CENTRAL
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HEALTH REGION

ENVIRONMENTAL HEALTH PROGRAM
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MEMORANDUM

Date: July 7, 1999

File: W-60, Senanus Road, Central Saanich

To: R. W. Bradbury, Manager
Capital Health Region

From: Murray M. Sexton, P. Eng.
Regional Public Health Engineer

RE: **Senanus Road**

At your request, I have reviewed the 6-page letter report entitled "Senanus Drive Well Water Quality Study", dated June 11, 1999, prepared by Dennis A. Lowen, P. Eng., P. Geo., of Lowen Hydrogeology Consulting.

The author has provided thoughtful data analysis, contributed data and improved our understanding of the water quality issue on Senanus Road. The following comments are presented with respect to the letter report.

The data provided showed acceptable levels for bacteria and met most of criteria outlined in the Guidelines for Canadian Drinking Water Quality (**GCDWQ**, 6th ed.) except where noted.

Electrical conductivity

Electrical conductivity (EC) ranged from 377 to 1079 µS/cm in the field and 416 to 1160 µS/cm in the lab analysis. Typically, levels above 1000 µS/cm are considered to have excessive salt content (highly mineralized water). For comparison the European Economic Community Standards (1980) for EC is 400 µS/cm as an aesthetic objective (AO).

EC can be related to total dissolved solids (TDS) by multiplying the conductance by a factor ranging from 0.55 to 0.75, albeit this conversion is tenuous as the multiplication factor is closer to 1.0 for water containing significant concentrations of sulphate and less the 0.5 for acidic or basic solutions. For this data the multiplier ranged from 0.61 to 0.76 with 0.7 being the average.

.../2

Total Dissolved Solids

Total Dissolved Solids (TDS) ranged from 265 to 807 mg/L. The AO for TDS is 500 mg/L. Four home exceeded the AO. TDS can indicate high mineralization of the water but the drinking water quality depends on the individual water quality parameters – hardness, taste, mineral deposition or corrosion – which are common properties of highly mineralized water.

We did not previously measure TDS or EC during our sampling events so we cannot compare the results to previous data.

553 Senanus

The home at 553 Senanus had elevated levels of turbidity, aluminum, TDS, iron, lead and manganese, which was attributable to the lack of use of the system. It would be expected to have improved water quality once the well had been flushed. There is no previous water quality data from this home to compare with. The water quality within this well will not be discussed further as the poor water quality is considered to be related to lack of use.

Other Metals

Iron levels (2 homes: 553 and 651), manganese levels (4 homes: 508, 553, 617, 651) and zinc (1 home: 507) were above the AO limits for those parameters. Neither iron nor zinc had previously been observed above the AO. The AO are set as they can affect the acceptance of the water by the consumer but they are not health-related criteria.

Chromium

Elevated chromium levels were not observed as was previously identified in five of the eight homes.

Sodium

None of the homes had sodium levels above the AO standard of 200 mg/L whereas three of the 8 homes previously monitored did have levels in excess of 200 mg/L.

Persons on sodium-restricted diets should, based on an a assumed typical diet, only receive 10% of the total sodium intake from drinking water, which would mean concentrations in drinking water would have to be less than 20 mg/L. Six of the 9 homes did have levels above 20 mg/L.

Calcium, Magnesium and Nickel

None of the homes had calcium or magnesium (contributors to hardness) above the reference values whereas 6 of the 8 homes previously monitored did have levels in excess of the reference value for either calcium or magnesium.

Nickel was below the laboratory detection limit for all homes sampled where as levels in 6 of the previous 8 homes exceeded the European Economic Community Standard (EECS) of 0.05 mg/L and one home exceeded the "Approved and Working Criteria for Water Quality" prepared by the Ministry of Environment, Lands and Parks, 1993, level of 0.20 mg/L.

Hardness

Of the 9 homes tested, the water supply would be categorized as moderately hard for one home, hard (150 - 300 mg/L) for 7 homes and very hard (300 - 500 mg/L) for one home.

Water supplies above 200 mg/L are considered poor (5 of 9 samples) but have been tolerated by consumers. Hardness levels above 500 mg/L are considered unacceptable. The previous very hard and unacceptable levels of hardness in excess of 300 mg/L (6 of 8 homes with one sample assumed to have a treatment device) with those 6 homes have hardness ranging from 302 mg/L to 2763 mg/L were not observed during this most recent sampling event.

Other Comments

My other comment regarding the most recent sample data and the letter report are as follows:

1. I would agree with Lowen based on this data set, that there is no health concern. However the water quality is much poorer during late summer early fall sampling.
2. Of the 9 homes sample by Lowen, only 2 homes were previously sampled by CRD staff and myself. This may make water quality comparisons difficult.
3. As stated by Lowen, water quality may fluctuate during the season and the poorest quality is expected to occur in October. Previous Capital Health Region sampling was conducted in the late summer early fall when water quality is expected to be poorest. Lowen may wish to repeat the sampling in early fall, or after an extended dry period, to determine the quality of the water at that time.
4. Based on Lowen's data and as he has concluded, the water can be treated with point-of-entry or point-of-use treatment device to meet the AO of the **GCDWQ.**

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5. Reverse Osmosis (RO) devices[1] provide good[2] to excellent[3] removal of hardness, iron, manganese, total dissolved solids, zinc, nickel, lead, chromium, etc. RO is also very effective in removing sodium and bacteria.
6. It appears (not confirmed by this office) that an in-home treatment device is in use at 643 Senanus Road and appears to produce acceptable water quality.
7. It is cautioned that softening water by sodium ion exchange may introduce high levels of sodium into drinking water, which is undesirable.
8. The bacteriological data collected May 5th by the Capital Health Region should be compared to the bacteria levels from the wells and the previous data to determine if bacteria levels were the result of growth in individual plumbing systems. Again in-home treatment devices, disinfection units or improved well and system maintenance can be used to improve bacteria levels.
9. Lowen did not discuss water quantity in the area. From a health-related standpoint, sufficient quantity of water must be available for sanitary purposes. Usually 680 L (150 Imperial gallons) per household per day (or 50 gallons per persons per day) is considered adequate for sanitary needs. If wells run dry in the summer months, then, obviously, there would be insufficient quantity for sanitary needs. Trucked water may be required to met sanitary needs or supply could be augmented with rainwater catchment systems (this would require additional treatment). Water conservation should be practiced.
10. Water for fire fighting, irrigation, or other purposes, is additional to that required for sanitary purposes. Water supply must be adequate to meet reasonable peak demands without development of low pressures that could result in health hazards. Water quantity in excess of sanitary needs is not part of my review.

Conclusions and Recommendations

It appears that there is still a concern over the quantity and quality of water in the area. It is assumed that the water quality during late summer and early fall will again be poor as previously observed, although sampling could be conducted to confirm this.

If water quality, as observed in the 1996 and 1997 sampling events, were poor on an annual basis, then the water would not be potable without proper treatment. If there is no water, then, obviously, there is no water to treat and there is insufficient quality for sanitary needs.

The previous identified options of establishing a community water system (this may or may not be allowed under municipal bylaw), extending the municipal water system or using point-of use (or point-of-entry) treatment devices would address the water quality issue. Only the first two options would address the quantity issue.

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[1] American Water Works Association, Water Quality and Treatment A Handbook of Community Water Supplies, 4th Ed., McGraw-Hill, 1990.

2 Good – 60 – 90 percent removal

[3] Excellent – 90 – 100 percent removal