RECORD OF DECISION

Frontier Chemical - Royal Avenue
Operable Unit 1- Overburden Soil and Groundwater

State Superfund Project
Niagara Falls, Niagara County
Site No. 932110
March 2012

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - RECORD OF DECISION

Frontier Chemical Royal Avenue
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Statement of Purpose and Basis

This document presents the remedy for the Frontier Chemical Royal Ave site, a Class 2 inactive hazardous waste disposal site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Frontier Chemical Royal Ave site and the public's input to the proposed Record of Decision Amendment presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Description of Selected Remedy

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. To maximize the net environmental benefit, Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including;
2.
   - using renewable energy sources
   - reducing green house gas emissions
   - encouraging low carbon technologies
   - foster green and healthy communities
   - conserve natural resources
   - increase recycling and reuse of clean materials
   - preserve open space and working landscapes
   - utilize native species and discourage invasive species establishment during restoration
   - promote recreational use of natural resources [new]

3. Removal of existing Site buildings, above grade structures, and demolition debris from the Site. [unchanged]

4. Excavation and on-site thermal treatment of contaminated source area soil (generally defined as soil with total VOC and monochlorotoluene > 100ppm). The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. Collection of appropriate soil confirmation samples to document removal of the source area. [modified]

5. Performance of a radiological surface soil scan to identify potential radiological soil "hot spots" that may interfere with the performance of the on-site thermal treatment system along with a radiological scanning protocol intended to identify radiological active material prior to thermal treatment. [new]

6. The backfill of soil removal areas with the soil originally removed from the excavation and the treated soil or other suitable material. [modified]

7. A site cover will be required to allow commercial/industrial use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where the soil cover is required, it will be a minimum of one foot of soil for areas of commercial development meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for commercial use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d); [modified]

8. Site groundwater will be controlled/treated through the use of the existing municipal combined sewer infrastructure in agreement with the Niagara Falls Water Board. [unchanged]

9. Imposition of an institutional control in the form of an environmental easement for the property that:

   (a) requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3).;

   (b) land use is subject to local zoning laws; the remedy allows the use and development of the controlled property for commercial and industrial uses;

(c) restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH, County DOH, or City Authority;

(d) prohibits agricultural or vegetable gardens on the controlled property; and

(e) requires compliance with the Department approved Site Management Plan; [modified]

10. A Site Management Plan is required, which includes the following:

(a) an Institutional Control Plan that identifies all use restrictions for the site and details the steps and media-specific requirements necessary to assure the institutional controls remain in place and effective. This plan includes, but may not be limited to:

(i) An Excavation Plan for the western portion of the site which details the provisions for management of future excavations in areas of remaining contamination;
(ii) Descriptions of the provisions of the environmental easement for the western portion of the site including any land use restrictions;
(iii) Evaluate the potential for vapor intrusion for any buildings constructed on the site, including provisions for mitigation of any impacts;
(iv) Maintaining site access controls and Department notification; and
(v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

(b) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

(i) monitoring of groundwater to assess the performance and effectiveness of the remedy;
(ii) a schedule of monitoring and frequency of submittals to the Department;
(iii) monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed in item (a) above.

(c) an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to: {include all that apply as appropriate}

(i) compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
(ii) maintaining site access controls and Department notification; and
(iii) providing the Department access to the site and O&M records. [modified]

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is 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 preference for remedies that reduce toxicity, mobility, or volume as a principal element.

March 28,2012

Date

Robert W. Schick, P.E., Acting Director
Division of Environmental Remediation

RECORD OF DECISION

Frontier Chemical Royal Avenue
Operable Unit 1- Overburden Soil and Groundwater
State Superfund Project
Niagara Falls, Niagara County
Site No. 932110
March 2012

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. The remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the reasons for selecting the remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repository:

Earl Brydges Memorial Library
1425 Main Street
Niagara Falls, NY 14304
Hours: Mon, Tues, Wed: 9am-9pm
Thurs: 9am-6pm; Fri, Sat: 9am-5pm

NYSDEC Region 9 Offices
Contact: Michael Hinton, Project Manager
270 Michigan Avenue
Buffalo, NY 14203
(716) 851-7220
Hours: Mon. - Fri. 8:30am - 4:45pm

A public meeting was held at the Earl bridges Memorial Library on February 28, 2012. At the meeting, the findings of the remedial investigation (RI) and the focused feasibility study (FFS) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal or written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the ROD in Appendix A.

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Frontier Chemical Royal Avenue site is approximately 9 acres in size and is located at the northwestern corner of Royal Avenue and 47th Street in the City of Niagara Falls.

Site Features: The majority of the buildings on the site have been demolished, although some smaller buildings and structures remain. The site is completely fenced and the majority of the surface of the site is covered by either concrete or blacktop. Several large areas of demolition debris piles also occupy areas on the surface of the site. A residential neighborhood is present approximately ½ mile west of the site. The Frontier Chemical site is in a heavily industrialized area of Niagara Falls. Numerous other inactive hazardous waste sites are within 1 mile of the site. These include several Occidental Chemical waste and plant sites, as well as DuPont Chemical, Olin Chemical, and the Solvent Chemical sites. The Niagara River is located approximately 3/4 mile south of the site.

Current Zoning/Use(s): The site is currently zoned for industrial use.

Historic Uses: The Frontier Chemical Waste Process Corporation operated a permitted waste treatment, storage, and disposal (TSD) facility at the Royal Avenue Site from 1974 to December 1992. While operating, this facility treated or stored approximately 25,000 tons of chemical wastes per year. Figure 2 shows the TSD facility layout in 2001. Several major spills were documented during Site operations, and in December 1992, following documented releases of hazardous waste from numerous drums, the Site was ordered closed by the NYSDEC.

Several investigations of the Site were performed between 1981-1990. These investigations were primarily focused on identifying areas of groundwater contamination, and were required under terms of the facility's operating permit. In 1992, the bankruptcy of the company's management firm ended the company's preliminary plans to implement corrective actions to address the identified groundwater contamination.

The facility closed in December 1992, and an emergency removal action was initiated by the US Environment Protection Agency (EPA) to remove the stored hazardous wastes from the Site. During 1993-1994, under a voluntary agreement with the EPA, a group of PRPs removed over 4,000 drums of waste from the Site. In a subsequent agreement with the EPA, a second removal was conducted by the PRPs during 1994-1995 which resulted in the removal of wastes from the 45 storage tanks on the property.

In 1995, the NYSDEC listed the Site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or environment and action is required.

In January 2001 the Site was referred to NYSDEC for action using the State Superfund.

Operable Units: The site was divided into two operable units. An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, thereat of release or exposure pathway resulting from the site contamination.

Operable Unit (OU) No. 1 consists of the overburden soil, as well as overburden and upper (defined as the A-zone and B-zone) bedrock groundwater. Operable Unit No. 2 is the deep (defined as the C-zone and deeper) bedrock groundwater.

Site Geology and Hydrogeology:

Geology:

The surface of the site is mostly covered by either asphalt or concrete. Up to 2 feet of fill material (generally gravel with some cinder, glass, wood, slag, bricks, etc.) over lies an overburden mostly comprised of a silty-clay, with some discontinuous seams of silty sand and clay. The total depth of the overburden is 14 to 17 feet. The bedrock immediately beneath the overburden is Lockport Dolomite. Distinct horizontal fracture systems have been characterized during the RI. The upper 35 feet of bedrock has been characterized as follows: the A-zone is identified as the fracture system consisting of the upper several feet of weathered bedrock; the B-zone is identified as the fracture system approximately 8-1 0 feet below the A-zone; and the C-zone is identified as the fracture system approximately 20 feet below the B-zone. While no previous Frontier Chemical investigations have targeted bedrock beneath the C-zone, numerous deeper bedrock fracture systems have been confirmed and described at other locations within the region. The bedrock A-zone, B-zone, and C-zone are described in greater detail in the Site Hydrogeology discussion. Regionally, bedrock groundwater is recharged by water from the

upper Niagara River (above the Falls), transmitted through fractures in the rock, and discharged to the lower Niagara River (at the gorge downstream from the Falls). There are two man-made structures which exert a significant influence on the flow of bedrock groundwater in the region: the New York Power Authority (NYPA) conduits and the Falls Street Tunnel.

Hydrogeology:

Depth to groundwater within the overburden ranges from about 2 to 10 feet below ground surface. There is a horizontal overburden groundwater gradient to the southeast, with a localized overburden "sink" (inwardly directed groundwater depression) in the south-central portion of the site. A downward vertical groundwater gradient exists between the overburden and the top of the bedrock.

Within the upper 35 feet of bedrock, 3 distinct horizontal fracture zones have been identified. The A-zone consists of the highly weathered upper 3 to 5 feet of bedrock. The B-zone is a fracture system which is up to 2 feet thick and is located approximately 8 to 10 feet below the A-zone. A downward vertical groundwater gradient exists from the A-zone to the B-zone. The C-zone is a fracture system approximately 20 feet below the B-zone. Although the C-zone has not been fully characterized, a slight upward vertical groundwater gradient has been calculated from the C-zone to the B-zone. The bedrock between the three defined horizontal fracture zones contains some vertical fractures which provide some groundwater communication between the zones.

The FST and the New Road Tunnel run along the south and east sides of the site, respectively. As both of these tunnels intersect the bedrock B-zone fracture system, site bedrock groundwater from the B-zone directly infiltrates into these tunnels. This infiltration in turn promotes a downward groundwater gradient from the site overburden and upper weathered bedrock into the B-zone. The construction of the drop shafts to the FST also promotes overburden groundwater drainage to the bedrock. The influence of these tunnels may also impart an upward groundwater gradient from the lower C-zone fracture system toward the B-zone.
The effect of the Falls Street tunnel as an upper bedrock groundwater interceptor has been well documented in numerous hydrogeologic studies of the area. The location, depth, and hydraulic influence of the tunnels has effectively intercepted site overburden and upper bedrock groundwater and prevented it from migrating beyond the Royal Avenue and 47th street tunnel alignments. At the Frontier Chemical site, groundwater within the bedrock C-zone and some of the lower bedrock fracture systems are also likely influenced by the NYPA conduit drain system. Site groundwater flow within some of these lower bedrock fracture zones is most likely toward the NYPA conduits. Since significant amounts of conduit water discharges into the Falls Street Tunnel, it appears likely that at least some of the C-zone and lower site bedrock groundwater is discharged to the FST.

Operable Unit (OU) Number 01 is the subject of this document. A Record of Decision was issued previously for OU 01 in March 2006 and for OU 02 in March 2011.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to commercial or industrial use as described in Part 375-1.8(g) are/is being evaluated in addition to an alternative which would allow for restricted use of the site.

SECTION 5: 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.

As a result of previous litigation resulting from the drum and tank removal actions, several hundred PRPs have been identified. These PRPs, as well as the current property owner - "5335 River Road, Inc.", may be legally liable for contamination at the site. The PRP group had previously entered into a Consent order to complete a Pre-design investigation for OU1 and a Remedial Investigation for OU2 (Deep groundwater). The Department is currently in negotiations with the PRPs to enter into a similar legal agreement to complete the remedial action which is the subject of this document.

SECTION 6: SITE CONTAMINATION

As described in the original ROD and other documents, many soil samples were collected at the Site to characterize the nature and extent of contamination. The primary contaminants of concern in the soil are volatile organic compounds (VOCs). The main categories of contaminants that exceed their SCGs are VOCs. The primary VOCs and their maximum detected concentrations in the Site soil are listed in Table 1.

TABLE 1
Primary Contaminants of Concern
Source Area Soil
Frontier Chemical Site
Niagara falls, NY

Contaminant of Concern	***Maximum Concentration (mg/kg)***
Monochlorotoulene	11,000
Tetrachloroethene	2,700
Chlorobenzene	950
1,2-dichlorobenzene	23,000
1,3-dichlorobenzene	2,300
1,4-dichlorobenzene	4,600
1,2,4-trichlorobenzene	33,000
1,1-dichloroethane	45

Trichloroethene	150
Toluene	600
Benzene	4,500

Due to the elevated nature of the VOCs identified in the soil during the RI, it was determined that the soil with concentrations of total VOCs greater than 100 ppm constituted source area soil (i.e., soil that would continue to act as a source of significant contamination in the future, if not remediated). Source area soils are shown in Figures 3 through10 for each successive 2-foot interval of the soil horizon, starting with the interval at the ground surface and descending to the bottom interval overlying the bedrock, which is located at a depth of approximately 16 feet below ground surface. The high concentrations of VOCs detected within overburden soil also suggest that non-aqueous phase liquid (NAPL) may exist within the soil matrix.

6.1: Summary of the Remedial Investigation

The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that has been addressed by the modification to the remedy identified in this ROD Amendment. The disposal of hazardous wastes at this site, as more fully described in the original ROD and Section 6 of this document, has contaminated various environmental media. The amendment is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This amendment identifies the new information which has lead to this amendment and discusses the reasons for the preferred remedy.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York; (6 NYCRR) Part 375. This document is a summary of the information that can be found in the site-related reports and documents in the document repository identified below.

On March 24, 2006, the New York State Department of Environmental Conservation (Department) signed a Record of Decision (ROD) for OU#1 Overburden Soil and Groundwater which selected a remedy to clean up the Frontier Chemical- Royal Ave Site. Through an Order on Consent and Administrative Settlement (Index #89-0571-00-01) entered into between the NYSDEC and the Potentially Responsible Parties Group (PRPs), a series of pre design investigations were performed from 2008 through 2010 in support of the final remedial design as required in the March 2006 ROD. These additional investigations improved the delineation of the source area soil allowing for a more accurate assessment of the Site conditions and features relative to the overburden, shallow bedrock, and deep bedrock groundwater impacts. The additional investigations also enabled further evaluation and understanding of the source area soil. The results of a treatability study performed during the remedial design investigation and subsequent engineering evaluations demonstrated that other remedial alternatives are viable and would be as, or more effective, more consistent with current sustainability goals, and have significantly less impact on the surrounding area/environment than the remedy for the source area soil selected in the March 2006 ROD.

Based upon this improved understanding of Site conditions, and considering the improvements in various remedial technologies over the past several years (particularly thermal treatment options), a Focused Feasibility Study (FFS) comparing the March 2006 ROD selected remedy with a thermal treatment remedy was submitted in November 2011 for Department review and approval.

The Department has amended the ROD for OU1of the Frontier Chemical Site. The major changes in the amended remedy include provision for on-site thermal treatment of contaminated source area soil, as well as the newly identified need for a radiological surface soil scan to identify potential radiological soil "hot spots" that may interfere with the performance of the On-site thermal treatment system along with a radiological scanning protocol intended to identify radiological active material prior to thermal treatment. The amended remedy will also allow the backfill of excavated areas with treated soils and clarification relative to the environmental easement and site management plan. Excavated soil that exceeds radiological background levels for the area will be transported off-site for disposal in a permitted disposal facility. Unexcavated soil that exceeds radiological background levels for the area can remain on site.

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Information

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data.

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

There were no IRMs performed at this site during the pre-design investigation.

6.3: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*.

This human health assessment characterizes exposures that may be presented by site contamination for both Operable Units. Since the site is fenced, and covered by asphalt or concrete, people will not come into contact with site-related soil and groundwater contamination unless they dig below the surface. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. The potential for soil vapor intrusion to occur on-site will be evaluated should the site buildings be re-occupied and/or if new construction occurs.

6.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

High concentrations of organic contaminants exist in soil and groundwater. Non-aqueous phase liquids (NAPL) have been found in both the overburden and bedrock groundwater. NAPL has also been detected in the upper bedrock fracture systems. NAPL will continue to act as a source of groundwater contamination.

Contaminants of concern at the site include various volatile organics (such as trichlorobenzene, dichlorobenzene, chlorobenzene, PCE, TCE, acetone, benzene, toluene, etc.), and various semi-volatile organics (such as chlorotoluene, phenol, dichlorophenol, etc.) Impacted media include soils, overburden and bedrock groundwater. Overburden and upper bedrock groundwater contaminant migration has been limited by the presence of the unlined bedrock tunnels on the east (the New Road Tunnel under 47th street) and south sides (the Falls Street Tunnel under Royal Avenue) of the site.

From groundwater data collected at the site from varying depths it appears that the highest levels of groundwater contamination is generally located in the soil and upper bedrock zones to be addressed in this ROD. Contaminants levels in deeper zones were as much as a 1,000 times lower than in this shallow zone. In addition, there appears to be an upward gradient of groundwater flow from the lower zones to the upper zones that also inhibits migration of the contaminants off-site.

During the course of work on the adjacent Norampac facility, elevated levels of radiation was detected in slag fill used on the site. The slag, that is believed to have been generated at the former Electromet facility, was used as fill in numerous locations around the Niagara Falls area. While radiation levels are not elevated enough to be a health concern requiring remediation,

controls are necessary to regulate off-site disposal and processing through the thermal treatment unit.

6.5: Summary of the Remediation Objectives

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the Site through the proper application of scientific and engineering principals.

The remediation goals stated for this Site in 2006 are to eliminate, reduce, or control to the extent practicable:

- Exposure of persons at or around the Site to contaminants in soil, groundwater, or air;
- The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards;
- The release of VOC vapors from soils or groundwater that may create exceedances of groundwater quality standards
- The off-site migration of contaminants within the overburden groundwater and within the bedrock groundwater zones of concern

Further, the 2006 remediation goals for the Site included attaining to the extent practicable:

- Ambient groundwater quality standards and
- NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives

The standards and criteria promulgated in 6 NYCRR Part 375-6 have superseded the guidance values in NYSDEC TAGM 4046. The planned soil remediation is compliant with the intent of the 2006 ROD and also incorporates factors associated with the promulgated regulations for soil cleanup.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

To be selected the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the feasibility study (FS) report.

Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth

costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

The Department has amended the ROD OU1 for the Overburden Soil & Groundwater remediation at the Frontier Chemical - Royal Avenue Site.

The selected remedy of the thermal destruction of the contaminants was chosen for the following reasons:

- It provides the same protectiveness as excavation and off-site disposal by removing contaminants from the site,
- It provides similar short term effectiveness since both remedies requires control of VOC emissions during excavation and will require the similar time to implement and complete.
- It provides greater long term permanence since contaminants are being destroyed instead of just transferred to another location such as a landfill,
- It has a smaller environmental and public safety footprint than off-site disposal since there will less trucking required which in turn reduces consumption of fuel, reduces emissions from transport vehicles, and reduces risks associated with vehicle traffic on public streets and highways. It also conserves permitted landfill storage space since treated soil will be placed back into the excavation from which it came and consumes valuable clean soil and related trucking from a required from a off-site since treated soil will be used as the backfill material, and
- This alternative cost is significantly less. The estimated present worth cost to carry out the amended OU 1 remedy is $7,870,000. The cost to construct the amended remedy is estimated to be $7,100,000 and the estimated average annual cost for 30 years to perform long term operation, maintenance and monitoring responsibilities is $50,000 per year.

The elements of the amended remedy listed below are identified as unchanged, modified or new when compared to the original 2006 ROD:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. To maximize the net environmental benefit, Green remediation and sustainability efforts are considered in the design and implementation of the remedy to the extent practicable, including;
2.
    - using renewable energy sources
    - reducing green house gas emissions
    - encouraging low carbon technologies
    - foster green and healthy communities
    - conserve natural resources
    - increase recycling and reuse of clean materials
    - preserve open space and working landscapes
    - utilize native species and discourage invasive species establishment during restoration

- promote recreational use of natural resources [new]

3. Removal of existing Site buildings, above grade structures, and demolition debris from the Site. [unchanged]

4. Excavation and on-site thermal treatment of contaminated source area soil (generally defined as soil with total VOC and monochlorotoluene > 100ppm). The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. Collection of appropriate soil confirmation samples to document removal of the source area. [modified]

5. Performance of a radiological surface soil scan to identify potential radiological soil "hot spots" that may interfere with the performance of the on-site thermal treatment system along with a radiological scanning protocol intended to identify radiological active material prior to thermal treatment. [new]

6. The backfill of soil removal areas with the soil originally removed from the excavation and the treated soil or other suitable material. [modified]

7. A site cover will be required to allow commercial/industrial use of the site. The cover will consist either of the structures such as buildings, pavement, sidewalks comprising the site development or a soil cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where the soil cover is required, it will be a minimum of one foot of soil for areas of commercial development meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for commercial use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d); [modified]

8. Site groundwater will be controlled/treated through the use of the existing municipal combined sewer infrastructure in agreement with the Niagara Falls Water Board. [unchanged]

9. Imposition of an institutional control in the form of an environmental easement for the property that:

   (a) requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);

   (b) land use is subject to local zoning laws; the remedy allows the use and development of the controlled property for commercial and industrial uses;

(c) restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the Department, NYSDOH, County DOH, or City Authority;

(d) prohibits agricultural or vegetable gardens on the controlled property; and

(e) requires compliance with the Department approved Site Management Plan; [modified]

10. A Site Management Plan is required, which includes the following:

(a) an Institutional Control Plan that identifies all use restrictions for the site and details the steps and media-specific requirements necessary to assure the institutional controls remain in place and effective. This plan includes, but may not be limited to:

(i) an Excavation Plan for the western portion of the site which details the provisions for management of future excavations in areas of remaining contamination;
(ii) descriptions of the provisions of the environmental easement for the western portion of the site including any land use restrictions;
(iii) evaluate the potential for vapor intrusion for any buildings constructed on the site, including provisions for mitigation of any impacts;
(iv) maintaining site access controls and Department notification; and
(v) the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

(b) a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

(i) monitoring of groundwater to assess the performance and effectiveness of the remedy;
(ii) a schedule of monitoring and frequency of submittals to the Department;
(iii) monitoring for vapor intrusion for any buildings occupied or developed on the site, as may be required by the Institutional and Engineering Control Plan discussed in item (a) above.

(c) an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to: {include all that apply as appropriate}

(i) compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
(ii) maintaining site access controls and Department notification; and
(iii) providing the Department access to the site and O&M records. [modified]

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Frontier Chemical Royal Avenue
Operable Unit - 01
State Superfund Project
City of Niagara Fall, Niagara County New York
Site No. 932110

The Amended ROD (AROD) for the Frontier Royal Avenue site, was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on March 28, 2012. The AROD outlined the remedial measure proposed for the contaminated overburden soil and groundwater, Operable Unit -01 (OU-1), at the Frontier Royal Avenue site. The release of the AROD was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on Tuesday February 28, 201, which included a presentation of the remedial investigation Focused Feasibility Study (FFS) for the Frontier Royal Avenue site, as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 13, 2012

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: Are there bedrock fractures in the deep zones as shown in the slide? For the contamination in the bedrock, is there an expectation that deeper GW zones will clean up after the source is removed?

RESPONSE 1: The slide is a general representation of the bedrock not a detailed cross section. The slide simply illustrates that the Falls Street Tunnel intercepts the bedrock fractures allowing the site water to enter the conduit. Yes, that is the expectation. A GW monitoring plan will be put in place to evaluate the status of the deeper GW in the future.

COMMENT 2: Are there chemicals in the Falls Street tunnel and South Side interceptor?

RESPONSE 2: Yes, contaminated groundwater water from the site is picked up by the Falls Street tunnel and the South Side interceptor

COMMENT 3: Excavation and burn for the soil, will there be fumes? Will there be Air Monitoring? There will be about 350 construction workers at the Greenpac site when this

when this remediation will take place. We expect numerous questions regarding what is going on and if there should be any concern.

RESPONSE 3: There will be treatment on the exhaust from the treatment unit and there will also be air monitoring performed to control fugitive dust and odors as part of the required NYS DOH Community Air Monitoring Plan (CAMP) for the site. The thermal treatment system will be tested to meet NYS Air requirements and in additional excavated soils will enclosed in a structure and the exhaust treated to eliminate any contaminant releases. The DEC and DOH project managers will also be available to meet with the Greenpac staff to discuss the project and can provide some information that can be provided to the workers.

COMMENT 4: What will be the fuel source for the treatment unit?

RESPONSE 4: Vendors and contractor selection is not complete, details on the operation of the systems will depend on who is selected to do the work. However, most likely the fuel source will be natural gas.

COMMENT 5: Are the areas outside the excavation limits clean and/or will a cover system be required? Will the backfill be compacted?

RESPONSE 5: The excavated areas will meet the cleanup goals for the site set at 100 ppm total VOCs. The excavated areas and other places with soil or gravel will have a foot of clean soil placed at the surface. In areas where the existing hard surfaces, concrete or asphalt are present and will remain, these features will serve as the cover system, however if removed in the future a minimum one foot of clean soil wold be required. A site management plan will be prepared to provide for future O&M and excavtion. The treated soil will also be augmented with water to bring the moisture content up for proper compaction and to reduce settling.

COMMENT 6: Will the existing pile of rubble and old existing tanks be removed?

RESPONSE 6: Yes, along with the all the remaining structures.

COMMENT 7: During the excavation on the Greenpac project. Contamination was found that was coming from Frontier. The excavation plan does not seem to go very close to this area.

RESPONSE 7: Per the slide the excavation limits are within a few feet of the property line in that area. The excavation will be guided by PID meters, confirmatory sampling and visual observation of the soil. Actual excavation will follow the field observations and not necessarily the lines drawn on the maps.

COMMENT 8: Will radiation screening be performed?

RESPONSE 8: Yes, an overall radiation survey has been conducted and a radiation meter will be on site to screen our any material suspected of containing elevated radiation levels.

APPENDIX B

Administrative Record

Administrative Record

Frontier Chemical Royal Avenue
Operable Unit - 01
State Superfund Project
City of Niagara Fall, Niagara County New York
Site No. 932110

1. Proposed Amended Record of Decision (AROD) for the Frontier Chemical Royal Avenue Site No. 932110, Operable Unit 1 Overburden Soil and Groundwater dated February 2012, prepared by the NYSDEC.

2. Order on Consent, Index No#89-0571-00-01, between the Department and {name of Responsible Parties who signed the order}, executed on August 15, 2008.

3. “Remedial Design report For Source Area Soil” Frontier Chemical Site, Niagara Falls, New York, December 2011 by CRA.

4. “Focused Feasibility Study” Frontier Chemical Site, Niagara Falls New York, November 2011.

5. Record of Decision for the Frontier Chemical Royal Avenue site, Operable Unit No.2, March 2011, prepared by NYSDEC.

6. "Remedial Pre-Investigation, Soil Characterization, Soil Remediation Pilot Test, Deep Bedrock Groundwater Report" Frontier Chemical Site, Niagara Falls, New York, September 2010, by Conestoga-Rovers & Associates.

7. Record of Decision for the Frontier Chemical Royal Avenue site, Operable Unit No.1, March 2006, prepared by NYSDEC.

8. "Supplemental Remedial Investigation Report for the Former Frontier Chemical Waste Process Site, Niagara Falls, New York", Vols. 1 & 2, November 2002, Ecology and Environment Engineering.

9. "Feasibility Study Report for the Former Frontier Chemical Waste Process Site, Niagara Falls, New York", May 2004, Ecology and Environment Engineering.

10. "Phase I Drum Removal Action Report", Vols. 1-3, May 1995, CRA.

11. "Sampling and Analysis/Site Security Plan", Vols 1-3, July 1994, BBL.

12. "Phase II Removal Action", July 1994, BBL.

13. "Evaluating the Technical impracticability of Ground-Water Restoration, Interim Final, Directive 9234.2-25", September 1993, USEPA.

14. "Site Cleanup Work Plan for USEPA", October 1993, Environmental Waste Technology, Inc.

15. "Niagara Falls Regional Groundwater Assessment", Vol 1 & 2, October 1992, Woodward-Clyde/CRA.

16. "Interim Remedial Measure Report", September 1991, ECCO, Inc.

17. "Hydrogeologic Investigation - Phase III", Vol 1 thru 7, April 1989, ECCO, Inc.

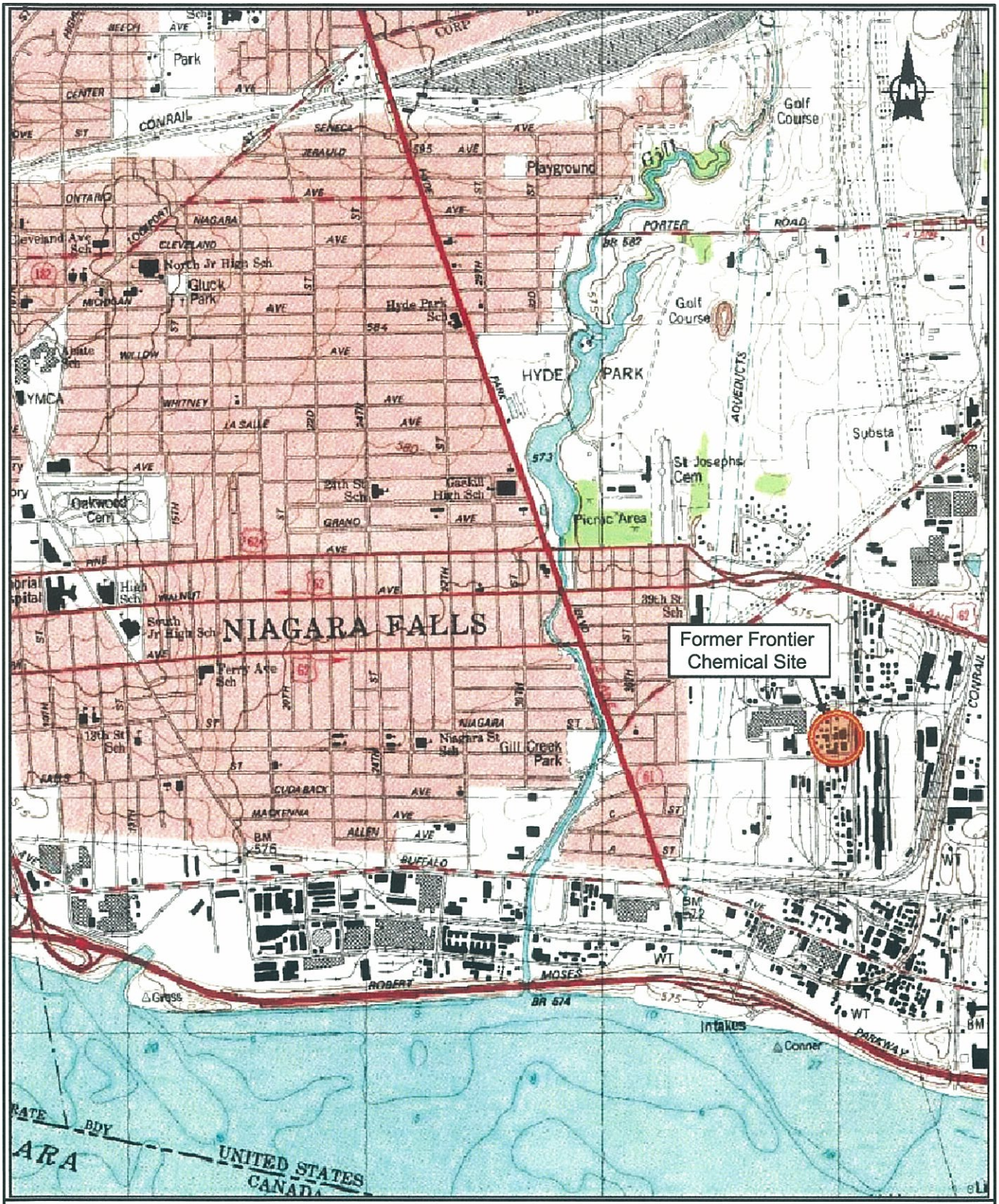
18. "Results of Phase I and I1 Hydrogeologic Investigations of Frontier Chemical, Niagara Falls, New York", April 1988, Golder Associates.

19. "Results of Phase I and I1 Hydrogeologic Investigations of Frontier Chemical, Niagara Falls, New York", April 1988, Golder Associates.

20. "Report to Frontier Chemical Waste Process, Inc. on Regional and Historical Data Review - Royal Avenue Plant Site", October 1986, Golder Associates.

21. "Report to Frontier Chemical Waste Process, Inc. - Hydrogeologic Review and Proposed Groundwater Investigation - Niagara Falls Plant", November 1985, Golder Associates.

22. "Frontier Chemical Hydrogeologic Investigation Evaluation of Groundwater Quality", June 1985, Thomsen Associates/Empire Soils Investigations.



SOURCE: E & E, 2002

figure 1

SITE LOCATION MAP

Frontier Chemical Site - Niagara Falls, New York

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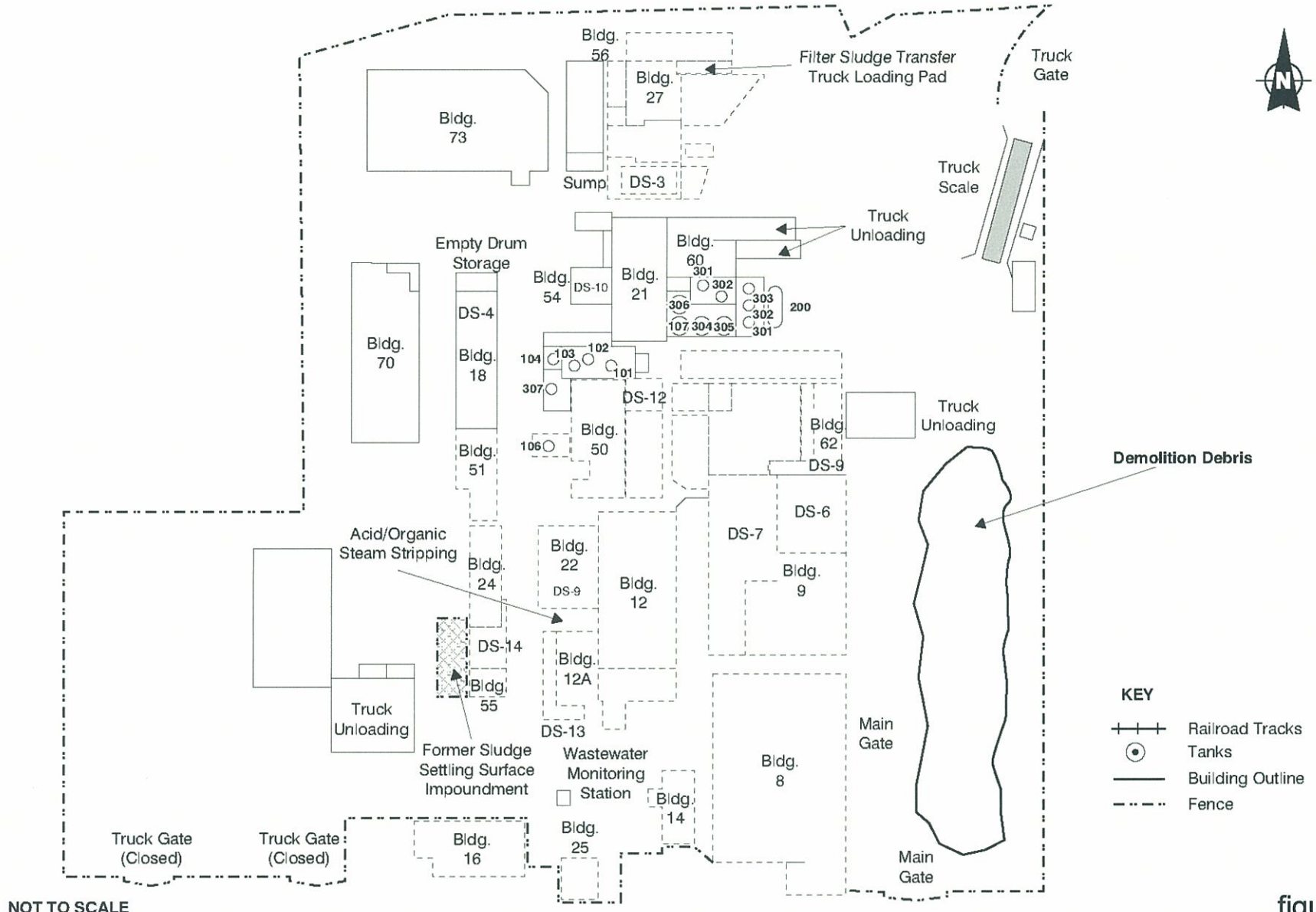

figure 2

2001 SITE MAP

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

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SOURCE: E & E, 2002

figure 3

SOURCE AREA SOIL
0 TO 2 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 4

SOURCE AREA SOIL
2 TO 4 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 5

SOURCE AREA SOIL
4 TO 6 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 6

SOURCE AREA SOIL
6 TO 8FT.

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 7

SOURCE AREA SOIL
8 TO 10 FT.

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 8

SOURCE AREA SOIL
10 TO 12 FT.

Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 9

SOURCE AREA SOIL
12 TO 14 FT.
Frontier Chemical Site - Niagara Falls, New York

SOURCE: E & E, 2002

figure 10

SOURCE AREA SOIL
14 TO 16 FT.

Frontier Chemical Site - Niagara Falls, New York