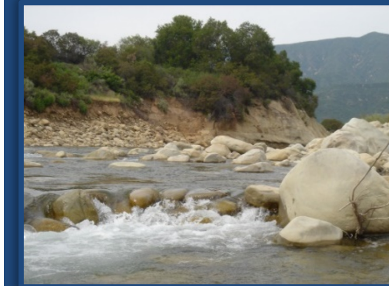
UPPER VENTURA RIVER GROUNDWATER AGENCY GROUNDWATER SUSTAINABILITY PLAN WORKSHOP NO. 2

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

MARCH 2, 2021
4PM

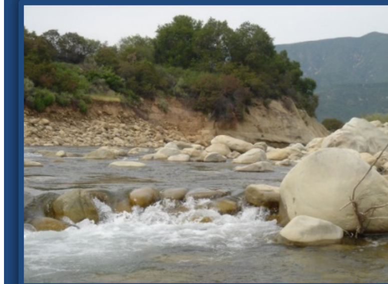


WORKSHOP AGENDA

No.	TIME	TOPIC
1	4:00 – 4:05 pm	Meeting Call to Order, Roll Call, and Public Comments
2	4:05 – 4:10 pm	• Welcome • Overview of Webinar Features • Agenda Review
3	4:10 – 4:15 pm	Get to Know the Audience (Attendee Polls Nos. 1 - 3)
4	4:15 – 4:45 pm	Sustainable Management Criteria • Presentation • Q & A
5	4:45 – 5:20 pm	Numerical Flow Model • Presentation • Q & A
6	5:20 – 5:25 pm	Next Steps – What to Expect March-Dec 21
7	5:25 – 5:50 pm	• Stakeholder Questions and Feedback • Attendee Poll Nos. 4 - 7
8	5:50 – 6:00 pm	UVRGA Director Comments
9	6:00 pm	Wrap-up

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

ATTENDEE POLL NOS. 1 - 3

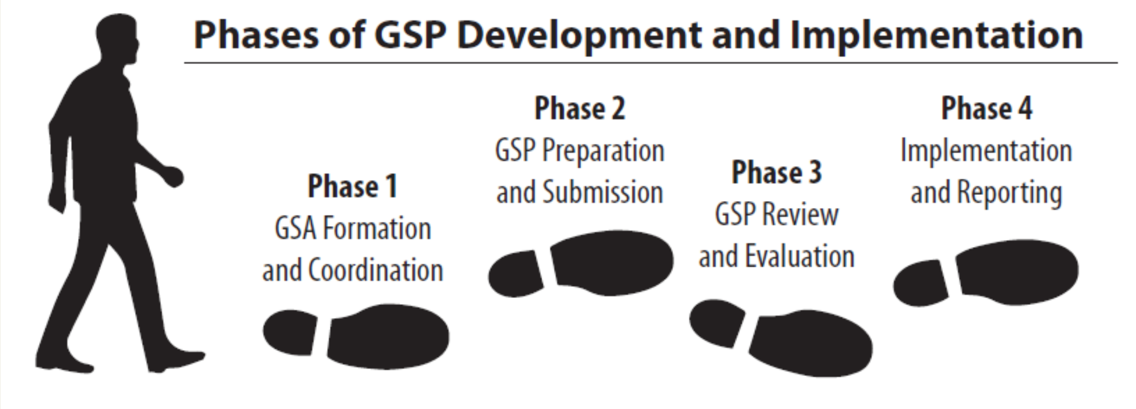


Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

SUSTAINABLE MANAGEMENT CRITERIA

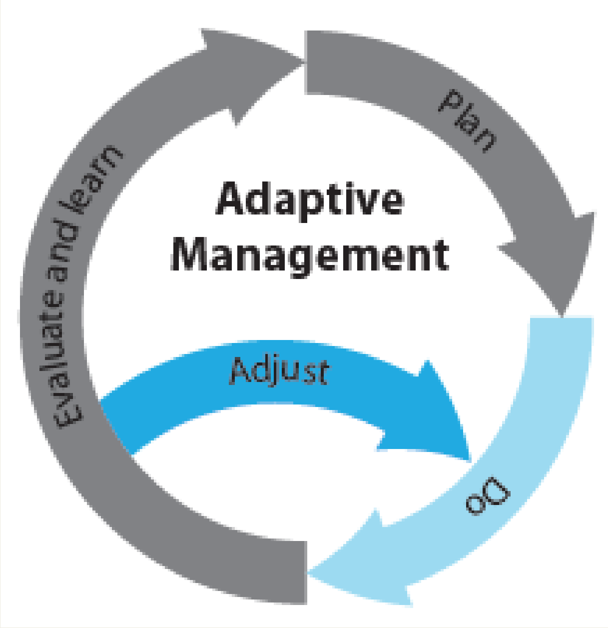
SUSTAINABLE GROUNDWATER MANAGEMENT ACT (SGMA) REQUIREMENTS

1. Form a Groundwater Sustainability Agency (GSA)
2. Adopt a Groundwater Sustainability Plan (GSP)
   - Due January 31, 2022
3. Achieve Sustainable Groundwater Management
   - 20 years following GSP adoption



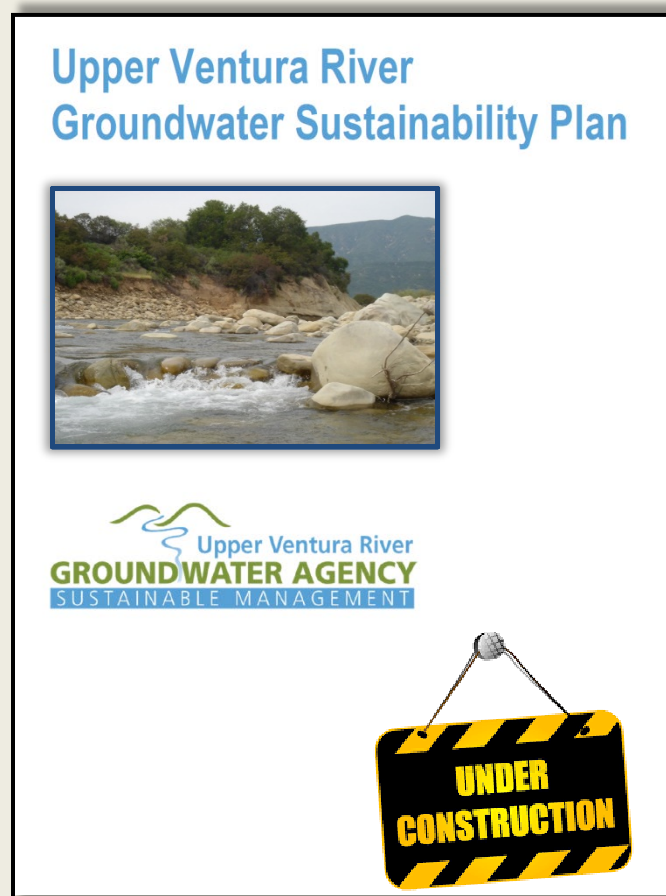
WHAT IS A GSP?

The GSP is a flexible road map for how a groundwater basin will achieve long term sustainability by avoiding undesirable results through data-driven, adaptive management



WHAT MUST A GSP INCLUDE?

- GSP Contents
  - Administrative Information
  - Basin Setting
  - Sustainable Management Criteria
  - Monitoring Networks
  - Projects and Management Actions
  - Implementation



****** Draft Basin Setting Available On MBGSA Website******

SUSTAINABLE MANAGEMENT CRITERIA

- Overarching goal of SGMA is to avoid undesirable results for each of the six SGMA sustainability indicators:

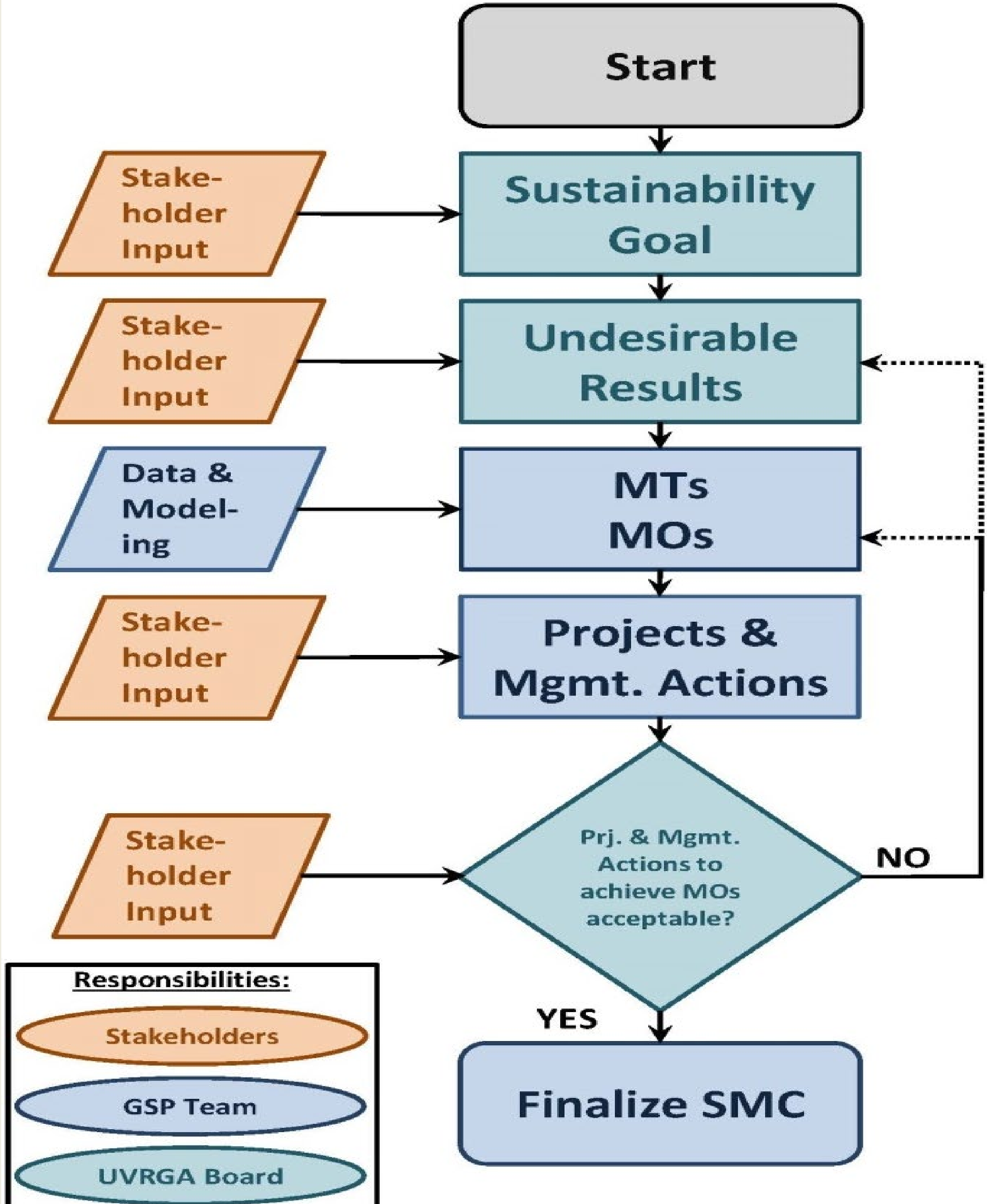
- Undesirable results and actions to prevent them are defined at the local level by the GSA

SUSTAINABLE MANAGEMENT CRITERIA

- Sustainability Goal
- Undesirable Results
  - Significant and unreasonable effects for sustainability indicators caused by groundwater conditions occurring throughout the basin
- Minimum Thresholds
  - Quantitative metrics indicating significant and unreasonable effects likely exist
- Measureable Objectives
  - Quantitative metrics that reflect basin desired conditions

SUSTAINABLE MANAGEMENT CRITERIA DEVELOPMENT PROCESS

SMC will be the central focus of the GSP



SUSTAINABILITY GOAL

- High-level policy framework to guide development of Sustainable Management Criteria & Plan Actions
- Adopted August 13, 2020
- Available on-line

Sustainability Goal
Adopted August 13, 2020

The goal of this GSP is to sustainably manage the groundwater resources of the Upper Ventura River Basin for the benefit of current and anticipated future beneficial users of groundwater, including the environment, and the welfare of the general public who rely directly or indirectly on groundwater. Sustainable groundwater management will ensure the long-term reliability of the Upper Ventura River Basin groundwater resources by avoiding SGMA undesirable results no later than 20 years from Plan adoption through implementation of a data-driven and performance-based adaptive management framework. It is the express goal of this GSP to develop sustainable management criteria and plan implementation measures to avoid undesirable results for the applicable SGMA sustainability indicators by:

1. *Using best available science and information, including consideration of uncertainty in the basin setting and groundwater conditions and future opportunities to address data gaps;*
2. *Conducting active and meaningful stakeholder engagement;*
3. *Developing a pragmatic and financially realistic approach to sustainable groundwater management that seeks the triple bottom line of vibrant and well-functioning ecological, social, and economic systems by:*
    a. *Considering the economic, social, and environmental impacts and benefits associated with the all current and anticipated future beneficial users of groundwater;*
    b. *Considering water supply reliability for agriculture, domestic, and municipal users;*
    c. *Considering the availability of alternative water sources for domestic groundwater beneficial users;*
    d. *Considering potential impacts to groundwater dependent ecosystems;*
    e. *Considering State, federal, or local standards relevant to applicable sustainability indicators;*
    f. *Considering the feasibility of projects and management actions necessary to achieve proposed measureable objectives; and*
    g. *Considering the economic impact of projects and management actions necessary to achieve proposed measureable objectives on all beneficial users, with special consideration of disadvantaged communities and agricultural enterprises lacking alternative land use options.*
    h. *Coordinating planning and implementation actions with local and State agencies, non-governmental organizations, and, as necessary, the California Judicial Branch.*

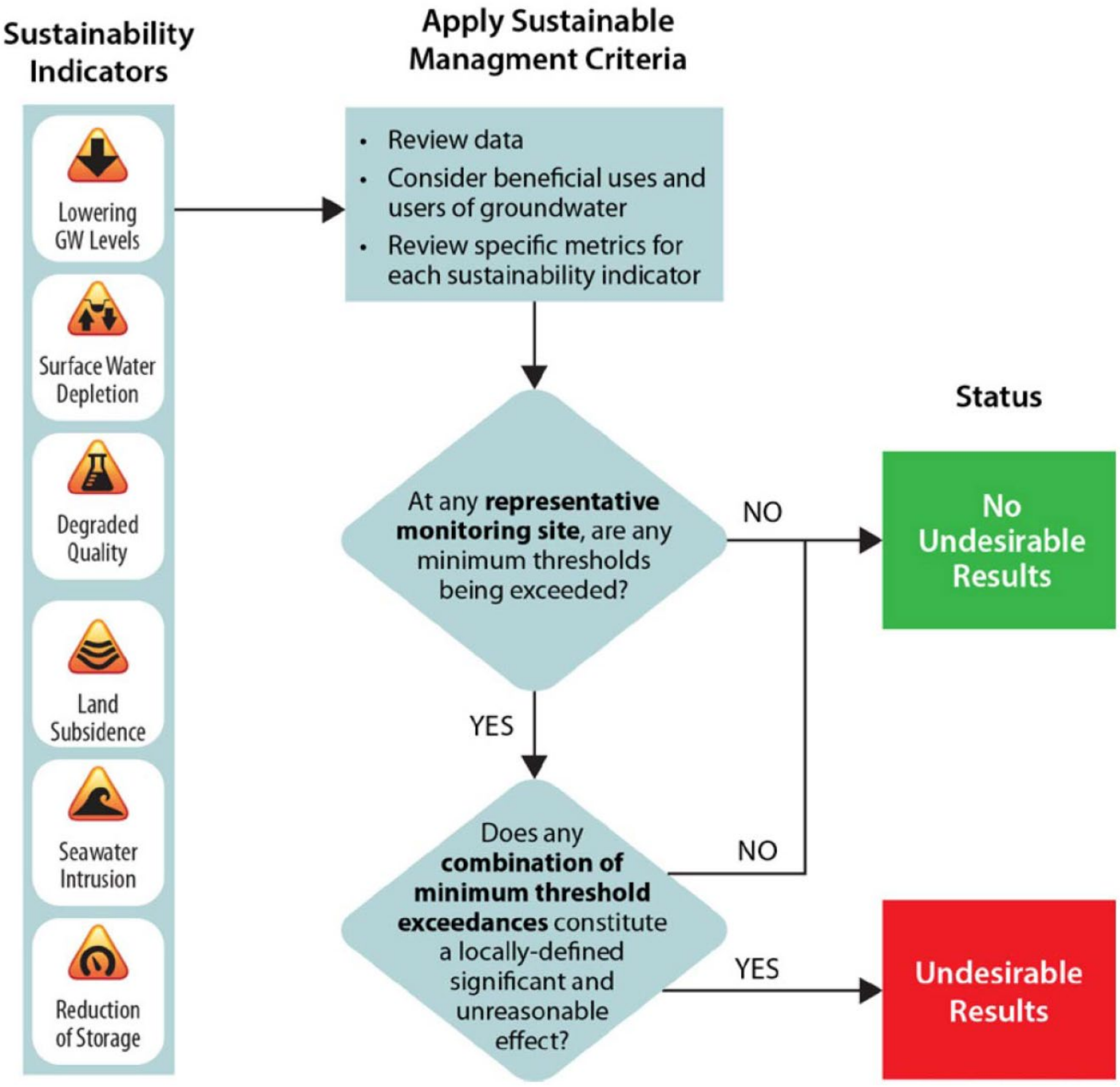
UNDESIRABLE RESULTS

"Significant and unreasonable effects for sustainability indicators caused by groundwater conditions occurring throughout the basin.

1. Significant and Unreasonable Effects: Undesirable results are significant and unreasonable effects related to a sustainability indicator. For example, seawater intrusion that impacts beneficial uses of groundwater.

2. Caused by Groundwater Conditions: The significant and unreasonable effects must be caused by managed groundwater conditions (i.e., pumping or GSP projects).

3. Throughout the Basin: The significant and unreasonable effects must occur or be caused by conditions throughout a large portion of the basin.



UR PROCESS

Minimum Thresholds:

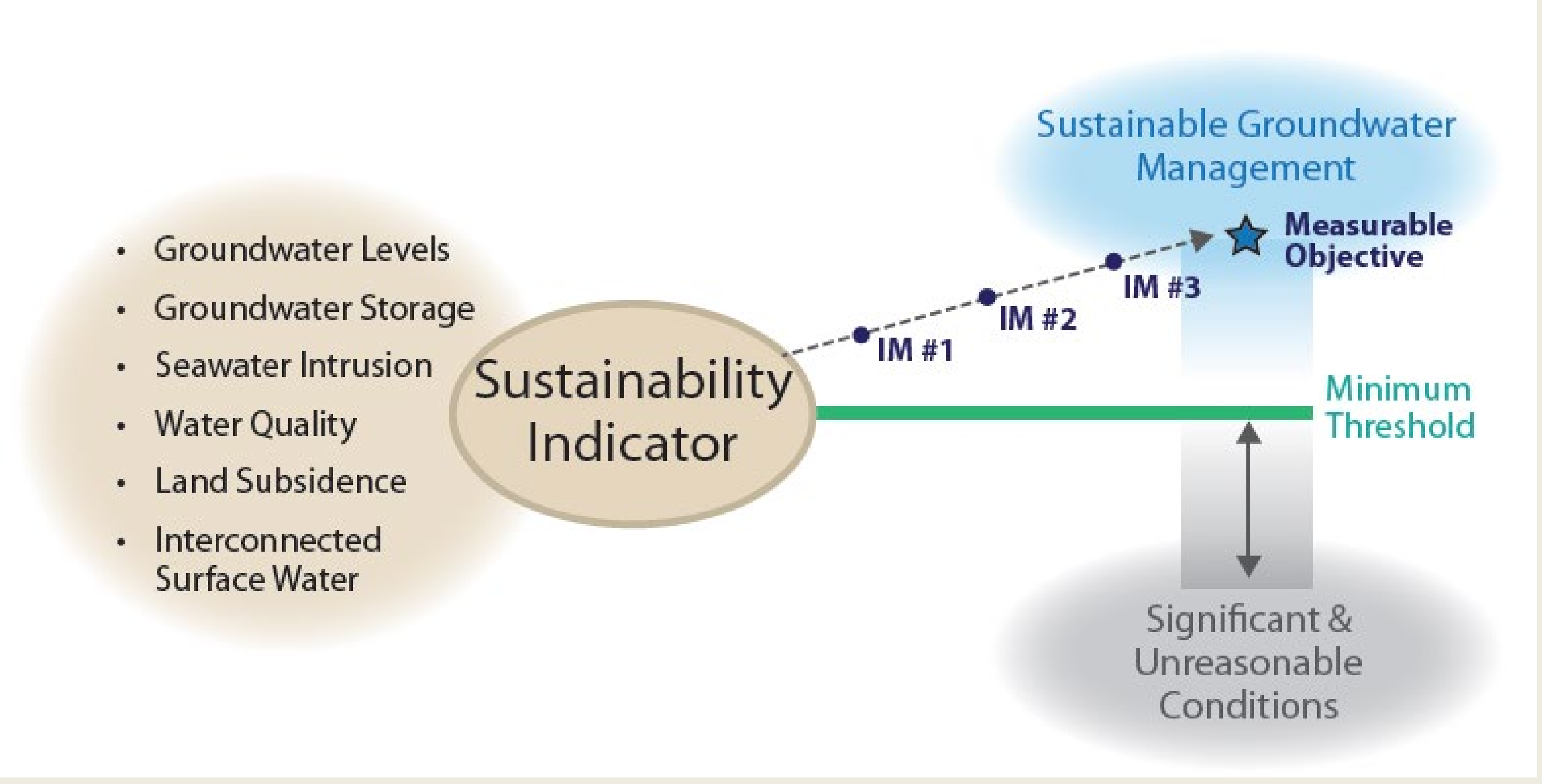
Quantitative measures that indicate significant and unreasonable effects in a particular area

Undesirable Results:

Combination of minimum thresholds exceedances that defines undesirable results

SUSTAINABLE MANAGEMENT CRITERIA

The overarching goal of SGMA is to avoid undesirable results



SMC DEVELOPMENT STATUS

Discuss Today

Pending Model Results

Screened Out

Pending Model Results

SUSTAINABILITY INDICATOR SCREENING RESULTS

Seawater intrusion is not physically possible (aquifer is ~200 ft above sea level and ~6 miles from the ocean)

Significant and unreasonable land subsidence is highly unlikely due aquifer properties and groundwater conditions

DRAFT WATER QUALITY SMC

- Current water quality supports beneficial uses (currently no undesirable results)
- Nexus between URs and groundwater conditions
  - Water quality degrades with declining water table.
  - SMCs only apply if basin management (pumping) causes degradation
    - i.e. - drought-induced quality degradation is not a SGMA UR

DRAFT WATER QUALITY MINIMUM THRESHOLDS

- Criteria for Minimum Threshold Development
  - Maximum Contaminant Levels (MCLs)
  - RWQCB Water Quality Objectives
  - Agricultural Toxicity Thresholds
  - Existing Water Quality

- MTs based on significant and unreasonable effects consistent with sustainability goal
  - Health effects of nitrate in the ~100 domestic wells (testing not required – may have unknown exposure)
  - Treatment costs for financially prohibitive (brine disposal for reverse osmosis)

DRAFT WATER QUALITY MINIMUM THRESHOLDS

Degraded Quality

- Nitrate: Maximum Contaminant Level[1]
- TDS: Upper Consumer Acceptance Level[1]
- Sulfate: Upper Consumer Acceptance Level[1]
- Chloride: Toxicity threshold for chloride-sensitive crops[2]
- Boron: Toxicity threshold for boron-sensitive crops[2]

[1]Treatment required when these levels are exceeded. Reverse osmosis would require brine discharge. Brine disposal pipeline is not likely feasible from a cost perspective.

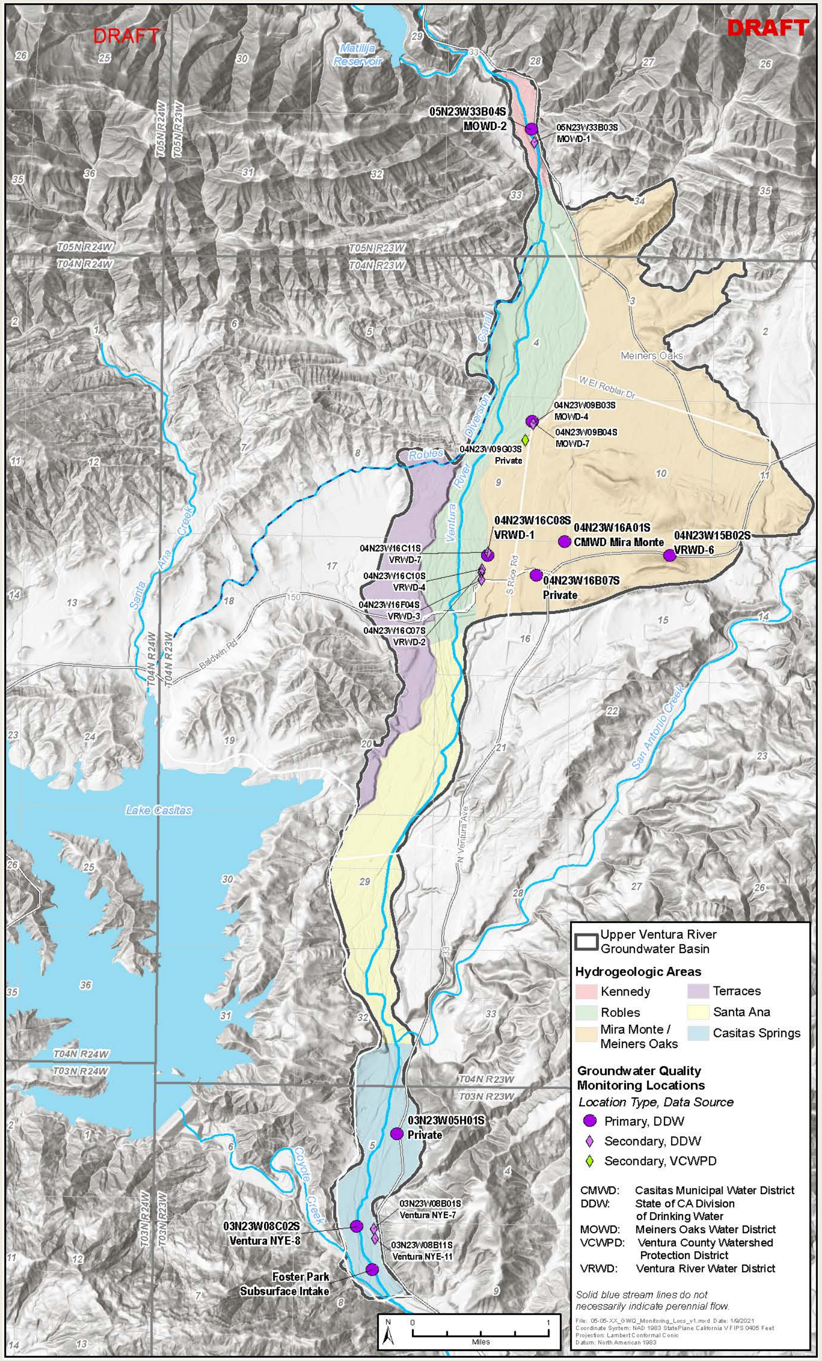
[2]Treatment for irrigation beneficial use is likely cost prohibitive.

DRAFT WATER QUALITY UNDESIRABLE RESULTS

- Criteria for Undesirable Results:
  - SGMA undesirable results are considered to be occurring when two-thirds (2/3) of the primary water quality monitoring wells exceed a minimum threshold concentration continuously for two years and UVRGA determines that the exceedances are caused by groundwater pumping.

GROUNDWATER QUALITY MONITORING LOCATIONS

- *Nine Areas*
- *Primary locations identified in areas with multiple closely spaced wells*
- *Monitoring performed by well owner or Ventura County*
- *Gaps to be addressed during GSP implementation*



DRAFT WATER QUALITY MEASURABLE OBJECTIVES

- Nitrate
  - Percolating Groundwater Areas
    - Lower than RWQCB WQO for groundwater to preserve existing water quality (7.5 vs. 10 mg/L)
  - Rising Groundwater Areas
    - Lower than RWQCB WQO for surface water to preserve existing water quality (3 vs. 5 mg/L)
- TDS – RWQCB WQO
- Sulfate – RWQCB WQO
- Chloride – Lower than RWQCB WQO to preserve existing water quality (75 vs. 100 mg/L)
- Boron – RWQCB WQO

DRAFT WATER QUALITY SMC

Degraded Quality

Table 1. Proposed Minimum Thresholds and Measurable Objectives

Constituent	MCL (mg/L)	Sec. MCL (R/U/ST)[1] (mg/L)	RWQCB WQO (mg/L)	Range of Average Historical Concentrations for Primary Wells (mg/l)	Proposed MT[2] (mg/L)	MT Rationale	Proposed MO[3] (mg/L)	MO Rationale
TDS	N/A	500/1,000/1,500	800	407 - 760	1,000	Prevent significant and unreasonable impact to municipal and domestic beneficial uses of groundwater consistent with Upper Consumer Acceptance Level.	800	Preserve existing groundwater quality for agricultural, municipal, and domestic beneficial uses consistent with RWQCB WQO.
Sulfate	N/A	250/500/600	300	35 - 300	500	Prevent significant and unreasonable impact to municipal and domestic beneficial uses of groundwater consistent with Upper Consumer Acceptance Level.	300	Preserve existing groundwater quality for agricultural, municipal, and domestic beneficial uses consistent with RWQCB WQO.
Chloride	N/A	250/500/600	100	29 - 61	100	Prevent significant and unreasonable impact to agricultural beneficial use of groundwater for chloride sensitive crops[4].	75	Preserve existing groundwater quality for agricultural, municipal, and domestic beneficial uses.
Boron	N/A	N/A	0.5	0.09 - 0.77	0.75	Prevent significant and unreasonable impact to agricultural beneficial use of groundwater for boron sensitive crops.[5]	0.5	Preserve existing groundwater quality for agricultural beneficial use consistent with RWQCB WQO.
Nitrate (as N)								
Percolating Groundwater Areas (Kennedy, Robles, Mira Monte/Meiners Oaks, and Terraces Hydrogeologic Areas)								
Nitrate (as N)	10	N/A	10	0.6 – 12.6	10	Prevent significant and unreasonable impact to municipal and domestic beneficial uses of groundwater consistent with the MCL.	7.5	Preserve existing groundwater quality for municipal and domestic beneficial uses.
Areas with Rising Groundwater (Santa Ana and Casitas Springs Hydrogeologic Areas)								
Nitrate (as N)	10	N/A	5 (Surface Water)WQO)	1.0 – 1.5	10	Prevent significant and unreasonable impact to municipal and domestic beneficial uses of groundwater consistent with the MCL.	3	Preserve existing groundwater quality for municipal and domestic beneficial uses. Protect surface water beneficial uses consistent with the RWQCB surface water WQO (MO is lower than surface water WQO).

[1] Consumer Acceptance Levels, where R = Recommended, U = Upper, and ST = Short Term

[2] Undesirable results for TDS, sulfate, chloride, and boron are considered to occur when two-thirds (2/3) of the primary monitoring wells exceed the minimum threshold concentration for a constituent continuously for two years and are determined by UVRGA to be the result of groundwater pumping. Undesirable results for nitrate are evaluated in the two distinct areas noted in the table. The 2/3 criterion applies separately within the two areas for nitrate.

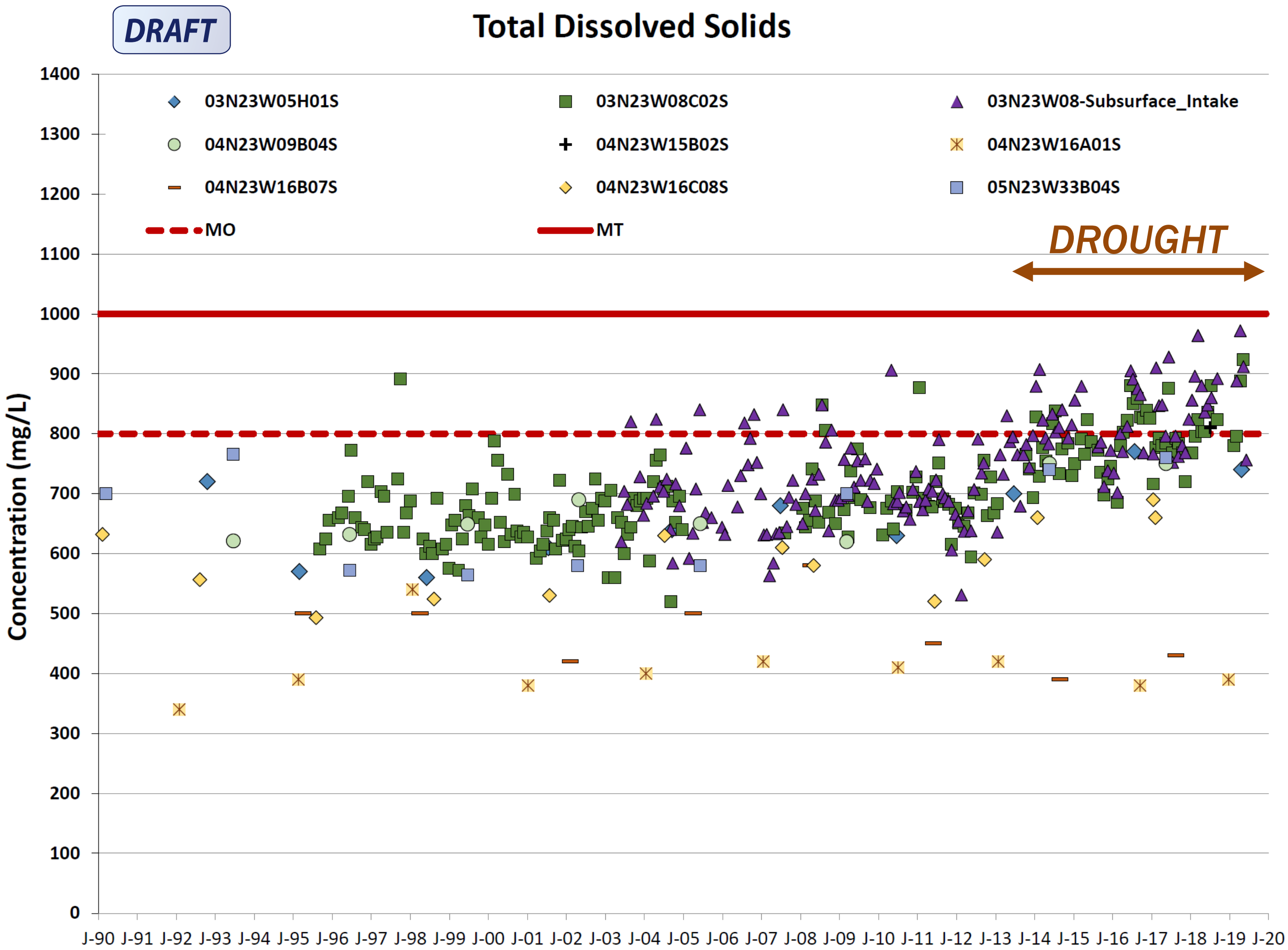
[3] Sustainability Goal for TDS, sulfate, chloride, or boron is considered to be met when at least one-third (1/3) of the primary monitoring wells are below the measurable objective for the constituent being considered.

[4] Avocados are a chloride sensitive crop grown in the Basin and is used as a proxy. The Avocado Production Handbook states that "When chloride and sodium exceed 100 ppm in the water there should be an alerted concern for ensuring adequate leaching of the root zone." Accordingly it is concluded that significant and unreasonable effects may occur at concentrations in excess of 100 mg/L https://ucanr.edu/sites/alternativefruits/Avocados/Literature/

[5] Upper limit of boron tolerance for citrus and avocado is 0.75. US Department of Agriculture: https://www.ars.usda.gov/pacific-west-area/riverside-ca/agricultural-water-efficiency-and-salinity-research-unit/docs/databases/boron-tolerance-of-crops/

EXAMPLE WQ SMC CHART

Degraded Quality



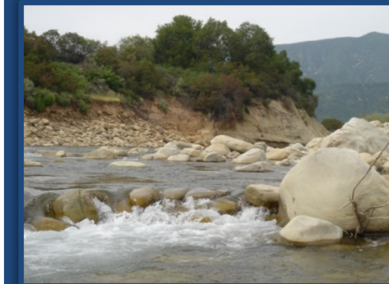
SCM NEXT STEPS

- For more information, please see the Degraded Water Quality White Paper available at https://uvrgroundwater.org/
- UVRGA Board will consider adopting Degraded Water Quality SMC during its March 11 meeting
- Remaining Sustainability Indicators will be developed in March and April

SUSTAINABLE MANAGEMENT CRITERIA QUESTIONS

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

NUMERICAL FLOW MODEL



CASITAS Municipal Water District

We Serve Water

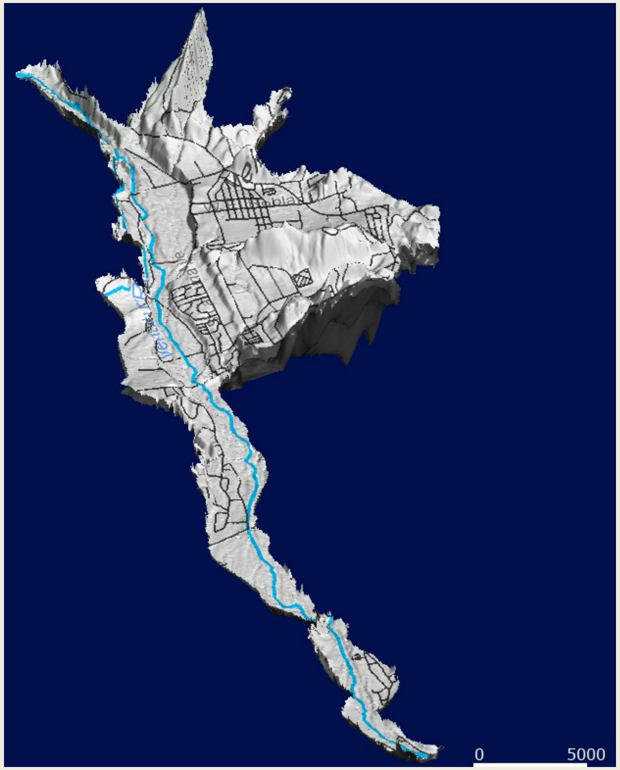
MEINERS OAKS WATER DISTRICT
VENTURA COUNTY SINCE 1949

COUNTY OF VENTURA CALIFORNIA

VENTURA WATER

WHAT IS A NUMERICAL FLOW MODEL?

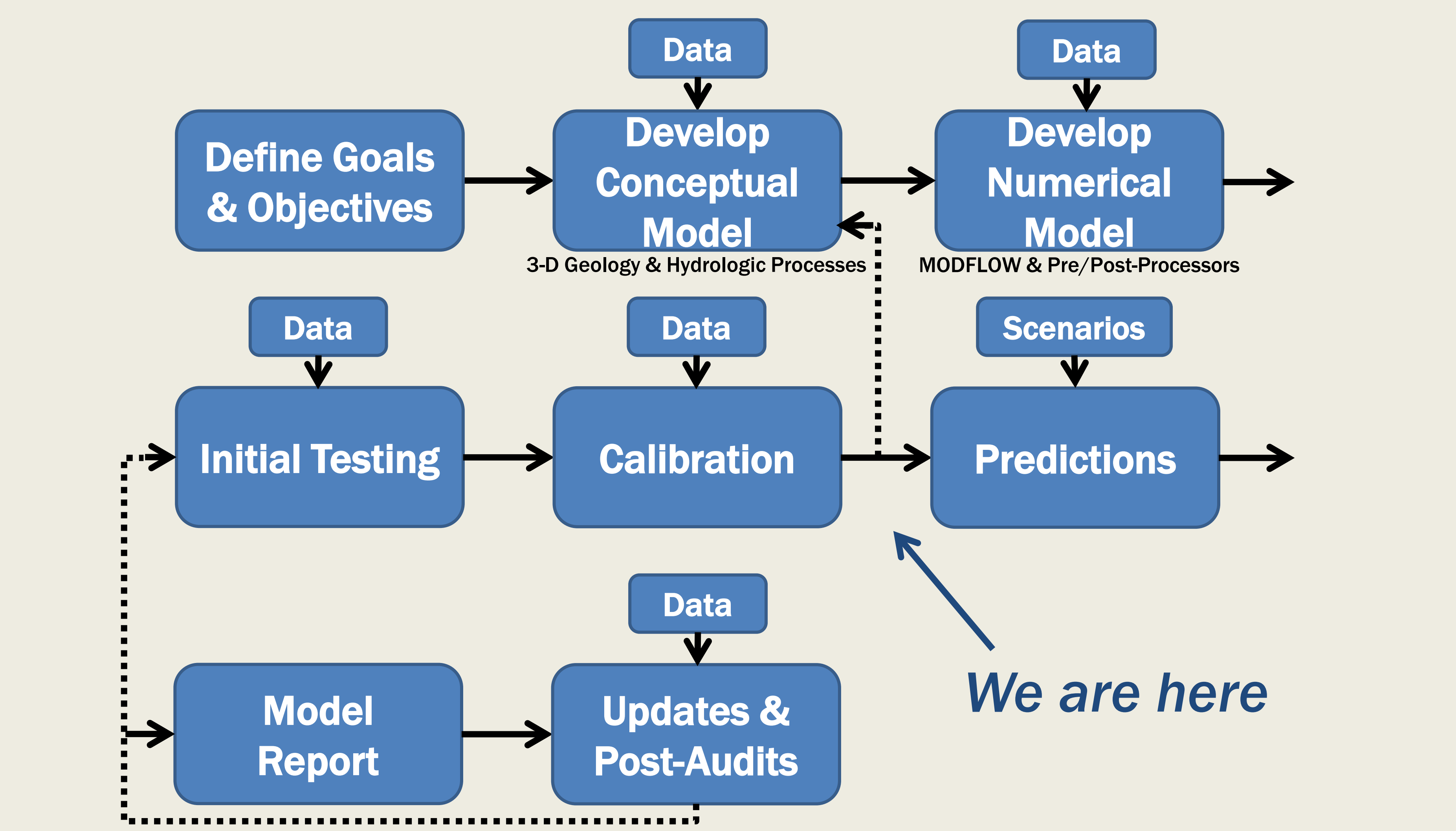
- Mathematical representation of the groundwater (GW) and surface water (SW) flow system
- Solves groundwater flow equation (GW level) and computes flows throughout the SW and GW systems
- A model is an approximation of the real system – only as good as the data upon which the model is based on



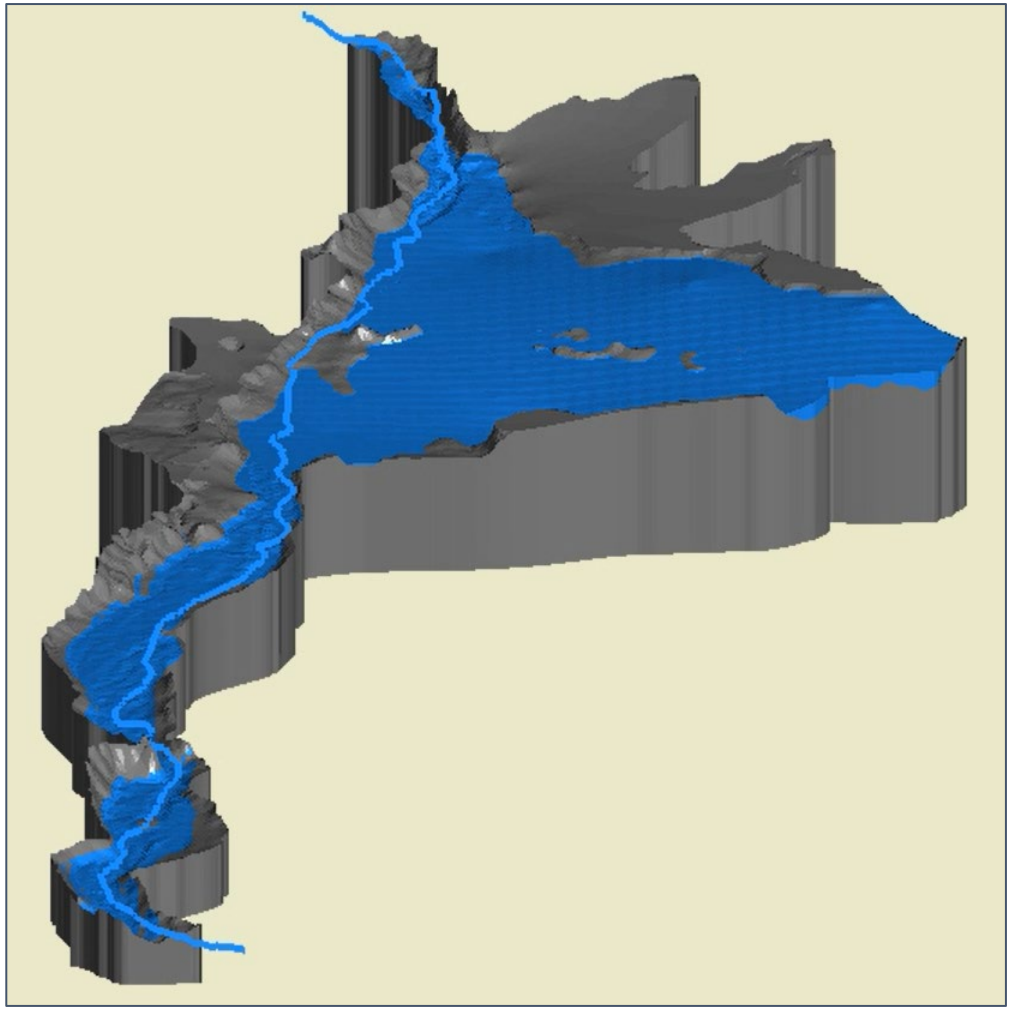
WHY DEVELOP A NUMERICAL FLOW MODEL?

- To comply with SGMA
  - SGMA requires model or “equally effective tool” for:
    - Water budgets
    - Quantification of interconnected surface water depletion
    - Estimate benefits of different projects or management actions (if needed)

GENERAL MODEL DEVELOPMENT PROCESS



Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT



Groundwater Model of the Upper Ventura River Subbasin

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

Mar 11, 2021

1 Hydrogeologic Conceptual Model

- Basin consists of fluvial-origin alluvium derived from weathering/erosion from surrounding mountain
- Younger alluvium deposited within the river floodplain
- Older alluvium underlies young alluvium (in some areas) and tends to be less permeable
- Bedrock consists of older marine deposits, underlies and bounds much of the river floodplain
  - Key driver of groundwater/surface-water interactions
- Oldest alluvial units (Ojai Conglomerate) present in much of Mira Monte Area.
  - Very low permeability and behaves more like bedrock.
- UVRGA basin boundary (modified in 2016) includes mapped (older and younger) alluvium units

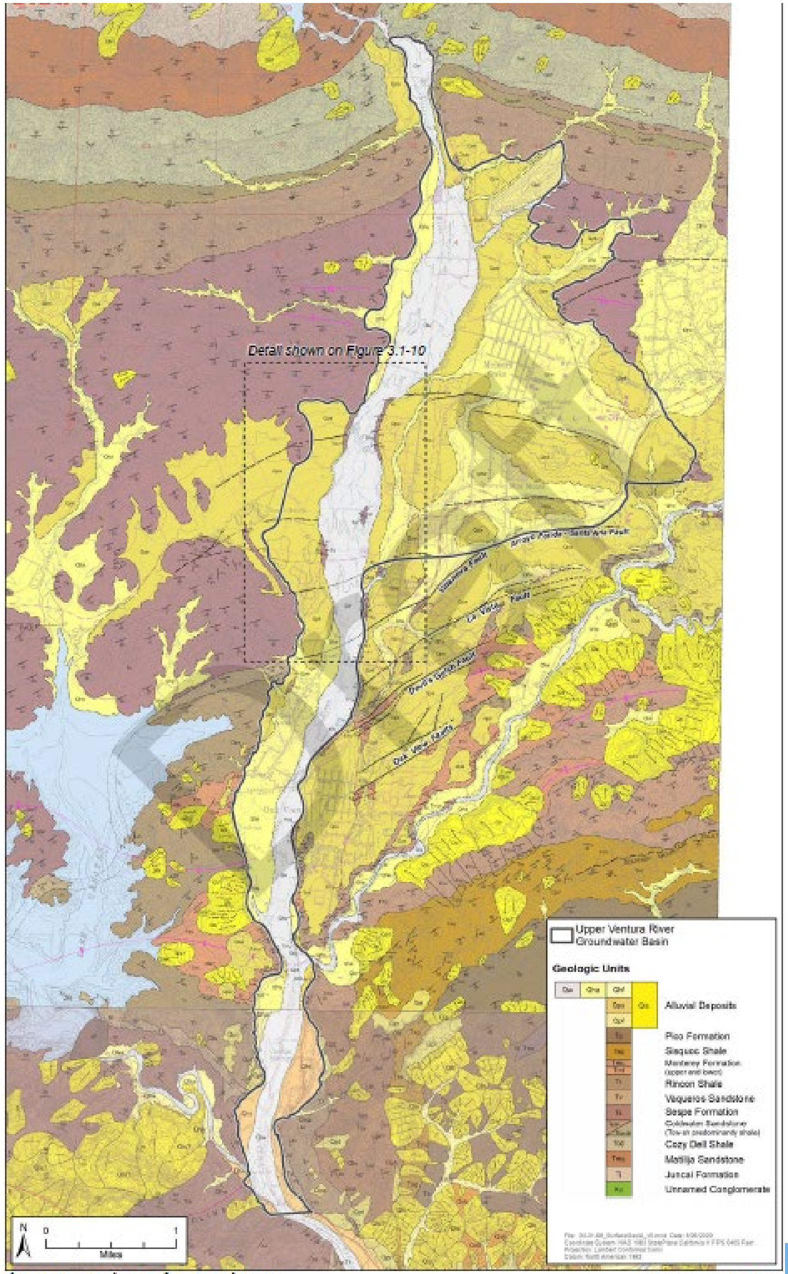
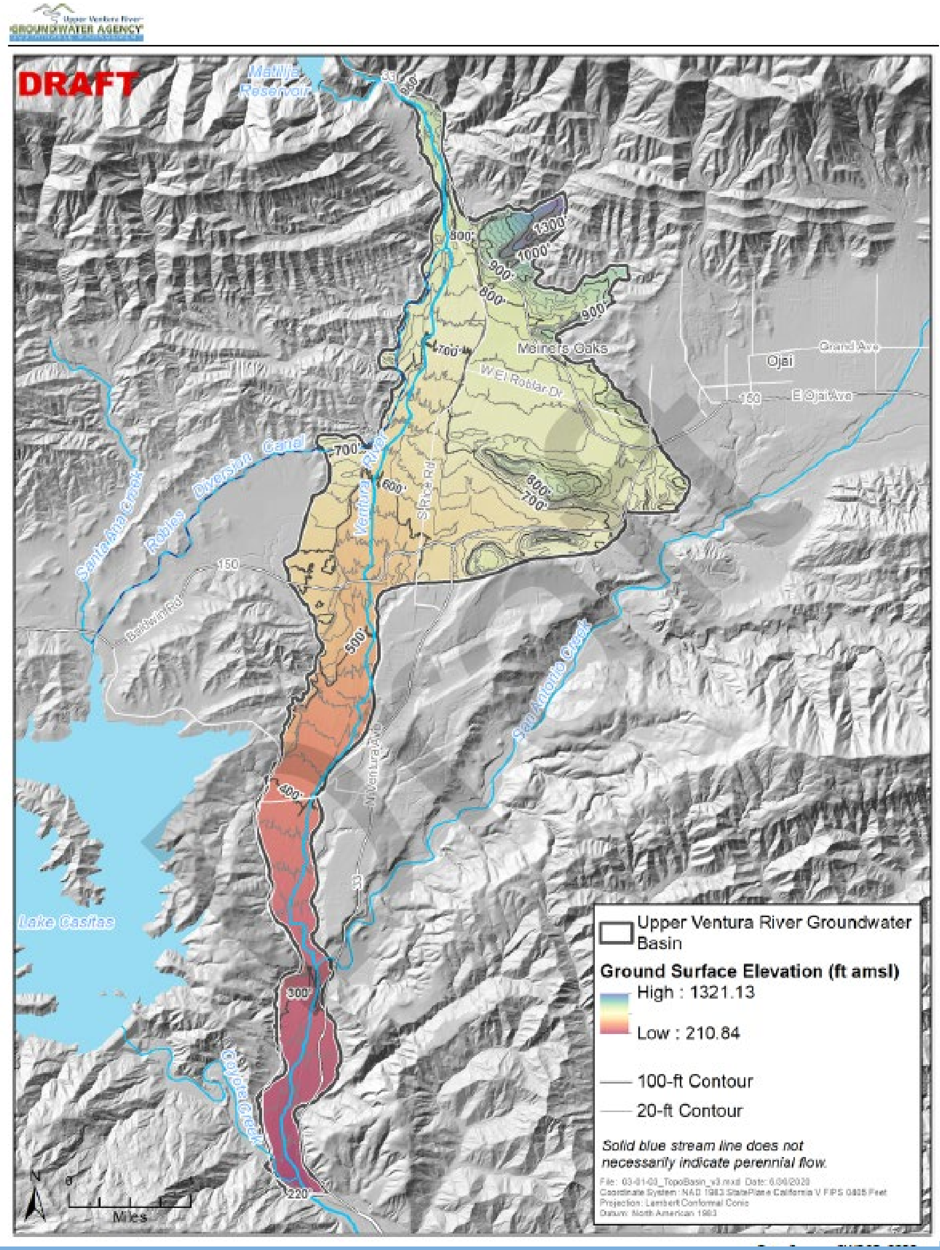


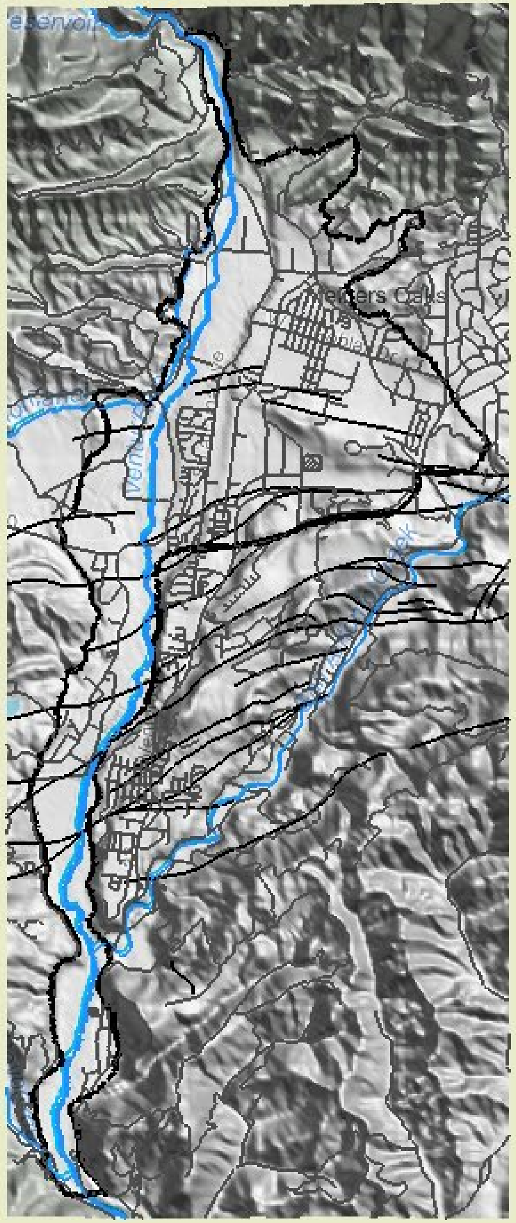
Figure 3.1-9 Regional Surface Geologic Map.

Data Source: USGS, 2003, 2006.

Hydrogeologic Conceptual Model

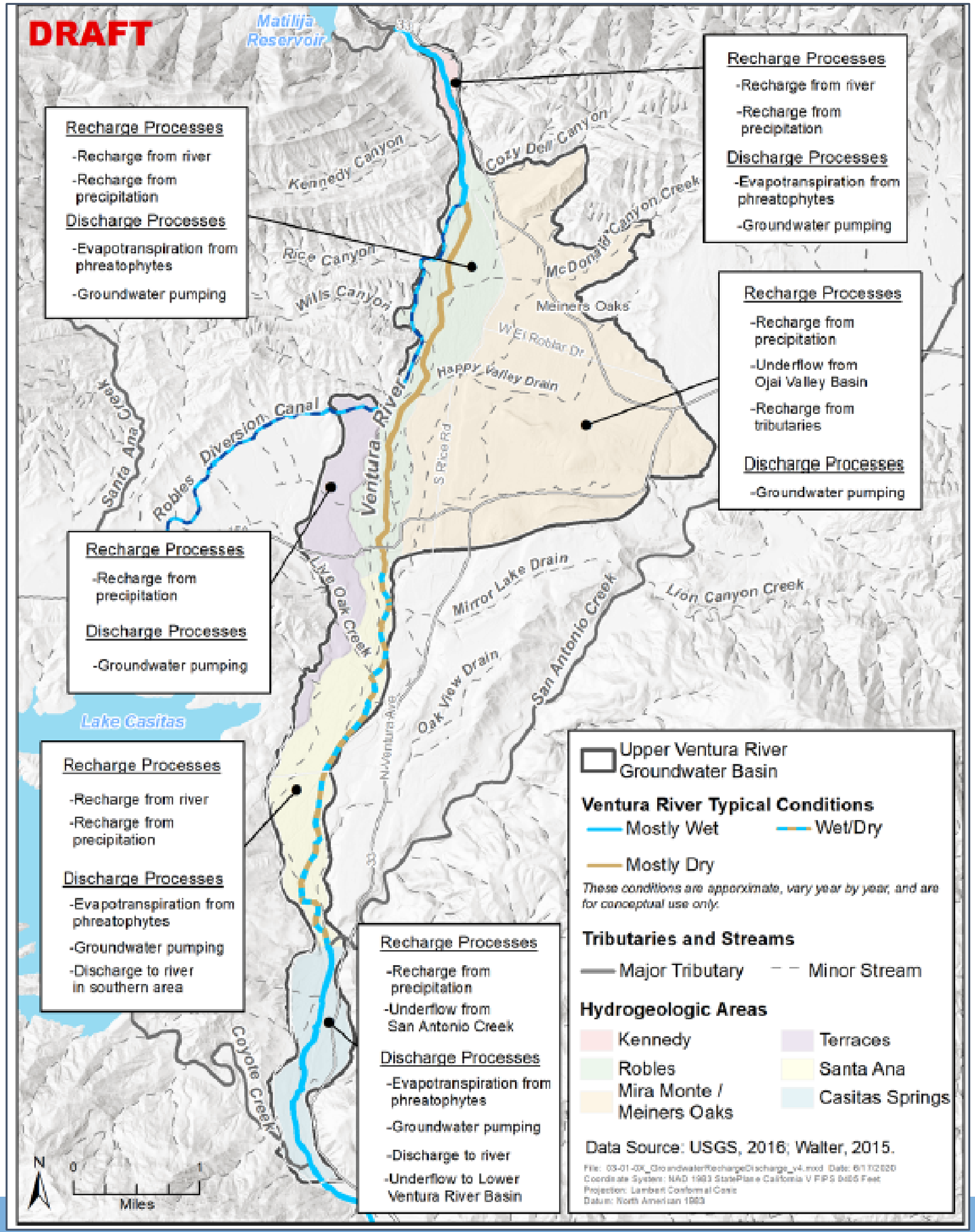
- Basin characterized by highly variable topography and stratigraphy
- Structure and hydrostratigraphy based on SWRCB surfaces
- Topography based on 10 ft Lidar data
- Refined stratigraphy based on review of well-boring logs, well construction records, surface geology maps, and published cross-sections





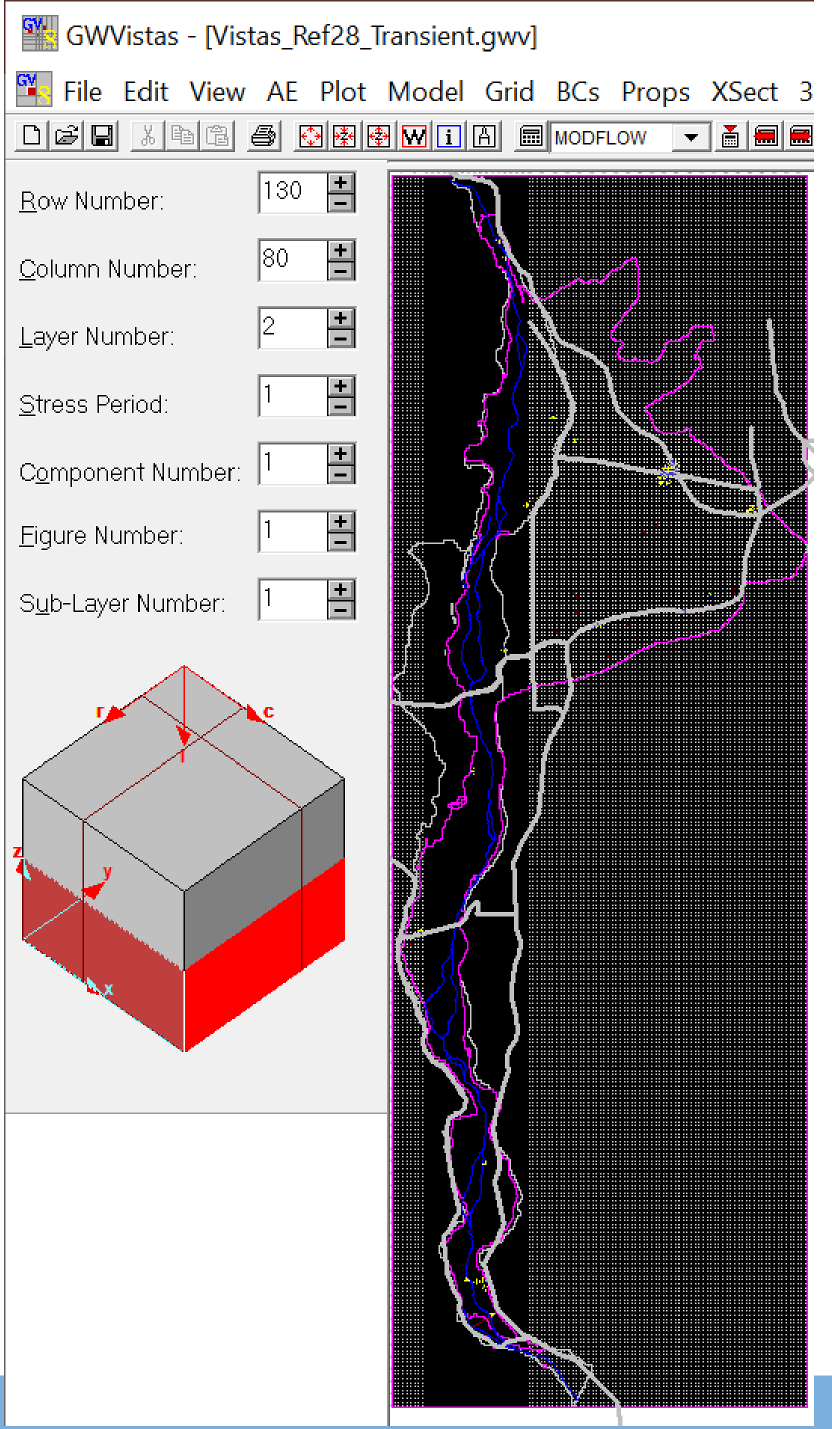
4 Key Recharge/Discharge Processes

- Primary inflow/outflow processes:
  - Flow to/from river
  - Precipitation-based recharge
  - Agricultural and M&I return flows
  - Pumping
  - Evapotranspiration
  - Underflows
- Spatial and temporal variability



5 Numerical Groundwater Model

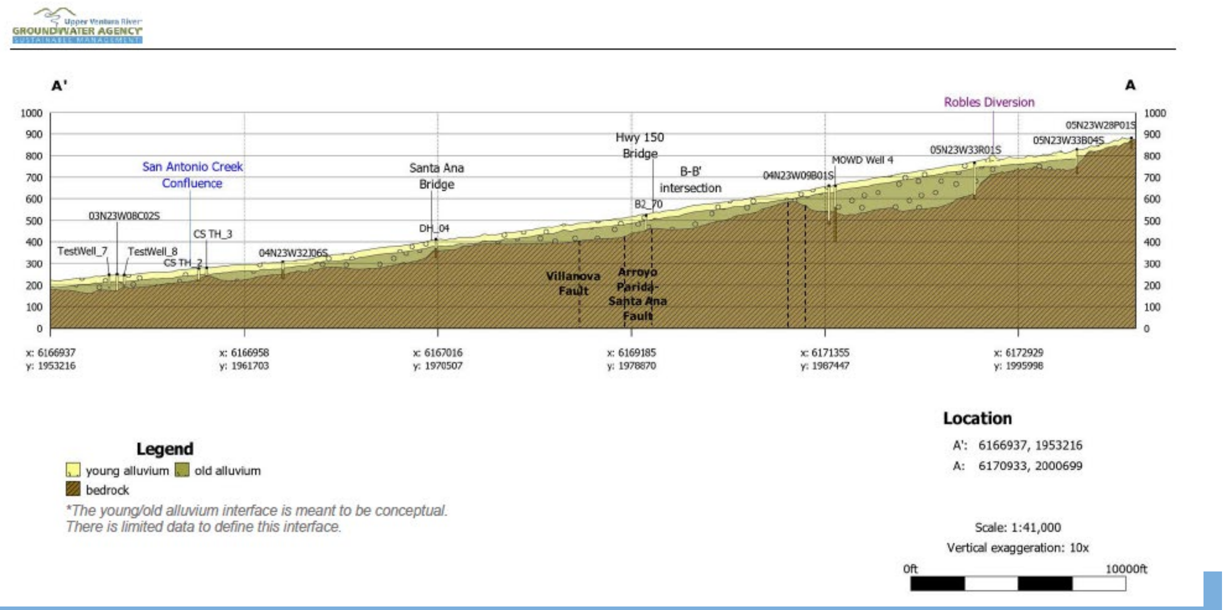
- Finite-Difference Groundwater Model developed in USGS code MODFLOW-NWT (Niswonger et al., 2011)
- Model simulates conditions from 2005 – 2019
  - Daily stress-periods: Nov – Mar; Monthly: Apr - Oct
- Model grid ranges from 50x100 to 100x100 ft
  - 505 rows, 213 columns, 2 layers
  - 215,130 total model grid cells
  - 46,180 active model grid cells
- Simulates groundwater/surface-water interaction using MODFLOW SFR (Prudic et al., 2004) module
- Model development and calibration consistent with ASTM standards (D5447, D5609, D5981)

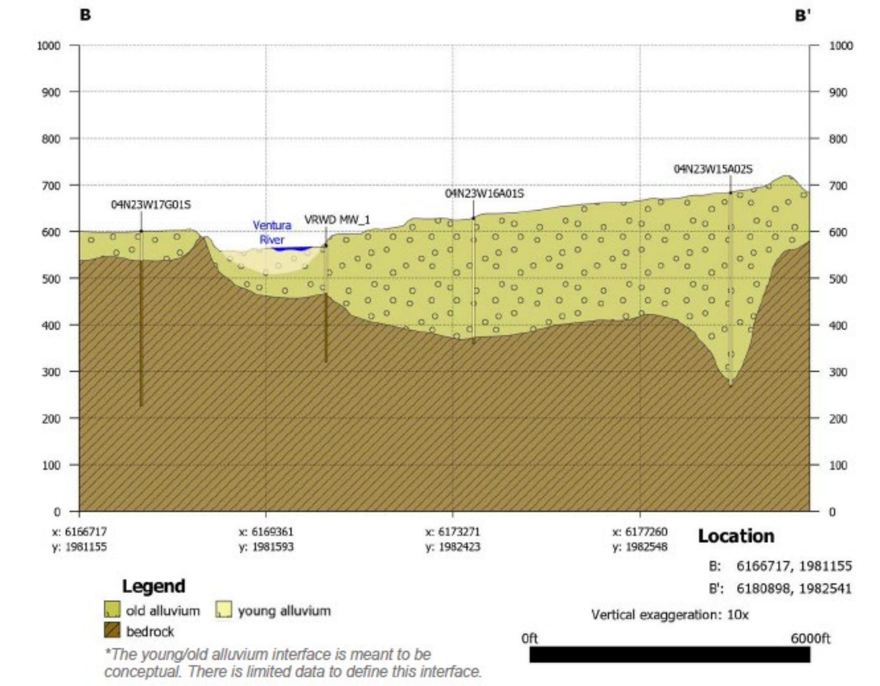


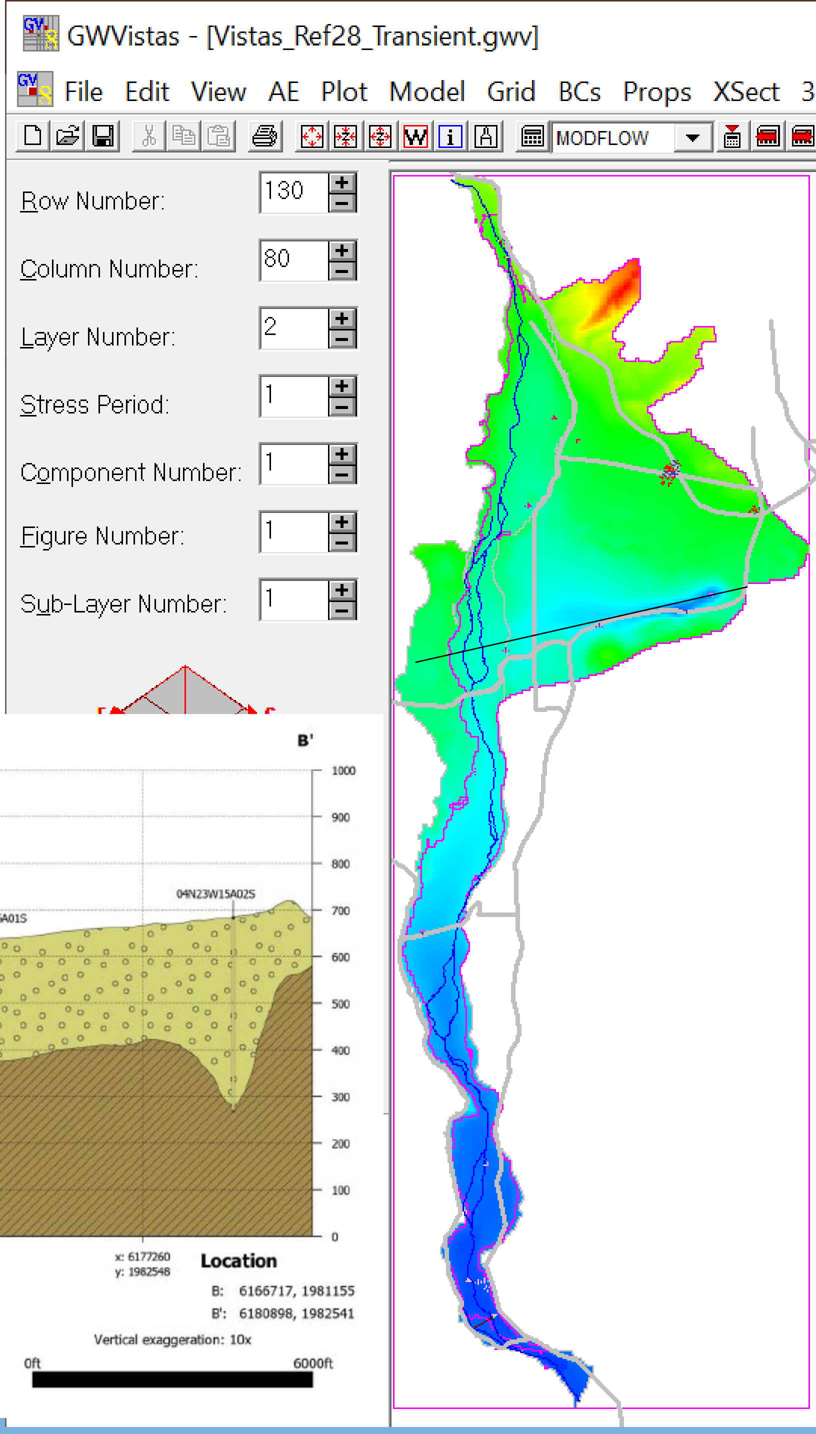
6

Numerical Groundwater Model - Structure

- Model structure based on 3D geologic model
- Depth to bedrock ranges from 200 – 1200 ft amsl
- Alluvium split into two layers
  - Younger alluvium in floodplain (<30 ft deep)
  - Older alluvium in the East and underlying the young alluvium in the floodplain

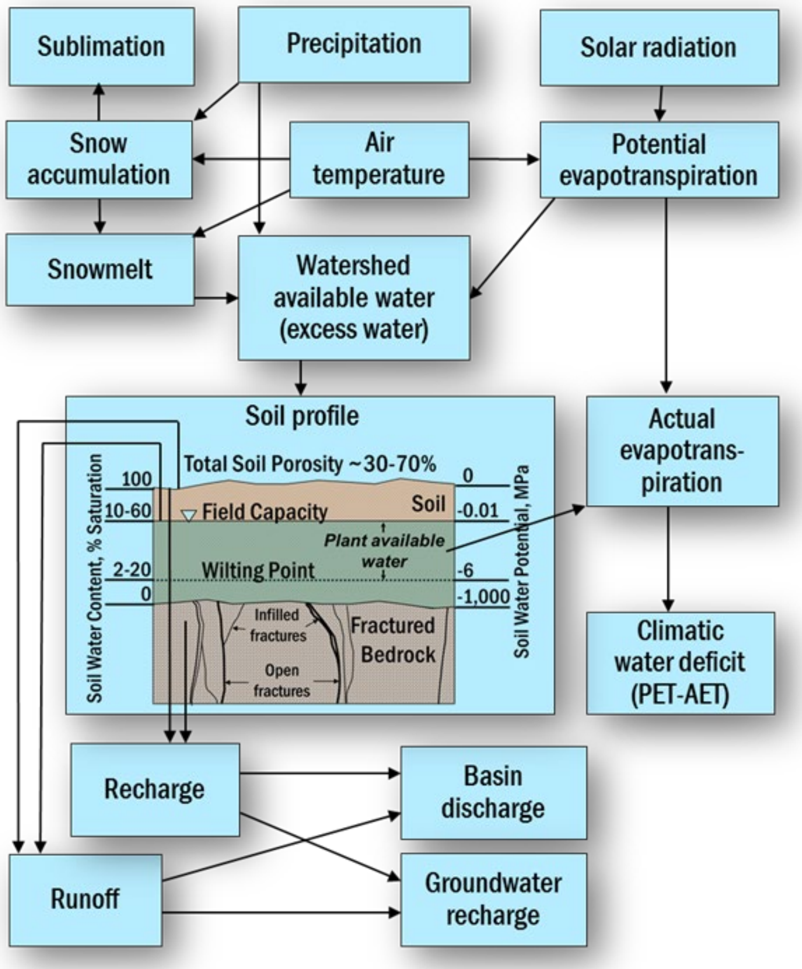






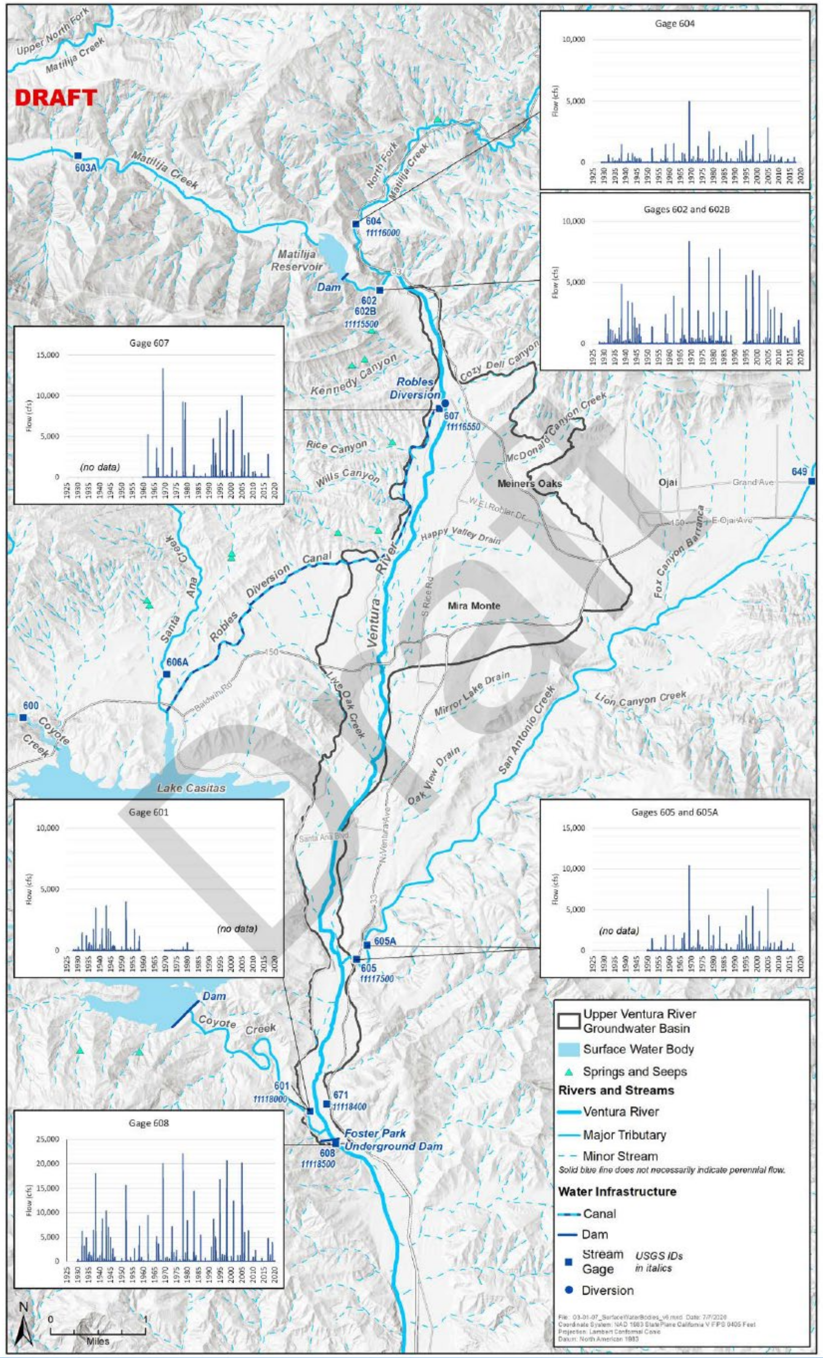
Numerical Groundwater Model - Recharge

- Monthly net recharge from precipitation calculated from California Basin Characterization Model (BCM) developed by USGS (Flints et al, 2013)
  - Regional-scale model incorporates rainfall, run-off, evapotranspiration in the surficial system
- Agricultural and M&I return flows estimated based on available data on water use



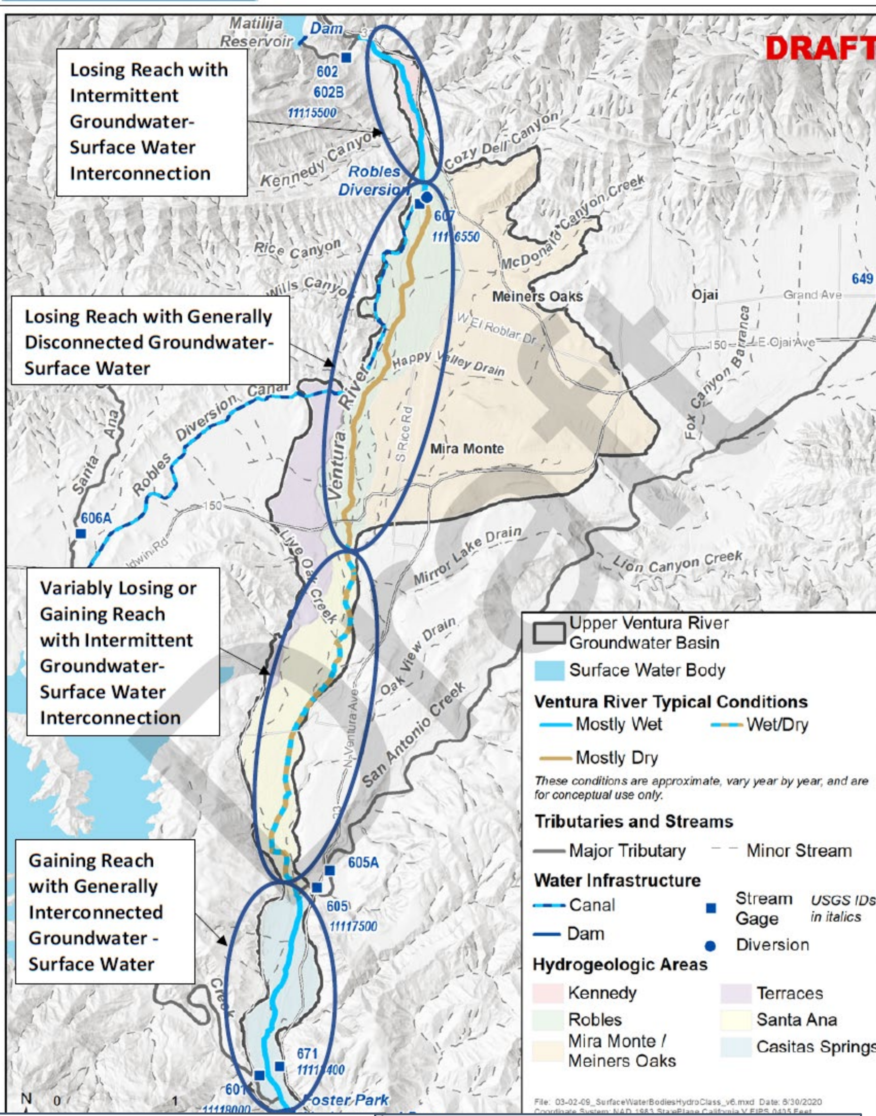
Numerical Groundwater Model - Streamflow

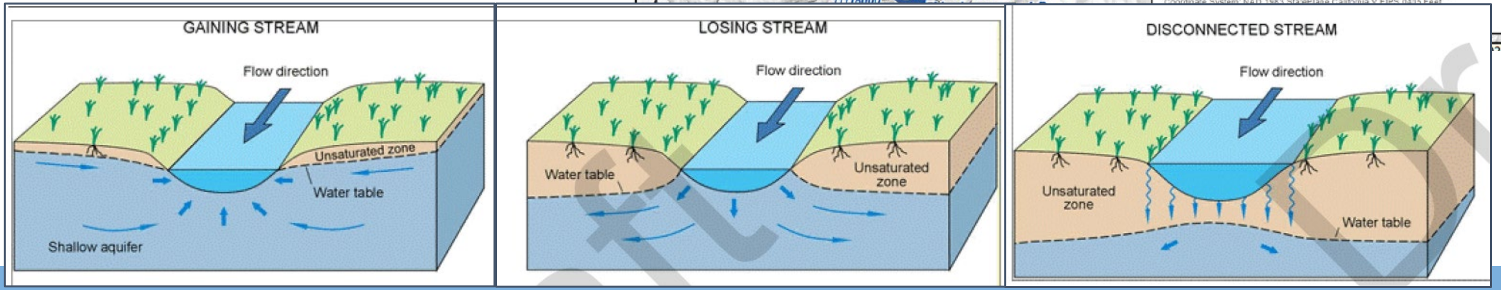
- River channel geometry based on areal imagery and Lidar data
  - Refined available NHD flowlines
  - Includes secondary braids
- Model routes gaged surface-flows from 602 (Matilija Creek) and 604 (North Fork Matilijia Creek)
- Robles Diversions based on daily data from CMWD
- Includes gaged tributary flows from San Antonio Creek and Coyote Creek
- Ungaged tributary flows estimated based on precipitation and size/characteristics of contributing catchment
- Outflow south of the Foster Park gage



Numerical Groundwater Model - Streamflow

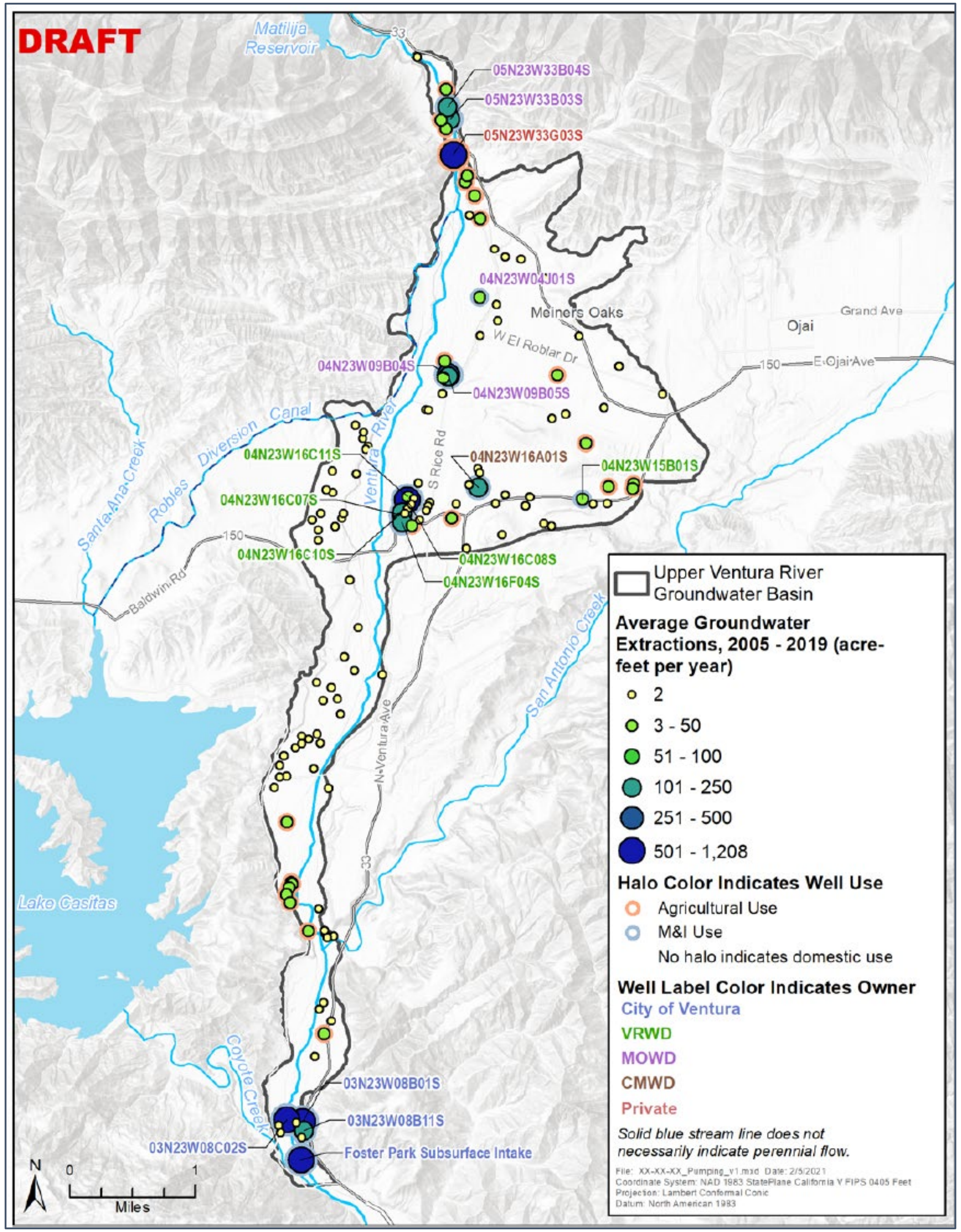
- River divided into 43 segments, with multiple reaches (total of 1462 reaches)
- SFR package routes surface-water along River channel
- Dynamically calculates GW/SW flows based on flow, stage, and width in River and groundwater table at model grid
- River can get disconnected from the water-table or dry up based on flow conditions and groundwater table
- Gaining/losing/intermittent reaches simulated by the model





Numerical Groundwater Model - Pumping

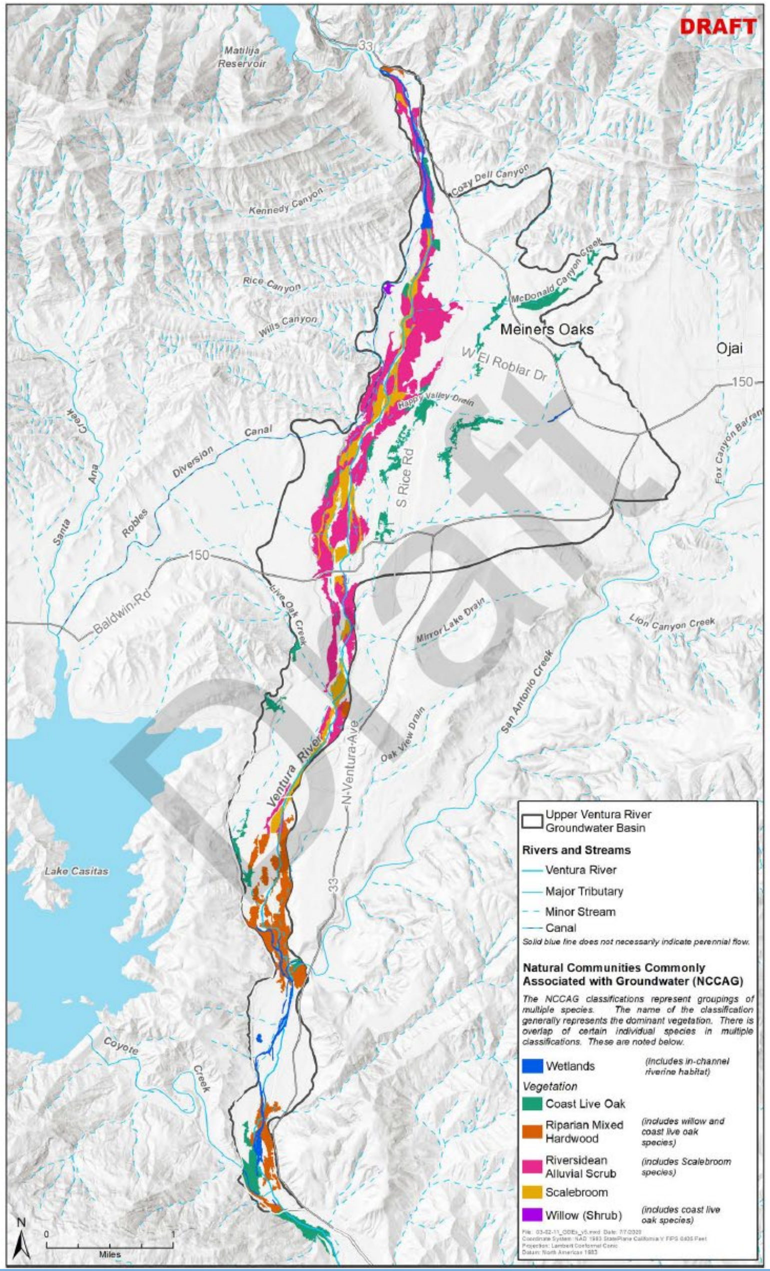
- Model simulates all known groundwater pumping and subsurface intakes between 2005 – 2019
- Data for pumping based on:
  - M&I pumping based on reports and data received from City of Ventura, VRWD, CMWD, and MOWD
  - Ag pumping based on estimates provided by UVRGA Executive Director and Adhoc Committee
- Subsurface dam modeled as a ‘hydraulic flow barrier’
- Subsurface intake modeled as series of wells along lateral intake



11

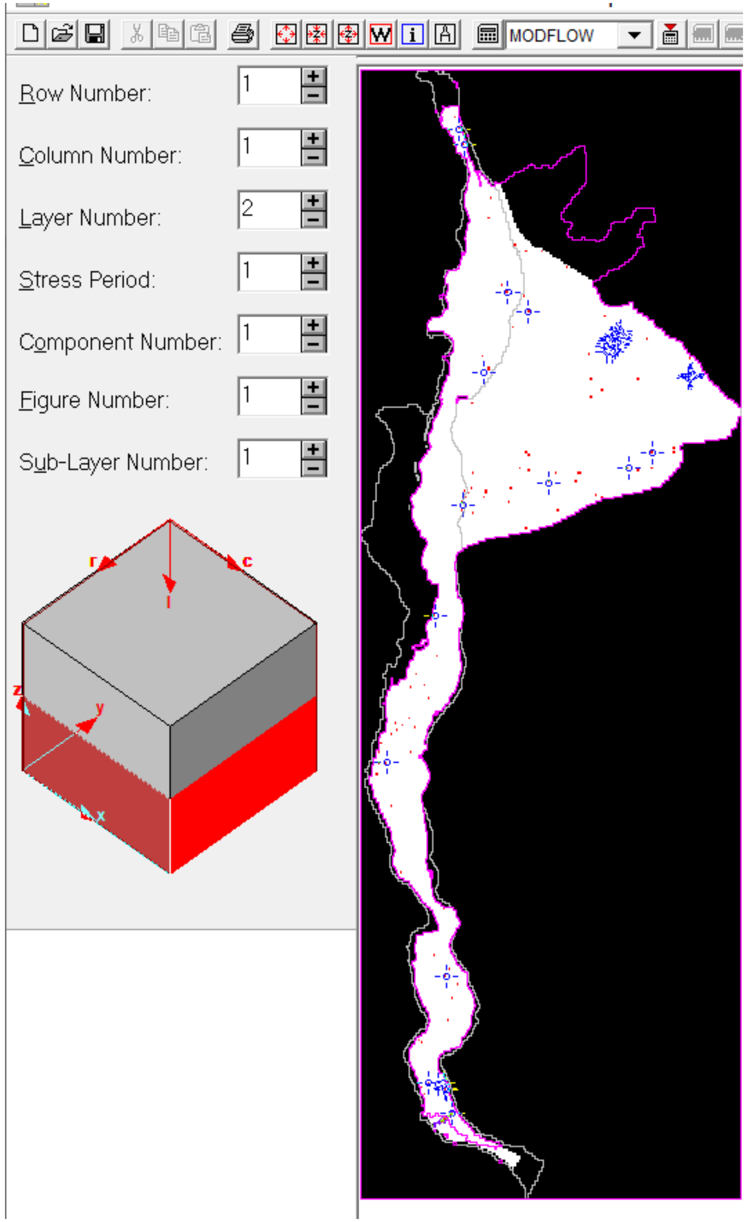
Numerical Groundwater Model - Evapotranspiration

- Groundwater ET by riparian phreatophytes within the River floodplain modeled using the evapotranspiration (EVT) module
- Based on TNC GDE dataset
- Worked with Rincon to develop spatial distributed ET parameters based on type and density of vegetation
- Incorporated time-varying Arundo coverages provided by Rincon
- ET rates incorporate data from two CMWD ET stations



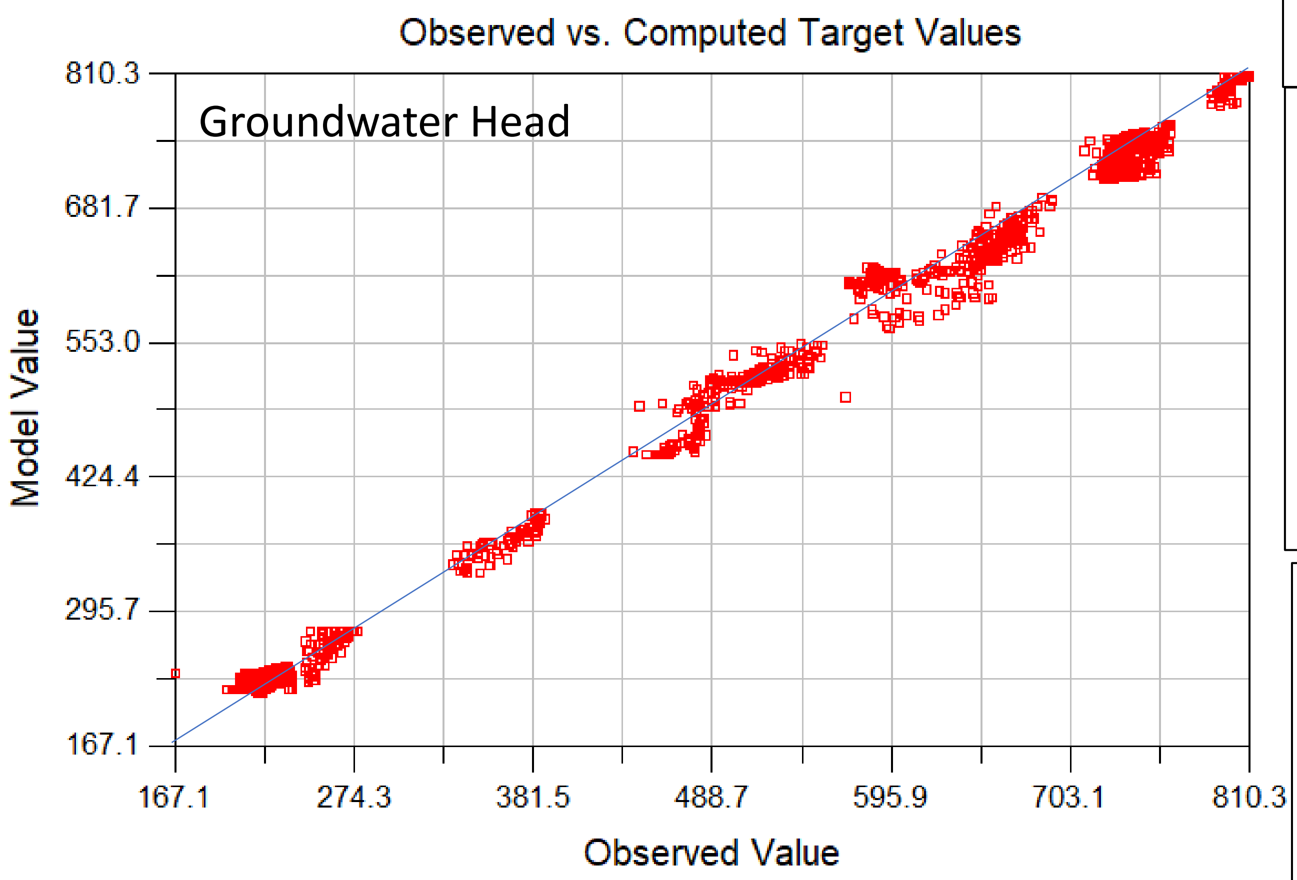
Numerical Groundwater Model - Calibration

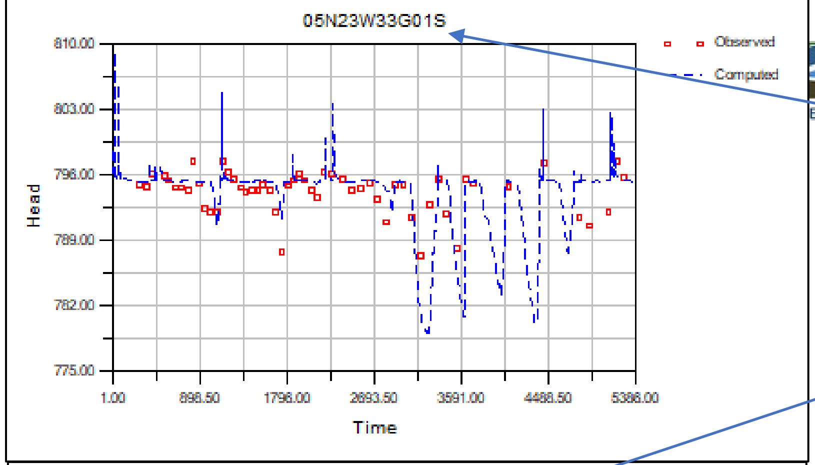
- Model calibrated to historical conditions (2005 – 2019)
- Groundwater model calibrated by varying aquifer hydraulic conductivities and storage properties to match observed groundwater levels
  - Root Mean Square Error = 3% of Range of Observations
  - Well within industry standard of 10%
- Surface-water flows calibrated by varying riverbed depth/conductance as well as groundwater parameters (conductivities and storage)
  - Match simulated and observed flows at Foster Park gauge and Robles Diversion gage
  - Match gaining/losing/intermittent reaches in different parts of the river

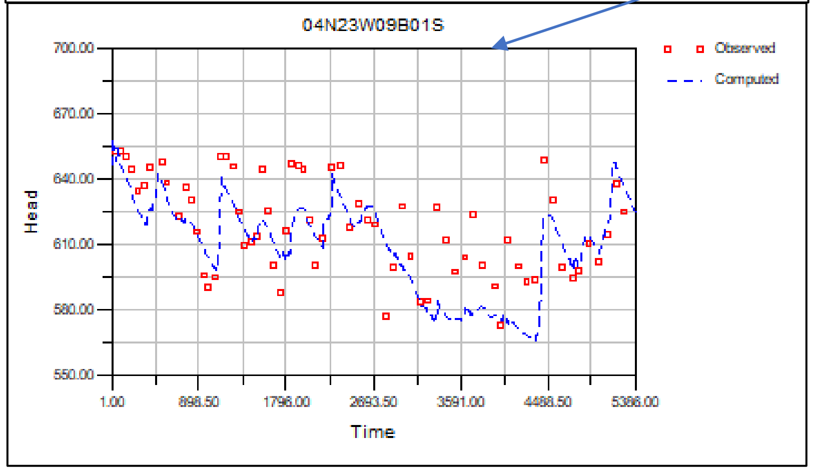


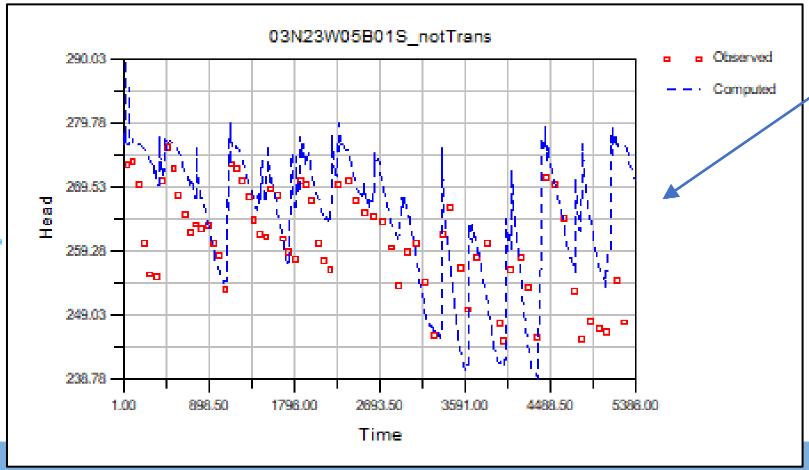
13

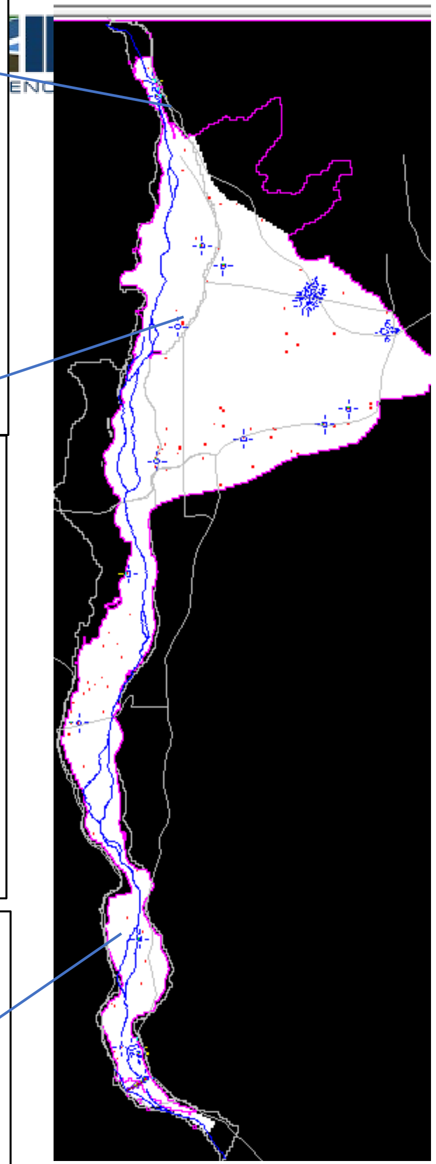
Numerical Groundwater Model - Calibration



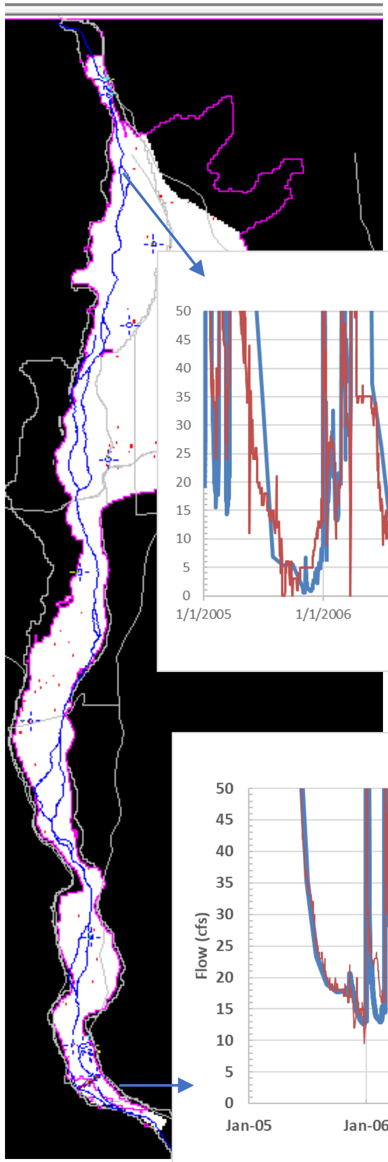


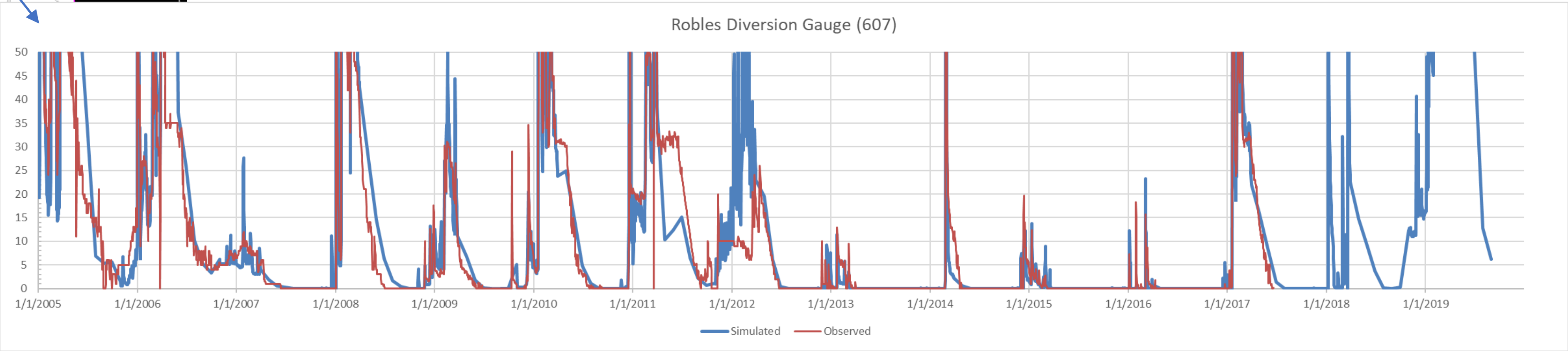


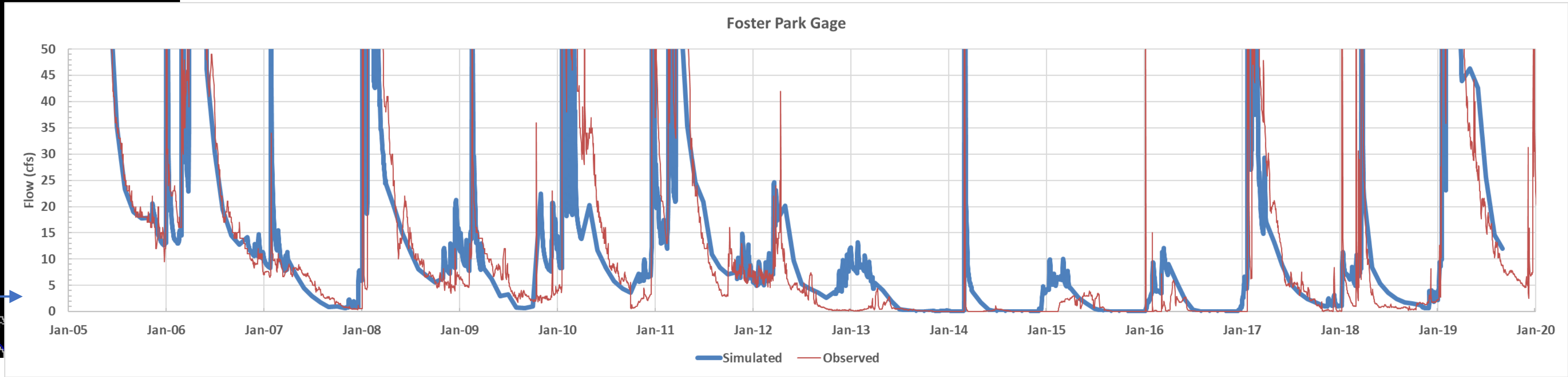




Numerical Groundwater Model - Calibration







Model Use and Limitations

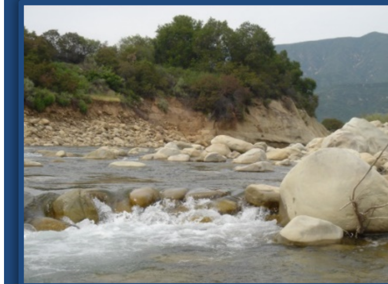
- Groundwater:
  - Model well calibrated to trends in groundwater elevations
  - Can be reliably used to estimate future trends in water levels, storage, and pumping impacts
  - Eastern area has limited area and complex structure – additional data would improve predictive capabilities
- Surface-water
  - Model matches low flows during summer/fall (within 1 cfs uncertainty)
  - Simulated spring baseflows lower than measured
  - Error/data-gaps in gage records impact model calibration
- Depth to bedrock is a key driver for groundwater levels and SW/GW interactions – additional geophysical/seismic data would help improve understanding
- Additional GW monitoring (near the river) and SW gages will reduce model uncertainty

Next Steps

- Finalize calibration and compile historical water budget information for GSP historical and “current” water budget requirements
- 50-year simulations for GSP future water budget projection requirements
- Simulations to evaluate depletion of interconnected surface water depletion sustainability indicator
- Model documentation TM – for GSP

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

NEXT STEPS



CASITAS Municipal Water District

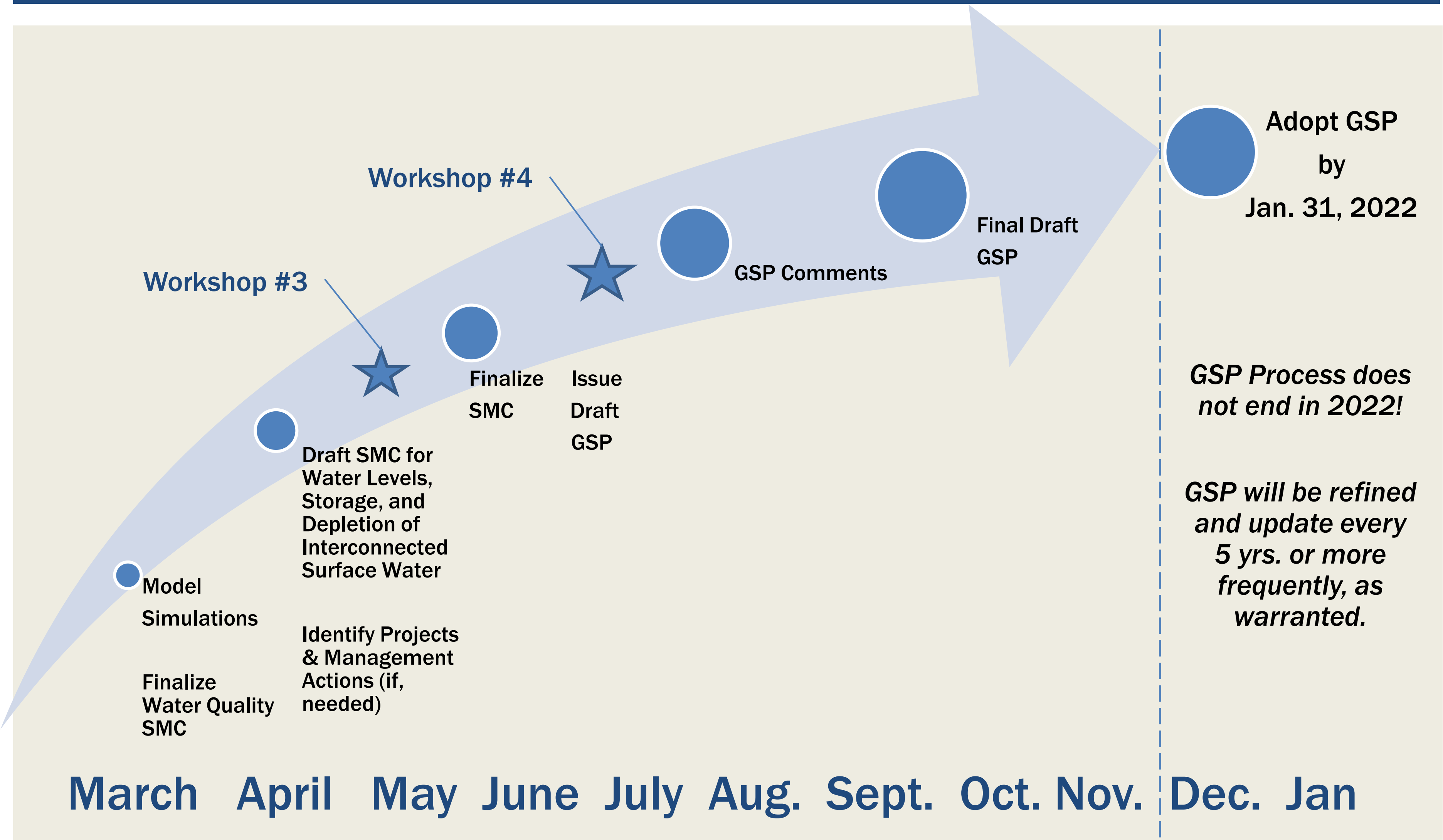
We Serve Water

MEINERS OAKS WATER DISTRICT VENTURA COUNTY SINCE 1949

COUNTY OF VENTURA CALIFORNIA

VENTURA WATER

NEXT STEPS

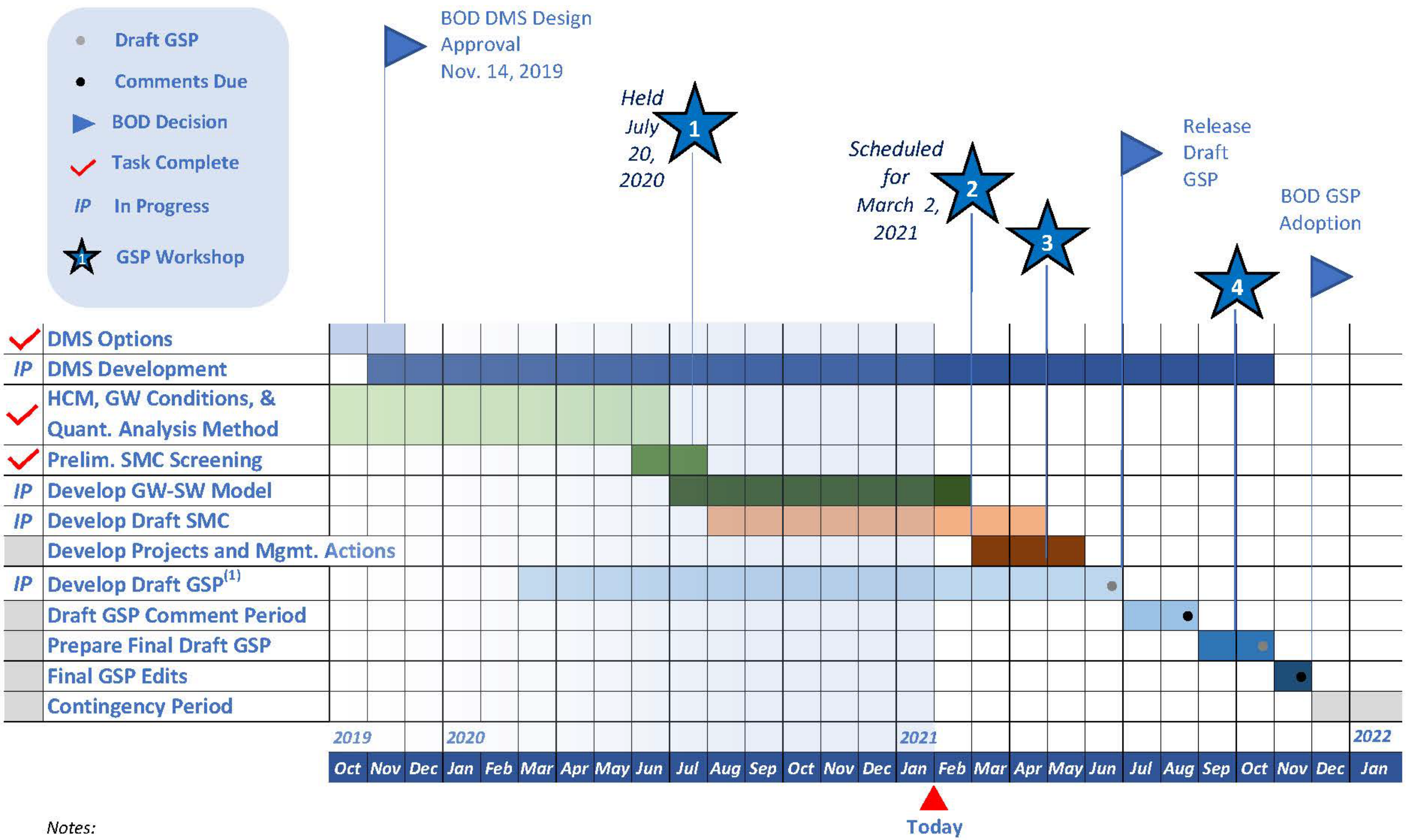


Workshop #4
Workshop #3
Model Simulations
Finalize Water Quality SMC
Draft SMC for Water Levels, Storage, and Depletion of Interconnected Surface Water
Identify Projects & Management Actions (if, needed)
Finalize SMC
Issue Draft GSP
GSP Comments
Final Draft GSP
Adopt GSP by Jan. 31, 2022
GSP Process does not end in 2022!
GSP will be refined and update every 5 yrs. or more frequently, as warranted.
March
April
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
Jan

GSP DEVELOPMENT SCHEDULE WILL BE UPDATED ON UVRGA WEBSITE

Upper Ventura River Groundwater Agency

GSP Development Schedule Updated January 31, 2021



Notes:

(1) GSP topics not listed above generally consist of background or supporting information and will be prepared concurrently with the above-listed tasks.

BOD = Board of Directors; DMS = Data Management System; HCM = Hydrogeologic Conceptual Model; GSA = Groundwater Sustainability Agency;

GSP = Groundwater Sustainability Plan; GW = Groundwater; SW = Surface Water

NEXT STEPS
QUESTIONS

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

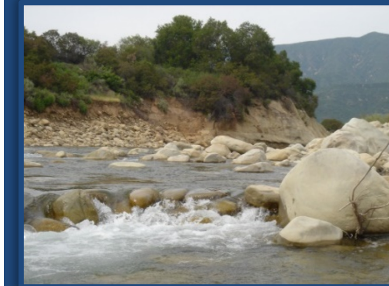
STAKEHOLDER
Q&A
&
FEEDBACK

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

ATTENDEE POLL NOS. 4 - 7

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

UVRGA DIRECTOR COMMENTS



CASITAS Municipal Water District

We Serve Water

MEINERS OAKS WATER DISTRICT
VENTURA COUNTY SINCE 1949

COUNTY OF VENTURA CALIFORNIA

VENTURA WATER

PLEASE STAY ENGAGED!!!

- Track status at: https://uvrgroundwater.org/
- Join the UVRGA Interested Parties List: https://uvrgroundwater.org/join-interested-parties-list/
- Email inquiries to: bbondy@uvrgroundwater.org

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

WRAP UP
THANK YOU FOR PARTICIPATING!

CASITAS Municipal Water District

We Serve Water

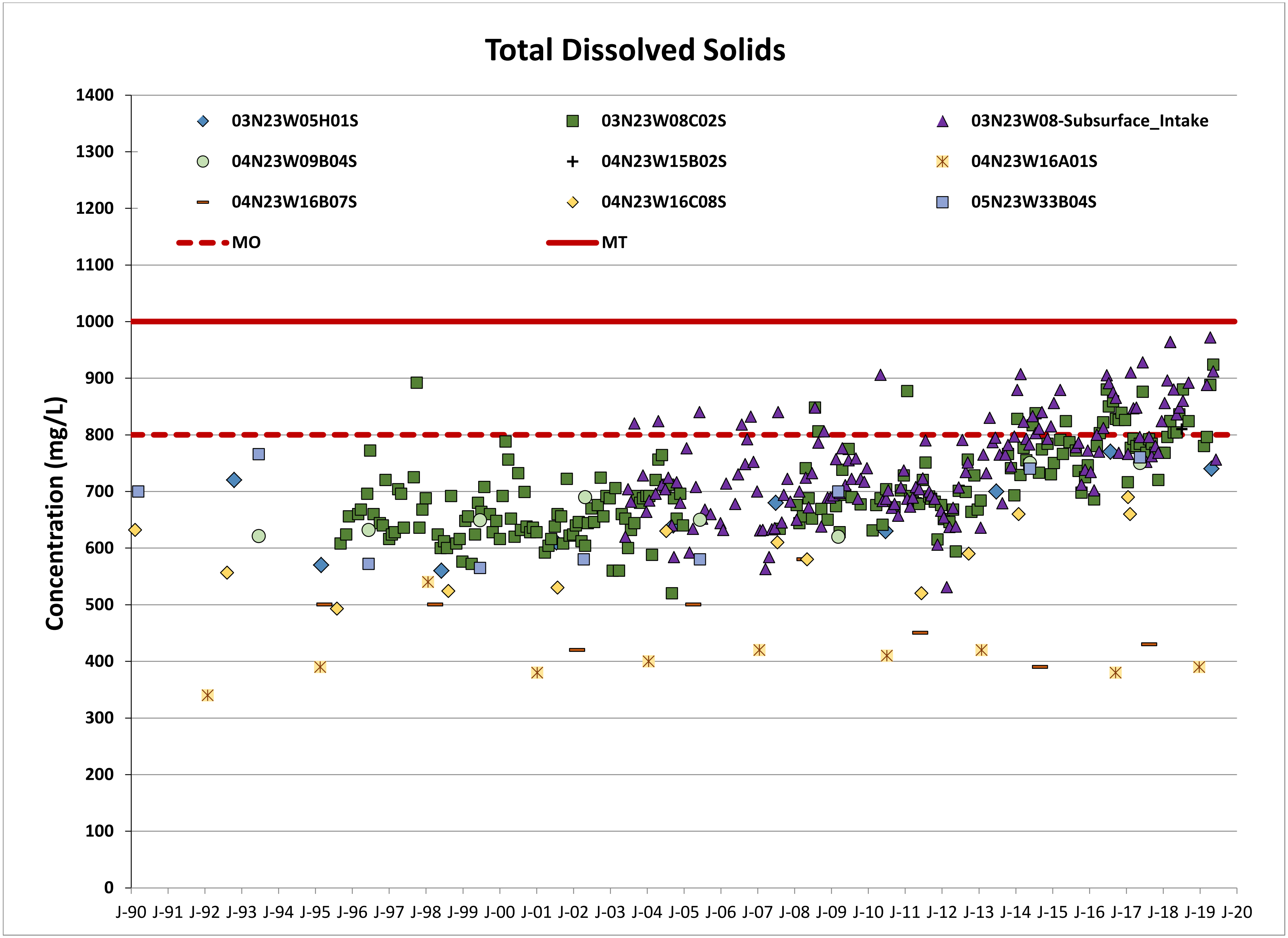
MEINERS OAKS WATER DISTRICT
VENTURA COUNTY SINCE 1949

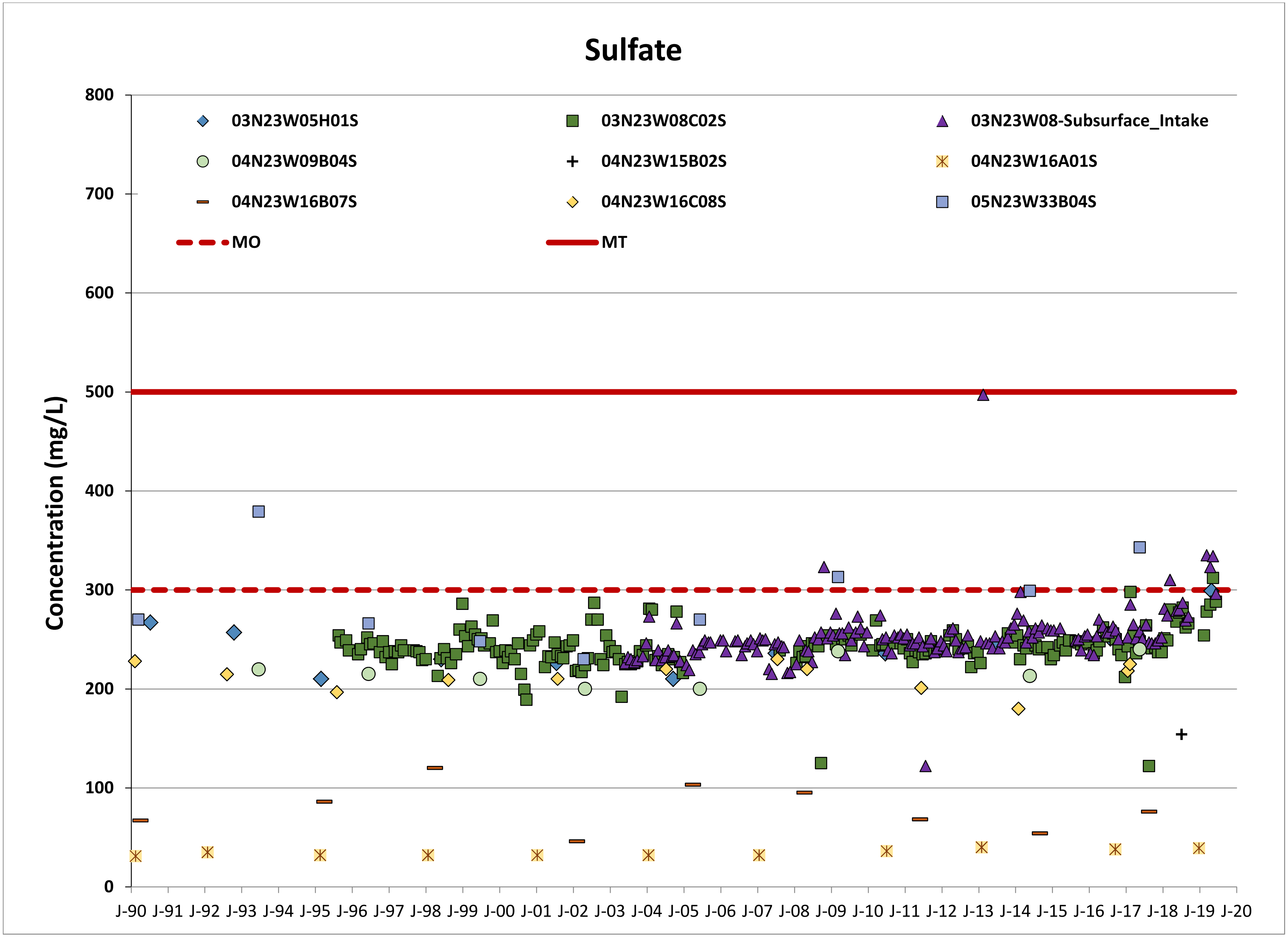
COUNTY OF VENTURA CALIFORNIA

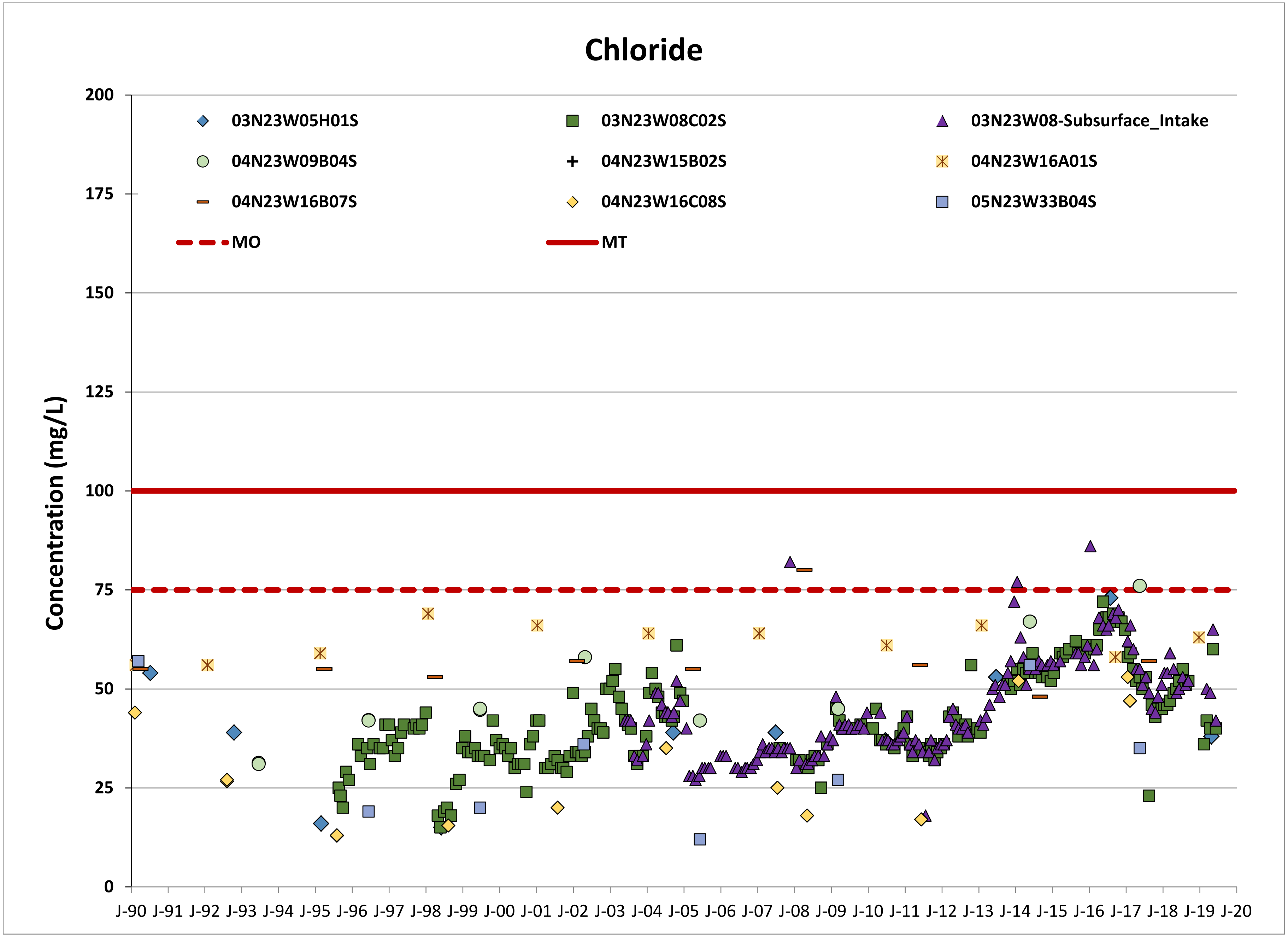
VENTURA WATER

Upper Ventura River
GROUNDWATER AGENCY
SUSTAINABLE MANAGEMENT

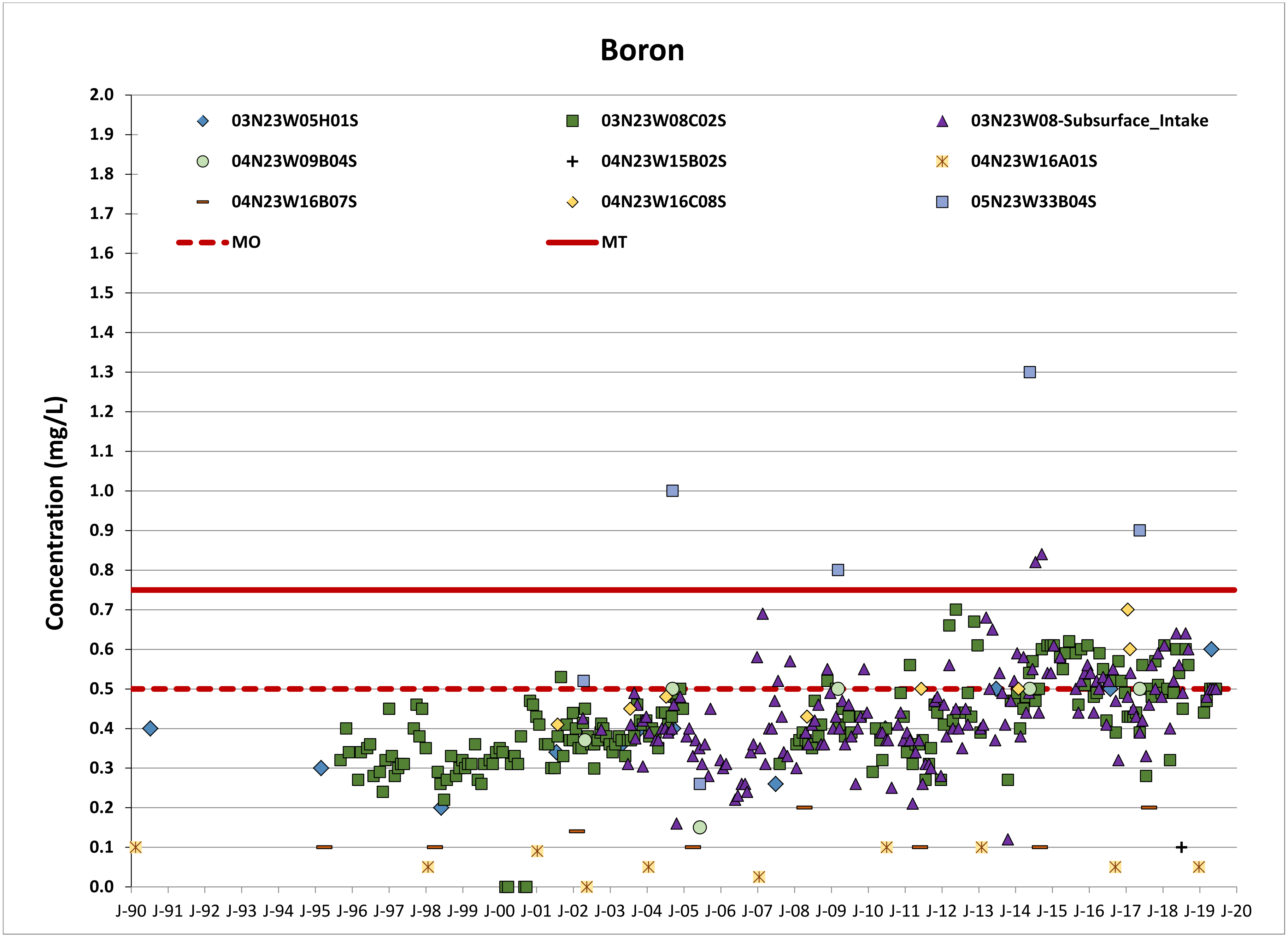
EXTRA SLIDES


Total Dissolved Solids
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
03N23W05H01S
03N23W08C02S
03N23W08-Subsurface_Intake
04N23W09B04S
04N23W15B02S
04N23W16A01S
04N23W16B07S
04N23W16C08S
05N23W33B04S
MO
MT
J-90
J-91
J-92
J-93
J-94
J-95
J-96
J-97
J-98
J-99
J-00
J-01
J-02
J-03
J-04
J-05
J-06
J-07
J-08
J-09
J-10
J-11
J-12
J-13
J-14
J-15
J-16
J-17
J-18
J-19
J-20

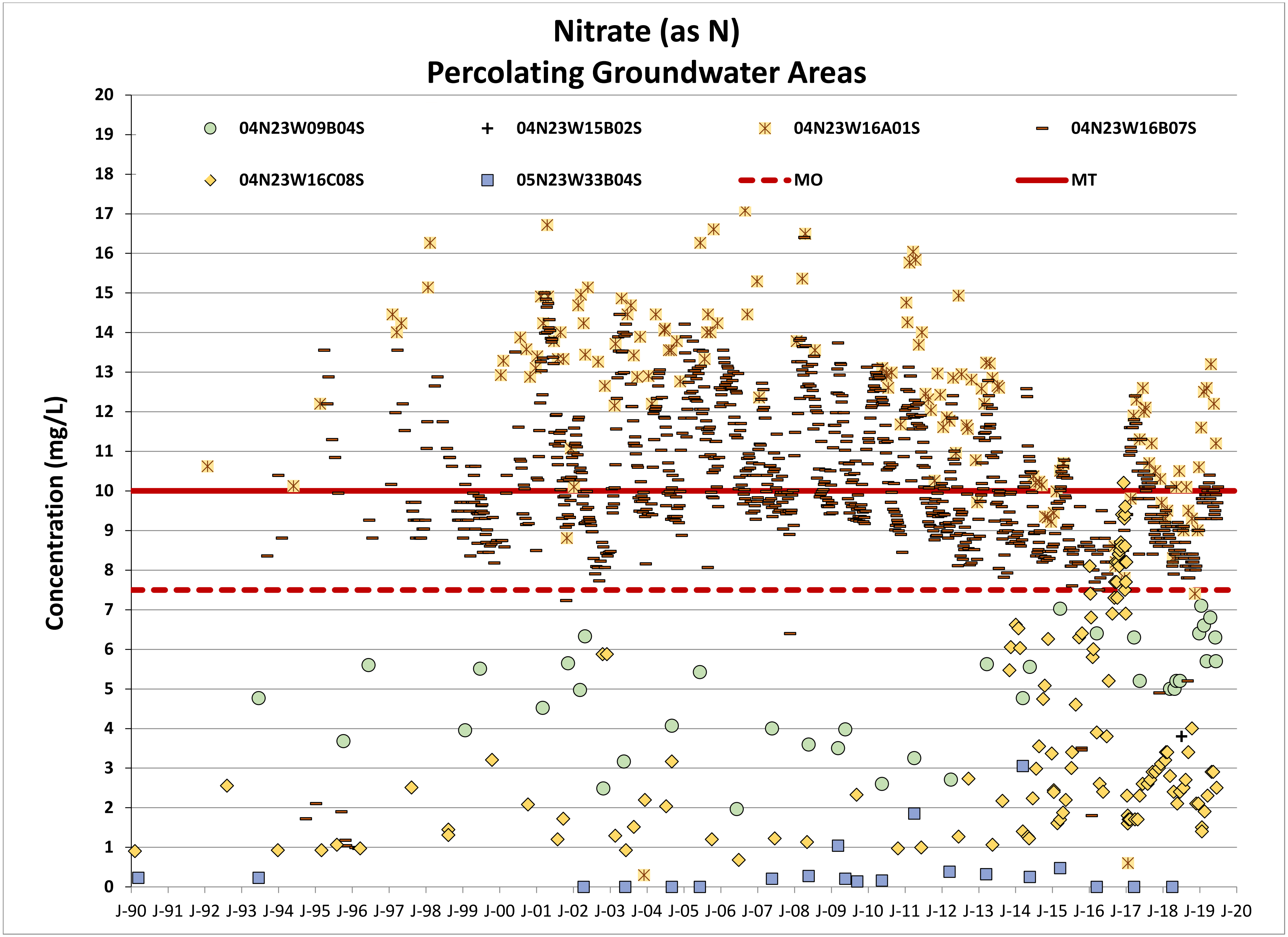

Sulfate
Concentration (mg/L)
0
100
200
300
400
500
600
700
800
03N23W05H01S
03N23W08C02S
03N23W08-Subsurface_Intake
04N23W09B04S
04N23W15B02S
04N23W16A01S
04N23W16B07S
04N23W16C08S
05N23W33B04S
MO
MT
J-90
J-91
J-92
J-93
J-94
J-95
J-96
J-97
J-98
J-99
J-00
J-01
J-02
J-03
J-04
J-05
J-06
J-07
J-08
J-09
J-10
J-11
J-12
J-13
J-14
J-15
J-16
J-17
J-18
J-19
J-20

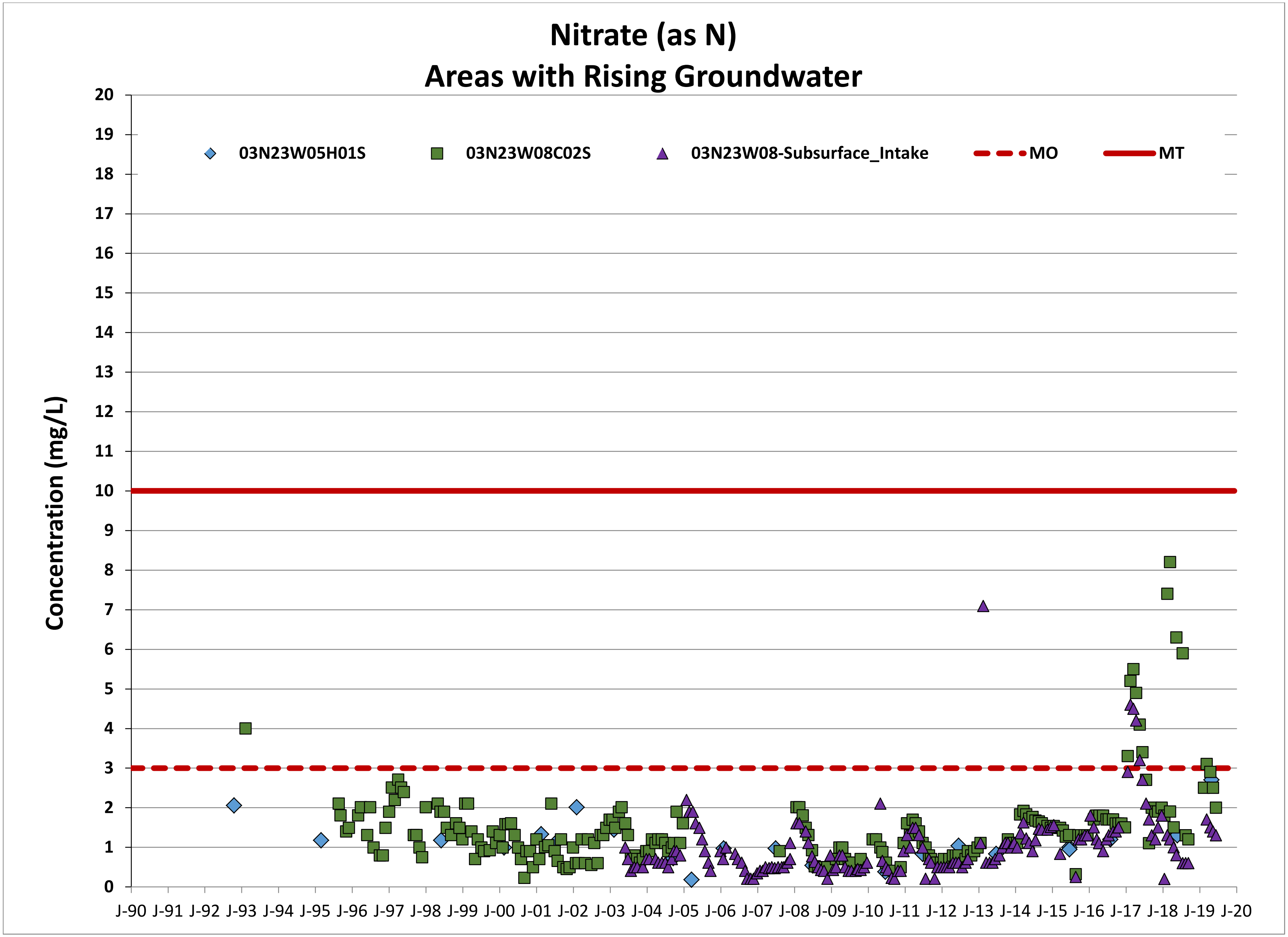


Chloride
Concentration (mg/L)
200
175
150
125
100
75
50
25
0
03N23W05H01S
03N23W08C02S
03N23W08-Subsurface_Intake
04N23W09B04S
04N23W15B02S
04N23W16A01S
04N23W16B07S
04N23W16C08S
05N23W33B04S
MO
MT
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20



Boron
Concentration (mg/L)
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
03N23W05H01S
03N23W08C02S
03N23W08-Subsurface_Intake
04N23W09B04S
04N23W15B02S
04N23W16A01S
04N23W16B07S
04N23W16C08S
05N23W33B04S
MO
MT
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20


Nitrate (as N)
Percolating Groundwater Areas
Concentration (mg/L)
04N23W09B04S
04N23W15B02S
04N23W16A01S
04N23W16B07S
04N23W16C08S
05N23W33B04S
MO
MT
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20


Nitrate (as N)
Areas with Rising Groundwater
Concentration (mg/L)
03N23W05H01S
03N23W08C02S
03N23W08-Subsurface_Intake
MO
MT
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
J-90 J-91 J-92 J-93 J-94 J-95 J-96 J-97 J-98 J-99 J-00 J-01 J-02 J-03 J-04 J-05 J-06 J-07 J-08 J-09 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20