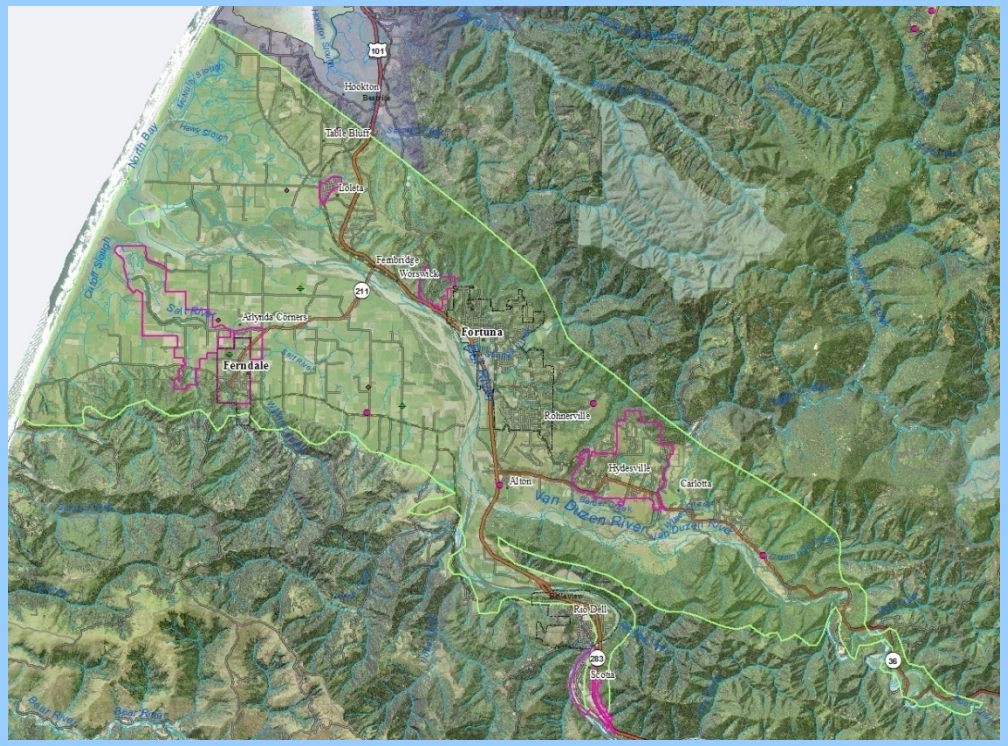
Eel River Valley Groundwater Working Group

Meeting No. 7

December 2, 2016 // 1:00 pm – 2:30 pm

Humboldt County Agricultural Center



Today's agenda

1. Introductions
2. Irrigation water use
3. DWR basin priority ranking
4. DWR Alternative Submittal requirements
5. Initial results from data collection (SHN Engineers & Geologists)
6. Review timeline and next steps

SGMA compliance – three potential pathways

1. DWR changes prioritization level of Eel River Valley groundwater basin from Medium to Low
   - 8 criteria; currently 2.82 points above medium-priority threshold
   - Now have improved data on irrigated acreage, groundwater reliance
   - Public Works proposes to ask DWR to review basis for prioritization
2. Alternative Submittal
   - Need to demonstrate basin has been managed sustainably for last 10 years (no undesirable results)
   - Prop. 1 technical studies will determine if evidence supports finding
   - Due January 1, 2017; would require five-year updates
   - “Local agency” can make submittal; GSA not required
3. Groundwater Sustainability Agency / Sustainability Plan
   - GSA required to prepare, adopt, implement a GSP
   - GSAs need to be established by June 30, 2017 (Plans due January 2022)

CALIFORNIA CODE OF REGULATIONS

TITLE 23. WATERS

DIVISION 2. DEPARTMENT OF WATER RESOURCES

CHAPTER 1.5. GROUNDWATER MANAGEMENT

SUBCHAPTER 2. GROUNDWATER SUSTAINABILITY PLANS

§ 358.2. Alternatives to Groundwater Sustainability Plans

(c) An Alternative submitted to the Department shall include the following information:

(1) An Alternative submitted pursuant to Water Code Section 10733.6(b)(1) shall include a copy of the groundwater management plan.

(2) An Alternative submitted pursuant to Water Code Section 10733.6(b)(2) that is not an adjudicated area described in Water Code Section 10720.8 shall include the following:

(A) Information demonstrating that the adjudication submitted to the Department as an Alternative is a comprehensive adjudication as defined by Chapter 7 of Title 10 of Part 2 of the Code of Civil Procedure (commencing with Section 830).

(B) A copy of the proposed stipulated judgment.

(3) An Alternative submitted pursuant to Water Code Section 10733.6(b)(3) shall provide information that demonstrates the basin has operated within its sustainable yield over a period of at least 10 years. Data submitted in support of this Alternative shall include continuous data from the end of that 10-year period to current conditions.

(d) The entity submitting an Alternative shall explain how the elements of the Alternative are functionally equivalent to the elements of a Plan required by Articles 5 and 7 of this Subchapter and are sufficient to demonstrate the ability of the Alternative to achieve the objectives of the Act.

Six Sustainability Indicators

1	Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply
2	Significant and unreasonable reduction of groundwater storage
3	Significant and unreasonable seawater intrusion
4	Significant and unreasonable degraded water quality
5	Significant unreasonable land subsidence
6	Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

2. Irrigation water use

Irrigation Water Use

- RCD, producers, Cheryl and Don Laffranchi, Jeff Stackhouse
- Estimate based on interviews and field observations
- Three water year types based on Ferndale rainfall
  - Dry Year: April 15-October 1 irrigation season
  - Normal Year: May 15-October 1 irrigation season
  - Wet Year: June 1-October 1 irrigation season
  - 2007-2016: 5 Dry Years, 3 Normal Years, 2 Wet Years
- Developed water use estimates for groundwater irrigation in basin:
  - Five equipment types
  - Flow rate (200 to 600 gal/min)
  - Minutes per set (10 to 24 hours)
  - Area irrigated per set (2.4 to 10.3 acres)
  - Sets per year, by water year type (4.0 to 6.5)
  - Inventory of irrigated acreage (13,558 acres)

Irrigation Water Use

- Assumptions for basin-wide water use estimate:
  - All acreage irrigated as grazed pasture or hay/alfalfa production
  - No significant change in irrigated acreage or irrigation practices over last 10 years

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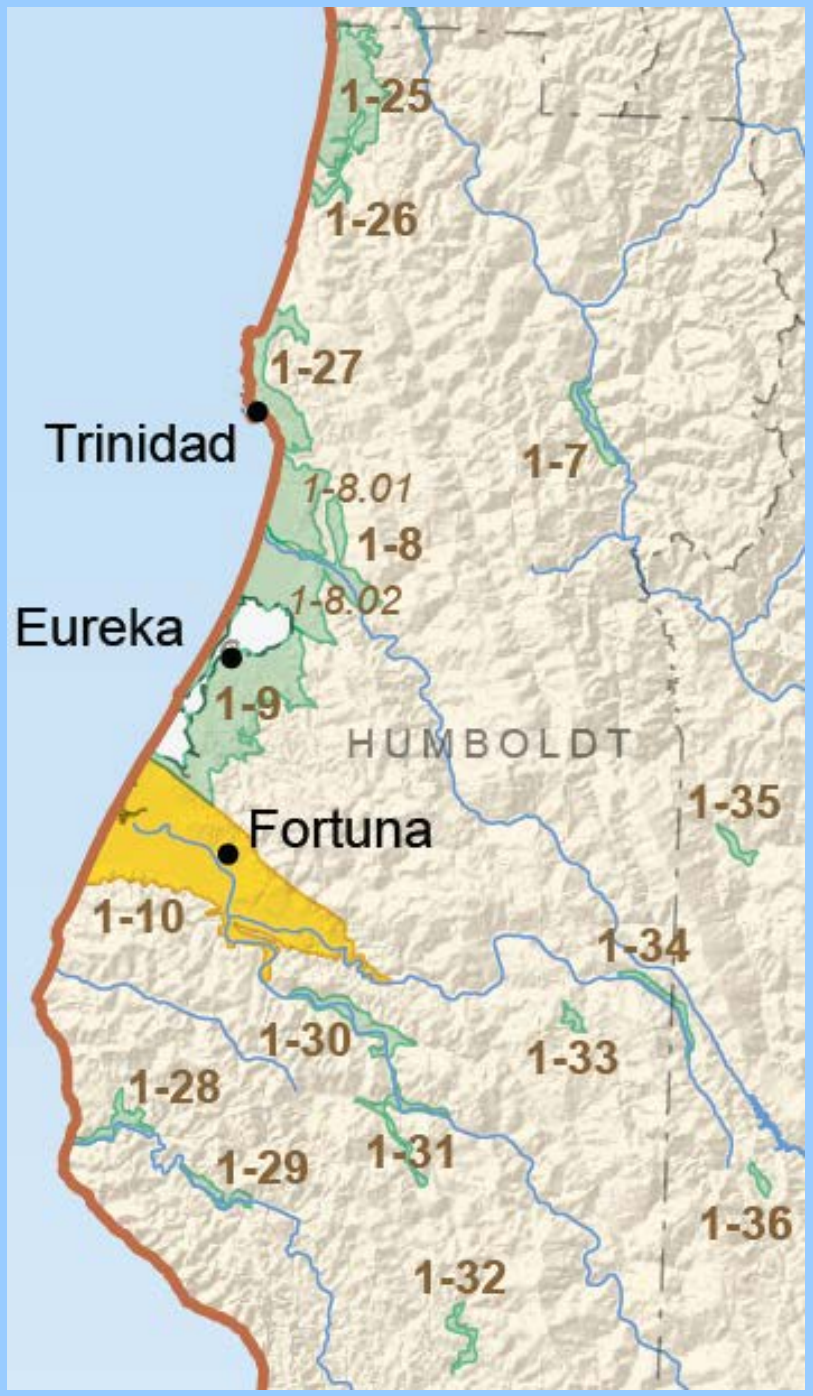
- Results:

Dry Year	16,680 acre-feet	1.2 acre-feet/acre
Normal Year	13,600 acre-feet	1.0 acre-feet/acre
Wet Year	10,265 acre-feet	0.8 acre-feet/acre

3. DWR basin priority ranking

Ranking of Groundwater Basin Importance – Humboldt County



Groundwater basin/subbasin

Basin prioritization ranking

- High
- Medium
- Low
- Very low

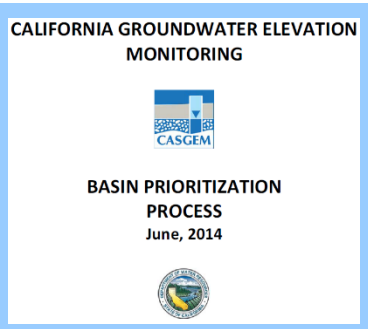
Source:
DWR Bulletin 118

DWR's Groundwater Basin Prioritization Process

Table 3. Data Component Ranking Ranges for CASGEM Groundwater Basin Ranking

Ranking	Ranking Value	Data Components and Ranking Ranges						
		Population		PSW Density	Total Well Density	Irrigated Acreage	Groundwater Reliance	
		Density	Projected Growth				GW Use	% of Total Supply [1]
		per sq.-mi	%	per sq.-mi	per sq. mi	ac/sq.-mi	ac-ft/acre	%
Very Low	0	x < 7	x < 0	x = 0	x = 0	x < 1	x < 0.03	x < 0.1
Low	1	7 ≥ x < 250	0 ≥ x < 6	0 > x < 0.1	0 > x < 2	1 ≥ x < 25	0.03 ≥ x < 0.1	0.1 ≥ x < 20
Moderately Low	2	250 ≥ x < 1000	6 ≥ x < 15	0.1 ≥ x < 0.25	2 ≥ x < 5	25 ≥ x < 100	0.1 ≥ x < 0.25	20 ≥ x < 40
Medium	3	1000 ≥ x < 2500	15 ≥ x < 25	0.25 ≥ x < 0.5	5 ≥ x < 10	100 ≥ x < 200	0.25 ≥ x < 0.5	40 ≥ x < 60
Moderately High	4	2500 ≥ x < 4000	25 ≥ x < 40	0.5 ≥ x < 1.0	10 ≥ x < 20	200 ≥ x < 350	0.5 ≥ x < 0.75	60 ≥ x < 80
High	5	x ≥ 4000	x ≥ 40%	x ≥ 1.0	x ≥ 20	x ≥ 350	x ≥ 0.75	x ≥ 80%

Note:
Population growth is percent growth from 2010 to 2030.
[1] Percent of total water supply (groundwater and surface water) that is provided by groundwater.
x = component data value



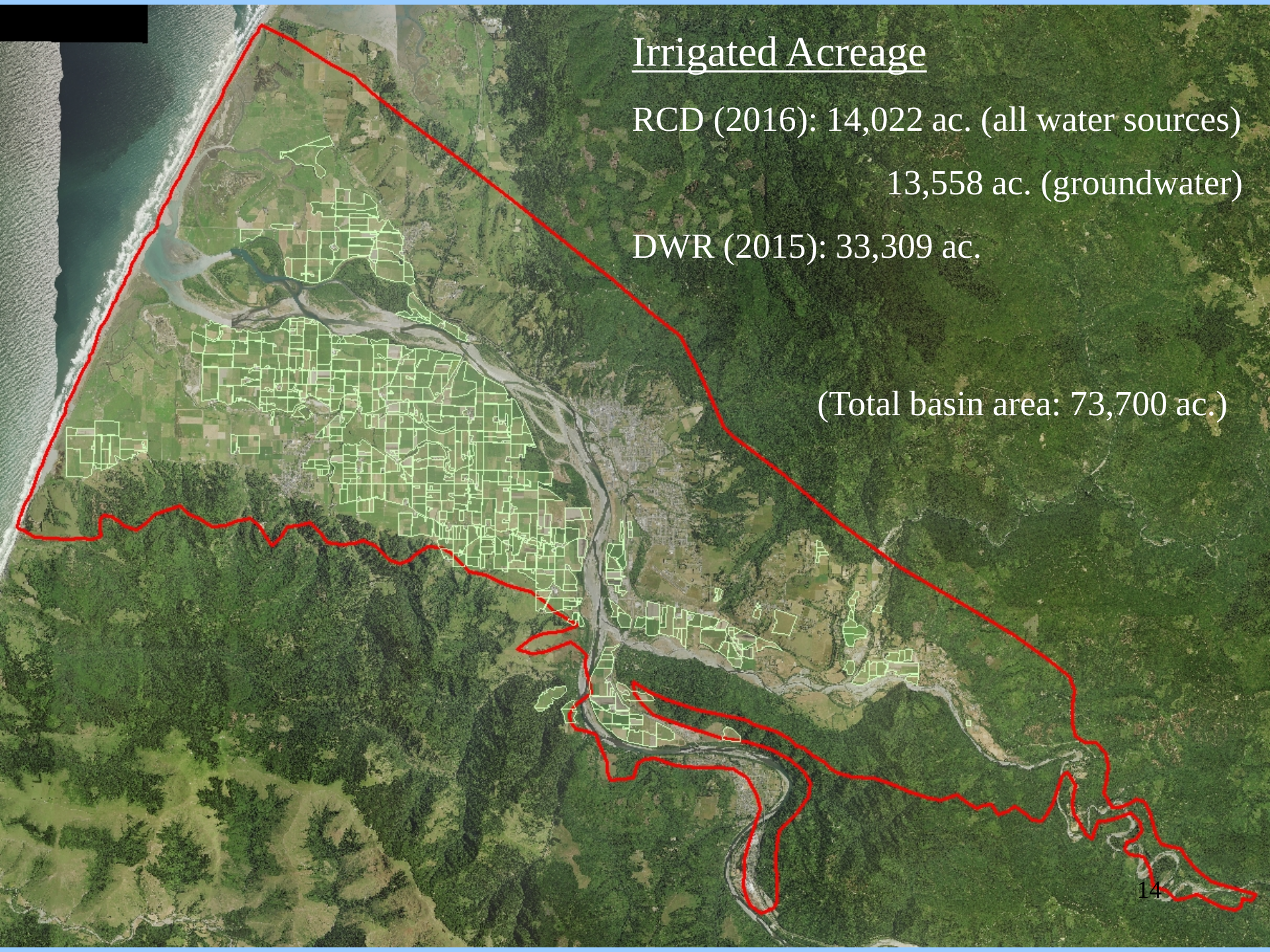
DWR's Ranking for Eel River Valley Basin

Overall Basin Ranking Score: 16.25

Medium Ranking Range: 13.43 – 21.08

Low Ranking Range: 5.75 – 13.42

Amount above medium ranking cut-off: 2.82


Irrigated Acreage
RCD (2016): 14,022 ac. (all water sources)
13,558 ac. (groundwater)
DWR (2015): 33,309 ac.
(Total basin area: 73,700 ac.)

DWR's Ranking for Eel River Valley Basin

	Component	Data	Adjusted Value	Range for this Value
1	Population (2010 census data)	21,558 persons 187 persons/sq-mi	1	7 – 250 persons/sq-mi
2	Population growth (projected to 2030)	112%	2	6-15%
3	Public supply wells	23 wells 0.2 wells/sq-mi	2	0.1 – 0.25 wells/sq-mi (Need <12 wells to be less than 0.1 wells/sq-mi)
4	Total wells	763 wells 6.6 wells/sq-mi	2.25 (discounted from 3)	5-10 wells/sq-mi – 3 pts 2-5 wells/sq-mi – 2 pts (Need <230 wells to be less than 2 wells/sq-mi)
5	Irrigated acreage	33,309 acres 290 acres/sq-mi	4	200-350 ac./sq-mi – 4 pts 100-200 ac./sq-mi – 3 pts

- 115 square miles (73,701 acres)

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DWR's Ranking for Eel River Valley Basin

	Component	Data	Adjusted Value	Range for this Value
6	Groundwater reliance	55,000 acre-feet/yr 0.746 acre-feet/acre 77% of total water supply	4	0.5-0.75 acre-feet/acre 60-80% total supply
7	Documented impacts	No impacts identified	0	--
8	Other information	Shallow basin with strong SW-GW interaction and fishery issues. Useable GW basin storage is estimated at 100,000 acre-feet and annual use is estimated at over one-half the total storage.	1	--

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DWR's Ranking for Eel River Valley Basin

To be adjusted

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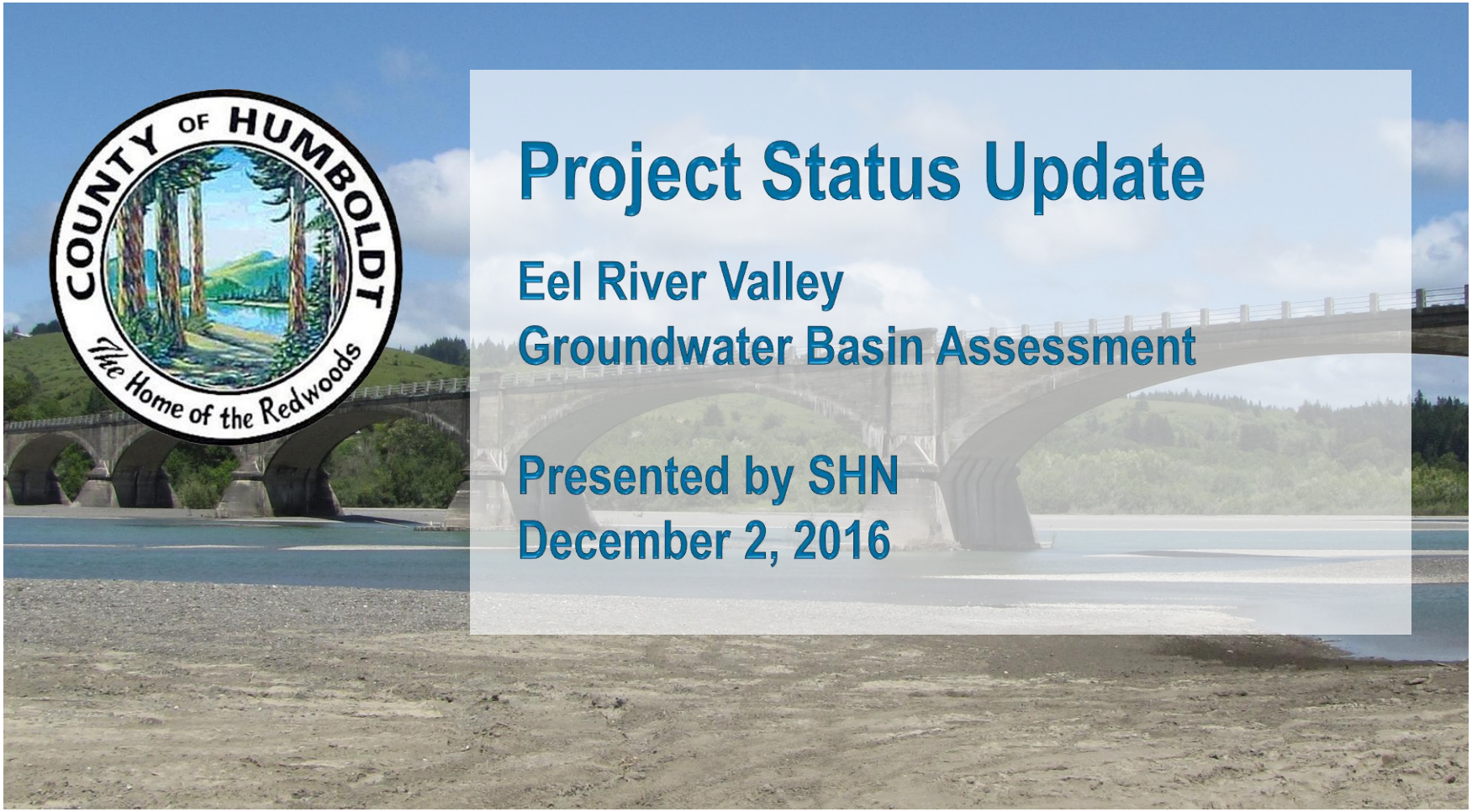
4. DWR Alternative Submittal requirements

DWR Alternative Submittal requirements

- Webinar this morning, guidance materials available Monday, submittals due Jan. 1
- Requires action by Board – only chance is Dec. 13
- Submittal uploaded on website, becomes publically available
- 60-day public review period after submission
- DWR response options: Approved, Inadequate, Incomplete
- No timeline for DWR review, possibly late 2017 or early 2018
- Annual reports required

5. Initial results from Groundwater Basin Assessment data collection



Project Status Update

Eel River Valley Groundwater Basin Assessment

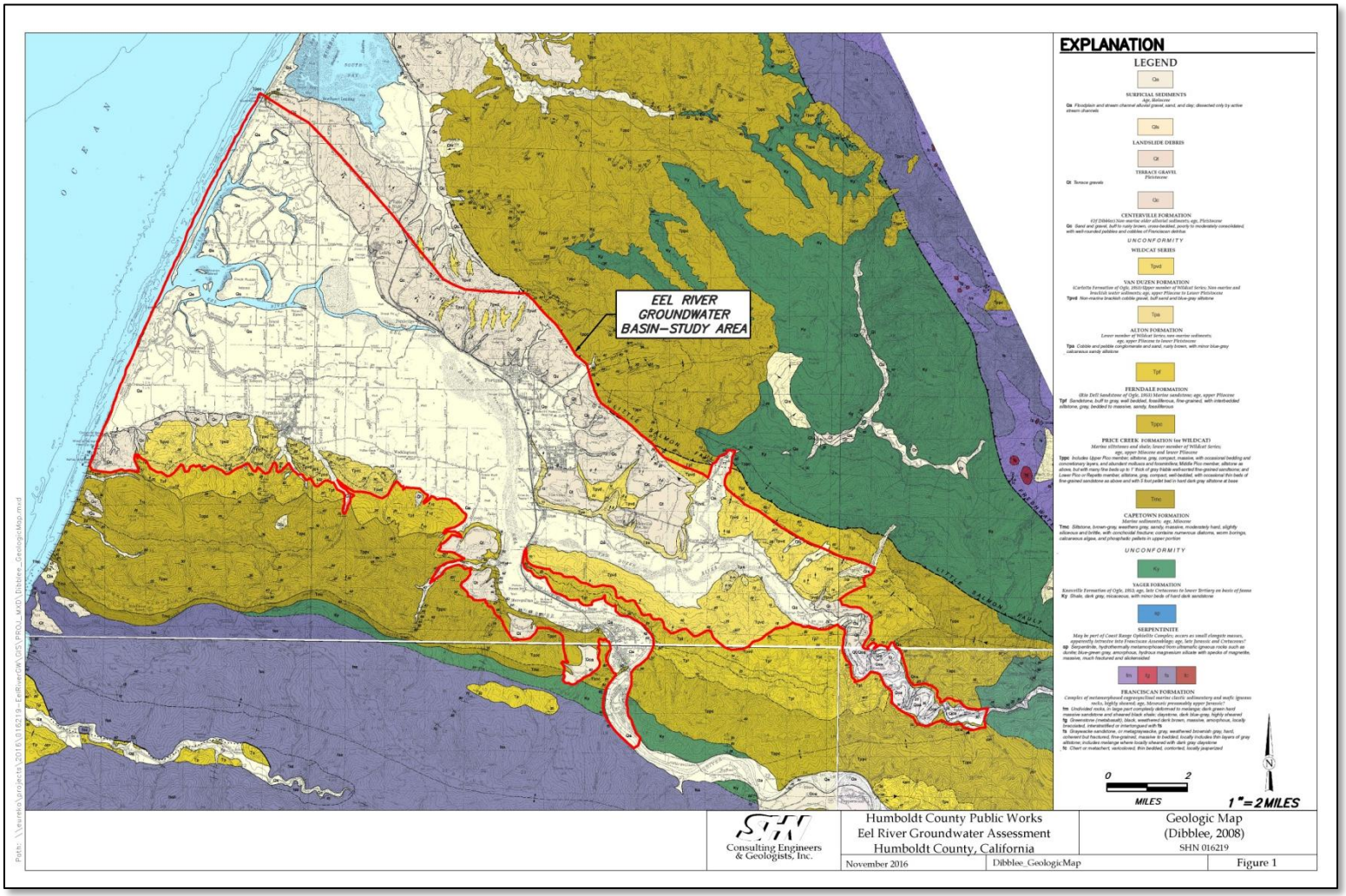
Presented by SHN
December 2, 2016

Engineers & Geologists

Introduction

- Review Conceptual Hydrogeologic Setting
- Review Preliminary Water Balance
- Discuss the Sustainability Indicators
- What's Next?

Geologic Map (Dibblee, 2008)



Geologic Cross Sections (Ogle, 1953)

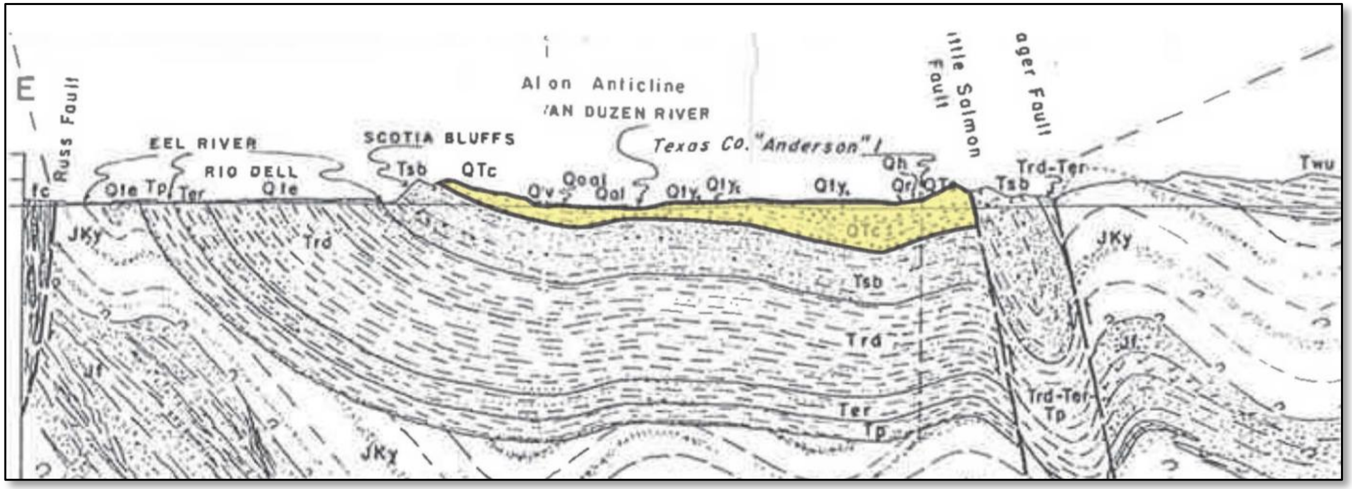
Introduction

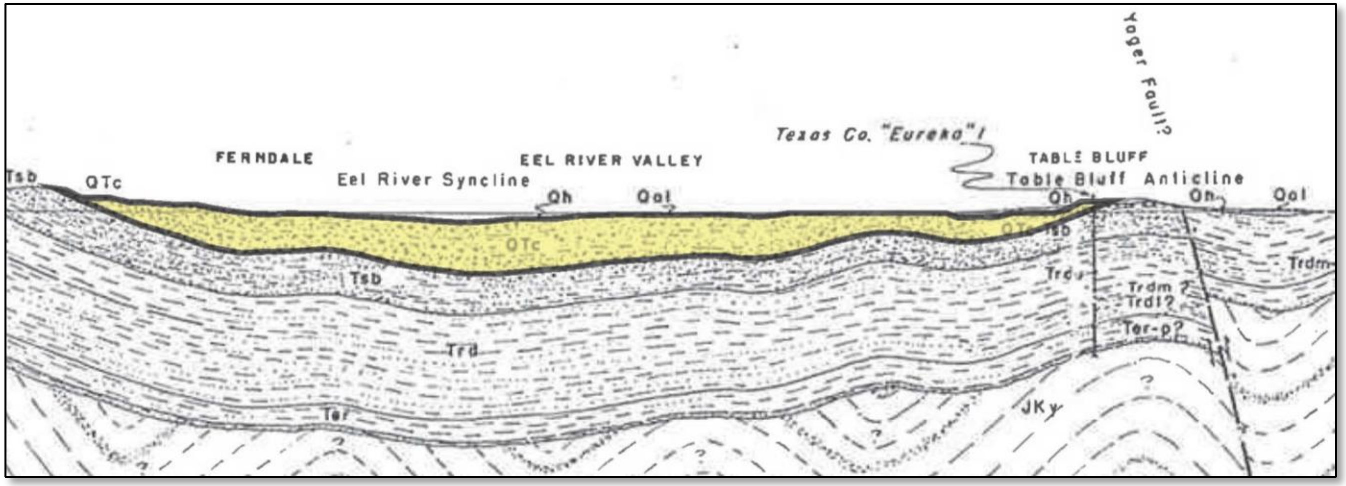
Conceptual Hydrogeologic Setting

Preliminary Water Balance

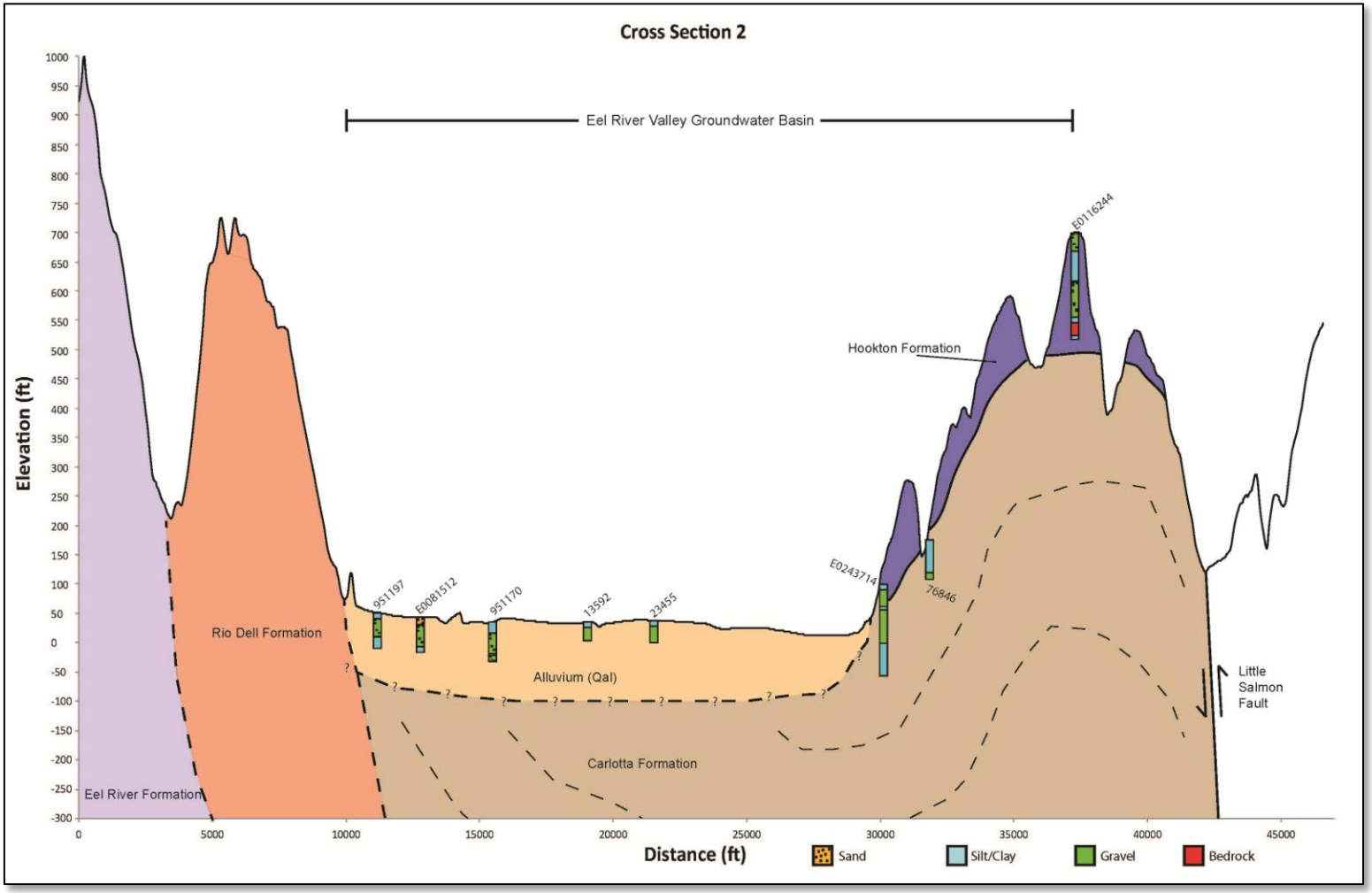
Sustainability Indicators

What's Next?

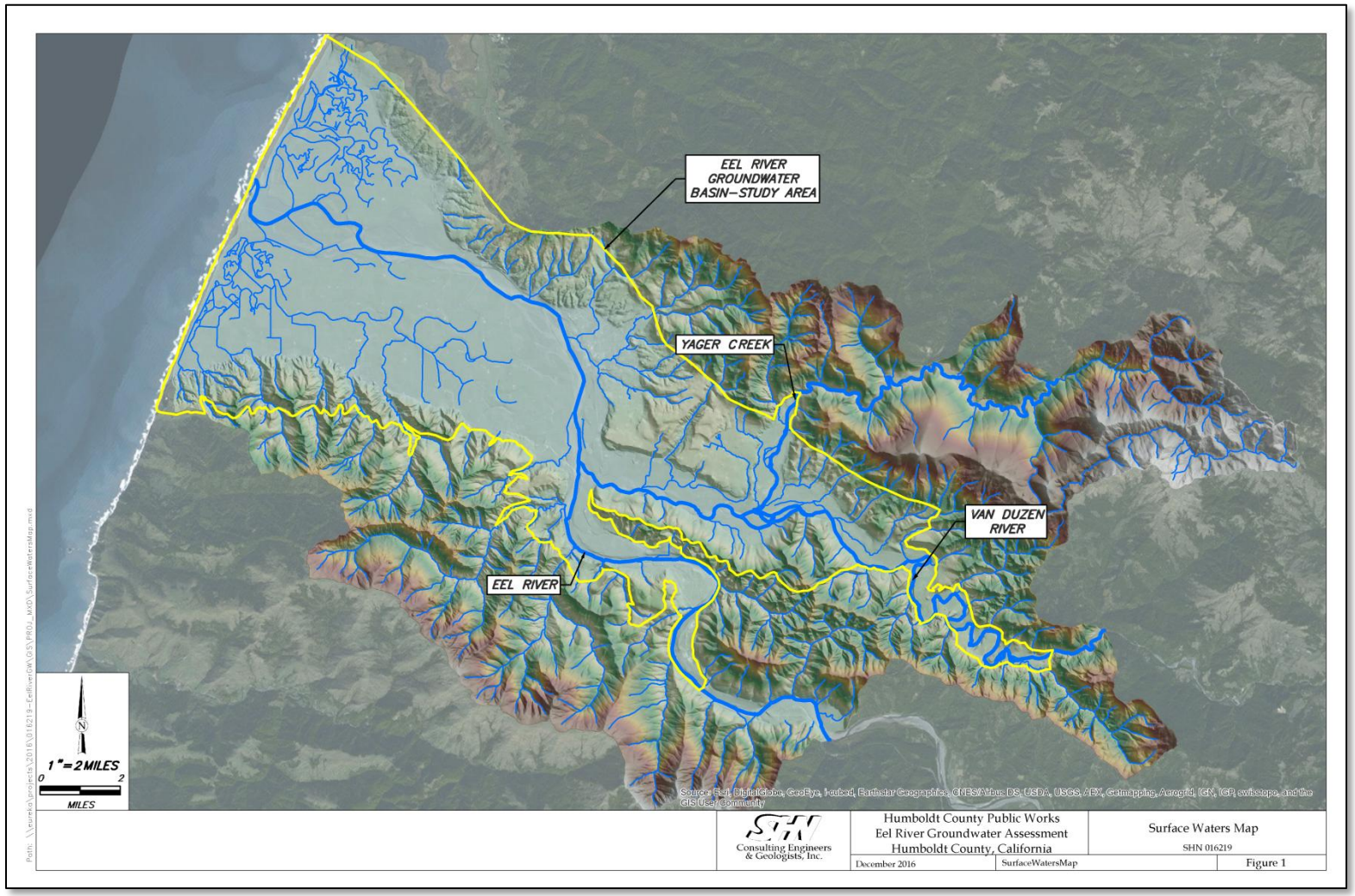




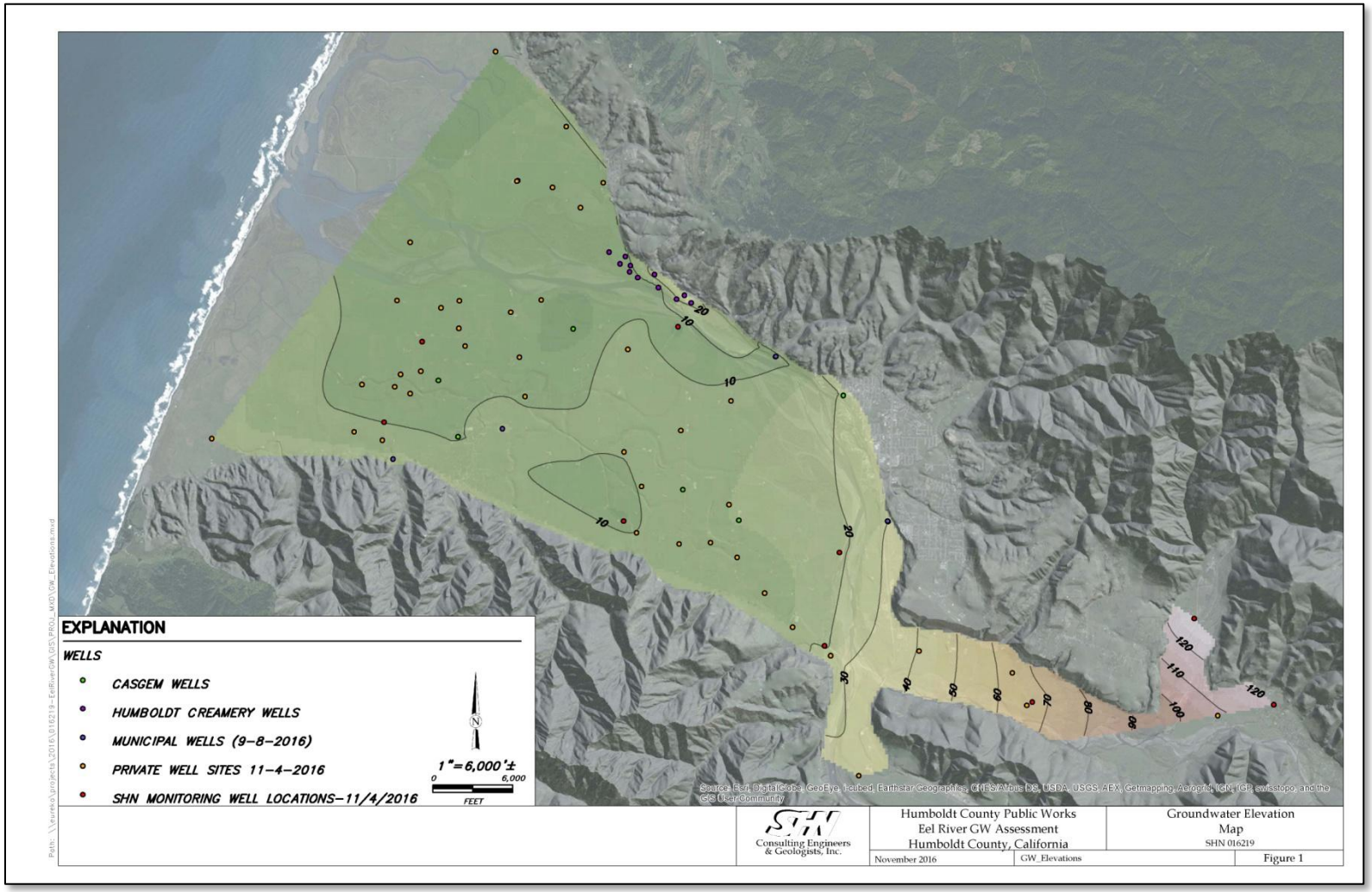
Geologic Cross-Sections (McAneny, 2016)



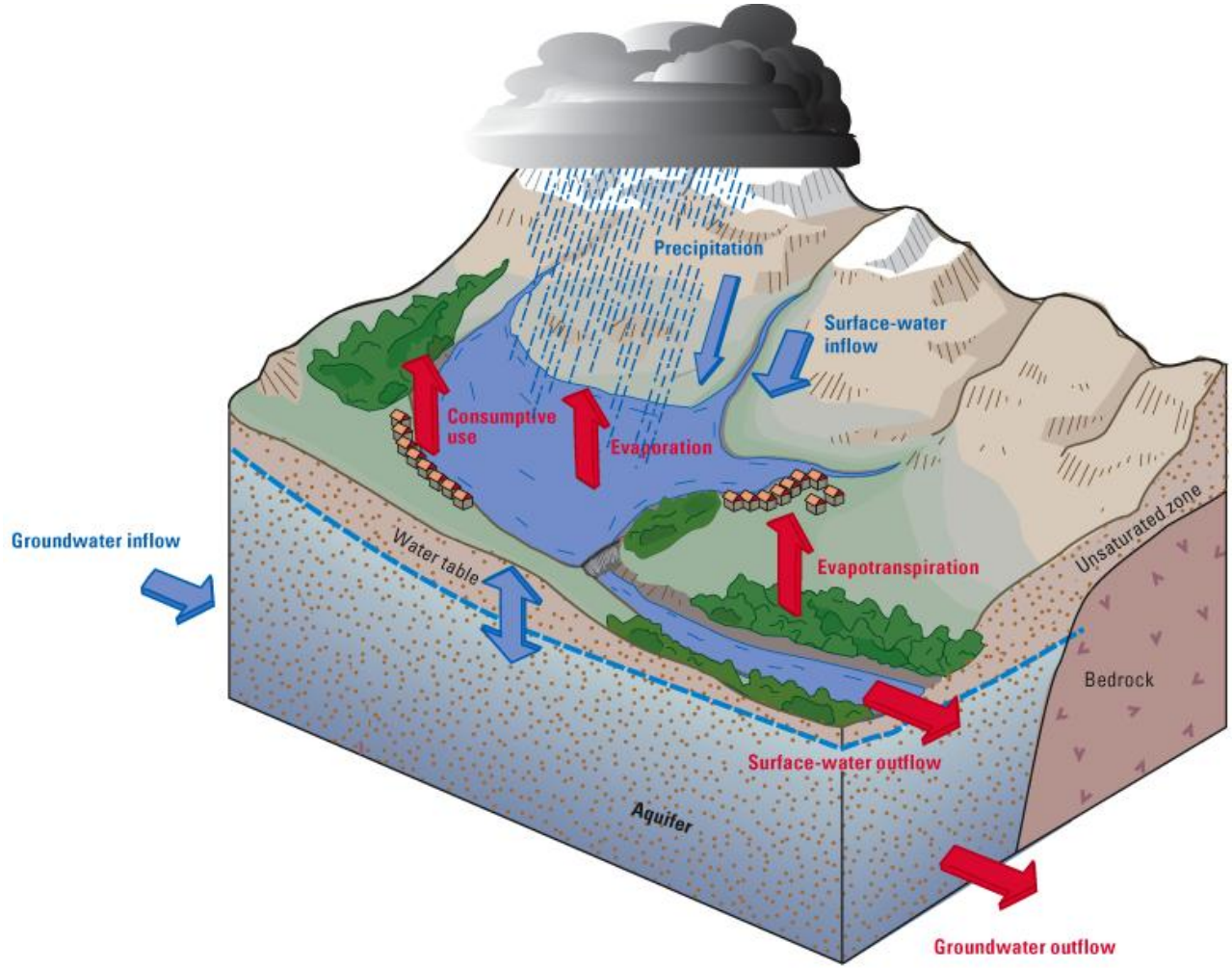
Basin Hydrology



Groundwater Contour Map



Water Balance Overview



Simplified Water Balance Equation

Based on the conditions of the Eel River Valley Groundwater Basin, the water balance equation can be reduced to:

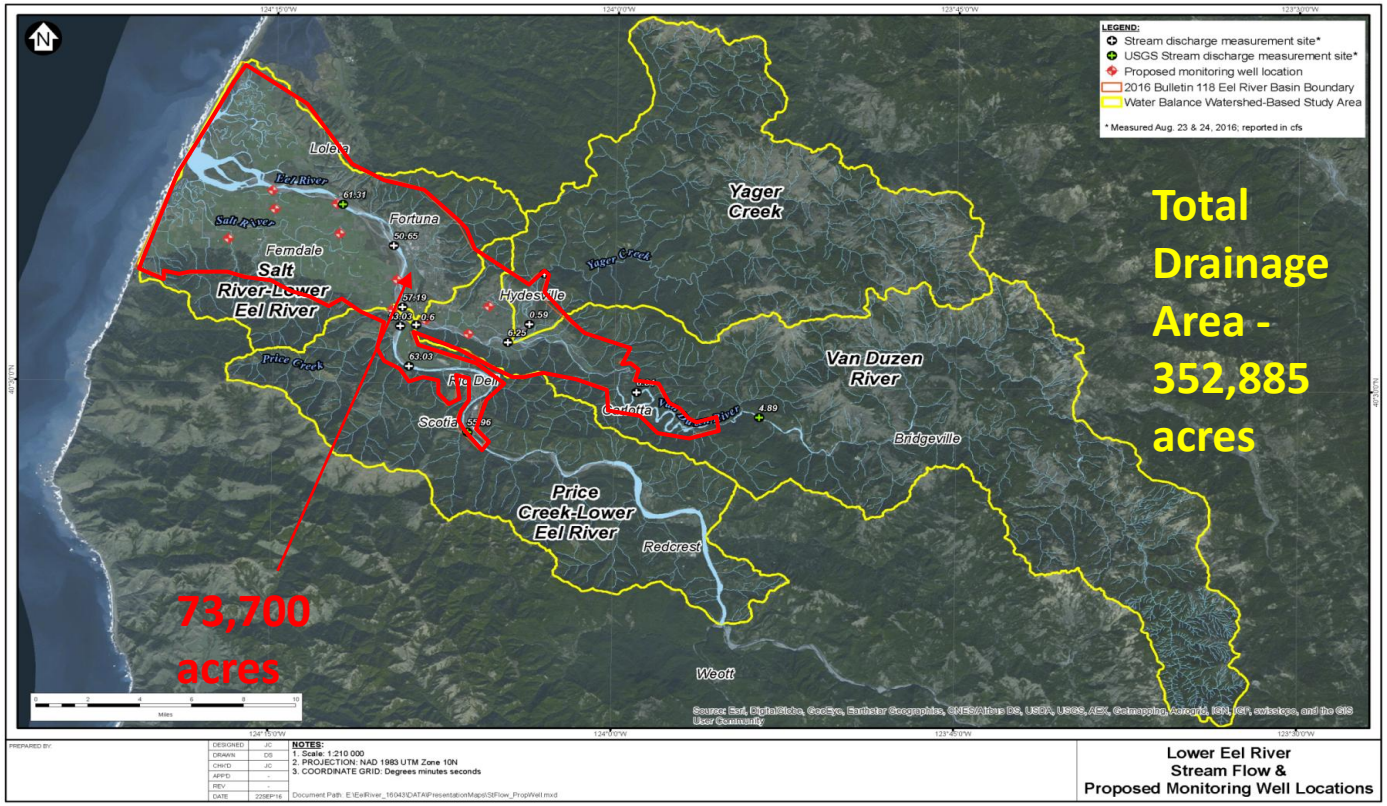
$$P+SW\downarrow in+GW\downarrow in=AET+SW\downarrow out+GW\downarrow out+\Delta S\downarrow SW+\Delta S\downarrow GW$$

Using a GIS Based model based on long-term climate averages, SW_{out} minus SW_{in} components can be represented by the total surface water runoff (RO) within the basin, and GW_{out} minus GW_{in} components can be represented by the total recharge (R) within the basin.

Precipitation = Evapotranspiration + Runoff + Recharge

Preliminary Water Balance – 5 Steps

- Step 1. Define the watershed boundary for all contributing surface water and groundwater inputs to the study area.



Preliminary Water Balance – 5 Steps

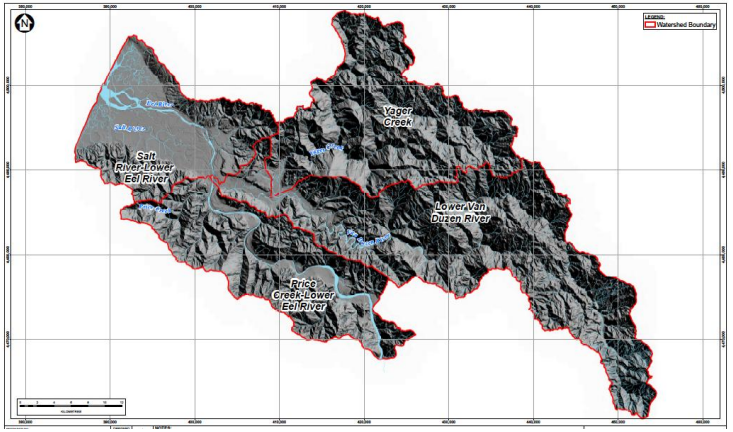
- Step 2. Calculate the water balance components for the study area.

Precipitation – Evapotranspiration = **Surplus** (amount of water available for Recharge and Runoff)

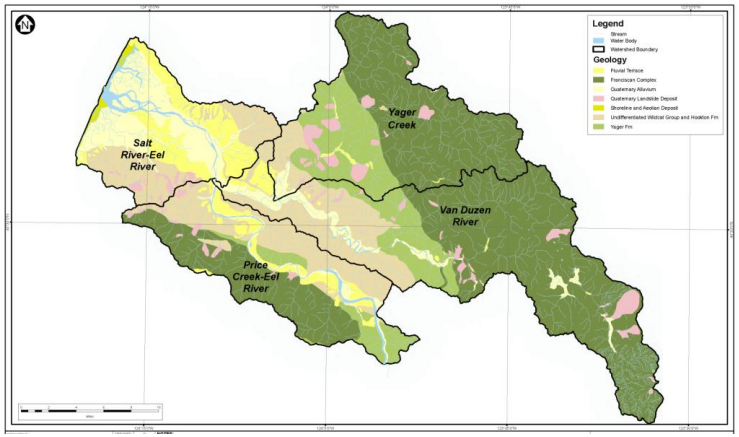
Scotia Station – Water Balance	**Long Term Climate Average Water Balance – Thornthwaite and Mather (1957) Accounting Method**												
Pre-Development Water Balance (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation	199.7	186.4	175.9	89.8	48.3	16.8	3.4	3.3	14.8	56.9	130.9	249.4	1175.5
Temperature	9.5	10.1	10.8	11.8	13.6	15.2	16.6	17.1	16.5	14.7	11.4	8.9	13.0
Potential Evapotranspiration (PET)	30	32	43	53	71	83	95	91	76	61	37	26	698
P - PET	170	155	132	37	-23	-66	-91	-88	-62	-4	93	223	478
Change in Soil Moisture Storage	-4	-1	-9	-7	-17	-3	-6	2	8	10	17	10	0
Soil Moisture Storage	122	121	112	105	88	85	79	81	89	99	116	126	-
Actual Evapotranspiration (AET)	30	32	43	53	65	20	9	1	7	47	37	26	371
Soil Moisture Deficit (mm)	0	0	0	0	6	63	85	90	70	14	0	0	327
Surplus (P - AET)	170	155	132	37	-17	-3	-6	2	8	10	93	223	804

Preliminary Water Balance – 5 Steps

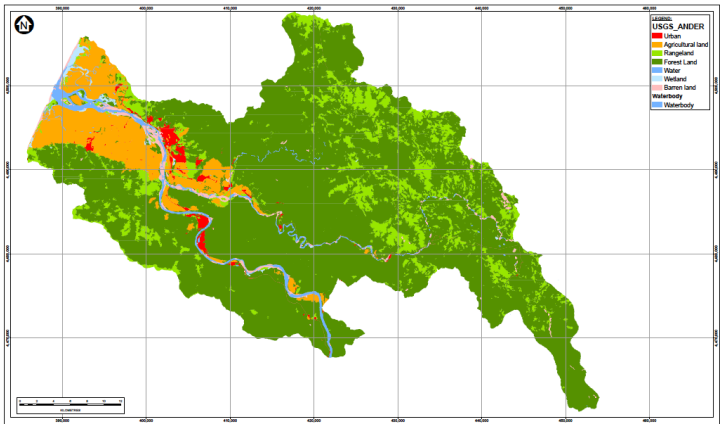
- Step 3. Partition Surplus into Recharge and Runoff based on key factors



Topography/Slope

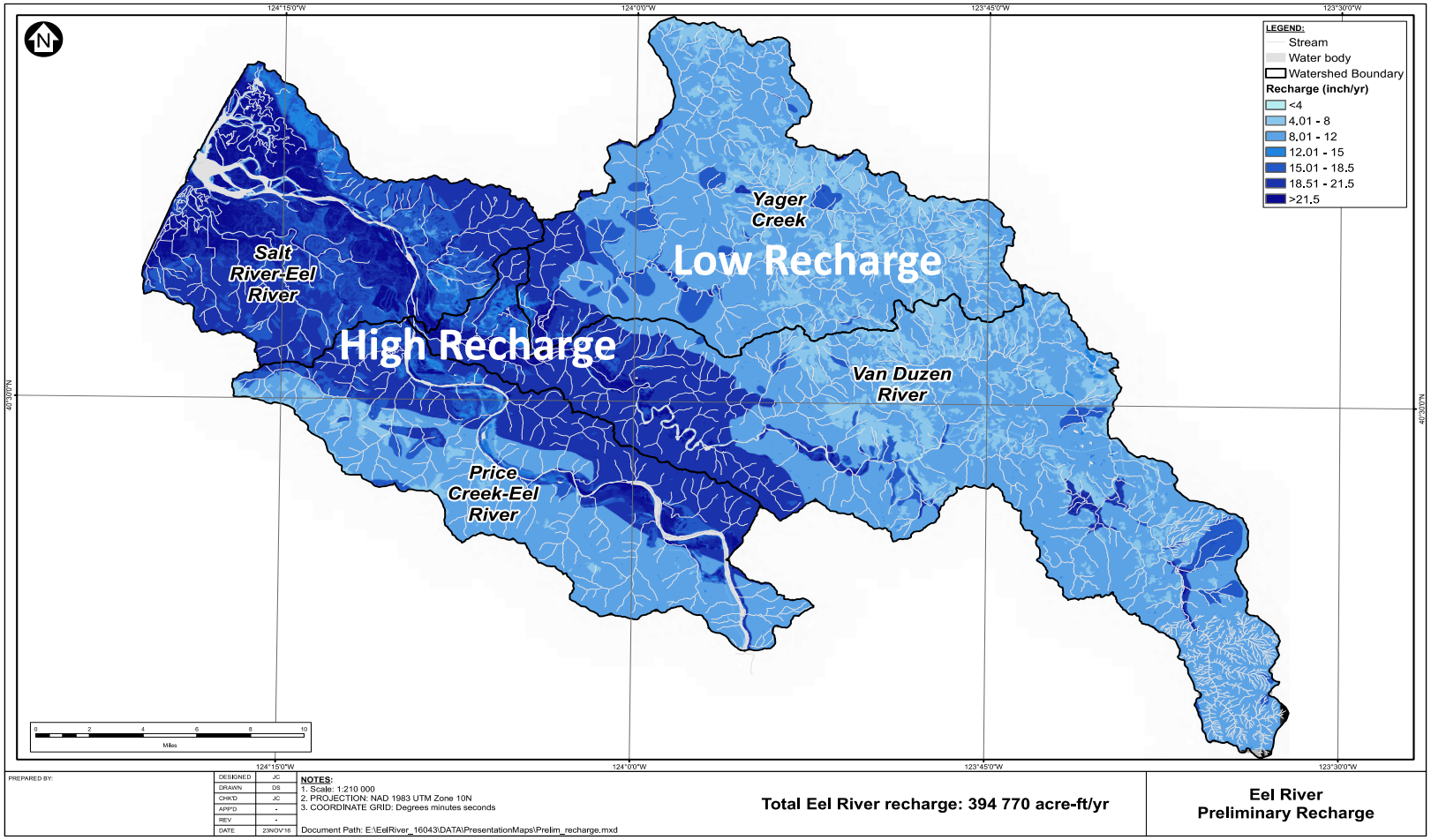


Geology/Soils

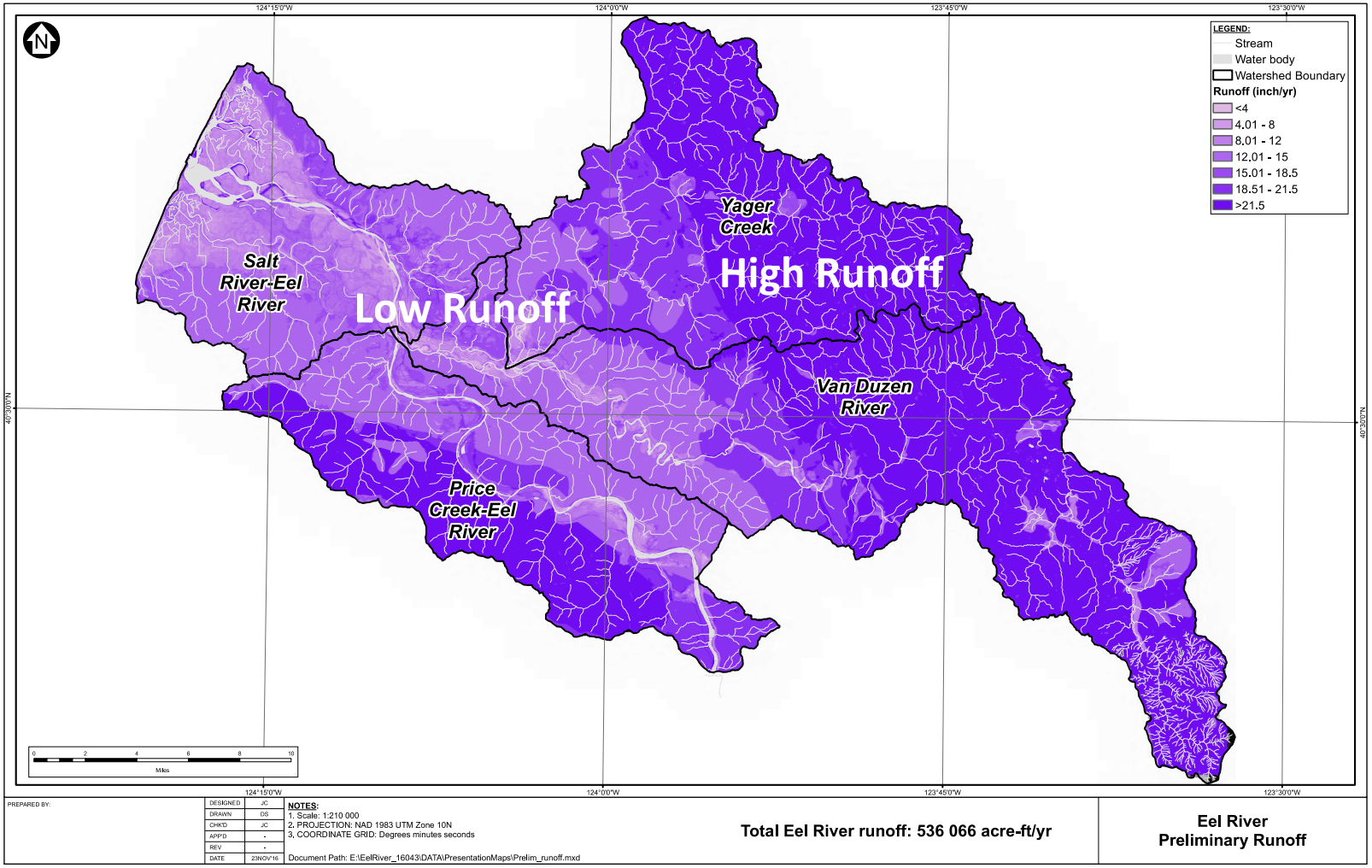


Land Use/Vegetation

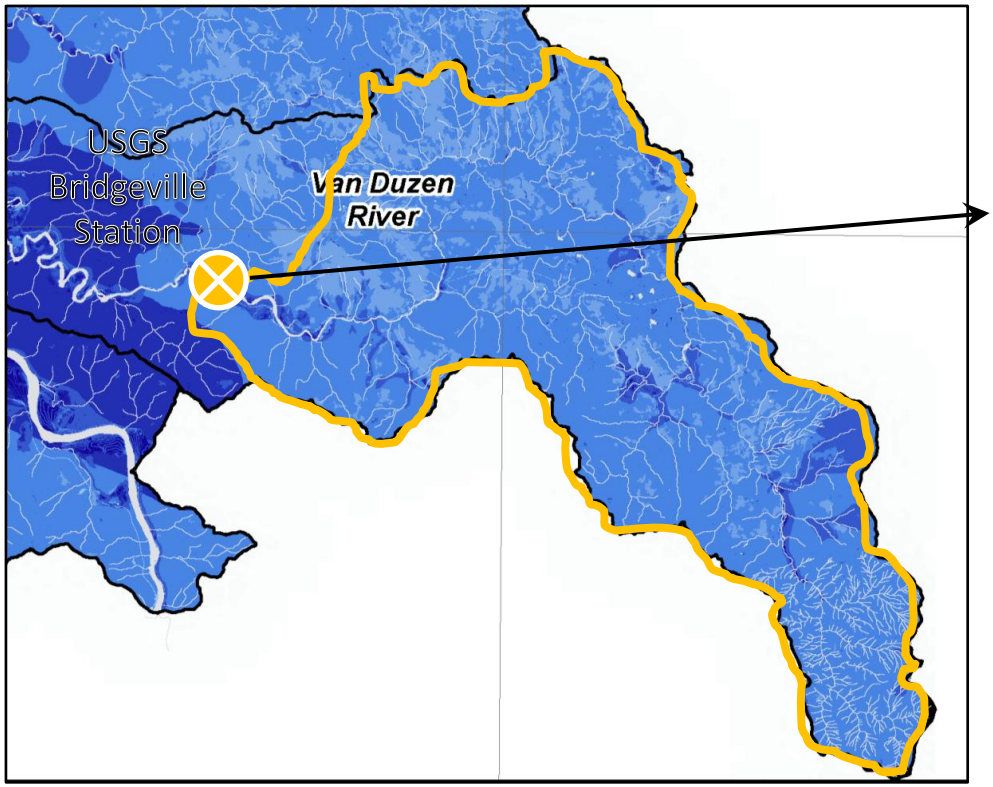
GIS Based Water Balance Model - Preliminary Recharge

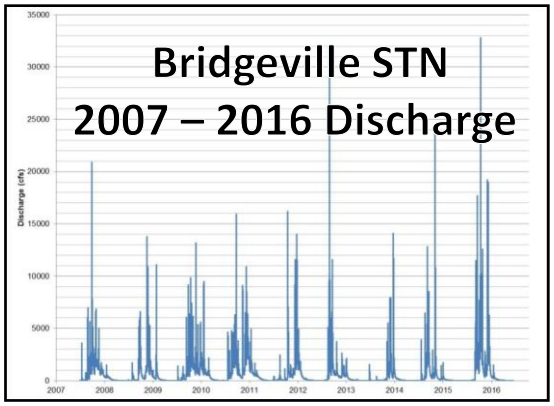


GIS Based Water Balance Model - Preliminary Runoff



Water Balance Model Calibration/ Validation: Upper Van Duzen Watershed





Recharge – Baseflow Calibration

- Modelled Annual Recharge (assumed to equal baseflow) – 98 cfs
- Estimated Average Bridgeville STN Baseflow – 65 cfs

Preliminary Water Balance – 5 Steps

- Step 4. Determine the percent (%) water demand taking into account irrigation, municipal and domestic water supply and water diversions.
- Step 5. Define a basin scale and sub-basin/sub-catchment stress level based on % water demand relative to a sustainable volume of available groundwater and surface water.

Water Demand

- From HCRCD (2016)
  - agricultural groundwater extraction totals 16,680 acre-feet/year (dry year)
  - municipal/ industrial/other uses total 3,000 acre-feet/year
- TOTAL = ~20,000 acre-feet/year

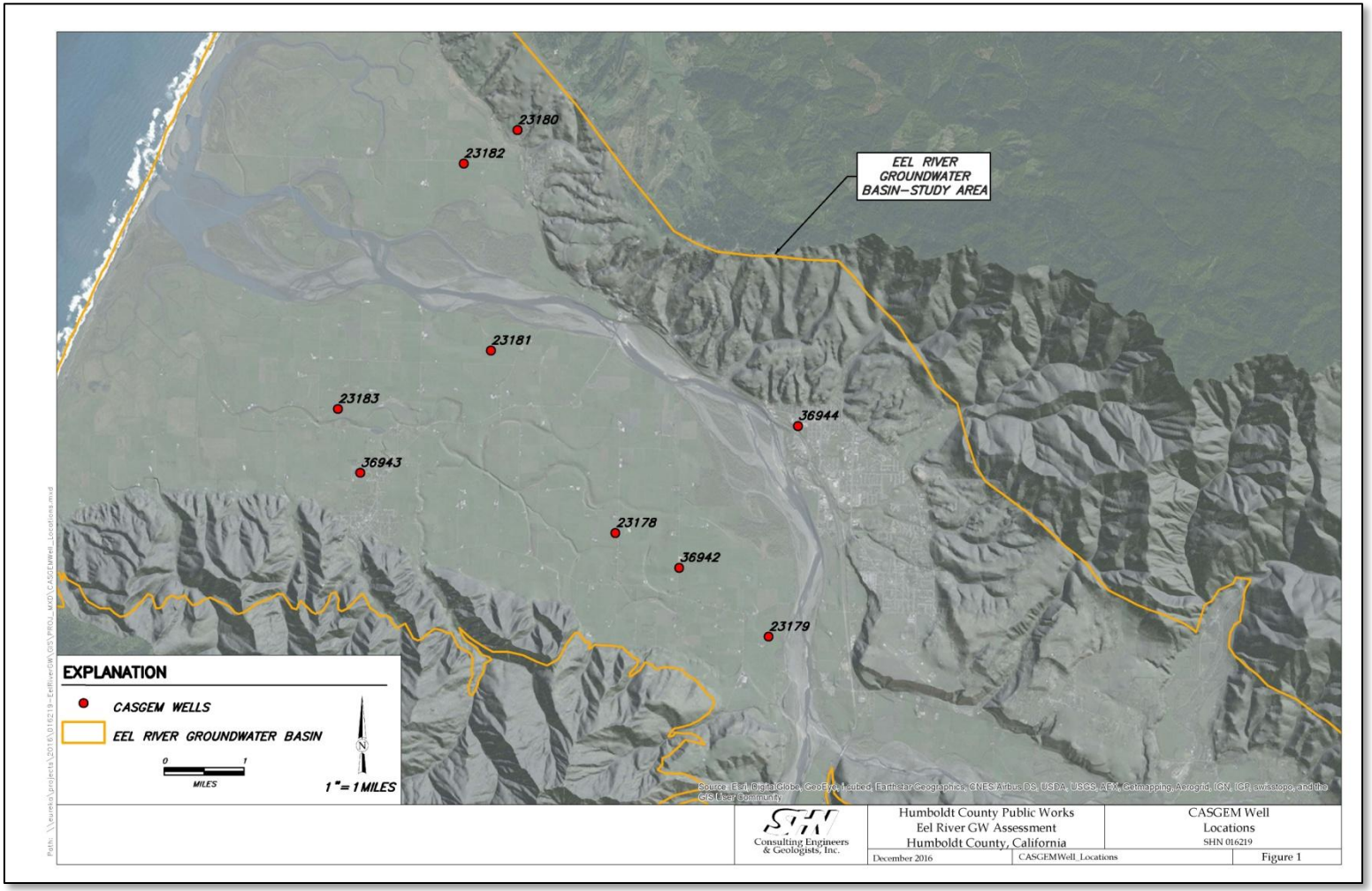
Water Sustainability

- Ratio of Average Annual Recharge to Water Demand
- Watershed Study Area (352,885 acres)
  - *Preliminary Recharge Estimate* – 394,770 acre-feet per year
  - Total Water Use – 20,000 acre-feet per year
  - Preliminary Water Stress – Approx. 5% of annual recharge is utilized
    - ➢ Low Stress

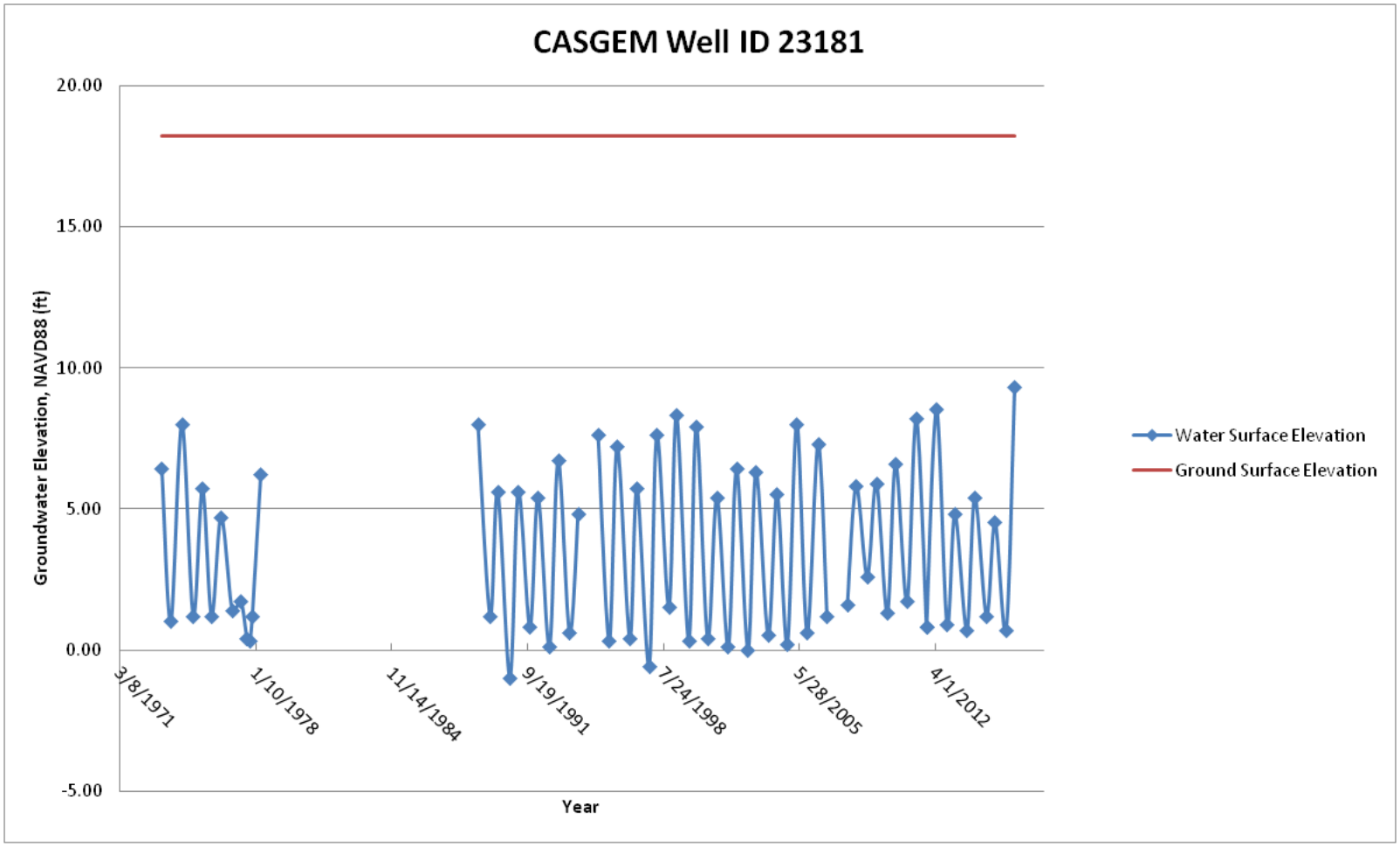
Sustainability Indicators

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

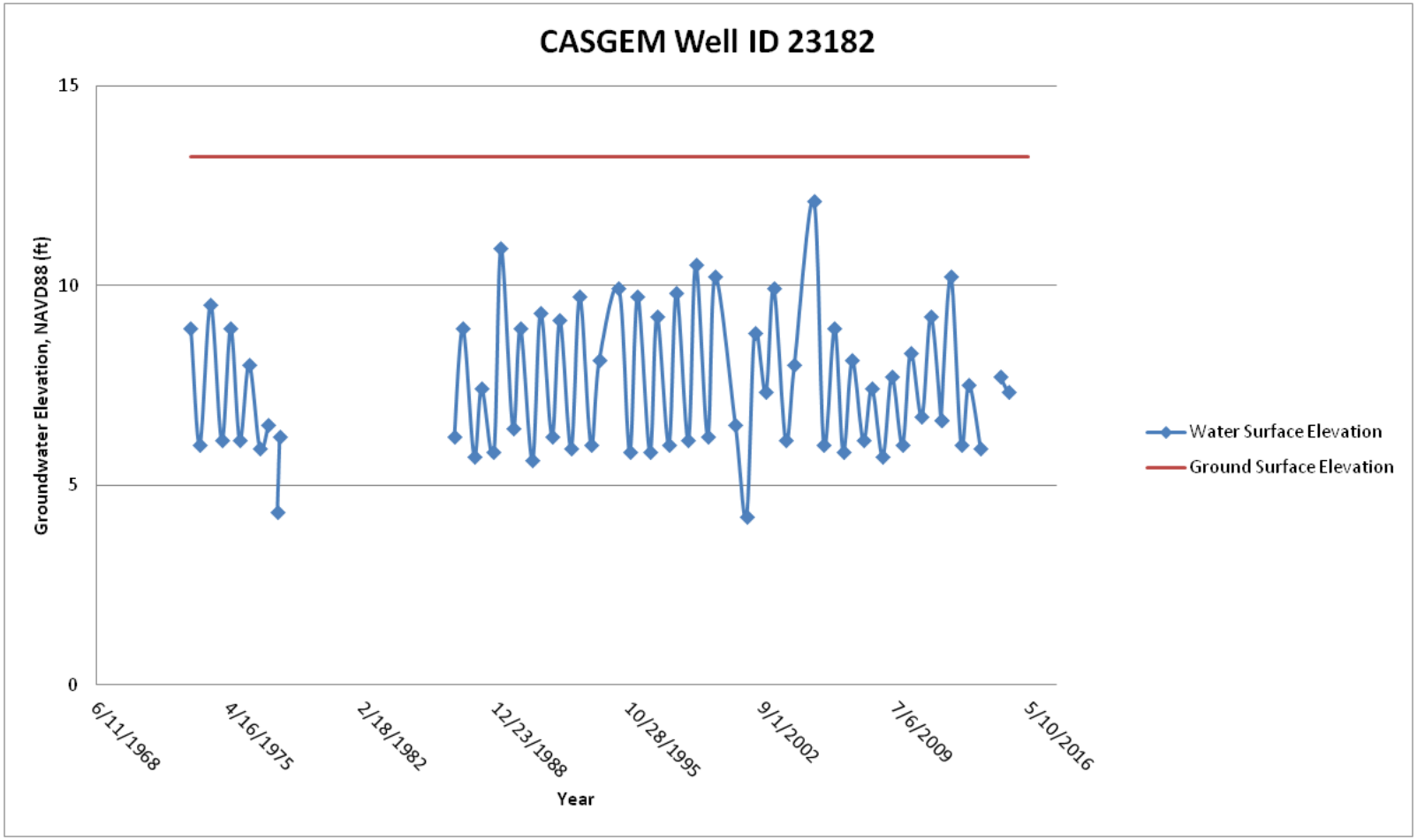
CASGEM Wells – our best long term GW dataset



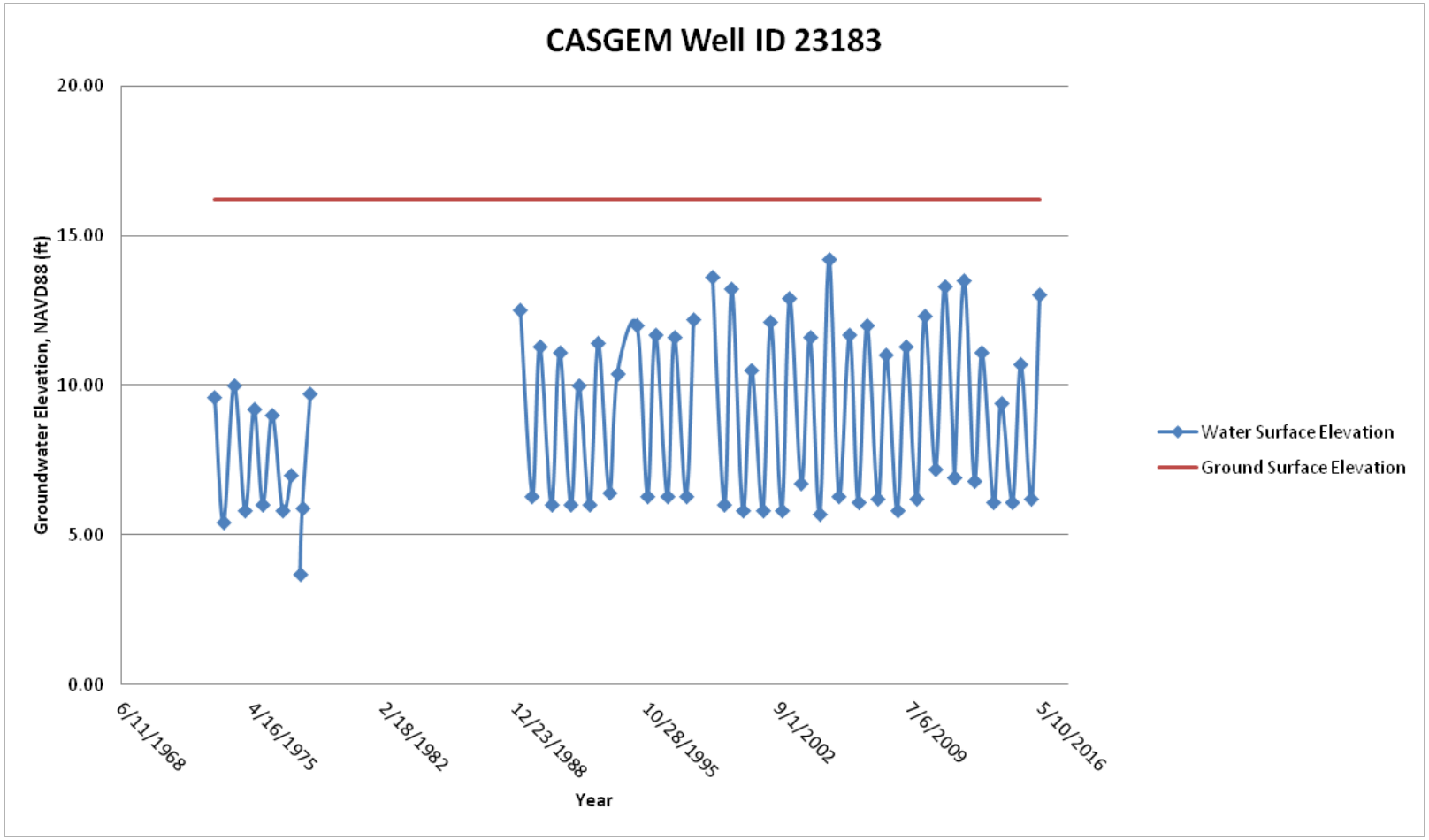
North of Goble Lane



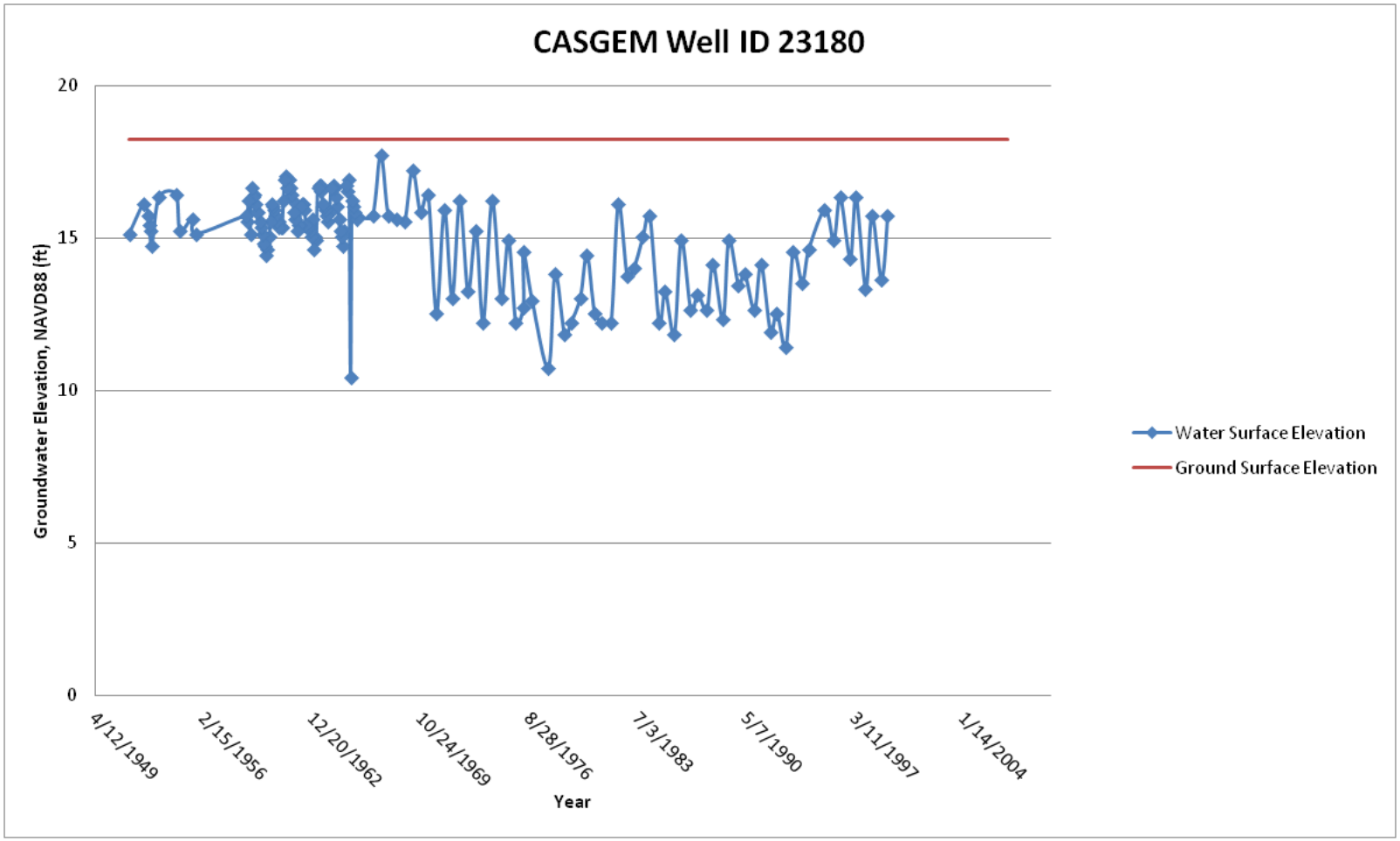
Loleta Bottoms



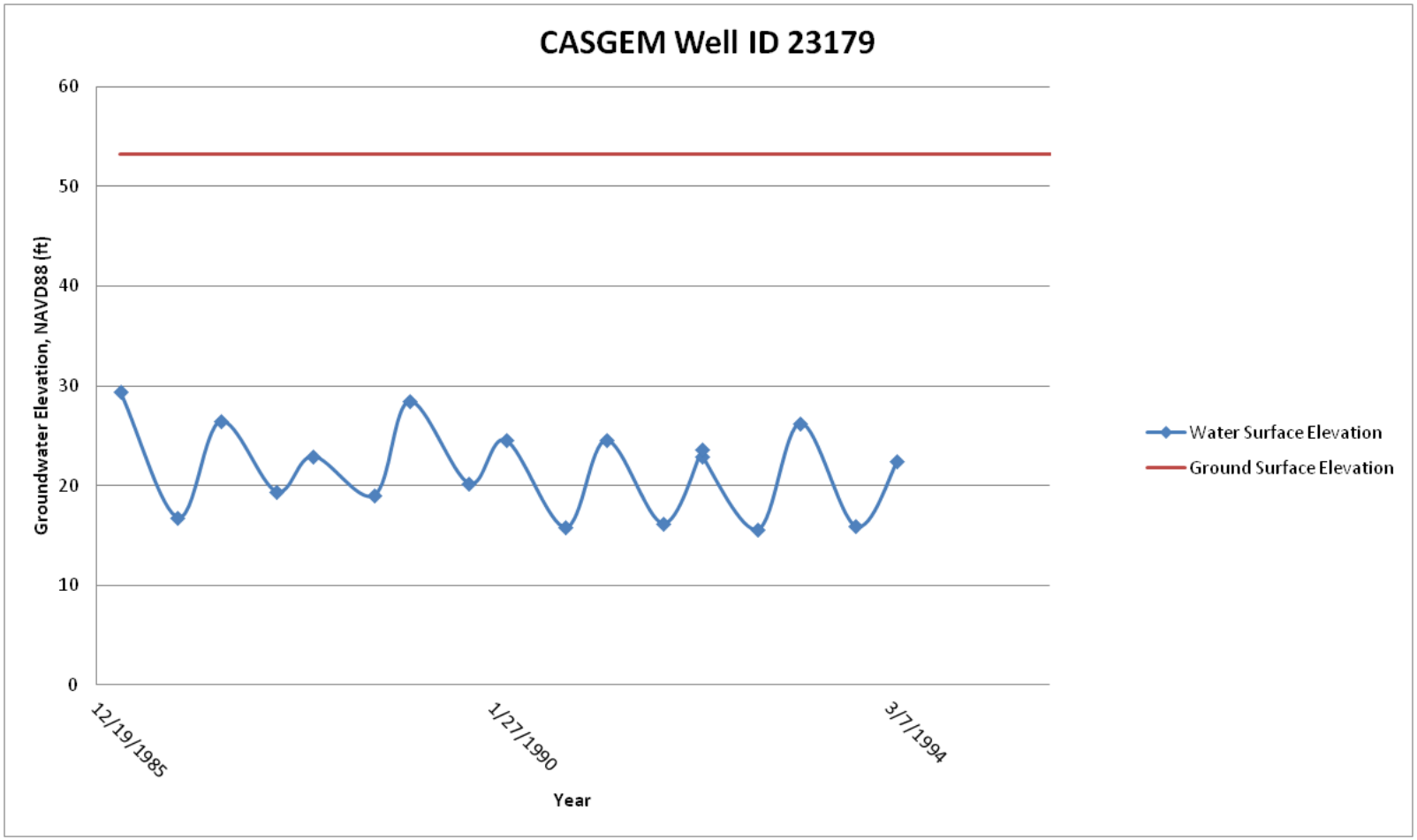
Port Kenyon Area



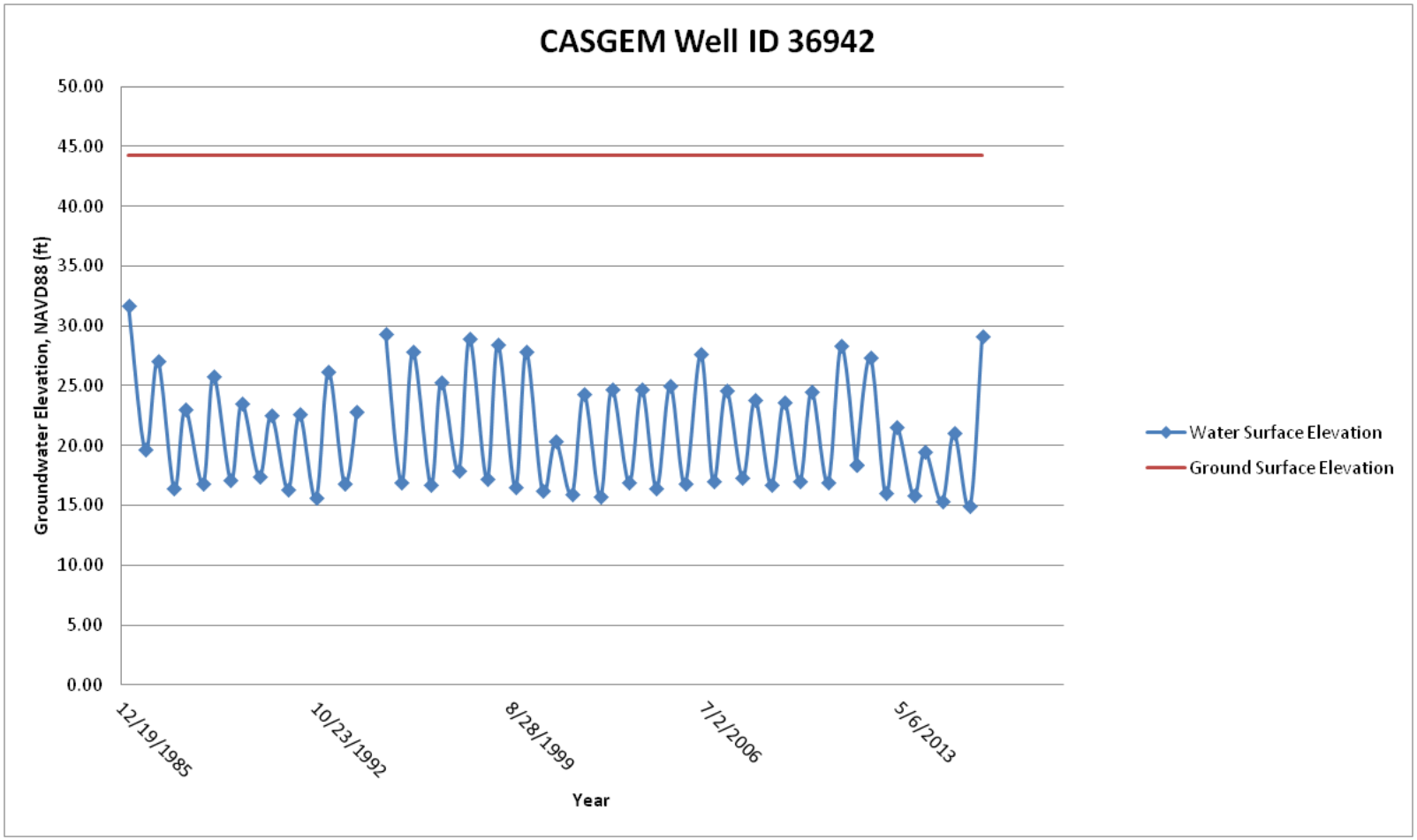
Loleta Foothills



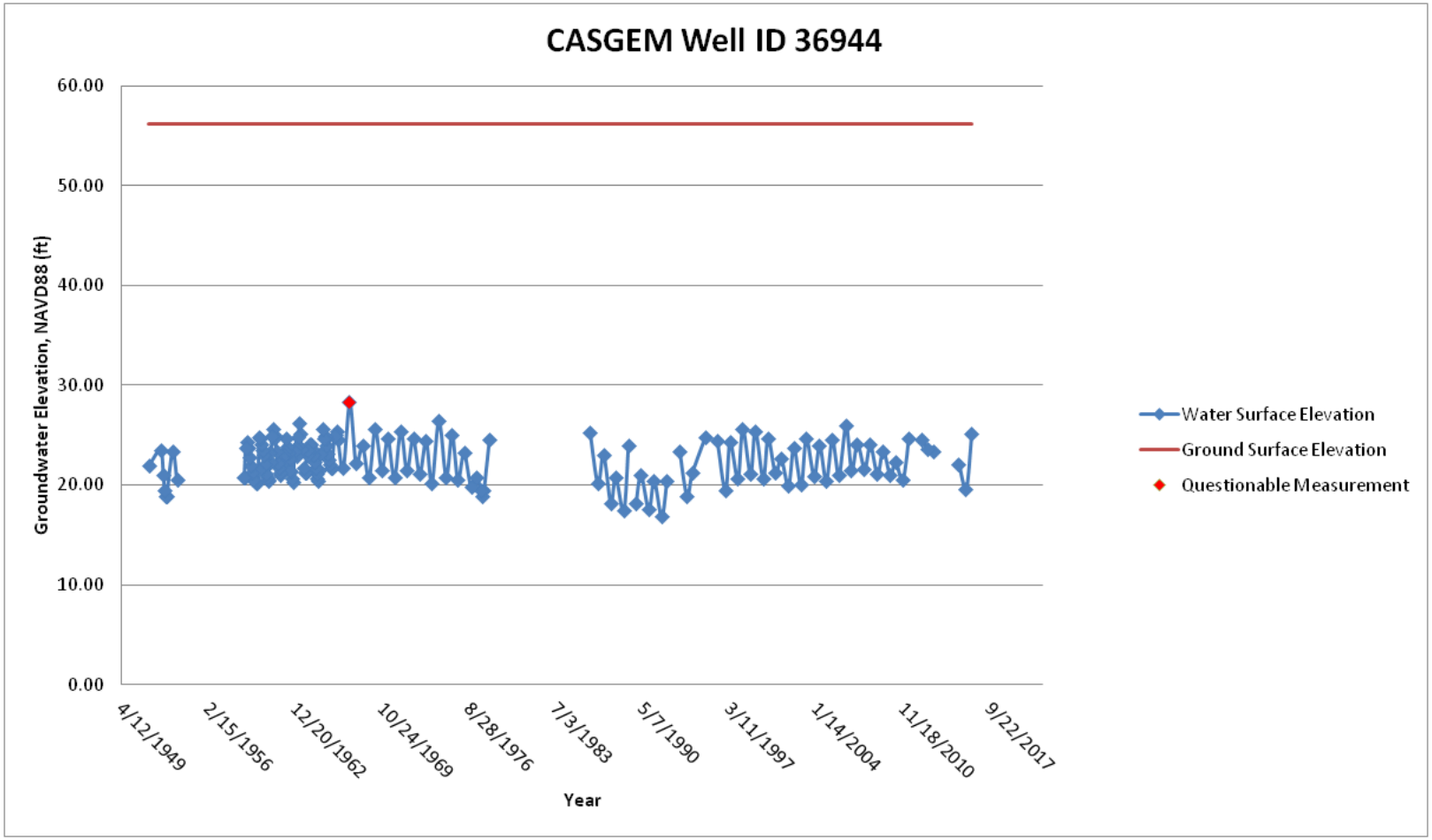
East Ferry Road Area



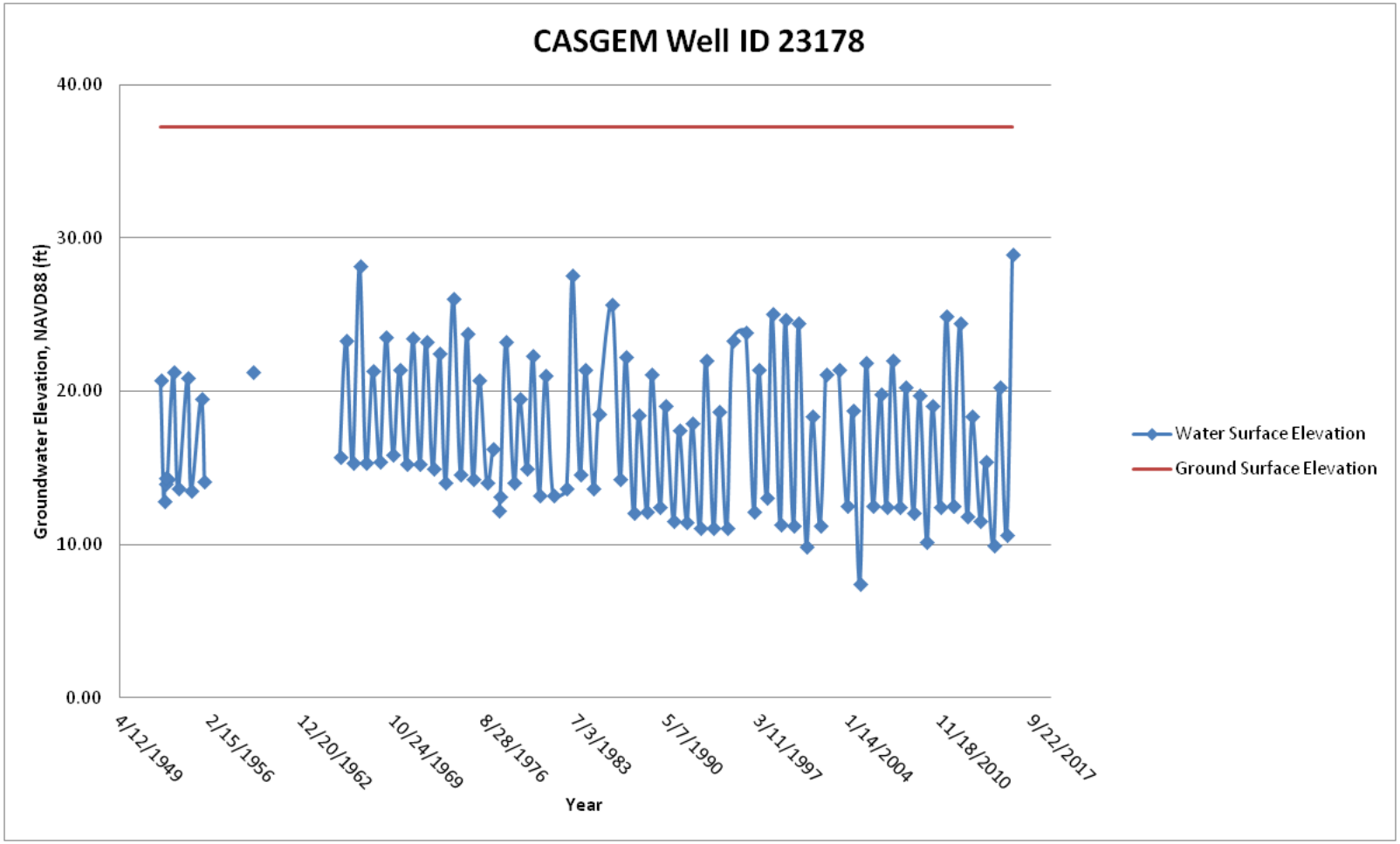
Pleasant Point Road Area



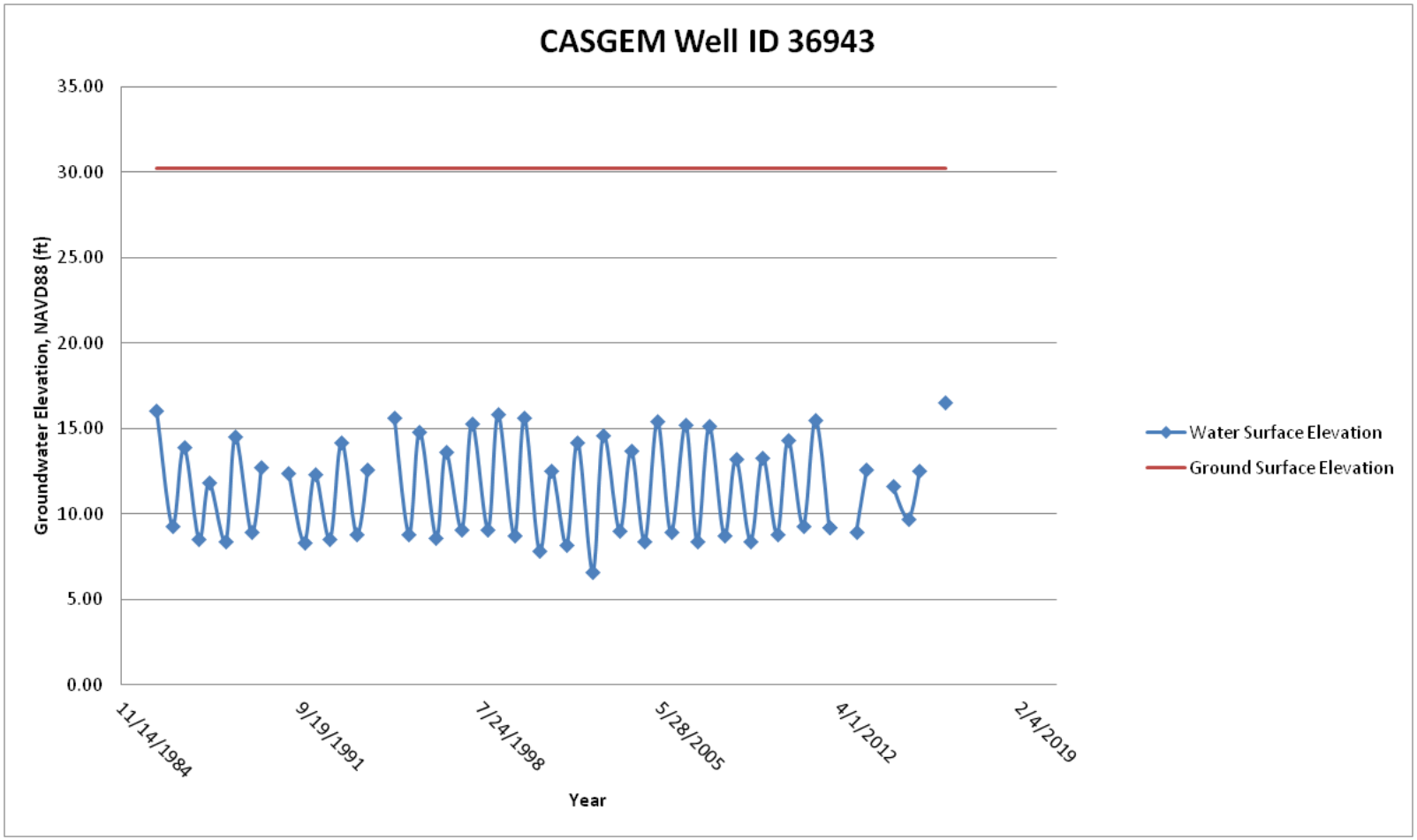
Fortuna Area



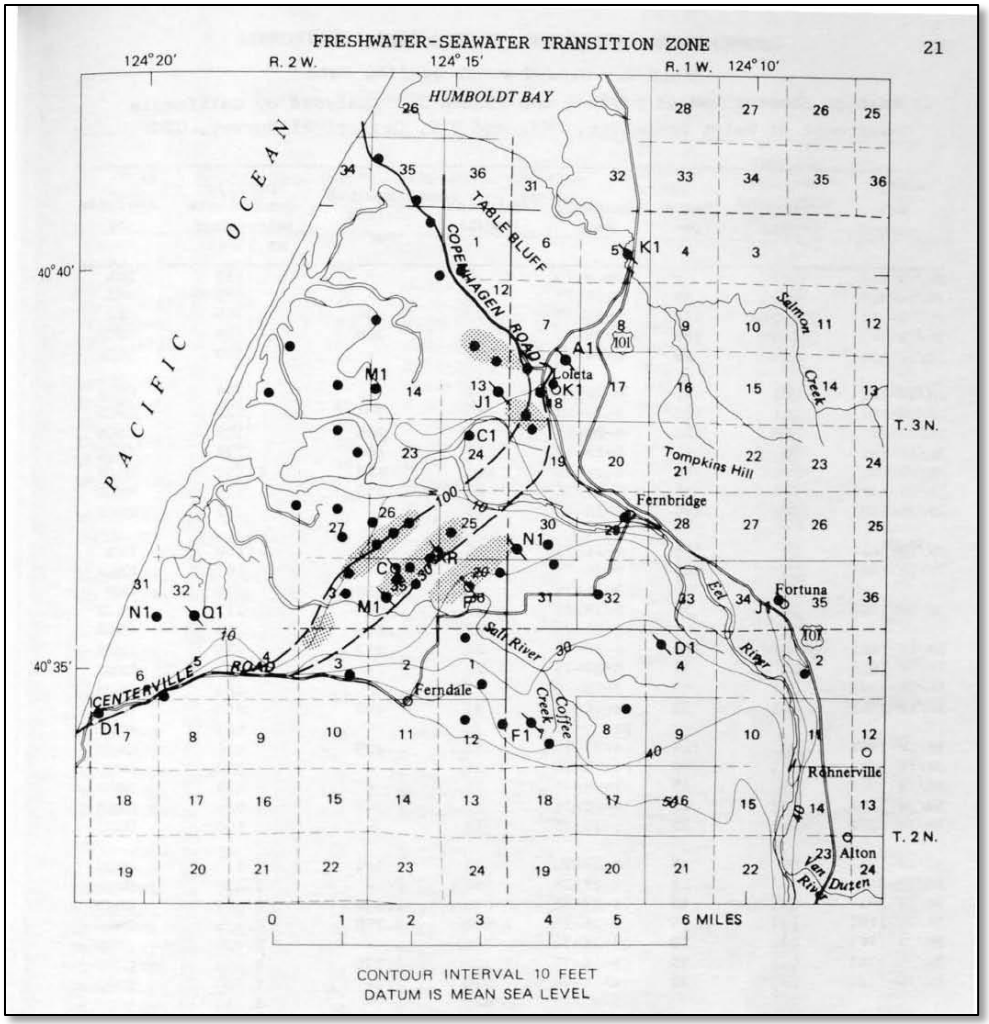
Waddington Road Area



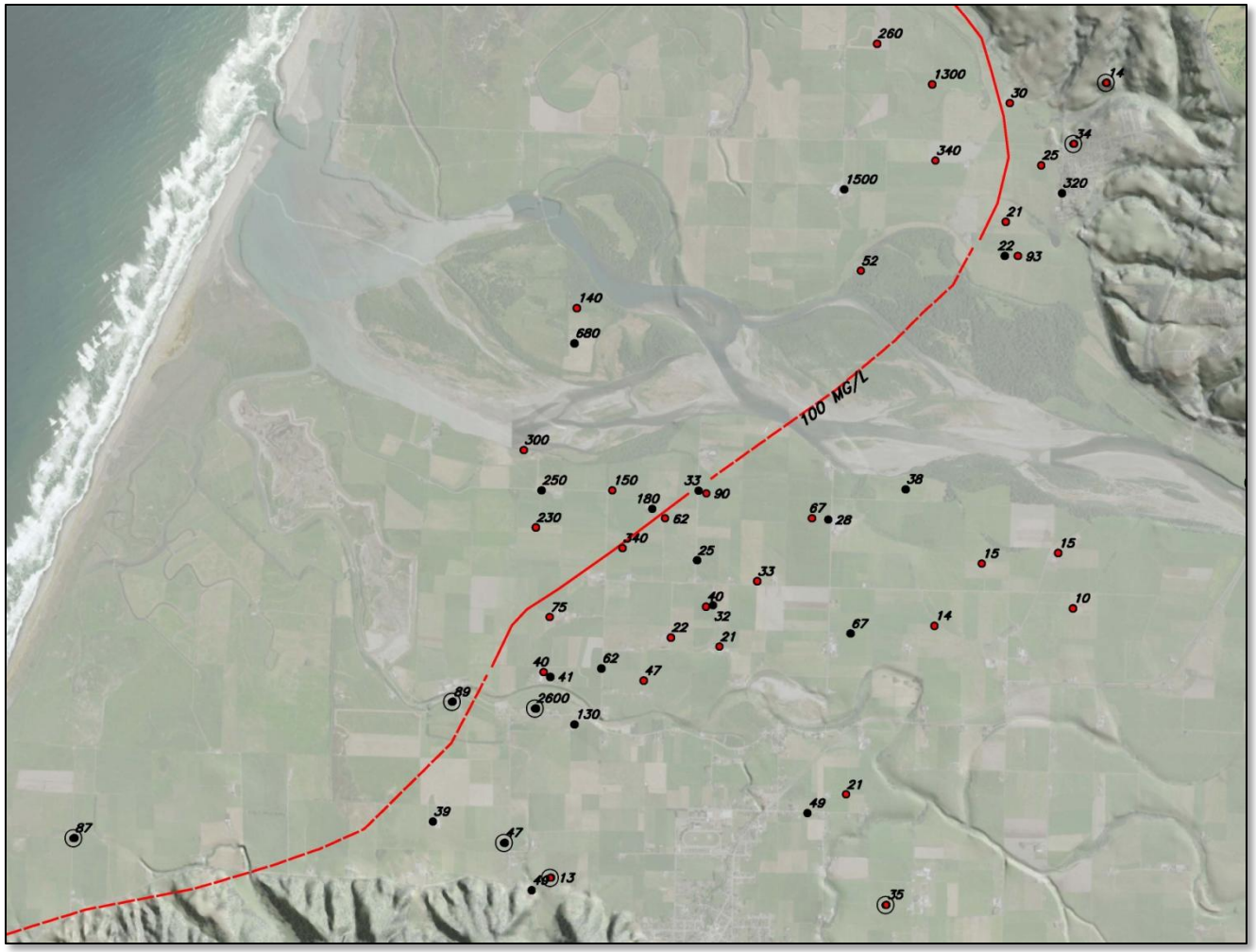
Ferndale – County Fairgrounds



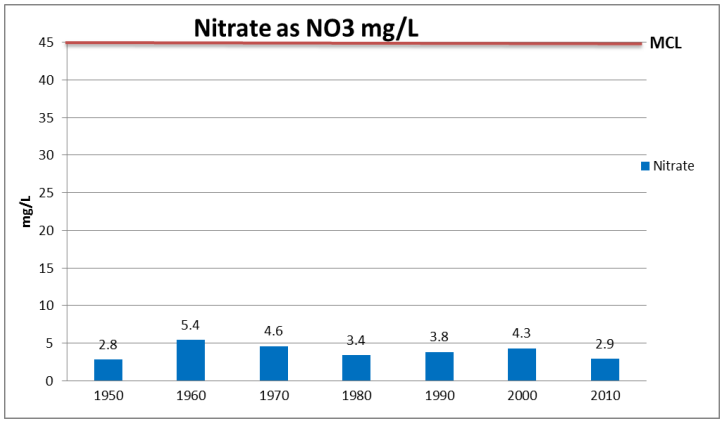
Seawater Intrusion Map (USGS, 1975)

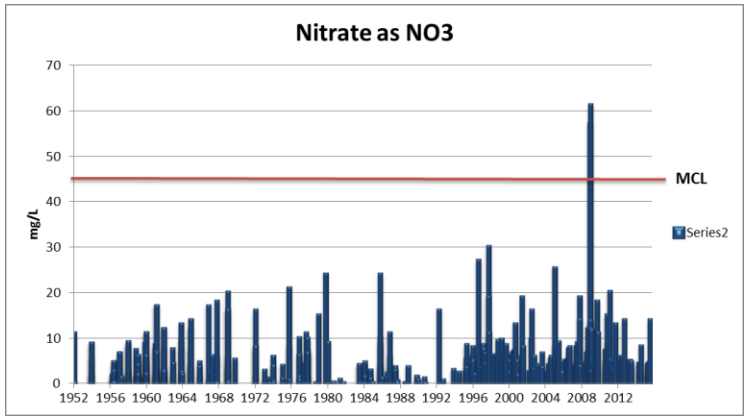


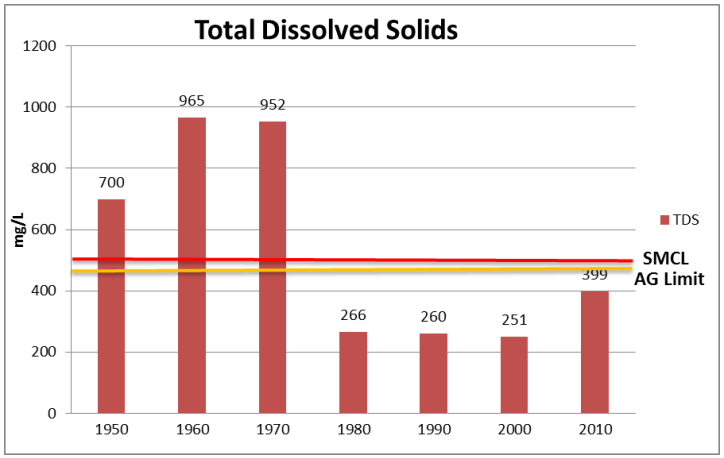
Seawater Intrusion Map - 1975 (red) and 2016 (black)

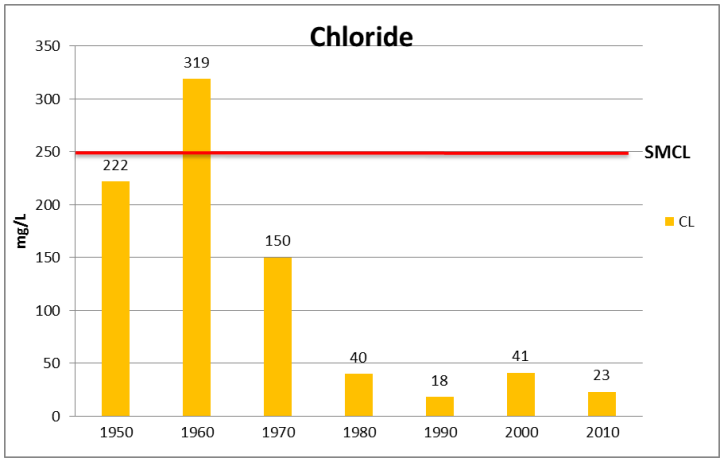


Degraded Water Quality







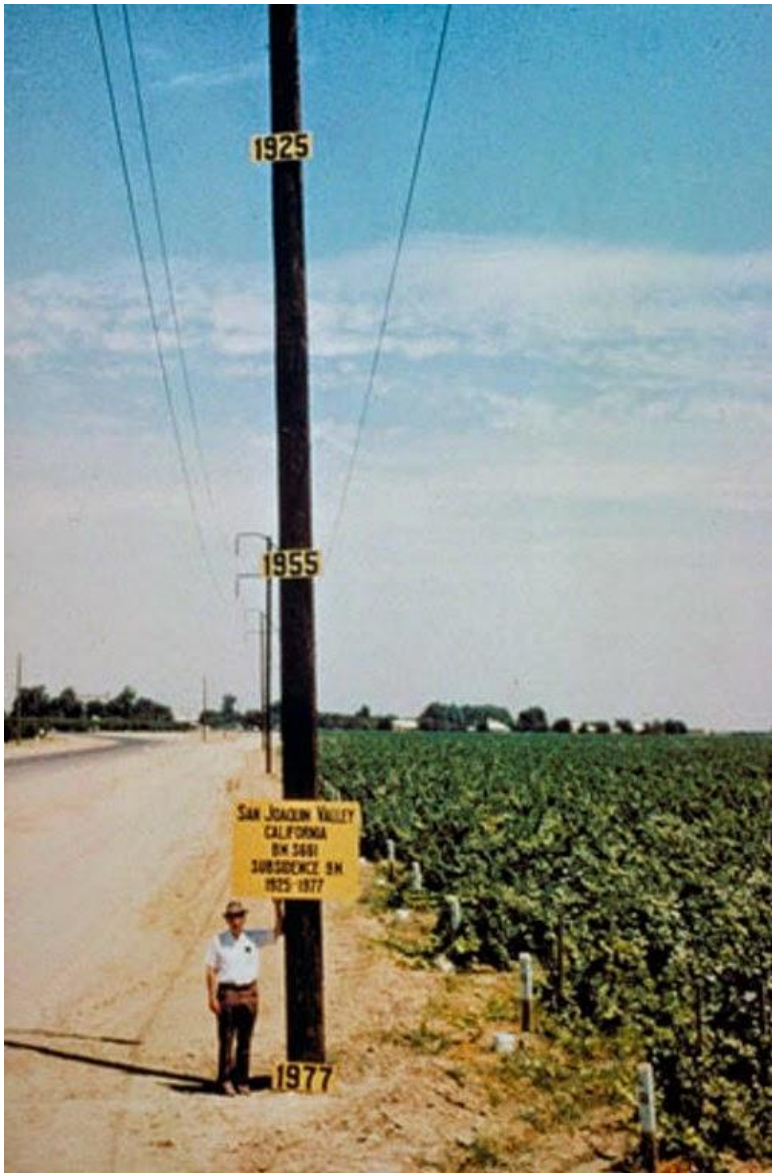


- Data tables courtesy of Jeremiah Puget (NCRWQCB)

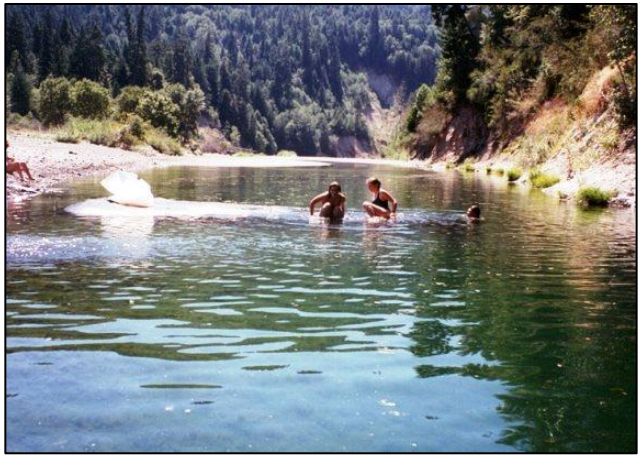
Land Subsidence

- Approximate location of maximum subsidence in the United States identified by research efforts of Dr. Joseph F. Poland (pictured). Signs on pole show approximate altitude of land surface in 1925, 1955, and 1977. The site is in the San Joaquin Valley southwest of Mendota, California.

Photo credit: Dick Ireland, USGS.



Depletion of Interconnected Waters

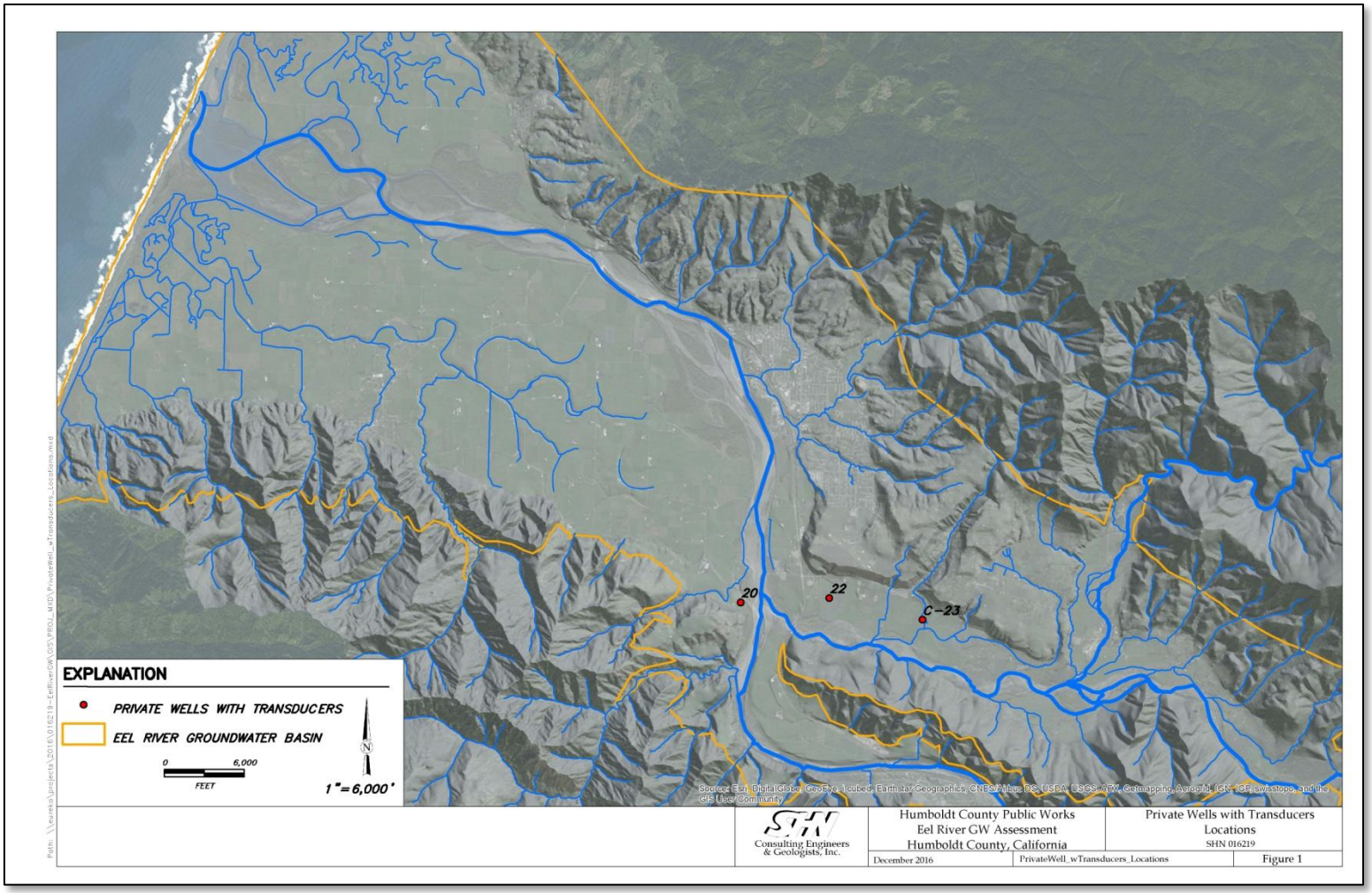


Salt River

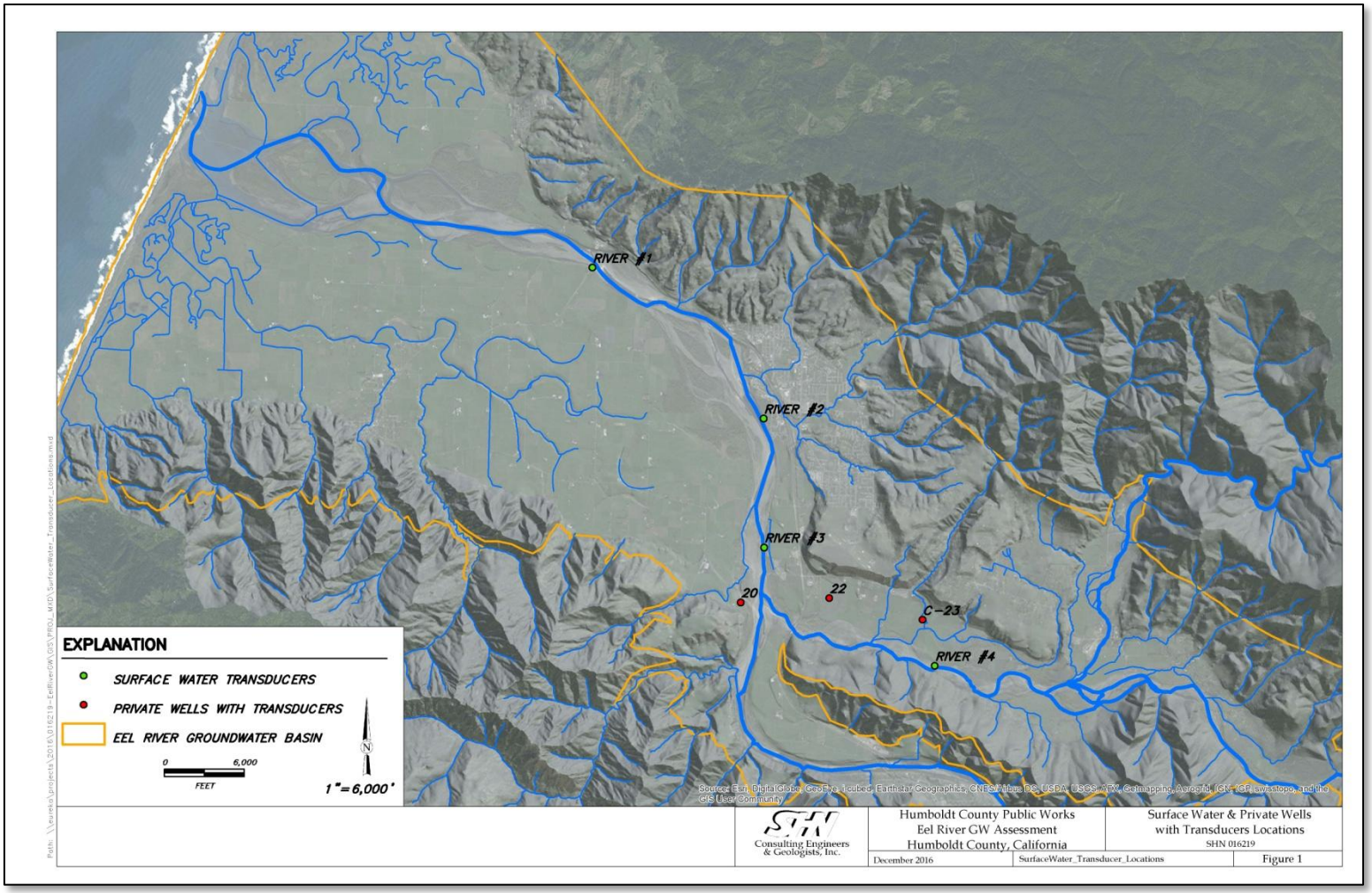
Van Duzen River

Eel River (2014)

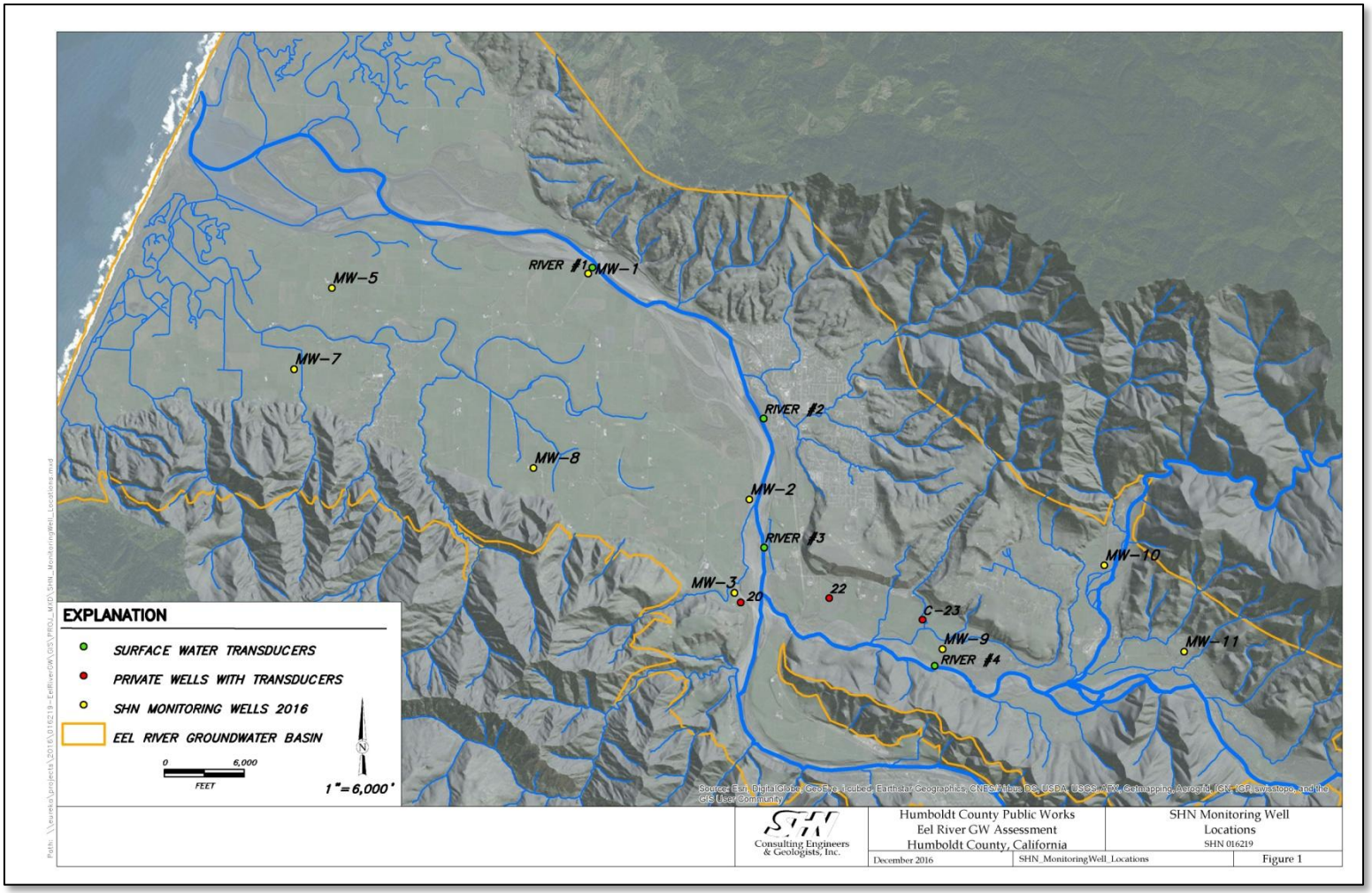
Transducers in Private Wells



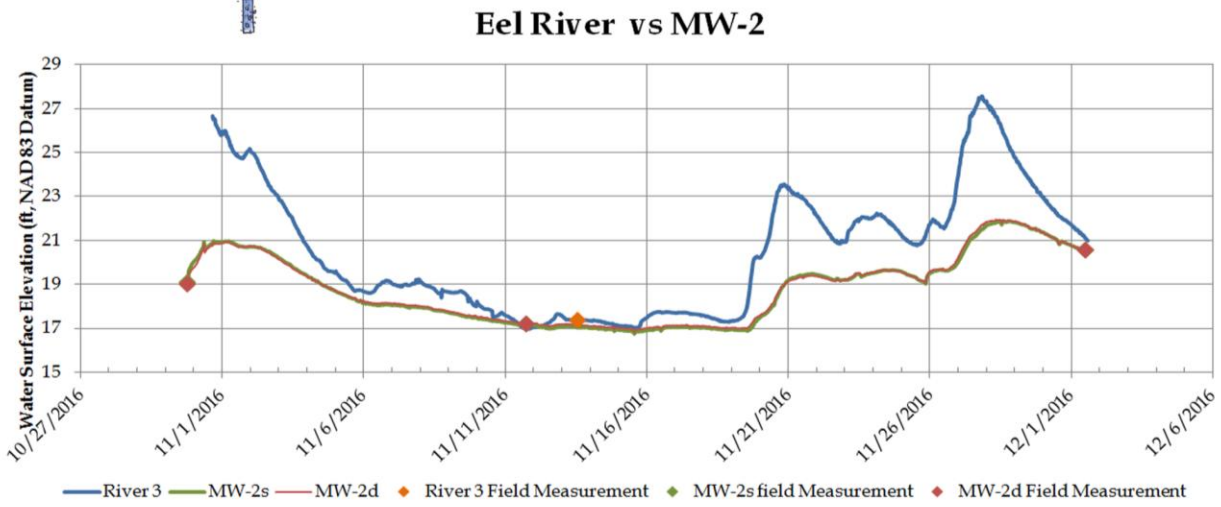
SHN River Transducer Locations



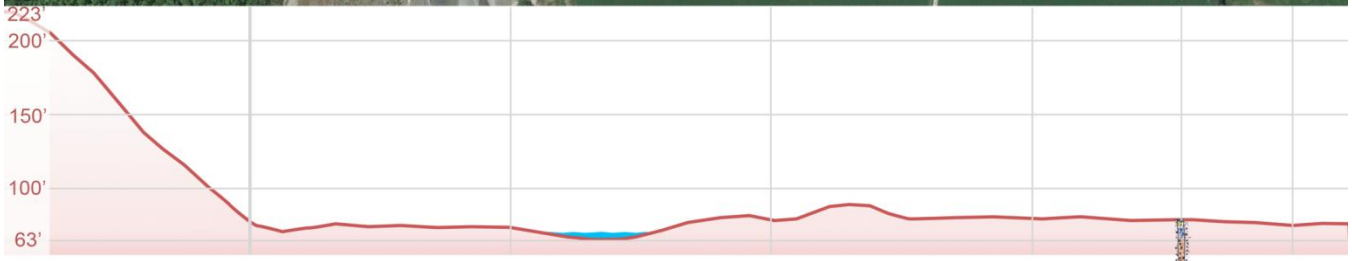
New Monitoring Wells

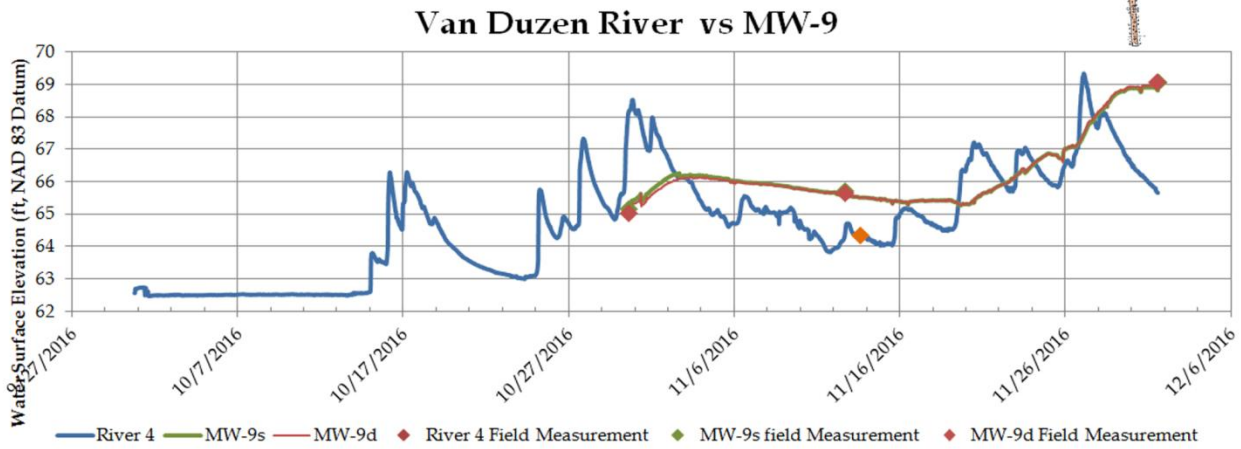


Surface Water/Ground Water Interaction

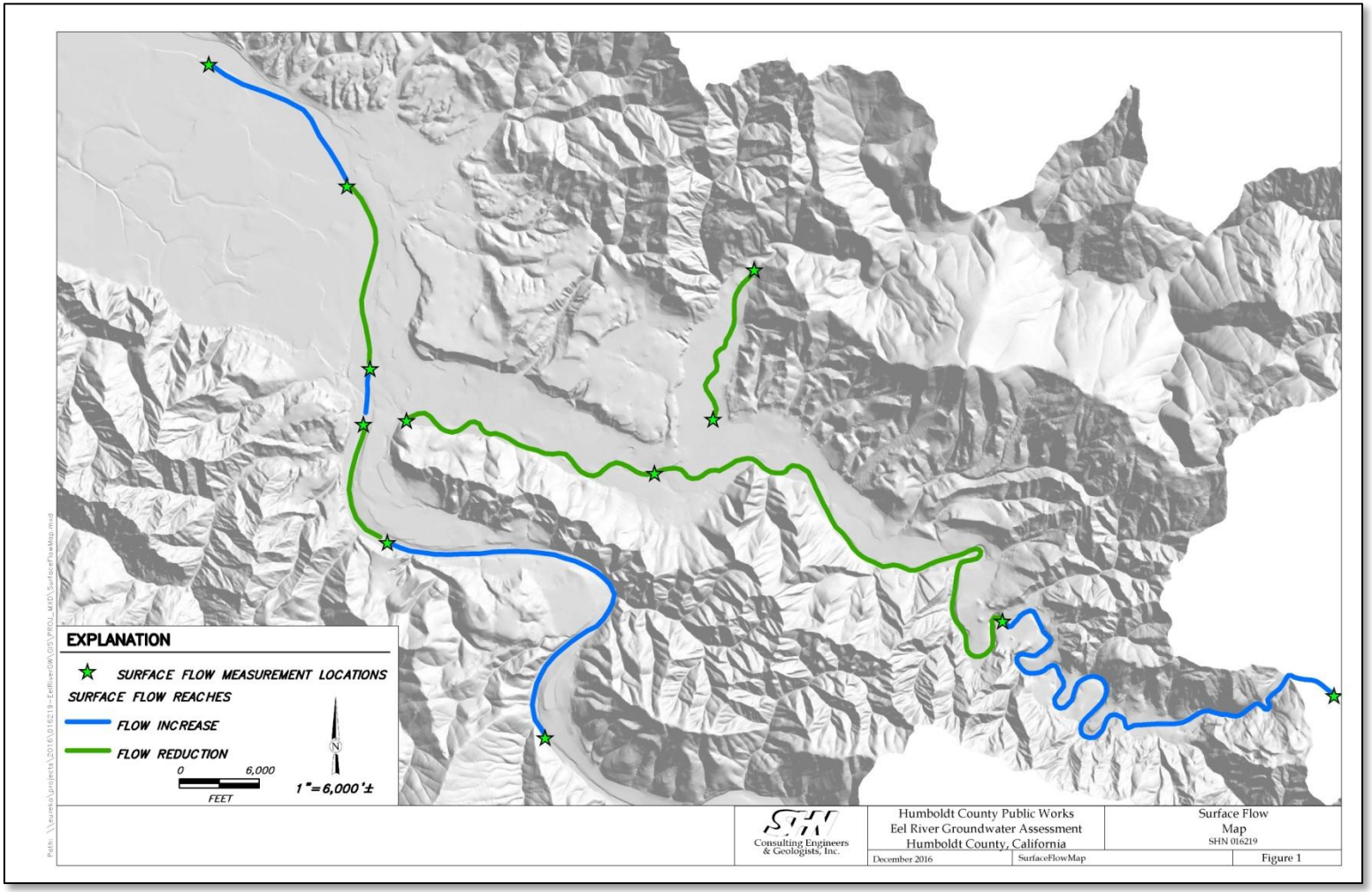


Surface Water/Ground Water Interaction





Surface Flow Measurements (August 23 - 24)



What Next?

- Continue analyzing field data
- Refine the water balance
- Prepare alternative submittal
- Field work scheduled for 2017

6. Review timeline and next steps

Timeline and next steps

Alternative Submittal

- Ongoing: SHN and County to develop Alternative Submittal
- December 13 (target): Board of Supervisors resolution
- December 20 (proposed): Working group meeting
- January 1 or earlier: Make submittal on DWR website

Technical

- Ongoing through Fall 2017: dataloggers in selected wells
- Spring 2017: Second round of basin-wide well monitoring
- Fall 2017: Analyze data from irrigation season
- December 2017: Complete grant-funded technical study

Timeline and next steps

Working Group

- 2017: Respond to DWR's evaluation of Alternative Submittal
- Determine shared efforts for ongoing monitoring and reporting