

Appendix B

Ground Water Quality in the Petaluma Watershed

**Ground Water Quality
in the
Petaluma Watershed**

Prepared by:
Southern Sonoma County Resource Conservation District

June 1998

This Project has been funded wholly or in part by the United States Environmental Protection Agency Agreement No. C6999482-97-0 to the State Water Resources Control Board and by Contract No. 6-048-250-0 in the amount of \$144,115. The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the State Water Resources Control Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Introduction

The goal of this study is to review and summarize published reports and data to evaluate ground water quality and contamination in the watershed. Research for this information has produced five documents pertaining to ground water quality in the Petaluma River watershed and contacts were made to agency personnel to identify available sources of information. (see appendix A)

Cumulative data has shown that up until 1984, when the last study was completed, Petaluma's ground water quality had continually degraded. Historical problems have been identified with excessive nitrates, electrical conductivity (salts), coliform bacteria, and mineral constituents associated with sea water intrusion and connate water sources. The following constituents present a general overview of ground water quality concerns in the Petaluma area.

Nitrates

The most pronounced ground water problem is nitrate contamination. All studies examined for this summary, have made reference to nitrate contamination specifically in the area northwest of Petaluma and west of Highway 101. (see Figure 1) The problem first surfaced in January, 1979 when a case of methemoglobinemia (blue baby syndrome) was reported to occur in the Gossage-Magnolia area. (Sonoma County, 1981) Blue baby syndrome is a temporary blood disorder which inhibits the transport of oxygen in the blood stream, resulting in oxygen deprivation and a consequential gray or blue like appearance in infants. Samples of ground water quality which were used for the infant's baby formula revealed high concentrations of nitrates.

The case prompted a study by the State of California Department of Water Resources which concluded that nitrates in the study area did not occur naturally and were "primarily the result of past agricultural practices (poultry and dairy operations)." (DWR, 1982) The study attributes much of the problem to poultry operations due to stockpiling of manure. The study also notes waste water systems as being a secondary source and that "the contribution of nitrates to ground water from individual waste water treatment systems (septic tank / leach lines) will become greater as rural development continues."

Electrical Conductivity

Electrical conductivity is sometimes associated with Total Dissolved Solids (TDS) and provides a measurement of the amount of minerals in ground water. Elevated readings can be attributed to connate water storage which is defined as sea or fresh water that is trapped in the earth's surface and isolated from the atmosphere for a considerable length of time. Connate water is stored near the base of the Merced formation, in the area northwest of Petaluma.

The Department of Water Resources identifies another source of contamination as being associated with land use activities such as animal agriculture. (DWR, 1982) Much of the study area containing nitrate contamination also has extensive electrical conductivity (EC)

problems. (see Figure 1) The DWR nitrate study revealed that of the 52 wells that had high nitrates, 24 had EC values in excess of drinking water standards. Of the 50 low-nitrate wells, only four had excessive EC values.

Coliform Bacteria

According to the DWR nitrate study, 7 wells out of 81 sampled in 1981 were found to contain 20 or more colonies of coliform bacteria. One of the contaminated wells did not contain a surface seal which may have allowed small animals to fall into the well. The remaining wells were properly sealed indicating that contamination was occurring from the subsurface zone. "This is an indication of some localized waste water contamination of the supply.", concludes the study.

Sea Water Intrusion and Connate Water Influences

Sea water intrusion is a result of a gradual depletion of the freshwater ground aquifer which causes sea water to encroach upon and replenish the aquifer with saline water. Sea water and connate influences are combined in this summary since they possess resembling water quality characteristics and both have been found to occur in the southern part of the Petaluma River watershed, near San Pablo Bay. (DWR, 1982)

In the past, sea water intrusion has degraded the few aquifers present in the bay mud deposits and aquifers in the alluvial fan deposits in the Petaluma Valley. According to a 1958 study, Cardwell describes ground water quality as such:

"Southeast of Petaluma and downstream many wells tap water which seems to be contaminated by intrusion of brackish bay water or unflushed connate water of similar character."

This proceeded to be a problem until 1962 at which time imported water was purchased from the Sonoma County Water Agency. Limited testing has shown no further deterioration in ground water quality since 1962. Water quality problems associated with these waters in the past have been sodium, salinity, total dissolved solids, boron, and hardness. (see Figures 2-5) (DWR, 1982) Of these constituents, sodium presents the greatest risk to humans, especially those with heart problems such as high blood pressure. Salinity and boron can be harmful to agricultural land uses in terms of crop health. Boron is specifically hazardous to crops such as apples and grapes. Hardness reduces the cleaning ability of most soaps. Water tanks and pipes are effected by reducing the available quantity and pressure of the water supply through build up of minerals. Iron and manganese impart a metallic taste to water and food and present a common problem to households by staining fixtures fabrics and utensils. (DWR, 1975)

Present Day Monitoring

Recently, the City of Petaluma has instituted a testing program for seven wells located within the watershed. (personal communication, City of Petaluma, 1998) These wells will eventually be permitted for potable use under Title 22 of the California Administrative Code. The wells will be tested for general mineral,

Physical, organic, inorganic, bacteriological, and radiological constituents. Nitrates will be tested yearly while chemical tests will be evaluated every three years. Wells are located as follows:

Well Name	Location
Luchessi Well	202 No. McDowell-Petaluma
Kingsmill Well	End of Castle Dr.-Petaluma
Prince Park Well No.	2301 E. Washington-Petaluma
Prince Park Well So.	2301 E. Washington-Petaluma
Airport Well	601 Sky Ranch Dr.-Petaluma
Frates Well	Frates Rd. @ Ely Blvd.-Petaluma

Conclusions

Past studies have shown nitrates and electrical conductivity to be of concern due to poultry and livestock agricultural land uses and secondary contamination due to septic and leach field systems. Today few poultry operations remain in existence, and water quality laws enforced by the Clean Water Act have deterred many livestock facilities from the practice of stockpiling of manure. Rural housing development has increased posing as a potential concern in terms of septic systems and leach lines.

Salt water intrusion in the lower Petaluma watershed has posed a problem in the past before water was imported into the area. The city of Petaluma is currently opening seven wells for drinking water use and wells will be monitored. The City of Petaluma's ground water monitoring program provides an excellent opportunity. Establishing an ongoing monitoring program will enable ground water quality to be evaluated on a regular basis providing water quality results to drinking water users.

References

California Department of Water Resources. "Study of Nitrates in Ground Water Petaluma Area, Sonoma County". 85p. May 1982.

----. "Evaluation of Ground Water Resources: Sonoma County". Bulletin 118-4. Vol. 1: Geologic and hydrologic Data. 177 p. December 1975.

----. "Evaluation of Ground Water Resources, Sonoma County, Petaluma Valley". Bulletin 118-4 Vol. 3. June 1982.

Sonoma County Department of Planning. "West Petaluma Specific Plan". April 1981.

U.S. Geological Survey. "Map Showing Areas in the San Francisco Bay Region where Nitrate, Boron, and Dissolved Solids in Ground Water May Influence Local or Regional Development". Miscellaneous Field Studies Map MF-432. 1972

----. "Geology and Ground Water in the Santa Rosa and Petaluma Valley Areas, Sonoma County, California". G.S. Water Supply Paper 1427. Prepared with Department of Water Resources. 276 p. 1958.

Appendix A

Ground Water Contacts

Sonoma County Department of Health Services
Ron Anderson
3313 Chanate Road
Santa Rosa, CA
(707) 525-6565

Comments: No information other than Petaluma Nitrate study which he worked on. Referred to City of Petaluma, State Health Dept., and San Francisco Bay Regional Water Quality Control Board.

State of California Department of Health Services
Drinking Water Field Operations
Martin Ross
50 D, Suite 200
Santa Rosa, CA
(707) 576-2145

Comments: No data available, however City of Petaluma will be turning on new wells and has well monitoring data. In the past, all drinking water in Petaluma has been obtained through the Sonoma County Water Agency. Referred to Lou Hodge at City of Petaluma.

City of Petaluma
Water Department
Lou Hodge
11 English St.
Petaluma, CA 94952
(707) 778-4392

Date of Contact: 4/28/98

Comments: The City of Petaluma is in the process of acquiring a drinking water permit under Title 22 of the State Health Code. Monitoring is done at seven wells in the Petaluma area ranging from Frates/Ely Roads to King's Mill/Park Place Roads. Nitrate tests will be done every year and chemical tests every three years. Tests include general mineral content, organic (synthetics) and inorganic and radiological tests. One possible well was abandoned at Sola Optical in South Petaluma (superfund site). Mr. Hodge is also involved with environmental compliance at the Petaluma Landfill. A total of five wells are being monitored, two for leachates and three for groundwater quality. They are

sampled quarterly and results are given to the San Francisco Bay Regional Water Quality Control Board.

State Water Resources Control Board
San Francisco Bay Regional Water Quality Control Board
John Gin
2101 Webster, Suite 500
Oakland, CA 94612
(510) 286-1255

Date of Contact: 5/4/98
Comments: No information he is aware of.

Sonoma County Water Agency
Doris Anderson / Jim Flugen
2150 West College Avenue
Santa Rosa, CA
(707) 547-1961

Date of Contact: 4/28/98
Comments: Jim Flugen was not aware of any information other than the Department of Water Resources nitrate study. Doris Anderson was only aware of wells monitored near the Laguna de Santa Rosa.