Sea Water Intrusion in the Los Osos Groundwater Basin

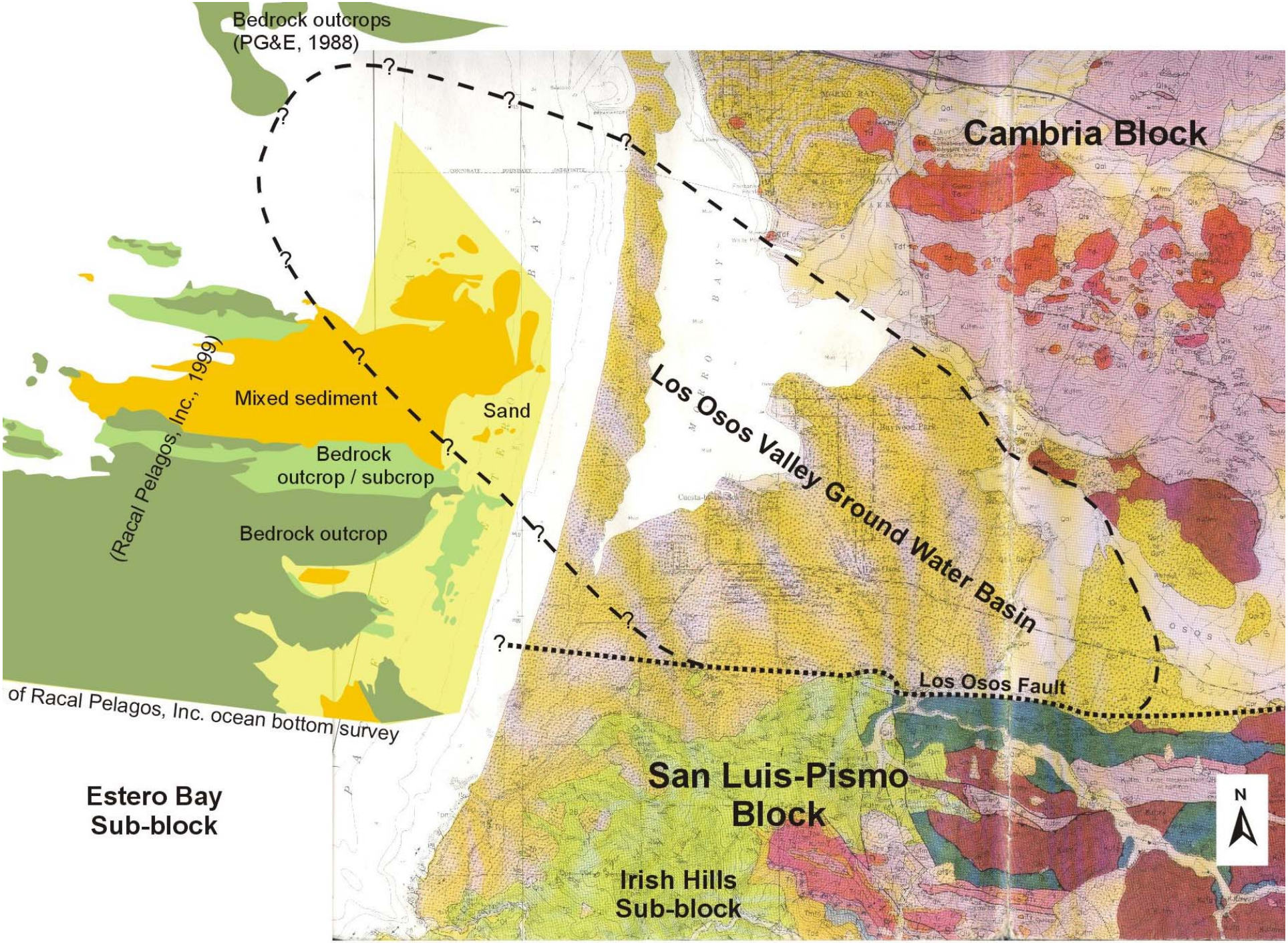
Presentation of Updated Technical Studies prepared by Cleath Harris Geologists

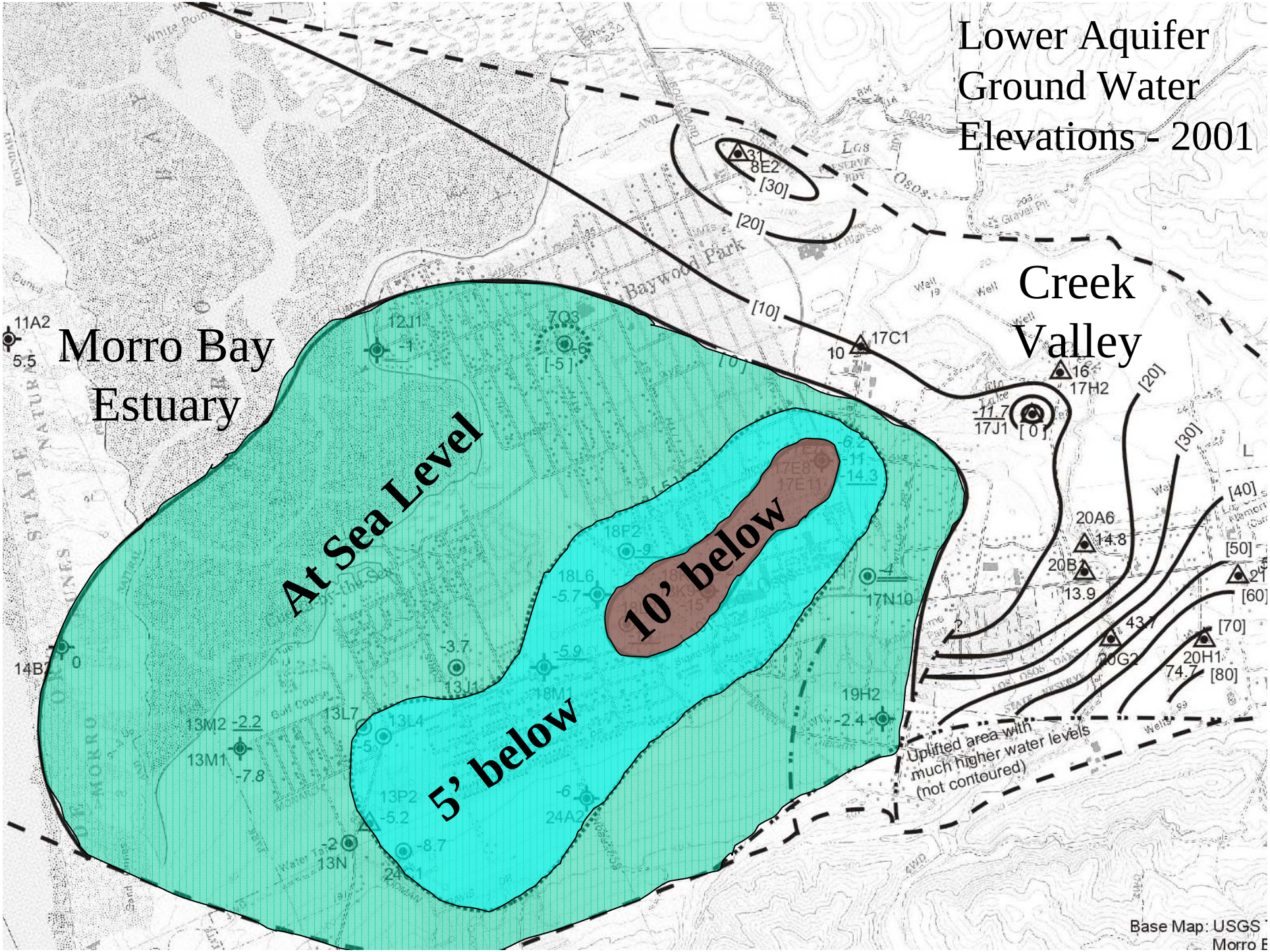
Golden State Water Company
A Subsidiary of American States Water Company

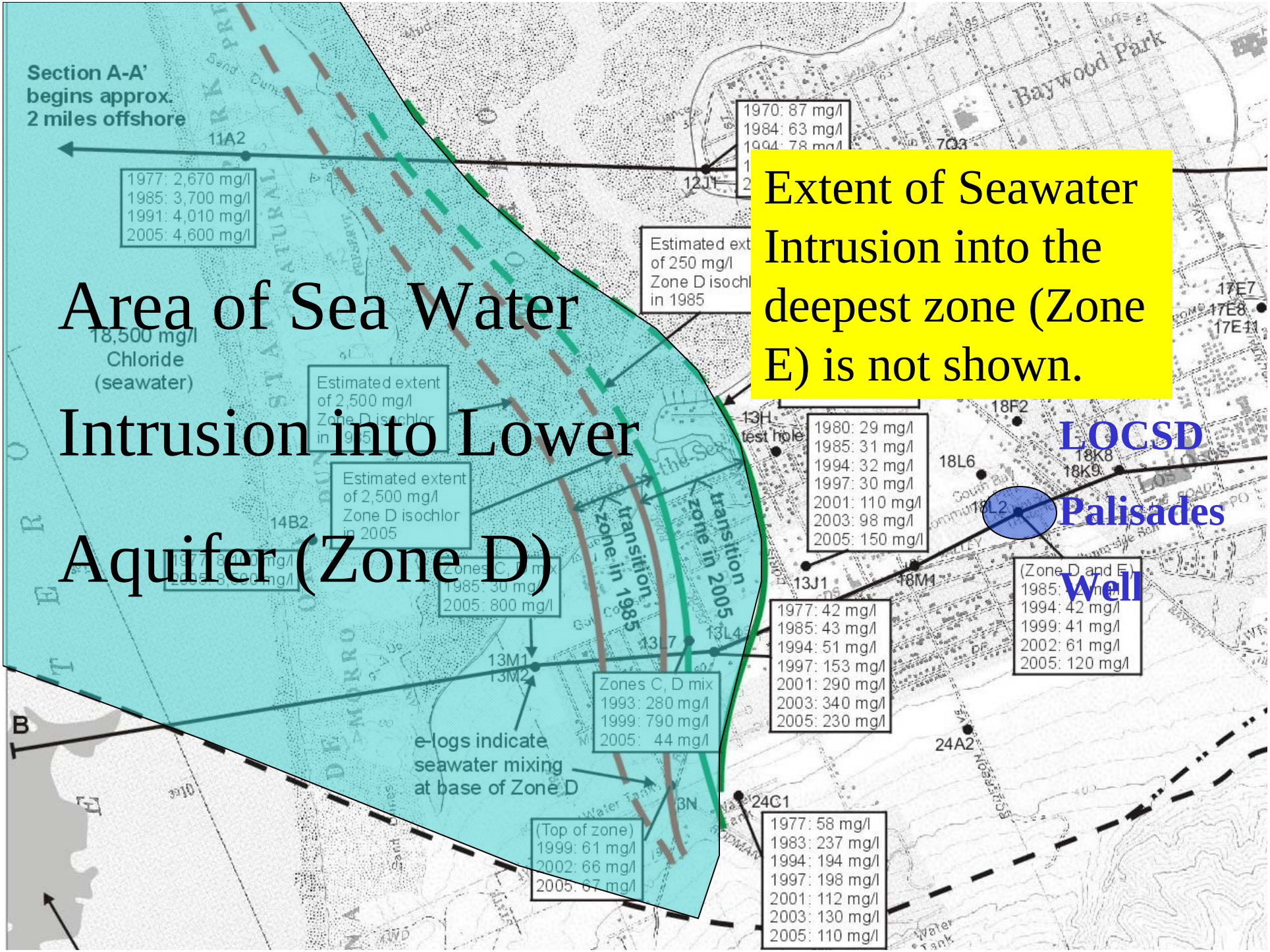
COUNTY OF SAN LUIS OBISPO, CALIFORNIA
ALCALDES 1850
NOT FOR OURSELVES ALONE

S & T Mutual Water

LOS OSOS COMMUNITY SERVICES DISTRICT

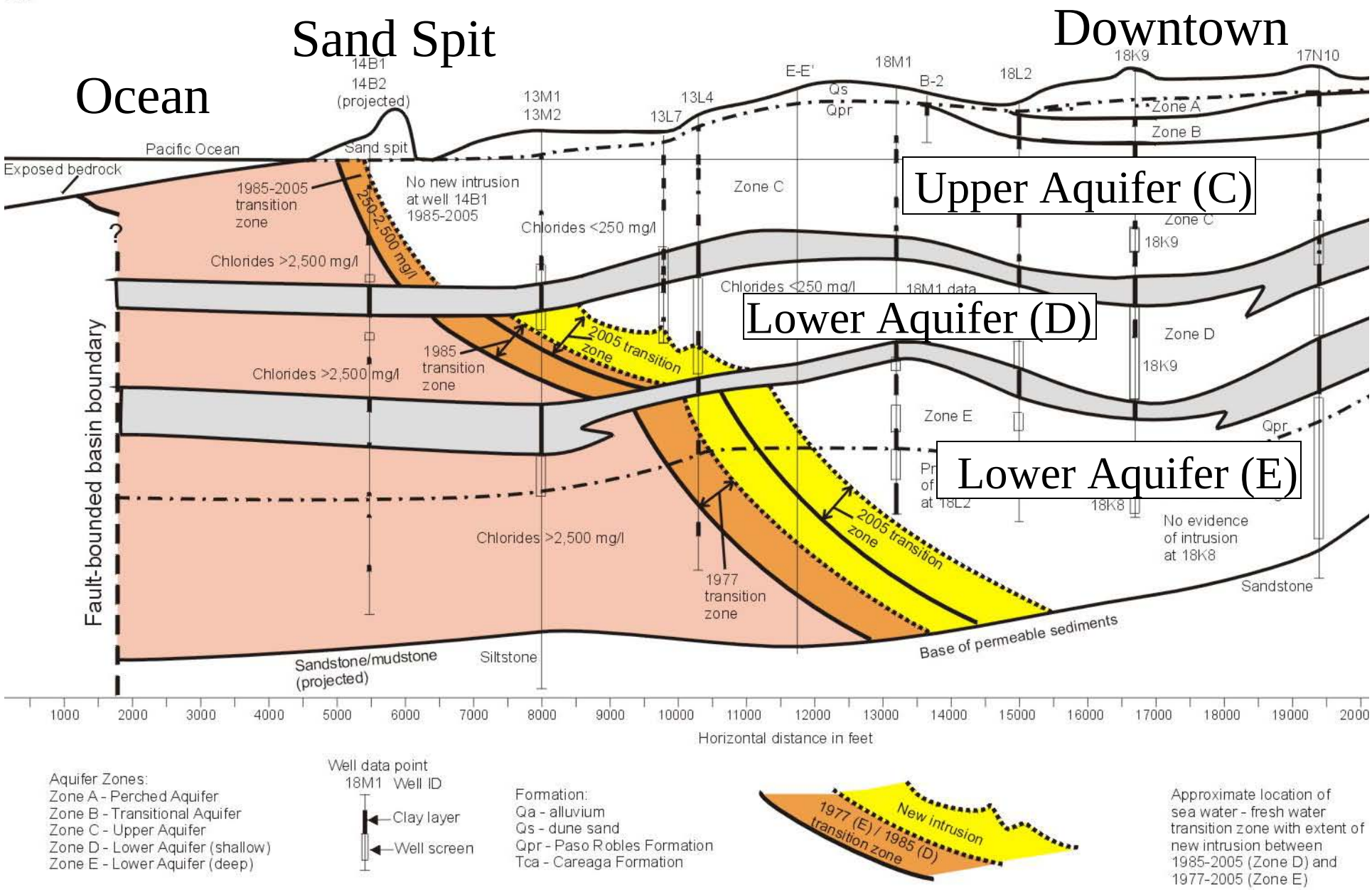

Bedrock outcrops
(PG&E, 1988)
Cambria Block
Mixed sediment
Sand
Bedrock
outcrop / subcrop
Bedrock outcrop
(Racal Pelagos, Inc., 1999)
Los Osos Valley Ground Water Basin
Los Osos Fault
of Racal Pelagos, Inc. ocean bottom survey
Estero Bay
Sub-block
San Luis-Pismo
Block
Irish Hills
Sub-block
N

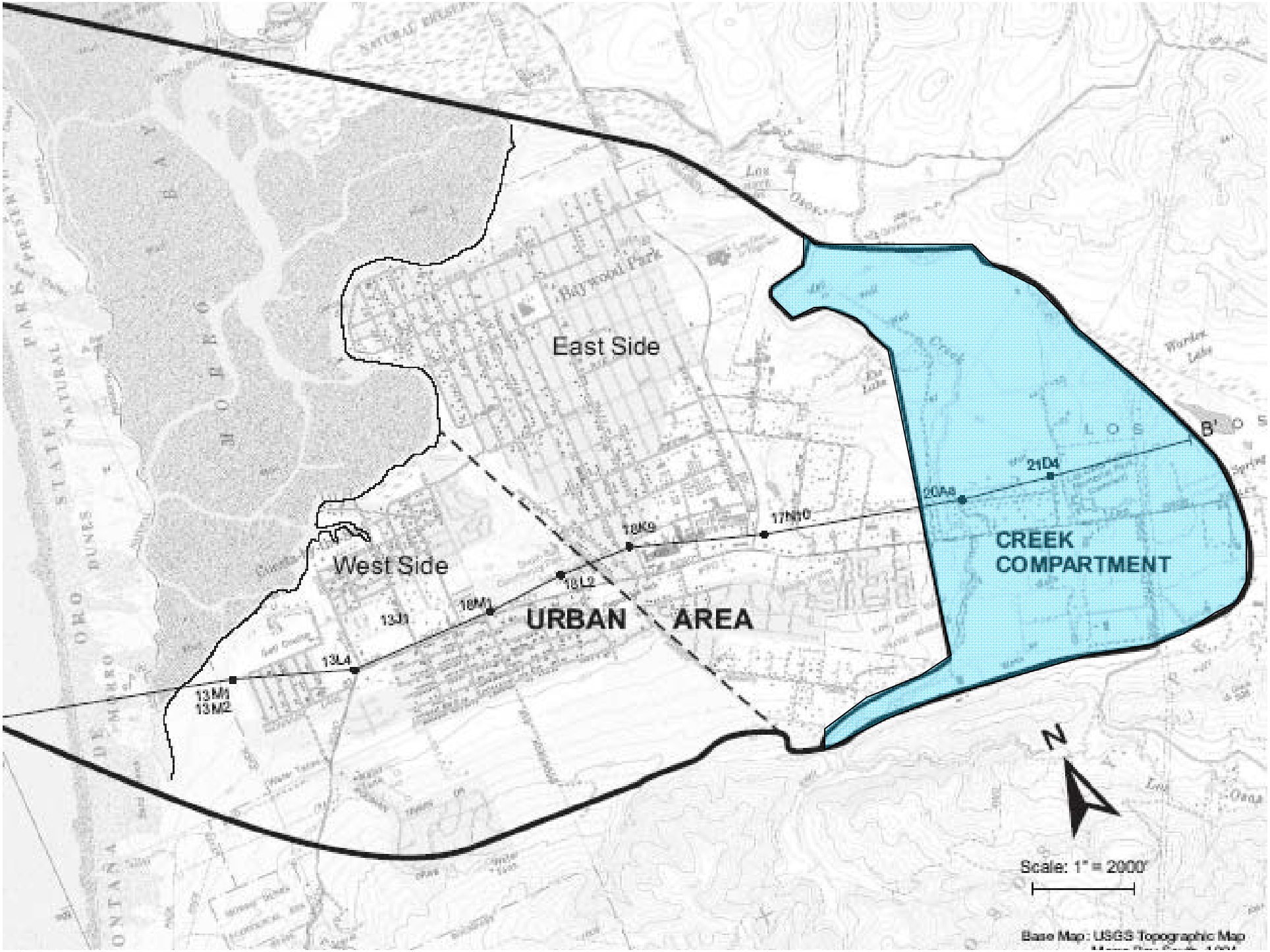

Lower Aquifer
Ground Water
Elevations - 2001
Morro Bay
Estuary
Creek
Valley
At Sea Level
10' below
5' below
Uplifted area with
much higher water levels
(not contoured)
Base Map: USGS
Morro B
Baywood Park
[10]
[20]
[30]
[40]
[50]
[60]
[70]
[80]
11A2
5.5
12J1
-1
7Q3
-6
[-5]
17C1
10
16
17H2
-11.7
17J1
[0]
17E8
17E11
-6.2
-11
-14.3
18F2
-9
18L6
-5.7
17N10
-4
20A6
14.8
20B1
13.9
43.7
20G2
20H1
74.7
14B2
0
-3.7
13J1
-5.9
18M1
19H2
-2.4
13M2
-2.2
13M1
-7.8
13L7
13L4
-5
13P2
-5.2
-6
24A2
-2
13N
-8.7
24C1



Area of Sea Water Intrusion into Lower Aquifer (Zone D)

Extent of Seawater Intrusion into the deepest zone (Zone E) is not shown.


Ocean
Sand Spit
Downtown
Upper Aquifer (C)
Lower Aquifer (D)
Lower Aquifer (E)
Pacific Ocean
Exposed bedrock
Sand spit
14B1
14B2
(projected)
13M1
13M2
13L7
13L4
E-E'
Qs
Qpr
18M1
B-2
18L2
18K9
17N10
Zone A
Zone B
Zone C
Zone D
Zone E
1985-2005
transition
zone
250-2,500 mg/l
No new intrusion
at well 14B1
1985-2005
Chlorides <250 mg/l
Chlorides >2,500 mg/l
Chlorides <250 mg/l
18M1 data
1985
transition
zone
2005 transition
zone
Fault-bounded basin boundary
No evidence
of intrusion
at 18K8
1977
transition
zone
Sandstone
Base of permeable sediments
Sandstone/mudstone
(projected)
Siltstone
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
2000
Horizontal distance in feet
Aquifer Zones:
Zone A - Perched Aquifer
Zone B - Transitional Aquifer
Zone C - Upper Aquifer
Zone D - Lower Aquifer (shallow)
Zone E - Lower Aquifer (deep)
Well data point
18M1 Well ID
Clay layer
Well screen
Formation:
Qa - alluvium
Qs - dune sand
Qpr - Paso Robles Formation
Tca - Careaga Formation
New intrusion
1977 (E) / 1985 (D)
transition zone
Approximate location of
sea water - fresh water
transition zone with extent of
new intrusion between
1985-2005 (Zone D) and
1977-2005 (Zone E)


East Side
West Side
URBAN AREA
CREEK COMPARTMENT
B'
21D4
20A8
17N10
18K9
18L2
18M1
13J1
13L4
13M1
13M2
N
Scale: 1" = 2000'
Base Map: USGS Topographic Map

ISJ Work Program

- Task 1 – Completed
  - Build on previous work efforts
  - Assess the potential of the upper aquifer before and after the wastewater project
- Task 2 - Completed
  - Evaluate and determine creek compartment safe yield
  - Assess water quality of creek compartment

ISJ Work Program

- Task 3 – Pending
  - Determine location of future wells for each purveyor
  - Run additional groundwater model scenarios
  - Confirm the amount of water required at build-out, with aggressive conservation
  - Update water conservation plan
  - Define water supply infrastructure and cost to achieve a balanced basin at build out
- Tasks 4 and 5 - Future
  - Further development of the groundwater model
  - Monitoring and assessment of actual basin performance

Private Well Water Use Estimates

- Purpose – to more accurately estimate the private domestic pumping in the basin
- Methodology:
  - Irrigation / aerial surveys
  - Review of demand data
  - Development of demand factors
- Conclusion – use estimates raised from 150 AFY to 200 AFY

Agricultural Water Use Estimates

- Purpose: to estimate ag pumping in the basin in the Los Osos Creek valley
- Methodology:

  - Detailed crop data submitted by farmers to SLO County

  - Estimates of water use by crop

  - Consideration of average-year climate
- Conclusion – previous use estimates confirmed: 800 AFY

Urban Area Basin Yield Update

- Purpose: to estimate the yield of the urban area under current and future conditions
- Provides a tool for basin management and infrastructure planning
- Considers role of wastewater project in planning efforts
- Updated model calibration efforts

Potential Purveyor Well Production under Current Septic Conditions

Purveyor	Well	Production (AFY)
GSWC	Upper Aquifer	740
	Lower Aquifer	310
	GSWC TOTAL	1,050
	Upper Aquifer	650
	Lower Aquifer	300
	LOCSD TOTAL	950
S&T	Upper Aquifer	100
PURVEYOR TOTAL		2,100

Note: Other optimum yield pumping distributions are possible. The actual distribution of well production would be subject to purveyor agreement.

Potential Purveyor Well Production under Wastewater Project Conditions with VPA2b Disposal

Purveyor	Well	Production (AFY)
GSWC	Upper Aquifer	740
	Lower Aquifer	310
	GSWC TOTAL	1,050
LOCSD	Upper Aquifer	485
	Lower Aquifer	415
	LOCSD TOTAL	900
S&T	Upper Aquifer	100
PURVEYOR TOTAL		2,050

Note: Other optimum yield pumping distributions are possible. The actual distribution of well production would be subject to purveyor agreement.

Key Conclusions

- Seawater intrusion can be mitigated through effective basin management including conservation, pumping shifts, and monitoring
- With effective basin management, adequate basin yield exists for current demand
- For build out demand, additional basin management strategies will be necessary (Task 3)

Key Conclusions

- Even with promising modeling results, significant purveyor challenges and decisions lay ahead
- If pumping can be reduced below the maximum yield, water quality and infrastructure benefits would result
- Conservation, recycling, and other strategies can further enhance water quality and allow for unforeseen conditions (Task 3)

Key Conclusions

- A sea level rise will result in a slightly lower sea water density (thermal expansion)
- A 2’ sea level rise would reduce the safe yield by approximately 50 AFY
- Other sea level rise factors can be analyzed

Creek Valley Yield Analysis

- Purpose: to estimate the yield of the creek valley portion of the aquifer
- Previous studies assumed that yield matched current pumping
- Stream data pointed to the potential for additional yield

Creek Valley Yield Scenarios

- Purveyor wells west of Los Osos Creek
  - Adjacent to existing purveyor infrastructure
  - May be more straightforward to permit
- Purveyor wells west and east of Los Osos Creek
  - Requires more extensive infrastructure
  - May integrate with recycled water agricultural exchange programs

Key Conclusions

- Yield increases by 250 AFY with purveyor wells on the west side of Los Osos Creek
- Yield increases by 500 AFY or more with purveyor wells on both sides of Los Osos Creek
- Significant decisions and challenges on well locations, pumping, and infrastructure still exist

Key Conclusions

- Water quality information was not as extensive as desired, but potable quality expected based on test results
- Significant decisions and challenges on well locations, pumping, and infrastructure still exist
- Additional wet weather studies are recommended to review actual creek flows

Next Steps

- Complete Task 3, with a focus on conservation and build-out supply infrastructure
- Implement a Basin Management Plan
- Move forward on a funding mechanism to finance water projects

Next Steps

- Expedite conservation measures where possible.
- Continue to reduce demand on the lower aquifer through pumping shifts and blending
- Remain engaged in wastewater project discussions

Questions?