

475

**A DETAILED EXAMINATION OF THE
SAN LUIS OBISPO COUNTY
NITRATE SAMPLING PROGRAM
(1982-1997)**

Citizens for Affordable Wastewater Systems
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EXECUTIVE SUMMARY

HIGH NITRATES ARE AN ARTIFICIATION OF THE THE COUNTY NITRATE SAMPLING PROGRAM

Although there may be areas of high levels of nitrate in the shallower portions of the Los Osos Ground Water Basin, the high levels reported in the last 15 years are the result of improper site selection and sampling methods

On January 15, 1980 the consulting firm of Brown and Caldwell began the only complete "Water Quality Management Study" yet performed in this ground water basin. In the process of evaluating water quality they found it necessary to fill in gaps in the distribution of data by installing additional "observation wells". These wells were not installed according to State of California Water Well Standards. They have no proper sanitary seal and after a period of time surface water can reach the ground water through the well. Samples bailed from such wells tend to represent the well and not the basin. The longer they are in place the more surface water will penetrate and the more water must be removed to get a valid sample. The County in sampling such wells, bails about 1/6 of the volume of water in the bore hole. Thus the method of sampling used by the county guarantees that the result will be inaccurate. These Wells were first sampled in June of 1982. In 1983 the County established a program to continue monitoring some of the wells used by Brown and Caldwell. Six of these B&C wells were retained. The basis for selection of sampling points has never been clearly explained. Some wells have been dropped. The remaining sampling points appear to be heavily weighted toward wells with high nitrate levels within the prohibition zone and low nitrate levels outside of the prohibition zone.

The appropriateness of the county well selection which tends to bias any statistical analysis has been frequently challenged. The program includes at least six sampling points with known local "point sources" of contamination. They should not be used as evidence of any general condition even in the shallow ground water. There is no evidence in the record of such contamination in the deeper aquifer of the ground water basin and ample evidence that surface water infiltration at improperly constructed and/or abandoned wells is the cause of such contamination in the shallow aquifer.

Eliminating these six wells from the county sampling program means that there is no well in the county sampling program showing nitrates in excess of the maximum contaminant levels for nitrates in drinking water

The author recommends that these wells be immediately sealed and abandoned according to State of California Well Standards and all records for the subject wells be expunged from the records.

New properly constructed observation wells, properly sealed and large enough to allow pumping of valid ground water samples should be installed at least 50 feet from each of the subject wells and extending at least 50 feet into the ground water to determine if indeed any change has taken place since June 1982.

He further recommends that Resolution 83-13, and any other action taken by the Central Coast Regional Water Quality Control Board or other agency, based on these data be seriously reconsidered; perhaps rescinded.

Wade D. Brim PE

Citizens for Affordable Wastewater Systems

DETAILED EXAMINATION OF THE SAN LUIS OBISPO
COUNTY NITRATE SAMPLING PROGRAM

Wade D. Brim PE

Although there may be areas of high levels of nitrate in the shallower portions of the Los Osos Ground Water Basin, it is clear that the high levels reported in the last 15 years are the result of improper site selection and sampling methods used by County Engineering to collect the data.

On January 15, 1980 the consulting firm of Brown and Caldwell⁽¹⁾ (B&C) began the only complete "Water Quality Management Study" yet performed in this ground water basin. In the process of evaluating water quality they found it necessary to fill in gaps in the distribution of data by installing additional "observation wells". Permits were taken by County Engineering in March of 1982 and are marked "exempt" on the records of County Environmental Health, which is apparently the "enforcing agency" in this county.

The wells were installed in June and July of 1982. They were not constructed according to State of California Water Well Standards⁽²⁾ (Part I, sections 1 & 2) for "observation or monitoring wells"; nor do they conform to the definition of "Test Wells", "test holes or exploratory holes" under those same regulations.

Figure 2 shows a properly constructed observation well and a typical B&C well described in different parts of that report as sampling well, observation well and test well. The typical well used is 30S/10E-13Q1. Driller's report and log for this well is included in the appendix. The well was bored through firm stratified clay and sand material including at least two layers of gravel. Water was encountered at 90 feet and the boring terminated at 100 ft. The casing is 1 1/2 inch schedule 40 PVC perforated in the lowest 3 feet (presumably capped). The bottom of the bore hole was gravel packed from for 5 feet with # 20 Monterey sand. The casing terminates at about one foot below ground level with a slip cap. The bore hole terminates about 2 inches below the ground surface in a steel collar with loose fitting depressed lid. The Driller's Report describes a surface "sanitary seal" of one foot depth for each well and an additional "seal against pollution" from 8 feet to 12 feet of bentonite pellets independent of any specific strata. The remainder of the bore hole was backfilled with unconsolidated native material removed from the hole. These wells do not have the proper 20 foot sanitary seal as defined under section 9, nor any sealing of gravel stringers between the surface and the ground water. After a period of time contaminated surface water can reach the ground water through the well. The winter of 1982/83 was very wet and the water quality samples taken before and after the heavy rainfall and runoff show that this is precisely what happened in each of these wells.

Samples bailed from these wells (following the procedure used by the County (see appendix for description) usually remove only about one sixth of the water in the bore hole and therefor tend to represent the well and not the groundwater. The longer such wells are in place the more surface water will penetrate and the more water must be removed to get a valid sample. In other words the method of sampling used by the county guarantees that the result will be incorrect. This is reflected in the erratic fluctuations in nitrates with time and rainfall rather than a steady increase or decline characteristic of changes in ground water from cultural changes.

Since 1983 the County has established a program to continue monitoring some of these wells.⁽³⁾ The basis for selection of sampling points has never been clearly explained. As time went by some wells have been dropped without any explanation for doing so. Remaining sampling points appear to be heavily selected from wells with high nitrate levels within the prohibition zone and low nitrate levels outside of the prohibition zone.

The appropriateness of the county well selection which tends to bias any statistical analysis, has often been challenged. Six of these "wells" are listed below with a detailed explanation of why they are not valid sampling points representative of general conditions. Each of these six can be shown to have local point-sources of surface contamination. They are listed below with the reasons they should not be used as evidence of any general condition. These contentions are supported by the data from the CCRWQCB⁽⁴⁾ data base as noted under each well listed below.

30S10E-13L5: This is an **observation well** installed by Brown and Caldwell next to the Golf course. After examining the data, they found that salt spray and subsequent over watering and fertilizing of the golf course greens and fairways lead to high nitrates, extremely high chlorides and TDS which did not represent conditions in the basin.

When this well was first sampled (06/18/82) the nitrate level was 35.44 mg/l (as NO₃) which is below the maximum Contaminant Level (MCL). A year and a half later (10/15/83) the nitrates had increased to 76.64 mg/l and seven months later (05/15/84) had increased to 111 mg/l. without any change of population or land use in the vicinity.

30S10E-13Q1: This **observation well**, located near the West end of Woodland, like the one above is subject to salt spray. Up gradient 1300ft is a horse boarding ranch with approximately 80 equine beasts on 5 acres of barren soil. Additional horses are located about 150 feet to the West of the well.

When this well was first sampled, the nitrate level was 47 mg/l (06/15/82) which is just above the Maximum Contaminant Level (MCL) of 45 mg/l. A year and a half later (10/15/83) nitrates had increased to 88 mg/l. For the next ten years while being sampled by the County the nitrates varied erratically from 64 mg/l to 107 mg/l

Brown and Caldwell stated that these two wells should be eliminated from Correlation analysis (p.5, 26)

30S10E-13H1 This is a private well in Cuesta by the Sea, not in use, 44 feet deep with no seal, shown on the sampling station listing as "gray water near by, easily contaminated from surface." (see Table 1 Location 9) The implication is that it is either used to dispose of gray water or is subject to surface inflow from gray water. This well should have been considered "abandoned" according to Part III sections 21-23 of Water Well Standards (WWS). The fact that the county has continued to use this and other wells in violation of these regulations and Chapter 7 of the California Water Code is creating a severe hazard of contamination to the ground water.

30S11E-18R1 This is an irrigation well 50 feet deep, without seal, installed in 1954. This well produced reasonably good water (NO₃ well below MCL) until 1977. Between 1979 and 1981 A subdivision of 149 homes (Bayridge Estates) was developed in the upslope area to the South. All surface drainage terminated in a collection basin about 100 feet south of this well. In addition all sewage was collected in a battery of septic tanks adjacent to the collection basin. When that system was installed, nitrates in the well increased from no (0.0 mg/l) nitrates in 1977 to 30mg/l in 1981. Since that time both of these county operated systems have overflowed and nitrate (as NO₃) have reached as high 93 mg/l. This is not a general condition of high nitrates down slope of a subdivision. It is clearly a point source surface contamination easily identified from information in the CCRWQCB database). Present owners complain of Mosquitoes from collection basin.

30S11E-7Q1 This County well was constructed before 1959 without sanitary seal. The casing has rusted through and the well head has been submerged several times by standing surface water. The county abandoned the well in 1978 and has been left open to further surface water contamination

The casing on this well should have been replaced and a sanitary seal provided years ago or properly abandoned by State Well Standards no later than 1979.

Elimination of these five wells from the nitrate database changes demonstrably the nitrate "contours" used by the county and the CCRWQCB to prove a generalized nitrate problem. Furthermore since the county program began in 1982, this means that **300 invalid data points** have been added which strongly skew the database. This information is in both the county and the CCRWQCB libraries.

30S11E-7L3 This observation well, when first sampled by B&C (06/15/82) showed nitrate levels at 19.05 mg/l, less than half the MCL. Sixteen months later (10/15/83) nitrates were measured at 85.5 mg/l. this is the highest nitrate ever reported for this well and is more than 4 times the original value, with no change in population or land use. Over the next ten years the reported nitrate figures varied erratically between 85.5mg/l and 35.9 mg/l

Eliminating these six wells from the county sampling for the last quarter of 1996 and the first 2 quarters of 1997 means that there is no well in the county sampling program showing nitrates in excess of the maximum contaminant levels for nitrates in drinking water I think the reports of high nitrate levels based on Sampling and reporting by the County Engineering department over the past 15 years, need to be reexamined. The reports are misleading. They imply a condition of high nitrate levels throughout the Los Osos Ground Water Basin which probably does not exist

By contrast let us examine two wells which remain on the sampling program within the prohibition zone

30S11E-7N1 This is the CSA9 Third Street production well for which we have very complete and accurate data (see Table 1 location 17). It was reconstructed in August 1957 apparently to State Well Standards. It is sealed to 56 feet and perforated from 61 to 83 feet. It was tested by PG&E in August 1957 at 133 GPM against 223 feet of head. Standing water level in 1957 was 5 feet below the well head. In 1997 static water level was 4 feet.

This well is located down gradient from the densest populated area, very close to the bay. Nitrates in this well had never exceeded 8mg/l (as nitrate* see note below) until February 1982 when the county first started monitoring this well as part of the "Baywood Park Ground Water Study." At that time the nitrates appeared to jump from 7 mg/l to 22 mg/l. Currently nitrates are about 9 mg/l as nitrate.

30S11E-18J6 This is listed as an observation well is actually a deep well adjacent to the bay at Pasadena Ave. with an obstruction at 40 feet. It exhibits the generally poorer mineral quality of the deeper aquifer. Total Dissolved Solids (TDS), Electrical Conductivity, sulfates and bicarbonates are all about 5 times as high as well 7N1. Why this well is included is not clear.

FINDINGS:

- 1.** All of the observation wells installed by Brown and Caldwell in June of 1982 appear to have provided satisfactory data the year they were installed. Since they had no standard seals they should have been abandoned according to state well standards. They were not filled and abandoned as required, but were retained by the county and sampled for the next 14 years. After heavy rainfall in the winter of 1982-83 they were sampled by the County and nitrates were found to have **all** increased between 200% and 400%. They were sampled by bailing 4 times the inner casing volume (about 1 gallon). The bore hole volume is about 6.5 gallons (assuming a voids ratio of 25%)

2. Two of these observation wells were found by B&C to be subject to local special conditions of point source contamination. **The Professional Consulting Engineers (B&C) did not use the data from these wells and stated that they should not be used.** County deliberately chose to ignore this advice. Two additional improperly abandoned shallow wells were acknowledged by the County to be contaminated by surface water containing septic wastes or gray water but were selected for use anyway. A Third private well without sanitary seal was contaminated by installations permitted by the county and now owned and operated by them.
3. Although some of these wells seem to have dropped below the Maximum Contaminant Level (MCL) occasionally since 1953 all of these wells and only these wells have been retained on the sampling program. None of these wells should have been retained as representative of nitrate conditions in the ground water basin.
4. There are properly constructed shallow municipal and private wells within the prohibition area which produce excellent water of high mineral quality which meets all public health standards. Thus the upper aquifer is not generally contaminated.

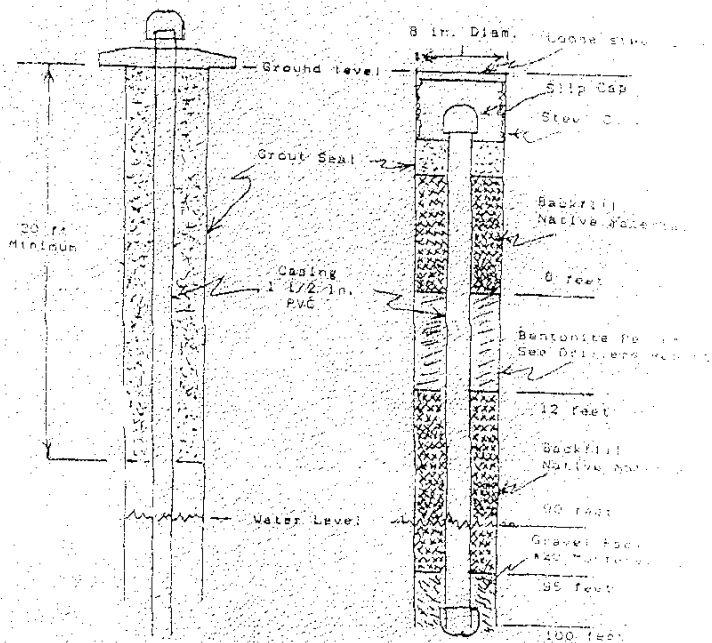
CONCLUSIONS:

1. All sampling done from the B&C "observation wells" after 1982 was sampling trapped surface water from the annulus of the well; not groundwater. All of these wells should have been backfilled and abandoned according to State Well Standards.
2. All of the current high nitrate sampling wells on this program, with the exception of 30S11E/18R01 which is still in use, are in violation of State Well Standards because they have been improperly abandoned and are contributing to contamination of the ground water by direct introduction of surface water.
3. Whether deliberately or through ignorance; **every data point showing nitrates in excess of the MCL from 14 years of this program is invalid.**
4. Degradation of well 30S11E-18R1 resulted from action permitted by the County and is now being degraded by facilities owned and operated by the county. It is the responsibility of the county to correct this problem.
5. Once the invalid sampling data has been eliminated, **the remaining data does not support a conclusion of general high nitrate concentrations in the ground water basin.** It appears to be an artifact of improperly collected data.

RECOMMENDATIONS:

1. Since **there are no valid nitrate records from the wells cited in this report** all of these six wells should be properly abandoned according to State Well Standards as required by law.
2. **All records from 1983 through 1997 should be expunged from the record** with the information listed herein cited in the record as the reason therefor. No use of this data should ever be made statistical or otherwise.
3. New properly constructed wells with proper seals should be installed at least 50 feet from the current wells to continue the Brown and Caldwell monitoring program to determine if there is any increase or decrease in nitrates in the shallow portions of the basin. At least some of these wells should extend at least 50 feet into the upper aquifer. Stratigraphic data should be collected with great care to supplement current meager data.
4. If Well 3011E-18R1 is still in use for domestic purposes it should be replaced by the county with a new well, properly constructed to State Standards and the existing well properly back filled with grout and abandoned.

Baywood sample wells drilled for
 B & C Well 30510E-1301 as typical
 well. Copy Well Log (B & C)



Properly constructed well
 Ref: Water Well Standards
 Part III C Page 31

Typical B & C well
 See Drillers Report 7/20/02
 Geologic Log, 6/21/02

FIGURE 2

**TABLE 2
GROUND WATER MONITORING WELL DATA**

Well Numbers	Address	Well Depth in feet	Screen Interval in feet	Casing Diameter in inches	Surface Elevation Above MSL* in feet	Groundwater Elevation above MSL* in feet 4-6-92
30S/10E-						
1211	Pasadena Drive**	389	349-389	1.5	6.5	-2.0
13A7	Pine Street	40	30-40	8.0	11.6	7.0
13H1	Mitchell**	44	36-44	8.0	14.04	8.1
1315	Howard/Del Norte**	35	32-35	1.5	29.98	7.18
13Q1	Woodland/Rieger**	100	97-100	1.5	98.61	8.71
30S/11E-						
7N1	CSA9A# 3rd St.**	80	7-80	8.0	9.13	9.1
7L3	CSA9A S Ysabel/5th	45	43-45	1.5	43.32	9.54
7K2	CSA9A S Ysabel/12th	65	62-65	1.5	92.80	40.7
7Q1	CSA9A 8th St.**	ND	29-75	8.0	23.96	22.3
7R1	CSA9A El Moro/12th	30	27-30	1.5	58.75	49.9
8N2	So Bay Blvd N	45	42-45	1.5	97.75	66.1
8N3	So Bay Blvd S	90	87-90	1.5	97.75	29.0
18D2	Cote-Ramona	88	73-88	6.0	29.90	3.1
18E1	Shores-Ramona	100	40-60	6.0	37.73	12.7
18L3	CSA9A Palisades Ave	55	52-55	1.5	83.47	45.9
18H3	Harrison-Nipomo	110	50-100	6.0	107.56	47.8
18L4	CSA9A 2060 Ferrell	25	22-25	1.5	101.13	88.28
18N1	Manzanilla/Ravens	90	87-90	1.5	106.82	25.2
18R1	Bender-Garage**	50	40-50	8.0	168.64	159.34
	13th Street***	68	58-68	4.0	92.00	38.0
	14th Street***	67	57-67	4.0	112.00	56.0
BEV	Bayridge Estates***	38	18-38	4.0	207.00	175

- * MSL Mean Sea Level
- # CSA9A County Service Area 9A
- ** Currently Active Groundwater Sampling Sites
- *** Test Sites For This Study
- ND No Data

The data in the table is provided by San Luis Obispo County Engineering Department