WOODLAND-DAVIS Clean Water Agency

WEST YOST ASSOCIATES

Yolo County IWFM Development

IWFM/IDC Users Group Meeting

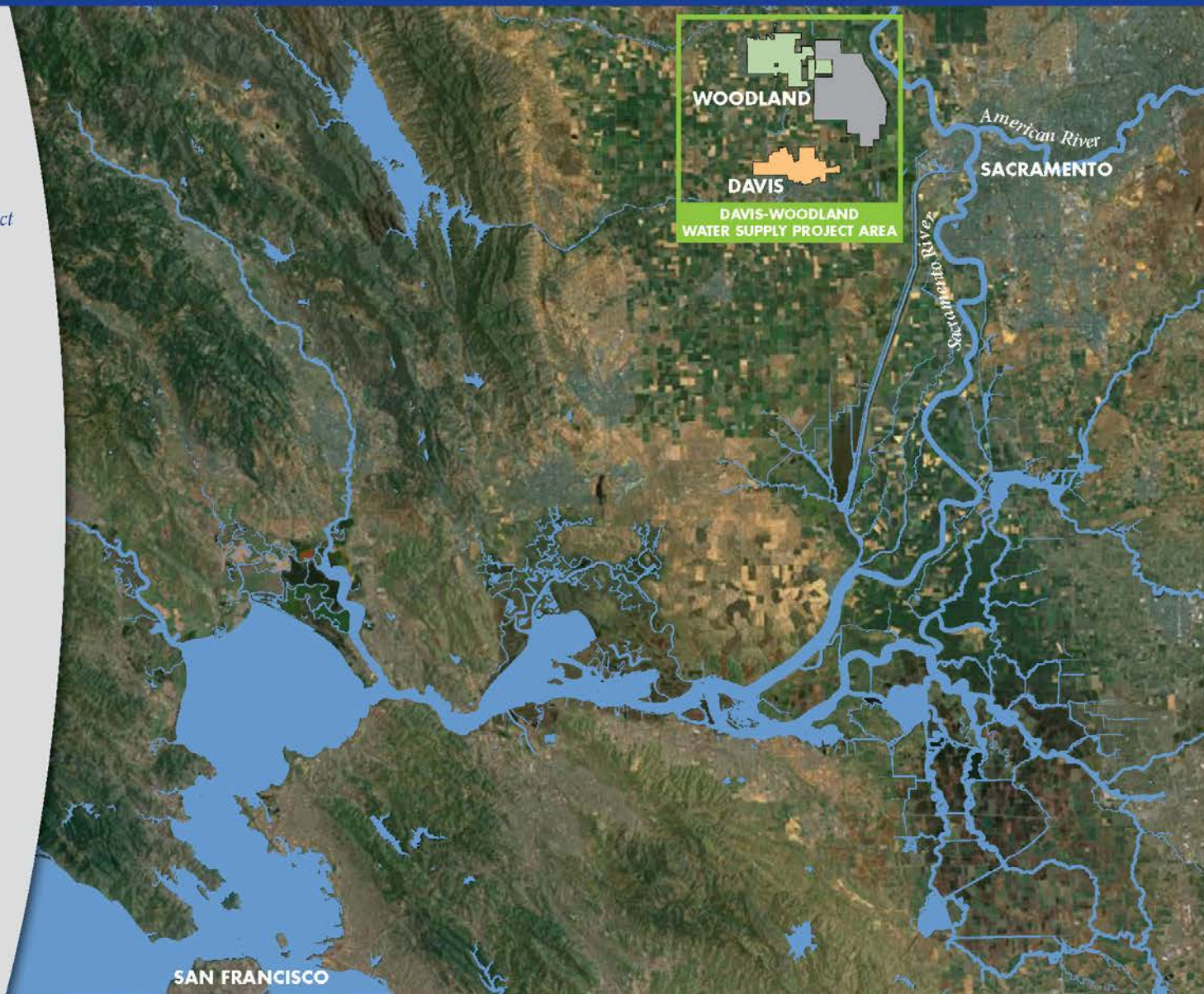
Ken Loy and Carlos Flores Arenas

December 3, 2014

DAVIS-WOODLAND WATER SUPPLY PROJECT

NORTHERN CALIFORNIA AREA

Davis-Woodland Water Supply Project
Location: Woodland, CA



Current Water Supply Issues

100%
Dependent on groundwater

Aging water infrastructure

Degrading **groundwater water quality**

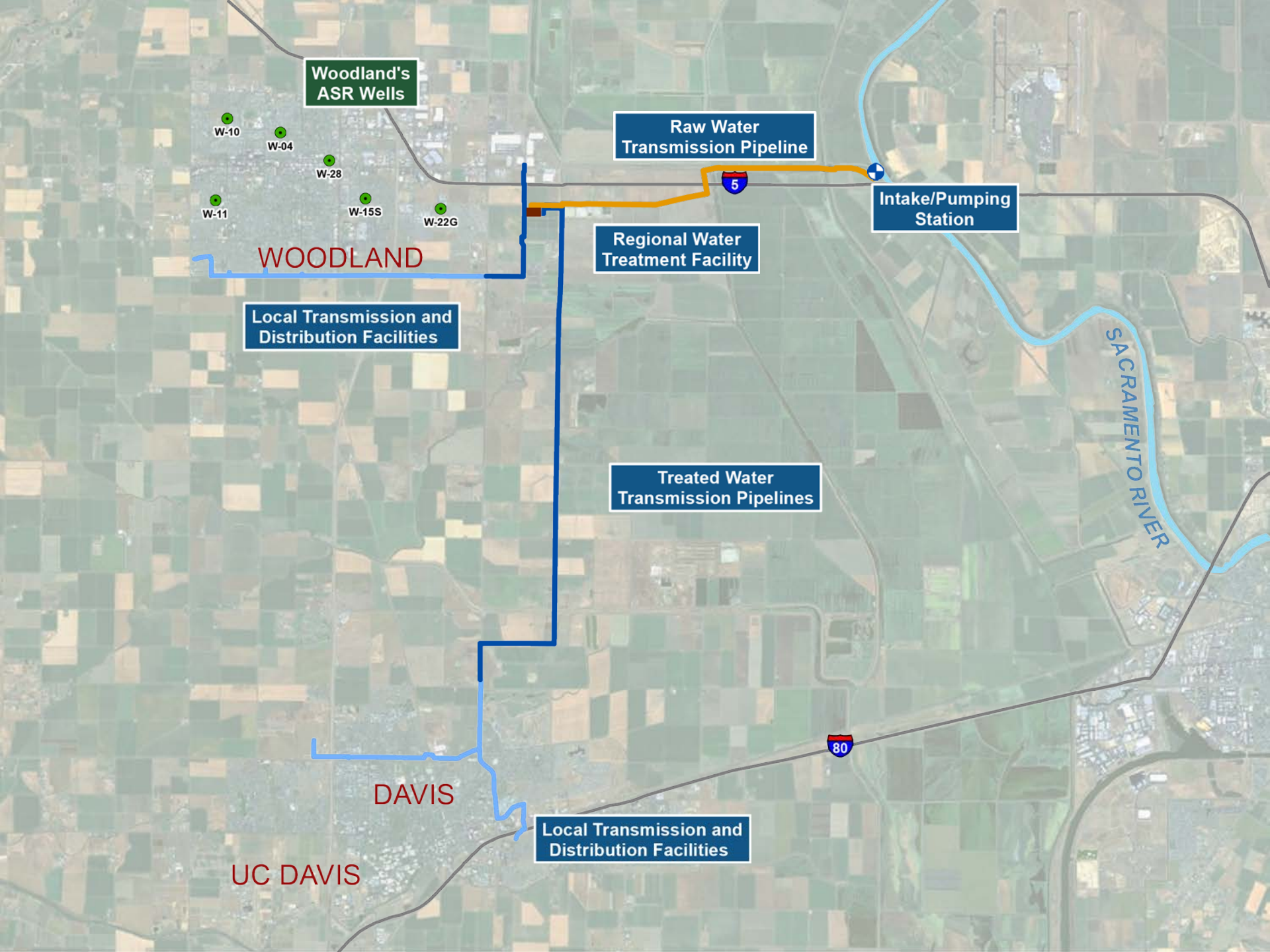
Example: Nitrates

Increasingly stringent **drinking water regulations**

Example: Hexavalent chromium

Increasingly restrictive **wastewater discharge regulations**

Example: Selenium, Salinity


Woodland's ASR Wells
W-10
W-04
W-28
W-11
W-15S
W-22G
Raw Water Transmission Pipeline
5
Intake/Pumping Station
Regional Water Treatment Facility
WOODLAND
Local Transmission and Distribution Facilities
SACRAMENTO RIVER
Treated Water Transmission Pipelines
80
DAVIS
Local Transmission and Distribution Facilities
UC DAVIS

Surface Water Supply

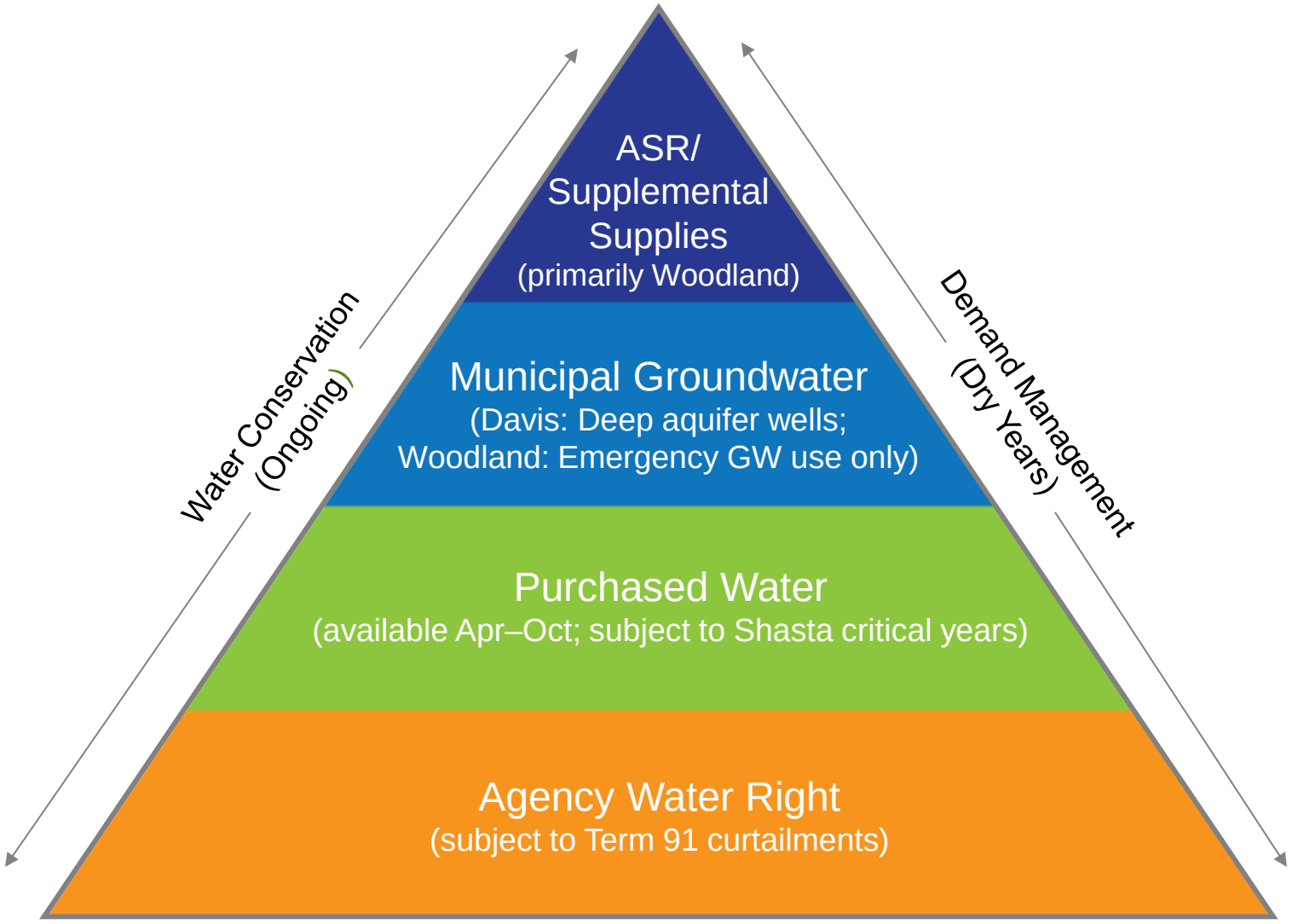
WDCWA Water Right Permit

- **1994:** Initial application filed
- **2011:** SWRCB Adopted Decision 1650
- **45,000 af / 80 cfs**
- **Subject to Term 91**

Water Right Purchase/ Contract Assignment

- **10,000 acre-feet/yr**
- **Available April - October**
- **Subject to Shasta Critical Year Curtailment**

Water Supplies



Demand/Supply Analysis

- **Demand/Plant Capacity Options**
- **81 year Record – Future Term 91 Criteria**
- **Restrictions on Groundwater Use**
  - 65 % Maximum in Davis
  - Zero to 30% Maximum in Woodland
- **ASR Use**
  - Varied Injection/Extraction Rates and Maximum Storage Capacity

5876 0987 876 223 492 3009 334 555 8670 2788 09 2098 027 36 4958 5876 0987 876 223 492 3009 334 555 8670 2788 09 2098 027 36 4958 5876 0987 876 223 492 3009 334 555 8670 0987 502343 0989 30987 09 502343 0989 30987 50 2343 0989 35222 55661 1122 5677 2788 09 2098 027 36 4958 5876 0987 876 223 492 3009 334 555 8670 30987 43 0989 35222 55661 1122 5677 2788 09 2098 027 36 4958 5876 0987 876 223 492 3009 334 555 8670 30987 502343 0989 35222 55661 1122 677 223 492 3009 334 555

Result - Probability of Supply Deficits

ASR Program Status

- Injection/Extraction Testing
- Geochemical Evaluations
- Groundwater Flow Modeling
- Water Right Modifications and Supplemental EIR

IWFM Development Status

- Transitioned to latest IWFM version from original IGSM
- Updated historical inputs
- Updated to 2008 agricultural land use
- Refined model layers
- Calibrated root zone and aquifer parameters

Upcoming Work

- Model runs for the ASR scenarios
- Report preparation
- Supplemental EIR
- Water Right Permit Modification

Model Layout

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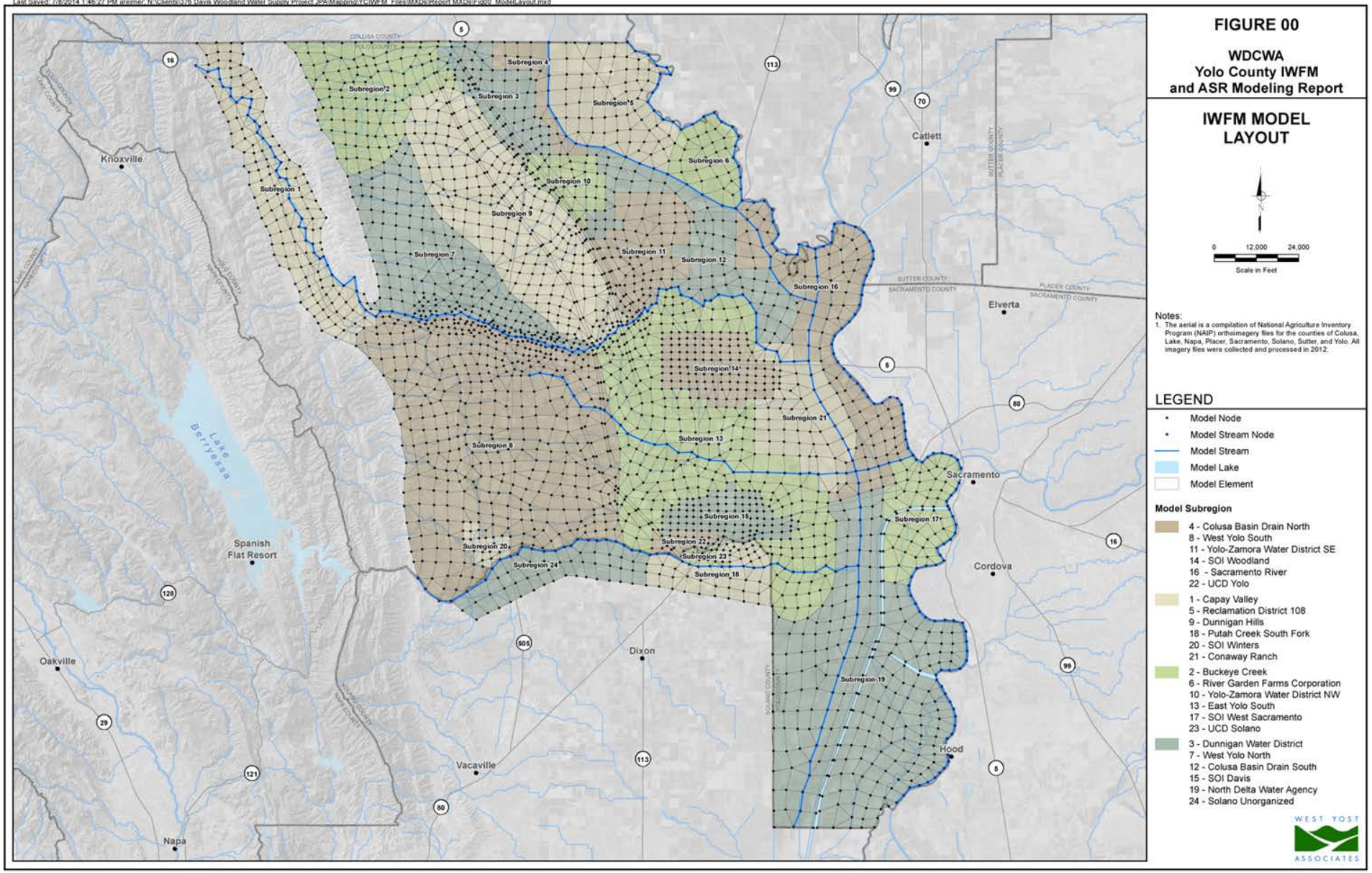
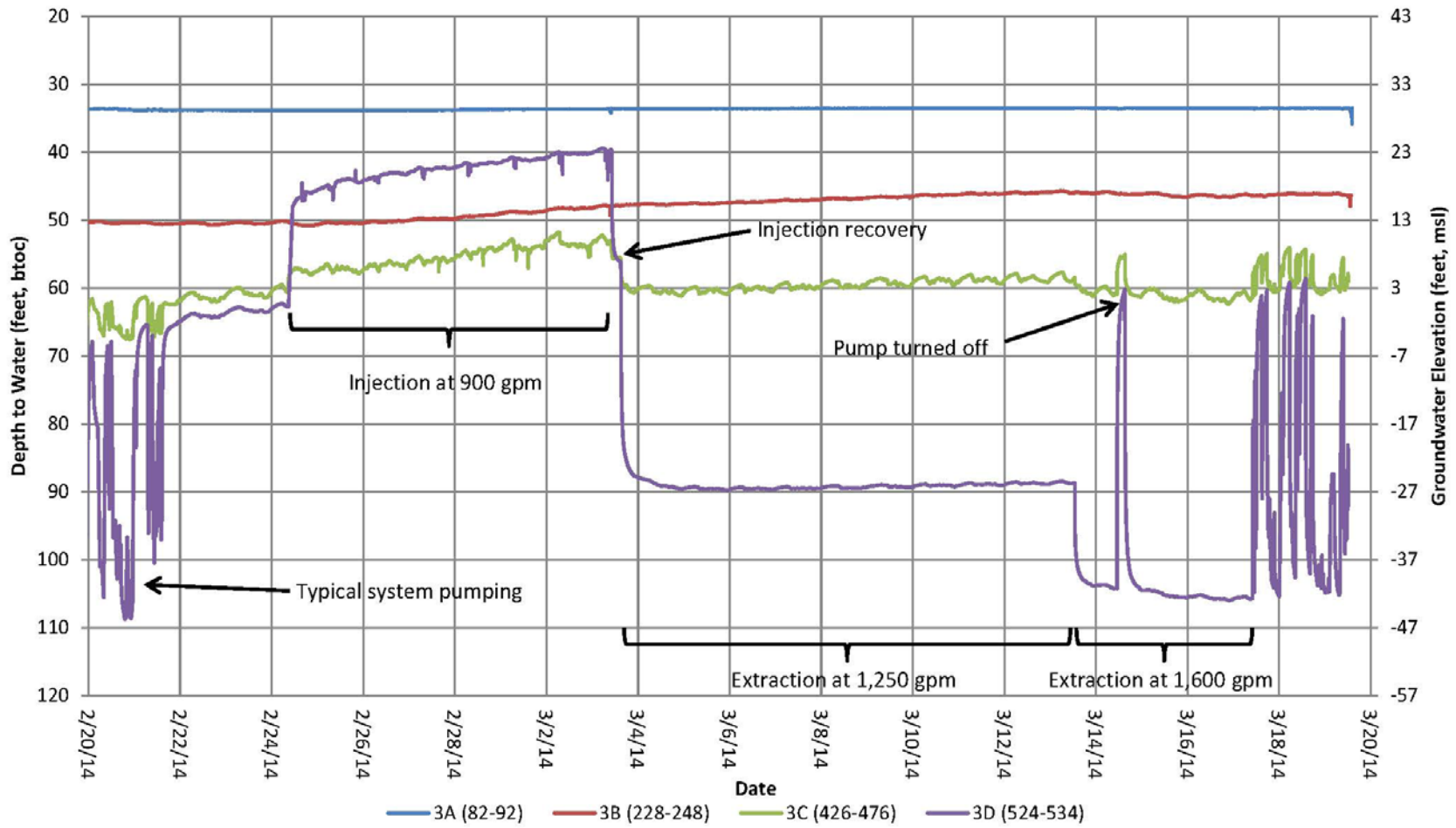
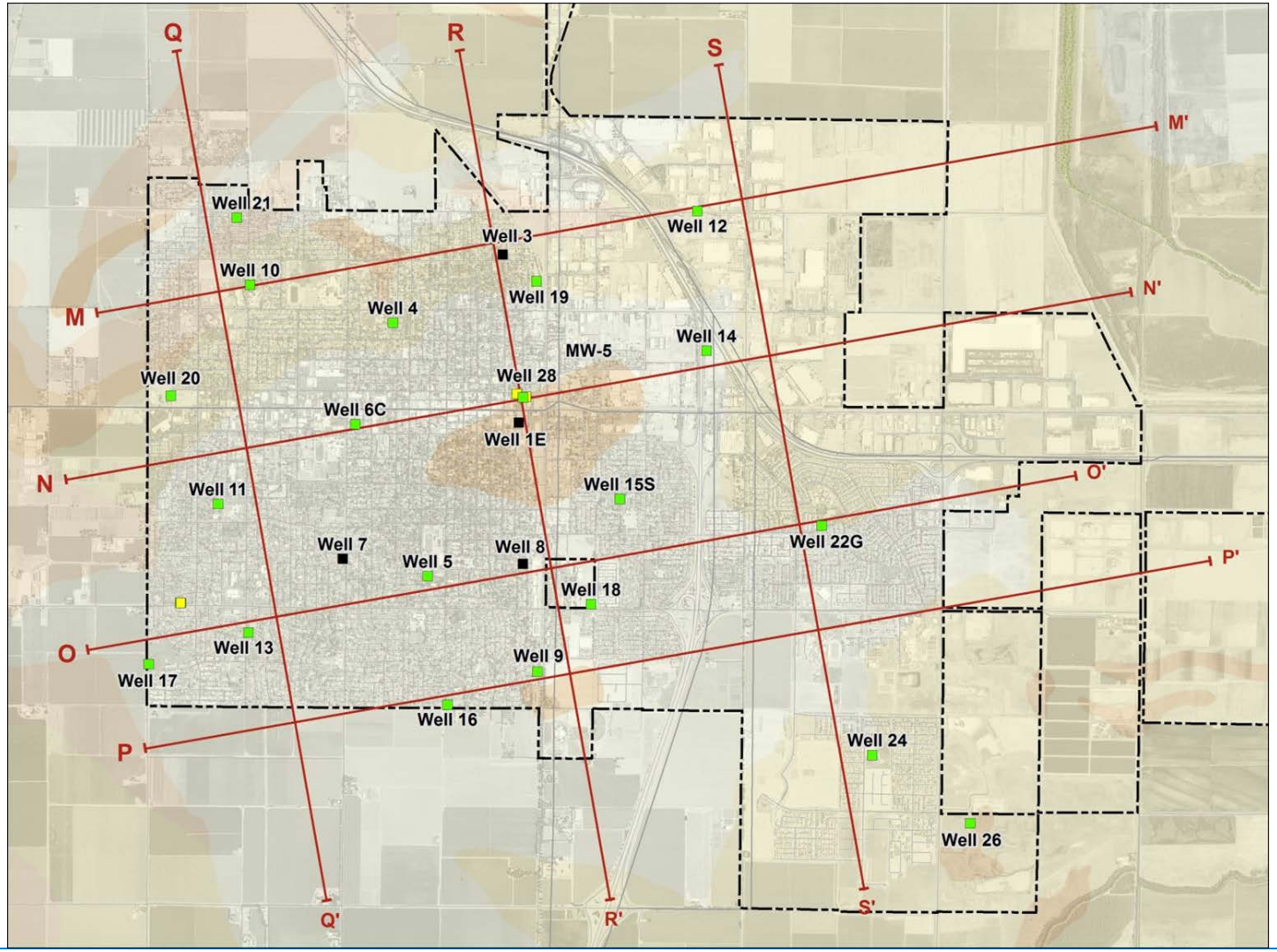


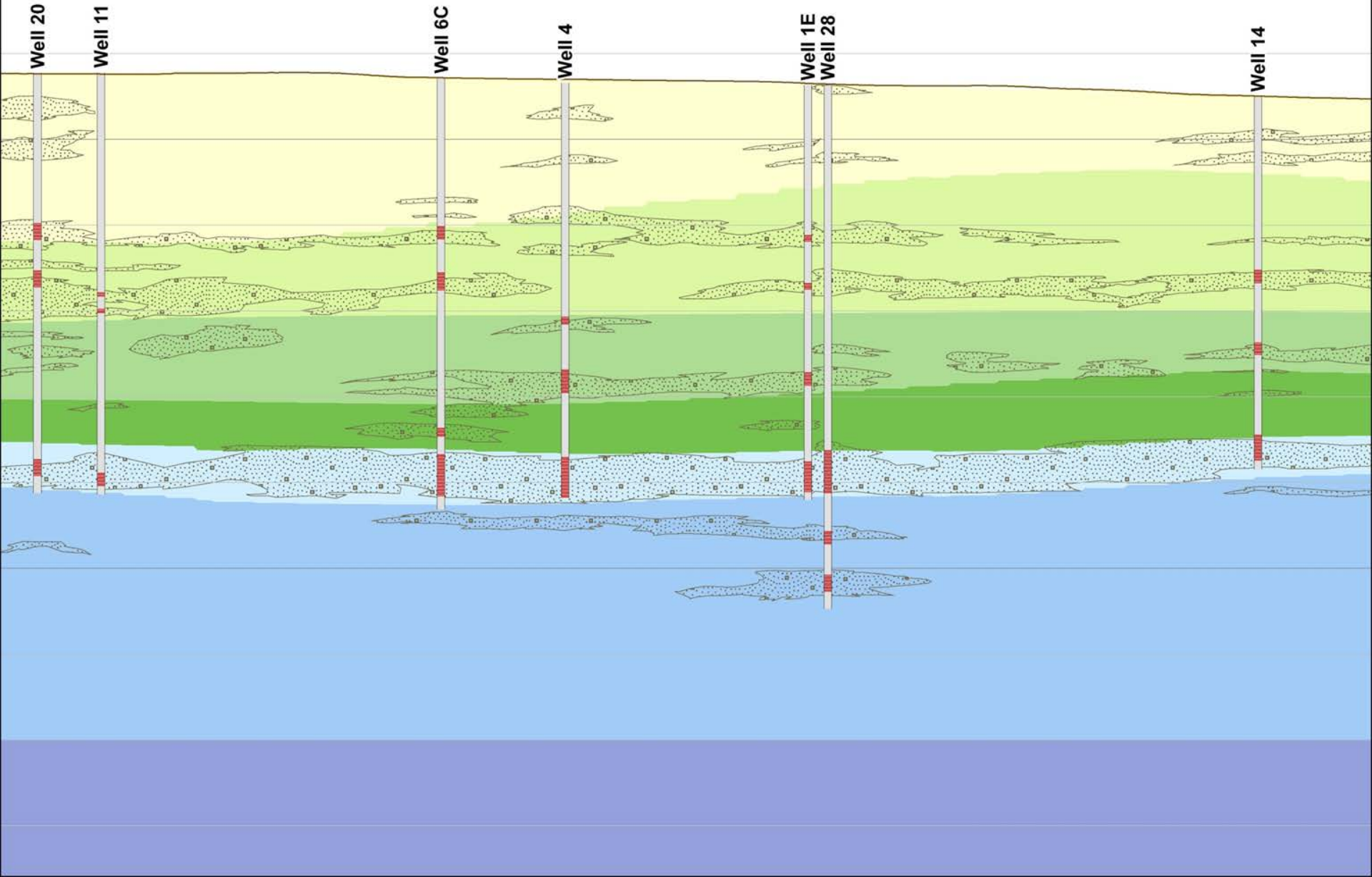
Observed Groundwater Levels



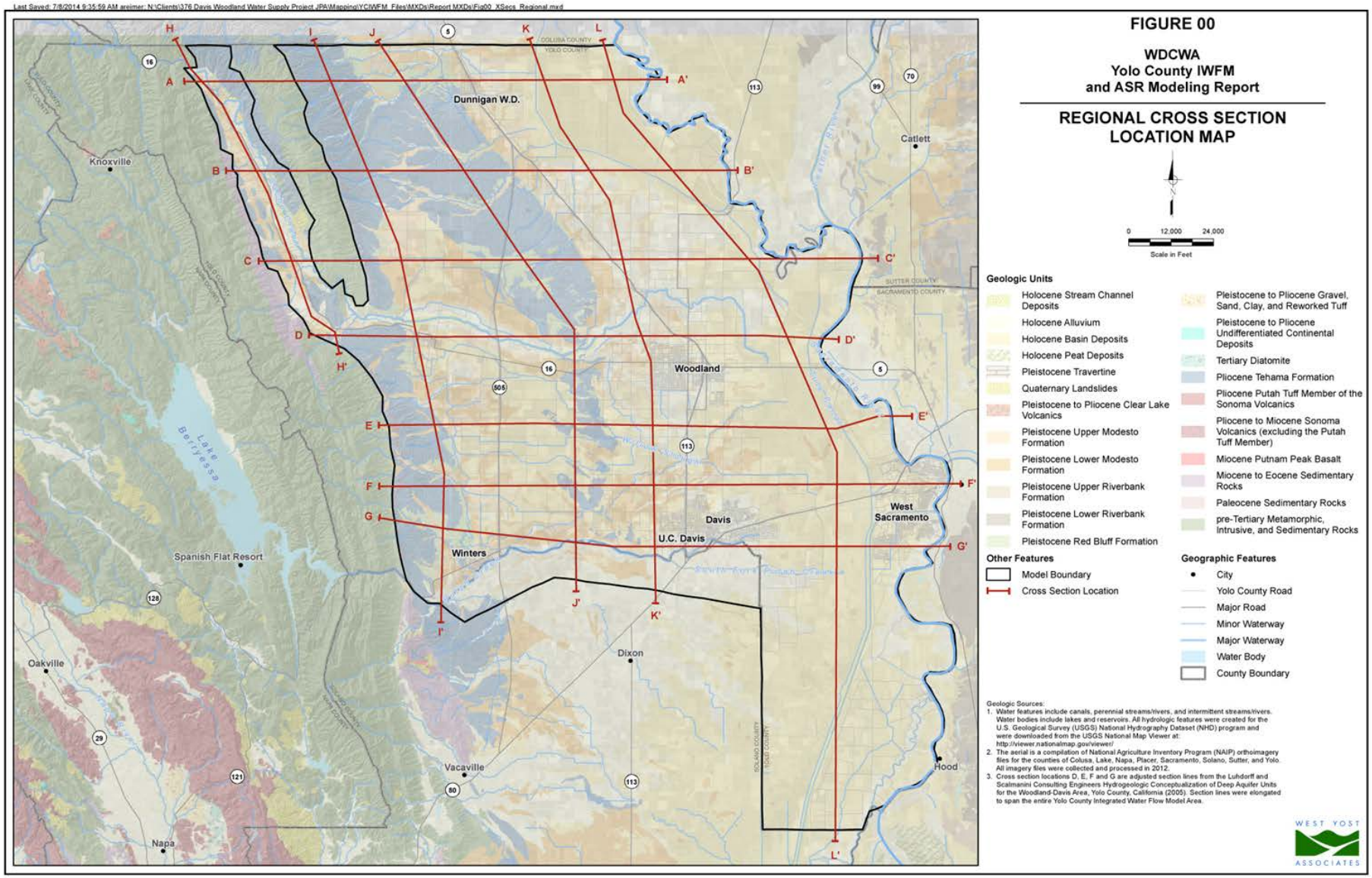
Woodland Cross Section Locations



Woodland Cross Section



Regional Cross Section Locations



Regional Cross Section

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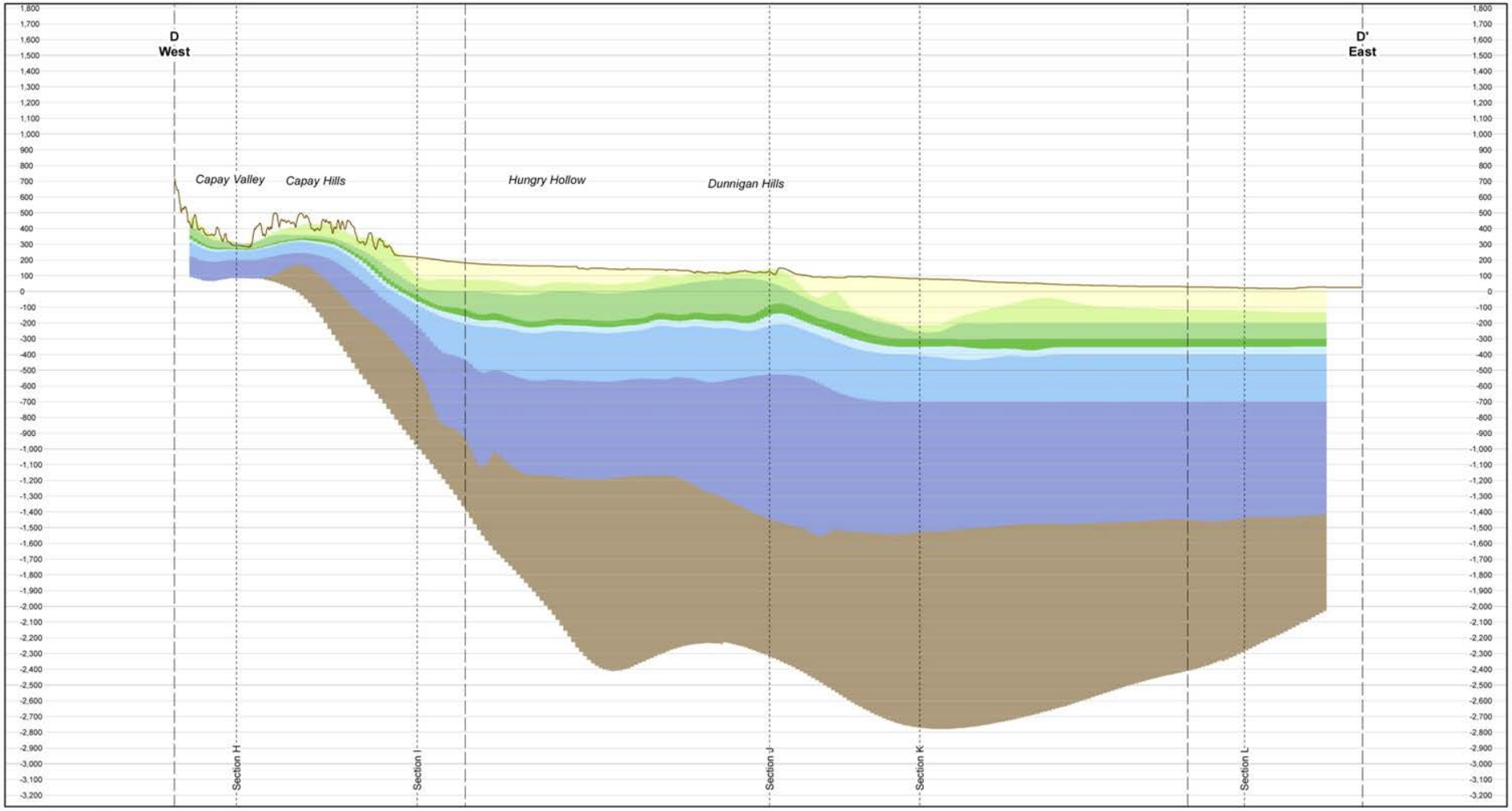


Cross Section Features

- Land Surface Elevation
- Intersection Line
- Section End or Bend
- Major Gridline
- Minor Gridline

Model Layers

- Model Layer 1
- Model Layer 2
- Model Layer 3
- Model Layer 4
- Model Layer 5
- Model Layer 6
- Model Layer 7
- Model Layer 8

Notes:

1. Elevations are in vertical datum North American Vertical Datum 1988 (NAVD 88). Values are in feet, mean sea level.
2. The land surface elevation polyline was created using overlaying U.S. Geological Survey (USGS) 1/3 arcsecond National Elevation Dataset (NED) grid files.
3. Model layers 1 and 8 are unaltered from the original Yolo County IWFM nodes (including top elevation, bottom elevation, and layer thickness). The model layer boundary surfaces were interpolated using the values assigned to each model node over the entire model area. Due to the top elevation of layer 1 being unchanged from the original model, it may not exactly match the land surface elevation.
4. Layer 2 from the original Yolo County IWFM was divided into the current model layers 2 through 7 based on the Cities of Woodland and Davis municipal well construction, lithology, and water quality data.
5. The regional cross section lines span the entire model area but do not end at the model boundary. Therefore, the model layers do not extend out to the ends of the regional cross sections.
6. The Yolo County IWFM does not exist through the Capay Hills.

0 6,000 12,000

Scale in Feet

Vertical Exaggeration = 20x

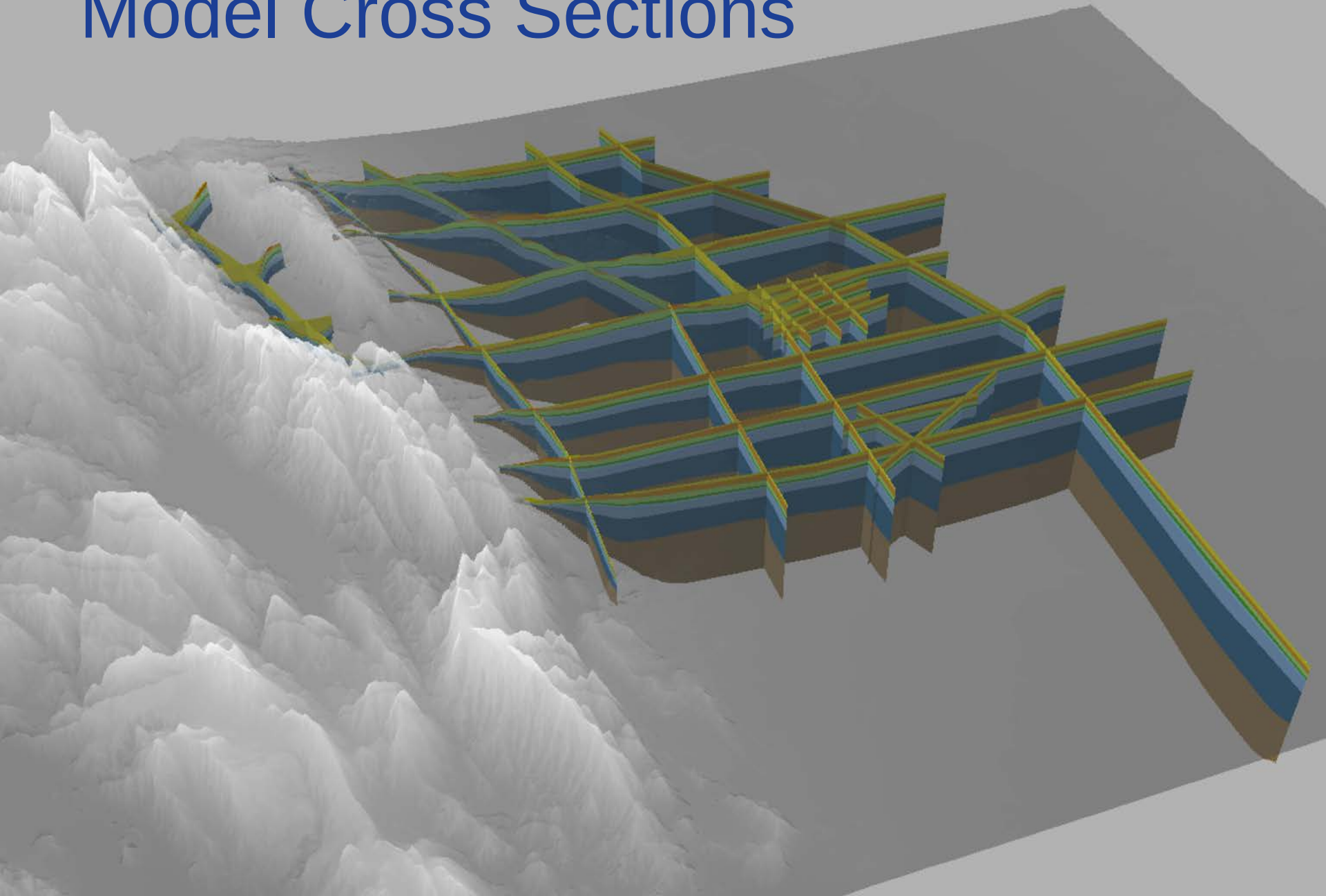
FIGURE 00

WDCWA
Yolo County IWFM
and ASR Modeling Report

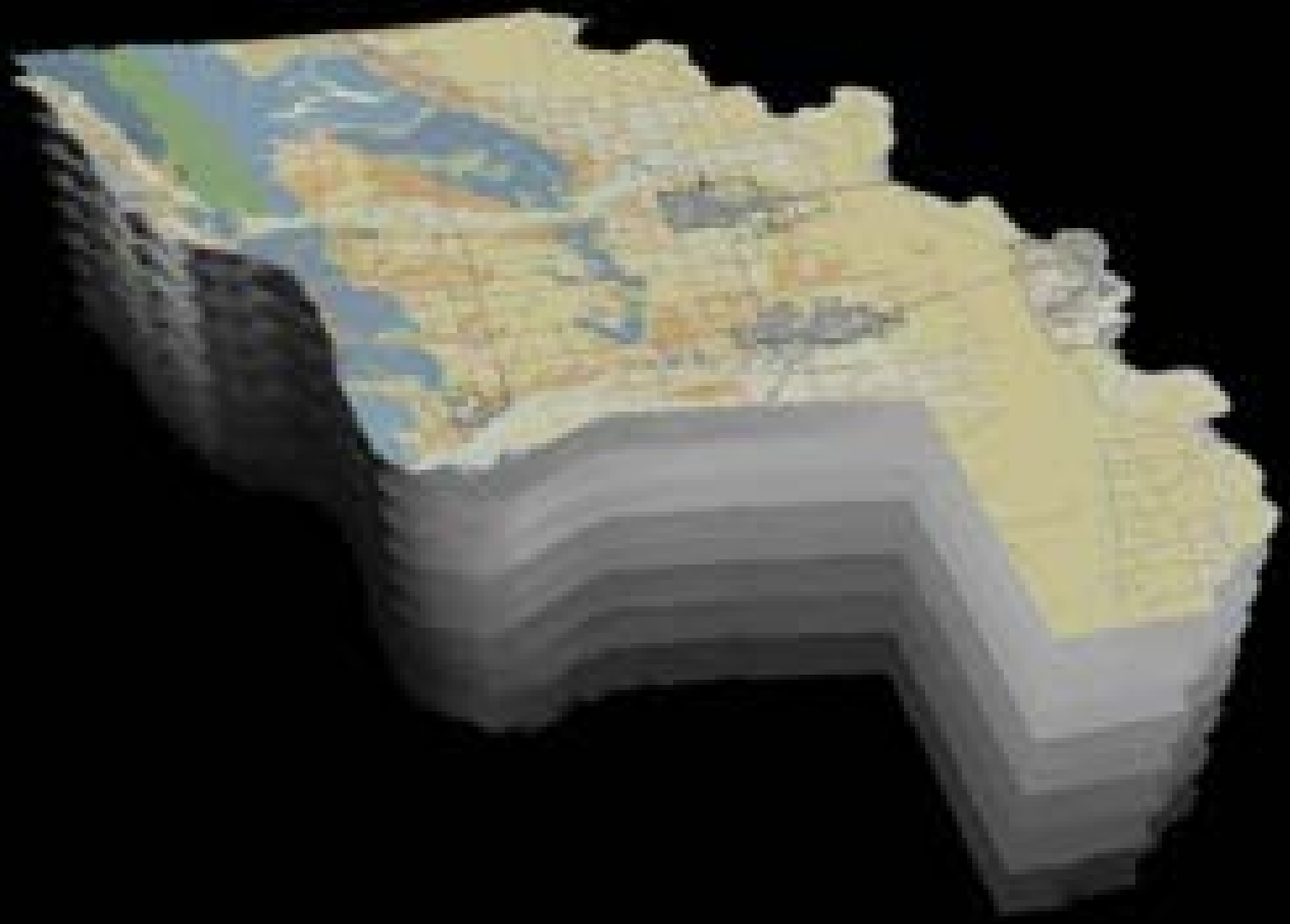
REGIONAL CROSS SECTION D-D'

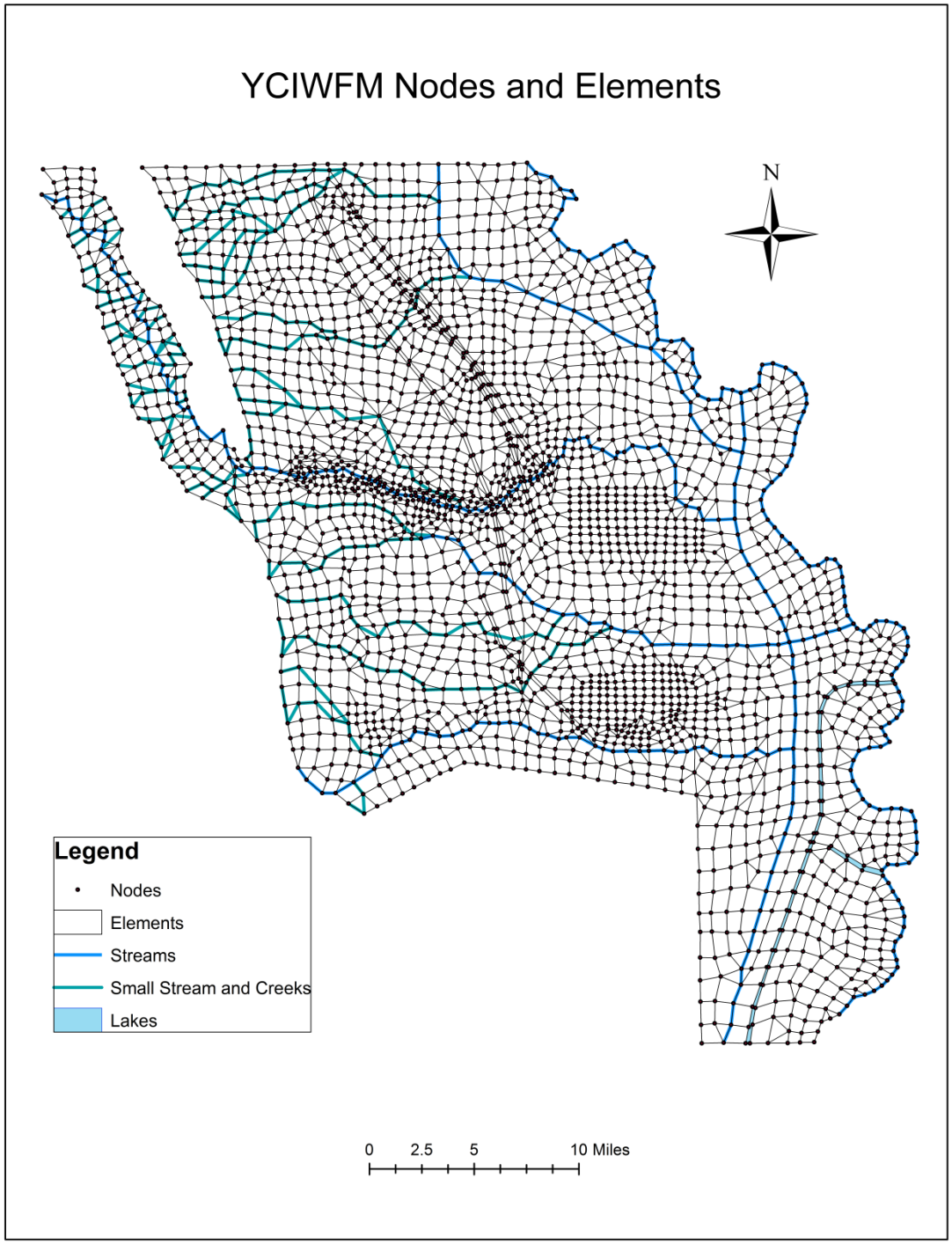
WEST YOST ASSOCIATES

Model Cross Sections



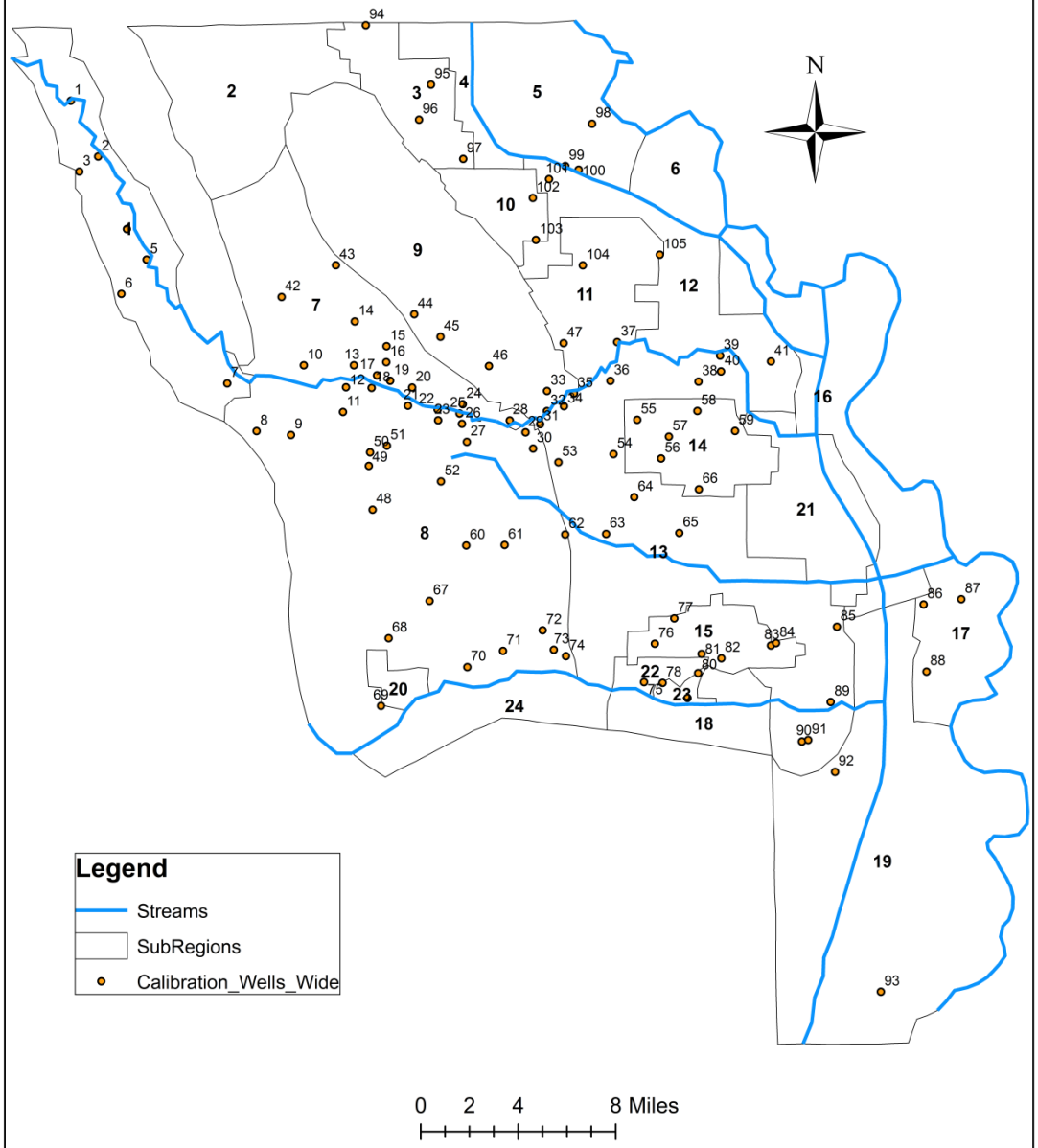
Model Layers





Area: 884 sq.mi
Nodes: 2840
Elements: 3068
Average element size: 185 ac.
Min. element size:17 ac.
Max. element size: 659 ac.
Stream nodes: 424
Stream reaches: 27

YCIWFM Calibration Wells



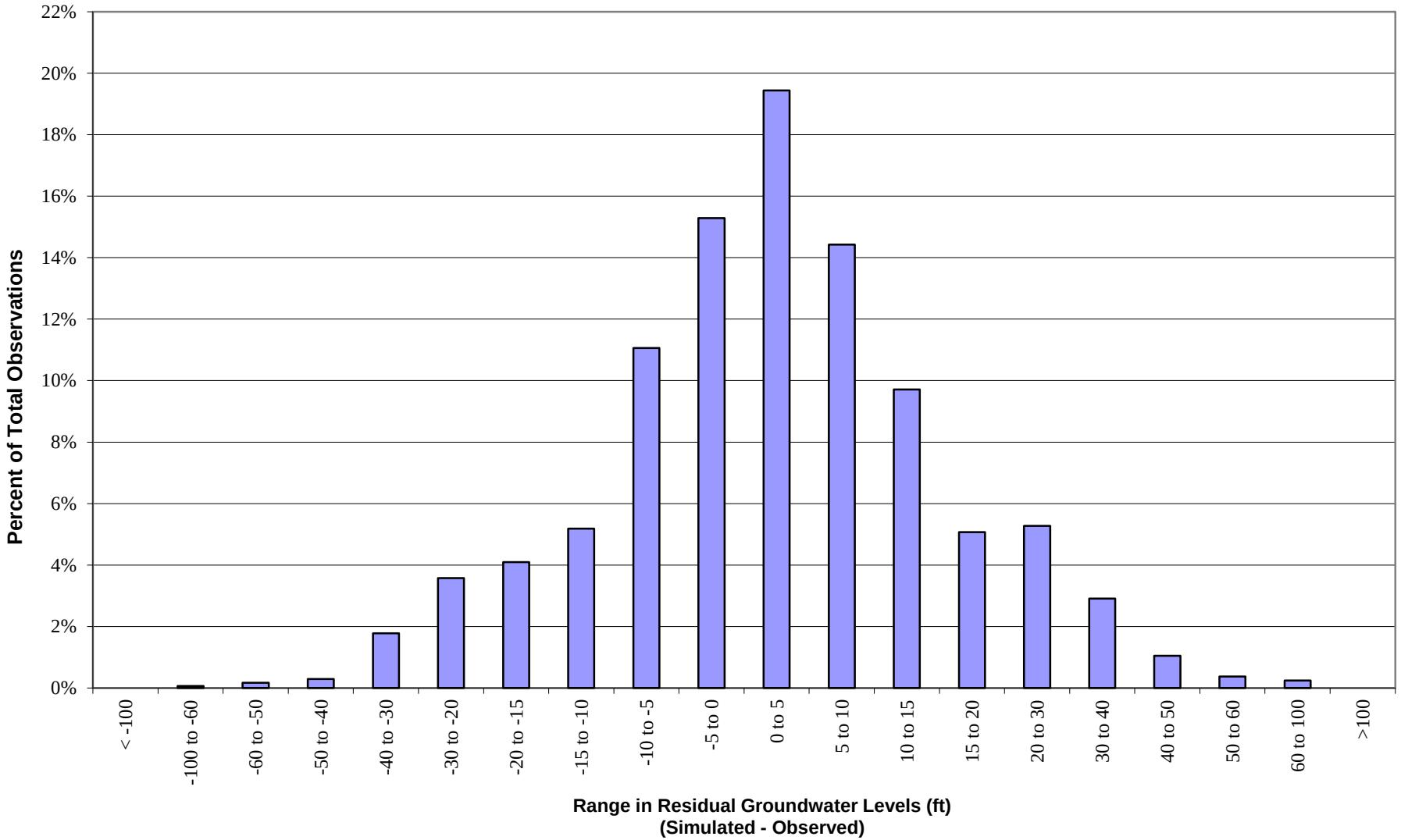
Sub Regions:

1-Capay Valley
2-Buckeye Creek
3-Dunningan WD
4-CBD North
5-RD 108
6-RiverGardenFarms
7- West Yolo North
8-West Yolo South
9-Dunnigan Hills
10-Yolo-Zamora NW
11-Yolo-Zamora SE
12-CBD South
13-East Yolo South
14-SOI Woodland
15-SOI Davis
16-Sacramento River
17-SOI West Sac
18-PutahCrSouthFork
19-NorthDeltaWA
20-SOI Winters
21-Conaway Ranch
22-UCD Yolo
23-UCD Solano
24-SolanoUnorgnzd

Calibration Targets

GW Levels within (ft)	Target	R9uL
5		34.7%
10	60%	60.2%
15		75.1%
20	75%	84.3%
30		93.1%

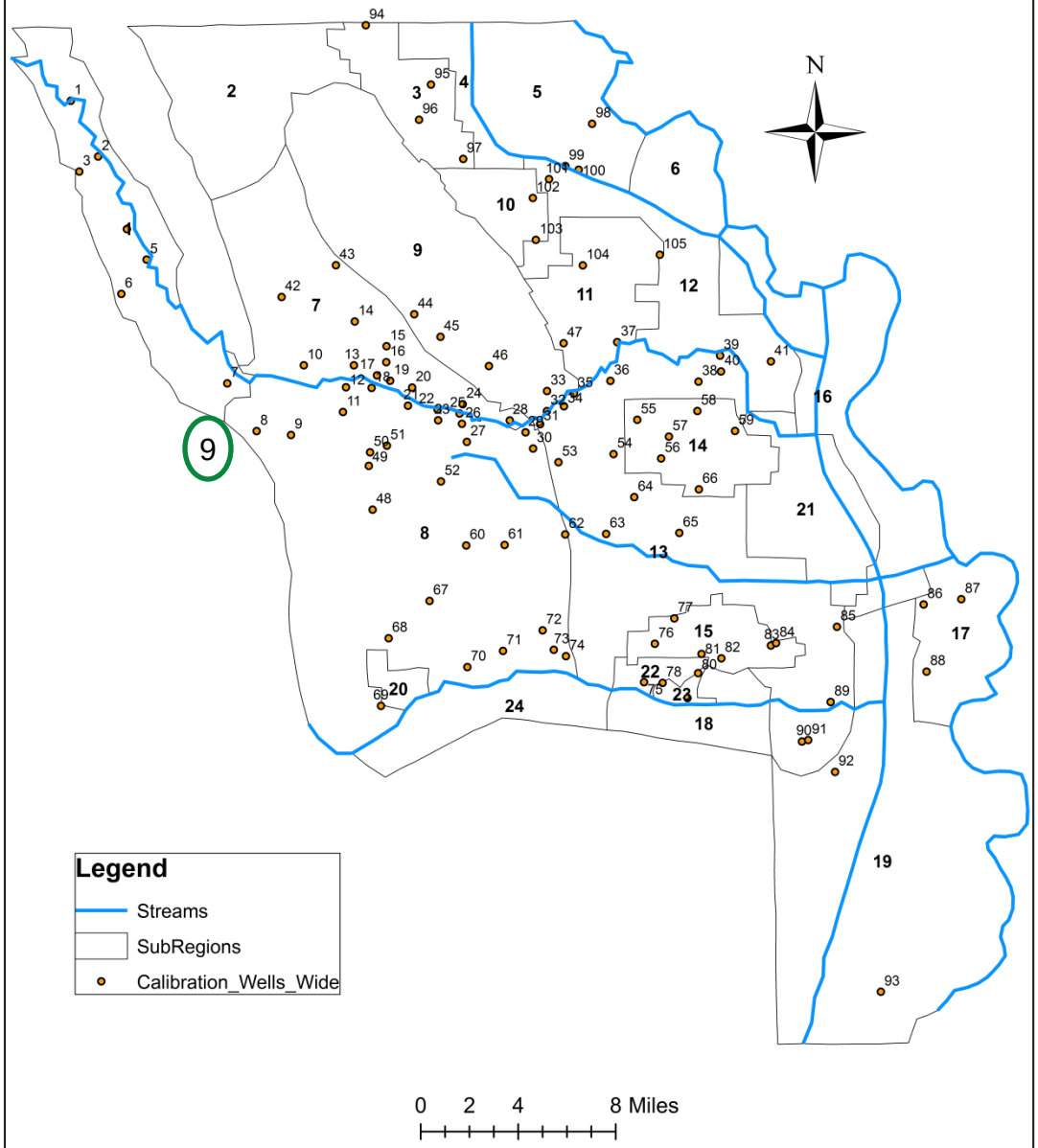
Mean absolute difference Obs-Sim: 3.5 ft

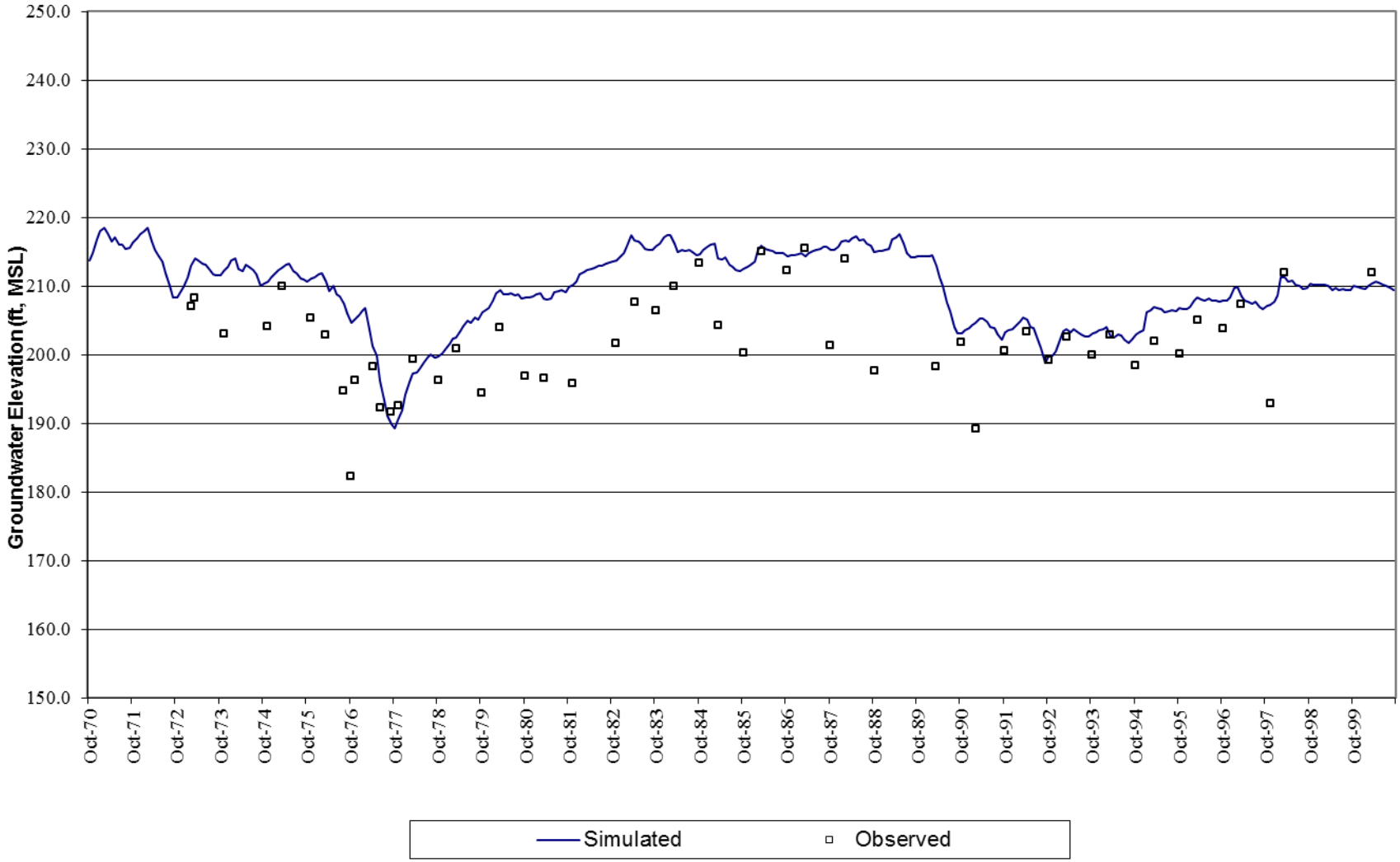


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

Histogram of Deviations between Simulated and Observed Groundwater Levels

YCIWFM Calibration Wells

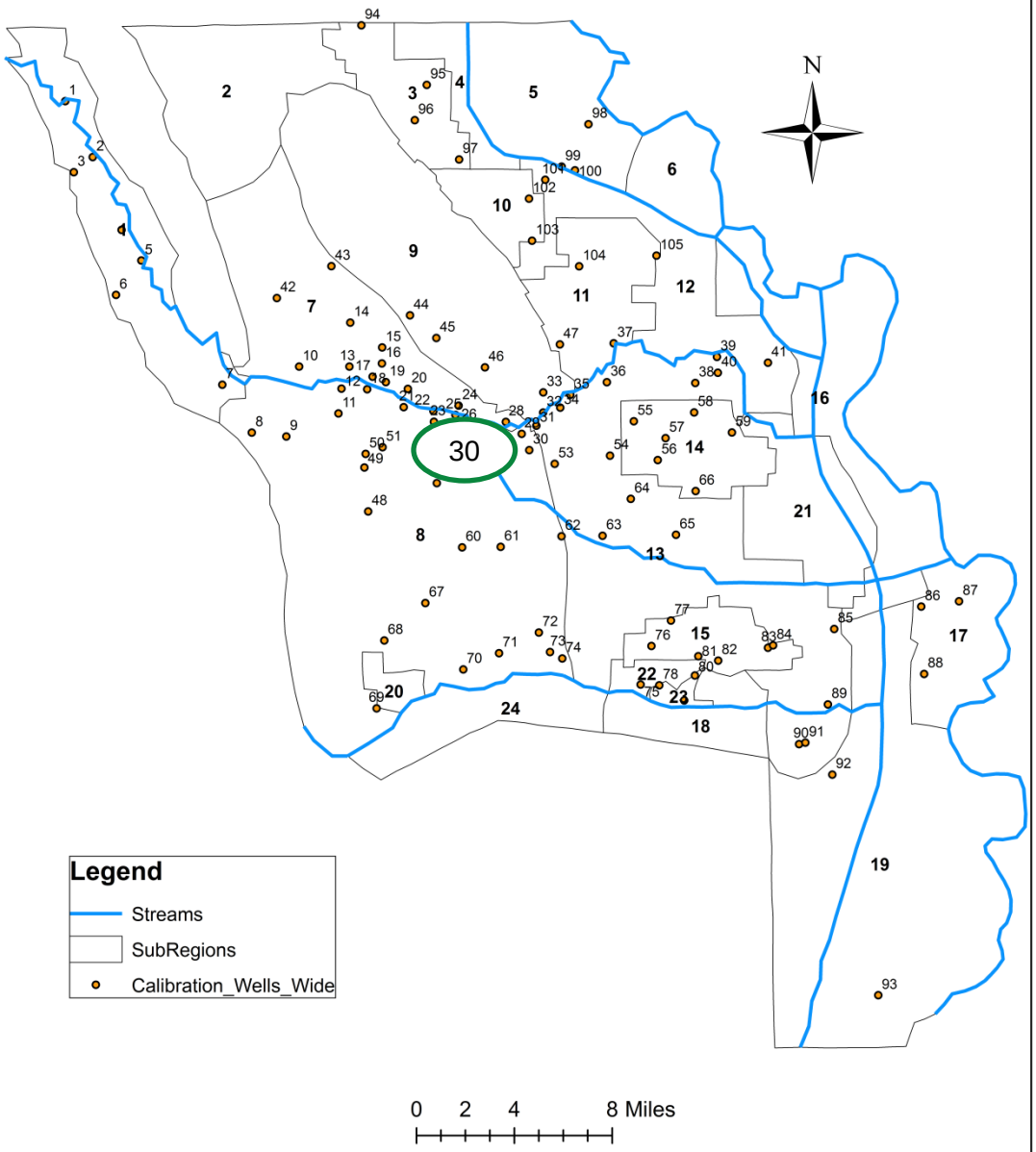


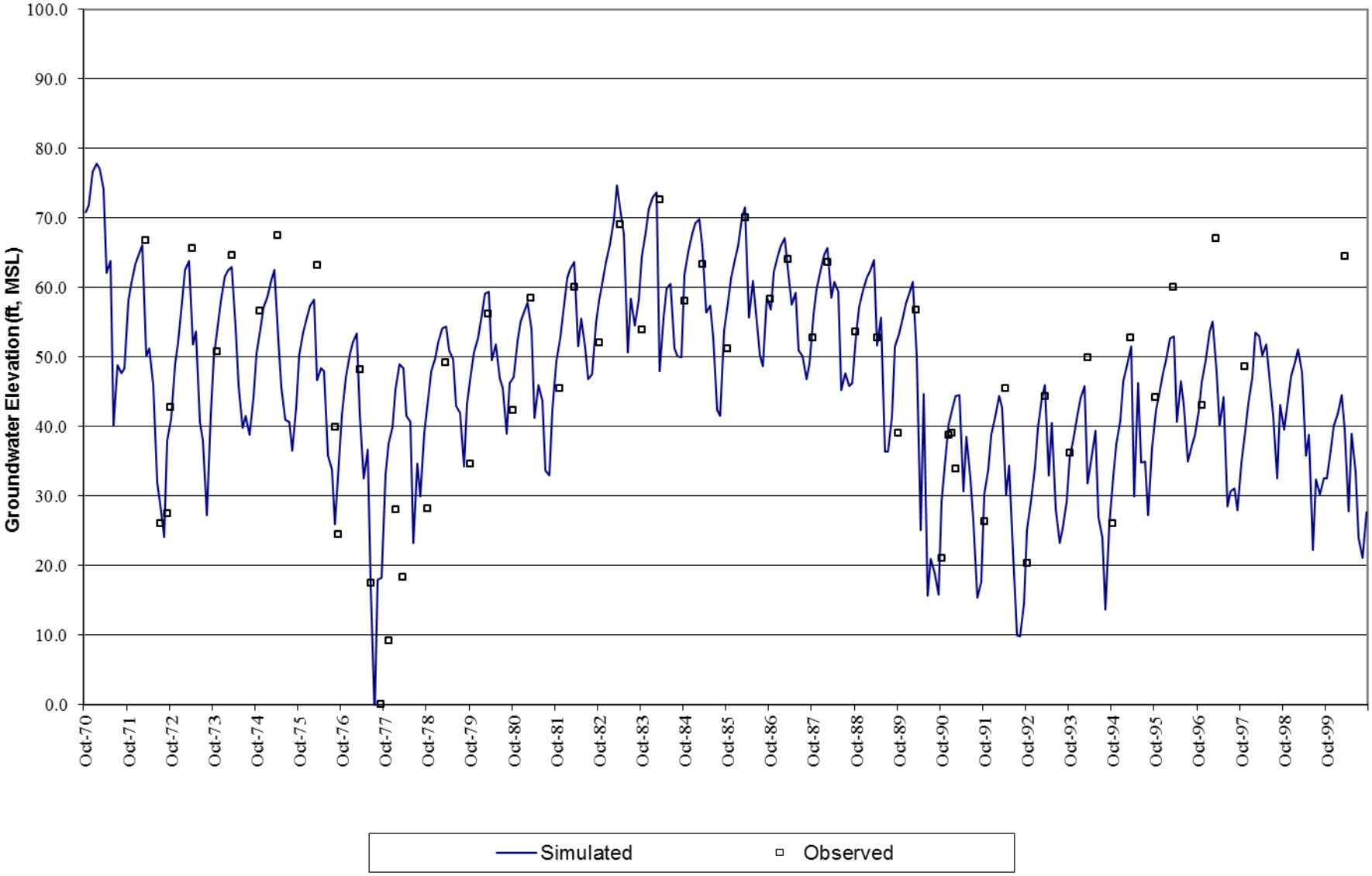


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 9 Groundwater Level Hydrograph

YCIWFM Calibration Wells

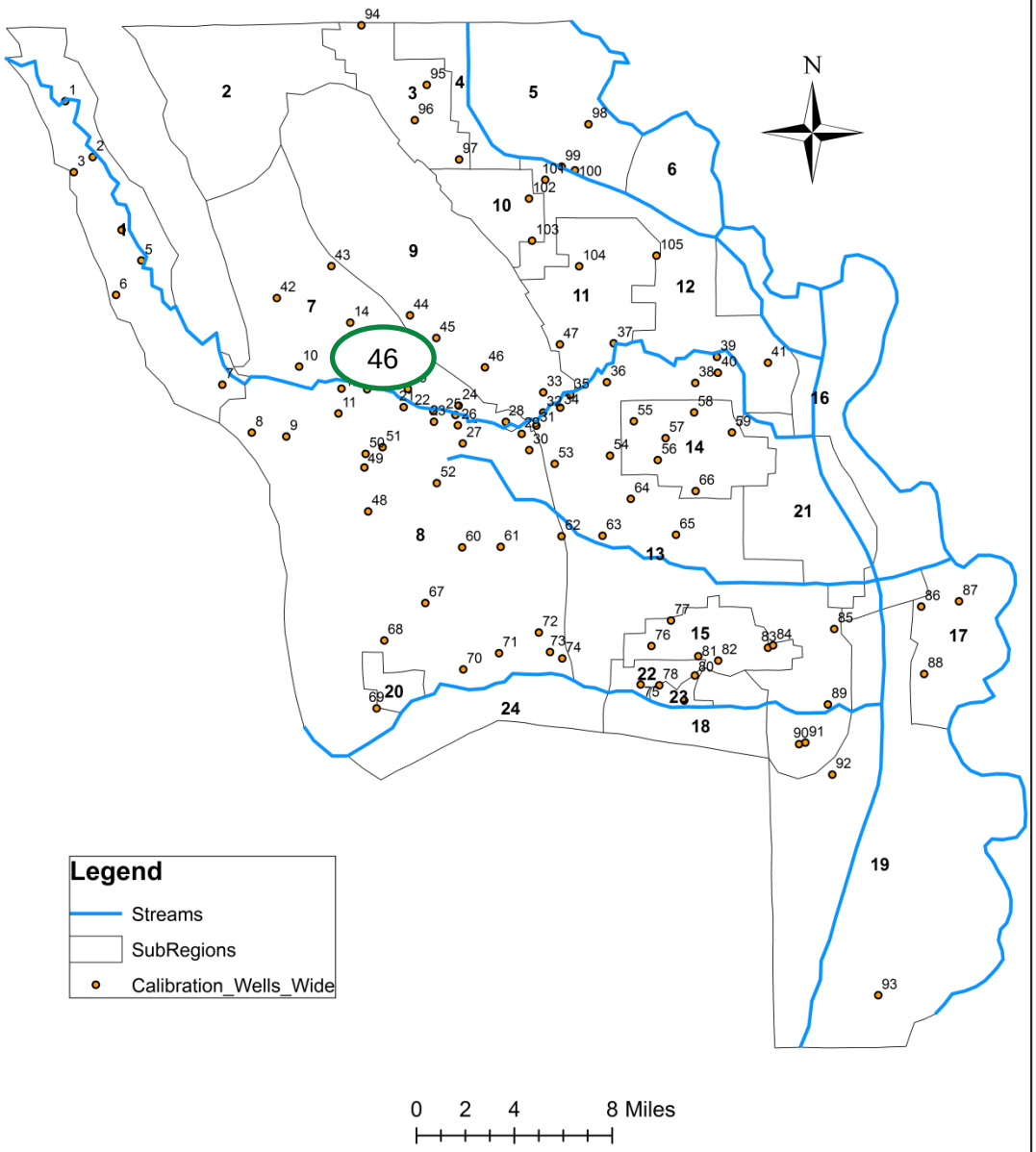


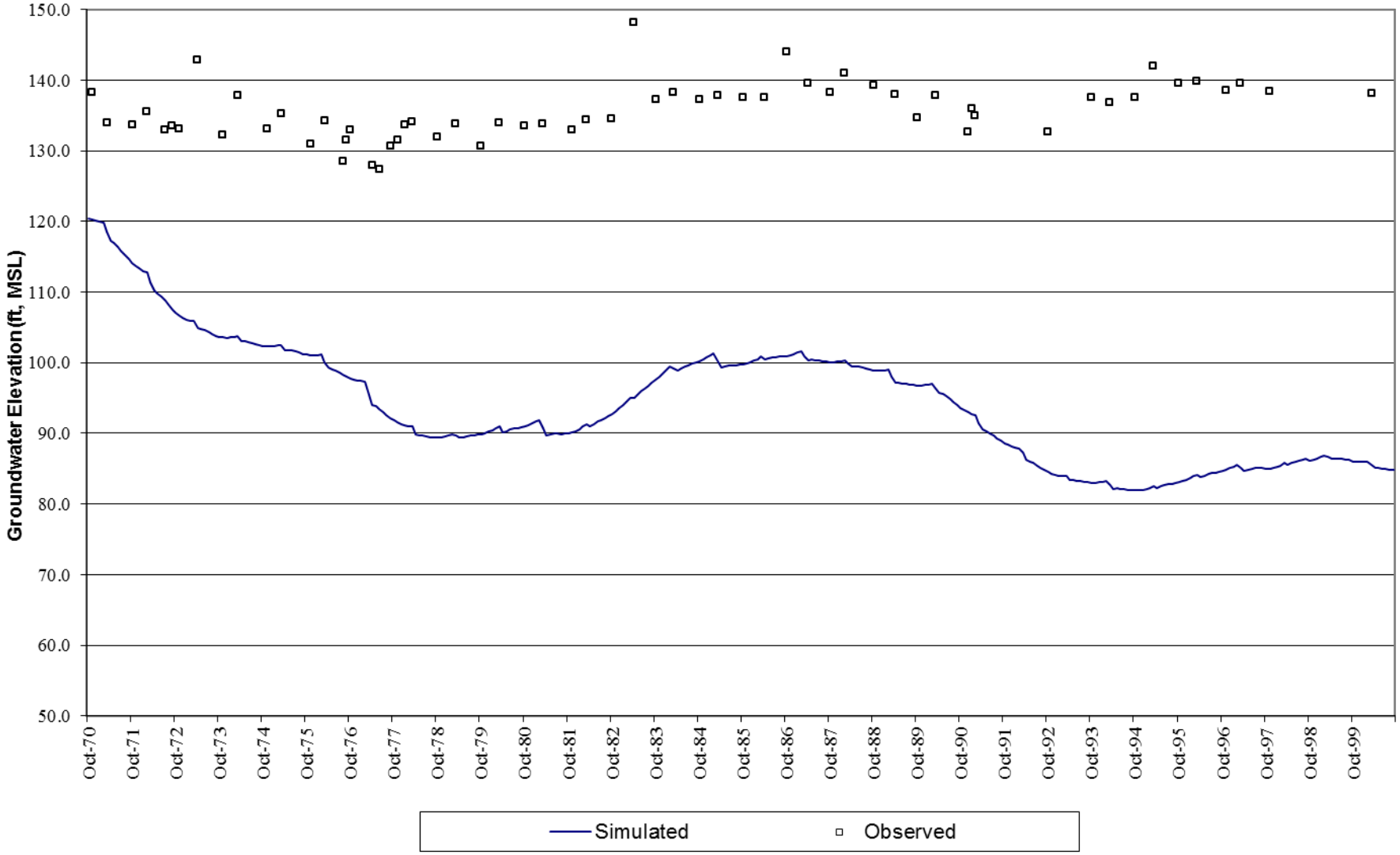


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 30 Groundwater Level Hydrograph

YCIWFM Calibration Wells

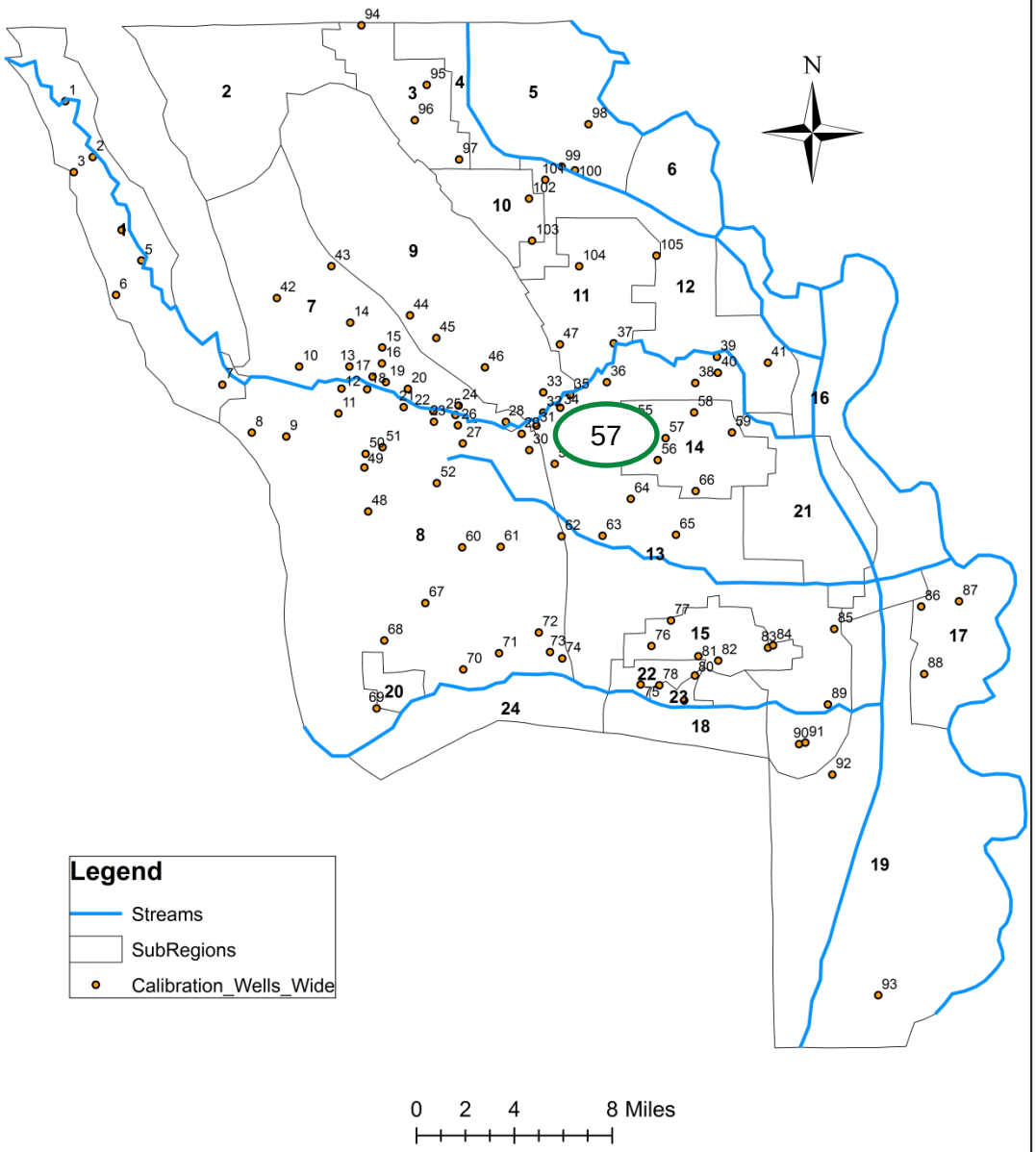


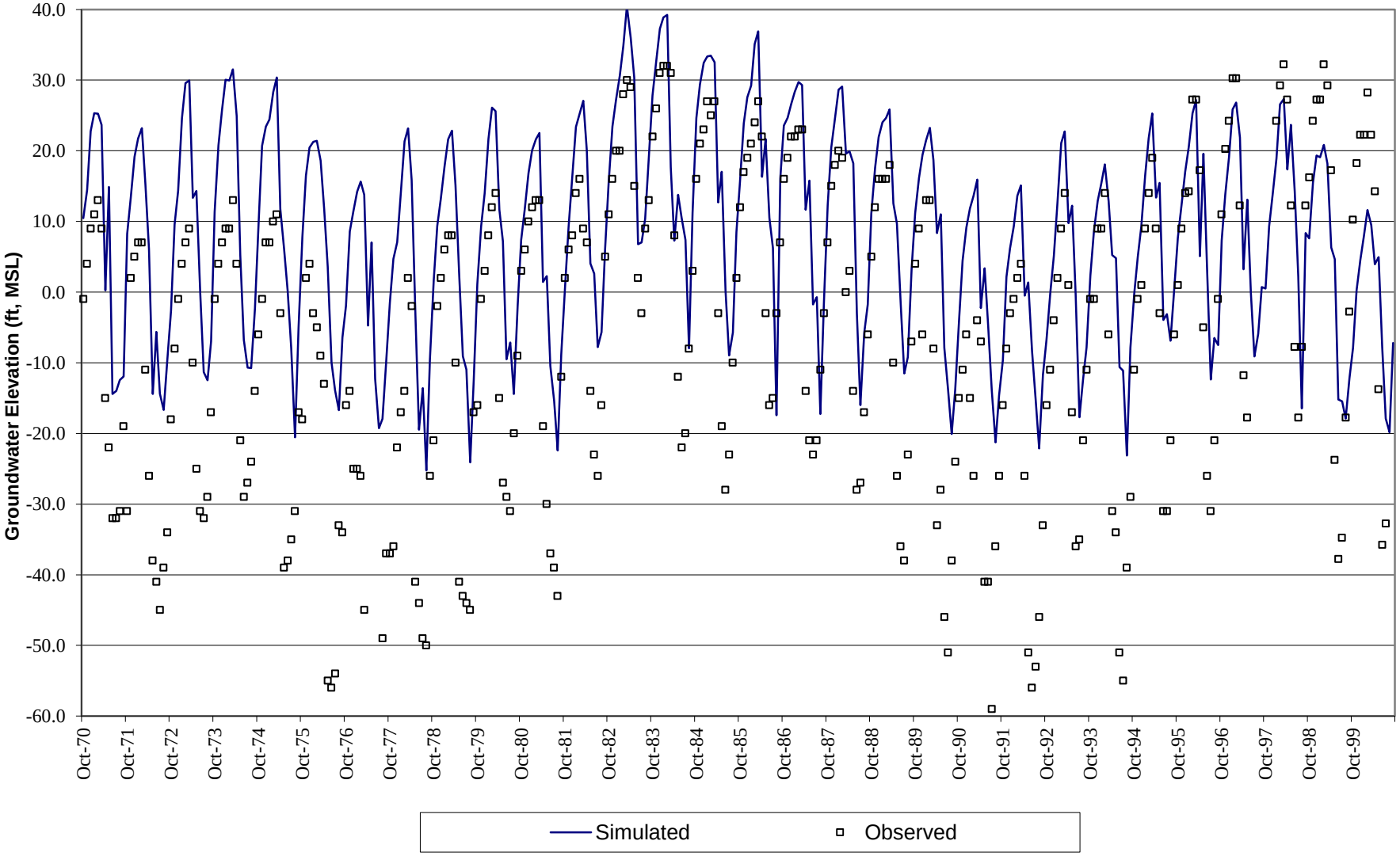


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 46 Groundwater Level Hydrograph

YCIWFM Calibration Wells

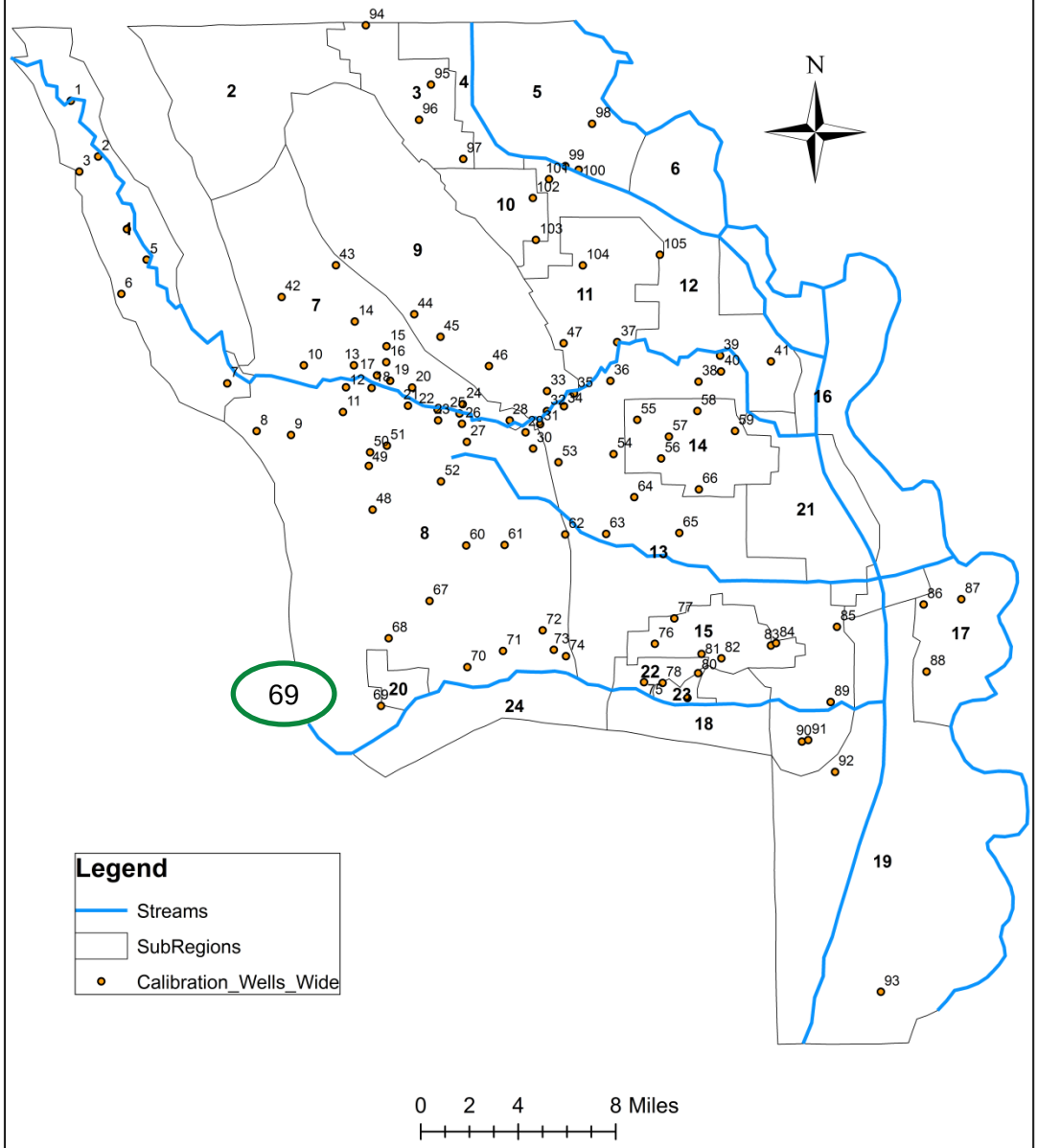


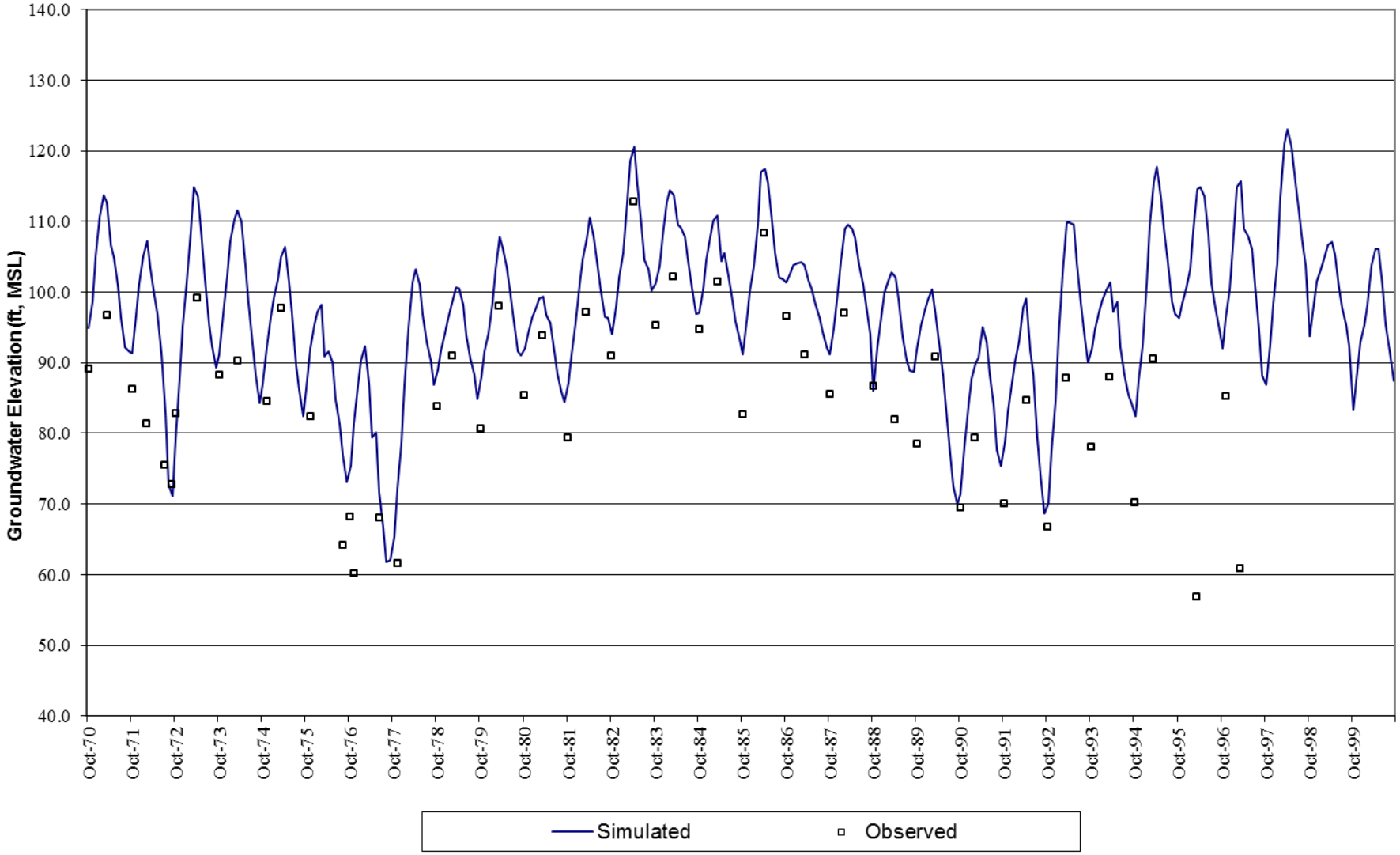


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 57 Groundwater Level Hydrograph

YCIWFM Calibration Wells

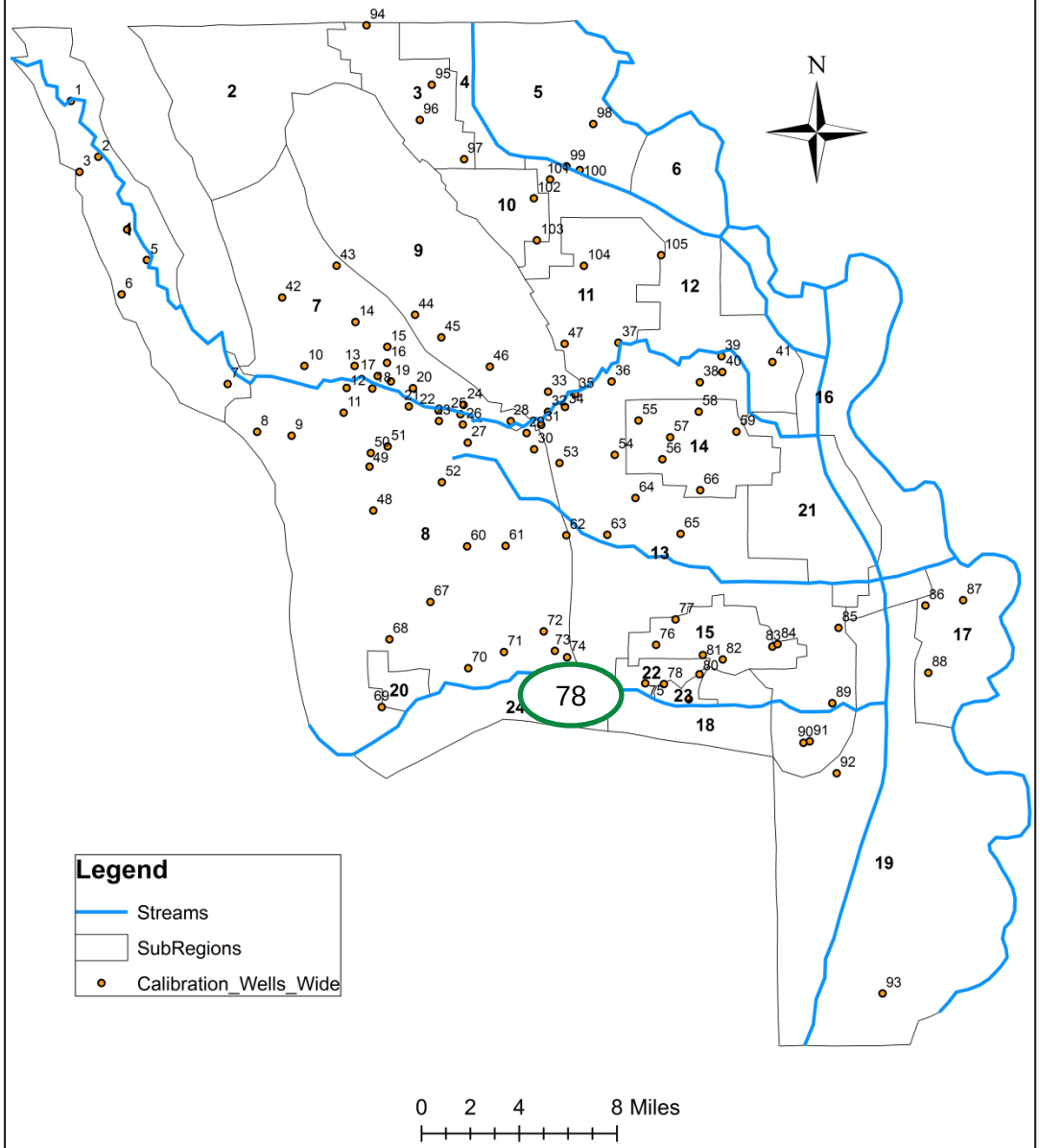


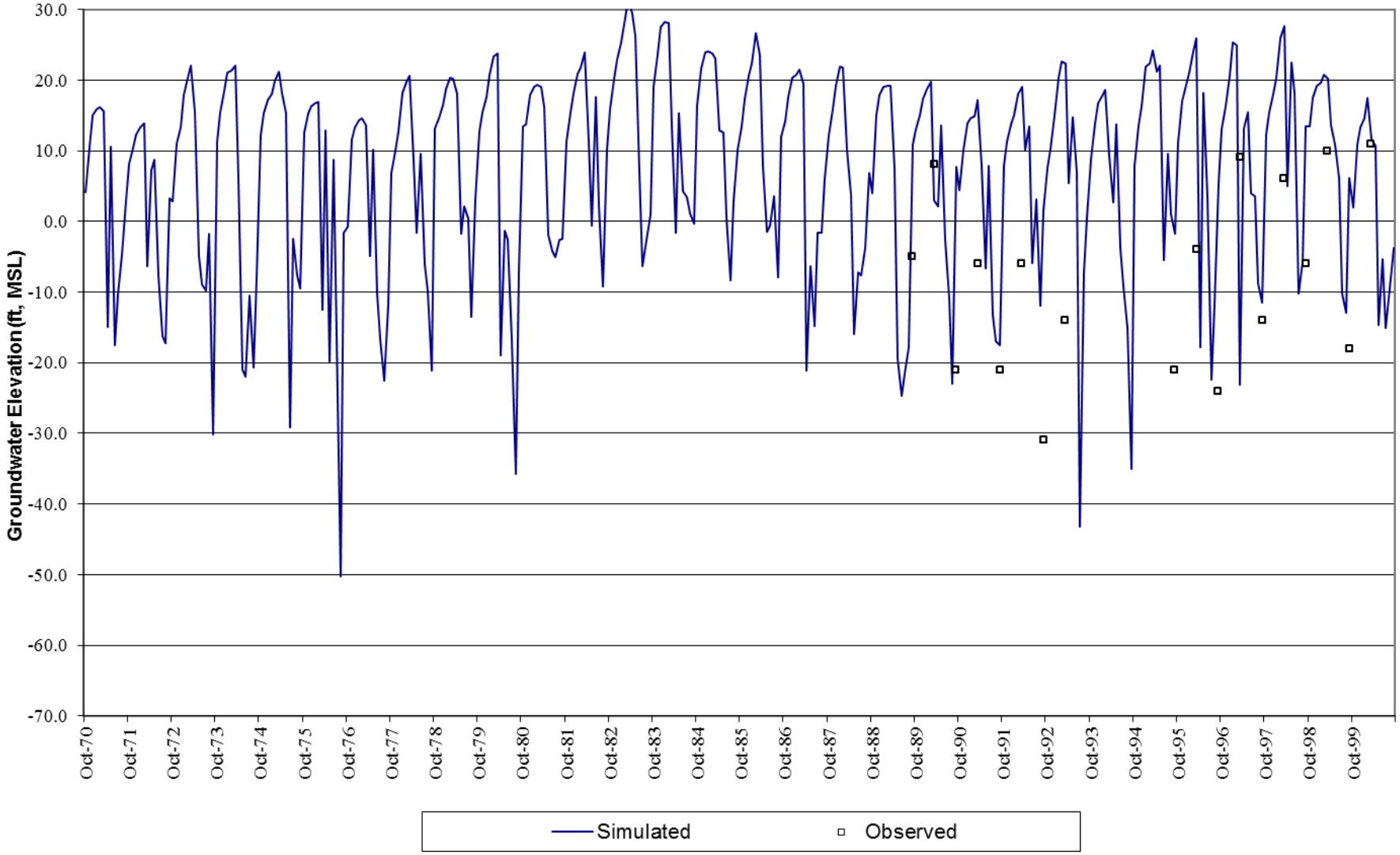


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 69 Groundwater Level Hydrograph

YCIWFM Calibration Wells

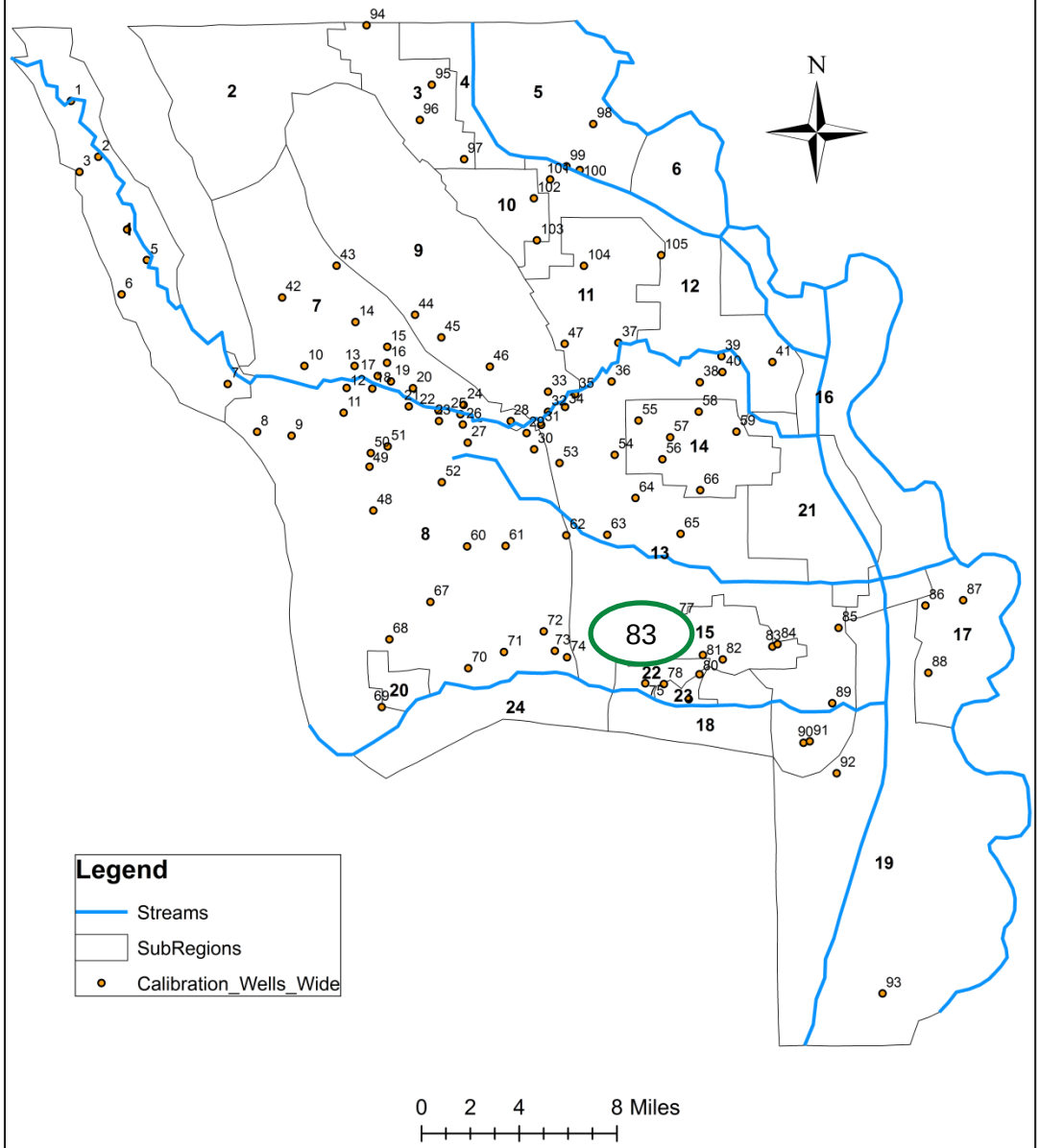


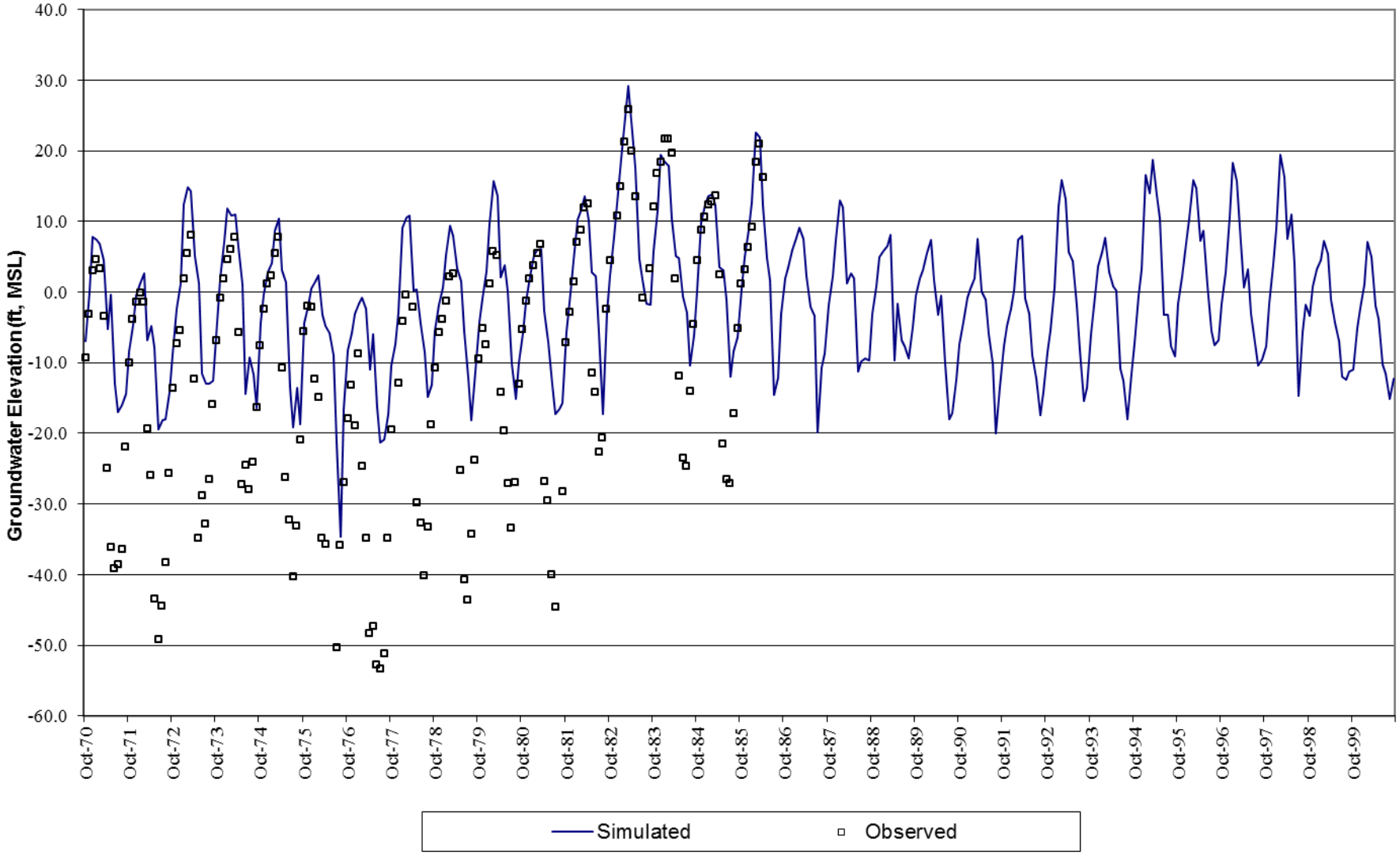


YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 78 Groundwater Level Hydrograph

YCIWFM Calibration Wells





YOLO COUNTY INTEGRATED WATER FLOW MODEL (YCIWFM)

YCIWFM Calibration Well 83 Groundwater Level Hydrograph

ASR Scenarios

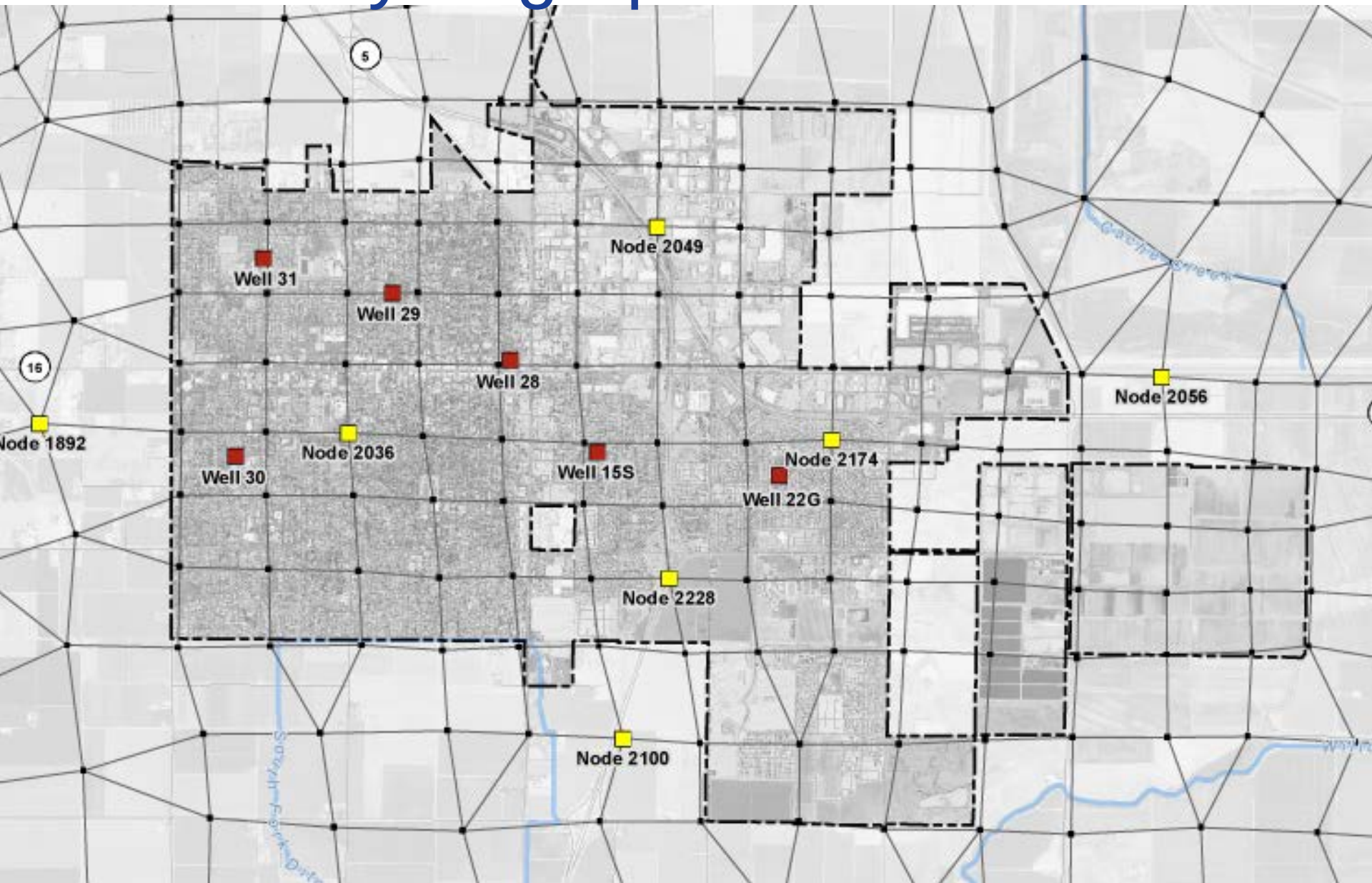
- Current (2014) Conditions with and without ASR
- Future (2040) Conditions with and without ASR

Groundwater Budget
Woodland (Current Conditions)

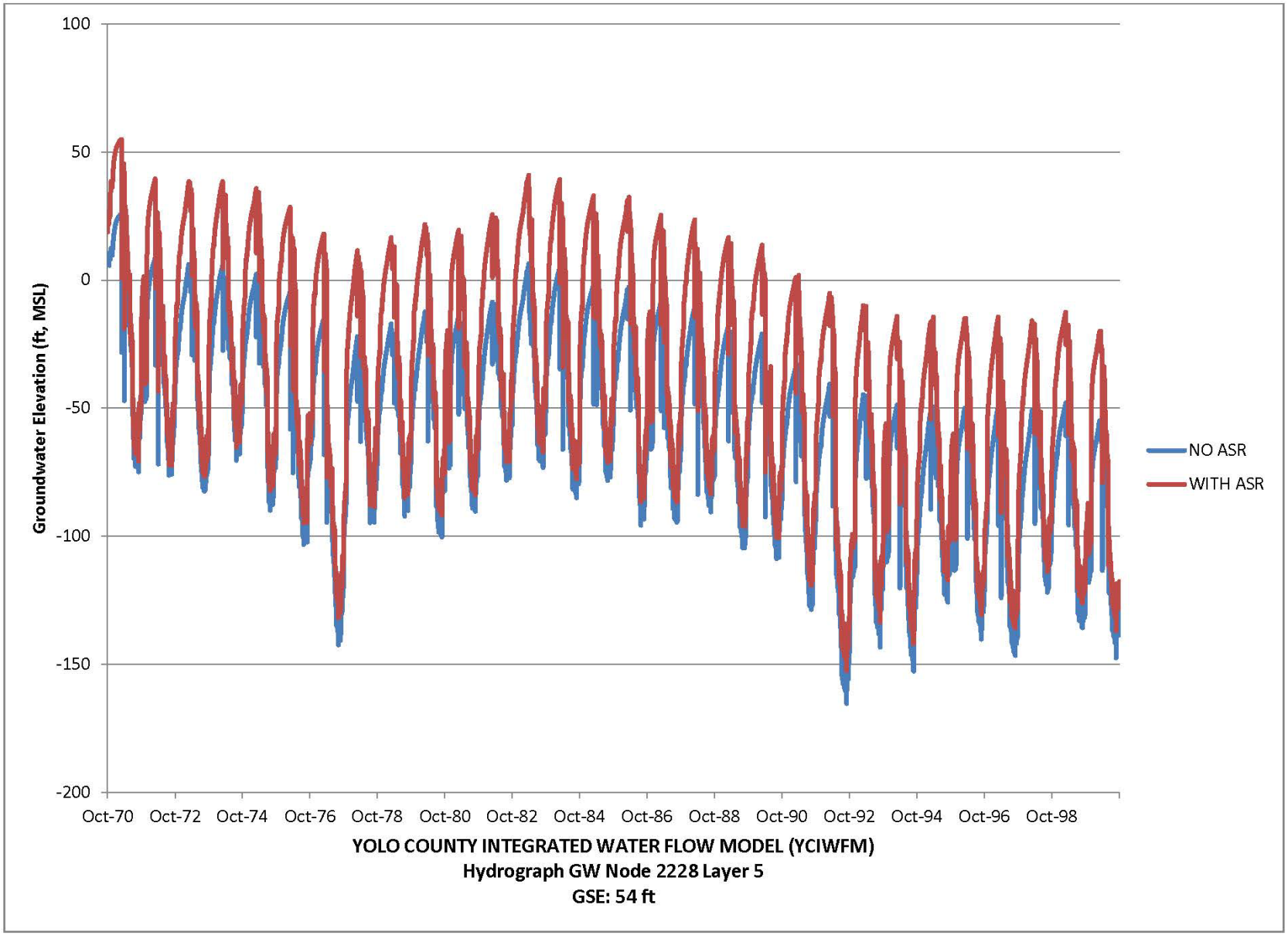
(Average Annual, Water Years 1970–2000)

IWFM SR 14 (ac-ft)		ASR	No ASR
Inflows	Deep Percolation	12,627	12,628
	Gain from Stream	0	0
	Recharge	5,230	11
	Boundary Inflow	0	0
	Total Inflows	17,858	12,639
Outflows	GW Pumping	9,674	9,532
	Inflow - Outflow	**8,184**	**3,107**

Hydrograph Locations



IWFM Node 2228



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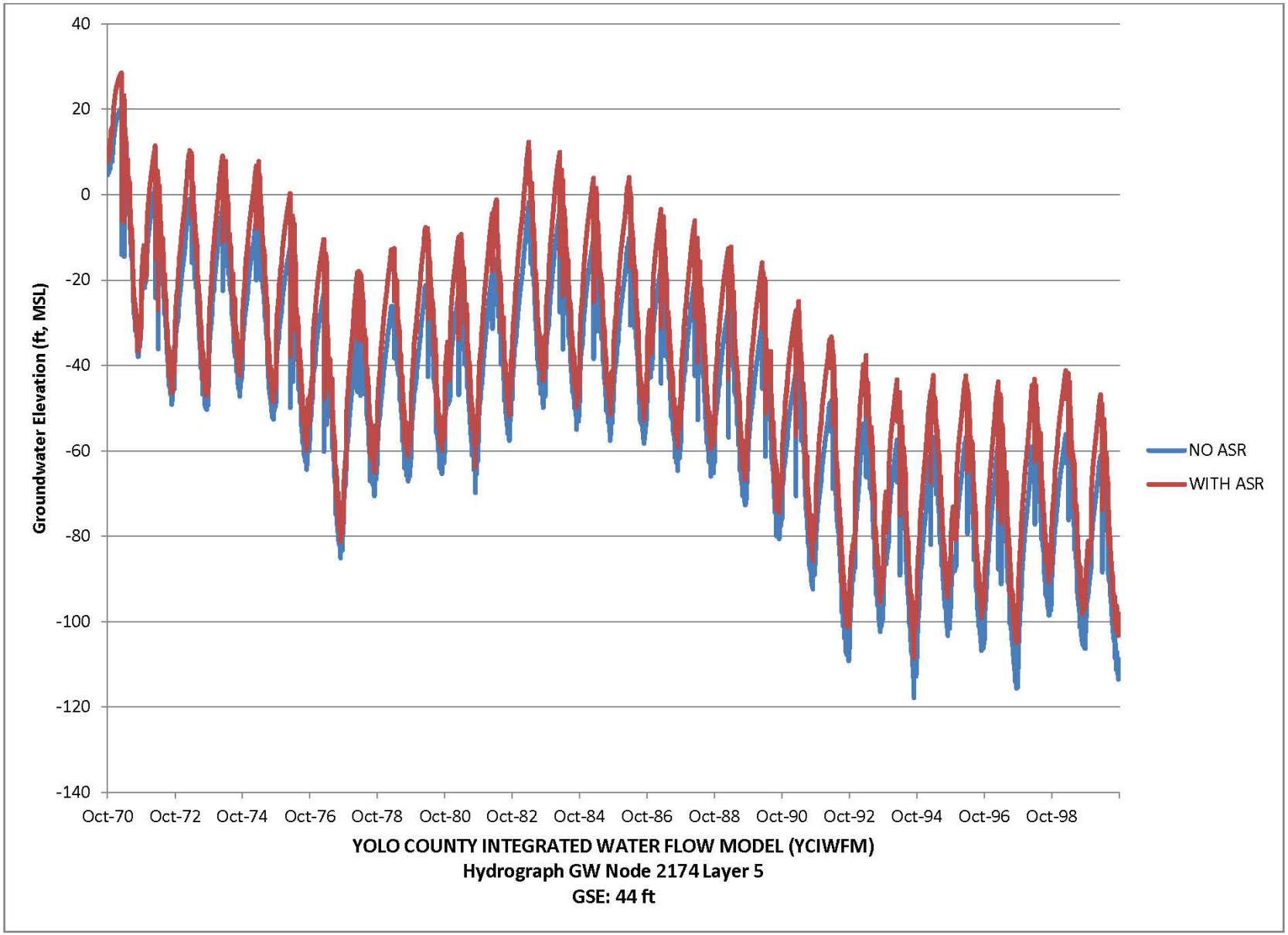
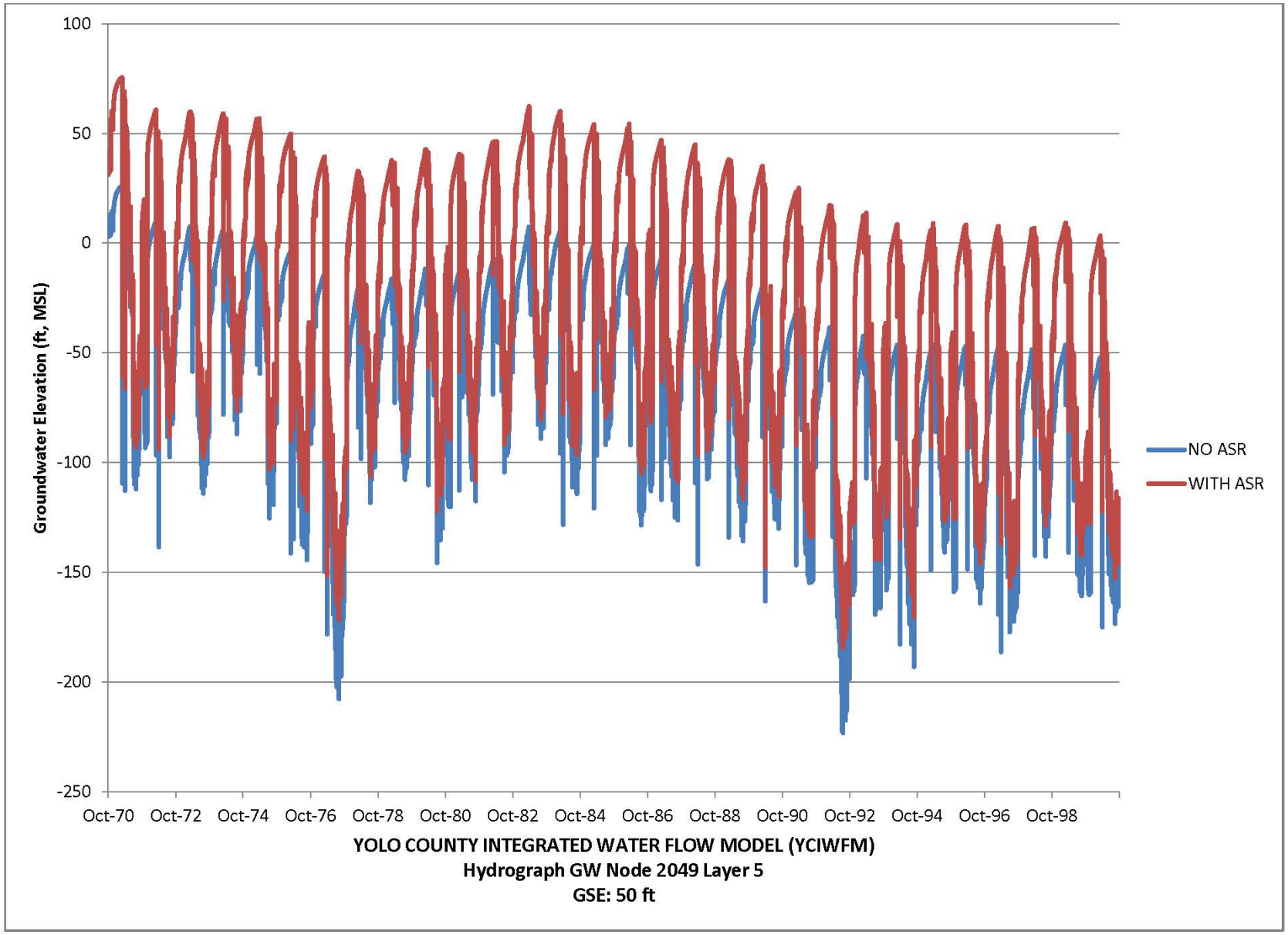


IWFM Node 2049



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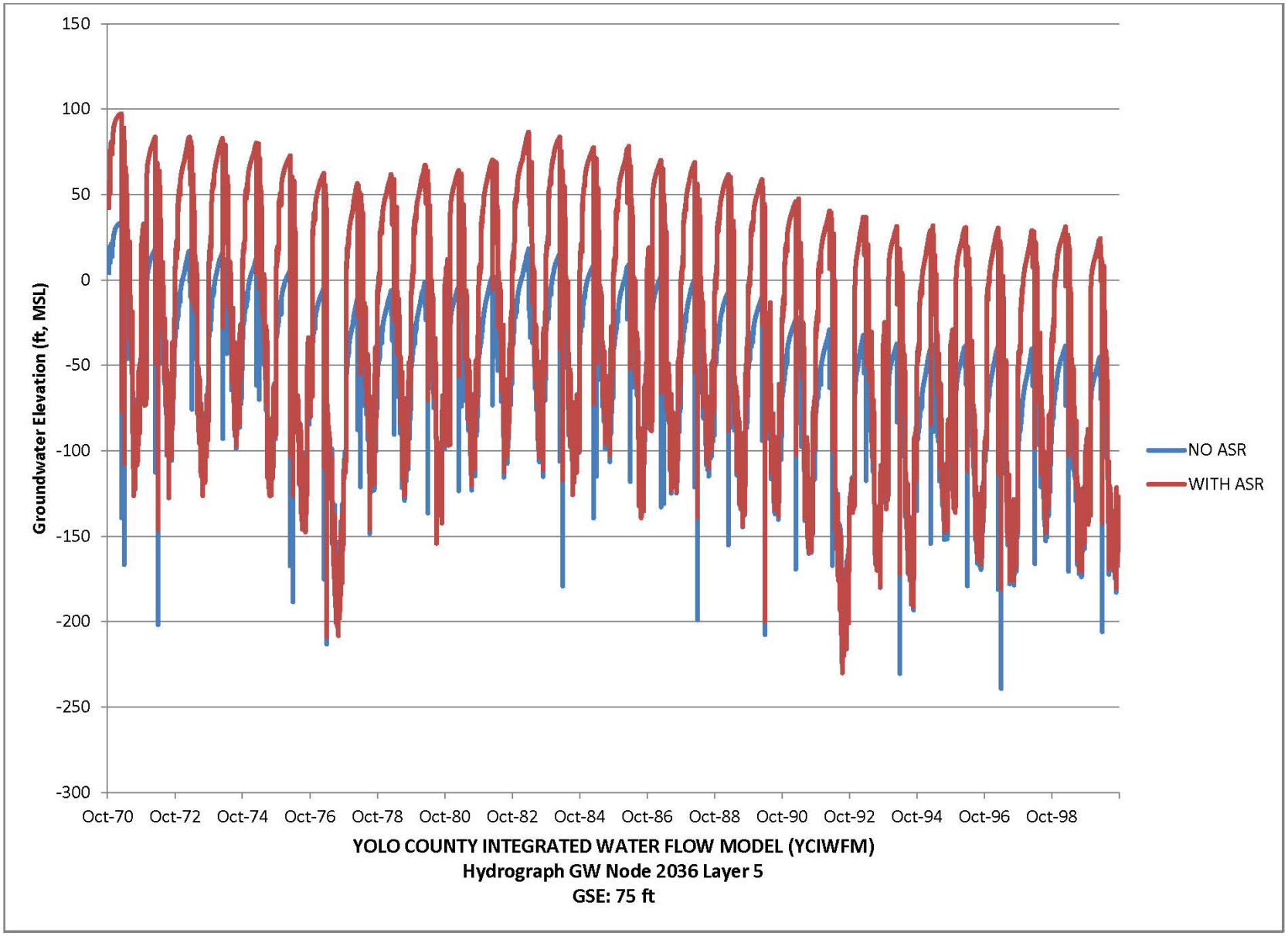

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Thank you