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Love Canal and the Poisoning of America

"Industry has shown laxity, not infrequently to the point of criminal negligence, in soiling the land and adulterating the waters with its toxins." So says a recent report from a House investigative subcommittee. The report adds that as deposits of dangerous industrial wastes proliferate, the authority charged with eliminating the hazards, the Environmental Protection Agency, has done little to search out such sites and compel offending companies to clean them up. Meanwhile, as much as 35 million tons of toxic waste continues to be improperly disposed of every year, and, charges one environmental watchdog group, another year and a half may pass before the EPA puts proper regulations into force. There may be as many as 34,000 seriously hazardous waste dumps spotted about the country. The article that follows documents the miseries and losses induced by only one such man-made horror, the infamous Love Canal dump in Niagara Falls, New York.

BY MICHAEL H. BROWN

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Niagara Falls is a city of unmatched natural beauty; it is also a tired industrial work-horse, beaten often and with a hard hand. A magnificent river—a strait, really—connecting Lake Erie to Lake Ontario flows hurriedly north, at a pace of a half-million tons a minute, widening into a smooth expanse near the city before breaking into whitecaps and taking its famous 186-foot plunge. Then it cascades through a gorge of overhung shale and limestone to rapids higher and swifter than anywhere else on the continent.

The falls attract long lines of newlyweds and other tourists. At the same time, the river provides cheap electricity for industry; a good stretch of its shore is now filled with the spiraled pipes of distilleries, and the odors of chlorine and sulfides hang in the air.

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"A Toxic Ghost Town" (July 1989)
Ten years later, scientists are still assessing the damage from Love Canal. By Michael H. Brown

The Environment
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Many who live in the city of Niagara Falls work in chemical plants, the largest of which is owned by the Hooker Chemical Company, a subsidiary of Occidental Petroleum since the 1960s.

Timothy Schroeder did not. He was a cement technician by trade, dealing with the factories only if they needed a pathway poured, or a small foundation set. Tim and his wife, Karen, lived in a ranch-style home with a brick and wood exterior at 460 99th Street. They saved all the money they could to redecorate the inside and to make such additions as a cement patio, covered with an extended roof. One of the Schroeders' most cherished purchases was a Fiberglas pool, built into the ground and enclosed by a redwood fence.

Karen looked from a back window one morning in October 1974, noting with distress that the pool had suddenly risen two feet above the ground. She called Tim to tell him about it. Karen then had no way of knowing that this was the first sign of what would prove to be a punishing family and economic tragedy.

Mrs. Schroeder believed that the cause of the uplift was the unusual groundwater flow of the area. Twenty-one years before, an abandoned hydroelectric canal directly behind their house had been backfilled with industrial rubble. The underground breaches created by this disturbance, aided by the marshland nature of the region's surficial layer, collected large volumes of rainfall and undermined the back yard. The Schroeders allowed the pool to remain in its precarious position until the following summer and then pulled it from the ground,

intending to pour a new pool, cast in cement. This they were unable to do, for the gaping excavation immediately filled with what Karen called "chemical water," rancid liquids of yellow and orchid and blue. These same chemicals had mixed with the groundwater and flooded the entire yard, attacking the redwood posts with such a caustic bite that one day the fence simply collapsed. When the chemicals receded in the dry weather, they left the gardens and shrubs withered and scorched, as if by a brush fire.

How the chemicals got there was no mystery. In the late 1930s, or perhaps early 1940s, the Hooker Company, whose many processes included the manufacture of pesticides, plasticizers, and caustic soda, began using the abandoned canal as a dump for at least 20,000 tons of waste residues—"still-bottoms," in the language of the trade.

Karen Schroeder's parents had been the first to experience problems with the canal's seepage. In 1959, her mother, Aileen Voorhees, encountered a strange black sludge bleeding through the basement walls. For the next twenty years, she and her husband, Edwin, tried various methods of halting the irritating intrusion, pasting the cinder-block wall with sealants and even constructing a gutter along the walls to intercept the inflow. Nothing could stop the chemical smell from permeating the entire household, and neighborhood calls to the city for help were fruitless. One day, when Edwin punched a hole in the wall to see what was happening, quantities of black liquid poured from the block. The cinder blocks were full of the stuff.

Although they later learned they were in imminent danger, Aileen and Edwin Voorhees had treated the problem as a mere nuisance. That it involved chemicals, industrial chemicals, was not particularly significant to them. All their lives, all of everyone's life in the city, malodorous fumes had been a normal ingredient of the ambient air.

More ominous than the Voorhees basement was an event that occurred at 11:12 P.M. on November 21, 1968, when Karen Schroeder gave birth to her third child, a seven-pound girl named Sheri. No sense of elation filled the delivery room. The child was born with a heart that beat irregularly and had a hole in it, bone blockages of the nose, partial deafness, deformed ear exteriors, and a cleft palate. Within two years, the Schroeders realized Sheri was also mentally retarded. When her teeth came in, a double row of them appeared on her lower jaw. And she developed an enlarged liver.

The Schroeders considered these health problems as well as illnesses among their other children, as acts of capricious genes—a vicious quirk of nature. Like Mrs. Schroeder's parents, they were concerned that the chemicals were devaluing their property. The crab apple tree and evergreens in the back were dead, and even the oak in front of the home was sick; one year, the leaves had fallen off on Father's Day.

The canal had been dug with much fanfare in the late nineteenth century by a flamboyant entrepreneur named William T. Love, who

wanted to construct an industrial city with ready access to water power and major markets. The setting for Love's dream was to be a navigable power channel that would extend seven miles from the Upper Niagara before falling two hundred feet, circumventing the treacherous falls and at the same time providing cheap power. A city would be constructed near the point where the canal fed back into the river, and he promised it would accommodate half a million people.

So taken with his imagination were the state's leaders that they gave Love a free hand to condemn as much property as he liked, and to divert whatever amounts of water. Love's dream, however, proved grander than his resources, and he was eventually forced to abandon the project after a mile-long trench, ten to forty feet deep and generally twenty yards wide, had been scoured perpendicular to the Niagara River. Eventually, the trench was purchased by Hooker.

Few of those who, in 1977, lived in the numerous houses that had sprung up by the site were aware that the large and barren field behind them was a burial ground for toxic waste. That year, while working as a reporter for a local newspaper, the *Niagara Gazette*, I began to inquire regularly about the strange conditions reported by the Schroeders and other families in the Love Canal area. Both the Niagara County Health Department and the city said it was a nuisance condition, but no serious danger to the people. Officials of Hooker Company refused comment, claiming only that they had no records of the chemical burials and that the problem was

not their responsibility. Indeed, Hooker had deeded the land to the Niagara Falls Board of Education in 1953, for a token \$1. With it the company issued no detailed warnings of the chemicals, only a brief paragraph in the quitclaim document that disclaimed company liability for any injuries or deaths which might occur at the site.

The board's attorney, Ralph Boniello, says he received no phone calls or letters specifically relating the exact nature of the refuse and what it could do, nor did the board, as the company was later to claim, threaten condemnation of the property in order to secure the land. "We had no idea what was in there," Boniello said.

Though Hooker was undoubtedly relieved to rid itself of the contaminated land, the company was so vague about the hazards involved that one might have thought the wastes would cause harm only if touched, because they irritated the skin; otherwise, they were not of great concern. In reality, as the company must have known, the dangers of these wastes far exceeded those of acids or alkalines or inert salts. We now know that the drums Hooker had dumped in the canal contained a veritable witch's brew — compounds of truly remarkable toxicity. There were solvents that attacked the heart and liver, and residues from pesticides so dangerous that their commercial sale was shortly thereafter restricted outright by the government; some of them were already suspected of causing cancer.

Yet Hooker gave no hint of that. When the board of education, which wanted the parcel for a new

school, approached Hooker, B. Klaussen, at the time Hooker's executive vice president, said in a letter to the board, "Our officers have carefully considered your request. We are very conscious of the need for new elementary schools and realize that the sites must be carefully selected so that they will best serve the area involved. We feel that the board of education has done a fine job in meeting the expanding demand for additional facilities and we are anxious to cooperate in any proper way. We have, therefore, come to the conclusion that since this location is the most desirable one for this purpose, we will be willing to donate the entire strip of property which we own between Colvin Boulevard and Frontier Avenue to be used for the erection of a school at a location to be determined ... "

The board built the school and playground at the canal's midsection. Construction progressed despite the contractor's hitting a drainage trench that gave off a strong chemical odor and the discovery of a waste pit nearby. Instead of halting the work, the authorities simply moved the school eighty feet away. Young families began to settle in increasing numbers alongside the dump, many of them having been told that the field was to be a park and recreation area for their children.

Children found the "playground" interesting, but at times painful. They sneezed, and their eyes teared. In the days when the dumping was still in progress, they swam at the opposite end of the canal, occasionally arriving home with hard pimples all over their bodies. Hooker knew

children were playing on its spoils. In 1958, three children were burned by exposed residues on the canal's surface, much of which, according to residents, had been covered with nothing more than fly ash and loose dirt. Because it wished to avoid legal repercussions, the company chose not to issue a public warning of the dangers it knew were there, nor to have its chemists explain to the people that their homes would have been better placed elsewhere.

The Love Canal was simply unfit as a container for hazardous substances, poor even by the standards of the day, and now, in 1977, local authorities were belatedly finding that out. Several years of heavy snowfall and rain had filled the sparingly covered channel like a bathtub. The contents were overflowing at a frightening rate, sopping readily into the clay, silt, and sandy loam and finding their exit through old creekbeds and swales and into the neighborhood.

The city of Niagara Falls, I was assured, was planning a remedial drainage program to halt in some measure the chemical migration off the site. But no sense of urgency had been attached to the plan, and it was stalled in red tape. No one could agree on who should pay the bill — the city, Hooker, or the board of education — and engineers seemed confused over what exactly needed to be done.

Niagara Falls City Manager Donald O'Hara persisted in his view that, however displeasing to the eyes and nose, the Love Canal was not a crisis matter, mainly a question of aesthetics.

O'Hara reminded me that Dr. Francis Clifford, county health commissioner, supported that opinion. With the city, the board, and Hooker unwilling to commit themselves to a remedy, conditions degenerated in the area between 97th and 99th streets, until, by early 1978, the land was a quagmire of sludge that oozed from the canal's every pore. Melting snow drained the surface soot onto the private yards, while on the dump itself the ground had softened to the point of collapse, exposing the crushed tops of barrels. Beneath the surface, masses of sludge were finding their way out at a quickening rate, constantly forming springs of contaminated liquid. The Schroeder back yard, once featured in a local newspaper for its beauty, had reached the point where it was unfit even to walk upon. Of course, the Schroeders could not leave. No one would think of buying the property. They still owed on their mortgage and, with Tim's salary, could not afford to maintain the house while they moved into a safer setting. They and their four children were stuck.

Apprehension about large costs was not the only reason the city was reluctant to help the Schroeders and the one hundred or so other families whose properties abutted the covered trench. The city may also have feared distressing Hooker. To an economically depressed area, the company provided desperately needed employment — as many as 3000 blue-collar jobs in the general vicinity, at certain periods — and a substantial number of tax dollars. Perhaps more to the point, Hooker was speaking of building a \$17 million headquarters in downtown Niagara Falls. So anxious were city officials to receive

the new building that they and the state granted the company highly lucrative tax and loan incentives, and made available to the firm a prime parcel of property near the most popular tourist park on the American side, forcing a hotel owner to vacate the premises in the process.

City Manager O'Hara and other authorities were aware of the nature of Hooker's chemicals. In fact, in the privacy of his office, O'Hara, after receiving a report on the chemical tests at the canal, had informed the people at Hooker that it was an extremely serious problem. Even earlier, in 1976, the New York State Department of Environmental Conservation had been made aware that dangerous compounds were present in the basement sump pump of at least one 97th Street home, and soon after, its own testing had revealed that highly injurious halogenated hydrocarbons were flowing from the canal into adjoining sewers. Among them were the notorious PCBs; quantities as low as one part PCBs to a million parts normal water were enough to create serious environmental concerns; in the sewers of Niagara Falls, the quantities of halogenated compounds were thousands of times higher. The other materials tracked, in sump pumps or sewers, were just as toxic as PCBs, or more so. Prime among the more hazardous ones was residue from hexadhlorocyclopentadiene, or C-56, which was deployed as an intermediate in the manufacture of several pesticides. In certain dosages, the chemical could damage every organ in the body.

While the mere presence of C-56 should have

been cause for alarm, government remained inactive. Not until early 1978 — a full eighteen months after C-56 was first detected — was testing conducted in basements along 97th and 99th streets to see if the chemicals had vaporized off the sump pumps and walls and were present in the household air. The U.S. Environmental Protection Agency conducted these tests at the urging of local Congressman John LaFalce, the only politician willing to approach the problem with the seriousness it deserved.

While the basement tests were in progress, the rain of spring arrived at the canal, further worsening the situation. Heavier fumes rose above the barrels. More than before, the residents were suffering from headaches, respiratory discomforts, and skin ailments. Many of them felt constantly fatigued and irritable and the children had reddened eyes. In the Schroeder home, Tim developed a rash along the backs of his legs. Karen could not rid herself of throbbing pains in her head. Their daughter, Laurie, seemed to be losing some of her hair.

Three month's passed before I was able to learn what the EPA testing had shown.

When I did, the gravity of the situation became clear: benzene, a known cause of cancer in humans, had been readily detected in the household air up and down the streets. A widely used solvent, benzene was known in chronic-exposure cases to cause headaches, fatigue, loss of weight, and dizziness followed by pallor, nose-bleeds, and damage to the bone marrow.

No public announcement was made of the

benzene hazard. Instead, officials appeared to shield the finding until they could agree among themselves on how to present it. Indeed, as early as October 18, 1977, Lawrence R. Moriarty, an EPA regional official in Rochester, had sent to the agency's toxic substances coordinator a lengthy memorandum stating that "serious thought should be given to the purchase of some or all the homes affected ... This would minimize complaints and prevent further exposure to people." Concern was raised, he said, "for the safety of some 40 or 50 homeowners and their families ... "

Dr. Clifford, the county health commissioner, seemed unconcerned by the detection of benzene in air. "We have no reason to believe the people are imperiled," he said. "For all we know, the federal limitations could be six times too high ... I look at EPA's track record and notice they have to err on the right-side." O'Hara, who spoke to me in his office about the situation, told me I was overreacting to the various findings. The chemicals in the air, he said, posed no more risk than smoking a couple of cigarettes a day.

Dr. Clifford's health department refused to conduct a formal study of the people's health, despite the air-monitoring results. A worker from the department made a perfunctory call to the school, 99th Street Elementary, and when it was discovered that classroom attendance was normal, apparently the department ceased to worry about the situation. For this reason, and because of the resistance growing among the local authorities, I went to the southern end of 99th Street to take an informal health survey of

my own. I arranged a meeting with six neighbors, all of them instructed beforehand to list the illnesses they were aware of on their block, with names and ages specified for presentation at the session.

The residents' list was startling. Though unafflicted before they moved there, many people were now plagued with ear infections, nervous disorders, rashes, and headaches. One young man, James Gizzarelli, said he had missed four months of work owing to breathing troubles. His wife was suffering epileptic-like seizures which her doctor was unable to explain. Meanwhile, freshly applied paint was inexplicably peeling from the exterior of their house. Pets too were suffering, most seriously if they had been penned in the back yards nearest to the canal, constantly breathing air that smelled like mothballs and weedkiller. They lost their fur, exhibited skin lesions, and, while still quite young, developed internal tumors. A great many cases of cancer were reported among the women, along with much deafness. On both 97th and 99th streets, traffic signs warned passing motorists to watch for deaf children playing near the road.

Evidence continued to mount that a large group of people, perhaps all of the one hundred families immediately by the canal, perhaps many more, were in imminent danger. While watching television, while gardening or doing a wash, in their sleeping hours, they were inhaling a mixture of damaging chemicals. Their hours of exposure were far longer than those of a chemical factory worker, and they wore no

respirators or goggles. Nor could they simply open a door and escape. Helplessness and despair were the main responses to the blackened craters and scattered cinders behind their back yards.

But public officials often characterized the residents as hypochondriacs. Timothy Schroeder would wander to his back land and shake his head. "They're not going to help us one damn bit," he said, throwing a rock into a puddle coated with a film of oily blue. "No way." His wife's calls to the city remained unanswered while his shrubs continued to die. Sheri needed expensive medical care and he was afraid the time would come when he could no longer afford to provide it. A heavy man with a round stomach and gentle voice, he had struck me as easygoing and calm, ready with a joke and a smile. That was disappearing now. His face—in the staring eyes, in the tightness of the lips and cheeks—candidly revealed his utter disgust. Every agent of government had been called on the phone or sent pleas for help, but none offered aid.

Commissioner Clifford expressed irritation at my printed reports of illness, and disagreement began to surface in the newsroom on how the stories should be printed. "There's a high rate of cancer among my friends," Dr. Clifford argued. "It doesn't mean anything." Mrs. Schroeder said that Dr. Clifford had not visited the homes at the canal, nor had he seen the black liquids collecting in the basements. Nor had the County Health Commissioner properly followed an order from

the state commissioner to cover exposed chemicals, erect a fence around the site, and ventilate the contaminated basements. Instead, Dr. Clifford arranged for the installation of two \$15 window fans in the two most polluted basements and a thin wood snow fence that was broken within days of its erection and did not cover the entire canal.

Partly as a result of the county's inadequate response, the state finally announced in May 1978 that it intended to conduct a health study at the dump site's southern end. Blood samples would be drawn to test for unusual enzyme levels showing liver destruction, and extensive medical questionnaires were to be answered by each of the families.

As interest in the small community increased, further revelations shook the neighborhood. In addition to the benzene, eighty or more other compounds were found in the makeshift dump, ten of them potential carcinogens. The physiological effects they could cause were profound and diverse. At least fourteen of them could impact on the brain and central nervous system. Two of them, carbon tetrachloride and chlorobenzene, could readily cause narcotic or anesthetic consequences. Many others were known to cause headaches, seizures, loss of hair, anemia, or skin rashes. Together, the compounds were capable of inflicting innumerable illnesses, and no one knew what new concoctions were being formulated by their mixture underground.

Edwin and Aileen Voorhees had the most to be concerned about. When a state biophysicist

analyzed the air content of their basement, he determined that the safe exposure time there was less than 2.4 minutes—the toxicity in the basement was thousands of times the acceptable limit for twenty-four-hour breathing. This did not mean they would necessarily become permanently ill, but their chances of contracting cancer, for example, had been measurably increased. In July, I visited Mrs. Voorhees for further discussion of her problems, and as we sat in the kitchen, drinking coffee, the industrial odors were apparent. Aileen, usually chipper and feisty, was visibly anxious. She stared down at the table, talking only in a lowered voice. Everything now looked different to her. The home she and Edwin had built had become their jail cell. Their yard was but a pathway through which toxicants entered the cellar walls. The field out back, that prosed "park," seemed destined to be the ruin of their lives. I reached for her phone and called Robert Mathews, a city engineer who had been given the job of overseeing the situation. Was the remedial program, now in the talking stage for more than a year, ready to begin soon? No. Could he report any progress in deciding who would pay for it? No. Could Mr. and Mrs. Voorhees be evacuated? Probably not, he said—that would open up a can of worms, create a panic.

On July 14 I received a call from the state health department with some shocking news. The preliminary review of the health questionnaires was complete. And it showed that women living at the southern end had suffered a high rate of miscarriages and had given birth to an abnormally high number of children with birth

defects. In one age group, 35.3 percent had records of spontaneous abortions. That was far in excess of the norm. The odds against it happening by chance were 250 to one. These tallies, it was stressed, were "conservative" figures. Four children in one small section of the neighborhood had documentable birth defects, club feet, retardation, and deafness. Those who lived there the longest suffered the highest rates.

The data on miscarriages and birth defects, coupled with the other accounts of illness, finally pushed the state's bureaucracy into motion. A meeting was scheduled for August 2, at which time the state health commissioner, Dr. Robert Whalen, would formally address the issue. The day before the meeting, Dr. Nicholas Vianna, a state epidemiologist, told me that residents were also incurring some degree of liver damage. Blood analyses had shown hepatitis-like symptoms in enzyme levels. Dozens if not hundreds of people, apparently, had been adversely affected.

In Albany, on August 2, Dr. Whalen read a lengthy statement in which he urged that pregnant women and children under two years of age leave the southern end of the dump site immediately. He declared the Love Canal an official emergency, citing it as a "great and imminent peril to the health of the general public."

Continued

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When Commissioner Whalen's words hit 97th and 99th streets, by way of one of the largest banner headlines in the *Niagara Gazette's* 125-year history, dozens of people massed on the streets, shouting into bullhorns and microphones to voice frustrations that had been accumulating for months. Many of them vowed a tax strike because their homes were rendered unmarketable and unsafe. They attacked their government for ignoring their welfare. A man of high authority, a physician with a title, had confirmed that their lives were in danger. Most wanted to leave the neighborhood immediately.

Terror and anger roiled together, exacerbated by Dr. Whalen's failure to provide a government-funded evacuation plan. His words were only a recommendation: individual families had to choose whether to risk their health and remain, or abandon their houses and, in so doing, write off a lifetime of work and savings.

On August 3, Dr. Whalen decided he should speak to the people. He arrived with Dr. David Axelrod, a deputy who had directed the state's investigation, and Thomas Frey, a key aide to Governor Hugh Carey.

At a public meeting, held in the 99th Street School auditorium, Frey was given the grueling task of controlling the crowd of 500 angry and frightened people. In an attempt to calm them, he announced that a meeting between the state and the White House had been scheduled for the following week. The state would propose that the Love Canal be classified a national disaster, thereby freeing federal funds. For now, however, he could promise no more. Neither could Dr. Whalen and his staff of experts. All they could say was what was already known: twenty-five organic compounds, some of them capable of causing cancer, were in their homes, and because young children were especially prone to toxic effects, they should be moved to another area.

Dr. Whalen's order had applied only to those living at the canal's southern end, on its immediate periphery. But families living across the street from the dump site, or at the northern portion, where the chemicals were not so visible at the surface, reported afflictions remarkably similar to those suffered by families whose yards abutted the southern end. Serious respiratory, problems, nervous disorders, and rectal bleeding were reported by many who were not covered by the order.

Throughout the following day, residents posted, signs of protest on their front fences or porch posts. "Love Canal Kills," they said, or "Give Me Liberty, I've Got Death." Emotionally exhausted and uncertain about their future, men stayed home from work, congregating on the streets or comforting their wives. By this time

the board of education had announced it was closing the 99th Street School for the following year, because of its proximity to the exposed toxicants. Still, no public relief was provided for the residents.

Another meeting was held that evening, at a firehall on 102nd Street. It was unruly, but the people, who had called the session in an effort to organize themselves, managed to form an alliance, the Love Canal Homeowners Association, and to elect as president Lois Gibbs, a pretty, twenty-seven-year-old woman with jetblack hair who proved remarkably adept at dealing with experienced politicians and at keeping the matter in the news. After Mrs. Gibbs's election, Congressman John LaFalce entered the hall and announced, to wild applause, that the Federal Disaster Assistance Administration would be represented the next morning, and that the state's two senators, Daniel Patrick Moynihan and Jacob Javits, were working with him in an attempt to get funds from Congress.

More disturbing facts continued to accumulate. From the slopes of the terrain, and the low points where creekbeds and swales had been filled, investigators found indication that chemicals had long ago traveled outside of the channel's banks, farther even than the first two "rings" of homes alongside the dump. Nearly a mile from the Schroeder home, to the north, I noticed one such downgrade of land near a small, neat house with a nameplate saying "Moshers" hung on a post in the front yard. I knocked on the door and a thin, pale man

reluctantly received me. We went into the kitchen to meet his wife, Velma, a fifty-four-year-old woman confined to a wheelchair and barely able to speak. She too was pale and fragile. "I'm just so tired all the time," she explained. "I'm just so tired, and I don't think they know what's really wrong with me." She said her great fatigue had set in more than a dozen years before, when she was operating a beauty shop in her basement. "It didn't smell right down there," she added. "Not at all. I'd get headaches all the time. I would go out back at night, to play croquet, and my legs would give way, just collapse." She closed the salon when she could no longer navigate the stairs.

Mr. Mosher was not as candid as his wife. He stepped back from me when I asked about his health, as if I had spoken a blasphemy. The reaction, I soon learned, was out of fear that any publicity would affect his standing at a local carbon plant, where he held a managerial position.

I walked toward the back door leading to the basement. "Do you have a flashlight?" I asked.

Mr. Mosher nodded his head and returned with one promptly. As we descended the stairs, he explained that no one had checked his home for contamination, so he had not worried about it. I stirred the sump pump sediment with a piece of wood and switched on the flashlight; there it was, a red, rubbery substance like that described by another person I had interviewed and which, upon testing, had been found to contain cancer-producing chemicals.

I grew impatient with Mr. Mosher's reticence about his health, warning him that he could be endangered. Having seen, in the sludge of the sump pump, that chemicals might have found a path into his cellar, he said, "Well, I've got some heart problems. And I had an enlarged spleen removed. It was twelve and a half pounds."

Velma heard the conversation and began to speak of the summer nights when strong fumes from the canal rendered their bedroom a trap for pungent air in which they could not properly breathe. As she recounted those many unpleasant nights, the woman weakly cocked her head to one side and stared up at her husband. "Tell him about your problem," she insisted.

Mr. Mosher stood where the hallway met the kitchen and stared at the floor. After a minute's silence, he looked up at me. In a low tone he said, "I've got cancer, in the bone marrow. They're treating me for it now."

Upon returning to the office, I searched through a book on toxicology, *Dangerous Properties of Industrial Materials*, for the symptoms of benzene poisoning. The lengthy list included fatigue, edema, narcosis, anemia, and hypoplastic or hyperplastic damage to the bone marrow. It was nearly midnight and a Sunday, but I felt compelled to call Dr. Axelrod of the state health department to inform him of the Moshers' condition. Dr. Axelrod was concerned and told me that, not far from the Moshers' home, researchers from his unit had detected benzene in the air.

With the Love Canal story now attracting attention from the national media, the Governor's office announced that Hugh Carey would be at the 99th Street School on August 7 to address the people. Decisions were being made in Albany and Washington. Hours before the Governor's arrival, a sudden burst of "urgent" reports from Washington came across the newswires. President Jimmy Carter had officially declared the Hooker dump site a national emergency.

Hugh Carey was applauded on his arrival. The Governor announced that the state, through its Urban Development Corporation, planned to purchase, at fair market value, those homes rendered uninhabitable by the marauding chemicals. He spared no promises. "You will not have to make mortgage payments on homes you don't want or cannot occupy. Don't worry about the banks. The state will take care of them." By the standards of Niagara Falls, where the real estate market was depressed, the houses were in the middle-class range, worth from \$20,000 to \$40,000 apiece. The state would assess each house and purchase it, and also pay the costs of moving, temporary housing during the transition period, and special items not covered by the usual real estate assessment, such as installation of telephones.

Soon the state, coordinating management of the crisis through its health and transportation departments, began the awesome task of mass evacuation. Ironically, their offices were put into the endangered 99th Street School while the

students transferred to classrooms elsewhere in the city. Houses were appraised individually and, one by one, the homeowners were brought in by appointment to negotiate a settlement. Some residents, more worried about their bank accounts than their health, refused to leave, causing an endless cycle of renegotiations until compromises were reached.

First in a trickle and then, by September, in droves, the families gathered their belongings and carted them away. Moving vans crowded 97th and 99th streets. Linesmen went from house to house disconnecting the telephones and electrical wires, while carpenters pounded plywood over the windows to keep vandals away. By the following spring, 237 families were gone; 170 of them had moved into new houses. In time the state erected around a six-block residential area a green chain-link fence, eight feet in height, clearly demarcating the contamination zone.

In October 1978, the long-awaited remedial drainage program began at the south end. Trees were uprooted, fences and garages torn down, and swimming pools removed from the area. So great were residents' apprehensions that dangerous fumes would be released over the surrounding area that the state, at a cost of \$500,000, placed seventy-five buses at emergency evacuation pickup spots during the months of work, in the event that outlying homes had to be vacated quickly because of an explosion. The plan was to construct drain tiles around the channel's periphery, where the back yards had been located, in order to divert

leakage to seventeen-foot-deep wet wells from which contaminated groundwater could be drawn and treated by filtration through activated carbon. (Removing the chemicals themselves would have been financially prohibitive, perhaps costing as much as \$100 million—and even then the materials would have to be buried elsewhere.) After the trenching was complete, and the sewers installed, the canal was to be covered by a sloping mound of clay and planted with grass. One day, city officials hoped, the wasteland would become a park.

In spite of the corrective measures and the enormous effort by the state health department, which took thousands of blood samples from past and current residents and made uncounted analyses of soil, water, and air, the full range of the effects remained unknown. In neighborhoods immediately outside the official "zone of contamination," more than 500 families were left near the desolate setting, their health still in jeopardy. The state announced it would buy no more homes.

The first public indication that chemical contamination had probably reached streets to the east and west of 97th and 99th streets, and to the north and south as well, came on August 11, 1978, when sump-pump samples I had taken from 100th and 101st streets, analyzed in a laboratory, showed the trace presence of a number of chemicals found in the canal itself, including lindane, a restricted pesticide that had been suspected of causing cancer in laboratory animals. While probing 100th Street, I had knocked on the door of Patricia Pino, thirty-four,

a blond divorcee with a young son and daughter. I had noticed that some of the leaves on a large tree in front of her house exhibited a black oiliness much like that on the trees and shrubs of 99th Street; she was located near what had been a drainage swale.

After I had extracted a jar of sediment from her sump pump for the analysis, we conversed about her family situation and what the trauma now unfolding meant to them. Ms. Pino was extremely depressed and embittered. Both of her children had what appeared to be slight liver abnormalities, and her son had been plagued with "non-specific" allergies, teary eyes, sinus trouble, which improved markedly when he was sent away from home. Patricia told of times, during the heat of summer, when fumes were readily noticeable in her basement and sometimes even upstairs. She herself had been treated for a possibly cancerous condition on her cervix. But, like others, her family was now trapped.

On September 24, 1978, I obtained a state memorandum that said chemical infiltration of the outer regions was significant indeed. The letter, sent from the state laboratories to the U.S. Environmental Protection Agency, said, "Preliminary analysis of soil samples demonstrates extensive migration of potentially toxic materials outside the immediate canal area." There it was, in the state's own words. Not long afterward, the state medical investigator, Dr. Nicholas Vianna, reported indications that residents from 93rd to 103rd streets might also have incurred liver damage.

On October 4, a young boy, John Allen Kenny, who lived quite a distance north of the evacuation zone, died. The fatality was due to the failure of another organ that can be readily affected by toxicants, the, kidney. Naturally, suspicions were raised that his death was in some way related to a creek that still flowed behind his house and carried, near an outfall, the odor of chlorinated compounds. Because the creek served as a catch basin for a portion of the Love Canal, the state studied an autopsy of the boy. No conclusions were reached. John Allen's parents, Norman, a chemist, and Luella, a medical research assistant, were unsatisfied with the state's investigation, which they felt was "superficial." Luella said, "He played in the creek all the time. There had been restrictions on the older boys, but he was the youngest and played with them when they were old enough to go to the creek. We let him do what the other boys did. He died of nephrosis. Proteins were passing through his urine. Well, in reading the literature, we discovered that chemicals can trigger this. There was no evidence of infection, which there should have been, and there was damage to his thymus and brain. He also had nosebleeds and headaches, and dry heaves. So our feeling is that chemicals probably triggered it."

The likelihood that water-carried chemicals had escaped from the canal's deteriorating bounds and were causing problems quite a distance from the site was not lost upon the Love Canal Homeowners Association and its president, Lois Gibbs, who was attempting to have additional

families relocated. Because she lived on 101st Street, she was one of those left behind, with no means of moving despite persistent medical difficulties in her six-year-old son, Michael, who had been operated on twice for urethral strictures. Mrs. Gibbs's husband, a worker at a chemical plant, brought home only \$150 a week, she told me, and when they subtracted from that the \$90 a week for food and other necessities, clothing costs for their two children, \$125 a month for mortgage payments and taxes, utility and phone expenses, and medical bills, they had hardly enough cash to buy gas and cigarettes, let alone vacate their house.

Assisted by two other stranded residents, Marie Pozniak and Grace McCoulf, and with the professional analysis of a Buffalo scientist named Beverly Paigen, Lois Gibbs mapped out the swale and creekbed areas, many of them long ago filled, and set about interviewing the numerous people who lived on or near formerly wet ground. The survey indicated that these people were suffering from an abnormal number of kidney and bladder aggravations and problems of the reproductive system. In a report to the state, Dr. Paigen claimed to have found, in 245 homes outside the evacuation zone, thirty-four miscarriages, eighteen birth defects, nineteen nervous breakdowns, ten cases of epilepsy, and high rates of hyperactivity and suicide.

In their roundabout way, the state health experts, after an elaborate investigation, confirmed some of the homeowners' worst fears. On February 8, 1979, Dr. David Axelrod, who by then had been

appointed health commissioner, and whose excellence as a scientist was widely acknowledged, issued a new order that officially extended the health emergency of the previous August, citing high incidences of birth deformities and miscarriages in the areas where creeks and swales had once flowed, or where swamps had been. With that, the state offered to evacuate temporarily those families with pregnant women or children under the age of two from the outer areas of contamination, up to 103rd Street. But no additional homes would be purchased; nor was another large-scale evacuation, temporary or otherwise, under consideration. Those who left under the new plan would have to return when their children passed the age limit.

Twenty-three families accepted the state's offer. Another seven families, ineligible under the plan but of adequate financial means to do so, simply left their homes and took the huge loss of investment. Soon boarded windows speckled the outlying neighborhoods.

The previous November and December, not long after the evacuation of 97th and 99th streets, I became interested in the possibility that Hooker might have buried in the Love Canal waste residues from the manufacture of what is known as 2,4,5-trichlorophenol. My curiosity was keen because I knew that this substance, which Hooker produced for the manufacture of the antibacterial agent hexachlorophene, and which was also used to make defoliants such as Agent Orange, the herbicide employed in Vietnam, carries with it an unwanted by-product

technically called 2,3,7,8-tetrachlorodibenzo-para-dioxin, or tetra dioxin. The potency of dioxin of this isomer is nearly beyond imagination. Although its toxicological effects are not fully known, the few experts on the subject estimate that if three ounces were evenly distributed and subsequently ingested among a million people, or perhaps more than that, all of them would die. It compares in toxicity to the botulinum toxin. On skin contact, dioxin causes a disfiguration called "chloracne," which begins as pimples, lesions, and cysts, but can lead to calamitous internal damage. Some scientists suspect that dioxin causes cancer, perhaps even malignancies that occur, in galloping fashion, within a short time of contact. At least two (some estimates went as high as eleven) pounds of dioxin were dispersed over Seveso, Italy, in 1976, after an explosion at a trichlorophenol plant: dead animals littered the streets, and more than 300 acres of land were immediately evacuated. In Vietnam, the spraying of Agent Orange, because of the dioxin contaminant, was banned in 1970, when the first effects on human beings began to surface, including dioxin's powerful teratogenic, or fetus-deforming, effects.

The ban on herbicidal warfare that involved Agent Orange was sparked by articles in *The New Yorker* under the byline of Thomas Whiteside. I called him for an informed viewpoint. "It's an extremely serious situation if they find dioxin there," he said. "This is most serious. If they buried trichlorophenol, there are heavy odds, heavy odds, that dioxin, in whatever quantities, will be there too."

After our conversation, I called Hooker. Its sole spokesman, Bruce Davis, executive vice president, was by now speaking to the media, but obtaining information from the firm was not the easiest, nor the most pleasant, of tasks. Often, questions had to be submitted days before they were answered; they would be circulated through the legal hands and sometimes sent on to Hooker's parent company, Occidental Petroleum in Los Angeles. I posed two questions concerning trichlorophenol: Were wastes from the process buried in the canal? If so, what were the quantities?

On November 8, before Hooker answered my queries, I learned that, indeed, trichlorophenol had been found in liquids pumped from the remedial drain ditches. No dioxin had been found yet, and some officials, ever wary of more emotionalism among the people, argued that, because the compound was not soluble in water, there was little chance it had migrated off-site. Officials at Newco Chemical Waste Systems, a local waste disposal firm, at the same time claimed that if dioxin had been there, it had probably been photolytically destroyed. Its half-life, they contended was just a few short years.

I knew from Whiteside, however, that in every known case, waste from 2,4,5-trichlorophenol carried dioxin with it. I also knew that dioxin *could* become soluble in groundwater and migrate into the neighborhood upon mixing with solvents such as benzene. Moreover, because it had been buried, sunlight would not break it down.

On Friday, November 10, I called Hooker again to urge that they answer my questions. Davis came to the phone and, in a controlled tone, gave me the answer: His firm had indeed buried trichlorophenol in the canal—200 tons of it.

Immediately I called Whiteside. His voice took on an urgent tone. According to his calculations, if 200 tons of trichlorophenol were there, in all likelihood they were accompanied by 130 pounds of tetra dioxin, an amount equaling the estimated total content of dioxin in the thousands of tons of Agent Orange rained upon Vietnamese jungles. The seriousness of the crisis had deepened, for now the Love Canal was not only a dump for highly dangerous solvents and pesticides; it was also the broken container for the most toxic substance ever synthesized by man.

I reckoned that the main danger was to those working on the remedial project, digging in the trenches. The literature on dioxin indicated that, even in quantities at times too small to detect, the substance possessed vicious characteristics. In one case, workers in a trichlorophenol plant had developed chloracne, although the substance could not be traced on the equipment with which they worked. The mere tracking of minuscule amounts of dioxin on a pedestrian's shoes in Seveso led to major concerns, and, according to Whiteside, a plant in Amsterdam, upon being found contaminated with dioxin, had been "dismantled, brick by brick, and the material embedded in concrete, loaded at a specially constructed dock, on ships, and dumped at sea, in deep water near the Azores." Workers in

trichlorophenol plants had died of cancer or severe liver damage, or had suffered emotional and sexual disturbances.

Less than a month after the first suspicions arose, on the evening of December 9, I received a call from Dr. Axelrod. He asked what my schedule was like.

"I'm going on vacation," I informed him.
"Starting today."

"You might want to delay that a little while," he replied. "We're going to have something big next week."

That confused me. "What do you mean by that?"

He paused, then said, "We found it. The dioxin. In a drainage trench behind 97th Street. It was in the part-per-trillion range."

The state remained firm in its plans to continue the construction, and, despite the ominous new findings, no further evacuations were announced. During the next several weeks, small incidents of vandalism occurred along 97th and 99th streets. Tacks were spread on the road, causing numerous flat tires on the trucks. Signs of protest were hung in the school. Meetings of the Love Canal Homeowners Association became more vociferous. Christmas was near, and in the association's office at the 99th Street School, a holiday tree was decorated with bulbs arranged to spell "DIOXIN."

The Love Canal people chanted and cursed at

meetings with state officials, cried on the telephone, burned an effigy of the health commissioner, traveled to Albany with a makeshift child's coffin, threatened to hold officials hostage, sent letters and telegrams to the White House, held days of mourning and nights of prayer. On Mother's Day this year, they marched down the industrial corridor and waved signs denouncing Hooker, which had issued not so much as a statement of remorse. But no happy ending was in store for them. The federal government was clearly not planning to come to their rescue, and the state felt it had already done more than its share. City Hall was silent and remains silent today. Some residents still hoped that, miraculously, an agency of government would move them. All of them watched with anxiety as each newborn came to the neighborhood, and they looked at their bodies for signs of cancer.

One hundred and thirty families from the Love Canal area began leaving their homes last August and September, seeking temporary refuge in local hotel rooms under a relocation plan funded by the state which had been implemented after fumes became so strong, during remedial trenching operations, that the United Way abandoned a care center it had opened in the neighborhood.

As soon as remedial construction is complete, the people will probably be forced to return home, as the state will no longer pay for their lodging. Some have threatened to barricade themselves in the hotels. Some have mentioned violence. Anne Hillis of 102nd Street, who told

reporters her first child had been born so badly decomposed that doctors could not determine its sex, was so bitter that she threw table knives and a soda can at the state's on-site coordinator.

In October, Governor Carey announced that the state probably would buy an additional 200 to 240 homes, at an expense of some \$5 million. In the meantime, lawyers have prepared lawsuits totaling about \$2.65 billion and have sought court action for permanent relocation. Even if the latter action is successful, and they are allowed to move, the residents' plight will not necessarily have ended. The psychological scars are bound to remain among them and their children, along with the knowledge that, because they have already been exposed, they may never fully escape the Love Canal's insidious grasp.

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