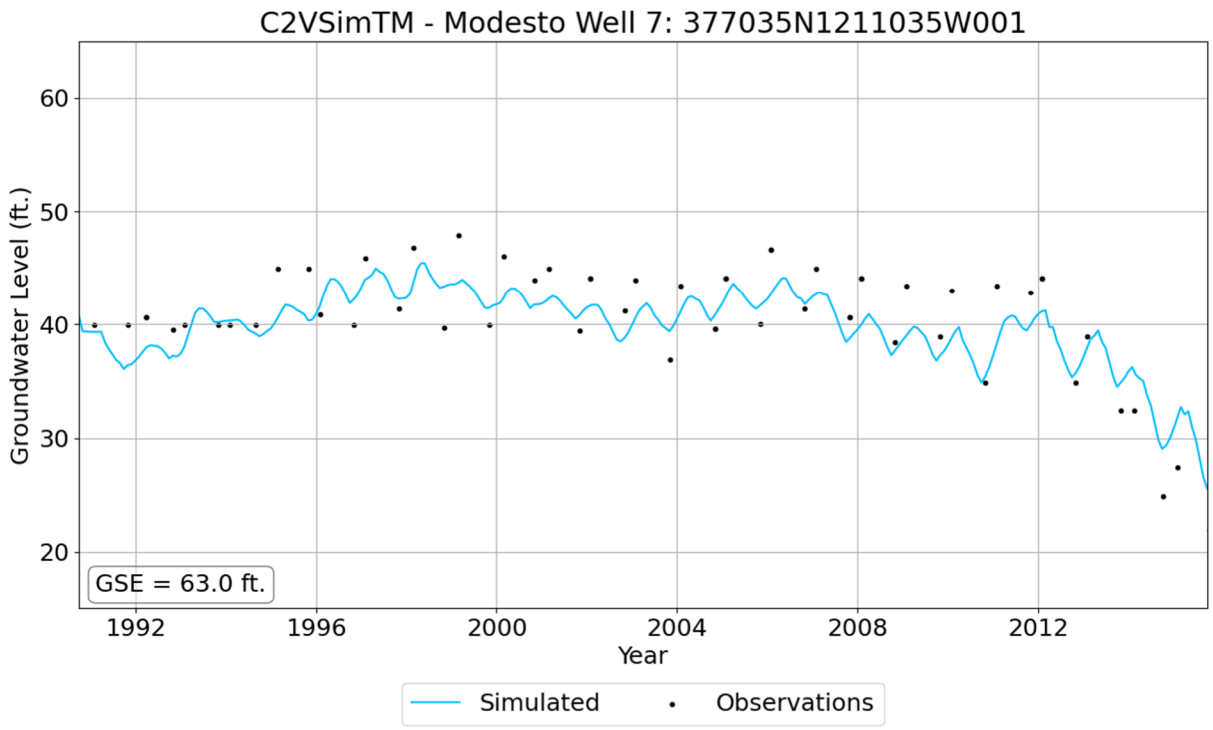

C2VSimTM - Modesto Well 2: 376738N1211435W001
Groundwater Level (ft.)
50
40
30
20
10
GSE = 47.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

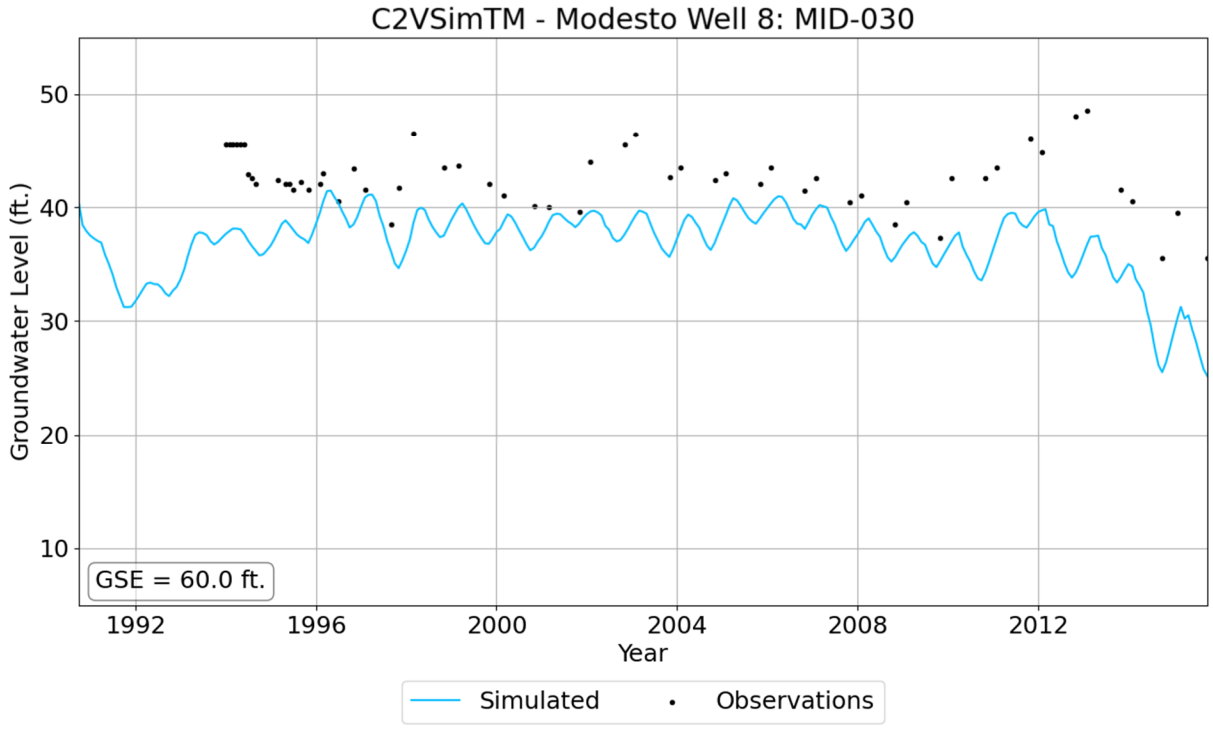

C2VSimTM - Modesto Well 3: MID-082
Groundwater Level (ft.)
50
40
30
20
10
GSE = 53.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

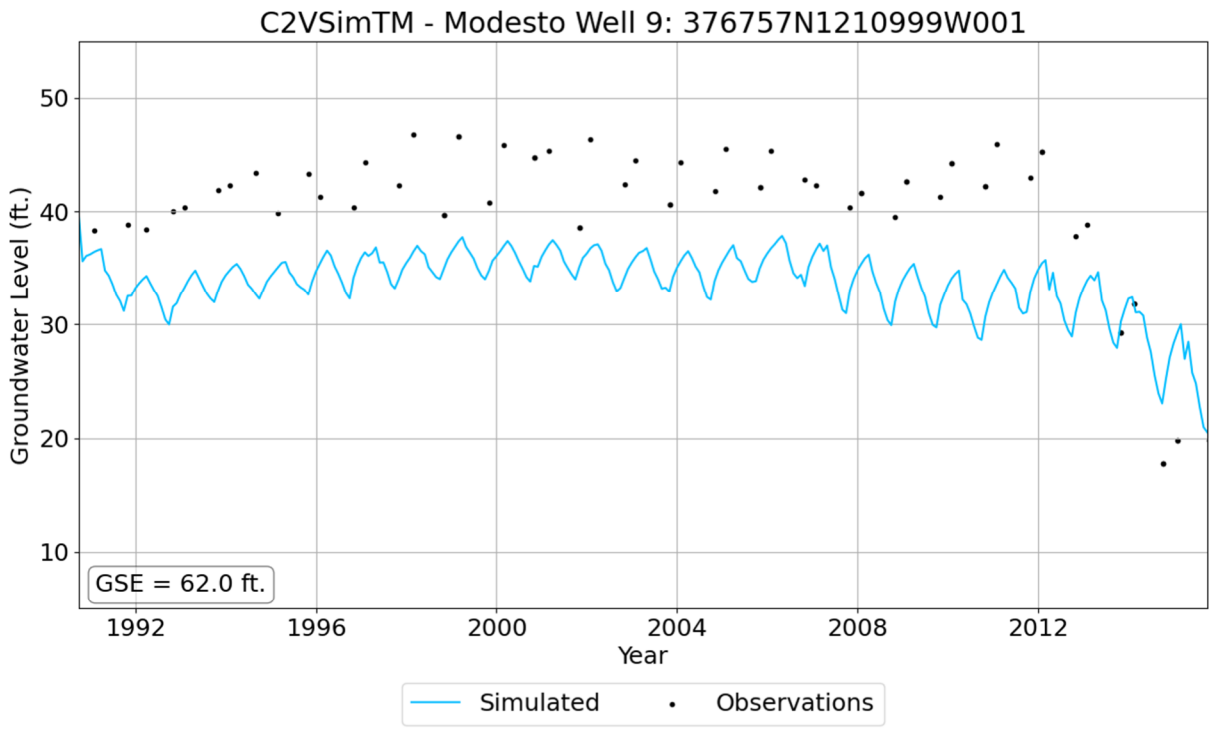

C2VSimTM - Modesto Well 4: 376130N1211307W001
Groundwater Level (ft.)
50
40
30
20
10
GSE = 50.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

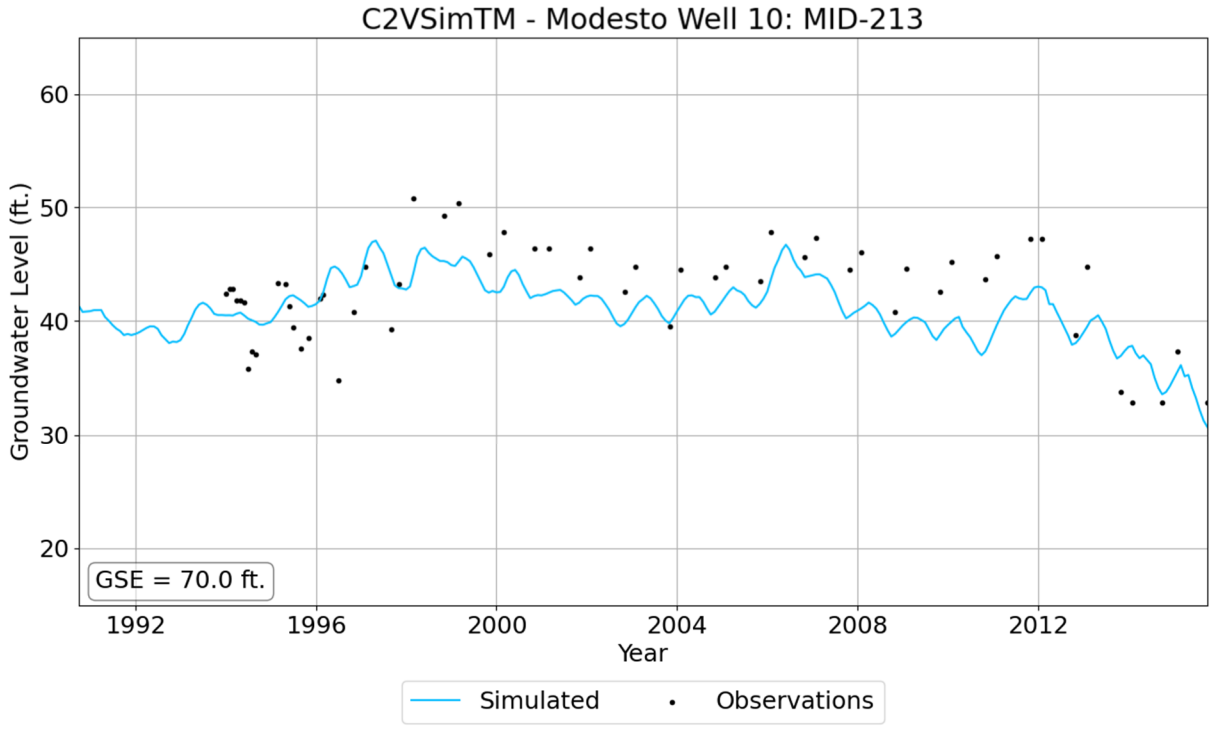

C2VSimTM - Modesto Well 5: 376946N1211227W001
Groundwater Level (ft.)
50
40
30
20
10
GSE = 53.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

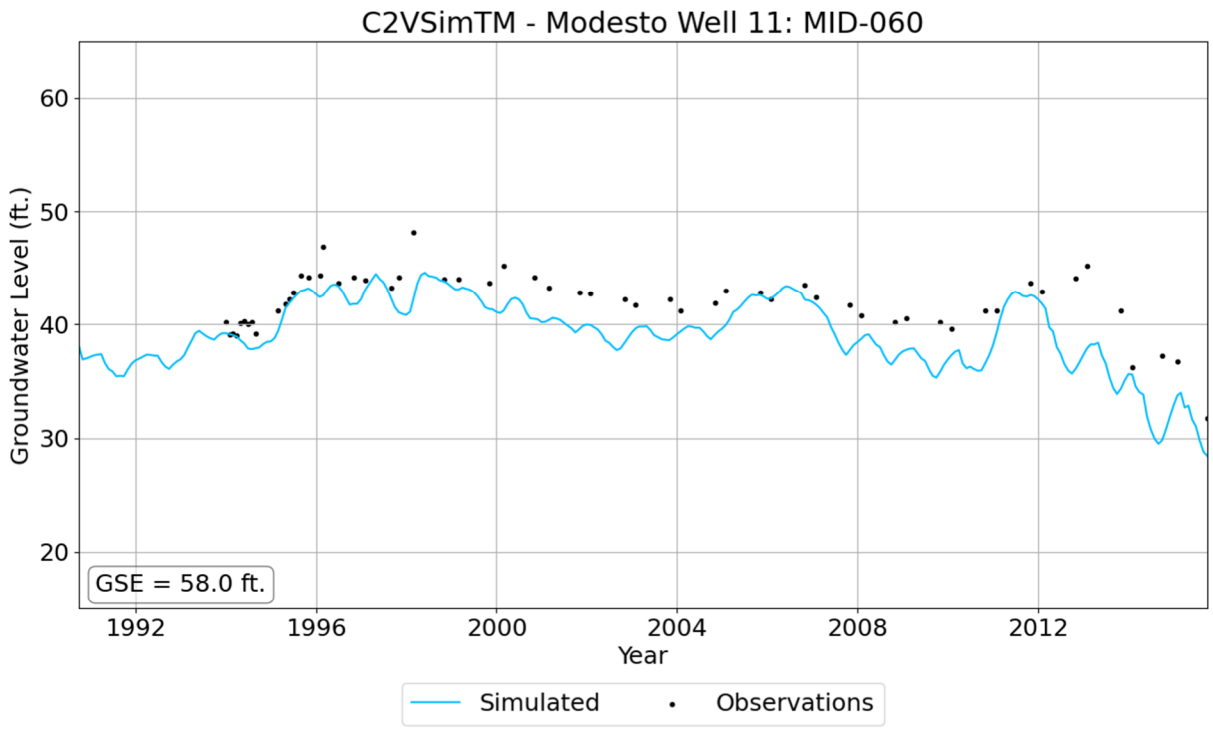

C2VSimTM - Modesto Well 6: MID-005
Groundwater Level (ft.)
50
40
30
20
10
GSE = 54.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

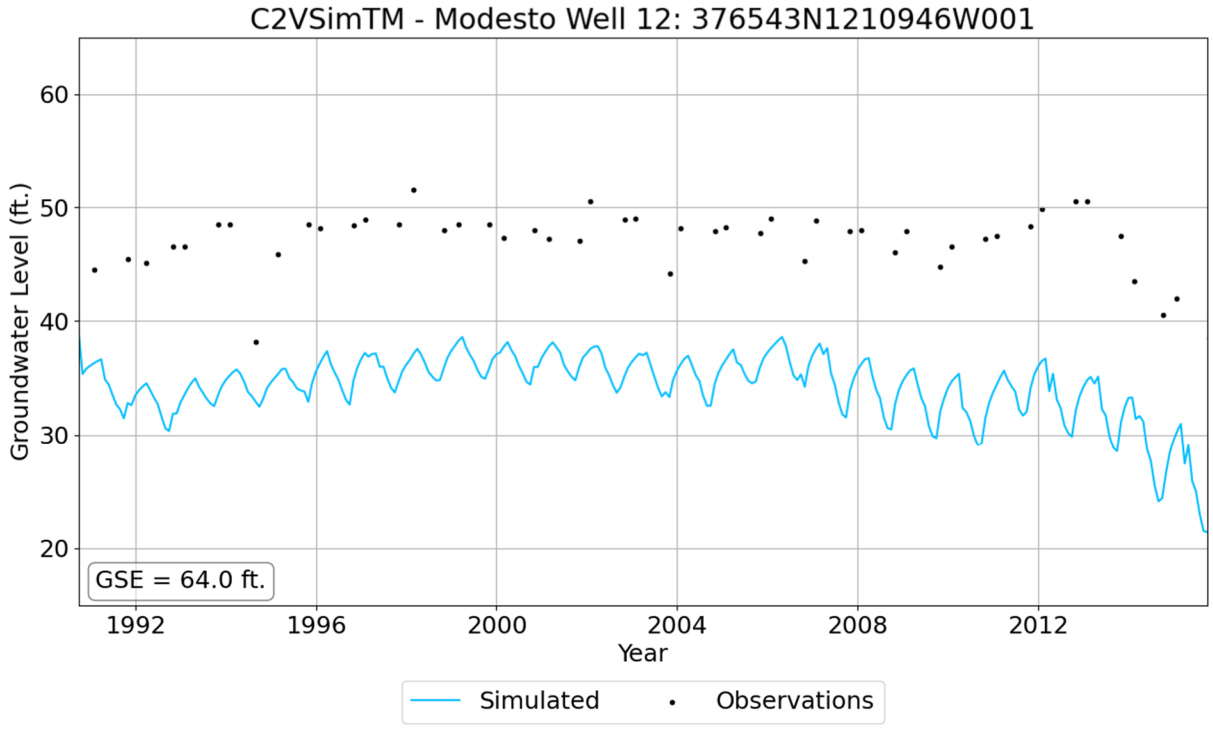

C2VSimTM - Modesto Well 7: 377035N1211035W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 63.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

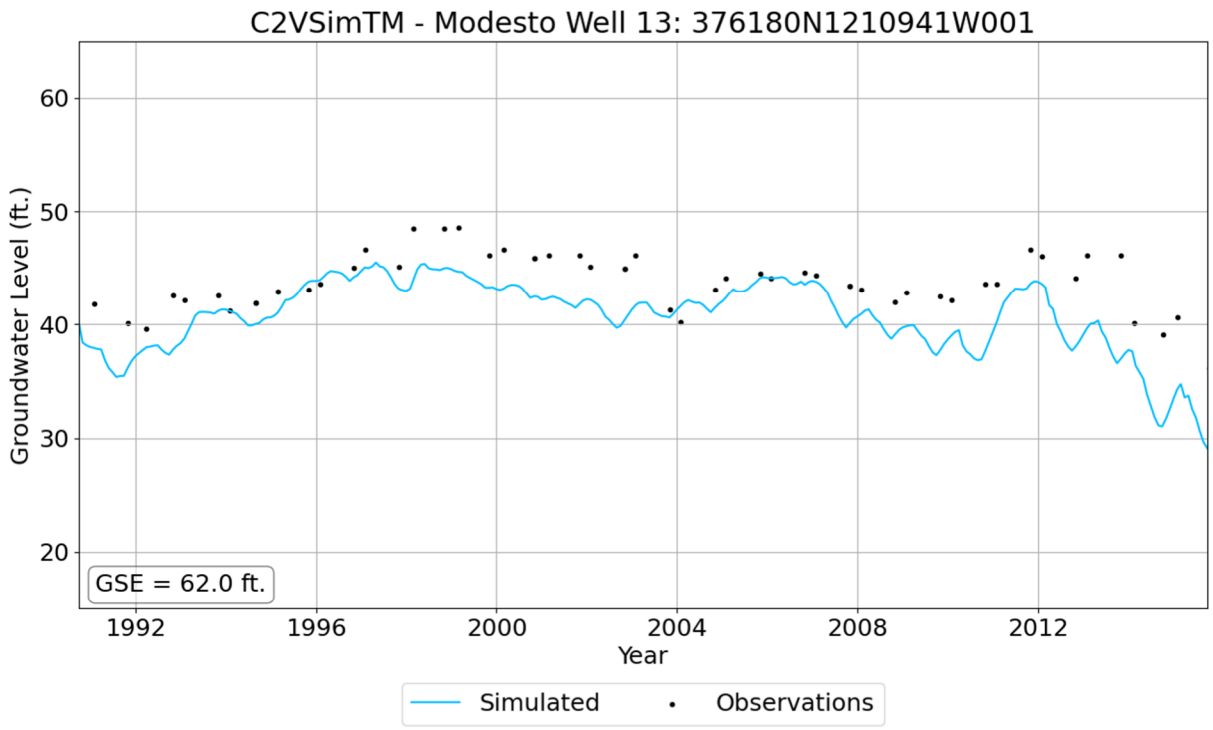

C2VSimTM - Modesto Well 8: MID-030
Groundwater Level (ft.)
50
40
30
20
10
GSE = 60.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

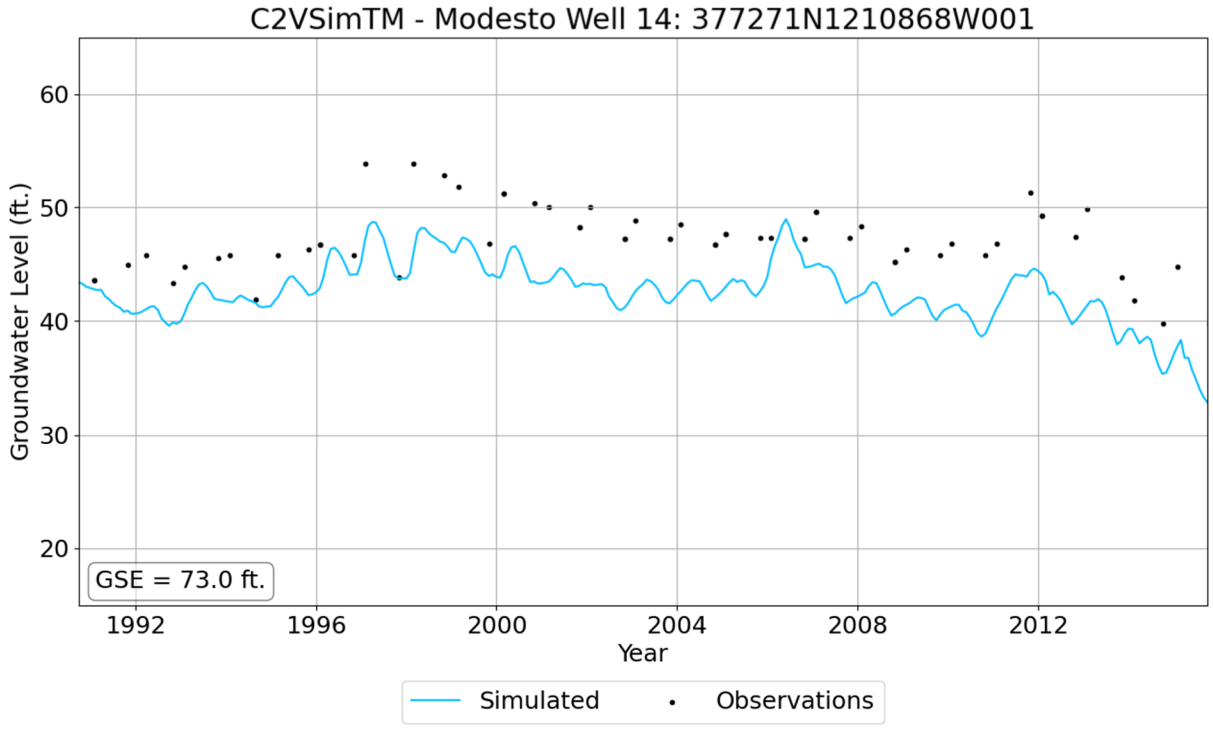

C2VSimTM - Modesto Well 9: 376757N1210999W001
Groundwater Level (ft.)
50
40
30
20
10
GSE = 62.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

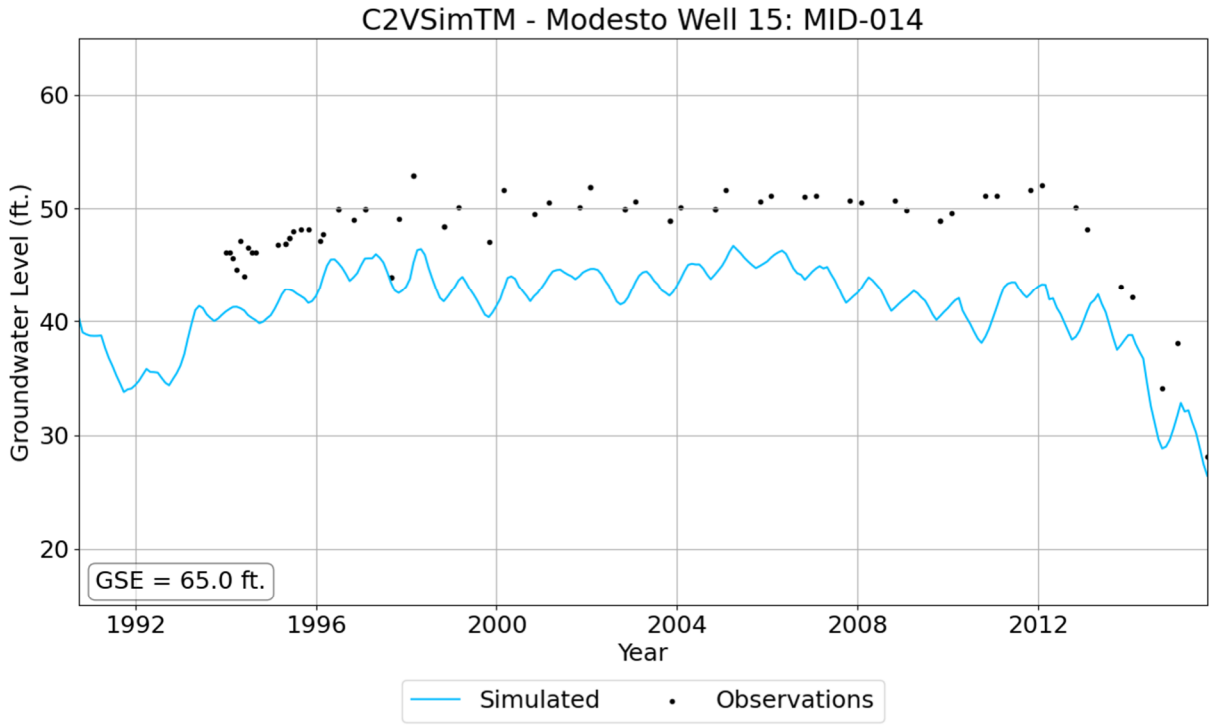

C2VSimTM - Modesto Well 10: MID-213
Groundwater Level (ft.)
60
50
40
30
20
GSE = 70.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

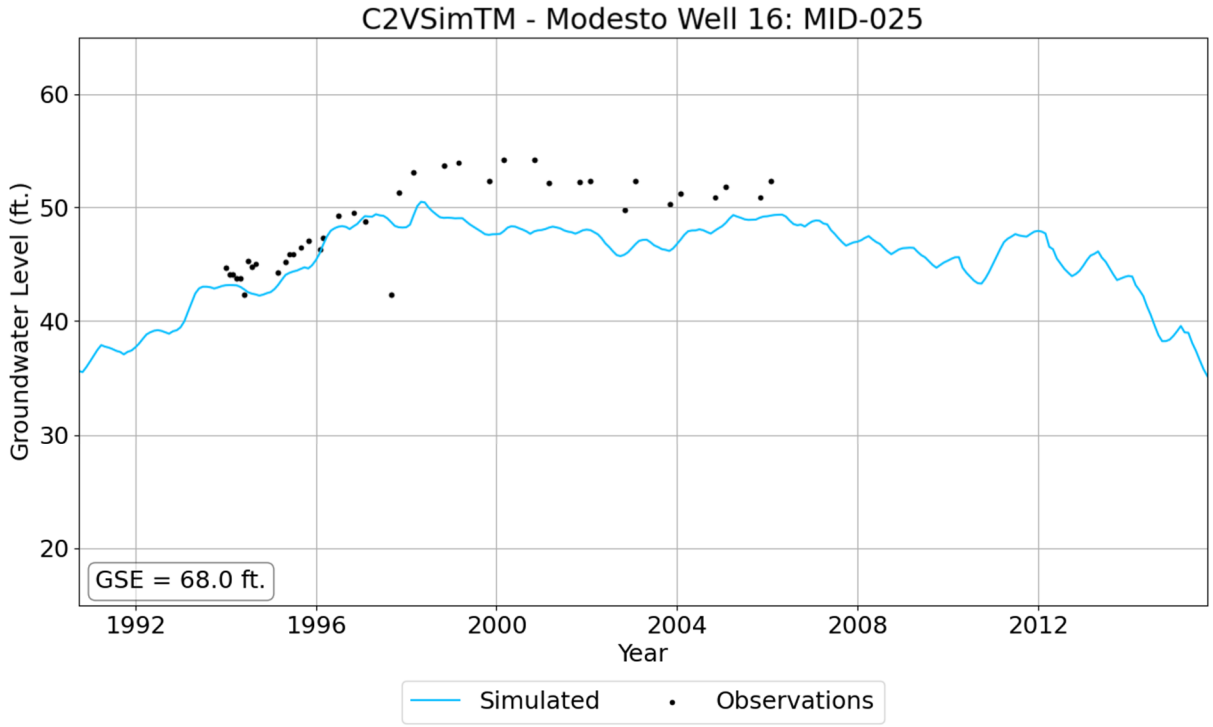

C2VSimTM - Modesto Well 11: MID-060
Groundwater Level (ft.)
60
50
40
30
20
GSE = 58.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

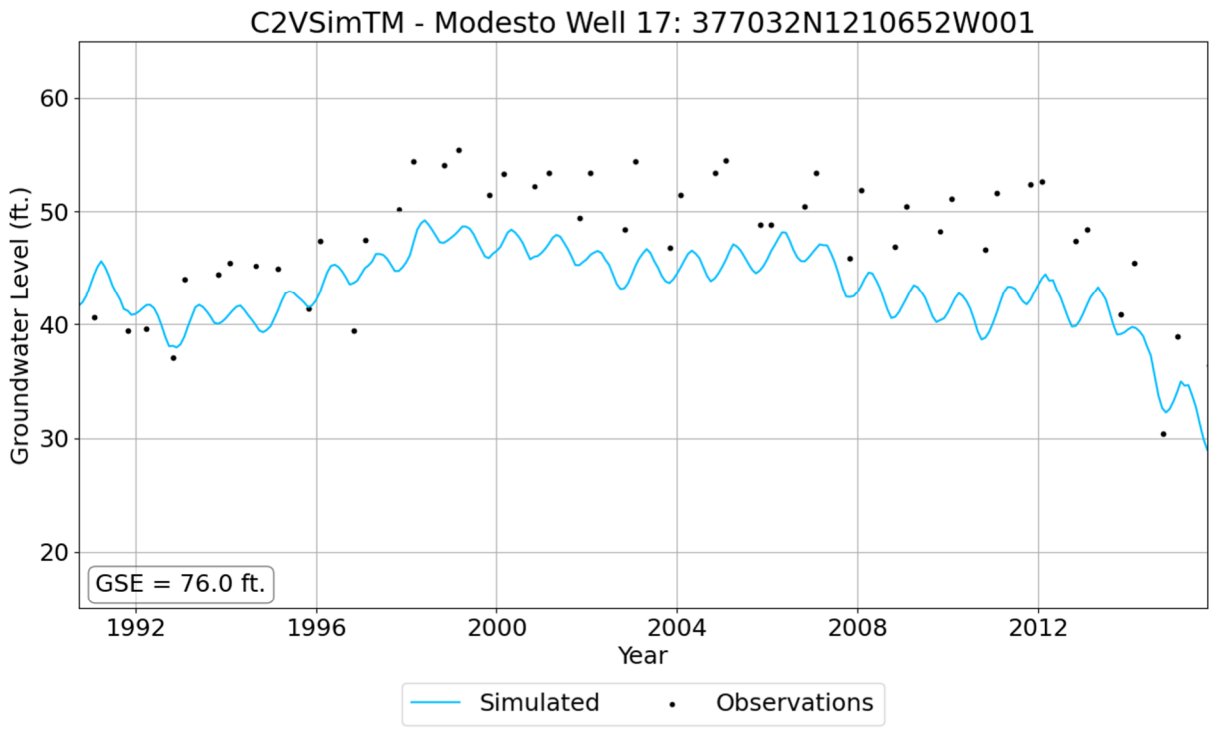

C2VSimTM - Modesto Well 12: 376543N1210946W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 64.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

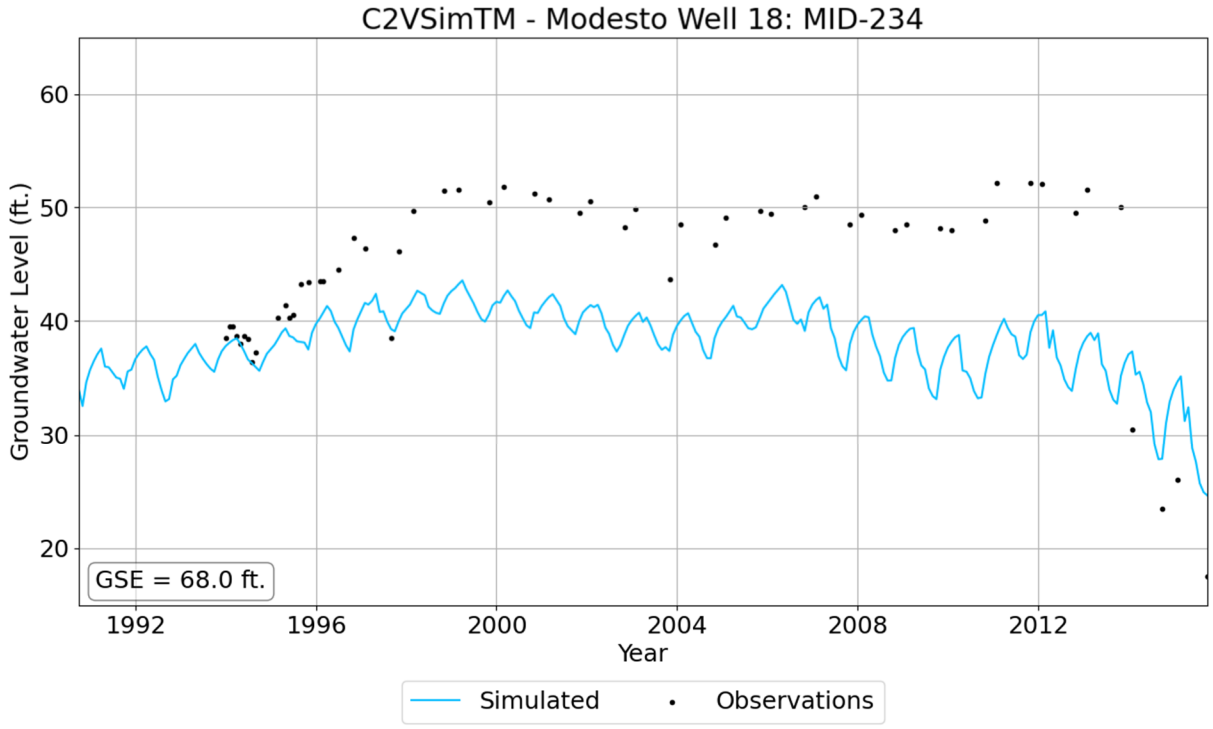

C2VSimTM - Modesto Well 13: 376180N1210941W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 62.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

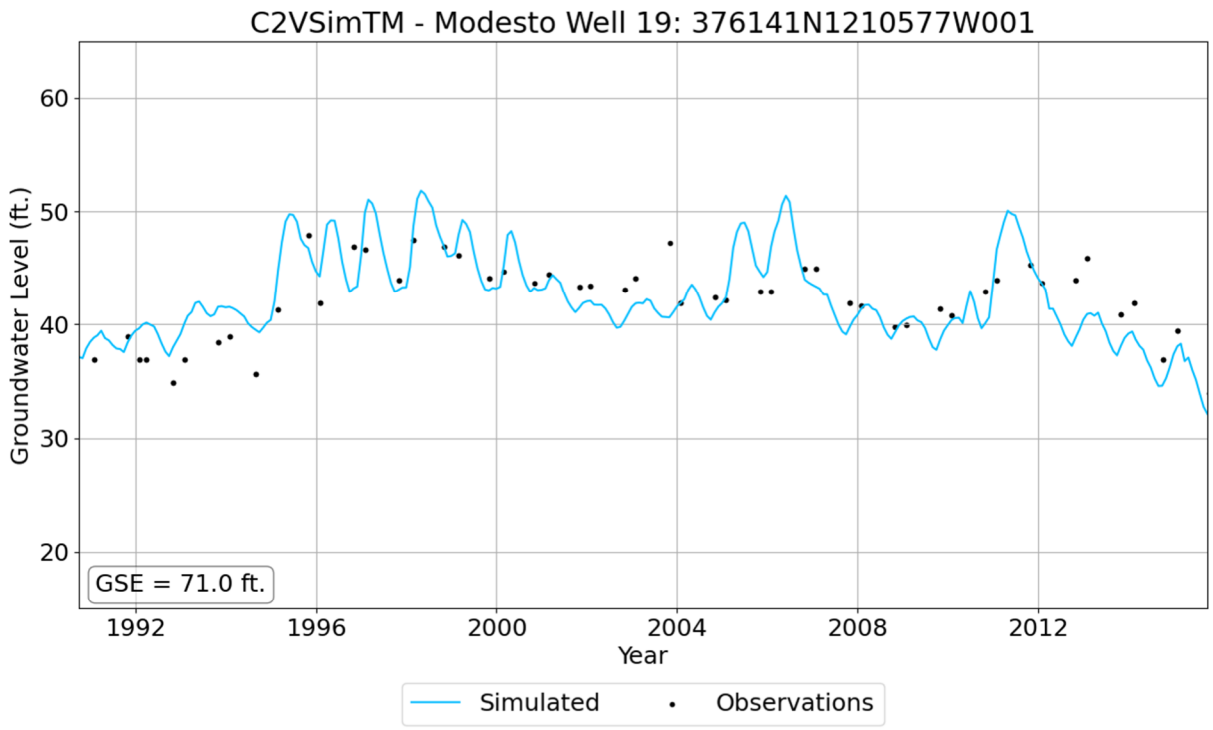

C2VSimTM - Modesto Well 14: 377271N1210868W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 73.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

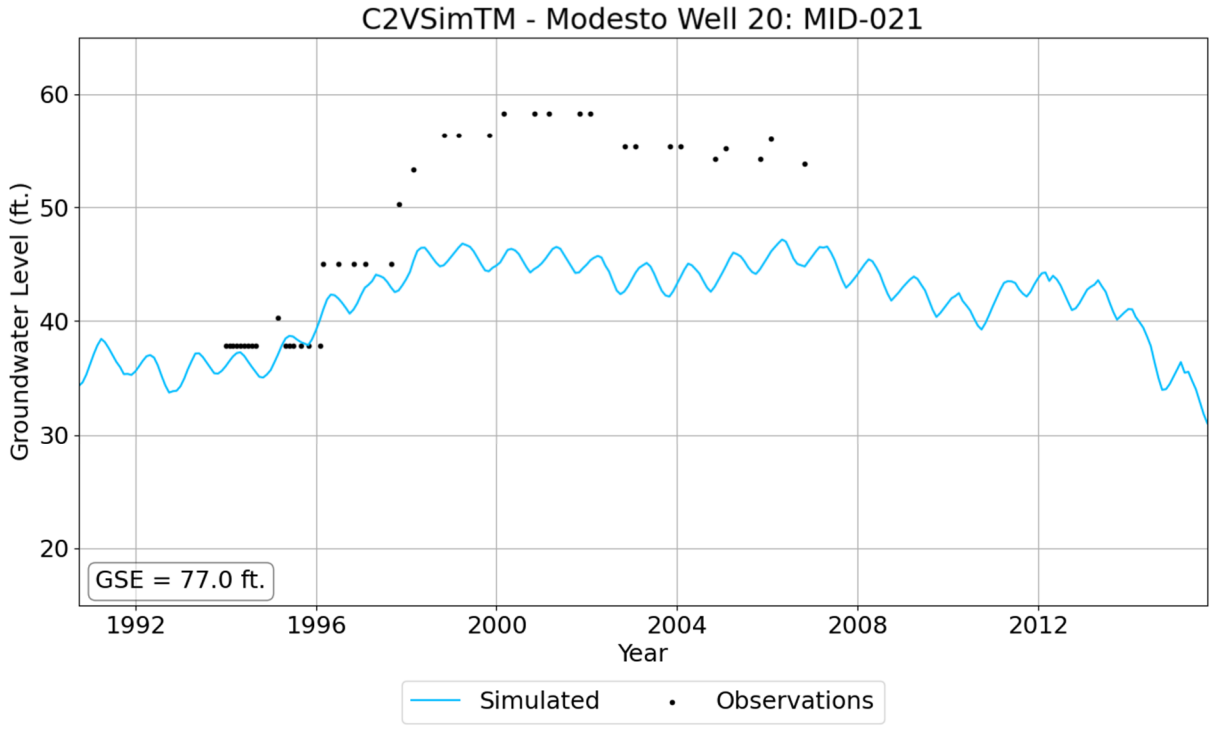

C2VSimTM - Modesto Well 15: MID-014
Groundwater Level (ft.)
60
50
40
30
20
GSE = 65.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

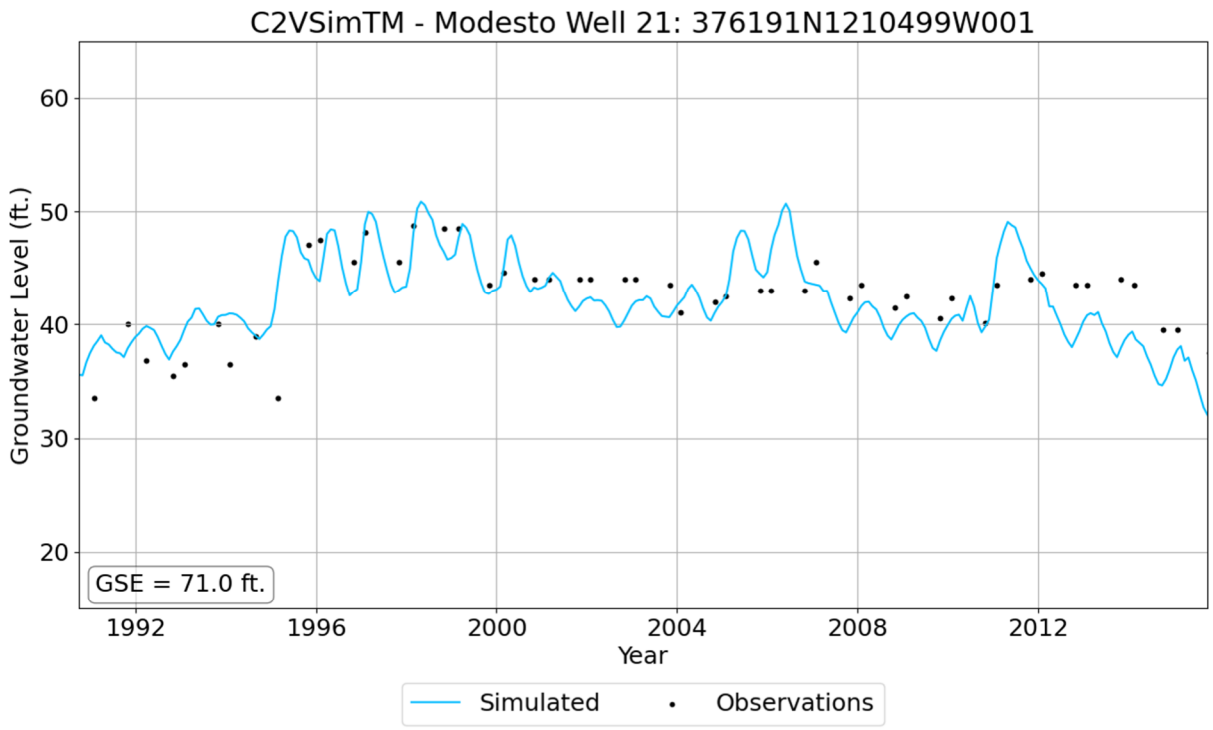

C2VSimTM - Modesto Well 16: MID-025
Groundwater Level (ft.)
60
50
40
30
20
GSE = 68.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

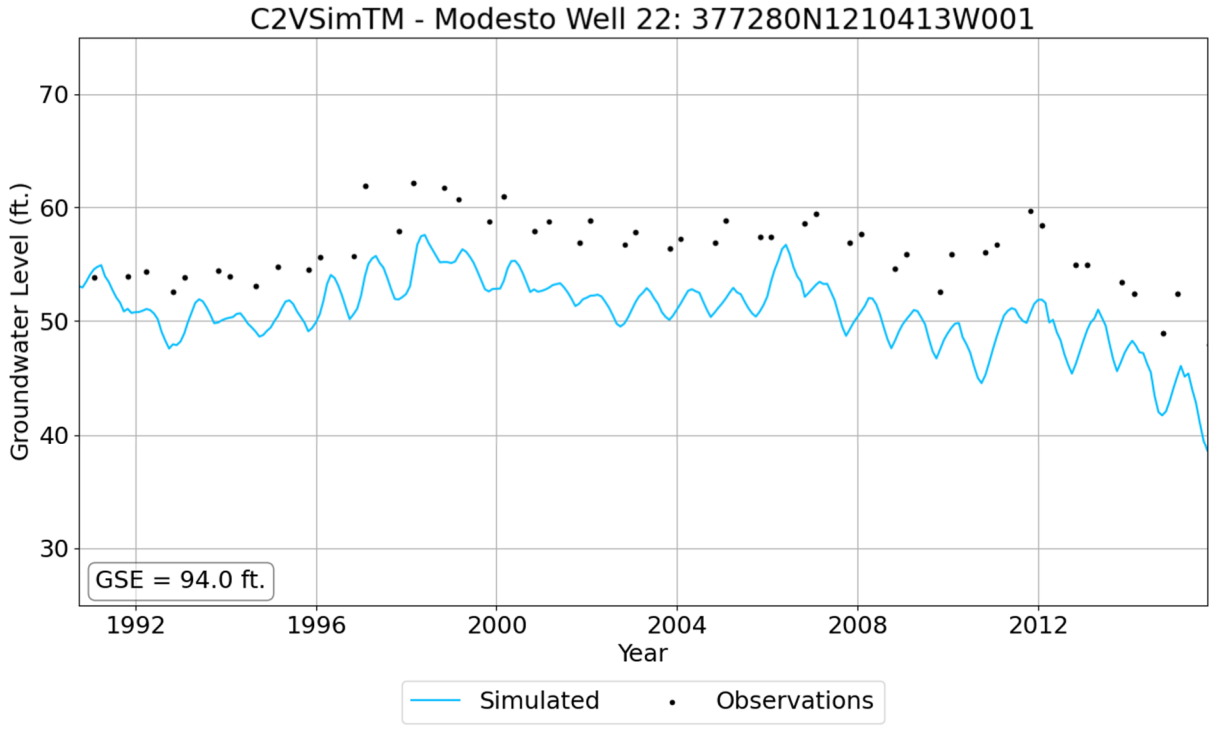

C2VSimTM - Modesto Well 17: 377032N1210652W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 76.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

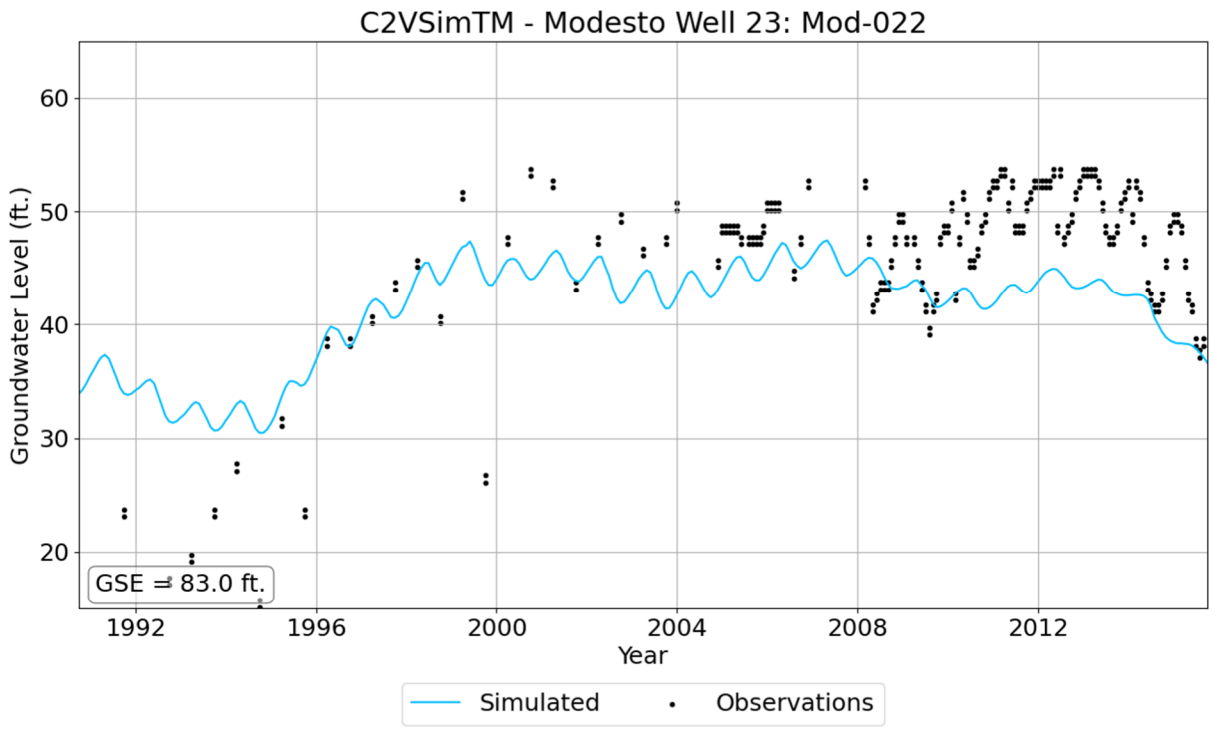

C2VSimTM - Modesto Well 18: MID-234
Groundwater Level (ft.)
60
50
40
30
20
GSE = 68.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

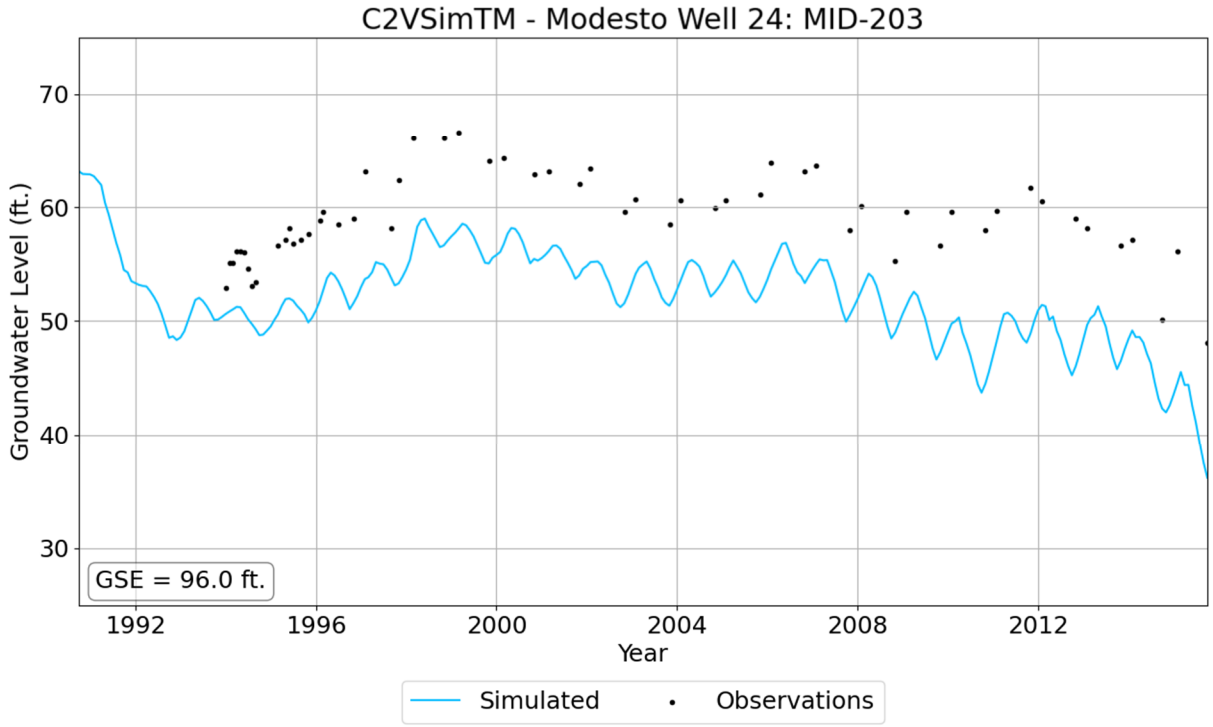

C2VSimTM - Modesto Well 19: 376141N1210577W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 71.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

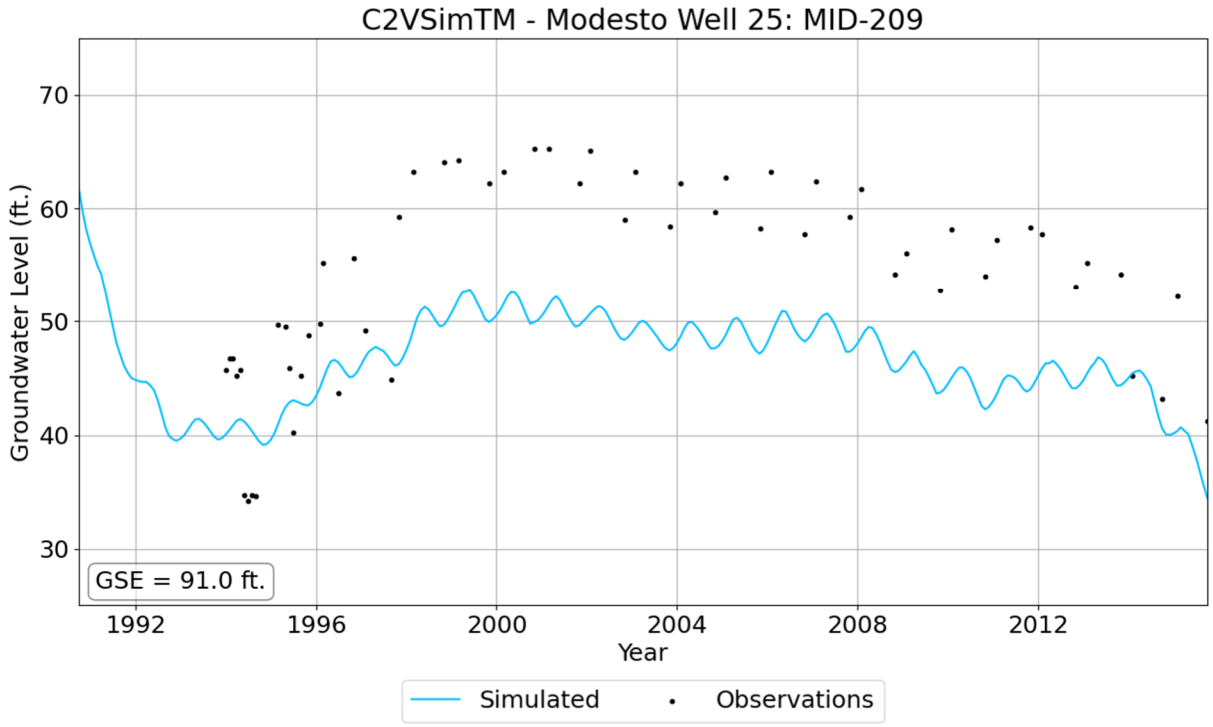

C2VSimTM - Modesto Well 20: MID-021
Groundwater Level (ft.)
60
50
40
30
20
GSE = 77.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

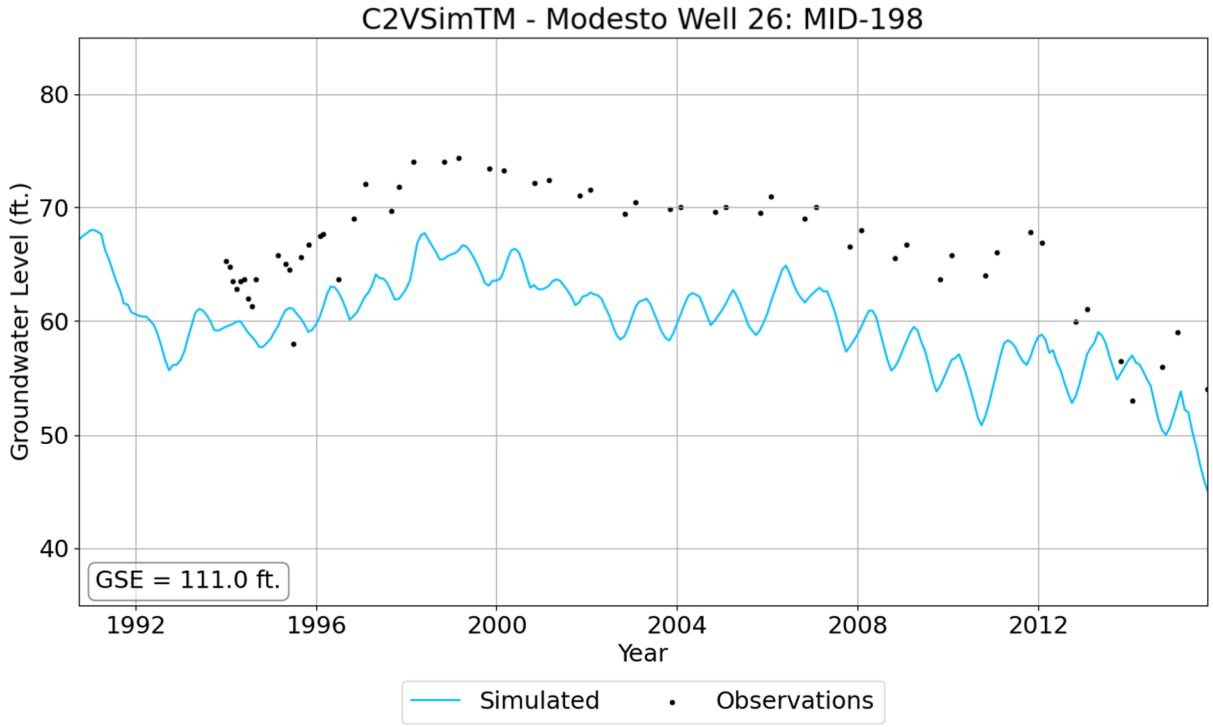

C2VSimTM - Modesto Well 21: 376191N1210499W001
Groundwater Level (ft.)
60
50
40
30
20
GSE = 71.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

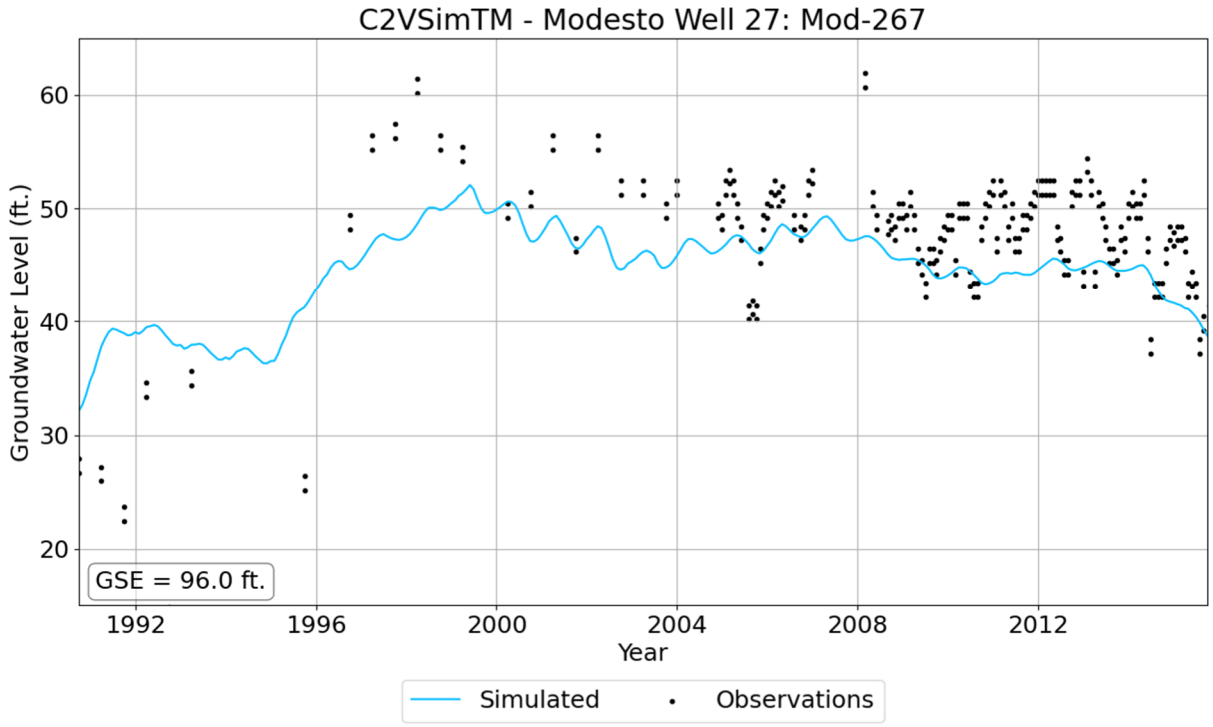

C2VSimTM - Modesto Well 22: 377280N1210413W001
Groundwater Level (ft.)
70
60
50
40
30
GSE = 94.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

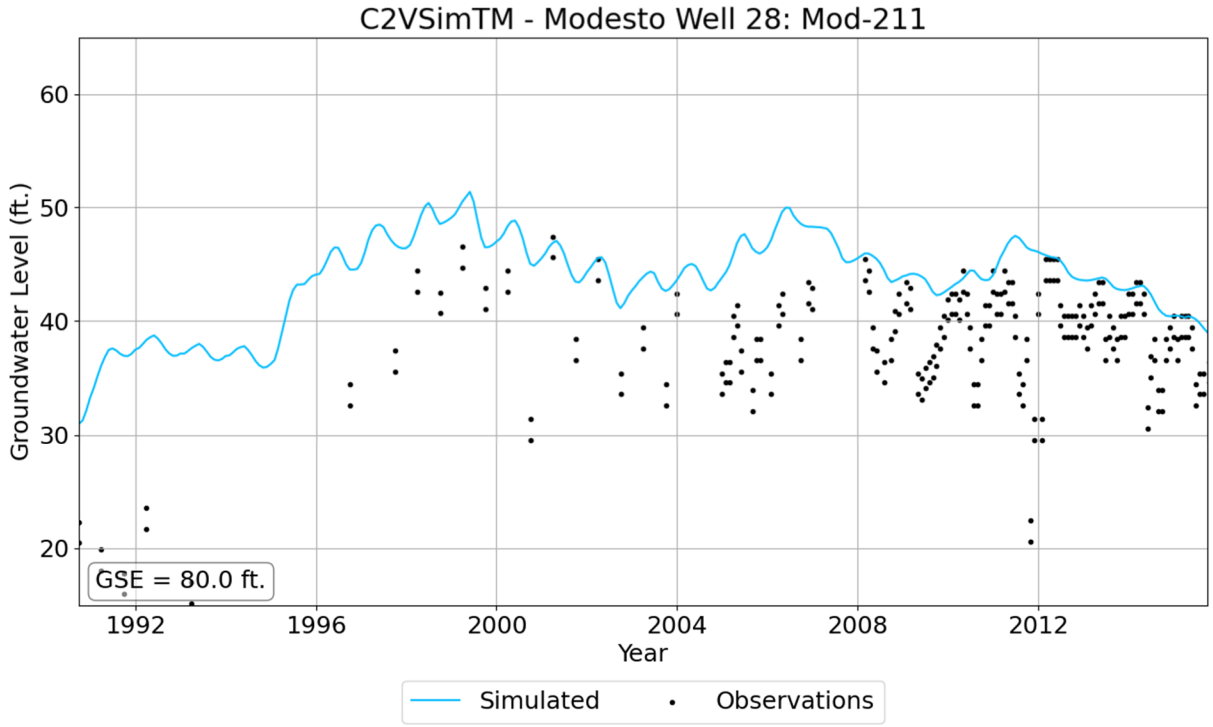

C2VSimTM - Modesto Well 23: Mod-022
Groundwater Level (ft.)
60
50
40
30
20
GSE = 83.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

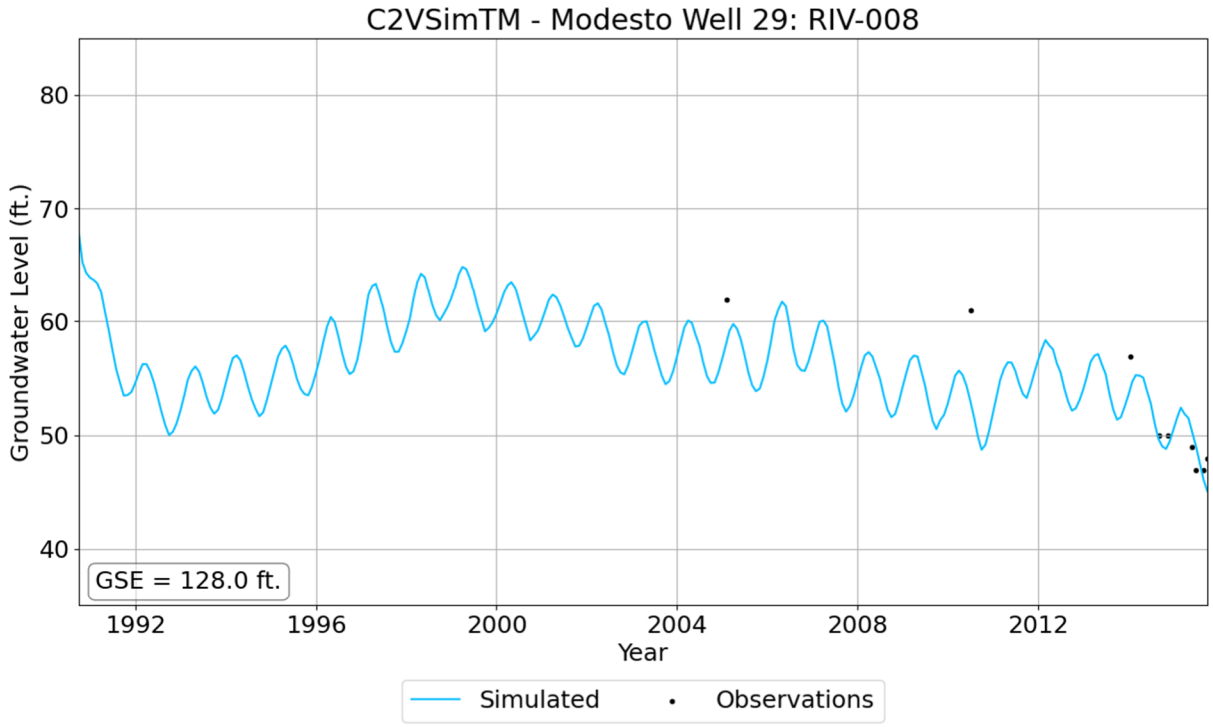

C2VSimTM - Modesto Well 24: MID-203
Groundwater Level (ft.)
70
60
50
40
30
GSE = 96.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

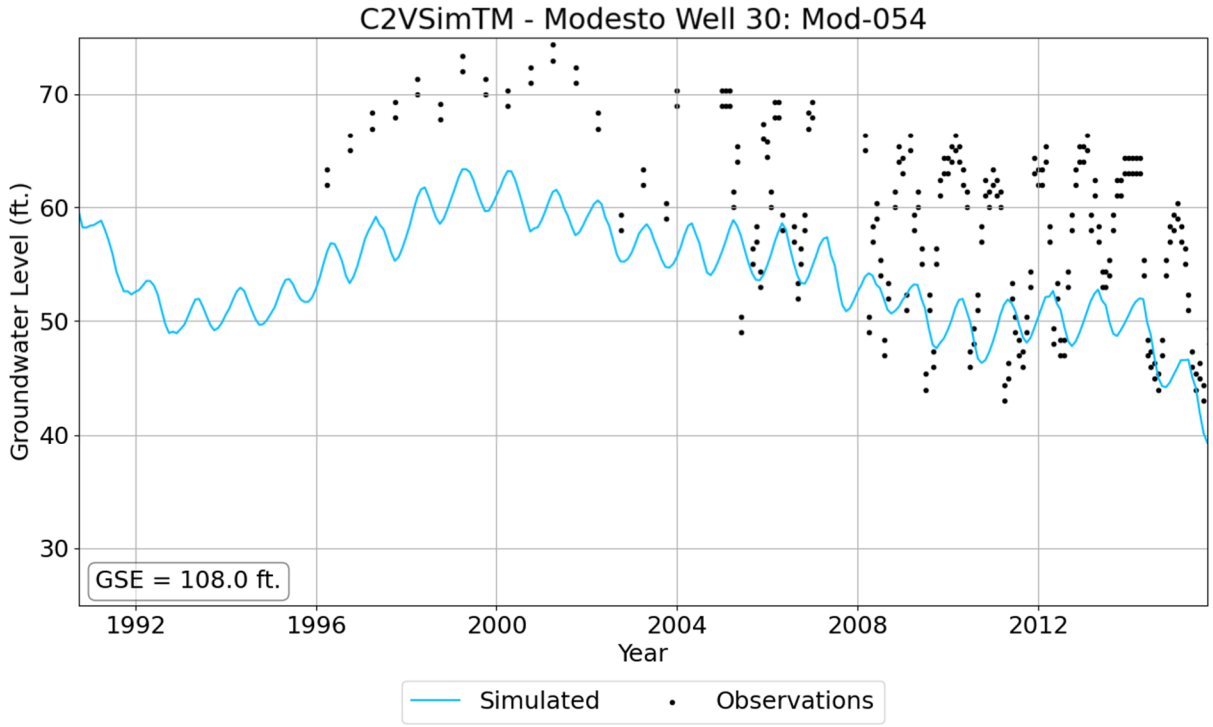

C2VSimTM - Modesto Well 25: MID-209
Groundwater Level (ft.)
70
60
50
40
30
GSE = 91.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

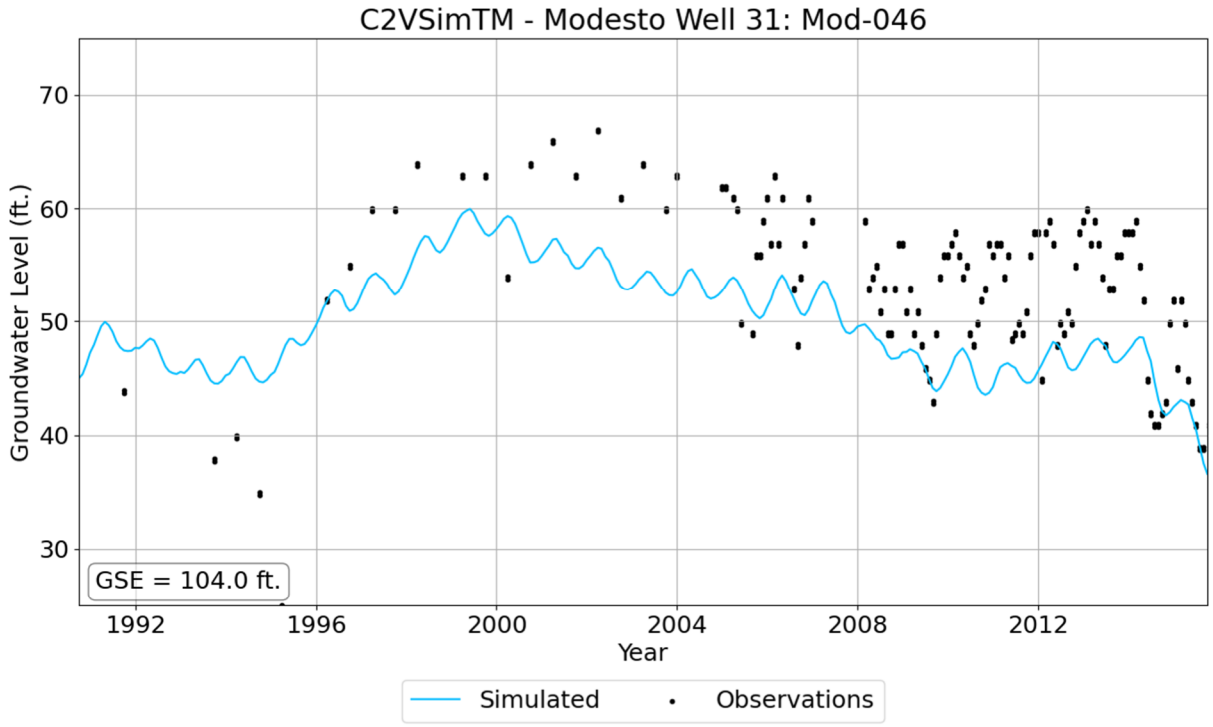

C2VSimTM - Modesto Well 26: MID-198
Groundwater Level (ft.)
80
70
60
50
40
GSE = 111.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

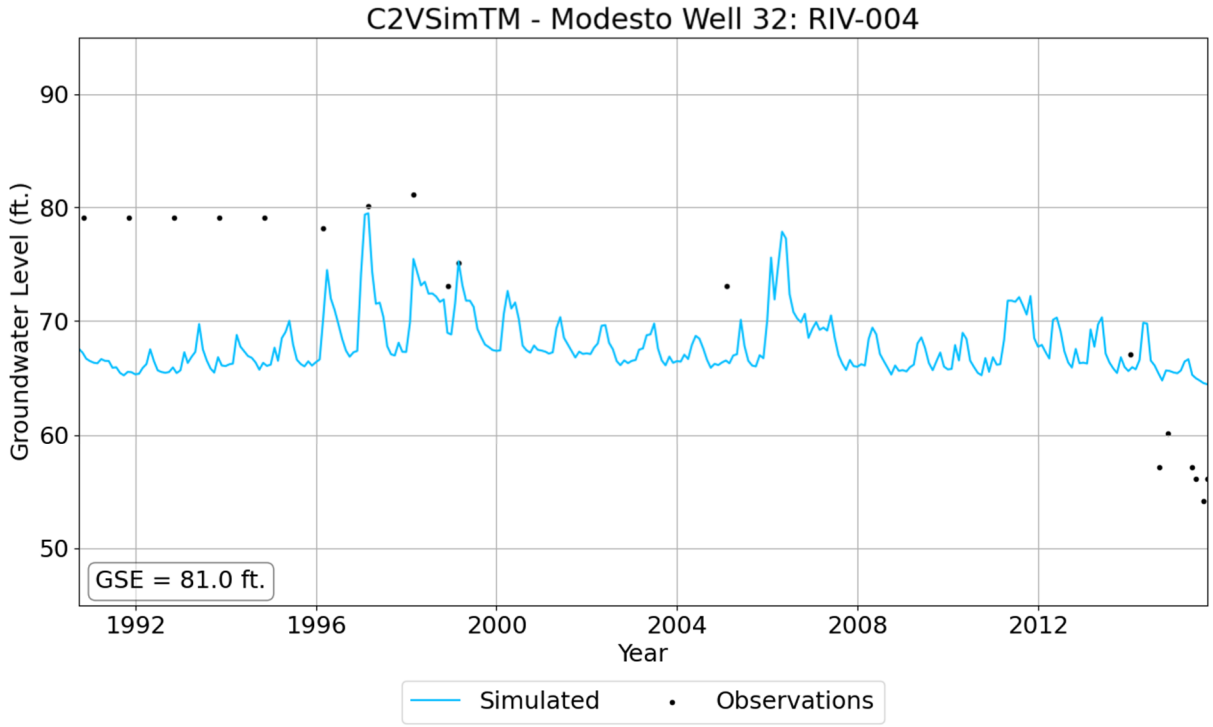

C2VSimTM - Modesto Well 27: Mod-267
Groundwater Level (ft.)
60
50
40
30
20
GSE = 96.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

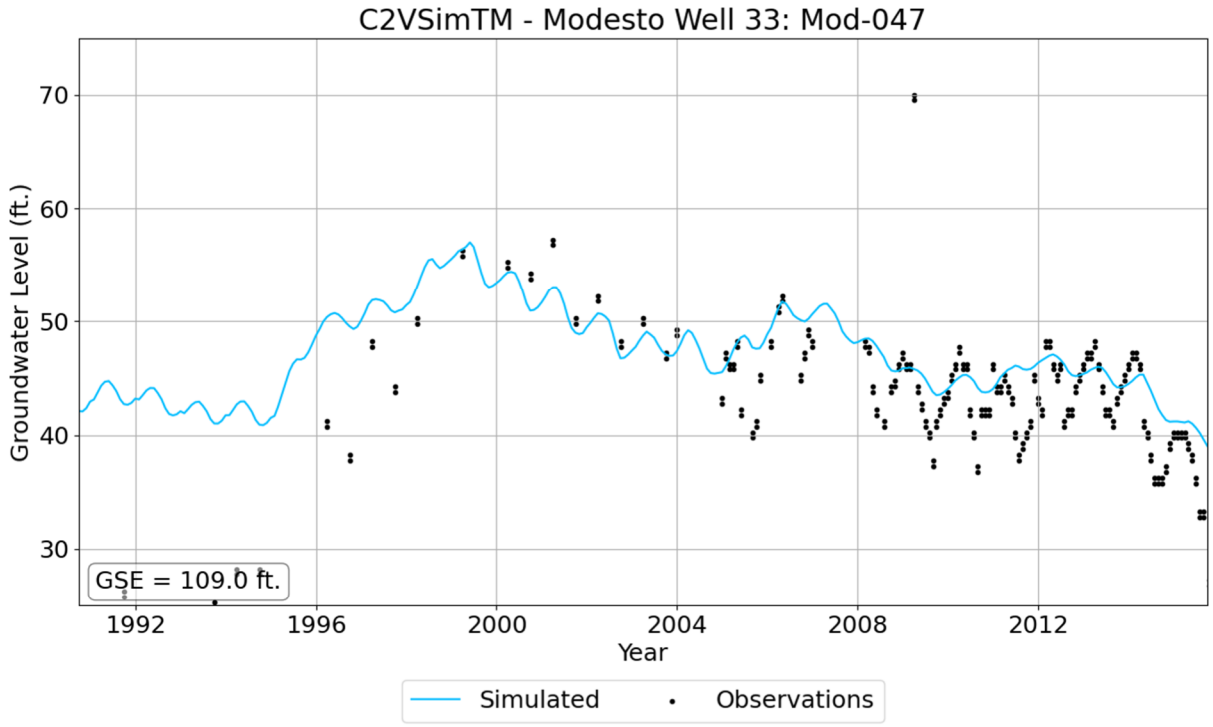

C2VSimTM - Modesto Well 28: Mod-211
Groundwater Level (ft.)
60
50
40
30
20
GSE = 80.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

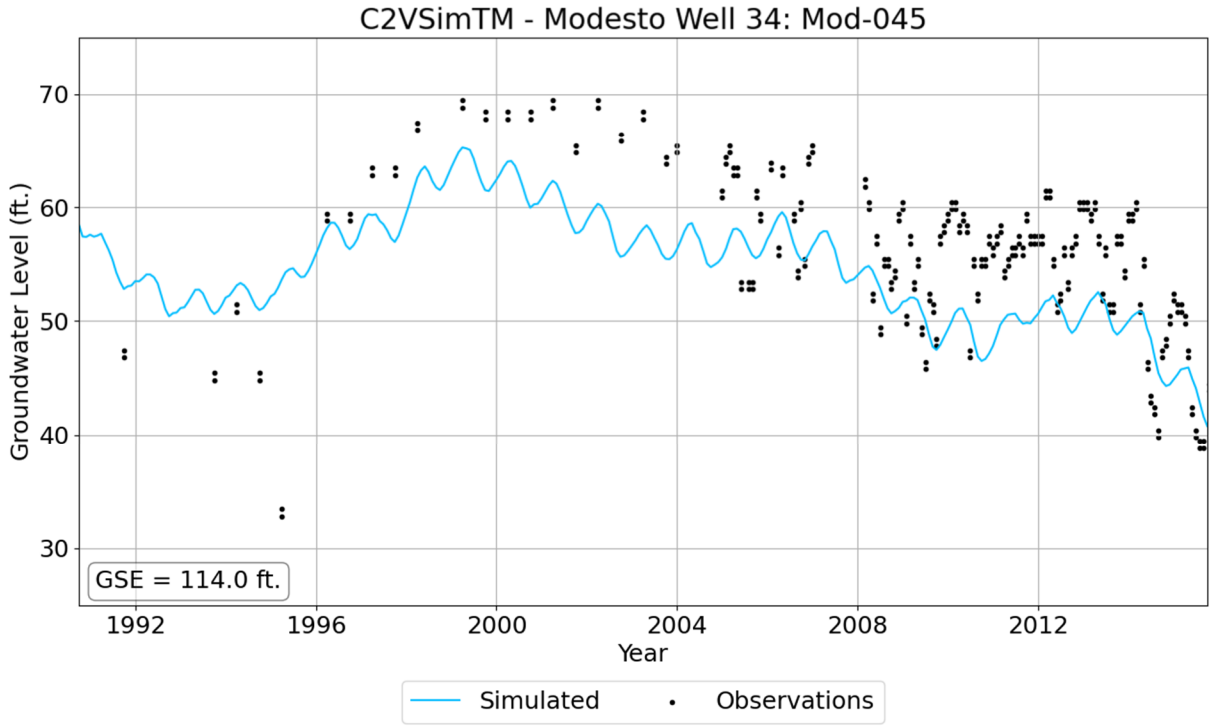

C2VSimTM - Modesto Well 29: RIV-008
Groundwater Level (ft.)
80
70
60
50
40
GSE = 128.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

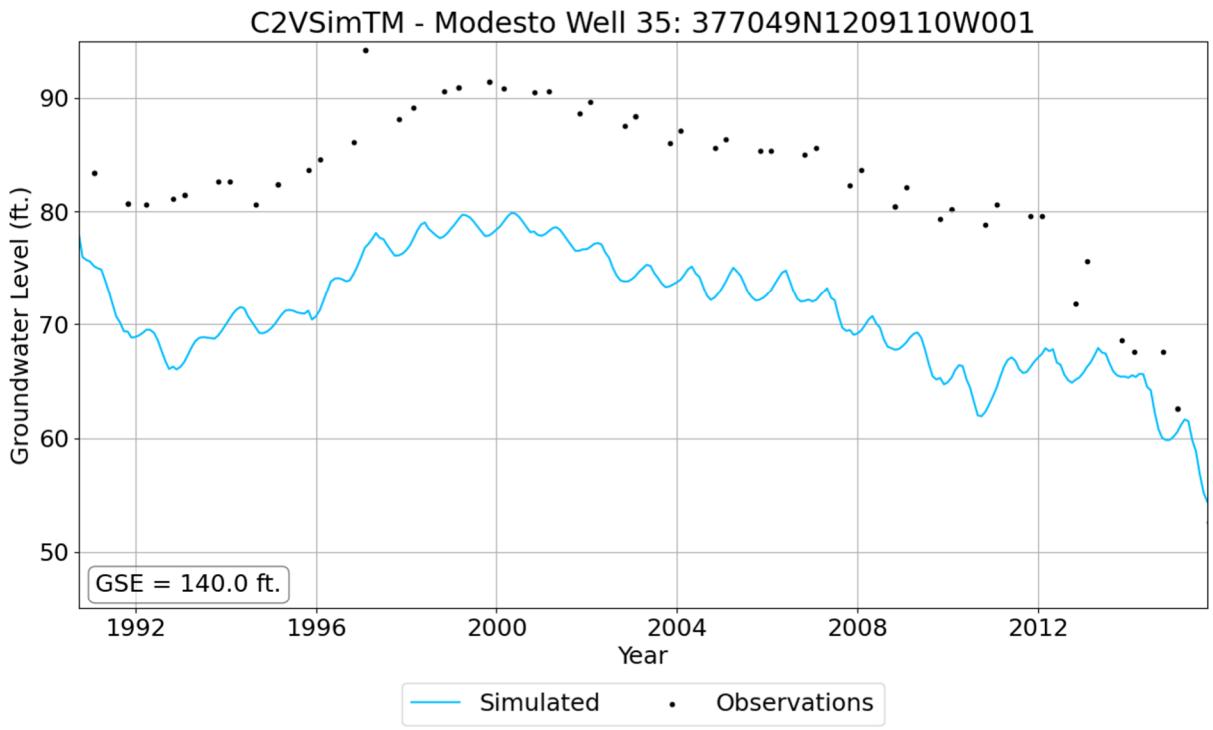

C2VSimTM - Modesto Well 30: Mod-054
Groundwater Level (ft.)
70
60
50
40
30
GSE = 108.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

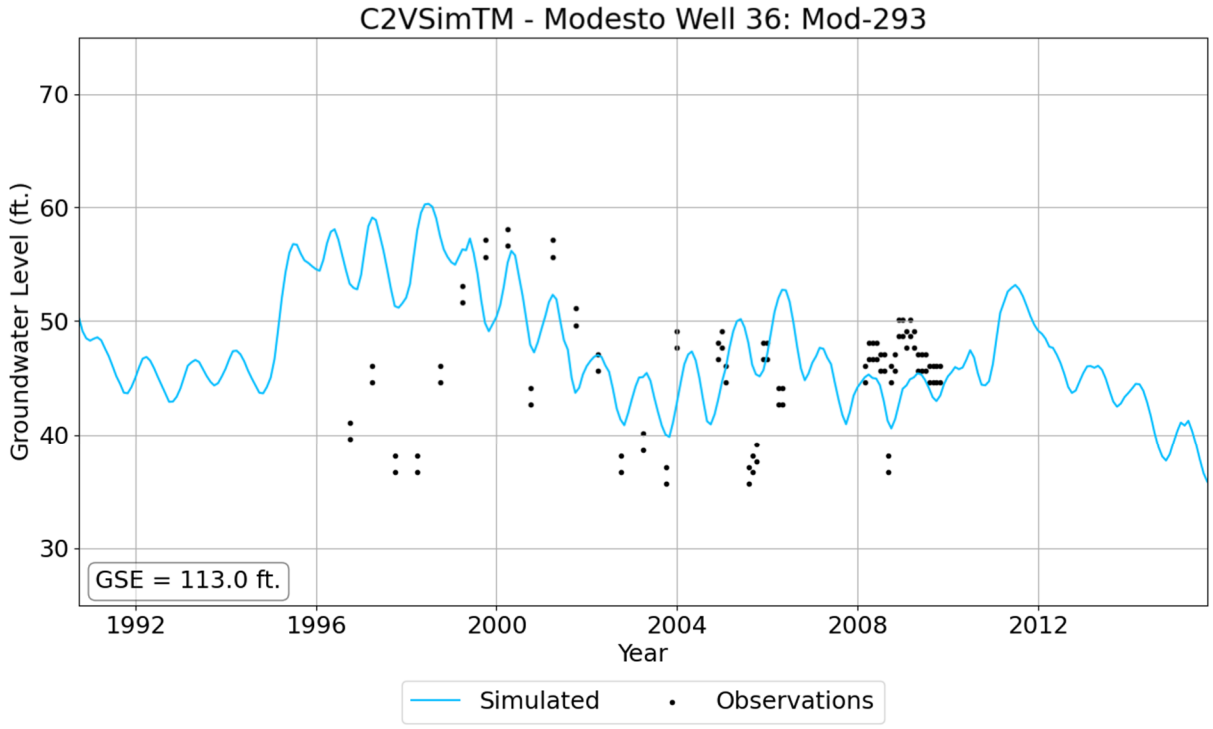

C2VSimTM - Modesto Well 31: Mod-046
Groundwater Level (ft.)
70
60
50
40
30
GSE = 104.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

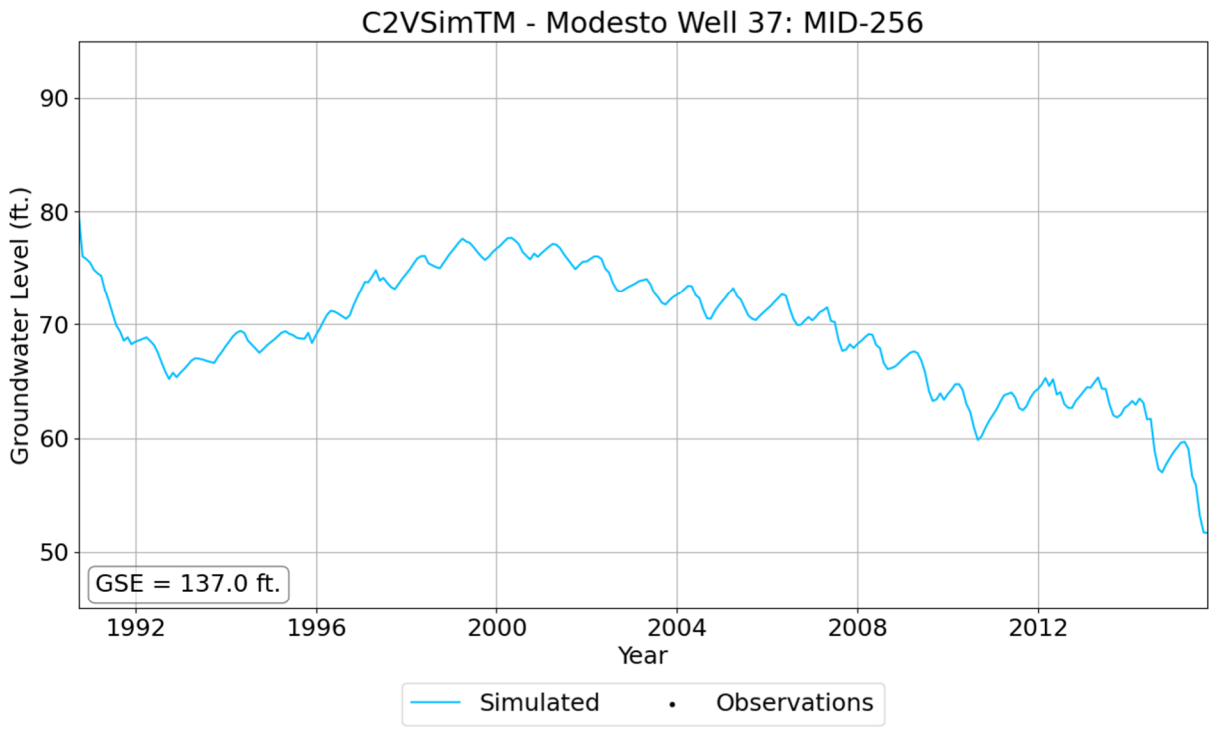

C2VSimTM - Modesto Well 32: RIV-004
Groundwater Level (ft.)
90
80
70
60
50
GSE = 81.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

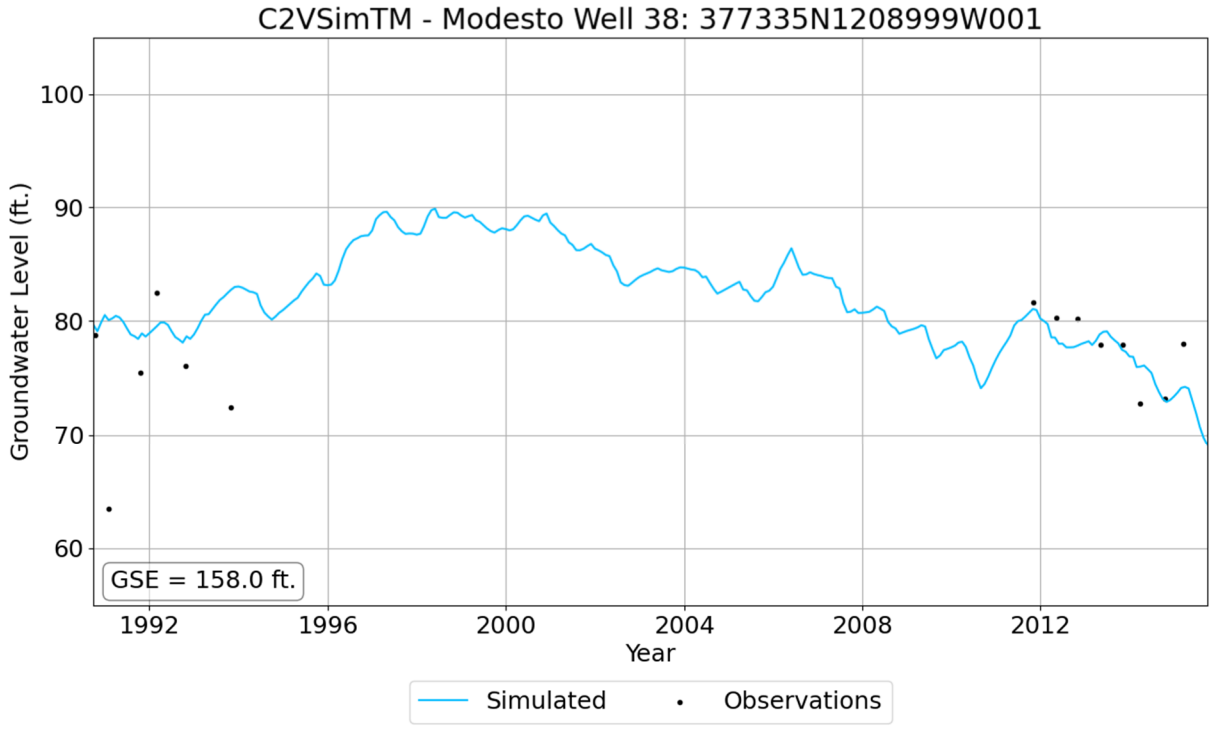

C2VSimTM - Modesto Well 33: Mod-047
Groundwater Level (ft.)
70
60
50
40
30
GSE = 109.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

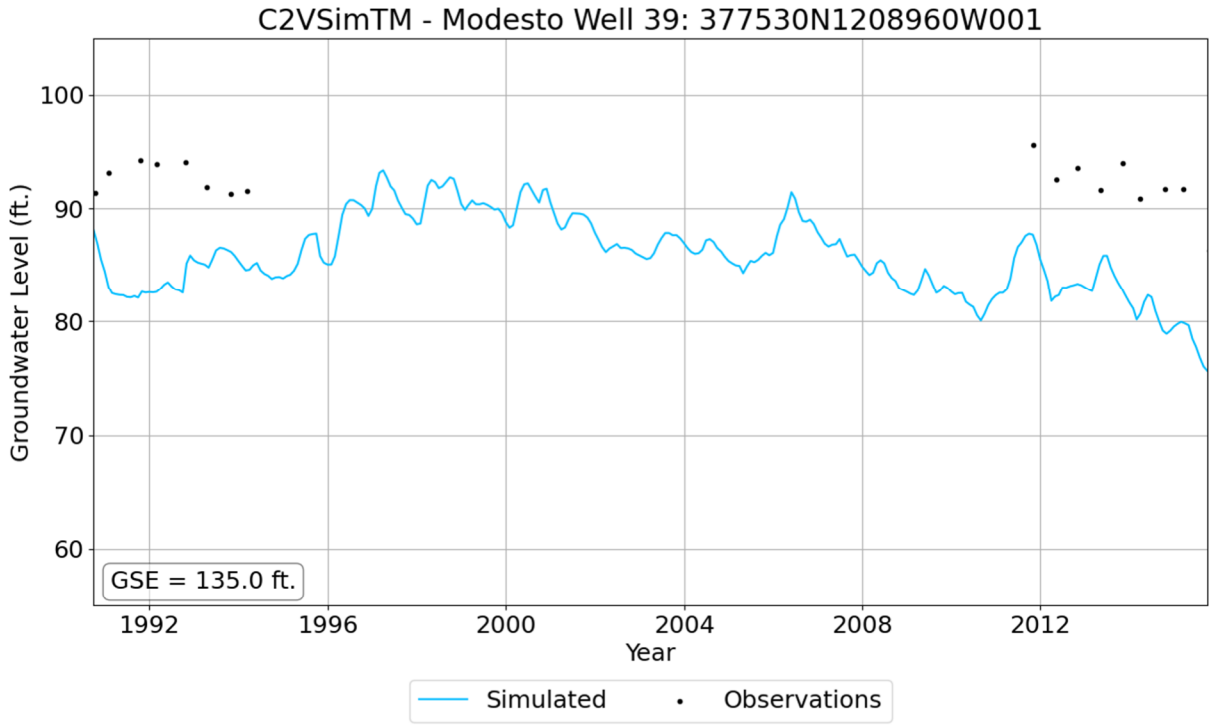

C2VSimTM - Modesto Well 34: Mod-045
Groundwater Level (ft.)
70
60
50
40
30
GSE = 114.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

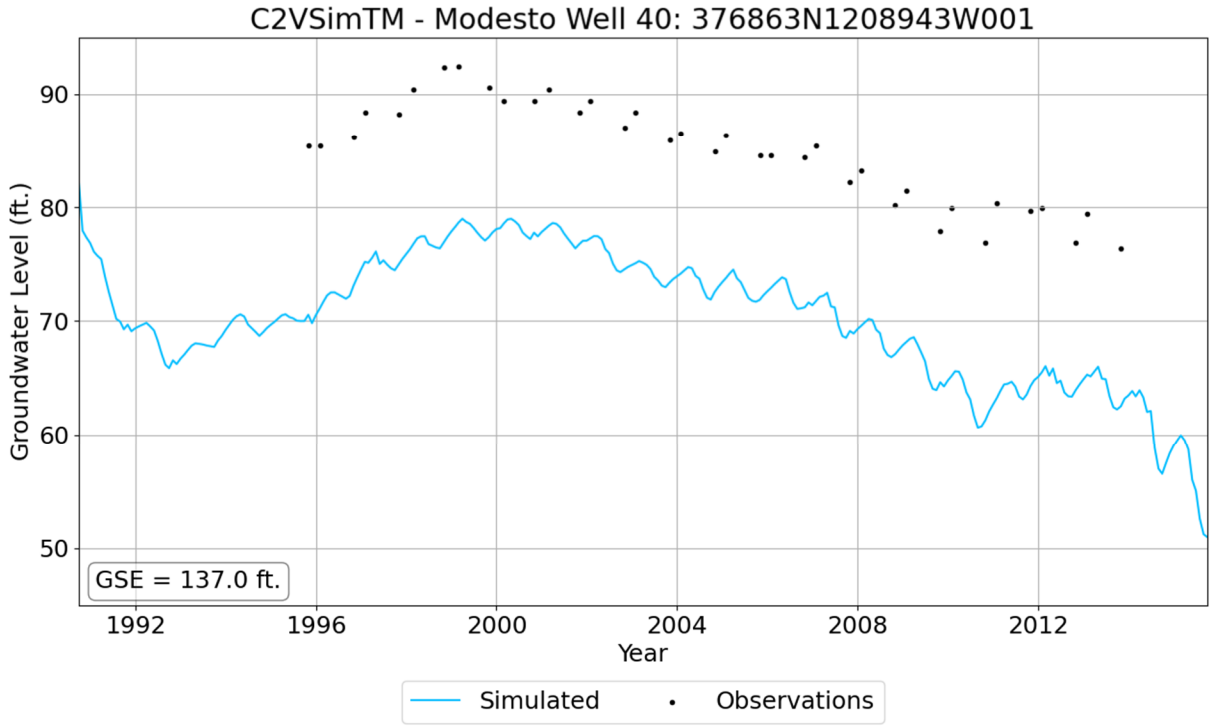

C2VSimTM - Modesto Well 35: 377049N1209110W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 140.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

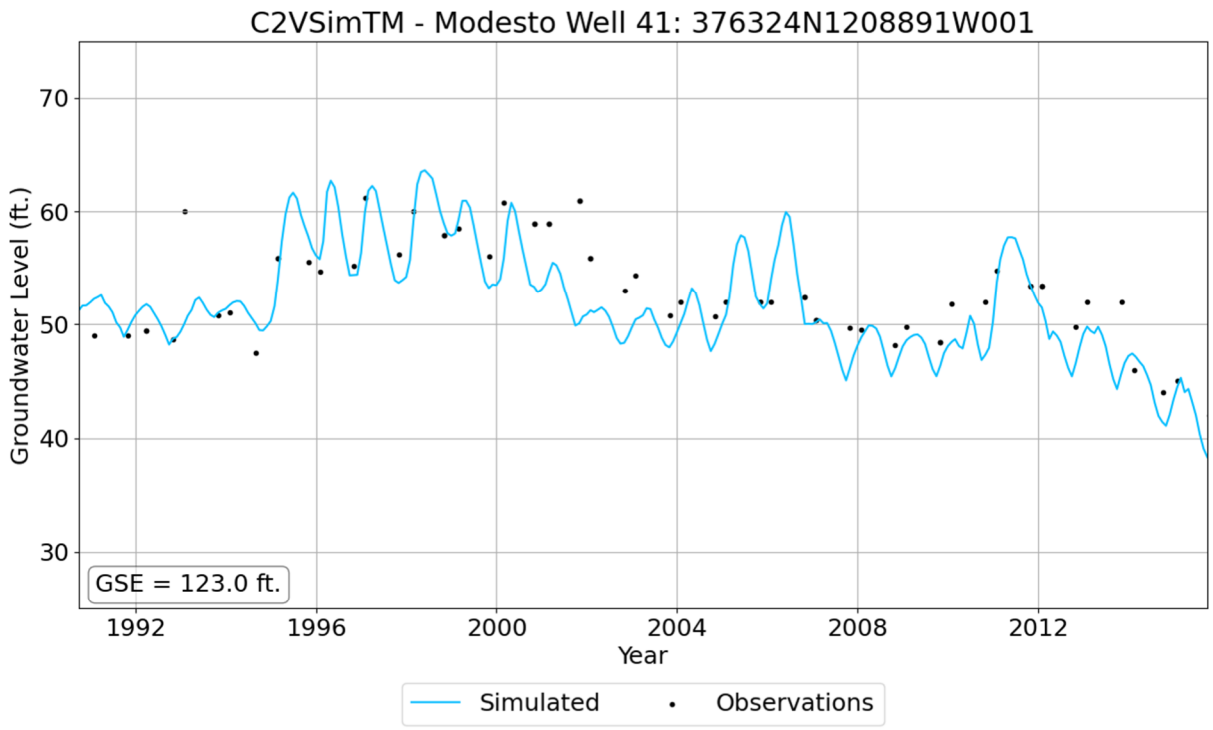

C2VSimTM - Modesto Well 36: Mod-293
Groundwater Level (ft.)
70
60
50
40
30
GSE = 113.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

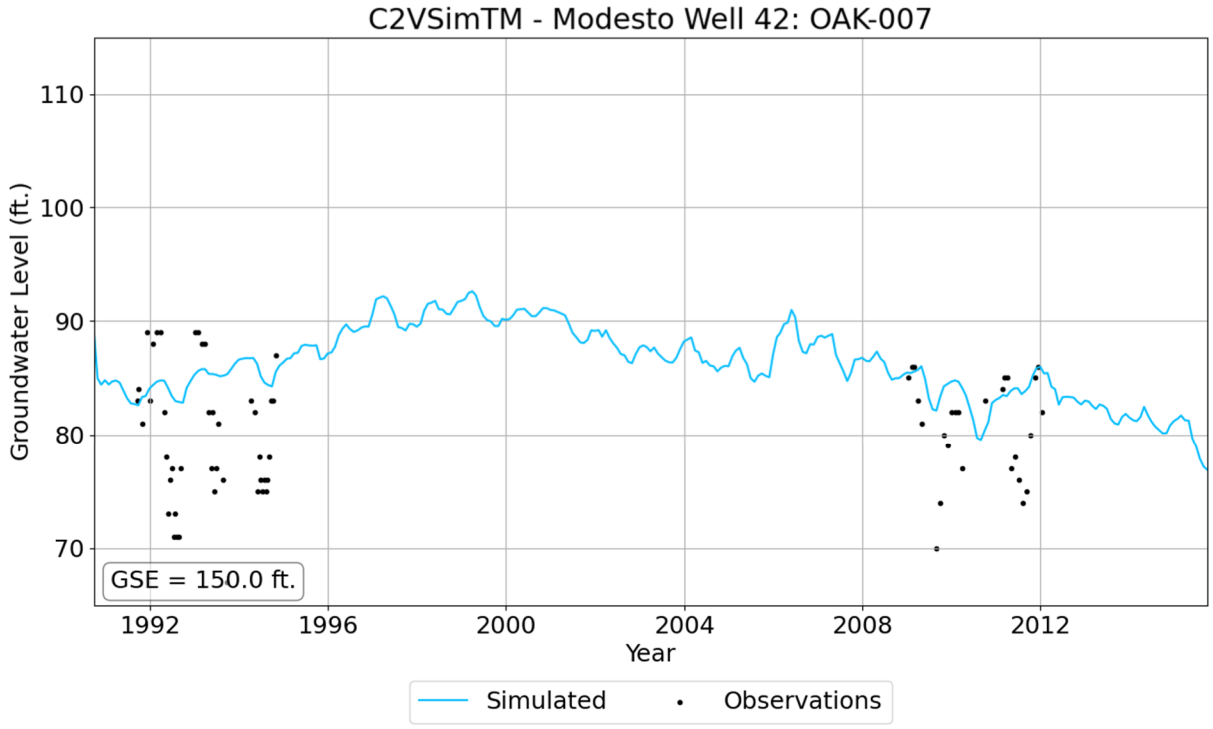

C2VSimTM - Modesto Well 37: MID-256
Groundwater Level (ft.)
90
80
70
60
50
GSE = 137.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

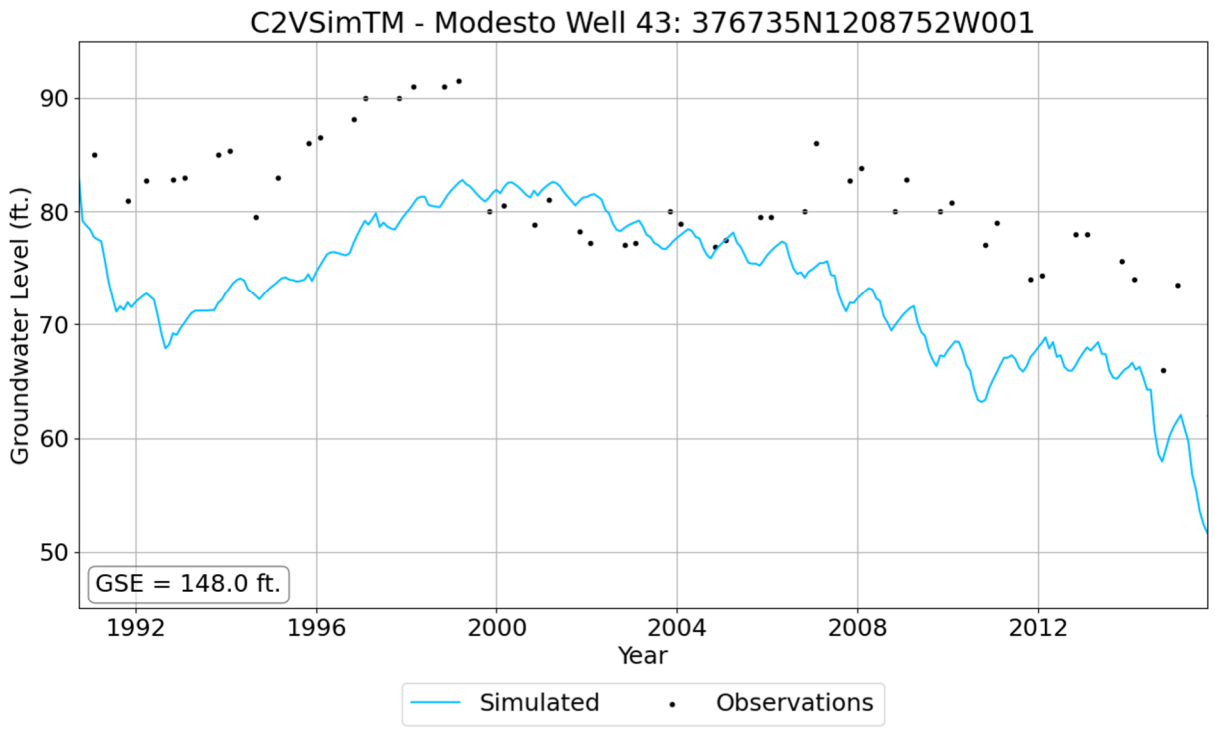

C2VSimTM - Modesto Well 38: 377335N1208999W001
Groundwater Level (ft.)
100
90
80
70
60
GSE = 158.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

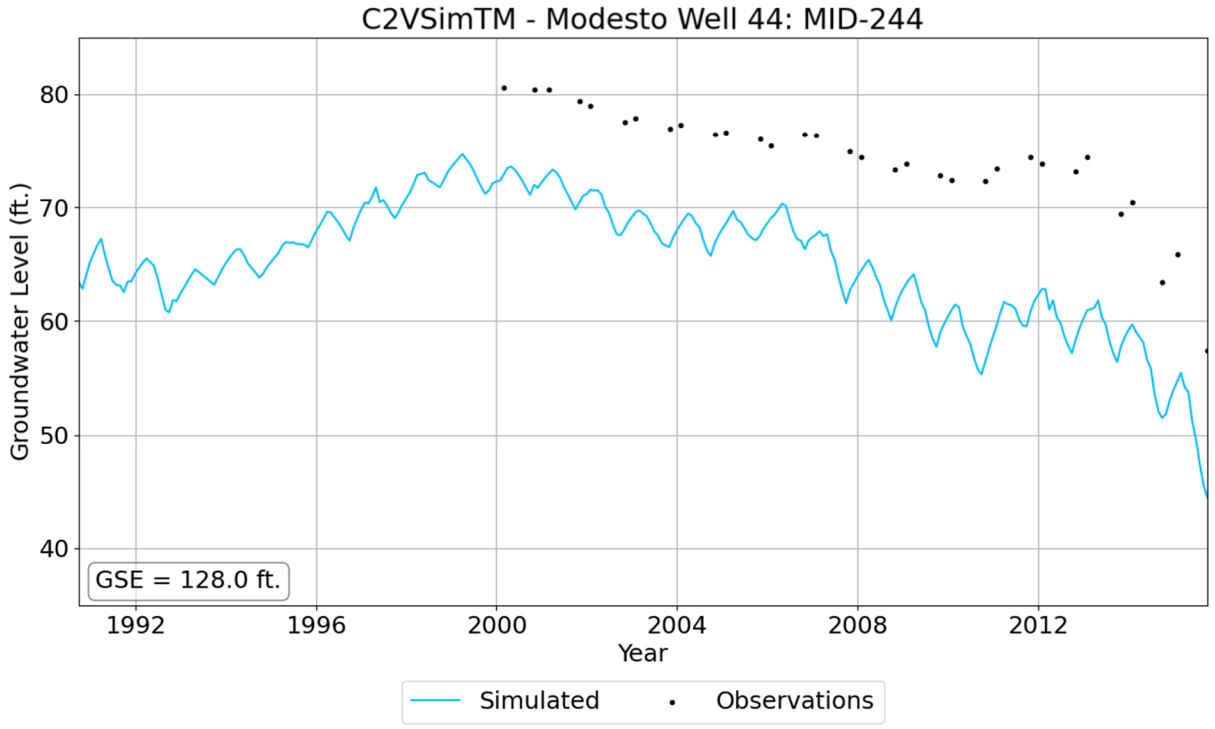

C2VSimTM - Modesto Well 39: 377530N1208960W001
Groundwater Level (ft.)
100
90
80
70
60
GSE = 135.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

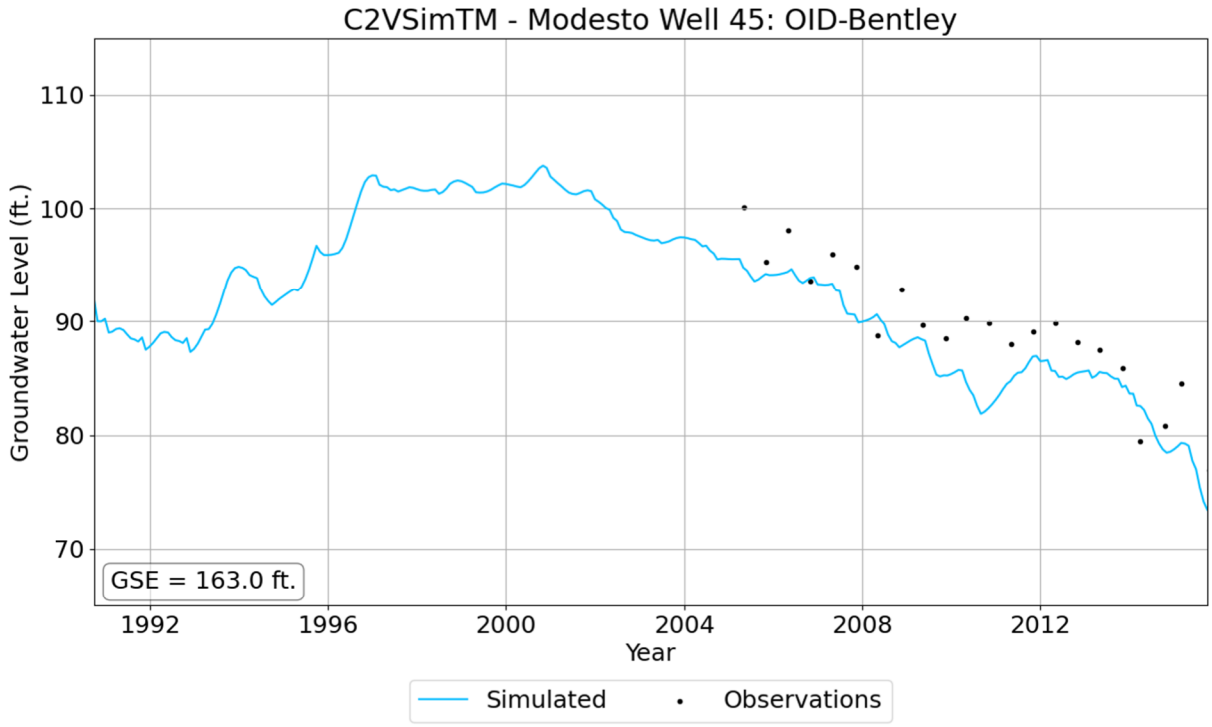

C2VSimTM - Modesto Well 40: 376863N1208943W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 137.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

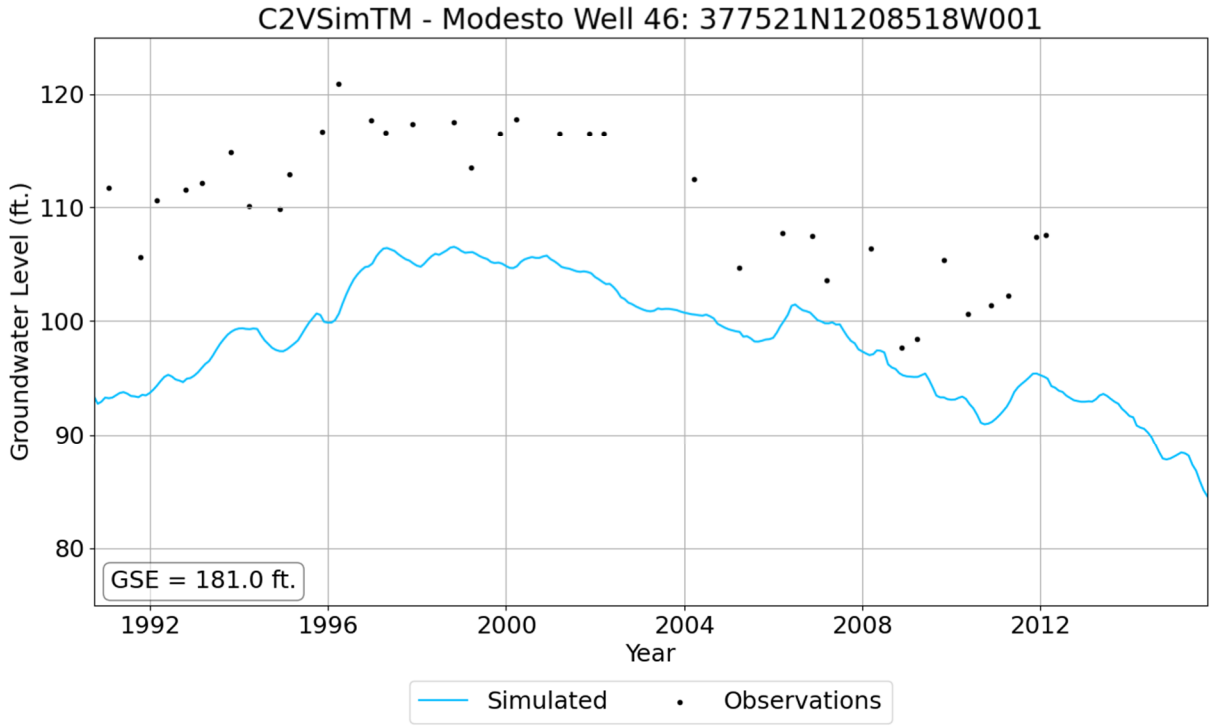

C2VSimTM - Modesto Well 41: 376324N1208891W001
Groundwater Level (ft.)
70
60
50
40
30
GSE = 123.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

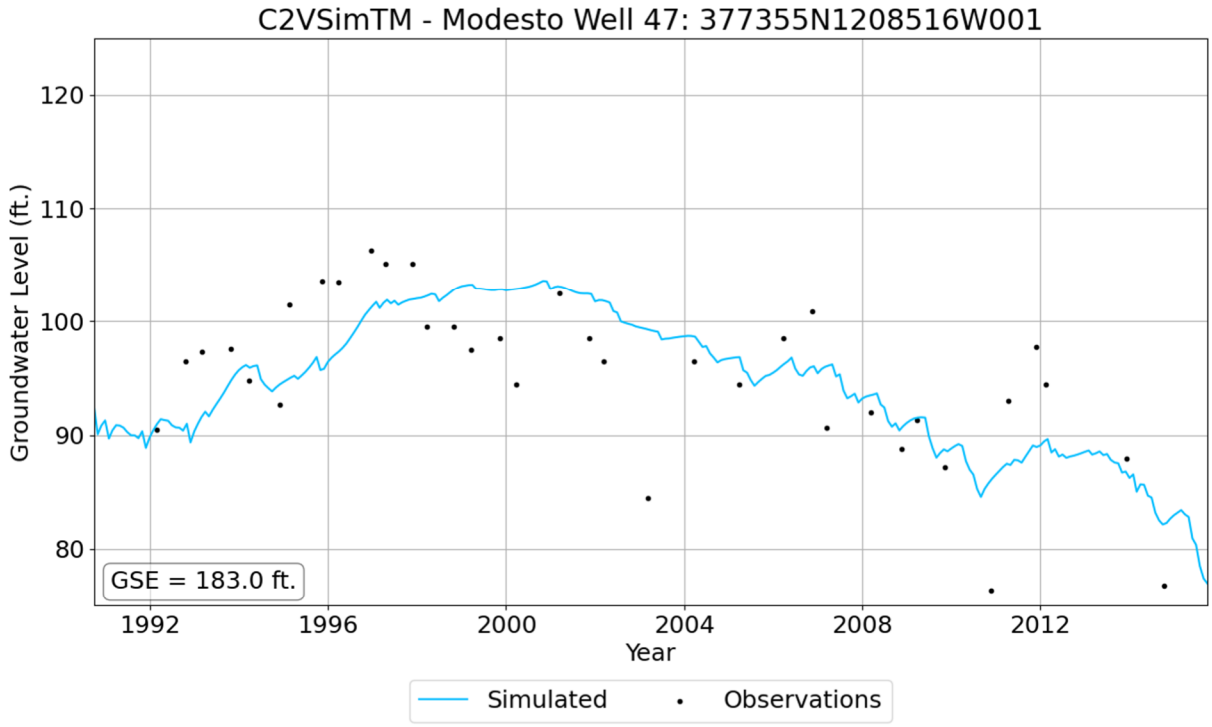

C2VSimTM - Modesto Well 42: OAK-007
Groundwater Level (ft.)
110
100
90
80
70
GSE = 150.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

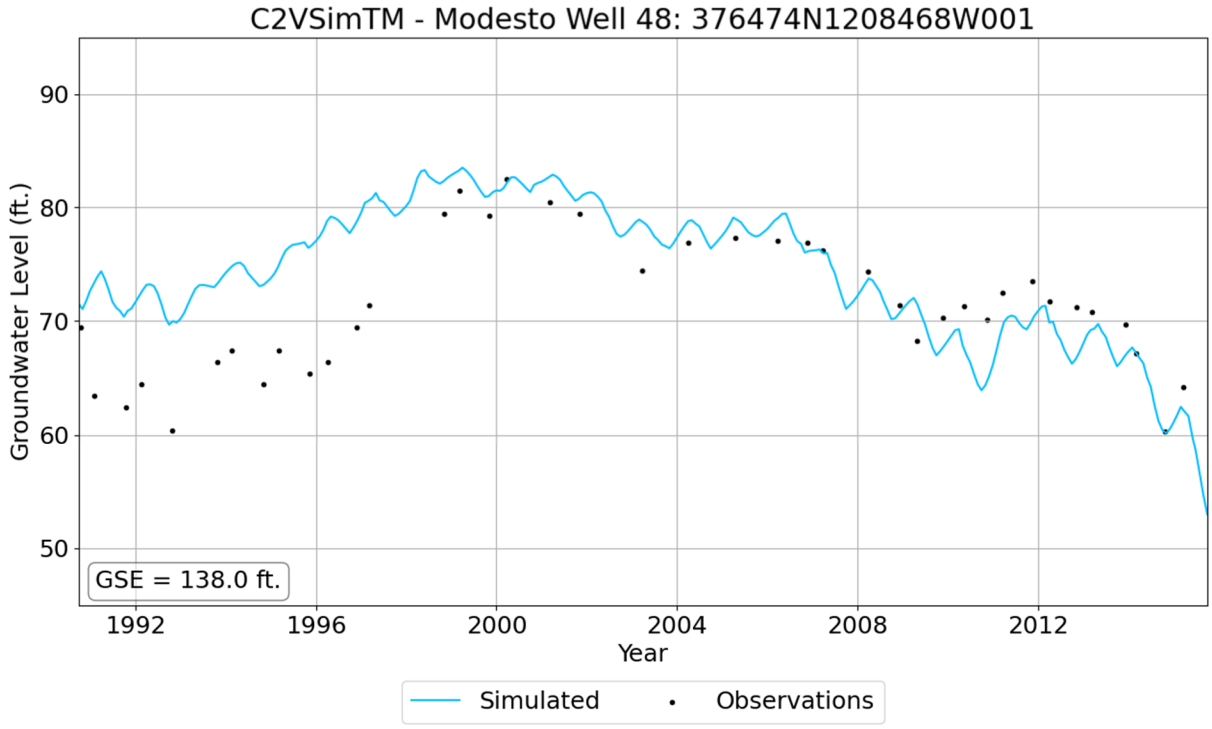

C2VSimTM - Modesto Well 43: 376735N1208752W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 148.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

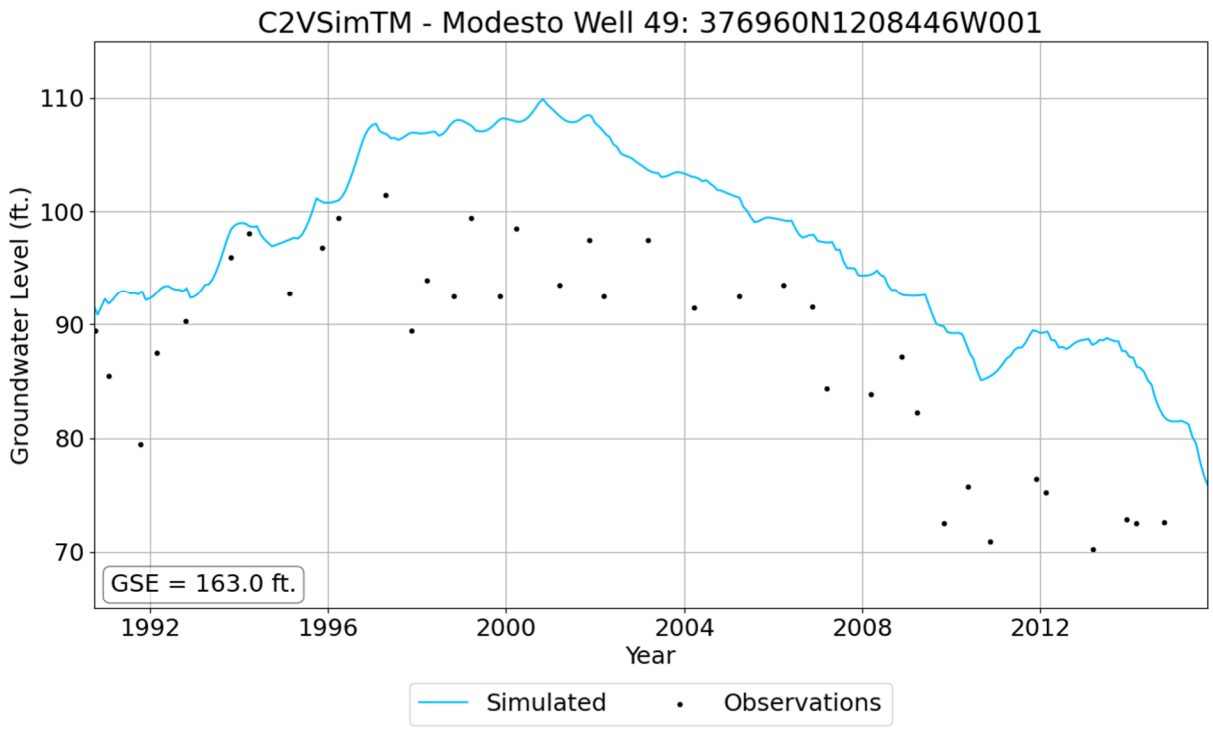

C2VSimTM - Modesto Well 44: MID-244
Groundwater Level (ft.)
80
70
60
50
40
GSE = 128.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

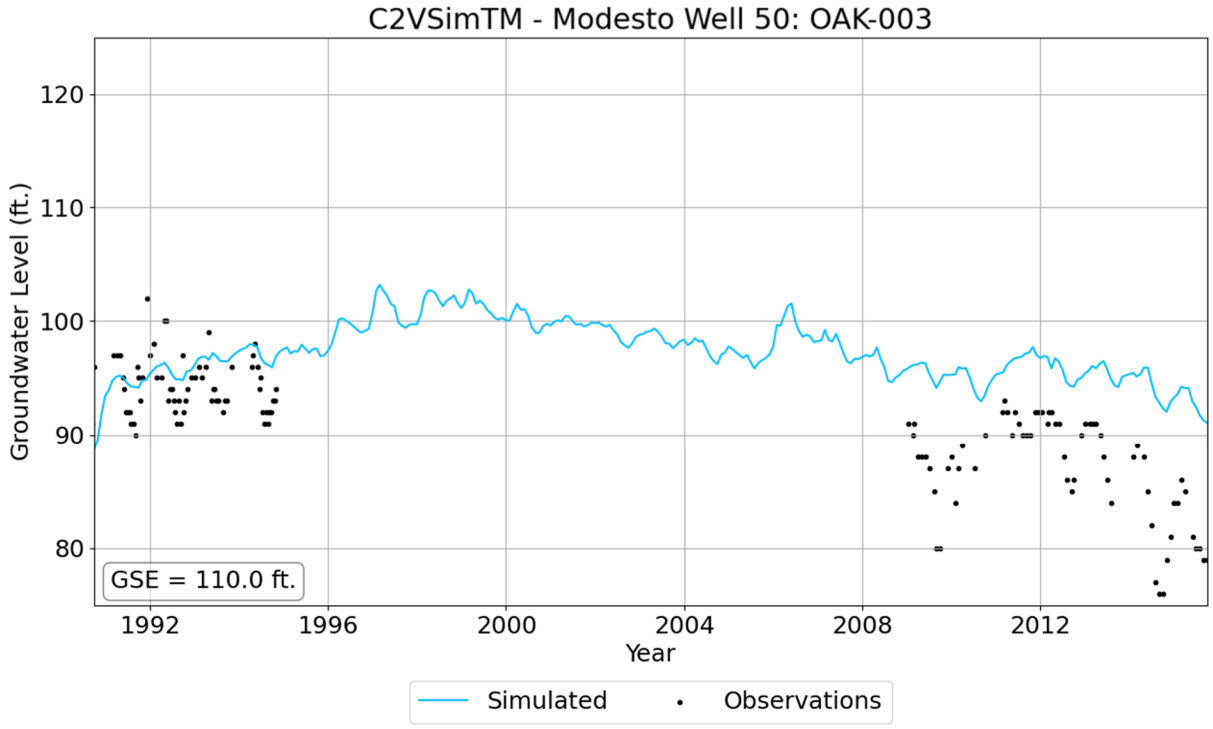

C2VSimTM - Modesto Well 45: OID-Bentley
Groundwater Level (ft.)
110
100
90
80
70
GSE = 163.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

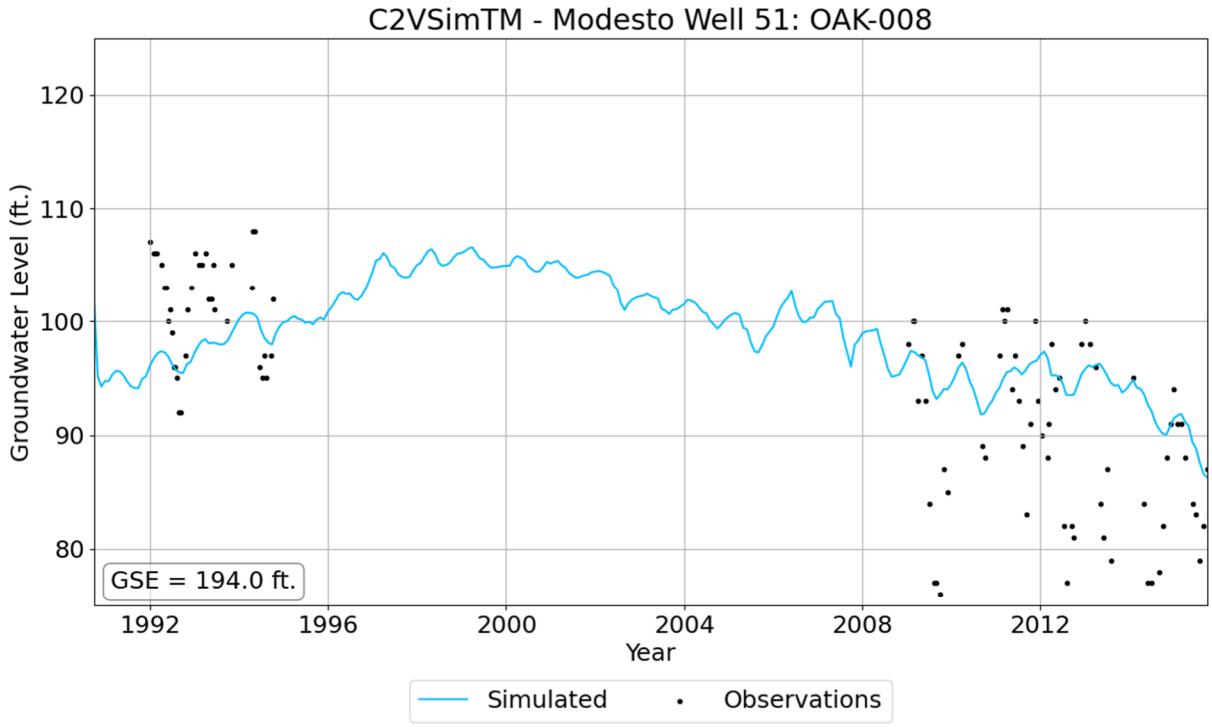

C2VSimTM - Modesto Well 46: 377521N1208518W001
Groundwater Level (ft.)
120
110
100
90
80
GSE = 181.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

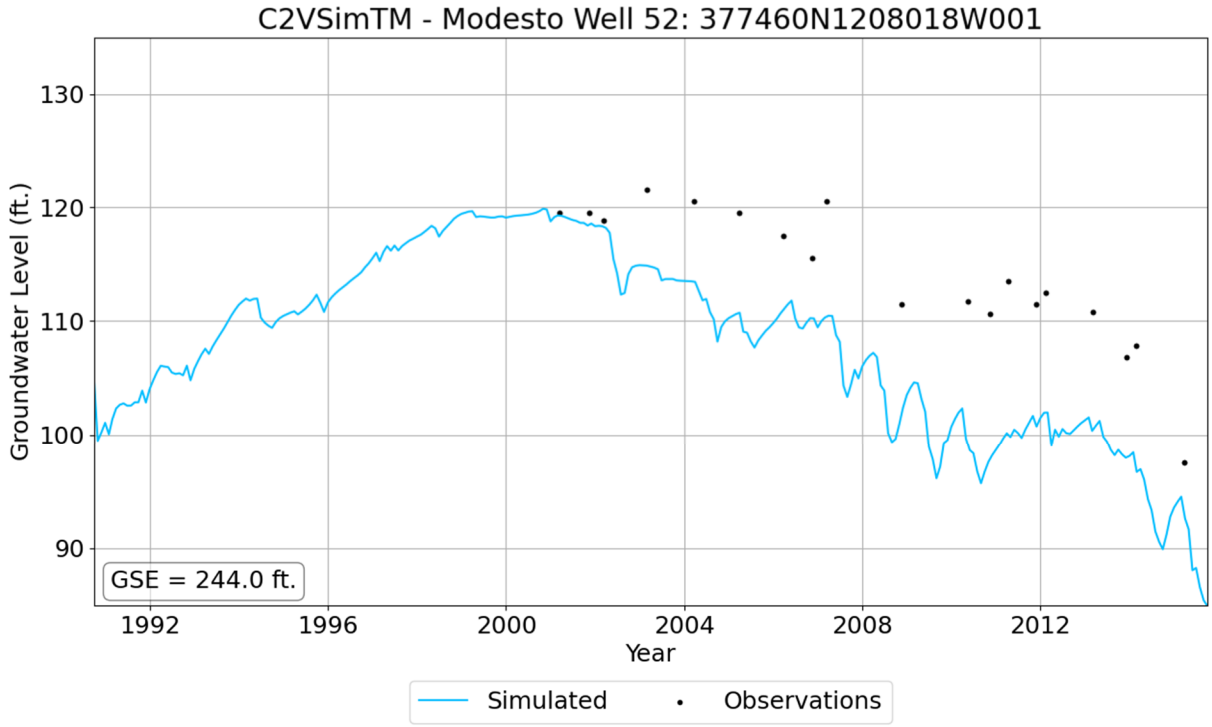

C2VSimTM - Modesto Well 47: 377355N1208516W001
Groundwater Level (ft.)
120
110
100
90
80
GSE = 183.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

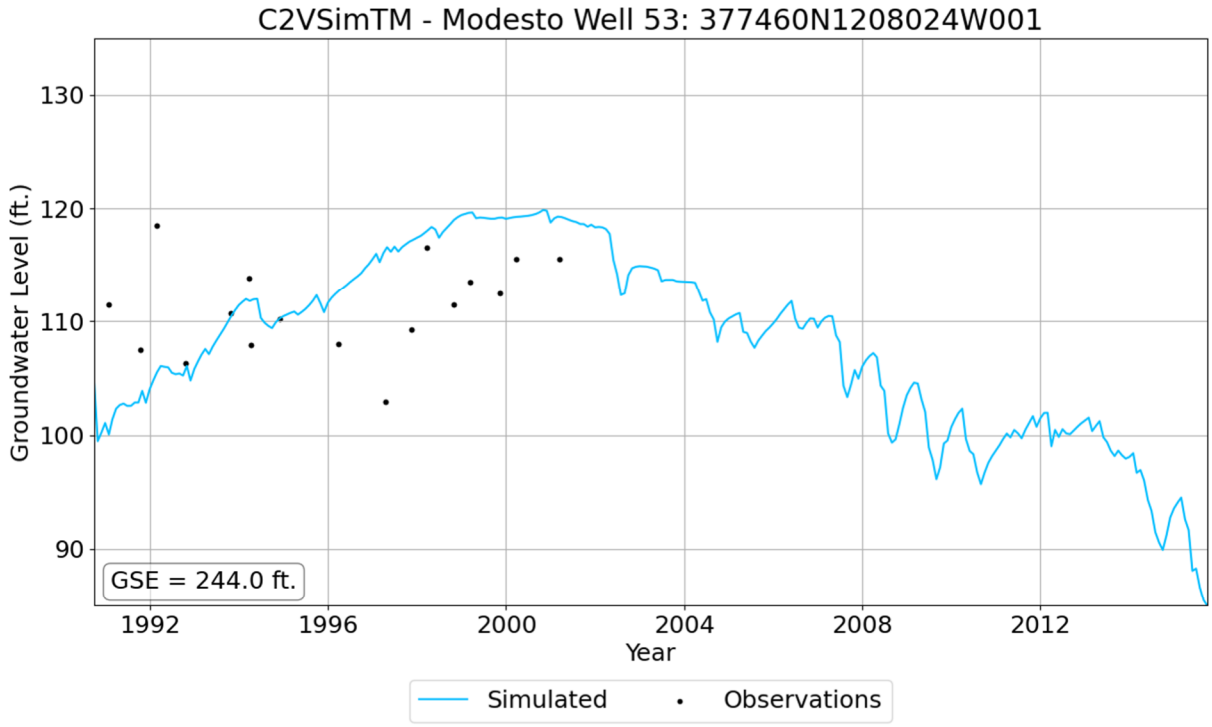

C2VSimTM - Modesto Well 48: 376474N1208468W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 138.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

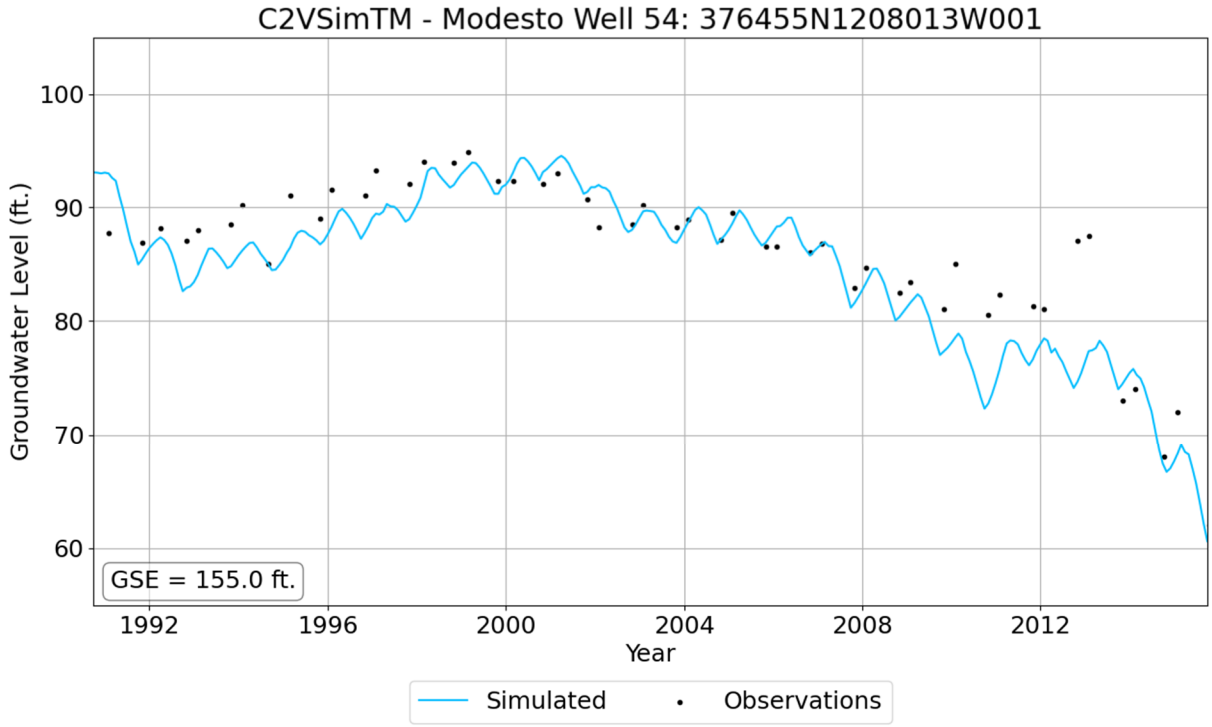

C2VSimTM - Modesto Well 49: 376960N1208446W001
Groundwater Level (ft.)
110
100
90
80
70
GSE = 163.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

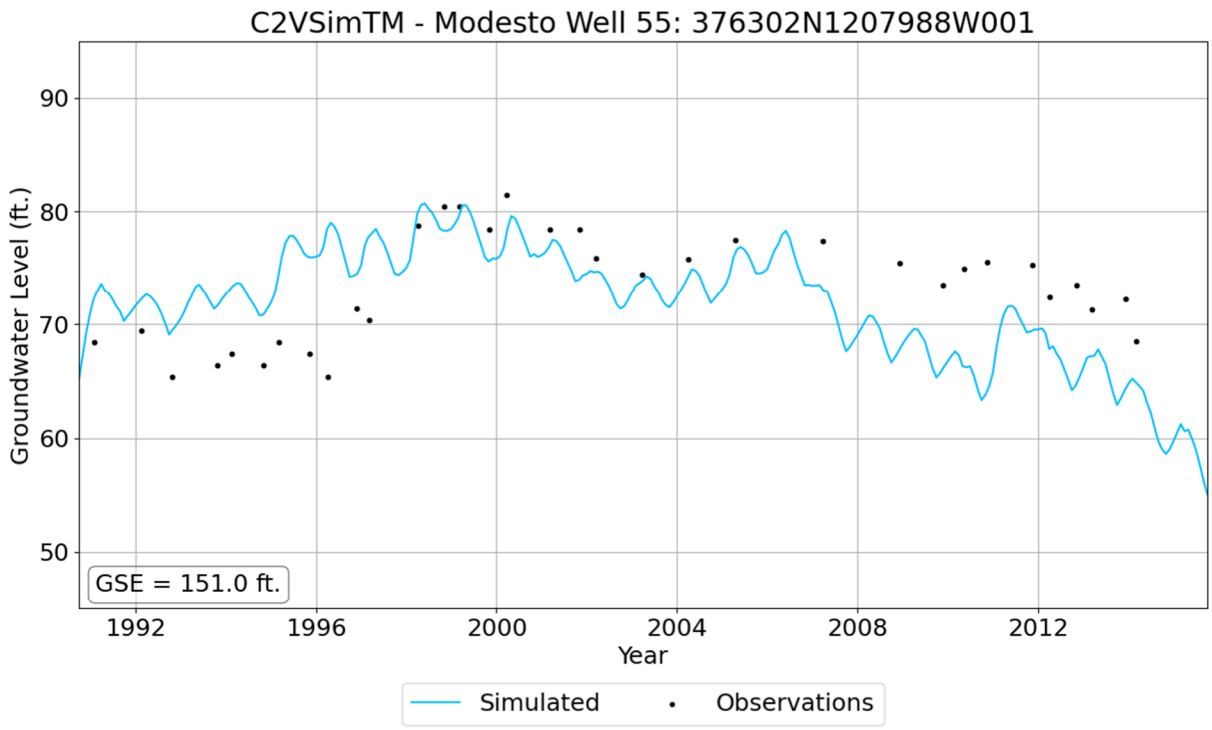

C2VSimTM - Modesto Well 50: OAK-003
Groundwater Level (ft.)
120
110
100
90
80
GSE = 110.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

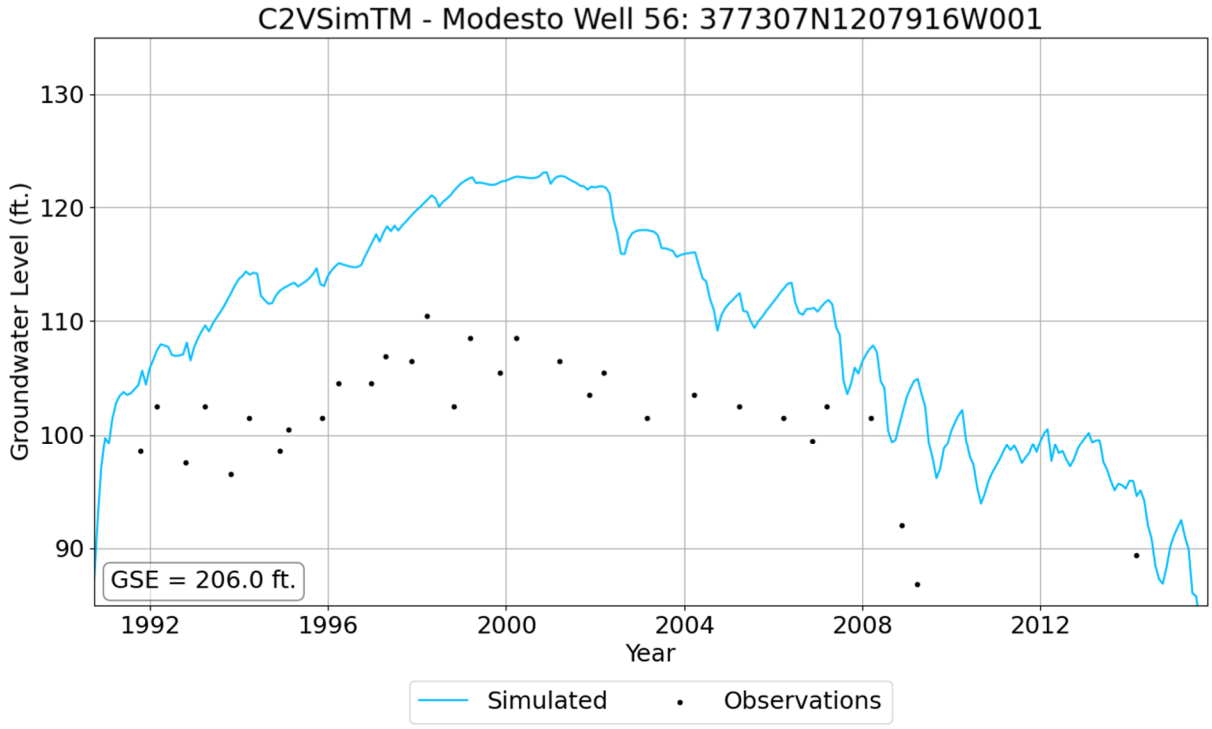

C2VSimTM - Modesto Well 51: OAK-008
Groundwater Level (ft.)
120
110
100
90
80
GSE = 194.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

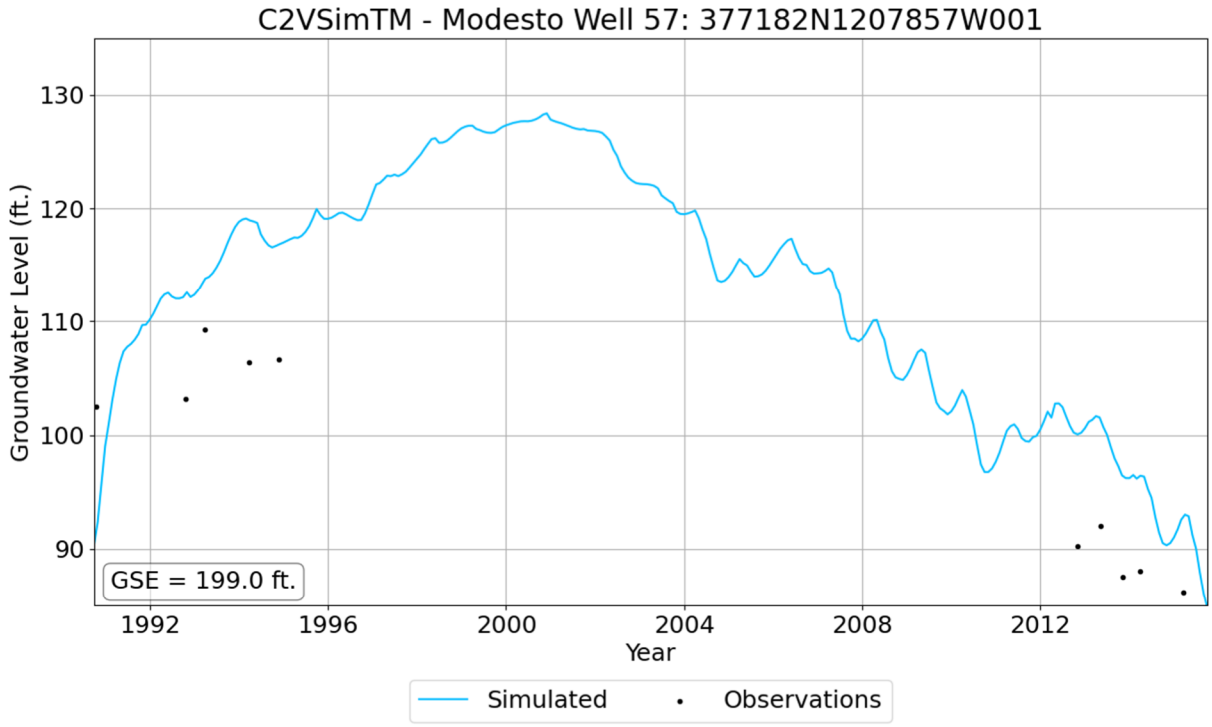

C2VSimTM - Modesto Well 52: 377460N1208018W001
Groundwater Level (ft.)
130
120
110
100
90
GSE = 244.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

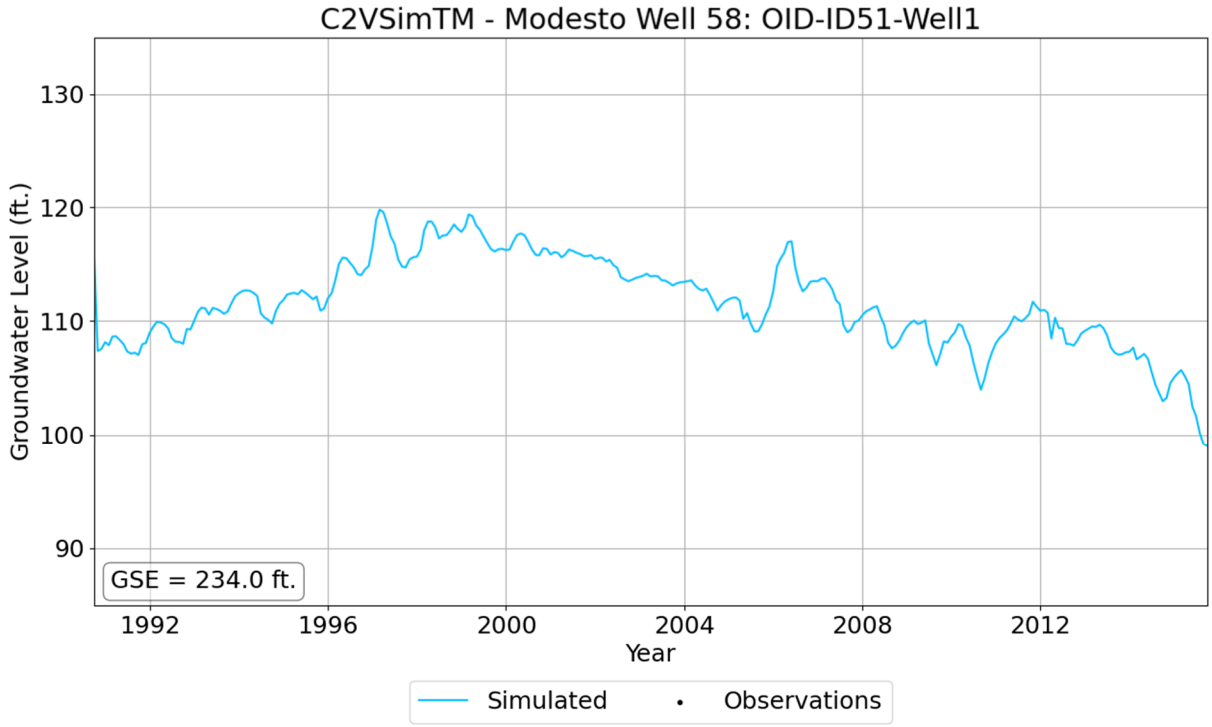

C2VSimTM - Modesto Well 53: 377460N1208024W001
Groundwater Level (ft.)
130
120
110
100
90
GSE = 244.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

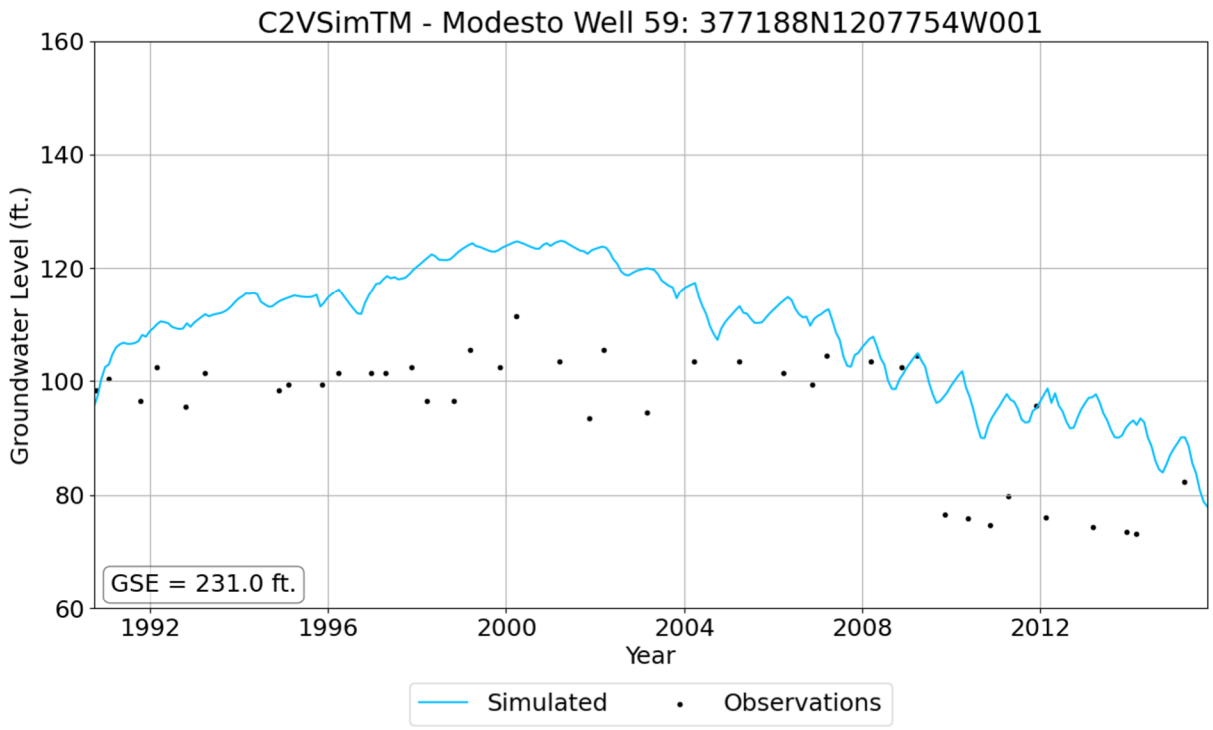

C2VSimTM - Modesto Well 54: 376455N1208013W001
Groundwater Level (ft.)
100
90
80
70
60
GSE = 155.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

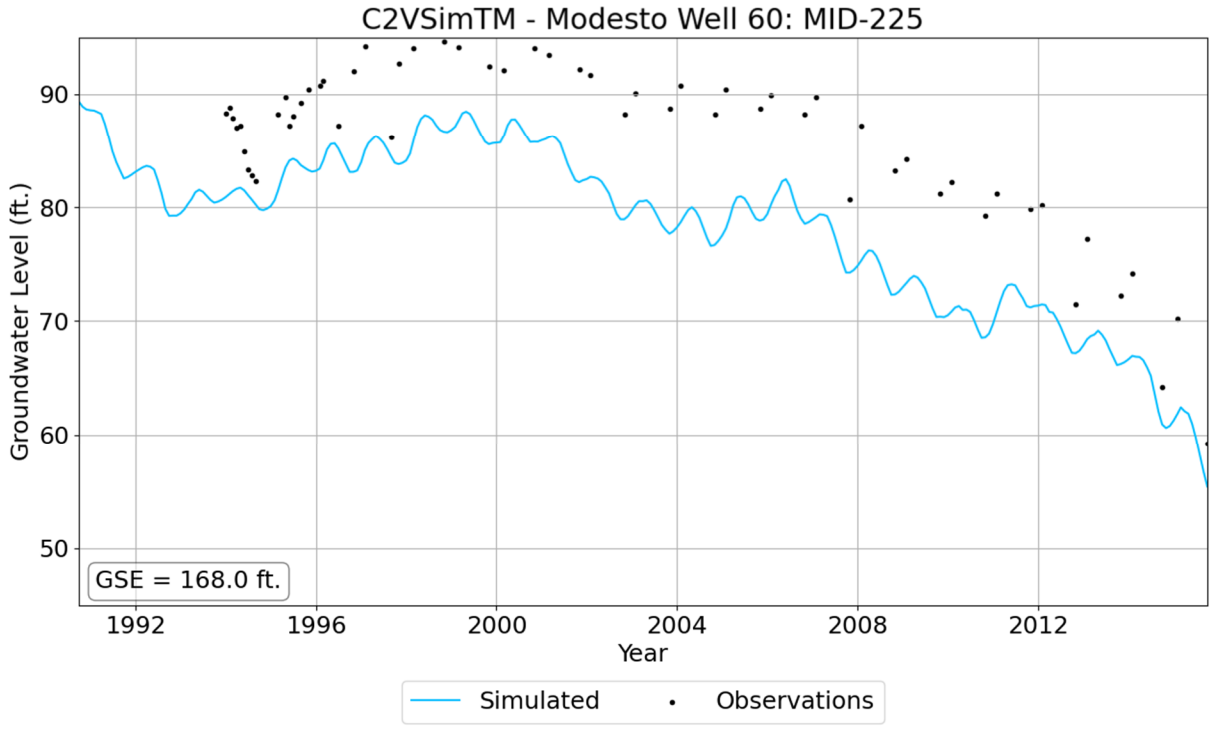

C2VSimTM - Modesto Well 55: 376302N1207988W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 151.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

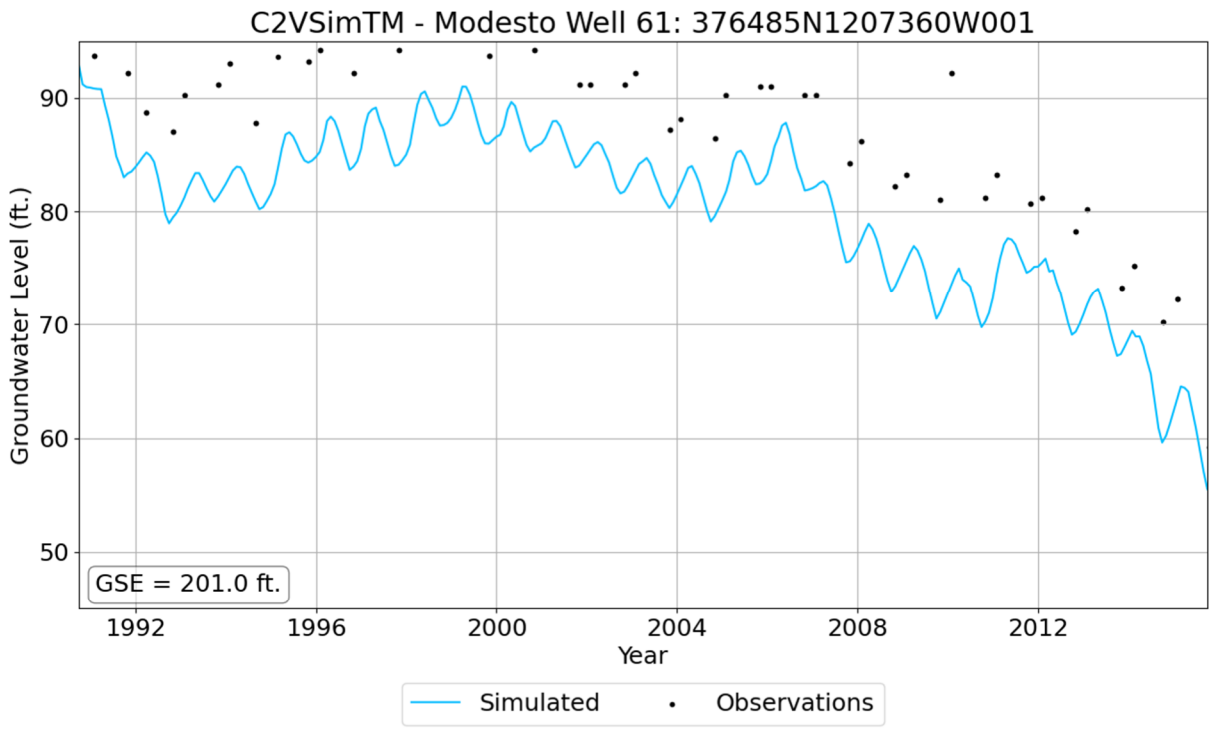

C2VSimTM - Modesto Well 56: 377307N1207916W001
Groundwater Level (ft.)
130
120
110
100
90
GSE = 206.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

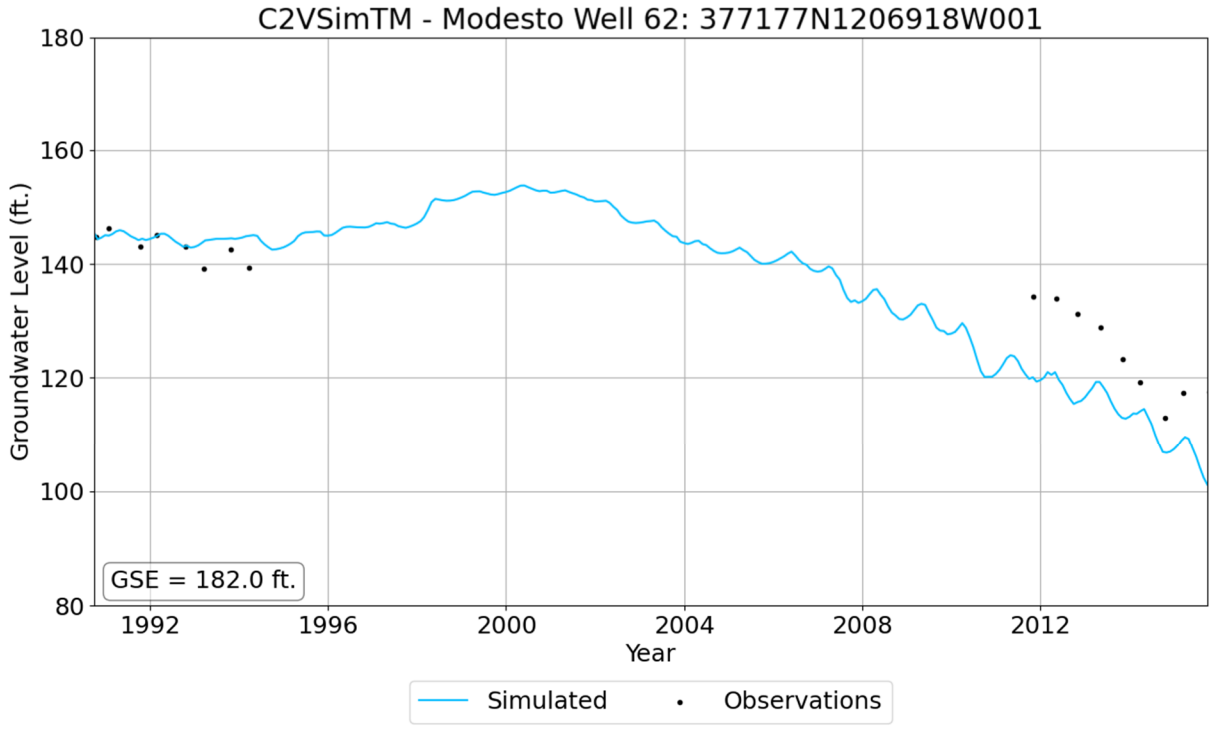

C2VSimTM - Modesto Well 57: 377182N1207857W001
Groundwater Level (ft.)
130
120
110
100
90
GSE = 199.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

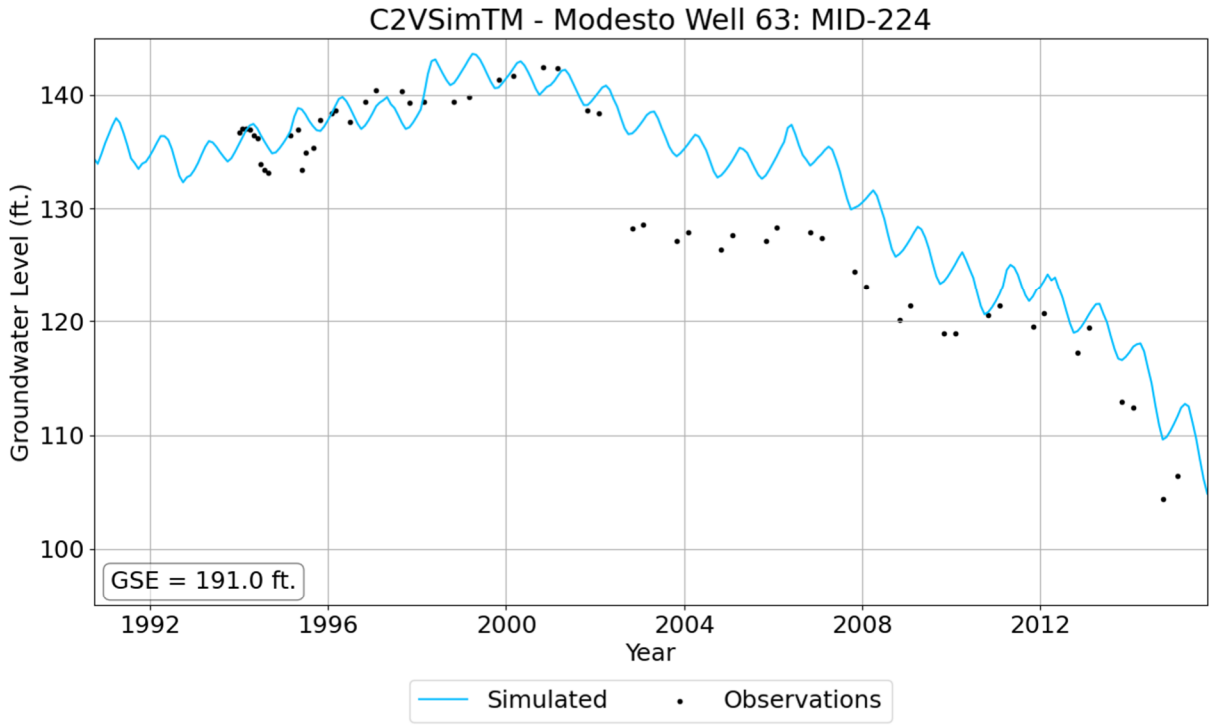

C2VSimTM - Modesto Well 58: OID-ID51-Well1
Groundwater Level (ft.)
130
120
110
100
90
GSE = 234.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

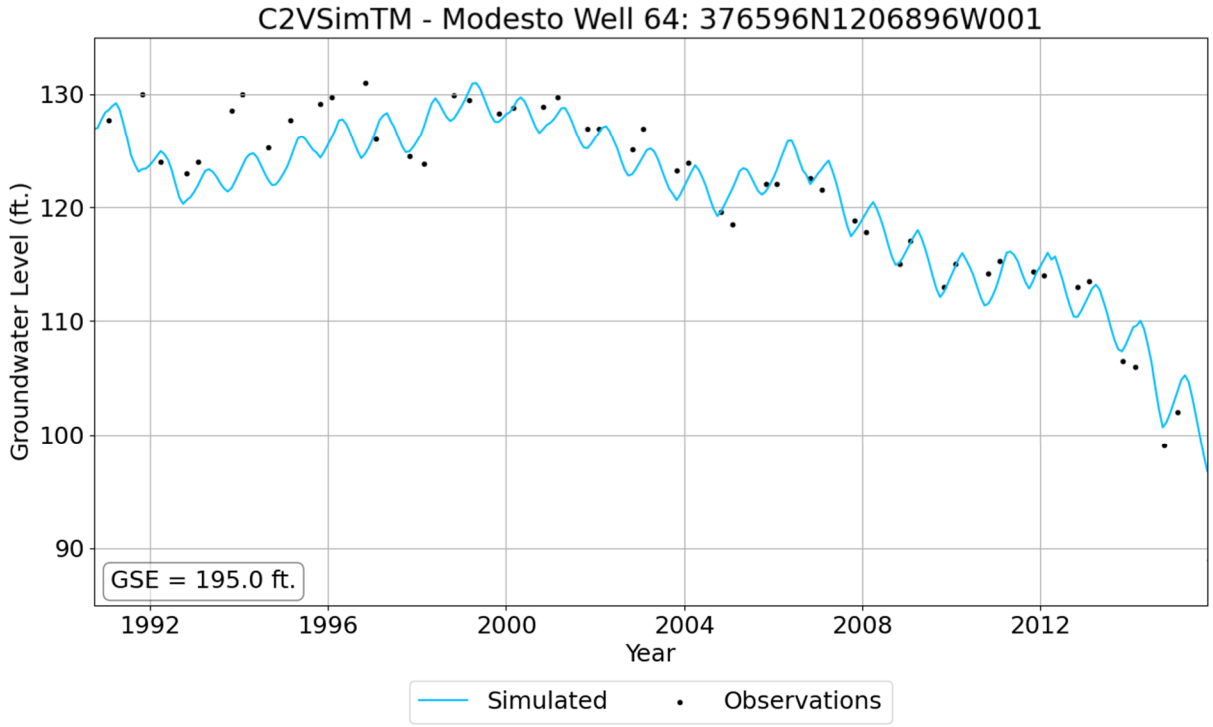

C2VSimTM - Modesto Well 59: 377188N1207754W001
Groundwater Level (ft.)
160
140
120
100
80
60
1992
1996
2000
2004
2008
2012
Year
GSE = 231.0 ft.
Simulated
Observations

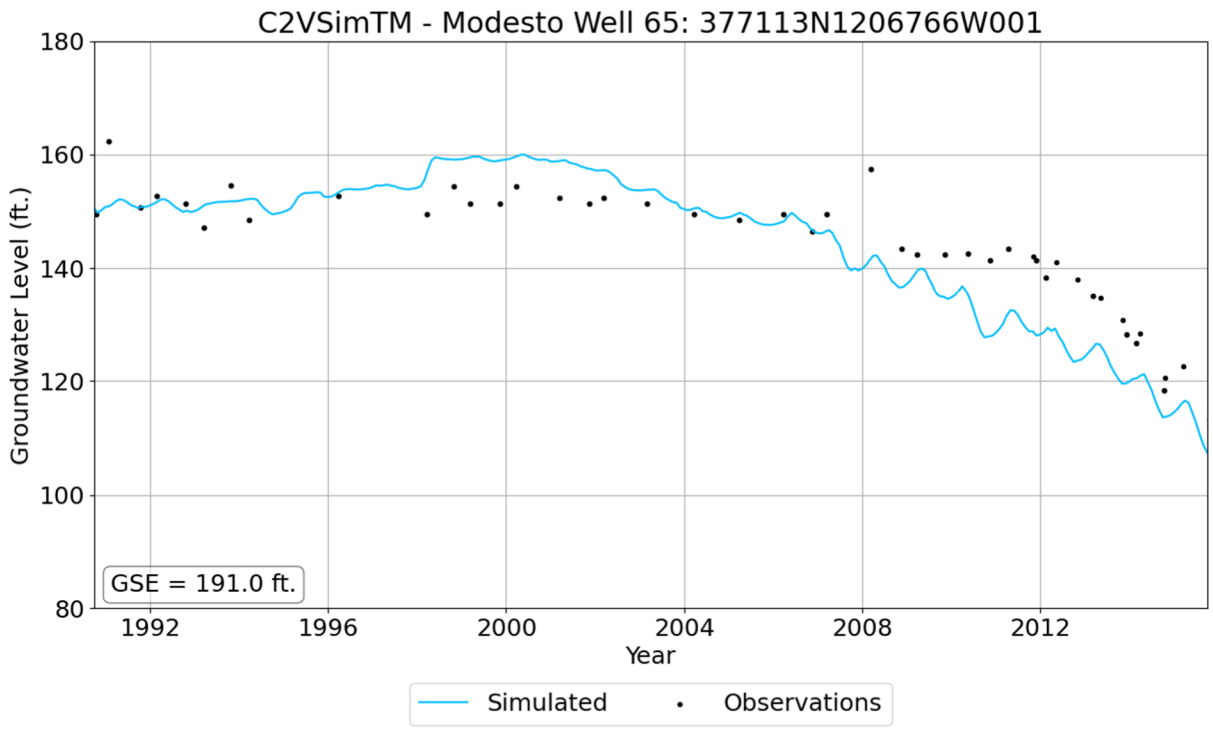

C2VSimTM - Modesto Well 60: MID-225
Groundwater Level (ft.)
90
80
70
60
50
1992
1996
2000
2004
2008
2012
Year
GSE = 168.0 ft.
Simulated
Observations

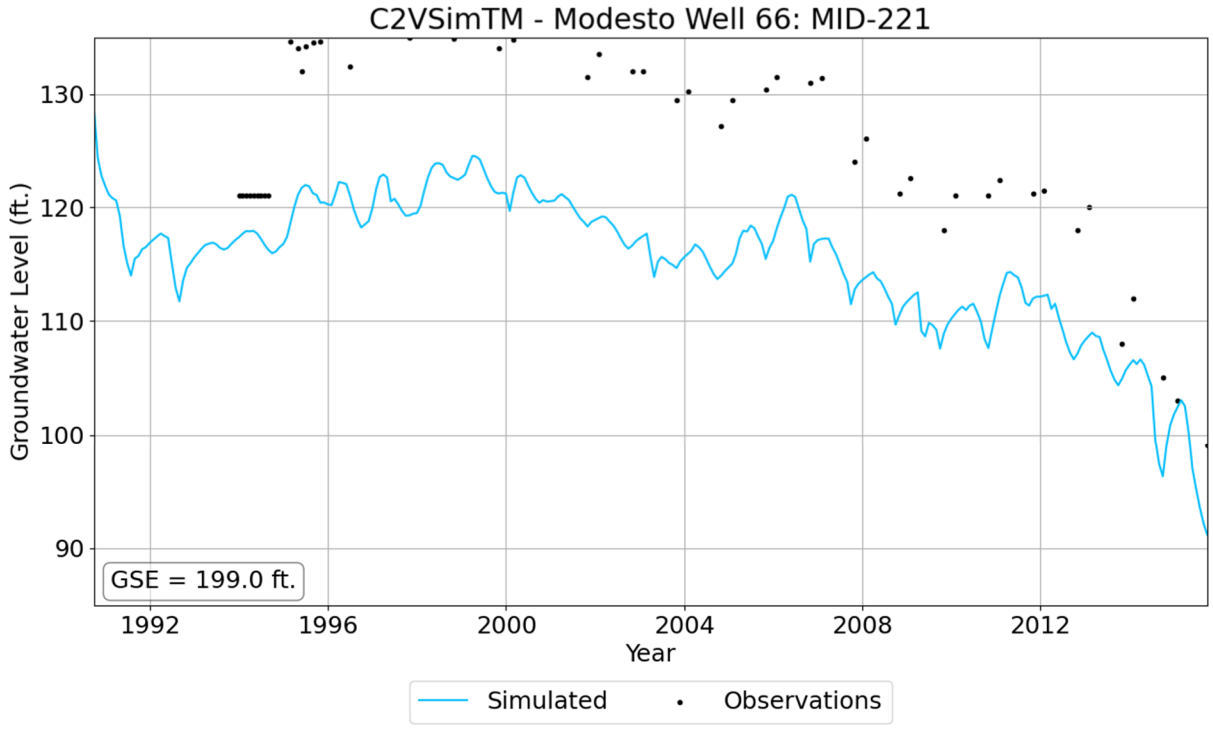

C2VSimTM - Modesto Well 61: 376485N1207360W001
Groundwater Level (ft.)
90
80
70
60
50
GSE = 201.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations


C2VSimTM - Modesto Well 62: 377177N1206918W001
Groundwater Level (ft.)
180
160
140
120
100
80
GSE = 182.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations


C2VSimTM - Modesto Well 63: MID-224
Groundwater Level (ft.)
140
130
120
110
100
GSE = 191.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations


C2VSimTM - Modesto Well 64: 376596N1206896W001
Groundwater Level (ft.)
130
120
110
100
90
GSE = 195.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations


C2VSimTM - Modesto Well 65: 377113N1206766W001
Groundwater Level (ft.)
180
160
140
120
100
80
GSE = 191.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations


C2VSimTM - Modesto Well 66: MID-221
Groundwater Level (ft.)
130
120
110
100
90
GSE = 199.0 ft.
1992
1996
2000
2004
2008
2012
Year
Simulated
Observations

Appendix D

Mapes Ranch, Stanislaus County, California:

Review of Potential Groundwater Dependent Ecosystems

MOORE BIOLOGICAL CONSULTANTS

November 10, 2021

Todd Groundwater
Attn: Ms. Phyllis Stanin and Ms. Liz Elliott
2490 Mariner Square Loop, Ste. 215
Alameda, CA 94501

Subject: "MAPES RANCH", STANISLAUS COUNTY, CALIFORNIA: REVIEW OF POTENTIAL GROUNDWATER DEPENDENT ECOSYSTEMS

Dear Ms. Stanin and Ms. Elliott:

During the past 2 months, I reviewed the areas on the privately-owned parcels on the Mapes Ranch that have been identified as potential Groundwater Dependent Ecosystems ("GDEs") by Todd Groundwater, consultants to the Stanislaus & Tuolumne Rivers Groundwater Basis Association ("STRGBA") Groundwater Sustainability Agency ("GSA"). I also conducted a cursory review of a few areas initially described as potential GDEs on adjacent properties managed by the Mapes Ranch ownership, but owned by the U.S. Fish and Wildlife Service ("USFWS"). Figure 1 depicts the Mapes Ranch ownership and the adjacent USFWS parcels, cumulatively described as the "Mapes Ranch". Figure 2 depicts the areas initially described as potential GDEs identified in the review area. This expanded analysis is a follow-up to my September 29, 2021 letter that discussed a few of the areas which were initially described potential GDEs, but that are very obviously not GDEs.

Methods

My analysis of the areas initially described as potential GDEs involved review of publicly available information, as well as several field surveys. I downloaded the Natural Communities Commonly Associated with Groundwater Dataset On-line

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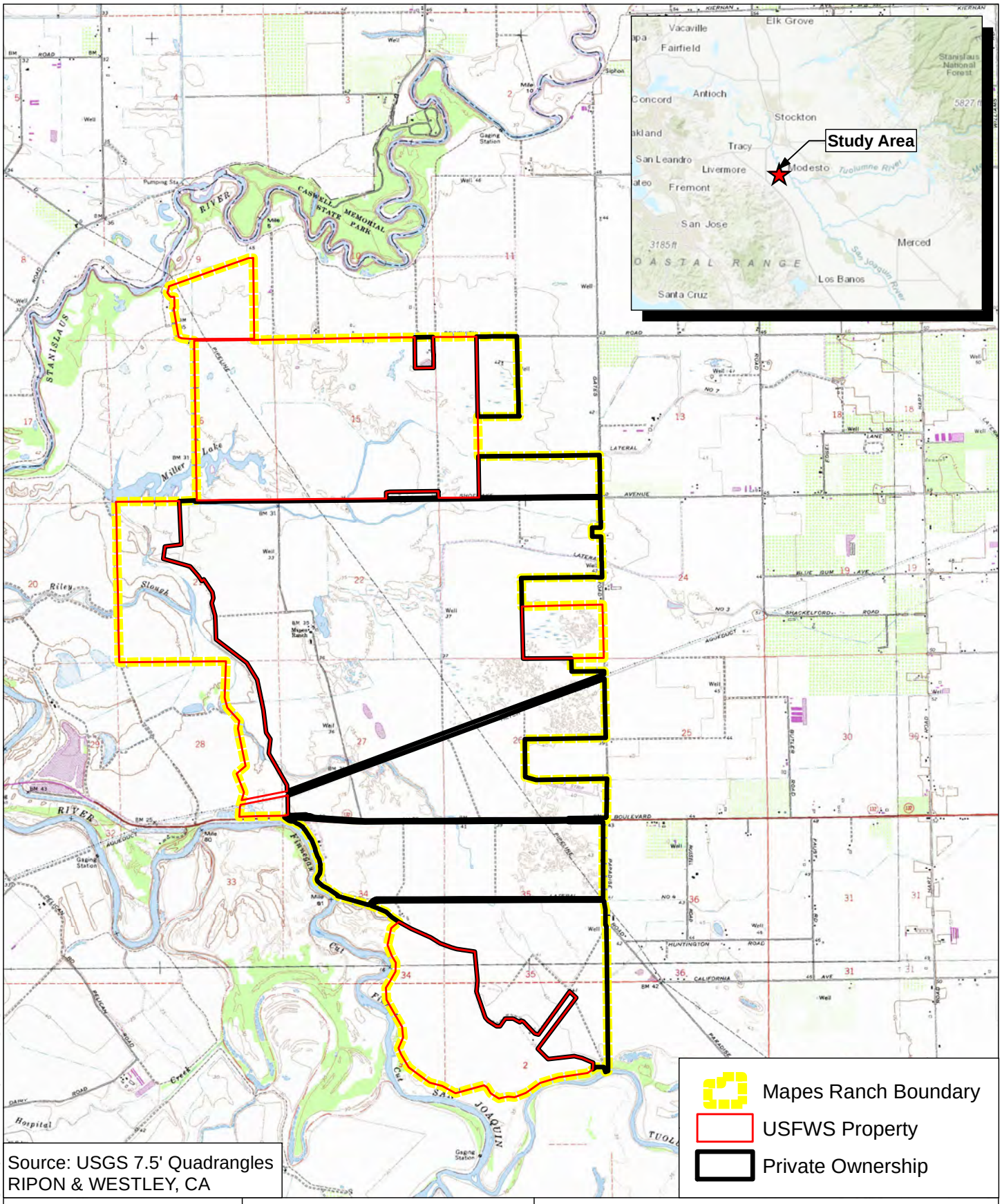
e-mail: moorebio@softcom.net



Source: USGS 7.5' Quadrangles
RIPON & WESTLEY, CA

Figure 1

Moore Biological Consultants

0 2,000 4,000

N W E S

Map Date: 10/18/2021

USGS

Mapes Ranch

Stanislaus County, CA

C:\EFC_INC\Projects\Moore Biological\Maps_Reports\MXD\maps_ranch_usgs_figure_1.mxd

Beckwith Rd.

7810 1690 7809 2606 7808 7805 7806 7807 7803 7802 7804 7801 7800 14358 2883 7799 7798 7797 18202 2882 7790 18198 2596 3212 1679 14336 7629 2595 14335 2593 2590 7780 2588 7779 2878 18191 16371 1669 7762 18182 18176 7760 18168 18164 2577 14333 12777 18159 7747 10841 7730 2880 2877 7783 7771 7768 7769 7767 7763 7766 7764 7765 7761 7759 7756 7758 7755 7757 16365 18170 7749 16671 7754 16669 7753 16667 7748 7746 16355 10839 2868 16350 7734 7727 7714 18147 7723 18141 18143 18137 7729 18133 7722 18129 16344 16340 7610 2559 7711 2556 132 18124 2861 18120 1014 7705 2546 2021 982 2540 12754 2017 896 980 2538 2539 2537 2522 1198 2003 1197 1630 103639 887 2514 1785 1897 7788 7786 2881 7784 992

USFWS Property
Private Ownership
Mapes Ranch Boundary
Potential Wetland Groundwater Dependent Ecosystems (GDEs)
Potential Vegetation Groundwater Dependent Ecosystems (GDEs)

Figure 2

Moore Biological Consultants

0 0.5 1
Miles

N W E S

Map Date: 10/19/2021
Aerial Source: Maxar (05/2020)

Potential GDEs

Mapes Ranch

Stanislaus County, CA

G:\EEC_INC\Projects\Moore Biological\Maps_Ranch\MXD\maps_ranch_gdes_figure_2v.mxd

Viewer (NC DataSet, 2021). I conducted a review of historical USGS topographic maps, relatively recent (1985 – 2020) aerial imagery on Google Earth, soils information (USDA NRCS, 2021), and the National Wetlands Inventory ("NWI") (USFWS, 2021). I also obtained historical aerial imagery (1932 – 1998) from the United States Department of Agriculture Natural Resources Conservation Service ("USDA NRCS"), and groundwater monitoring well data from Modesto Irrigation District ("MID"). Additionally, I reviewed the Plant Rooting Depth Database (Groundwater Resources Hub, 2021). Finally, I toured Mapes Ranch and spoke at length with the Ranch's ownership regarding the history of the Ranch, past and current land uses, irrigation and drainage practices, bottom depths of some of the areas initially described as potential GDEs, and management of conservation areas for waterfowl (i.e., duck ponds, flooded fields and crop management). All of this information was useful in understanding existing habitats, watershed areas, drainage patterns, soil permeability, land uses, groundwater levels, as well as irrigation and drainage improvements and operations on the Ranch.

The fieldwork involved an inspection of each area initially described as a potential GDE on the Ranch's privately owned parcels and inspection of a few representative potential GDE sites on the USFWS properties. At each site, I took notes on land use, topography, vegetation, and water management. Ground-level photographs were also taken of representative potential GDE sites. Special attention was made to identify the source(s) of hydrology of the areas initially described as potential GDEs. For example, many of the polygons depicted as potential GDEs are upland areas where a gate from a lateral can be opened to flood the area for waterfowl habitat and many others are agricultural drains conveying irrigation water runoff from adjacent pastures and croplands. Finally, observations were made regarding the mapping accuracy, as many of the areas initially described as potential GDEs included not just a wetland area, but also portions of adjacent roads, as well as other uplands.

Each of the areas described as potential GDE sites was evaluated to determine if they met the three criteria for delineating wetlands as defined by the U.S. Army Corps of Engineers ("ACOE") Wetlands Delineation Manual (1987) and 2008 Regional Supplement: hydrophytic vegetation, hydric soils, and wetland hydrology. This step was undertaken because most GDEs are either waters or wetlands (i.e., wetlands, rivers, streams, estuaries, seeps, springs); GDEs also include plants that are supported groundwater via their roots, such as riparian forests adjacent to rivers and some valley oak woodlands.

At each potential GDE site, the vegetation was identified as shallow or deep-rooting (Groundwater Resources Hub, 2021) to determine if the vegetation could be supported by groundwater. For example, the maximum rooting depth of tules (*Schoenoplectus acutus*) and cattails (*Typha latifolia*) is 1 to 2 feet, while the rooting depths of black willow (*Salix gooddingii*), Freemont cottonwood (*Populus fremontii*), and valley oak (*Quercus lobata*) are approximately 7, 7, and 80 feet, respectively.

We first evaluated the riparian forest areas with deep-rooting vegetation associated with the Tuolumne River and San Joaquin Rivers, and concluded that such riparian forest vegetation and floodplain wetland vegetation are *potential* GDEs and, therefore, we did not conduct further analysis for purposes of this report. A few photographs of the Tuolumne River, San Joaquin Rivers, and adjacent riparian forest and scrub vegetation are included in Attachment A.

On relatively higher elevation portions of the Ranch, including all of the privately owned parcels, the combined depth of the area initially described as potential GDEs below adjacent lands and rooting depth of vegetation was then compared to groundwater levels below the ground surface documented by the MID monitoring wells or observations of groundwater in the field. For example, an agricultural drain incised 3 feet below the adjacent uplands supporting tules with a rooting depth of 1 to 2 feet (i.e., 4 to 5 feet total) was compared to groundwater levels of 15+/- feet below the ground surface.

In the few areas on the Ranch where the roots of willows and cottonwoods could potentially be long enough to extend underground within a few feet of groundwater during some years, further analysis was undertaken regarding the trees' level of dependence on artificial irrigation. Conclusions were then made about whether the trees would be present absent water management on the Ranch, and whether the trees would die if the irrigation ceased. Historical aerial imagery was particularly helpful to evaluate whether these areas naturally supported trees, as this would indicate a potential dependence on groundwater.

The areas initially described as potential GDEs which consist of uplands (i.e., not meeting the 3 wetland criteria), such as paved and graveled areas, leveled fields, equipment and hay storage pads, and developed areas were classified as uplands and eliminated as GDEs. Areas initially described as potential GDE sites supporting vegetation with rooting depths clearly too shallow to reach groundwater were classified as either vernal pool grasslands, agricultural drains, or constructed habitat and thus eliminated as potential GDEs. Finally, potential GDE sites supporting vegetation that my study, research, and analysis leads to the conclusion that the vegetation would not persist absent artificial irrigation were also classified as either vernal pool grasslands, agricultural drains, or constructed habitat and eliminated as potential GDEs.

Results

SETTING: Mapes Ranch is situated north of the confluence of the Tuolumne River and the San Joaquin River, and east of the confluence of the Stanislaus River and the San Joaquin River, in Stanislaus County, California (Figure 1). The Ranch is located within Sections 9, 14-16, 21-23, 26, 27, 34 and 35 in Township 3 South, Range 7 East, and Sections 2 and 3 in Township 4 South, Range 7 East of the USGS 7.5-minute Ripon and Westley topographic quadrangles (Figure 1).

The Ranch is generally flat and is at elevations of approximately 20 to 45 feet above mean sea level (Figure 1). The north part of the Ranch slopes down gently to the southwest and the central part of the Ranch slopes down gently to the northwest, with all of this land draining towards the San Joaquin River. The southeast part of the Ranch slopes down gently to the south, draining towards the Tuolumne River. The privately owned parcels are situated on relatively higher lands in the east part of the ranch, mostly at elevations of 35 to 45 feet above mean sea level. The USFWS holdings include much lower areas along the San Joaquin River, as well as some higher ground in the north and east parts of the Ranch.

SOILS: There are numerous soils types throughout the Ranch (Figure 3). The soils on the privately owned parcels, such as Fresno sandy loam, slightly alkaline, 0 to 1 percent slopes, and Waukena Fresno sandy loam, strongly saline- alkaline, 0 to 1 percent slopes, have hardpans or other impermeable substrates precluding vegetation being associated with the underlying groundwater.

NATIONAL WETLAND INVENTORY: The NWI was compiled primarily from interpretation of aerial photographs from the 1980s and is very patchy in coverage. Further, the NWI is a compilation of wetlands that may potentially be identified as GDEs, as well as seasonal wetlands, such as vernal pools, that are not GDEs. The NWI also contains many irrigation canals, dairy lagoons, and other man-made features. The NWI is a data source that wetland consultants rely on little, if at all, in conducting wetland delineations.

Most of the areas initially described as potential GDEs on the Mapes Ranch were pulled directly from the NWI (Figure 4). The Tuolumne River and the San Joaquin River are mapped as Riverine features, as were the MID canals and drains that cross through the ranch. Despite being extensive, very little of the well-developed riparian forests along the Tuolumne River and San Joaquin River are mapped in the NWI as Freshwater Forested/Shrub Wetland features.

Soils on the Project Site:

CaA	Chualar sandy loam, 0 to 3 percent slopes
CbA	Chualar sandy loam, slightly saline-alkali, 0 to 3 percent slopes
CcA	Columbia fine sandy loam, 0 to 1 percent slopes
CdA	Columbia fine sandy loam, moderately saline, 0 to 1 percent slopes
CfA	Columbia silt loam, 0 to 1 percent slopes
CgA	Columbia silt loam, slightly saline, 0 to 1 percent slopes
CkA	Columbia silt loam, moderately deep over temple soils, 0 to 1 percent slopes
CmA	Columbia silt loam, moderately deep over temple soils, slightly saline, 0 to 1 percent slopes
CpA	Columbia soils, 0 to 1 percent slopes
CsB	Columbia soils, channeled, 0 to 8 percent slopes
DeA	Delhi loamy sand, 0 to 3 percent slopes, MLRA 17
DgA	Delhi loamy sand, silty substratum, 0 to 3 percent slopes
DkA	Dello loamy sand, 0 to 1 percent slopes
DmA	Dinuba fine sandy loam, 0 to 1 percent slopes, MLRA 17
DoA	Dinuba fine sandy loam, deep, 0 to 1 percent slopes
DpA	Dinuba fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
DwA	Dinuba sandy loam, slightly saline-alkali, 0 to 1 percent slopes
FoA	Foster very fine sandy loam, very porly drained, slightly saline-alkali, 0 to 1 percent slopes
FpA	Fresno fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
FrA	Fresno fine sandy loam, moderately saline-alkali, 0 to 1 percent slopes
FsA	Fresno fine sandy loam, strongly saline-alkali, 0 to 1 percent slopes
FtA	Fresno sandy loam, slightly saline-alkali, 0 to 1 percent slopes
FuA	Fresno sandy loam, moderately saline-alkali, 0 to 1 percent slopes
FvA	Fresno sandy loam, strongly saline-alkali, 0 to 1 percent slopes
GfA	Grangeville fine sandy loam, 0 to 1 percent slopes, MLRA 17
GgA	Grangeville fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
GhA	Grangeville sandy loam, 0 to 1 percent slopes
GkA	Grangeville sandy loam, slightly saline-alkali, 0 to 1 percent slopes
GmA	Grangeville very fine sandy loam, 0 to 1 percent slopes
GnA	Grangeville very fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
GsA	Greenfield sandy loam, 0 to 3 percent slopes
GvA	Greenfield sandy loam, deep over hardpan, 0 to 3 percent slopes
HkbA	Hilmar loamy sand, slightly saline-alkali, 0 to 1 percent slopes
MmA	Modesto clay loam, 0 to 1 percent slopes
MnA	Modesto clay loam, slightly saline-alkali, 0 to 1 percent slopes
MpA	Modesto loam, slightly saline-alkali, 0 to 1 percent slopes
OaA	Oakdale sandy loam, 0 to 3 percent slopes
RfA	Rossi clay, moderately saline-alkali, 0 to 1 percent slopes
RgA	Rossi clay, strongly saline-alkali, 0 to 1 percent slopes
RkA	Rossi clay loam, moderately saline-alkali, 0 to 1 percent slopes
RnA	Rossi-Waukena complex, moderately saline alkali, 0 to 1 percent slopes
RoA	Rossi-Waukena complex, strongly saline alkali, 0 to 1 percent slopes
Rr	Riverwash
RtA	Ryer clay, 0 to 1 percent slopes
TcA	Temple loam, overwashed, slightly saline, 0 to 1 percent slopes
TdA	Temple loam, overwashed, moderately saline, 0 to 1 percent slopes
TeA	Temple silty clay, slightly saline, 0 to 1 percent slopes
TmA	Traver fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
TnA	Traver fine sandy loam, moderately saline-alkali, 0 to 1 percent slopes
ToA	Traver fine sandy loam, strongly saline-alkali, 0 to 1 percent slopes
TpA	Traver sandy loam, slightly saline-alkali, 0 to 1 percent slopes
TrA	Traver sandy loam, moderately saline-alkali, 0 to 1 percent slopes
TsA	Traver sandy loam, strongly saline-alkali, 0 to 1 percent slopes
TuA	Tujunga loamy sand, 0 to 3 percent slopes
W	Water
WaA	Waukena fine sandy loam, slightly saline-alkali, 0 to 1 percent slopes
WbA	Waukena fine sandy loam, moderately saline-alkali, 0 to 1 percent slopes
WcA	Waukena fine sandy loam, strongly saline-alkali, 0 to 1 percent slopes
WeA	Waukena sandy loam, moderately saline-alkali, 0 to 1 percent slopes

Figure 3

Moore Biological Consultants

N W E S

0 1,500 3,000

Study Area

Potential Wetland & Vegetation Groundwater Dependent Ecosystems (GDEs)

SOILS

Mapes Ranch

Stanislaus County, CA

Data Source: Natural Resources Conservation Service (2021) *Aerial Photo: ESRI; Maxar (2020)*

Map Date: 10/19/2021

Study Area
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Riverine
Potential Wetland & Vegetation Groundwater Dependent Ecosystems (GDEs)

7810 1690 7809 2606 7808 7805 7806 7807 7803 7802 7804 7801 7800 14358 2883 7799 7798 7797 18202 2882 18198 2596 7790 3212 1679 14336 7629 2595 14335 2593 2590 7780 2588 7779 2878 18191 16374 1669 18182 18176 7760 18168 18164 2577 14333 12777 18159 7747 7785 7786 7784 2880 2877 7783 7766 7771 7768 7769 7767 7763 7764 7765 7761 7759 7756 7758 7755 7757 16365 18170 7749 1897 2881 992 7788 16671 7754 16669 7753 16667 7748 7746 16355 10899 2868 16350 10841 7730 7734 7727 18147 7723 18141 18143 18137 7729 18133 7722 7714 18129 16344 16340 7610 7711 2559 2556 18124 2861 18120 1014 7705 2546 2021 2540 982 12754 2047 996 980 2538 2539 2537 1198 2003 1197 1630 109639 2522 887 2514

Figure 4

Moore Biological Consultants

N W E S

0 1,500 3,000

National Wetlands Inventory (NWI)

Mapes Ranch

Stanislaus County, CA

Data Source: NWI (USFWS; 2021)
Aerial Photo: ESRI; Maxar (2020)
Map Date: 10/19/2021

A few constructed ponds on the Ranch are mapped as Freshwater Pond features, including two constructed duck ponds on the privately owned parcels (i.e., areas identified as potential GDEs # 16350/16355/10839 and 16365/18170). The NWI also depicts three constructed duck ponds on the USFWS holdings (i.e., areas identified as potential GDEs # 16667, 16669, and 16671) as Freshwater Pond features. Virtually all of the vernal pool grasslands on the Ranch are depicted as Freshwater Emergent Wetlands, as were the agricultural drains throughout much of the Ranch. The NWI also depicts some Freshwater Emergent Wetland areas on the Ranch which are not mapped as potential GDE sites.

MID MONITORING WELL DATA: MID has been documenting groundwater levels in the spring and fall in two locations on Mapes Ranch and one location just east of the Ranch (Figure 5 and Table 1). Groundwater levels in the area experience minor fluctuations over time for a number of factors such as periods of drought and periods of heavy rainfall, among others. Groundwater depths at Well 101 from 2000 through 2020 range from 6 to 20 feet below the ground surface, with a mean of 11.4 and 13.4 feet in the spring and fall, respectively. At Well 109, groundwater depths are notably consistent from 2000 through 2020 range from 5 to 11 feet below the ground surface, with means of 7.7 and 8.3 feet in the spring and fall, respectively. Groundwater depths at Well 108 from 2000 through 2013 are also quite consistent, ranging from 7 to 13 feet below the ground surface, with means of 8.2 and 10 feet in the spring and fall, respectively.

GDES AND OTHER HABITATS: The areas shown as potential GDEs on the maps provided to the GSA by Todd Groundwater were derived from the Natural Communities Commonly Associated with Groundwater Dataset (NC DataSet, 2021), which is largely comprised of features mapped in the NWI. **Based upon my extensive research, I have concluded that the majority of the areas mapped as potential GDEs on the privately owned parcels of Mapes Ranch, as well as many of the areas mapped as potential GDEs mapped on the USFWS holdings on the Ranch are <u>not</u> GDEs. In reality, the majority of the**

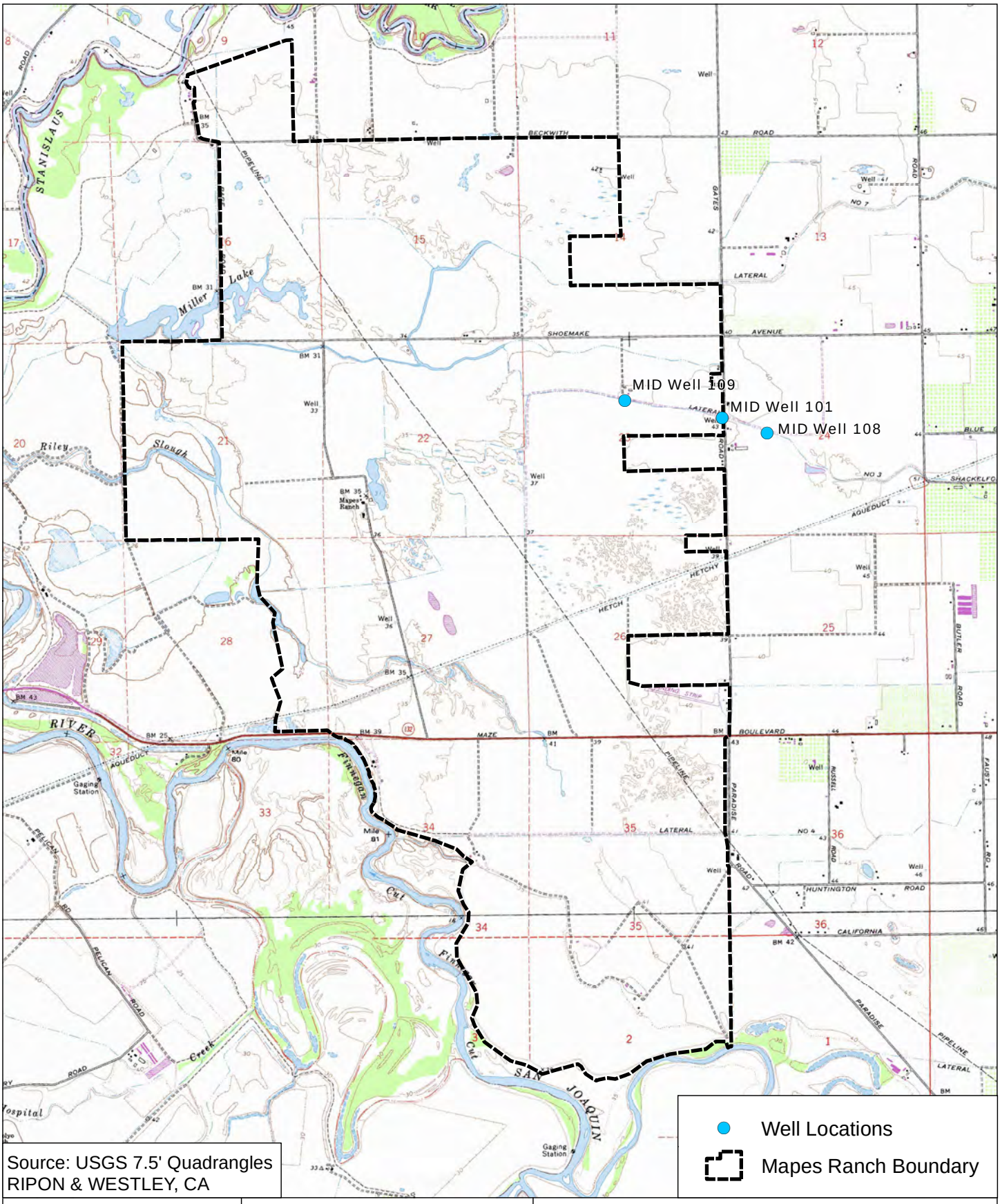


Figure 5

Moore Biological Consultants

Monitoring Wells

Mapes Ranch

Stanislaus County, CA

Map Date: 10/20/2021

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TABLE 1
MID GROUNDWATER MONITORING WELL DATA

Year	MID Well 101 Depth to Water (ft)**		MID Well 108* Depth to Water (ft)**		MID Well 109 Depth to Water (ft)**	
	Spring	Fall	Spring	Fall	Spring	Fall
2000	7	10.1	7.8	9	7.5	8
2001	9.3	9.8	8.3	8	8	6.9
2002	8	12.7	7	9	6	5.8
2003	9	12.1	8.3	9.8	5	6.2
2004	10	10.2	9	9.3	7.1	7.2
2005	7.2	11.2	6.3	9.2	6.5	9
2006	8.4	11.5	7.5	10.3	7.4	10
2007	9	12.1	9.2	11.2	9	10
2008	10	12.5	10.3	10.6	8.5	9
2009	10.7	12.7	9.8	11.2	10.5	9.2
2010	10.5	13.1	9.2	10.8	8	11.1
2011	9.8	10.8	8.5	13.2	7	6.5
2012	8.4	5.4	7	9	6.5	7.8
2013	6	16	7		7	8
2014	18	17			9	7
2015	15	19.5			6.5	10
2016	18	20			8	8
2017	16.5	16.5			7.5	10
2018	16	15.5			11	8.5
2019	13.5	16.5			7	9.5
2020	16	16			8	7
2021	15				8	
Mean	11.4	13.4	8.2	10.0	7.7	8.3

* Note: Measurements during 2013 to 2017 indicated a potential issue with the well and are not considered reliable. Measurements were discontinued after 2017.
** Note: Depth to water below the ground surface.

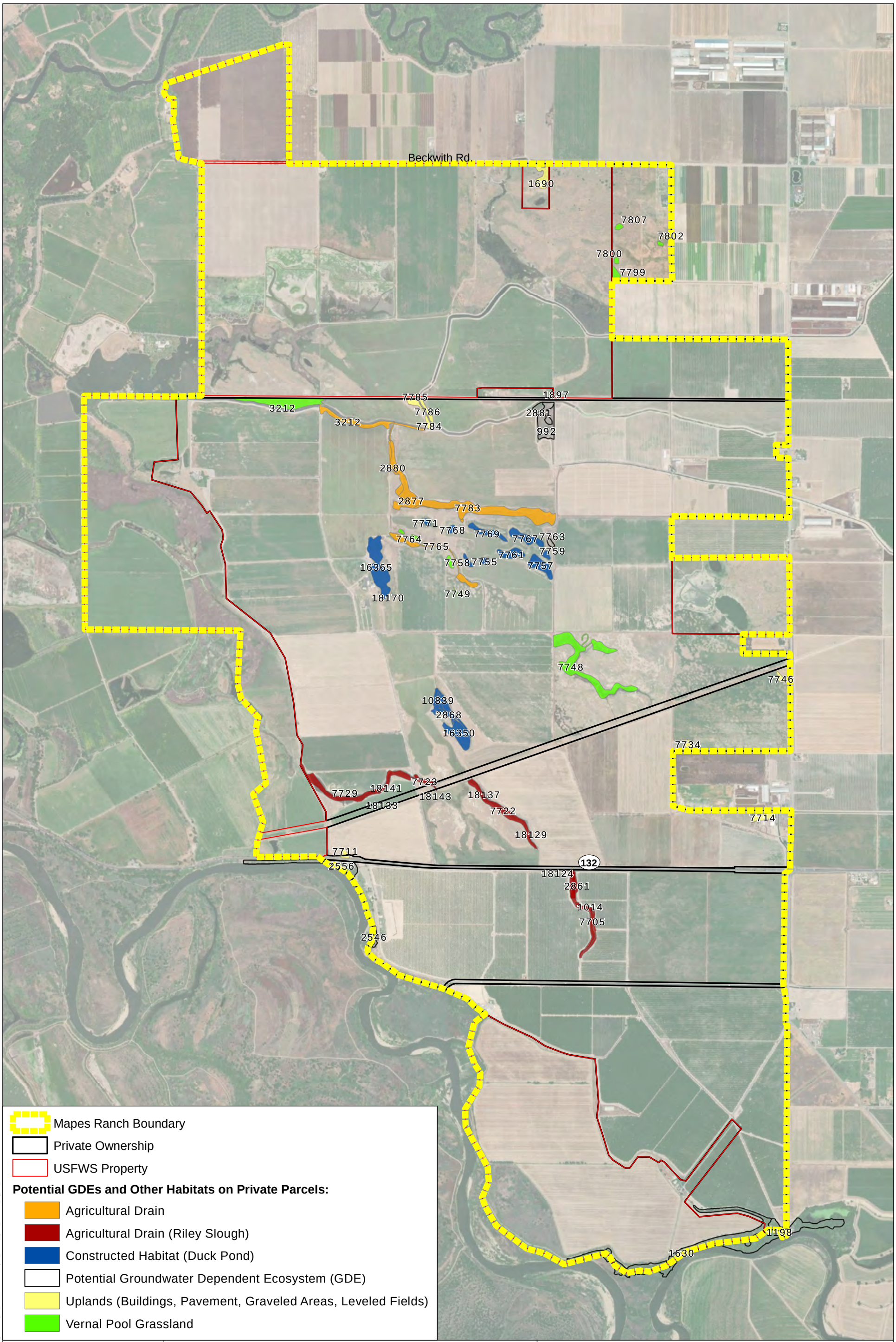
areas mapped as potential GDEs are in fact areas where an irrigation gate from a MID lateral is only opened when the private landowner decides to open the irrigation valve to flood the area for waterfowl habitat, groundwater recharge, irrigation water recapture, or production of pasture for cattle. It is pretty clear that numerous of the areas initially described as potential GDEs would be bone dry if the landowners did not intentionally provide water in these areas. These areas are more appropriately referred to as "Controlled Artificial Surface Water Dependent Ecosystems" (CASWDEs).

Areas initially described as potential GDEs and "other habitats" that had been described as potential GDEs are depicted on Figure 6 and listed on Table B1 in Attachment B. The "other habitats" actually include upland areas such as buildings, pavement, graveled areas, and leveled fields, constructed habitats (e.g., duck ponds), vernal pool grasslands, and agricultural drains, including "Riley Slough," which is a notable drain in the south part the Ranch. Each of these habitat types are described below and photographs of representative habitats are included in Attachment A.

Uplands: Upland areas on the Ranch are clearly not GDEs, as they are not wetlands and are not vegetated (Figure 6 and series of photographs in Attachment A). For example, the area described as potential GDE #7785 is actually a leveled concrete pad, adjacent gravel areas, and a sliver of MID's lateral. A second example is the area described as potential GDE #7714, which is a hay barn and equipment storage yard in the east part of Mapes Ranch. A third example, identified as potential GDE # 18124, is a portion of Highway 132, which primarily consists of the paved road and road shoulders, and also includes a portion of an agricultural drain and a portion of a leveled hay field. Similarly, the area identified as potential GDE # 7711 primarily consists of a portion of a leveled hay field, and also includes a farm road and a road shoulder.

Constructed Habitats: All of the areas depicted as Constructed Habitats on Figure 6 are ponds that were either entirely constructed in uplands or shallow basins (i.e., seasonal wetlands and vernal pools) **that were enlarged**. All of the ponds are relatively shallow (i.e., 1 to 3 feet) and are supported by surface water and/or water pumped from private wells. While trees have been planted around some of the ponds, none of the constructed ponds support vegetation with deep enough roots to be supported by groundwater.

There is a cluster of constructed habitats in the central part of the Ranch comprised of the areas described as potential GDEs # 7755, 7757, 7758, 7759, 7761, 7767, 7768, 7769, and 7771 that are connected together with a series of



Mapes Ranch Boundary

Private Ownership

USFWS Property

Potential GDEs and Other Habitats on Private Parcels:

- Agricultural Drain
- Agricultural Drain (Riley Slough)
- Constructed Habitat (Duck Pond)
- Potential Groundwater Dependent Ecosystem (GDE)
- Uplands (Buildings, Pavement, Graveled Areas, Leveled Fields)
- Vernal Pool Grassland

Figure 6

Moore Biological Consultants

0 0.5 1
Miles

N W E S

Map Date: 10/20/2021
Aerial Source: Maxar (05/2020)

Potential GDEs and Other Habitats

Mapes Ranch

Stanislaus County, CA

pipes and control gates to manage the water. Many of these shallow basins were first constructed in the early-1900's for waterfowl hunting, and some have been improved several times, including planting of trees approximately 20 years ago. This managed conservation area receives water when a gate along the MID lateral to the east is opened and/or through water pumped from private wells. The area described as potential GDE # 7769 is an example of one of these constructed habitats, consisting of a very shallow basin excavated in uplands for waterfowl (see photographs in Attachment A).

There is a similar set of constructed habitats in the east part of the Ranch, on USFWS property comprised of the areas described as potential GDEs # 16667, 16669, and 16671, all of which are supported by water from MID and/or water pumped from private wells. Mapes Ranch ownership manages the water levels in these ponds, pursuant to the direction of USFWS, and USFWS pays for the electricity when water is provided from the private wells.

The area described as potential GDE # 16365/18170 is another good example of a constructed habitat. This large shallow basin adjacent to the Mapes Ranch's office is less than 3 feet deep and was also constructed in the early-1900's for waterfowl hunting. This constructed habitat receives water from the MID lateral to the east via a pipeline and/or through water pumped from private wells. This constructed habitat is kept full year-round and portions of the adjacent lands are landscaped.

Agricultural Drains, including Riley Slough: All of the areas depicted as Agricultural Drains, including Riley Slough on Figure 6 are topographically low areas, most of which were historical ephemeral streams and/or seasonal wetland swales. Over many decades, the drains have been incorporated into the Ranch irrigation and drainage infrastructure; there control gates in some areas to manage the water for agricultural and/or conservation purposes. **All of the agricultural drains are relatively shallow (i.e., 1 to 5 feet) and are supported by surface water and/or water pumped from private wells.** The very limited

number of willows and cottonwoods along the edges of Riley Slough are supported by irrigation water as evidence by the fact that there are no trees apparent in historical aerial imagery. There are also no trees along the other agricultural drains.

Riley Slough (i.e., the areas described as potential GDEs # 1014/7705/2861, 18129/7732/18137, and 18143/7723/18141/18133/7729) is an excellent example of an agricultural drain (Figure 6 and series of photographs in Attachment A). Water is delivered to the upstream tip of Riley Slough from the MID lateral to the south via a pipeline, and/or from groundwater wells. Riley Slough also receives runoff from flood irrigated pastures along its length.

Riley Slough does not support vegetation with deep enough roots to be supported by groundwater. For example, the deepest part of Riley Slough is incised 3 to 5 feet below the adjacent uplands along most of its length. The relatively deeper parts of the slough primarily support tules and cattails, and there are a few willows and cottonwoods in higher areas along the edges of the slough. By comparing the maximum rooting depth of this vegetation to groundwater levels ranging from approximately 5 to 15 feet below the ground surface over time, it is clear the vegetation in Riley Slough is not dependent on groundwater.

Another example of an agricultural drain is the east part of the area described as potential GDE # 3212, just south of Shoemake Road, which also demonstrates mapping accuracy issues of many of the areas initially described as potential GDEs (see photograph in Attachment A). In this location, the area described as potential GDE # 3212 encompasses the low end of an irrigated pasture, the adjacent agricultural irrigation drain, an elevated MID access/maintenance road, and the south edge of an MID drain. Further east of where the photograph was taken, the area described as potential GDE # 3212 narrows down to only encompass the elevated MID access/maintenance road. The agricultural irrigation drain and the MID drain are a maximum of 5 feet below the adjacent

uplands in this area, several feet above groundwater, and are not dependent on groundwater. The low end of the irrigated pasture and the elevated MID access/maintenance road are clearly not dependent on groundwater.

Artificially Flooded Vernal Pool Grasslands: All of the areas depicted as Vernal Pool Grasslands on Figure 6 are ponds are grasslands containing artificial vernal pools, artificial seasonal wetlands, and artificial seasonal wetland swales that are managed for agricultural and/or conservation purposes. Some of the naturally low areas in the vernal pool grasslands have been slightly enlarged by excavation, yet all are relatively shallow (i.e., 1 to 3 feet). The vernal pool grasslands are flooded with surface water and/or water pumped from private wells, or from irrigation water runoff from adjacent pastures and croplands.

The area described as potential GDE # 7748 is an excellent example of vernal pool grasslands that are flooded for agricultural and/or conservation purposes (Figure 6 and series of photographs in Attachment A). This potential GDE site actually receives water from the MID canal to the south via a pipeline, from groundwater wells and/or runoff from irrigated lands to the south. There is a similarly flooded vernal pool grassland area on a Mapes Ranch ownership parcel in the northeast part of the Ranch (i.e., the area identified as potential GDEs # 7799, 7800, 7802, and 7807). Another example of a vernal pool grassland area that may be flooded on occasion is the west part of potential GDE # 3212, just south of Shoemake Road (see photograph in Attachment A). There are also flooded vernal pool grassland areas on USFWS property in the east part of the Ranch (i.e., the area identified as potential GDE # 7753), a cluster of flooded vernal pool grassland areas described as potential GDEs in the northeast part of the Ranch, and on USFWS property (i.e., the areas described as potential GDEs # 7800, 7801, 7803, 7805, 7806, and 7809).

Through my review of aerial imagery and soils data, and based upon my understanding of vernal pool grasslands gained through 25+ years of

conducting wetland delineations in the Central Valley, I am confident these artificial vernal pool grasslands are not dependent on groundwater and would be bone dry nearly year-round absent the intentional application of surface water or pumped groundwater.

Conclusion

I highly encourage Todd Groundwater to eliminate all of the areas initially described in the maps provided to the GSA as potential GDEs on the Mapes Ranch property that have been ground-truthed and determined to be other habitats, as depicted on Figure 6 and as listed in Table B1 in Attachment B from the GSP altogether. Further, additional analysis needs to be conducted for the areas on the Mapes Ranch property that have not yet been definitely ruled out as potential GDEs. Finally, a more thorough analysis should be completed prior to concluding the many similar "other habitats" on the USFWS owned parcels are GDEs.

I look forward to continuing my analysis of the areas initially described as potential GDEs. Although my background is generally described in my September 29, 2021 letter, a more thorough summary is provided in Attachment C.

Please call me at (209) 745-1159 with any questions.

Sincerely,

Diane S. Moore, M.S.
Principal Biologist

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References

ACOE (U.S. Army Corps of Engineers). 1987. Technical Report Y87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MI.

ACOE. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. U.S. Army Engineer Research and Development Center, Vicksburg, MS. September.

USDA/NRCS. 2021. Web Soil Survey, Stanislaus County, California, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

USFWS (U.S. Fish and Wildlife Service). 2021. National Wetlands Inventory. https://www.fws.gov/wetlands/

NC DataSet. 2021. Natural Communities Commonly Associated with Groundwater Dataset On-line Viewer. https://gis.water.ca.gov/app/NCDatasetViewer/

Groundwater Resources Hub. 2021. Plant Rooting Depth Database. https://groundwaterresourcehub.org/sgma-tools/gde-rooting-depths-database-for-gdes