EASTON, CA – POLLUTANT PLUMES

By Dr. David Cehrs

April 2012

Sampling for pollutants at Easton, CA occurred in 1995-1997 and again in 2012. At both times nitrates and DBCP were sampled. In 2012 uranium and TCP were also sampled.

Potential sources for nitrates in Easton include septic tanks at the Easton dwellings, synthetic agricultural fertilizer, and the Malaga sewage treatment plant percolation pond some three miles up the hydraulic gradient from Easton. DBCP was used as an agricultural soil fumigant for nematodes in vineyards. TCP was briefly used as an additive in Telone, an agricultural soil fumigant, but more importantly it was used as an industrial solvent for paint and grease. Potential TCP sources are along the Highway 99 corridor in and near Malaga. Uranium is a naturally occurring element with origins in the granitic rocks of the Sierra Nevada. The derived sediments of the Sierra, now deposited in the San Joaquin Valley, have residual uranium within them and are preferentially found with clays and organic material.

I have plotted nitrate concentrations versus uranium, DBCP, and TCP. There is a very interesting correlation between nitrates and uranium but there seems to be no real correlation between nitrates and DBCP or TCP. Why there is a correlation between nitrate and uranium is a very interesting question that needs to be answered. The lack of correlation between nitrates and DBCP would seem to indicate that if the nitrate source is agricultural the source material was applied in different areas and at different rates or have moved differentially in the subsurface. Alternatively, if the nitrate source is not agricultural this would disassociate the two constituent concentrations from one another. Assuming that the majority of the TCP is from industrial use, the lack of correlation between nitrates and TCP indicate different sources.

I then plotted and contoured the sampled constituents. In all plots the areas in color are above the constituent MCL (NO3, U, DBCP) or concentration goal (TCP).

Between 1997 and 2012 nitrate concentrations have increased in absolute values and the area affected has increased. Of more interest is the areal distribution of the nitrates in 2012 with NE-SW aligned areas of higher and lower nitrate values. These areas are very possibly influenced by the sedimentary geology of the area which has subsurface, sandier paleo-channels of both the Kings River and Fancher Creek (see the aerial photo). Subsurface vadose zone and groundwater flow would be controlled by these paleo-channel sands and direct groundwater flow preferentially along and through them.

The uranium plot show a striking similarity to the nitrate plot with a very prominent NE-SW alignment of the higher and lower concentrations. This then posits the question why are the uranium and nitrate concentrations correlated so well spatially? Has the subsurface sedimentary geology, sandier paleo-channel or flood plain clay deposits, preferentially distributed the

uranium, or possibly has the nitrate in the groundwater flowing through these different deposit types influenced or remobilized the sedimentary uranium?

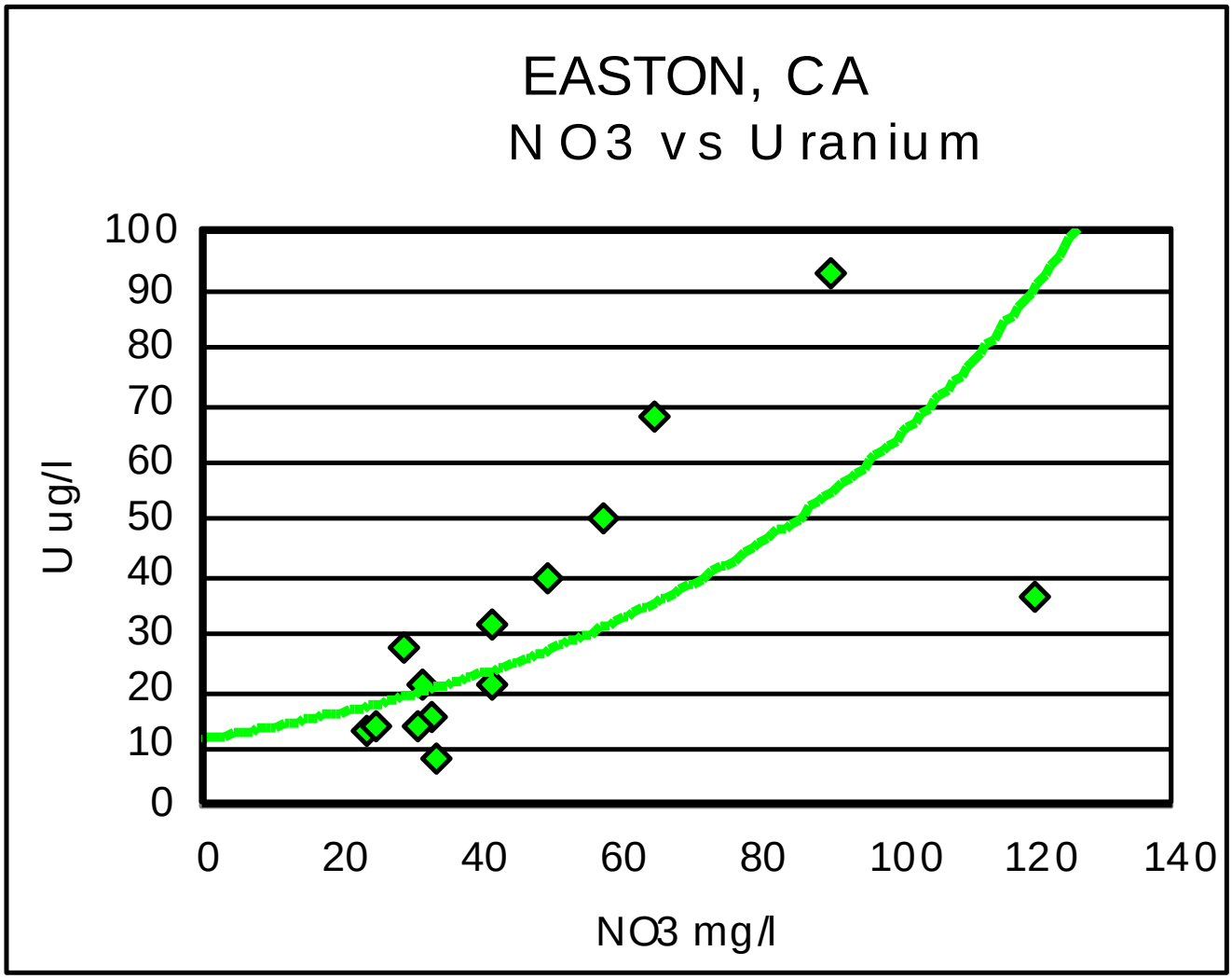
The DBCP concentrations have declined between 1997 and 2012. But the plume has not really moved, which is interesting. Other DBCP plumes in the greater Fresno area have not only moved with time but dissipated over time. The Easton plume seems to be stationary but dissipating.

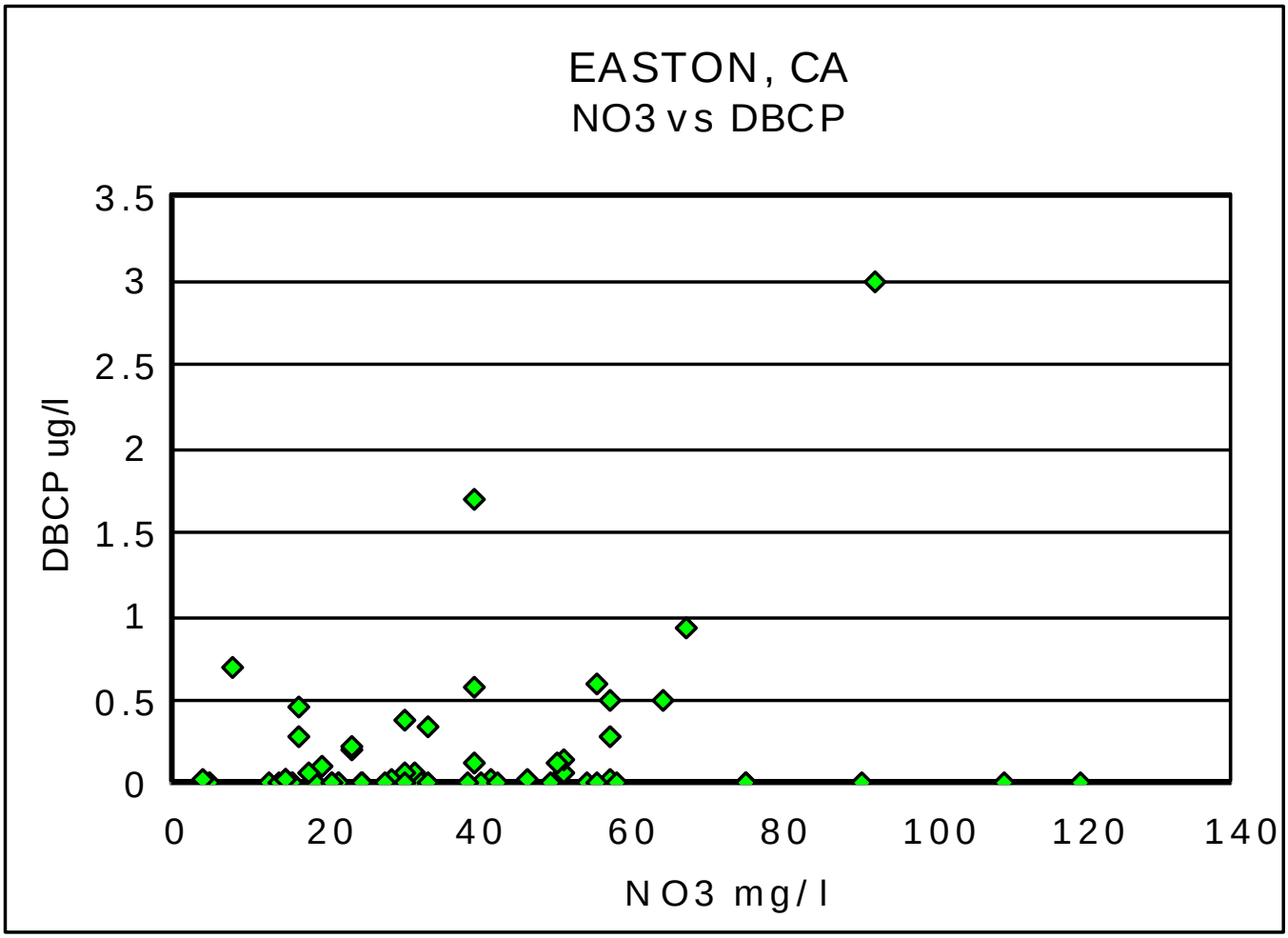
The high TCP concentrations are to the south and east but overlap the high-low boundary of the nitrates and uranium. In this southeast direction are the sandier, paleo-channel deposits of the Kings River. Could the TCP be coming from the Highway 99 corridor and flowing down gradient in the sandier deposits?

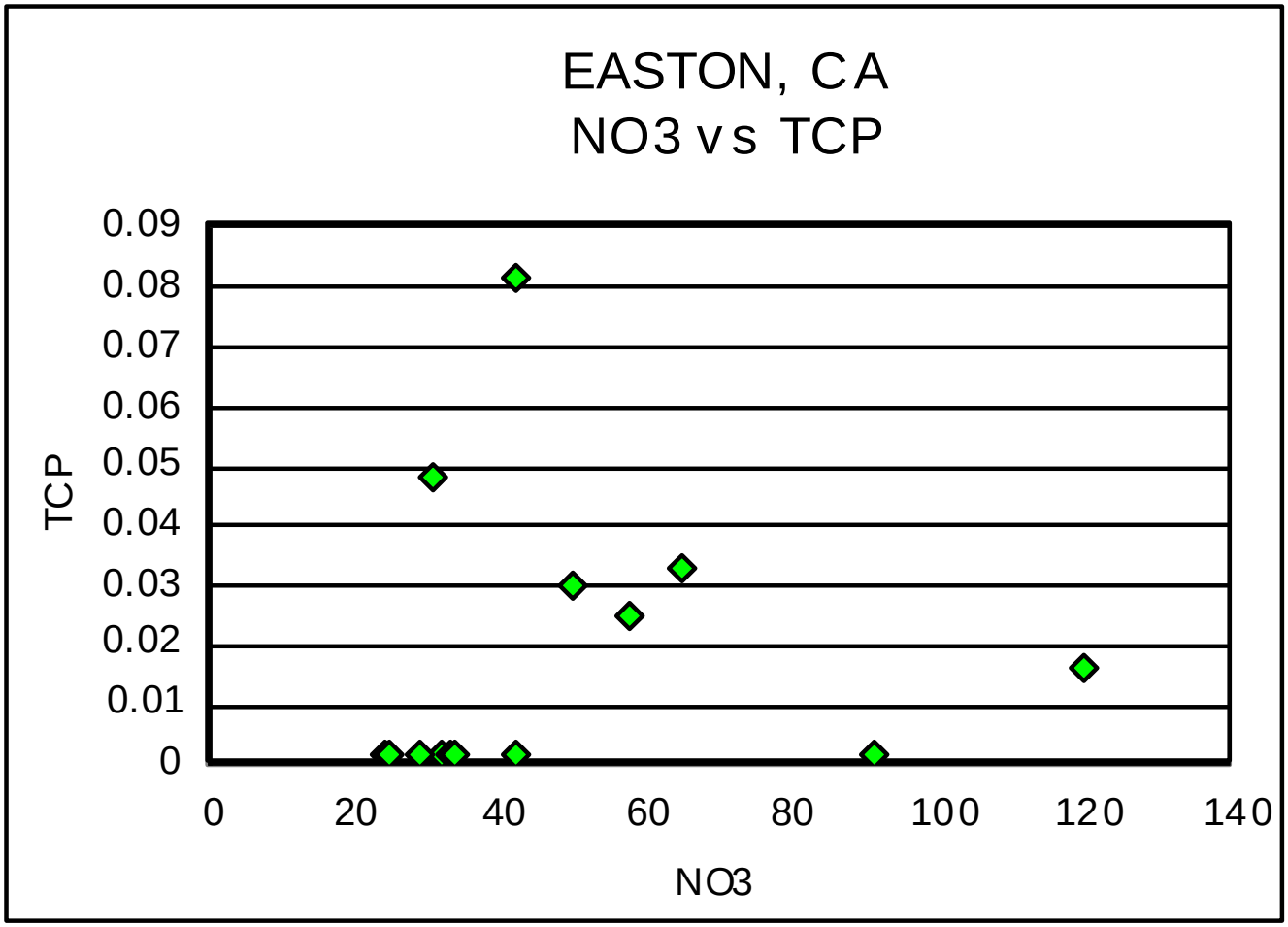
It is my guess that there is substantial sedimentary geologic control over groundwater flow paths and that these preferred flow paths are influencing the pollutants beneath Easton.

Things that need to be determined:

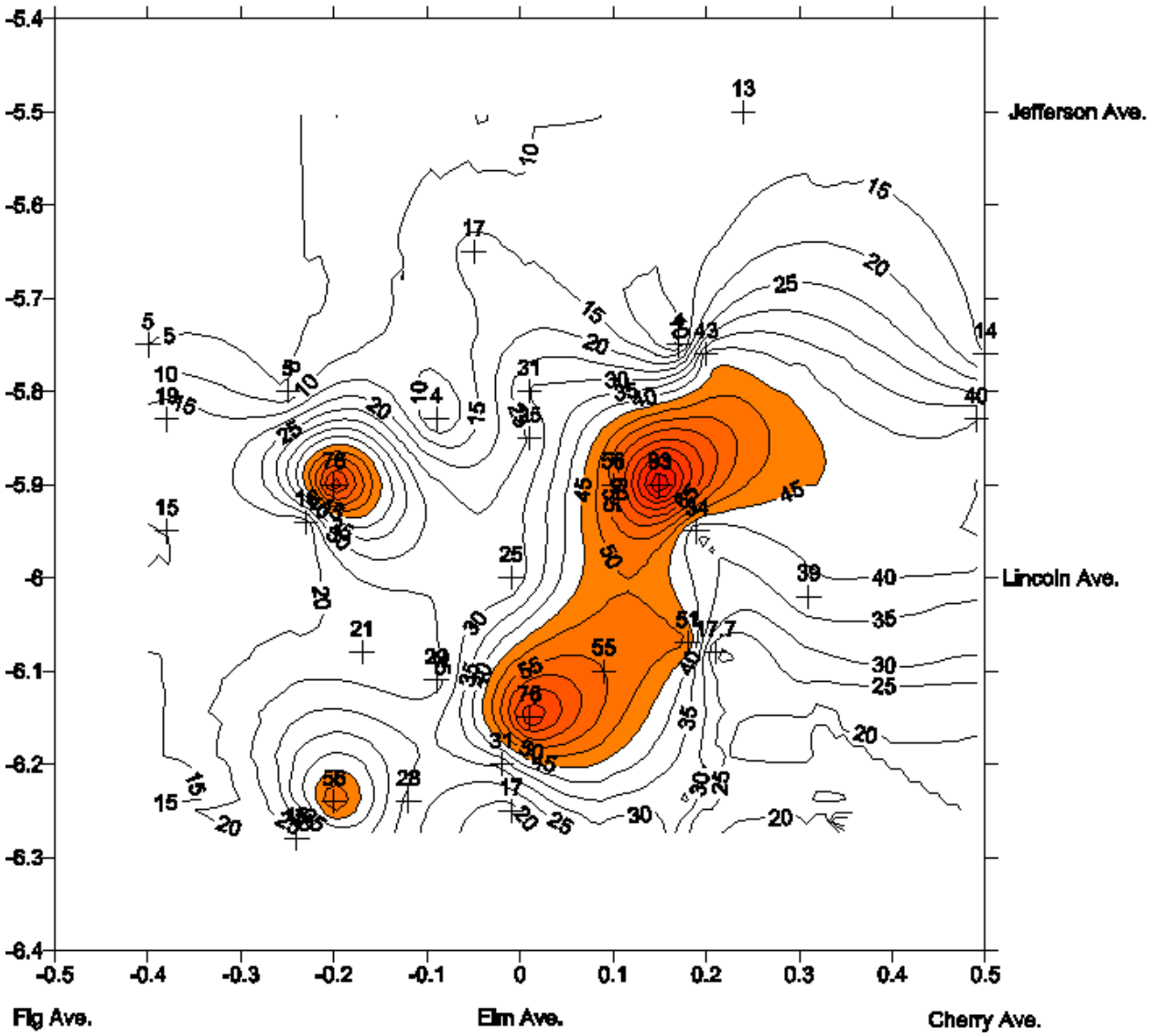
1. Source of the nitrates – sewage (Easton and/or Malaga), agricultural, or soil.
2. Figure out the relationship between nitrates and uranium. Are the nitrates influencing the mobilization of the uranium from the sediments.
3. Why has the DBCP plume not moved beneath Easton?
4. What is the source for TCP – industry along the highway 99 corridor?
5. What is the relationship between subsurface geology and the concentrations of the pollutants? Is the geology controlling groundwater flow and the pollutants there in?


EASTON, CA
NO3 vs Uranium
U ug/l
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
120
140
NO3 mg/l

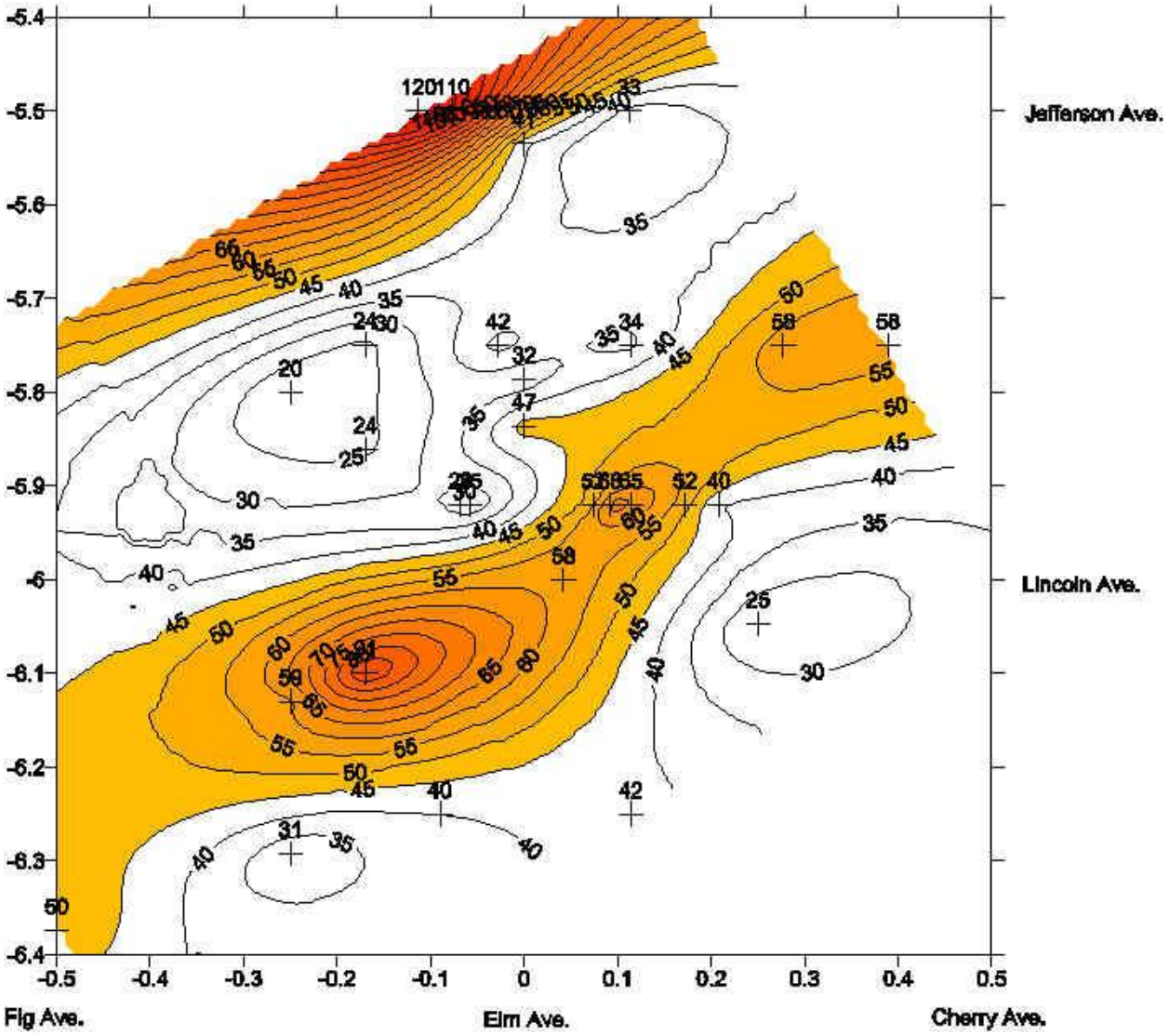

EASTON, CA
NO3 vs DBCP
DBCP ug/l
3.5
3
2.5
2
1.5
1
0.5
0
0
20
40
60
80
100
120
140
NO3 mg/l


EASTON, CA
NO3 vs TCP
TCP
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
20
40
60
80
100
120
140
NO3

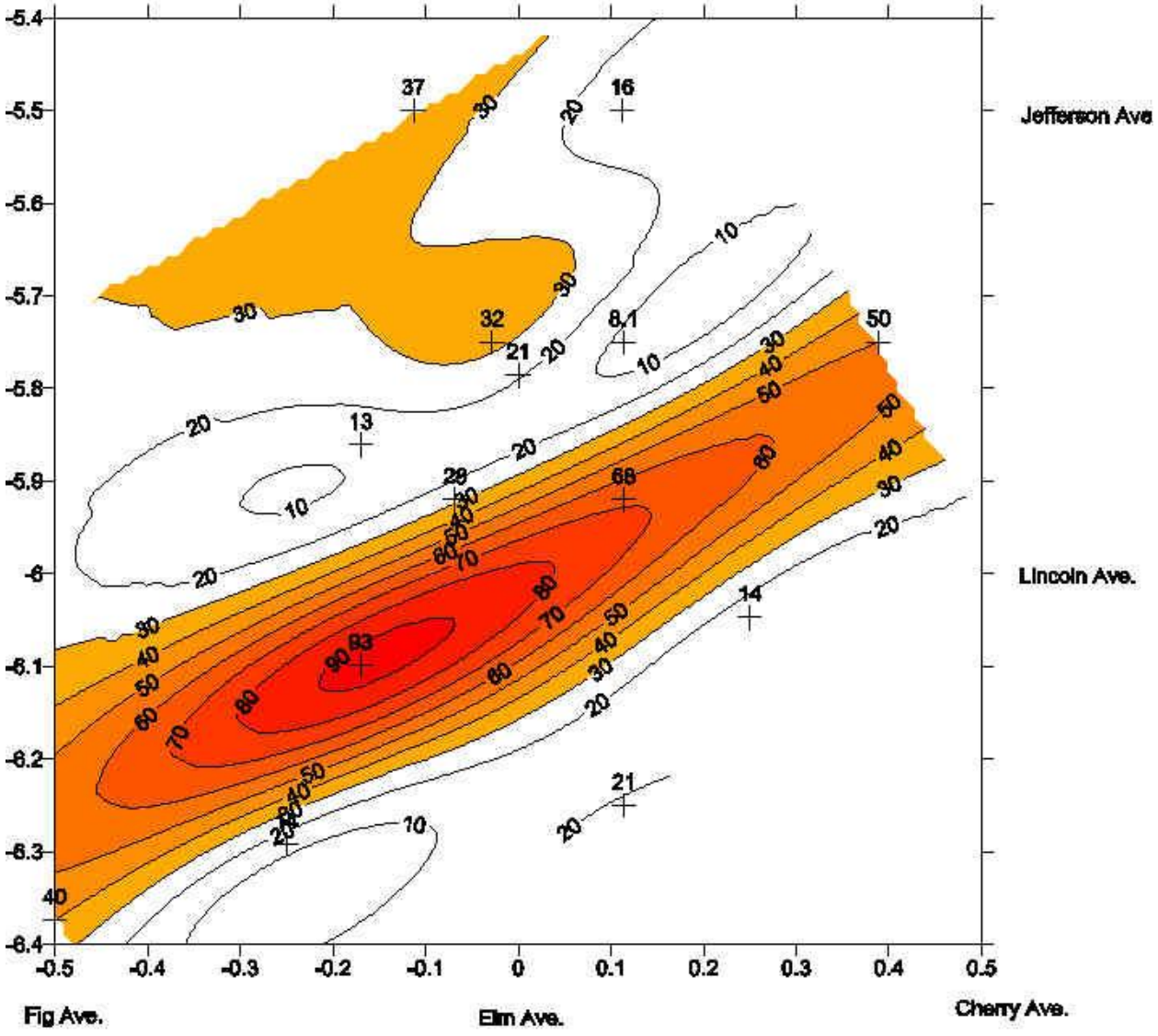
EASTON CALIFORNIA
Nitrate mg/l
1997



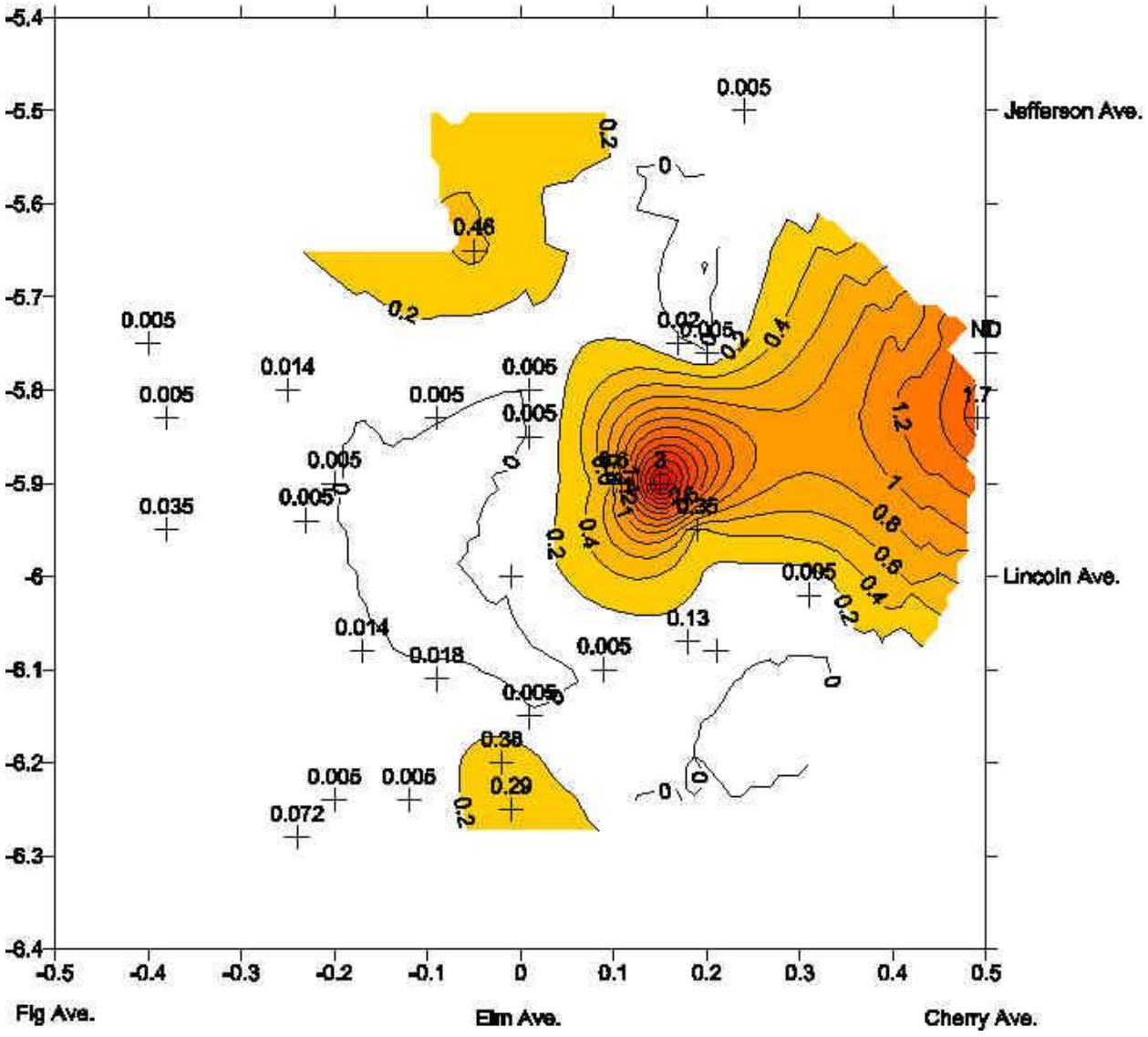
EASTON CALIFORNIA
Nitrate mg/l
2012



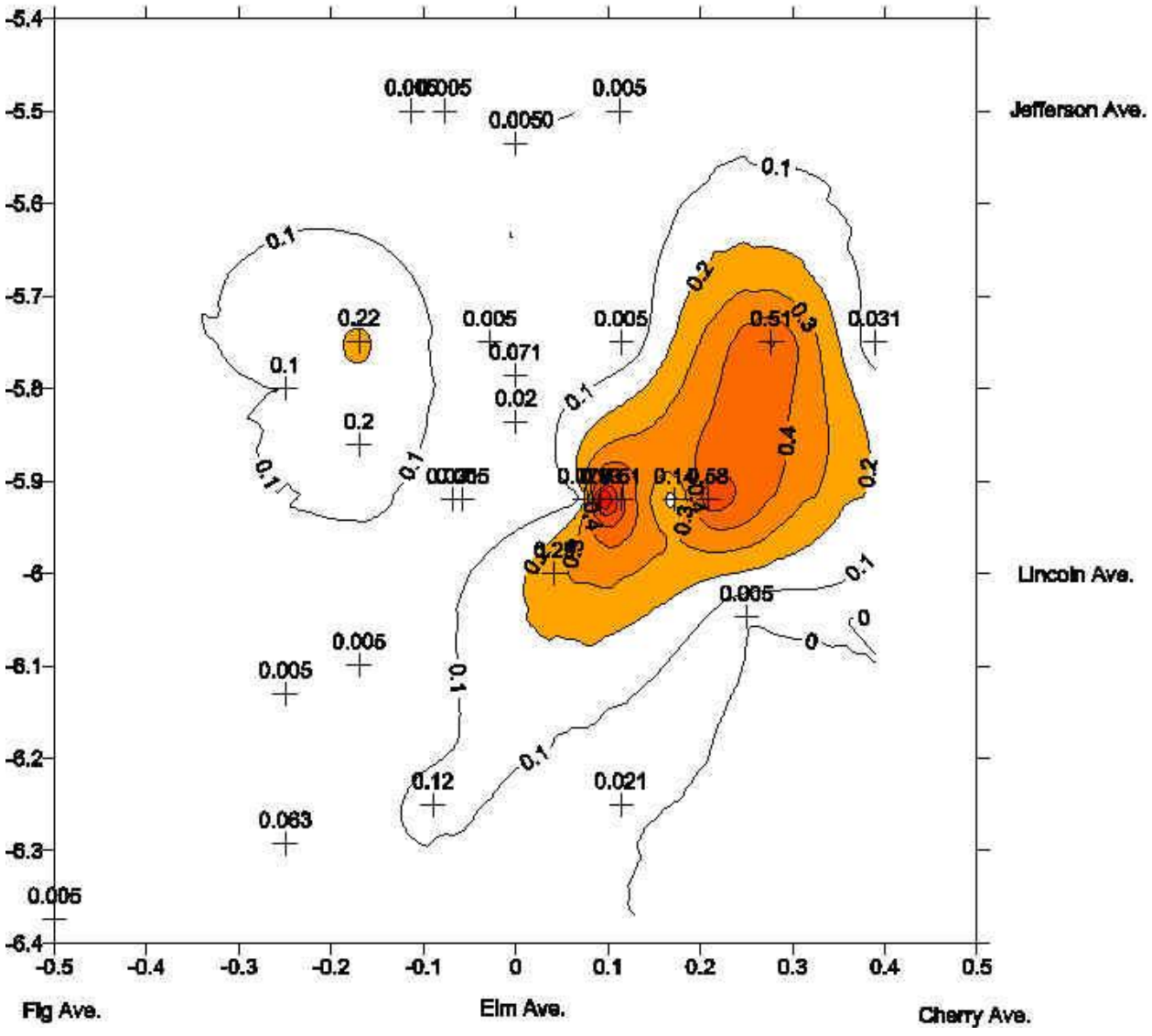
EASTON CALIFORNIA
Uranium ug/l
2012



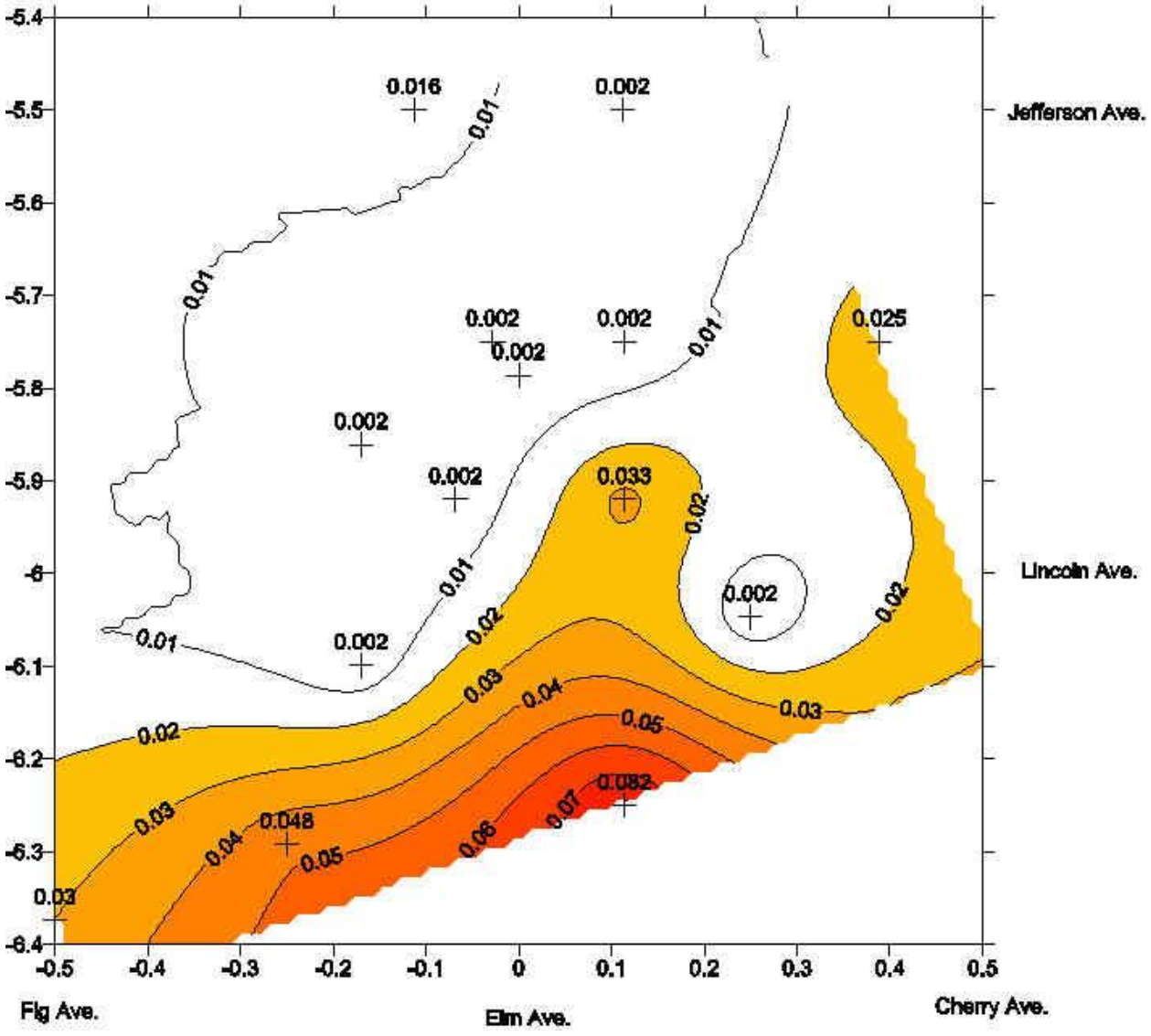
EASTON CALIFORNIA
DBCP ug/l
1997

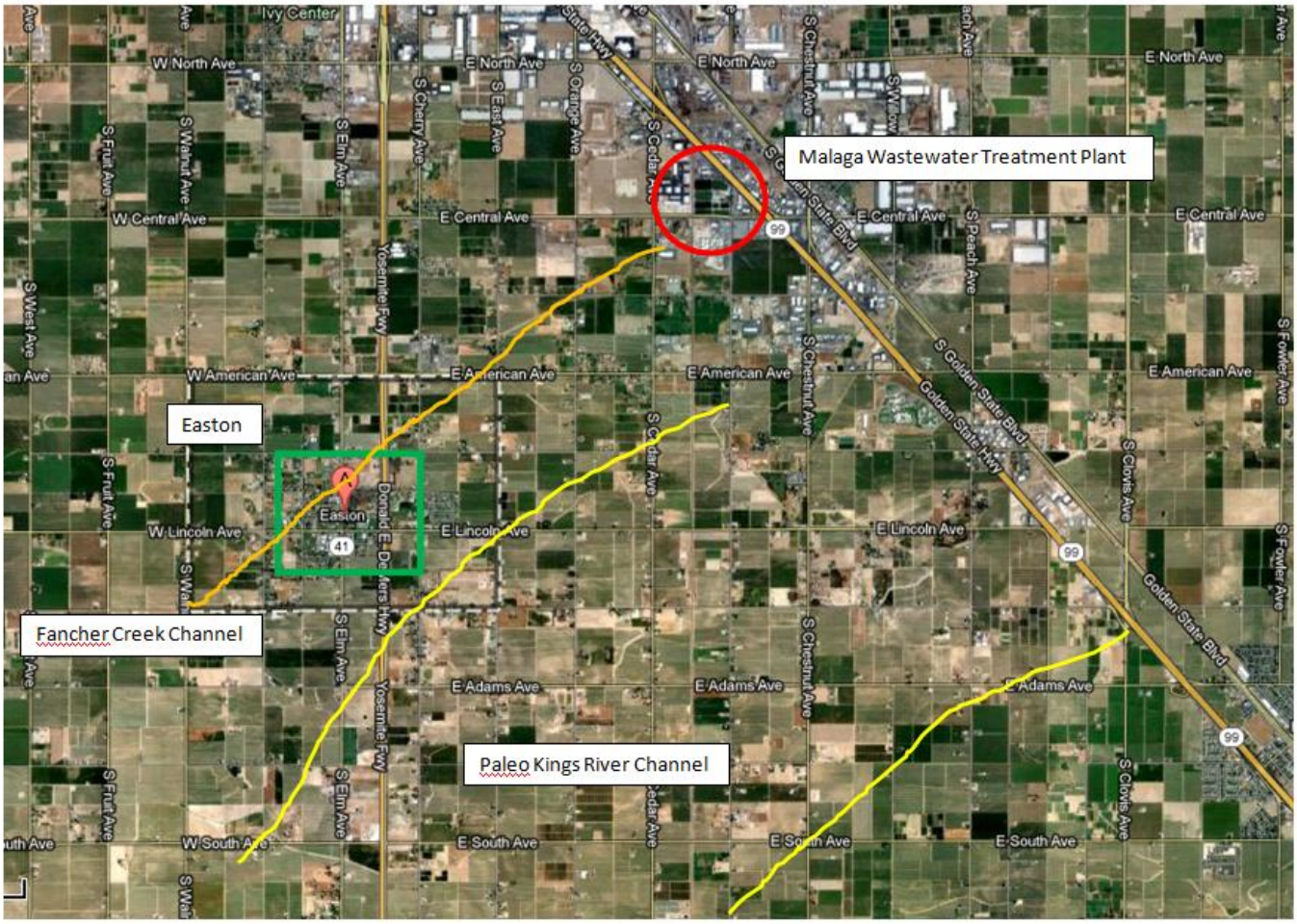


EASTON CALIFORNIA
DBCP ug/l
2012



EASTON CALIFORNIA
TCP ug/l
2012




Malaga Wastewater Treatment Plant
Easton
Fancher Creek Channel
Paleo Kings River Channel
W North Ave
E North Ave
W Central Ave
E Central Ave
W American Ave
E American Ave
W Lincoln Ave
E Lincoln Ave
E Adams Ave
W South Ave
E South Ave
Yosemite Fwy
Golden State Blvd
S Chestnut Ave
S Cedar Ave
S Elm Ave
S Fruit Ave
S Clovis Ave
S Fowler Ave
S Peach Ave
99
41