RECORD OF DECISION

Gill Creek Sediments Removal Project

Site No. 932013

Prepared by:

New York State
Department of Environmental Conservation

March 1992

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RECORDS OF DECISION
FOR GILL CREEK - NIAGARA FALLS #932013

PREPARED BY:

New York State Department of Environmental Conservation

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DECLARATION STATEMENT - RECORD OF DECISION

Gill Creek Remediation by E.I. du Pont de Nemours and Company and Olin Corporation

Site Code: 932013

Classification Code: 2

STATEMENT OF PURPOSE

This Record of Decision sets forth the selected Remedial Action Plan for Gill Creek. The Remediation Plan was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the New York State Environmental Conservation Law (ECL). The selected remedial plan complies to the maximum extent practicable with the National Oil and Hazardous Substance Pollution Contingency Plan, 40 CFR Part 300, of 1985.

STATEMENT OF BASIS

This decision is based upon the Record of the NYSDEC for the Gill Creek site and upon public input to the Remedial Action Plan proposed by Du Pont and Olin. A copy of the pertinent documents is available at the Niagara Falls Public Library, 1425 Main Street, Niagara Falls, New York and at the New York State Department of Environmental Conservation, 270 Michigan Avenue, Buffalo, New York. A bibliography of those documents included as part of the Record of the NYSDEC is contained in Appendix B.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedial action plan will control the migration of contaminants from Gill Creek and, consequently, will provide for protection of environment and of public health. It is technically feasible and it complies with statutory requirements. Briefly, the selected remedial action plan includes the following:

* The sediments in Areas 1, and 3 in Gill Creek will be mechanically removed to the top of bedrock by dewatering the creek. A thin layer of contaminants in Area 2D will be dredged. Contaminated sediments will be disposed of in a secure landfill.

* A monitoring plan will be established to assess the effectiveness of the remediation plan. The plan consists of sampling and analysis of any accumulated sediments from the remediated areas for a period of five (5) years subsequent to remediation. It can be extended to the (10) years should results of analyses warrant continuance.

DECLARATION

The selected Remedial Action Plan is protective of human health and the environment. The remedy selected will meet the substantive requirements of the Federal and State laws, regulations and standards that are applicable or relevant and appropriate to the remedial action. The remedy will satisfy, to the maximum extent practicable, the statutory preference for remedies that employ treatment that reduce toxicity, mobility or volume as a principal element. This statutory preference will be met by eliminating the mobility of contaminants which currently have a direct pathway of migration to the Niagara River. All contaminated sediments will be removed and either disposed at an approved RCRA/TSCA landfill or stored for subsequent treatment and/or disposal according to EPA land ban requirements.

Michael J. O'Toole for

Edward O. Sullivan
Deputy Commissioner
Office of Environmental
Remediation
New York State Department of
Environmental Conservation

3/30/92

STATE OF NEW YORK
DEPARTMENT OF HEALTH

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March 27, 1992

Mr. Michael J. O'Toole, P.E., Director
Division of Hazardous Waste Remediation
NYS Dept. of Environmental Conservation
50 Wolf Road
Albany, New York 12233

RE: Proposed Remedial Action Plan &
Record of Decision
Gill Creek Sediments Removal Project
(Site ID #932013)
Niagara Falls, New York

Dear Mr. O'Toole:

My staff have reviewed the Proposed Remedial Action Plan (PRAP) and the March 1992 Record of Decision (ROD) for the Gill Creek Sediments Removal Project (Site No. 932013) in Niagara Falls, New York. The PRAP and ROD's remedial alternative calls for the removal of creek sediments from Areas 1, 2D and 3 and restores those areas to a productive aquatic environment. We concur with the selected remedial alternative and find it protective of human health.

My staff will continue to work with your Department's Region 9 staff to ensure that an adequate Health and Safety Plan is developed and implemented by the responsible parties, DuPont and Olin Chemical companies.

Should you have any questions please contact me or Mr. Al Wakeman at 458-6310.

Sincerely,

Allison C Wakeman
for
G. Anders Carlson, Ph.D.
Director
Bureau of Environmental Exposure
Investigation

jlf/20840695

Record of Decision
Gill Creek - Niagara Falls (932013)

Section 1 - Site Location & Description

Gill Creek is located in the City of Niagara Falls. Before it joins the Niagara River, it traverses the Du Pont Niagara Plant, the Olin Buffalo Avenue Plant and the Robert Moses Parkway (RMP) (Figure 1).

The study area is divided into three major areas. Area 1 is between the Niagara River and Staub Road; Area 2 is further divided into Area 2 upstream (2U - covers the area adjacent to Olin) starts at Adams Avenue and ends at Buffalo Avenue and Area 2 downstream (2D-covers the area adjacent to DuPont) starts at Staub Road and ends just south of Adams Avenue; and Area 3 is located in and around Adams Avenue (Figure 2). Access to the creek is restricted by a chain link fence and posted warning signs from Buffalo Avenue to the Niagara River. The depth of the creek varies from very shallow around Buffalo Avenue to five to eight feet deep around the mouth of the Niagara River.

Section 2 - Site History

The contamination found in Gill Creek has resulted from the chemical operations at both the Du Pont and Olin plants. The Olin Buffalo Avenue Plant has been a manufacturing facility since 1897. Chlorine and caustic soda were produced from rock salt. In addition, several organic chemicals, including trichlorobenzene, trichlorophenol, and hexachlorocyclohexane (gamma BHC) were manufactured between 1950 and 1956. The Du Pont Niagara Plant has been in operation since 1898. Some of the past chemical operations at the plant include the manufacturing or use of tetrachloroethene, trichloroethene, vinyl chloride and polychlorinated biphenyl (PCBs) as Arochlor 1248.

There are several mechanism by which these chemicals may have found their way into Gill Creek: industrial spills, leakages from the plant storage facilities, groundwater seepages and the explosion at the BHC facility in Olin's Plant 2 in 1950.

In 1981-82, the portion of Gill Creek between Buffalo Avenue and RMP was jointly cleaned by Olin and Du Pont. The clean up operation consisted of excavation and removal of contaminated sediments to the top of the bedrock surface in the creek bottom. To accomplish this, the creek was dewatered between Buffalo Avenue and a temporary dam installed just upstream of the RMP. Contaminated sediments were removed and disposed of off-site in a secure landfill.

In 1988, a second phase of Gill Creek investigation was undertaken. This was prompted when very high levels of PCBs were detected in sediment and in various aquatic plants in the mouth of Gill Creek by the New York State Department of Environmental Conservation (NYSDEC) and the Ontario Ministry of the Environment. A supplementary sediment and surface water investigation was carried out in 1990 to define the contaminated areas in the creek bed and to determine how the sediments are transported in the creek. This Remedial Investigation (RI) included a health and environmental risk assessment. It also included bench scale studies to determine the treatability of creek sediments.

Section 3 - Current Status

The Site Feasibility Study (FS) was submitted to the NYSDEC in August 1991. The results and findings of the FS are outlined below.

A. Sediment Contamination

The likely source of sediment contamination in the Creek is 1) manufacturing process wastes and 2) material handling losses over the 100 years of chemical processing at the plant sites.

A number of organic and inorganic compounds are present in Gill Creek sediments (Table 1). Among the inorganics, mercury contamination in sediment ranges from non-detect to 274 parts per million (ppm). The list for organic compounds present in sediments includes 1,2 dichloroethene, tetrachloroethene, vinyl chloride, and trichloroethene. Among the organics, PCB-1248 (10,700 ppm) is present in the mouth area (Area 1). In general, heavy contamination is present in and around the mouth area and in an area around the Adams Avenue bridge (Area 3). There is also a veneer of contaminated sediment between Adams Avenue and Staub Road (Area 2D).

B. Groundwater

Groundwater in the vicinity of the site is encountered in both the overburden and in the bedrock (Lockport Formation). It is contaminated with similar chemicals. Overburden groundwater flow around Gill Creek is toward the creek; however, at short distances from the creek, the flow direction varies. The flow in bedrock is generally toward the north, north easterly direction, and is influenced by the Olin production well and the Falls Street Tunnel (Figure 1).

Du Pont has recently completed construction of an overburden groundwater remediation system which collects, pumps, and treats contaminated groundwater. When that pump and treat system achieves steady state groundwater flow conditions, it is anticipated that contaminant flow into the creek via groundwater will be substantially reduced. The system consists of 22 recovery wells across the plant site.

C. Geology

There is a significant amount of fill present along the banks of Gill Creek. Fill material is known to have been disposed along the shoreline since 1895. In addition to fill, the area soil contains alluvium, glaciolacustrine deposit and till as seen in Table 2.

The overburden is underlain by a sandstone dolomite which constitutes the Lockport Formation. In the vicinity of Gill Creek, the bedrock surface generally slopes to the south towards the Niagara River and is fractured both laterally and vertically. Through these fractures, contaminated groundwater is known to have travelled into deeper zones of the Lockport formation.

Section 4: Risk Assessment

Human Health and Environmental Risk assessments, were undertaken to determine the impact of chemicals present in the Gill Creek sediments. Table 3 lists the seven possible remedial actions which were evaluated in the Health and Environmental Risk assessments. The results of the Health Risk Assessments are shown in Table 4.

Seven alternative remedial options, differing only with respect to the areas considered for remediation, were evaluated in terms of eliminating or reducing to an acceptable level the concentration of contaminants in the areas of concern.

In evaluating the human health and environmental risk, it was assumed that exposure would occur due to 1) chemicals dissolved in water and 2) sediments suspended in the water column. The primary health risk factor is associated with consumption of contaminated fish (Table 4). The environmental risk is associated with the potential impact of compounds present in sediments on fish propagation and bioconcentration of contaminants in the water column (Table 5).

Section 5 - Enforcement Status

The Gill Creek remediation project is being conducted persuant to an Order on Consent. The Order became effective on March 20, 1991 and covers all aspects of the project from study to the final remediation. However, for the Consent Order to be effective for remedial design and remedial action, the companies (Olin and Du Pont) must be in agreement with the remedial option selected by the Department. The companies and the Department are in tentative agreement with the proposed selected remedy; therefore, the project will automatically move to the design phase when the remedial action plan becomes final in the Record of Decision (ROD).

Section 6 - Goals of the Remedial Action

1. Minimize the potential for both the short and long-term human exposure to chemicals in the creek sediments.

2. Reduce to the maximum extent practicable the exposure of chemicals to aquatic environment by removing sediments in the creek, therefore, restoring the affected area to a productive aquatic environment.

3. Minimize and/or stop the potential for migration of chemicals/sediments to the Niagara River.

4. Permanently treat and/or dispose of sediments in a manner consistent with all State and Federal regulations.

5. Restore the site to a condition allowing productive use in accordance with local zoning laws and with minimal site restrictions or institutional controls.

Section 7 - Description and Evaluation of the Primary Alternatives

The remedial alternatives were analyzed with respect to the seven criteria presented in Technical and Administative Guidance Memorandum (TAGM) HWR-90-4030. They are:

- Compliance with New York State Standards, Criteria and Guidelines (SCGs - See Table 10).
- Protection of human health and the environment.
- Short-term impacts and effectiveness.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility and volume.
- Implementality
- Cost

As a result of the RI, the companies recommended the remediation of sediments in Areas 1 and 3. Remediation of Area 2 was not recommended due to the relatively small mass of contamination. However, due to the levels (concentrations) of contaminants, Area 2 was included in the FS for further evaluation.

Technologies including containment, excavation, treatment and incineration were evaluated in the FS for the site remediation. These alternatives were evaluated to determine those that are technically feasible, protective of human health and the environment, and cost effective. The selected alternatives are described below.

Primary Alternative 1: "Containment" consists of leaving sediments in place and covering them with an impervious cap to isolate the sediments from the water flowing in the creek.

Primary Alternative 2: "Source Removal" consists of the physical removal of sediments, either by excavation or dredging. Fine grained sediments with some gravels and cobbles would be removed from Gill Creek. During the removal, some resuspension of sediment and volatilization of contaminants would occur. Temporary surface water and groundwater controls would be required with this alternative.

Primary Alternative 3: "Sediment Treatment Technologies" were identified and screened for the most effective and feasible technologies. They are:

- Solvent Extraction (BEST Process)
- Chemical dechlorination (KPEG process)
- Thermal Treatment
- Off-site Landfill (TSCA/RCRA permitted)

Water treatment technologies were also identified and screened along with the sediment treatment technologies. Water treatment will be necessary for groundwater that may seep into the creek during sediment excavation and for water which could be generated when sediments are filter pressed to remove excess water prior to disposal.

In accordance with HWR-90-4030, eleven preliminary alternatives were evaluated on the basis of being able to meet the remedial action objectives (see Table 6). Area 2 remediation was also considered in terms of 1) no action, 2) biomonitoring, and 3) veneer cleanup. Out of the eleven preliminary alternatives for remediation, three alternatives were dropped in the initial screening. In the end, a total of 24 permutations for remedial action for Areas 1,2, and 3 were considered (Table 7). Before discussing the remediation alternatives in detail, it should be pointed out that the "containment" alternative was ruled out as being ineffective for the following reasons:

1. A sediment cover composed of liner/concrete may not be uniform if installed under water.

2. Any leaks in the cap would allow the creek water to seep through the contained sediments, and allow contaminated water to seep back into the creek.

3. The concrete/liner would not provide protection of the groundwater.

Because of these difficulties, the "containment" option was not considered further.

Detailed Analysis of Alternatives

Alternatives 1A - 4C will require the construction of various dams in Gill Creek and the Niagara River, the diversion of flow in Gill Creek and the mechanical removal of sediments from Areas 1 & 3 (see Figures 3, 4 and 5).

1. Alternatives 1A, 1B and 1C are alike, in that each calls for off-site land disposal of excavated sediments.

Alternative 1A - Mechanical Excavation for Areas 1 & 3, on-site water treatment, off-site land disposal, no action for Area 2.

Short-Term Effectiveness: It will take minimal amount of time for excavation. Some volatilization of organics and mercury may occur during excavation, however, any low level air emissions will be of short duration. Off-site disposal of sediments has a minor risk associated with possible transportation accidents.

Long-Term Effectiveness: Mechanical excavation will effectively remove contaminated sediments, therefore, the need for future remedial activities for those areas is not anticipated.

Reduction of Toxicity, Mobility and Volume: The toxicity of sediments will not be reduced. However, the sediments will be permanently removed from the creek bed. Mechanical filter pressing prior to transportation will provide some reduction in volume. The wastewater generated from sediment filtration will be treated at the on-site treatment plant where organics and solids in water will be removed before the effluent is discharged to the Publicly Owned Treated Works (POTW).

Implementability: Mechanical excavation of sediments is a simple technique and equipment to do this is widely available. This approach will require dewatering of the creek by way of building dams in the creek bed. After dewatering the creek, groundwater seepage will need to be controlled throughout the remediation. Wastewater generated during the remediation is proposed to be treated at the on-site treatment plant.

Compliance with SCGs: This alternative would meet all of the SCGs.

Protection of Human Health and the Environment: Since all contaminated sediments that can be removed will be removed from the creek bed, maximum long term protection of human health will be achieved and the environmental risk will be minimized. However, the handling of sediments could result in low level short term air emissions and the accidental release of sediments during transportation is possible. There is a low long-term risk to the environment associated with disposal at a secure landfill.

Cost: Approximately $6.9 million

Alternative 1B - Mechanical Excavation for Areas 1 & 3, on-site water treatment, off-site land disposal, Biomonitoring for Area 2.

This alternative is the same as Alternative 1A expect that biomonitoring of Area 2 is included. Area 2 contains a veneer of contaminated sediments and its impact on the benthic organisms was studied in the environmental risk assessment. Although the risk was determined to be lower than the EPA's proposed acceptable risk level, long term monitoring (once every five-year period for a total of ten (10) years) of benthic organisms in the creek and in the Niagara River would be appropriate.

Cost: Approximately $7.0 million.

Alternative 1C - Mechanical Excavation for Areas 1&3, on-site water treatment, off-site land disposal, Biomonitoring for Area 2 U, Suction dredging for Area 2 D.

This alternative is similar to Alternative 1B except that Area 2D will be included in the sediment removal. The thin layer of sediment redeposited in this area contains relatively high levels of contaminants. Removal of this material will provide an additional degree of protection beyond alternatives A and B.

Cost: Approximately $7.2 million.

2. Alternatives 2A, 2B and 2C are alike in that each calls for off-site incineration of excavated sediments.

<u>Alternative 2A - Mechanical excavation for Areas 1 and 3, on-site water treatment, off-site incineration, no action for Area 2.</u>

Sediment incineration achieves a high degree of reduction in contaminant toxicity and mobility. However, there is a potential short-term health risk of inhalation, ingestion and/or dermal exposure during handling and off-site transportation. There is also the potential for accidental release of excess flue gas emissions. In all other aspects, this alternative is similar to Alternative 1A. Due to the presence of dioxin, it is unlikely that an incinerator will be found that would accept this material. The cost of incineration is substantially higher than land disposal. The incinerator would need EPA approval for burning PCBs and other hazardous constituents.

Cost: Approximately $15.5 million.

Alternative 2B - Mechanical Excavation of Areas 1 & 3, on-site water treatment, off-site incineration, biomonitoring for Area 2.

This alternative is similar to Alternative 2A with addition of biomonitoring of Area 2.

Cost: Approximately $15.7 million.

Alternative 2C - Mechanical Excavation for Area 1&3, on site water treatment, off-site incineration, biomonitoring of Area 2C, suction dredging for Area 2D.

This alternative is similar to Alternative 2B in that biomonitoring is also included, but area 2D would also be remediated.

Cost: Approximately $16.1 million

3. Alternatives 3A, 3B and 3C are alike in that each calls for on-site incineration of excavated sediments.

Alternative 3A - Mechanical excavation for Areas 1&3, on-site incineration, on-site water treatment, no action for Area 2.

This alternative is similar to Alternative 2A, however, on-site incineration instead of off-site incineration is proposed. Obtaining approval would require obtaining EPA permission for trial burns. Full scale incineration would also require EPA approval. These approvals will add time to the project. There is a potential for accidental release of excess flue gas emissions with this alternative. The cost of incineration is substantially higher than land disposal.

Cost: Approximately $14.9 million.

Alternative 3B - Mechanical excavation for Areas 1&3, on-site water treatment, on-site incineration, biomonitoring for Area 2.

This alternative is similar to Alternative 3A except for biomonitoring of Area 2. This alternative would require the same EPA approvals as 3A and it will have the same potential negative short term impacts on local air quality.

Cost: Approximately $15.0 million.

Alternative 3C - Mechanical Excavation for Area 1&3, on-site water treatment, on-site incinceration; biomonitoring for Area 2U, suction dredging for Area 2D.

This alternative is similar to Alternative 3A except that it includes remediation of Area 2D.

Cost: Approximately $15.3 million.

4. Alternatives 4A, 4B and 4C are alike in that each calls for on-site solvent extraction of excavated sediments.

Alternative 4A - Mechanical Excavation for Areas 1&3, on-site water treatment, on-site solvent extraction, no action for Area 2.

Solvent extraction is often used in the remediation of contaminated soil and/or sediments. In the Gill Creek sediment removal project, a solvent, triethylamine (TEA), is used to extract organics from the contaminated sediments into a non-soluble phase and then the TEA is recycled. In the laboratory, it was demonstrated that treated sediments cannot be land disposed after this extraction without further treatment to prevent mercury from leaching out.

Short-term Effectiveness: There will be some volatilization of organics and mercury during excavation; there will be an increased potential for worker contact with contaminated sediments, and volatile fugitive emissions from extraction processes can be expected.

Long-term Effectiveness: No future remediation of the creek in areas 1 and 3 is anticipated to be necessary with this alternative.

Reduction of Toxicity, Mobility and Volume: Although contaminated sediments would be removed permanently from the creek bed, solvent extraction will not provide the degree of reduction of toxicity that incineration would provide. Liquid extract will require incineration in a TSCA and RCRA approved incinerator. Bench scale testing indicates the residual solids would display Toxic Characterization Leaching Procedure (TCLP) for mercury, therefore, additional treatment would be required to reduce the mercury level below allowable limits prior to land disposal.

Implementability: Mechanical excavation of sediments can be done with high efficiency. However, there may be a disposal problem due to presence of mercury in the treated solids.

Compliance with SCGs: This alternative will comply with the existing SCGs.

Protection of Human Health and the Environment: Since all contaminated sediments that can be removed will be removed from the creek bed, maximum long term protection of human health will be achieved and the environmental risk will be minimized. Potential short-term risks include health risk due to accidental releases of sediments, treated sediments, and product oil (contains organic contaminants) during transportation. Potential environmental impacts could result from a spill of sediments, product oil, product water or TEA.

Cost: Approximately $12.3 million.

<u>Alternative 4B - Mechanical excavation for Areas 1 & 3, on-site water treatment, on-site solvent extraction, biomonitoring for Area 2.</u>

This alternative is similar to Alternative 4A, with the addition of biomonitoring for Area 2.

Cost: Approximately $12.5 million.

Alternative 4C: Mechanical excavation for Areas 1&3, on-site water treatment, on-site solvent extraction, biomonitoring for Area 2U suction dredging for Area 2D.

This alternative is similar to Alternative 4B with the addition of suction dredging of Area 2D.

Cost: Approximately $12.8 million.

5. Alternatives 5A, 5B and 5C related to the KPEG dechlorination process were dropped from detailed analysis due to its low effectiveness and the difficulties of implementation. The vendor recommended against the use of this technology for this particular application.

6. Alternatives 6A-9C call for dredging of sediments in the part of Area 1 downstream of RMP, and the mechanical excavation of the dewatered sediments in a dewatered creek in Area 1 upstream of RMP and in Area 3.

Alternatives 6A, 6B and 6C are similar in that each calls for off-site land disposal of removed sediments.

Alternative 6A - Dredging of Area 1/mechanical Excavation of Area 3, on-site water treatment, off-site land disposal, no action for Area 2.

This alternative is similar to Alternative 1A except for the dredging of sediments. Dredging which is done underwater using a clamshell or a backhoe will resuspend some sediments in Area 1 which in turn will enter the Niagara River with no chance of recovery. Area 3 sediments will be removed by mechanical excavation.

Cost: Approximately $6.8 million

Alternative 6B - Dredging of Area 1/mechanical excavation of Area 3, on-site water treatment, off-site land disposal, biomonitoring for Area 2.

This alternative is similar to Alternative 1B

Cost: Approximately $6.9 million.

Alternative 6C - Dredging of Area 1/mechanical excavation of Area 3, on-site water treatment, off-site land disposal, biomonitoring for Area 2U, suction dredging for Area 2D.

This Alternative is similar to Alternative 1C except for the suction dredging of Area 1.

Cost: Approximately $7.1 million

7. Alternatives 7A, 7B and 7C are alike in that each calls for off-site incineration of removed sediments.

Alternative 7A - Dredging of Area 1/mechanical excavation of Area 3, on-site water treatment, off-site incineration, no action for Area 2.

This alternative is similar to Alternative 2A except for the suction dredging of Area 1.

Cost: Approximately $15.4 million.

Alternative 7B - Dredging of Area 1/mechanical excavation of Area 3, on-site water monitoring, off-site, incinceration, biomonitoring for Area 2.

This alternative is similar to Alternative 2B except for the suction dredging of Area 1.

Cost: Approximately $15.5 million.

Alternative 7C - Dredging of Area 1/mechincal excavation of Area 3, on-site water treatment, off-site incineration, biomonitoring for Area 2 U, suction dredging for Area 2 D.

This alternative is similar to Alternative 2C except for the suction dredging of Area 1.

Cost: Approximately $16.0 million.

8. Alternatives 8A, 8B and 8C are alike in that each calls for on-site incineration of removed sediments.

Alternative 8A - Dredging of Area 1/Mechanical excavation of Area 3, on-site water treatment, on-site incineration, no action for Area 2.

This alternative is similar to Alternative 3A except for the suction dredging of Area 1.

Cost: Approximately $14.7 million.

Alternative 8B - Dredging of Area 1/Mechanical excavation of Area 3, on-site water treatment, on-site incineration, biomonitoring for Area 2.

This alternative is similar to Alternative 3B except for the suction dredging of Area 1.

Cost: Approximately $14.9 million.

Alternative 8C - Dredging of Area 1/mechanical excavation of Area 3, on-site water treatment, on-site incineration, biomonitoring for Area 2 U, suction dredging for Area 2 D.

This alternative is similar to Alternative 3C except for the suction dredging of Area 1.

Cost: Approximately $15.1 million.

9. Alternatives 9A, 9B and 9C are alike in that each calls for solvent extraction of removed sediments.

Alternative 9A - Dredging of Area 1/mechanical excavation of Area 3, on-site water treatment, on-site solvent extraction, no action for Area 2.

This Alternative is similar to Alternative 4A except for the suction dredging of Area 1.

Cost: Approximately $12.2 million.

Alternative 9B - Dredging of Area 1/mechanical excavation for Area 3, on-site water treatment, on-site solvent extraction, biomonitoring for Area 2.

This alternative is similar to Alternative 4B except for the suction dredging of Area 1.

Cost: Approximately 12.4 million.

Alternative 9C - Dredging of Area 1/mechanical excavation for of Area 3,on-site water treatment on-site solvent extraction. Biomonitoring for Area 2 U, suction dredging for Area 2D.

This alternative is similar to Alternative 4 except for the suction dredging of Area 1.

Cost: Approximately $12.6 million.

Table 8 summarizes the approximate cost of each alternative.

Section 8: Selected Remedy:

The remedial action plan selection is based on the seven evaluation criteria listed in HWR-90-4030, and the State's preference for permanent remedial action. Although Alternative 1A has received the highest score, it did not include the removal of contaminated sediments from Area 2D, which contains high levels of PCBs and other chemicals of concern. After further negotations with DuPont and Olin, the companies have agreed to revise Alternative 1A to include Area 2D in the proposed remediation.

The revised remediation proposal, therefore, includes Areas 1, 2D, and 3. The sediments in Areas 1 and 3 will be mechanically removed by dewatering the creek. On the other hand, the thin layer of sediments in Area 2D will be removed by suction dredging. Seepage water into the creek during remediation will be treated on-site and discharged to the POTW. Although sediments from Area 1 and 2D will be disposed of at an appropriate off-site landfill, the Area 3 sediments that have both failed the EP Toxicity Test and the TCLP test will have to be treated as hazardous waste and disposed of accordingly.

The selected remedy will remove highly contaminated sediments from the natural environment in Gill Creek while addressing requirements of the New York State's SCGs, and Applicable Relevant and Appropriate Requirements (ARARs). It will be protective of human health and the environment and consistent with CERCLA as amended by SARA and NCP. It also meets the goals of the Niagara River Toxicity Reduction Plan accepted by the United States and Canadian governments.

Post-remediation of the creek is not necessary due to the fact that all sediments that are removable in the creek bed will be removed and disposed. However, a post-remediation monitoring plan for the remediated sections of the Creek will be developed. The plan will consist of sampling and analysis of accummulated sediments from the remediated areas. The sampling plan which will be implemented for a period of five years can be extended to ten years should results of analyses warrant continuance. No biomonitoring program will be required for any portion of the creek.

The remediation plan has the following components:

Several dams will be constructed in Areas 1 and 3 to dewater the sediments before excavation. During the excavation, water seepages into the excavation zone will be controlled and the collected water will be treated at the on-site water treatment facility and discharged to the POTW. Dewatered sediments/soil for Area 1 will be disposed of in a secure landfill because the RCRA land disposal restrictions do not apply to wastes identified or listed as hazardous waste after November 8, 1984 for which EPA has not promulgated land disposal prohibitions or treatment standards. For a point of reference, Area 1 sediments have passed the EP Toxicity test but failed the TCLP. This, by definition, will render the Area 1 wastes eligible for land disposal. However, since the Area 3 sediments have both failed the EP Toxicity and the TCLP tests, they will have to be treated as hazardous waste and land ban restrictions will apply. One of the land ban requirements is that any non-liquid PCBs at concentrations of 50 ppm or greater in the form of contaminated soil shall be disposed of in an incinerator which complies with 40 CFR 761.70. Since the Area 3 sediments contain dioxin, there is no incinerator in the United States presently, willing to incinerate this type of sediment/soil. Therefore, until an incinerator is available, the sediment/soil from Area 3 will have to be stored in a storage facility which meets the requirements for storage of PCBs as described in 40 CFR 761.65.

Sediments in Area 2D is in the form of a thin veener covering the creek bed. Therefore, instead of dewatering the entire section of Area 2 it would be more cost effective to suction dredge, dewater and dispose of the sediments in a secure landfill with the rest of the Area 1 sediments. Even though the sediments in Area 2D were not tested for their toxicity using TCLP and EP Toxicity tests, it is assumed that they would not fail the tests because the Area 2D sediments have less contamination in comparison to the Area 1 and/or 3 sediments.

The excavation of creek sediments, the treatment and the disposal of these sediments will have to comply with other applicable Federal, State and the local rules and regulations (Table 10). As such, if the sediments are rendered as hazardous waste, Du Pont and Olin will need to comply with 6 NYCRR Part 372.2. Due to the presence of PCBs in sediment (greater than 50 ppm), TSCA regulations would apply to the storage and disposal of sediments. These regulations are found in 40 CFR 761.60-761.79, subpart D.

The NYSDEC Division of Air Resources has developed guidelines for the control of toxic ambient air contaminants. These guidelines are applicable to point sources resulting from on-site treatment of Gill Creek sediments.

As far as the chemical-specific SCGs are concerned, there are two chemical-specific SCGs associated with the remediation of Gill Creek sediments. These include compliance with the POTW and ambient air quality standards.

1. Any wastewater discharged from the remediation work into the City of Niagara Falls POTW has to meet the sewer ordinance which includes the general federal regulation found at 40 CFR 403.

2. The State of New York has established ambient air quality standards for nine priority pollutants which are potential air quality SCGs for the remediation of the site. Out of the four general levels of air quality standards, Level IV standards are applicable.

There are several Federal and New York State laws and regulation that set restriction on the type of activities conducted at a remediation site. They are:

1. Clean Water Act, Section 404

This Act regulates the discharge of dredged or fill material into all waters of the US. Section 404 is applicable because remediation of Gill Creek sediments will likely include the construction of a temporary water-retaining structure to facilitate the excavation of contaminated sediments.

2. Fish and Wildlife Coordination Act.

Because a temporary water retaining structure will likely be constructed to facilitate the excavation of contaminated creek sediment, the Fish and Wildlife Coordination Act of 1934 will apply to protect the fish and wildlife resources.

3. New York Water Pollution Control Regulations

During the remediation, a temporary obstruction is planned for the creek before the excavation of sediments takes place. The NYS Water Pollution Control Regulations as defined in Section 608.4 apply to this project with respect to sediment excavation and to the placement of a temporary obstruction in the creek.

4. Ports and Waterways Safety Act

If a barge is to be used to facilitate excavation of contaminated sediments from the creek, the Ports and Waterways Safety Act of 1972 may be relevant and appropriate to the remediation of Gill Creek.

Section 9 - Present Worth of Proposed Remediation

The total cost of the remedial construction project will be approximately $7.3 million. In addition, there will be the cost of post-monitoring of the creek sediments. For a period of five years, sediments from the creek bottom will be analyzed for a list of selected chemical compounds that are attributable to the past operation of Du Pont and Olin Corporations. The present worth of the post-monitoring is estimated at approximately $50,000. Maintenance of the creek after the remediation will not be necessary, since most of the creek sediments would be removed, thus no future maintenance cost. Present values of the other alternatives are summarized on Table 8.

Section 10 - Summary of the State Decision

A. Public Participation

Citizen Participation activities for the Gill Creek Remediation Project began in February 1992 with the establishment of a local document repository at the Niagara Falls Public Library. A citizen participation plan was finalized in March 1992.

A public meeting was held on March 23, 1992, to present the proposed remedial action plan and to receive public input. A 30-day comment period was held for additional public input and ended on March 27, 1992.

A transcript of the public meeting has been made part of the Administrative Record and is available to the public at the document repositories. Following the public meeting, a brief meeting summary was sent to the site contact list.

B. Summary of Selected Remedial Action

The Remedial Action Plan for Gill Creek has been selected to mitigate and/or stop the migration of contaminants from the creek via sediment transport to Gill Creek and the Niagara River. It will also reduce to the maximum extent practicable the exposure of chemicals to aquatic environment, therefore, restoring the affected areas to a productive aquatic environment.

The remedial plan includes Areas 1, 2D and 3. The contaminated sediments in Areas 1 and 3 will be mechanically removed from dewatering the week. Area 2D sediments will be removed by suction dredging. All sediments will either be disposed of at an approved RCRA/TSCA landfill or stored for subsequent treatment and/or disposal according to EPA land ban requirements.

Several dams will be constructed in Areas 1 and 3 to dewater the sediments before excavation. Seepage water into the creek during remediation will be treated on-site and discharged to the POTW.

Post-remediation of the creek is not necessary because all sediments that are removable in the creek bed will be removed and disposed. However, post-remediation monitoring plan for the remediated sections of the creek will be developed and implemented for a period of five (5) years. The plan can be extended to ten years should the results of analyses warrant continuance.

Section 11 - Responsiveness Summary

This section summarizes the public comments expressed during the public comment period for the Gill Creek Remediation project. No written comments were received.

The following is a summary of questions and answers during the public meeting.

Question: Will the Robert Moses Parkway have to be closed or restricted?

Answer: The companies will be working with the Department of Transportation to make sure that traffic disruption is kept to a minimum during remedial activities.

Question: Will drivers be exposed to any air contamination?

Answer: Remedial activities will be monitored continuously at the exacavation boundry to check the level of organic vapor emissions from the excavation zone. If levels exceed those called for in the Health and Safety Plan, work will immediately be stopped and corrective measures will be implemented. Therefore, it is very unlikely that drivers will be exposed to any harmful vapor emissions from the remediation activities.

Question: Where will the sediments be stored?

Answer: Sediments from Area 3 will be placed in a number of roll off containers and stored at the DuPont Buffalo plant site.

Question: Will it be north or south of Buffalo Avenue?

Answer: The probable storage location will be the west yard of DuPont plant site, located to the south of Buffalo Avenue. Storage of the sediments will have to meet the strict RCRA storage requirements.

Question: Love Canal was covered too, and look what happened there?

Answer: Today, there is no available technology by which the Area 3 sediments can be rendered harmless to the environment. The companies are, meanwhile, trying to find an incinerator that will incinerate a waste/sediment that contains dioxin. Until such time, the Area 3 sediments will be stored in the west yard. During storage the sediments will be carefully monitored to ensure that there is no leakage.

Question: How long will they be stored on site?

Answer: See the previous answer.

Question: Could you go into more detail on the actual removal?

Answer: A report which includes the details of the construction activities has just been submitted to the Department. Until we have a chance to review and comment on the report, it will be premature to describe the construction details.

Question: Will suctioned sediments have to be moist or dry?

Answer: The sediments will have to have enough moisture so that they could be suctioned off easily.

Question: Has a contractor been chosen yet?

Answer: This question should be directed to the companies who will do the remediation. The State, however, will make sure that the chosen contractor will have no conflict of interest by doing the work.

Question: When will you be able to give out the construction details?

Answer: Construction details will be available when the State approves the final design for the remediation project. Approval may taken 1 1/2 months.

Question: How about groundwater contamination?

Answer: The DuPont Buffalo Buffalo Avenue plant site groundwater remediation project officially started on January 1, 1992. It has been treating contaminated groundwater at a rate of 30 gpm and monitored continously. Groundwater that may seep into the creek bed during remediation activities will be collected and treated at the DuPont groundwater treatment plant before discharge into POWT.

Question: What about pre-treatment?

Answer: During the remediation activities, collected water in the creek bed will be treated at the DuPont groundwater treatment plant. Before organics are stripped from wastewater, it may require filtration and will need activated carbon adsorption treatment.

Question: Draining and/or lower of Hyde Park Lake was not included in the proposed Remedial Action Plan. Any draining or lowering of the lake level will have a drastic negative impact upon the lake's ecosystem.

Answer: Because the concept of lowering the lake level is considered in the realm of the final design, it was not included in the Proposed Remedial Action Plan. The state has not completed its review of the final design concept of the Gill Creek remedial project. Before the final approval is given, the

State Fish and Wildlife Division will be consulted to make sure that draining or lowering of the lake will not have a negative impact upon the lake's ecosystem.

Question: Removal of the rock/stone "bar" at the mouth of the creek would be detrimental as it provides the best fish holding structure.

Answer: This question will be studied in depth in the final design stage. The State, in consultation with the Army Corps of Engineers and the State Fish and Wildlife will study the impact of removing the rock/stone "bar" at the mouth of Gill Creek. Their recommendations will be included in the final design concepts report which requires the State's approval before the remediation of the creek commences.

GILL CREEK RECORD OF

DECISION

APPENDIX A

FIGURES AND TABLES

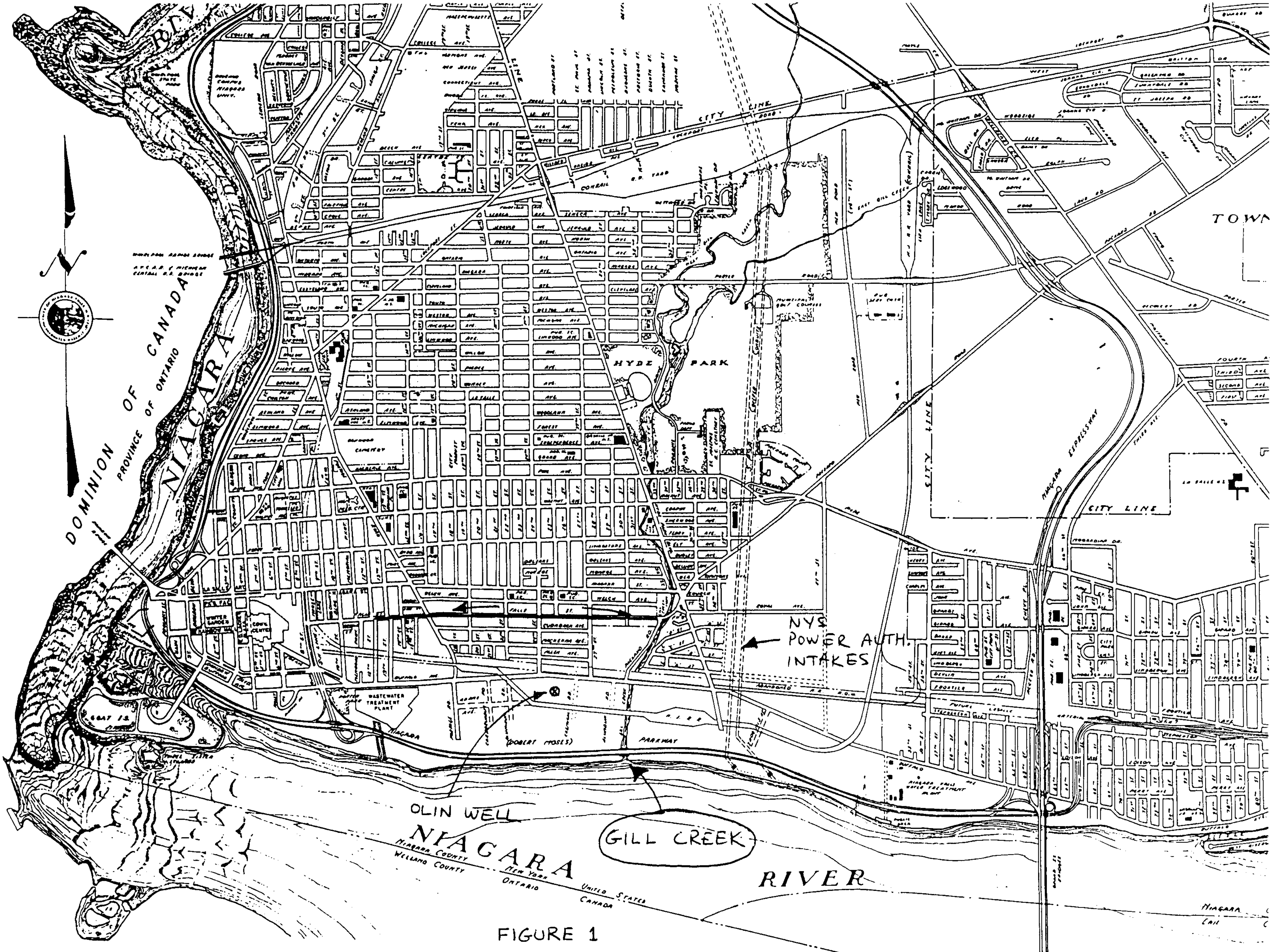
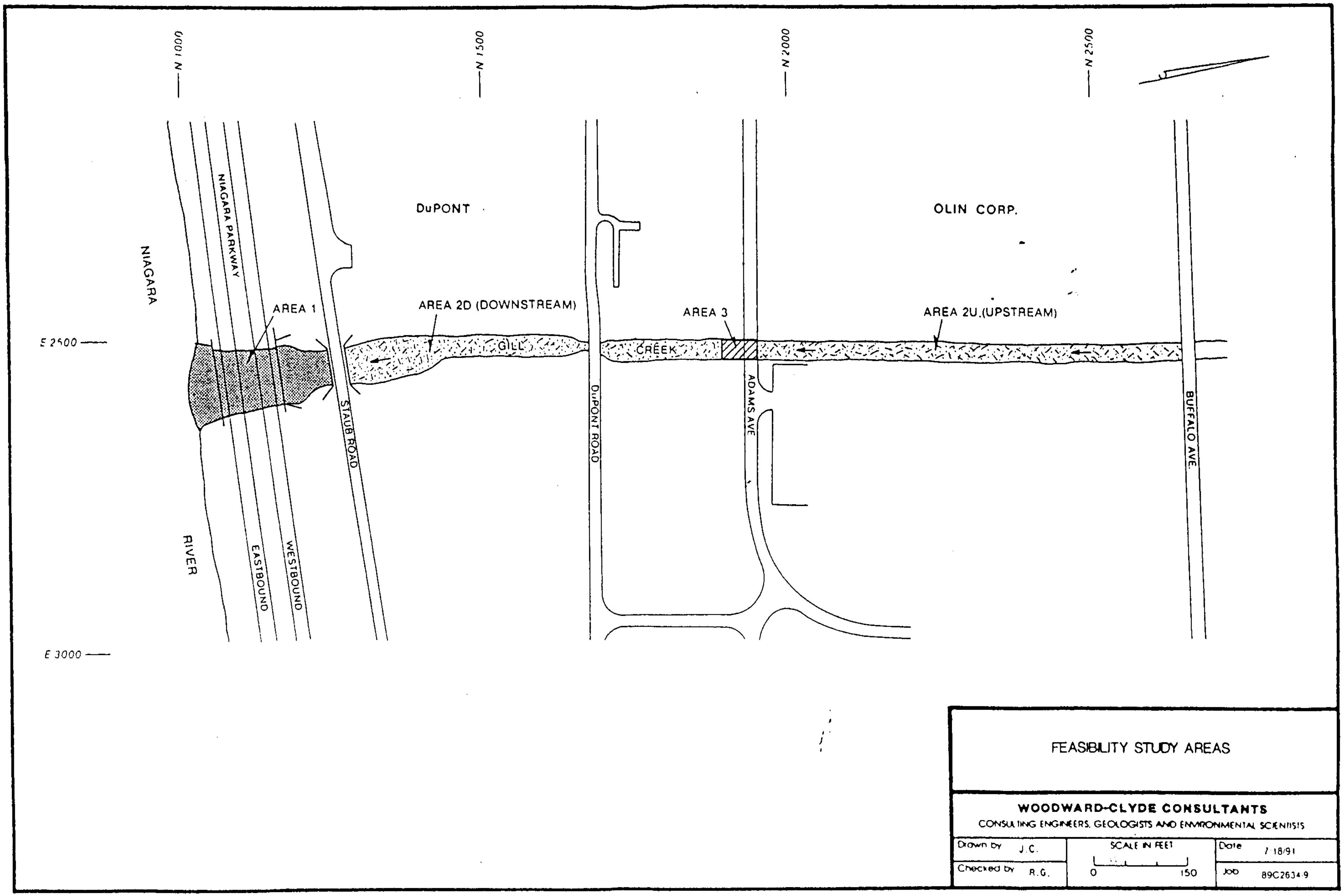

NYS POWER AUTH. INTAKES
OLIN WELL
GILL CREEK
NIAGARA RIVER
DOMINION OF CANADA
PROVINCE OF ONTARIO
NIAGARA
HYDE PARK
CITY LINE
NIAGARA EXPRESSWAY
ROBERT MOSES PARKWAY
WASTEWATER TREATMENT PLANT
GOAT IS.
NIAGARA COUNTY
WELLAND COUNTY
NEW YORK
ONTARIO
UNITED STATES
CANADA
TOWN

FIGURE 1



N 1000
N 1500
N 2000
N 2500
E 2500
E 3000
DuPONT
OLIN CORP.
NIAGARA
RIVER
NIAGARA PARKWAY
EASTBOUND
WESTBOUND
STAUB ROAD
DuPONT ROAD
ADAMS AVE
BUFFALO AVE.
AREA 1
AREA 2D (DOWNSTREAM)
AREA 3
AREA 2U (UPSTREAM)
GILL
CREEK
FEASIBILITY STUDY AREAS
WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
Drawn by J.C.
Checked by R.G.
SCALE IN FEET
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150
Date 7.18/91
Job 89C2634-9

FIGURE 2

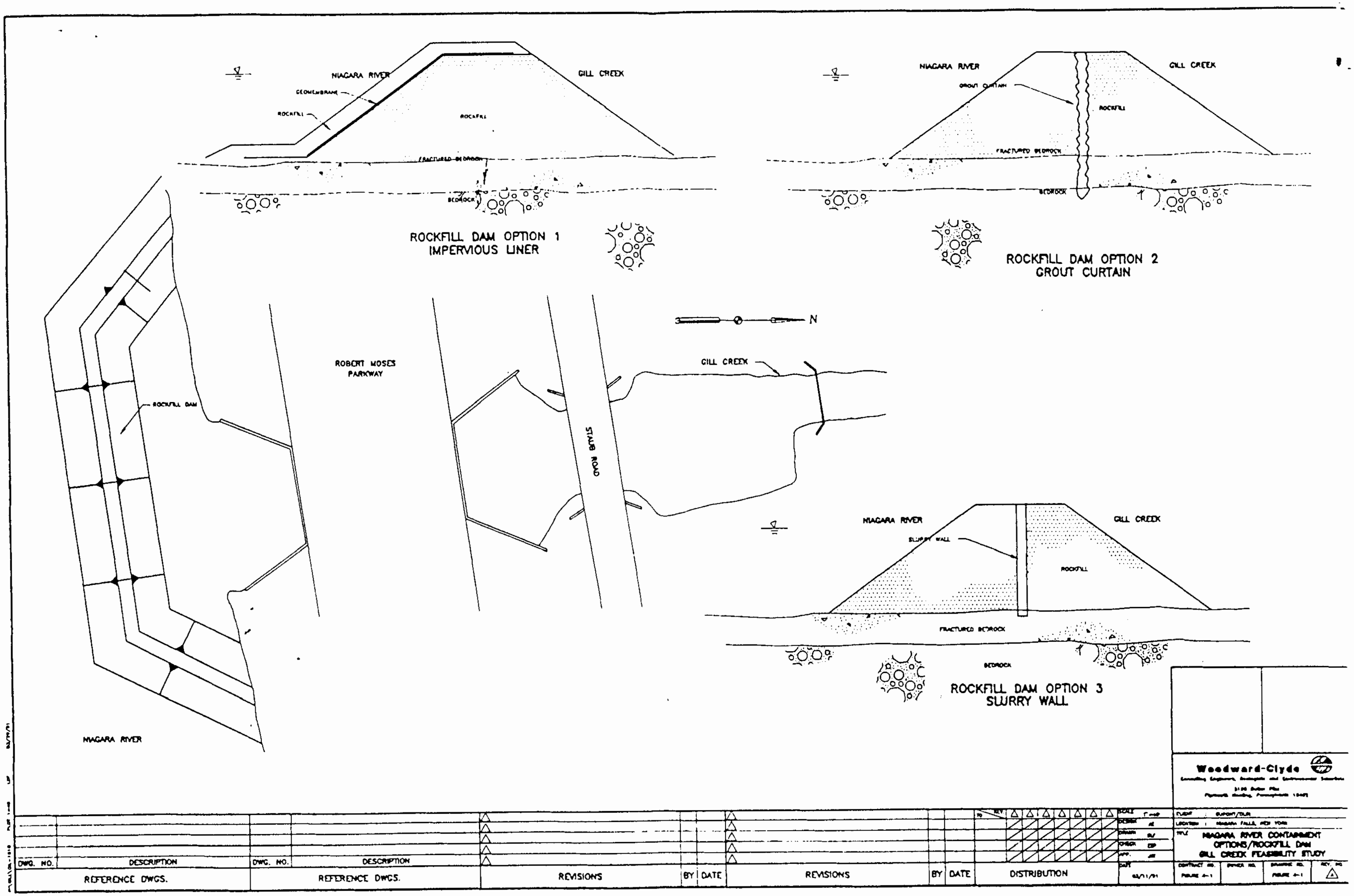
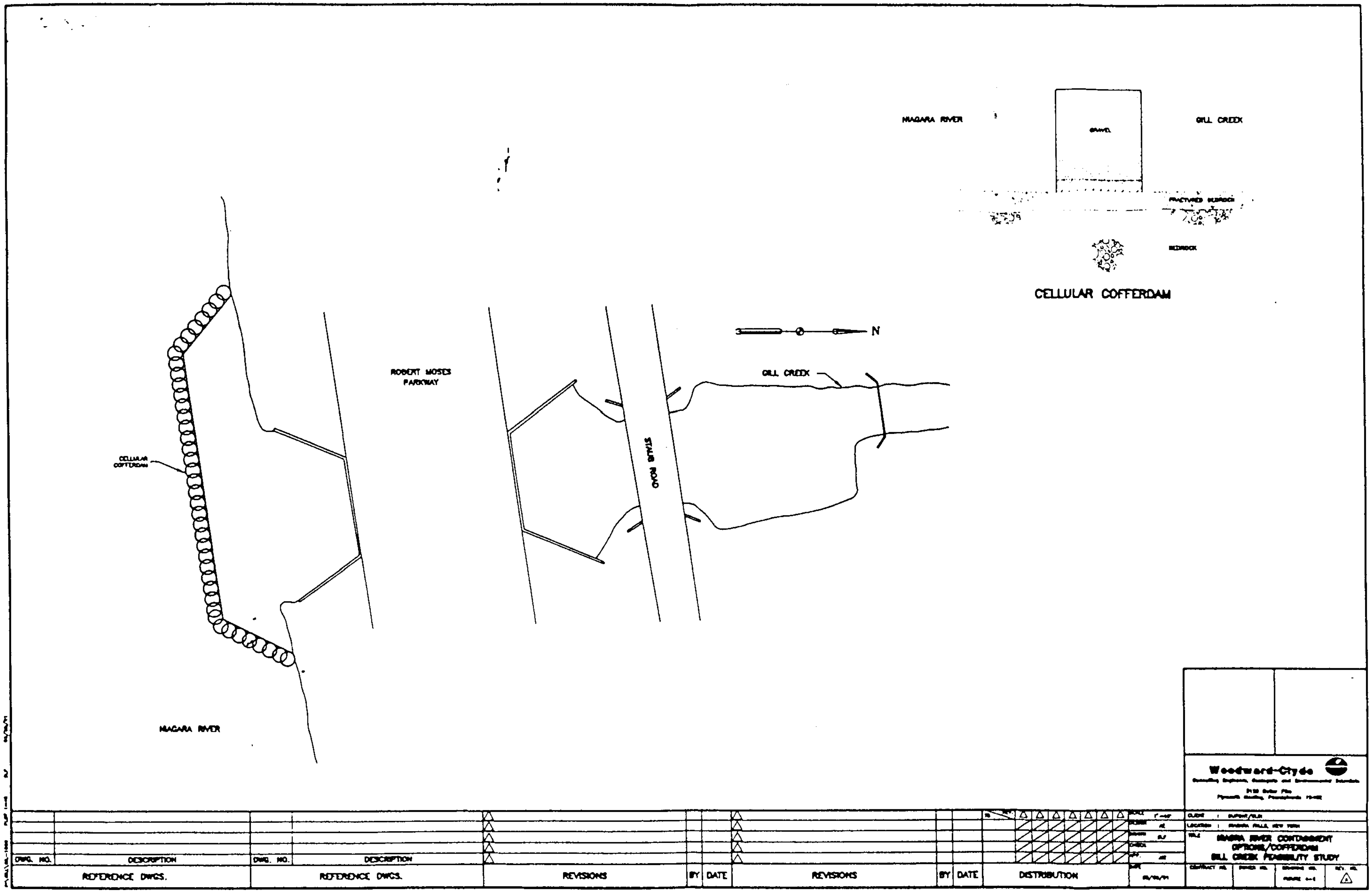
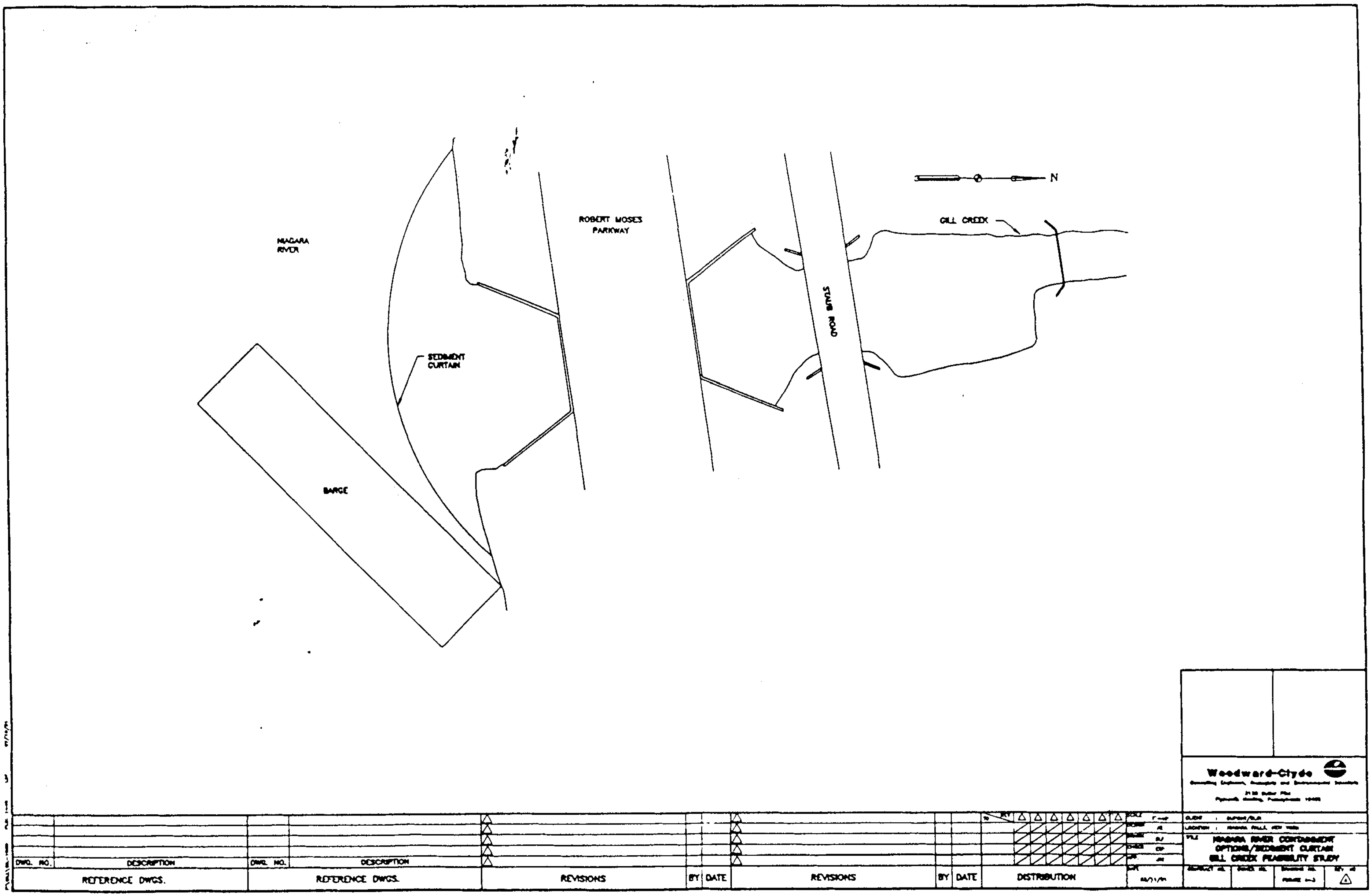

NIAGARA RIVER
GILL CREEK
GEOMEMBRANE
ROCKFILL
FRACTURED BEDROCK
BEDROCK
ROCKFILL DAM OPTION 1
IMPERVIOUS LINER
GROUT CURTAIN
ROCKFILL DAM OPTION 2
GROUT CURTAIN
N
ROBERT MOSES PARKWAY
ROCKFILL DAM
STAUB ROAD
SLURRY WALL
ROCKFILL DAM OPTION 3
SLURRY WALL
Woodward-Clyde
NIAGARA FALLS, NEW YORK
NIAGARA RIVER CONTAINMENT
OPTIONS/ROCKFILL DAM
GILL CREEK FEASIBILITY STUDY
DWG. NO.
DESCRIPTION
REFERENCE DWGS.
REVISIONS
BY
DATE
DISTRIBUTION

FIGURE 3



NIAGARA RIVER
GILL CREEK
CELLULAR COFFERDAM
N
GILL CREEK
ROBERT MOSES PARKWAY
CELLULAR COFFERDAM
NIAGARA RIVER
Woodward-Clyde
NIAGARA RIVER CONTAINMENT
OPTIONS/COFFERDAM
GILL CREEK FEASIBILITY STUDY
DWG. NO.
DESCRIPTION
REFERENCE DWGS.
DWG. NO.
DESCRIPTION
REFERENCE DWGS.
REVISIONS
BY
DATE
REVISIONS
BY
DATE
DISTRIBUTION

FIGURE 4



NIAGARA RIVER
ROBERT MOSES PARKWAY
STAUB ROAD
GILL CREEK
N
SEDIMENT CURTAIN
BARGE
Woodward-Clyde
NIAGARA RIVER CONTAINMENT
OPTIONS/SEDIMENT CURTAIN
GILL CREEK FEASIBILITY STUDY
DWG. NO.
DESCRIPTION
REFERENCE DWGS.
REVISIONS
BY
DATE
DISTRIBUTION

FIGURE 5

TABLE 1

GILL CREEK SEDIMENT SAMPLE
CONCENTRATION RANGES FOR AREAS 1, 2U, 2D, 3, AND 4

Parameter	Area 1	Area 2U	Area 2D	Area 3	Area 4
a-BHC	1,160-440,000	130	130-610,000	410,000-13,000,000	ND(12)-13,600
b-BHC	ND(2,000)-142,000	52	ND(200)-51,000	61,000-460,000	68-6,320
PCB-1248	20,200-10,700,000	1,100	410-97,000(3)	11,000-140,000	ND(23)-143,000
Hexachlorobutadiene	22,500-1,740,000	ND(450)	ND(430)-6,900(4)	1,200(8)	ND(390)-10,900
Hexachlorobenzene	3,630-580,000	ND(450)	320-1100(5)	ND(540)-ND(220,000)(7)	240-1,200(10)
Mercury	1,600-274,000	200	130-37,600	440-14,400	ND(120)-217,000
Vinyl Chloride	8,900-168,000(1)	ND(14)	ND(12)-ND(10,000)	130-53,000	ND(12)-110(12)
Total 1,2-Dichloroethene	7,500-2,300,000(2)	ND(7)(2)	36-16,000(2)	570-22,000(2)	ND(6)-290
Trichloroethene	5,400-3,460,000	7	6-16,200	62-83,000	ND(6)-19(11)
Tetrachloroethene	47,900-11,600,000	9	8-22,000	310-110,000	ND(6)-21(11)
1,1,2,2-Tetrachloroethane	ND(5000)-181,000	5	13-440(6)	86-9,200	ND(6)-24(11)
Benzene	ND(5000)-10,200	ND(7)	ND(6)-54(7)	110-110,000	ND(6)-3(11)

NOTE:

(1) 1 ND at 10,000
(2) Values are for trans-1,2-Dichloroethene
(3) 1 ND at 2000
(4) 2 ND at 8000
(5) 2 ND at 8000, 1 ND at 16000
(6) 1 ND at 5000
(7) 1 ND at 5000
(8) 2 ND at 60,000, 1 ND at 77,000, 86,000, and 220,000
(9) 2 ND at 60,000, 1 ND at 77,000, and 86,000
(10) 2 ND at 8000
(11) 2 ND at 50
(12) 2 ND at 100
(13) Parameters are risk assessment indicator chemicals
(14) All units ppb; µg/kg

TABLE 2

GENERALIZED STRATIGRAPHIC COLUMN

GEOLOGIC AGE: PERIOD	GEOLOGIC AGE: EPOCH	GEOLOGIC AGE: STAGE	FORMATION	APPROX. THICKNESS (feet)	STRATUM NO.		DESCRIPTION
QUATERNARY	RECENT		FILL unconformity	6 - 23	1	OVERBURDEN	Brown to gray sand and silt with clay and gravel, having brick, cinders and rock locally
QUATERNARY	RECENT		ALLUVIUM unconformity	0 - 3	2	OVERBURDEN	Brown to gray silt and fine sand with gravel locally
QUATERNARY	PLEISTOCENE	WISCONSIN	GLACIO - LACUSTRINE	0 - 4	3	OVERBURDEN	Red-brown clay, silt, silty clay and clayey silt with sand and gravel laminated
QUATERNARY	PLEISTOCENE	WISCONSIN	TILL unconformity	0 - 8	4	OVERBURDEN	Red-brown silt, sand, gravel and clay, with rock fragments having occasional boulders
SILURIAN	UPPER		LOCKPORT FORMATION	156.5 (Maximum Penetrated)	5	BEDROCK	Dark gray to brown, massive to thin-bedde[d] dolomite locally containing algal and gyp[sum] deposits
SILURIAN	LOWER		ROCHESTER SHALE	7 (Maximum Penetrated)		BEDROCK	Gray, thin to shaly-bedded shale

TABLE 3

REMEDIAL ALTERNATIVES

Alternative 1 - No action:

Areas 1, 2U, 2D, 3 and 4 contribute a mass loading.

Alternative 2 - Remediation of Area 1:

Areas 2U, 2D, 3 and 4 contribute mass loading.

Alternative 3 - Remediation of Areas 1 and 4:

Areas 2U, 2D and 3 contribute mass loading.

Alternative 4 - Remediation of Areas 1, 2D, 2U, and 3:

Area 4 contributes mass loading.

Alternative 5 - Remediation of Areas 1 and 3:

Areas 2U, 2D and 4 contribute mass loading.

Alternative 6 - Remediation of Areas 1, 2D, and 3:

Areas 4 and 2U contribute mass loading.

Alternative 7 - Remediation of Areas 1, 2U, and 3:

Areas 4 and 2D contribute mass loading.

As discussed in Section A1.0, the alternatives differ only in the area of remediation. It is assumed that the selected remedial option will isolate or remove the contamination from the environment.

TABLE 4

REMEDIAL ALTERNATIVES

INCREMENTAL CANCER RISK DUE TO FISH INGESTION AND DRINKING WATER PATHWAYS (ULTRA CONSERVATIVE SCENARIO)*

Chemical	Alt. 1	Alt. 2	Alt. 3	Alt. 4
a-BHC	$2.9x10^{-8}$	$1.4x10^{-8}$	$1.4x10^{-8}$	$3.1x10^{-11}$
b-BHC	$1.6x10^{-9}$	$9.5x10^{-11}$	$9.1x10^{-11}$	$3.9x10^{-12}$
PCB-1248	$9.7x10^{-5}$	$5.4x10^{-7}$	$5.0x10^{-7}$	$3.8x10^{-8}$
Hexachlorobutadiene	$1.4x10^{-10}$	$1.4x10^{-12}$	$1.1x10^{-12}$	$2.3x10^{-13}$
Hexachlorobenzene	$1.6x10^{-7}$	$3.7x10^{-9}$	$2.9x10^{-9}$	$7.3x10^{-10}$
trans-1,2-Dichloroethene	N/A	N/A	N/A	N/A
Tetrachloroethene	$2.7x10^{-8}$	$7.9x10^{-13}$	$7.8x10^{-13}$	$5.4x10^{-15}$
1,1,2,2-Tetrachloroethane	$2.5x10^{-7}$	$7.7x10^{-10}$	$7.5x10^{-10}$	$1.9x10^{-11}$
Trichloroethylene	$9.9x10^{-9}$	$3.0x10^{-13}$	$3.0x10^{-13}$	$3.4x10^{-15}$
Vinyl chloride	$2.1x10^{-8}$	$7.5x10^{-11}$	$7.2x10^{-11}$	$2.6x10^{-12}$
Benzene	$4.2x10^{-11}$	$7.8x10^{-13}$	$7.7x10^{-13}$	$1.4x10^{-14}$
Mercury	N/A	N/A	N/A	N/A
PCDD/PCDF (TEF)	$2.1x10^{-8}$	$2.3x10^{-9}$	$1.9x10^{-9}$	$4.3x10^{-10}$
TOTAL:	$9.7x10^{-5}$	$5.6x10^{-7}$	$5.2x10^{-7}$	$4.0x10^{-8}$

Chemical	Alt. 5	Alt. 6	Alt. 7
a-BHC	$6.1x10^{-10}$	$4.0x10^{-11}$	$6.0x10^{-10}$
b-BHC	$2.8x10^{-11}$	$4.3x10^{-12}$	$2.8x10^{-11}$
PCB-1248	$5.3x10^{-7}$	$5.0x10^{-8}$	$5.2x10^{-7}$
Hexachlorobutadiene	$1.2x10^{-12}$	$2.6x10^{-13}$	$1.2x10^{-12}$
Hexachlorobenzene	$3.2x10^{-9}$	$8.6x10^{-10}$	$3.1x10^{-9}$
trans-1,2-Dichloroethene	N/A	N/A	N/A
Tetrachloroethene	$6.0x10^{-13}$	$1.0x10^{-14}$	$6.0x10^{-13}$
1,1,2,2-Tetrachloroethane	$5.9x10^{-10}$	$2.8x10^{-11}$	$5.8x10^{-10}$
Trichloroethylene	$2.3x10^{-13}$	$5.8x10^{-15}$	$2.3x10^{-13}$
Vinyl chloride	$4.6x10^{-11}$	$3.6x10^{-12}$	$4.5x10^{-11}$
Benzene	$4.8x10^{-13}$	$2.2x10^{-14}$	$4.7x10^{-13}$
Mercury	N/A	N/A	N/A
PCDD/PCDF (TEF)	$2.1x10^{-9}$	$8.0x10^{-10}$	$1.7x10^{-9}$
TOTAL:	$5.3x10^{-7}$	$5.2x10^{-8}$	$5.2x10^{-7}$

INCREMENTAL CANCER RISK DUE TO FISH INGESTION AND DRINKING WATER PATHWAYS
(CONSERVATIVE SCENARIO)*

Chemical	Alt. 1	Alt. 2	Alt. 3	Alt. 4
a-BHC	1.2×10^{-8}	7.3×10^{-9}	7.2×10^{-9}	4.0×10^{-12}
b-BHC	5.9×10^{-10}	9.3×10^{-11}	9.2×10^{-11}	1.3×10^{-12}
PCB-1248	4.3×10^{-7}	9.5×10^{-10}	8.2×10^{-10}	1.3×10^{-10}
Hexachlorobutadiene	7.9×10^{-12}	3.6×10^{-14}	2.9×10^{-14}	7.1×10^{-15}
Hexachlorobenzene	3.0×10^{-9}	4.2×10^{-11}	3.4×10^{-11}	7.6×10^{-12}
trans-1,2-Dichloroethene	N/A	N/A	N/A	N/A
Tetrachloroethene	1.3×10^{-8}	1.1×10^{-12}	1.1×10^{-12}	6.7×10^{-15}
1,1,2,2-Tetrachloroethane	4.8×10^{-10}	2.4×10^{-12}	2.4×10^{-12}	5.0×10^{-14}
Trichloroethene	8.4×10^{-10}	1.9×10^{-13}	1.9×10^{-13}	1.8×10^{-15}
Vinyl chloride	6.4×10^{-8}	2.4×10^{-10}	2.3×10^{-10}	4.6×10^{-12}
Benzene	2.3×10^{-11}	4.2×10^{-13}	4.2×10^{-13}	4.1×10^{-15}
Mercury	N/A	N/A	N/A	N/A
PCDD/PCDF (TEF)	1.4×10^{-11}	1.3×10^{-12}	1.1×10^{-12}	1.5×10^{-13}
TOTAL:	5.3×10^{-7}	8.6×10^{-9}	8.4×10^{-9}	1.5×10^{-10}

Chemical	Alt. 5	Alt. 6	Alt. 7
a-BHC	2.9×10^{-11}	1.2×10^{-11}	2.1×10^{-11}
b-BHC	3.9×10^{-12}	2.2×10^{-12}	3.0×10^{-12}
PCB-1248	7.4×10^{-10}	3.8×10^{-10}	4.8×10^{-10}
Hexachlorobutadiene	1.9×10^{-14}	1.3×10^{-14}	1.4×10^{-14}
Hexachlorobenzene	2.2×10^{-11}	1.6×10^{-11}	1.3×10^{-11}
trans-1,2-Dichloroethene	N/A	N/A	N/A
Tetrachloroethene	2.2×10^{-13}	4.3×10^{-14}	1.8×10^{-13}
1,1,2,2-Tetrachloroethane	5.5×10^{-13}	2.0×10^{-13}	4.0×10^{-13}
Trichloroethene	3.8×10^{-14}	9.5×10^{-15}	3.1x10[illegible]
Vinyl chloride	3.4×10^{-11}	1.5×10^{-11}	2.4×10^{-11}
Benzene	5.4×10^{-14}	2.0×10^{-14}	3.9×10^{-14}
Mercury	N/A	N/A	N/A
PCDD/PCDF (TEF)	1.0×10^{-12}	9.5×10^{-13}	2.4×10^{-13}
TOTAL:	8.3×10^{-10}	4.3×10^{-10}	5.5×10^{-10}

* The conservative exposure scenario assumed that expsoures would occur to desorbed (aqueous) chemicals (chemicals of concern dissolved in the water column) and is based on conservative intake factors. The ultra conservation exposure scenario considered exposures to aqueous chemicals and chemicals sorbed to sediments suspended in the water column.

TABLE 5

RATIO: ESTIMATED CONCENTRATION/FISH PROPAGATION STANDARD (units)

Chemical	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Tetrachloroethene	45 *	0.0039	0.0039	2.3×10^{-5}
PCB-1248	9.3	0.020	0.018	0.0028
a-BHC	13	8.1	8.1	0.0045
Hexachlorobutadiene	0.028	1.3×10^{-4}	1.0×10^{-4}	2.5×10^{-5}
PCDD/PCDF (TEF)	2.2×10^{-4}	2.0×10^{-5}	1.8×10^{-5}	2.2×10^{-6}
Mercury	1.1	0.031	0.020	0.011

Chemical	Alt. 5	Alt. 6	Alt. 7
Tetrachloroethene	7.5×10^{-4}	1.5×10^{-4}	6.3×10^{-4}
PCB-1248	0.016	0.0082	0.010
a-BHC	0.032	0.013	0.023
Hexachlorobutadiene	6.8×10^{-5}	4.5×10^{-5}	4.8×10^{-5}
PCDD/PCDF (TEF)	1.6×10^{-5}	1.5×10^{-5}	3.8×10^{-6}
Mercury	0.029	0.016	0.024

* Ratios exceeding unity suggest that the chemical could have an adverse effect on aquatic life. The chemicals PCB-1248, tetrachloroethene, a-BHC, and mercury exhibit ratios exceeding unity for Alternative 1 (No Action). All chemicals are estimated to be present at levels far below the fish propagation standards for Alternative 5 (remediation of Areas 1 and 3).

TABLE 6
SUMMARY OF PRELIMINARY ALTERNATIVES

ALTERNATIVE	DESCRIPTION
1	Mechanical Excavation – Areas 1 & 3 No Action – Area 2 Offsite Landfill Sediment
2	Mechanical Excavation – Areas 1 & 3 No Action – Area 2 Offsite Incineration Sediment
3	Mechanical Excavation – Areas 1 & 3 No Action – Area 2 Onsite Incineration Sediment
4	Mechanical Excavation – Areas 1 & 3 No Action – Area 2 Onsite Solvent Extraction/Stabilization
5	Mechanical Excavation – Areas 1 & 3 No Action – Area 2 Dechlorination
6	Dredge/Mechanical Exc. – Areas 1& 3 No Action – Area 2 Offsite Landfill Sediment
7	Dredge/Mechanical Exc. – Areas 1& 3 No Action – Area 2 Offsite Incineration Sediment
8	Dredge/Mechanical Exc. – Areas 1& 3 No Action – Area 2 Onsite Incineration Sediment
9	Dredge/Mechanical Exc. – Areas 1& 3 No Action – Area 2 Onsite Solvent Extraction/Stabilization
10	Dredge/Mechanical Exc. – Areas 1& 3 No Action – Area 2 Dechlorination
11	Fabriform Cap – Areas 1 & 3 No Action – Area 2

TABLE 7

PRIMARY REMEDIAL ALTERNATIVES FOR
AREA 1 & 3 RETAINED FOR DETAILED ANALYSIS

Primary Alternative	Description
1	Mechanical excavation, on-site water treatment, off-site land disposal
2	Mechanical excavation, on-site water treatment, off-site incineration
3	Mechanical excavation, on-site water treatment, on-site incineration
4	Mechanical excavation, on-site water treatment, on-site solvent extraction/stabilization
6 *	Dredging/Mechanical excavation, on-site water treatment, off-site landfill
7	Dredging/Mechanical excavation, on-site water treatment, off-site incineration
8	Dredging/Mechanical excavation, on-site water treatment, on-site incineration
9	Dredging/Mechanical excavation, on-site water treatment, on-site solvent extraction/stabilization

*Primary Alternative No. 5, the chemical dechlorination (KPEG) process is not suitable to the site-specific conditions at Gill Creek.

TABLE 8
SUMMARY OF ALTERNATIVE COSTS

ALTERNATIVE	TOTAL COST
1A	$6,904,000
1B	$7,037,000
1C	$7,211,000
2A	$15,544,000
2B	$15,677,000
2C	$16,091,000
3A	$14,856,000
3B	$14,990,000
3C	$15,263,000
4A	$12,346,000
4B	$12,479,000
4C	$12,767,000
6A	$6,775,000
6B	$6,908,000
6C	$7,082,000
7A	$15,415,000
7B	$15,549,000
7C	$15,962,000
8A	$14,727,000
8B	$14,861,000
8C	$15,134,000
9A	$12,217,000
9B	$12,351,000
9C	$12,638,000

TABLE 9

SUMMARY OF DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

Analysis Score/	1			2			3			4			6			7			8			9		
Alternatives	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1. Compliance	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2. Protection	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
3. Short-term effectiveness	9	9	9	9	9	9	8	8	8	8	8	8	6	6	6	6	6	6	5	5	5	5	5	5
4. Long-term effectiveness	12	12	12	13	13	13	15	15	15	12	12	12	11	11	11	12	12	12	14	14	14	11	11	11
5. Reduction	4	4	4	13	13	13	13	13	13	11	11	11	4	4	4	12	12	12	12	12	12	11	11	11
6. Implementability	12	12	12	8	8	8	9	9	9	8	8	8	12	12	12	8	8	8	9	9	9	8	8	8
7. Costs	15	14	14	7	6	6	7	7	7	8	8	8	15	15	14	7	7	6	7	7	7	8	8	8
TOTAL SCORE	82	81	81	80	79	79	82	82	82	77	77	77	78	78	77	75	75	74	77	77	77	73	73	73

TABLE 10

There are three types of Federal and New York State Standards, Criteria and Guidelines (SCGs) that are applicable to the Gill Creek sediment removal project. They are 1) chemical specific 2) location specific, and 3) action specific SCGs.

1. <u>Chemical-Specific SCGs</u>:

a) Public Owned Treatment Works (POTW) discharge standards - sewer ordinance, 40 CFR 403.

b) New York Ambient Air Quality Standards for nine priority pollutants.

2. <u>Location -Specific SCGs:</u>

a) Clean Water Act, Section 404
b) Fish and Wildlife Coordination Act
c) New York Water Pollution Control Regulations
d) Ports and Waterways Safety Act.

3. Action - Specific SCGs

a) New York State Hazardous Waste Rules

i) Generator Requirements

ii) Manifest Requirements

iii) Thermal Treatment Requirements

iv) Waste Water Treatment Unit Requirements

v) Container Storage Requirements

b) Toxic Substance Control Act (TSCA)

c) NYSDEC Air Quality Emissions Limits

d) RCRA Requirements

i) RCRA Land Disposal Restrictions

ii) RCRA/HSWA Incinerator Requirements

GILL CREEK RECORD OF
DECISION

APPENDIX B

RECORD OF THE NYSDEC - BIBLIOGRAPHY

LIST OF REFERENCES
REMEDIATION PROGRAM
GILL CREEK

Reference No.	Document Woodward-Clyde to Du Pont/Olin	Date of Submittal
1	Gill Creek Sediment Study	4/5/89
2	Scope of Work, Gill Creek Risk Assessment and Feasibility Study Niagara Falls, New York	11/29/89
3	Technical Memorandum Candidate Remediation Technologies for the Gill Creek Project Niagara Falls, New York	4/2/90
4	Supplemental Sampling Results Gill Creek of Adams Avenue	11/9/90
5	Risk Assessment for Remedial Option Gill Creek Sediment Project	12/7/90
6	Data Presentation and QA/QC Audit Gill Creek Supplemental Program	8/28/90
7	Treatability Testing Plan for Gill Creek	1/3/91
8	Treatability Study Report for Gill Creek	2/14/91
9	Response to NYSDEC Comments in the Gill Creek Risk Assessment	3/7/91
10	Evaluation of Gill Creek Sediments on Aquatic Life	5/13/91
11	Feasibility Study; Remediation of Gill Creek Sediments	10/21/91