Sustainable Management Criteria for the WMA

MAY 12, 2021

DUDEK

Undesirable Results and Minimum thresholds (MTs) under the SGMA

- From the SGMA Emergency GSP Regulations (§354.26):
  - "Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin"
    - Description of the Undesirable Result should include:
      - The **cause** of groundwater conditions…based on the ***basin setting***, and other data or models as appropriate
      - The criteria used to define when and where the effects of groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of **minimum threshold** exceedance that cause significant and unreasonable effects in the basin."

SUSTAINABILITY INDICATORS

Groundwater elevation
MT = Water Level

Groundwater in storage
MT = Water Level

Land Subsidence
MT = *InSAR and Continuous GPS Data*

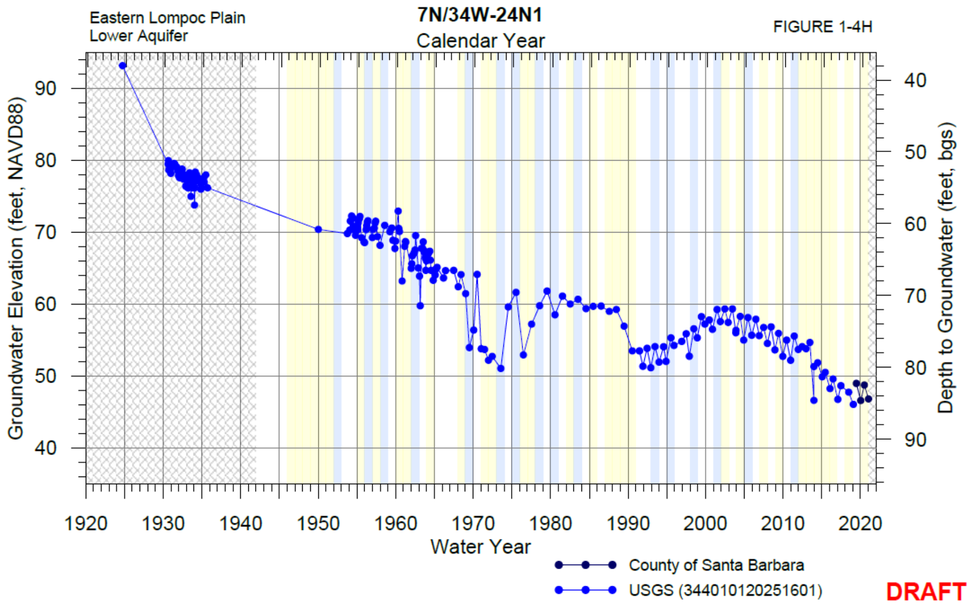
Interconnected Surface Water
MT = Water Level

Water Quality
MT = Salt and
Nutrient Concentrations

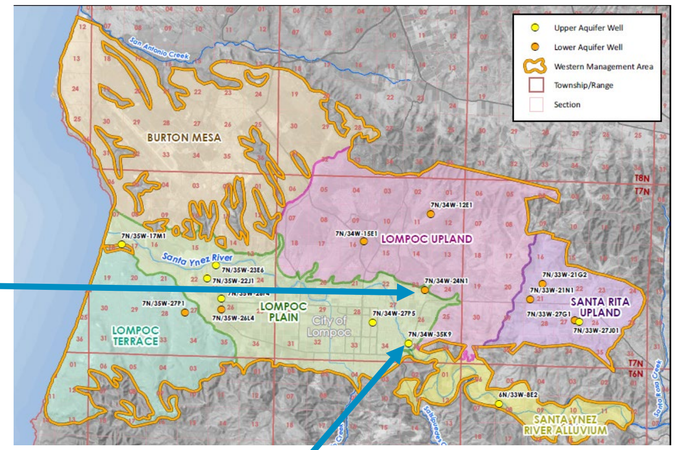
Seawater Intrusion
MT = Cl^- isocontour

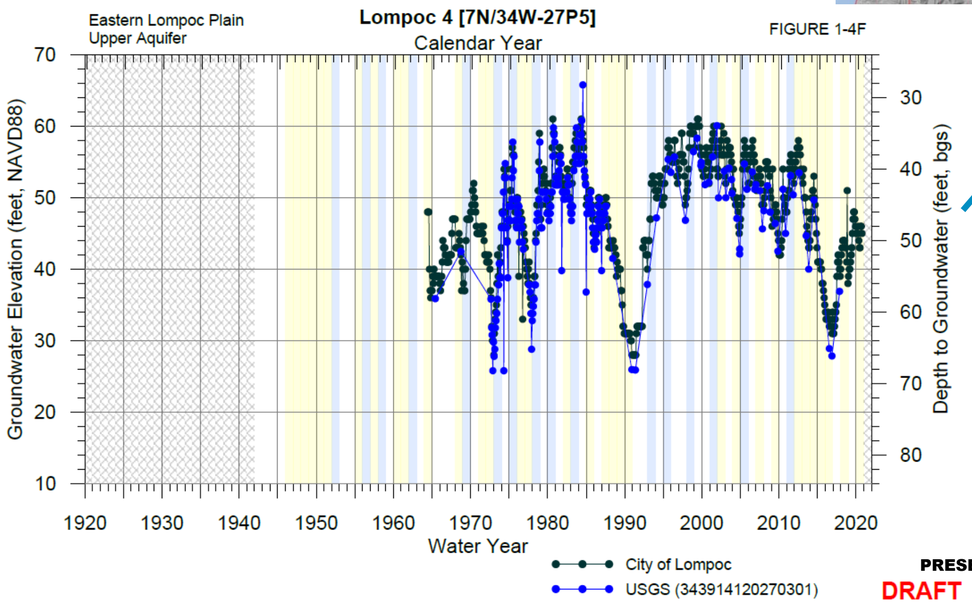
Undesirable Results: Chronic Lowering of Groundwater Levels

"…groundwater elevation indicating a depletion of supply at a given location that may lead to an undesirable result" (§354.28 (c) (1) – Minimum Thresholds)



Groundwater elevations in the lower aquifer exhibit long-term declining trends



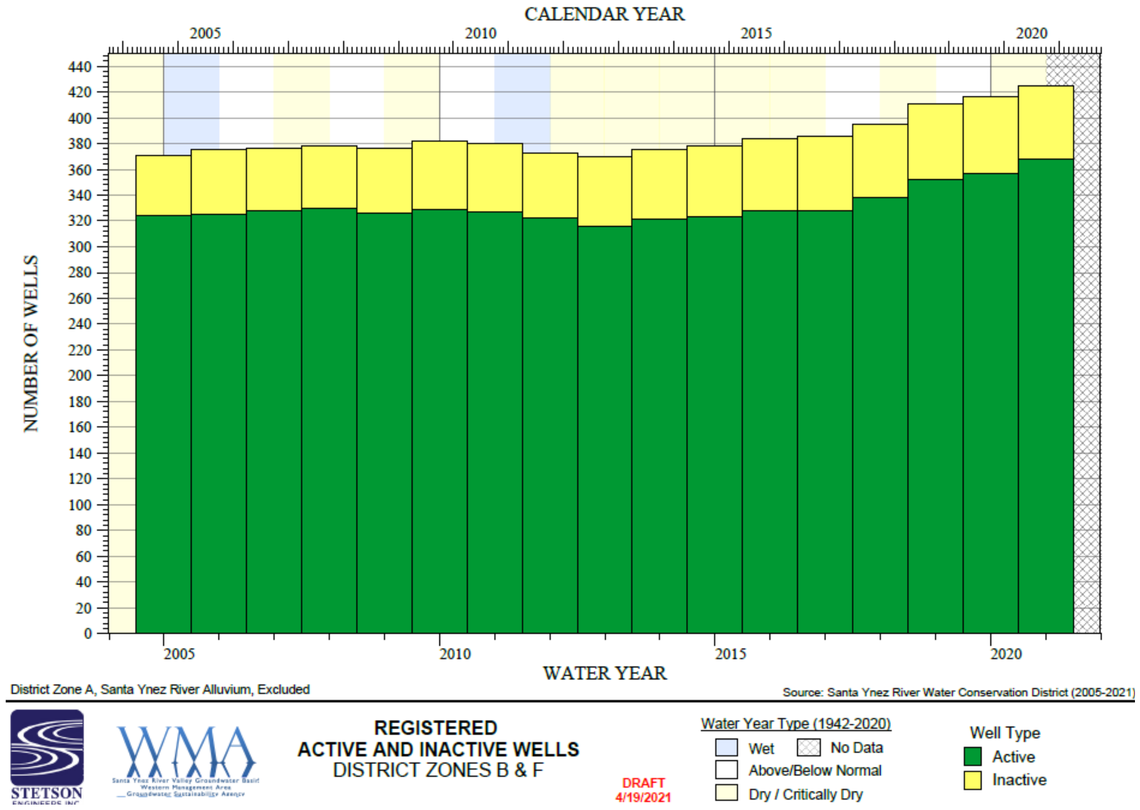


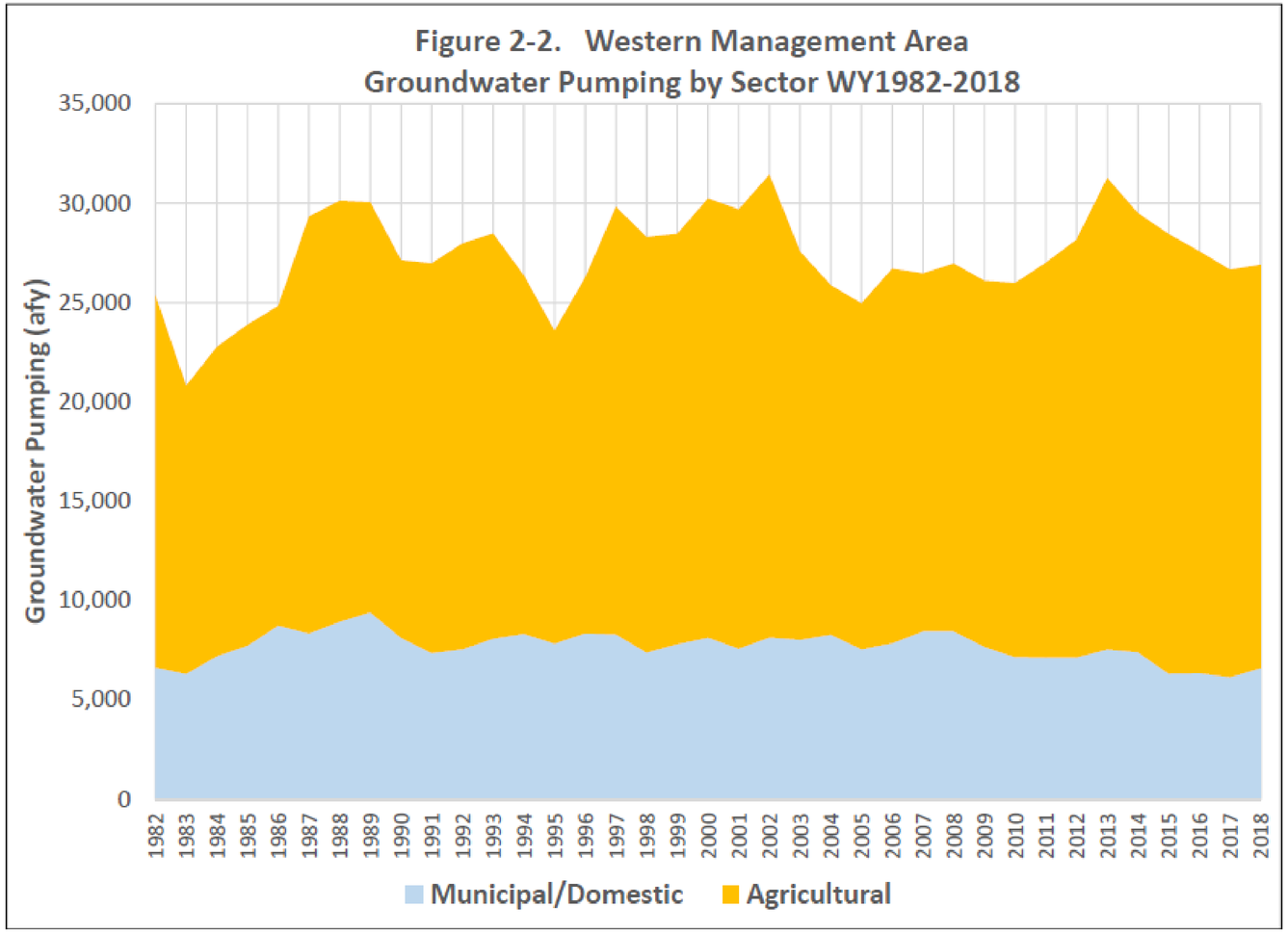
Groundwater elevations in the upper aquifer have been relatively stable over the last 50 years

Source: Stetson Engineers Inc.

Undesirable Results: Chronic Lowering of Groundwater Levels

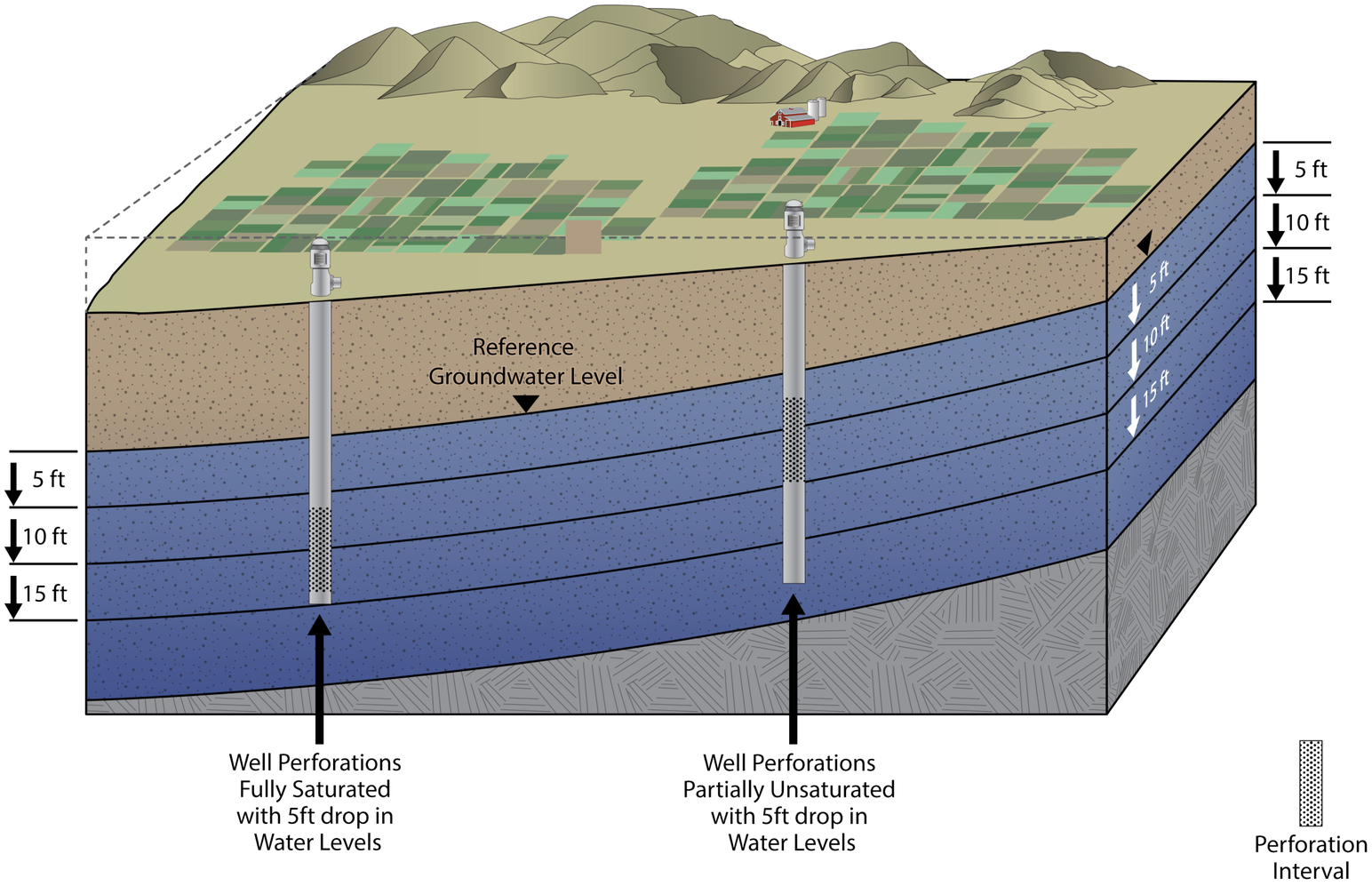
- No historical evidence of a depletion of supply





Source: Stetson Engineers Inc.

Proposed method for defining Undesirable Results associated with declining groundwater levels *and* loss of storage



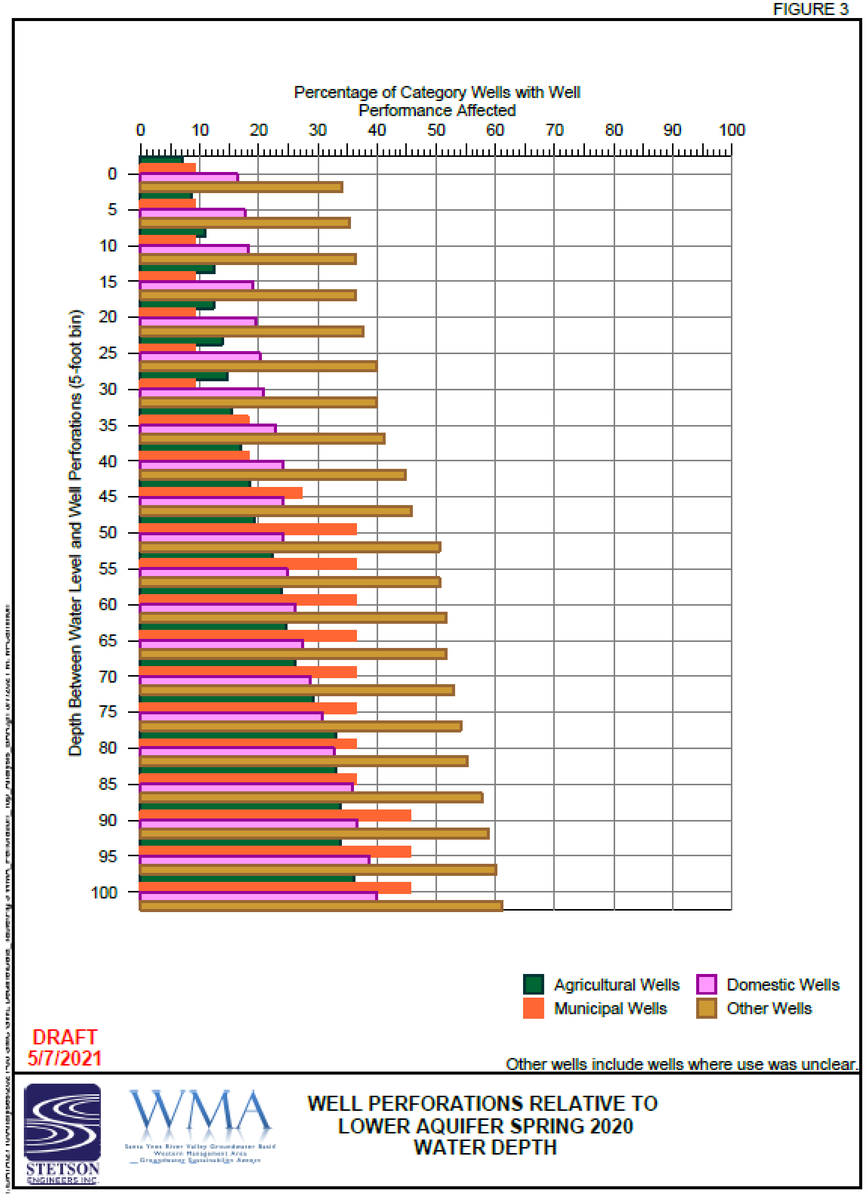
Schematic demonstrating well impact analysis
Source: Stetson Engineers Inc.

Regionally dependent

- Protective against:
  - Seawater Intrusion
  - Depletion of interconnected surface water
- GW Elevation corresponding to % of wells with water levels below top of perforations
  - Analyzed by Domestic, Municipal, and Agricultural water uses
  - Analyzed by subarea

Proposed method for defining Undesirable Results associated with declining groundwater levels *and* loss of storage

FIGURE 3



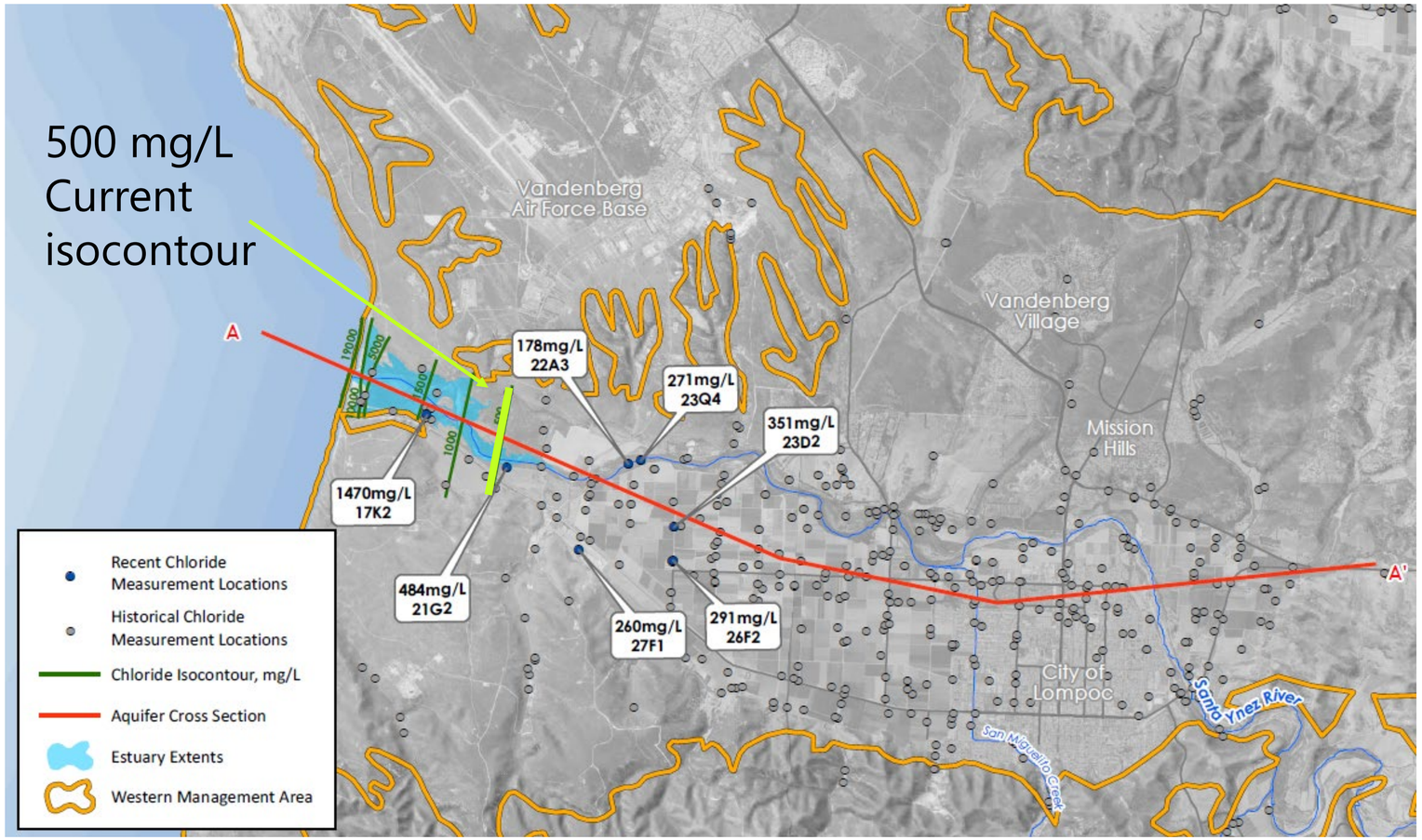
Well Impact Analysis

- Need committee input on well impact percentages that constitute "significant and unreasonable" depletion of supply

Source: Stetson Engineers Inc.

Undesirable Results for Seawater Intrusion

"…chloride concentration isocontour where seawater intrusion may lead to an undesirable result" (§354.28 (c) (1) – Minimum Thresholds)



- Title 22 Secondary Drinking Water Standard for Chloride:
  - Recommended Standard: 250 mg/L
  - Upper Limit: 500 mg/L
  - Short-term limit: 600 mg/L

Source: Stetson Engineers Inc.

Undesirable Results for Seawater Intrusion

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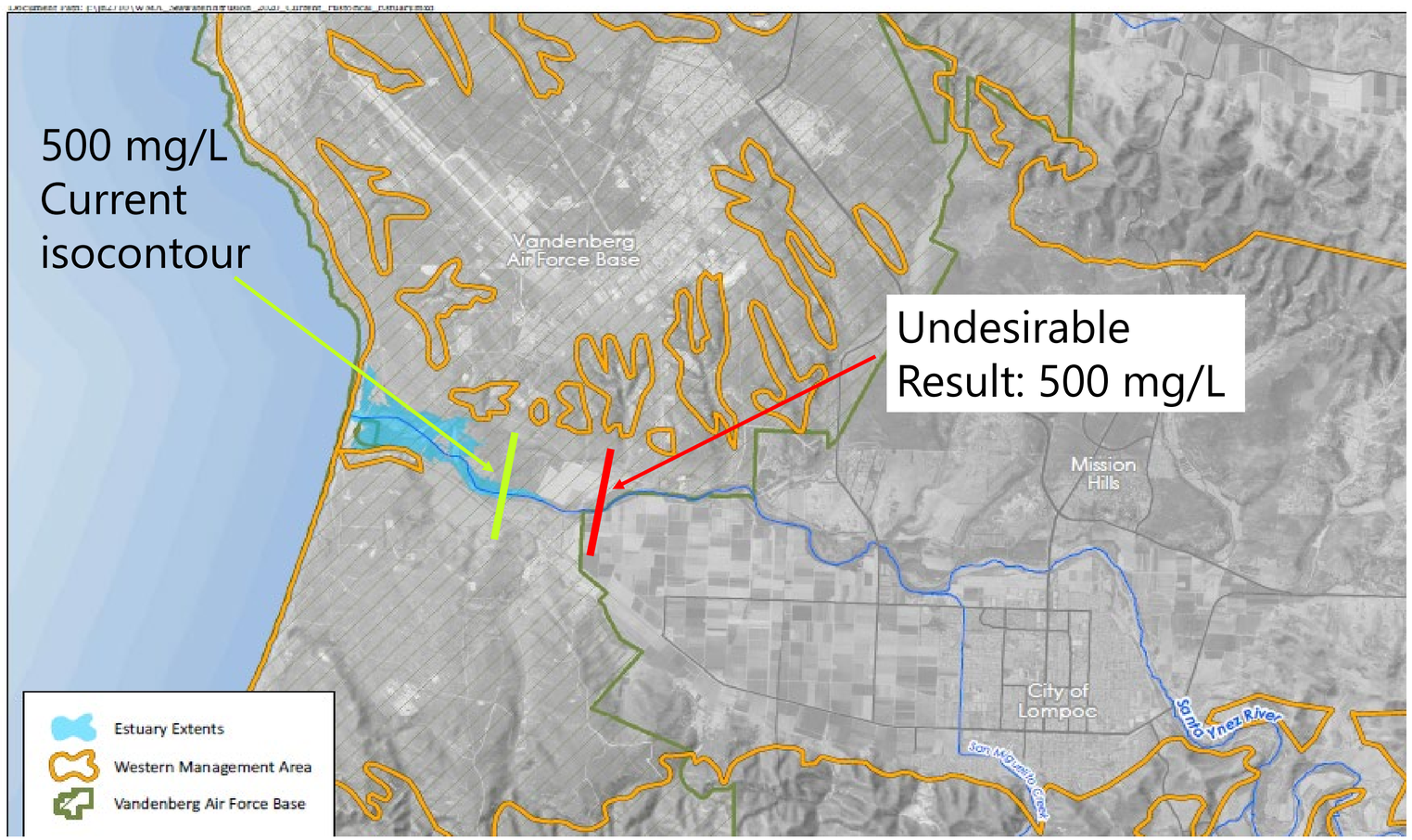
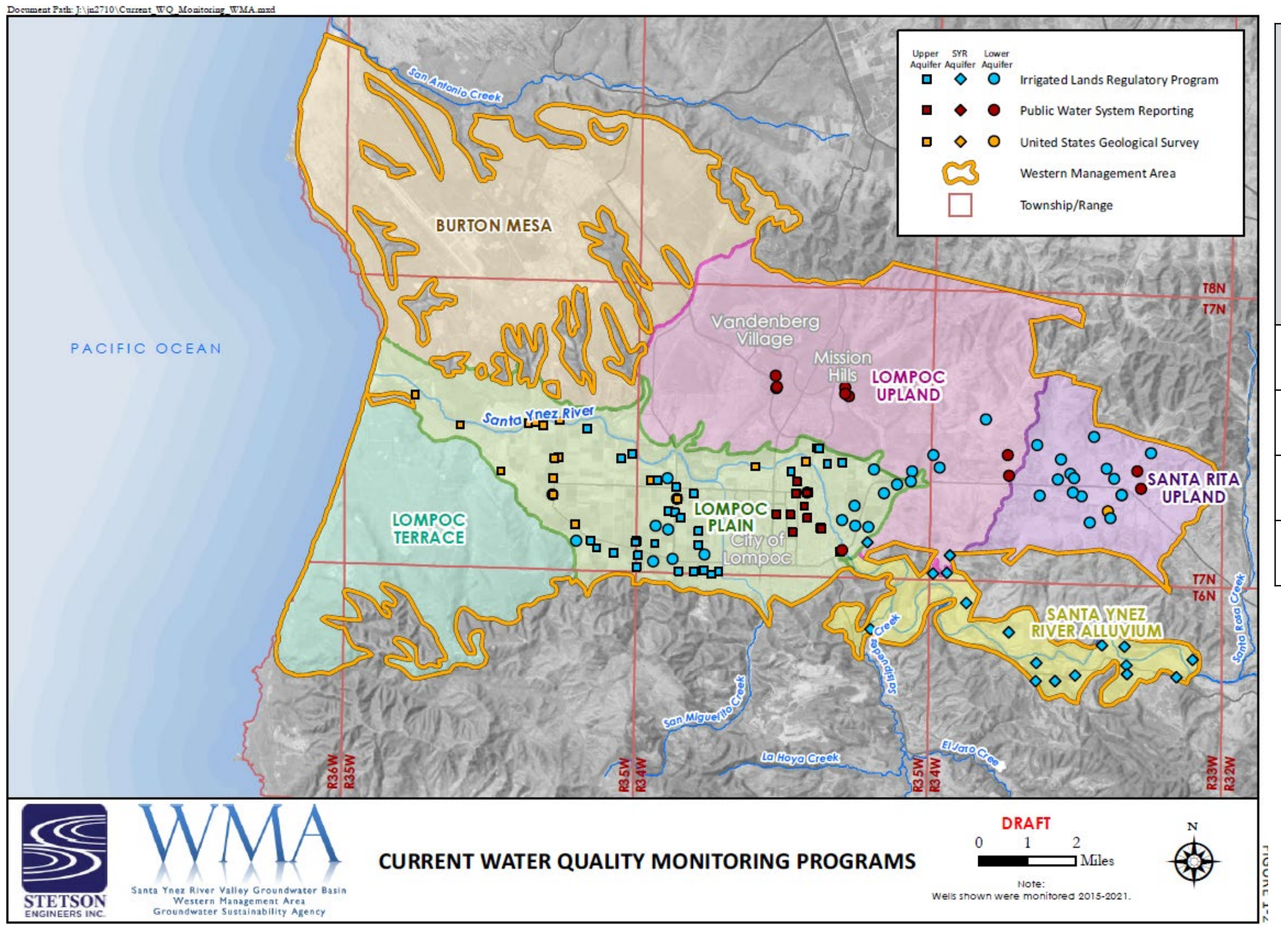


- Title 22 Secondary Drinking Water Standard for Chloride:
  - Recommended Standard: 250 mg/L
  - Upper Limit: 500 mg/L
  - Short-term limit: 600 mg/L
- Undesirable for 500 mg/L to migrate east of Vandenberg Air Force Base

Source: Stetson Engineers Inc.

Undesirable Results: Water Quality

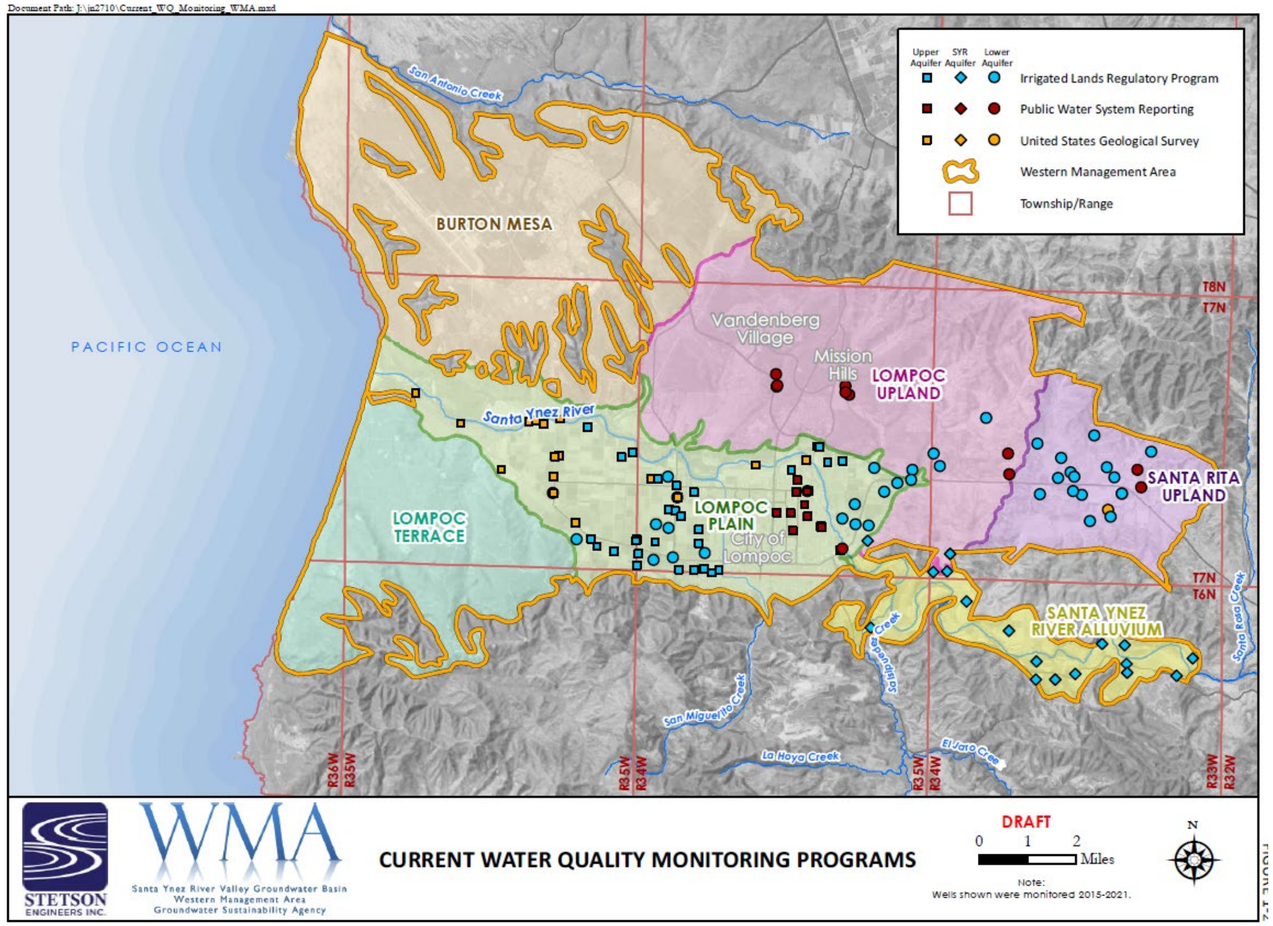


Subarea	Salinity as Total Dissolved Solids (TDS)		Chloride		Sulfate		Boron		Sodium		Nitrate as N	
	WQO (mg/L)	Avg 2015-2018	WQO (mg/L)	Avg 2015-2018	WQO (mg/L)	Avg 2015-2018	WQO (mg/L)	Avg 2015-2018	WQO (mg/L)	Avg 2015-2018	WQO (mg/L)	Avg 2015-2018
Lompoc Plain	1250	1600	250	285	500	518	0.5	0.666	250	190	2	9.9
Lompoc Upland	600	756	150	157	100	174	0.5	0.29	130	89	2	1.9
Lompoc Terrace	750	-	210	-	100	-	-	-	100	-	1	-
Santa Rita Upland	1500	583	150	95	700	149	0.5	0.248	100	68	1	1.5

- Salt and Nutrient concentrations exceed Water Quality Objectives (WQOs) for much of the WMA

Source: Stetson Engineers Inc.

Undesirable Results: Water Quality



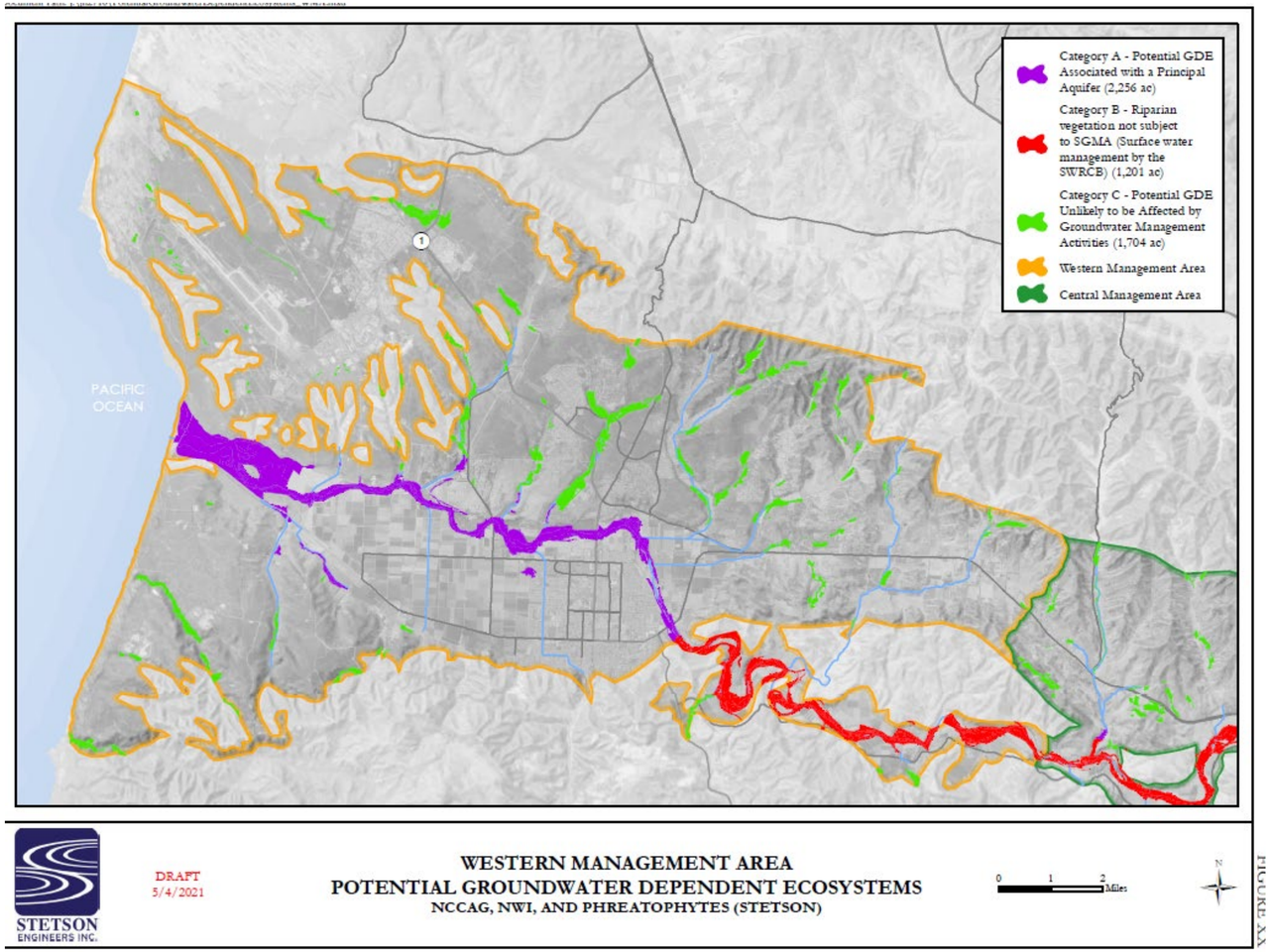
"degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator water quality…The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the Basin" (§354.28 (c) (1) – Minimum Thresholds)

- Salt and Nutrient concentrations exceed Water Quality Objectives (WQOs) for much of the WMA
- Proposed Threshold (pending available data):
  - Average 2015-2018 concentrations
    - 10 mg/L for Nitrate (MCL concentration)
- Proposed Measurable Objective:
  - Water Quality Objectives established in Central Coastal Basin Plan

Source: Stetson Engineers Inc.

Undesirable Results: Interconnected Surface Water

"…the rate or volume of surface water depletions *caused by groundwater use* that has adverse impacts on beneficial uses of surface water" (§354.28 (c) (1) – Minimum Thresholds)



- Depletion of interconnected surface water assessed by identifying the presence of groundwater dependent ecosystems (GDEs)

- Category C:
  - Not likely affected by groundwater management
  - No undesirable results established

Source: Stetson Engineers Inc.

Undesirable Results: Interconnected Surface Water

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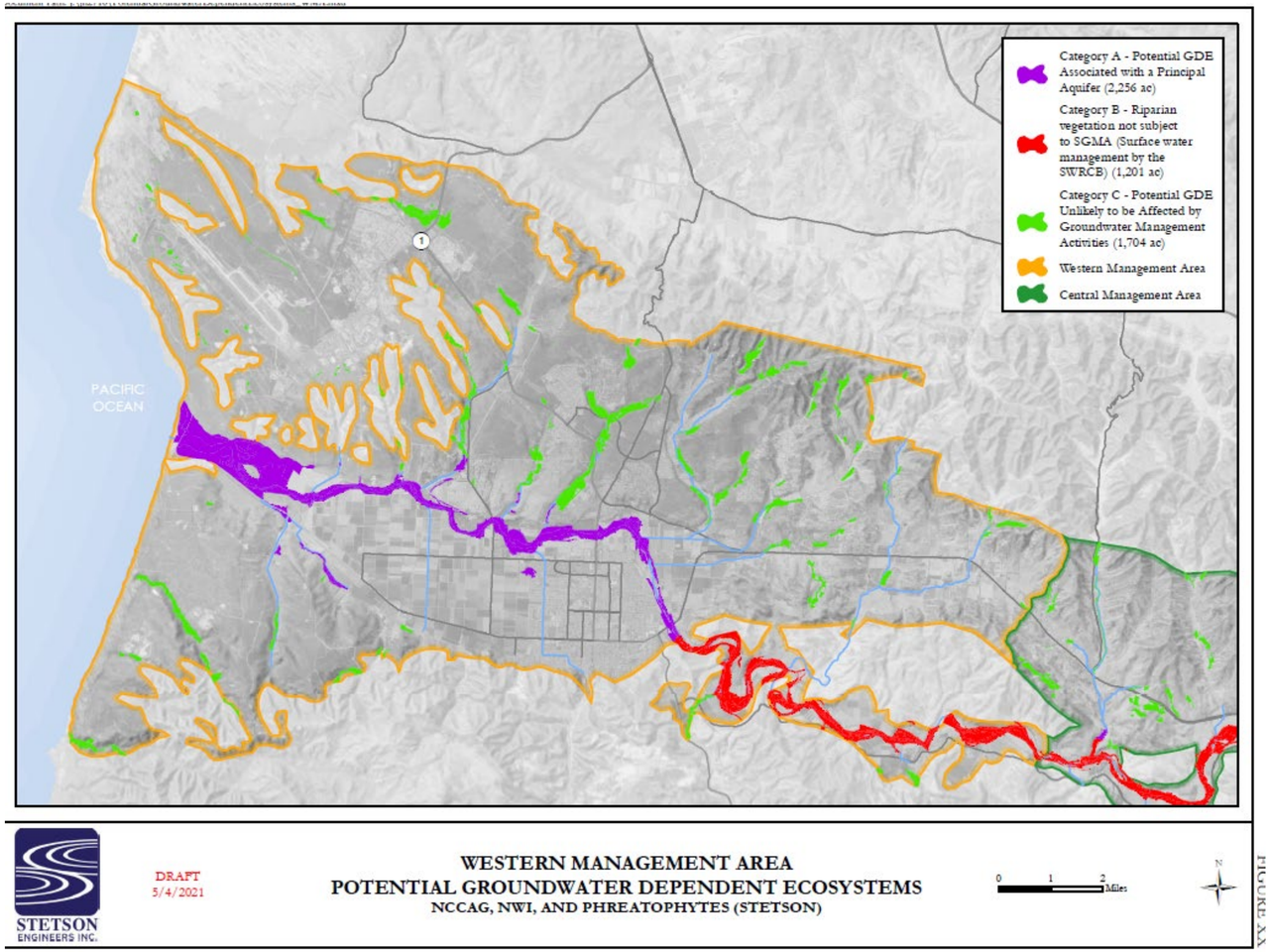


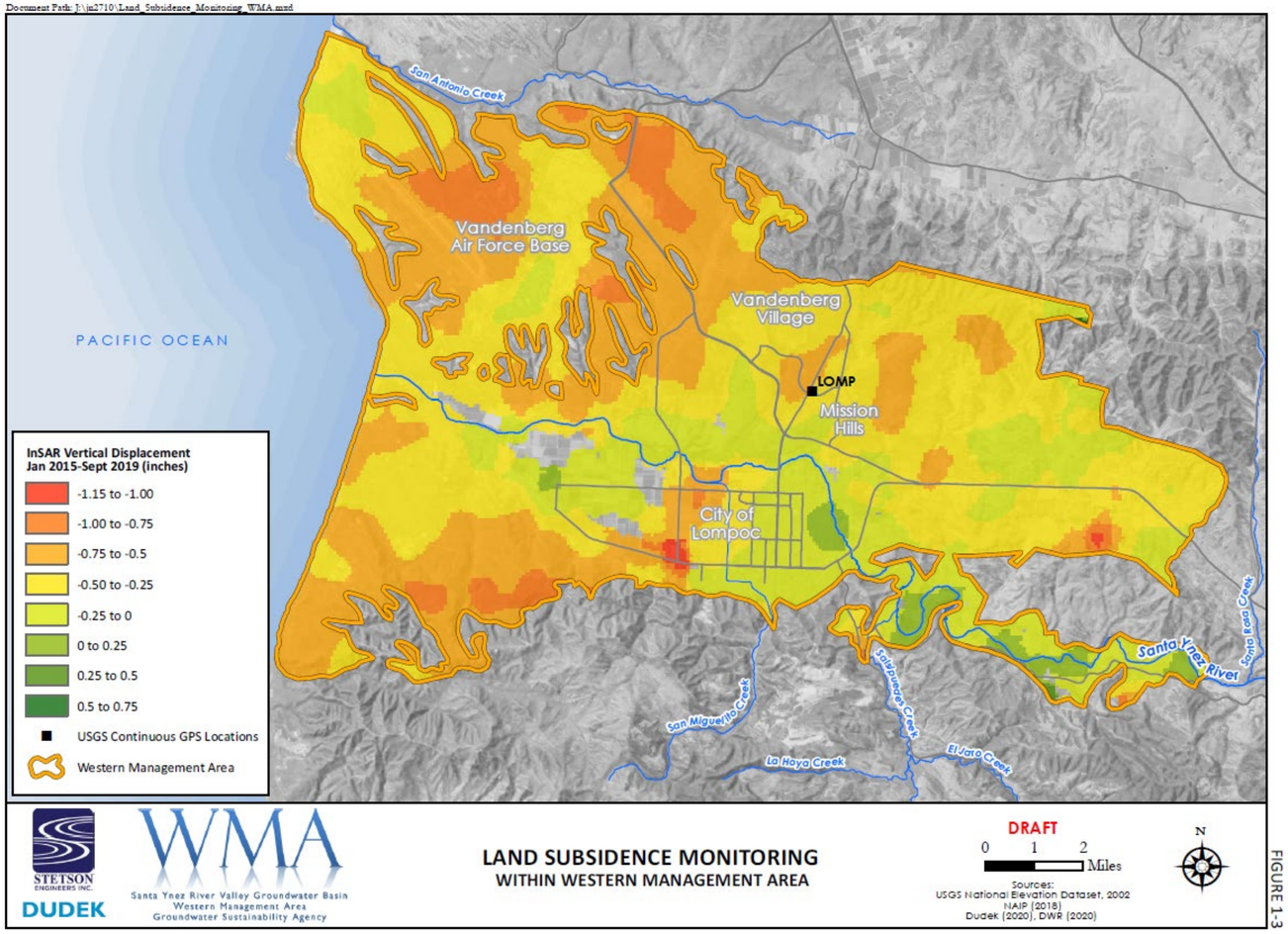
- Category A:
  - Health of vegetation communities has remained stable since 1985 (TNC, 2021) [a]
  - Not considered vulnerable to groundwater production (Jones and Stokes 2000)
  - Groundwater levels managed by releases from Cachuma Reservoir under SWRCBC Order 2019-148
  - Proposed Undesirable result:
    - Groundwater elevations near the SY River that drop below historical low water levels in the Upper Aquifer

Source: Stetson Engineers Inc.

[a]Habitat Health is quantified by The Nature Conservancy using Landsat data to compute the Normalized Derived Vegetation Index (NDVI) and Normalized Derived Moisture Index (NDMI) for the period from 1985 through 2018

Undesirable Results: Land Subsidence

"…the rate and extent of subsidence that substantially interferes with land uses and may lead to undesirable results" (§354.28 (c) (1) – Minimum Thresholds)



- No historical evidence of groundwater-related subsidence in the WMA:
  - City of Lompoc, Solvang Public Works Department, Santa Ynez River Conservation District, Central Coast Water Authority
- Undesirable Results not likely to occur
- Propose:
  - Ongoing monitoring of InSAR data, continuous GPS data, and reported infrastructure failure by relevant agencies

Source: Stetson Engineers Inc.