California Regional Water Quality Control Board
Santa Ana Region

STAFF REPORT

June 6, 2008

ITEM: **18**

SUBJECT: Water Quality Concerns Resulting from the Use of Onsite Septic Tank-Subsurface Disposal Systems within the Community of Lake Williams[1], San Bernardino County

DISCUSSION:

The community of Lake Williams is located approximately 3.5 miles southeast of Baldwin Lake in the San Bernardino Mountains of western San Bernardino County. The community consists of approximately 121 developed lots and has a total built-out capacity of 234 residences. The lake and lots are located in the Gocke Valley, generally surrounded by mountainous terrain (see Figure 1). The City of Big Bear Lake Department of Water and Power (BBLDWP) supplies water to residents from two municipal supply wells located within the Lake Williams area. A number of homeowners have private domestic wells for their water supply. The area does not have a sanitary sewer system and all homes utilize individual septic tank-subsurface leaching/percolation systems for wastewater disposal.

Board staff has four pending applications for approval of the use of septic tank-subsurface disposal systems for new dwellings in the Lake Williams community. The Board's Minimum Lot Size Requirements generally do not apply to these developments since the lots received approval prior to September 7, 1989. The Lake Williams area is specifically excluded from the septic tank-subsurface disposal system prohibition area established for the Big Bear Valley mountain area and its environs[2]; developments using subsurface disposal systems in the Lake Williams area are currently required only to meet San Bernardino County requirements and to comply with the Board's Guidelines for Sewage Disposal from Land Developments[3]. However, water quality data collected by BBLDWP and Regional Board staff indicate that compliance with these requirements/guidelines will not suffice to assure the protection of water quality and beneficial uses.

---

[1] Lake Williams is also known as the Lake William service area by the Big Bear Lake Department of Water and Power (BBLDWP).

[2] California Regional Water Quality Control Board – Santa Ana Region, May 13, 1983, Prohibitions Applying to Subsurface Leaching-Percolation Systems, III. Prohibition - Exemption Criteria, B. 2.b. Lake Williams Area. Approved by the State Water Resources Control Board on February 14, 1986.

[3] California Regional Water Quality Control Board – Santa Ana Region, January 24, 1979, Guidelines for Sewage Disposal from Land Developments. Approved by Regional Board Resolution No. 79-32 and State Board Resolution 79-46 (5/17/79)

Specifically, BBLDWP has noted that the nitrate concentrations in one city well, Monte Vista Well, have been increasing since 1990. Nitrate concentrations reached 32 mg/L in January 2006. This increasing nitrate trend prompted BBLDWP to fund a study to form the scientific basis for planning efforts to address the nitrate concentrations before they exceed the State and Federal maximum contaminant level (MCL) of 45 mg/L as NO_3. The study will provide a basis for planning, timing and implementation of nitrate mitigation and/or management alternatives.

The study, conducted by GEOSCIENCE Support Services, Inc,[4] showed that the Lake Williams Groundwater Basin is defined as an aquifer system within the unconsolidated alluvial portion of the Lake Williams Tributary Sub-area of the Baldwin Lake Watershed. The Lake Williams Groundwater Basin is not identified in the Basin Plan and no water quality objectives are specified for the basin. However, the basin is used for domestic supply; in fact, it is currently the only source of water for the community of the Lake Williams. Groundwater within the alluvium occurs at depths ranging from approximately 10 ft below ground surface in the western portion to 100 ft below ground surface in the eastern portion of the sub-area. The general direction of the groundwater flow is from the surrounding mountains to the valley and then from the west to the east. The public supply wells are located down-gradient from the homes and septic systems.

The GEOSCIENCE study concluded that septic systems in the community of Lake Williams are the sources of the nitrate measured in groundwater. The report concluded further that without mitigation, future nitrate concentrations will continue to increase in the Monte Vista production well to levels that will exceed the MCL.

Investigation by Regional Board Staff

Regional Board staff reviewed the GEOSCIENCE report and met with the BBLDWP staff at the community of Lake Williams to inspect their two water supply wells and the general condition of the community. Regional Board staff also requested and was provided with existing data related to the geology, hydrogeology and water quality of the area. After reviewing the report and the existing data, staff agrees with the conclusion of the GEOSCIENCE report that the nitrate in supply wells originates from the septic systems in the community.

To further investigate the impact of septic systems on groundwater water quality and the community's water supply wells, Regional Board staff conducted well sampling and analysis of the community's supply wells and privately owned domestic wells. Figure 1 depicts the location of the wells sampled by Regional Board staff. The costs of the analyses of the well samples were paid by the Regional Board and the results were

---

[4] GEOSCIENCE Support Services, Inc., March 17, 2006, Geohydrologic Evaluation of Nitrate in Ground Water in the Lake William Area, Baldwin Lake Watershed, Prepared for the City of Big Bear Lake.

provided to well owners free of charge. Samples were analyzed for general minerals including nitrate, pharmaceuticals and personal care products, and nitrogen and oxygen isotopes. The general mineral results are tabulated in Table 1 and are comparable to the analytical results previously collected by the BBLDWP staff (also shown in Table 1).

As shown in Figure 2, nitrate concentrations in the Monte Vista Well show an overall increasing trend over the past decade. Although the nitrate concentrations are still below the MCL of 45 mg/L, the increasing trend is of concern. Furthermore, the nitrate concentrations in one privately owned well (Ploense) also show an increase in concentration from 4.7 to 31 mg/L – see Table 1. If, as expected, the increasing trend continues, the water from water supply wells may not be suitable for domestic supply without treatment. As previously noted, these wells are the only source of drinking water for the community.

In addition to nitrate concentrations, dissolved organic carbon, an indicator of septic system contamination, was detected in one public well (Monte Vista) and one privately owned well (Ploense). An antibiotic compound, sulfamethoxazole, was also detected in one privately owned well (J Collins) and one public well (Onyx Well). Overall, there is strong evidence that both public supply wells and private domestic wells have been impacted by discharges from existing septic systems.

CONCLUSIONS/RECOMMENDATIONS:

From the BBLDWP study report and from the recent Regional Board sampling results, there is strong evidence that the use of existing septic tank subsurface disposal systems will continue to increase the nitrate loading into the groundwater, and if additional septic tanks are allowed to be installed in the Lake Williams area, this water quality problem will only be further exacerbated. Protection of the use of the Lake Williams Groundwater Basin is of vital importance to the community of Lake Williams. Board staff intends to hold in abeyance pending and new applications for new septic system use in the Lake Williams area while we work with BBLDWP, San Bernardino County Environmental Health Services, and California Department of Public Health to develop possible solutions to address the issue. These solutions could include: the requirement for the installation of alternative treatment systems that will reduce the nitrate concentrations in the effluent to acceptable levels before the effluent is discharged to the ground; amending the Basin Plan to include a prohibition on new septic systems; and/or replacement of existing septic systems with an alternative treatment system that reduces the nitrate concentration of the wastewater.

Figure 1. Lake Williams Ground Water Wells Sampled by RB Staff

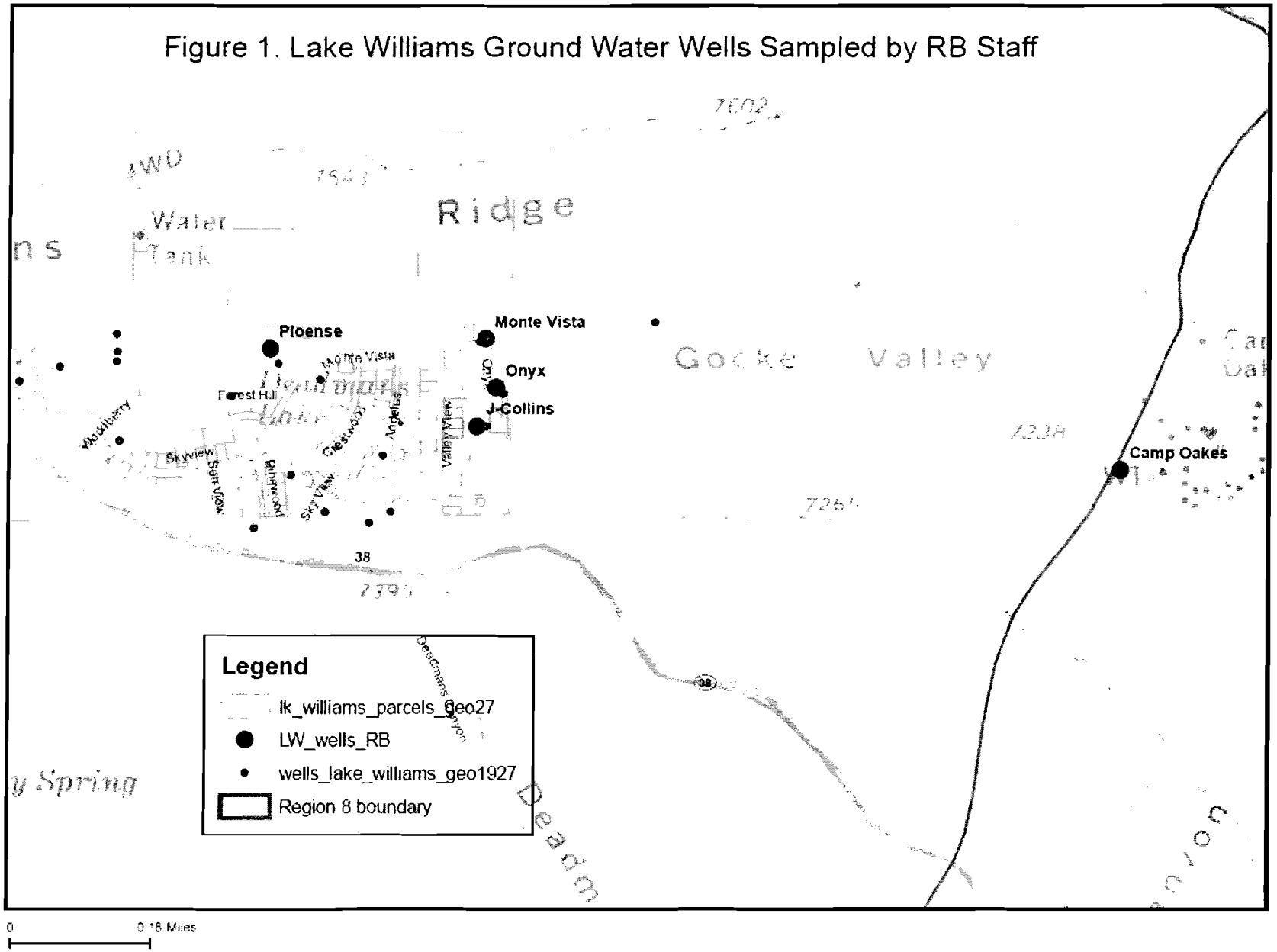

Table1. Summary of Water Quality Constituents - Lake Williams Area Wells

	Collection Date	Nitrate as NO_3 [mg/L]	Fluoride [mg/L]	Calcium [mg/L]	Magnesium [mg/L]	Sodium [mg/L]	Potassium [mg/L]	Carbonate Alkalinity [mg/L]	Bicarbonate Alkalinity [mg/L]	Sulfate [mg/L]	Chloride [mg/L]	Total Dissolved Solids [mg/L]
Monte Vista Well	22-May-90	5.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4-Sep-90	5.2	0.8	34.4	9.4	16.4	1.9	1	144	13.3	13.8	186
	5-Oct-93	9.8	0.8	35.2	8.9	18.8	1.6	< 5.0	154	13.9	10.3	175
	15-Oct-96	14.6	0.82	36.8	11.7	18.1	2.1	< 5.0	146	19.8	14.9	191
	12-Oct-99	16.5	0.9	39.7	9	21.7	1.4	< 5.0	160	17	17.5	202
	15-Oct-02	16	1	38	8	20	1.3	< 5.0	140	15	16	190
	21-Jan-04	19	0.98	38	11	21	2	< 5.0	140	18	20	420
	19-Oct-05	26	1	41	13	23	2	< 5.0	180	17	20	240
	12-Jan-06	32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4-May-07	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12-Sep-07	24	NA	38	12	22	3.3	< 3.0	160	15	20	240
Skyview Well	22-May-90	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4-Sep-90	1.8	0.2	NA	NA	NA	NA	NA	NA	NA	NA	198
	5-Oct-93	1	0.1	27.7	10.4	21.4	4.7	< 5.0	147	17.3	14.5	169
	15-Oct-96	3.2	0.12	31.7	12.1	19.3	5.2	< 5.0	145	17.4	22.6	183
	21-Jan-97	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12-Oct-99	< 2.0	0.12	30.1	8.9	18	2.1	< 5.0	148	17.1	13.6	163
	15-Oct-02	2.8	0.18	34	11	21	4.6	< 5.0	160	14	22	190
	27-Jan-04	4.9	< 0.10	43	17	21	5.7	< 5.0	180	14	32	220
	19-Oct-05	4.8	< 0.10	42	19	21	5	< 5.0	190	9.7	36	240
	12-Jan-06	5.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Onyx Well	21-Jan-97	5.2	2.7	32.2	5.9	27	1.8	< 5.0	150	16.7	12.9	178
	10-Feb-98	NA	2.6	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12-Oct-99	5.4	2.5	33.3	6.8	30	1.3	< 5.0	152	15.1	14.9	184
	30-Oct-02	5.9	2.6	32	7.5	32	1	< 5.0	150	15	14	180
	21-Jan-04	5.3	2.7	33	6.1	34	2.3	< 5.0	150	19	15	200
	19-Oct-05	5.8	2.8	32	7.2	30	1.8	< 5.0	160	18	15	200
	12-Jan-06	9.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	4-May-07	21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

	Collection Date	Nitrate as NO_3 [mg/L]	Fluoride [mg/L]	Calcium [mg/L]	Magnesium [mg/L]	Sodium [mg/L]	Potassium [mg/L]	Carbonate Alkalinity [mg/L]	Bicarbonate Alkalinity [mg/L]	Sulfate [mg/L]	Chloride [mg/L]	Total Dissolved Solids [mg/L]
	12-Sep-07	14	NA	34	7.9	29	3.2		150	15	17	240
	19-Jan-06	< 2.0	1.2	38	6.2	24	3.1	< 5.0	180	25	7.9	190
	16-Sep-03	11	1	35	11	20	1.5	< 5.0	140	16	15	210
	12-Jan-06	4.7	0.59	31	8.9	19	1.1	< 5.0	160	9.4	< 1.0	180
	12-Sep-07	31	NA	NA	11	20	3.1	< 3.0	150	15	21	260
Moulthrop well	19-Jan-06	< 2.0	1.2	38	6.2	24	3.1	< 5.0	180	25	7.9	190
Ploense Well	16-Sep-03	11	1	35	11	20	1.5	< 5.0	140	16	15	210
	12-Jan-06	4.7	0.59	31	8.9	19	1.1	< 5.0	160	9.4	< 1.0	180
	12-Sep-07	31	NA	NA	11	20	3.1	< 3.0	150	15	21	260
Scotty's Well	18-Jan-06	< 2.0	2.4	17	5.6	23	3.6	< 5.0	89	23	7.1	120
Camp Oakes Monitoring Well	17-Sep-03	0.88	NA	10	3.2	42	2.6	< 5.0	74	34	5.9	160
	18-Nov-03	<0.88	8.2	NA	NA	NA	NA	NA	NA	NA	NA	160
	17-Feb-06	< 2.0	7.3	11	3.1	31	2.6	< 5.0	73	27	3.3	130
Camp Oakes Well No. 1	17-Sep-03	0.88	NA	NA	NA	NA	NA	NA	NA	NA	NA	160
	1-Oct-03	< 2.0	0.13	18	5.7	1.1	< 1.0	< 5.0	88	< 0.50	< 1.0	110
	18-Nov-03	1.9	0.1	NA	NA	NA	NA	NA	NA	NA	NA	110
Camp Oakes Well No. 2	18-Nov-03	1.6	0.5	NA	NA	NA	NA	NA	NA	NA	NA	130
	1-Oct-03	2	0.14	16	5.6	1	1.3	< 5.0	83	< 0.50	< 1.0	110
	12-Sep-07	1.6	NA	12	4.8	17	2.7	ND	85	2.3	11	120
MCL or Action Level		45	2	NA	NA	NA	NA	NA	NA	500	600	500 - 1000

Notes:
NA - Not Analyzed or Not Applicable
mg/L - milligrams per liter
MCL - Maximum Contaminant Level
< 2.0 - Constituent not detected above indicated detection limit
Results from RB sampling. All other samples collected and analyzed by the City of Big Bear Lake Department of Water and Power.
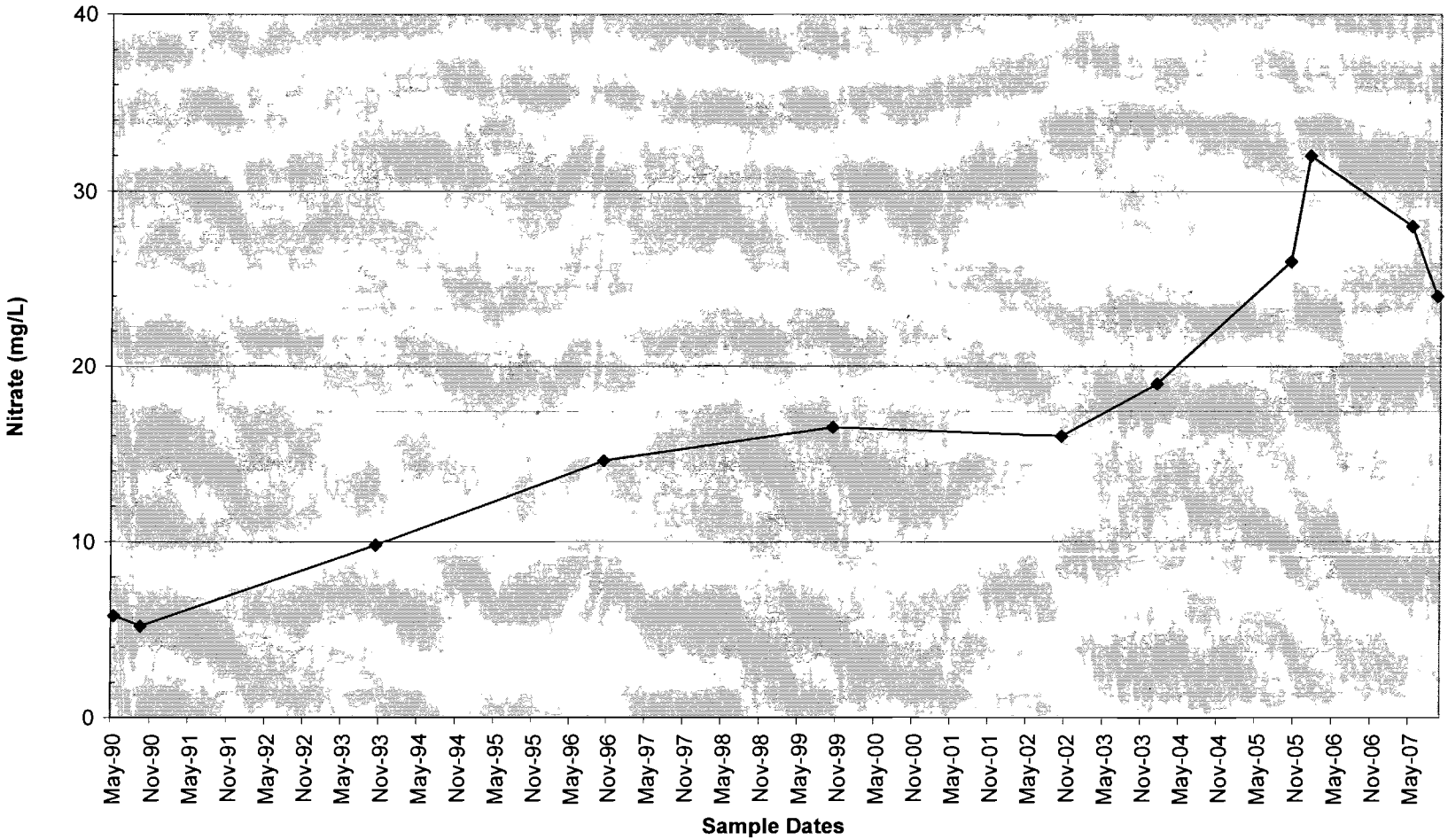
Figure 2. Monte Vista Well Nitrate Concentration Over Time