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**leachate damage assessment
case study of the Fox Valley solid waste disposal site
in Aurora, Illinois**

LEACHATE DAMAGE ASSESSMENT

Case Study of the Fox Valley Solid Waste Disposal Site
in Aurora, Illinois

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FOREWORD

Since its beginning in 1965, one of the concerns of EPA's Office of Solid Waste Management Programs (OSWMP) has been the development and use of environmentally sound methods of solid waste disposal. OSWMP recognizes that land disposal of wastes is an essential element in any present and future solid waste management system, and it is necessary to ensure that these land disposal sites do not adversely impact the environment. To this end, OSWMP currently has four studies in the area of leachate control: (1) leachate characterization, production, and migration, (2) leachate damage assessment, (3) leachate control technology, and (4) leachate administrative controls (land disposal site permitting and enforcement programs). The goal of these projects is to develop landfill standards or guidelines to protect our surface and ground water resources from leachate contamination.

This report is an output of the leachate damage assessment project. It discusses the leachate damages which occurred at a specific land disposal site.

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The leachate damage assessment project examines the impacts and magnitude of the leachate contamination problem in the United States on local, regional, and national levels. This includes the identification of the types and locations of sites causing leachate damages, the types and extent of leachate damages, and the comparison of damage costs and risks to control costs. The leachate damage assessment project establishes the need, if any, for leachate control standards or guidelines, and gives insights into what controls are necessary. This project is described further in Leachate Damage Assessment: An Approach.*

—SHELDON MEYERS
Deputy Assistant Administrator
for Solid Waste Management

*Leachate Damage Assessment: An Approach. Kenneth A. Shuster. Environmental Protection Agency, 1976.

PREFACE

Leachate is contaminated water which is produced when rain or other water passes through wastes in a land disposal site, picking up various mineral, organic, and other contaminants. Depending on the types of wastes received at the disposal site, leachate may contain various decaying organics, bacteria and viruses, and heavy metals and other toxic chemicals. Unless controlled, each of these contaminants will migrate different distances based primarily on the type of operation, the physical and chemical properties of the contaminants, and the hydrogeologic conditions around the site. If allowed to migrate from the site, leachate may contaminate ground or surface water and result in damages such as polluted wells or fishkills. The occurrence of such damages is directly related to the proximity of the resource to the disposal site, the direction of surface or ground water (leachate) flow, and dilution.

Past disposal practices in the United States have typically overlooked the leachate problem, frequently favoring the use of cheaper and more remote "waste lands" such as flood plains, quarries, sand and gravel pits, and marshlands. These marginal sites tend to be more socially and politically acceptable, as well as cheaper, when the leachate problem is ignored.

Due to the lack of ground-water monitoring around disposal sites in the United States, the seriousness and extent of the leachate problem is unknown. In most situations, only when wells are polluted or fish are killed, does the problem surface and attract attention. A number of studies of leachate production and migration at specific sites, however, has been recently completed. Information on leachate migration from damage cases and specific site studies coupled with general information on disposal site locations and operations in the United States indicate that at least one-fourth and possibly as many as three-fourths of the municipal land disposal sites in the United States have leachate migration problems. Hopefully, as more of the older sites are replaced by new sites which are better located, designed, and operated, these conditions will improve.

This report is the third in a series of case studies documenting damages caused by leachate from municipal land disposal sites. Described are the history and type of operation, damages caused by leachate, remedial actions, and associated costs.

The author acknowledges the special assistance of Charles E. Clark (Illinois State Environmental Protection Agency) for providing the major information upon which this report is based, and Joyce Corry for editing the report.

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CONCLUSIONS

1. The Aurora Fox Valley disposal site was neither located nor operated according to currently accepted sanitary landfill practices. Although the site was at a high elevation, it was unsuitable for landfill because it had only a thin layer of protective soil over a creviced bedrock aquifer, and domestic wells were located in the aquifer downgradient of the site. In 1965 the city of Aurora contracted with the Fox Valley Disposal Company to convert the open dump on the site to a sanitary landfill. But instead of improving the thin layer of protective soil, the site operator stripped away the soil and placed wastes in the resulting trench, directly on the bedrock. This enabled free channel flow of leachate to the wells below.
2. During the period 1961 to 1965, the site was used as an open dump, apparently without adverse impacts on the domestic wells below. The removal of the thin layer of soil in late 1965 by the operator resulted in leachate migration and well contamination. Although the trench operation apparently received more wastes than when the site was an open dump, the lack of contamination before conversion indicates the thin layer of soil was at least partially effective in protecting the groundwater. The leachate production and migration could also have been enhanced by runoff collecting in the trench and saturating the wastes rather than flowing off the site which was located at a high elevation; by liquid and septic tank wastes received at the site; by concentrating the wastes in the trench; or by the placement of wastes over the old farm well which existed on the site. All of these potential explanations indicate the importance of an engineering design for landfill sites.
3. Because of the thin soil layer and the use of wells in the area, the State and county had advised against the use of the site, but the city of Aurora acquired the land and used the site anyway. This case demonstrates the need for State level authority to grant or deny permits for proposed disposal sites. Otherwise, the local political and social pressures coupled with the pressures to locate a disposal site may result in the improper selection of a site. State control also helps protect communities from leachate migration from other jurisdictions (for example, in this case, from Aurora to wells in an unincorporated area).
4. Due to the proximity of the Fox River, the extent of leachate contamination was only about 0.04 to 0.06 square miles.

5. Seven domestic wells were polluted beyond use, and two other domestic wells were contaminated to a lesser degree. Damages also included plumbing and water fixtures.
6. The well owners experienced difficulty in obtaining temporary water. Use of a National Guard tank was vetoed by the State Health Department and Governor because it might be unsanitary, despite its use by the National Guard. A 1,000 gal tank of the Civil Defense unit was denied because it was reserved for emergencies, and the homeowners might need it for many months.
7. The well owners went 16 months without a permanent water supply. Three months passed before they filed a suit against the city of Aurora and Fox Valley Disposal Company. This delay in filing was due to (1) preparations for the suit including investigations by the State to prove the source of contamination, (2) possible solution resulting from legal action by the State Sanitary Water Board initiated March 4, 1966 against the Fox Valley Disposal Company and/or the city of Aurora to get them to correct the problem, and (3) evidence that the Fox Valley Disposal Company and its insurance company would take full responsibility for the damages and settle out of court. When it became apparent that neither the State, city, nor Fox Valley Disposal Company would take appropriate steps to correct the problem or get public water hooked up to the homes, the well owners filed suit. Due to inextinguishable delays, it took another six months to get a court date set and one more month to get a decision. Then four more months passed during which the homes were annexed by North Aurora, a contract was let to extend the water supply to the homes, and the supply line was constructed.
8. If the State Health Department had not conducted their study to show that the disposal site was the cause of contamination, the seven well owners probably would not have been able to afford and obtain such evidence themselves and may not have won their law suit.
9. The city of Aurora contract required the Fox Valley Disposal Company to carry liability insurance to cover all the damage liabilities of the city. Liability insurance tends to minimize the incentives to run an environmentally sound operation.
10. The impacts on the well owners included: (1) material damages including wells and plumbing, (2) inconveniences of temporary water, torn up streets and lawns, and repair damages, (3) lost time seeking assistance from the State, suing the disposal site owner and operator, obtaining and using temporary water, and making repairs, (4) psychic impact of the inconvenience, lost time, damages, financial impact, embarrassment due to

malodorous houses and the need to borrow water and bathe at the homes of others, lack of response from the disposal site owner and operator, and the inadequacies of the judicial process, and (5) economic impacts.

11. The disposal site operator was also impacted. The insurance company covered the operator's liabilities but did not cover the administrative, consulting, and operational expenses associated with attempting to correct the problem by site alterations at the request of the State Sanitary Water Board.
12. There was apparently little the operator could do to correct the problem short of removing the wastes to another site (closing the site) or retrofitting the existing site with an impermeable liner. No other site existed so the State Sanitary Water Board could not realistically shut the site down. To shut the site down would not have been wise anyway because the ground water was already contaminated which merely closing the site would not correct, and the size of the site meant a very high cost to correct the problem even if another site existed. The cheapest remedial solution would have been to require the operator to finance the development of a public water supply to the affected homes and to permit the site to continue operating.
13. There are numerous indirect, non-market, and intangible impacts or costs resulting from leachate damages whose values are difficult to identify or determine. In this case, the economic impact (out-of-pocket expenditures) was at least \$115,000 or \$16,430 per home. But this cost does not include: the cost to the well owners of phone calls, letters, and trips for meetings related to the contamination; the inconvenience, lost time (including lost work time), and psychic costs; the cost of temporary water (including bottled water, laundromat costs, and water obtained from the homes of friends); administrative expenses incurred by the National Guard, Civil Defense, and bottled water companies in considering temporary water supplies; some of the plumbing fixtures; the value of the road which was never properly resurfaced; the net effect of the new tax burden versus benefits received as a result of the forced annexation by North Aurora; the expense of water consumption over the years over the expense of electrical consumption of the well system; the costs to the State Sanitary Water Board for their deliberations, communications, and litigation considerations; administrative, consultant, and legal costs incurred by the Fox Valley Disposal Company, city of Aurora, and the insurance company; or the costs incurred by the Fox Valley Disposal Company to attempt to correct the problem. It also does not include the value of the damaged wells (about \$7,000).

SUMMARY

History. In 1959, Kane County requested the State of Illinois to evaluate a proposed landfill site in Aurora Township near State Highway Route 25 and the Fox River. The State Geological Survey advised against the use of the site, concluding that "pollution of presently used ground water aquifers can occur from the proposed landfill" since the site has only a thin layer of soil over a creviced bedrock aquifer. The county in turn would not approve the site. Despite this opposition, the city of Aurora purchased and annexed the land in 1961 to circumvent the existing county and State authorities. The city used the site as an open dump from 1961 to late 1965 when it contracted with the Fox Valley Disposal Company to operate a landfill on the site. Fox Valley Disposal Company proceeded to dig a trench to the bedrock and to fill it with waste. As a result, runoff collected in the trench and saturated and leached the waste (Table 1).

Damages. Within two months, unfiltered leachate migrated from the site and polluted seven residential wells between the landfill and the Fox River in exactly the manner predicted by the State Geological Survey. The wells contained strong, black, odorous leachate and were totally unusable. The leachate damaged sinks, faucets, and other plumbing fixtures. The seven residents who owned these wells went 16 months without household water. Two other nearby wells experienced increases in various constituents to a lesser degree and were not immediately abandoned.

Remedial Action. The city of Aurora disclaimed any responsibility for the well contamination, saying that if the disposal site were indeed the source, it was the fault of the Fox Valley Disposal Company, the operator. The seven affected residents had to sue the Fox Valley Disposal Company and the city of Aurora to get remedial action. In the meantime, they had to maintain a temporary water supply through such means as buying bottled water, collecting rain water, and showering at the homes of friends or relatives. The State Department of Public Health took at least 59 water samples on 17 different days, took water levels to determine ground water flow, drilled test wells, and used a fluorescein tracer which proved conclusively that the disposal site was the source of well contamination. The clincher was the application of the fluorescein on the disposal site which appeared in one of the domestic wells about 2-1/2 weeks later. The Fox Valley Disposal Company had insurance to cover its own liability, and the city's contract with Fox Valley Disposal required insurance to cover the city's liability, including legal fees.

TABLE 1
SUMMARY OF CITY OF AURORA/FOX VALLEY
DISPOSAL SITE LEACHATE DAMAGE CASE

Type of operation	open dump, landfill
Location	on bedrock
Years of operation	1961-1972
Types of wastes	residential, commercial, industrial, septic tank pumpings
Size of operation	
Acres	22 (8.8 ha)
Peak annual tonnage	68,000 (61,200 t)
Waste thickness (ft)	55 (16.8 m)
Annual precipitation (in. /year)	37 (94 cm)
Extent of contamination	0.04 to 0.06 mi ² (0.10 to 0.15 km ²)
Damages	7 residential wells; home fixtures
Remedial actions	wells abandoned; public water supplied; fixtures replaced
Litigation	yes, \$54,000 award
Costs	
Value of damaged resources (wells)	\$ 7,000
Damage costs (e.g. clothes, fixtures)	5,250 +
Corrective costs	?
Avoidance costs	33,000 +
Administrative costs	76,750 +
Total costs (excluding value of wells)	\$115,000 +
Cost per home affected (excluding value of wells)	16,430 +
Status	concluded

The lawsuit resulted in a directed verdict in which the jury awarded \$88,000 to the seven plaintiffs to cover damages and the installation of a public drinking water supply. This amount was reset by the judge to \$54,000. Due to the drudgery and nuisance of using bottled water and the facilities of others, having rancid toilets, and so on, time was of the essence in getting drinking water for the plaintiffs. Because of this, and because of limited funds to pursue an appeal for a higher amount (the plaintiffs were from low- to moderate-income homes), the plaintiffs settled with the insurance company for the \$54,000.

Costs. An incomplete tabulation of the damage costs directly attributable to the well contamination amounted to \$115,000. This includes the \$54,000 awarded the plaintiffs which covered the water supply pipeline from North Aurora, the individual hookups, replacement of some plumbing fixtures, and legal fees. The \$115,000 also includes an estimated \$61,000 investigative expense incurred by the State. Not recovered by the plaintiffs and not included in the \$115,000 are the costs of such items as bottled water, laundromat use, water used at the homes of others, some plumbing fixtures, some administrative expenses, lost time, and inconvenience.

HISTORY OF SITE DEVELOPMENT

Location. The city of Aurora, in Kane County, is about 35 miles west of Chicago. The Fox Valley Disposal Company landfill, on city land north of Aurora, is about 500 feet east of the Fox River, and next to State Route 25 (Figure 1).

History and Type of Operation. On September 18, 1959, the Kane County Planning Department director requested the State Sanitary Water Board and Health Department in Springfield to evaluate five potential landfill sites in the county.¹ This request was forwarded on September 24 to the State Geological Survey in Urbana², which responded in a four-page letter dated October 6.³ The Aurora site was one of the five sites evaluated; it was determined to be unsuitable because of shallow soils over bedrock (Figures 2 and 3).

...The Soil Survey Map shows this area to contain yellow-gray silt loam to a depth of 10 to 40 inches. Our geologic map classifies the underlying material as (coarsely granular) outwash....Dolomite bedrock is present beneath the unconsolidated material at depths ranging from about 10 to 40 feet and is quarried about one-half mile north....Ground water supplies in this vicinity are obtained chiefly from solution channels and crevices in the dolomite bedrock.

Locally the gravel deposits may extend to the shallow bedrock making it one continuous water-bearing unit.

If, as seems likely, gravel is present below the landfill site, it is probable that, at times, seepage from the landfill would descend through this permeable material into the dolomite bedrock. Once into the bedrock, the seepage would no longer undergo any filtering action and would move in response to hydraulic gradients. The exact direction and distance of movement is difficult to predict, however, influencing factors on the direction of this movement would be the Fox River....

In summary, pollution of presently used ground water aquifers can occur from the proposed landfill.³

On October 14, 1959, less than one month after the five-site evaluation request, the State Sanitary Water Board forwarded the evaluations to Kane County with a cover letter stating that "none of the five potential landfill sites are completely satisfactory," and only one site (not the Aurora site) "could be used after adequate evaluation....(to) determine the number of shallow wells in the area..."⁴

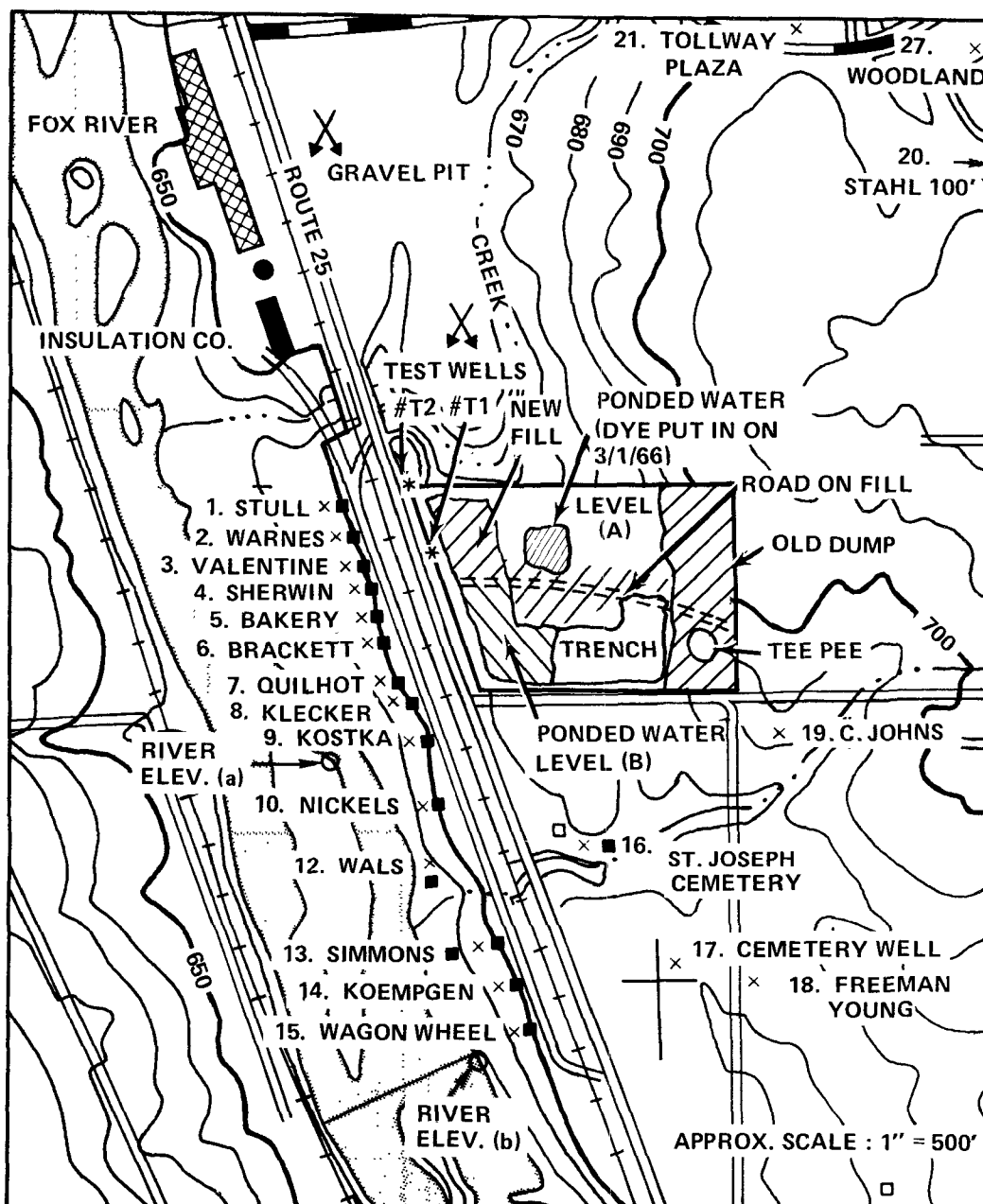


Figure 1. Fox Valley Disposal Company/City of Aurora Disposal Site and Wells in the Area (March 1, 1966).



Figure 2. Layered Dolomite at Gravel Pit Near Aurora Fox Valley Disposal Site Which is Visible in the Background (1975).



Figure 3. Closer View of Dolomite Bedrock Which Underlies the Aurora Landfill (1975).

Despite these determinations, the city of Aurora purchased the site in 1961, strip-annexed it to the city, and used it as an open dump until the latter part of 1965, when it was leased to the Fox Valley Disposal Company for the operation of a landfill. Between November 1965 and January 1966, Fox Valley Disposal excavated a large trench on the site and deposited wastes in it (Figure 1). Site investigations by the State in February, 1966, revealed that a portion of the trench (B, Figure 1), and another area within the site (A, Figure 1) contained a considerable amount of ponded water. A house and a well on the site, used by the caretaker when the city operated the dump, was bulldozed out either late in the city-operated period, or soon after Fox Valley Disposal Company took over. The house and well were evidently located in the area of ponded water (A).

The trench dug by Fox Valley Disposal Company removed any attenuating soil or soil barrier, and collected runoff which saturated the wastes in the trench. This produced leachate which ran directly into the unprotected creviced rock aquifer. The demolished well on the site may have also accelerated the flow of leachate from the site. Within two weeks after a major thaw in January, seven residential wells became contaminated by unfiltered leachate, and two other domestic wells experienced a significant but lesser degradation in quality.

Types and Amounts of Waste Disposed. No records on the amount of waste disposed at the site were located. The dump/landfill received residential, commercial, industrial, and septic tank pumpings from the city of Aurora and from private haulers in the area. The population of Aurora increased from 63,715 in 1960 to 74,182 in 1970. Assuming 3.5 pounds of waste per capita per day for 1961 and 5.0 pounds per capita per day for 1970, the landfill received about 41,000 tons of waste in 1961 and 68,000 tons in 1970. A cumulative total of about 235,000 tons by 1966, and 545,000 tons by 1970 had been disposed in the site. The final height of the site was about 45 to 60 feet above grade (Figures 4 and 5).

Site Selection and Engineering Design. The disposal site operation consisted of a series of blunders. As previously discussed, the site was evaluated by the Illinois State Geological Survey in 1959 and determined to be a poor site hydrogeologically. Despite this finding, the city of Aurora purchased the land in 1961 for use as a city dump and leased the site to the Fox Valley Disposal Company in 1965 to operate a landfill. No engineering design was done, and the site was not properly operated. Based on the 1959 study, the removal of topsoil by conversion to trench disposal maximized ground water pollution. The use of the trench method collected runoff and saturated the wastes. Placing wastes over an existing well without sealing it off caused free-channel flow to the aquifer.

Hydrogeological Description of Site. As discussed in the State Geological Survey evaluation, the site was covered by 10 to 40 inches of yellow-gray silt loam. Beneath this loam were coarsely granular outwash materials which covered the creviced dolomite bedrock. The silt loam layer was the only layer with sufficient attenuation properties to help prevent contaminants from entering the ground water. At the bedrock level, water and leachate flowed freely through channels with little or no filtering. The disposal site was above the Fox River flood plain at from 20 to 60 feet above the normal river level (Figure 5). Between the dump and the Fox River, downgradient from the landfill, were the residential homes and wells which were contaminated. The flow of leachate down to the residential wells may have been accelerated by a former well on the site.



Figure 4. View of the Completed Aurora Landfill Showing That It Is Approximately 45 to 60 Feet Above Grade (1975).

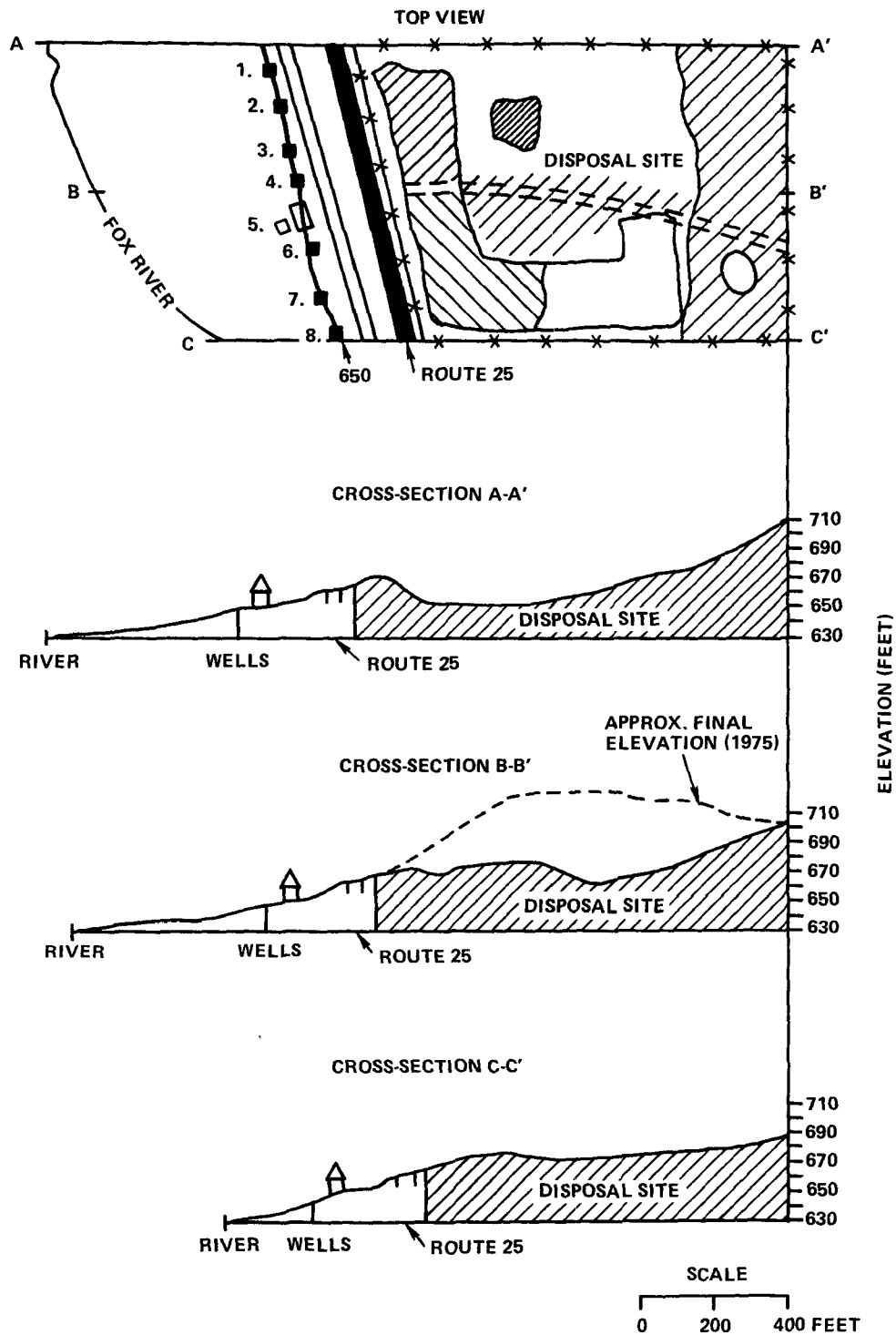


Figure 5. Top and Cross-sectional Views of the City of Aurora Disposal Site, Showing Surface Contours (1964).

LEACHATE DAMAGE ASSESSMENT

Problem Identification. Apparently, the first taste and odor problem was observed in the domestic wells downgradient of the landfill shortly after a major thaw which occurred in January 1966. On February 2, 1966, Mr. Thomas E. Philbin (Regional Engineer, Illinois Department of Public Health, Aurora) received a telephone call from State Representative Jack Hill reporting that an odor problem was affecting several private wells north of Aurora, and directly west of the disposal site operated by the Fox Valley Disposal Company (Figures 6 and 7, Appendix). On February 3, Mr. Philbin visited the four homes which were apparently involved and collected water samples for analysis. All samples were clear, but three exuded a characteristic odor of decomposing garbage. On February 14, prior to receiving the completed analyses, one of the residents brought a water sample to the Aurora office which was black in color and very odorous. The completed analysis of the original samples confirmed extensive biological as well as chemical pollution in all four samples.

On the basis of this apparent gross water pollution and the implication of the refuse disposal site, Mr. Charles E. Clark (Sanitary Engineer, Illinois Department of Public Health, Springfield) joined Mr. Philbin and Messrs. James Hackett, George Hughes, and Ron Landon of the Illinois Geological Survey on February 17, to survey the area. More water samples were taken of the contaminated wells and other wells in the area around the refuse disposal site to determine the extent of contamination, to provide background chemical and biological data from unaffected wells, and to establish the static ground water gradient. These samples revealed that a total of eight wells were polluted, although three of these had no odor. At the time of the survey on February 17, the water in both areas of the site had been frozen solid for more than a week. The samples collected on February 17 from the original four wells all indicated decreased pollution because of the freeze. Further samples were collected by Mr. Clark on February 21, and by Mr. Philbin on February 24, mostly from additional wells.

On March 1, Mr. Clark, Mr. Ray from his department, and Messrs. Hughes and Landon revisited the site and ran levels on all the wells which could be sounded, on standing water at the site, and on the river (Table 2). The static water level elevations that were obtained showed that the ponded water and the water in the test holes drilled between Route 25 and the disposal site were higher than the water in the polluted wells. The ground water gradient was determined to be from the disposal site west to the river. The higher levels, relative to the other wells, reported for wells 0 and 3 (unverified



Figure 6. View From the Aurora Landfill Toward the Homes Which Were Contaminated by Leachate From the Site (1975).



Figure 7. More of the Seven Homes Contaminated by Leachate From the Aurora Landfill (1975).

TABLE 2
WELL AND WATER LEVEL DATA

Well or site	Date	Elevations		Type	Depth	Comments
		Ground level	Static level 3-1-66			
0	---	---	---	Drilled	---	Reported to flow.
1	1946	---	---	Drilled	46	Casing head buried. Pitless adapter.
2	1946	640.2	628.5	Drilled	60	Pressure system and hand pump.
3	very old	---	---	Dug	---	Spring fed - flowing. First well with odor.
4	1962	---	---	Drilled	60	
5	---	---	---	---	---	May not have well. Owned by owner of #6.
6	---	---	---	Drilled	---	In pit.
7	---	---	---	Drilled	75	Bad taste early Feb. Odor started about Feb. 16-17.
8	---	643.0	635.8	Drilled	---	Pressure and hand pump.
9	---	---	---	Drilled	---	Buried.
10	---	641.0	628.0	Drilled	---	In pit.
12	---	---	---	Drilled	---	
14	---	---	---	Drilled	90	
15	---	640.0	626.5	Drilled	---	Inside tavern - head not sealed.
16	---	655.3	645.9	---	---	Hand pump on well head.
17	---	---	---	Drilled	---	Hand pump on well head.
18	1947	679.1	647.0	Drilled	100	In pit
19	---	---	---	Drilled	110 casing	Two pipe jet in pit.
20	---	---	---	Drilled	---	Casing head buried.
21	---	---	---	Drilled	---	Submersible pump - pitless adapter.
T1	---	655.4	638.6	---	---	
T2	---	655.8	639.2	---	---	
River elev. (a)	---	---	626.5	---	---	
River elev. (b)	---	---	626.0	---	---	
Ponded water (a)	---	---	646.7	---	---	
Ponded water (b)	---	---	647.7	---	---	

discharging overflow) and measured in well 8, suggested that these three wells may have been interconnected with another aquifer of higher pressure.

On March 1, it was observed that a massive thaw was occurring at the disposal site, and that the grossly polluted standing water in Area A appeared to be falling. Fluorescein dye was placed in the water to trace its flow. Six hours later, it was observed that the water level in this area had fallen 4 to 6 in., while the level in Area B had not changed. Prior to leaving the area, the observation team requested all residents who had polluted wells to leave a tap open and periodically check the water for any presence of dye. On March 17, the owner of well No. 7 reported the dye had shown up in the well water. Samples collected on March 17 and on March 22 confirmed the presence of the dye in a diluted concentration.

To further confirm the source of contamination, two test wells were drilled on the highway right-of-way between the disposal site and the contaminated wells during the week of March 21, 1966. Test well No. 1, in direct line between the alleged source of contamination and the most heavily contaminated wells, was found to be grossly contaminated by landfill leachate. Black light lab tests revealed extensive fluorescence, indicating the presence of the dye (the sample was so black that no dye could visually be observed). Test well No. 2, located in line with the northernmost and least contaminated wells, was contaminated to a considerably lesser degree, but sufficiently to be unpotable.

As a result of Sanitary Water Board action against the landfill operator in March, some physical changes were made at the site, including the elimination of the standing water in Area A. Samples collected on April 25 and 26 showed increased contamination in wells No. 0 and 3, with only a slight decrease in well No. 7. Because of these findings, the Sanitary Water Board recommended legal action against Fox Valley Disposal Company in May, and routine observation was discontinued.

On May 17, the owner of well No. 9 complained that the water had developed a disagreeable taste. A sample collected from the well on that date indicated characteristic contamination at a higher level than found in the earlier sampling. Investigation by Regional Engineer Philbin of a complaint on September 15, 1966 found the operator of the site to again be dumping refuse in the standing water (B).

A complaint was received by the Department on November 14, 1966, that the water from well No. 1 had become discolored. Samples were collected on that date from wells No. 1, 2, and 8; these showed greatly increased contamination of the wells since they were last sampled in February and March.

Leachate Characterization. In total, nine wells were contaminated: Nos. 0, 1, 2, 3, 4, 6, 7, 8, and 9. All nine wells contained constituents at levels above the levels in the Fox River sample and the background levels in the area. All seven wells involved in the damage suit received unfiltered leachate which substantially exceeded the 1962 PHS or 1972 EPA drinking water standards and were unpotable (Table 3). Particularly high were chlorides, total solids, organic acid, hardness, sulfates, sodium, BOD, and biological contaminants indicative of municipal wastes. The appearance and odor of the contents of the wells were aesthetically very offensive. In comparison with leachate found in the disposal site test wells (Table 4) and other wells in the area (Table 5), the seven polluted wells showed strong leachate concentrations. The other two domestic wells were contaminated with concentrations of leachate that were lower, but significantly above background levels for the area.

No other source of such contaminants was found in the area. The BOD levels found in wells No. 2 and 3 and test well No. 1 exceed those found in raw sewage. The organic acid is characteristic of biological degradation not found in raw sewage, but rather in sewage that has been partially treated. The only source of possible sewage pollution was the trunk sewer line from North Aurora, but it was located downgradient of the wells near the river, 300 or more feet west of the wells. It is hydraulically impossible for sewage from this line or water from the Fox River to flow "uphill" to the wells.

Surface water samples were taken on May 6, 1966, in response to a reported fishkill (Table 6). The disposal site operator had dug a ditch about 300 feet long from the waste trench to the creek to drain the trench. No dead fish were found by the State inspector when he took the samples. The leachate ditch was filled in upon a directive from the State, and leachate discharge into the stream was virtually eliminated.

Flourescent dye placed in standing water on the disposal site was observed in samples from test well No. 1 and from well No. 7, providing additional proof of the connection between the landfill and the contaminated wells.

Damages. In summary, a total of nine wells were contaminated: Nos. 0, 1, 2, 3, 4, 6, 7, 8, and 9. Seven of these wells (Nos. 1-8) were contaminated beyond use. The investigations, sampling, and testing by the State proved beyond reasonable doubt that the nine wells were contaminated by leachate from the city of Aurora/Fox Valley Disposal Company refuse disposal site. The wells were located in creviced limestone strata immediately underlying the entire area, and were at a lower elevation in the strata than the disposal site. The wells ranged in age from 4 years to over 40 years, and all were operated without problems until the latter part of January 1966. The pollution of the wells coincides with the deep trench excavation which was done at the refuse

TABLE 3

SEVEN PLAINTIFFS' WELLS WATER ANALYSES

Well *	Date †	Chloride (Cl)	Sodium (Na)	Nitrogen (N)	Sulfate (SO ₄)	pH	Hardness	Total solids	Odor	Color	BOD	ODI	Organic acid	Coil	SPC	Protozoa	Other
1.	2/17	80	32	0.8	38	7.2	660	730†	No	Clear	1	0	0	0	160	0	---
	11/15	155	23	2.2	46	7.0	690	740†	Yes‡	Milky†	2	---	20	15	14,000	---	---
2.	2/3	580‡	170	1.4	154	7.7	800	1190†	Yes‡	Milky†	0	8.5	180	32	18,000	8,130	---
	2/17	165	92	0.9	53	7.3	700	800†	Yes‡	Brown†	1	0	0	5	12,000	490	---
	3/2	230	115	0	66	7.7	750	1000†	Yes‡	Black†	19	0	0	32	13,000	<10	---
	3/10	270‡	120	0	77	7.7	660	920†	Yes‡	Black†	120	4	20	9	---	1,700	---
	11/15	390‡	258	0	5	7.1	890	1450†	Yes‡	Black†	580	---	400	4.8	35,000	---	---
3.	2/3	840‡	336	0	185	7.6	1140	1870†	Yes‡	Cloudy†	340	120	430	240	36,000	5,540	---
	2/14	490‡	313	0	123	7.5	1040	1720†	Yes‡	Black†	350	---	720	---	---	100	---
	4/25	700‡	175	0	---	7.0	1020	1400†	Yes‡	Black†	1020	280	760	130	8,800	---	---
4.	2/3	940‡	327	0	216	7.6	1110	1820†	Yes‡	Cloudy†	16	45	192	62	44,000	5,340	---
	2/17	405‡	248	0	65	7.2	830	1370†	Yes‡	Brown†	98	45	100	2400	47,000	8,310	---
6.	2/3	1120‡	391	0	231	7.6	1210	2060†	No	Clear	0	0	48	32	6,000	5,540	---
	2/17	305‡	225	.5	120	7.6	940	1430†	Yes‡	Clear	2.0	0	0	3	100	0	---
7.	2/21	470‡	230	0	138	7.2	900	1400†	Yes‡	Clear	22	12	40	0	12,000	50	Turned brown
	3/2	212	276	0	231	7.8	860	1460†	Yes‡	Brown†	25	7.5	80	32	2,800	<10	---
	3/17	800‡	---	---	---	7.4	890	1630†	Yes‡	Brown†	206	---	180	---	---	<100	Fluorescent §
	3/22	700‡	340	0	58	7.5	880	1620†	Yes‡	Black†	490	60	180	---	---	---	Fluorescent §
	4/25	450‡	308	0	123	7.6	820	1490†	Yes‡	Black†	208	65	160	130	24,000	40	---
8.	2/21	106	85	1.1	70	7.1	576	764†	No	Clear	0.8	0	0	0	14	0	---
	3/2	82	86	1.0	28	7.6	612	700†	No	Clear	10	0	0	4.8	3	<10	---
	11/15	1350‡	1155	9.9	28	6.8	1890	4400†	Yes‡	Milky†	260	---	10	0	940	---	---
Range	---	80-1,350	23-1,155	0-9.9	5-231	6.8-7.8	576-1,890	700-4,400	---	---	0-1,020	0-280	0-760	0-2,400	3-47,000	0-8,310	---

*Well numbers refer to Figure 1.

†All samples taken in 1966.

‡Exceed 1962 PHS or 1972 EPA drinking water standards.

§A green dye used as a leachate tracer.

TABLE 4

LANDFILL TEST HOLES LEACHATE WATER ANALYSES

Source	Date*	Chloride (Cl)	Sodium (Na)	Nitrogen (N)	Sulfate (SO ₄)	pH	Hardness	Total solids	Odor	Color	BOD	ODI	Organic acid	Other
T ₁	3/22	600†	730	0	66	6.3	1,660	3,240†	Yes†	Black	2,550	870	1,360	Fluorescent†
	3/22	800†	681	0	77	6.2	1,660	3,140†	Yes†	Black	2,560	900	1,360	Fluorescent†
	3/25	680†	570	0	23	6.0	2,000	3,240†	Yes†	Black	3,020	1,000	1,720	---
T ₂	3/25	70	---	0	19	7.5	540	5,350†	Yes†	Brown	53	55	20	---

* All samples taken in 1966.

† Exceed 1962 PHS or 1972 EPA drinking water standards.

‡ A green dye used as a leachate tracer.

TABLE 5

WELL WATER ANALYSES OF OTHER WELLS IN PROXIMITY TO THE LANDFILL

Well *	Date †	Chloride (Cl)	Sodium (Na)	Nitrogen (N)	Sulfate (SO ₄)	pH	Hardness	Total solids	Odor	Color	BOD	ODI	Organic acid	Coli	SPC	Protozoa	Other
0.	2/15	120	60	0	45	7.3	460	590	No	Clear	2	40	336	0	---	0	---
	2/24	100	92	0	36	7.3	430	620	No	Clear	1	2	---	0	---	0	---
	4/26	140	69	0	105	7.4	500	650	No	Clear	0	5	0	0	120	0	---
9.	2/17	65	115	1.1	30	7.2	560	810	No	Clear	0	0	0	0	10	10	---
	2/24	70	118	0	41	7.3	600	640	No	Clear	0	12	0	0	10	10	---
	3/1	72	49	0.4	25	7.6	524	630	No	Clear	0	0	0	0	3	<10	---
	5/17	80	64	---	92	7.7	610	750	No	Clear	0	0	0	240	2,000	---	Taste complaint
10.	2/24	65	9	2.3	31	7.2	480	500	No	Clear	0	25	0	0	---	0	---
	3/2	62	32	5.0	20	7.7	480	550	No	Clear	0	0	0	0	5	---	---
	3/10	60	23	2.8	35	7.5	480	530	No	Clear	0	0	20	0	51	>10	---
12.	2/17	10	9	5.5	35	7.3	550	570	No	Clear	0	0	0	2	50	0	---
	2/24	30	18	3.8	39	7.1	460	500	No	Clear	0	20	0	0	243	0	---
	3/2	28	35	4.0	19	7.6	524	600	No	Clear	0	0	0	0	50	<10	---
	3/10	35	5	4.3	43	7.5	530	540	No	Clear	0	0	0	0	48	<10	---
14.	2/24	50	5	0	26	7.2	440	500	No	Clear	0	0	20	0	195	0	---
15.	2/17	30	7	0	38	7.2	540	550	No	Clear	0	0	0	9	20	0	---
16.	2/17	35	9	0	40	7.2	540	560	No	Clear	12	0	0	32	0	0	---
17.	2/17	30	5	0	29	7.3	510	520	No	Clear	2	0	0	0	50	0	---
18.	2/17	35	5	0.7	38	7.0	560	570	No	Clear	1	0	0	9	320	0	---
19.	3/1	25	17	0	28	7.7	604	640	No	Clear	0	0	0	0	380	<10	---
20.	2/17	8	9	0	26	7.4	530	550	No	Clear	1	0	0	0	0	0	---
21.	2/17	20	9	0	38	7.2	520	540	No	Clear	0	0	0	0	70	0	---
Range	---	8-140	5-118	0-5.5	19-105	7.0- .7	430-610	500-810	---	---	0-12	0-40	0-336	0-240	0-2,000	0->10	---

*Well numbers refer to Figure 1.

†All samples taken in 1966.

TABLE 6
SURFACE WATER ANALYSES

Source	Date*	Chloride (Cl)	Sodium (Na)	Nitrogen (N)	Sulfate (SO ₄)	pH	Hardness	Total solids	Odor	Color	BOD	Organic acid	Coliform	SPC	Entero
Leachate ditch	5/6	--	--	--	--	7.7	--	188	Yes	Blackish- Green	640	--	200,000	--	4,000
Ditch at creek	5/6	--	--	--	--	7.6	--	536†	Yes	--	>450	--	200,000	--	3,000
Creek 25 ft downstream	5/6	--	--	--	--	8.0	--	102	--	--	>110	--	36,000	--	600
Creek at Fox River	5/6	--	--	--	--	8.7	--	42	--	--	8	--	5,000	--	40
Creek 10 ft Upstream	5/6	--	--	--	--	8.4	--	29	--	--	--	--	2,000	--	500
Fox River	11/15	48	53	2.6	26	7.8	416	530†	No	--	3	5	13,000	10,000	--

*All samples taken in 1966.

†Exceed 1962 PHS or 1972 EPA drinking water standards.

disposal site (between November 1965 and January 1966) and with adverse weather conditions (freezing and thawing). Other wells in the area at higher elevations and water levels than the disposal site were not contaminated. The static water level gradient in the aquifer extends from the disposal site past the polluted wells, to the Fox River.

Litigation. The owners of the seven grossly contaminated wells sued the Fox Valley Disposal Company and the city of Aurora for damages in a joint action. The trespass suit was for \$1,030,988 to cover the costs of annexing the area to the village of North Aurora, running a water line from North Aurora to the area and connecting the homes to it, and replacing all the plumbing fixtures; temporary water and nuisance costs; and legal fees.

Remedial Action. At the outset, it is significant to note that the affected homes were in an unincorporated area outside the city limits of Aurora (which located the landfill knowing it would probably contaminate their wells) and outside the city limits of North Aurora. Because of the terrain and bedrock in the area, it was cheaper for the affected well owners to get public water from North Aurora than from Aurora.

State Action. The State Department of Public Health and the State Geological Survey sampled the wells, investigated the landfill operations, confirmed that the landfill was the cause of contamination, and made corrective recommendations. The Department of Public Health, through the State Sanitary Water Board and Attorney General's office, threatened to close the disposal site down. If there had been an alternative disposal site near Aurora, the landfill would most likely have been shut down.

As a result of investigations by State personnel, the State Sanitary Water Board passed a resolution on March 4, 1966, requesting the Attorney General to file an action to enjoin the Fox Valley Disposal Company and/or the city of Aurora from polluting the underground water with leachate from the solid waste dump. Through a series of meetings and exchanges, the Fox Valley Disposal Company and the city of Aurora convinced the Sanitary Water Board at its April 5 meeting to request the Attorney General to delay taking action pending the hiring of a consultant by Fox Valley Disposal Company and their attempt to correct the problem. Fox Valley and their insurer also accepted responsibility for the pollution and agreed to assist the damaged-well owners to obtain a safe water supply.

In the absence of success in stopping the pollution or any affirmative action to assist the well owners, the Sanitary Water Board, at its May 3 meeting, requested the Attorney General to "proceed with the action as passed March 4,

1966, expeditiously." In mid-May 1966 the owners of seven of the contaminated wells started a separate private suit to obtain a new water supply and to recover damages.

Apparently because of the lack of a disposal alternative for the city of Aurora and because of the private damage suit, the injunctive action was never filed. Instead, despite the severe contamination of the ground water by leachate, and other operational deficiencies, the site continued to operate from 1966 to 1972 in defiance of many State laws, as evidenced by sporadic inspection reports and violation letters and telegrams from the Illinois Department of Public Health to the Fox Valley Disposal Company. In addition to the pollution of wells and the continued ground water contamination, these violations included pollution of surface waters (leachate was pumped from the trench into a ditch which flowed into a creek and then into the Fox River), open burning (both in a tepee incinerator and openly on the site itself), open dumping, inadequate fencing and control of blowing litter, refuse not covered daily and inadequate daily and final soil covering, scavenging, and several other offenses.

City of Aurora Action. The city of Aurora denied any wrongdoing throughout and in the words of James Ahlgren, City of Aurora Commissioner, would "take no responsibility for the dump and has no authority to stop pollution. Aurora is not at fault here as we merely lease the land for the dump to the disposal company, and the rest is up to them. They are responsible for any pollution and they will have to stop it - not Aurora." The city lease arrangement with the Fox Valley Disposal Company required Fox Valley to carry insurance to cover all damages that might occur, including legal fees. The lease arrangement called for Fox Valley, which received wastes from numerous private haulers, to pay the city five percent of gross profit, which amounted to \$1,200 to \$1,400 per year, according to Ahlgren.

The city of Aurora also felt very confident that the State could not shut the landfill down unless an alternative disposal site were developed, and the city apparently did nothing to search for or to attempt to develop such an alternative.

City of North Aurora Action. The city of North Aurora agreed to supply public water to the homes, but the area would have to be annexed and the homeowners would have to foot the total bill. Ultimately, this is exactly what happened.

Actions by Owners of Contaminated Wells. The two outlying well owners with the most diluted contamination apparently continued to use their water. It

is unknown whether they used bottled water for drinking and cooking. However, in one of the two homes, the husband "blew his top," and the wife stated: "I'm going to drink the water if it kills me."

The other seven wells were so contaminated that the well owners could not use the water even for bathing or other uses. These seven owners had no alternative but to sue the city of Aurora and the Fox Valley Disposal Company. They went for 16 months without tap water. During this period they showered at the homes of friends and relatives, collected rainwater from their roofs and in standing pots, and used bottled water (frequently filled at the homes of friends). They requested a National Guard water tanker from the Aurora Armory, but Governor Otto Kerner responded in a letter that they could not use the tanker water because it was considered unsanitary (despite the fact that hundreds of guardsmen and soldiers used it for weekend maneuvers).

The Aurora Civil Defense coordinator checked with the Chicago office and reported "They have a 1,000-gallon trailer tank which could be used for short emergencies, but for something of this nature, which may take months to resolve, they do not want their equipment tied up."

One of the affected well owners operated a small tailoring business in the home. Before customers would enter the house the homeowner had to apologize and explain the smell and its cause. Upon investigation, a reporter of the Aurora Beacon-News reported "The water was as black as the ink in this story. The odor was as strong as that of a glue factory in mid-summer."

Finally, in May, a distributor for Hinckley-Schmidt bottled water service in Chicago installed a free dispenser in each of the affected homes and furnished two free five-gallon bottles of water. These containers could be retained as long as needed at no charge and refilled at the users' expense.

One of the seven plaintiff families acted as spokesman for the group. The husband and wife spent many hours conversing with State officials, the city, the disposal company, and lawyers in seeking remedial actions.

LEACHATE DAMAGE COSTS

Due to difficulties in identifying and quantifying costs, the total damage costs were not determined, but a partial tabulation amounted to \$115,000 (Table 7).

Avoidance Costs. No estimate was made of the cost or value of temporary water, including the collection of rainwater, bottled water, laundry at laundromats, and showers at the homes of friends or relatives.

When it became apparent that the Fox Valley Disposal Company was unable to correct the pollution problem, and the city of Aurora and the disposal company had no intentions of rectifying the damage they caused, seven of the contaminated-well owners initiated legal action. In May 1966, they started a private suit for \$1,030,000 against the city of Aurora and the Fox Valley Disposal Company.

On December 1, 1966, a Kane County Circuit jury returned an \$88,000 verdict against the Fox Valley Disposal Company in favor of the seven residents whose wells had been contaminated. The trial lasted two weeks and ended the day after the city of Aurora was dismissed as a defendant in the case.

The proof of the source of damage was so conclusive that the Court, at the close of all the evidence in the case, directed a verdict in favor of the plaintiffs and against the dump operator on the issues of liability. In other words, the Court held as a matter of law that no reasonable mind on the jury could come to any conclusion other than that the operation of the dump polluted the wells. Directed verdicts are relatively rare. Because of such conclusive proof, this is probably the first and possibly the only case in the U.S. in which a directed verdict was given for a case where damage occurred to the underground water strata, and hence to wells. The judge then decided the \$88,000 award was too high and reduced it to \$54,000.

Time was of the essence in getting a settlement for this case due to the hardship and inconvenience being experienced by the seven plaintiffs due to a lack of piped water. Partly because of their low income and their consequent inability to support a court appeal, they decided to accept the \$54,000 and get on with the process of being annexed by North Aurora and getting hooked up to their water supply. The insurance company representing the Fox Valley Disposal Company readily accepted the low settlement.

The \$54,000 paid for the cost of annexation, a mainline from North Aurora, and hookups to individual homes (estimated at \$33,000), plus legal expenses. Not covered by the plaintiffs were administrative, nuisance, and inconvenience costs, and the costs of temporary water and associated costs.

TABLE 7
LEACHATE DAMAGE COSTS

	Cost
<u>Tangible direct damage costs</u>	
Household piping and fixtures	\$ 5,250+
Replaced by court award	\$5,250
Not covered by court award	?
Value of the damaged wells	\$ 7,000
<u>Intangible direct damage costs</u>	
Lost time	?
Inconvenience	?
Psychic impacts and costs	?
Property value degradation (e.g., road never properly resurfaced)	?
<u>Corrective costs</u>	
Fox Valley Disposal Co. site alterations	?
<u>Avoidance costs</u>	
Temporary water (bottled water, laundromat, etc.)	?
Public water supply mainline and hookups	\$ 33,000
Cost of piped water over well water	?
<u>Administrative costs</u>	
Seven plaintiffs (telephone, trips, letters, etc.)	?
Plaintiffs' tax increases due to annexation	?
State professional staffs	\$ 52,000+
State, other expenses	9,000
City of Aurora (council time, legal fees)	?
Fox Valley Disposal/Insurer (legal fees, consultant fees, etc.)	?
Legal fees (plaintiffs)	\$ 15,750
Total damage costs (excluding value of wells)	\$115,000+

Administrative Costs. Administrative costs incurred by the State were substantial. About 11 professionals, from the Department of Public Health (Springfield and Aurora), the Sanitary Water Board (Chicago office), the Highway Department, and the Geological Survey (Naperville), participated in field investigations. The Health Department personnel made at least 20 field trips to the site, taking at least 54 water samples. The Sanitary Water Board made two field trips to investigate the deliberate discharge of leachate from the waste trench to the Fox River via pumping, a ditch, and a creek. The Highway Department drilled three test holes on the Route 25 right-of-way. Three members of the Geological Survey assisted in taking water levels to establish the ground water gradient (direction of flow) in the area. These personnel were backed up by about 12 more professionals including the lab technicians who analyzed the 54 water samples; staff from the Governor's office, which responded to a request for National Guard or Civil Defense temporary water; and staff from the Sanitary Water Board and the Attorney General's office, which held at least five hearings concerning the contamination and corrective actions, and initiated legal proceedings to enjoin Fox Valley Disposal Company and/or the city of Aurora from pollution of the underground water strata and wells. The salaries for these persons for the time spent on this case is estimated to have been \$52,000 (1966 dollars) or two man-years. In addition, travel expenses, numerous telephone calls, telegrams, rental cost of drilling rigs, lab analyses, and secretarial support amounted to an estimated \$9,000.

The impact on the city of Aurora personnel, the insurance company, and Fox Valley Disposal Company was not determined. However, several trips by lawyers from all three organizations were made to Springfield, and corrective actions were attempted by Fox Valley Disposal through regrading, surfacing sensitive areas, and pumping and ditching the leachate. In addition, Fox Valley Disposal Company hired a consultant to evaluate the problem and to recommend corrective actions.

The affected residents spent many man-days attempting to get temporary and permanent water. They attended many hearings and court proceedings and made at least one trip to Springfield, and numerous long distance phone calls, site investigations, and written and oral reports to State investigators.

Two local newspapers and one from Chicago investigated the leachate problem in Aurora, including field trips. At least 17 news articles resulted.

REFERENCES

1. Letter. C. M. Carlson, Planning Director, Kane County Planning Department, to State Sanitary Water Board, Sept. 18, 1959.
2. Letter. C. W. Klassen, Chief Sanitary Engineer, [Illinois] State Sanitary Water Board to State Geological Survey, Sept. 24, 1959.
3. Letter. A. J. Zeizel, State Geological Survey, to C. W. Klassen, State Sanitary Water Board, Oct. 6, 1959.
4. Letter. C. W. Klassen, State Sanitary Water Board, to C. M. Carlson, Kane County Planning Department, Oct. 14, 1959.

SOURCES

Clark, C. E. Investigation of ground water pollution commencing in January 1966, to the present, in portions of the N.W. 1/4 and S.W. 1/4 of Sec. 10, T. 38N, R. 8E, 3d P.M., Kane County [and] Supplemental report. [Springfield, Illinois Bureau of General Sanitation], 1966. 5 p., maps, charts, notes. (Unpublished report.)

Deposition. T. E. Philbin, in the Circuit Court for the Sixteenth Judicial Circuit, Kane County, Illinois, General Number 66-CI-1243, Sept. 23, 1966. 94 p.

Memorandum. O. S. Hallden, [Illinois] State Sanitary Water Board, to C. W. Klassen, State Sanitary Water Board, Feb. 3, 1966.

Memorandum. T. E. Philbin, Regional Engineer, Illinois Department of Public Health, Feb. 15, 1966.

Newspaper articles (17) in the Aurora Beacon-News, Aurora Star, and Chicago Tribune, Mar. 4-Dec. 2, 1966.

Numerous other letters, memorandums, site investigation reports, water analyses, and reports, Mar. 4, 1966-Nov. 11, 1971.

Personal communication. C. Clark, State of Illinois Environmental Protection Agency, to K. Shuster, Office of Solid Waste Management Programs, Feb. 11, 1975.

Personal communication. R. Eichmeier, lawyer for the plaintiffs, to K. Shuster, Office of Solid Waste Management Programs, Feb. 12, 1975.

Personal communication. Mrs. K. A. Warnes, damaged-well owner and plaintiff, to K. Shuster, Office of Solid Waste Management Programs, July 24, 1975.

APPENDIX
Chronology of Events

Sept 18, 1959	-	letter from Kane County to State Sanitary Water Board (SWB) requesting evaluation of proposed disposal site
Sept 24, 1959	-	letter from SWB to State Geological Survey requesting site evaluation
Oct 6, 1959	-	letter from State Geological Survey to SWB advising against use of site
Oct 14, 1959	-	letter from SWB to Kane County advising against use of site
1961 (?)	-	strip annexation of site by Aurora for use as disposal site
1965	-	city of Aurora contracts Fox Valley Disposal Company (FVD) to operate a landfill on the site. Between Nov and Jan FVD digs trench to bedrock and dumps wastes into it
Feb 2, 1966	-	State Representative Jack Hill requests State Health Department (HD) investigate well contamination (odor)
Feb 3, 1966	-	HD takes water samples from 4 contaminated wells and investigates disposal site
Feb 14, 1966	-	one well owner brings in black water sample for analysis
Feb 15, 1966	-	Feb 3 lab tests received - indicative of leachate; another contaminated well sampled
Feb 17, 1966	-	HD and State Geological Survey take 5 more water samples from contaminated wells and samples of 7 other wells in the area. Results received at a later date indicate leachate contamination.
Feb 21, 1966	-	HD samples 2 contaminated wells and 4 other wells
Feb 24, 1966	-	HD samples 2 contaminated wells and 3 other wells

- Mar 1, 1966 - HD and State Geological Survey run water level tests on all accessible wells in the area, and sample 2 more wells. Results show the disposal site (and ponded water on it) are in direct line upgradient of the contaminated wells. The ponded water is observed seeping rapidly away, so the HD places a flourescein dye in the ponded water. The well owners are asked to pump their wells to waste and watch for evidences of the dye.

- Mar 2, 1966 - HD samples 3 contaminated wells and 3 other wells

- Mar 4, 1966 - based on data collected by the HD and State Geological Survey, SWB passes resolution requesting and authorizing the Attorney General to file an action to enjoin the FVD and/or the city of Aurora from pollution of the ground water and wells; copies sent to FVD and the city of Aurora. First newspaper article on the contamination in the Aurora Beacon-News.

- Mar 10, 1966 - HD samples 1 contaminated well and 2 other wells

- Mar 11, 1966 - Aurora attorney responds to Mar 4 letter saying this is the first information his office has received on the alleged pollution, and asking for more information.

- Mar 16, 1966 - representatives of SWB, HD, and Attorney General's office meet with attorneys for FVD and Aurora and recommend they hire a consultant to develop corrective actions; defendants may submit offer of compromise by April 5 SWB meeting

- Mar 17, 1966 - one of the well owners reports to HD that fluorescein dye has been observed; water sample is taken by HD. Fluorescence in the sample is later confirmed.

- Mar 20, 1966 - Aurora City Council directs FVD to hire consulting engineer

- Mar 21, 1966 - Bureau of Highways (at request of HD) drills and cases test wells on Rt 25 right-of-way between disposal site and contaminated wells. HD takes 4 samples from test wells (Mar 22 and 25). Results received later show strong leachate and fluorescence. One contaminated well is also sampled.

- Mar 30, 1966 - FVD attorney phones SWB and says FVD insurance co. will assume all damages. He asks if the State has conclusive evidence the site was at fault which it indicated it had. He admits he thinks FVD is probably at fault, but that an independent engineer is to be engaged for his evaluation. And that FVD hesitated to take any corrective actions until the insurance co. gave its view.

- Mar 30, 1966 - letter from lawyer for well owners to Governor requesting use of a National Guard or Civil Defense water tank; he mentions plans and bids are being obtained (expected by June 1) for hook-up to the No. Aurora water system; that No. Aurora will annex the area; and that experts tell him that the SWB/Attorney General's action will not make the wells potable again.

- Apr 4, 1966 - HD memorandum cautioning on the use of fluorescein as a tracer without confirmation of the type of fluorescene (which the HD does not have the equipment to test)

- Apr 4, 1966 - well owner meets with HD in Springfield

- Apr 4, 1966 - letter from well owner to HD saying that leachate at site was observed that day being pumped out of trench toward creek

- Apr 5, 1966 - attorney and consulting engineer for FVD appeared before the SWB to explain corrective actions. The abandoned farmstead well on the site was capped with 3 ft of clay and the trench between the well and Rt 25 was filled and capped with clay which was slopped to maximize runoff. A pump was installed to pump leachate from the remaining trench which will take 3 mo to fill. The insurance co. position was clarified prior to contact with well owners and corrective actions. FVD and their insurer accept responsibility for well contamination. Based on this report, the SWB moved to delay action on their Mar 4 decision pending a report by HD staff on whether FVD actions would be sufficient to prevent further contamination of ground water.

- Apr 25, 1966 - 2 contaminated wells are sampled

- Apr 26, 1966 - one contaminated well is sampled
- Apr 1966 - in response to well owners' request, Governor denies use of water tanks
- May 3, 1966 - based on HD report, SWB requests Attorney General to proceed with action passed on Mar 4.
- May 6, 1966 - well owner reports to HD and Kane County Clean Streams Committee that FVD is pumping (leachate) from disposal site into a creek which is tributary to the Fox River, killing fish. SWB investigates and takes 5 samples from ditch, creek upstream, and creek downstream. No evidence of fishkill is observed, but a section of the creek downstream from the ditch is grossly polluted by leachate. Beyond Rt 25 the creek is clear, with fish. FVD had dug a 4 ft deep, 300 ft long ditch, partially through landfilled waste, to drain a 200 x 100 ft trench being filled with waste. Leachate is flowing in the ditch (1-2 gpm) and a pump system, although not in operation, exists from the trench to the ditch. The HD had previously asked that no leachate be pumped to the creek.
- May 6, 1966 - SWB advises FVD to fill in ditch, which it does, and discharge to creek ceases.
- May 12, 1966 - 7 well owners file \$1,030,988 damage suit against FVD and Aurora in the Circuit Court of Geneva.
- May 15, 1966 - Hinckley-Schmidt (a bottled water service co. of Chicago) provides 5 gal bottled water dispenser and 2 bottles to each home free of charge.
- May 17, 1966 - one contaminated well is sampled
- Aug 3, 1966 - [HD site inspections: open burning is occurring in violation of State regulations; waste is being placed in ponded water
- Sept 15, 1966 - [
- Sept 17, 1966 - [
- Sept 23, 1966 - Deposition of T. Philbin of HD
- Nov 15, 1966 - 3 contaminated wells and Fox River are sampled.

- Nov 30, 1966 - Judge dismisses the city of Aurora as a defendant in the case.

 - Dec 1, 1966 - after a two week trial, the 7 well owners (plaintiffs) receive a directed verdict in their favor and a jury award of \$88,000. The Judge later reduced this award to \$54,000. Attorney General's action still pending.

 - Apr, 1967 - unincorporated area annexed by No. Aurora and well owners hooked up to No. Aurora water supply.

 - Nov 3, 1967 to - various HD site investigation reports show the site con-
Nov 11, 1971 tinued to operate in violation of State regulations, includ-
 ing frequent reports of blowing litter, open burning, and
 inadequate cover soil.

 - 1972 - FVD/Aurora site officially closed.
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