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Assessment of the Extent of Environmental Problems Posed by Hooker Chemical Dumps in Niagara Falls, New York and Estimated Cleanup Costs

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603-675-2833

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I. Introduction

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A. Background

During a period extending from the 1930s to the early 1970s, the Hooker Chemical and Plastics Corporation used a number of sites in the Niagara Falls area of New York State for the dumping of hazardous chemical wastes. On-site disposal areas used by Hooker during this period include the well-publicized site at Love Canal, the Hyde Park Dump (Bloody Run), the 102nd Street Dump, the S-Area Dump and 14 disposal sites located on Hooker's North Tonawanda property. Hooker also utilized a number of other sites in the Niagara area for which little information is currently available. The locations of Hooker disposal sites in the Niagara area are depicted in Figure 1. With the exception of Love Canal, all of the above-mentioned sites are currently owned by Hooker. In addition, a number of off-site disposal areas have been and currently are being used by Hooker.⁽¹⁾

This report does not attempt to present the full scope of environmental problems posed by hazardous wastes dumped by Hooker at all sites in the Niagara Falls area. Instead, this report focuses on three sites for which there was sufficient information accessible to develop an adequate estimation of the scope of problems associated with the sites. These sites are the Hyde Park Dump, the 102nd Street Dump, and the S-Area Dump. The environmental disaster which occurred at Love Canal is well known and is not further addressed within this report [REDACTED]

[REDACTED] The situation at Love Canal does, however, have a

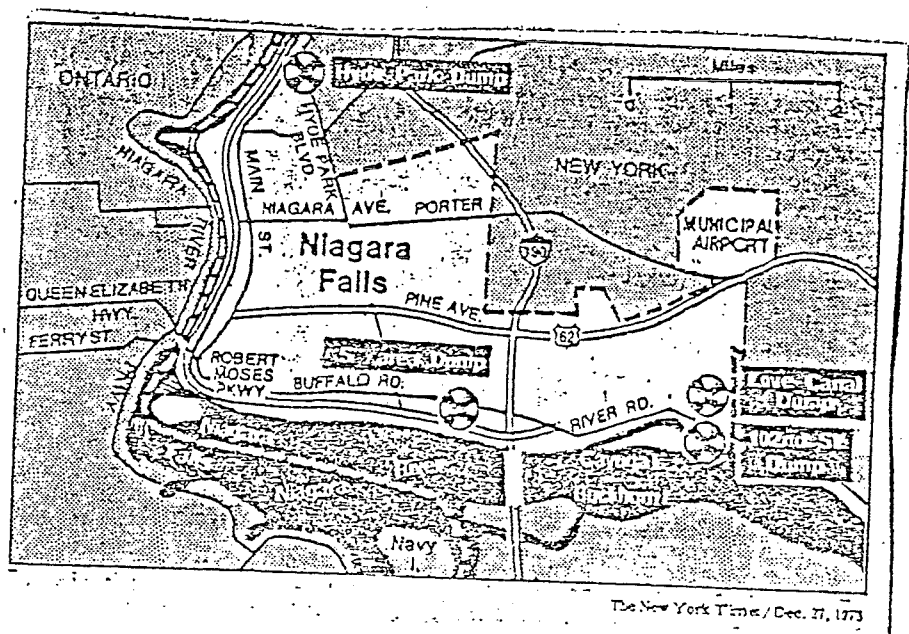


Figure 1. Locations of major dump areas used by the Hooker Chemical and Plastics Corporation near Niagara Falls.

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bearing on this report because the 102nd Street Dump was used for disposal of Hooker's wastes prior to its use of the Love Canal site⁽²⁾ while, in later years, the Hyde Park Dump was used as an outlet for many types of chemical wastes which had previously been dumped in Love Canal.⁽³⁾ Insufficient information is currently available on the [REDACTED] sites to develop a comprehensive picture of the scope of environmental problems posed by those sites. While there are indications that other Hooker dumps exist in the Niagara Falls area (notably N-Area, F-Area, V-Area, D-Area, [REDACTED] [REDACTED] is [REDACTED]), these sites are not discussed in this report because little is known about these sites, to date.

Information which was obtained from an extensive document review, from interviews with knowledgeable governmental personnel and others, and from visits to Niagara Falls area has been utilized to develop assessments of the Hyde Park, 102nd Street and S-Area Dumps as presented in subsequent chapters.

Among the problems attributable to the three dumps which are specifically addressed herein include:

1. damage to public health and safety;
2. damage to property;
3. air quality problems;
4. contamination of ground water, surface water, and soils.

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While Hooker has been cognizant of these problems for many years, the Company has been slow in appropriately responding to many requests and requirements sought by environmental regulatory authorities over the years. For example, with reference to the Hyde Park Dump, the New York State Department of Environmental Conservation (DEC) stated the following:

"Hooker was initially very uncooperative in addressing the problems at this site. After a great deal of pressure from the Department, a program to be undertaken by Hooker to study the hydrogeology and contaminant migration from the site was agreed to by Hooker in May 1977."(4)

Although adequate cleanup of the dump sites poses an enormous financial liability to the Company, it is vital to the protection of human health and the environment.

Based on available information, the scope of the continuing problems posed by these three sites includes: (1) the escape of pollutants from the sites into the environment due to the sites' inadequacies as receptacles for hazardous wastes and to the improper disposal methods which were employed; and (2) the potential health threat due to the toxicity of the escaping chemicals to humans and other organisms.

B. General Hydrogeologic Setting

The geology of the Niagara Falls area is characterized by layered sands, silts and clays with an aggregate thickness ranging from a few feet to over forty feet. Ground water is contained in the permeable

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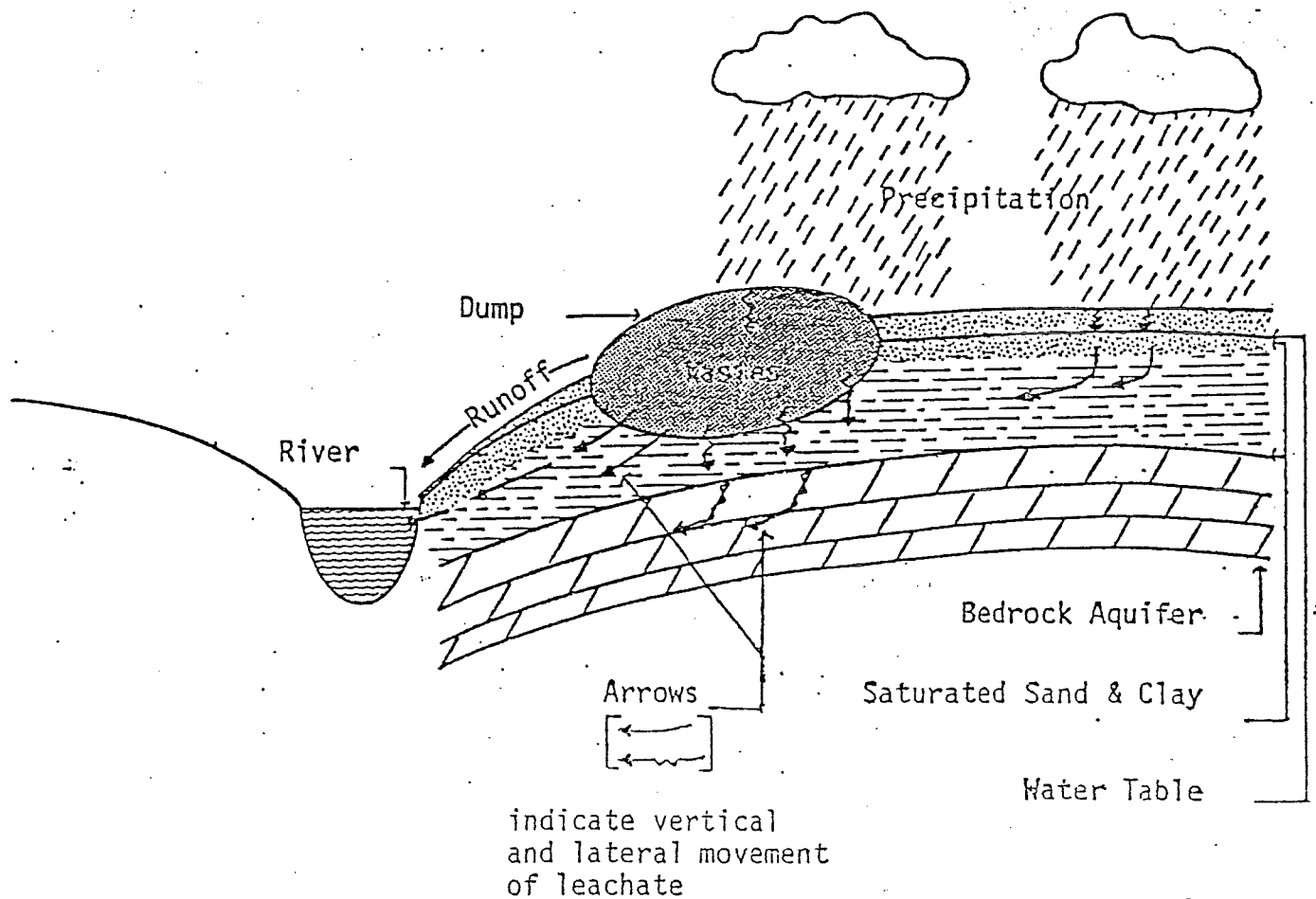
sandy zones. These strata are underlain by fractured dolostone bedrock which also contains ~~ground water in cracks and pores~~. Throughout the area, both surface water (runoff) and ground water discharge into the Niagara River, directly or via tributaries. The River, in turn, discharges to Lake Ontario. The Niagara River is used as the major source of drinking water for the area, and Lake Ontario is a vital resource for recreation and commercial fishing.

The mechanism by which hazardous chemicals from the Hooker dumps migrate into the ground water and the Niagara River is shown in schematic cross section (Figure 2) and can be summarized as follows: precipitation seeps through the wastes, generating "leachate" or water contaminated with chemicals from the waste. This leachate moves downward until it reaches the top of a saturated sandy zone or "water table". From this point it flows laterally ultimately discharging into the Niagara River. The ease with which contaminants enter into the ground water and migrate to the River can be affected by such factors as improper disposal methods or site location. This is the case at the S-Area site where there is evidence that Hooker excavated trenches and dumped wastes directly into the water table there.⁽⁵⁾ In addition, the location of the 102nd Street site which extends right up to the shoreline of the Niagara River provides an easy pathway for contaminants into the River.

Some of the leachate in the dump sites continues to flow downward from the water table into cracks in the bedrock aquifer. This occurs

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FIGURE 2. SCHEMATIC ILLUSTRATION OF MIGRATION OF CONTAMINANTS FROM DUMP SITE INTO GROUND WATER AND STREAMS



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quickly where bedrock lies near the surface, or slowly where clays lie

between the wastes and the bedrock. There is evidence that the Hyde

Park Dump was excavated to bedrock⁽⁶⁾, thus at the site, contaminants have ready access to the bedrock aquifer. Interconnected cracks in the bedrock aquifer create conduits of flow whereby contaminated ground water can move a significant distance over a relatively short period of time. Furthermore, acidic wastes dumped by Hooker would create a dissolution reaction with the dolostone, tending to enlarge existing cracks and cavities. Flow patterns within the bedrock aquifer in the area are not well known. There are, however, a number of local wells which penetrate this aquifer, thereby offering the potential of further contamination of private drinking water supplies.

Although Hooker and a number of governmental agencies have conducted sampling and testing programs to examine the extent of contamination of water resources, insufficient data is available to fully assess the environmental problems posed by the Hooker dumps. This, in part, is related to the fact that a vast range of hazardous organic chemicals have been dumped by Hooker:

"Over 250 chemicals, many with numerous variations, were produced between 1930 and 1975." [by Hooker in the Niagara Falls area](7)

"Seventy-two potentially hazardous waste streams were reported, totalling ~~145,384 tons of liquids~~ solids and sludges and ~~3,867,000 gallons of liquids~~ and sludges." [by Hooker's Specialty Chemical Division](8)

Exhibit
32
Tab A-1
FOIL
OW installation
OW 10-70
drilled thru
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OW 1-1
place
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"State health officials have now identified about 200 chemical compounds in the Love Canal, including what one researcher described as "organic curiosities."(9)

The analysis of these chemicals in environmental media is difficult and costly. Among the chemicals of particular concern are dioxin, described as one of the most toxic chemicals known to man⁽¹⁰⁾, its precursor, trichlorophenol (TCP), and Mirex, also highly toxic, and the agent responsible for the fishing ban at Lake Ontario. Hooker's concern over the Mirex situation is evidenced by its proposed Mirex-chlorocarbon program budgeted for over \$6 million including costs for extensive monitoring, long range toxicological investigations, fish sampling, and epidemiological studies.⁽¹¹⁾ These and a host of other chemicals dumped by Hooker pose a significant health and ecological risk at very low levels of concentration. Toxicological information on some of the chemicals dumped in large quantities by Hooker is summarized in the following section.

C. Toxicological Summary

The risks to human health and the environment posed from these chemicals can be evaluated in several ways. The most obvious and immediate risk arises from an individual coming into contact with contaminated substances either by breathing contaminated air or by touching contaminated materials (e.g., soils). These effects usually manifest themselves quickly and with careful study can be diagnosed to be the

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result of the dispersion of chemicals and pesticide by-products. In humans, symptoms such as respiratory ailments and skin irritations and rashes can be anticipated. Other species can exhibit acute effects depending on the exposure levels.

However, the assessment of the risks involved from the present circumstance goes further than these obvious effects. Chronic exposure to low dosages of these chemicals either individually or as mixtures carry risks that cannot be fully ascertained at present levels of understanding. Several of the compounds which are suspected to be leaching from the Hooker dumps into the ground water and ultimately the drinking water of the area, are known or suspected to be carcinogens or mutagens. Scientists do not agree on the risk presented by low levels of these toxins in air, food and drinking water since most of the available data on the toxicity of these compounds arises from tests on animals and not humans. Other experts feel that any exposure to these agents can cause cancer and thus no minimal threshold value for exposure is acceptable.

The U.S. Environmental Protection Agency has stated its position on assessing these risks in the Interim Primary Drinking Water Regulations (40 CFR Part 141); where it states: "...the regulatory agencies have found it prudent, as a matter of policy, to take the conservative position of accepting the 'no safe level' conclusion, since this position is more protective of public health and the preponderance of scientific opinion supports it." EPA's approach to the evaluation of health risk has been

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endorsed by the Director of the National Cancer Institute, Dr. Arthur C. Upton. In his letter of April 10, 1978 to Douglas Costle, the Administrator of the U.S. EPA, Dr. Upton lists several conclusions which are applicable to the present risk assessment. They are:

"Exposure to even very small amounts of carcinogenic chemicals poses some risk and repeated exposure amplifies the risk.

'Cancers induced by exposure to small amounts of chemicals may not be manifested for 20 or more years and thus are difficult to relate to a single specific cause.

'Some portion of the population that is exposed is at a greater risk because of other contributing factors such as prior disease states, exposure to other chemicals, or genetic susceptibility."(12)

Therefore, the presence of these chemicals in the environment poses risk to the human health and biota in the area. In addition, some of the compounds in the landfill are thought to be potentiating agents which can increase the possibility of the development of cancer or mutations. The effect of these chemicals in the presence of known carcinogens potentially magnifies the risks involved.

Although the precise nature of the damage caused by these landfills is unclear, ~~the potential for human and biota in the area exists~~ ~~that a potentially~~ ~~serious hazard~~ to humans and biota in the area exists. The fact that the actual effects of these chemicals could take 20 years or longer to be exhibited dictates the need for foresight in order to mitigate the full potential of the hazard.

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D. General Approaches to Site Cleanup

There are two general approaches to cleaning up hazardous waste dumps:

1. completion of emergency measures to prevent problems from worsening, including the institution of a "perpetual care" program; and,
2. permanent remedy of the problem.

In the case of the Hooker dumps, the former approach would involve encapsulation of wastes by covering the tops of the dumps with low-permeability clay, and sealing the sides with clay or grout to retard lateral migration of contaminants. The effectiveness of such an approach, however, would be limited, due to the fact that without a bottom seal, pollutants could continue to contaminate ground water. Also, a containment structure around the perimeter of the site would not remedy problems created by contaminants which have already migrated beyond the confines of the site. Pumpage and treatment of leachate, continuing monitoring and analyses, a perpetual program of maintenance and security, and a variety of other measures specific to each site would also be necessary.

The major aspect of permanent remedy of problems posed by the Hooker dumps would involve excavation of wastes and contaminated soils and final deposition in a licensed, secured, hazardous waste landfill, or incineration of the wastes, or some combination of the two.

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It is uncertain at present whether interim mitigation, as opposed to permanent remedy of the problems, will be required of Hooker by the State of New York. If an "encapsulation" approach is implemented, it would constitute a temporary solution, as in the case of the Love Canal where the site is being clay-covered and drained:

"The city has proposed building a tile drainage ditch along the [Love] canal to prevent further spread of the contamination.

'Officials hope the ditch will drain the toxic wastes away from affected areas and channel them into a treatment facility. Effective drainage would prevent the leaching that is damaging residents' property.

'This solution is only temporary, however, according to [EPA Region II Administrator] Beck. He said EPA is looking for a permanent solution, perhaps removing the waste material to a more appropriate landfill site."(13)

A report on earlier studies of the Love Canal problem stated the following:

"The greatest potential for complete and final solution to the Love's [sic] Canal landfill problem rests on removal of drums from the landfill and detoxification of their contents, probably by incineration. This is also probably the most costly and the most dangerous to field personnel."(14)

The level of protection that will be afforded by temporary measures which would require perpetual care by Hooker is dubious, given the fact that previous remedies undertaken by the Company have not been properly

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and effectively maintained. For example, Hooker attempted a closure of the Hyde Park Dump in the early 1970s at the insistence of regulatory authorities. Measures undertaken included strengthening of dikes, improvement in leachate collection, control of surface runoff, upgrading of clay cover, surface seeding, installation of security fences and testing of runoff. This program, however, was apparently inadequately implemented and/or maintained such that the State, since last year, actively pursued requiring a variety of improvements due to continuing environmental problems. Available correspondence and other documents, in fact, indicate that the state and other regulatory authorities have expended considerable effort in pressing for cleanup of the Hooker sites. The response from the Company has been a succession of interim remedial measures, which have abated problems partially and/or temporarily. This sequence of "problem/partial remedy/renewal problem" will continue to impose a burden on the resources of State and other regulatory authorities. It would therefore seem most prudent to seek the full cleanup of the Hooker dumps necessary to deem the concomitant environmental problems "permanently resolved."

A full cleanup, (i.e., excavation and proper final disposition of wastes) will be technologically complex and require massive capital expenditure over the near term. However, in view of the continuing maintenance costs and liabilities associated with the encapsulation approach, permanent cleanup may be more desirable, from an economic standpoint, as well as from an environmental standpoint.

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Methods for both the encapsulation (temporary) and excavation (permanent) approaches to cleanup of the Hyde Park, 102nd Street and S-Area Dumps are described in general terms in the following chapters of this report. In addition, estimated costs for these two approaches are presented for each site. The cost estimates for the encapsulation approach are conservative in that they do not consider contingencies, nor do they consider liabilities for potential future health and ecological damage that may result from malfunction, failure, or inadequate maintenance of control systems. The U.S. Environmental Protection Agency, in its most recent draft of regulations for the treatment, storage, and disposal of hazardous wastes under Section 3004, Subtitle C of the Resource Conservation and Recovery Act (42 USC 3251) states that:

"Requirements for continuity of operation and financial responsibility are specified in Section 25.43-9. The continuity of operation regulation will set up a reserve of funds to assure the closure and post-closure responsibilities as required under Section 250.43-7 can be met.

"The term financial responsibility has been interpreted by the EPA to mean the ability to pay for injuries to third parties resulting from escape of hazardous wastes into the environment. The primary objective of the financial responsibility regulations is to ensure a source of funds accessible to the legal process that would be sufficient to meet legitimate third party claims for damage."(15)

Cost estimates for excavation are also conservative in that they do not consider the extreme precautionary measures that may be necessary during the cleanup operations as envisioned in 1977 for cleanup of the Love Canal situation:

"...it seems that excavation of the landfill will have to be approached with archeological caution...

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'To eliminate potentially hazardous atmospheric contamination in these same areas, we can even visualize housing the excavation itself in large air supported structures, with air discharged from the structure through activated carbon filters, or perhaps to provide oxygen to incinerators constructed on site to detoxify liquids...

'Using hand tools, personnel equipped with suitable protective clothing and breathing apparatus would remove the soil cover and sufficient soil from the side of the landfill to permit inspection of the drums.'"(16)

Since satisfactory cleanup programs have neither been prescribed nor approved for the Hooker dumps by the prevailing regulatory authorities, both the temporary and permanent options have been examined within this report. Given the magnitude of concern surrounding the Hooker dump site problems in Niagara Falls, it is very possible that the responsible authorities may press for permanent problem resolution or for implementation of emergency remedial measures followed in the near term by complete cleanup.

E. Estimated Cleanup Costs

Cleanup cost estimates are presented in subsequent chapters for three of the Hooker dump sites in Niagara Falls. These estimates are based on all information available with regard to the size of the sites, the quantities and types of wastes disposed, local hydrogeology, and the extent of environmental contamination. Substantial additional data would be necessary to develop specific engineering designs for remedial measures and their associated costs.

Applying best available information and engineering estimates, the full cleanup of the three sites discussed herein could entail expenditures of up to \$150 million.

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II. Hyde Park Dump

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The Hyde Park Dump (Bloody Run) is currently owned by Hooker Chemical and Plastics Corporation and was operated by Hooker from approximately 1953 to August, 1975. There is some confusion as to the exact size of the site which in three recent documents is respectively reported to be ~ 15 acres, approximately 1750 X 600 or ~ 18 acres, and 25 acres.(1) The site drains to Bloody Run Creek, a small tributary to the Niagara River.

The landfill was purchased by Hooker in 1953 and zoned as a permitted site for storage of waste materials in August, 1953. The permit has conditions for continued use, including key points:

1. No waste material is to be deposited on the earth's surface at the present grade level;
2. The layer of earth is not to exceed ten (10) feet in height;
3. No waste material stored within twenty (20) feet of any property line.(2)

According to a recent internal Hooker document, "it is possible that existing conditions are not in compliance with these conditions."(3)

The site was used for the land disposal of organic chemical waste produced by Hooker's Specialty Chemical Division from the manufacture of pesticides and other organic chemicals. According to a recent Hooker document:

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"the site was used starting approximately in 1953 as an outlet for drummed chemical waste previously deposited in the Love Canal site which was closed at roughly the same time as HPL startup. Material was buried at the site by dumping truck loads of drums into open holes and eventually backfilling the excavation. Soil permeability or other leachate reduction characteristics of the geology were not considered during the disposal process."(4)

No complete inventory of wastes disposed at the Hyde Park Landfill appears to exist. In addition, there are some discrepancies in the inventory information which is available. In a letter dated June 6, 1978 from Hooker to NYSDEC, a partial inventory is provided of "larger volume or pesticidal substances believed to be buried at Hyde Park Landfill."(5) This lists ten major substances, including the trichlorophenol waste product, 2, 3, 7, 8 tetrachlorodibenzo p-dioxin, henceforth referred to as dioxin. This substance is probably the most highly toxic of the many hazardous wastes dumped by Hooker at the Hyde Park site. This substance has low solubility in water but is believed to be soluble in other chemical constituents which are present at the site such as toluene and benzene.(6)

The most complete internal inventory information available for the Hyde Park landfill provides a listing of wastes and waste quantities disposed during 9 of the 22 years the site was in operation and includes many chemicals which are toxic at low concentrations as discussed in a previous section of the report.(7) In the letter to the State, which inventories "larger volume or pesticidal substances," the pesticide, Mirex (or dechlorane) is not identified as being disposed at the site.

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This substance, however, is shown in the internal Hooker inventory and was also identified in a letter to EPA Region II of May 21, 1976.⁽⁸⁾ In that letter, Hyde Park Landfill was the only site identified as a disposal area for solid Mirex wastes which were produced at the Niagara Plant from 1959 to June, 1967.

The bioaccumulation of Mirex by Lake Ontario fish has been well-documented. Further, "Commissioner Berle stressed that scientific data continues to show that Mirex, dumped by Hooker Chemicals and Plastics Corp., Niagara Falls, and others is still present in the lake."⁽⁹⁾ Also, many other organics, including pesticides, have reportedly been disposed in the Hyde Park fill and could be affecting the biological resources of the Niagara River and Lake Ontario. In a letter dated October 5, 1978 concerning the Hyde Park Landfill leachate, Hooker states:

"Polychlorinated biphenyls (PCB's) were detected. The exact Arochlor or Arochlors could not be ascertained. It appears to be 1248 or 1242 or a mixture of both, plus some unknown. A very rough calculation, based on a 10 ng Arochlor 1248 standard, places the concentration at less than 5 ug/l. This number is given as a gross approximation and is in no way to be considered accurate."⁽¹⁰⁾

Uncertainties as to the full scope of the waste substances that may be buried at Hyde Park fill are further illustrated by the following excerpt from an internal Hooker document:

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"The inventory of materials located at HPL is extensive and diversified. Segregation of wastes with the possible exception of sulfides, was not considered as a rule and records are unclear as to the location of specific materials within the site."(11)

The history of environmental problems stemming from poor waste management at the Hyde Park fill can be summarized as follows: An internal Hooker document states:

"The general cause of complaints was the contamination of Bloody Run creek as the result of 'pond' drainage of organics or leachate migration from the landfill walls. The first record of these complaints was in 1964 from the State Health Dept. A series of similar type observations (as recorded in the file notes) from surrounding residents, Niagara County Health Dept., Town of Niagara, and New York State Dept. of Environmental Conservation were reported to Hooker between 1964 and 1978."(12)

Problems have existed for at least 14 years, yet negotiations for clean-up still continue.

Table 1 includes a number of complaints as referenced in the Hooker document.(13) Major complaints centered around fire and odor problems and seepages from the site into the township of Niagara.

The facility was "closed" in 1972 and reported closure costs to Hooker were \$500,000. Apparently, closure procedures and/or post-closure maintenance were inadequate, as DEC notes three current problems:

TABLE 1
REPRESENTATIVE COMPLAINTS - HYDE PARK DUMP
(1964 - 1978)

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1964	06	12	HYSDH	Plant Manager	Permission to enter Hydro Park Boulevard site in Tn of Niaga to check out complaint regarding Industrial Wastes in a small creek.
1964	06	19	J Wilkenfeld	H L Parker	Answer to above letter - took samples of brown and green algae thought to be the source of pollution - attached analytical results of ditches Outside Fence, Past Cooperage, Before HU and East and West Ponds
1967	04	24	HCMD	Dr Alexander Katona	status after inspection drains containing wastes are leaching or seeping into a ditch which flows through populated areas request complete report and attached copy of Chp IV - Niagara County Sanitary Code please note Section 6
1968	04	17	HCMD	J Brogard	Letter stating great concern over seepage from site in Township of Niagara - want immediate report relative to the present situation and what they may expect in way of relief.
1969	00	10	Mr & Mrs Whitehead	Hooker Greiff Brothers SPA	Making each aware of a pond of water 'new to the landscape' of their property located S of HU - just intended to advise each of the companies of their concern.
1969	09	05	HYSDH/Health	F T Oloka	Recaps problems over the last five years and states that if "continued operation of this disposal site must be based upon strict adherence to the agreement that positive assurances would be taken to absolutely prevent another breakthrough and this would include extensive diking and around the clock 24 hr day, 7 days a week surveillance of the dike to detect any possible weak points before a breakthrough occurs and immediate elimination of these defects.
1969	10	22	J H Brogard	Conference Notes	Niagara Plant Residues - Initial Task Force Meeting Ref to Hooker facing strong regulatory pressures to control pollution problems at HRP. There are residues that could be disposed of at the Residue Burner right now instead of being sent to HRP - tech control will assist in eliminating any bottlenecks to accomplish this.
1971	07	30	HCMD	J Judy	Unsatisfactory Operation of Hooker Disposal Site Tn of Niagara lists 8 violations indicating it is a partial list - asks for a definite statement concerning Hooker's plans for this site
1972	00	31	John Judy	Laura R. Hys HL Ind-TAM Dly	Apology for incident at HRP disposal site - involving odors from the site causing a personnel problem in his plant - summary of what you are doing and expect to do

1972	11	29	tygart, PE NYSDEC	P T Olotka	requesting cause discharge of all water from the lagoon areas and to remove these wastes to another site where an adequate and approved method of treatment can be provided. after the above liquid industrial wastes are removed from the site, this office will entertain application for discharge of uncontaminated surface water.
1975	03	13	NCHD	B J Carrono	During 4 occasions when leachate was found in same spots given to May 20, 1975 to remove all leachate material, liquid and contaminated solid.
1975	10	07	Niagara Gazette	Pollutants lake entry propud.	"began studying possibility that a toxic chemical pollutant may be entering Lake Ontario from landfill sites..... B Gedeon, Assistant NCH Comm for environmental matters, said this morning he know of no landfill close enough to the lake which could be the source of the material, He acknowledged that it might be possible, given certain water and rock conditions underground, for an inland landfill site to leach enough material through to the lake. PCB's do not break down after ingestion, and hence may also travel undisturbed through the food chain from smaller to larger fish....."
1976	10	13	John Marasco	B J Carrono	Tour of Hooker landfill sites 9/17 by DEC personnel - toured all three sites no visible contaminant at Love's Canal 102nd St site a small amount of leachate in the lagoon. HPD north side had several tiny leach spots but all inside the Hooker property - noted well and oil seeping from tank at Howe Oil Company
1976	12	08	J J Czapl	P T Olotka	Preliminary Results of NYSDEC results and "Paul Foresch indicated then DEC felt that there is seepage from HPD Land fill site into the HPD west ditch, further he felt Hooker would be required to submit and institute some type of control program
1976	12	10	NYSDEC	Hooker	Samples of leachate emanating from these sites were collected by reps of the Dept for chemical analysis. HPD contained significant quantities of chlorinated hydrocarbons stated preliminary data received is sufficient to cause serious concern. Requested a meeting 12/20/76
1977	04	01	McMahon NYSDEC	P T Olotka	stating phenol level of west side ditch at HPD was found to be about 45% of the level found in the leachate collection pond - the continued utilization of HPD landfill is not acceptable and is to be discontinued immediately.
1978	03	01	NYSDEC	B J Carrono	Confirms phone call 2/28 a flow estimated at 2gpm of interanal leachate was observed escaping from the collection west thru the outer berm just east of the west conduit which drains the top of HPD. As soon as weather permits - a thorough inspection of the berm is to made and appropriate action taken to assure
1978	00	04	J Czapl	Dist List	DEC Sampling of the HPL 0 provides defensible evidence of purported discharges of Hires and other pesticides to the Niagara River Hooker and DEC to sample concurrently.

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- contamination of sediments in Bloody Run Creek (the stream draining the area) and tributaries;

2 { rupture of the protective berm at the facility, malfunction of the leachate collection system and consequent movement of contaminants from the site;

- likely contamination of ground water. (14)

According to the NYSDEC, "determination of pollutant migration from the site [Hyde Park] is strongly complicated by the likely contamination of the soils and sediments surrounding the outside of the site and in the surface drainage system to the Niagara River." (15) Sediments show contamination by chlorinated toluene, benzene, and other compounds.

Bloody Run Creek is contaminated from the fill to a point near Niagara University where it goes underground and eventually discharges to the river. The extent of contamination of the underground conduit is not known due to the lack of access to this area. In 1976 and 1977, a total of over 5 million gallons of leachate was transported from the site and treated out-of-state (reportedly in underground injection wells in Ohio). (16) These disposal costs are approximately \$500,000 per year.

During the past year, there have been two breeches of the berm, resulting in discharges to Bloody Run Creek and the preparation of a legal referral by DEC. In July, 1976, U.S. EPA found Mirex in water from the site's collection pond, in the collection ditch, and in soil from the north side of the site. A September, 1977 DEC sample from a culvert under Port Authority Road showed high levels of Mirex (1850 ppb). A July, 1978 sediment sample from Bloody Run Creek showed extensive

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contamination: 633 parts per million (ppm) tetrachlorobenzene, 154 ppm BHC (lindane), 3851 ppm hexachlorobenzene and 68 parts per billion (ppb) Mirex, based on a sample of 320 grams wet soils and 75 ml decanted liquid.⁽¹⁷⁾ All of these contaminants are hazardous in the low ppb range.

The possibility that ground water contamination had occurred at the Hyde Park Dump was raised in an internal Hooker memo dated September 6, 1977 from J. Czapla to F.T. Olotka, B.J. Carreno, and R.A. Bowman:

"monitoring wells have been installed - possibility that the ground water at the HPD may be contaminated with materials buried at the site because - initial excavations may have been made to bedrock. observation of discolored soils in borings and strong odor similar that that of the lagoon - preliminary groundwater samples were discolored and have a phenolic odor."⁽¹⁸⁾

Four months later, however, in a letter dated January 18, 1978, (from Czapla to John McMahon, NYSDEC Regional Administrator for Environmental Quality) which accompanied a report by Hooker on the Hyde Park Landfill, the indications of ground water contamination internally noted earlier are not discussed. Instead, Hooker maintains that groundwater investigations are not necessary and that groundwater contamination is unlikely because of the particular soil and hydraulic conditions present at the site:

ask R - when was he last involved?

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"Hyde Park Site

1. It is our opinion there is no appreciable contamination of surface waters from the site since runoff monitoring results indicate compliance with minor exceptions to drinking water standards.
2. Ground water investigations do not warrant further consideration for the following reasons:
 - a. The landfill was constructed in natural clayey silt material having a low permeability factor of 0.003 ft/day (0.0000010 cm/sec.).
 - b. For leachate to migrate horizontally to contaminate surrounding ground water particular soil and hydraulic conditions must exist. None of these conditions are present at the site."(19)

NYSDEC, however, disagreed with Hooker's assessment that groundwater investigations were not necessary. In September, 1978, the Agency stated the following after reviewing the borings logs in a June 1978 report on the Hyde Park Monitoring program (prepared by Hooker's consultants, Conestoga-Rovers):

"The boring logs given in Conestoga-Rovers and Associates June 1978 report entitled "Site Investigation and Monitoring Programs" indicate that contamination of groundwater both above and below the clay seam is likely."(20)

Because of the indications of groundwater contamination, NYSDEC would only tentatively approve Hooker's engineering plans for interim mitigative measures at the site. The agency did not feel that Hooker's plans for intercepting the contaminated leachate fully addressed the problem:

"...We can give approval to these plans only with the caveat that the Department may require modifications or additions to the proposed construction activities based on these additional documents. While the submitted plans will reduce the movement of contaminants [sic] into surface and ground waters, they do not fully address this problem. The main thrust of the proposed construction seems to be to reduce the volume of leachate requiring collection and treatment, and thus reduce Hooker's cost for treating leachate from the site.

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'...Locating the tile drain at the elevations stated in the plans will reduce the piezometric head within the raised portion of the landfill but it may not intercept most water moving out of or into the soils under the fill. In fact, in many places the drain system is actually at a higher elevation than the elevation of the land surface at the nearest point outside of the landfill (that is, the elevation of the natural grade of the surface). To be more effective, the drain tile should be much deeper than is presently proposed."(21)

Letters from James Czapla of Hooker Specialty Chemicals to John McMahon of New York State DEC, dated 10/16/78 and 11/7/78 stated:

"It is mutually understood by DEC and Hooker that the current construction program may not alleviate all environmental concerns at the site and depending upon monitoring results future work may be deemed necessary.

In conjunction with those interim mitigative measures, Hooker also recently proposed to truck or pipe the collection leachate to the Niagara Falls treatment plant. This plan, however, would require approval by the Niagara Plant and there are uncertainties, however, as to the capacity of the facility to handle the wastes. The treatment plant is apparently already functioning up to or beyond capacity and experiences operational difficulties.

Recently, two health problems relating to escape of pollutants from Hyde Park into the environment have been identified for further investigation: (1) presence of toxics in water wells near the site (analytical data is not yet available, however, the Health Department indicated verbally that contaminants have been detected in small quantities,

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justifying the need to extend the public water supply lines); (2) medical reports indicate that 7 members of a local family whose property borders on the Hyde Park Site, suffer from inexplicable respiratory ailments (see Attachment 1).(22)

Other significant environmental and health problems could arise from chemicals leaving the area via Bloody Run Creek which flow to the Niagara River and ultimately to Lake Ontario.

Hooker's inventory of materials disposed at the Hyde Park Dump for various years (1955, 1957, 1962 -- no volumes indicated), 1964, 1968, 1969, 1973, and 1974) can be used to estimate the total disposal volume at the dump site. The average weight of materials dumped during these seven year of record is approximately 10,500 tons per year. Using this value and knowing that the site was in operation for twenty years, the total weight of material at the Hyde Park site is estimated at 210,000 tons. If the material is assumed to have a specific gravity of 1.2, (i.e., the density of the material is 1.2 times that of water), a tons of material is approximately equal to a cubic yard. Based on this analysis, the volume of waste at the site is estimated to be 210,000 cubic yards, exclusive of contaminated soils. Such a volume would be roughly equivalent to a 15-acre site piled with hazardous material 10 feet high. Soil borings in the area indicate that bedrock varies from 7 feet to 35.5 feet below natural grade.(23)

ATTACHMENT 1

October 6, 1978

Dr. Francis J. Clifford, Commissioner
Health Department, Niagara County
5467 Upper Mountain Road
Lockport, New York 14094

DRAFT

Re: Armagost Family
477 Belvedere Avenue
Niagara Falls, New York 14302

Dear Dr. Clifford:

It has come to my attention that the creek known as Bloody Run traverses thru the property of the Fred Armagost family living at 477 Belvedere Avenue, Niagara Falls, New York 14302. Mr. Armagost, his son, Wayne, age 24, Wayne's wife, Barbara, and four of his grandchildren all live on this property and all have severe upper respiratory problems. Each of the grandchildren has had problems since returning home from the newborn nursery following birth.

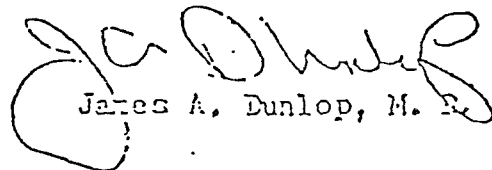
As you know, Hooker Chemical has recently admitted to dumping Mirex into the Bloody Run Creek. In addition, Hooker has been dumping various chloride compounds in the creek; these latter chemicals are known to be highly toxic to the respiratory tract.

All of the Armagosts have been evaluated by myself and Dr. Byung Park, Professor of Pediatrics and Immunology at Buffalo Children's Hospital, and we together cannot explain the high incidence of respiratory disease in this family on any other than extrinsic causes.

I have discussed the situation with Dr. Laverne Campbell of the State Health Department and Dr. Campbell feels that the situation should be handled initially by the Niagara County Health Department.

Where do we go from here? I'll look forward to hearing from you regarding this matter in the near future.

Sincerely,


James A. Dunlop, M. D.

JAD/er

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The Hyde Park site has been plagued with problems over the years. The site has experienced significant subsidence in parts, the berms and dikes have collapsed, and the leachate collection system has malfunctioned periodically. [REDACTED] that hazardous organics from the site have leached through the surface and contaminated Bloody Run Creek.

Hooker recently hired Conestoga-Rovers and Associates to develop engineering plans to correct some of the immediate problems at the site. Conestoga-Rovers and Associates have estimated that the costs required for these corrective measures to be \$996,190.⁽²⁴⁾ Hooker has evidently estimated the costs for the project at \$1,240,000.⁽²⁵⁾ It is the impression of DEC that Hooker is also planning to dredge the entire drainage system and contaminated section of Bloody Run Creek. According to information provided in the NYSDEC Draft Information Dossier 78.13, Rovers has apparently estimated costs of \$1,000,000 to dredge the contaminated sections of Bloody Run Creek and probably to install a new drainage system. Hooker is waiting for authorization from its Board of Directors to expend these funds. As of October 24, 1978, no permit applications had been received by DEC or the Corps of Engineers for the dredging plan. DEC will undoubtedly press to assure adequate cleanup of Bloody Run Creek.

Remedial measures necessary to resolve problems at the Hyde Park site and the costs of those measures are identified in Table 2. In Table 2, both emergency measures and permanent measures are considered.

TABLE 2
ESTIMATED CLEANUP COSTS ASSOCIATED WITH
THE HYDE PARK DUMP SITE

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Activity	Costs
1. Dredge Bloody Run Creek, possibly under Niagara University to the Niagara River	unknown
2. Extend Niagara Falls water system	\$30,000
3. Emergency mitigative measures	
(a) cut-off barrier	\$1,250,000
(b) clay cover, grading, surface water runoff control, and monitoring	\$1,240,000
(c) annual perpetual care program (inspection, replacement of cover, leachate treatment, security)	\$500,000/yr.
4. Permanent mitigative measures	
(a) Excavate concentrated hazardous wastes	\$2,900,000
(b) Excavate contaminated soils to bedrock	\$2,800,000
(c) Transportation to hazardous waste disposal site	\$4,300,000
(d) Incineration of concentrated hazardous wastes	\$15,200,000
(e) Secure landfilling of contaminated soils	\$23,400,000
(f) Random fill material	\$1,500,000
(g) Site closure and post closure monitoring program	unknown
5. Third party damage claim fund	\$5,000,000
Total = \$57,620,000 + \$500,000/year	

Note: Total does not include several unknown cost items

III. 102nd Street Dump

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The location of the 102nd Street Dump is depicted in Figure 1. The 102nd Street Landfill (also referred to by Hooker as the River Road, or LaSalle site) is bordered on the north by Buffalo Avenue, on the south by the east branch of the Niagara River, on the east by Olin-Mathieson Chemical Company, and on the west by Griffon Park, formerly the site of the City of Niagara Fall's municipal landfill. The site drains to the Niagara River. According to data included in an internal Hooker document, the size of the site is approximately 20 acres.⁽¹⁾ The site was used from the 1930s to 1971. The landfill had been a low-lying marsh, and "wastes were apparently dumped right up to the [Niagara] river's edge."⁽²⁾ It is uncertain as to whether there may have been actual dumping into the River, since: "It appears questions remained throughout the landfill life as to the location of the legal shoreline."⁽³⁾

The site was once subdivided and used by Oldbury Electro Chemical Company, Niagara Alkali Company and Hooker. Niagara Alkali and Oldbury were acquired by Hooker in the mid-1950s. "Niagara Alkali waste consisted primarily of inorganic wastes such as brine sludge, cell tops, possible caustic and refuse. Landfilling operations at the two Oldbury parcels utilized material segregation for the most part. Chlorates, flyash, and brine sludge were landfilled in the east parcel, while phosphorous wastes were buried in the west parcel. There are documented incidents, however, where violations of the practice are indicated."⁽⁴⁾ The Hooker parcel was used prior to the Love Canal for dumping solid and drummed residues which may have included a host of chemicals:

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Benzoyl Chloride
Thionyl Chloride
Benzyl Chloride
Chlorinated Waxes
MCT
PNBC
MNBC
LDS
Polychlorinated Naphtalenes
Butyryl Chloride
HCl
Benzeyl Disulfide
BTC
Antimony Chloride
Ferric Chloride
Benzoic Acid
Benzoate of Soda
Aluminum Chloride
Caprylyl Chloride
Chlorisondamine (?)⁽⁵⁾

An unidentified black liquid was dumped on the site from the late 1940s through the early 1950s at a rate of about 500 gallons/week (or a total of over 100,000 gallons, assuming four years of dumping).⁽⁶⁾ Also, between 1948 and 1954, tetrachlorobenzene (a priority pollutant) filter cake and possibly Lindane (banned under the Insecticide Act) filter cake were disposed at a rate of 54 drums/day (or a total of 16,848 drums over a six year period).⁽⁷⁾

The facility had a history of explosions caused by the mixture of phosphorous and chlorate wastes. During hte late 1960s, "...only fly-ash, sludge, mud, and generally inoffensive materials..." were disposed, due to the "visibility" of the site operations.⁽⁸⁾ Among the problems and complaints associated with the site were the following:

1. "firecracker bangs" being experienced by truck drivers (7/26/67);
2. two youth alleged to have been burned in the dump area (7/27/67);
3. explosions caused by mixture of chlorates and phosphorus (8/8/67);
4. small explosions caused by mixing of red phosphorus and chlorate (8/9/67); and
5. paint staining complaints (12/21/71).(9)

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On December 8, 1970, the Army Corps of Engineers issued an order to Hooker to immediately cease construction, filling, dumping in the east branch of the Niagara River and along its shore upstream of Cayuga Island. Hooker agreed to grade and cover the site and erect a bulkhead. This work included emplacement of a 2-foot clay cap, topsoil, revegetation and construction of a stone bulkhead at a total cost of \$86,000.(10)

According to a NYSDEC document:

"While the closure design seems to have been, in part, directed toward controlling leachate, the main thrust of the design, the bulkhead, was to prevent the washing away of wastes by the Niagara River. In order to limit leachate formation, two feet of compacted clay were placed over the entire site after it had been graded. The site was then covered with topsoil and seeded."(11)

The completed work was approved by the Corps on December 27, 1972, however, since that time it has become apparent that these measures did not resolve the environmental problems posed at the site. A recent internal Hooker document states:

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"The Hooker area now appears to be stable except for a few isolated cave-ins which should be repaired. Technical Control recommends that additional top soil be spread on the site and the entire area seeded early this summer. We believe this can be justified based on the following:

1. Additional soil will cover the chunks of waste BHC which are present over the entire bare area. The grass root system should prevent this material from working to the surface in the future. This is important since a number of children have been injured in the past as a result of handling the BHC.
2. Filling in the cave ins will minimize the chances of children or adults being injured on the site.
3. A good grass cover will help to stabilize the area against further erosion.
4. Since this area is in the public view from both River Road and the river, the seeding will present a much better image of Hooker.

"Since this property is of limited or no use to Hooker, it is recommended that Niagara investigate the possibility of selling it to the City of Niagara Falls. The river frontage plus the fact that the site is contiguous with Griffon Park should make this attractive to the City. Sale of the property will relieve Hooker of the \$9200/yr. property taxes as well as continuing maintenance."(12)

Problems with the site are currently of significant concern to the New York State Department of Environmental Conservation (DEC). This concern relates to the leaching of wastes from the fill into the River and consequent contamination of the Niagara River from which large quantities of water are withdrawn downstream to provide a drinking water supply to the area. In a February 9, 1977 letter to Hooker from DEC, a number of questions were raised as to the integrity of the site. (In fact, one would be hard put to find a worse location for a hazardous

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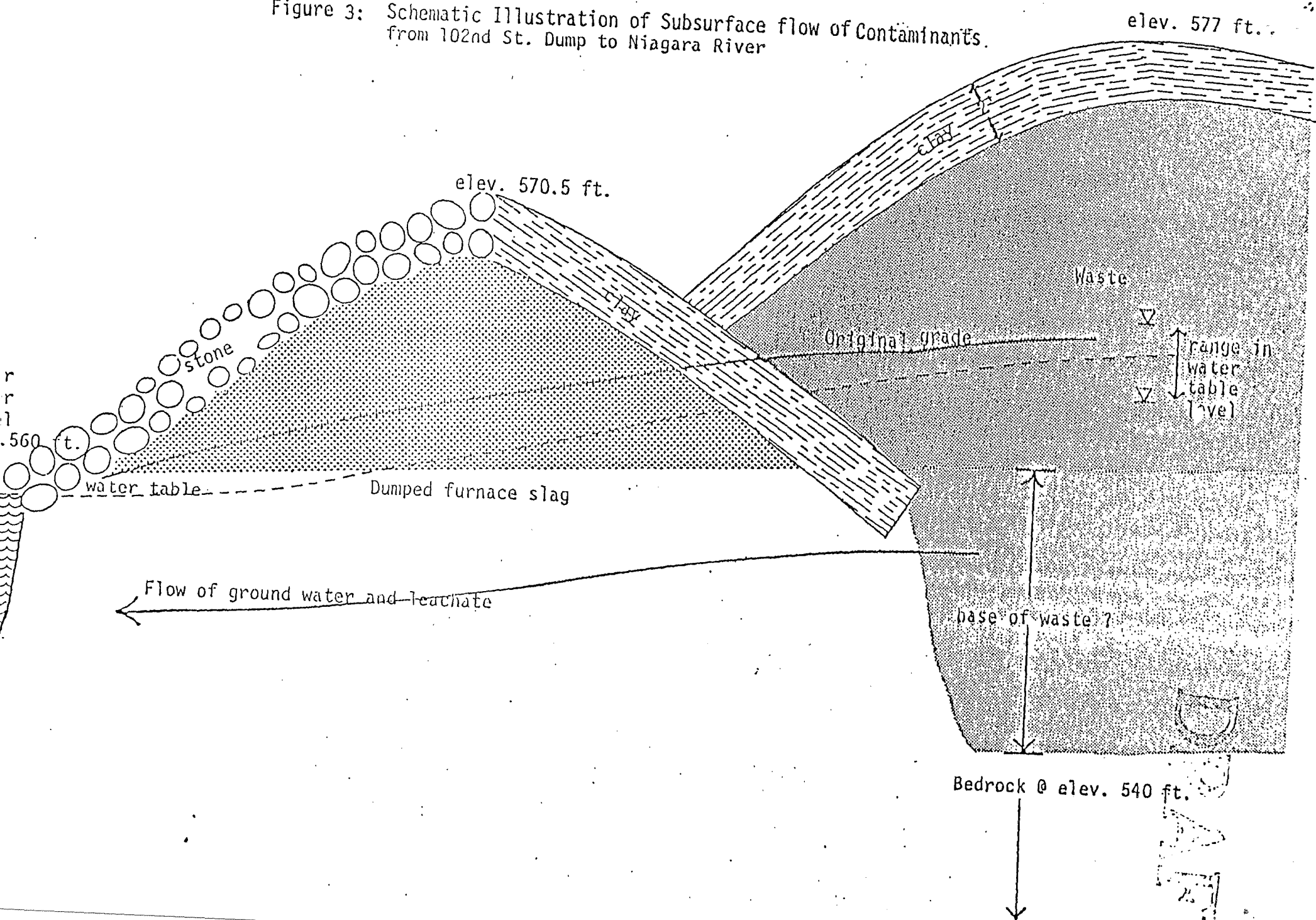
waste disposal facility). The statement was made that: "This Department is very concerned over the leachate emanating from the above landfill sites" (102nd Street and Hyde Park).(13)

A cross-sectional diagram illustrating flow of ground water and leachate is provided by Figure 3. This figure was based on information contained in documents prepared by Hooker and dated January 6, 1977; January 15, 1977; January 26, 1977; and July 13,, 1978.(14-17) The depth to which wastes were buried is uncertain, however, it is known that pits or trenches were excavated at the site and wastes were dumped below land surface but above River level. Given the information available as to the water table elevation, it is apparent that wastes were dumped into the upper part of the aquifer. Also, waste residues have been encountered at some depth within the aquifer. As a result, the clay "cap" and berm are ineffective in preventing lateral flow of contaminants directly into the River. According to a 1978 NYSDEC document:

"When the site was inspected in August of 1976, several leachate seeps on the River side of the bulkhead were apparent. The sediment from one of these seeps was sampled November 16, 1976. Analysis showed total PCB at 26.6 ppm and Mirex at less than .007 ppm.

'Upon pressure in the Department, Hooker conducted a hydrogeological and water quality investigation of the site during the summer and fall of 1977. A report on this investigation was submitted to the Department on January 18, 1978. After review, the Department requested additional information and analyses."(18)

Figure 3: Schematic Illustration of Subsurface flow of Contaminants.
from 102nd St. Dump to Niagara River



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Analytical data from six monitoring wells showed high concentrations (to 940 ppm) of TOC (a general indicator of organic contamination). Shoreline River surface water, however, reportedly had low TOC concentrations (6 ppm). According to the State, "contamination of water within the fill was found in almost all of the wells."⁽¹⁹⁾ Net organic halide concentrations in well samples were up to 47.4 ppm, however, Hooker expressed questions with regard to the reliability of the data.⁽²⁰⁾ Available analytical data is insufficient to assess the magnitude of the contamination problem posed by leachate emanating from the 102nd Street fill. Although some testing was performed by Hooker at DEC's insistence, additional work is needed to design a final cleanup plan. DEC has requested Hooker to "identify every halogenated organic exceeding 10 ppb in concentration."⁽²¹⁾ In view of the ready access of pollutants from the fill to the River, and the failure of previous simplistic efforts to adequately mitigate leachate migration, the implementation of more carefully designed waste containment measures will be necessary to assure adequate protection of the important water resource that the Niagara River represents. An engineering options for preventing the problem from worsening would be sealing the fill from the environment. This could involve injecting grout (or emplacing clay) just landward of the River and along the remaining three sides of the perimeter of the site from surface to bedrock. Vertical sealing coupled with covering of the site with an adequately thick layer of clay to minimize infiltration of precipitation over the long term, and grading to avoid standing surface water would significantly reduce the environmental risks which are

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posed by the site in its present conditions. Such a program would require a continuing monitoring and maintenance program to measure the long-term effectiveness and integrity of the control system.

The option considered for the permanent remedy of the problem involves excavation and removal of the wastes from the site with subsequent re-disposal at a licensed secure landfill. Because of the explosive nature of the phosphorous wastes at the site, extreme caution must be exercised during all of the various phases of waste handling operations. A pretreatment process to neutralize the phosphorous would be required. Although this option would be in keeping with the Clean Water Act goal of enhancing the quality of surface water resources, and with the goals and guidelines of the Resource Conservation and Recovery Act, the technical complexities and costs associated with such an approach would be enormous.

The known amounts of material disposed at the 102nd Street dump between 1946-1971 can be used to estimate the total volume at the dump site. The annual amounts of wastes dumped is approximately 7,400 tons. Using this value, the total weight of material dumped is estimated at 200,000 tons. If the wastes material is assumed to have a specific gravity of 1.2, a ton of material is approximately equal to a cubic yard. Based on this analysis, the volume of wastes at the site is estimated to be 200,000 cubic yards. Such a volume is approximately equal to a 14 acre site covered with 10 feet of wastes. The depth to bedrock in the vicinity of the site is approximately 27 feet below natural grade.

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TABLE 3

ESTIMATED CLEANUP COSTS ASSOCIATED

WITH THE 102ND STREET DUMP SITE

<u>Activity</u>	<u>Costs</u>
1. Niagara River testing, monitoring & treatment program	unknown
2. Dredging of the Niagara River contaminated sediment deposits	unknown
3. Emergency mitigative measures	
(a) cut-off barrier	\$1,000,000
(b) clay cover, grading and surface water runoff control	\$1,600,000
(c) annual perpetual care program (inspection, replacement of cover, monitoring, leachate treatment, security)	\$500,000/yr.
4. Permanent mitigative measures	
(a) Excavate and pretreat reactive & toxic concentrated hazardous wastes	\$4,000,000
(b) Excavate contaminated soils to bedrock	\$2,900,000
(c) Transportation to hazardous waste disposal sites	\$4,300,000
(d) Secure landfilling of concentrated hazardous wastes	\$8,000,000
(e) Secure landfilling of contaminated soils	\$23,000,000
(f) Random fill material	\$1,700,000
(g) Site closure & post closure monitoring program	unknown
5. Third party damage claim fund	\$5,000,000

Total = \$51,500,000 + \$500,000/yr.

Note: Total does not include several unknown cost items.

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Table 3 lists a summary of cost estimates for various mitigative measures.

IV. S-AREA DUMP

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The S-Area Dump, also known as the River Front Landfill, was purchased by Hooker on October 12, 1947 and operated until 1970. As can be seen in Figure 1, the site is bordered on the South by the Robert Moses parkway and the Niagara River into which two of its outfalls discharge (N Area and Area 4). The City of Niagara Falls water works filtration plant is situated to the East of the site; while Adams Avenue and N area (an additional piece of property owned by Hooker) are to the North and West respectively. The size of the site is approximately 17 acres.⁽¹⁾

According to old city maps, the S-Area site is situated in an area that was reclaimed from the Niagara River shoreline. Maps show that the river's previous shoreline was close to Buffalo Avenue, which is located to the north of the site (see Figure 1). Photographs taken in 1924 indicate that the site was underwater at that time. Since the site is now described as "above river level", it is believed to have been reclaimed prior to acquisition by Hooker. Furthermore, "excavated material was described as consisting of cinders, stone, slag, dirt and "carborundum abrasives", suggesting spoils typically used for waterfront reclamation projects."⁽²⁾ These materials would allow rapid migration of leachate into the River. Interviews with employees involved in landfilling operations conducted for an internal Hooker study indicated that groundwater at the S-Area site was almost always encountered at 4 feet below the existing grade.⁽³⁾ During these interviews, it was also indicated that the natural drainage of the site was disturbed as a result of construction activities for the Robert Moses Parkway:

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"Drainage was probably towards the river (north to south). J. Gibson recalled that the bulkhead applied by road crews during the construction of the Robert Moses Parkway (directly south of the landfill activities) acted like a seal, and resulted in water backup problems during new entrenching operations."(4)

The S-Area site was used for the land disposal of solid and liquid residues produced by the adjacent Hooker Niagara plant and by the Hooker Durez Division plant located in the nearby Town of North Tonawanda. These residues consisted of a number of organic chemical wastes including phenol residues from the plant at North Tonawanda. According to an internal Hooker document, it is believed that "most bulk liquid residues" (residues collected in trailers) were disposed of at the S-Area Landfill.⁽⁵⁾ The site has also been identified as "a staging area for drummed materials destined for Love Canal during 1947-1952."⁽⁶⁾

Although several inventories of buried and dumped residues have been made during the landfill's existence, only two of the 30 years the site was in operation are covered in detail. Moreover, discrepancies exist between information provided by the inventories and information supplied by interviews with employees involved in landfilling operation at the site. For example, a Hooker document states that "C-56 disposal at this site (S-Area) was not recalled by J. Gibson;" however a 1955 Residue Disposal Study conducted by Hooker indicates that C-56 was disposed of at the site.⁽⁷⁾

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An extensive inventory of toxic wastes believed to be disposed of at the S-Area site were identified through interviews with Hooker employees for a recent Hooker survey. No quantities were listed for these wastes. Wastes disposed at the S-Area site for 1957 and 1958 include large quantities of hazardous chemicals. An internal Hooker document indicates that "residues were always placed in pits or entrenchments" at this site. (8)

According to a Hooker's Internal Residue Disposal Study of November 4, 1955, disposal at the S-Area site and at the Hyde Park site (another Hooker landfill area) was carried out in the following manner;

"Residue is taken out of the plant in residue trailers and 55-gallon drums. All trailers are sent to the River Dump [S-Area] while the majority of drummed residues is buried in the Hyde Park Dump. A crane and bulldozer are on hand at the dump for digging holes and covering residues.

'At the River Dump separate pits are provided for each of three drummed residues; thionyl chloride, aluminum chloride and benzol. Two additional pits are dug for residue trailers containing (1) C-56 DDM, sulfide, sulfane and monochlorotoluene, and (2) p-dichlorobenzene, o-dichlorobenzene, monochlorobenzene, and tri-tetra blend.

'Two trailers, 1500 gallon and 2000 gallon capacities, are used in the plant for hauling residues. The entire operation of transporting, dumping and returning the trailer takes approximately 1 hour. A truck-load of drummed residues (18 drums) is removed from the plant, dumped and the truck returned in 1 1/2 to 2 hours. During the course of a week an average of 26 trailer-loads and 12 truckloads of drummed residues are removed from the plant." (9)

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This description of disposal, coupled with the S-Area site waste inventories would indicate that while some drummed residues were disposed at S-Area, the predominant amount of wastes disposed at the site were liquid residues which were first collected in trailers for hauling to the site where the liquid wastes were then dumped into pits or entrenchments that had been dug into the ground. After the liquids had been emptied from the trailers, the trailers were returned to the point from which they had embarked.

This description of the disposal of liquid residues at the S-Area site is corroborated in an eyewitness report made by Elliot Lynch, a chemist at the City of Niagara Fall's water treatment plant located adjacent to the site. In 1958, while working at the water treatment plant, he observed the disposal practices at the S-Area site. Photographs taken by Mr. Lynch verifying these dump practices are included as Figures 4 through 7. In an interview with Mr. Lynch, he reported that wastes were routinely disposed of at the site by the emptying of liquid wastes from trailer trucks into trenches which were excavated below grade. In addition, he stated that some wastes were transported in drums which were then rolled into the ditches and punctured enabling the contents to drain. This documentation leaves no doubt as to the ease with which contaminants could drain directly in the Niagara River.

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In a Hooker waste disposal survey, additional information was provided regarding disposal practices at the S-Area Site and related problems:

"The Aluminum and Antimony Chloride residues have been disposed of by hydrolysis in a water filled hole at the river dump when the wind is favorable. They contain pyrophoric metal particles which burst into flame when exposed to air as well as the chlorides which give off copious quantities of HCl in contact with water. It is not known what can be done with these; however, since the processes are to be down for several months, they are not presently a problem." (10)

Closure of the S-Area site appears to have occurred in approximately 1970, although a gradual phase-out of activities at the site began in the 1960's. As stated in a 1978 internal Hooker document, one of the primary reasons for the phase-out and closure of the site was the increased visibility of the site to the public resulting from construction of the Robert Moses Parkway which began in the late 1950's:

"...the high visibility caused by the construction and subsequent use of the Robert Moses Parkway, resulted in a reduction in activity at this disposal site..." (11)

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Hooker's 1958 waste disposal survey conducted to determine alternatives to disposal at the S-Area or River Front Dump states:

"Residue Disposal Following the Abandonment of the
River Front Dump

We have been asked to summarize the situation with which the Niagara Plant will be faced in regard to residue disposal when the proposed Niagara Parkway along the river front is completed. It is generally conceded that general face-lifting of the South side of the plant will be necessary before that view is open to public examination. One aspect of this which will no doubt be considered necessary is the abandonment and covering of the river front dump.

Methods for disposal of numerous residues and trash now dumped there must be studied and be ready for use at that time. Thionyl Chloride, Sulfur Monochloride and Aluminum Chloride residues cannot now be disposed of at the river because of the risk of interfering with construction work already in progress. Disposal methods for these residues are already assigned to various groups and proposals should be forthcoming soon."⁽¹²⁾

Disposal at the S-Area site was phased out gradually:

"While a phase out of organic residue disposal was occurring throughout the 1960's, sulfur chloride residues, particularly thionyl chloride, continued to be landfilled here until approximately 1967."⁽¹³⁾

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The last reported occurrence of disposal at the site in 1970 involved approximately 2500 drums of phosphorus pentachloride which were "landfilled in 2 pits dug at the S-Area site approximately 8 years ago. Plastic bags were placed over the drums and a lime buffer surrounded the drums."(14)

An internal Hooker document states that "it is not believed that this site was monitored through site life or after closure."(15) As a result of improper monitoring and operations management practices coupled with the poor location of the S-Area site, wastes which have leached from the site into the Niagara River may have also entered the public water supply via the City's water intakes or tunnel structure located near the site. This possibility and the possibility of other unspecified environmental problems resulting from the site are indicated in an internal Hooker document:

"The S-Area site was referenced by NYSDEC during the Mirex sampling program as offering the potential of leaching into the river and the City of Niagara Falls water intakes (memo - B.J. Carreno to F.T. Olotka 10/5/76). However, it is felt that regulating agencies do not have an idea of the extent of operations carried on at this site."(16)

The reference to possible contamination of the City of Niagara Fall's water intakes may be related to an incident occurring in

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1978. In the summer of 1978, divers were hired by the City of Niagara Fall's Municipal Water Treatment Plant to investigate sediments which had accumulated in its water intake structure located 200 yards east of the S-Area landfill and 20 feet below the ground surface.

The Niagara Municipal Water Treatment Plant (rated at 64 mgd) was originally constructed in 1911 with significant modifications performed in 1952 to enlarge the plant. The water intake tunnels which were constructed in 1911 with extensions constructed in 1952 were placed through fractured dolostone beneath the Niagara River.

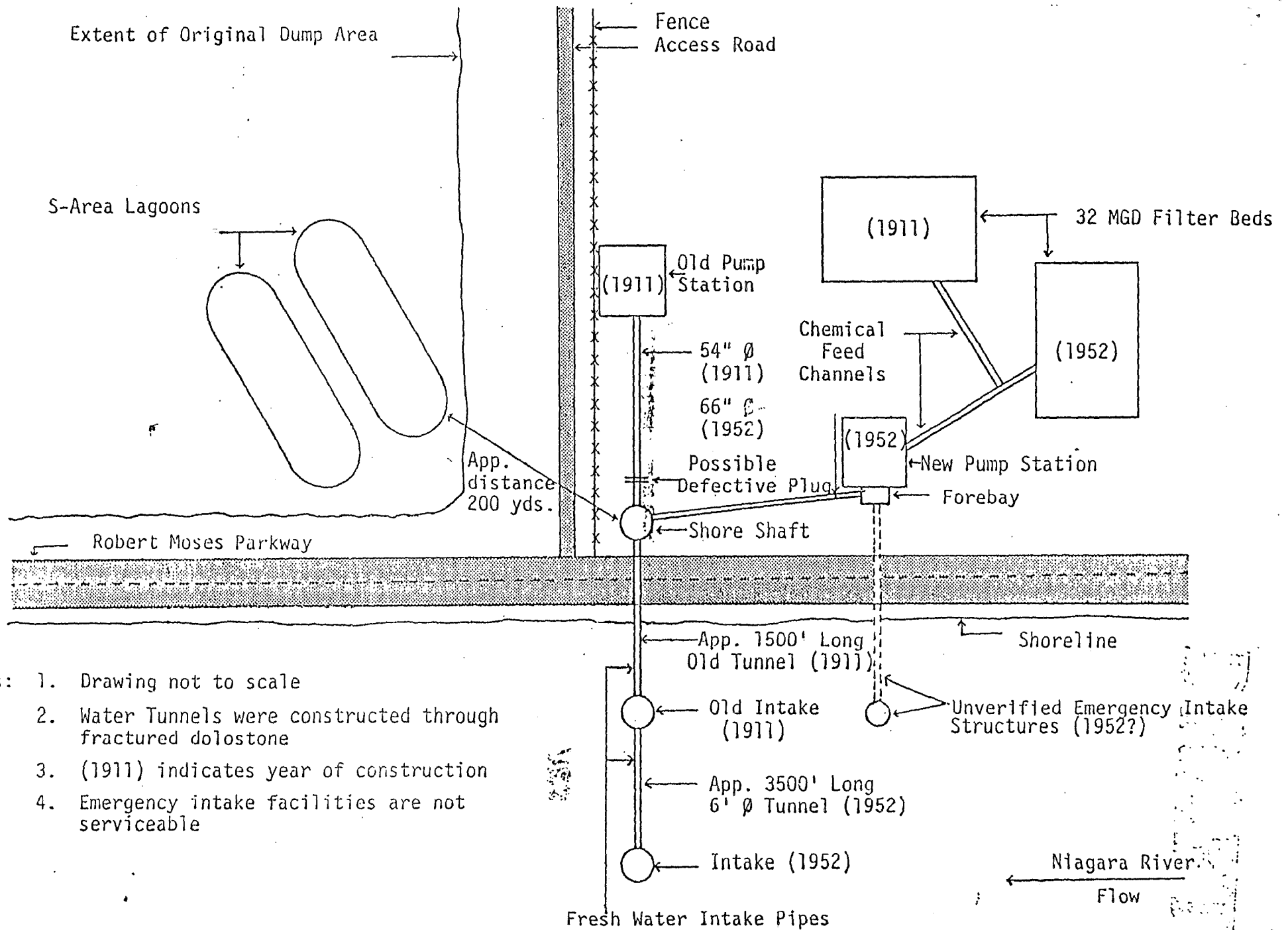
In 1978, samples of the water were taken at the intake structure, the stone shaft, the forebay, the chemical feed channels, and from the finished water. Additional samples were taken at the filter beds and from the mud balls. As a result of this investigation, some of these water samples were found to be contaminated with sediments containing a number of substances which are also found in the S-Area site and could possibly be produced by other plants upstream.

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Efforts to mitigate the immediate contamination problem included removing the sediments in the bottom of the pipes, in the water intake line from the river, and by plugging up an old water line leading from an abandoned pump station (see Figure 8). Costs which have been incurred by the City of Niagara Falls, to date, for removing the accumulated sediment and plugging the abandoned line are estimated at \$147,000. There are additional plans to reclean and resample these areas next Spring in order to ensure that all contaminants have been removed.

It remains unclear whether the source of these contaminants was from one or more plants upstream or could have resulted from leaching of contaminants from the adjacent S-Area site into the vicinity of the water treatment plant. [REDACTED] regular analytical program to examine the quality of raw water at the intake. Finished water is sampled and analyzed for conventional pollutant parameters [REDACTED]. Furthermore, the treatment plant does not have the instrumentation to perform more sophisticated analyses to identify such organic constituents as chlorinated hydrocarbons, although a program to measure trihalomethanes and to assess the operations of the plant is currently being performed by the firm of Malcolm Pirnie. The treatment plant does not currently utilize activated carbon treatment, although they periodically dose carbon to combat seasonal taste and odor problems. An emergency intake structure is reported to have been constructed in 1952, but plant personnel are unable to verify the location of this structure. Recent attempts have been made to activate this line, but they have been unsuccessful, to date.

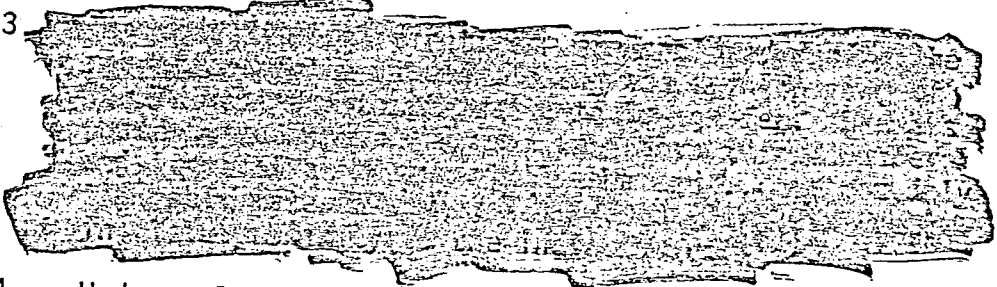
FIGURE 8



- Notes:
1. Drawing not to scale
 2. Water Tunnels were constructed through fractured dolostone
 3. (1911) indicates year of construction
 4. Emergency intake facilities are not serviceable

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The following key points summarize the problems posed by the S-Area site:

1. The site itself is situated in a very poor location for disposal of hazardous wastes, in view of its proximity to the Niagara River, the drinking water intake pipe with the River, and the municipal water treatment plant adjacent to the site.
2. No provisions were made to secure the site, so as to prevent the escape of pollutants into local water resources.
3. 
4. Hydrogeologic conditions in this filled area are indicative of a ready pathway for wastes and contaminated leachate from the dump to the Niagara River.
5. This escape of wastes from the site may be related to past and possible future problems of contamination in the near-by public water intake tunnel and treatment plant.
6. Whether or not the intake tunnel contamination and S-Area discharges are linked, leachate from this site can continue to contaminate the Niagara River, may threaten downstream water uses, and will ultimately flow into Lake Ontario until the site is adequately secured.
7. The bulkhead required for the construction of the Robert Moses Parkway may have drastically altered previous groundwater flow patterns at the site.

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Options for measures which could be undertaken to secure the site are discussed below. These include isolation by using a grout or clay barrier curtain to reduce the spread of leachate, and the removal of material to a secure landfill site. This would also entail the removal of the S-lagoons currently situated on top of the S-Area landfill and used by Hooker to treat liquid wastes. An additional cost for encasing the old water tunnel with PVC pipe has been developed in the event it is required to protect the water supply from materials entering through the fractured dolomite. Removal of wastes would provide the highest level of long-term environmental protection but such a measure would require enormous expenditures. The clean-up approach that may be required by regulatory authorities is not presently known.

Because complete records were not kept for the wastes dumped in the S-Area, an estimate must be used to calculate the extent of the contaminated area and the associated volumes of material. For purposes of this estimate, dimensions were scaled from drawings showing the area to be approximately 300 feet wide by 400 feet long. Although these dimensions would result in a surface area of approximately 3 acres, Hooker documents indicate that this dump area is 17 acres. The height of this area is assumed to be 10 feet (both above and below the original ground surface). The two S-Area lagoons, which are currently being used by Hooker to treat liquid wastes, are situated above the former dump area. The dimensions of the lagoons are assumed to be 200 feet wide, 300 feet long, and 15 feet high. Bedrock is assumed to be 20 feet below the original grade at the site. Estimated costs of various remedial measures are presented in Table 4.

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A PVC pipe may be required to line the inside of the old municipal water tunnel to eliminate any possible migration of hazardous material. PVC pipe was used upstream in Lockport, New York, to protect the municipal water intake line which may have corroded due to discharges from the Hooker facility at Durez. The costs for this line were approximately \$400,000 paid by the Lockport Water Treatment Plant.

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TABLE 4

ESTIMATED CLEANUP COSTS ASSOCIATED
WITH THE S-AREA SITE

<u>Activity</u>	<u>Costs</u>
1. Niagara River testing, monitoring, and treatment program	unknown
2. Reline Niagara Falls fresh water intake pipe	\$300,000
3. Relocation and construction of treatment lagoons	unknown
4. Emergency mitigative measures	
(a) cut-off barrier	\$1,000,000
(b) clay cover, grading, and surface water runoff control	\$1,000,000
(c) annual perpetual care program (inspection, replacement of cover, monitoring, leachate treatment, security)	\$500,000/yr.
5. Permanent mitigative measures	
(a) Transfer lagoon wastes	\$220,000
(b) Excavate highly contaminated soils	\$1,450,000
(c) Excavate contaminated soils to bedrock	\$2,260,000
(d) Transportation to hazardous waste disposal site	\$3,280,000
(e) Secure landfilling of contaminated soils	\$23,900,000
(f) Random fill material	\$1,640,000
(g) Site closure and post closure monitoring program	unknown
6. Third party damage claim fund	\$5,000,000
Total = \$40,050,000 + \$500,000/yr.	

Note: Total does not include several unknown cost items.

I. Introduction -- References

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- T7 14077 1. Letter from J. Czapla/Hooker to John E. Iannotti/NYSDEC, December 19, 1977. [#] T7 25 OK
- T7 340 2. Attachment to Katona Document 075006, 102nd Street Landfill: "Materials Located at 102nd Street Site", August 25, 1978. ^{Derwinski - OK} T7 #37
- T7 188 3. Katona Document 075004, Summary: Hyde Park Landfill, August 25, 1978. ^{" - OK} T7 #31 (77)
- DEC 958 4. Internal NYSDEC Memorandum from Mr. Wilkie to Mr. Rich, Re: Briefing Document on Hooker Chemical Corporation's HP Disposal Site, June 30, 1978. ^{OK DEC 9}
- T7 443 5. Katona Document, S-Area Landfill, August 23, 1978; also cf. photos taken in 1958 by Elliot Lynch, Chemist, City of Niagara water treatment plant. ^{Derwinski - OK} T7 #44
- T7 210 6. Attachment to Katona Document 075004, Hyde Park Landfill: "Bibliography;" excerpt of letter from J. Czapla to R. Bowman, F. Olotka, and B. Carreno, September 6, 1977. ^{T7 A} 31A
- T7 26 7. Hooker Waste Disposal Sites Survey from period 1930 to 1975, Niagara County to John Iannotti/Interagency Task Force on Hazardous Wastes from Jay A. Cull/Program Manager, Special Environmental Situations, Hooker, November 17, 1978. ^{OK T7 B}
8. op. cit., Wilkie Memorandum, NYSDEC, June 30, 1978.
9. Niagara Gazette, "200 Chemicals found in Canal," November 22, 1978. ^{OK}
10. U.S. EPA Criterion Document: Dioxin. ^{OK}
11. Hooker Internal Memorandum from M.R. Zavon, M.D., to Russ Bowman, March 28, 1977. ^{OK}
12. Letter from Dr. Arthur C. Upton/Director, National Cancer Institute to Doug Costle/U.S. EPA Administrator, April 10, 1978. ^{OK}
13. Environment Reporter, "Current Developments," August 11, 1978, p. 581. ^{OK}
- OK 14. Calspan Corporation, Report #ND-6097-M-1, Characterization and Abatement of Groundwater Pollution from Love Canal Chemical Landfill, Niagara Falls, New York, August, 1977. (Prepared for the City of Niagara Falls). ^{OK}
- OK 15. Resource Conservation and Recovery Act (RCRA), Section 3004, Draft Regulations, November 21, 1978, page 95. ^{OK}
16. op. cit., Calspan Report.

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II. Hyde Park -- References

1. " ~ 15 acres": Hooker Document 977-399, Site Investigation and Monitoring Program -- Hyde Park Landfill, June 1978; " ~ 18 acres": NYSDEC Information Dossier 78.13, Hyde Park Chemical Landfill, October 17, 1978; and "25 acres": Attachment to Katona Document, S-Area Landfill, Memorandum from W.O. Dietsche to J. Wilkenfeld, ~~T7449~~ ^{Review Report given to State DE} ~~T7446~~ - August 6, 1957, Table 5 - Real Estate Costs. OK.
2. Katona Document 075004, Summary: Hyde Park Landfill, August 25, 1978. ~~OK~~ 31A
3. Ibid.
4. Ibid.
5. Letter from J. Czapla/Environmental Engineer, Hooker Specialty Chemicals to J. Beecher/ Environmental Engineer, NYS Department of Environmental Conservation, Buffalo, New York, June 6, 1978. OK
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6. Niagara Gazette, "Tons of Dioxin Agent in Canal," November 10, 1978; "Canal Dioxin Proof Could Take Months," November 11, 1978; and "Lethal Nature of Dioxin Calls for Caution," November 12, 1978. OK
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7. Attachment to Katona Document 075004, Summary: Hyde Park Landfill, "Inventory of Materials at Hyde Park Site." OK
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8. Letter from A.W. Chambers, Jr./Associate Counsel, Hooker to G.A. Shanahan/U.S. EPA, Region II, May 21, 1976. OK DEC-A
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9. NYSDEC news release Friday, March 31, 1978, "Berle Lifts Mirex Possession Ban". OK
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10. Letter from J. Czapla/Environmental Control, Hooker to Robert Matthews/Director - Department of Utilities Niagara Falls Water Treatment Plant, October 5, 1978. OK
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11. op. cit., Katona Document 075004. OK
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12. Ibid. OK
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13. Attachment to Katona Document 075004, Summary: Hyde Park Landfill, "Bibliography." OK
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14. op. cit., NYSDEC Information Dossier 78.13. OK
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15. Internal NYSDEC Memo from Mr. Goddard to Mr. Collins, "Hazardous Waste Management Concerns -- Hooker Chemical Company," March 24, 1978. OK
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- EC-5W 16. Attachment to Letter from J. Czapla/Environmental Engineer, Hooker Specialty Chemicals to J.C. McMahon/Regional Engineer for Environmental Quality, NYSDEC, Buffalo, January 18, 1978; and Letter from J. Czapla/Hooker Specialty Chemicals to R. Matthews/Director, Department of Utilities Niagara Falls Treatment Plant, October 5, 1978. OK
- DEC 9 92
- OK 17. op. cit., NYSDEC Information Dossier 78.13. OK
- OK 18. op. cit., Attachment to Katona Document 075004, "Bibliography." OK
- OK 19. Letter from J. Czapla/Hooker to J.C. McMahon/NYSDEC Regional Engineer, January 18, 1978. OK
- EC9-179 20. Letter from J.C. McMahon/NYSDEC Regional Engineer to J. Czapla/Hooker Specialty Chemicals, September 22, 1978. OK
- OK 21. Ibid.
- OK 22. Letter from James A. Dunlop, M.D., to Francis J. Clifford/Commissioner of Health, Niagara County Department of Health, October 6, 1978. OK
- gum to DEC 23. Conestoga-Rovers and Associates, "Site Investigation and Monitoring Programme -- Hyde Park Landfill," June 1978, 977-399. ?
- T7 116 24. Conestoga-Rovers and Associates, "Budget Requirements, Hyde Park Landfill," August 1978, 977-399, page 14. ?
- T7 189 25. Summary Document, confidential, August 25, 1978, Hyde Park Landfill 1953-1978, page 2, and Memo, Letters, Reports, etc. pertaining to Hyde Park Dump, August 16, 1978, page 22. OK T7 31A
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III. 102nd Street Dump -- References

- T7 466 1. Attachment to Katona Document, S-Area Landfill, Memorandum from W.O. Dietsche to J. Wilkenfeld, August 6, 1957, Table 5 - Real Estate Costs. OK
- DEC 9 - 68 2. Internal NYSDEC Memorandum from Mr. Goddard to Mr. Collin, "Hazardous Waste Management Concerns -- Hooker Chemical Company," March 24, 1978. OK
- T7 349 3. Katona Document 075006, 102nd Street Landfill, August 23, 1978. OK T7 #37
OK 4. Ibid.
- T7 340 5. Attachment to Katona Document 075006, "Materials Located at 102nd Street Site," August 25, 1978. OK
OK 6. op. cit., Katona Document 075006.
OK 7. op. cit., Attachment to Katona Document 075006, "Materials Located at 102nd Street Site."
OK 8. op. cit., Katona Document 075006.
OK 9. Attachment to Katona Document 075006, "Bibliography." OK
- T7 402 10. Attachment to Katona Document 075006, Internal Hooker Memo from B.J. Carreno to W.E. Fitzgerald, April 24, 1974. OK
OK 11. op. cit., NYSDEC, "Goddard Memorandum".
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- T7 299 13. Letter from J.C. McMahon/Regional Engineer for Environmental Quality NYSDEC to F.T. Olotka/Manager - SHEC, Hooker Specialty Chemicals Division, February 9, 1977. OK T7 #38
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- 47 0044 14. Internal Hooker Memorandum from G.M. Dworzanski to F.T. Olotka Re: 102nd Street Landfill, January 6, 1977. OK
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15. Letter and Report from J. Czapla/Environmental Engineer, Hooker to J.C. McMahon/Regional Engineer for Environmental Quality, NYSDEC, January 18, 1977. OK
- EC 00212 16. Report from J. Czapla/Environmental Engineer, Hooker to J.C. McMahon/Regional Engineer for Environmental Quality, NYSDEC, May 26, 1977. OK
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- DEC-SW 17. Letter from T.R. Johnson/Manager -- Operations Support, Hooker to G. Shanahan/U.S. EPA Region II, July 13, 1978. OK

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III. 102nd Street Dump -- References (continued)

18. op. cit., NYSDEC, "Goddard Memorandum."
19. Ibid.
20. op. cit., Letter from T.R. Johnson, July 13, 1978.
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