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Surveillance and Monitoring Program (SAMP)

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Policy-Related Questions for Executive Committee Discussion

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SAMP Overview

- The Recycled Water Policy also requires that the SNMPs include a Surveillance and Monitoring Program (SAMP) as a component:
  - *"A basin/sub-basin wide monitoring plan that includes an appropriate network of monitoring locations. The scale of the basin/sub-basin monitoring plan is dependent upon the site-specific conditions and shall be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives."*

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SAMP Objectives

- Demonstrate the effectiveness of implementation of the SNMP through:
  - Establishment of a cost-efficient program that relies on data from existing monitoring programs to the maximum extent possible.
  - Use of selected data sources that provide a statistically-significant dataset to periodically assess:
    - Ambient water quality (AWQ).
    - TDS and nitrate trends in groundwater.

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SAMP Policy-Related Questions

There are a number of policy questions that we are seeking input on as the development of the SAMP continues:

1. Which groundwater basins should be included in the SAMP?
2. How often should AWQ and trends be assessed?
3. What data should be collected in the SAMP?
4. How should the monitoring programs be stratified in terms of well depth and what data sources are best for evaluating AWQ and trends?
5. What is the management framework for the SAMP and how will the database be managed?

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SAMP Policy-Related Questions

Question 1 - Which groundwater basins should be included in the SAMP?

Valley floor groundwater basins vs. out-of-valley floor groundwater basins.

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Groundwater Basins Included in the SAMP

Which groundwater basins should be included in the SAMP?

- Valley floor groundwater basins (DWR) account for the majority of area and population.
- DWR groundwater basins outside of the valley floor are sparsely populated and may include fractured bedrock basins.

DWR Hydrologic Region	Valley Floor GW Basins	
	Percent Area	Percent Population
Sacramento River	88.8%	98.5%
San Joaquin River	99.7%	99.9%
Tulare Lake	96.6%	98.1%
Total	95.0%	98.8%

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Groundwater Basins Included in the SAMP
Sacramento River Hydrologic Area

Groundwater Basins Included in the SAMP
San Joaquin River Hydrologic Area

Groundwater Basins Included in the SAMP
Tulare Lake Hydrologic Area

Question 1 Recommendation

The SAMP should establish monitoring networks that only include groundwater basins located within the valley floor.

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SAMP Policy-Related Questions

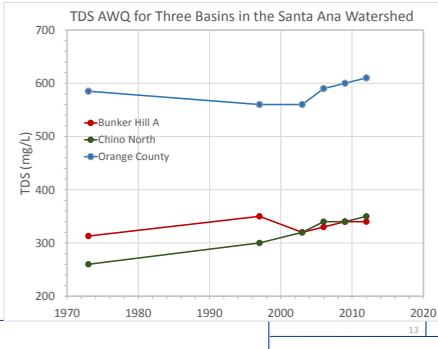Question 2 - How often should AWQ and trends be assessed?

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Recycled Water Policy Requirements

- The Recycled Water Policy (RWP) states that "The frequency of *monitoring* shall be determined in the salt/nutrient management plan and approved by the Regional Water Board."
- The RWP states that the "monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. The *data shall be reported* to the Regional Water Board at least every three years."
- The RWP is silent as to how often AWQ or trends are determined for TDS and nitrate in groundwater.

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Trend Example – Santa Ana Region

TDS AWQ for Three Basins in the Santa Ana Watershed

- Bunker Hill A
- Chino North
- Orange County

TDS (mg/L)

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Question 2 Recommendations

AWQ and trends should be re-assessed every five years.

- Will result in a substantial cost savings while still providing trend information for each groundwater basin within a reasonable time frame.
- Optional - If desired, time-series data for indicator wells could be analyzed on a more frequent basis, *e.g.*, every three years, to provide interim results.

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SAMP Policy-Related Questions

Question 3 - What data should be collected in the SAMP?

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Constituents Included in the SAMP Database?

- The RWP states, "The scale of the…monitoring plan is dependent upon the site-specific conditions and shall be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives."

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Constituents Included in the SAMP Database?

- The RWP states a "provision for annual monitoring of Constituents of Emerging Concern (*e.g.*, endocrine disrupters, personal care products or pharmaceuticals) (CECs) consistent with recommendations by CDPH and consistent with any actions by the State Water Board taken pursuant to paragraph 10(b) of this Policy."

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Constituents Included in the SAMP Database?

- Potential "other constituents of concern" could include:
  - Trace elements and non-point source agricultural chemicals (DBCP, EDB, perchlorate, etc.).
  - Non-TDS and nitrate data associated with point sources, *e.g.*, petroleum hydrocarbons, benzene, MTBE, associated with a gas station spill.
  - Constituents of Emerging Concern (*e.g.*, endocrine disrupters, personal care products or pharmaceuticals).

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Question 3 Recommendations

- Only the following constituents should be included in the database:
  - Groundwater elevations
  - TDS
  - Nitrate
  - Electrical conductivity
  - Ancillary water quality data (*e.g.*, major cations and anions) to support QA/QC activities

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SAMP Policy-Related Questions

Question 4 - How should the monitoring programs be stratified in terms of well depth?

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Determining the spatial adequacy of the monitoring networks

- In order for the SAMP to be statistically robust, a number of wells that are spatially distributed will be required. Statistical tools will be used to:
  - Determine the number of wells necessary to compute an average value and trends with a given level of certainty.
  - Decluster wells in areas where the density is too great and would not provide representative results.
  - Identify data gaps.
- One of the objectives of the SAMP is to develop a program that is cost-efficient by using data from existing monitoring programs to the maximum extent possible.

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Sources of Data in the CV-SALTS Database

- The source of data used for the SAMP is the CV-SALTS groundwater database:
  - GAMA
  - CDPH
  - DWR
  - Dairy
  - USGS
- Includes shallow, deep, unknown depth, and wells that are screened in both aquifer systems.

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Deep versus Shallow Monitoring Well Networks

- Shallow wells are typically impacted to a greater degree from both nitrate and TDS. The shallow zone trends would help forecast potential impacts to the deep zone.
- Deeper wells generally have lower concentrations of TDS and nitrate, due to the longer travel time to move through the shallow aquifer zone to reach the deeper aquifer zone. The deep zone is where most of the potable water supply is pumped from.
- One could treat all groundwater as one depth zone, but that would blend water quality and one would lose resolution and vertical stratification. Alternately, one could stratify data by depth.
- Given that we will want to stratify groundwater quality by depth and the desire to utilize existing monitoring program information, we will need to determine if there is adequate spatial coverage for both the deep and shallow zones.

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Question 4 - First Recommendation

- Develop two monitoring networks to assess AWQ and trends:
  - Deep
  - Shallow
- Optional – develop a monitoring network for area designated as the production zone

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Question 4 - Continued

Deep Monitoring Well Network

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Deep Wells in the CV-SALTS Database

- Number of deep wells in the CV-SALTS database: 10,735 (33%)
- Deep wells by groundwater basin:
  - Minimum – 4
  - Maximum – 1,242
  - Median – 194
  - Average – 275
  - Density – 52 wells/100 square miles

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Deep Monitoring Network

- Community Water Systems (CWS) wells are categorized in the CV-SALTS database as being in the deep aquifer system
  - Depth will be verified where possible
- Propose to use the CWS data from DDW as the backbone of the deep SAMP monitoring network.
  - Relatively good spatial coverage
  - Water level and water quality samples are already routinely collected.
- Decluster wells that are densely spaced.
- Augment or statistically handle areas with lower densities of wells (or no wells).
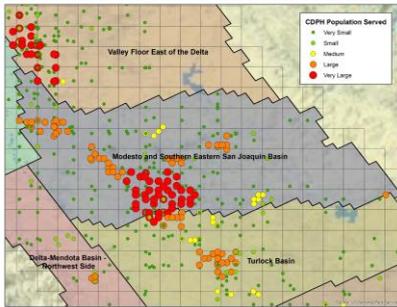
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Community Water System Wells

- CWS Categories:
  - Very Small: 25-500 people
  - Small: 501-3,300 people
  - Medium: 3,301-10,000 people
  - Large: 10,001-100,000 people
  - Very Large: 100,001+ people
- CWS wells by groundwater basin:
  - Minimum – 0
  - Maximum – 818
  - Median – 84
  - Average – 146
  - Density – 28 wells / 100 square miles

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Deep Monitoring Network

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Question 4 – Deep Network Recommendation

- Deep Monitoring Network
  - Rely on the Community Water System (CWS) wells as the basis to assess AWQ and trends
    - Relatively good spatial coverage
    - Water level and water quality samples are already routinely collected
    - Final well selection will consider need to decluster wells and augment where data gaps exist

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Question 4 - Continued

Shallow Monitoring Well Network

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Shallow Wells in the CV-SALTS Database

- Number of shallow wells in the CV-SALTS database: 8266 (25% of the wells in the CV-SALTS database)
- Shallow wells by groundwater basin:
  - Minimum – 0
  - Maximum – 1,024
  - Median – 131
  - Average – 212
  - Density – 40 wells/100 square miles

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Shallow Monitoring Network

- Shallow monitoring network will be more difficult
  - Dedicated monitoring programs are not as spatially robust
- Proposed shallow monitoring system will consider shallow wells in existing monitoring programs:
  - CWS wells that are re-categorized as shallow.
  - Shallow dairy wells from the Dairy Representative Monitoring Program
  - Shallow monitoring wells proposed by the ILRP coalitions
  - Shallow environmental monitoring wells
- Care needed to avoid oversampling of hotspots
- Shallow domestic and irrigation wells will then need to be considered to provide additional spatial coverage

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Question 4 – Shallow Monitoring Network Status

- The development of the shallow monitoring network is still a work in progress.
  - Proposed shallow monitoring system will consider shallow wells in existing monitoring programs to the extent possible.
  - Shallow domestic and irrigation wells will then need to be considered to provide additional spatial coverage.

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SAMP Policy-Related Questions

Question 5 - What is the management framework for the SAMP and how will the database be managed?

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SAMP Management Framework and Database

- The components of the SAMP management framework include:
  - Database
    - Use and build off the existing CV-SALTS Access database.
    - Build a query to retrieve data associated with only shallow and deep SAMP monitoring networks.
    - Periodic updates to the CV-SALTS database to accomplish the five-year assessment of groundwater quality.
  - Where is the database housed (and backed up)?
  - Decide who QA/QCs the data and uploads to the database.
  - Determine process for performing the assessment and administering the program.
  - Determine degree and form of access to the database.

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Question 5 Recommendations

- Use the existing CV-SALTS database.
- Use queries to retrieve data from wells associated with shallow and deep monitoring networks.
- Data QA/QC'd and uploaded every five years.
- Database stored at the Central Valley Water Board and at least two other entities.
- Still to be determined, but will need decisions on the following:
  - how the SAMP is administered and by whom?
  - degree and form of access to the database.

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Questions?

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