Groundwater Committee Meeting

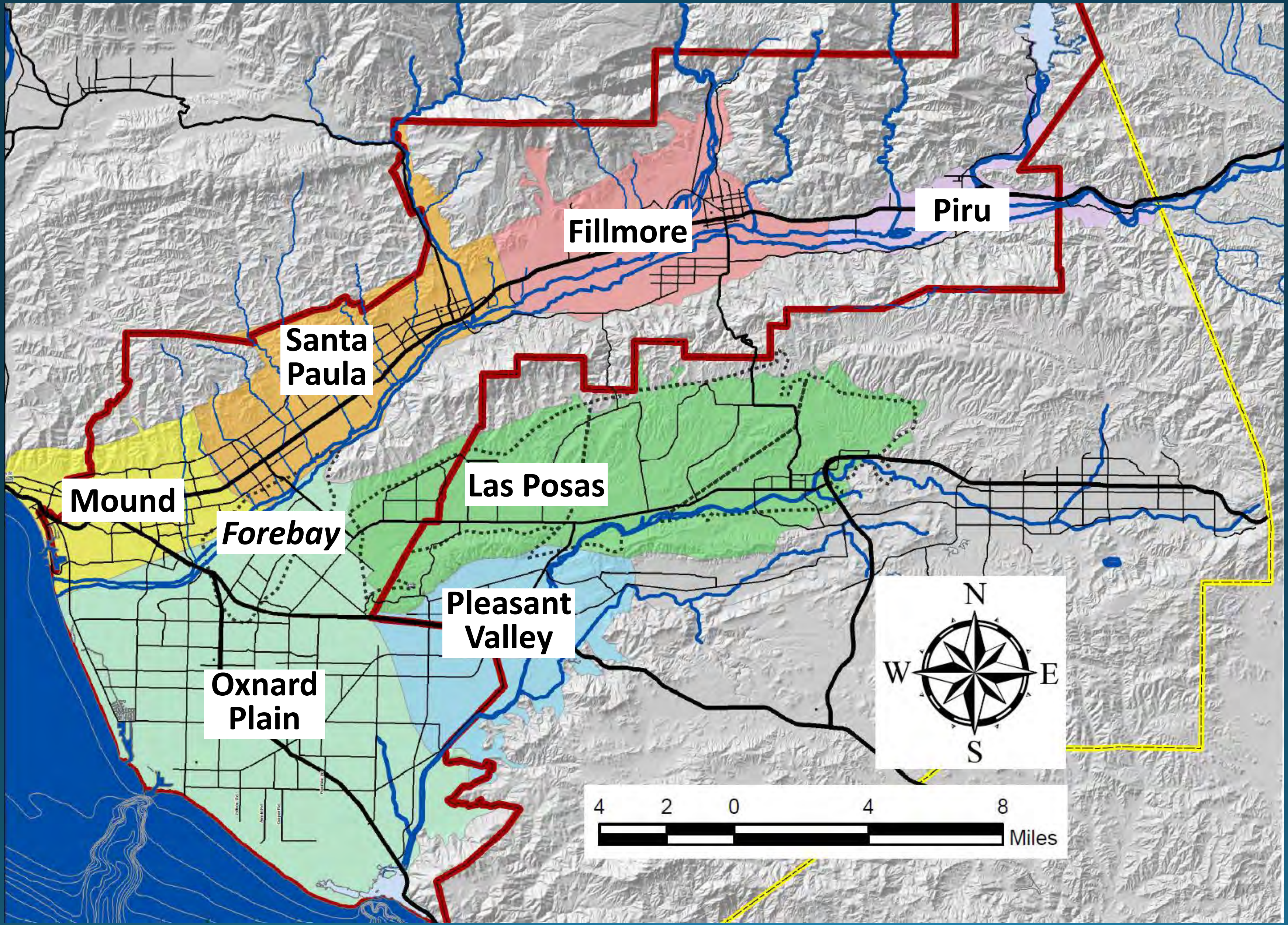
March 26, 2019

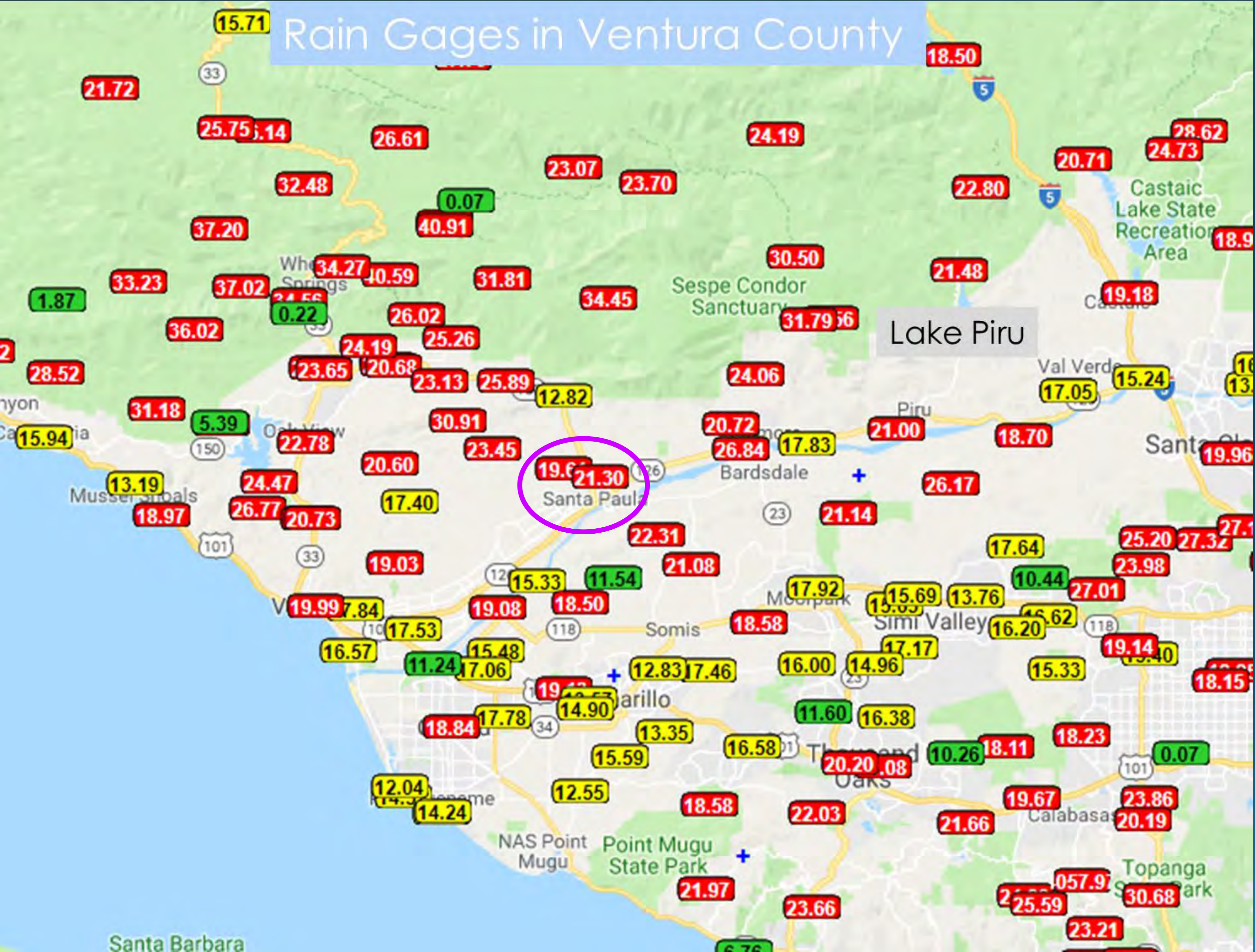
United Water Conservation District

Agenda Items 1 through 3

1. Public Comment
2. Approval of the Agenda
3. Approval of the Minutes

4. Groundwater Conditions

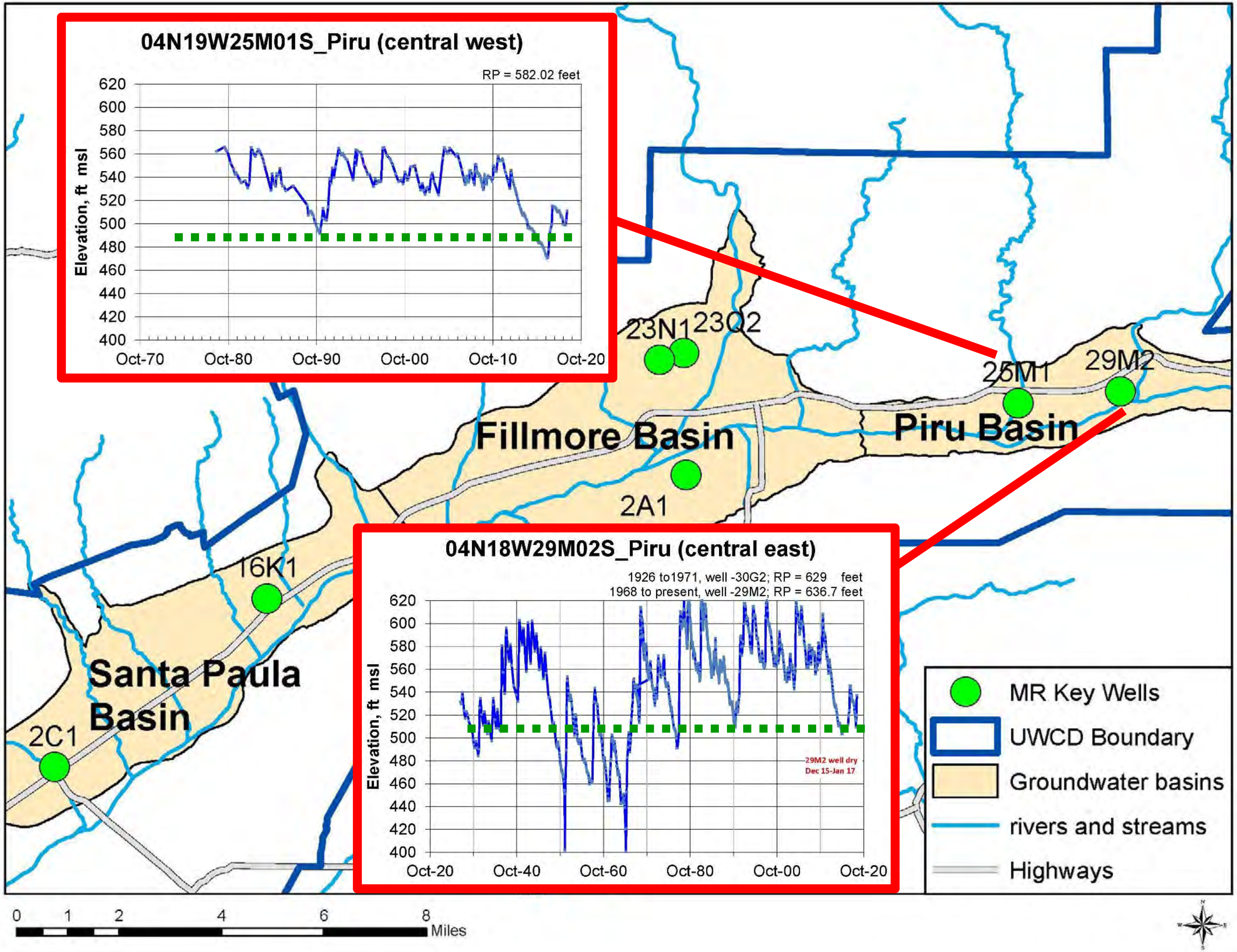


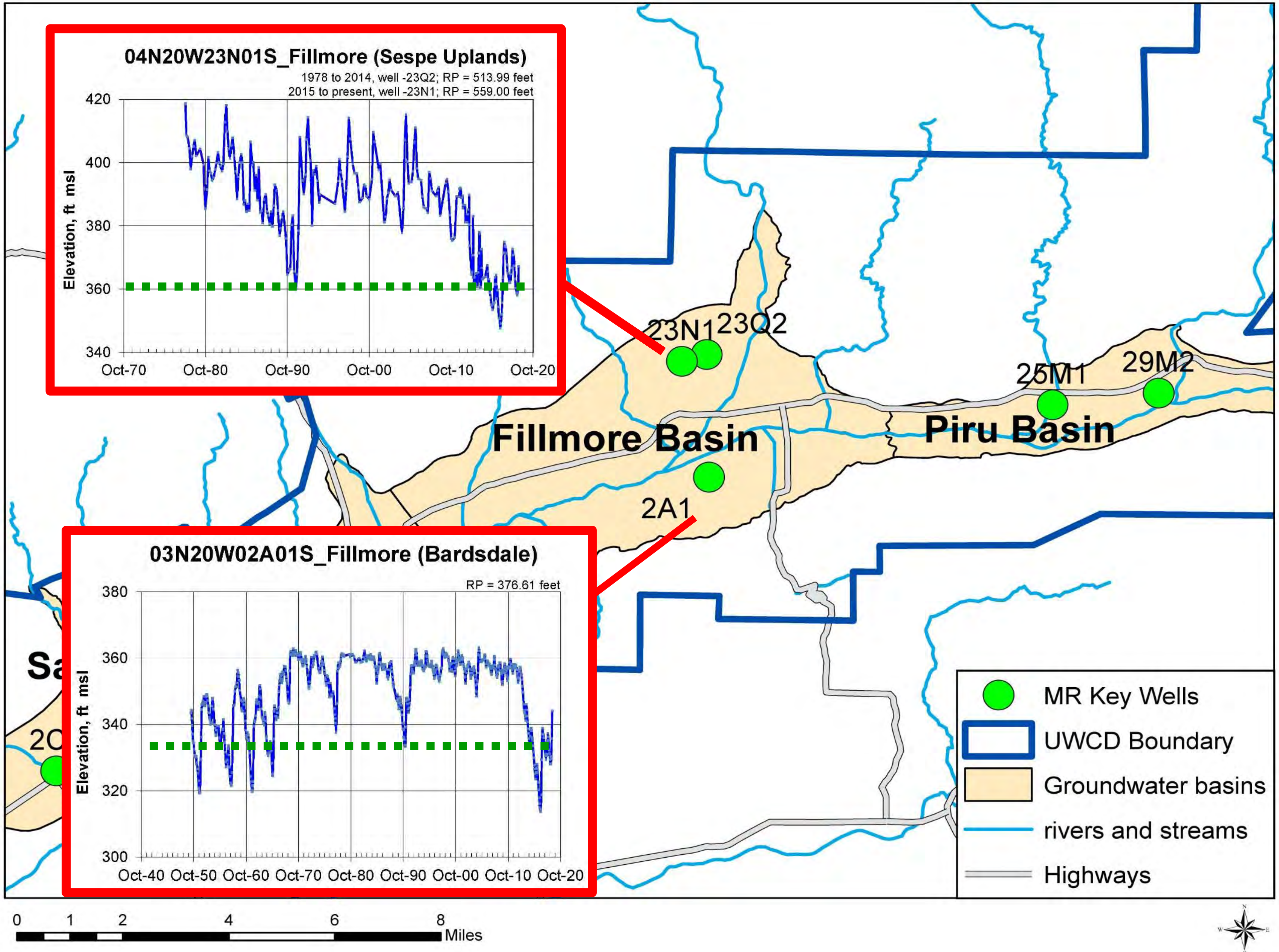


On average, *Santa Paula receives 90% of its total water-year rainfall by the end of March.*

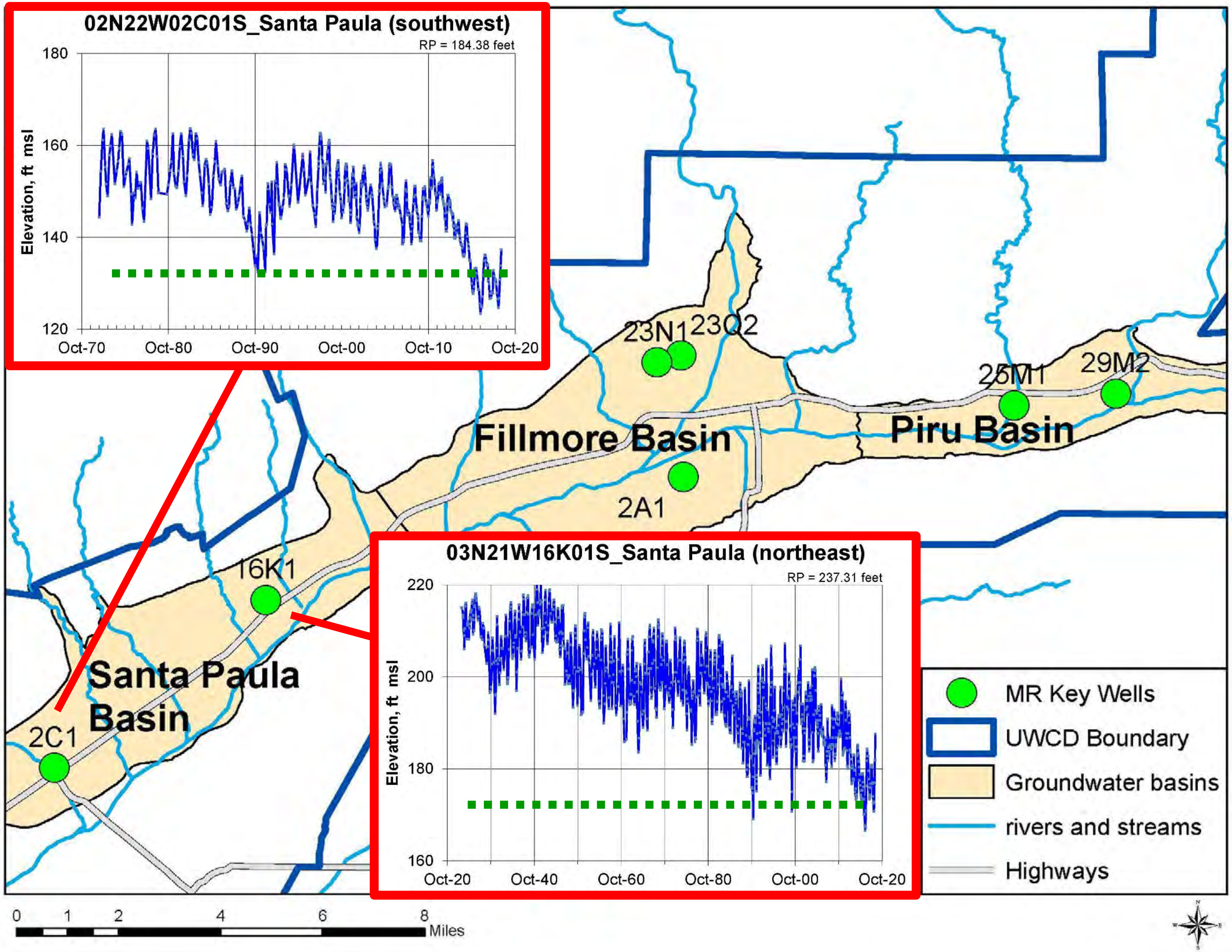
Average at end of March = 15.51″ (max = 39.33″)

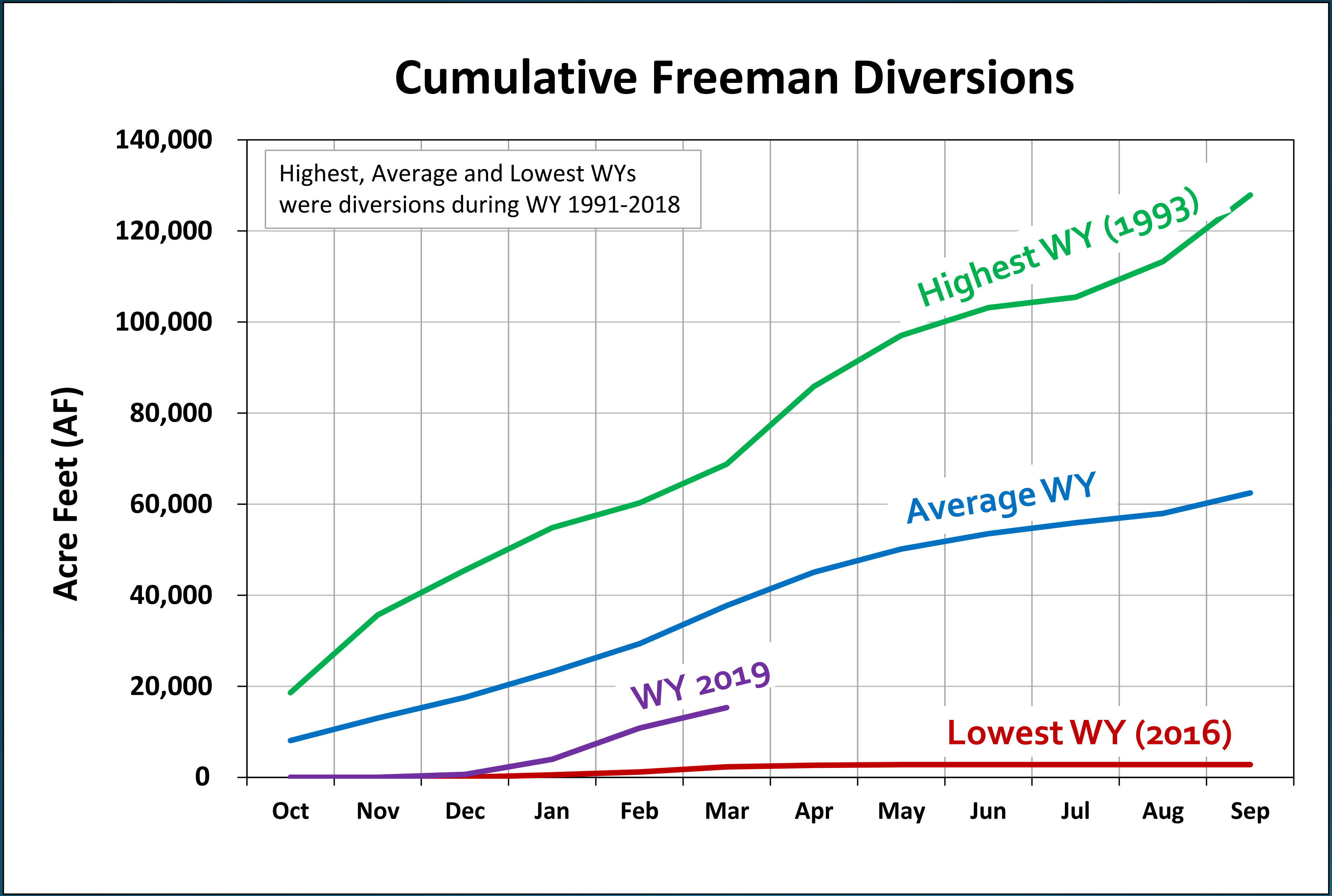
Average at end of Water Year = 17.19″ (max = 44.77″)

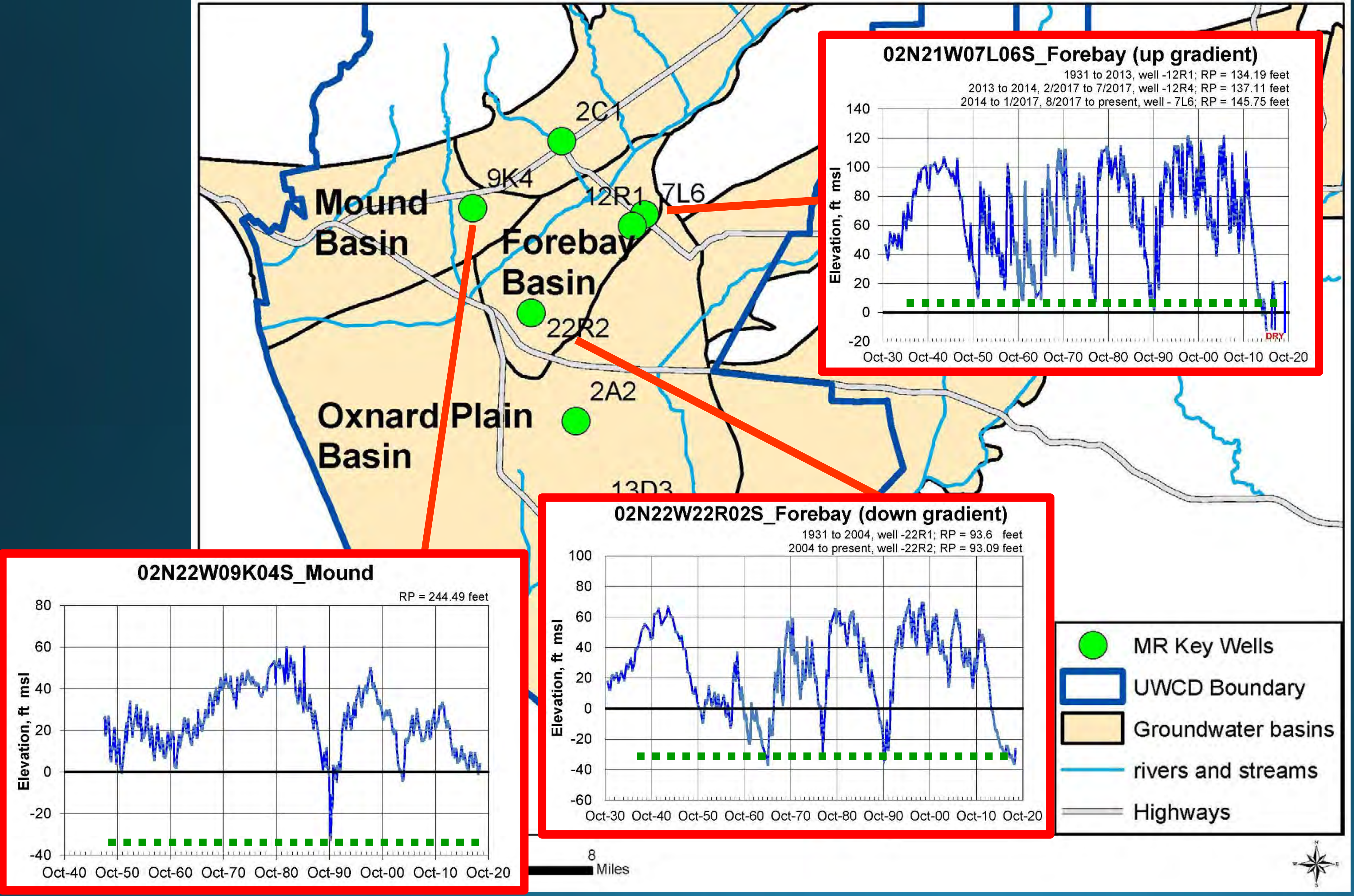

04N19W25M01S_Piru (central west)
RP = 582.02 feet
Elevation, ft msl
620
600
580
560
540
520
500
480
460
440
420
400
Oct-70
Oct-80
Oct-90
Oct-00
Oct-10
Oct-20
04N18W29M02S_Piru (central east)
1926 to1971, well -30G2; RP = 629 feet
1968 to present, well -29M2; RP = 636.7 feet
Elevation, ft msl
Oct-20
Oct-40
Oct-60
Oct-80
Oct-00
Oct-20
29M2 well dry
Dec 15-Jan 17
23N1
23Q2
25M1
29M2
2A1
16K1
2C1
Fillmore Basin
Piru Basin
Santa Paula Basin
MR Key Wells
UWCD Boundary
Groundwater basins
rivers and streams
Highways
0
1
2
4
6
8
Miles



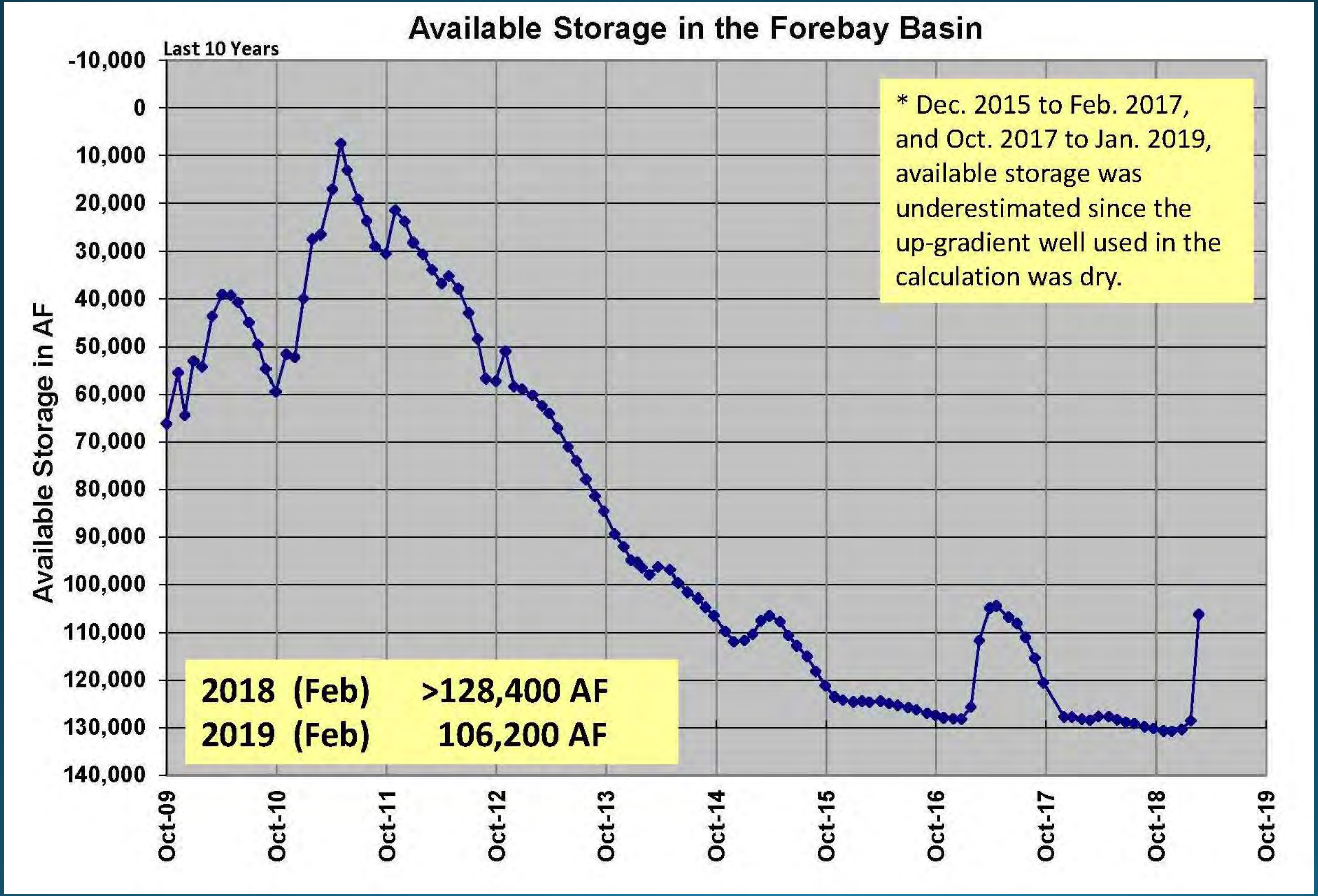
04N20W23N01S_Fillmore (Sespe Uplands)
1978 to 2014, well -23Q2; RP = 513.99 feet
2015 to present, well -23N1; RP = 559.00 feet
Elevation, ft msl
420
400
380
360
340
Oct-70
Oct-80
Oct-90
Oct-00
Oct-10
Oct-20
23N1
23Q2
25M1
29M2
Fillmore Basin
Piru Basin
2A1
03N20W02A01S_Fillmore (Bardsdale)
RP = 376.61 feet
Elevation, ft msl
380
360
340
320
300
Oct-40
Oct-50
Oct-60
Oct-70
Oct-80
Oct-90
Oct-00
Oct-10
Oct-20
MR Key Wells
UWCD Boundary
Groundwater basins
rivers and streams
Highways
0
1
2
4
6
8
Miles


02N22W02C01S_Santa Paula (southwest)
RP = 184.38 feet
Elevation, ft msl
180
160
140
120
Oct-70
Oct-80
Oct-90
Oct-00
Oct-10
Oct-20
03N21W16K01S_Santa Paula (northeast)
RP = 237.31 feet
Elevation, ft msl
220
200
180
160
Oct-20
Oct-40
Oct-60
Oct-80
Oct-00
Oct-20
23N1
23Q2
25M1
29M2
2A1
16K1
2C1
Fillmore Basin
Piru Basin
Santa Paula Basin
MR Key Wells
UWCD Boundary
Groundwater basins
rivers and streams
Highways
0
1
2
4
6
8
Miles

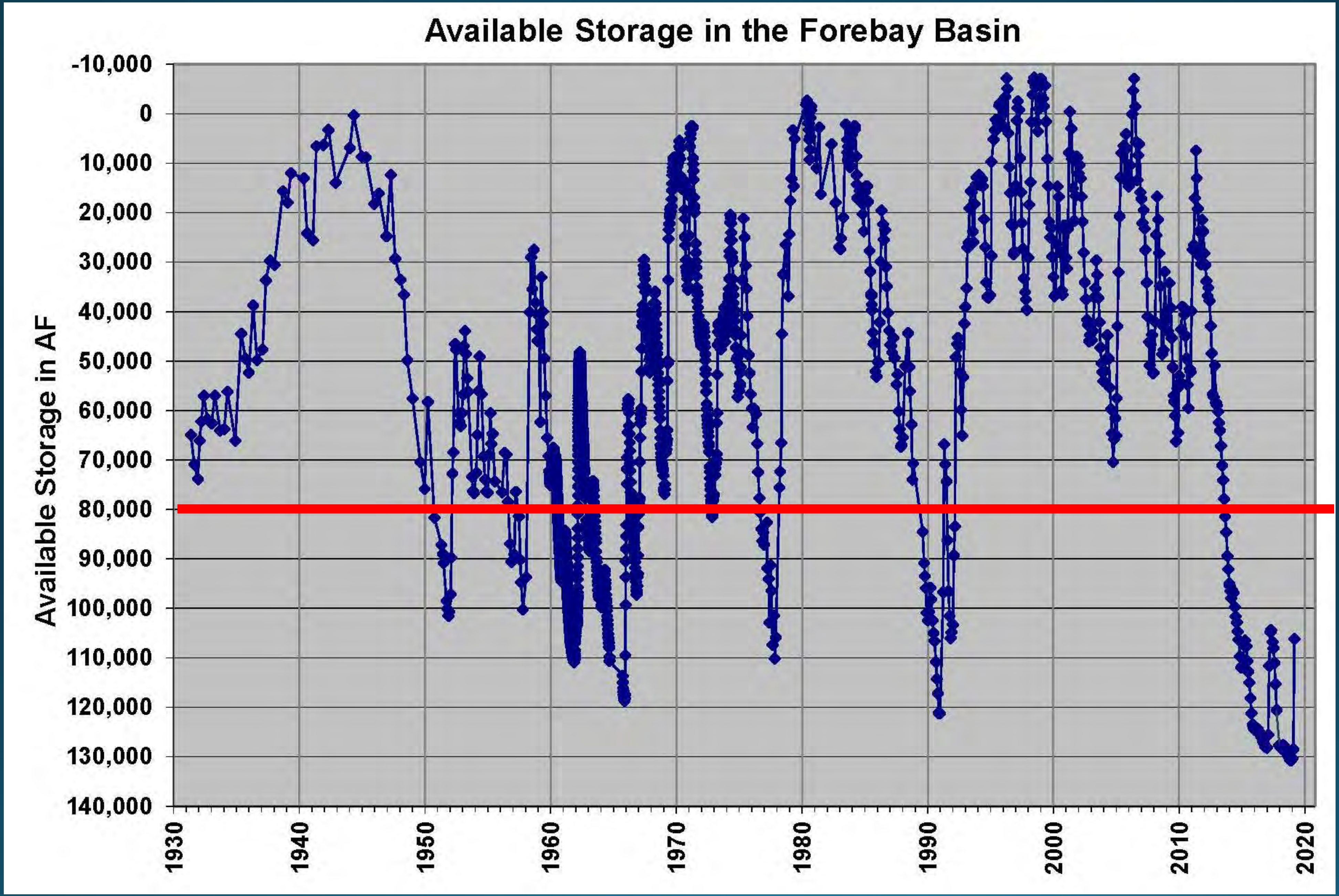

Cumulative Freeman Diversions
Highest, Average and Lowest WYs
were diversions during WY 1991-2018
Acre Feet (AF)
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Highest WY (1993)
Average WY
WY 2019
Lowest WY (2016)

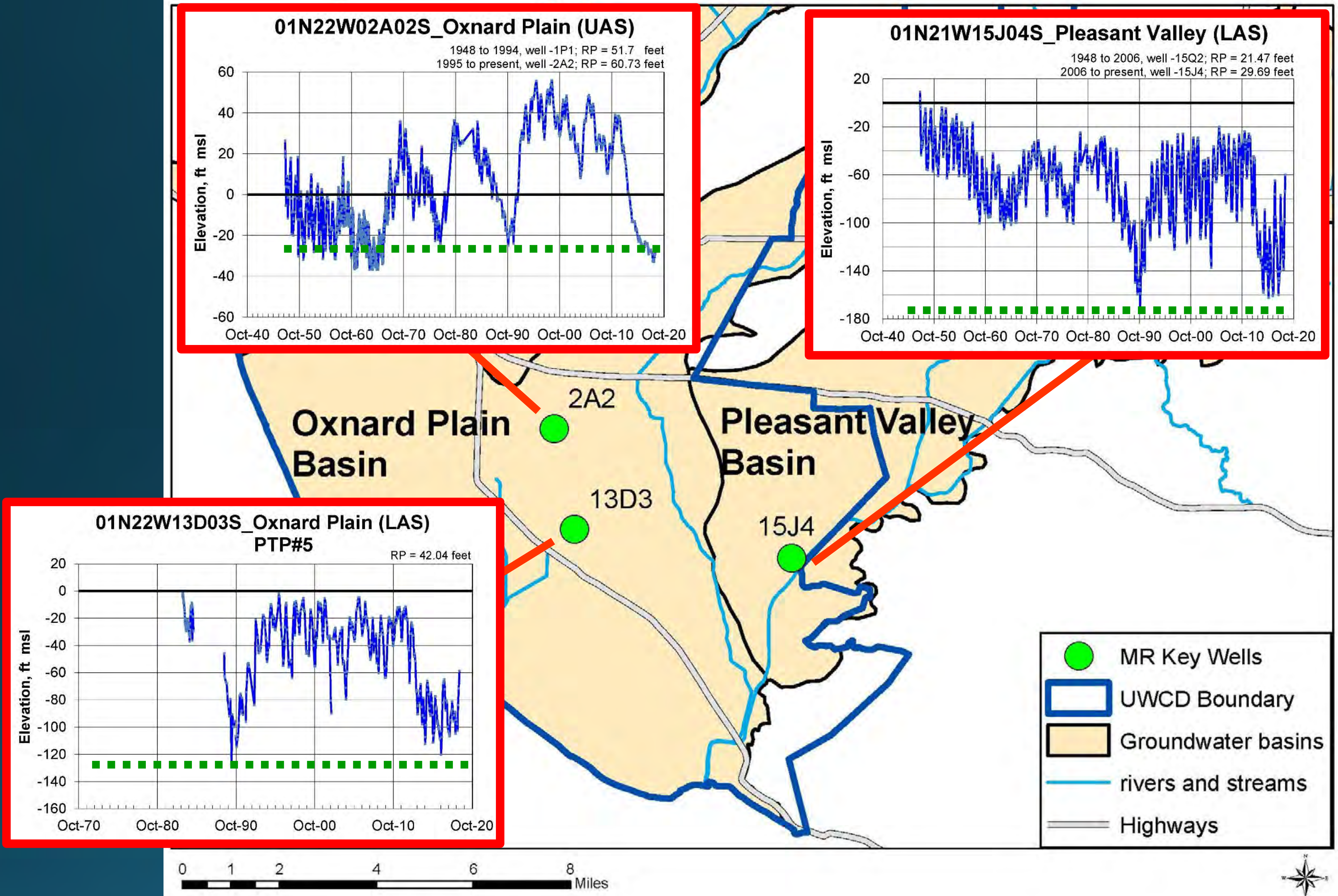


2C1
9K4
12R1
7L6
Mound Basin
Forebay Basin
22R2
2A2
Oxnard Plain Basin
13D3
02N21W07L06S_Forebay (up gradient)
1931 to 2013, well -12R1; RP = 134.19 feet
2013 to 2014, 2/2017 to 7/2017, well -12R4; RP = 137.11 feet
2014 to 1/2017, 8/2017 to present, well - 7L6; RP = 145.75 feet
Elevation, ft msl
DRY
02N22W22R02S_Forebay (down gradient)
1931 to 2004, well -22R1; RP = 93.6 feet
2004 to present, well -22R2; RP = 93.09 feet
Elevation, ft msl
02N22W09K04S_Mound
RP = 244.49 feet
Elevation, ft msl
8
Miles
MR Key Wells
UWCD Boundary
Groundwater basins
rivers and streams
Highways

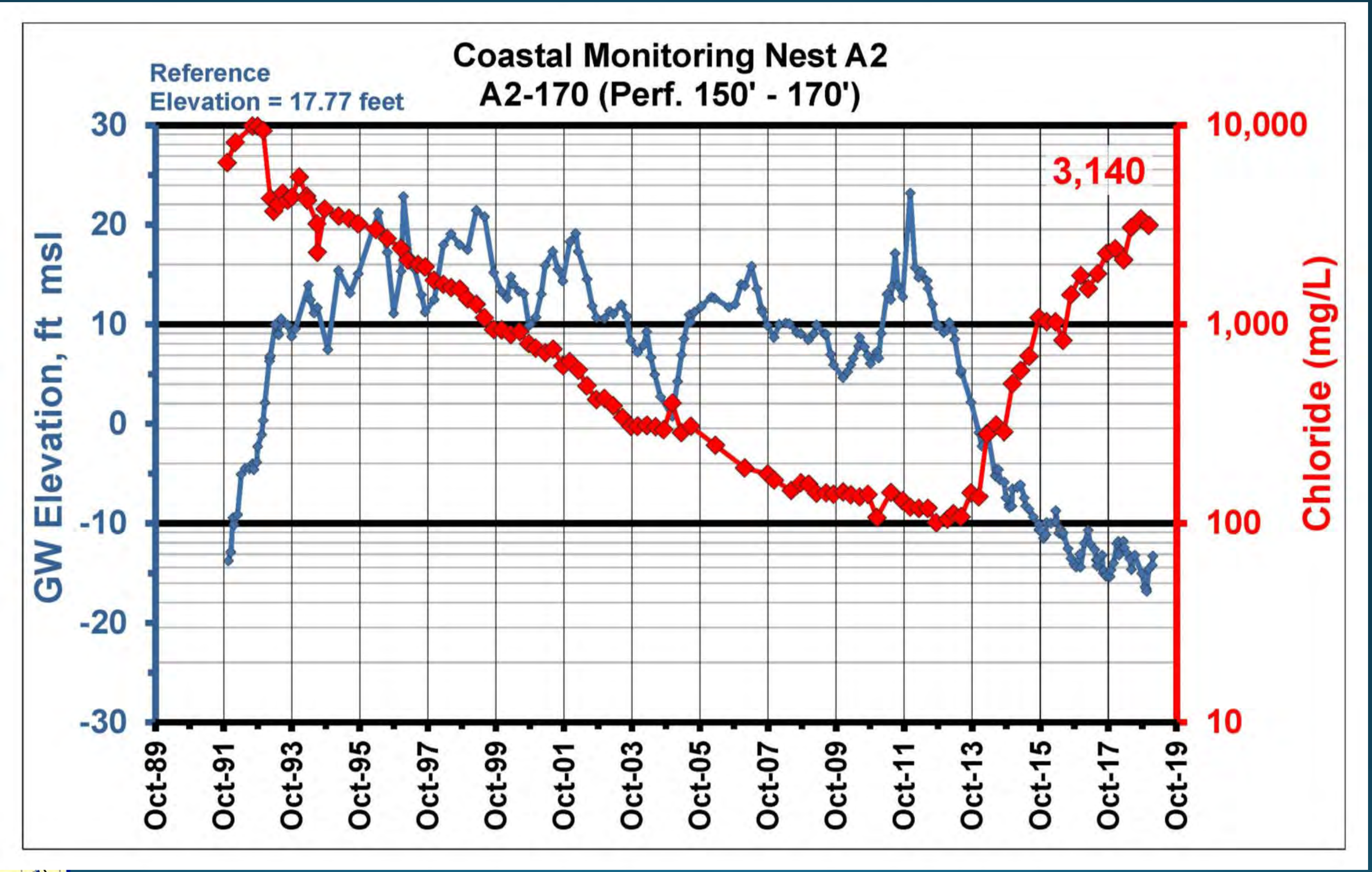


Available Storage in the Forebay Basin
Last 10 Years
Available Storage in AF
-10,000
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
130,000
140,000
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16
Oct-17
Oct-18
Oct-19
* Dec. 2015 to Feb. 2017, and Oct. 2017 to Jan. 2019, available storage was underestimated since the up-gradient well used in the calculation was dry.
2018 (Feb) >128,400 AF
2019 (Feb) 106,200 AF

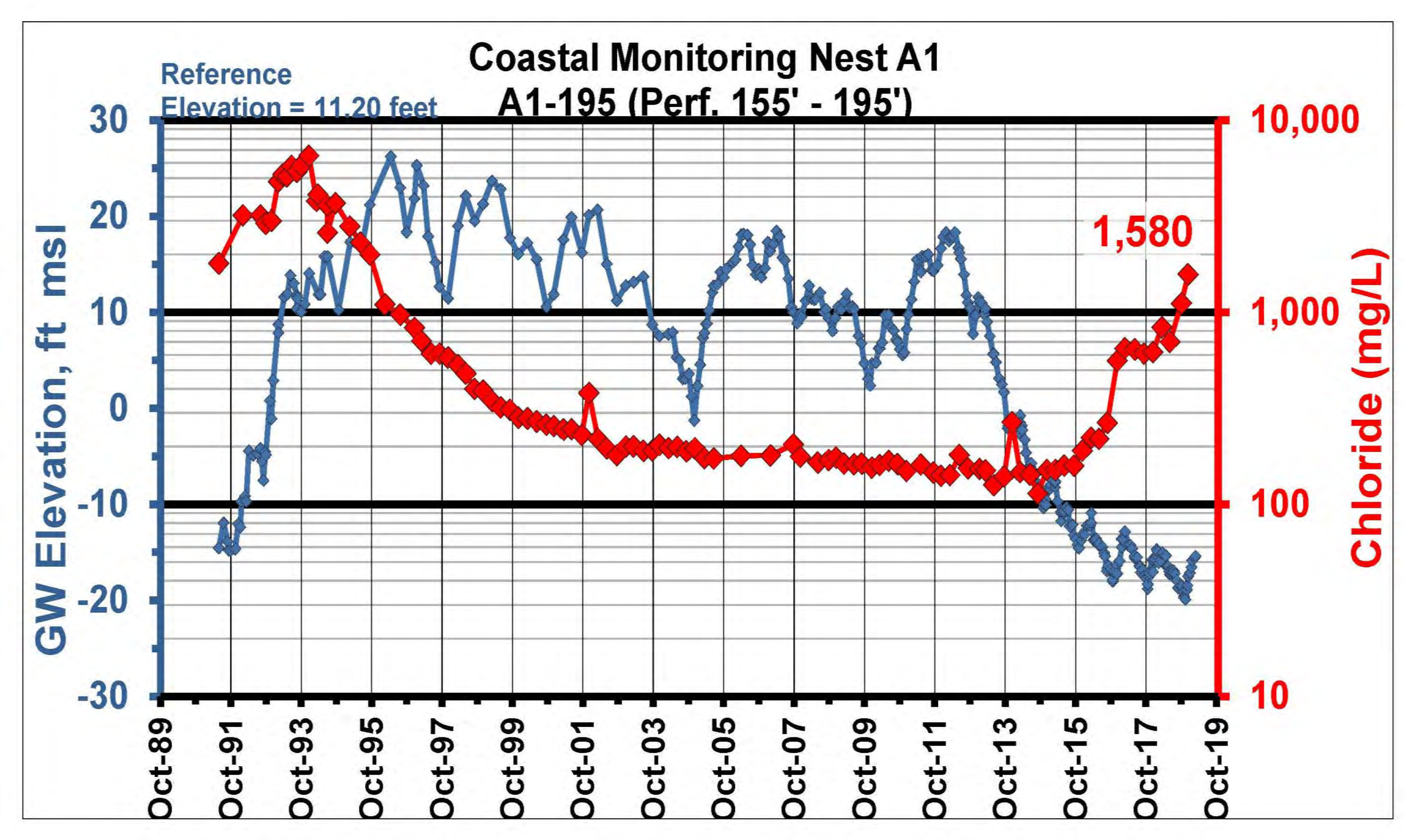

Available Storage in the Forebay Basin
Available Storage in AF
-10,000
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000
80,000
90,000
100,000
110,000
120,000
130,000
140,000
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020



01N22W02A02S_Oxnard Plain (UAS)
1948 to 1994, well -1P1; RP = 51.7 feet
1995 to present, well -2A2; RP = 60.73 feet
Elevation, ft msl
60
40
20
0
-20
-40
-60
Oct-40 Oct-50 Oct-60 Oct-70 Oct-80 Oct-90 Oct-00 Oct-10 Oct-20
01N21W15J04S_Pleasant Valley (LAS)
1948 to 2006, well -15Q2; RP = 21.47 feet
2006 to present, well -15J4; RP = 29.69 feet
Elevation, ft msl
20
-20
-60
-100
-140
-180
Oct-40 Oct-50 Oct-60 Oct-70 Oct-80 Oct-90 Oct-00 Oct-10 Oct-20
01N22W13D03S_Oxnard Plain (LAS)
PTP#5
RP = 42.04 feet
Elevation, ft msl
20
0
-20
-40
-60
-80
-100
-120
-140
-160
Oct-70 Oct-80 Oct-90 Oct-00 Oct-10 Oct-20
2A2
13D3
15J4
Oxnard Plain Basin
Pleasant Valley Basin
MR Key Wells
UWCD Boundary
Groundwater basins
rivers and streams
Highways
0 1 2 4 6 8
Miles


Coastal Monitoring Nest A2
A2-170 (Perf. 150' - 170')
Reference
Elevation = 17.77 feet
3,140
GW Elevation, ft msl
Chloride (mg/L)
30
20
10
0
-10
-20
-30
10,000
1,000
100
10
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
Oct-15
Oct-17
Oct-19


101
1
A2-170

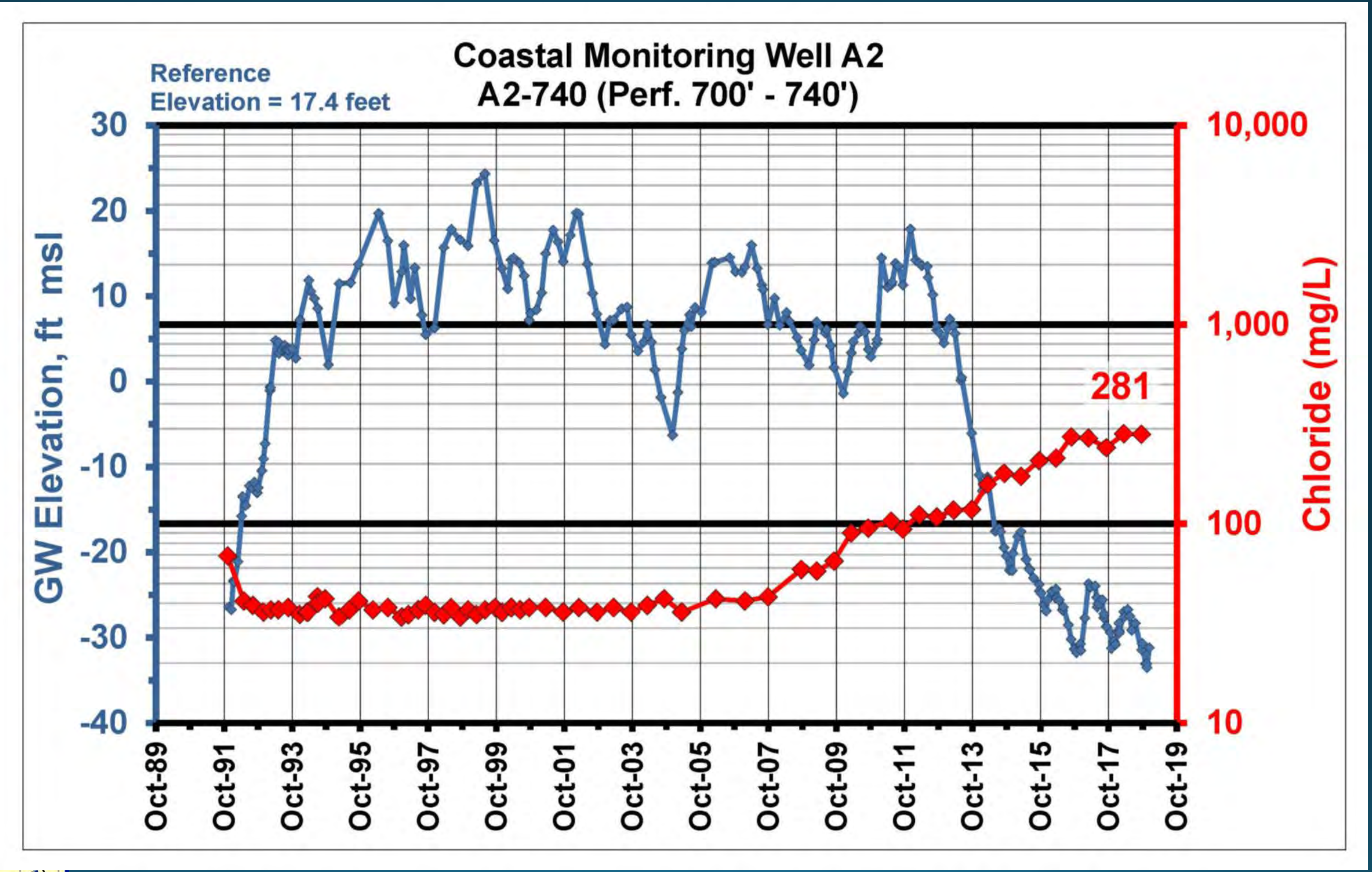


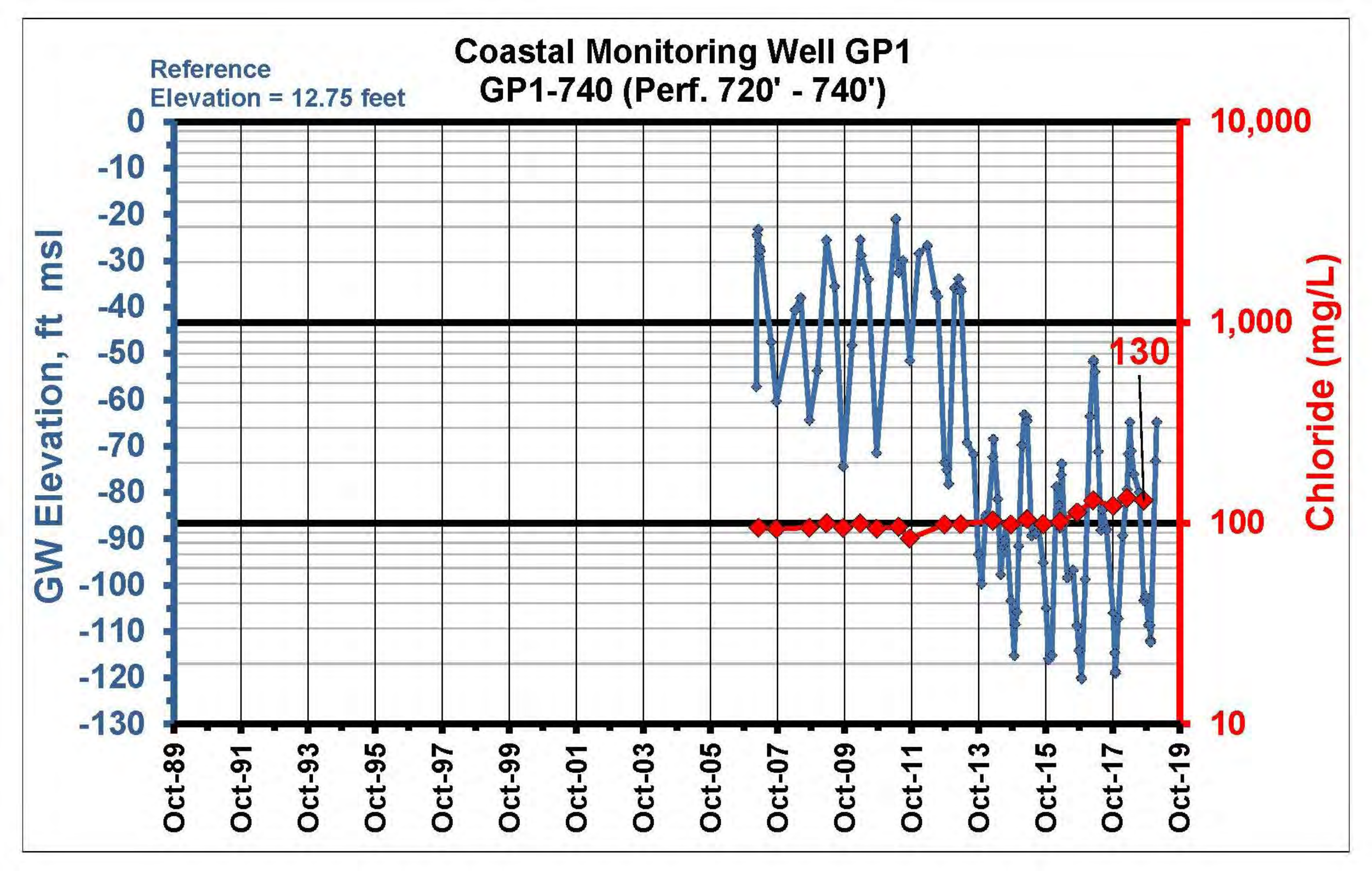
Coastal Monitoring Nest A1
A1-195 (Perf. 155' - 195')
Reference
Elevation = 11.20 feet
GW Elevation, ft msl
Chloride (mg/L)
1,580
30
20
10
0
-10
-20
-30
10,000
1,000
100
10
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
Oct-15
Oct-17
Oct-19

101
1
A1-195

CM2-760

- stable chloride for last 15 years ~10,000 mg/l.
- Last sample 10/3/2018 chloride was 8,900 mg/l

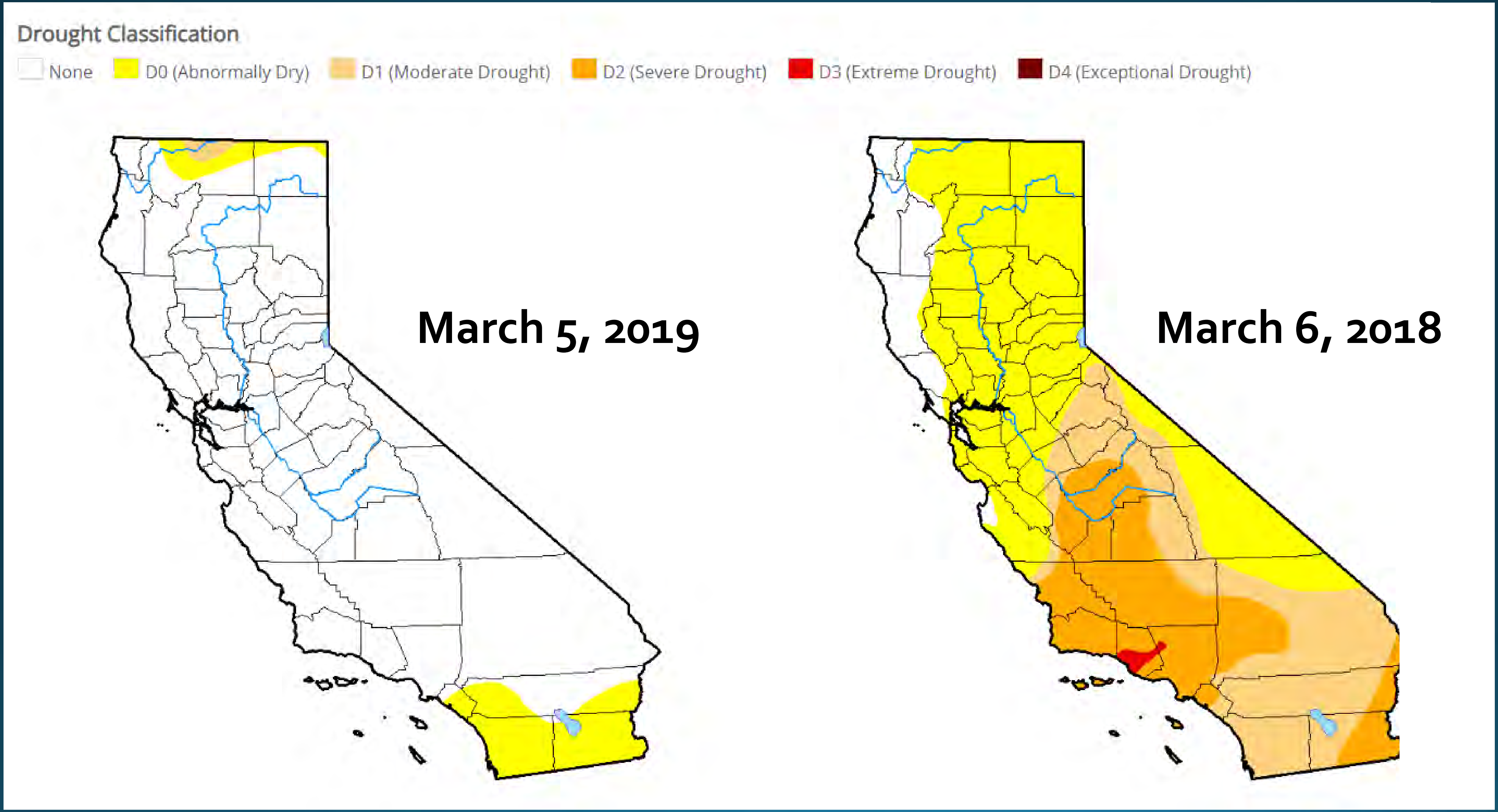




Coastal Monitoring Well GP1
GP1-740 (Perf. 720' - 740')
Reference
Elevation = 12.75 feet
GW Elevation, ft msl
Chloride (mg/L)
130
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
10,000
1,000
100
10
Oct-89
Oct-91
Oct-93
Oct-95
Oct-97
Oct-99
Oct-01
Oct-03
Oct-05
Oct-07
Oct-09
Oct-11
Oct-13
Oct-15
Oct-17
Oct-19

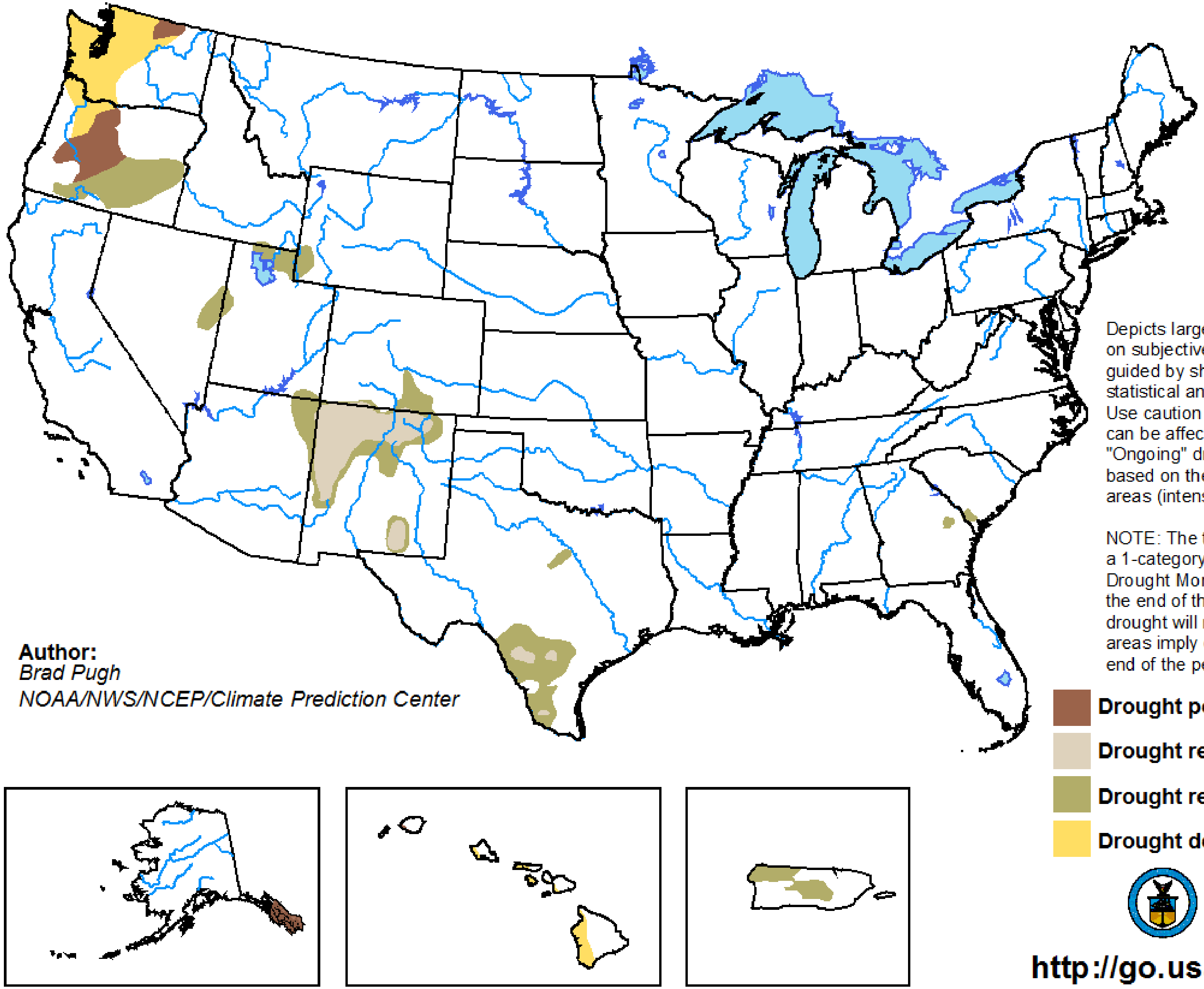
101
1
GP-740

5. Short-Term Climate Forecast


Drought Classification
None
D0 (Abnormally Dry)
D1 (Moderate Drought)
D2 (Severe Drought)
D3 (Extreme Drought)
D4 (Exceptional Drought)
March 5, 2019
March 6, 2018

U.S. Seasonal Drought Outlook
Drought Tendency During the Valid Period

Valid for March 21 - June 30, 2019
Released March 21



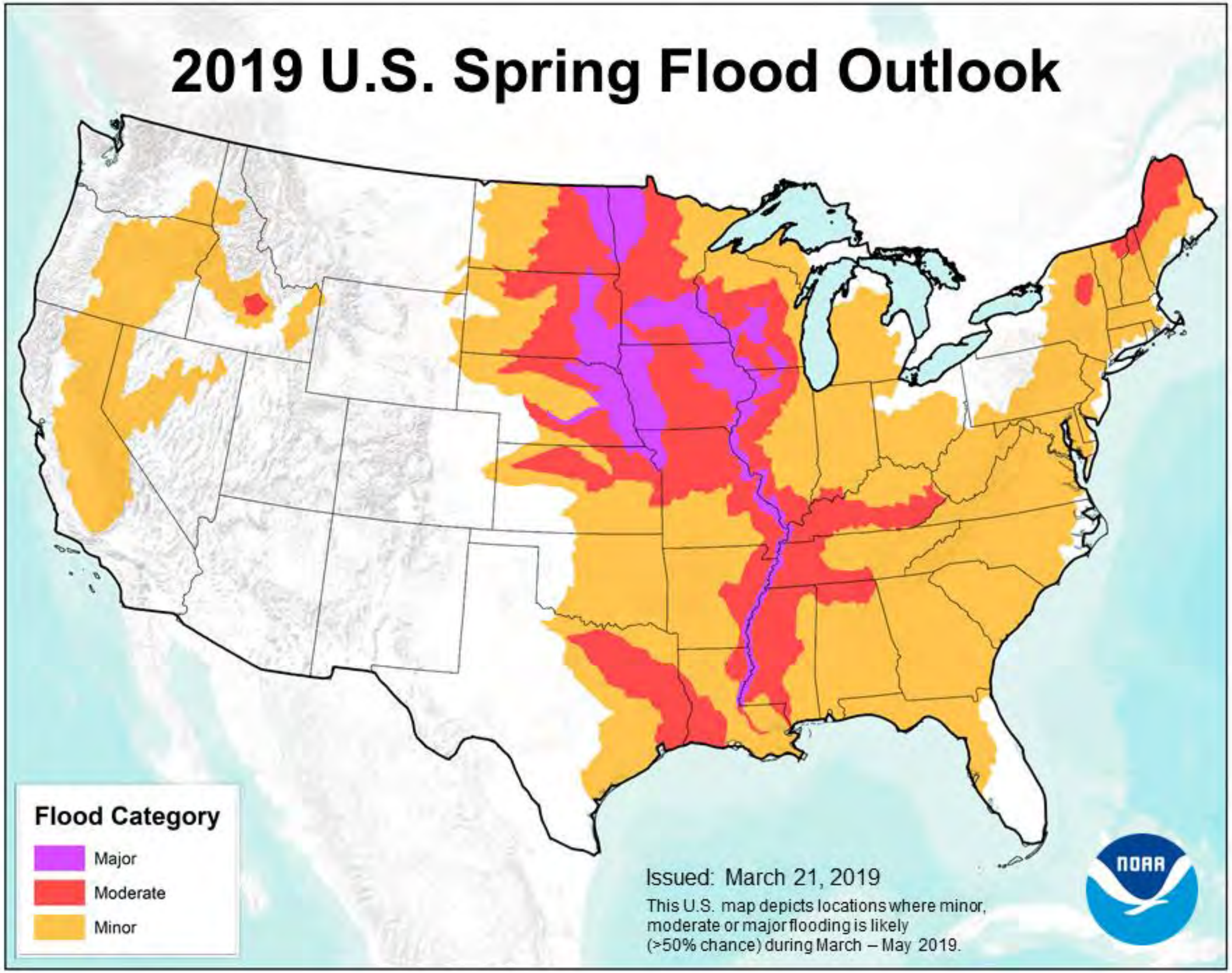
Author:
Brad Pugh
NOAA/NWS/NCEP/Climate Prediction Center

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Use caution for applications that can be affected by short lived events. "Ongoing" drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4).

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none).

- **Drought persists**
- **Drought remains but improves**
- **Drought removal likely**
- **Drought development likely**

http://go.usa.gov/3eZ73


2019 U.S. Spring Flood Outlook
Flood Category
Major
Moderate
Minor
Issued: March 21, 2019
This U.S. map depicts locations where minor, moderate or major flooding is likely (>50% chance) during March – May 2019.
NOAA

El Niño/Southern Oscillation (ENSO)

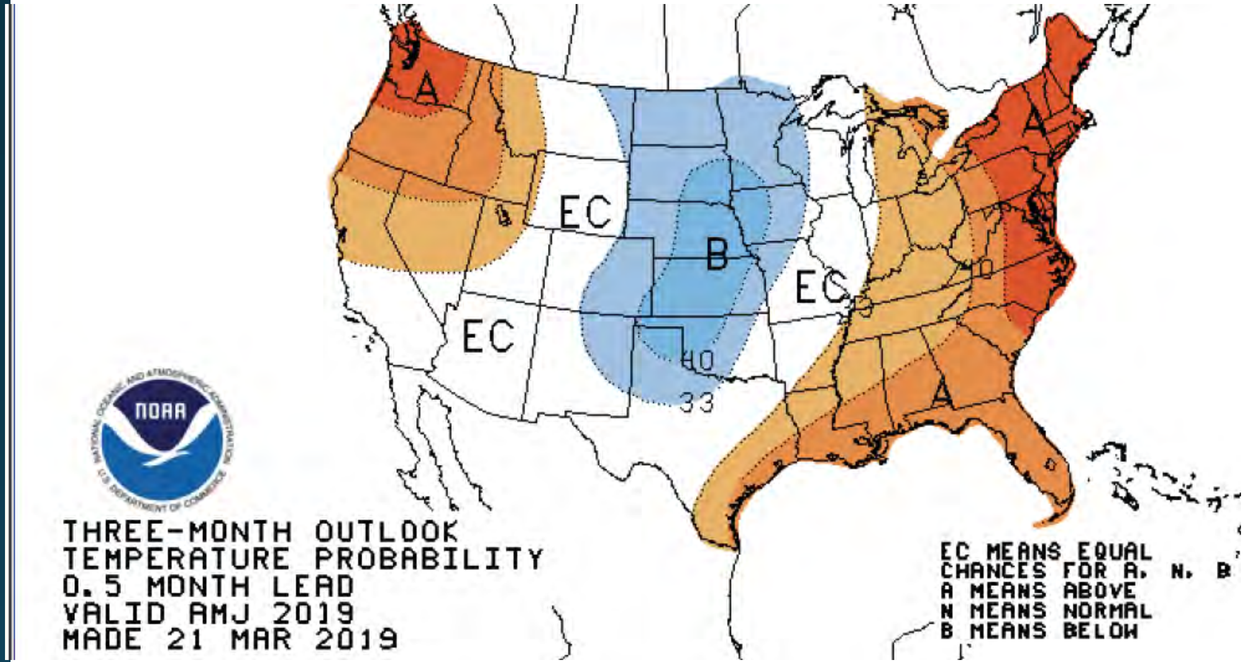
Recent Evolution, Current Status and Predictions:

- ❑ El Niño conditions are present.
- ❑ Equatorial sea surface temperatures (SSTs) are above average across most of the Pacific Ocean.
- ❑ The pattern of anomalous convection and winds are consistent with El Niño.
- ❑ Weak El Niño conditions are expected to continue through the Northern Hemisphere spring 2019 (~55% chance).

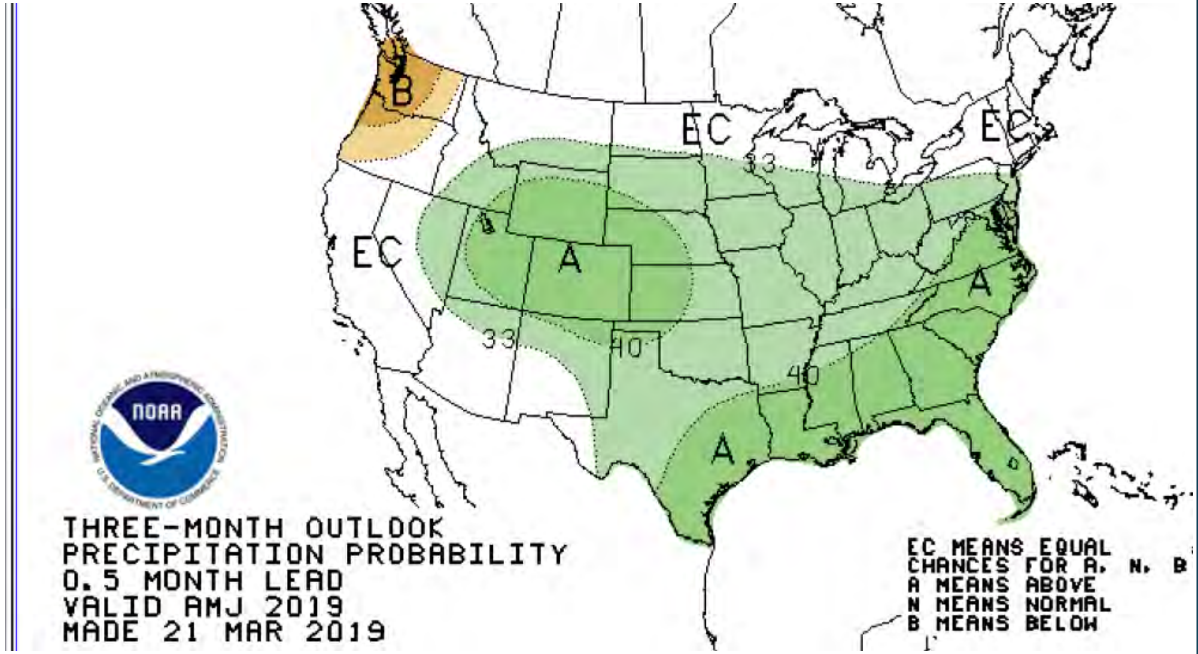
Update prepared by:
Climate Prediction Center / NCEP
4 March 2019

April - June 2019

Temperature



Precipitation



6. Presentation of ASAPP

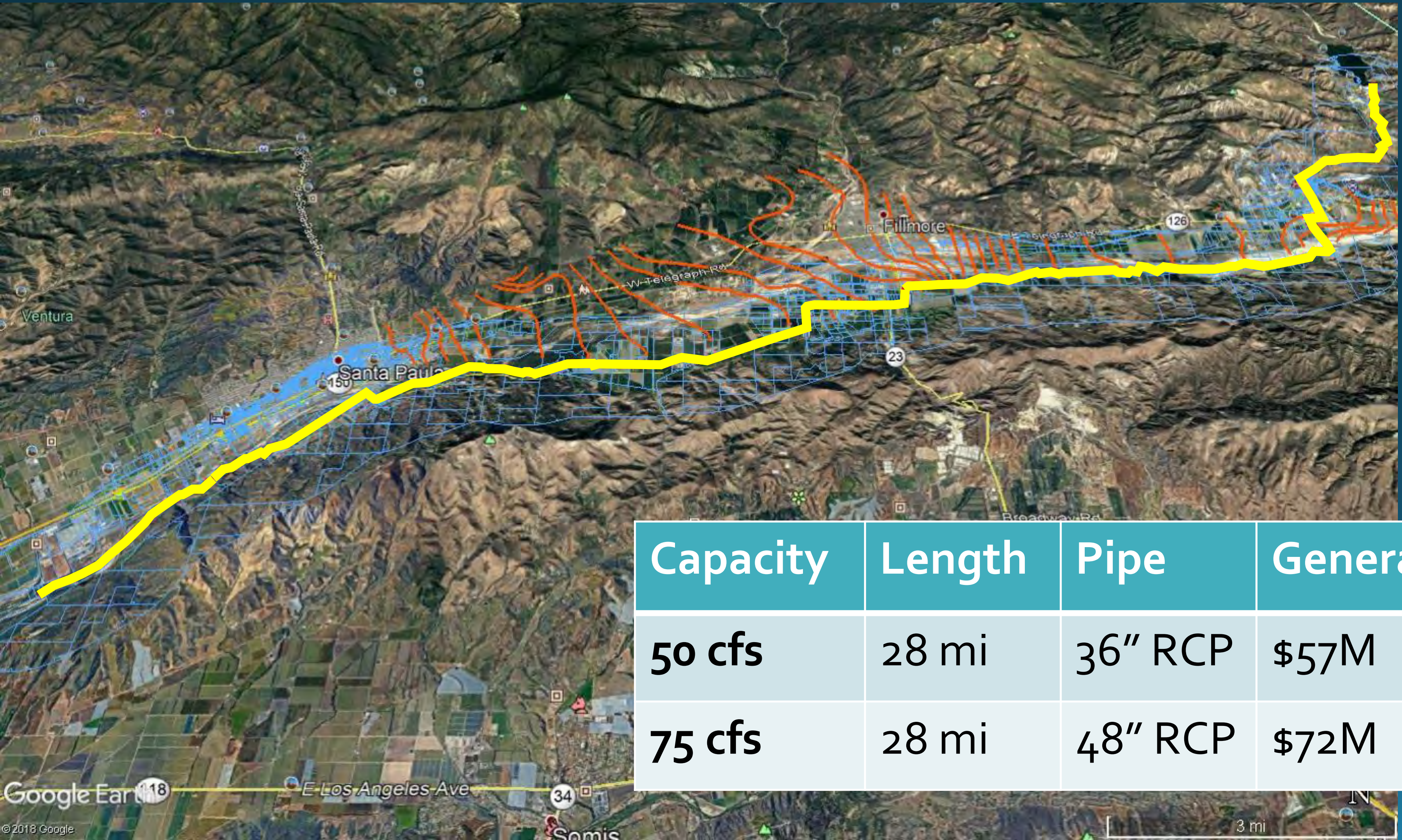
ASAPP Objective

= Maximize surface water deliveries to Oxnard Plain when importing alternative water supplies

How?

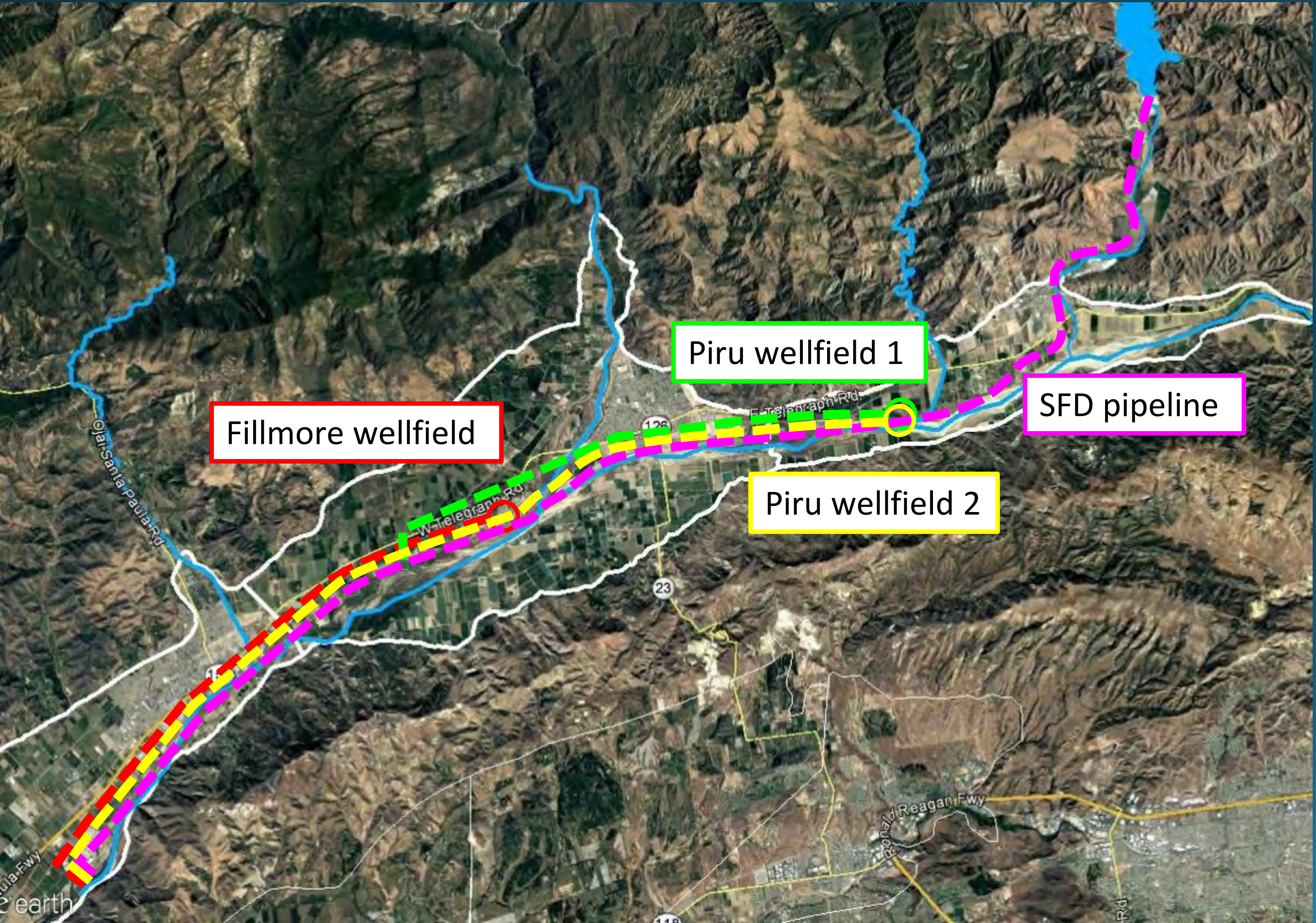
- Import alternative water supplies (AWS) to Lake Piru
- Maintain historic releases to Upper Basins (~28,000 AF/yr)
- AWS distributed to Upper Basins/OP per tax assessment
- Deliver stored water to OP via pipeline to surface water delivery system (when demand is not met by Freeman diversions)
- Additional pipeline releases for recharge to minimize spill losses

Conceptual Design



Capacity	Length	Pipe	General	Sitework	Total
50 cfs	28 mi	36″ RCP	$57M	$46M	**$103M**
75 cfs	28 mi	48″ RCP	$72M	$58M	**$129M**

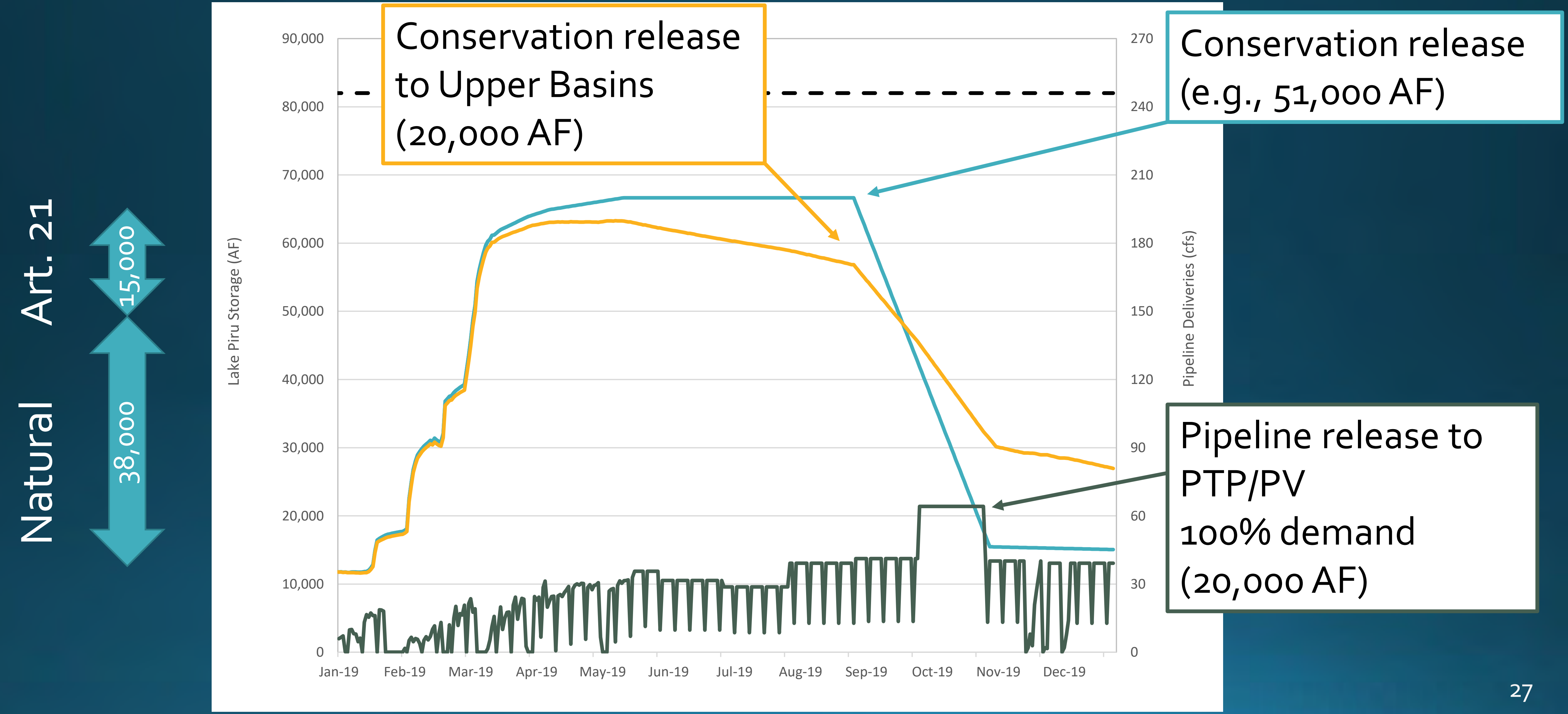
Alternatives considered



Well field alternatives:

- Reduced yield
- Delayed deliveries
- Limited operational control
- Addl. environmental concerns
- Lower cost

ASAPP example for 2019



ASAPP scenarios

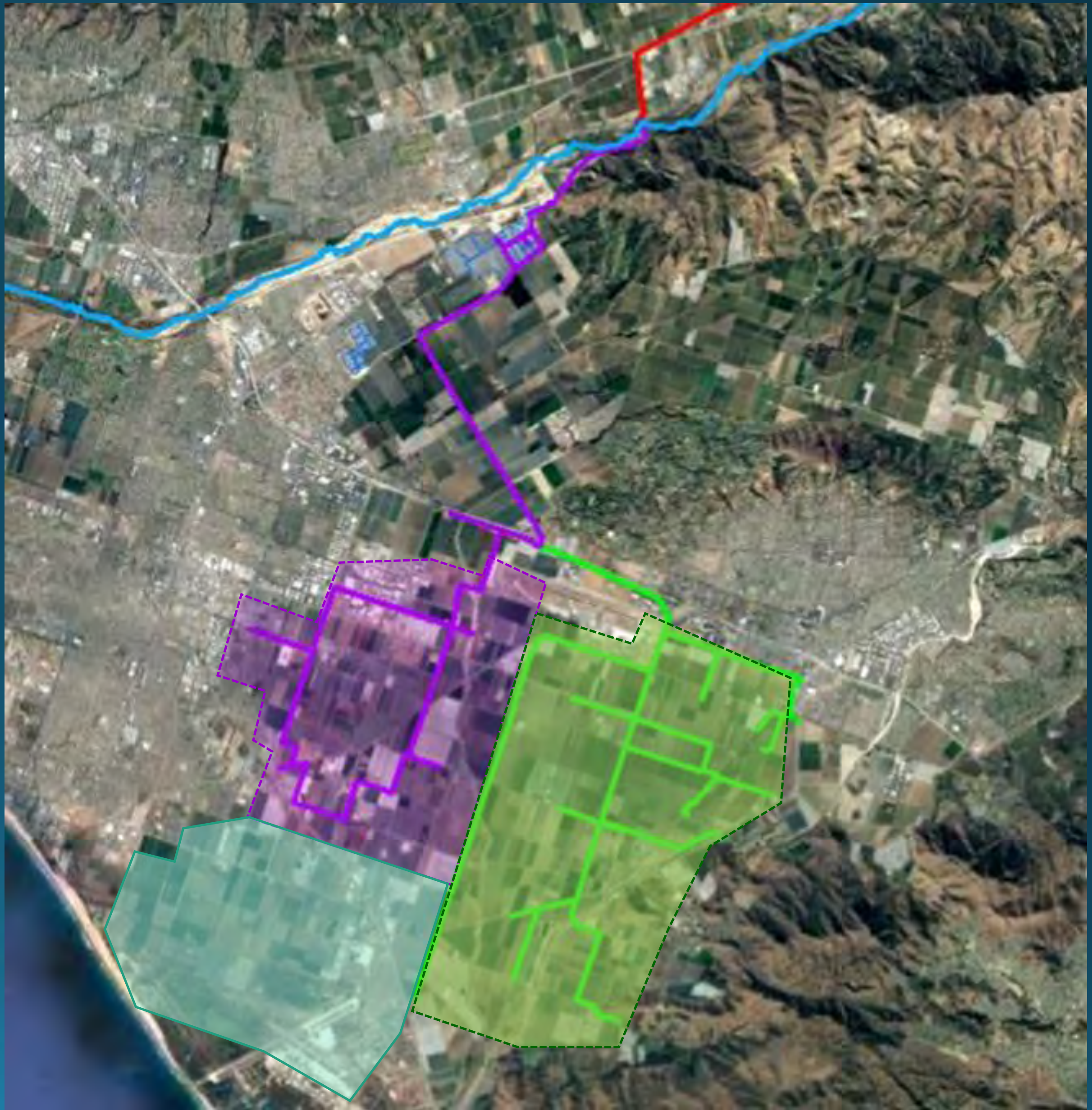
Scenario	Pipeline capacity (cfs)	Alternative Water Supply (AWS)	Surface water demand
Baseline	n/a	n/a	Historic
S1-20	20	5000 DN	Historic
S1-50	50	5000 DN	Historic
S1-75	75	5000 DN	Historic
S2-20	20	5000 DN + Art 21	Historic
S2-50	50	5000 DN + Art 21	Historic
S2-75	75	5000 DN + Art 21	Historic
S3-20	20	5000 DN + Art 21	Service area pumping
S3-50	50	5000 DN + Art 21	Service area pumping
S3-75	75	5000 DN + Art 21	Service area pumping
S4-20	20	5000 DN + Art 21	Service area + coastal pumping
S4-50	50	5000 DN + Art 21	Service area + coastal pumping
S4-75	75	5000 DN + Art 21	Service area + coastal pumping

Surface water demand scenarios

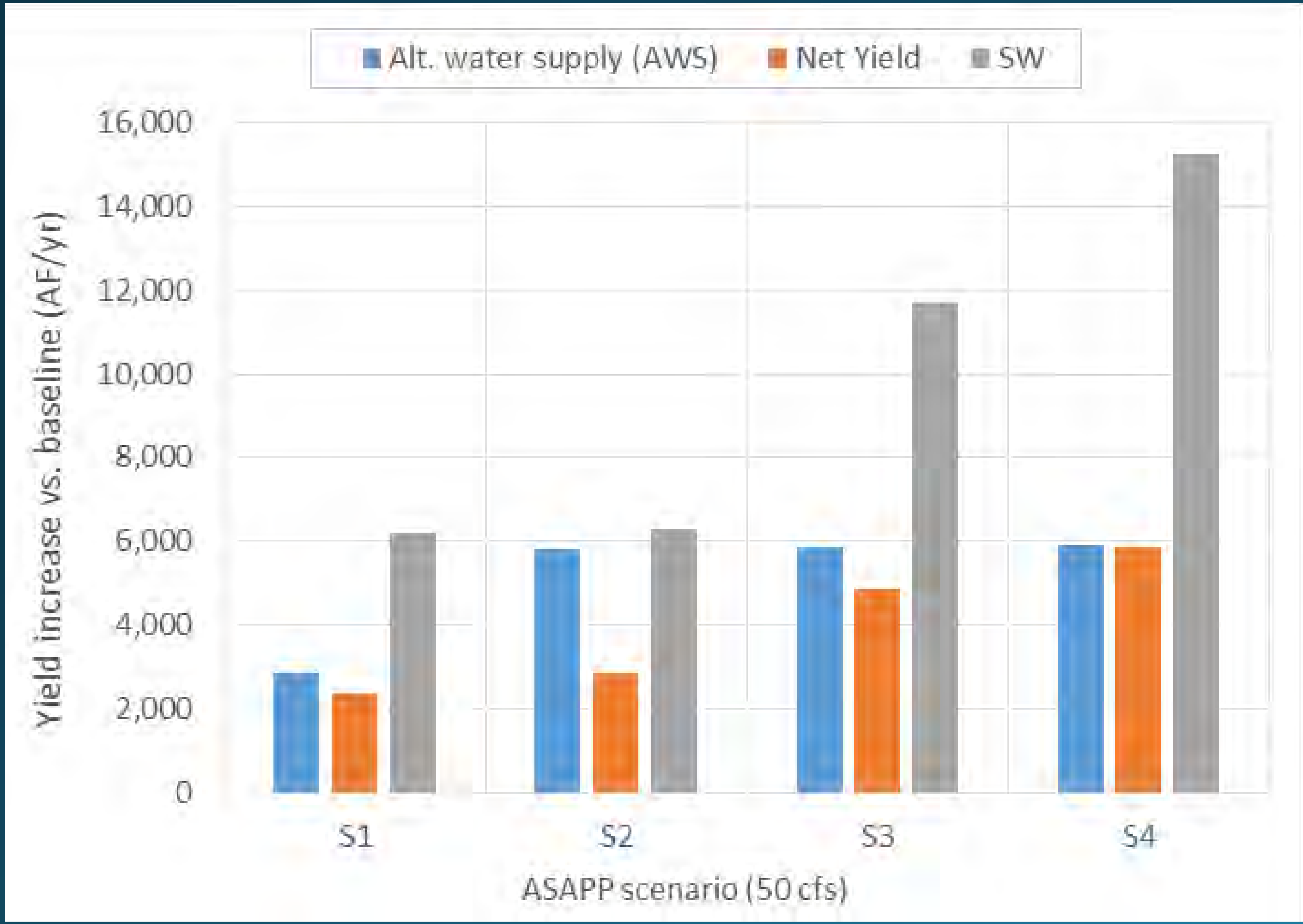
Historic

Service Area Pumping

Service Area Pumping + Coastal

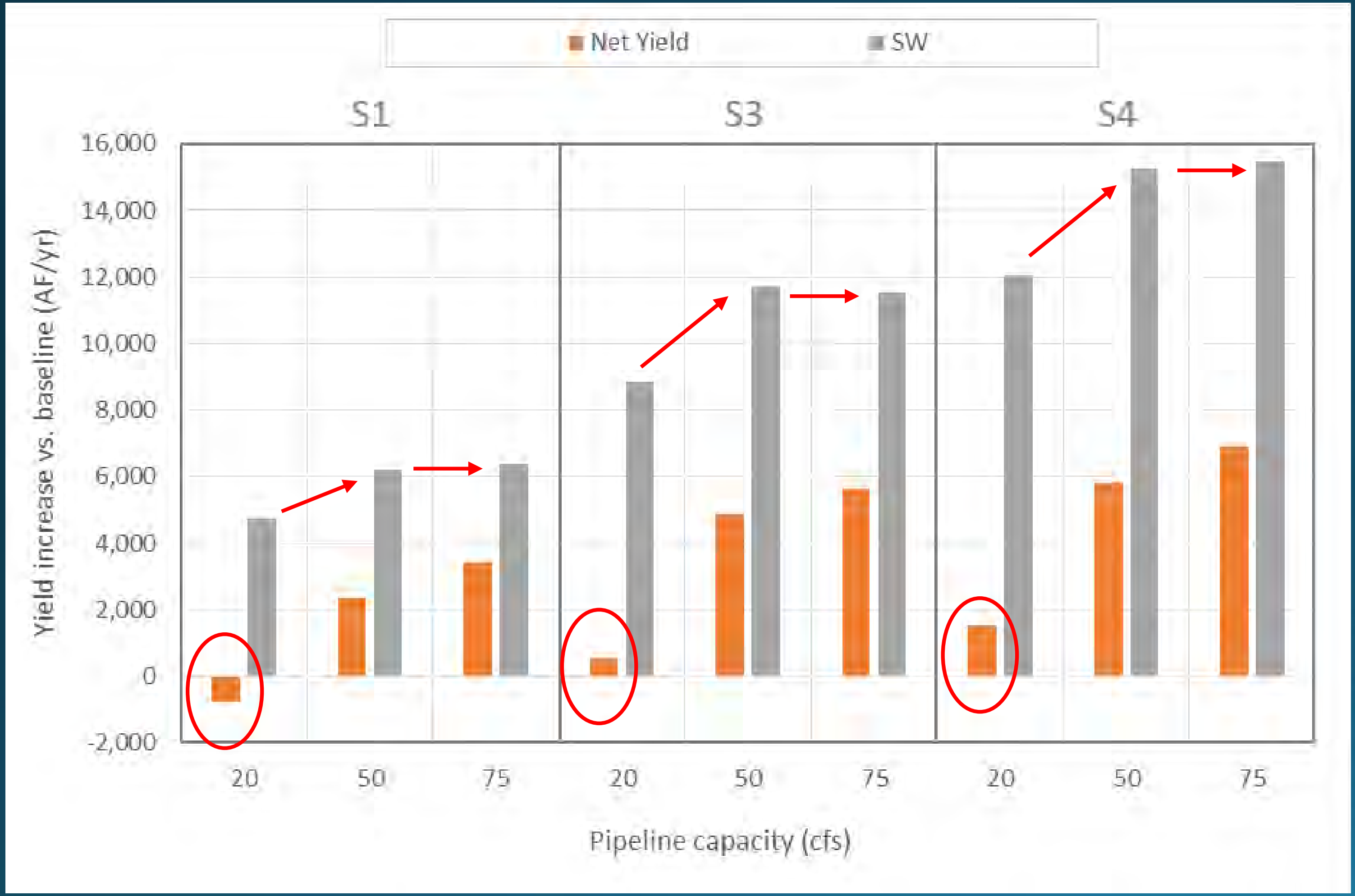


ASAPP significantly increases surface water deliveries (vs. baseline)



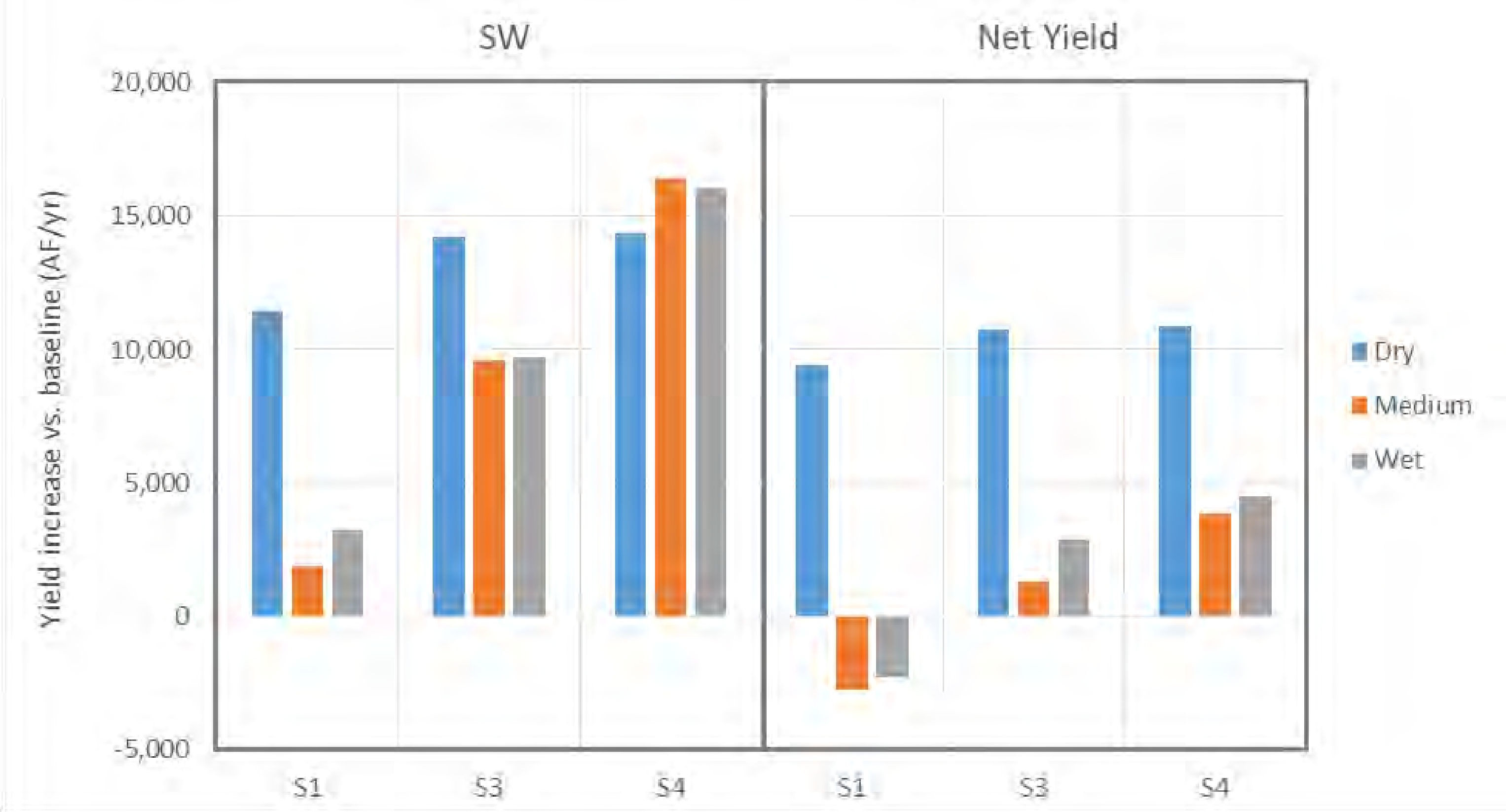
- SW deliveries increase by 6,000 – 15,000 AF/yr
- S2 not effective (high AWS, low demand)
- High AWS (6,000 AF/yr) benefits from delivery system expansion (S3, S4)

Pipeline capacity of 50 cfs optimal for SW deliveries



- Low net yield at 20 cfs
- Large increase in SW deliveries/net yield from 20 to 50 cfs
- Smaller increases from 50 to 75 cfs

Yields higher during dry years



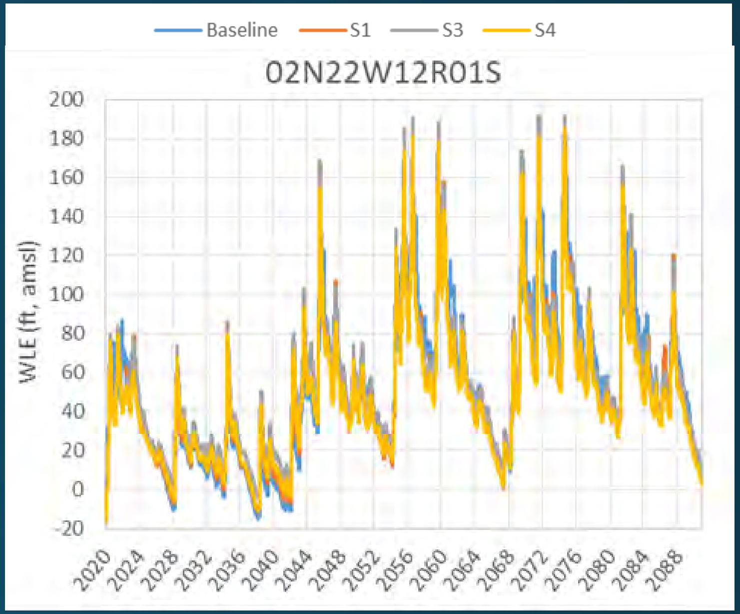
- SW deliveries higher during dry years for S1, S3
- Net yield higher during dry years for all scenarios

Evaluation of groundwater benefits

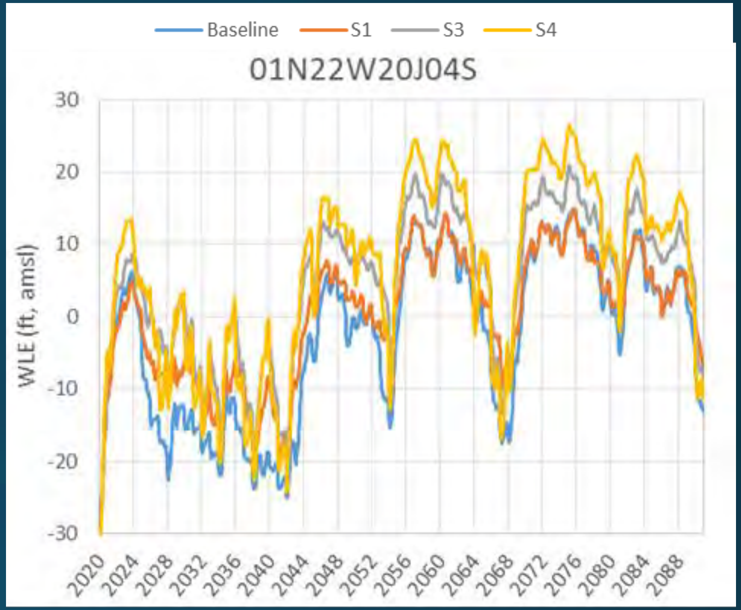
WLE

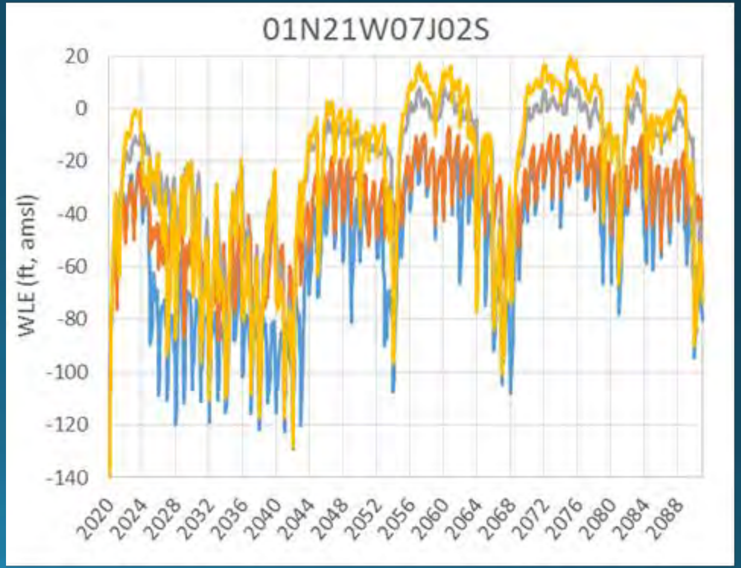
Seawater intrusion

Some increases in UAS WLE

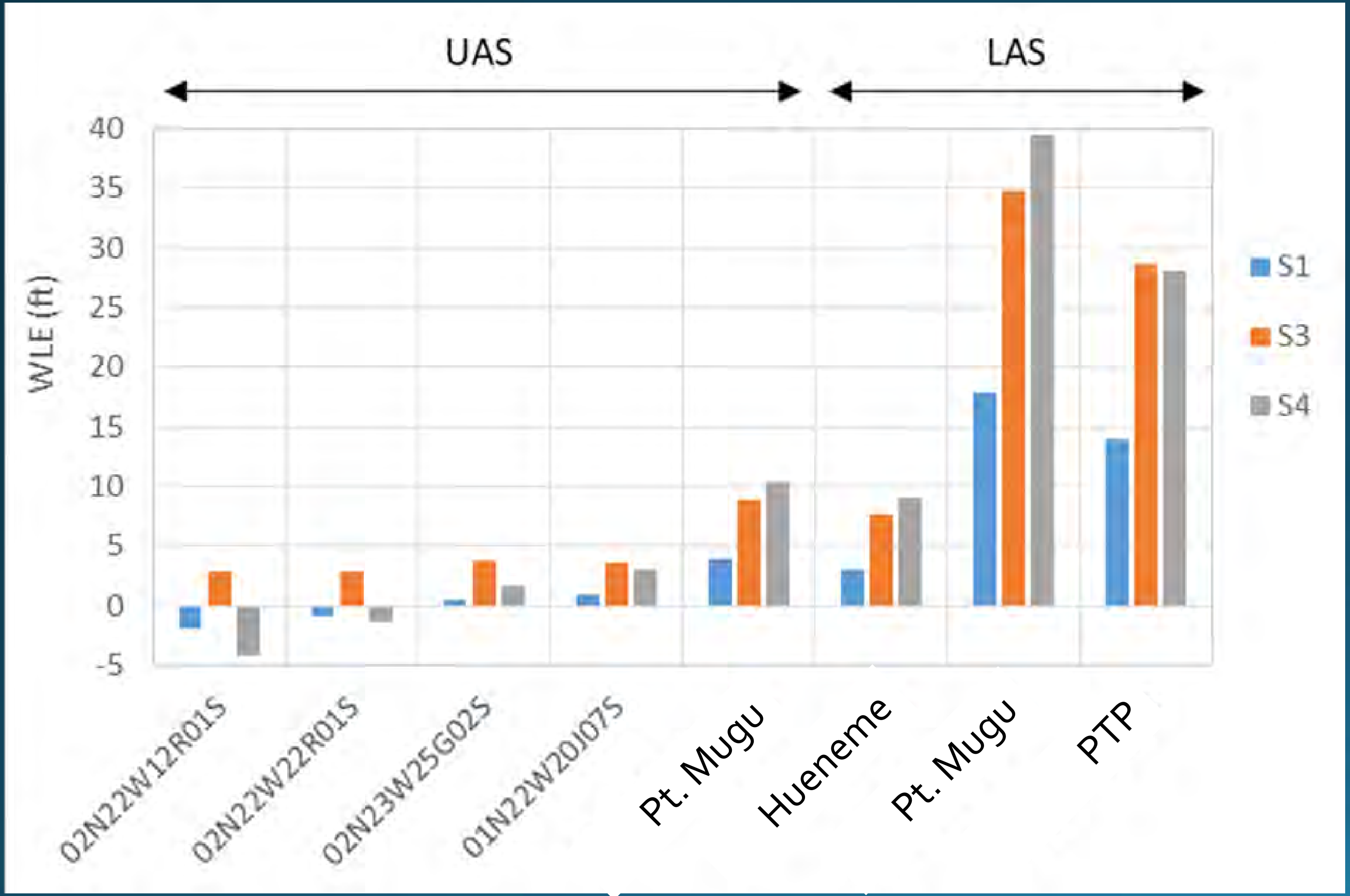


Significant increases in LAS WLE

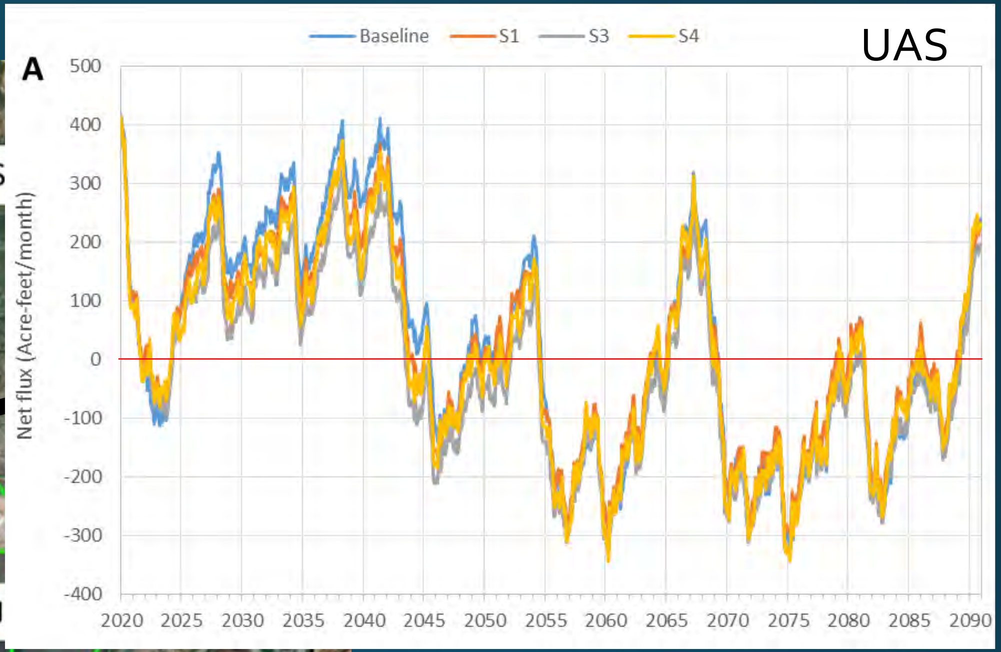


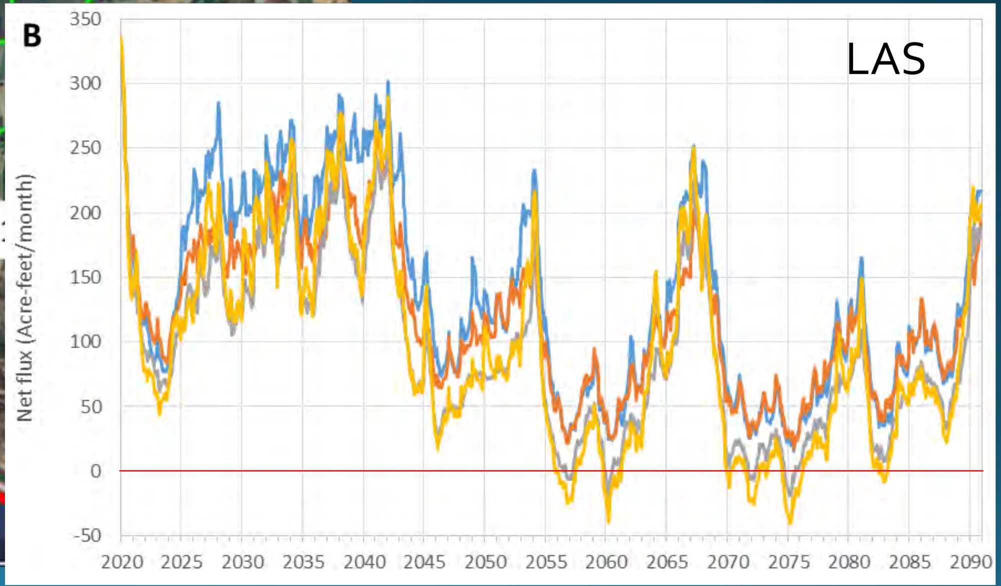


ASAPP increases average WLE

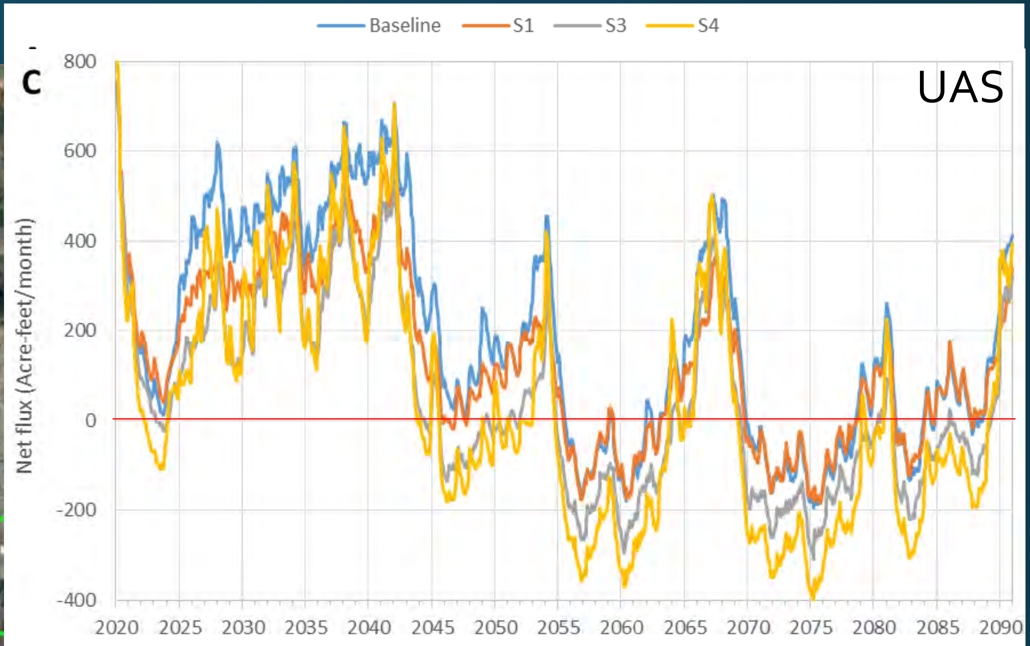


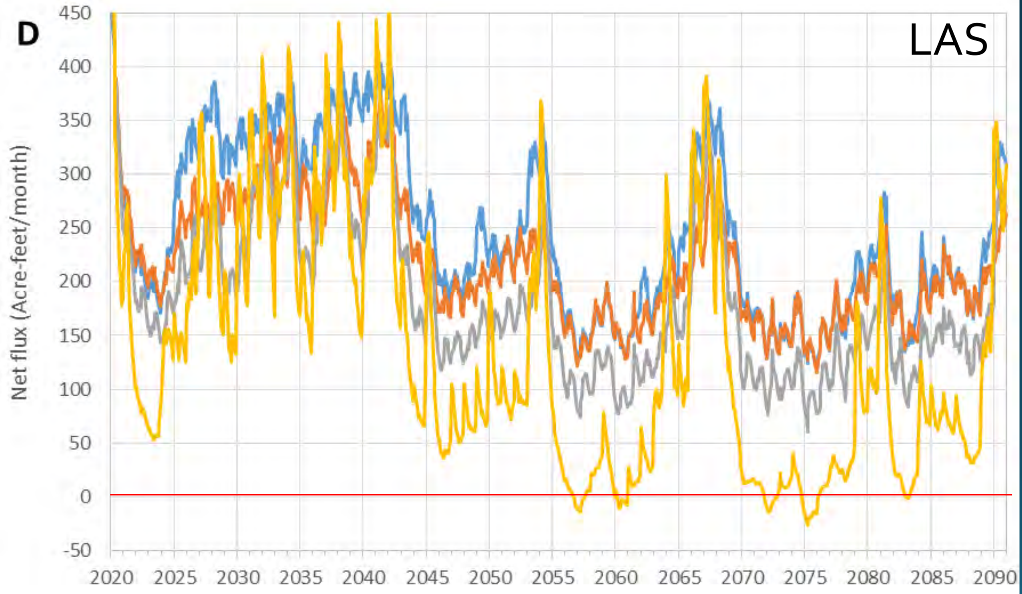
Some reduction onshore flux north coast



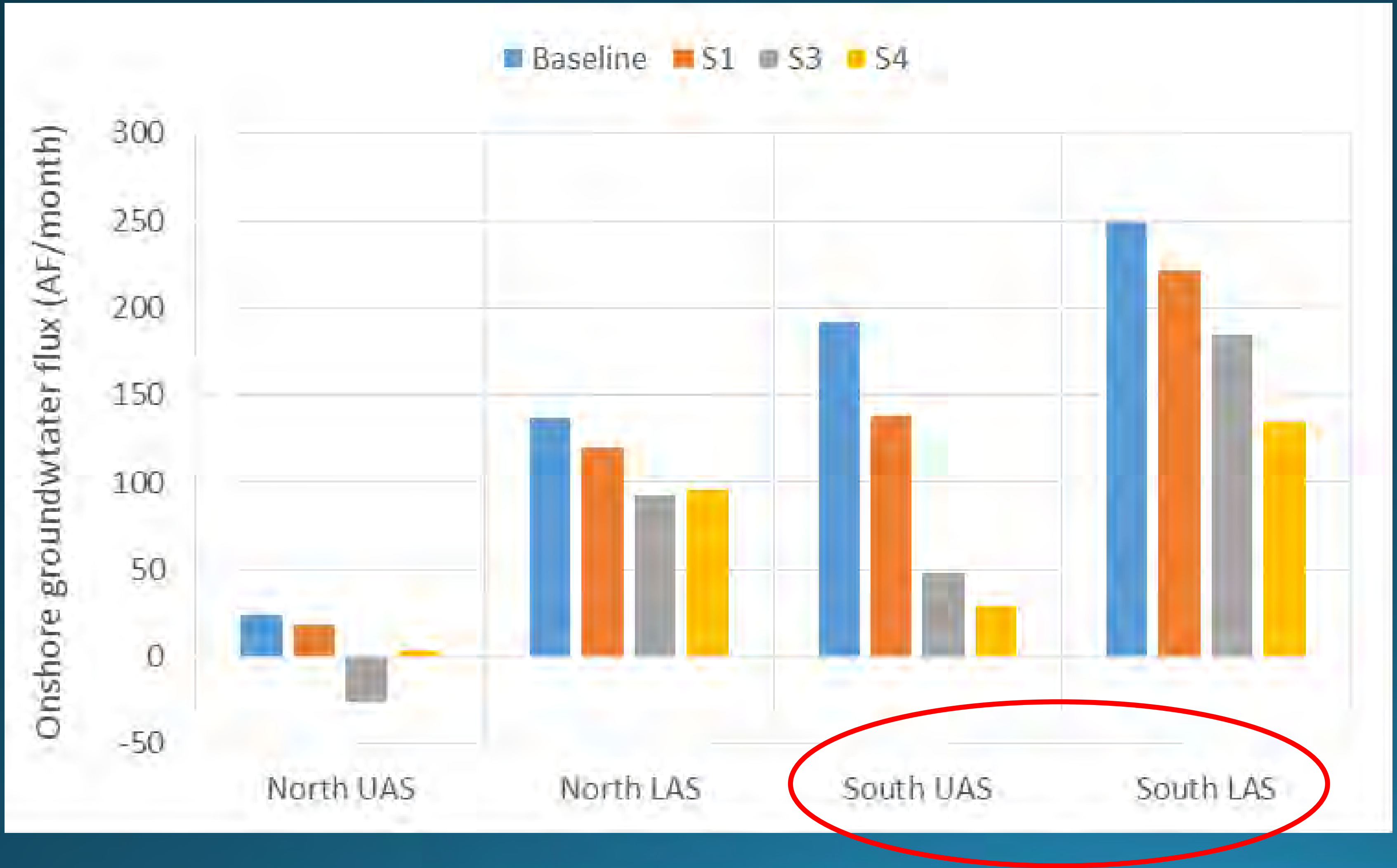


Significant reduction onshore flux south coast





ASAPP significantly reduces average onshore groundwater fluxes



Conclusions

- Analysis of ASAPP yield and groundwater benefits complete (assumed AWS imports of 3,000 – 6,000 AF/yr)
- ASAPP effectively increases surface water deliveries to Oxnard Plain by 5,000 – 15,000 AF/yr
- Significant increases in WLE in LAS (3 to 40 ft)
- Significant decreases in onshore groundwater fluxes in south coast (-11% to -85%)
- ASAPP expected to increase sustainable yield
- Maximum benefits requires expansion of surface water delivery system

Next Steps

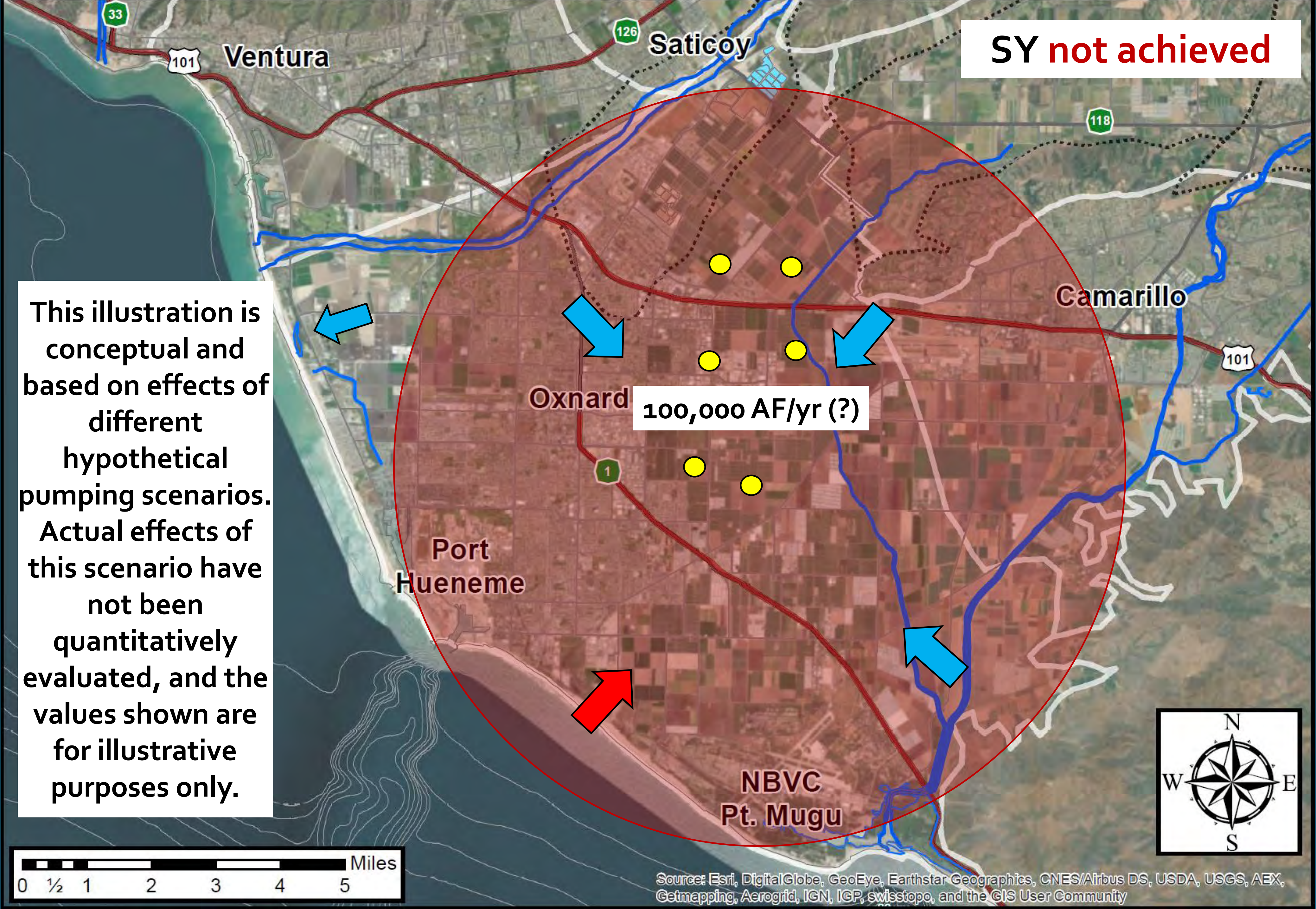
- Finalize yield and groundwater benefits report
- Engineering feasibility report
- Compare to groundwater benefits other projects

7. Effects of Pumping Location on Sustainable Yield and Saline Intrusion in Oxnard Plain and Pleasant Valley Basins—Concepts and Evaluations to Date

"GSP-Lite" Results for Pumping Scenarios (No New Water-Supply Projects)

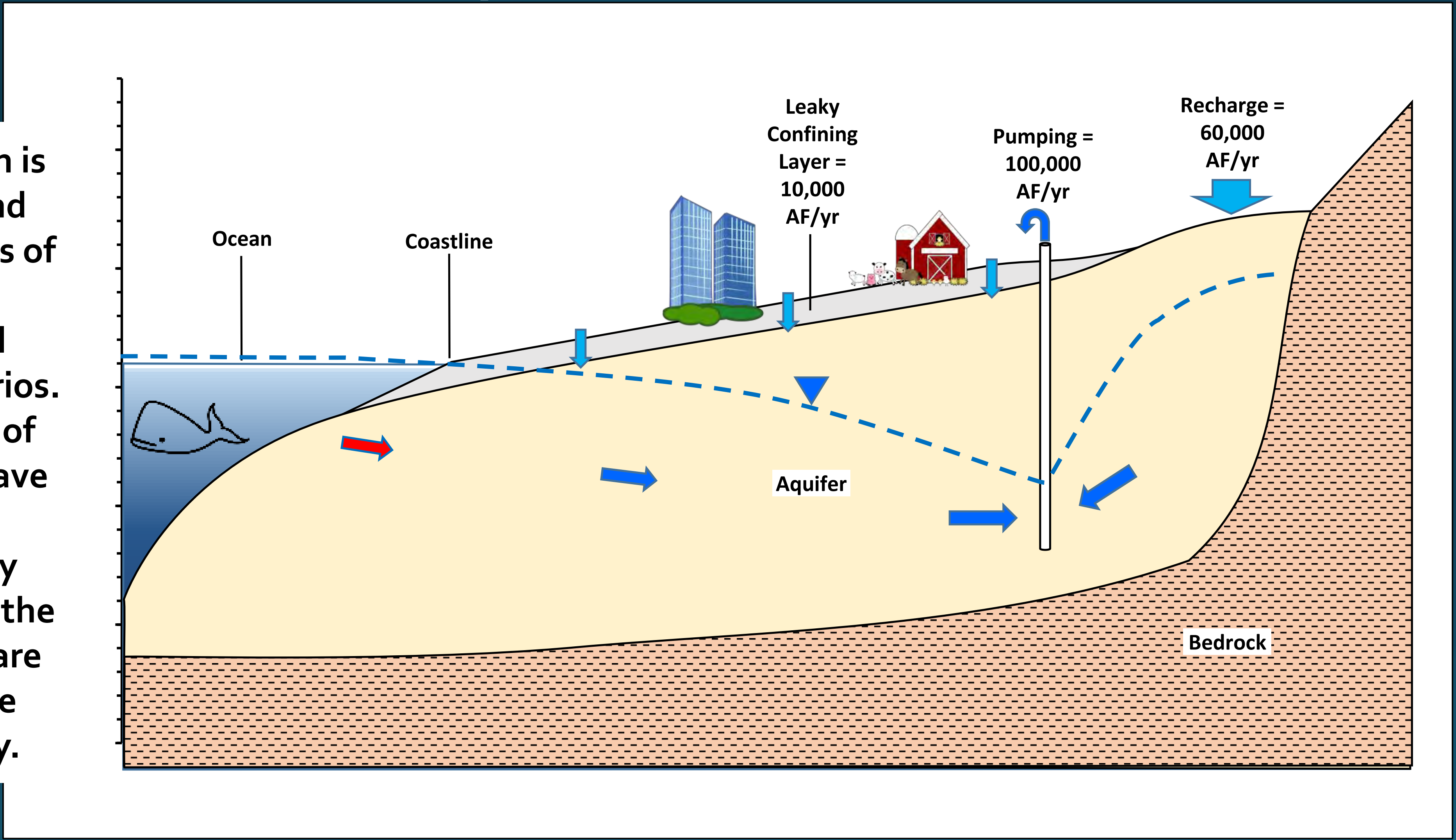
Scenario	Pumping Rate Changes	Avg. GW Extractions (AF/yr)	Reduction in Pumping (%)
Base Case	*No changes in 1985-2015 pumping rates*	*99,000*	*0*
Reduced Pumping	50% "haircut" in pumping	49,000	50
Shifted Pumping	**No pumping in coastal area, 75% reduction in lower-aquifer pumping, 50% increase in upper-aquifer pumping**	**69,000**	**30**

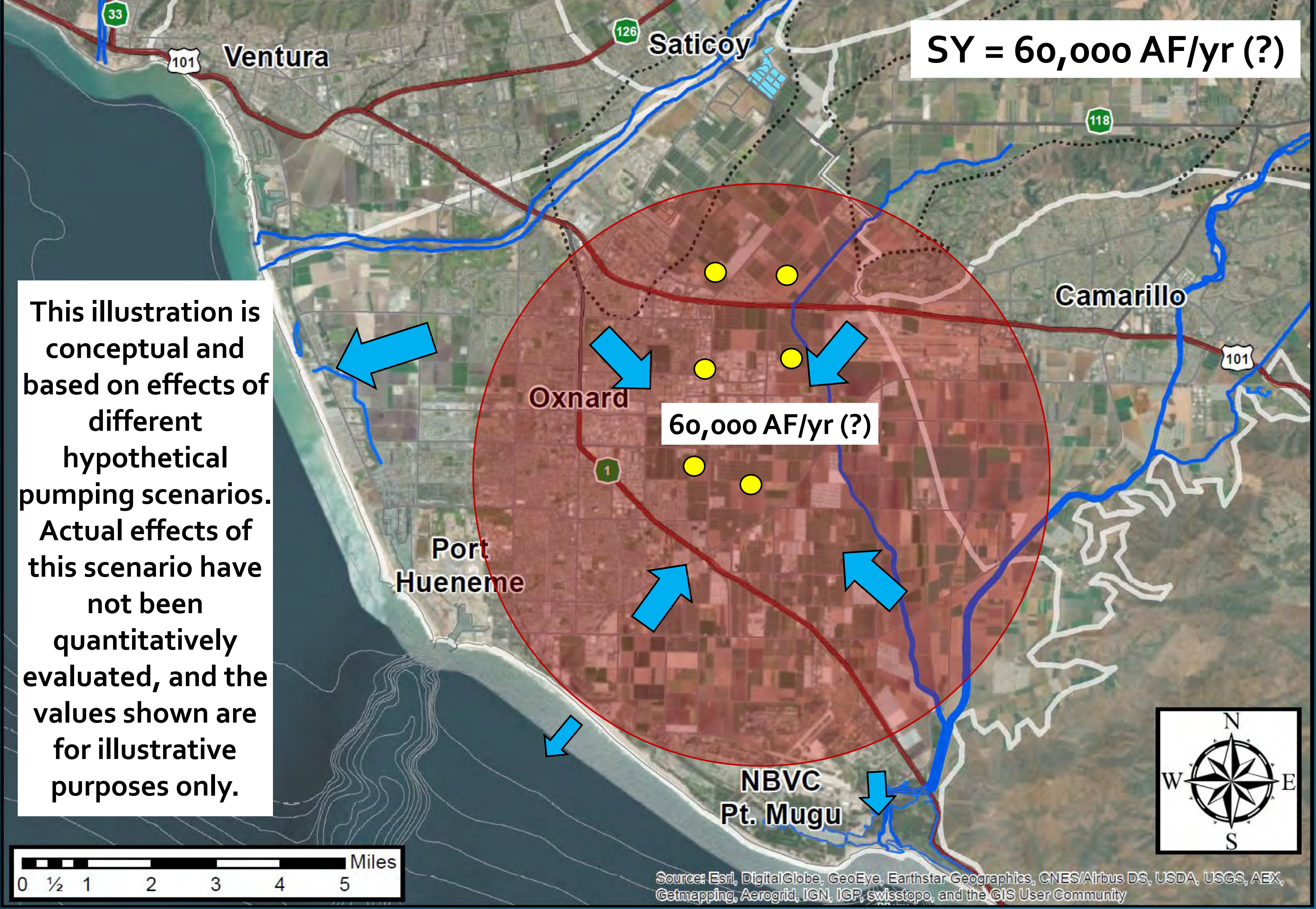
Conceptual effects of pumping 100,000 AF/yr from a single wellfield near the center of a coastal basin



Hypothetical Inland Pumping Only
SY < 100,000 AF/yr

This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.

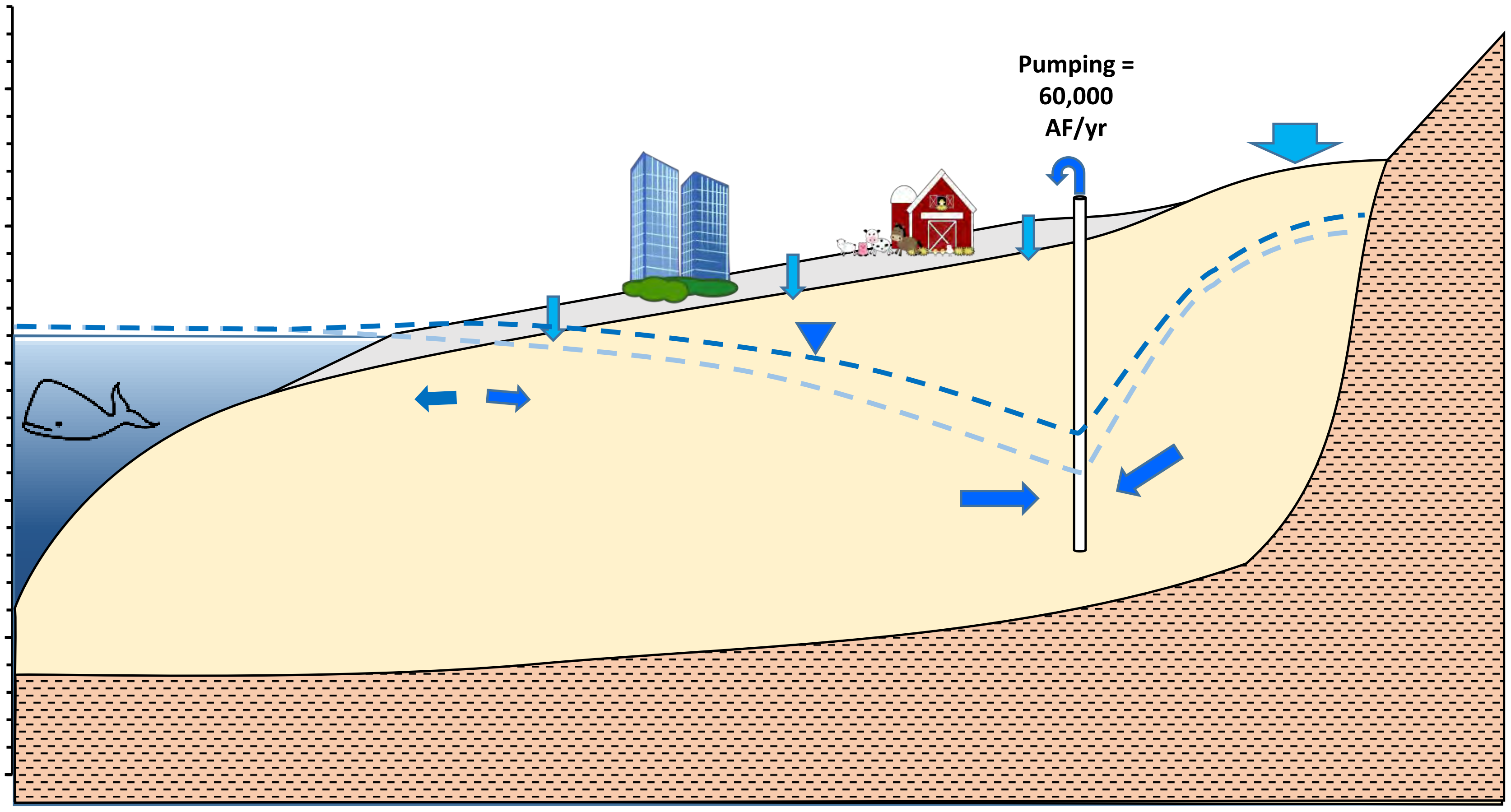


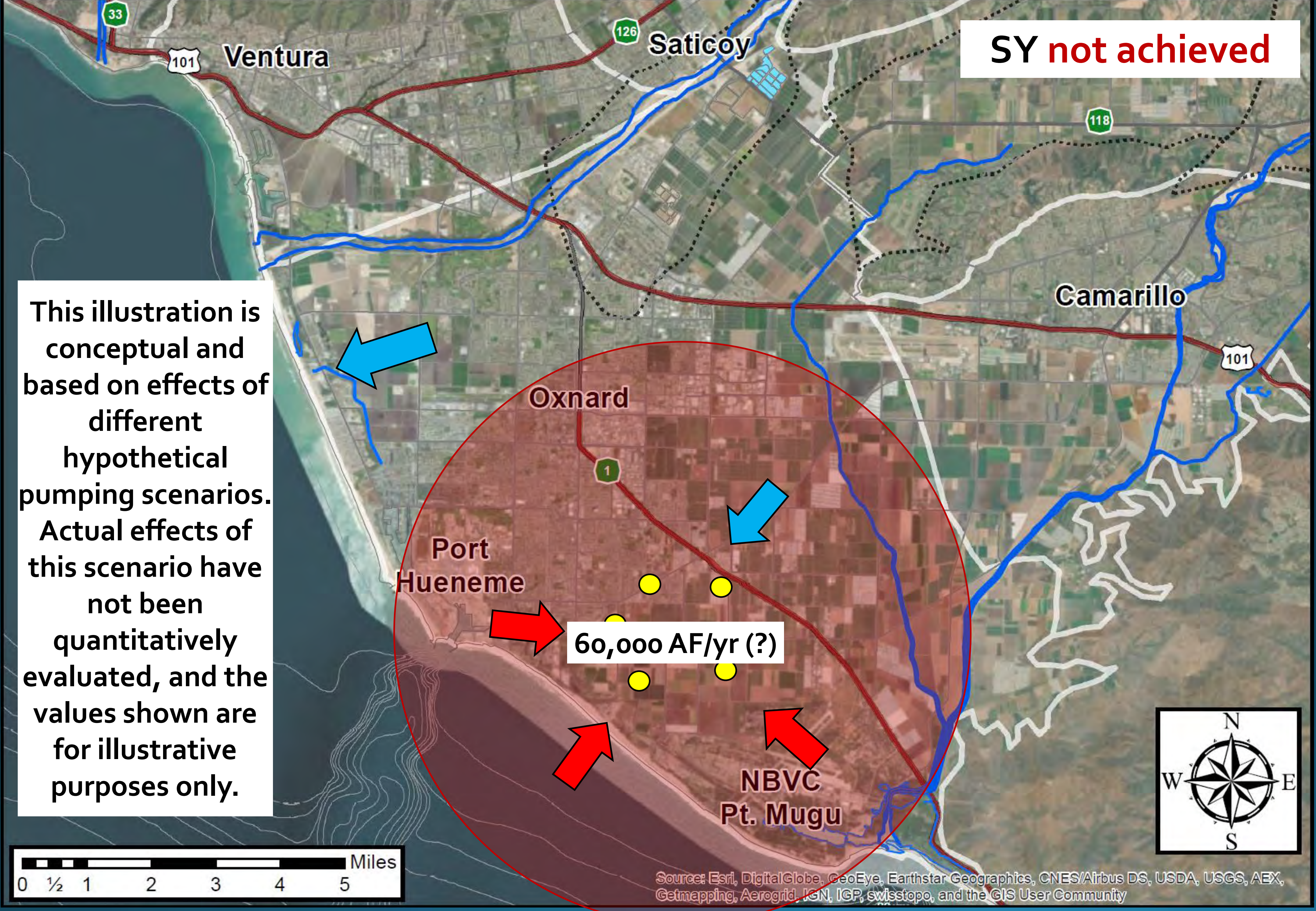


Total pumping must be reduced to avoid seawater intrusion

Hypothetical Inland Pumping Only
SY = 60,000 AF/yr

This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.

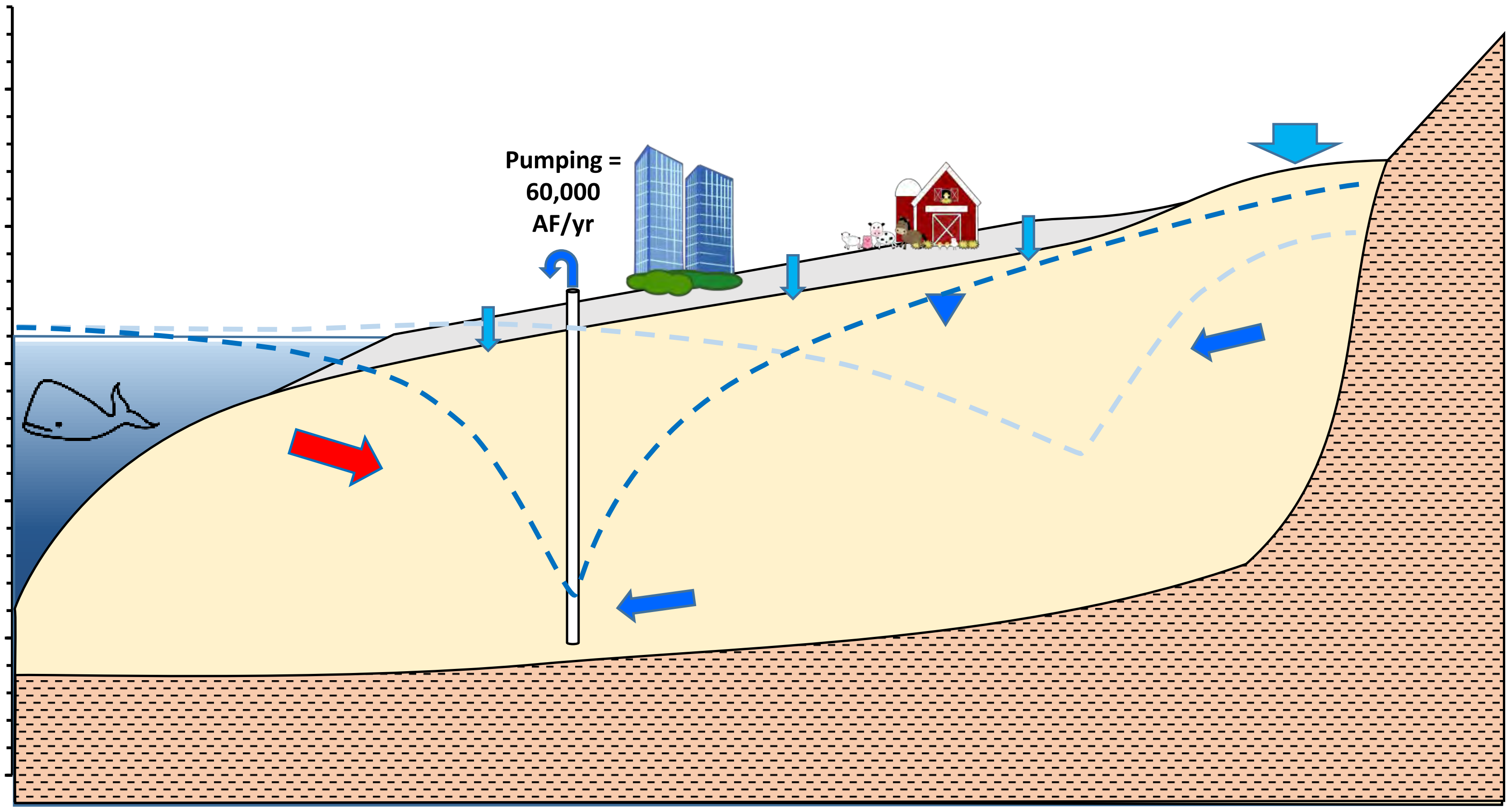


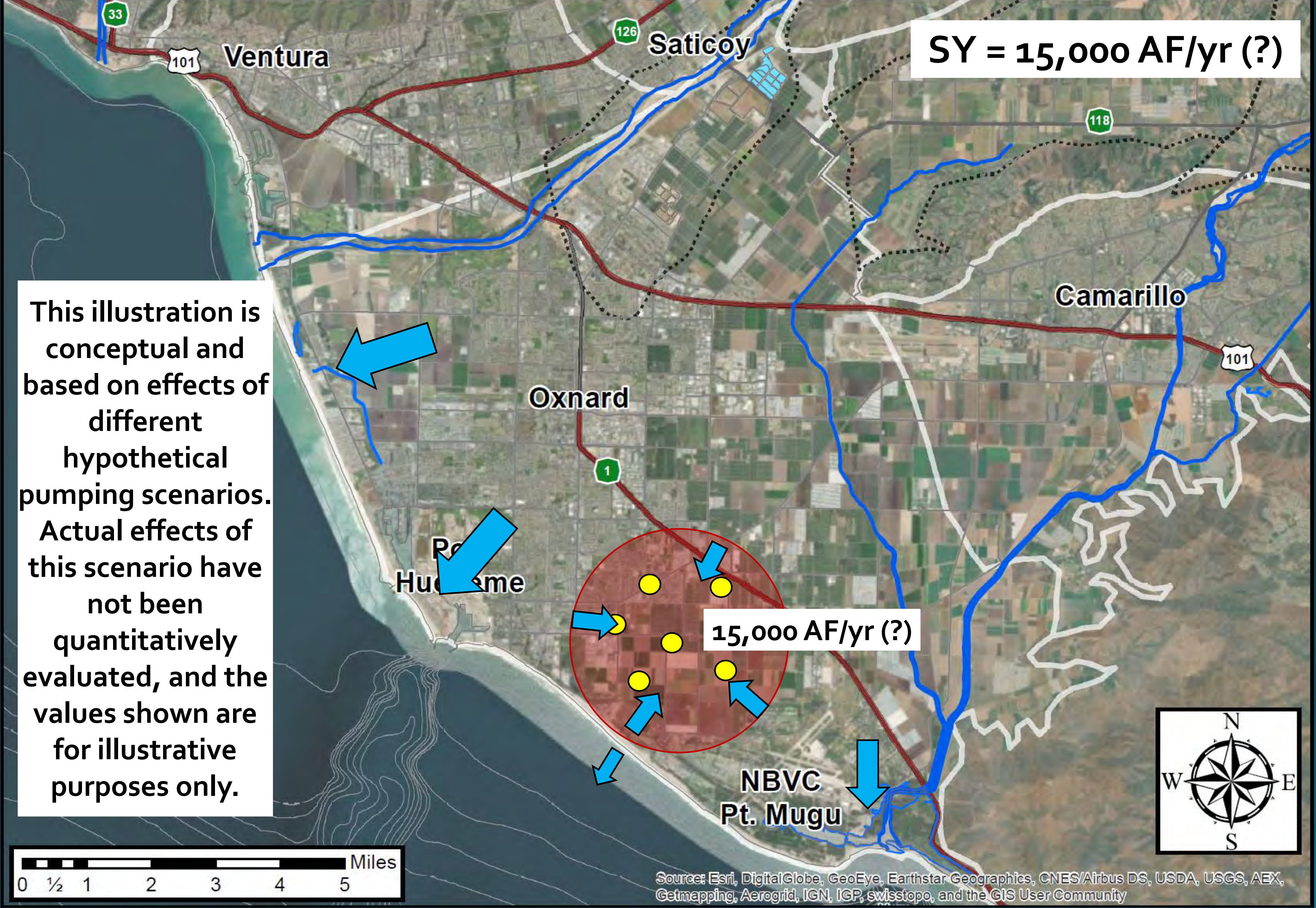


However, if the same total pumping occurred at wells closer to the coast, then seawater intrusion is a problem again

Hypothetical Coastal Pumping Only SY < 60,000 AF/yr

This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.

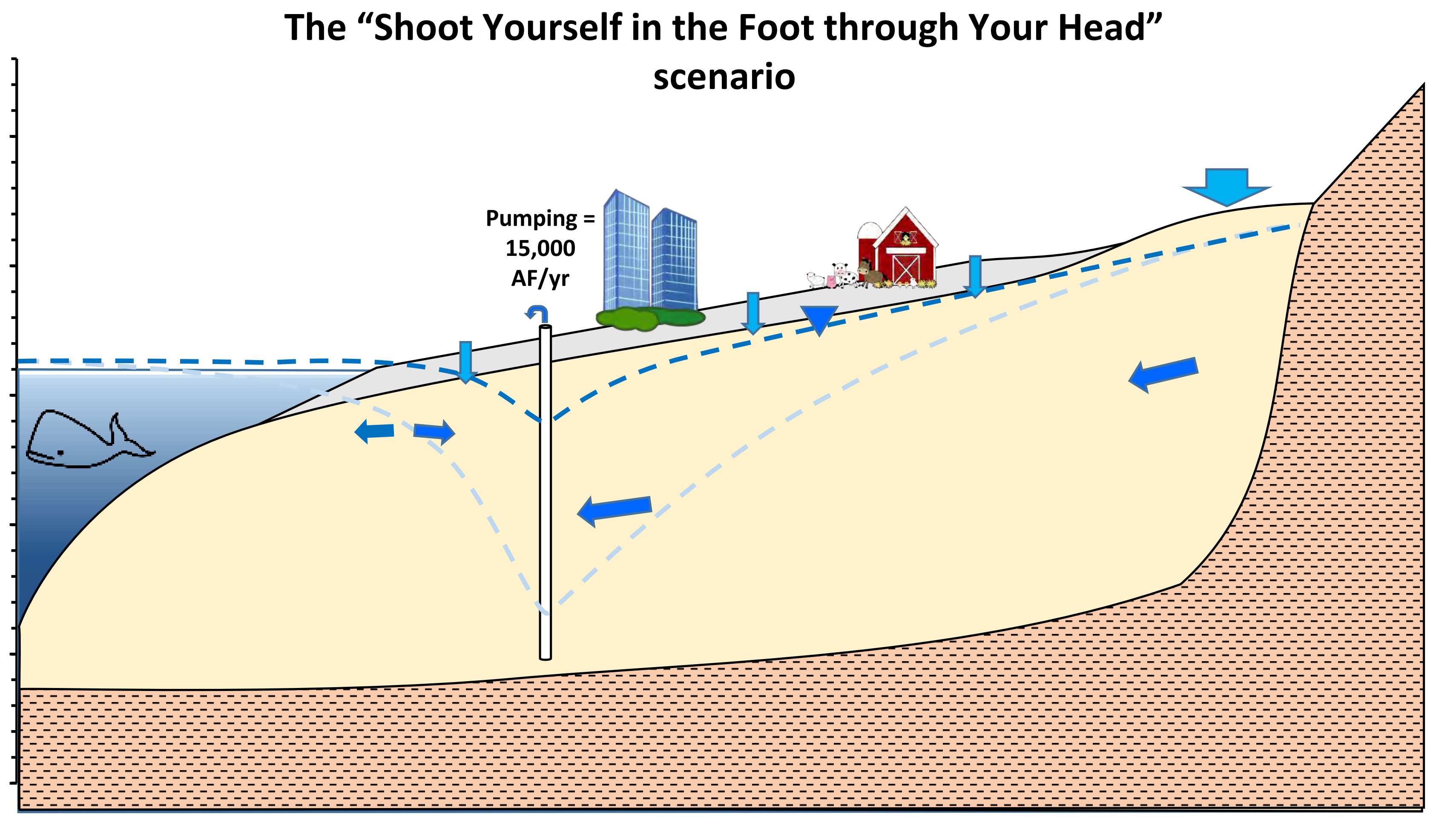


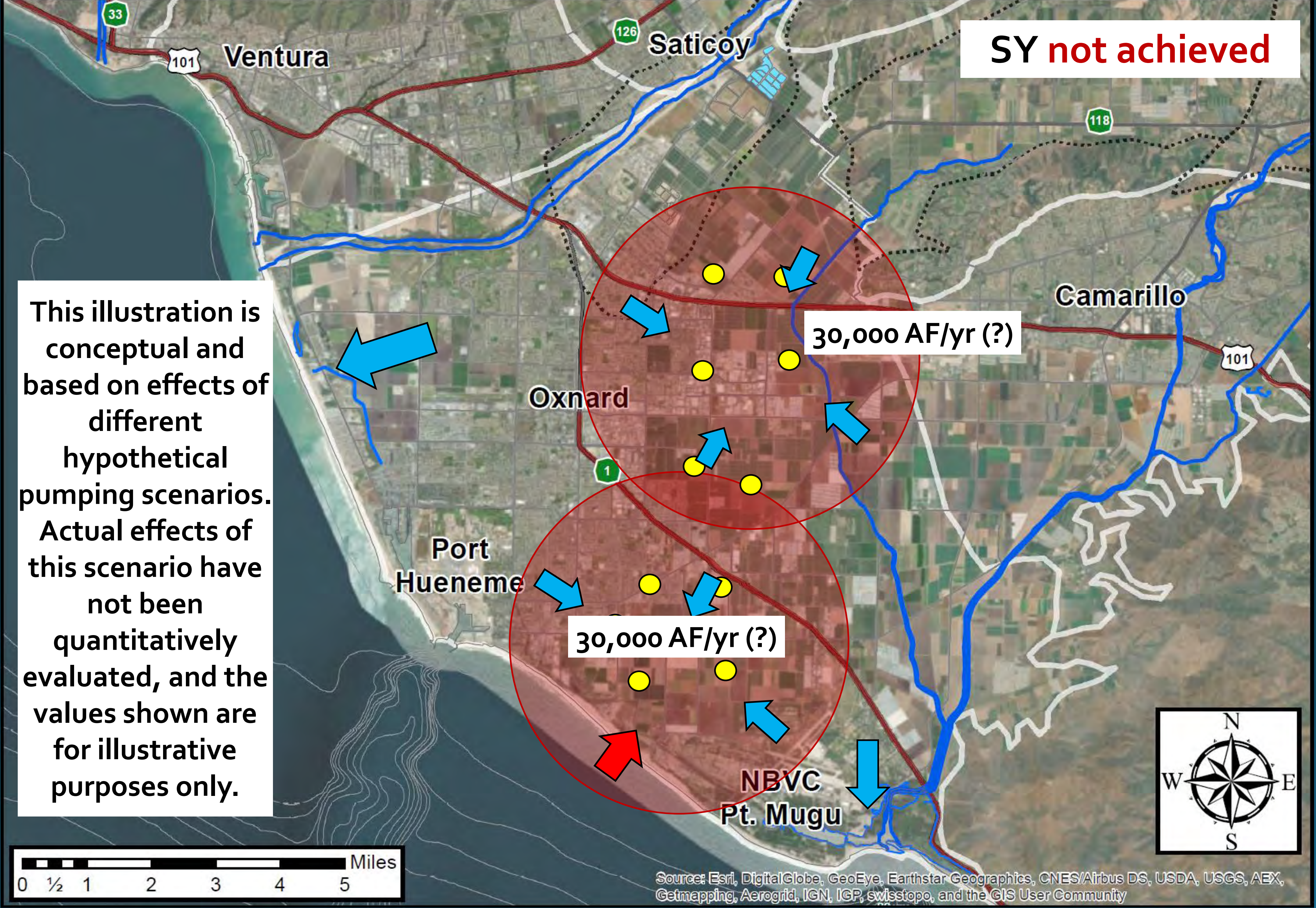


When pumping occurs near the coast, drastic cutbacks may be required to prevent seawater intrusion

Hypothetical Coastal Pumping Only
SY = 15,000 AF/yr

This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.



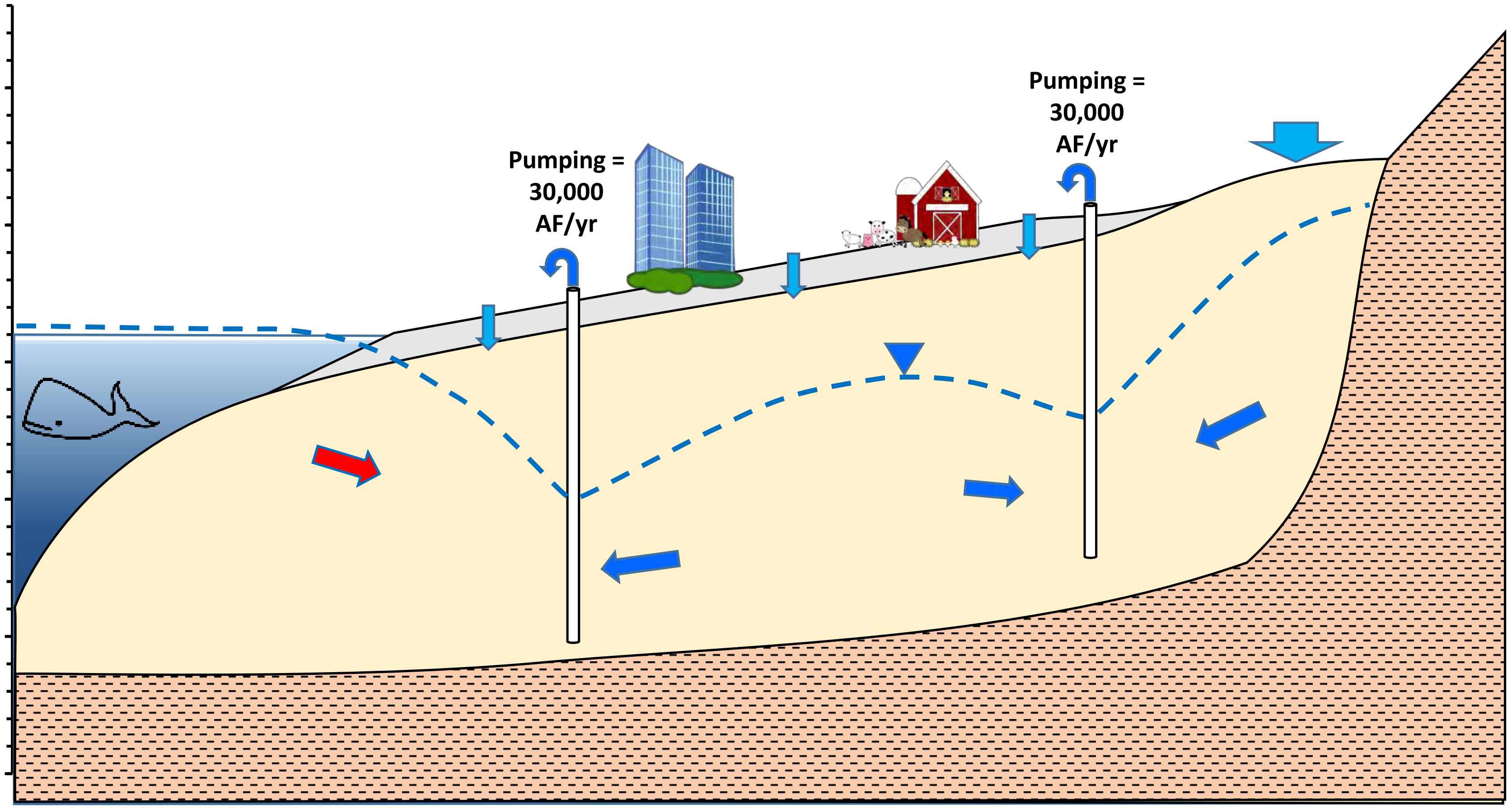


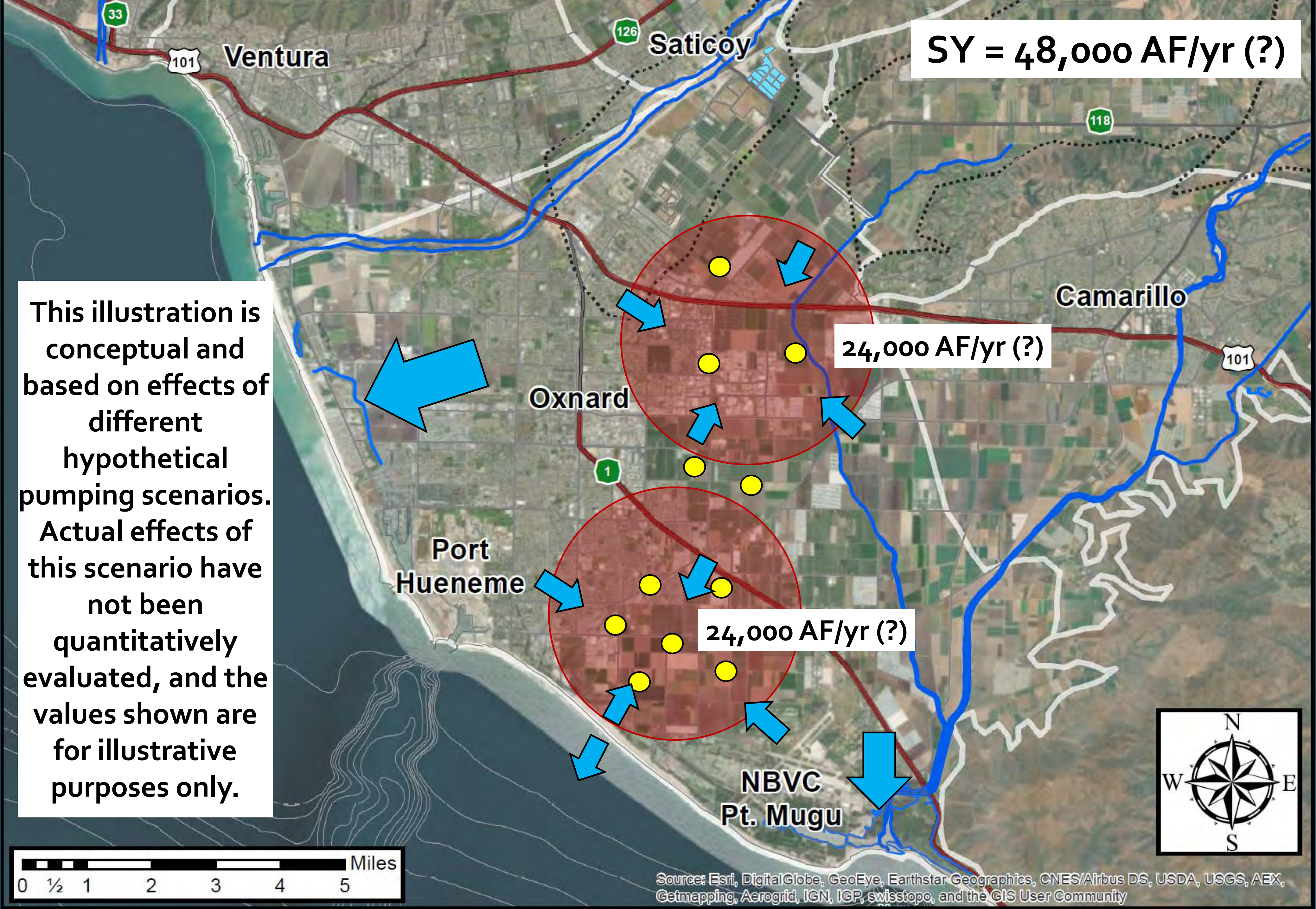
Now consider two distinct well fields pumping a total of 60,000 AF/yr:

Seawater intrusion becomes a problem again

Hypothetical Inland + Coastal Pumping SY < 60,000 AF/yr

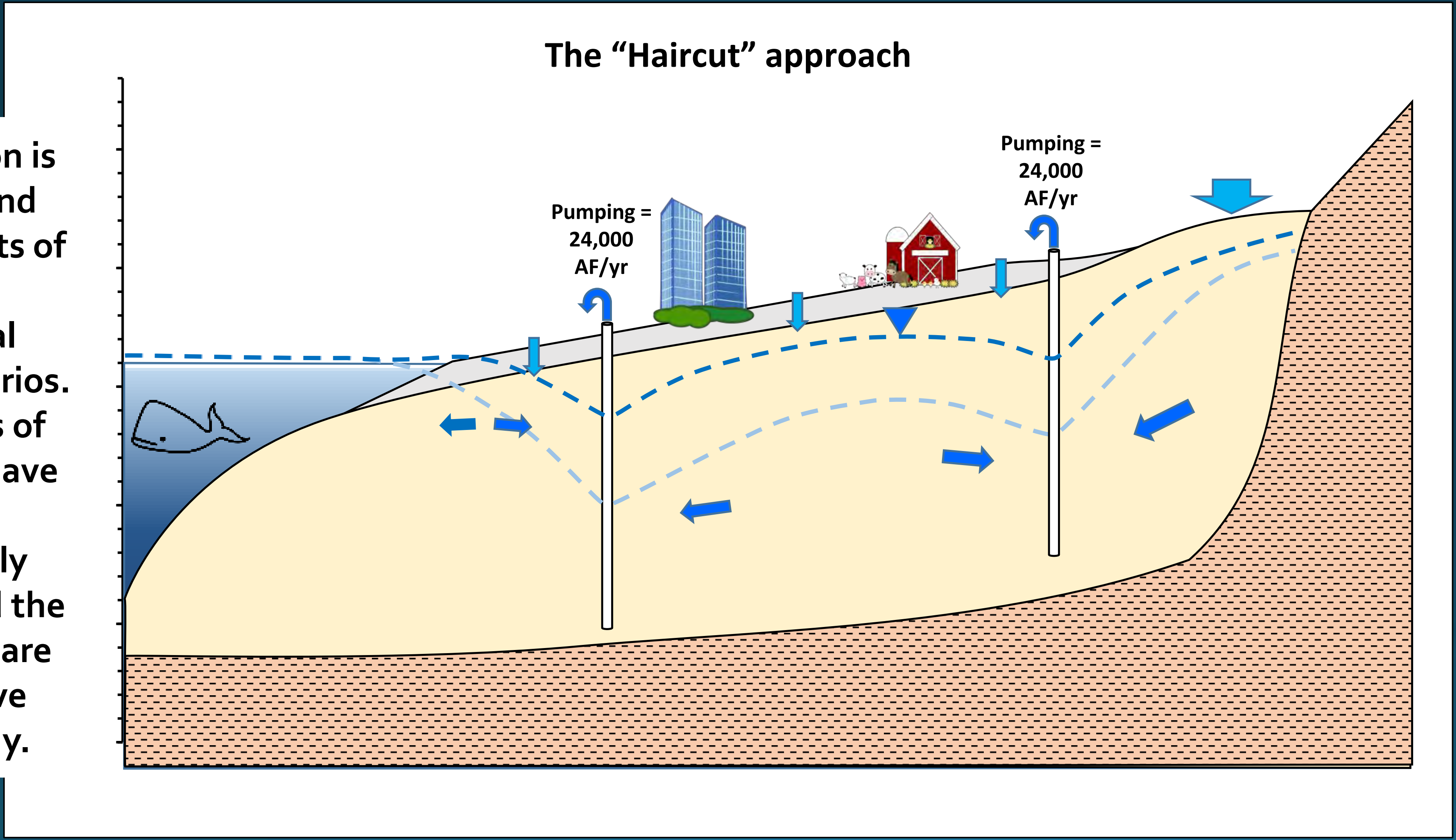
This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.



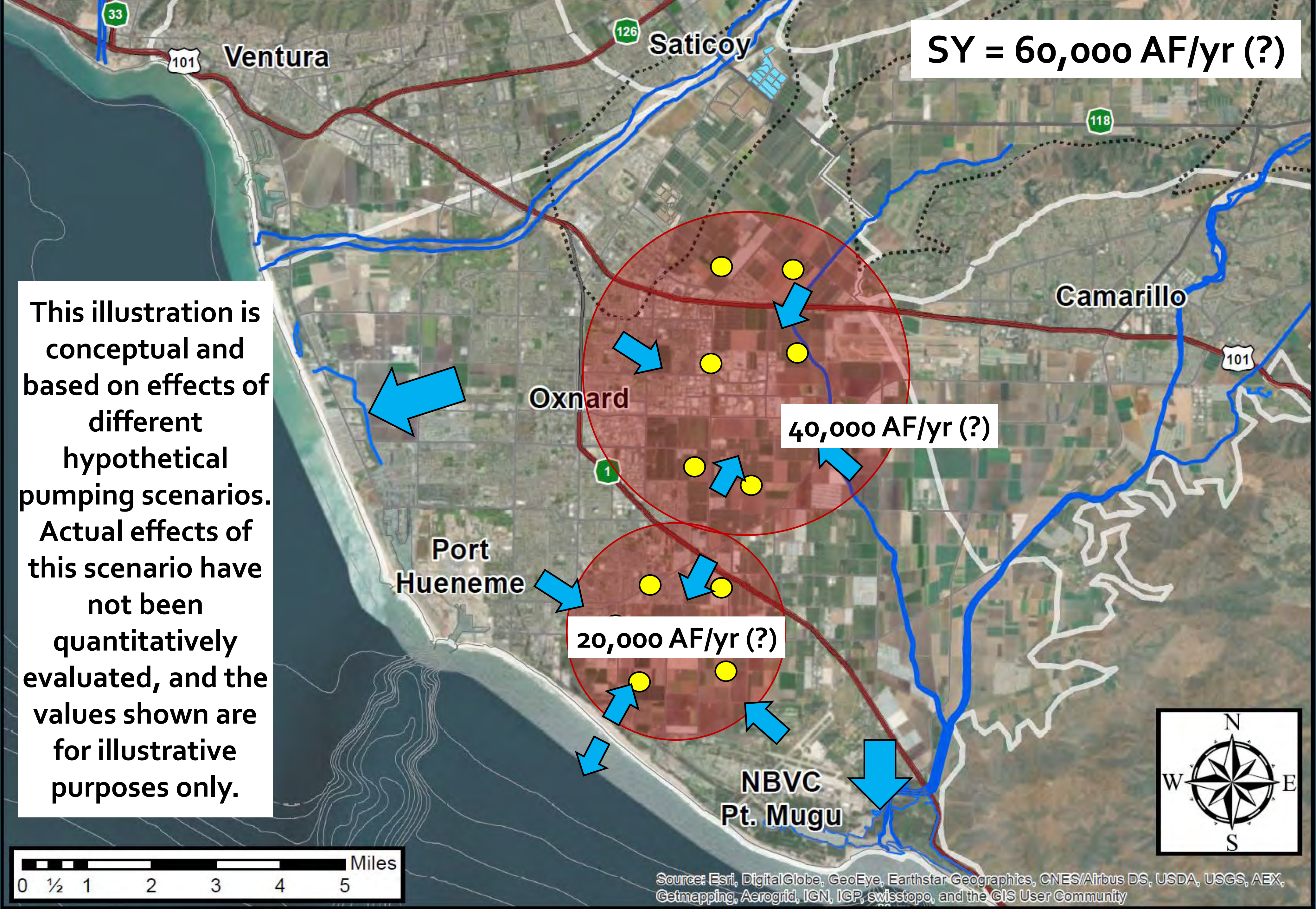


Equal cuts mean each well field will have to reduce pumping to prevent seawater intrusion

Hypothetical Inland + Coastal Pumping SY = 50,000 AF/yr



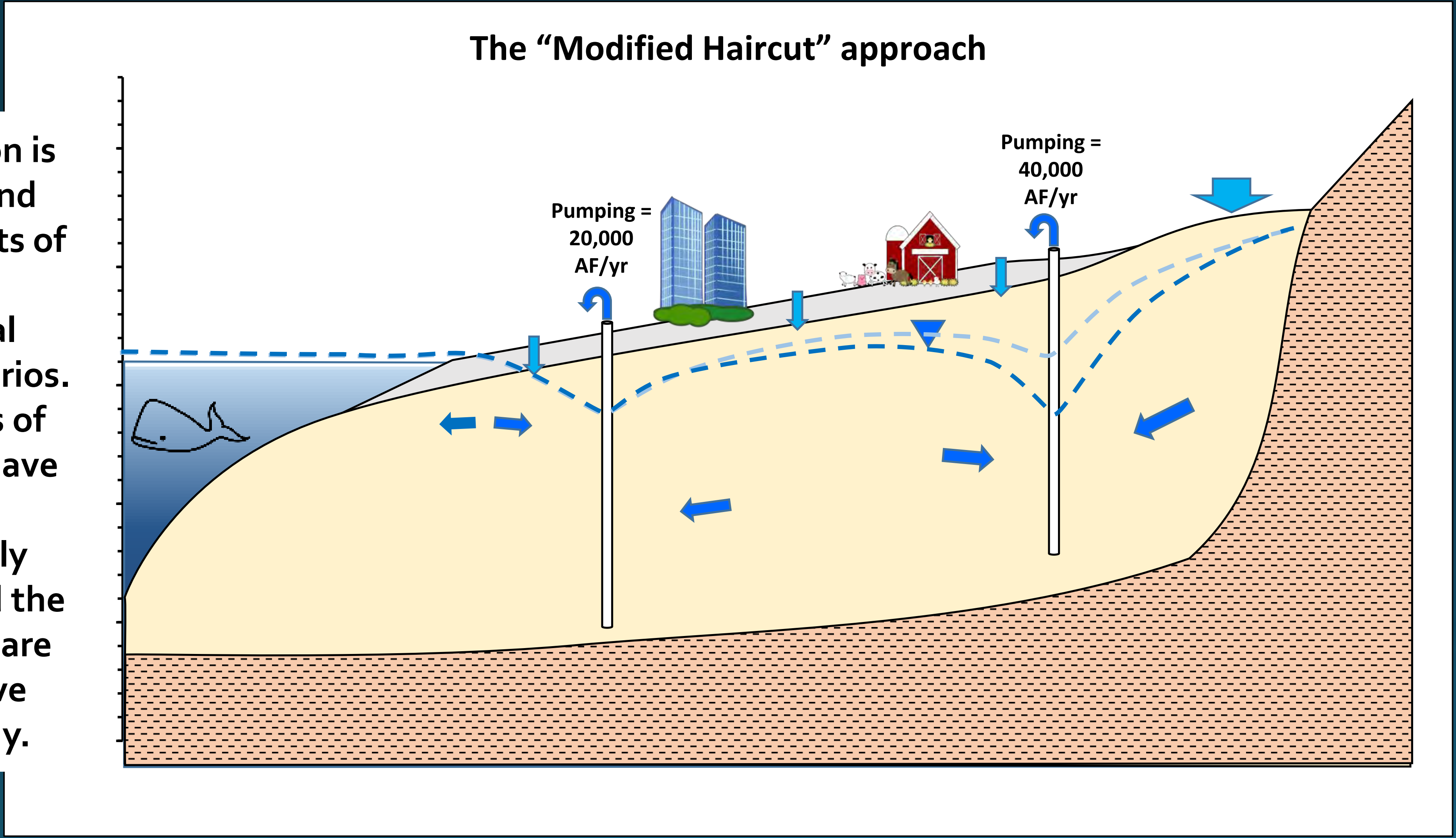
This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.



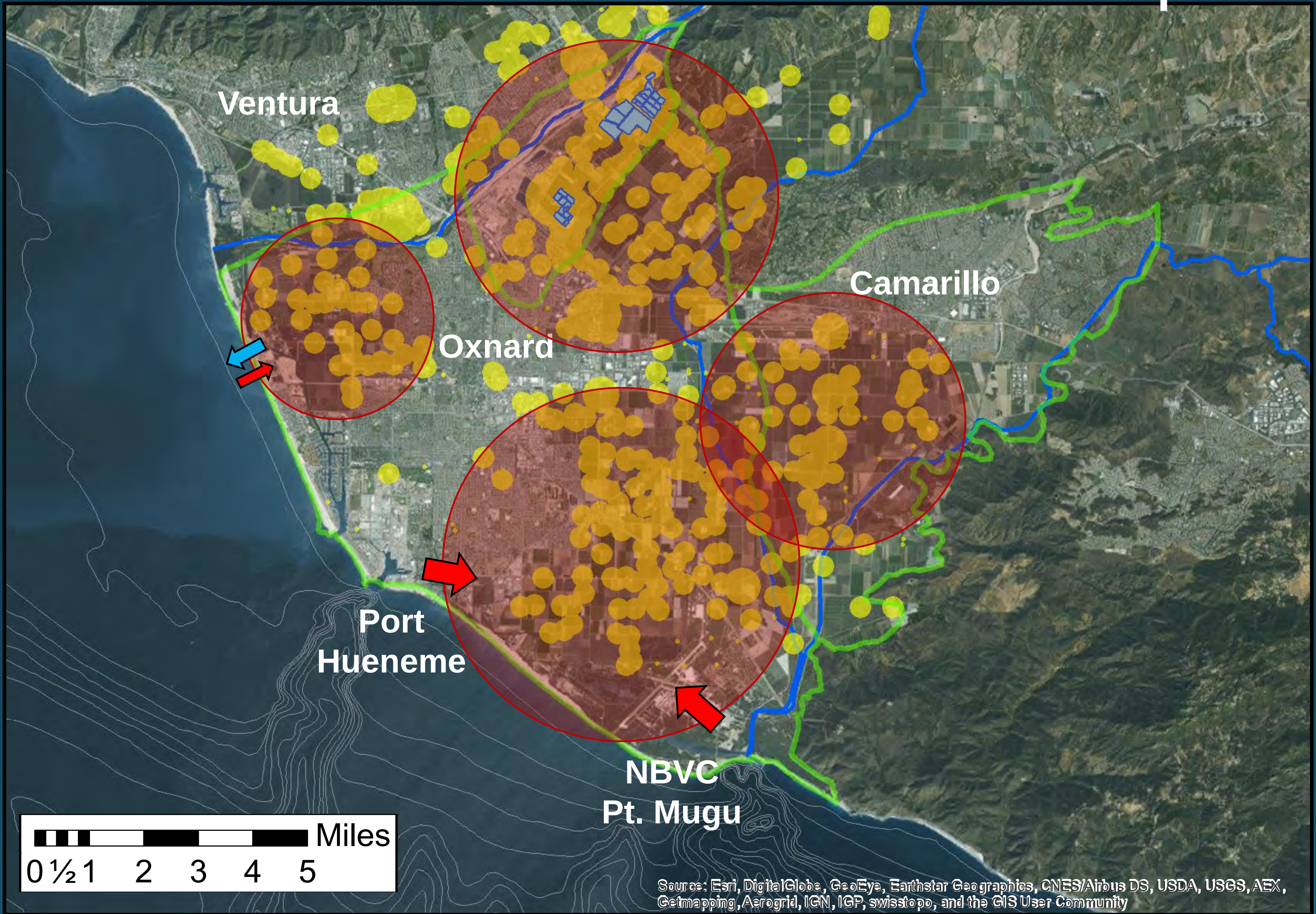
Greater cuts near the coast (compared to inland wells) increases total basin yield without causing seawater intrusion

Hypothetical Inland + Coastal Pumping SY = ~~50,000~~ *60,000* AF/yr

This illustration is conceptual and based on effects of different hypothetical pumping scenarios. Actual effects of this scenario have not been quantitatively evaluated, and the values shown are for illustrative purposes only.



Actual Well Locations are More Complicated



8. Fox Canyon Groundwater Management Agency (FCGMA) Agenda Review

Oxnard sub-basin (Oxnard Plain)

Priority: High – **Critical**

Reason: Seawater intrusion, overdraft

GSA: Fox Canyon GMA

Pleasant Valley basin

Priority: High – **Critical**

Reason: Saline intrusion, overdraft

GSA: Fox Canyon GMA

Las Posas basin

Priority: High

Reason: Water quality, overdraft

GSA: Fox Cyn. GMA

Future agenda items/upcoming activities:

- Regular BoD meeting for March 27 cancelled
  - Held Special Meeting and GSP workshop on sustainability criteria on March 15
  - Working on revisions to Allocation Ordinance
- Not clear whether a special BoD meeting will be held in April
- April TAG meeting cancelled

Modeling Performed by United:

- 1930-79 Climatic Conditions:
  - **Base case (no reduction in pumping)**
  - **New projects, no reduction in pumping**
  - **New projects, 35% reduction in Oxnard basin, 20% reduction in PV & WLP**
  - **Reduced pumping—45% in Oxnard basin, 25% in PV & WLP**
  - Reduced pumping—55% in Oxnard basin, no reduction in PV & WLP
  - Reduced pumping—55% in Oxnard basin, 20% in PV & WLP
- 1940-89 Climatic Conditions:
  - Base case (no reduction in pumping)
  - Reduced pumping—45% in Oxnard basin, 25% in PV and WLP

Allocation Ordinance: Lingering Issues to Resolve

1. Differences between PVCWD and FCGMA on groundwater use, partial or complete allocation for Conejo Creek surface water
2. Allow carryover of surface-water allocations, same as groundwater
3. 10-year rolling average for surface-water deliveries (instead of 5)
4. Allow allocation sharing among wells in a well field, without requiring a variance
5. Add language allowing exceedance of allocation during "Emergencies"
6. OH-user vs. United allocation language

9. Mound Basin Groundwater Sustainability Agency (MBGSA) Agenda Review

Mound basin

Priority: Medium => High

Reason: Water quality, dependence on groundwater, forecasted population growth

GSA type: JPA

Recent Activities (as of March 21 Board meeting)

- Contract with United for GSP support
- GSP contractor selected (Intera)

Future agenda items/upcoming activities:

- Next meeting: April 25 at 1:00 pm
  - May be cancelled if not needed
- Future agenda items/upcoming activities:
  - Groundwater isotope analysis (coordinate sampling with United)
  - Team kick-off meeting, begin data exchange and analysis for GSP
  - Plan for new monitoring wells

10. Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA) Agenda Review

Piru basin

Priority: High

Reason: Water quality, dependence on groundwater

GSA type: JPA (Fillmore + Piru)

Fillmore basin

Priority: Medium => High

Reason: Water quality, dependence on groundwater, forecasted population growth

GSA type: JPA (Fillmore + Piru)

Recent Activities (as of March 21 Board meeting)

- GSP contractor (Daniel B. Stephens & Assoc.) and United staff sharing data, preparing GSPs
  - Renewed stakeholder outreach effort planned
- Presentation on SWP purchases by United

Future agenda items/upcoming activities:

- Special BoD meeting: March 28 at 5:00 pm
  - Financial issues
- Next regular meeting: April 18 at 5:00 pm
- Future agenda items/upcoming activities:
  - Stakeholder engagement plan development
  - Data exchange and analysis for GSP
  - Plan for new monitoring wells

11. Santa Paula Basin Technical Advisory Committee (TAC) Update

Santa Paula basin

Priority: Medium => Very Low

Reason: Adjudicated

GSA type: Technical Advisory Committee

Recent Activities

- Draft 2017 Annual Report revised, resubmitted to TAC
  - Must complete SGMA reporting for adjudicated basins by April 1, 2019
- TAC Working Group on groundwater elevation "triggers" making progress

Upcoming Activities

- Next TAC meeting: Sept. 5 (not a public meeting)
- Upcoming activities:
  - Consider effects of Ventura SWP-Interconnection project on potential Santa-Paula-basin "yield enhancement" projects
  - Progress regarding "triggers" document and funding for yield-enhancement projects
  - Evaluate existing index wells, need for more pressure transducers?

12. Future Agenda Items

ADJOURNMENT

"Infiltration… through regional groundwater recharge projects, has the capacity to capture large volumes of water on both individual storm and annual time frames."

from Natural Resources Defense Council and The Pacific Institute's
"June 2014 Issue Brief: Stormwater Capture Potential in Urban and Suburban California"