

DRAFT

Quilley Verdict Final

RESULTS OF RESIDENTIAL WELL WATER SAMPLING
VILLAGE OF COTTAGE GROVE AND WOODBURY TOWNSHIP

October 6, 1966

INTRODUCTION

At the request of the Woodbury Township Board 3M offered to collect and analyze well water samples from any residence in the immediate area of the 3M disposal site located in Woodbury Township, that wanted this service. The analytical work included an analysis for trace organic chemicals and a complete routine water analysis.

BACKGROUND INFORMATION

The 3M disposal site is located in the S $\frac{1}{2}$ of section 35, T28N R21W, in Woodbury Township. The site was initially purchased and operated by St. Paul Terminal Warehouse Company. 3M had contracted with St. Paul Terminal for the hauling and disposal of 3M's industrial wastes. In August, 1964, 3M purchased the site from St. Paul Terminal. St. Paul Terminal had a permit from the Township Board for disposal of industrial waste on this site and 3M, with the knowledge and consent of the Township Board, took over this permit when the property was acquired. At all times during the operation of this site under both St. Paul Terminal and 3M, the site had been utilized for the disposal of liquid scrap ^{or} non-pumpable residue. All of the scrap disposed of at the site after 1962 was put in bentonite or clay lined sealed pits. The volume of scrap disposed of at the site has been continuously decreased until in 1965 and the early part of 1966 only small volumes of non-pumpable scrap ^{has} ~~have~~ been disposed of at the site.

Exhibit
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State of Minnesota v. 3M Co.,
Court File No. 27-CV-10-28862

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On April 25, 1966, it was reported to 3M that the water from the well on the Herman Schuessler farm located just west of the 3M disposal site had developed a severe taste and odor. Although there was no indication that the 3M disposal site was the cause of the problem the 3M operations at the site were terminated immediately. The residents of Cottage Grove and Woodbury Township, however, continued to use the site for their general refuse disposal.

After intensive laboratory investigation the cause of the taste and odor in the Schuessler well water was identified as isopropyl ether. On August 17, 1966, the Township held a public meeting with the residents of the area and representatives of 3M to review the status of the problem. As one part of the future program to further investigate the problem, 3M agreed to collect samples and provide the laboratory analytical work necessary to determine the quality of well water of any of the residents in the area that requested it. The Minnesota Department of Health also agreed to provide analysis for nitrates and surfactants in the well water samples from any residential well in the disposal site area. The residents, however, collected their own samples for the Health Department.

SAMPLING

Samples were collected from the following Woodbury Township and Cottage Grove Village residents on September 19, 20 and 21, 1966.

Wolterstorff, Robert
Weyand, Al
Shannon, David
Hinz, Philip
Sawyer, Richard
Hartung, Roger
Hartung, Howard
Ratzlaff, Gerald
Marty, Wilbert
Bahls, Raymond

Zinschlag, Arnold
Borgstrom, Darrel
Romig, Raymond
Sanders, Donald
Wolf, Frank
Ratzlaff, Donald
Marks, Joe
Nieman, Earl
Hartung, Pearl

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Samples had previously been collected from the Art ^{Scholz} and Walter Gadde residences. *No samples were collected from the Leonard Sawyer residence since they were in the process of developing a new well.* Water samples from wells developed in the various geologic strata

but far enough away from the disposal site to be unaffected by any possible contamination were also collected and analyzed for use as controls.

From the information available the depth of the wells varied from 90 feet to 240 feet. The geology of the area varies from residence to residence, however, the glacial drift generally extends to a depth of about 130 feet, the St. Peter Sandstone from 130 feet to about 160 feet, the Shakopee limestone from 160 feet to about 260 feet and the Jordan Sandstone from 260 feet to about 360 feet. It appears that most of the wells that information was available on are finished in the St. Peter sandstone or at the top of the Shakopee limestone.

RESULTS OF LABORATORY ANALYSIS

The results of the laboratory analyses on the the well water samples are shown in Table I. Both routine water analyses, including nitrate nitrogen, surfactants (detergent), chlorides, alkalinity, total ~~hardness~~ hardness and iron, and analyses for trace organic chemicals were made on all of the water samples.

Routine Water Analyses

The nitrate nitrogen concentration in the well water samples varied from about 18 ppm (parts per million) to 415 ppm. These results were very similar to the results obtained by the Minnesota Department of Health. A concentration of 50 ppm has been established by the United States Public Health Service as a maximum limit in water that is used for feeding infants. In this case 11 wells were found to have nitrate concentrations near or in excess of 50 ppm.

These concentrations, although generally high, appear to be relatively

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representative of the concentrations found in this area. The control sample collected from the drift well showed a nitrate concentration of 37 ppm and a control sample collected from a well in the Shakopee limestone showed a concentration of 53 ppm. It is our understanding that the Minnesota Department of Health has already contacted these people about the high concentrations of nitrate *and leaving the wells for bacteriological analysis.*

The surfactant (ABS) is a principal ingredient of modern household detergents and, consequently, is a good indicator in water of localized pollution from septic tanks, household drainage, etc. With the exception of the Donald Ratzlaff well, the concentration of surfactants found in all of the other well water samples was negligible. A surfactant concentration of 0.38 ppm was found in the Ratzlaff's well water sample. Although this is not significantly high, the nitrate nitrogen concentration was 108 ppm and the chloride concentration was 44 ppm, which is *slightly* higher than the concentrations usually found in this area, which may indicate localized pollution.

The alkalinity and hardness concentrations found in all of the water samples were about what would be expected from wells in this area.

The concentrations of iron found in the well water samples varied from less than 0.02 ppm to 3.0 ppm. High concentrations of iron are objectionable because it will cause a brownish stain to ~~ix~~ water fixtures in the home and to laundered goods. High concentrations of iron will also cause objectionable tastes in water. The United States Public Health Service has recommended a maximum limit of 0.3 ppm of iron to eliminate objectionable taste or laundry staining.

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Trace Organic Chemicals

shown the results of the trace organic chemical analyses are

The analysis for trace organic chemicals in the well water samples was made by an F & M Model 810 gas chromatograph and a ¹² ~~14~~ foot long separating column. This column will elude all organic chemical components in the water up to a boiling point of about 155⁰F. On nearly all of these samples, including the control samples, 32 components were eluded. Of these components only 12 were tentatively identified. A sample of St. Paul city water was also used as a control to compare with the well water samples. The source of the St. Paul city water supply is a surface supply, however, after treatment it is potable.

Since the concentration of isopropyl ether in the Schuessler well water is known, it was used as a base and the relative concentration of each component that eluded and was recorded on the chromatograph was calculated from the known concentration of the ether. The sensitivity of ~~the~~ ⁴³ procedure is estimated at about 0.01 ppb (parts per billion), that is, the lowest concentration of any component that could be detected was 0.01 ppb.

There were traces of nearly all 32 components in all of the well water samples. In all cases, with the exception of methyl ethyl ketone, the amount of organic components in all the wells was about the same as that in the control well samples, and in these same wells was ~~also~~ always lower than the amount found in the St. Paul water, and ~~is~~ only a very small percentage of the amount found in the Schuessler well water samples.

Methyl ethyl ketone was found in small concentrations of 0.01 ppb to 0.38 ppb in 9 wells surrounding the disposal site, but none was ~~detected~~ in the well control sample or the St. Paul city water. 1,1,1 - trichloroethane and heptane eluded together in the analysis and no differentiation between the two could be made, however, small concentrations were detected in all of the well water samples and the St. Paul city water, but not in

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the control well water samples. The concentration in the St. Paul City water was much higher than in any of the well water samples.

Although organic components were detected in nearly all of the well water samples, the sensitivity of the analysis is so great that trace elements were eluding that are present in most ground water samples that originate in this geological strata. In all cases, there does not appear to be any water that is severely contaminated or that has become non-potable because of chemical contamination.

In the case of methyl ethyl ketone skin and eye irritation would be noticed at concentrations of about 200 ppm, which is about 500,000 times higher than those detected in these well water samples.

SUMMARY AND CONCLUSIONS

At the request of the Woodbury Township Board 3M collected and analyzed well water samples from 19 residence in the immediate vicinity of the 3M Woodbury disposal site. Samples were collected by 3M for routine water analysis and trace organic chemical analysis and by the Minnesota Department of Health for nitrate and surfactant analysis. As a result of these surveys the following conclusions were reached:

- (1) Eighteen well water samples were collected at residences in the vicinity of the 3M disposal site. From information available the depth of the wells varied from about 90 feet to about 240 feet. The average depth of wells in this area is about 160 feet to 180 feet.
- (2) The routine water analyses showed that 11 of the 18 wells had nitrate concentrations in excess of the maximum allowable concentrations recommended for use in feeding infants. ~~It appears that the~~ natural concentrations of nitrates in the water in these aquifers is very high

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and have undoubtedly been increased by localized pollution and the increased use of crop fertilizers.

- (5) The wells at the following residences contained the excessive concentrations of nitrate:

a. Roger Hartung	g. Raymond Romig
b. Howard Hartung	h. Donald Sanders
c. Gerald Ratzlaff	i. Donald Sanders Ratzlaff
d. Wilbert Marty	j. Earl Hieman
e. Raymond Bahls	k. Pearl Hartung
f. Darrel Borgstrom	

- (4) With the exception of the Donald Ratzlaff well, the surfactant concentration found in all of the water samples was about what would be considered normal for this area.
- (5) The concentration of chlorides found in the well water ~~was~~ ^{sample from the} also higher than would be considered normal for this area, ~~in the same~~ ^{general} wells that had the high nitrate concentrations.
- (6) The concentration of trace organic chemicals that could be detected in all of the well water samples ~~we~~ were very low, and with the exception of methyl ethyl ketone were very ^{similar} sensitive to the well water control samples. Based on the results of these analyses there does not appear to be any ~~trace~~ organic chemical contamination of the area wells sampled during this survey.
- (7) To maintain a log on these wells it is recommended that another set of samples be collected in June, 1967, for analysis to determine if there has been any significant change in the quality of water from any of the wells.

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