

# Background Quality of Delta Island Soil and Ground Water and the Implications for Reusing Dredged Sediments

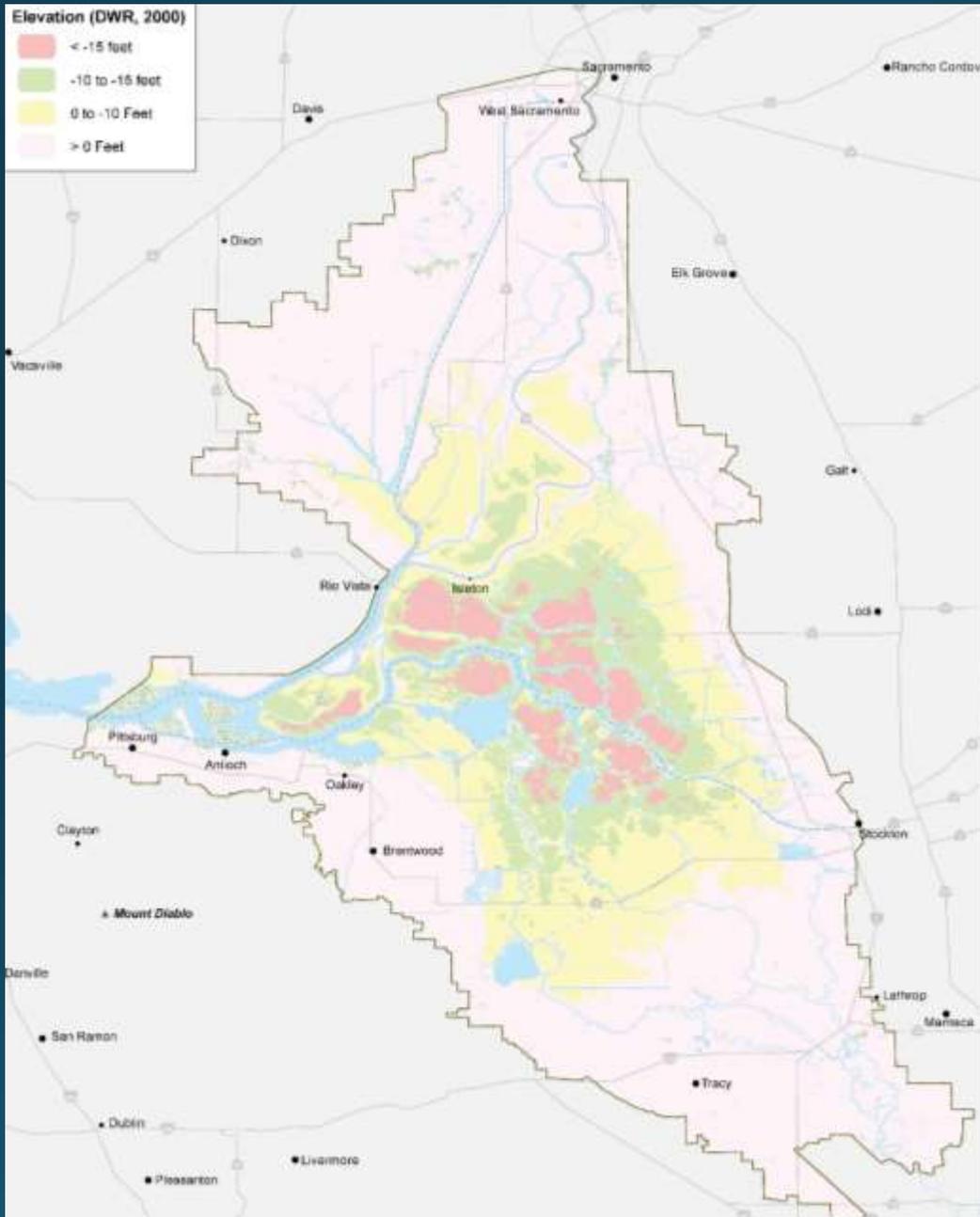


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Applied Water Resources



# Outline

- 💧 Very Brief History of Reusing Dredged Sediment in the Delta
- 💧 Regulations Controlling Reuse of Dredged Sediment
- 💧 Study Purpose and Design
- 💧 Findings so far
- 💧 Obstacles / Solutions to streamlining reuse
- 💧 Q & A



## Sources of Dredged Seds

Dredging

DWSC maintenance

several 100k cyds/yr

DWSC Deepening (planned)

~25 - 35M cyds to Stockton

~10 - 15M cyds to Sacramento

Sloughs, Ports, Marinas

## Uses of Dredged Seds

Levees – setback, raise, back slope

Subsidence Reversal

Habitats – upland, wetland, aquatic

Construction – road, pads, backfill

Agriculture – improve soil

Beach Nourishment

Reduce CO<sub>2</sub>, CH<sub>4</sub> - Bury Peat

# Brief History – Sed Reuse & Water Board

- 💧 ~pre 2000 - Unrestricted use of dredged sediments
- 💧 ~2000 – Policy changes
  - Notify before reusing
- 💧 2004 – Jones Tract levee break
  - Press : Sediment = Toxic Muck
  - Water Board: Dredged sediment is a waste
  - Approve before reusing
  - Landfills threatened
  - DWR spends \$1M+ to address levee repair using dredged seds
- 💧 2005 – 2008 – Characterize Sediment Biogeochemistry
  - In-depth study of dredged sediments at RN<sub>1</sub>, RN<sub>2</sub>, S<sub>4</sub>
  - Study shows sediment benefit Delta island ground water >> island soil



# Brief History – Sed Reuse & Water Board

## 💧 ~2009 – present

- Water Board begins to permit reuse
- LTMS tries to deal with dredging and reuse
- R5-2009-0085
- Permit reuse of 2M+ cyds at POS

## 💧 Current Reuse Process

- Reuse only if inert waste
- NOI to NOA process
- Site by site study and approval basis
- Dredged sediment placement sites must maintain capacity
- Recipient must accept a waste

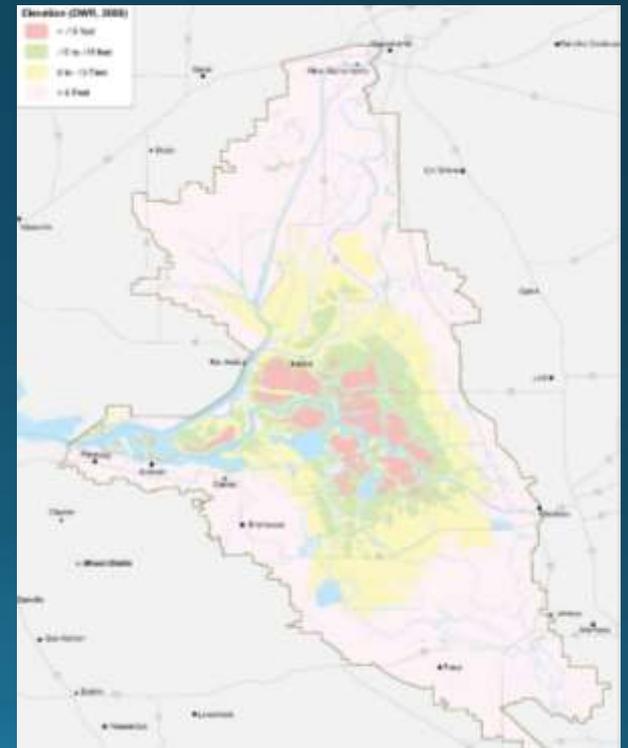
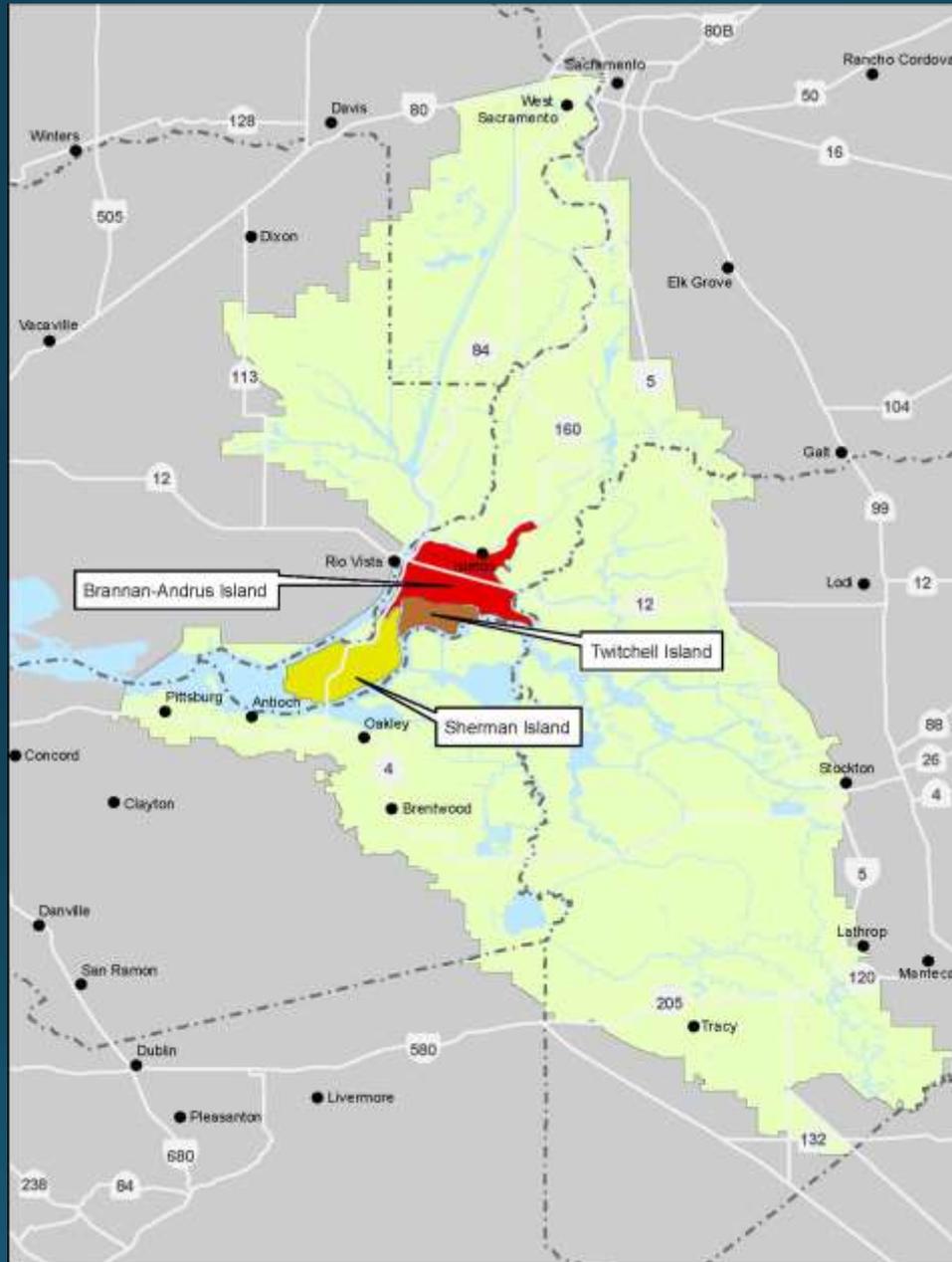


# Study Purpose

- Characterize the background quality of shallow soil and ground water across the Island to allow an evaluation of the risks posed by the placement and reuse of dredged sediment.
- 2008 - Proposed Background Study of 35 Islands
  - DWR Special Projects
  - DWR Accepted for 10 western Delta Islands
  - Sherman, Twitchell, Brannan-Andrus

# Background Study

- Sherman
- Twitchell
- Brannan- Andrus



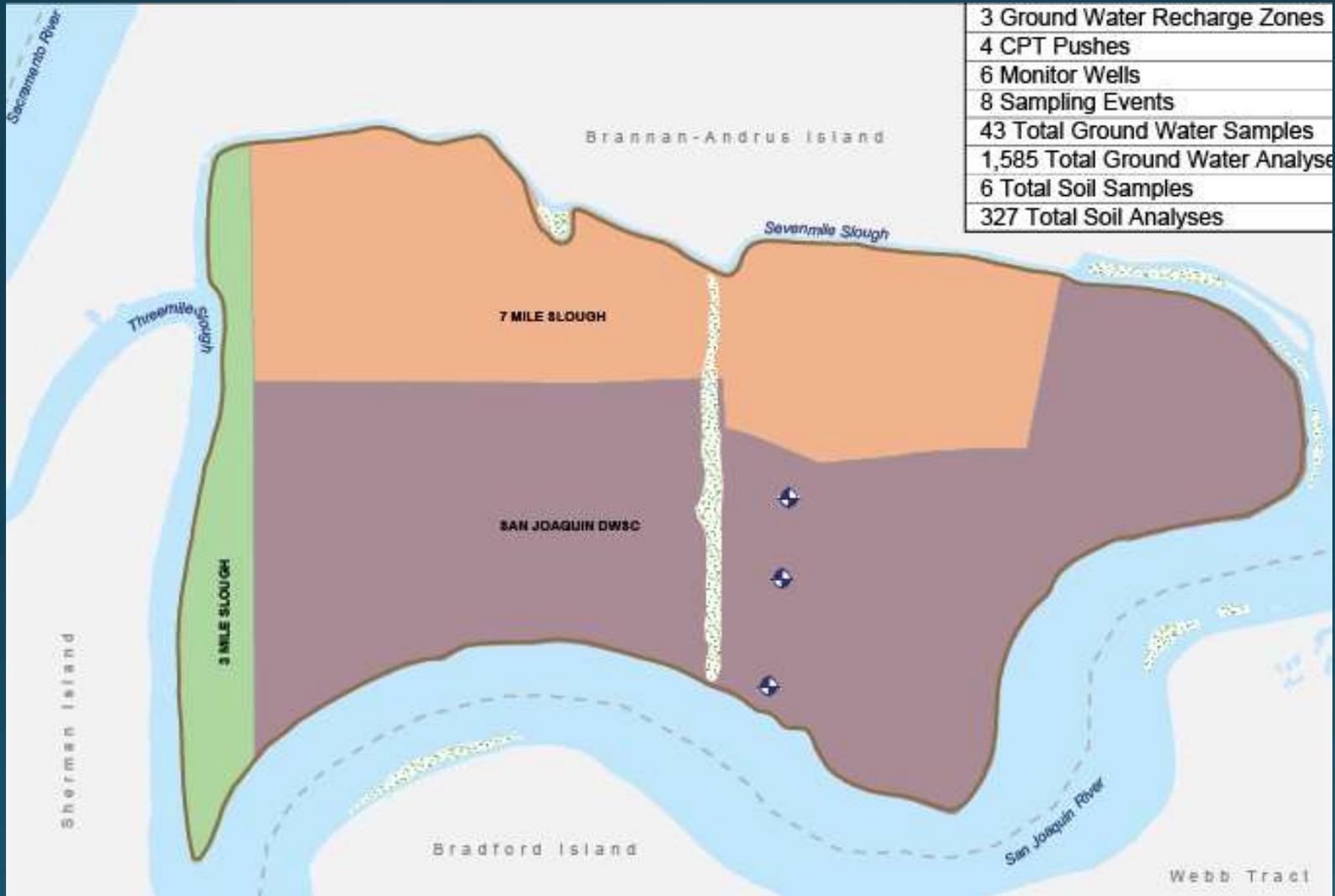
# Study Design

- If Dredged Sediment Quality  $\geq$  Island Background, then it's an inert waste
  - Poses no significant risk in the location placed
  - Must understand background
- Characterize
  - Shallow Ground Water and Soil
  - Alternative borrow materials
  - Levee materials
  - Total and water soluble chemistry
  - Natural constituents, no anthropogenic chemicals (ie., ag)

# Sherman Island

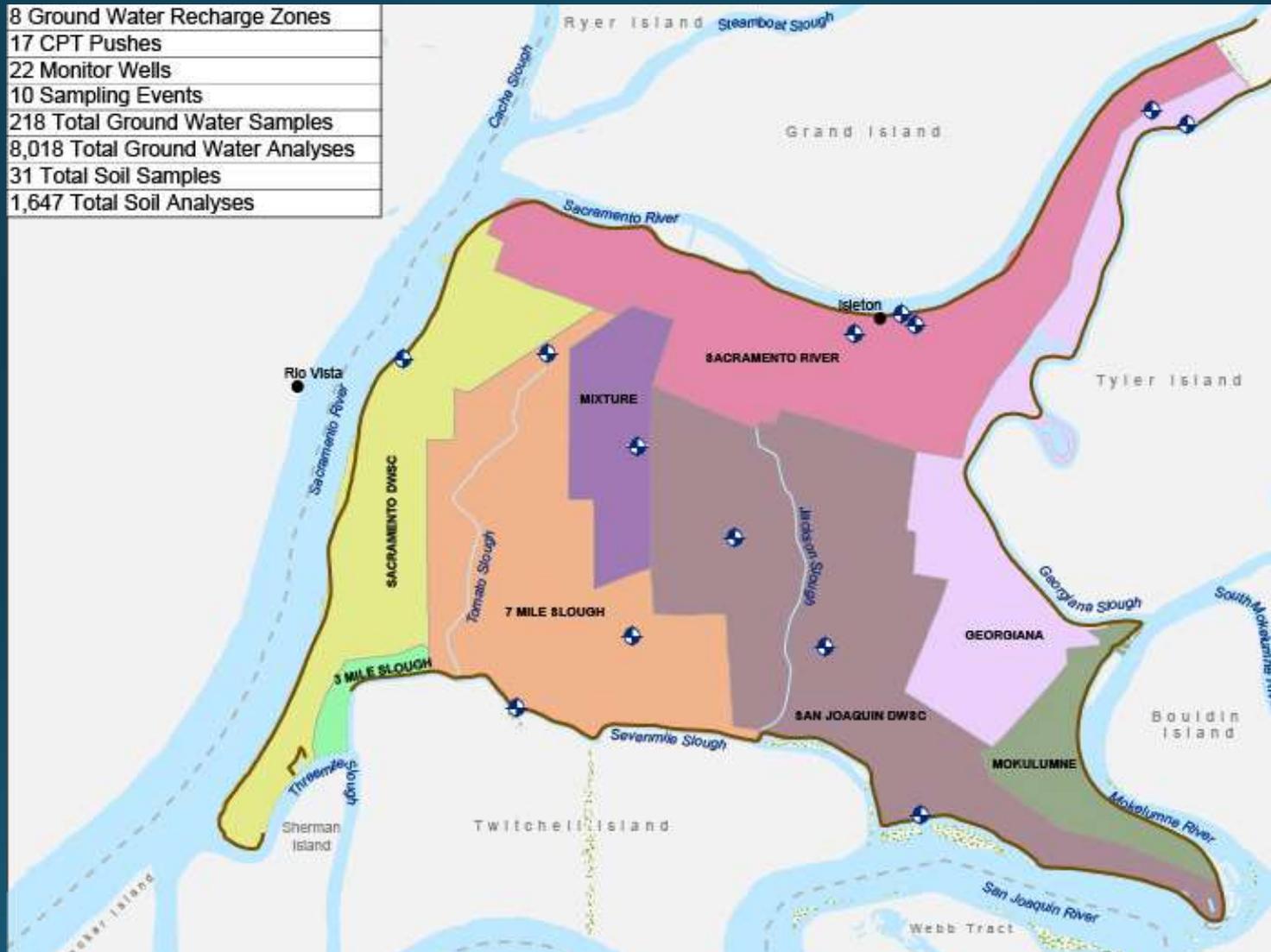


# Twitchell Island



# Brannan-Andrus Island

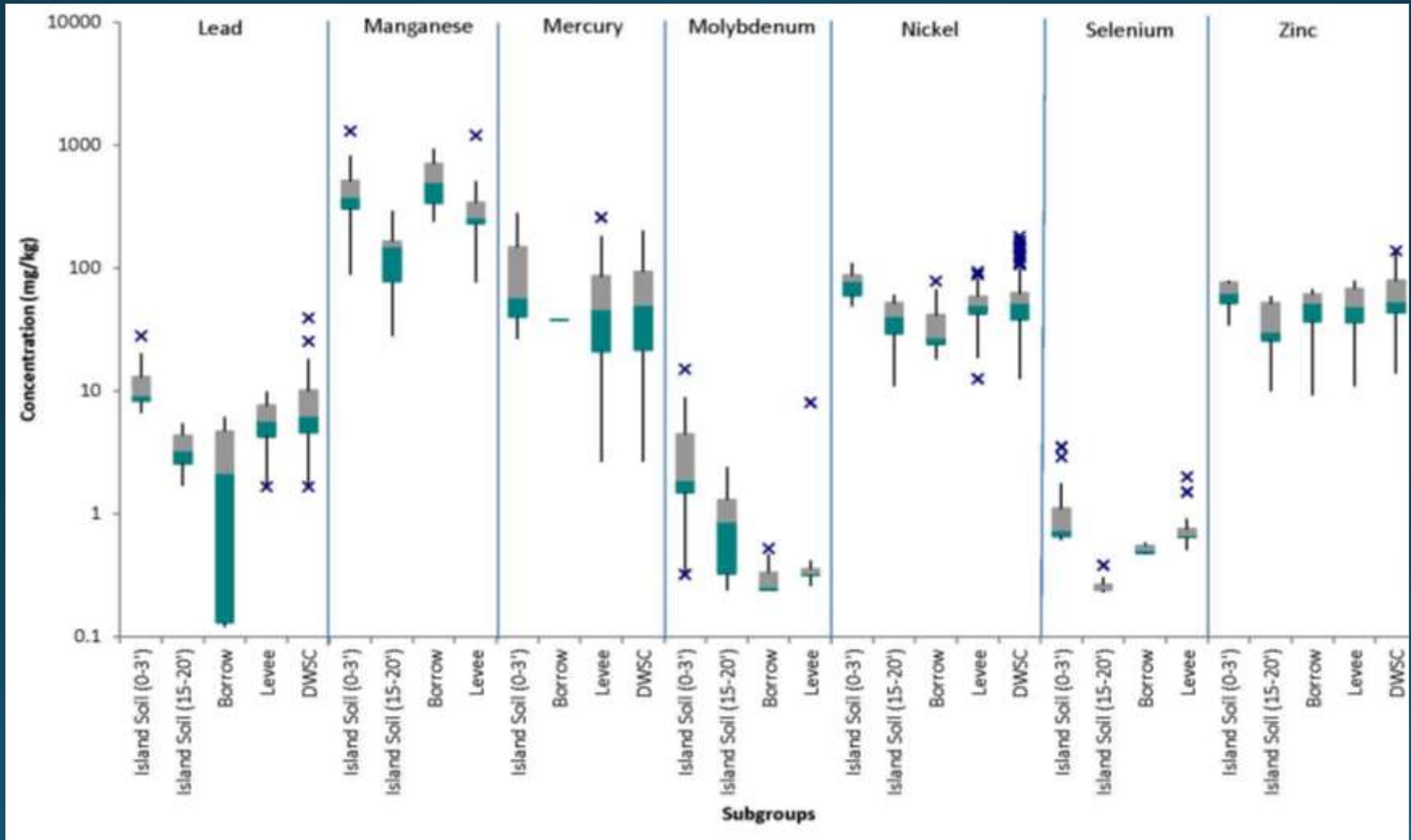
8 Ground Water Recharge Zones
17 CPT Pushes
22 Monitor Wells
10 Sampling Events
218 Total Ground Water Samples
8,018 Total Ground Water Analyses
31 Total Soil Samples
1,647 Total Soil Analyses



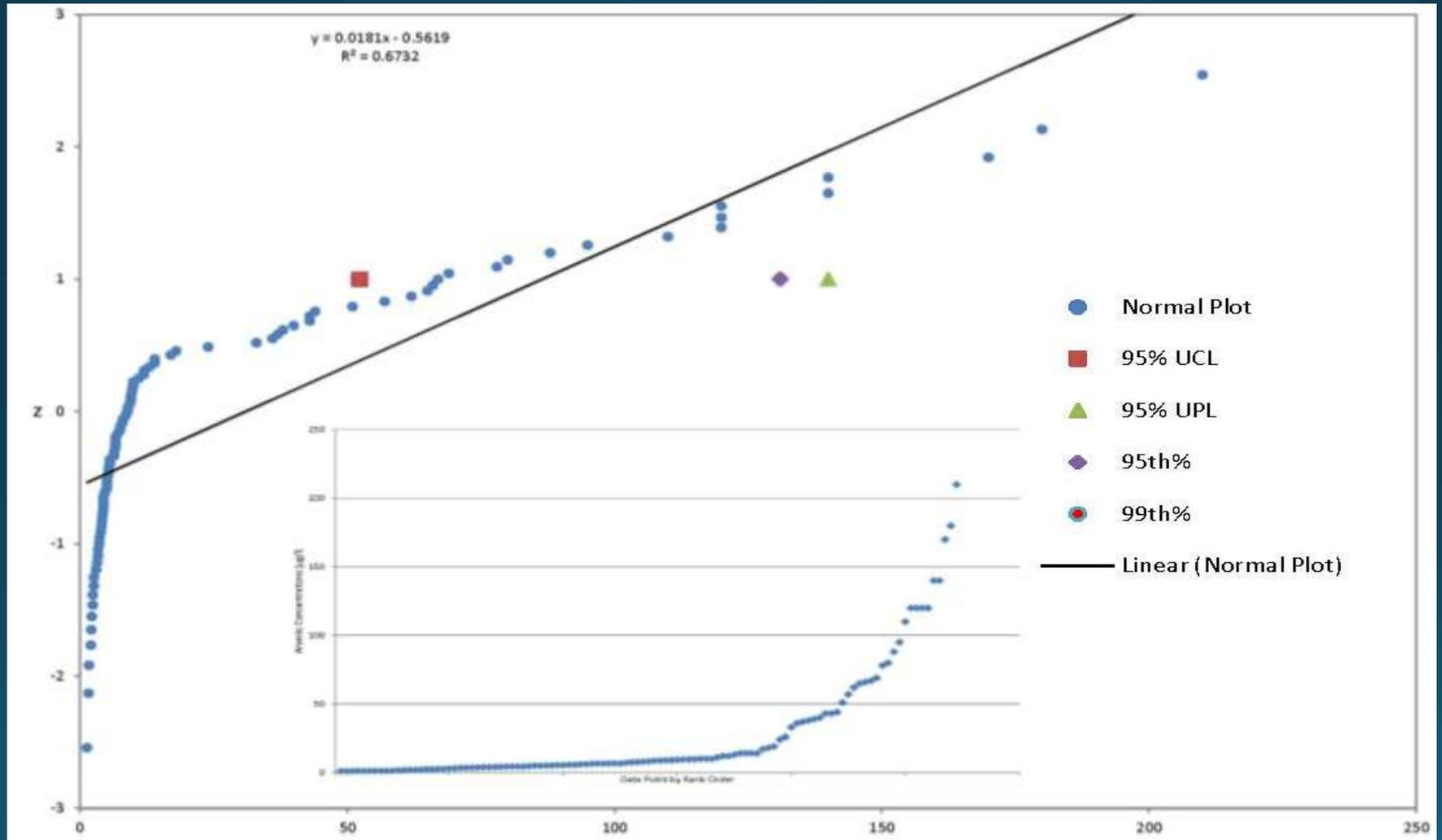
# Scope – Characterize Each Recharge Shed

- 💧 Transect from nearshore to interior
  - CPT at each location to get lithology – 50 - 80 ft
- 💧 Soil - Near surface and ~3 ft deep
- 💧 Ground water
  - Shallow = peat - organic rich shallow GW saturated zone
  - Deeper = first underlying sandy GW bearing zone
  - 10 monitoring events in one year
- 💧 Nearby Borrow Sites
- 💧 Levees - Various depths (driven by grain size)
- 💧 Chemistry - Metals (total & DIWET), minerals, properties

# Soil: Box-Whisker by location



# Soil: Probability & Rank Order



# Findings (still in process)

## 💧 Island Land Use (general)

- Sherman – grazing
- Twitchell – ag and wetlands
- Brannan Andrus – ag and grazing

## 💧 Soil

- Similar across the islands
- Peat Quality << Sandy zone
- Dredged Sediments Quality >> Peat

## 💧 Ground Water

- Chemistry dominated by soil, not SW recharge
- Quality of Peat << Sandy zone
- Salinity (TDS) increases inland

# Implications for Dredged Sediments

- 💧 Geochemically an inert waste (typical)
- 💧 Benefit ground water quality
- 💧 Accepted by ag as valuable resource (generally)
- 💧 Useful in habitat construction, levees, construction, etc.
- 💧 Should be regulated and managed as a valuable public resource

# Obstacles to Reusing Dredged Sediments

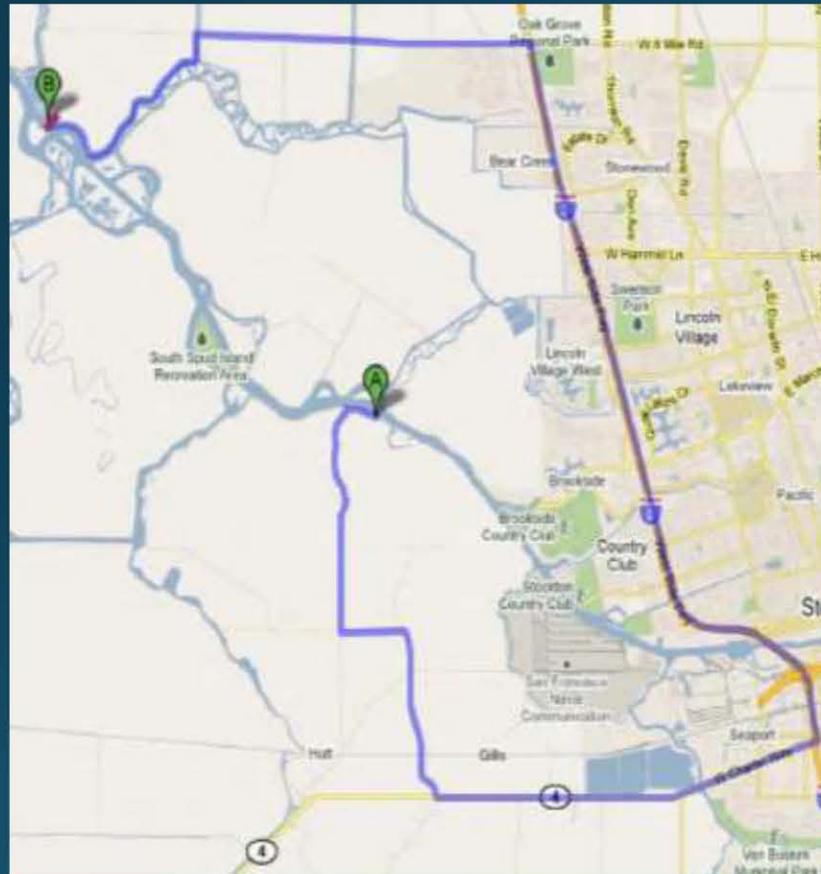
- 💧 Stigma and liability concerns persist
- 💧 End users still receive a regulated waste
- 💧 Corps not funded to support beneficial reuse
- 💧 Corps' only funded to place immediately next to channel
- 💧 NOI / NOA for each reuse site can be expensive
- 💧 Background study eliminates this need for the 3 islands
- 💧 DWR (public) and RDs pay \$\$\$ for trucking
- 💧 Sometimes cheaper to import from borrow sites, due to routes
- 💧 Sediment Generators and Consumers are disconnected

# RN2 to Empire Tract

From A to B

Driving from Stockpile to Reuse: 30 mi = 158,500 feet, about 57 minutes

Pumping from channel: approx 500 feet from DWSC

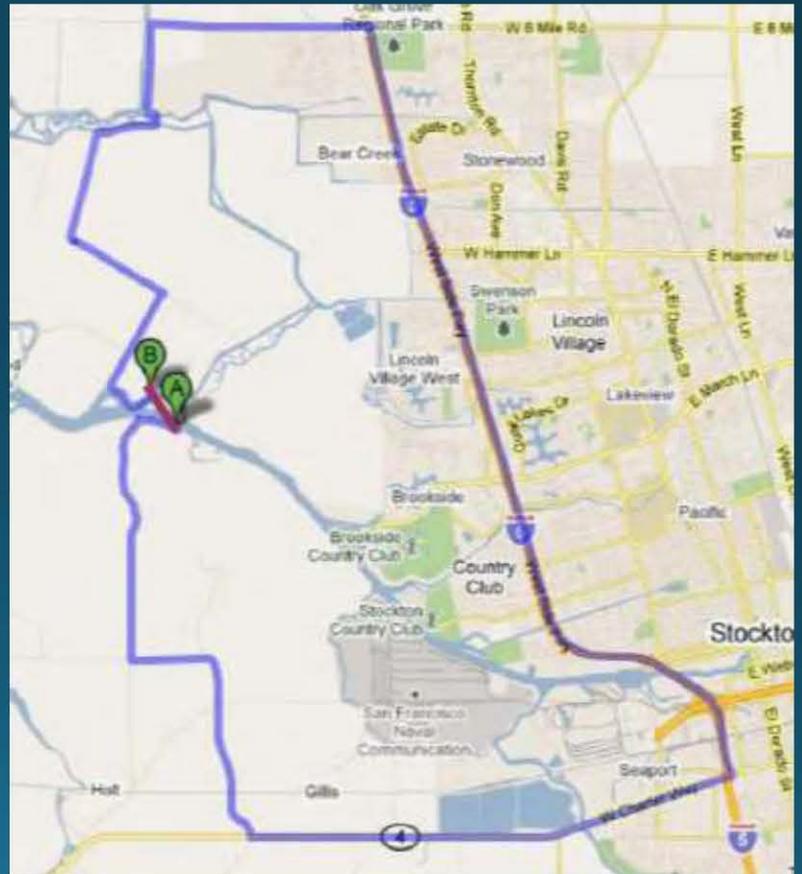


# RN2 to Rindge Tract

From A to B

Driving from Stockpile to Reuse: 30.5 mi = 161,000 feet, about 56 minutes

Pumping from channel: 2,500 feet from stockpile, or 800 feet from DWSC

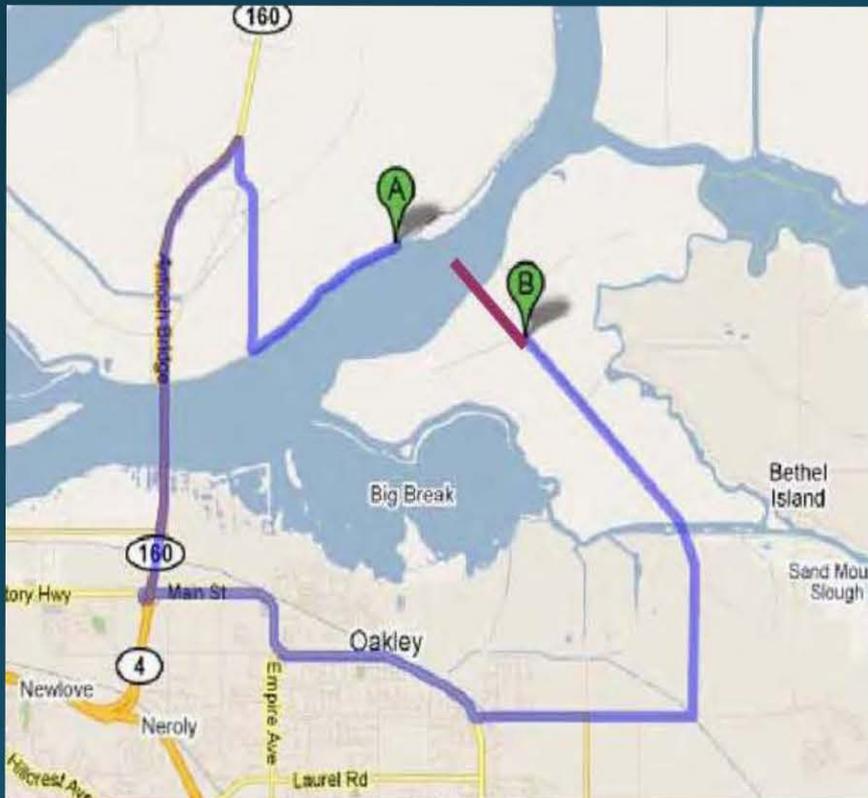


# Sherman to Jersey

From A to B

Driving from Stockpile to Reuse: 17 mi = 90,000 feet, about 36 minutes

Pumping from channel: approx 3,000 feet from DWSC

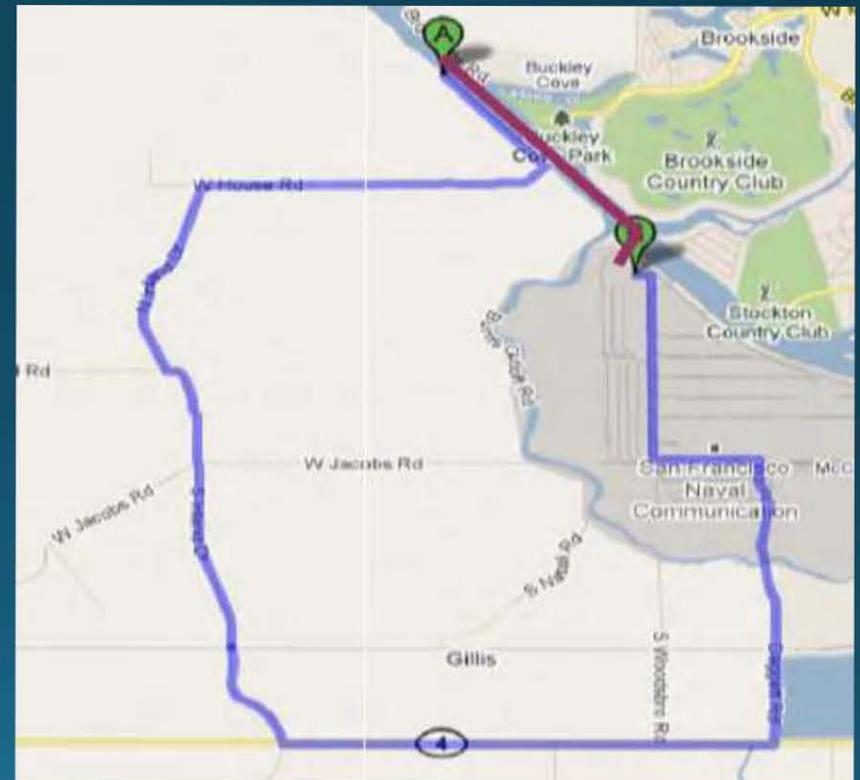


# RN1 to Rough & Ready Isl

From A to B

Driving from Stockpile to Reuse: 10.6 mi = 56,000 feet, about 30 minutes

Pumping from channel: 6,000 feet from stockpile, or 500 feet from DWSC



# Solutions

- 💧 Establish background for each island with the potential to use dredged sediments and DWR (public) \$\$\$
- 💧 Coordinate generators with consumers
- 💧 Alter Water Board policy to consider dredged sediments a material if tests clean
- 💧 Alter Corps dredge funding to support beneficial reuse in Delta
- 💧 Efficiently use tax dollars (crazy idea)

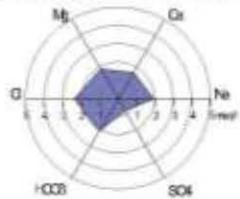
# Questions & Discussion



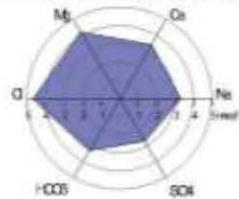
## West Delta Water Quality Cation/Anion Radial Diagrams

### Agricultural Drain Monitoring Stations

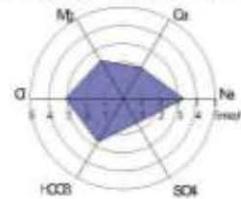
Ag Drain on Brannan Island, PP. No. 2 (a)



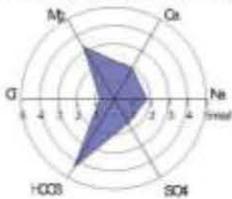
Ag Drain on Brannan Island, PP. No. 3 (b)



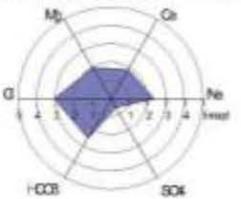
Ag Drain on Brannan Island, PP. No. 4 (c)



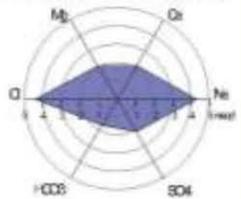
Ag Drain on Egbert Tract, PP. No. 1 (r)



Ag Drain on Staten Island PP. No. 2 (u)

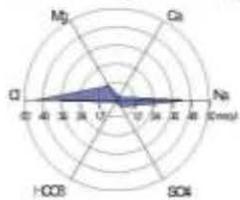


Ag Drain on Twitchell Isl., PP. No. 1 (c)

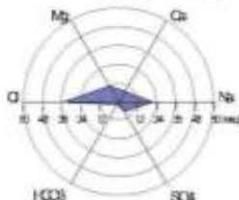


### San Joaquin River Monitoring Stations\*

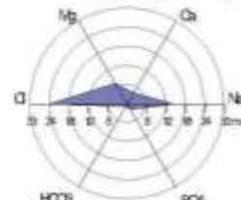
Sacramento River @ Millard Island (t)



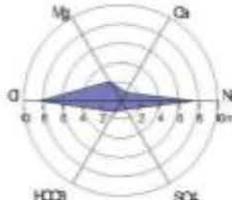
Sherman Island Dredge Site 02 (h)



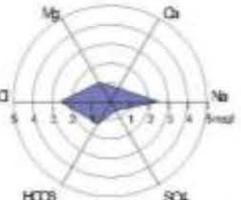
Sherman Island Dredge Site 01 (g)



San Joaquin River at Jersey Point (f)

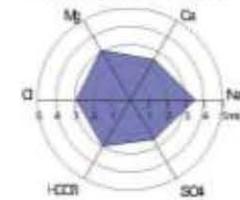


Twitchell Siphon Number 19 (p)

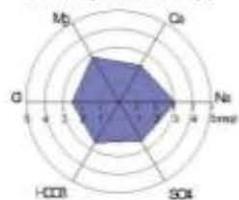


### Seven Mile Slough Monitoring Stations\*

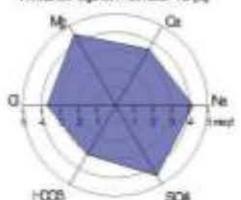
Twitchell Siphon Number 98 (m)



Twitchell Siphon Number 11 (n)

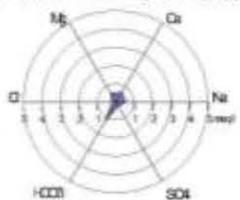


Twitchell Siphon Number 12 (o)



### Mokelumne River Monitoring Stations\*

Mokelumne R. above Georgiana Slough (d)

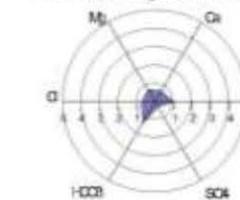


Mokelumne R. below Georgiana Sl (e)

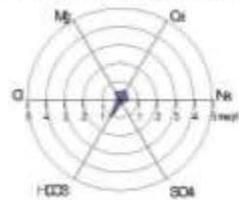


### Sacramento River Monitoring Stations\*

Sacramento River @ Rio Vista Bridge (s)



Sacramento River at Greene's Ldg. (v)



\*All Stations are in order of farthest downstream (left) to farthest upstream (right)

