Department of Environmental Conservation

Division of Environmental Remediation

SOLVENT CHEMICAL

RECORD OF DECISION

December 1996

Site Number 9-32-096

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* MICHAEL D. ZAGATA, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Solvent Chemical Site
Niagara Falls (C), Niagara County
Inactive Hazardous Waste Site No. 9-32-096

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedial action for the Solvent Chemical Inactive Hazardous Waste Site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for Solvent Chemical Inactive Hazardous Waste Site and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened release of hazardous waste constituents and hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential threat to public health and the environment.

Description of the Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) for Solvent Chemical Site and the criteria identified for the evaluation of alternatives, the NYSDEC has selected an overburden containment remedy with a phased bedrock hydraulic control program for the Solvent Chemical site and associated groundwater. The major elements of the selected remedy include the following:

1. Containment of highly contaminated soils on site with a clean soil cover system. Prior to cover system construction, buildings and other existing site structures will be demolished and the resulting rubble will be used as fill for grading purposes. In addition, existing tanks and utilities will removed or closed in place as appropriate.

2. Contaminated overburden groundwater will be controlled and collected through construction and operation of an overburden collection system. This system will incorporate existing site utilities, basements, sumps, etc. to the extent practical, in conjunction with hydraulic control/collection segments to be installed along the south, west and north site perimeter.

3. A phased bedrock hydraulic system will be implemented for control of contaminated bedrock groundwater. In the first phase, a system of pumping wells will be installed and operated within the bedrock B-zone. A system of pumping wells will be also installed near Buffalo Avenue between the site and Gill Creek to achieve hydraulic control over highly contaminated groundwater found in overburden and upper fractured bedrock in the vicinity of Olin monitoring wells OBA-15A and OBA-3A.

4. The B-zone and lower bedrock groundwater zones of concern will be monitored to evaluate the effectiveness of the first phase of the remedy. A determination will be made by the State whether the first phase of the remedy is sufficiently reducing off site contaminant loading within the bedrock zones. If the first phase does not demonstrate an adequate reduction in contaminant loadings within the bedrock zones, or if regional hydrogeology is altered in a way which significantly reduces the effectiveness of the remedy, subsequent phases may be required under this ROD.

5. Contaminated groundwater resulting from operation of pumping and collection systems will be treated and disposed of in accordance with all Federal, State, and Local regulatory requirements. Treatment may occur either on site or off site.

6. A long term monitoring program will be implemented. An annual review will be made as part of routine operation and maintenance efforts to evaluate the continued effectiveness of the implemented remedy.

7. Deed restrictions are recommended to prevent future uses of the site which may be incompatible with the selected remedy.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that reduce toxicity, mobility, or volume as a principal element.

12/31/96
Date

Michael O'Toole Jr.
Michael O'Toole Jr., Director
Division of Environmental Remediation

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

RECORD OF DECISION

Solvent Chemical Site

City of Niagara Falls, Niagara County, New York
Site No. 9-32-096
December 1996

SECTION 1: SITE LOCATION AND DESCRIPTION

The Solvent Chemical site is a 5.7 acre site located at 3163 Buffalo Avenue in Niagara Falls, N.Y. The site is adjacent to several industrial facilities. It is bordered to the north by Buffalo Avenue, to the west by the Olin Corporation, and to the south and east by the DuPont Niagara plant. Gill Creek, which flows into the Niagara River, is situated approximately 400 feet west of the site. The Niagara River is approximately 800 feet south of the site. The nearest residential area is approximately 1/4 mile north of the site. Figure 1 shows the site location.

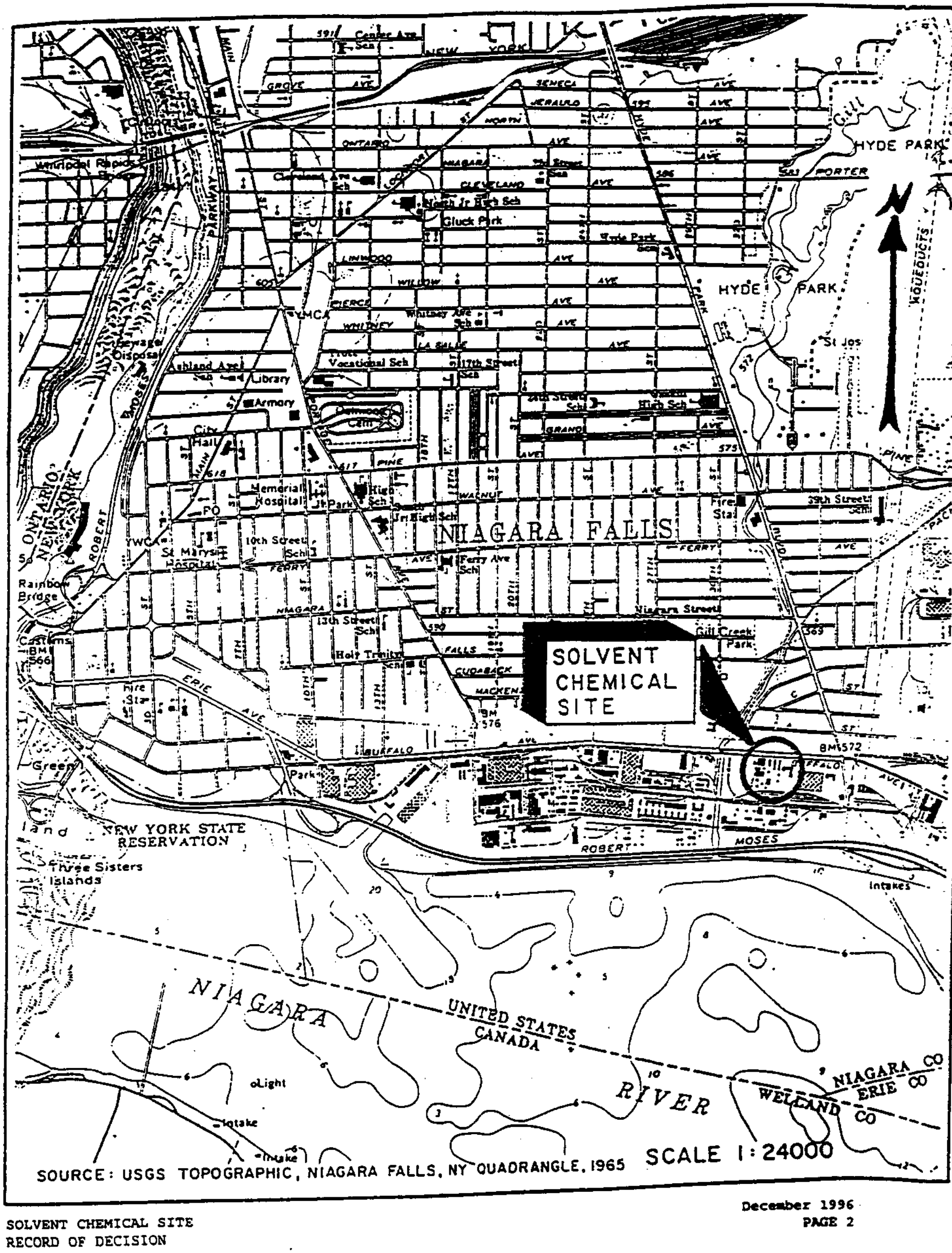
SECTION 2: SITE HISTORY

2.1: Operational/Disposal History

The Solvent Chemical site functioned as a chemical manufacturing and storage facility during various periods starting in 1940.

1940-1945	Plant built and operated by DuPont under contract to the U.S. Government to manufacture "Impregnite". Various by-products of Impregnite production included organic sludges, various chloroanilines, and phenolics.
1951-1953	Site was reactivated for Impregnite production during the Korean Conflict. The plant was operated by the Hooker Electrochemical Company under contract to the U.S. Government.
1950s	Site laboratory used by Hooker for various projects
1972	Site purchased by the City of Niagara Falls and sold to the Solvent Chemical Company.
1973-1977	Site used by the Solvent Chemical Company to manufacture chlorinated benzenes, zinc chloride and zinc ammonium chloride.

FIGURE 1 Site Location



1978-1980 Site owned by Transit Holding Company and leased to Newco Chemical Waste Systems. Site used for chemical storage.

1980-1983 Site leased to Frontenac Chemical Waste Service, Ltd. Site was used as a waste transfer station and wastes such as halogenated solvents, electroplating sludge, spent pickle liquor, acid and caustic wastes, paint sludge, cyanides, etc. were brought to the site in drums and in bulk.

1983-Present Site owned by the 3163 Buffalo Avenue Corporation. During a portion of this period the site was leased by the Niagara Industrial Warehouse for storage of soda ash, potash, fuel oil and other non-hazardous materials.

2.2: Remedial History

Two hydrogeologic investigations were conducted at the site in 1980. Overburden and bedrock groundwater monitoring wells were installed and sampled. Soil and groundwater sampling during this time revealed substantial chlorinated benzene contamination in both soil and groundwater.

A Phase II investigation was completed in 1985 which confirmed various types of contaminants in the soil and groundwater.

A Remedial Investigation (RI) was performed in 1989 by a group of the Potential Responsible Parties (PRPs). The report was never formally approved by the NYSDEC. The RI indicated significant groundwater and soils contamination. Principal contaminants discovered in the RI included chlorobenzene, dichlorobenzene, trichlorobenzene, and metals such as lead, mercury, etc. The PRPs could not reach an agreement among themselves to perform a Feasibility Study (FS) to evaluate remedial alternatives. As a result, the site was referred to the State Superfund Program.

SECTION 3: CURRENT STATUS

A Supplemental Remedial Investigation was completed under the State Superfund Program in order to gather additional information necessary to adequately evaluate various remedial alternatives. The Supplemental RI report was approved in June, 1995. In addition, a Post Screening Investigation/Treatability Study was completed to evaluate certain remedial technologies. This report was also approved in June, 1995. Using this data, along with the original RI data, a Feasibility Study was completed to evaluate various remedial alternatives to address site contamination. The FS report was approved in February, 1996. An FS Supplement prepared by the NYSDEC in July 1996 includes three additional remedial alternatives as well as a discussion of off site groundwater contamination. These reports may be found in the document repositories.

3.1: Summary of the Remedial Investigations

The purpose of the RI performed in 1989-1990 was to define the nature and extent of contamination resulting from previous activities at the site.

A report entitled "Remedial Investigation Report for the 3163 Buffalo Avenue Site" was prepared in 1990/1991 by Ecology and Environment and described findings of field activities and investigations performed in 1989-1990.

The RI activities consisted of the following:

- Monitoring well installation and development
- Environmental sampling of groundwater, soil, and sediment in sewers/storm drains
- A health risk assessment of site groundwater contaminant migration

Sixteen groundwater monitoring wells were installed in the overburden and various bedrock water-bearing zones. An assessment of site hydrogeology was performed using these wells.

A Supplemental Remedial Investigation was performed during 1993-1994 in order to further characterize the full extent of site contamination and gather information necessary to adequately evaluate various remedial alternatives.

These activities consisted of :

- Soil gas survey and overburden groundwater sampling at site perimeter and on adjacent property
- On-site and off site adjacent underground utilities investigation
- Additional Bedrock groundwater monitoring well installation and sampling
- Supplemental subsurface soil sampling and characterization
- Site mapping and survey
- Tank, sump and pit sampling

Site Geology

Site overburden consists of fill (silt, sand, gravel, railroad ballast, demolition debris, etc.), placed directly on top of native materials. The native materials consists of sand, silt, and clay deposits overlaying glacial till. These deposits are thinner in the southern half of the site, increasing in thickness to the north. Bedrock is encountered below the till at a depth of between 8 and 14.5 feet below ground surface. The bedrock formation below the site consists of Lockport Dolomite which extends to a depth of approximately 150 feet in the vicinity of the site.

Site Hydrogeology

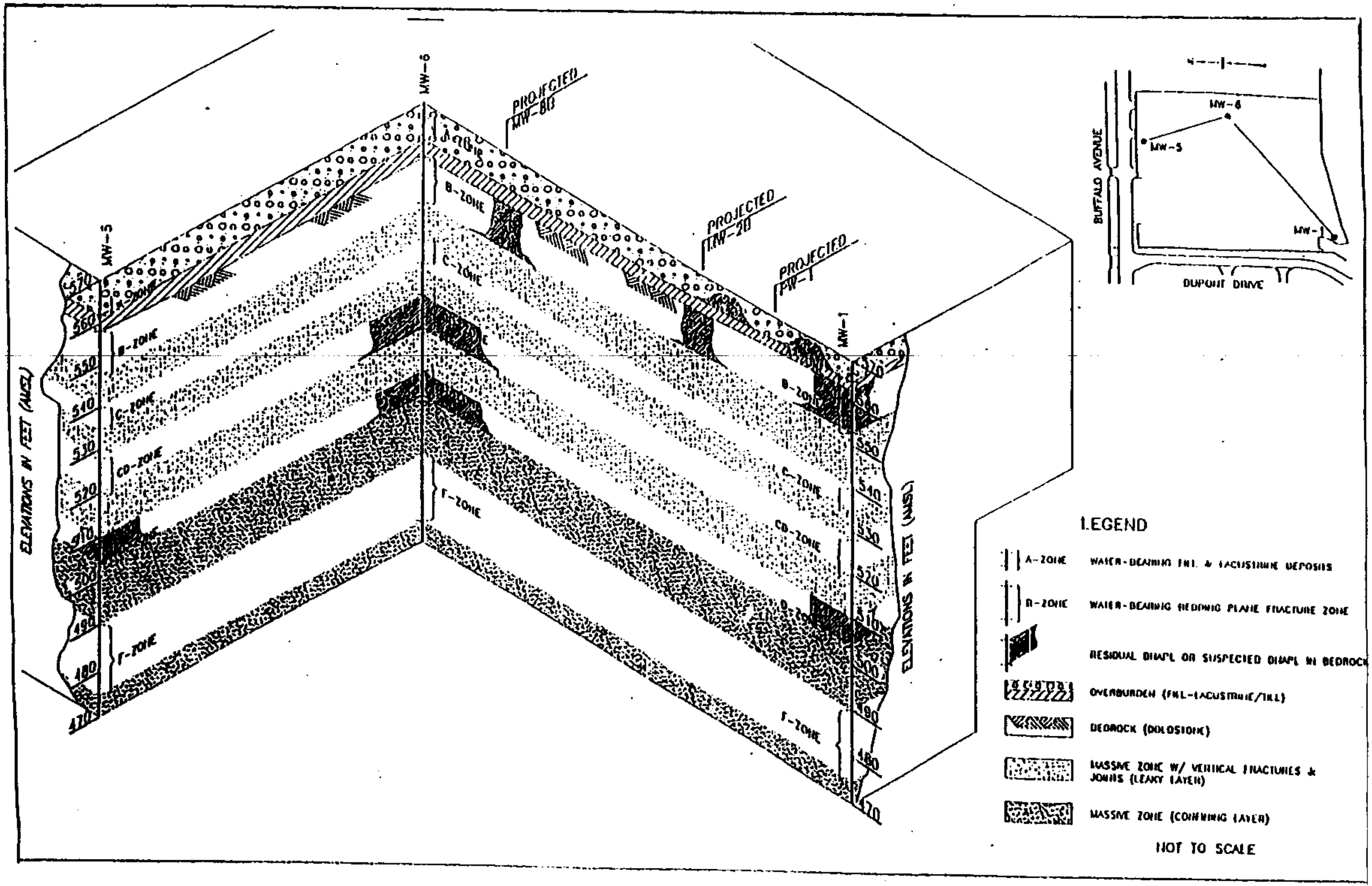
Overburden groundwater flow direction is generally to the north, but there is very little horizontal gradient, and flow within the overburden appears to be influenced by on-site and off site underground utilities. The Lockport Dolomite is a dolostone containing a series of laterally extensive horizontal fracture zones capable of transmitting large quantities of water. The first 5 bedrock fracture zones included within the Oak Orchard formation of the Lockport Dolostone and are labeled (in order of depth) B, C, CD, D, and F. Figure 2 shows a cross-section rendering of these bedrock fracture zones of concern. In general, a downward vertical gradient exists in the B thru CD bedrock fracture zones. Fracture zone F generally exhibits an upward vertical gradient. The bedrock groundwater in these zones generally flows from the Solvent Chemical site to the northeast under the influence of man made underground structures such as the Falls Street Tunnel and the New York Power Authority (NYPA- formerly known as PASNY) conduits (see below discussion of Regional hydrogeology).

Groundwater within the B-zone is influenced by the fluctuations of the Niagara River, and the bedrock fracture system associated with this zone appears capable of transmitting a high volume of groundwater from the site towards the north. The B-zone has a much greater hydraulic conductivity than the lower fracture zones. It has been estimated that this zone is responsible for transmitting approximately 60% of the contaminant loadings from the site. Vertical fractures exist between the bedrock zones, allowing for transmittal of groundwater between horizontal fracture systems. Due to the heterogeneity of the various fracture systems, considerable variation of hydraulic conductivity exists within each bedrock zone.

Regional Hydrogeology

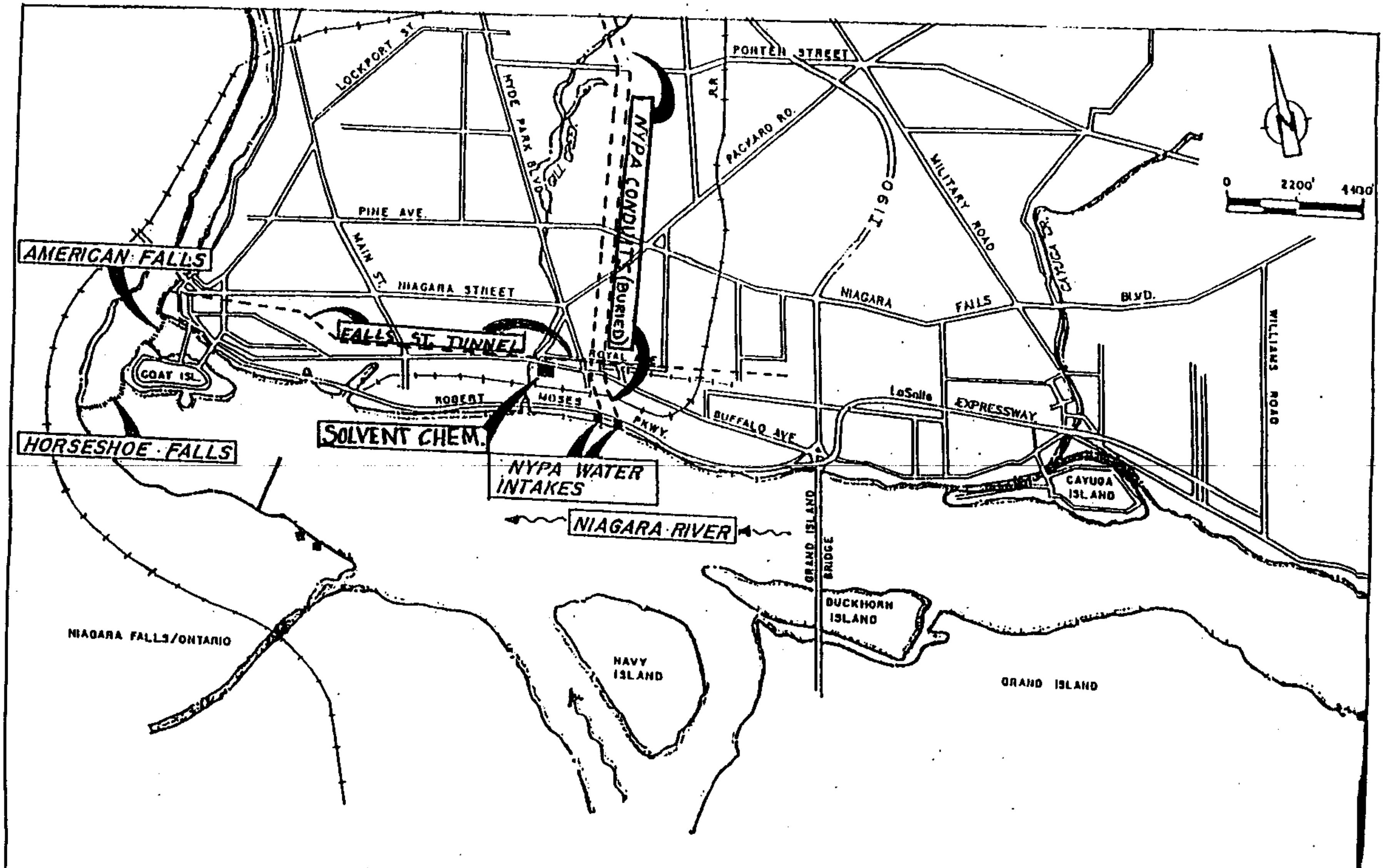
Regionally, groundwater in the bedrock is readily recharged by water from the Upper Niagara River (above the falls), and flows through fractures in the rock and discharges to the Lower Niagara River (below the falls). Two man-made underground structures exert a significant influence on the flow of bedrock groundwater in the vicinity of the Solvent site (see Figure 3).

FIGURE 2 Bedrock Groundwater Fracture Zones



SOLVENT CHEMICAL SITE
BEDROCK GROUNDWATER FRACTURE ZONES
WITHIN THE OAK ORCHARD FORMATION

FIGURE 3 Falls St. Tunnel and NYPA Conduits



GENERAL ALIGNMENT OF FALLS ST. TUNNEL AND NYPA CONDUITS IN VICINITY OF SOLVENT CHEMICAL SITE

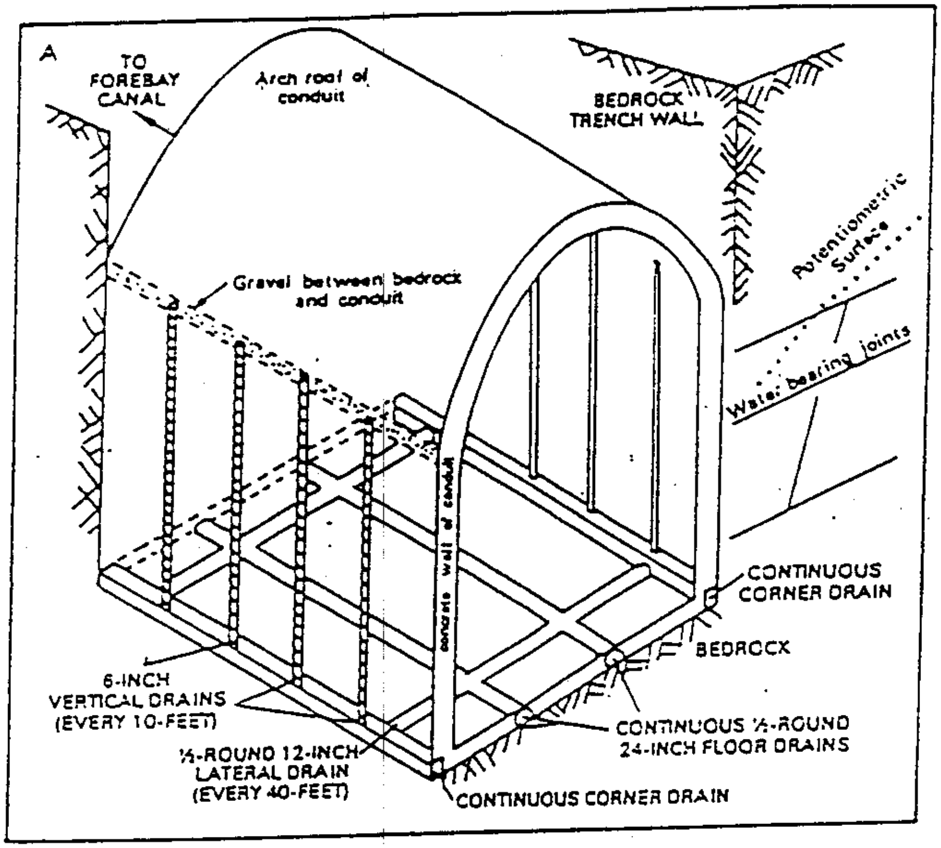
The Falls Street Tunnel is an unlined bedrock tunnel, originally built as a combined sanitary sewer, which directly influences groundwater flow in the B-zone in the southern portion of Niagara Falls. The tunnel runs east to west and is located approximately 1500 feet to the north of the Solvent site. The area between the Solvent site and the Falls Street Tunnel consists of both commercial and residential properties.

Based upon site investigations and regional data, it is likely that B-zone bedrock groundwater migrating north from Solvent Chemical is intercepted by the Falls Street Tunnel. As dry weather flow and a portion of wet weather flow in the Falls Street Tunnel is currently treated by the City Public Owned Treatment Works (POTW), a significant portion of groundwater contamination within the B-zone which has migrated off site is likely intercepted and treated under current conditions. It is also likely that some portion of B-zone contamination is not currently treated during high flow conditions (rain events which result in a hydraulic by-pass of the city POTW treatment system). Under these conditions, this untreated groundwater contamination is discharged directly to the Niagara River. Current estimates have projected that approximately 70% of the total groundwater infiltration into the Fall Street Tunnel is treated by the POTW. The remaining 30% is associated with high flow periods (storm events, etc.) when storm water bypasses the POTW and is discharged directly to the lower Niagara River near the rainbow bridge.

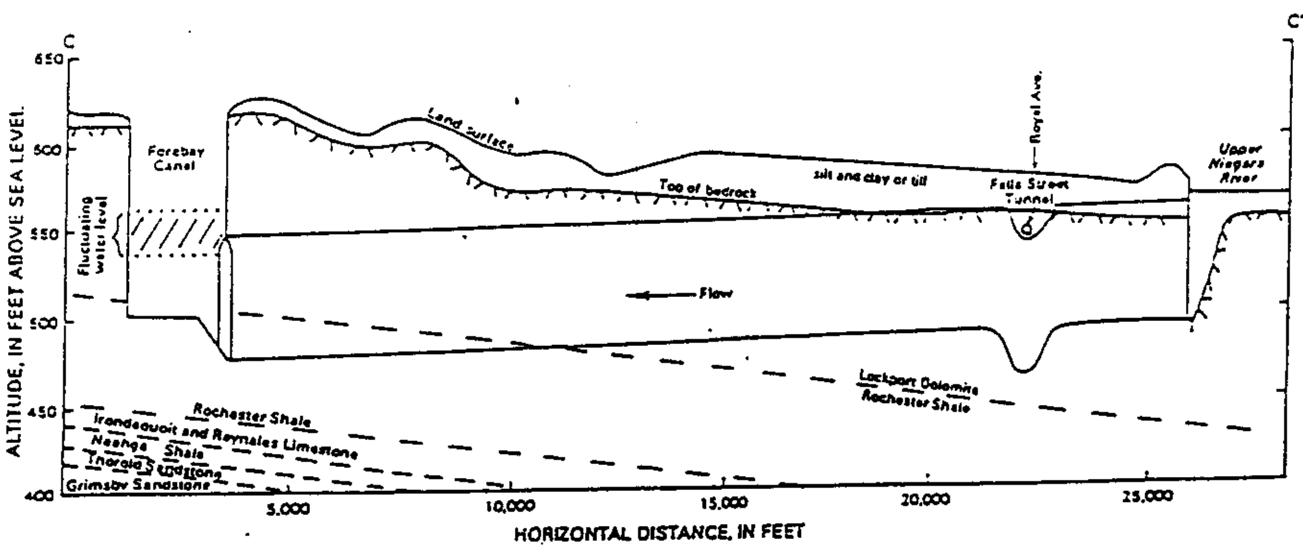
The NYPA conduit drain system also has a considerable influence on the fracture zones of the Oak Orchard bedrock groundwater. The conduit drain system was constructed to surround the exterior of the large concrete conduits which transmit water from the upper Niagara River for power generation (see Figure 4). Regional studies on bedrock groundwater flow have determined that the conduit drain system appears to influence and intercept a portion of the upper bedrock groundwater. The bedrock groundwater zones which are believed to be influenced by the conduit drains correspond to the Solvent Chemical C, CD, and D bedrock zones. The regional studies also indicate that it is likely that the conduit drain system discharges upwards into the Falls Street Tunnel where the Falls Street Tunnel crosses over the conduits.

As a result of the hydraulic influence of these two man-made systems, it appears that at least a portion of the contaminated bedrock groundwater from the C, CD, and D zones ultimately infiltrates into the Falls Street Tunnel and is subsequently treated during dry weather (and a portion of wet weather) flow. It is important to note however, that the collection of contaminated bedrock groundwater by the Falls Street Tunnel is not by design, and infiltration of site contamination into the Tunnel does not represent permitted discharge of waters to the City POTW. The City has taken steps in the past to limit the infiltration of groundwaters into the Falls Street Tunnel. In 1989 the City rehabilitated the lined section of the Falls Street Tunnel where it crosses over the NYPA conduit drains. The rehabilitation did substantially reduce (by approximately 50%) but did not eliminate infiltration along this section of the Tunnel. Groundwater infiltration into the Falls Street Tunnel at the intersection with the NYPA conduits has recently been estimated at 4 - 5 million gallons per day.

FIGURE 4 NYPA Conduit Details



General Construction Detail



Conduit Cross-Section

There exists a number of uncertainties and considerations concerning the influences of these two man-made structures on Solvent Chemical contaminants. It is not clear whether all of the flow in the lower bedrock zones of concern, particularly the CD and D zones, is currently being intercepted by the NYPA conduit drain system and transmitted into the Falls Street Tunnel. In addition, the City is under no obligation to maintain the Falls Street Tunnel as a groundwater interceptor and could conceivably undertake additional measures in the future to reduce groundwater flows into the Falls Street Tunnel. Such modifications could affect the fate of the off site contaminant plume.

However, under current conditions, the Falls Street Tunnel and the NYPA conduit drain system likely provide a hydraulic boundary for much of the contaminant plume which has migrated off site. Provided these structures continue to function in their current capacity, and assuming on-site sources of groundwater contamination are controlled in a way which significantly reduces further migration of contaminants off site, it is likely that the off site contaminant plume for the Solvent Chemical site will not expand further and may undergo some attenuation in the long term. It is important to note that this conclusion is also dependent on the relative lack of mobile Dense Non-Aqueous Phase Liquid (DNAPL).

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI and Supplemental RI analytical data were compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater and drinking water SCGs identified for the Solvent Chemical site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. NYSDEC Division of Environmental Remediation Technical and Administrative Guidance Memorandum (TAGM) 4046-soil cleanup guidelines for the protection of groundwater, background conditions, and risk based remediation criteria were used as SCGs for soil.

Based upon the results of the remedial investigation in comparison with the SCGs and potential public health and environmental exposure routes, certain areas and media at the site require remediation. These are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb) for groundwater, and parts per million (ppm) for soils and sediments. For comparison purposes, SCGs are given for each medium.

3.1.1 Nature of Contamination

As described in the SRI report, many soil, groundwater, and sediment samples as well as sump, pit, and tank water samples were collected to characterize the nature and extent of contamination. The RI and SRI sampling indicated significant concentrations of organic and inorganic contaminants in soils and both the overburden and bedrock groundwater. Principal organic contaminants include benzene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and 1,2,4-trichlorobenzene. Numerous other organic contaminants were detected in site groundwater in lower concentrations. Principal inorganic contaminants detected in soils and groundwater include chromium, lead, manganese, mercury, and zinc.

3.1.2 Extent of Contamination

Tables 1 through 5 summarize the extent of contamination for the contaminants of concern in site groundwater and soil and compares the data with the proposed remedial action levels (SCGs) for the site. The following are the media which were investigated and a summary of the findings.

Soils

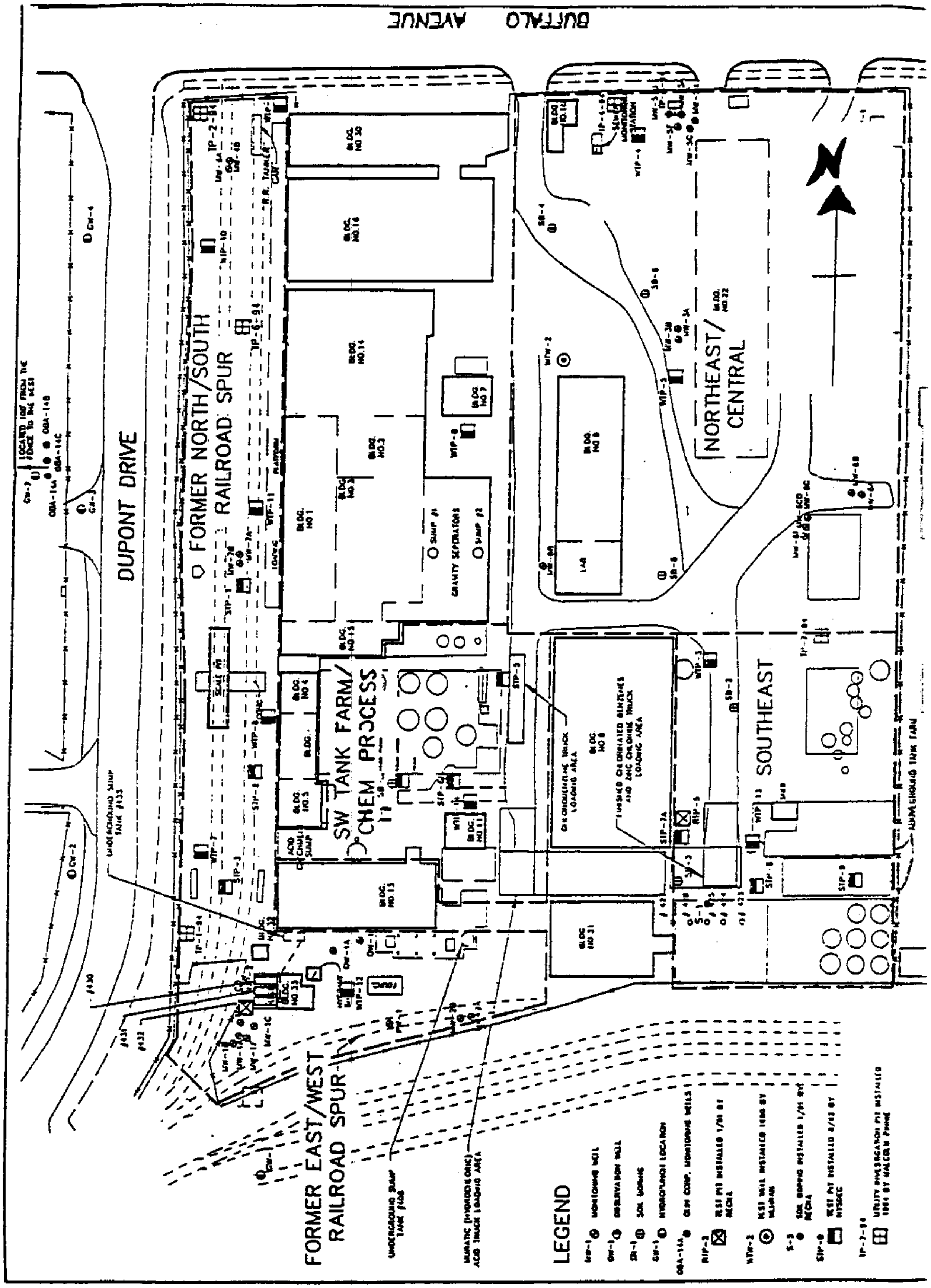
The RI and SRI characterized extensive soil contamination at the site. Predominant organic contaminants at the site include: benzene; chlorobenzene; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; 1,2,4-trichlorobenzene; PAHs; chlorinated aliphatics; and carbon disulfide. Areally, the highest concentrations of organics (primarily chlorinated benzenes) were found in the west, southwest, and southeast (see figure 5). Site soils in the northeastern quarter of the site are relatively free of organic contamination. The highest organic concentrations were detected near the top of the till at an average depth of 7 feet below ground surface. Organic concentrations in the former western rail spur were detected at up to 22,000 ppm (1,2-dichlorobenzene).

Inorganic soil contamination at the site is widespread. Predominant inorganic contaminants detected at the site include: chromium, lead, manganese, mercury, and zinc. Lead was detected at up to 31,600 ppm in the southwest tank farm area. Zinc was detected at up to 56,900 ppm in soils on the former western rail spur. Mercury was detected at up to 443 ppm in site soils in the extreme southwestern corner of the site.

Groundwater

Contaminant concentrations have been detected within the overburden groundwater at up to 540,000 parts per billion (ppb). Table 2 provides a comparison of specific contaminants to applicable State Criteria and Guideline (SCG) values. The highest organic contamination detected in the overburden groundwater was detected near the former railroad spurs along the west and south sides of the site, as well as in the vicinity of the underground benzene storage tanks located in the southwest corner of the site (see Figure 5 which shows site features). Benzene and chlorobenzene were detected in concentrations up to 540,000 ppb and 180,000 ppb respectively. Concentration of benzene and chlorinated benzenes decrease in off site areas to the north and west of the site. Inorganic groundwater contamination appears more widespread throughout the site, however, several individual inorganic compounds exhibited their maximum detected concentrations in the vicinity of the railroad spurs. The following inorganic compounds comprised some of the contaminants

FIGURE 5 Site Features



detected within the overburden groundwater: lead at up to 3,430 ppb, copper at up to 861 ppb, manganese at up to 7,270 ppb, mercury at up to 216 ppb, and zinc at up to 8,690 ppb.

Contaminant concentrations within the B-zone groundwater have been detected at up to 310,000 ppb. Table 4 provides a comparison of specific contaminants detected in the bedrock B-zone to applicable State Criteria and Guideline (SCG) values. Within the B-zone bedrock groundwater, the highest organic contamination was detected along the former southern railroad spur and in the extreme southwest portion of the site. Specific chlorinated benzene compounds were detected in the B-zone at concentrations up to 120,000 ppb. Organic contaminant concentrations decrease toward the north and east of the site. DNAPL was obtained from several B-zone monitoring wells in the southern end of the site as well as in the center of the site. Several inorganic compounds exhibited maximum concentrations in the vicinity of the former railroad spurs. Inorganic contaminant detections in this zone included mercury at 11.9 ppb, zinc at 3,230 ppb, lead at 524 ppb, and cyanide at 1890 ppb.

Contaminant concentrations within the bedrock C-zone are generally up to an order of magnitude lower than in the B-zone bedrock groundwater. The highest C-zone bedrock contamination was detected in the eastern and northern portions of the site. Specific chlorinated benzene compounds were detected in the C-zone at concentrations up to 19,000 ppb. Cyanide was detected at 2,450 ppb in the C-zone in the north of the site, which was its maximum detected groundwater concentration. See Table 5 for a comparison of C-zone contaminants with SCGs.

The CD-zone contained concentrations of benzene and chlorinated benzenes similar to those in the C-zone. Specific chlorinated benzenes were detected at up to 28,000 ppb in the northeast portion of the site. Inorganics in this zone include lead at up to 86 ppb, zinc at up to 400 ppb, and cyanide at up to 825 ppb. DNAPL was detected in a CD-zone well located in the eastern central portion of the site. See Table 6 for a comparison of CD-zone contaminants with SCGs.

No groundwater analytical data is available for the D-zone. However, based upon evidence of organic contamination (and possibly DNAPL) present in bedrock core samples taken from wells that were installed into the F-zone, concentrations of organic contaminants in the D-zone are expected to exceed F-zone levels and be similar to and possibly greater than those detected in the CD-zone.

Significantly lower benzene and chlorinated benzene concentrations were identified in the F-zone as compared to all other water bearing zones. See Table 7 for a comparison of F-zone contaminants with SCGs. This is likely attributable to an upward gradient within the F-zone. Inorganics in this zone were generally lower than concentrations detected in the CD-zone. Table 3 summarizes the bedrock groundwater zones of concern with respect to various organic contaminants detected.

Underground Utilities

Sediment samples were collected from on-site sewers in the southwest corner and northern site boundary during the RI. Chlorobenzenes were detected in the southwest corner at up to 2,700 ppm and in the northern portion of the site at up to 52 ppm. Off site investigations of the 18 inch storm sewer (which exits the site in the southwest corner and runs to Gill Creek) were performed during the SRI. Six test pits were excavated on site and four test pits were excavated off site along this storm sewer alignment. Chlolobenzene compounds were detected in soils along the sewer route at up to 11 ppm. Soil samples obtained from the two western-most test pits (closest to Gill Creek) did not indicate the presence of Solvent Chemical related organic contaminants (it should be noted however that the sewer pipe itself could not be exposed during the excavations due to a layer of concrete above the pipe, running along the length of the sewer alignment). The interior of the sewer was inspected through use of a video camera and appeared to be open from the Solvent site to Gill Creek (although debris was present within the sewer).

Tank/sump/pit sampling

Numerous underground storage tanks (USTs), sumps, and collection pits are located throughout the site. In general these tanks, sumps, and pits contain surface water runoff and/or contaminated groundwater. Organic compounds related to chlorobenzene manufacturing were detected at levels similar to concentrations found in groundwater. Inorganic compounds which appear to be related to previous site production of zinc ammonium chloride and zinc oxide were also detected in building sumps and pits in concentrations similar to levels detected in site groundwater.

3.2 Interim Remedial Measures

Interim Remedial Measures (IRMs) are conducted at sites when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

An IRM consisting of building and tank demolition/removal was deemed appropriate for the site. Negotiations were held with a PRP to perform this work, but were ultimately unsuccessful. One smaller scale IRM was implemented by the NYSDEC. This was the placement of a low permeability clay barrier to cut off the 18-inch diameter storm sewer and its associated backfill material at the southwest corner of the property. This was done as a precaution to restrict the off site migration of any storm water, soil, or groundwater from the site through the sewer or its bedding material.

3.3 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added human health risks to persons at or around the site. A more detailed discussion of the health risks can be found in the Qualitative Risk Assessment contained in Volume 2, Appendix D of the Supplemental RI.

The Qualitative Risk Assessment identified potential exposure pathways from the site (i.e. how an individual may come into contact with a contaminant). The five elements of an exposure pathway are 1) the source of the contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Completed pathways which are known to or may exist because of the site include:

- Dermal (skin) contact with contaminated surface soils by site trespassers (who have been observed on site) or future users of the site
- Dermal contact with, or incidental ingestion of contaminated sump, pit, or tank waters by site trespassers or future site users
- Inhalation of vapor phase chemicals from soils or standing waters by trespassers or future site users
- Dermal contact with, or incidental ingestion of contaminated soils, or water in adjacent utilities by utility workers
- Dermal contact with, or incidental ingestion of contaminated soils, water, or sediment by workers performing construction in the subsurface in the vicinity of the site
- Ingestion of fish from the Lower Niagara River or Lake Ontario which may have bioaccumulated site related contaminants

In addition, the Qualitative Risk Assessment indicated numerous physical hazards at the site including: collapsed and weakened buildings and structures; open pits and sumps containing water; flooded basements; open manways to underground storage tanks; and debris and rubble scattered throughout site. These physical hazards pose a risk to site workers and trespassers. Hazards include potential injuries from cuts or falls caused by scattered debris, injuries from unstable structures or buildings, or potential injury or death resulting from a fall into an open pit, sump, or tank which may be flooded.

3.4 Summary of Environmental Exposure Pathways

This section summarizes the types of environmental exposures which may be presented by the site. An Environmental Risk Assessment was not performed as part of the Supplemental RI. Due to the industrial nature of this area of Niagara Falls, there is little suitable habitat for wildlife within the property boundaries. However since there is off site migration of contaminants, and some of the bedrock groundwater contamination is ultimately discharged to the Niagara River (which in turn flows into Lake Ontario), the potential exists for aquatic resources to be effected by site contaminants. Of the organic site contaminants of concern, dichlorobenzenes and 1,2,4-trichlorobenzenes are expected to bioaccumulate in aquatic organisms. All three dichlorobenzene isomers were detected in Lake Ontario trout in 1980 at concentrations ranging from 1 ppb to 4 ppb. Metals of concern found at the site which are capable of bioaccumulation in aquatic organisms include arsenic, cadmium, chromium, copper, lead, mercury, and zinc. Of these, copper, lead, mercury, and zinc can bioaccumulate significantly. Based upon non-site related contaminants, the NYSDOH has issued a health advisory for fish for the Lower Niagara River and Lake Ontario.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers. Section 2.1 contains a brief chronological outline of past plant owners/operators.

A legal agreement which required a group of the PRPs to perform a Remedial Investigation was executed in 1989.

Stipulation

Date	Index	Subject
10/4/89	CIV-83-1401C	Remedial Invest.

The PRPs for this site did not complete a full RI/FS. After the Record of Decision is issued, the PRPs will be given the opportunity to implement the remedy. If an agreement cannot be reached with the PRPs, the NYSDEC will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the State for recovery of all response costs the State has incurred.

SECTION 5: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6NYCRR 375-1.10. The overall remedial goal is to meet all standards, criteria, and guidance (SCGs) and be protective of human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to public health and to the environment presented by the hazardous waste at the site, through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate to the extent practicable the potential for direct human contact with site contaminants.

- Reduce, control or eliminate to the extent practicable the contamination present within the soils on the site.

- Reduce, control or eliminate to the extent practicable the groundwater contamination present within the overburden.

- Reduce, control or eliminate to the extent practicable the groundwater contamination present within the bedrock zones of concern.

- Prevent to the extent practicable further off site migration of contaminated groundwater through the bedrock in order to facilitate attenuation of the off site plume and to reduce the potential for future environmental and human health risks.

SECTION 6: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Solvent Chemical site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled "Feasibility Study for the Solvent Chemical Site" dated February 1996, as well as the "Feasibility Study Supplement", dated July 1996.

A summary of the detailed analysis follows. As used in the following text, the time to implement reflects only the time required to implement the remedy, and does not include the time required to design the remedy, procure contracts for design and construction, or to negotiate with responsible parties for the implementation of the remedy.

6.1: Description of Alternatives

The potential remedies are intended to address the contaminated soils, sewer sediment, and groundwater at the site.

Alternative 1: No Action

Present Worth:	$655,00
Capital Cost:	$59,000
Annual O&M (30 years):	$52,000
Time to Implement:	1 month

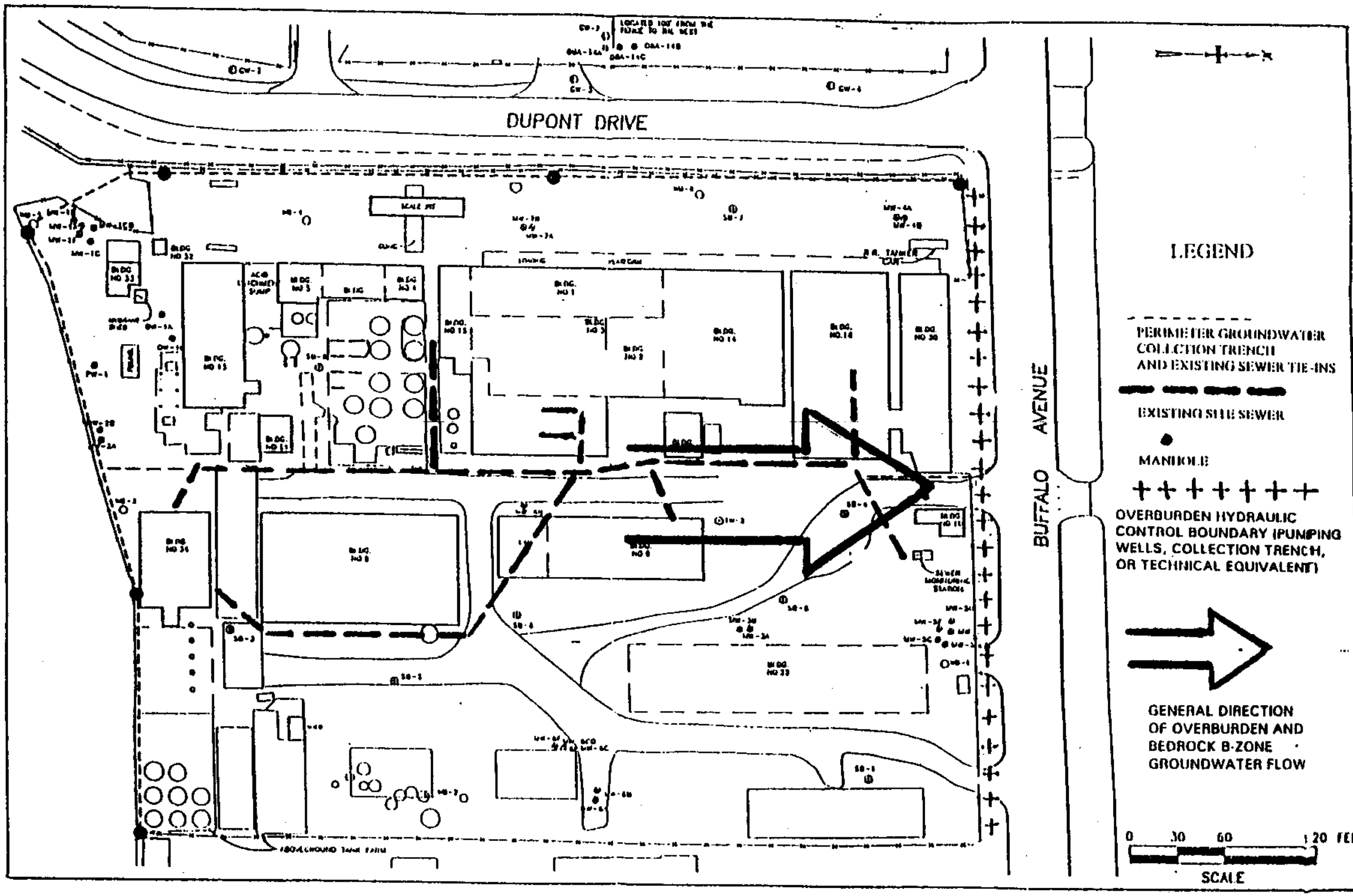
The no action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires institutional controls and continued monitoring only, allowing the site to remain in an unremediated state. The only physical action taken at the site beyond long term monitoring would be the replacement of the existing site fence to prevent trespassers from exposure through direct contact with contaminated surface soils, standing waters, etc. Otherwise, this alternative would leave the site in its present condition and would not provide any additional protection for human health and the environment.

Alternative 2: Overburden Containment with B-Zone Bedrock Groundwater Collection/ Treatment

Present Worth:	$10,990,000
Capital Cost:	$4,120,000
Annual O&M (30 years):	$600,000
Time to Implement:	6-18 months

Alternative 2 would provide for containment of contaminated soils and overburden groundwater through construction of a cover system and an overburden collection system. An overburden collection system would be operated to maintain hydraulic control and prevent off site migration of overburden groundwater. If appropriate, such a system would utilize the following as collection lines or drainage points to be incorporated into an overburden collection system: existing site sewers, building foundations, basement sumps, collection sumps and pits. Such existing site features would be used in combination with new overburden collection lines and other hydraulic controls as appropriate to collect contaminated overburden groundwater and prevent this groundwater from migrating from the site. Figure 6 represents a conceptual layout of such an enhanced overburden containment/collection system. A permeable type cover system would be constructed to prevent

FIGURE 6 Conceptual Overburden Collection

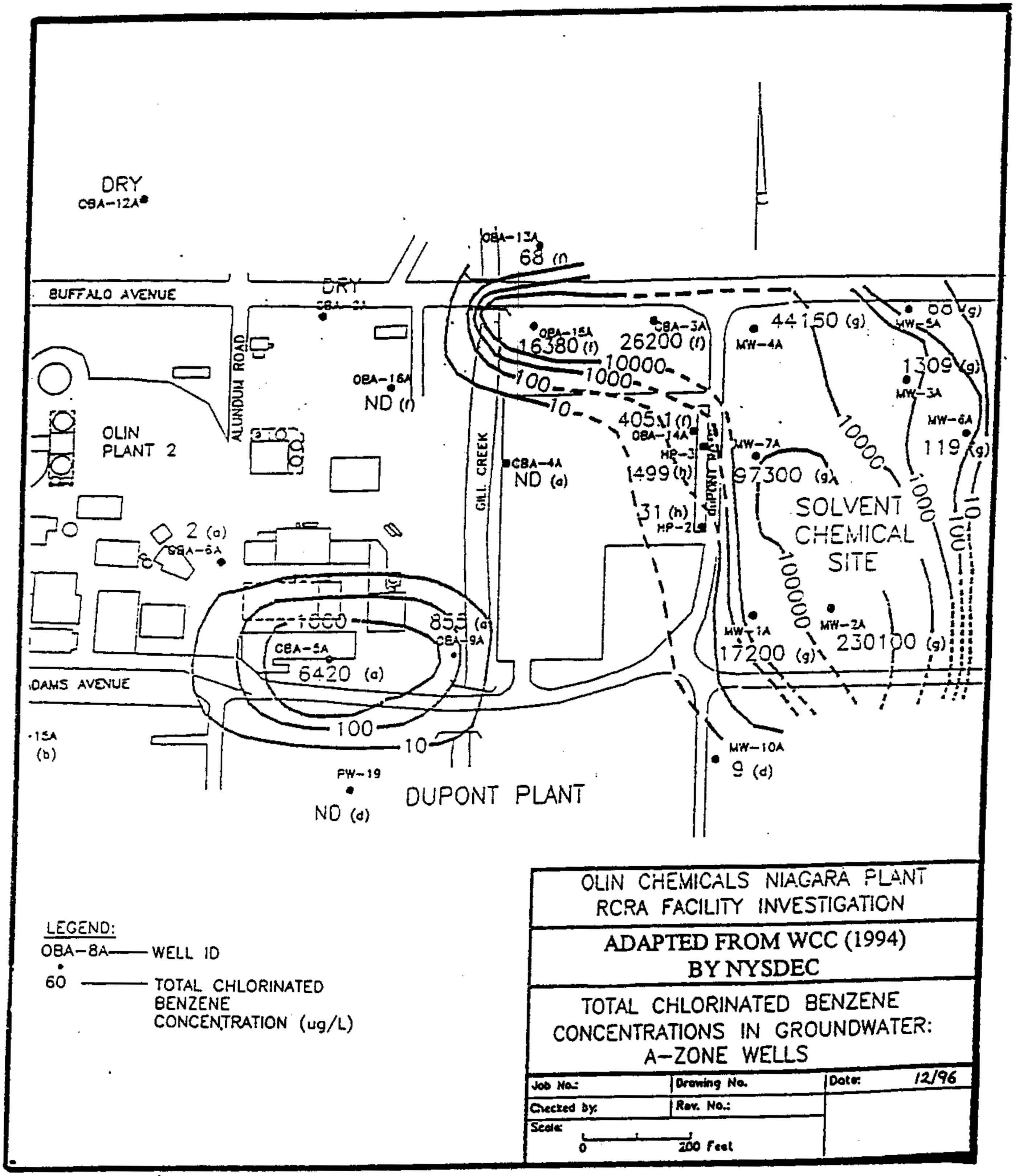


SOLVENT CHEMICAL SITE
CONCEPTUAL OVERBURDEN COLLECTION TRENCH

human exposure to contaminated surface soils and prevent erosion and subsequent off site migration of contaminated soils. Prior to cover system construction, site structures would be demolished in order to eliminate exposure routes (posed by open pits, sumps, basements, and tanks) as well as to eliminate the physical hazards posed by the site structures and debris. Debris from building demolition would be used as grading material for proper drainage of the cover system. Underground tanks and utilities would be closed in place, provided such closure did not interfere with any component of this alternative. Any underground tanks or utilities which interfere with design or construction of a component of this alternative would be removed. This alternative also would require the construction and operation of pumping wells within the B-zone of the bedrock to achieve hydraulic containment of the B-zone bedrock groundwater. Bedrock groundwater from this zone and overburden groundwaters would be either treated on site to regulatory standards and discharged to the Niagara River (discharged effluent would be required to meet substantive requirements similar to those under a SPDES permit), or discharged off site for treatment. Any treatment option selected would be required to comply with all Federal, State and local regulations. Groundwater could be treated on site using activated carbon, an Advanced Oxidation Process (AOP) such as ultraviolet oxidation, or any other treatment technology which achieves discharge criteria. For cost estimating purposes, it was assumed an on site groundwater treatment facility would be constructed and operated, with discharge of treated water to the Niagara River. It is possible that small quantities of DNAPL may accumulate during operation of B-zone pumping wells. If DNAPL is observed during pumping operations, recovery would be attempted to the extent feasible with pumps, and the DNAPL would be disposed of off site in a proper manner which is consistent with all Federal, State, and local regulations. Construction of a bedrock grout curtain could be included in this alternative in order to reduce the pumping rates required to achieve hydraulic containment of the B-zone. Such a reduction could prove cost effective if the savings due to reduced flow rates outweigh the expense of the grout curtain construction. A determination on the cost effectiveness of a grout curtain and whether construction was warranted would be made during detailed remedy design once groundwater treatment details and final cost estimates are available. Similarly, a decision on construction of a grout curtain could also be made after the B-zone hydraulic control system is operational and the hydraulic effects and flow rates are known with certainty. Additional pumping wells would be constructed and operated near Buffalo Avenue to the west of the site to achieve hydraulic control over a highly contaminated area of overburden and upper fractured bedrock. The contaminants found in this area are similar to predominant site indicator chemicals, and are likely due in part to migration from the Solvent site. This water would be added to the on site water for treatment/disposal. The volume of groundwater collected in this area is not expected to be significant in relation to the combined on-site flows from the overburden and bedrock groundwater system. Figure 7 shows the approximate area of concentrated off site groundwater contamination.

This alternative would include long term monitoring of the various groundwater zones to ensure remedy effectiveness. Deed restrictions would also be recommended in order to prevent future site uses which may be incompatible with elements of the remedy.

FIGURE 7 Overburden Contaminant Plume (Chlorobenzenes)



Alternative 3: Overburden Containment with Phased Bedrock Groundwater Containment/ Treatment

Present Worth:	$10,990,000 - $13,830,000
Capital Cost:	$4,120,000 - $6,830,000
Annual O&M (30 years):	$600,000 - $610,000
Time to Implement:	6-18 months for initial phase

Alternative 3 would provide for containment of contaminated soils and overburden groundwater through construction of a cover system and an overburden collection system. An overburden collection system would be operated to maintain hydraulic control and prevent off site migration of overburden groundwater. If appropriate, such a system would utilize the following as collection lines or drainage points to be incorporated into an overburden collection system: existing site sewers, building foundations, basement sumps, collection sumps and pits. Such existing site features would be used in combination with new overburden collection lines and other hydraulic controls as appropriate to collect contaminated overburden groundwater and prevent this groundwater from migrating from the site. A permeable type cover system would be constructed to prevent human exposure to contaminated surface soils and prevent erosion and subsequent off site migration of contaminated soils. Prior to cover system construction, site structures would be demolished in order to eliminate exposure routes (posed by open pits, sumps, basements, and tanks) as well as to eliminate the physical hazards posed by the site structures and debris. Debris from building demolition would be used as grading material for proper drainage of the cover system. Underground tanks and utilities would be closed in place, provided such closure did not interfere with any component of this alternative. Any underground tanks or utilities which interfere with design or construction of a component of this alternative would be removed.

Similar to Alternative 2, this alternative would require the construction and operation of pumping wells within B-zone of the bedrock to achieve hydraulic containment of contaminants within the B-zone. Bedrock groundwater from this zone and overburden groundwaters would be either treated on site to regulatory standards and discharged to the Niagara River (discharged effluent would be required to meet substantive requirements similar to those under a SPDES permit), or discharged off site for treatment. Any treatment option selected would be required to comply with all Federal, State and local regulations. Groundwater could be treated on site using activated carbon, an Advanced Oxidation Process (AOP) such as ultraviolet oxidation, or any other treatment technology which achieves discharge criteria. For cost estimating purposes, it was assumed an on site groundwater treatment facility would be constructed and operated, with discharge of treated water to the Niagara River. It is possible that small volumes of DNAPL may accumulate during operation of B-zone pumping wells. If DNAPL is observed during pumping operations, recovery would be attempted to the extent feasible with pumps, and the DNAPL would be disposed of off site in a proper manner which is consistent with all Federal, State, and local regulations.

As with Alternative 2, additional pumping wells would be constructed and operated near Buffalo Avenue to the west of the site to achieve control over a highly contaminated area of overburden and upper fractured bedrock. The contaminants found in this area are similar to predominant site indicator chemicals, and are likely due in part to migration from the Solvent site. This water would be added to the on-site water for treatment/disposal.

Following operational status of a B-zone hydraulic containment system, the B-zone and the lower bedrock groundwater zones (including the D-zone) would be monitored to evaluate the effectiveness of this phase of the remedial system on the bedrock groundwater contamination. At a minimum, operation of the B-zone system would be required to create an inward gradient that reduces, to the extent practicable, any further off site contaminant migration from that zone. A determination would be made by the State whether this phase of the remedy was having a sufficient effect on reducing contaminant migration from the B-zone to the lower bedrock groundwater zones and in turn reducing off site contaminant loading within the lower bedrock zones. When performing this evaluation, the State would also take into consideration any new or additional information regarding the fate of the off site contaminant plume, such as whether the regional hydrogeological influences are better understood or have been altered.

If the initial phase of hydraulic containment does not sufficiently demonstrate a significant reduction in contaminant loadings to the lower zones and off site migration from the lower bedrock zones, subsequent phase(s) would be implemented to actively control the lower bedrock zone(s). Such subsequent phases may include increased B-zone extraction, implementation of hydraulic and/or physical containment systems within the lower bedrock zones of concern, or other appropriate bedrock measures. Monitoring of the lower zones(s) would continue to be performed and further evaluations made as to the effectiveness of the subsequent control efforts. The State would again make a determination whether further steps would be necessary to achieve significant reduction of off site contaminant loadings within the lower bedrock zones.

Construction of a bedrock grout curtain could be included in this alternative in order to reduce the pumping rates required to achieve hydraulic containment of the targeted bedrock zones. Such a reduction could prove cost effective if the savings due to reduced flow rates outweigh the expense of the grout curtain construction. A determination on the cost effectiveness of a grout curtain and whether construction was warranted would be made during detailed remedy design once groundwater treatment details and final cost estimates are available. Similarly, a decision on construction of a grout curtain could be made after the B-zone hydraulic control system is operational and the hydraulic effects of and flow rates are known with certainty.

This alternative would include long term monitoring of the various groundwater zones to ensure remedy effectiveness. Deed restrictions would also be recommended in order to prevent future site uses which may be incompatible with elements of the remedy.

Alternative 4: Ex-Situ Soil Treatment with Complete Bedrock Groundwater Collection/ Treatment

Present Worth:	$33,500,000
Capital Cost:	$26,870,000
Annual O&M (20 years):	$610,000
Time to Implement:	24-36 months

Alternative 4 would require the remediation of contaminated soils through excavation and treatment. Using existing soil contaminant distribution data (supplemented as needed with further soil characterization), soil areas would be excavated and the organics and/or metal contaminants within the soil treated. An estimated 37,900 yd^3 of soils would be excavated and treated. Treatment of the soils would be achieved by thermal desorption for organic compounds, followed by solidification/stabilization for inorganic fixation. Soils contaminated with metals alone would be treated by a solidification/stabilization process alone. Soil excavation would be performed using controls to prevent exposure of adjacent properties and residences to dusts and volatile organic vapors. Treated soils would be replaced on site after treatment. After soil treatment, site structures would be demolished and the debris placed on site. A clean soil cover system would then be placed over the site.

This alternative would also require the construction and operation of pumping wells within the B, C, CD, and D bedrock groundwater zones to achieve hydraulic containment of the contaminated bedrock groundwater under the site. Such a system would require the installation of several pumping wells within each bedrock zone to establish hydraulic containment of each zone. Additional well installations and/or pumping tests would need to be completed in order to design a pumping system to maintain hydraulic control in the B, C, CD, and D groundwater flow zones. Installation of a partial grout curtain (such as a two sided up-gradient curtain) or complete (four sided) grout curtain through the bedrock fracture zones near the perimeter of the site (beyond areas of NAPL contamination) could be implemented. Such a grout curtain could offer economic benefit by reducing the amount of groundwater which must be pumped and treated.

Like Alternatives 2 and 3, additional pumping wells would be constructed and operated near Buffalo Avenue to the west of the site to achieve control over a highly contaminated area of overburden and upper fractured bedrock. The contaminants found in this area are similar to predominant site indicator chemicals, and are likely due in part to migration from the Solvent site. This water would be added to the on-site water for treatment/disposal.

Bedrock groundwater collected from the bedrock groundwater zones and overburden groundwaters would be either treated on site to regulatory standards and discharged to the Niagara River (discharged effluent would be required to meet substantive requirements similar to those under a SPDES permit), or discharged off site for treatment. Any treatment option selected would be required to comply with Federal, State, and local regulations. On-site treatment of groundwater could be accomplished using activated carbon, an Advanced Oxidation Process (AOP) such as ultraviolet oxidation, or any other treatment technology which achieves discharge criteria. For cost estimating purposes, it was assumed an on-site groundwater treatment facility would be constructed and operated, with discharge of treated water to the Niagara River. It is possible that some DNAPL may accumulate during operation of B-zone pumping wells. If DNAPL is observed during pumping operations, recovery would be attempted to the extent feasible with pumps, and the DNAPL would be disposed of off site in a proper manner which is consistent with all Federal, State, and local regulations.

This alternative would include long term monitoring of the various groundwater zones to ensure remedy effectiveness. Deed restrictions would also be recommended in order to prevent future site uses which may be incompatible with elements of the remedy.

6.2: Evaluation of Remedial Alternatives

The criteria used to evaluate the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternative against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs).

Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance. The most significant chemical specific SCGs for the site include soil clean-up criteria contained in NYSDEC TAGM HWR-92-4046 (soil guidance for the protection of groundwater/drinking water quality) and groundwater standards and guidance values contained in NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.

Due to the extremely high concentrations of contaminants within the groundwater, and the presence of residual DNAPL which will serve as a continuing source of contamination (and cannot be readily extracted from soil and bedrock fractures), achievement of groundwater standards on site within a reasonable time frame through remedial measures is considered technically impracticable. As such, pursuant to U.S. Environmental Protection Agency guidance Evaluating the Technical Impracticability of Ground-Water Restoration, Interim Final, Directive 9234.2-25, September 1993, the NYSDEC has determined that the SCGs for on-site groundwater should be waived.

While on-site groundwater quality restoration is impracticable with present technology, source control measures are technically feasible to prevent groundwater contaminants from continuing to emanate from the site and therefore will allow for the reduction of off site contaminant levels. The prevention of continued groundwater contaminant migration within the groundwater zones of concern may allow the off site groundwater to eventually achieve groundwater standards over the long term. Therefore SCGs for protection of groundwater continue to apply to the off site groundwater.

Alternative 1 would not result in compliance with chemical specific SCGs. Groundwater at the site presently exceeds groundwater standards, both in the overburden and in the B, C, CD, D (assumed), and F bedrock zones. Contaminant concentrations are of such magnitude that without treatment, contaminant concentrations would not biodegrade or attenuate appreciably. In addition, the persistence of DNAPL within the fractured bedrock will continue to serve as a source of future groundwater contamination for an extremely long period of time.

Alternative 2 would not result in full compliance with chemical specific SCGs. Overburden soils would not be treated and thus would not meet soil clean-up criteria. While overburden groundwater would be hydraulically contained on site, contaminant reduction would likely occur only very slowly and SCGs for on site overburden groundwater would not be met in a reasonable time frame. Contaminant concentrations within the off site plume of the overburden would be expected to attenuate and may eventually achieve standards.

A pumping system installed in the B-zone would provide hydraulic containment of bedrock groundwater within this zone and on site concentrations within the zone would be expected to gradually decrease. However, due to the on site presence of residual DNAPL in the B-zone, on site B-zone groundwater would not likely achieve SCGs in a reasonable time period. Contaminant concentrations in the off site plume of the B-zone would be expected to attenuate and may eventually achieve standards. Similarly, due to the persistence of residual DNAPL on site in the deeper bedrock zones, on site groundwater in the deeper zones would also not likely achieve SCGs in a reasonable time period. Though uncertain, improvements to groundwater contaminant levels off site in the lower zones may occur, provided that future reduction of migration through the lower zones from operation of the B-zone pumping system is extensive enough. SCGs for treatment and discharge of contaminated groundwater would be met.

Alternative 3 would be very similar to Alternative 2 in ability to meet SCGs, with one significant difference. Alternative 3 would provide a higher level of confidence that contaminant levels in the lower bedrock zones would be significantly reduced, and a higher probability that off site groundwater in these zones could eventually reach SCGs. This added level of confidence results from the provision which requires active control of lower bedrock groundwater should future site conditions warrant.

Alternative 4 will result in compliance with chemical specific SCGs for site soils. Organic soil contamination would be reduced by low temperature thermal desorption to below NYSDEC TAGM No. 4046 cleanup goals. Soils would be stabilized so that inorganic contamination would be prevented from leaching into overburden groundwater after the treated soils were placed back on site. Overburden groundwater would achieve standards. Concentrations of on site bedrock groundwater contaminants would be expected to gradually decrease through operation of a bedrock groundwater hydraulic control and treatment system, but due to the persistence of residual DNAPL within the bedrock fracture zones, would not likely achieve groundwater standards within a reasonable time period. Contaminant concentrations within the off site contaminant plume in the overburden and bedrock groundwater zones would be expected to attenuate and may eventually achieve standards.

2. Protection of Human Health and the Environment

This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

Alternative 1 would not adequately protect human health and the environment. In its present condition, the site poses numerous physical hazards and chemical hazards to site users and trespassers, potential hazards to utility and construction workers in the vicinity of the site, and long term threats to the environment. Without overburden or bedrock groundwater containment/treatment, site contaminants would be allowed to continuously migrate off site. Some of this contaminated groundwater would enter the Niagara River, and could have impacts to human health or the environment.

Alternative 2 would offer significantly improved protection of human health and the environment in comparison to Alternative 1. Alternative 2 would eliminate the physical and chemical exposure hazards associated with the site structures through building demolition, and would eliminate potential for human exposures through direct contact with contaminated soils by placement of a cover system over the site. Bedrock B-zone hydraulic containment and treatment would provide for some incremental protection of human health and the environment by preventing further off site migration of B-zone bedrock groundwater contaminants. Overburden and B-zone bedrock groundwater containment would significantly reduce potential exposure to utility and construction workers in the vicinity of the site by preventing future off site migration of contaminants within these zones. However, this alternative would not prevent off site migration of contaminants within the lower bedrock groundwater zones. Site contaminants within these lower bedrock zones would continue to migrate off site. Some of this contaminated groundwater would continue to enter the Lower Niagara River (during POTW by-pass periods) and would continue to pose a threat to human health and the environment.

Alternative 3 would offer similar protection for human health and the environment as Alternative 2, but with additional provisions to address deep bedrock contaminant migration. Alternative 3 would eliminate the physical and chemical exposure hazards posed by existing site structures through demolition of site structures, and would eliminate potential for human exposures through direct contact with contaminated soils by placement of a cover system over the site. Overburden and B-zone bedrock groundwater containment would significantly reduce potential exposure to utility and construction workers in the vicinity of the site by preventing future off site migration of contaminants within these zones. Bedrock groundwater containment/collection and treatment in the B-zone and as necessary, in the C, CD and D zones would significantly reduce the migration of contaminants from the bedrock source area to the NYPA conduit system, the Falls Street Tunnel, and the Lower Niagara River.

Alternative 4 would offer the most protection of human health and the environment since the site soils would be treated and all bedrock zones would be actively pumped. Treatment of the soil would reduce the concentrations of organics in the soils to below DEC TAGM 4046 cleanup goals and would stabilize inorganic contaminants to reduce their potential for future impacts to groundwater. The construction of a cover system would eliminate potential for exposures through direct contact with stabilized soil residuals placed back on site. Demolition of site structures would eliminate physical and chemical exposure hazards posed by site structures. Hydraulic control and treatment of overburden groundwater and bedrock groundwater in the B thru D zones would prevent contaminants from migrating off site, thereby reducing potential for human exposure in nearby underground utilities and future structures and reducing contaminant migration to the Niagara River.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. <u>Short-term Effectiveness</u>

The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared with the other alternatives.

Alternative 1 presents no adverse short term impacts because there would be no construction activities beyond fence replacement.

Alternative 2 would present limited short term impacts, primarily from the closure of underground utilities and tanks, construction of the overburden and bedrock collection system, and construction of a cover system. Personal protection and monitoring would be employed to minimize impacts from these activities to acceptable levels. Remedial action objectives would be met for overburden soils and groundwater, and for B-zone bedrock groundwater after the remedial measures are implemented (within 6-18 months). The overburden and bedrock hydraulic containment system would be required to be operated continuously (most likely for decades) in order to satisfy objectives. Remedial action objectives would not be achieved for bedrock groundwater zones below the B-zone which have been impacted by the site.

Alternative 3 would present limited short term impacts very similar to Alternative 2. The only difference would be from the possible installation of additional bedrock groundwater extraction systems as part of the hydraulic containment systems. Personal protection and monitoring would be employed to minimize these impacts to acceptable levels. Remedial action objectives would be met for overburden soils and groundwater, and for B-zone bedrock groundwater after the remedial measures are implemented (within 6-18 months). The overburden and bedrock hydraulic containment system would be required to be operated continuously (most likely for decades) in order to satisfy objectives. Unlike Alternative 2, this Alternative will provide the ability to achieve remedial action objectives for bedrock groundwater zones below the B-zone. The decision to pursue bedrock remediation in the lower zones will be based, in part, upon the ability to satisfy the remedial action objectives for bedrock groundwater.

Alternative 4 would present greater short term impacts than Alternatives 2 and 3 due to the excavation and handling of contaminated soils during ex-situ treatment processes. Limited short term impacts would be associated with construction activities involved with removal of underground site utilities and tanks, construction of a cover system, and installation of a bedrock groundwater collection/treatment system. Personal protection and monitoring would be employed to minimize these impacts to acceptable levels. Remedial action objectives would be met for the overburden through soil treatment as opposed to containment. However, due to the numerous controls required to prevent unacceptable emissions of airborne contaminants, soil treatment would likely take several years to complete (24-36 months). Remedial action objectives for bedrock groundwater would be met by the operation of the bedrock groundwater collection/treatment system. Such a system would be required to be operated continuously (most likely for decades) in order to satisfy objectives.

4. Long-term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternative 1 would not provide for long term effectiveness or permanence since no remedial measures would be performed. No active controls would be implemented to limit exposures from site contamination other than replacement of the fence to restrict access to the site.

Alternative 2 would provide long term effectiveness and permanence. While contaminated soils would remain on site, they would be effectively contained through construction of a cover system and collection and treatment of overburden groundwater. A cover system would provide an effective and permanent means of preventing contact with contaminated soils. Maintenance of the cover system would provide reliability. Hydraulic control/treatment of the overburden and B-zone bedrock groundwaters would effectively prevent off site migration of some of the site contaminants. Such a system would be permanent for as long as the system was operated and maintained. The decision on treatment of collected groundwater either through an on-site treatment system or through a permitted off site discharge would be based on which alternative offered the most economical long term reliability. Either treatment option would provide an effective and permanent means of groundwater treatment/disposal. This alternative would not be an effective or permanent means of preventing off site migration of groundwater contamination within the lower (C, CD, and D) bedrock zones.

Alternative 3 offers much of the same long term effectiveness and permanence as Alternative 2. However, this alternative could offer greater long-term effectiveness and permanence since it offers the ability to control bedrock groundwater contamination below the B-zone. Since the ultimate receptor of contaminated site groundwater is the Niagara River, this alternative would provide long term reduction of contaminant loadings to the Niagara River. Pumping wells would be operated to provide on-site hydraulic containment of bedrock groundwater zones, and such a system would be effective for as long as it was operated. The decision on treatment of collected groundwater either through an on-site treatment system or through a permitted off site discharge would be based on which alternative offered the most economical long term reliability. Either treatment option would provide an effective and permanent means of groundwater treatment/disposal.

Alternative 4 would provide for a more effective and permanent soil remediation than alternative 2 or 3 by removing organics from soil through low temperature thermal desorption. Subsequent stabilization of inorganics within the soil through a mixing process using additives would provide an effective and permanent means of treating inorganic contaminants within the soil. Hydraulic control/treatment of the overburden and bedrock groundwaters would effectively prevent off site migration of contaminants. Such a system would be permanent for as long as the system was operated and maintained. The decision on treatment of collected groundwater either through an on-site treatment system or through a permitted off site discharge would be based on which alternative offered the most economical long term reliability. Either treatment option would provide an effective and permanent means of groundwater treatment/disposal.

5. **<u>Reduction of Toxicity, Mobility or Volume</u>**

Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative 1 would not provide for any reduction in toxicity, mobility, or volume of soil or groundwater contaminants.

Alternative 2 would provide for a permanent reduction in the mobility of soil and groundwater contaminants within the overburden and B-zone bedrock. A cover system would prevent the migration of contaminated soils by erosion. The mobility of groundwater contaminants in the overburden and the bedrock would be reduced by the hydraulic containment achieved by the pumping system. Reduction of toxicity of groundwater within the bedrock would occur gradually. This Alternative would also reduce the toxicity of contaminated groundwater and volume of contaminants through collection from the overburden and the B-zone and subsequent on site or off site treatment. This alternative would not provide for the reduction of toxicity, mobility, or volume within the lower (C, CD, and D) bedrock zones.

Alternative 3 would provide for a similar reduction of toxicity, mobility, and volume as alternative 2, but in addition would offer further reductions in the lower bedrock zones if the first phase of the remedy does not have a sufficient effect on significantly reducing off site contaminant loading within the bedrock zones.

Alternative 4 would provide for a reduction in toxicity, mobility, and volume of soil contaminants through the destruction of organic contaminants and the immobilization and stabilization of inorganic contaminants. Thermal desorption would result in an organic contaminant volume reduction of greater than 99.9%. The toxicity and mobility would be reduced correspondingly. Inorganic contaminants (metals) within the overburden soils would be stabilized/solidified to significantly reduce the mobility of the inorganics (i.e. the ability of inorganics to leach into the groundwater). Bedrock groundwater containment/treatment would provide for a reduction in mobility of soil and groundwater contaminants within the overburden and bedrock.

6. <u>Implementability</u>

The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personal and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Alternative 1 would be readily implementable. Fence replacement and periodic groundwater monitoring would be readily implementable.

Alternative 2 would be readily implementable. Electricity would need to be supplied to the site to operate the pumps. If on-site groundwater treatment was chosen, a treatment system would need to be designed and built, however it is expected that readily available technology would be sufficient for treatment needs. An operator would need to be trained to monitor system operation and to package and dispose of process residuals. Bench scale testing for various treatment processes may need to be performed during a pre-design stage. All substantive State requirements for discharge of this water would have to be met (similar to establishing SPDES discharge limitations). If off site groundwater treatment is selected, all appropriate regulatory requirements on the Federal, State, and local level would need to be addressed. It is expected that these requirements could be readily met. Monitoring for remedy effectiveness would be relatively straight forward and reliable. Bedrock hydraulic monitoring may require systematic well installations to ensure monitoring points are in contact with the bedrock fracture system. If economically beneficial and technically suitable, installation of a grout curtain would be readily implementable.

Alternative 3 would require additional hydraulic monitoring in deeper bedrock groundwater zones and may require hydraulic containment of lower bedrock zones, but would offer similar Implementability as Alternative 2.

Alternative 4 would be implementable, although with considerably more difficulties than Alternatives 2 and 3. Significant technical coordination would be required to stage and operate a thermal desorption unit and soil stabilization equipment given the relatively small size of the site. Significant administrative implementability concerns would need to be addressed when excavating highly contaminated soils for treatment. A community air monitoring plan would need to be developed and implemented to protect nearby residents and workers. Easements may need to be obtained to remediate contaminated soils beyond the property boundaries. Issues regarding air discharge from the thermal treatment unit would also need to be addressed. An overburden and bedrock hydraulic control/treatment system would be readily implementable. If economically beneficial and technically suitable, installation of a grout curtain would be readily implementable.

7. <u>Cost</u>

Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 7.

Costs estimates for alternatives 2, 3, and 4 were developed in the FS report and the FS Supplement. The costs for the bedrock groundwater portion of these alternatives utilize costs developed to construct, operate and maintain an on-site treatment system utilizing AOP Treatment (ultra-violet oxidation) and/or carbon adsorption treatment technologies. Alternative 2 assumes a total lower flow than alternatives 3 or 4, and assumes an activated carbon treatment system. Alternative 4 assumes a higher flow rate and an AOP treatment system with a secondary treatment phase of carbon adsorption, as this was projected to be the more likely treatment method to be implemented. Groundwater treatment system costs for each alternative use existing site data to estimate flow rates necessary to achieve hydraulic control of groundwater flow zones.

Both capital costs and O&M costs may be significantly reduced if an off site treatment alternative can be arranged. Such off site treatment would be required to meet all Federal, State, and Local regulatory requirements. In addition, should design evaluations or treatment system operations show that a grout curtain would offer additional economic benefits, there would be some increase in capital costs in order to provide a long term operation and maintenance cost reduction through reduced flows.

Alternative 4 would likely cost three or more times that of Alternatives 2 or 3. Estimates for Alternatives 2 and 3 are dependant upon actual flow rates necessary to achieve hydraulic containment. As such, the estimates provided in this ROD may change considerably, however the relative costs of each alternative in relation to one another would remain relatively constant.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is focused upon after public comments on the Proposed Remedial Action Plan have been received.

8. <u>Community Acceptance</u>

Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan were evaluated. A " Responsiveness Summary" that describes public comments received and the Department responses is included as Appendix A.

Numerous comments were received from representatives of the responsible parties. Comments were also received from the Olin Corporation, and from one resident of Niagara Falls.

Comments from the responsible parties and the Olin Corporation were generally supportive of the selected remedy. There also were comments both for and against specific aspects of the proposed plan. As an example, one party commented that they were in agreement with the bedrock remedial strategy but opposed to the overburden remedial strategy. Another party commented that they disagreed with the bedrock remedial strategy but agreed with the overburden remedial strategy. Some specific comments received from the parties led to minor modifications of the proposed remedy, and these changes have been incorporated into the ROD. Most of these modifications were made to provide greater flexibility in the remedy while still satisfying the remedial goals.

A comment was received which discussed the lack of a complete investigation of the 18 inch storm sewer (and its bedding material) which travels from the southwest corner of the site to Gill Creek. The State has included an additional component in the selected remedy to address this sewer. The sewer and the associated bedding material will be either be removed, or a thorough investigation will be performed and appropriate subsequent remedial measures taken.

Several comments were received from a group of PRPs proposing alternative components to the remedy which would be technically equivalent in their performance. One of these comments was that a system of recovery wells near the northern side of the site could be constructed to achieve a "dewatering" of the overburden, and thus provide a hydraulic barrier on the northern side of the site which would prevent overburden groundwater migration to the north. The remedy selected requires specific performance criteria, but is flexible enough to allow a modification for a technically equivalent component of the remedy.

A comment was received by the current property owner concerning restrictions on future use of the site after the remedy is implemented. While the selected remedy does not preclude future use of the site, future use should be restricted to commercial or industrial purposes. Without special construction considerations, construction of structures with basements would not be consistent with the remedy since this would introduce a new exposure pathway and corresponding risk to human health.

Many comments were received from the U.S. Army Corps of Engineers on behalf of the U.S. Government, one of the PRPs for the site. These comments generally request justification of elements of the remedy, and explanation of the threat the site presents to human health and the environment. These comments are addressed in detail in the Responsiveness Summary.

The comments received by the resident of Niagara Falls was generally supportive of the remedy, however a suggestion was made to incorporate this site into a "regional" remedy which would address groundwater contamination from the numerous sites in this vicinity of Niagara Falls. These comments are addressed in detail in the Responsiveness Summary.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 6, the NYSDEC has selected Alternative 3 as the remedy for this site.

This selection is based upon the review of the site data and evaluation of the alternatives and their ability to meet the above discussed criteria.

This selection is also based on the following:

Alternative 1 fails to meet either of the threshold criteria and is rejected on that basis.

None of the four alternatives would fully comply with SCGs for groundwater. As such, a waiver from groundwater SCGs would be appropriate for the on-site bedrock groundwater in Alternatives

2, 3 and 4. SCGs for groundwater may be achieved in the off site plume for both Alternatives 3 and 4 after a long period of time, with Alternative 4 more likely to achieve SCGs than Alternative 3.

Unlike Alternative 3 or 4, Alternative 2 would not facilitate attenuation of the off site contaminant plume in the deeper zones. Some of the contaminated bedrock groundwater from these zones would ultimately enter the Niagara River. Because Alternative 2 has no provision for deeper bedrock groundwater control, it may not ever achieve groundwater SCGs in the off site plume. As such, Alternative 2 would not assure adequate protection of human health and the environment since it may not prevent or significantly reduce off site migration of site contaminants within the lower (C, CD, and D) bedrock zones.

Alternatives 3 and 4 would provide equal long term effectiveness and permanence with both alternatives considered superior to Alternative 2 in this regard.

While Alternative 4 is the only alternative which would meet soil cleanup objectives, Alternatives 2 and 3 would meet remedial action objectives for soils through the containment of contaminated overburden soils. Alternatives 2 and 3 would also both provide a reliable means for containment of overburden contaminants left on site.

Alternative 4 would result in a greater reduction in toxicity, mobility, and volume of overburden contaminants than Alternatives 2 or 3 but would have greater short term impacts and would be much more difficult to implement. Alternative 3 offers similar performance as Alternative 2 in regard to the overburden contaminants, but offers greater overall reduction in mobility of contaminants than Alternative 2.

Finally, Alternative 3 is much lower in cost than Alternative 4, and since it would equally satisfy the other criteria, including the threshold criteria, it is the preferred alternative.

The estimated present worth cost to implement the proposed remedy is estimated at between $10,990,000 and $13,830,000. The capital cost to construct the remedy is estimated at between $4,120,000 and $6,830,000 and the estimated average annual operation and maintenance cost for 30 years is between $600,000 and $610,000 (the upper range of these cost estimates assume a grout curtain would be installed to reduce flow rates required to achieve contaminant containment). It should be noted that there is a large variability in cost estimates due to numerous uncertainties in accomplishing hydraulic containment of the different bedrock fracture zones. As previously discussed, these costs could be significantly less than estimated due to uncertainties in flow rates, steady state contaminant concentrations, and treatment method.

The elements of the proposed remedy are as follows:

1. Demolition of the existing site structures will be performed with rubble suitable for use as fill to be placed on site for grading purposes.

2. An in-place closure of existing underground tanks and utilities will be completed on those tanks and utilities which will not be utilized in an overburden collection system and which do not interfere with any other remedial elements. Any underground tanks or utilities which interfere with the design or construction of a remedial component of the remedy will be removed.

3. The 18 inch storm sewer (which leads from the site to Gill Creek) and its bedding material will be fully investigated in order to make a definitive determination if site related contamination has migrated along this pathway. The State will make a determination based upon the results of these future investigations whether contaminated soils and/or sediment must be removed from this sewer alignment. The sewer will then be closed in-place (unless it may function as an element of the final remedial design).

   Alternatively, the storm sewer and its bedding material will be excavated and disposed of on site with the other demolition material. Any sections of the storm sewer which cannot be removed (such as a segment under the active electrical power sub-station) will be closed in place.

4. A remedial design program will be completed to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

5. Construction, operation, and maintenance (as appropriate) of the following:

   - A vegetated clean soil cover system over the entire site.

   - An overburden collection system for effective overburden groundwater control. Such a system will utilize appropriate existing site utilities, basements, sumps, foundations, etc. to the extent possible, in conjunction with hydraulic control/collection segments to be installed along the south, west and north site perimeter.

   - A system of pumping wells installed at the site within the bedrock B-zone. At a minimum, operation of the B-zone system will be required to create an inward gradient that reduces, to the extent practicable, any further off site migration from that zone.

   - A system of pumping wells installed near Buffalo Avenue between the site and Gill Creek to achieve hydraulic control over the highly contaminated area of overburden and upper fractured bedrock (see Figure 7) in the vicinity of Olin monitoring wells OBA-15A and OBA-3A. At a minimum, operation of these pumps will be required to control this area and effect reduction of the groundwater contamination within the overburden and upper B-zone.

6. The B-zone and lower bedrock groundwater zones of concern will be monitored to evaluate the effectiveness of the first phase of the remedy.

7. A determination will be made by the State whether the first phase of the remedy is having a sufficient effect on significantly reducing off site contaminant loading within the bedrock zones. The State shall make a determination that either: the system should be enhanced; the system has demonstrated sufficient reduction of the lower bedrock zone loadings as not to require further enhancements; or that a reduction is occurring, and that operation of the system should be allowed to continue as-is for a specified period of time. If the system is allowed to run for an additional period of time while further assessments are made, the State would again make a determination at the conclusion of this period whether the system should continue to be operated as-is, whether the system should be enhanced, or whether the system has demonstrated sufficient reduction of the bedrock zone loadings as not to require further enhancements.

8. If the first phase does not demonstrate a significant reduction in contaminant loadings within the bedrock zones, subsequent phases will be required. Such phases may include increased B-zone extraction, implementation of hydraulic and/or physical containment systems within the lower bedrock zones of concern, and/or any other appropriate bedrock measures.

9. If any of the regional hydrogeolgical influences are altered, or if information becomes available to further understand or define their influences on the site's bedrock groundwater, the State will determine if the bedrock groundwater control remedy should be expanded or modified.

10. Arrangements will be made for the proper treatment and disposal of all contaminated groundwater resulting from operation of pumping and collection systems. Any disposal or treatment method will be in accordance with all Federal, State, and Local regulatory requirements.

    If an on-site treatment alternative is selected as the most appropriate method of disposal, the following will be required: Design, construction, operation, and maintenance of an on-site groundwater treatment system capable of treating all groundwaters to appropriate regulatory standards. On-site treatment of groundwaters will be required to achieve substantive requirements similar to those required under a SPDES permit before effluent is allowed to be discharged to any surface water.

11. Since the remedy results in untreated hazardous waste remaining at the site, a long term monitoring program will be instituted. This program will allow the effectiveness of the selected remedy to be monitored and would be a component of the operation and maintenance for the site. Pursuant to NYSDEC guidelines, an annual review will be included as part of routine operation and maintenance efforts to evaluate continued effectiveness of the implemented remedy.

12. Deed restrictions will be pursued to prevent future uses of the site which are incompatible with the selected remedy.

SECTION 8: Highlights of Community Participation

As part of the remedial investigation process, a number of citizen participation activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following citizen participation activities were conducted:

- Document repositories were established for public review of project related material.
- A site mailing list was established which included nearby property owners, local political officials, local media, potentially responsible parties, and other interested parties. This list has been periodically updated.
- A citizen participation plan was established in 1990 and updated periodically throughout the remedial process.
- Fact sheets were distributed to the mailing list on several occasions to update the public and interested parties. Fact sheets were distributed at the following times: January 1990; July 1991; July 1995; and August 1996.
- A public availability session was held on December 8, 1993 to discuss and answer questions regarding the Supplemental RI, the FS process, and other site related activities.
- A public comment period was held from August 23, 1996 to October 23, 1996 to receive input from the public and other interested parties.
- A public meeting was held on September 11, 1996 to present the PRAP and discuss and answer questions regarding the proposed remedy and the RI/FS.

- A Responsiveness Summary which addresses the comments received during the public comment period on the PRAP was prepared and will be made available to the public in January 1997 as a part of the ROD distribution.

Table 1

Nature and Extent of Overburden Soil Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppm)	FREQUENCY EXCEEDING SCGs	SCG [1] (ppm)
Overburden Soils	Organic Compounds (mg/Kg)	Benzene	ND[2] to 68	5 of 21	0.06
		Chlorobenzene	ND to 1,500	11 of 21	1.7
		1,2- Dichlorobenzene	ND to 8,500	48 of 57	7.9
		1,3-Dichlorobenzene	ND to 3,400	42 of 57	1.6
		1,4-Dichlorobenzene	ND to 2,000	41 of 57	8.5
		1,2,4-Trichlorobenzene	ND to 4,300	30 of 38	3.4
	Metals (mg/Kg)	Barium	59.7 to 19,200	9 of 10	300
		Copper	19.4 to 8,180	9 of 10	25
		Lead	24.2 to 31,600	16 of 21	500 [3]
		Mercury	0.3 to 443	21 of 21	0.1
		Zinc	129 to 56,900	21 of 21	20

Notes

1 NYSDEC Division of Environmental Remediation Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels; "ppm" - parts per million (mg/Kg)

2 ND - Non detectable (i.e. below detection limits)

3 Provided by NYSDOH as residential soils clean-up level

Table 2

Nature and Extent of Overburden Groundwater Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY EXCEEDING SCGs [1]	SCG [2] (ppb)
Overburden Groundwater	Organic Compounds ($\mu g/l$)	Benzene	ND[3] to 540,000	5 of 12	0.7
		Chlorobenzene	ND to 180,000	6 of 12	5.0
		1,2-Dichlorobenzene	ND to 25,000	9 of 12	4.7
		1,3-Dichlorobenzene	ND to 4,800	7 of 12	5.0
		1,4-Dichlorobenzene	ND to 21,000	6 of 12	30
		1,2,4-Trichlorobenzene	ND to 24,000	8 of 12	5.0
	Metals ($\mu g/l$)	Barium	649 to 8350	4 of 7	1000
		Copper	229 to 861	7 of 7	200
		Lead	322 to 3430	11 of 11	25
		Mercury	0.92 to 216	8 of 10	2
		Zinc	882 to 8690	11 of 11	300
		Cyanide	ND to 256	1 of 7	100

Notes:

1 Samples include those taken by E&E in 1989/1990 as well as those taken by MPI in 1993/1994

2 NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1; "ppb"- parts per billion

3 ND - Non detectable (i.e. below detection limits)

Table 3

Summary of Bedrock Organic Contamination

	CONTAMINANTS OF CONCERN (ppb)					
Bedrock	Benzene	Chlorobenzene	1,2 DCB[1]	1,3 DCB[2]	1,4 DCB[3]	1,2,4 TCB[4]
B-zone	ND[5]- 310,000	ND - 43,000	83 - 120,000	65 - 20,000	94 - 75,000	120 - 47,000
C-zone	920 - 2,300	1,200 - 19,000	ND - 11,000	ND - 2,300	ND - 5,500	ND - 4,100
CD-zone	1,100 - 2,500	7,200 - 16,000	620 - 28,000	180 - 4,000	700 - 13,000	32 - 12,000
F-zone	ND - 43	ND - 340	ND - 600	ND - 73	4 - 290	ND - 110

Notes:

1 1,2 - Dichlorobenzene
2 1,3 - Dichlorobenzene
3 1,4 - Dichlorobenzene
4 1,2,4 - Trichlorobenzene
5 Non-Detectable (i.e. below detection limits)

Table 4

Nature and Extent of B-zone Bedrock Groundwater Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY EXCEEDING SCGs [1]	SCG [2] (ppb)
B-zone Bedrock Groundwater	Organic Compounds ($\mu g/l$)	Benzene	ND[3] to 310,000	7 of 10	0.7
		Chlorobenzene	ND to 43,000	8 of 10	5.0
		1,2- Dichlorobenzene	83 to 120,000	9 of 10	4.7
		1,3-Dichlorobenzene	65 to 20,000	10 of 10	5.0
		1,4-Dichlorobenzene	94 to 75 ,000	10 of 10	30
		1,2,4-Trichlorobenzene	120 to 47,000	10 of 10	5.0
	Metals ($\mu g/l$)	Barium	ND to 136	0 of 9	1000
		Copper	ND to 61.4	0 of 9	200
		Lead	ND to 524	4 of 9	25
		Mercury	ND to 11.9	1 of 9	2
		Zinc	74 to 3,230	4 of 9	300
		Cyanide	ND to 1890	5 of 9	100

Notes:

1 Samples include those taken by E&E in 1989/1990 as well as those taken by MPI in 1993/1994

2 NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1; "ppm" - parts per million

3 ND - Non detectable (i.e. below detection limits)

Table 5

Nature and Extent of C-zone Bedrock Groundwater Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY EXCEEDING SCGs [1]	SCG [2] (ppb)
C-zone Bedrock Groundwater	Organic Compounds (μg/l)	Benzene	920 to 2300	5 of 5	0.7
		Chlorobenzene	1,200 to 19,000	5 of 5	5.0
		1,2- Dichlorobenzene	ND[3] to 11,000	4 of 5	4.7
		1,3-Dichlorobenzene	ND to 2,300	3 of 5	5.0
		1,4-Dichlorobenzene	ND to 5 ,500	3 of 5	30
		1,2,4-Trichlorobenzene	ND to 4,100	3 of 5	5.0
	Metals (μg/l)	Barium	ND to 28.5	0 of 3	1000
		Copper	ND to 41	0 of 3	200
		Lead	ND to 67	1 of 5	25
		Mercury	ND to 0.43	0 of 5	2
		Zinc	24 to 486	1 of 3	300
		Cyanide	112 to 2450	3 of 3	100

Notes:

1 Samples include those taken by E&E in 1989/1990 as well as those taken by MPI in 1993/1994

2 NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1; "ppb" - parts per billion

3 ND - Non detectable (i.e. below detection limits)

Table 6

Nature and Extent of CD-zone Bedrock Groundwater Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY EXCEEDING SCGs [1]	SCG [2] (ppb)
CD-zone Bedrock Groundwater	Organic Compounds (μg/l)	Benzene	1100 to 2500	5 of 5	0.7
		Chlorobenzene	7,200 to 16,000	5 of 5	5.0
		1,2- Dichlorobenzene	620 to 28,000	5 of 5	4.7
		1,3-Dichlorobenzene	180 to 4,000	5 of 5	5.0
		1,4-Dichlorobenzene	700 to 13,000	5 of 5	30
		1,2,4-Trichlorobenzene	32 to 12,000	5 of 5	5.0
	Metals (μg/l)	Barium	ND to 17	0 of 3	1000
		Copper	ND to 42	0 of 3	200
		Lead	ND to 86	1 of 5	25
		Mercury	ND	0 of 5	2
		Zinc	9 to 400	1 of 3	300
		Cyanide	24 to 825	2 of 3	100

Notes:

1. Samples include those taken by E&E in 1989/1990 as well as those taken by MPI in 1993/1994

2. NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1; "ppb" - parts per billion

3. ND - Non detectable (i.e. below detection limits)

Table 7

Nature and Extent of F-zone Bedrock Groundwater Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY EXCEEDING SCGs [1]	SCG [2] (ppb)
F-zone Bedrock Groundwater	Organic Compounds (μg/l)	Benzene	ND[3] to 43	2 of 5	0.7
		Chlorobenzene	ND to 340	2 of	5.0
		1,2- Dichlorobenzene	ND to 600	3 of 5	4.7
		1,3-Dichlorobenzene	ND to 73	3 of 5	5.0
		1,4-Dichlorobenzene	4 to 290	2 of 5	30
		1,2,4-Trichlorobenzene	ND to 110	2 of 5	5.0
	Metals (μg/l)	Barium	ND to 103	0 of 3	1000
		Copper	ND to 32	0 of 3	200
		Lead	ND to 22	0 of 5	25
		Mercury	ND	0 of 5	2
		Zinc	23 to 177	0 of 3	300
		Cyanide	ND	0 of 3	100

Notes:

1 Samples include those taken by E&E in 1989/1990 as well as those taken by MPI in 1993/1994

2 NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1; "ppb" - parts per billion

3 ND - Non detectable (i.e. below detection limits)

Table 8

Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
Alt. 1: No Action	$59,000	$52,000	$655,000
Alt. 2: Overburden Containment w/ B-zone Bedrock Groundwater Containment/Treatment [1]	$4,120,000	$600,000	$10,990,000
Alt. 3: Overburden Containment w/ Phased Bedrock Groundwater Containment/Treatment [1]	$4,120,000 - $6,830,000	$600,000 - $610,000	$10,990,000[2] - $13,830,000[3]
Alt. 4: Ex-Situ Soil Treatment w/ Complete Bedrock Groundwater Containment/Treatment [1]	$26,870,000	$600,000	$33,500,000[4]

Notes:

1 Assuming complete on-site treatment by UV oxidation and/or carbon adsorption - Expected flow rates taken from FS and Supplemental FS Reports. (Alt. 2: 175 GPM; Alt. 3: 175-225 GPM; Alt 4: 225 GPM w/grout curtain).

2 Site Structures Operable Unit: Taken from Feb. 1996 FS Report Appendix F.3 - Alternative SS-2
Overburden Operable Unit: Taken from July 1996 FS Supplement Tables 3 and 4
Bedrock groundwater Operable Unit: Taken from July 1996 FS Supplement Tables 5, 6, and 7

3 Site Structures Operable Unit: Taken from Feb. 1996 FS Report Appendix F.3 - Alternative SS-2
Overburden Operable Unit: Taken from July 1996 FS Supplement Tables 3 and 4
Bedrock Groundwater Operable Unit: Taken from Feb. 1996 FS Report Attachment B-Alternative BR-4 (flow=225GPM)

4 Site Structures Operable Unit: Taken from Feb. 1996 FS Report Appendix F.3 - Alternative SS-2
Overburden Operable Unit: Taken from Feb. 1996 FS Report Appendix F.2 - Alternative OB-6
Bedrock Groundwater Operable Unit: Taken from Feb. 1996 FS Report Attachment B-Alternative BR-4 (flow=225GPM)

APPENDIX A

RESPONSIVENESS SUMMARY

SOLVENT CHEMICAL SITE

Proposed Remedial Action Plan
Niagara Falls, New York
Niagara County

The Proposed Remedial Action Plan (PRAP) for the Solvent Chemical Site was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the public on August 23, 1996. This Plan outlined the basis for the recommended remedial action at the Solvent Chemical Site and provided opportunities for public input prior to final remedy selection. The selected remedy is summarized in section 7 of the Record of Decision.

The release of the PRAP was announced via a notice to the mailing list, informing the public of the PRAP's availability.

A public meeting was held on September 11, 1996 and included a presentation of the Supplemental Remedial Investigation (SRI), the Feasibility Study (FS), and the Feasibility Study Supplement. The PRAP was also presented at this meeting. This meeting provided an opportunity for citizens and interested parties to discuss their concerns, ask questions, and comment on the proposed remedy. The comments received at this meeting have been included in the Administrative Record for this site. The public comment period closed on September 23, 1996.

This Responsiveness Summary responds to the questions and comments raised at the September 11, 1996 public meeting as well as to written comments received by the NYSDEC on the PRAP.

The following was the only question that was raised at the public meeting:

Question: **The remedy as contained in the PRAP will not allow for future use of the site. Why can't the overburden remedy be changed to allow for future use of the property?**

State Response:

The selected remedy does not preclude future use of the site. It does recommend restricting future use of the site to commercial or industrial purposes which are not incompatible with the remedy. Buildings or other structures could be constructed at the site and the site could be continued to be used. However, construction of buildings or other structures with basements would not be recommended as this could introduce a new human exposure pathway and corresponding potential risk to human health. Buildings and other structures could be constructed at the site without special construction requirements, provided they were built utilizing at grade foundations (such as using a concrete slab). Buildings requiring deep foundations could also be constructed, however appropriate health and safety measures must be followed during construction activities which are likely to encounter contaminated soils. In addition, any contaminated soils excavated require proper disposal off site, and the cover system must be restored to function in its original capacity.

Several letters were received during the comment period regarding the PRAP. They will be incorporated into the Administrative Record for the site.

A letter was received from the current site owner. The following is a summary of the questions/comments. Comments have been paraphrased for the purposes of this Responsiveness Summary. The complete original letter has been incorporated into the Administrative Record.

Comment 1:

The proposed plan is unacceptable as the site will be considered a landfill such as Love Canal, 102nd Street Landfill, and Necco Park. Future use will be restricted, and as such the property cannot offer a site for a revenue and tax generating business.

State Response:

While the site will have a containment remedy, it will not be considered or treated as a landfill. Future site use is not precluded, however it is highly recommended that any future site development be limited to commercial/industrial uses. Any site development should ensure that construction of any buildings or structures at the site is consistent with the remedy, that any possibly contaminated site material generated during development is properly handled and disposed, that appropriate Health and Safety precautions be taken during intrusive site work, and that effective isolation of all wastes remaining on site be maintained. See the response to a similar question asked during the public meeting which presented the proposed remedy.

Comment 2:

All demolition debris should be removed from the site and sent to a C&D landfill. If demolition of the buildings is allowed without cleaning the contaminated floors, then additional treatment costs will be incurred. Floors that have been contaminated must be pressure washed with the wash water collected and treated. After removal of the debris, the site should be covered with a blacktop barrier consisting of stone and multiple layers of blacktop and there should be catch basins installed to drain storm water to the storm sewer.

State Response:

Buildings will be demolished, rubblized, and will remain of site as part of the cover system. There are no current plans for off site disposal of this C&D material, as this would increase costs significantly for this phase of the remedy. Considering the level of contamination already present in site soils and the contamination which will remain, disposal of any contaminated concrete off site during demolition would not be expected to have a significant effect on the overall site contaminant levels. The cover system in the ROD will allow for infiltration of precipitation which will help "flush contamination" in the overburden. A blacktop cover is not consistent with the permeable cover remedy, but would not be considered as an incompatible future use should the site owner elect to construct some type of parking area.

Comment 3:

A bentonite wall should be installed around the perimeter of the site to prevent infiltration and exfiltration. This would eliminate flows onto Olin and Dupont properties. It would also dramatically reduce the loading to the treatment system proposed.

State Response:

The overburden soils consist of a relatively compact fill material along with some native soils, and therefore have a relatively low horizontal hydraulic permeability. While the overburden collection system will prevent the continued off site migration of overburden groundwater contamination, it is not expected to collect large amounts of groundwater. As such, the expense of installing a low permeability wall within the overburden (such as a bentonite slurry wall) would exceed the cost savings from the reduction in treatment of contaminated groundwater flow. In the bedrock zones, horizontal permeability is much greater and a physical horizontal barrier may significantly reduce operational costs. The selected remedy recognizes this possibility and includes provisions for construction of a bedrock grout curtain.

Comment 4:

In order to reduce treatment costs, Phytoremediation and Rhizofiltration should be considered.

State Response:

There is on-going research and numerous studies underway which appear to show the potential for poplar trees and other plants to provide uptake and metabolism of some organic and inorganic contaminants. Poplar trees in particular have extensive root systems which can be used to limit infiltration of precipitation into a waste or contaminant source area.

Perimeter overburden collection system segments were selected due to their proven effectiveness at preventing off site migration of contaminated groundwater. However the planting of poplar trees and other vegetation is not inconsistent with the cover system component of the overburden remedy selected in the ROD. The site owner may choose to plant such vegetation in the future for aesthetic or other reasons, but the State does not believe that such plantings alone would significantly reduce any treatment costs nor achieve a level of remediation that could eliminate the need for any of the selected remedial components.

A letter was received from a resident of Niagara Falls. The resident asked several questions concerning the potential effects of the site on the neighborhoods nearest the site, and also asked questions concerning the proposed remedy in relation to the regional groundwater contaminant problems caused by numerous industrial plants in this area of Niagara Falls. Questions are summarized below. They are paraphrased for the purposes of this responsiveness summary. The complete letter has been incorporated into the Administrative Record for this site.

Comment 1:

Was any bedrock plume sampling done for specific chemical indicators which would serve to "fingerprint" compounds used at the Solvent Chemical site?

State Response:

Sampling of bedrock groundwater at the site indicates the presence of numerous compounds associated with past chemical manufacturing processes at the site. Many other contaminants were detected at the site whose origins are undetermined. Extensive off site bedrock groundwater sampling to define or characterize a contaminant plume from the site was not performed.

Comment 2:

A pilot plant for the production of Hydrazine was initiated during the early operating period at the site. Will the employees who perform remediation at the site be told that the chemicals of concern are organic chlorobenzenes and inorganics, or other compounds? Will there be a complete listing of chemical exposure possibilities expected from the site, including raw materials used, intermediates formed, products produced and waste streams generated?

State Response:

The State is aware that "high energy fuels" research was performed by Olin Chemicals in the early

1950s at the site. All health and safety plans for remedial activities at the site must be prepared by a Certified Industrial Hygienist. They will have access to all site data when preparing these plans. Responsibility for worker health and safety lies with the contractors, and is regulated by the Federal Government through the Occupational Safety and Health Administration.

Comment 3:

How many specific chemicals have been found both on-site and off site, where and at what depths?

State Response:

A discussion of the major compounds of concern can be found in Section 3 of the ROD. A complete listing of data, locations, and depths can be found in the 1990 RI and the 1995 Supplemental RI Report.

Comment 4:

With the Echota neighborhood so close and in a direct path of the bedrock plume, was there a soil gas survey conducted in that area?

State Response:

A soil gas survey was not performed in the Echota neighborhood, but a soil gas survey was performed at and around the perimeter of the site. Results of the soil gas survey showed that volatile organics were detected in the highest concentrations to the west of the Solvent site on Olin property, and along the southeast perimeter of the Solvent site. Soil gases were either not detected or were detected at very low concentrations (less than 0.6 micrograms per cubic meter) along the northern edge of the property (along Buffalo Ave.). Soil gas concentrations are related to the concentration of volatile organics within the groundwater. As the groundwater contaminant concentrations decrease from the low levels found off site and to the north of Buffalo Avenue, the levels of soil gas would also decrease. Therefore, no significant off-gassing is expected in areas north of the site.

Comment 5:

Was there any investigation of basement air quality in the Echota neighborhood? It is my opinion that many older homes in the area with eight foot high basements (and foundation walls extending down several more feet) are subject to low level vapor exposure from contaminated organics which may be in the area.

State Response:

The concentrations of volatile organic contaminants detected in groundwater samples collected from the overburden (to a depth of about 8 feet) on the north side of Buffalo Avenue, between Solvent Chemical and the Echota neighborhood, were relatively low (50 parts per billion or less). There has not been an investigation of basement air in the Echota neighborhood. For contaminants to impact basements and living spaces in the neighborhood, they would have to volatilize from the groundwater which has entered the basements through cracks, utility entrances, or sumps. Based upon the low levels of volatile organic compounds detected in the groundwater near Buffalo Avenue, the State does not believe that the Solvent Chemical contaminants would cause indoor air problems in the Echota neighborhood.

Comment 6:

Each of the alternatives make one very weak assumption, that there are no downgradient human health hazards, so we can simply stop the chemical migration at the source. I simply do not agree.

State Response:

A "health hazard" may exist if people are being exposed to chemical contaminants at a level of concern. For exposure to occur, five elements must exist: (1) A contaminant source must exist; (2) Environmental media (for example soil or groundwater) must have been contaminated through a transport mechanism; (3) An exposure point must be identified; (4) A route of exposure, such as ingestion, inhalation, or dermal contact must be present; and (5) A receptor population must be present.

At the Solvent Chemical site a contaminant source has been identified. Contamination has been identified in on-site surface and subsurface soil, groundwater, and on-site surface waters. With the exception of site trespassers, the on-site contamination does not provide a route of exposure to the general public.

While there has been migration of contaminants from the site in the past within the groundwater, there are limited exposure pathways present. As discussed in the ROD, the main off site human exposure pathway identified is to utility/construction workers near the site in the downgradient plume. These workers normally follow appropriate health and safety protocols in this vicinity of Niagara Falls, since soil and groundwater contamination within this area is widely known. The other human exposure pathway identified is to recreational users of the Lower Niagara River, where some contaminated bedrock groundwater likely discharges into the river. Exposures from this pathway would be very low and infrequent. Other than the potential routes of exposure described in the ROD, the State has not identified any actually occurring "health hazards" from the site to date.

Comment 7:

What keeps vapors from being released into the air between the site and the Falls Street Tunnel as contaminants migrate off site?

State Response:

The overburden groundwater contamination is very low to the north of the Solvent Chemical site. Due to these very low levels, it is highly unlikely that volatile organic contaminants in soil gas would be released to the air in detectable concentrations. The majority of contaminant migration off site occurs within the bedrock B-zone. This zone is approximately 12 or more feet below ground surface. The overburden on the north side of the site and further northward (toward the Falls Street Tunnel) consists of lacustrine deposits and fill materials, as well as several feet of glacial till which is relatively dense (and has a relatively low hydraulic conductivity). This glacial till acts somewhat as a barrier between the upper fractured bedrock and the overburden soils. See also a discussion of overburden contaminant migration in the previous State responses to comments.

Comment 8:

The containment remedy for this site should be expanded or modified to provide for a much more comprehensive remedial strategy for the contaminated groundwater in this area of Niagara Falls.

State Response:

An effort was made in the early 1990s by DuPont to enlist the other manufacturers in this area of Niagara Falls to undertake a Regional Groundwater Assessment, in an effort to identify a "regional" approach to groundwater contamination in this area. The only companies which elected to participate and fund that study were Occidental Chemical and Olin. After the study was completed, no further cooperative work on any "regional" groundwater remedial controls were pursued by the various companies in the area.

While the State agrees that a "regional groundwater remedy" is logical and may provide greater benefits to the regional groundwater, implementation of such a remedy would be extremely problematic. There are several reasons for this. First, it would be extremely difficult (if not impossible) for the various active facility owners and PRPs of inactive sites to agree on a cost allocation for a "regional" groundwater remedy. The second reason is the fact that the various parties have already agreed to design and implement groundwater remedies for their respective sites. Many of the groundwater remedial systems have been completed and are now in operation. These companies have already spent tens of millions of dollars on remedial systems, and are committed to maintain these systems in the future. The third reason is the lack of regulatory authority to "force" these companies to complete remedial systems (or re-imburse the State under a State Superfund remedy). The State cannot compel these facilities to develop a "regional" groundwater remedy.

Comment 9:

Homes located near Gill Creek are required to have flood insurance as they are in the 100 year flood plain. Doesn't this indicate that the water table would be relatively high in this area, and that the water table could carry contaminants away from the site? Chlorinated hydrocarbons tend to be much lighter than water and it would seem that these hydrocarbons would migrate to the top of the water table and then ride up on the overburden (soil) on a seasonal basis when rain saturates the soil. Since these hydrocarbons have very low vapor pressure densities it is the long term low level exposure to airborne contaminants that I believe pose the greatest risk to human health, not the incidental contact made on site.

State Response:

The primary organic contaminants of concern from the Solvent Chemical site are benzene, chlorobenzene, and the various chlorobenzene isomers (i.e. 1,2 di-chlorobenzene, 1,2,4 Tri-chlorobenzene, etc). With the exception of benzene, these contaminants are heavier than water, and if present in non-dissolved form would tend to migrate downward as they move laterally in the overburden soils. However, site data does not show significant quantities of non-dissolved phase contamination. Contaminant migration from the site would generally be in the dissolved (in groundwater) phase and would travel in the same manner as groundwater. Data is available from the Olin Chemicals RCRA program investigations which characterize the relative concentrations of these contaminants near Gill Creek and on either side of Buffalo Avenue. Figure 4 in the ROD indicates the area of contamination toward Gill Creek which is addressed in the ROD. A requirement is included in the ROD to implement hydraulic containment measures for this area. This is the only area of significant contamination found in the general downgradient direction from the Solvent site.

Historically, Gill Creek was contaminated by several sources and has been remediated between the Niagara River and Buffalo Avenue. Contamination in Gill Creek between Buffalo Avenue and Packard Road will be addressed through the Olin Industrial Welding site remediation. Available data from previous Olin site investigations in this area indicate that Gill Creek likely discharges water into the bedrock aquifer. Moreover, Gill Creek flows toward the Niagara River. As such, the State has not identified a potential exposure pathway related to contaminant migration within Gill Creek, or through the volatilization of contaminants within the groundwater table.

A letter was received from AIG Environmental Management Inc. on behalf of the former Solvent Chemical Company, one of the PRPs for the site. The following is a summary of the questions and comment from this letter. Comments have been paraphrased for the purposes of this Responsiveness Summary. The complete original letter has been incorporated into the Administrative Record.

Comment 1.

Solvent Chemical's technical representatives have previously discussed the anticipated elements of an overburden collection system with the NYSDEC. We believe that B-zone groundwater extraction wells should be located near the north side of the site to intercept the groundwater and prevent its departure from the site. In addition to the B-zone wells, Solvent Chemical suggests the installation of passive relief wells screened through the overburden and into the B-zone to enhance the drainage of the overburden into the capture zone of the B zone wells. This arrangement is technically equivalent to the overburden collection trench and barrier wall discussed in the PRAP. Solvent Chemical believes that the barrier wall discussed in the PRAP would be ineffective because: (i) the sewer bedding is in direct contact with the bedrock, and (ii) the B-zone pumping wells will act as a drain for the sewer bedding. Accordingly, the barrier wall should be deleted from the remedy.

State Response:

After previous discussions with representatives of the PRP group, the State is of the opinion that hydraulic control of the overburden along the north side of the site could be effectively achieved with methods other than a collection trench and barrier. The Olin Chemical Corrective Measures Program will be relying on a system similar to what Solvent is suggesting (passive relief wells in the overburden, in combination with bedrock recovery wells). The State will allow technically equivalent components of the remedy, provided performance objectives are met.

Comment 2:

The PRAP lists "in-place closure of underground storage tanks" as an element of the remedy. Solvent Chemical believes that some tanks (such as the five underground tanks in the soil mound on the southern edge of the site) will interfere with or complicate construction of the cover system. Solvent Chemical believes that all structures, including underground tanks which are above grade should be removed or demolished such that all remaining structures are below the rough grade.

State Response:

The State had intended that the noted above grade buried tanks would be removed. As a clarification, the State included language in the ROD which specifies the removal of any tank or structure which interferes with any component of the remedy.

Comment 3:

The PRAP lists the treatment/disposal options for groundwater as either off-site disposal at the POTW or on-site treatment and direct discharge under a SPDES permit. Solvent Chemical believes that this is too restrictive. Treatment and disposal of wastewater from the site should be restricted only to treatment and disposal according to applicable laws and regulations so as to allow the greatest flexibility in the design of the remedy and to maximize the effectiveness.

State Response:

The ROD has been revised to allow any treatment/disposal method which is consistent with all local, state, and federal regulations.

Comment 4:

The PRAP includes the 18 inch storm sewer from the site to Gill Creek as one of the utilities that can be closed in place. Solvent Chemical believes that the previous investigation of this sewer performed in the SRI was adversely effected by the concrete cap which is apparently present to protect the underground hydrogen line that parallels the sewer pipe. Solvent Chemical believes that an appropriate remedy for the potential contamination along the storm sewer to Gill Creek is either: 1) fully investigate the potential contamination in the sewer bedding followed by an appropriate remedial response, or alternatively; 2) removal of the sewer and contaminated bedding to the extent practicable with confirmatory sampling and analysis and/or closure in place in the event that removal is not practicable. Practicability would be determined by safety issues related to underground utilities and the power substation and overhead lines in this vicinity.

State Response:

The ROD acknowledges that the sewer investigation was not conclusive due to the limitations from the concrete cover. The ROD has been revised to allow either: a complete investigation of the sewer with removal of contaminated soils and sediments, followed by in-place closure (unless it is to be used as a component of the site remedy such as to discharge treated waters), or; excavation of the storm sewer and its bedding material (to the extent practicable) with disposal back on the Solvent Chemical site.

A letter was received from the Army Corps of Engineers on behalf of the U.S. Government, one of the PRPs for the site. The following is a summary of the questions/comments. Comments have been paraphrased for the purposes of this Responsiveness Summary. The complete original letter has been incorporated into the Administrative Record.

General Comment I.

From our assessment of the supporting documents from which the plan was developed, we agree that it appears necessary that an improved groundwater collection system and a site-wide cap are necessary to obtain acceptable risks on the site. However, the existing evidence does not support a long-term, site-wide, groundwater pump-and-treat system. Site-wide groundwater containment is not necessary from a risk-based perspective. Site specific risk-based cleanup goals should be calculated and used as a basis for starting/continuing groundwater containment at the site. A fourth alternative should be developed: an enhanced overburden groundwater collection and treatment/Site-wide soil cover/Poplar Tree cap/Phased groundwater containment/treatment alternative.

State Response:

As part of the remedy for this site, contaminated soils will remain on site. Residual DNAPLs will remain in the bedrock. Both contaminated soils and DNAPL will be a source of groundwater contamination for an extremely long period of time. Without groundwater containment, this contamination would provide a continuing source for a groundwater contaminant plume emanating from the site. New York State considers groundwater an important natural resource, and protection of this resource is one of the fundamental reasons for the groundwater remedial measures selected in the ROD. Federal and State guidance for remediation of this type of site includes containment of contaminant sources. While restoration of site groundwater quality on-site is technically impracticable at this time due to DNAPL persistence within the fractured bedrock, off site groundwater quality will be significantly improved with groundwater containment at the site boundaries. The remedy is consistent with Federal regulations and guidelines in its approach to groundwater containment.

Site specific risk based clean-up goals are not necessary since containment of groundwater, in conjunction with the other elements of the remedy will minimize the future potential exposures to groundwater. Groundwater containment components (such as overburden perimeter collection trench segments and bedrock pumping wells) will be designed and constructed and operated to prevent further off site migration of groundwater contaminants, not to restore on-site groundwater quality. For off site groundwater, the selected remedy will consider existing risk based standards set forth as State SCGs and Federal ARARs.

See also State Response to the Site Owner's Comment 4 concerning Phytoremediation.

General Comment II:

There is no evidence that the potential contaminants of concern on the site pose significant risks. The Qualitative Risk Assessment (RA) performed as part of the 1990 RI concludes that the human health risks from the off site migration of groundwater are not significant. The Qualitative RA performed as part of the 1995 SRI did not establish complete exposure pathways or determine quantitative risk-based clean-up levels.

State Response:

The Qualitative Risk Assessment performed in the 1995 SRI was intended to identify exposure pathways which are known to exist or are suspected to exist. The Qualitative Risk Assessment evaluated several exposure pathways which may exist if trespassers enter the site or if future use of the site is unrestricted. Trespassers, primarily children, have been observed on the site. These trespassers may be exposed to site contamination through direct contact with the soil or surface water or through inhalation of volatile organic compounds. Other potential pathways that could be considered complete include utility workers coming into contact with contaminated groundwater in the vicinity of the site.

General Comment III:

It is stated in the plan that a prospective remedy must comply with SCGs, yet it is also stated that achievement of groundwater standards for the on-site bedrock groundwater is technically impracticable. The Plan is not consistent in its proposed use of the NY State Standards, Criteria, and Guidance (SCGs).

State Response:

Any remedy which is considered for selection must be protective of human health and the environment and must comply with SCGs. However, both Federal and State guidelines provide for a waiver of groundwater SCGs if there is sufficient justification, and protection of human health and the environment is maintained. In this case, it is appropriate to provide a waiver of SCGs for the on-site groundwater since it is technically impracticable to remove the DNAPL from the bedrock. The containment remedy proposed for the bedrock groundwater will provide for the protection of human health and the environment.

General Comment IV:

Alternative Clean-up goals must be established because the NYSDEC has determined that remediation of the on-site groundwater is technically impracticable.

State Response:

One of the remediation goals included in the ROD is to "reduce, control, or eliminate to the extent practicable" the contamination present within the overburden and bedrock groundwater zones of concern. The hydraulic containment measures included in the ROD are consistent with the remediation goals. There is no reason to formulate alternative numeric risk based clean-up goal as part of the ROD. Instead, the on-site remedial program will rely on performance objectives appropriate to hydraulic containment. See also State Response to General Comment I.

General Comment V:

The contaminant concentrations detected in the water from the pump test indicates a significant decrease in concentrations vs. those detected in the groundwater during the 1990 RI. In addition, average and mean concentrations of organics and inorganics detected in the overburden and B-zone wells sampled during 1990 and later in 1992 appear to indicate a large reduction in contaminant concentrations during this time. The PRAP does not include the results or discussion of the investigations which show significantly decreased contaminant levels on the site.

State Response:

The concentrations of benzene and chlorobenzenes referred to during the pump test were concentrations in the groundwater shipped to Ultrox, Inc. (Canada) for treatability study testing. This water was collected during dynamic pumping conditions while the recovery well was yielding approximately 40 gallons/min. of groundwater. These concentrations are much lower than those detected during the original RI. However, lower concentrations during this type of pumping in fractured bedrock are not unexpected. The State believes the lower concentrations are not the result of a decrease in contaminant concentrations at the site over time, but rather the result of changing the local aquifer from its state of equilibrium during the test. Under dynamic pumping, dilution from off site groundwater and a high rate of flow through the contaminated fracture zone that reduces the contact time of groundwater with contaminant sources are contributing factors to the observed lower concentration levels.

While it is true that the 1992 groundwater concentrations are generally lower than those included in the 1990 RI, it is also true that the contaminant concentrations are generally within the same order of magnitude. In several cases, in specific organic contaminants of concern, there exists either a very close correlation between the sampling events, or concentrations are actually higher in 1992 than 1990. Furthermore, a direct comparison between two samples taken 2-3 years apart is not a reliable means of establishing groundwater trends. To provide conclusive evidence of a contaminant trend, groundwater sampling would need to be undertaken with much greater frequency, and over many more site locations. It is important to note that samples taken on different days or even at different times of the day may indicate different contaminant concentrations. This is particularly true at sites such as Solvent Chemical where organic contaminants are present in such high concentrations, and mobile NAPLs are known to be present. An example which illustrates this point can be found at another chemical manufacturing facility near the Solvent site. During groundwater sampling performed at this facility, even split samples taken from the same well at the same time exhibited notable concentration differences.

General Comment VI:

DNAPL persistence is discussed in the PRAP as the reason that restoration of on-site groundwater to standards is impracticable. The PRAP states that the off site groundwater may eventually achieve groundwater standards. DNAPL has been found on the Olin property to the west of the southwest corner of the Solvent site. Therefore a differentiation should be made between the areas of off site contamination.

State Response:

The Olin well in which DNAPL was observed in the past was well OBA-10A which is situated in close proximity to Gill Creek (within 30 feet). This monitoring well is also in close proximity to a sewer line which runs north-south next to Gill Creek. Test pit along the alignment of the 18 inch sewer which runs from the southwest corner of the site to Gill Creek did not indicate the presence of DNAPL. The 18 inch storm sewer and its bedding were cut-off during the Supplemental Remedial Investigation to eliminate further potential for contaminant migration from the site along this route. The ROD includes a requirement that the storm sewer bedding material along the alignment of the 18" sewer be more fully investigated as a former potential contaminant migration pathway. Any contaminated bedding materials will then be removed. Alternatively, this sewer and its bedding material could be removed and consolidated on-site during demolition activities.

In reference to the DNAPLs detected in monitoring well OBA-2 and the other contamination which may be present on the Olin property to the east of Gill Creek: this contamination will be addressed under the on-going Olin Corrective Measures Program under the State's RCRA Program. The area of concentrated contamination in the overburden and upper fractured bedrock on Olin property along Buffalo Avenue between the Solvent site and Gill Creek is addressed in the Solvent Chemical ROD.

General Comment VII:

The PRAP does not adequately consider the anisotropy of the site bedrock and the difficulties that may result in the achievement of bedrock hydraulic containment because of the anisotropy.

State Response:

The State has considered the anisotropy (unequal flow velocities in different directions) of the bedrock. Anisotropy of the bedrock is one of the factors that produce uncertainty for any pump and treat system and was a factor in the decision to implement a phased pumping approach for Solvent. Hydraulic containment has been accomplished within similar bedrock fracture zones, and phased bedrock pump and treat programs are currently under way at the nearby Olin and Occidental Chemical sites.

General Comment VIII:

The PRAP discusses the remediation goals of reducing, controlling, eliminating, and/or preventing contaminants "to the extent practicable". Please explain why it is necessary for reduction of levels, exposures, and/or migration to levels below which are necessary to eliminate or mitigate all significant threats to public health and to the environment.

State Response:

The PRAP did not, and the ROD does not require the reduction, control, or elimination of contaminants below that which is necessary for protection of human health and the environment.

Specific Comments 1, 2, 3:

These comments request wording changes or minor text rgvkskons"kn"the PRAP.

State Response:

None of these modifications are deemed necessary by the State.

Specific Comment 4a:

How did the 1989 rehabilitation of the Falls Street Tunnel effect collection of groundwater from the site?

State Response:

Measures were taken to reduce infiltration into the Falls Street tunnel in the vicinity of the cross-over at the NYPA conduits. It does not appear that these measures had any significant effect on the migration of bedrock groundwater contaminants from the site, or the stability of the off site contaminant plume.

Specific Comment 4b:

Provide quantitative estimates of the amount of C-,CD-, and D-zone groundwater from the site which would be expected to hydraulically by-pass the City POTW.

State Response:

Previous reports have estimated that approximately 70% of total groundwater intercepted by the Falls Street Tunnel is treated by the city POTW. Using the estimated off site contaminant loadings contained in the 1995 SRI, the amount of off site loadings which by-pass the POTW have been estimated as follows: Total Organics from C, CD, and D zones approximately 70 lbs/year; Total Metals from C, CD, and D zones approximately 1 lb/year.

Specific Comment 4c:

Are there any direct or indirect City POTW taxes or costs which the industries in the area of the site are now paying which subsidize the cost of treatment of the groundwater in the Falls Street Tunnel?

State Response:

It is the State's understanding that while local industries participated with funding during the initial construction of the POTW carbon system, there are not any direct taxes or user fees that are structured to cover the cost of treatment of contaminated groundwater which is inadvertently being collected by the City system.

Specific Comment 4d:

Are their any current or future City plans to either restrict or to expand the collection capacity of the Falls Street Tunnel? Are their any plans by the City POTW to charge area industries to treat the collected groundwater?

State Response:

The State is unaware of any City plans to either hydraulically alter the Falls Street tunnel or charge area industries for treatment of the groundwater which infiltrates the Tunnel. The U.S. EPA has been evaluating the need for City POTW treatment of Falls Street Tunnel flow during wet weather flows in addition to the current requirements to treat all Falls Street Tunnel dry weather flows.

Specific Comment 5:

Explain why the contaminants in the site groundwater are compared to drinking water standards and not standards for industrial use.

State Response:

There are no "industrial use groundwater standards" for New York State.

Specific Comment 6a,b:

Compare the behavior of the concentrations of organics and metal contaminants of concern in the groundwater with respect to time. Data from wells sampled in 1992 appear to show significant contaminant decreases vs. the same wells sampled in 1990. Discuss the decrease in contaminant levels over time.

State Response:

See State Response to General Comment V.

Specific Comment 6c:

The concentrations of benzene and chlorobenzene detected during the pump test were several orders of magnitude lower that those detected during the 1990 RI sampling events. Discuss the possibility that the relatively low pump test concentrations of these compounds are the result of decreased contaminant levels on the site.

State Response:

See State Response to General Comment V.

Specific Comment 6d:

How will the SCG values for lead and other metals be applied when the SCG value is above the site-specific background value?

State Response:

Groundwater at the site (in some zones) exceeds both SCGs for lead and the background concentrations for lead. Nevertheless, the selected remedy is performance based (hydraulic control), and lead and other metal concentrations are not expected to be a determining factor in operational requirements.

Specific Comment 7:

The PRAP should reference the Quantitative RA contained in the 1990 RI. The proposed remedy should take into consideration the results of the Quantitative RA.

State Response:

The 1990 RI is part of the site's Administrative Record. Consideration was given to the Quantitative RA in preparation of the proposed remedy.

Specific Comment 8a:

Exposure pathways which "may exist" are not completed until their existence is established. The only completed pathways are the pathways which were evaluated in the Quantitative RA. The pathways included in the PRAP should be re-designated as "potential exposure pathways".

State Response:

The State does not agree with the assessment that the only completed pathways which exist are those which were evaluated in the Quantitative RA. For example there are completed exposure pathways for site trespassers, and these pathways were not included in the Quantitative RA. The ROD lists the exposure pathways under the introductory sentence "Completed pathways which are known to" (exist) "or may exist because of the site include:". The State always considers both completed and potential exposure pathways when evaluating remedial options for a site.

Specific Comment 8b:

There should be a section included in the plan which includes the conclusion reached in the 1990 RI that "it is unlikely that all of the site groundwater contaminants taken together would pose a significant threat to human health by the exposure pathways evaluated, and even less likely that the mobile, site-derived contaminants would pose such a risk."

State Response:

This conclusion referenced represents the views of the Responsible Party group and their consultant, not necessarily the views of the State. Since the 1990 RI is included in the Administrative Record for the site, additional discussion of the 1990 Risk Assessment is not needed.

Specific Comment 9a:

The PRAP states that all three dichlorobenzene isomers were detected in Lake Ontario trout in 1980. What are the present concentrations of dichlorobenzenes and other contaminants of concern in fish (if known)?

State Response:

Fish from the Lower Niagara River have not been analyzed for dichlorobenzene isomers since 1980. Therefore, the present concentrations are not known.

Specific Comments 9b,c:

The PRAP states that based upon non-site related contaminants the NYSDOH has issued a health advisory for fish for the Lower Niagara River and Lake Ontario. How are the "non-site related contaminants" related to contamination on or from the site and the clean-up of the contamination on the site? Is the health advisory still in effect?

State Response:

The NYSDOH health advisories on sportfish consumption are referenced only as a point of information concerning the Niagara River. These advisories are based on comparison of contaminant levels to fish in the United States Food and Drug Administration (USFDA) tolerance/action levels or health risk assessment if no USFDA tolerance/action levels are available. The current health advisories on the consumption of sportfish in the Lower Niagara River or Lake Ontario are based upon the levels of PCBs, Mirex, and Dioxin found in fish collected for the Lower Niagara River or Lake Ontario. The NYSDOH "1996/1997 Health Advisories: Chemicals in Sportfish and Game" states that generally people should "..eat no more than one meal (one-half pound) per week of fish taken from the State's freshwaters...". NYSDOH also recommends that infants, children under 15 years of age, and women of child bearing age should not eat any fish from a waterbody with specific recommendations to restrict sportfish consumption due to chemical contamination. Specified waterbodies include the Niagara River or Lake Ontario. The specific advisory for Lake Ontario and the Lower Niagara River recommends that other people eat none of several species of fish and no more than one meal per month of a few other species.

Specific Comment 10:

The section Summary of the Remediation Goals states that "at a minimum, the Plan selected should eliminate or mitigate all significant threats to public health and to the environment presented by the hazardous waste at the site." This section should state that the Quantitative

RA concluded that there is no indication of significant human health risk exists from the migration of groundwater off site.

State Response:

This section outlines site specific remedial goals to eliminate or mitigate all significant threats to public health and the environment. The purpose of this section is not to discuss the possible risks that this site poses, therefore it is not necessary to include this discussion of the 1990 risk assessment in the ROD. See related State responses to comments 7, 8a and 8b.

Specific Comment 11:

All remediation goals listed for the site use the language reduce, control, eliminate and/or prevent "to the extent practicable" when referring to the contaminant concentrations, exposures, or migration on-site or off site. Give the rationale for reducing, controlling, eliminating, and/or preventing contaminant levels, exposures, and/or migration below levels which are necessary to "eliminate or mitigate all significant threats to public health and the environment."

State Response:

See State Response to General Comment VIII.

Specific Comment 12:

The Plan should include the statement made in the FS Supplement that "the NYSDEC has determined that it would be technically impracticable to achieve groundwater standards for the on-site bedrock groundwater within a reasonable time frame due to the presence of DNAPL in fractured bedrock."

State Response:

Section 6.2 of the ROD discusses this issue.

Specific Comment 13a,b:

Section 7.2 states that all remedies must comply with New York State SCGs in order to be considered for selection, yet the PRAP states that none of the alternatives will meet SCGs. Explain the inconsistency. If SCGs must be achieved, develop alternatives which meet SCGs.

State Response:

The language in the PRAP is intended to relay the State's intent to meet SCGs whenever possible. When remedial measures are warranted and no identified alternative can meet all SCGs or, for example, when meeting SCGs would be extraordinarily expensive, the alternative which is closest in satisfying SCGs and other criteria may still be selected. The selection process allows SCGs to be waived if meeting them is impracticable. For this site, the ROD clearly states that meeting SCGs for on-site groundwater is considered technically impracticable. See also State Response to General Comment III.

Specific Comment 13c:

If SCGs cannot be used for on-site groundwater, a site specific risk-based level should be developed through a baseline quantitative risk assessment.

State Response:

Groundwater SCGs are used as a goal. If they are not attainable, they are used as a performance standard. Therefore risk based clean-up levels are not needed. Also, see State responses to General Comments I and IV.

Specific Comment 14:

Section 6.2 states that the "contaminant concentrations are of such magnitude that without treatment, contaminant concentrations would not biodegrade or attenuate appreciably." The FS notes that "concentrations of benzenes and chlorinated benzenes are likely to inhibit microbial activity". Some levels of benzenes and chlorobenzenes detected in the 1992 Supplemental sampling and the 1995 SRI are below levels cited which inhibit biodegradation. The plan should be revised to indicate that biodegradation is possible.

State Response:

The PRAP did not say that biodegradation was not possible. Instead, the point made was that contaminant concentrations are extremely high at the site and without treatment, contaminant concentrations would not be expected to undergo natural degradation and achieve acceptable contaminant reduction within a reasonable time frame.

Specific Comment 15:

Due to the presence of DNAPL within the fractured bedrock, even if the site had more favorable conditions such as higher DNAPL solubilities and higher conductivities, it would

take more than 100 years to remove a DNAPL plume using pump and treat technologies. Remediation for the DNAPL at the Solvent site would likely be on the order of thousands of years using pump and treat technology. The Plan should re-evaluate Alternatives 2, 3, and 4 to include the extremely long time periods expected for DNAPL clean-up using the pump-and-treat technology.

State Response:

The State recognizes that the presence of residual DNAPL makes restoration of the aquifer very difficult and the time period associated with restoration very long. The ROD states that due to the presence of DNAPL within the bedrock, it is technically impracticable to achieve SCGs for groundwater within the bedrock. This essentially means that no remedial alternatives can be developed using present technology which will (with reasonable cost effectiveness) achieve remediation of the bedrock groundwater. Alternatives 2, 3 and 4 have been assembled and evaluated on the basis of their ability to achieve control of the site contaminants and thus to prevent further off site migration. Long term operation of the remedial system selected in the ROD will be required to effect a significant reduction on contaminant migration within the bedrock.

Specific Comment 16a:

From the 1995 FS and FS Supplement, there appears to be two possible off site contaminant plumes: a possible plume to the west of the site which is attributable to a sewer through which chlorobenzenes were formerly discharged to Gill Creek; and a potential plume to the north/northeast of the site, in the direction of general groundwater flow from the site. The off site contaminant plume to the west of the site if documented in the Olin Chemical RCRA Facility Investigation Report. The Evaluation of Alternatives should identify where the potential plumes are located, the vertical and horizontal plume delineations, the potential plume sources, and the contaminant levels.

State Response:

The "plumes" identified in the PRAP and ROD are: the area of "concentrated contamination" located along Buffalo Avenue to the west of the site; and downgradient contamination from the site within the overburden and bedrock.

Information on the concentrations and distribution of these contaminants is found in detail in the Olin reports done under the State RCRA program. These documents are included in the Administrative Record in the Solvent ROD.

The downgradient contamination within the overburden and the bedrock is primarily to the north and northwest. Extensive off site investigations of this "plume" have not been undertaken.

It is unknown if the 18 inch storm sewer which runs from the southwest corner of the Solvent site to gill creek has contributed to significant contaminant migration from the site. Though there is some conjecture, there is no direct evidence that this was a sewer "through which chlorobenzenes were formerly discharged to Gill Creek." See State Response to General Comment VI for a further discussion of this storm sewer.

Specific Comment 16b:

From the data available from the off site hydropunch sampling to the north/northwest of the site, it appears contaminant levels are very low. Discuss whether hydraulic control on the west and north/northeast sides of the site are necessary.

State Response:

Extensive off site sampling was not performed. Limited overburden hydropunch sampling investigations to the north/northeast and to the west of the site indicated the presence of site specific contaminants in some of the overburden groundwater. Only one of the two hydropunch samples to the north/northeast had sufficient water to sample.

As the western side of the site exhibits heavily contaminated soils along its entire length, an overburden collection trench is necessary along this side. As the direction of flow in both the overburden and upper bedrock is generally to the north, the northern side of the site is an appropriate location for pumping or collection wells which will provide a hydraulic boundary to prevent off site contaminant migration. This location would take advantage of the pre-existing gradients and would provide effective hydraulic controls with lower pumping rates than would other possible locations. The hydraulic boundary in the overburden could be designed as a collection trench, as part of a combined overburden/upper bedrock pumping system, or other systems which meet performance objectives.

Specific Comment 17a,b:

Discuss the extent to which hydraulic containment can be achieved in light of the anisotropic conditions indicated by the wide ranges of hydraulic conductivity. Where have other sites with similar hydrogeology implemented similar hydraulic containment measures.

State Response:

The Occidental Chemical Corporation Main Plant site (nearby along Buffalo Avenue) has similar requirements under the RCRA program for hydraulic control of the bedrock. The site has similar contaminants with DNAPL contamination within the same fractured bedrock. In addition, the OCC Main Plant site remedial measures include hydraulic control of the bedrock at much greater depths (approximately 150 feet) than those required in the Solvent ROD.

Specific Comment 17c:

Indicate the number of wells which were used to prepare the costs in the Plan. Compare these numbers against the number of wells which were necessary to achieve hydraulic containment in the other sites. How was hydraulic containment measured in the other sites?

State Response:

The FS Report includes a discussion of the number of wells modeled within each zone and the flow rates expected. In general, modeling utilized 8 B-zone, 4 C/CD-zone, and 4 D-zone wells. These numbers and the flow rates associated with them are based upon the data available to date. The actual number of wells and the flow rates required to achieve hydraulic containment cannot be determined with certainty until the pre-design and design stages, and may require additional well installations and pump tests. It is difficult to draw conclusions from comparison with other sites in Niagara Falls due to the nature of the bedrock. However, Occidental Chemical currently has 19 pumping wells installed and operating at depths up to approximately 150 feet (controlling zones below the "Solvent Chemical F-zone"), designed to create a hydraulic boundary along a perimeter of approximately 3200 feet. The Olin Chemical Corporation will be installing 4 pumping wells and 3 passive relief wells on their site to the west of Gill Creek under the RCRA Corrective Action Program. These wells are designed to provide a hydraulic boundary within the overburden and the B-zone. Olin currently operates a production well which pumps from the C and CD zones at a flow rate of approximately 600 gpm to achieve hydraulic containment of those zones.

Specific Comment 18a:

The different expectations presented in Alternatives 2 and 3 with respect to their ability to achieve groundwater standards seem to assume that pumping of the B-zone will not result in significant reductions in contaminant loadings in the deeper bedrock zones. Clarify whether pumping the B-zone is an actual option in Alternative 3.

State Response:

Alternative 3 consists of a phased approach to bedrock hydraulic containment. It is possible that the initial phase (B-zone hydraulic containment) may reduce contaminant loadings to the lower bedrock zones sufficiently so that no further well installations are required in the lower zones. This is one of the major reasons why the State has selected Alternative 3 over Alternative 4. On-site groundwater within the lower bedrock zones would not be expected to achieve groundwater standards under any of the pumping scenarios. Off site groundwater within these lower zones may or may not achieve standards, depending upon the effects of the B-zone hydraulic containment and whether pumping of the lower bedrock groundwater zones is implemented.

Specific Comment 18b:

What criteria will be used to "demonstrate a significant reduction in contaminant loadings"?

State Response:

The percentage of contaminant reduction accomplished with hydraulic containment of the B-zone will be evaluated after completion of the remedial system. At this time, no specific reduction percentages have been proposed. The State will evaluate a number of items when reviewing the phased pumping system, including among other things, the magnitude of loading reduction achieved and the status of the regional groundwater influences.

Specific Comment 18c:

The discussion of Alternative 2 states that groundwater within the lower bedrock zones would not be expected to achieve groundwater standards. Justify this statement.

State Response:

On-site bedrock groundwater is not expected to achieve groundwater standards for two reasons. The first reason is that residual DNAPLs have been observed in the lower bedrock fracture units down to the CD zone. DNAPLs will continue to serve as a source of contamination for a very long time. As the D-zone has not been investigated (other than observation of corings through this zone), and there is a downward gradient from the CD zone to the D zone, it is possible that DNAPL is present in the D zone as well. The second reason is that the hydraulic control systems installed in the bedrock will likely not be designed in an attempt to "clean-up" the on-site groundwater, rather they will be designed to prevent migration of contaminants off site.

Specific Comment 19:

Identify and explain how the site "poses long term threats to the environment".

State Response:

New York State considers groundwater an important natural resource. The site poses a long term threat to this resource. In addition, some of the site groundwater contaminants presently discharge into the Niagara River, with some of the site specific contaminants known to bioaccumulate in aquatic organisms.

Specific Comment 20:

Revise the discussion to include the findings of the Quantitative RA which indicate that there is no evidence of significant human health risks from the migration of groundwater off site. Also, discuss the fact that the Quantitative RA was performed assuming that none of the groundwater migrating to the Niagara River through the Falls Street Tunnel was treated by the City.

State Response:

Although the 1990 risk assessment concluded that there is no evidence of a significant health risk from the migration of contaminated groundwater off site, contaminated groundwater continues to migrate from the site and a portion of that contamination reaches the Niagara River. Discharge of contaminated groundwater into the Lower Niagara River results in human exposure pathways which can be considered complete. The FS Supplement acknowledges that there is a relatively low potential which exists for human health impacts from contaminated groundwater within the area of the contaminant plume. See State Response to Specific Comments 8a and 8b.

Specific Comment 21:

Revise the Evaluation of Remedial Alternatives section to include the findings of the Quantitative RA.

State Response:

See State Response to General Comment II and Specific Comment 8a and 8b.

Specific Comment 22a:

The plan states that Alternatives 2 and 3 would significantly reduce potential exposure to utility and construction workers in the vicinity of the site by preventing future off site migration of contaminants within the zones of concern. The site is surrounded by chemical manufacturing facilities with already existing soil and groundwater contamination. Describe each off site chemical manufacturing facility, its current contaminant and remediation status, and the health and safety plan which are in effect for individuals performing work on the grounds of those facilities.

State Response:

Buried utilities and utility bedding material may provide a preferential pathway for contaminated groundwater. One exposure pathway referred to in the PRAP was intended to address the potential for utility workers, City personnel, construction personnel, etc. to be exposed to site contaminants within the bedrock B zone down gradient of the site or within the utilities or utility bedding material. It is not an exposure pathway related to any other manufacturing plant site activities. The health and safety of individuals performing work at neighboring facilities are protected by rules and regulations of the Federal Occupational Safety and Health Administration.

Specific Comment 22b:

Discuss how the potential off site contaminant migration will significantly affect the extent to which current and future utility and construction workers are/will be exposed.

State Response:

Hydraulic control of the bedrock B zone will prevent further contaminant migration within this zone and thereby reduce downgradient off site concentrations which may be encountered by future utility and construction workers who come into contact with groundwater from this bedrock zone. Therefore, to minimize future exposures to utility or construction workers, contaminated shallow groundwater must be controlled.

Specific Comment 23:

Hydraulic containment will prevent groundwater contamination from migrating off site. However DNAPL can migrate off site in fractures which are oriented in combined vertical/horizontal directions. Revise the plan taking into account the different flow behaviors of groundwater and DNAPLs.

State Response:

Vertical DNAPL migration within the fractured bedrock has occurred. The potential also exists for some lateral migration of DNAPLs at the site. However, large quantities of DNAPL have not been found at the site nor does the site history suggest that large quantities of DNAPL were disposed at the site. This is a significant difference from many of the other sites in the area known to contain large quantities of DNAPL (i.e. Hyde Park Landfill, Occidental Chemical S-Area, and DuPont Necco Park).

At the Solvent Chemical site, it is likely that DNAPL within the bedrock extends beyond the site property boundaries in the southwest corner of the site. This area is generally in a hydraulically up-gradient location and subject to controls included in the selected remedy. Migration of DNAPL in bedrock beyond other site boundaries is not considered likely. As discussed, recovery of DNAPLs within the fractured bedrock is technically impracticable at this time. However, hydraulic control of the bedrock fracture zones will prevent dissolved phase groundwater contamination from migrating off site.

Specific Comment 24:

The plan states that the installation of pumping systems to achieve soil and groundwater containment with B-zone pumping (Alternative 2) or B-, C-,CD-, and D-zone pumping (Alternative 3) would be readily implementable. The plan should discuss the wide range of hydraulic conductivity and the subsequent effects on achievement of groundwater containment on the site.

State Response:

The ROD acknowledges that the ultimate flow rates to achieve hydraulic containment of the bedrock fracture zones cannot be known with certainty at this time. The State considers hydraulic control of each of the zones to be technically feasible and does not consider such control to be cost prohibitive.

Specific Comment 25:

The plan should be modified to identify the number and costs projections for pumping wells to achieve hydraulic containment of the zones of concern.

State Response:

This information is already provided in detail in the Feasibility Study, which is included in the Administrative Record for the site.

Specific Comment 26:

Discuss the advantages and disadvantages of using site-specific risk-based cleanup goals to replace the SCGs.

State Response:

See State Response to General Comment III and IV.

Appendix B

Solvent Chemical Administrative Record

Site Investigations

Phase I Report - Solvent Chemical ; Engineering-Science Inc. in association with Dames & Moore, June 1983

Remedial Action Investigation - Former Solvent Chemical Corperation Site ; RECRA Research Inc., December 3, 1980

Phase II Investigation - Solvent Chemical ; Engineering-Science in association with Dames & Moore, July 1985

Supplemental Environmental Contaminant Investigation ; RECRA Environmnetal Inc., January 1992

Remedial Investigation Report for the 3163 Buffalo Avenue Site, Volumes I and II, Ecology and Environment Inc., November 1990 and June 1991 Revisions.

Final Work Plan for the Remedial Investigation of the 3163 Buffalo Avenue Site ; Ecology and Environment Inc., December 1989

Quality Assurance Project Plan for the Remedial Investigation of the 3163 Buffalo Avenue Site ; Ecology and Environment Inc., July 1987, and March 1989 Addenda

Post-Screening Investigation/Treatability Study Workplan ; Solvent Chemical Site; Malcolm Pirnie Inc., May 1994

Final Report- NYSDEC Solvent Chemical Site DVE Pilot Study ; Terra Vac; December 1994

RI/FS Workplan ; Solvent Chemical Site, Malcolm Pirnie Inc., August 1993

Post-Screening Investigation/Treatability Study Report ; Solvent Chemical Site; Malcolm Pirnie Inc., June 1995

Project Management Plan - New York State Superfund Standby Contract; Work Assignment D002852-6.4 ; Solvent Chemical Site; Malcolm Pirnie Inc; July 1995

Supplemental Remedial Investigation; Solvent Chemical Superfund Site; Volumes I and II; Malcolm Pirnie Inc.; July 1995

Feasibility Study for the Solvent Chemical Site ; Malcolm Pirnie Inc., February 1996

Proposed Remedial Action Plan - Solvent Chemical Site ; NYSDEC, August 1996

Feasibility Study Supplement - Solvent Chemical Site ; NYSDEC, July 1996

Soil Gas Survey Report ; Solvent Chemical Site; Tetra K Testing, November 1993

Draft Evaluation of Interim Remedial Measures ; Solvent Chemical Site; Malcolm Pirnie Inc., April 1994

Soil Sampling Data ; NYSDEC Sampling analysis performed by RECRA Environmental Inc.; Contract # COO2412; September 1992

Niagara Falls Regional Groundwater Assessment ; Woodward ClydeCosultants/ Conestoga-Rovers & Associates; October 1992

Considerations in Ground-Water Remediation at Superfund Sites and RCRA Facilities -- Update; Directive No. 9283.1-06 ; US Environmental Protection Agency; May 27, 1992

Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration; Directive 9234.2-25 ; Interim Final; US Environmental Protection Agency; May 27, 1992

Strategy for Groundwater Remediation Decision Making at Inactive Hazardous Waste Sites and Petroleum Contaminated Sites in New York State; Draft ; NYSDEC; April 22, 1996

RCRA Facility Investigation - Report for the Olin Buffalo Avenue Plant; RCRA-89-3013-0208 ; Woodward Clyde Consultants, Inc., August 1994

Correspondence Regarding Solvent Chemical PRAP

US Army Corps of Engineers - October 23, 1996

Olin Corporation - September 10, 1996

Mr. Guy M. Zaczek - September 14, 1996

Mr. Corrigan Sanoian - October 21, 1996

AIG Environmental Management Inc. - October 22, 1996

Legal Documents

Order On Consent, Index # CIV-83-1401C