

# Occurrence of Perchlorate in the Santa Ana Region

California Regional Water Quality Control  
Board, Santa Ana Region

March 12, 2004

# Affected Public Drinking Water Wells

- Statewide: 338
- Santa Ana Region total: 171
- San Bernardino County: 105
- Riverside County: 36
- Orange County: 30

# Sources of Perchlorate

- Industrial Point Sources
  - ◆ Aerospace, explosives, fireworks
- Colorado River Water
- Fertilizer (Chilean Nitrate)

# Perchlorate Source Areas

- North Rialto (defense contractors, DoD, fireworks)
- Mentone (Lockheed Martin)
- Glen Avon (Stringfellow site)
- Orange County (Colorado River water)

# Perchlorate in Colorado River

- Releases by Kerr McGee into Las Vegas Wash (270-900 pounds/day)
- Colorado River water imported to Southern California contains perchlorate (< 4 – 9 ppb)
- Recharged into Orange County Groundwater Basin
- 1950-1998: Approximately 2.9 million acre-feet of recharge

# Fertilizer

- Many contaminated areas with no sources
- Staff research – Chilean Nitrate fertilizer used in citrus groves in the Inland Empire from at least 1915 through at least the 1940s
- Chilean Nitrate contains perchlorate
- Chilean Nitrate, alone or combined with CRW, may be source of widespread low-level perchlorate contamination

# Affected Wells

- SAR total: 171
- Known sources: 96
- Unknown sources: 75

# Perchlorate Concentrations

- 171 municipal wells exceed current detection level (and recent drinking water action level) of 4 ppb
- 13 wells exceed 18 ppb
- Median concentration of all wells is 6.5 ppb
- 72 wells below new PHG and drinking water action level of 6 ppb

# Orange County

- 30 wells contain perchlorate  $> 4$  ppb
- 29 of these wells contain perchlorate  $< 7$  ppb
- 19 wells  $< 6$  ppb

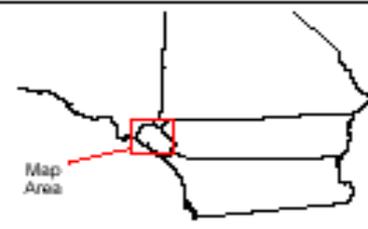
**TIN/TDS Phase 2A -- Tasks 2**  
**Compliance Metric at Prado Dam**

**Water Character Index**

- <149
- 150 - 199
- 200 - 249
- 250 - 299
- 300 - 399
- > 500

**Other Map Features**

- Santa Ana River
- Extent of Groundwater Recharged 25-Years-Ago at OCWD-SAR Facilities (Clemens-Kost & others, 1999)
- OCWD-SAR Recharge Facilities
- Unconsolidated Sediments
- Semi-consolidated Sediments
- Consolidated Bedrock
- Waterways and Reservoirs
- Orange County Management Zone
- Highways and Freeways
- Primary roads

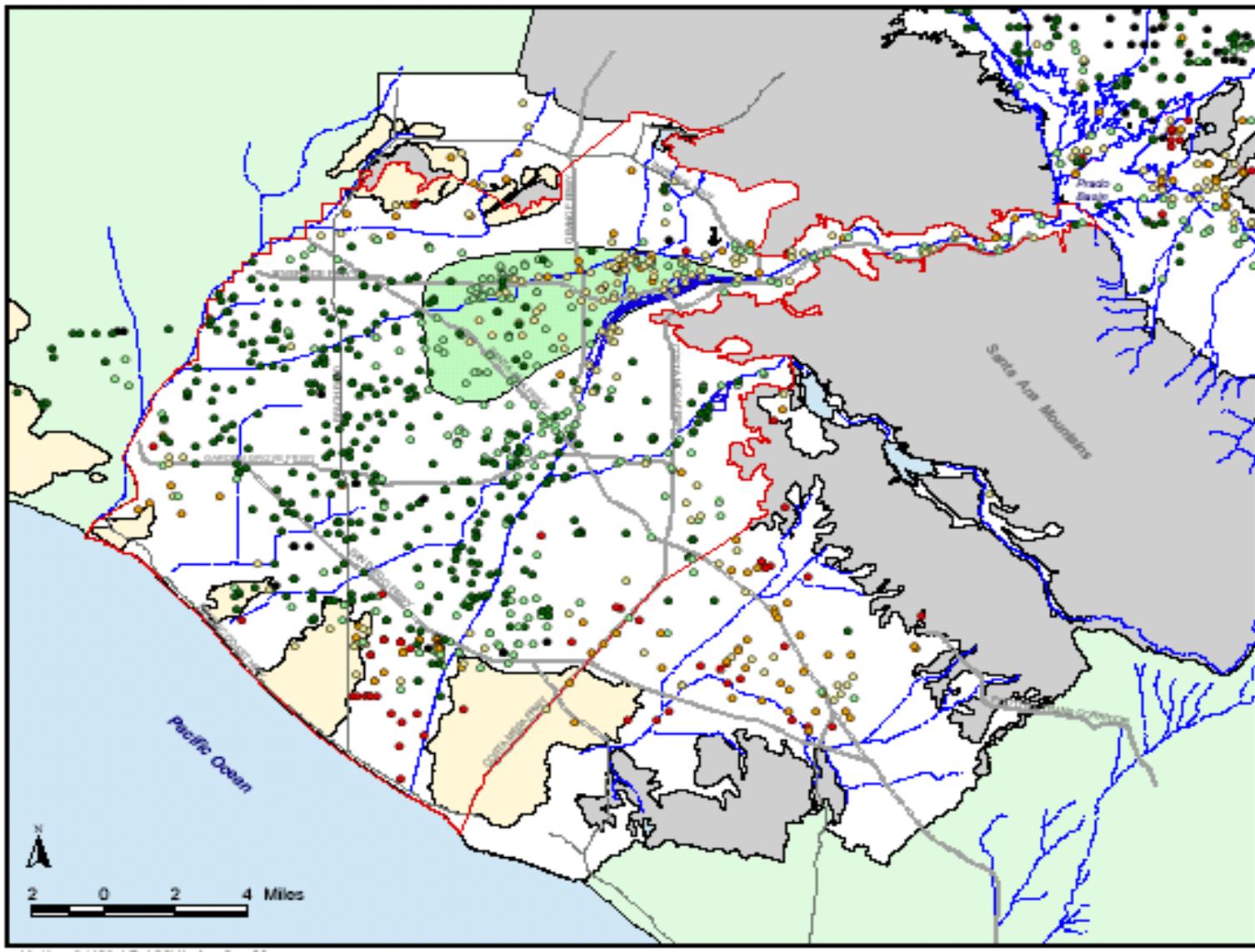


**Figure 6-6**

**Water Character Index**  
**in the Orange County Basin**  
 Average WCI for Period 1952 to 1998

**WE** WILDERMUTH ENVIRONMENTAL, INC.

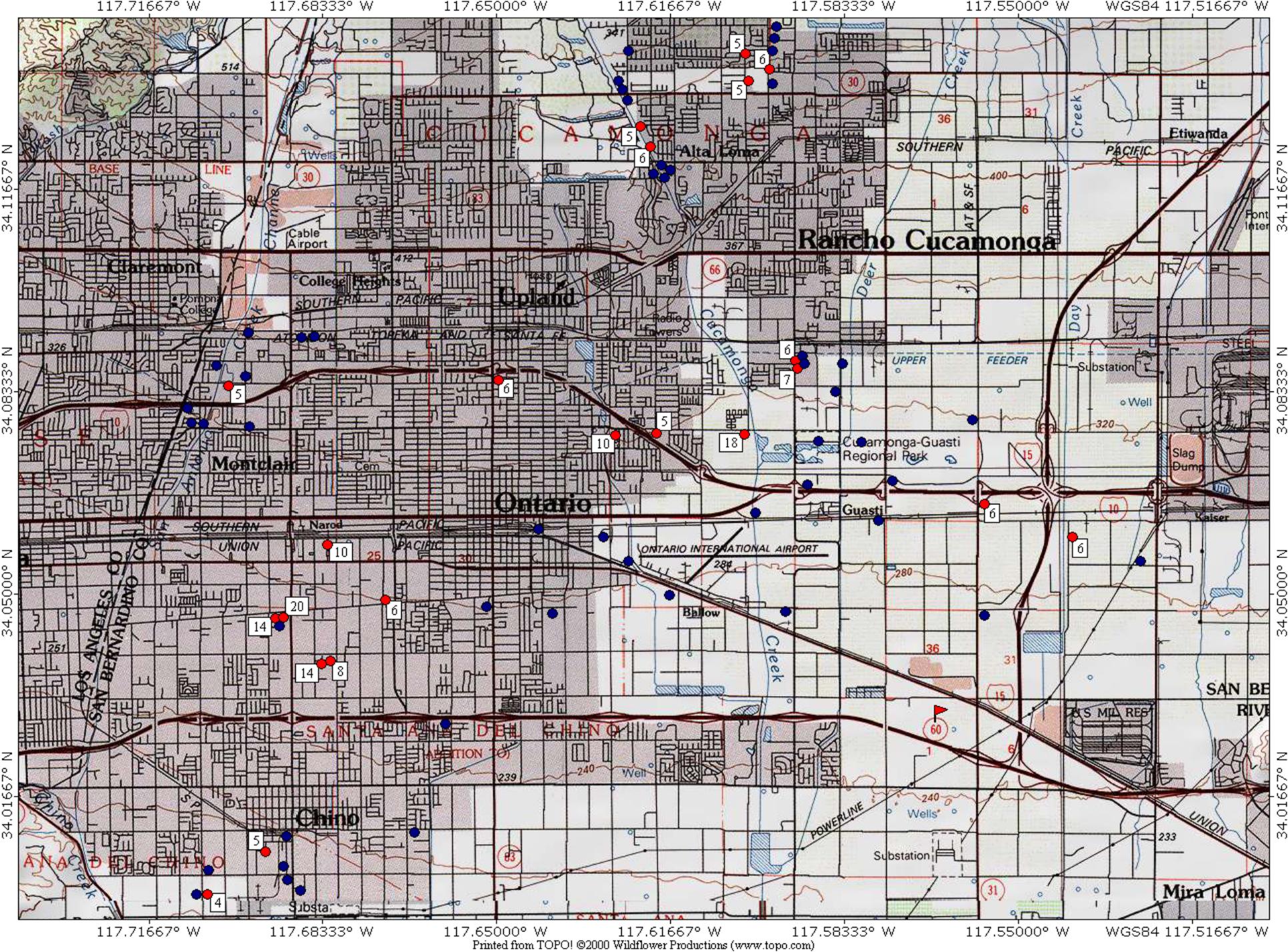
Prepared by: JPL Date: July 2000





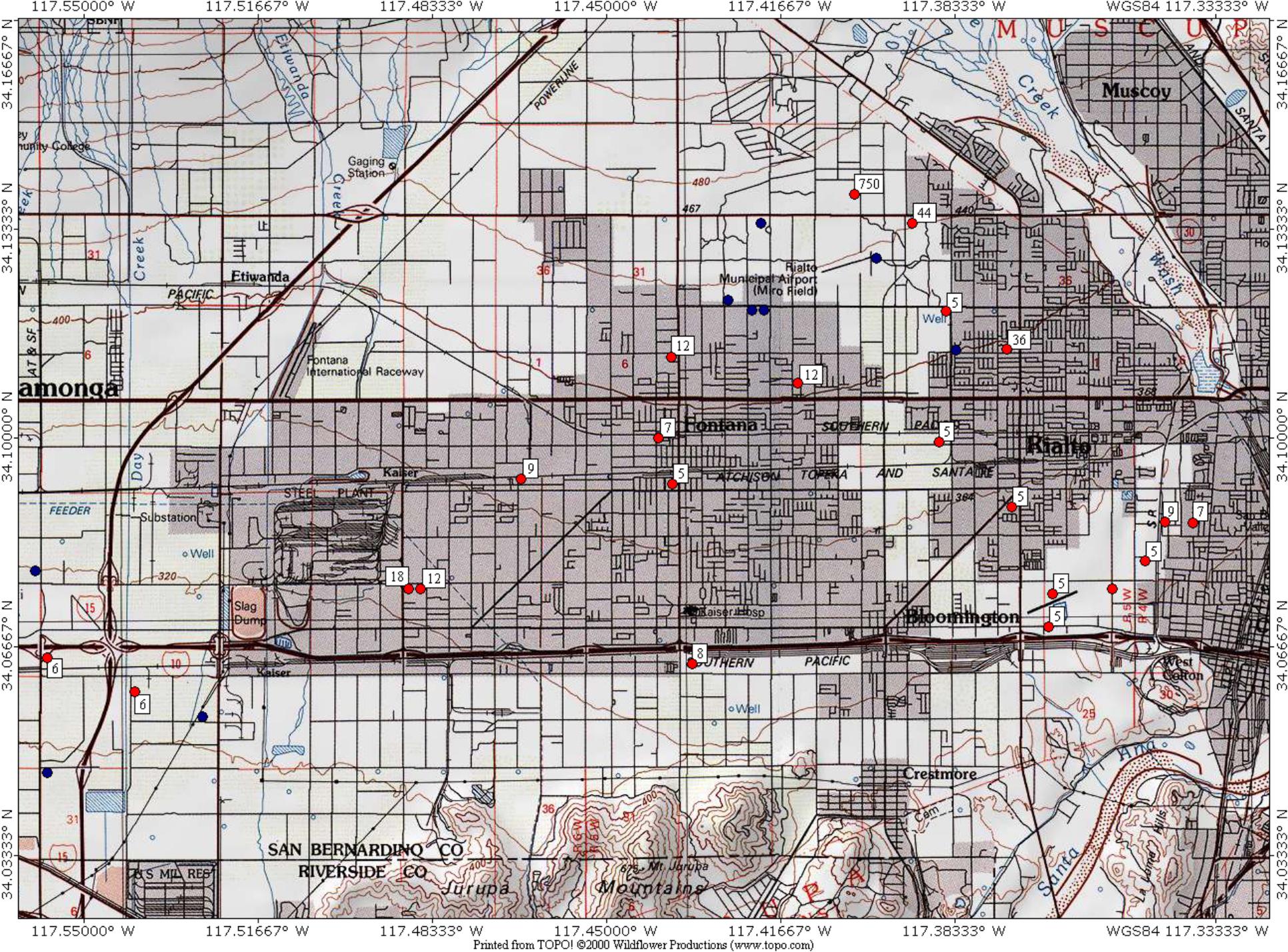
# Chino Basin

- 32 wells contain perchlorate  $> 4$  ppb
- Chino, Chino Hills, Ontario, Fontana, Rancho Cucamonga
- All wells  $< 20$  ppb
- 24 wells  $< 10$  ppb
- 14 wells  $< 6$  ppb



# Rialto/Colton Basin

- 10 wells contain perchlorate  $> 4$  ppb
- 4 wells  $> 9$  ppb (750, 44, 36 and 9 ppb)
- 5 wells  $< 6$  ppb



# San Bernardino Area

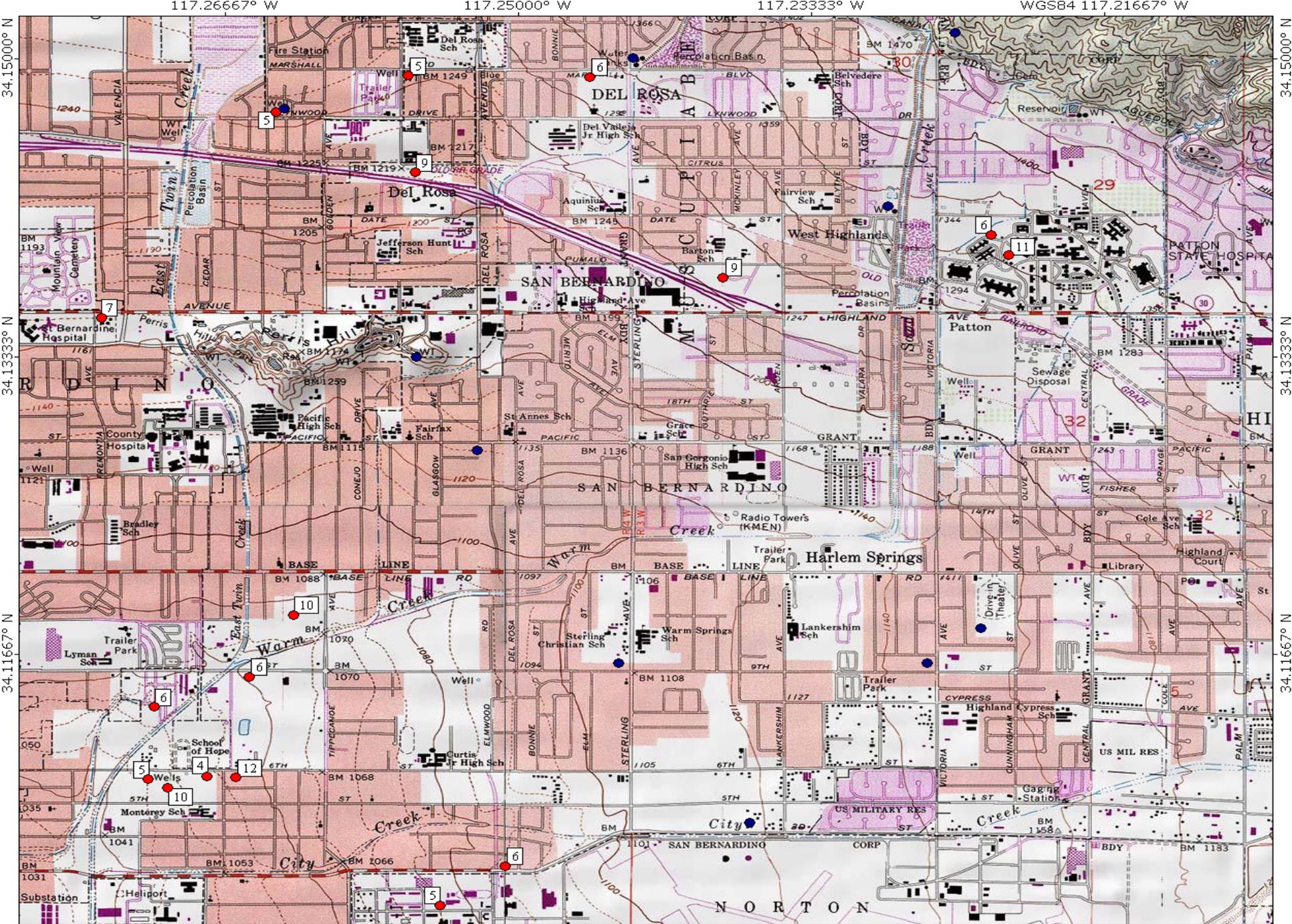
- 18 wells contain perchlorate  $> 4$  ppb
- All wells  $< 12$  ppb
- 9 wells  $< 6$  ppb

117.26667° W

117.25000° W

117.23333° W

WGS84 117.21667° W



117.26667° W

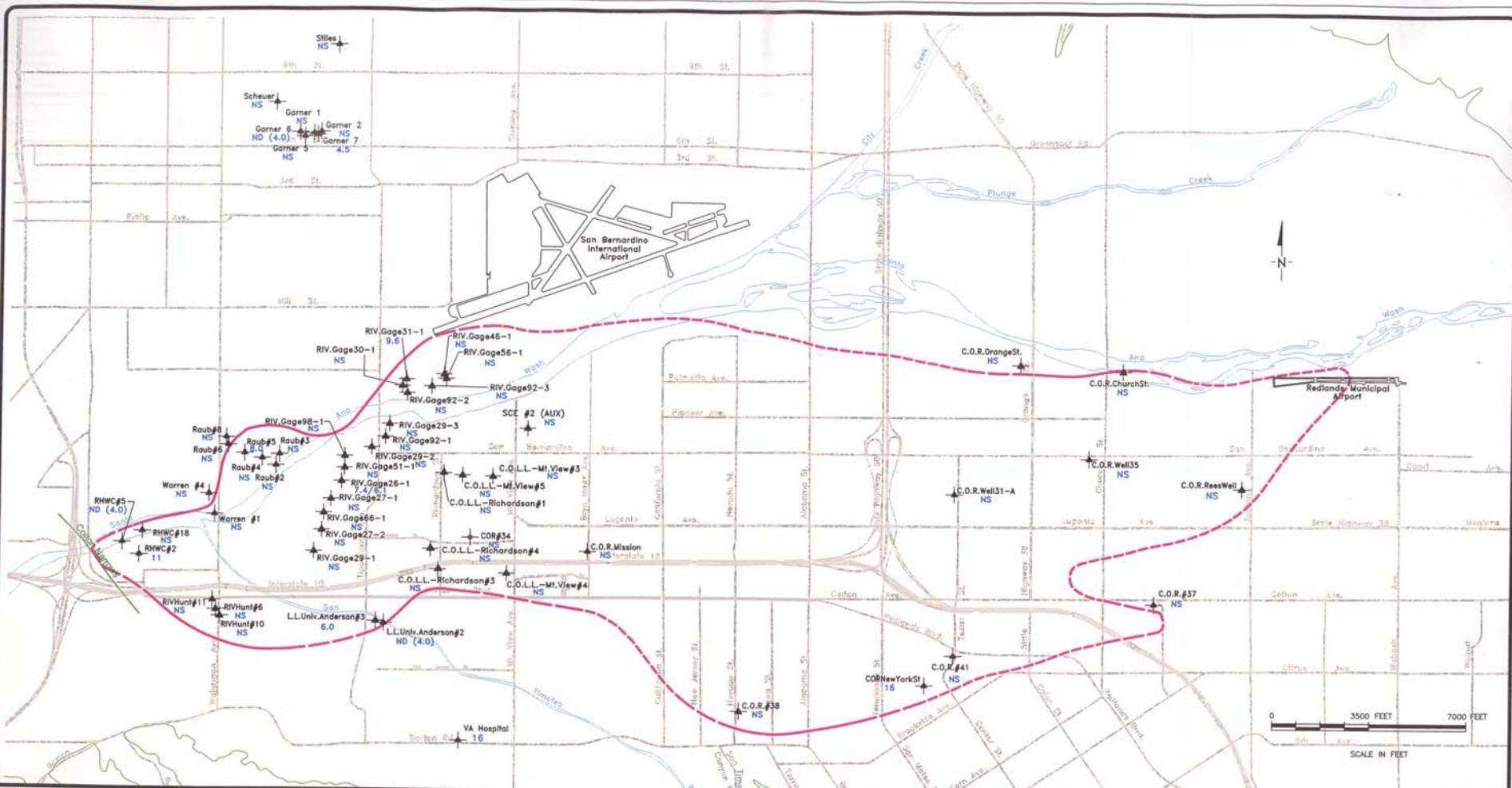
117.25000° W

117.23333° W

WGS84 117.21667° W

# Redlands/Loma Linda Area

- 46 wells contain perchlorate  $> 4$  ppb
- 9 wells  $> 18$  ppb (18 – 67 ppb)
- 13 wells  $< 6$  ppb

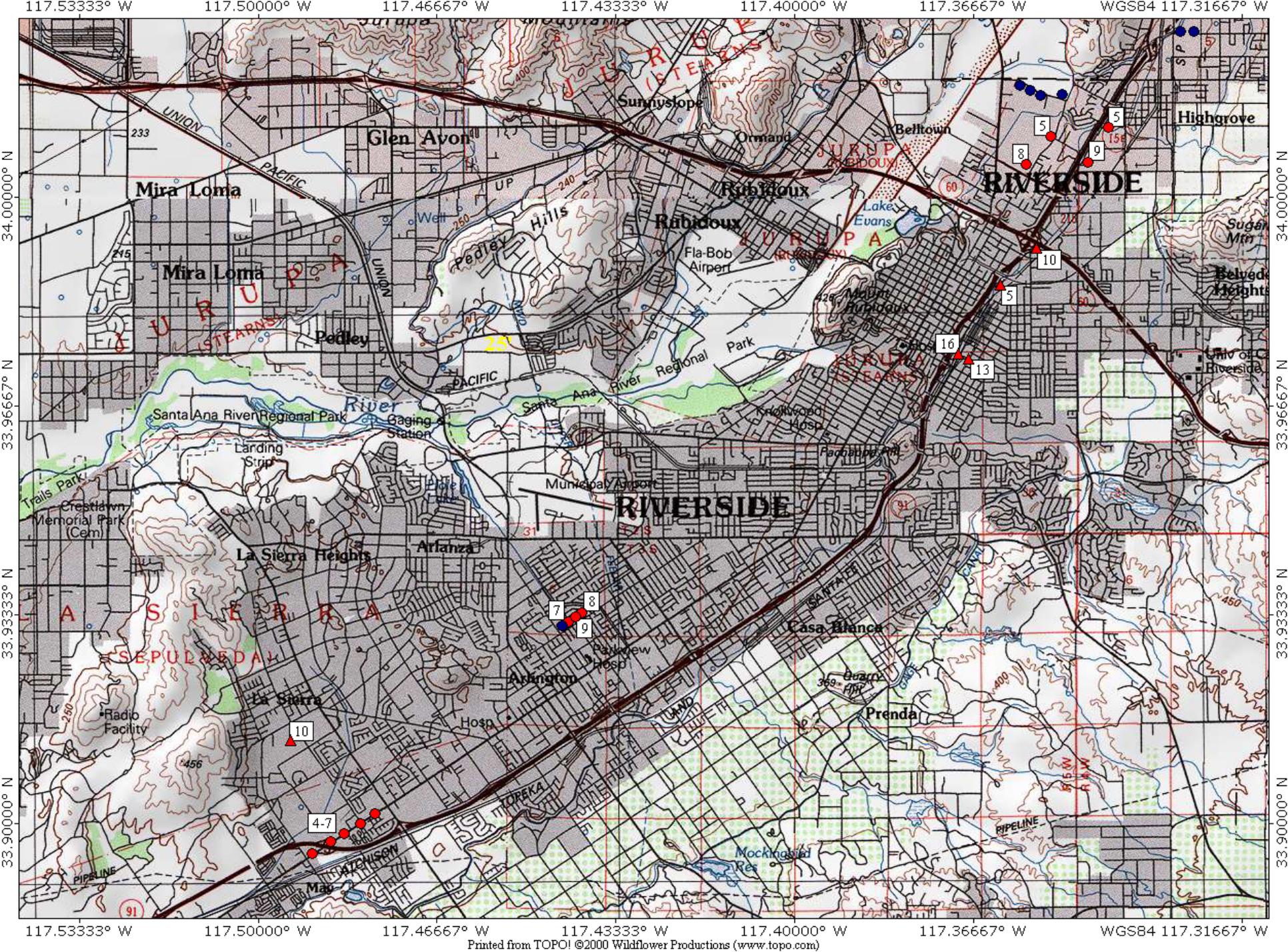


EXPLANATION	
	Wells Currently Sampled Under the Existing WSCP Sampling Program
<b>46</b>	Perchlorate ( $\mu\text{g/L}$ ) Results
ND(4.0)	Not Detected at Indicated Detection Limit
NS	Not Sampled
	Perchlorate Plume Boundary (4 $\mu\text{L}$ ) (Earthtech November 2003 Interpretation)
	Location Uncertainty Less Than 1,000 Feet
	Location Uncertainty 1,000 To 2,000 Feet
	Location Uncertainty Greater Than 2,000 Feet
<b>ND (4.0)</b>	C.O.L.L. Mountain View Blend - Lawton
<b>ND (4.0)</b>	C.O.L.L. Richardson Blend
<b>4.2</b>	Riv. Iowa Booster (Waterman)
<b>7.4</b>	Riv. Gage Delivery (Gage)
<b>4.6</b>	Riv. 7th + Chicago (Reservoir)
<b>7.3</b>	Gage Arlington

<b>TITLE: WSCP Production Well Sampling Program</b> <b>Perchlorate Data Results December 2003</b>		
<b>LOCATION: LOCKHEED MARTIN</b> <b>REDLANDS, CALIFORNIA</b>		
EARTH TECH <small>A TYPICAL INTERNATIONAL LTD COMPANY</small>	CHECKED: Liles Cobb DRAFTED: Jeffrey Waugen PROJ.: 52773 DATE: 02/25/04	FIGURE: <b>2</b>

# Riverside Area

- 12 wells contain perchlorate  $> 4$  ppb
- 2 wells  $> 9$  ppb (13 and 16 ppb)
- 6 wells  $< 6$  ppb



# Corona Area

- 16 wells contain perchlorate  $> 4$  ppb
- All wells  $< 12$  ppb
- 5 wells  $< 6$  ppb

117.60000° W

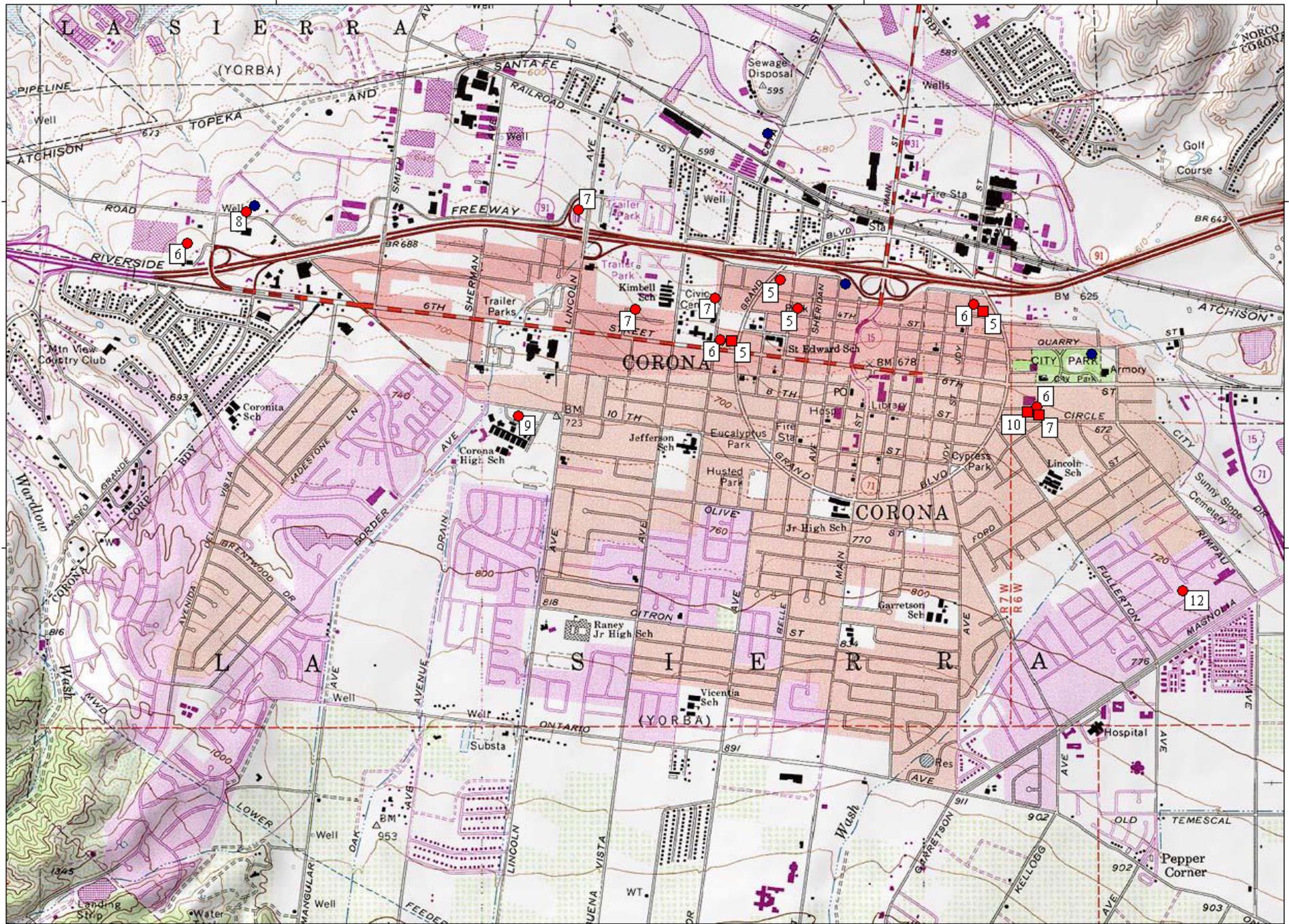
117.58333° W

117.56667° W

WGS84 117.55000° W

33.88333° N

33.88333° N



117.60000° W

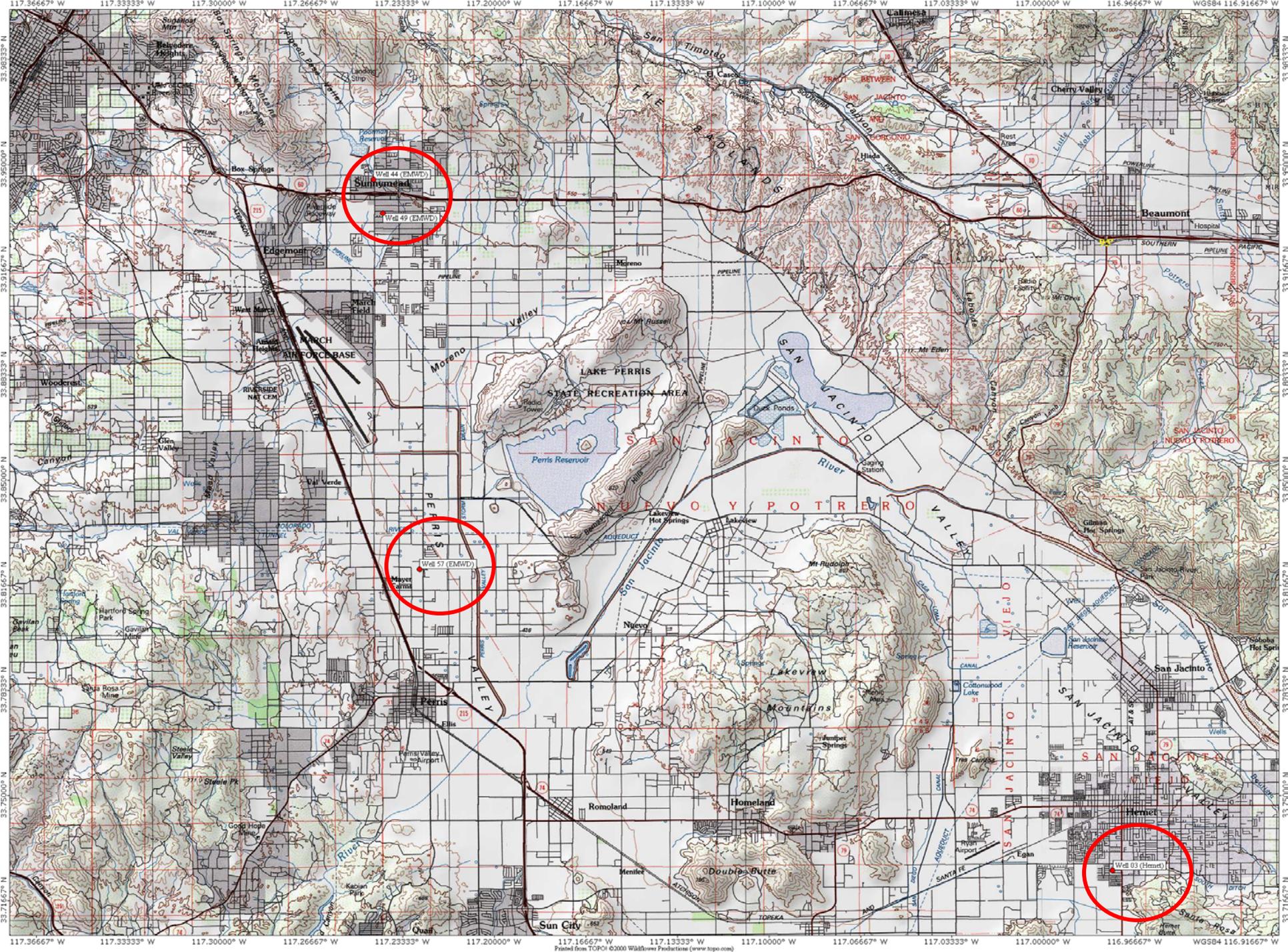
117.58333° W

117.56667° W

WGS84 117.55000° W

# Hemet-San Jacinto Area

- 4 wells contain perchlorate > 4 ppb (12, 8, 6 and 5 ppb)



Well 44 (EMWD)

Well 57 (EMWD)

Well 03 (EMWD)

# Chilean Nitrate

- Sodium nitrate, nitrate of soda, soda, saltpeter
- Contained 0.15 - 0.2 % perchlorate
- Applied to many citrus orchards in Inland Empire at rates of about 100 – 500 pounds per acre
- Location of wells containing perchlorate correlate closely with historic citrus areas

*Grow more* **DOLLARS**  
*in your*  
**Citrus Grove!**

**N**ITROGEN is as essential to the health of your trees as wholesome food to your children.

Chilean Nitrate is the nitrogen for citrus trees . . . other fruit trees too. It is natural nitrogen, not synthetic.

At the famous Fontana Farms near San Bernardino, fertilizer experiments have been conducted over many years. They show wonderful results for Chilean Nitrate of Soda. See this great ranch if you can.

Your trees respond at once to an application of Chilean Nitrate for its nitrogen is immediately available. Begins its good work as soon as you apply it.

Trees keep better color. Fruit is earlier, larger and juicier . . . and you get much more fruit per tree.

*New Fertilizer Book . . . FREE*

Our new 44-page book "How to Use Chilean Nitrate of Soda" tells how to fertilize citrus and all other crops. Ask for Book No. 1 or tear out this ad and mail with your name and address.

**Chilean**  
**Nitrate of Soda**  
EDUCATIONAL BUREAU

*Bank of Italy*  
*Building*



*San Jose,*  
*California*

*In writing, please mention Ad No. 2A*

California Citrograph

March, 1925

# Citrus Growers Look at This

*Is beefsteak good food?*

*Yes!*

*Is sugar good food?*

*Yes!*

Well, eat either of these alone for three months and see where you will be!

Superphosphate is good fertilizer.

Potash is good fertilizer.

Nitrate of Soda is the best of fertilizer.

But feed your trees on any one of these alone for 17 years; and what should you expect your trees to be? The Rubidoux citrus experiments *can show you.*

If you would see what the *proper use* of these fertilizers will do, go and see those beautiful and highly profitable orange groves of Highland and many other places where the growers use all of these freely.

CHILEAN NITRATE OF SODA

Educational Bureau

DR. WILLIAM S. MYERS, Director  
3413 Second Ave., Los Angeles, Calif.

Hurt Bldg., Atlanta, Ga.

55 East State St., Columbus, Ohio

701 Cotton Exchange Bldg.,

Memphis, Tenn.

Hibernia Bank Bldg.,

New Orleans, La.

25 Madison Ave., New York

California Citrograph

October, 1928

Mr. Brand spoke briefly on the national fertilizer supply situation. He said that much rests on the ability to get larger supplies of nitrate of soda from Chili. The limiting factor is the matter of boat transportation from Chili, warehousing in the ports, and rail transportation.

Weller Noble of the Pacific Guano Co., just returned from Washington, explained that customers must realize it will be necessary to take some substitute materials in their fertilizers, but that as far as the Pacific coast is concerned, he expected the requirements to be met. He said the order will be to have the farmers take in their supplies early and store them for future use. In other words, users should plan now as to what their requirements for nitrate of soda and other materials will be next spring, and place their orders for delivery as soon as possible. This will relieve the situation as regards to warehousing and transportation.

California Citrograph

June, 1942

**NATURAL  
CHILEAN  
NITRATE**

**Have Aided Pacific Coast Growers Through  
the Past Six Critical Years**

**R**emember the old-timer who said "I'm an old, old man and I have had many, many troubles...*most of which were imaginary*"?

Folks were plenty worried about their nitrogen supply when war broke out in 1939, but, thanks largely to heavy increases in shipments from Chile, everybody has had enough for essential needs. Yes, west coast fruit and vegetable growers received over a quarter of a million tons of natural nitrate in the six years since 1939-40 — and almost all of it in California.

That's a lot of nitrate . . . it has settled a lot of doubts among folks who feared the consequences of not being able to get their accustomed fertilizers. Results have shown their fears to be groundless. In fact, quite the reverse, because in those same six years, when they used about seven times as much Chilean Nitrate as nor-

mally, California growers produced the largest and best citrus and vegetable crops on record — *the best they ever made.*

Yes, Chilean Nitrate saved the day, as far as nitrogen is concerned. These last six years and the quarter of a million tons of nitrate from Chile, made a tremendous field demonstration of its value and effectiveness to California growers.

The old man with his imaginary troubles sure had something.

Much has been accomplished in the past but much more remains to be accomplished. While the going was tough and the results in doubt, Chilean Nitrate was in there, pitching. And this year and in all the years to come, it stands ready and able to continue as in the past — serving — helping out — wherever the opportunity offers.

4-65

D-2-12



M-1-16

