CMA

Santa Ynez River Valley Groundwater Basin
Central Management Area
Groundwater Sustainability Agency

January 2021

Stakeholder Workshop

STETSON ENGINEERS INC.

DUDEK

Geosyntec consultants

engineers | scientists | innovators

Housekeeping

- Recording the meeting for the purpose of capturing public feedback
- Recording can be made available upon request
- Opportunities for public feedback and questions throughout the workshop
- Public comments on the GCTM should be submitted to the website:

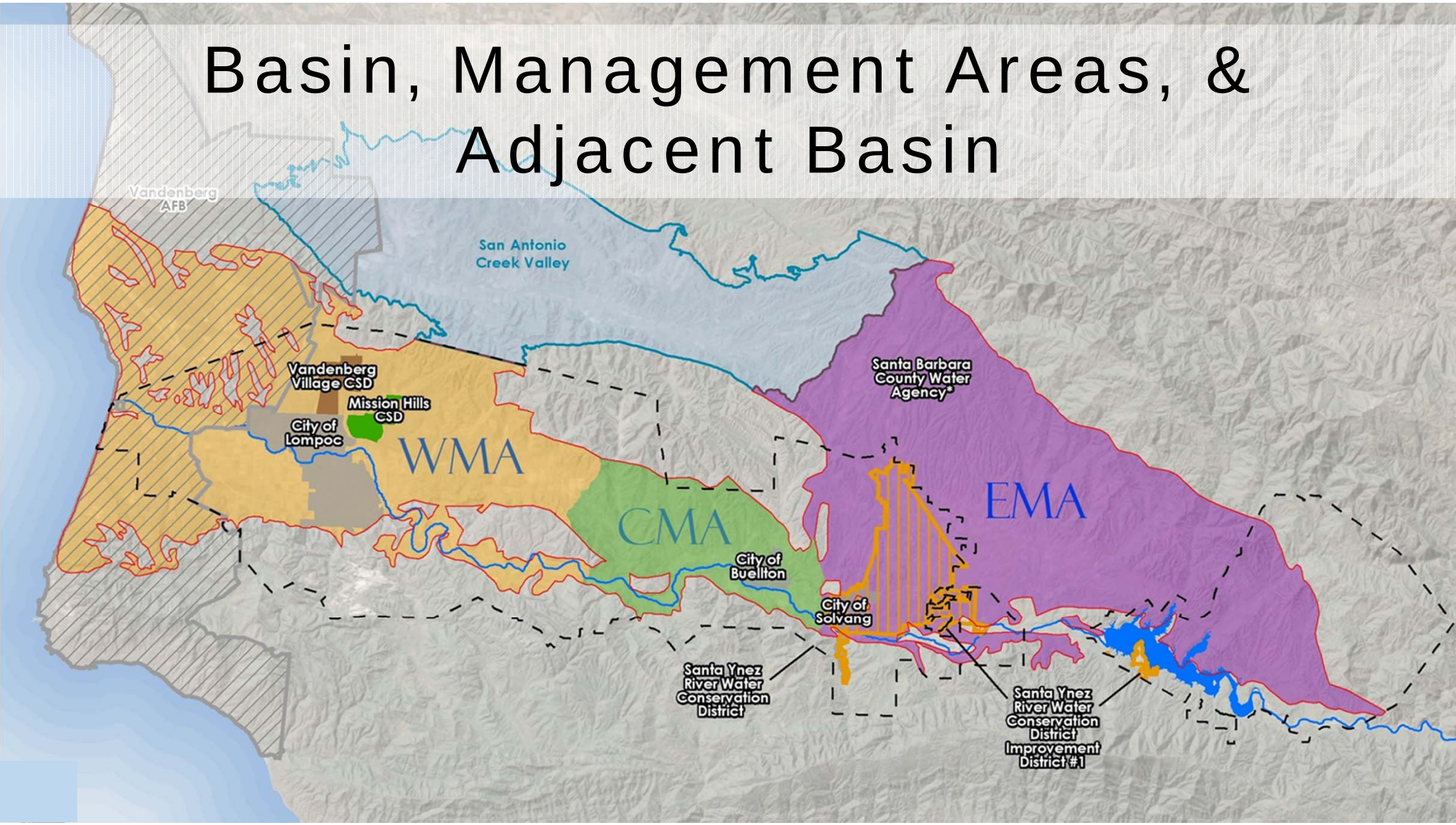
www.santaynezwater.org

- Slide numbers in lower right

Agenda

1. Groundwater Conditions Tech Memo
2. Water Budget Technical Memo
3. Groundwater Model Update
4. Sustainable Management Criteria – Example Thresholds
5. The Way Ahead
6. Schedule

Basin, Management Areas, & Adjacent Basin



Groundwater Conditions Technical Memo

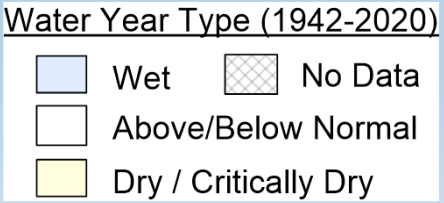
Describes the current groundwater conditions within the CMA.

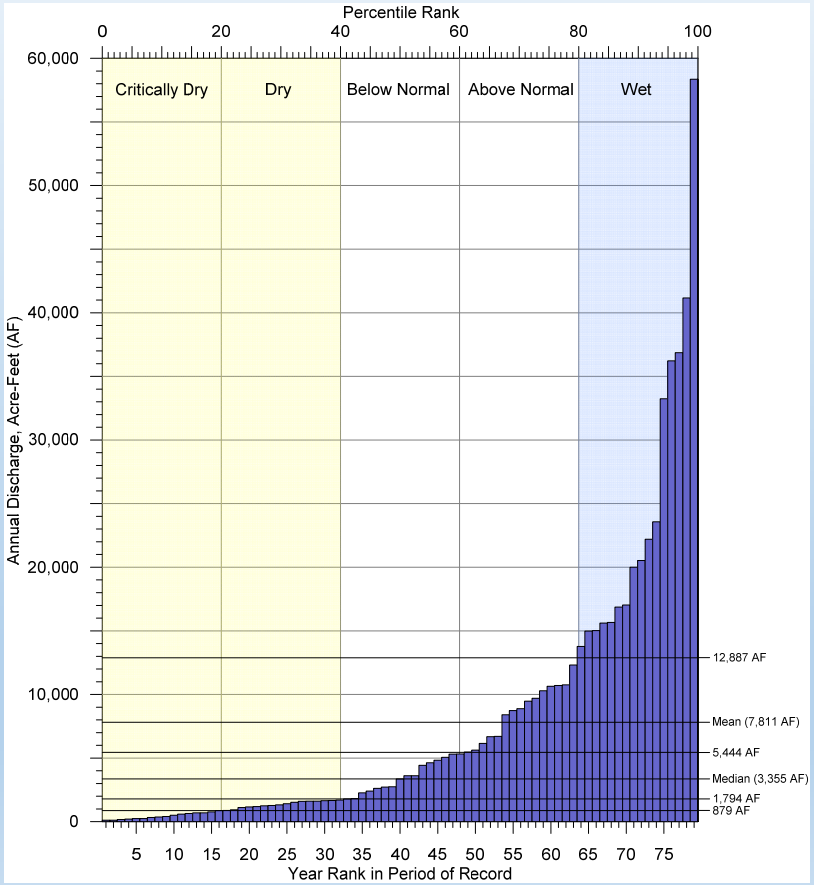
Chapters describe:

- Groundwater Elevations and Hydrographs
- Groundwater Storage
- Groundwater Quality
- ~~Seawater Intrusion~~
- Land Subsidence
- Interconnected Surface Water and Groundwater Dependent Ecosystems

New GCTM Content

- New Water Year Classification
- Additional water quality analysis to supplement SGMA requirements



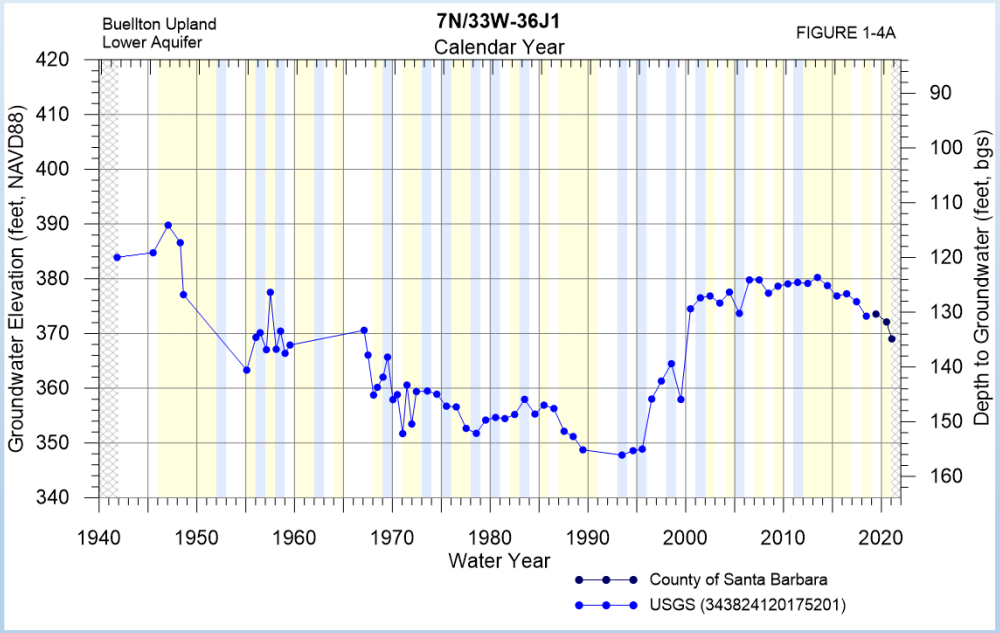


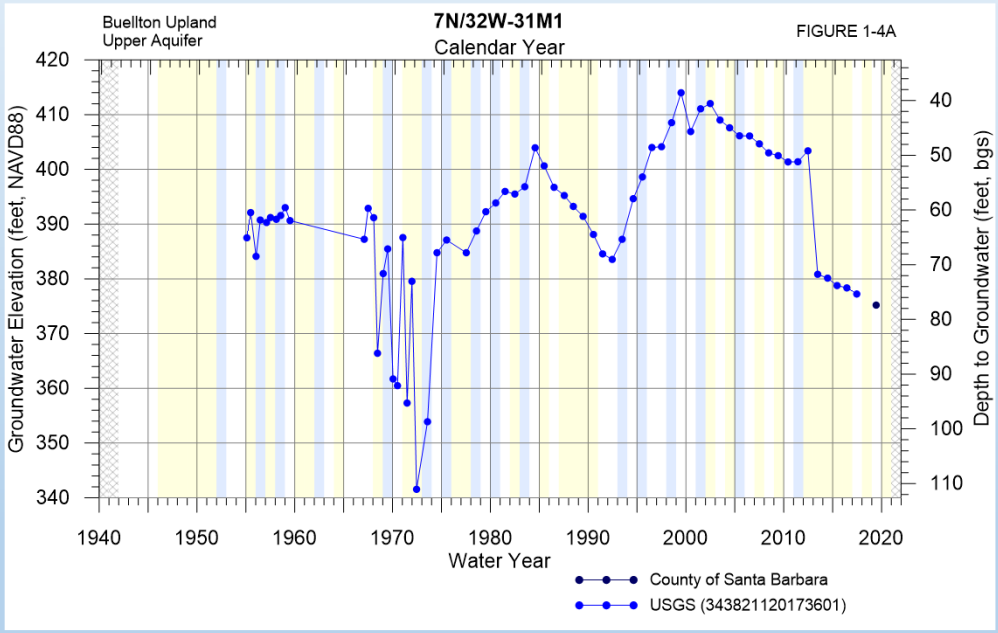
Water Year Ranking

GCTM Components

Water Year Type (1942-2020)
Wet
No Data
Above/Below Normal
Dry / Critically Dry

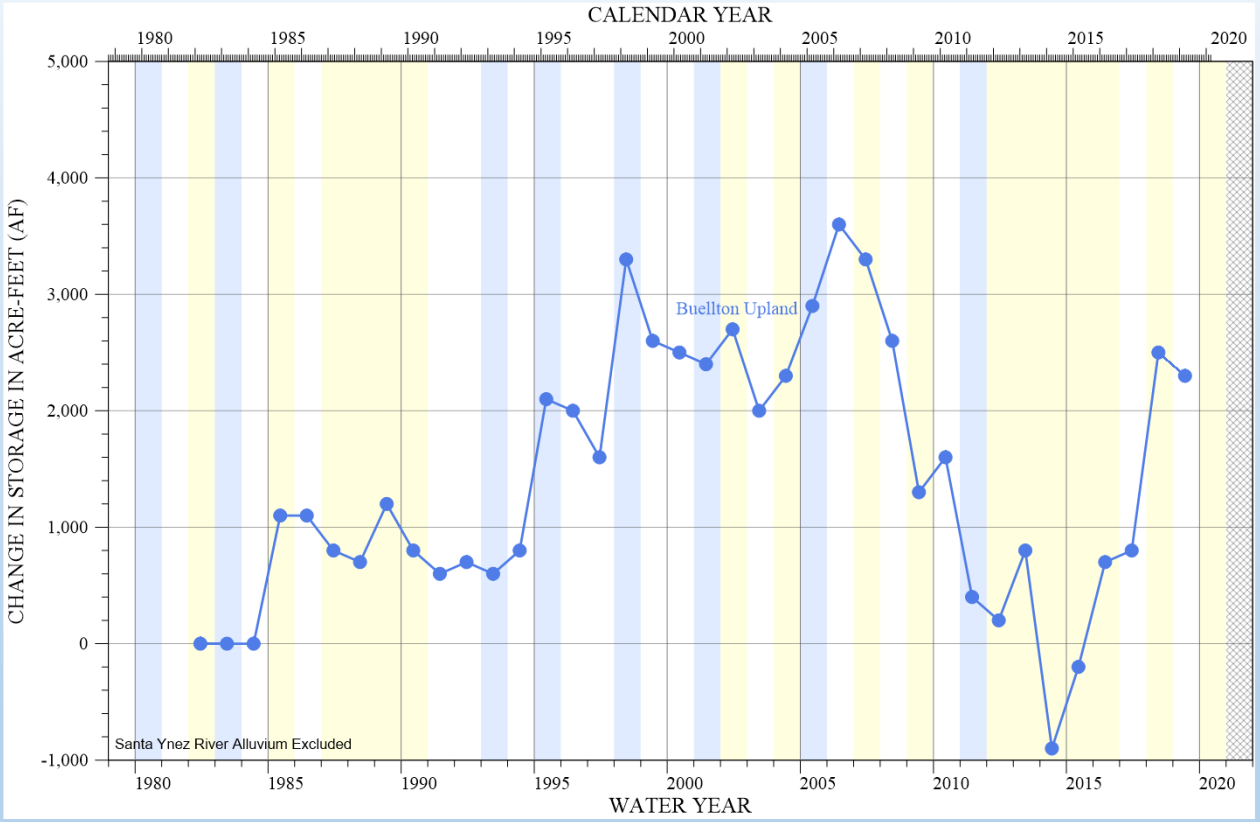
Groundwater Elevation Hydrographs for the CMA



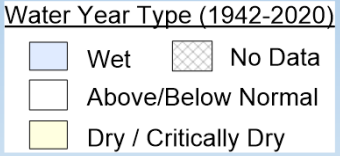


Examples groundwater elevation decline
during recent drought 2012-2018

GCTM Components



Cumulative Change in Groundwater in Storage Since March 1982



Graphic showing accumulated dewatered storage, as presented by the SYRWCD in annual reports.

This represents the empty space within the aquifer, not the amount of water in storage.

Groundwater Quality in the CMA

- In accordance with SGMA....
- GW Quality data is provided for reference, in terms of various beneficial uses in the CMA. Baseline conditions are provided as a snapshot, and the goal of the CMA will be not to create an undesirable result under the GSP (will be discussed further under Sustainable Management Criteria, SMCs).
- Managing GW quality in an effort to meet basin plan objectives is the responsibility of other agencies.
- Future GW management actions in the CMA will not adversely affect GW quality, nor will they interfere with other agencies objectives or responsibility to manage, maintain or improve GW quality.

Central Coast 2019 Basin Plan

Water Quality Objectives

Central Coast Regional Water Quality Control Board

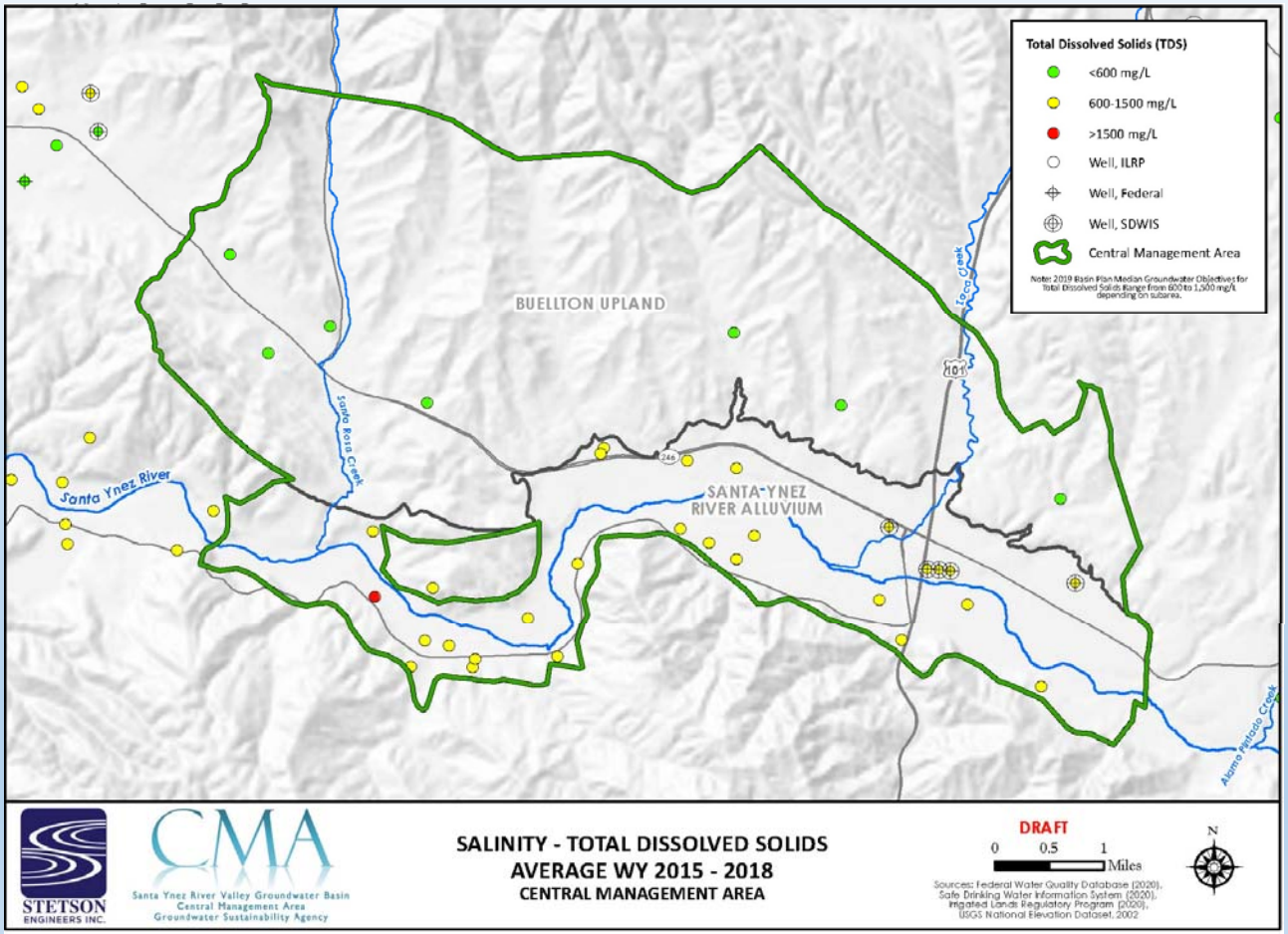
Table 3-6. Median Groundwater Objectives, mg/L[a]

Basin/Sub-Area	TDS	Cl	SO_4	B	Na	N[b]
Big Basin						
Near Felton	100	20	10	0.2	10	1
Near Boulder Creek	250	30	50	0.2	20	5
Pajaro Valley						
Hollister	1200	150	250	1.0	200	5
Tres Pinos	1000	150	250	1.0	150	5
Llagas	300	20	50	0.2	20	5
Salinas Valley						
Upper Valley[f]	600	150	150	0.5	70	5
Upper Forebay[f]	800	100	250	0.5	100	5
Lower Forebay[f]	1500	250	850	0.5	150	8
180 foot Aquifer[f]	1500	250	600	0.5	250	1
400 foot Aquifer[f]	400	50	100	0.2	50	1
Paso Robles Area[g]						
Central Basin[f]	400	60	45	0.3	80	3.4
San Miguel[f]	750	100	175	0.5	105	4.5
Paso Robles[f]	1050	270	200	2.0	225	2.3
Templeton[f]	730	100	120	0.3	75	2.7
Atascadero[f]	550	70	85	0.3	65	2.3
Estrella[f]	925	130	240	0.75	170	3.2
Shandon	1390	430	1025[h]	2.8	730	2.3
Estero Bay						
Santa Rosa	700	100	80	0.2	50	5
Chorro	1000	250	100	0.2	50	5
San Luis Obispo	900	200	100	0.2	50	5
Arroyo Grande	800	100	200	0.2	50	10
Carrizo Plain	[e]	[e]	[e]	[e]	[e]	[e]
Santa Maria River Valley[c]						
Upper Guadalupe[f]	1000[d]	165	500[d]	0.5	230	1.4[e]
Lower Guadalupe[f]	1000[d]	85	500[d]	0.2	90	2.0[e]
Lower Nipomo Mesa[f]	710	95	250	0.15	90	5.7[e]
Orcutt[f]	740	65	300	0.1	65	2.3[e]
Santa Maria[f]	1000[d]	90	510	0.2	105	8.0[e]
Cuyama Valley	1500	80	--	0.4	--	5
San Antonio Creek Valley	600	150	150	0.2	100	5
Santa Ynez River Valley						
Santa Ynez	600	50	10	0.5	20	1
Santa Rita	1500	150	700	0.5	100	1
Lompoc Plain[f]	1250	250	500	0.5	250	2
Lompoc Upland[f]	600	150	100	0.5	100	2
Lompoc Terrace[f]	750	210	100	0.3	130	1

Groundwater Quality in the CMA

This graphic shows Total Dissolved Solids (TDS) concentrations in milligrams per liter (mg/L), for groundwater samples collected from wells within the CMA.

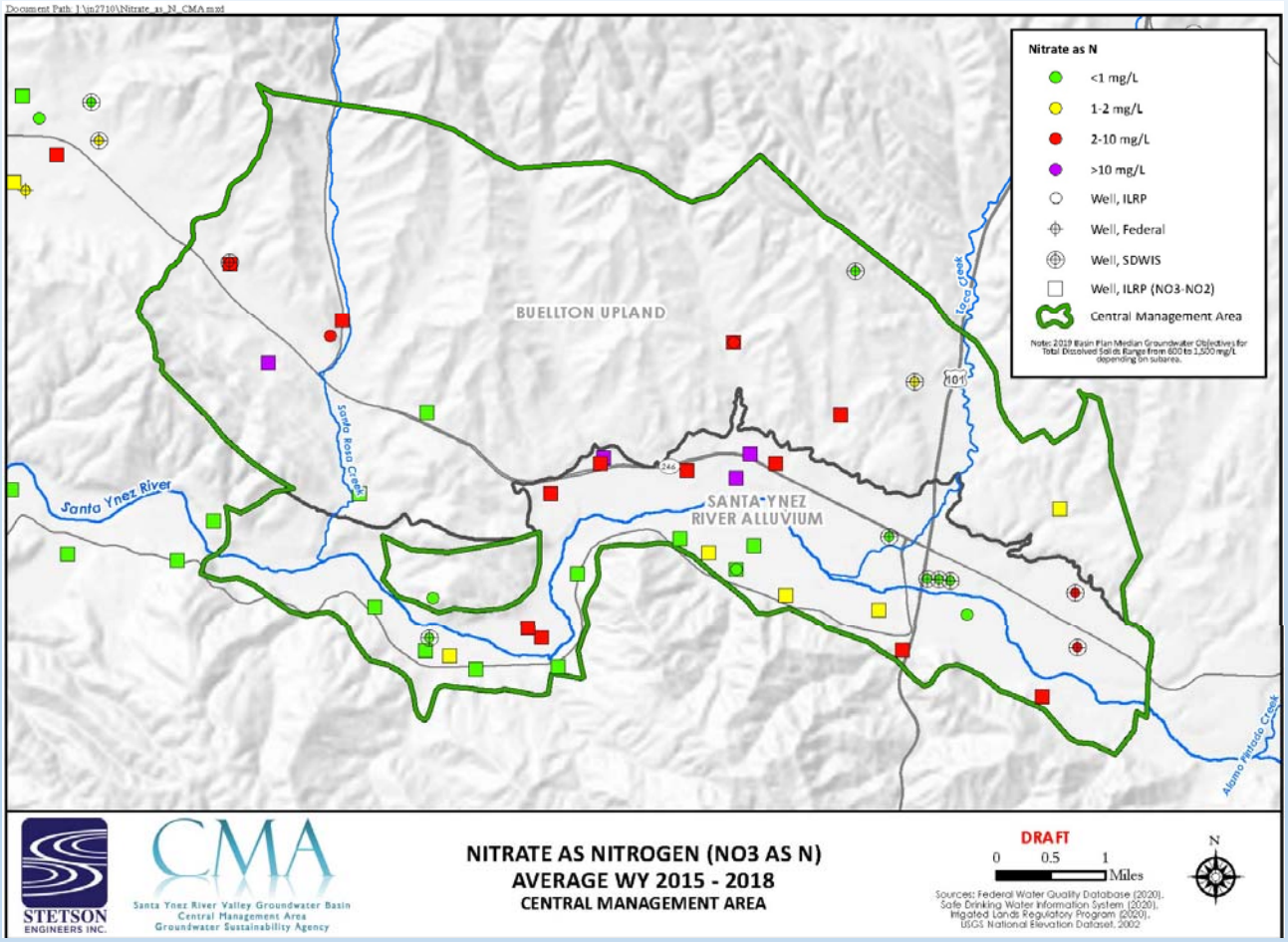
The colors relate to the TDS concentrations observed. Water quality objective (2019) is 1,500 mg/L.



Groundwater Quality in the CMA

This graphic shows Nitrate concentrations in milligrams per liter (mg/L), for groundwater samples collected from wells within the CMA.

The colors relate to the nitrate concentrations observed. Water quality objective (2019) is 1 mg/L.



GCTM Requirements

SGMA Regulations, Six SGMA indicators, and document align.

DWR Checklist Requirements for GC

2.2.2 **Current and Historical Groundwater Conditions** ***(Reg. § 354.16)***

- Groundwater elevation data
- Estimate of groundwater storage
- Seawater intrusion conditions
- Groundwater quality issues
- Land subsidence conditions
- Identification of interconnected surface water systems
- Identification of groundwater-dependent ecosystems
  - Including potentially related factors such as instream flow requirements, threatened and endangered species, and critical habitat.

DWR (2016) Groundwater Sustainability Plan (GSP) Annotated Outline. Guidance Document for the Sustainable Management of Groundwater.

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The DWR Checklist is a summary of some key requirements for the GCTM, as written in the SGMA regulations.

These are the SGMA regulations which describe the full list of requirements for preparing the GCTM.

SGMA Regulations

§ 354.16. Groundwater Conditions

Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:

(a) Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:

(1) Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.

(2) Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.

(b) A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.

(c) Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.

(d) Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.

(e) The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

(f) Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

(g) Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.

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Groundwater Conditions Technical Memo

Questions?

Water Budget Technical Memo

Accounts for the water inflows (water supply) and outflows (water demand) within the CMA.

Presents historical changes to water supply and water demand, according to CMA hydrology, population, land use, and climatic conditions.

Water Budget Analysis Time Period (W.Y. 1982 – W.Y. 2018)

Water Budget Keys

Basic Equation for Groundwater Storage:

Inflows – Outflows = Change in Storage

More inflow than outflow:

Groundwater levels and Storage increase

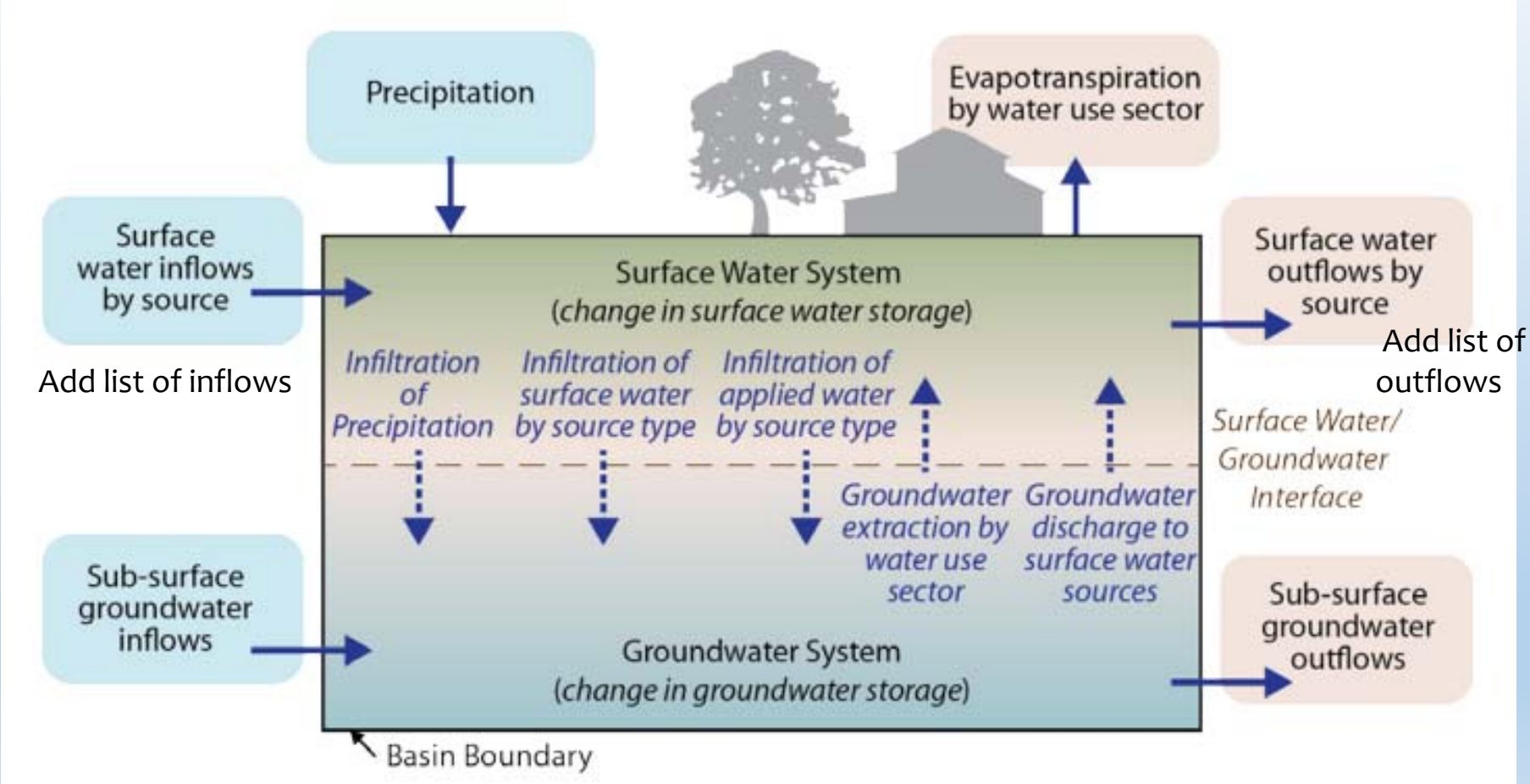
More outflow than inflow:

Groundwater levels and Storage decrease

Water Budget will address variability:

- Hydrologic- Droughts 1987-1991, 2012-2018; Floods i.e. 1998
- Changes in Land Use/Demands, quantity and timing
- Climate Change, quantity and timing

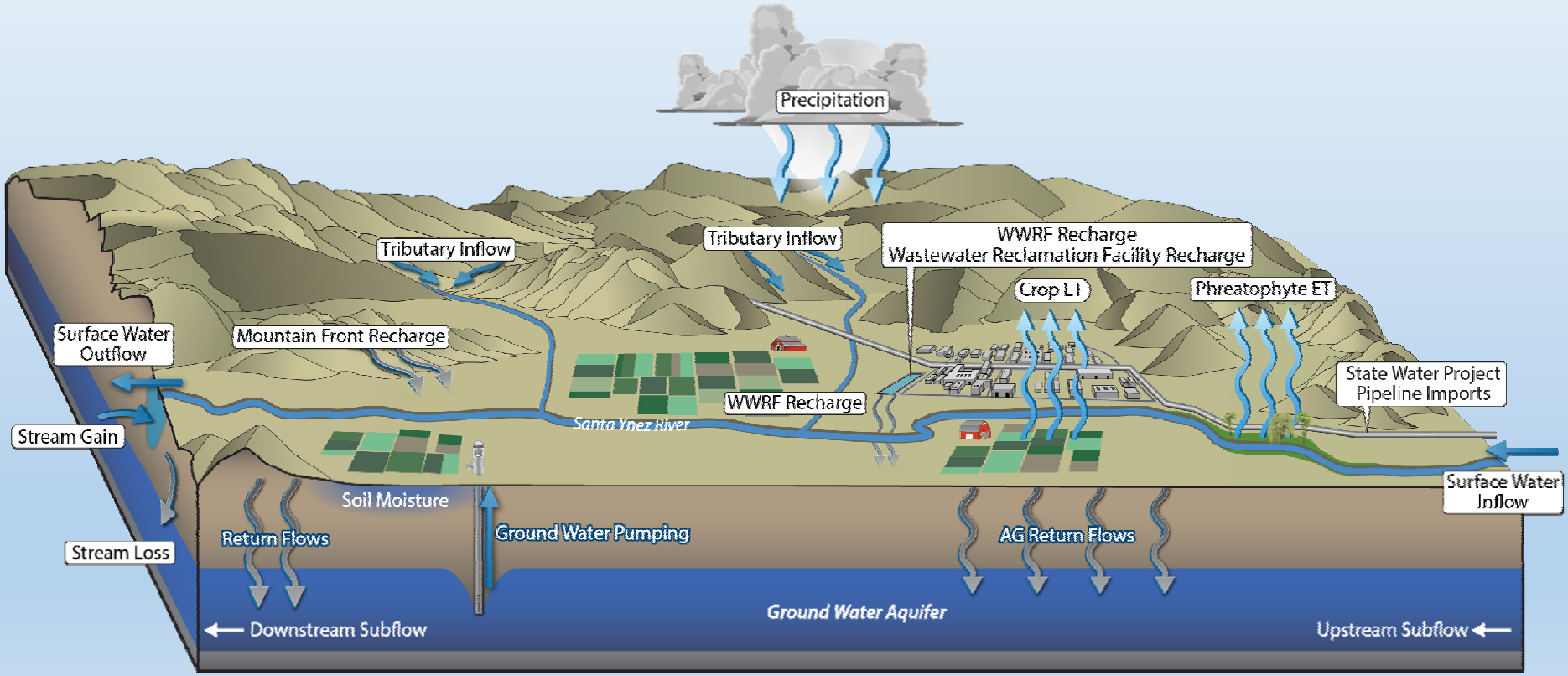
Required Water Budget Components



DWR SGMA Water Budget BMP, 2016

CMA Water

CENTRAL MANAGEMENT AREA OF THE SANTA YNEZ RIVER VALLEY GROUNDWATER BASIN



CMA Water Budget Inflows

Surface Water Inflows

- Santa Ynez River
- Tributaries
- Groundwater discharge to surface water
- State Water Project imports

Groundwater Inflows

- Recharge from precipitation
- Percolation of streamflow to groundwater
- Subsurface inflow from adjacent aquifers
- Return flows
  - Agricultural/Irrigation
  - Wastewater Treatment Plants
  - Septic Tanks

CMA Water Budget Outflows

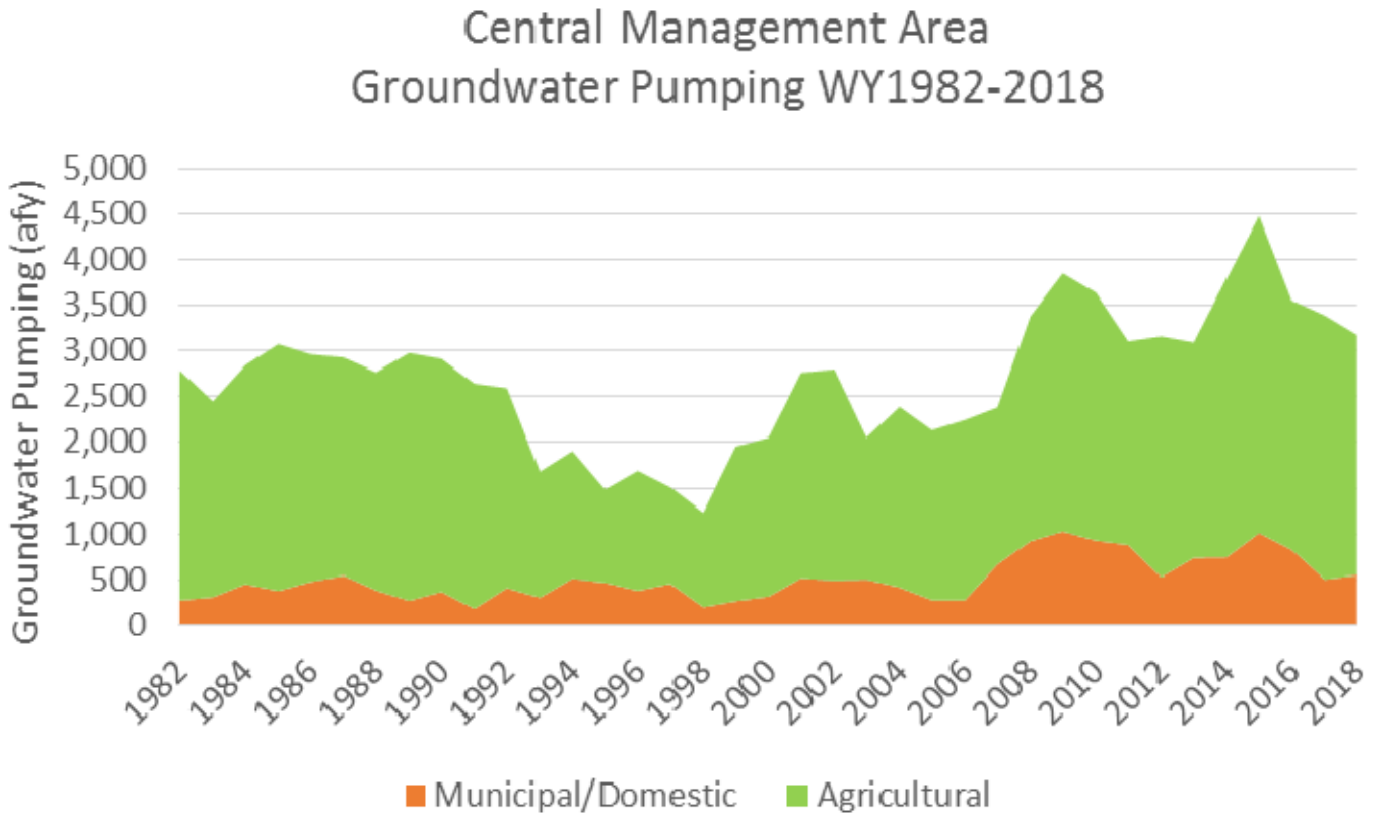
Surface Water Outflows

- Percolation of streamflow to groundwater
- Evaporation
- Santa Ynez River outflow

Groundwater Outflows

- Groundwater pumping
  - Agriculture, municipal, domestic
- Evapotranspiration
- Subsurface outflows
- Groundwater discharge to surface water

CMA Groundwater Pumping



Annual pumping based on reporting to SYRWCD. Total pumping ranges from about 1,500 to 4,500 afy. Does not include Santa Ynez River underflow diversions (SWRCB).

Water Budget Technical Memo

Questions?

Groundwater Model Update

How will it help us comply with SGMA?

Using “best available science to quantify the water budget and to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface” § 354.20.E

Entire Santa Ynez River Valley Groundwater Basin using MODFLOW – USG (Unstructured Grid) Model Software

- public domain open source software

What is it used for?

Planning tool

Model currently being calibrated for Historical Conditions Water Years 1982-2018 (37 years)
Model will be used to simulate Future Projected Conditions Water Years 2018-2072 (55 years).

Groundwater Model Update

Groundwater Model Uses and SGMA:

- Quantitative estimate of groundwater inflows and outflows to the CMA (informs the Water Budget),
- Considerations for seasonality and temporal changes to groundwater availability and recharge,
- Quantitative framework to estimate future potential scenarios, and
- Guide development of SMC thresholds.

Groundwater Modeling Steps:

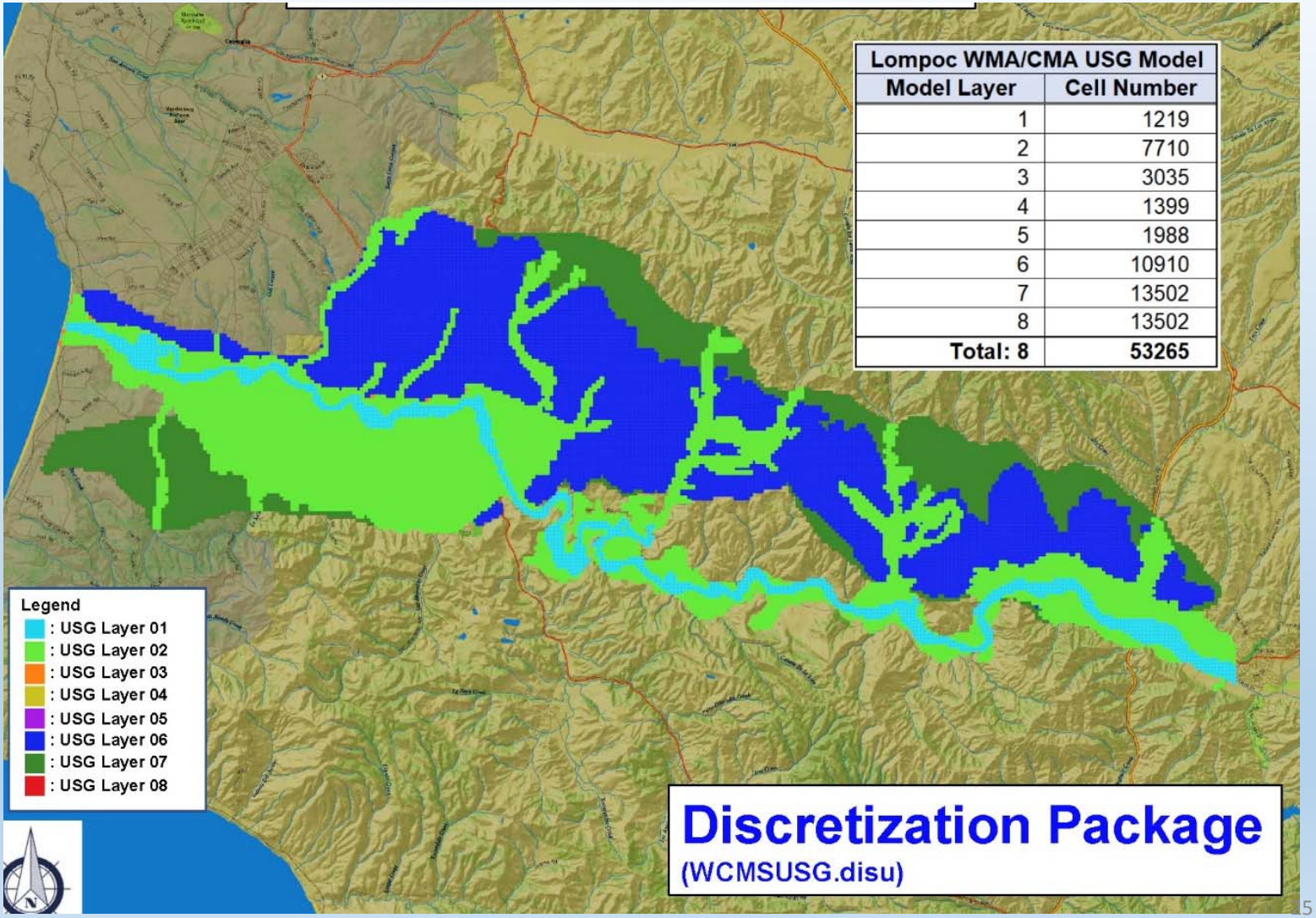
- Build
- Calibrate
- Run Scenarios

Model Grid

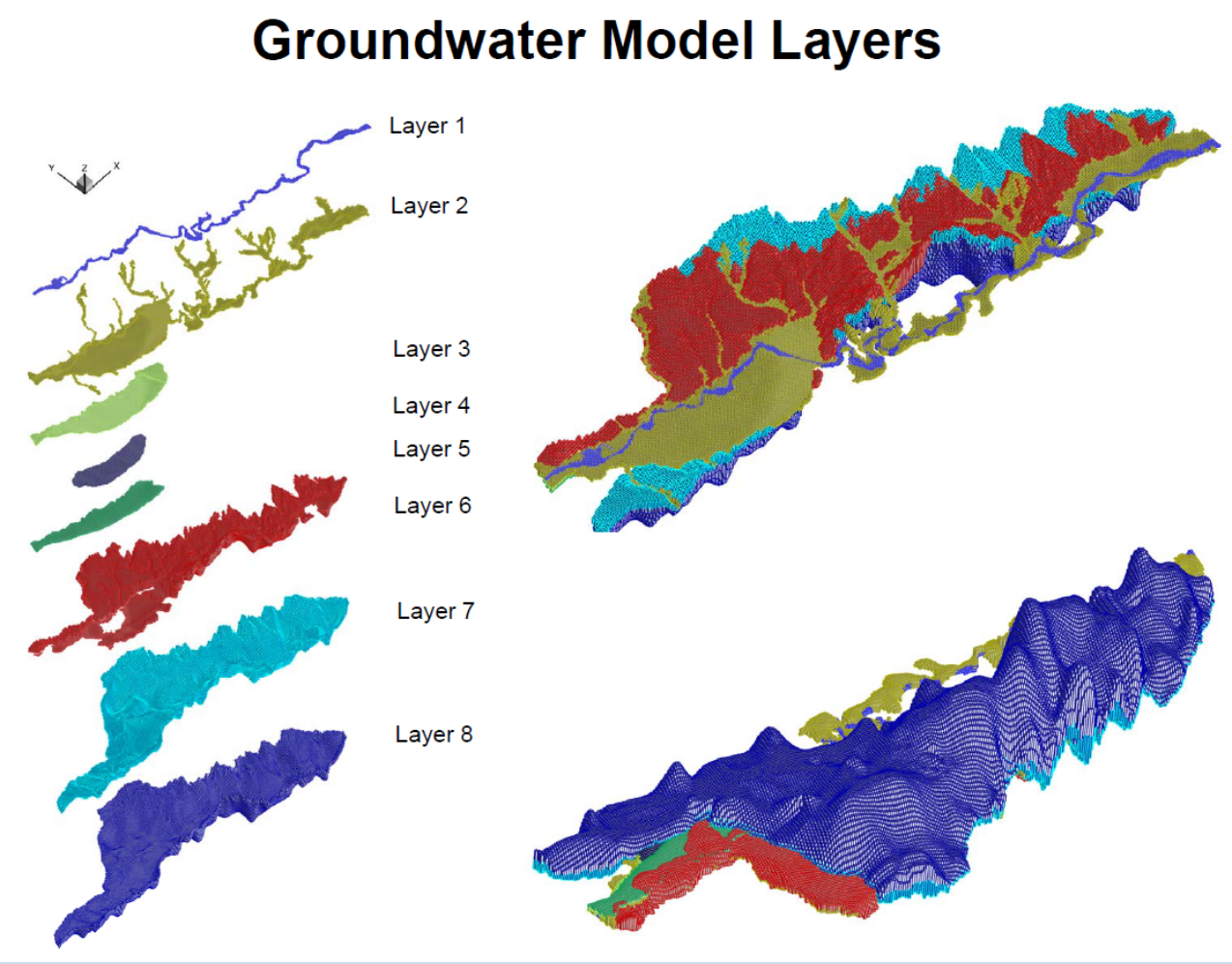
Model cells are 4 acres.

Monthly timestep.

Solvang to Pacific Ocean



Groundwater Model Update



The 3D subsurface geologic model was used to export the various groundwater model layers.

Each layer correlates to a different geologic formation (or unit) and identified Principal Aquifer.

These layers are used as the basis for the groundwater model.

The model estimates groundwater flow velocities, recharge rates, and model scenarios to predict future groundwater supply and demand based on current groundwater uses.

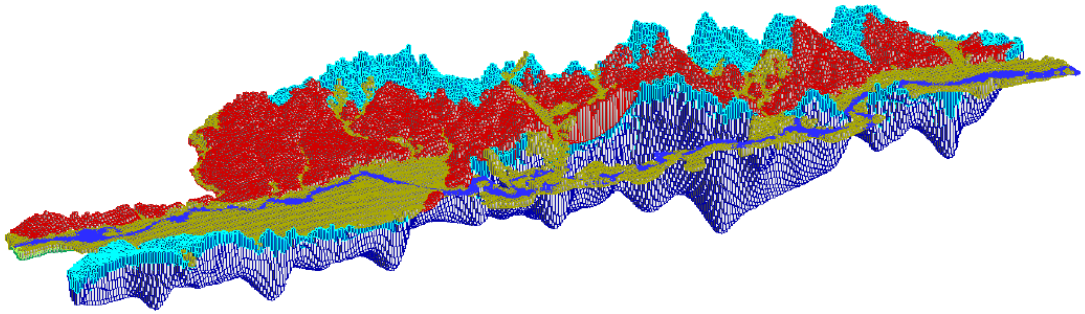
Groundwater Model Update

View of all Groundwater Model Layers stacked together

Layer Property Flow Package
(WCMSUSG.lpf)

Model Aquifer Properties

Model Layer	Kx = Ky (ft/day)	Kz (ft/day)	Ss (ft^{-1})	Sy	Remark
1	240	0.24	0.0001	0.1	Stream Deposits
2	55	0.055	0.0001	0.1	Upper Alluvium
3	35.5	0.0355	0.0001	0.1	Lower Alluvium
4	2.2	0.0022	0.0001	0.1	Silt
5	300	0.3	0.0001	0.1	Main Water Bearing Zone
6	15	0.015	0.0001	0.1	Older Alluvium
7	50	0.05	0.0001	0.1	Upper Careaga
8	10	0.01	0.0001	0.1	Lower Careaga

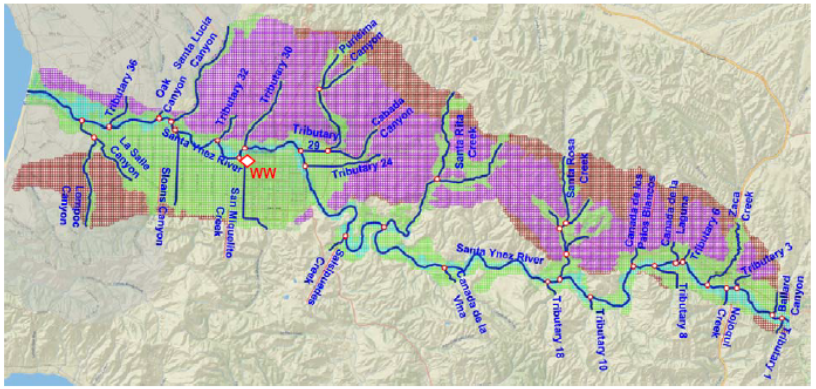


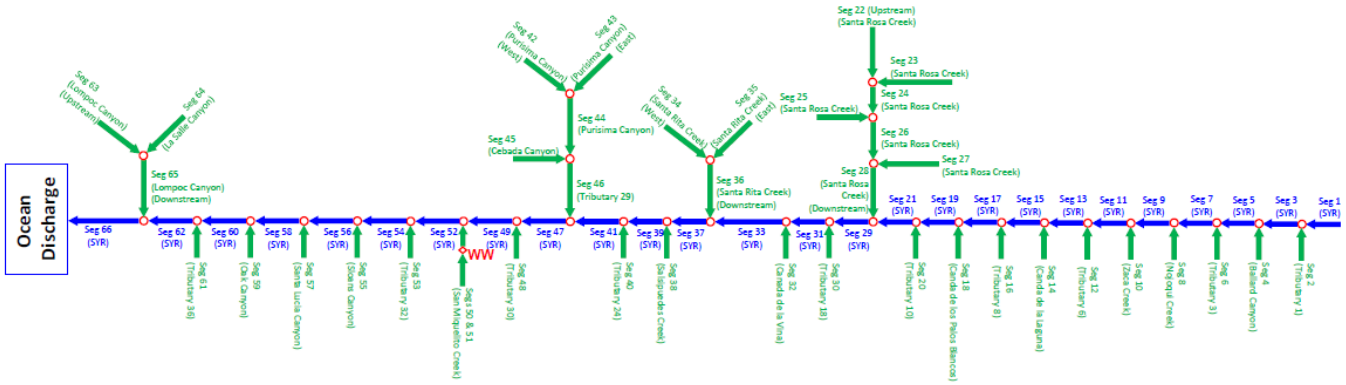
Aquifer properties for each model cells will be adjusted based on model cell locations during model calibration

Groundwater Model Update

Stream Flow Routing Package
(WCMSUSG.sfr)

WMA/CMA USG Model Stream Flow System



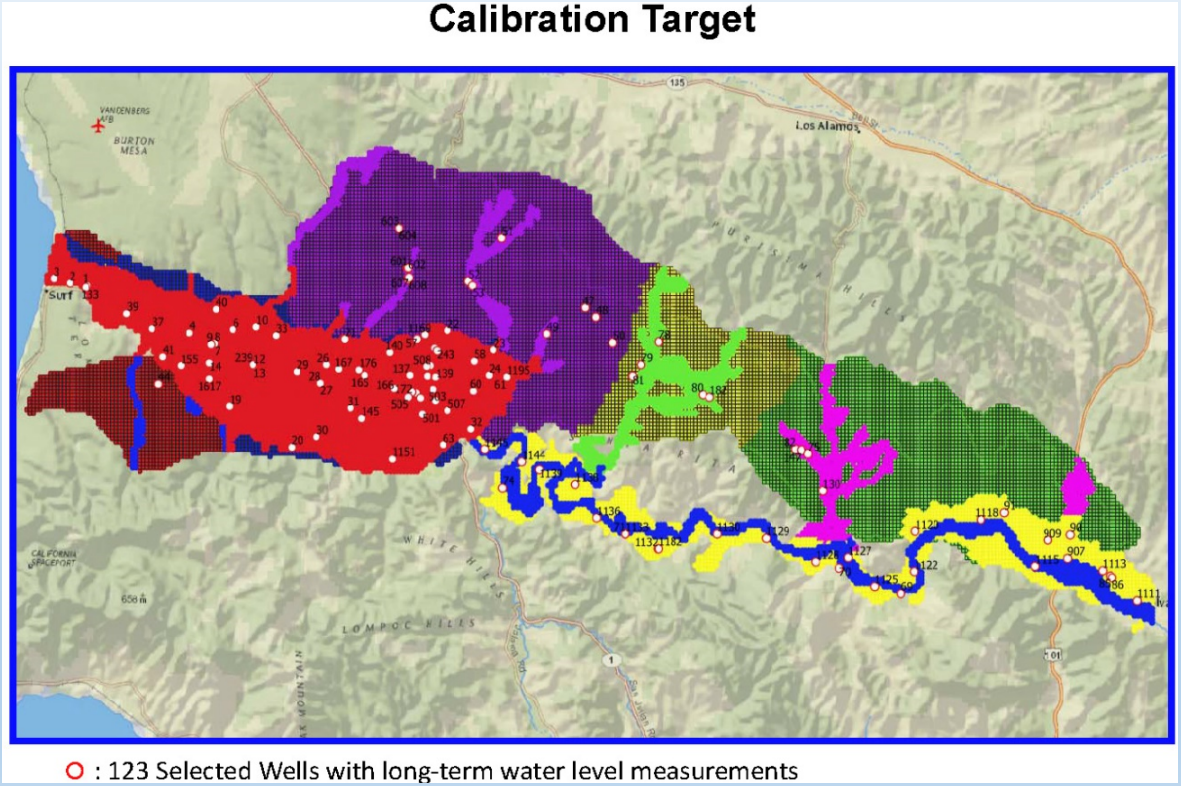


Visual representation of how stream flows are considered and integrated into the groundwater model.

Stream flows contribute to recharge of the identified Principal Aquifers.

Calibration time period WY 1982-2018

Groundwater Model Update



Water Budgets developed per subareas. For CMA: Buellton Upland and Santa Ynez River Alluvium subareas

Calibration time period
WY 1982-2018

Calibrated to Measured:
-Groundwater Levels/Contours
-Streamflow gages
-Intra/Inter Annual Variability

Groundwater Model Update

Questions?

Sustainable Management Criteria (SMC)

Management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.

Undesirable results categorized by six sustainability indicators.

- Lowering Groundwater Levels
- Reduced Groundwater Storage
- Land Subsidence
- Degraded Water Quality
- Surface Water Depletion
- Seawater Intrusion

Avoidance of undesirable results is critical to the success of a GSP.

Need to establish undesirable results thresholds. How do we do that???

SMC Development Steps

1. Basin Conditions	2. Sustainability Goal	3. Undesirable Results	4. Minimum Thresholds	5. Measurable Objectives
Gather a good **understanding** of basin conditions. Select representative wells.	**Qualitative statement** that guides threshold setting process.	**Quantitative set of conditions** related to minimum thresholds that cause significant and unreasonable conditions.	Numeric **values for each sustainability indicator** used to define undesirable results and sustainability.	Quantifiable goals for the **maintenance or improvement** of specified groundwater conditions over 20 years.

Examples of Undesirable Results

- Lowering Groundwater Levels
  - Water levels continue to decline due to pumping rather than climatic conditions.
- Reduced Groundwater Storage
  - Water level declines reducing the volume of groundwater in storage such that there is insufficient supply to support pumping during drought conditions without causing undesirable results.
- Land Subsidence
  - Groundwater pumping practices causing depletion of interconnected surface water.

Examples of Undesirable Results

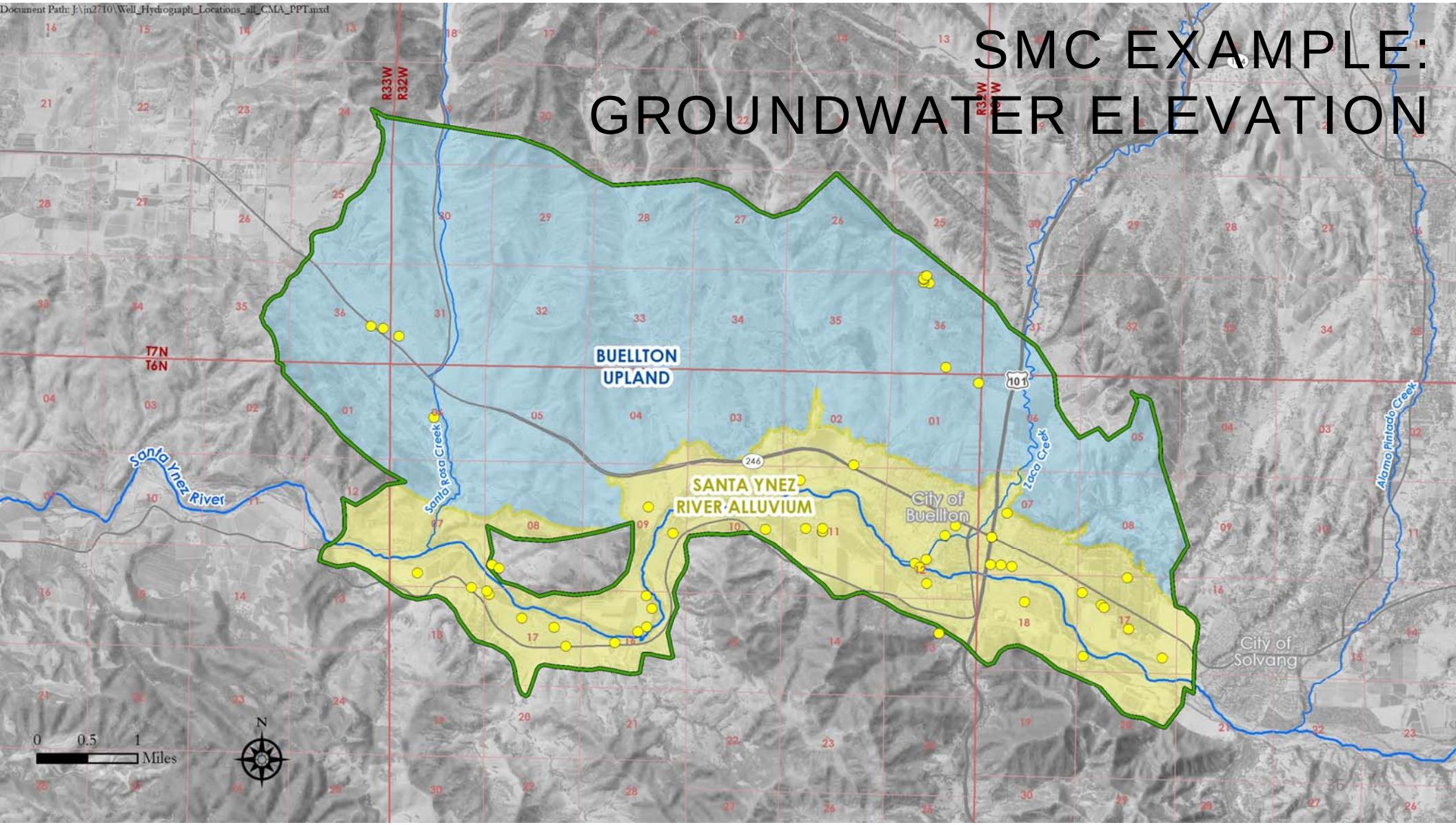
- Degraded Water Quality
  - Groundwater pumping practices that cause:
    - Migration of impaired water resulting in impairment of water supplies.
    - Concentrations exceed regulatory levels.
- Surface Water Depletion
  - Groundwater pumping practices causing depletion of interconnected surface water.
- ~~Seawater Intrusion~~
  - ~~Groundwater pumping practices causing migration of seawater into groundwater supplies~~.

CMA Example SMC Thresholds

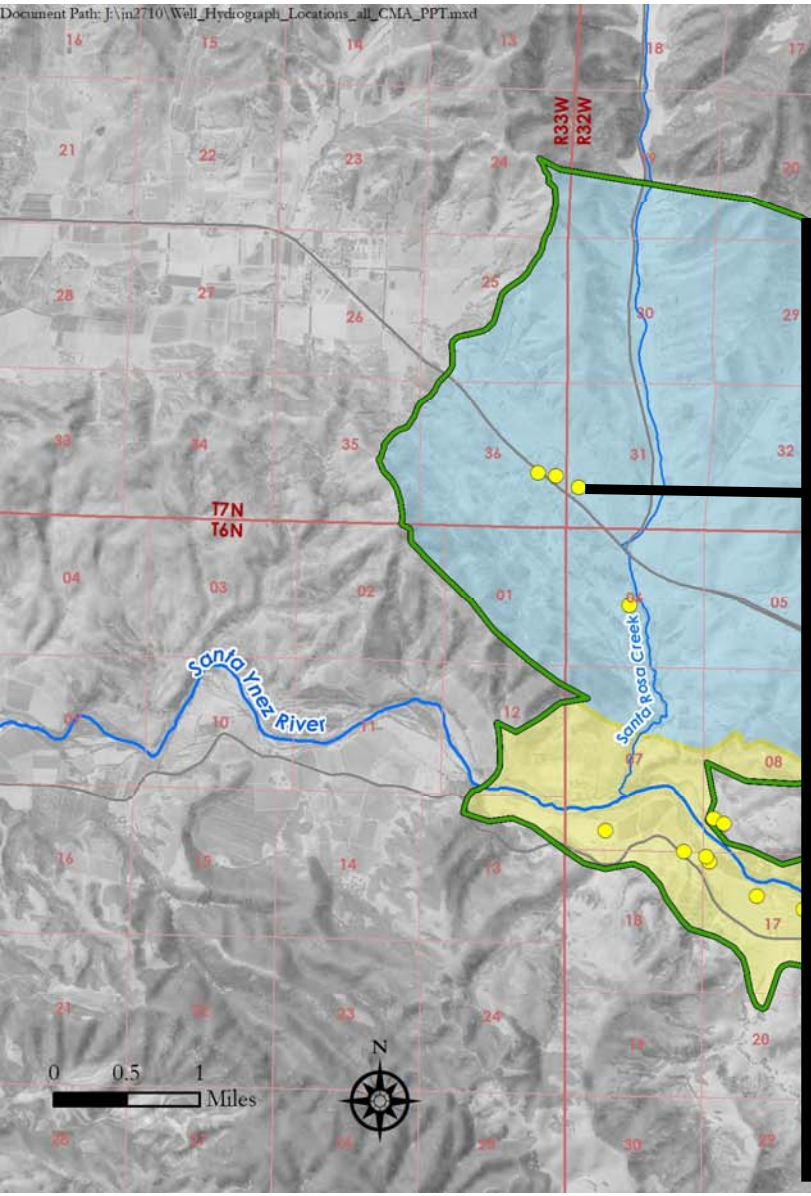
Groundwater Elevations

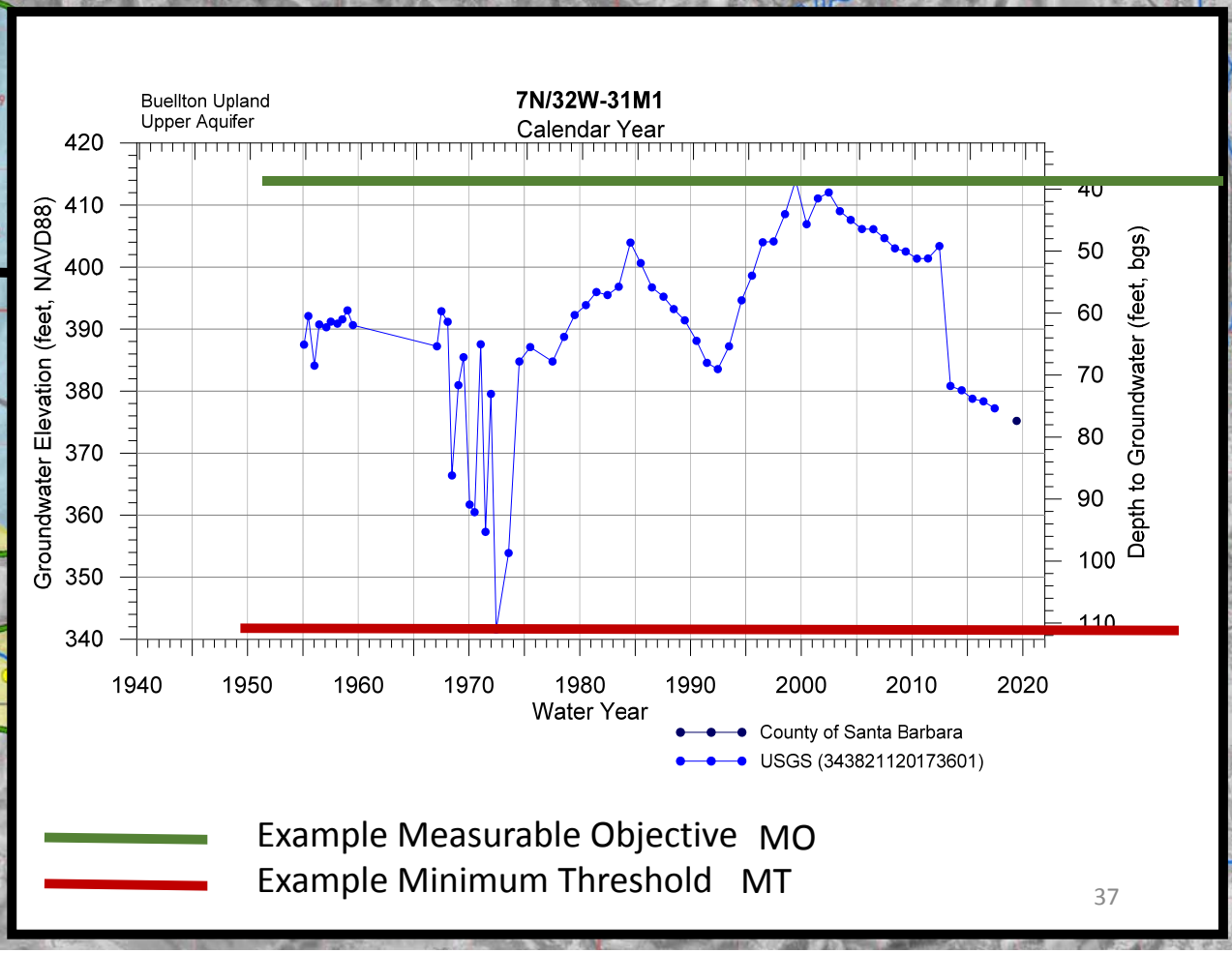
EXAMPLE FOR DISCUSSION

SMC EXAMPLE: GROUNDWATER ELEVATION

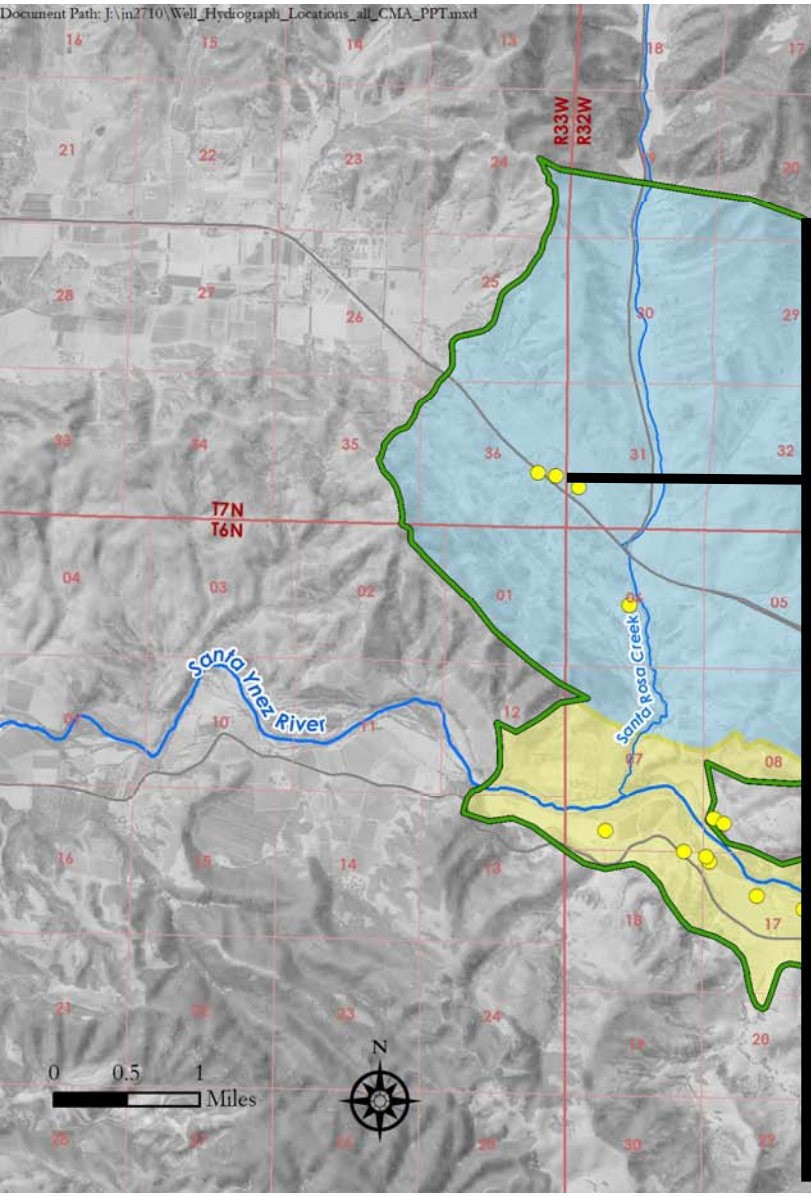


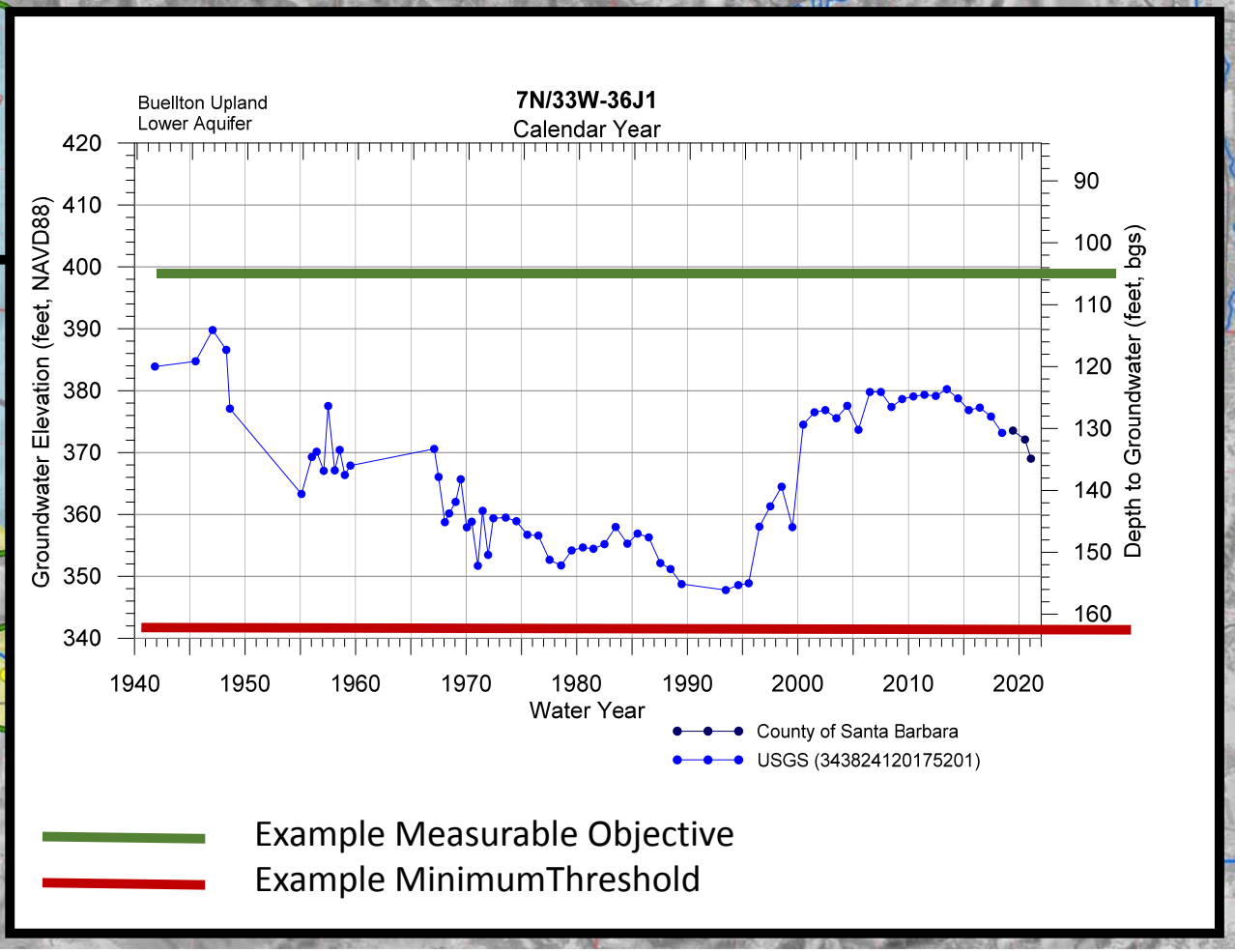
SMC EXAMPLE: GROUNDWATER ELEVATION



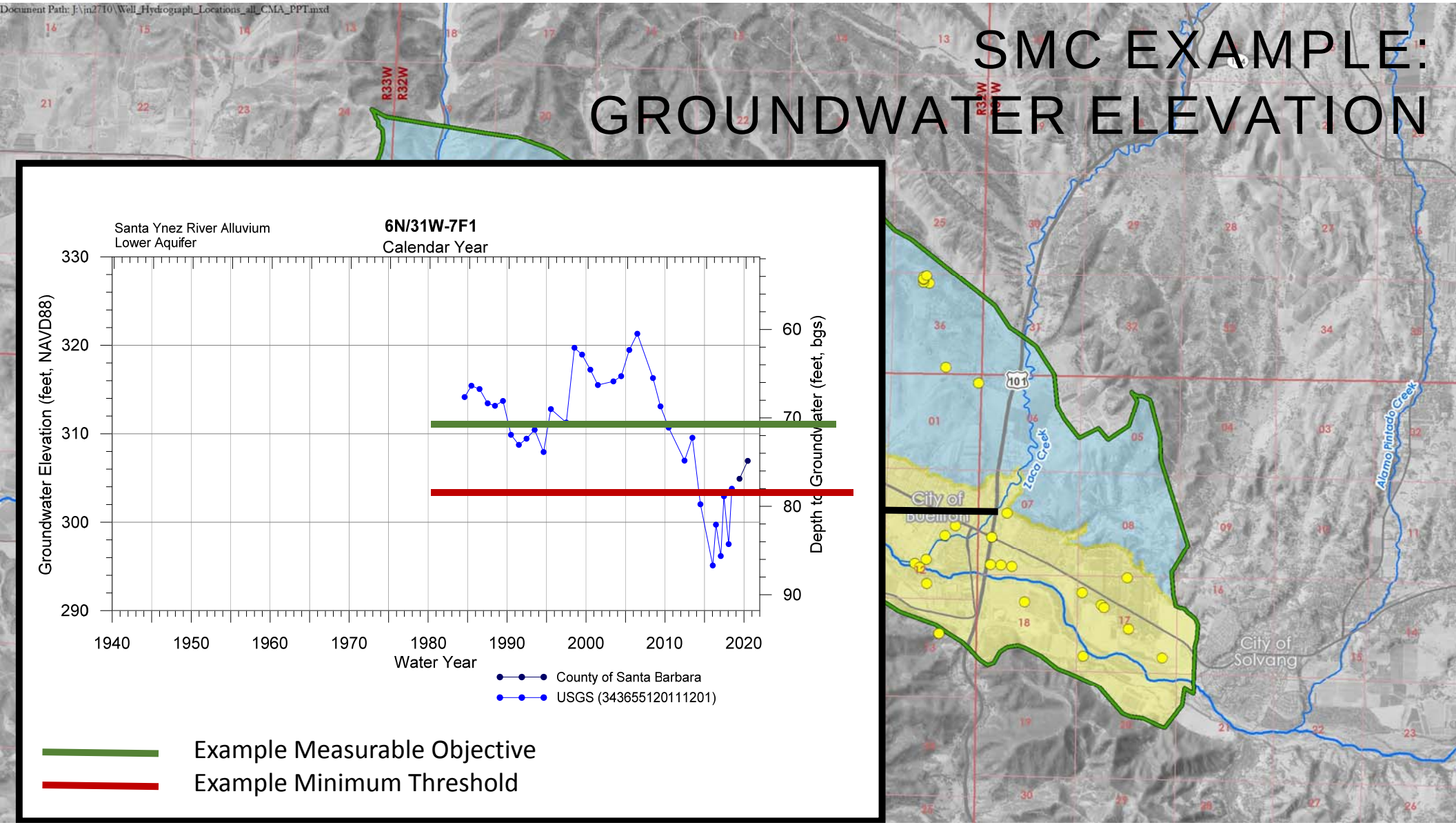


SMC EXAMPLE: GROUNDWATER ELEVATION

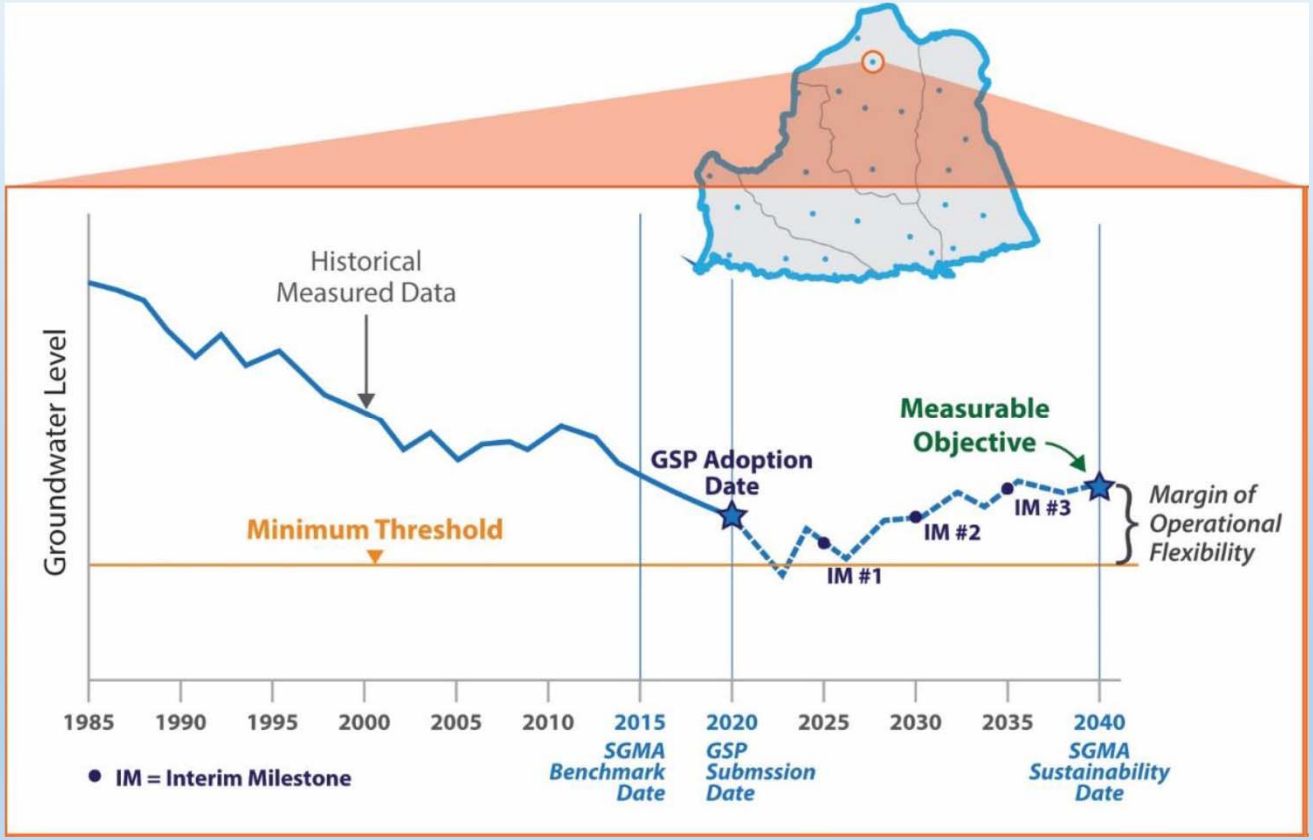


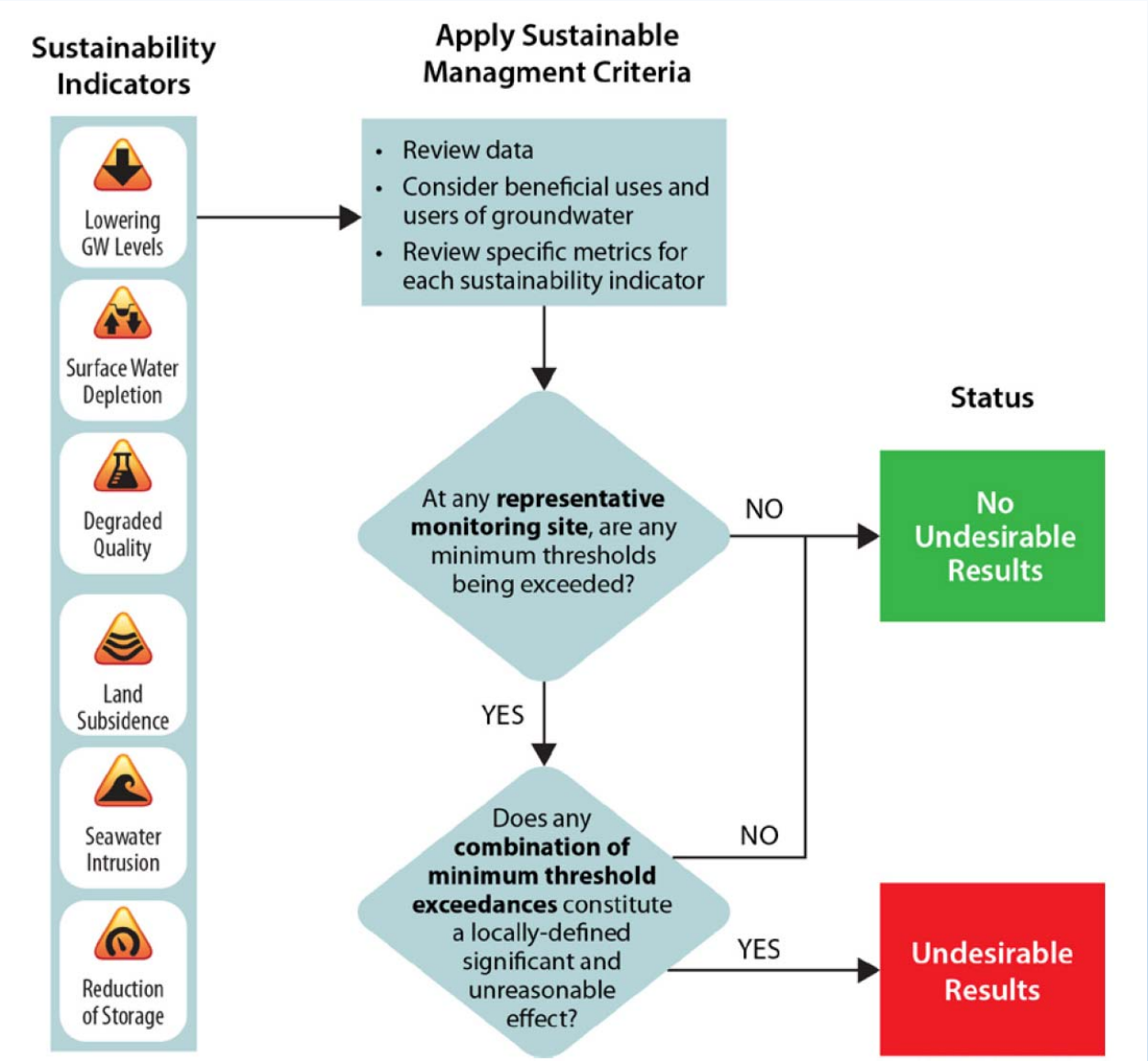


SMC EXAMPLE: GROUNDWATER ELEVATION



Minimum Thresholds and Planning Horizon under SGMA





Process for Determining Undesirable Results

- **Six indicators**
- **Review data and beneficial uses**
- **Locally-defined significant and unreasonable effects**
- **Minimum Thresholds**
- **Monitoring**

Examples of SMCs for Other Indicators' Undesirable Results

- Reduced Groundwater Storage
  - Tied to MTs and MOs of water levels of representative wells
- Land Subsidence
  - MT = allowed subsidence at critical infrastructure without causing damage
  - MO = no long term reduction at monitoring locations
- Degraded Water Quality
  - Groundwater pumping practices that cause:
    - MT = drinking water quality standards (xx% of wells must exceed)
    - MO = natural baseline conditions
- Surface Water Depletion
  - Assess impacts to GDEs (not along the river)

SMC and Undesirable Results

Questions?

The Way Ahead

- Complete the Groundwater Conditions Tech Memo
- Complete the Water Budget
- Complete the Groundwater Model
- Establish Monitoring Network
- Establish Sustainable Management Criteria Thresholds
- Identify Projects and Management Actions
- Release DRAFT GSP

The Way Ahead

Questions?

Comments can be submitted to the website:

www.santaynezwater.org