US Army Corps
of Engineers®
Buffalo District

RECORD OF DECISION

FOR THE GROUNDWATER OPERABLE UNIT

LINDE SITE, TONAWANDA, NEW YORK

DECEMBER 2006

I.

DECLARATION FOR THE RECORD OF DECISION

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Groundwater Operable Unit, Linde Site
Town of Tonawanda, New York

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the decision for the Groundwater Operable Unit (OU) at the Linde Site in the Town of Tonawanda, New York. The decision was made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, 42 United States code 9601 et seq., as amended (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as directed by Congress in the Energy and Water Appropriation Act for Fiscal Year 2000, PL 106-60, 10 U.S.C. 2701. The information supporting the United States Army Corps of Engineers (USACE) decision as the lead agency for the Groundwater OU is contained in the Administrative Record file located at the USACE Public Information Center, 1776 Niagara Street, Buffalo, NY 14207 and the Tonawanda Public Library, 333 Main Street, Tonawanda, NY 14150.

Comments on the proposed plan provided by the New York State Department of Environmental Conservation (NYSDEC) were evaluated and considered in the USACE decision. The NYSDEC comment letter is postmarked 30 June 2006 and is attached to Appendix A of this ROD. The NYSDEC does not concur that the no action decision recommended in the Proposed Plan (PP; USACE 2006) is sufficiently protective of human health and the environment. The NYSDEC considers a combination of institutional controls and long-term monitoring as necessary to provide satisfactory protection. USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible constituents of concern (COCs) in the affected groundwater. This conclusion is based on the USACE's determination that naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment, and treatment to remove the naturally occurring constituents would also remove any of the FUSRAP-eligible COCs that may be present. Since no actions are warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit.

ASSESSMENT OF SITE

The USACE, as lead agency, has determined that no action is necessary to protect public health or welfare or the environment.

DESCRIPTION OF THE SELECTED REMEDY

Background

During the early to mid-1940's, portions of the property formerly owned by Linde Air Products Corp., a subsidiary of Union Carbide Industrial Gas (Linde) now owned by Praxair, Inc., in the Town of Tonawanda, New York were used for the separation of uranium ores. The separation processing activities, conducted under a Manhattan Engineer District (MED)/Atomic Energy Commission (AEC) contract, resulted in elevated radionuclide levels in portions of the Linde property. Subsequent disposal

and relocation of the processing wastes from the Linde property resulted in elevated levels of radionuclides at three nearby properties in the Town of Tonawanda: the Ashland 1 property; the Seaway property; and the Ashland 2 property. Together, these three (3) properties, with Linde, have been referred to as the Tonawanda Site.

Under its authority to conduct the Formerly Utilized Sites Remedial Action Program (FUSRAP), the U.S. Department of Energy (DOE) conducted a Remedial Investigation (RI), Baseline Risk Assessment (BRA), and Feasibility Study (FS) of the Tonawanda Site. In November 1993, DOE issued a PP for public comment for the Tonawanda Site (DOE 1993a), describing the preferred remedial action alternative for disposal of remedial waste and cleanup plans for each of the Tonawanda Site properties. The 1993 PP recommended that remedial wastes from the Tonawanda Site properties be disposed in an engineered on-site disposal facility to be located at Ashland 1, Ashland 2, or Seaway.

Numerous concerns and comments were raised by the community and their representatives regarding the preferred alternative identified in DOE's 1993 PP and the proposed onsite disposal of remedial action waste. In 1994, DOE suspended the decision-making process on the 1993 PP and re-evaluated the alternatives that were proposed.

On October 13, 1997, the Energy and Water Development Appropriations Act, 1998, was signed into law as Public Law 105-62. Pursuant to this law, FUSRAP was transferred from the DOE to the USACE. As a result of this transfer, USACE assumed responsibility for this project. The Energy and Water Development Appropriations Act for Fiscal Year 2000, Public Law 106-60, provides authority to USACE to conduct restoration work on FUSRAP sites subject to the CERCLA, 42 United States Code 9601 et seq., as amended. This USACE authority is limited to remediating contamination related to the nation's early atomic energy program. Other contamination is not eligible under FUSRAP. Therefore, this ROD only addresses FUSRAP-eligible COCs.

In April 1998, USACE issued a ROD (USACE 1998) for cleanup of Ashland 1, Ashland 2, and Area D of the Seaway Site properties. Remediation of those properties was initiated by USACE in June 1998. USACE is addressing the Seaway Site in separate CERCLA documents.

USACE issued a CERCLA ROD for the Linde Site in March 2000 (USACE 2000). The March 2000 Linde ROD outlined remedial actions to address Linde Site soils and structures that were radioactively contaminated as a result of the uranium processing that was conducted at the Linde Site under an MED/AEC contract in the 1940s. The March 2000 Linde ROD excluded CERCLA decision-making on Building 14 and groundwater at the Linde Site. Remedial actions in accordance with the March 2000 Linde ROD were initiated in June 2000 and are planned for completion in 2009.

In April 2003, USACE issued its CERCLA ROD (USACE 2003a) for the Building 14 OU at the Linde Site and remedial actions in accordance with the April 2003 ROD, including the removal of Building 14, have been completed.

The March 2000 ROD for the Linde Site excluded decision-making on Linde Site groundwater. No-Action related to Groundwater was presented in the 1999 Proposed Plan for the Linde Site; however, comments received during the public comment review period expressed concerns about the adequacy of samples relied upon at that time in coming to a conclusion that no remediation of the groundwater is warranted. As a result, USACE conducted investigations in 2001 and 2002 to further address groundwater and has concluded that no action is warranted for Linde groundwater.

The shallow and the deep groundwater comprise the Groundwater OU at the Linde Site. As described in detail in subsequent sections of this ROD, the shallow groundwater at the Linde Site is separated from the deep groundwater by a thick layer of clay. Extensive remediation of FUSRAP eligible contaminants in site soils and buildings has removed potential sources of contamination of shallow groundwater, and USACE has determined that no further action is warranted for the shallow groundwater at the Linde Site since potential sources of contamination have been removed. As also described in greater detail in subsequent sections of this ROD, liquid wastes from MED/AEC-related operations were injected into the deep groundwater at the Linde Site in the mid-1940's. Extensive investigations of deep groundwater have been conducted at the Linde Site, including prior investigations by the DOE and the more recent USACE investigations. As described in the following sections, USACE has also determined that no action is warranted for deep groundwater at the Linde Site. In determining that no action is warranted for shallow or deep groundwater at the Linde Site, USACE addressed only the groundwater impacted by releases from the early site operations related to the MED/AEC programs.

USACE issued an FS Report (USACE 2004) for the Groundwater OU at the Linde Site in October 2004 and an Addendum to the FS Report (USACE 2005) for the Groundwater OU at the Linde Site in September 2005. The PP (USACE 2006) for the Groundwater OU at the Linde Site was issued by USACE in May 2006. This ROD addresses the Groundwater OU at the Linde Site. This is the final decision regarding any FUSRAP response action for the Linde Site Groundwater OU.

Decision Summary

As described in the March 2006 PP, no action for Linde Site groundwater is warranted because there are no exposure pathways to human or environmental receptors for any FUSRAP-eligible COCs in the affected groundwater.

STATUTORY DETERMINATIONS

No CERCLA Section 121 statutory determinations are necessary for this ROD since USACE has determined that no remedial action is necessary under CERCLA and no remedy is being selected. USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible COCs in the affected groundwater. This conclusion is based on the USACE's determination that naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment, and treatment to remove the naturally occurring constituents would also remove any of the FUSRAP-eligible COCs that may be present. Since no actions are warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit.

_____/S/_____ ___29 Jan 2007___
BRUCE A. BERWICK Date
Brigadier General, U.S. Army
Commanding

RECORD OF DECISION
FOR THE GROUNDWATER OPERABLE UNIT
LINDE SITE, TONAWANDA, NEW YORK

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ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
bgs	below ground surface
BNI	Bechtel National, Inc.
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ci	Curie
cm/s	centimeters/second
COC	constituent of concern
Conrail	Consolidated Rail Corporation
CPS	counts per second
DOE	Department of Energy
FS	Feasibility Study
ft	foot/feet
FUSRAP	Formerly Utilized Sites Remedial Action Program
g	gram
L	liter
lb(s)	pound(s)
MCLs	Maximum Contaminant Levels
MED	Manhattan Engineer District
m	meters
m/yr	meters per year
µg	microgram
µ	micron
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NRC	Nuclear Regulatory Commission
NWI	National Wetlands Inventory
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
pCi	picocuries
PP	Proposed Plan
ppm	parts per million
Ra	radium
RI	Remedial Investigation
ROD	Record of Decision
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SMCLs	Secondary Maximum Contaminant Levels
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Test
TDS	total dissolved solids
Th	thorium
U	uranium
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.	United States
U.S.C.	United States Code

ACRONYMS AND ABBREVIATIONS (continued)

USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WET	Waste Extraction Test
yr	year(s)

II.

DECISION SUMMARY

1. SITE NAME, LOCATION, AND DESCRIPTION

Groundwater OU, Linde Site
Town of Tonawanda, New York

1.1 Linde Site Overview

The Linde Site is now owned by Praxair, Inc. and comprises about 135 acres located at East Park Drive and Woodward Avenue in the Town of Tonawanda. The site is bounded on the north and south by other industrial properties and small businesses, on the east by CSX Corporation (CSX) [formerly Consolidated Rail Corporation (Conrail)] railroad tracks and Niagara Mohawk property and easements, and on the west by a park owned by Praxair that is open to the public. West of the park owned by Praxair, the Linde Site is bounded by a low density residential area and a school. The regional and vicinity locations of the Linde Site are shown in Figures 1 and 2.

The property contains office buildings, fabrication facilities, warehouse storage areas, material laydown areas, and parking lots. Access to the property is controlled by Praxair. Approximately 1,400 employees work at the Praxair facilities. Figure 3 shows Linde Site locations.

The property is underlain by a series of utility tunnels that interconnect some of the main buildings and by an extensive network of storm and sanitary sewers. The Linde Site is served by public water and sanitary sewer systems. The source of the public water supply is the Niagara River, which has a flow in excess of 100 billion gallons per day. Groundwater at the Linde Site is not currently utilized for any purpose and because an ample supply of fresh water is available from the public water supply system, no future use of Linde Site groundwater is anticipated. Development of the deep groundwater at the Linde Site as a source of drinking water is precluded without costly treatment to remove naturally occurring high levels of total dissolved solids and other constituents. Development of the shallow groundwater at the Linde Site is precluded due to unsuitable subsurface conditions. In the event that a water supply well was to be installed and used at the Linde Site, a building and/or plumbing permit would be required under Chapter 54 of the Town Code. While there are no specific prohibitions against such facilities, Town approval would be required. The Erie County Department of Health would have to approve any public water supply well.

The Linde property is generally flat and it is estimated that approximately half of the Linde plant area is covered with impervious surfaces such as roofs, paved areas and sidewalks; the other half is covered with a packed gravel surface and sod that allows infiltration of precipitation. Several railroad spurs extend onto the property from the CSX property east of the site.

Land uses in proximity to the Linde property include the CSX property, and commercial and residential areas to the east; small businesses, light industries, and residential areas to the north; business and industrial areas to the south; and a low density residential area and Holmes Elementary School to the west. Sheridan Park, owned by the Town of Tonawanda's Parks and Recreation Department, is located one-fourth mile to the northwest of the Linde property. Twomile Creek flows through this property. Recreational uses include an 18-hole public golf course, picnicking, and playgrounds. Other uses within one mile of the Linde property include five schools, two community buildings, a senior citizens' center, and Kenmore Sisters of Mercy Hospital. The Linde property is fenced and has a buffer zone of grass and trees around the main buildings (DOE 1993c).

1.2 USACE's Authority at the Linde Site

USACE is the lead agency for purposes of selecting and implementing a remedial action at the Linde Site, if required, pursuant to authority established in CERCLA and Public Law 105-245. The Linde Site is not listed on the United States Environmental Protection Agency's (USEPA's) National Priority List. For purposes of FUSRAP, any remedial actions conducted for the Groundwater OU at the Linde Site would address only hazardous substances that were released during the period of MED/AEC contract work and related to activities in support of MED/AEC and not any earlier or later releases of hazardous substances that may have occurred, except to the extent they may be commingled with the MED/AEC-related hazardous substances. As described herein, USACE has determined that no remedial action is warranted for Linde Site groundwater.

1.3 Zoning and Future Land Uses

The Linde Site is currently used for commercial and industrial purposes, and industrial facilities have been present at the site for more than 60 years. As described above, the site is surrounded by industries and small businesses on three sides and by a park owned by Praxair on the fourth side.

The Town of Tonawanda has adopted a zoning ordinance that regulates land uses in the Town, and zoning districts were established to permit varying degrees of land uses. The Linde property is located in a Performance Standards Zoning District. The purpose of the Performance Standards Zoning District is to encourage and allow the most appropriate use of the land, while remaining unhampered by restrictive categorizing, thus extending the desirability of flexible zoning.

Zoning regulations for this district permit an institution for human care or treatment, or a dwelling unit, only if the development abuts a residential zoning district. Restricted uses include junkyards, waste transfer or disposal, land mining, and stockyards. Any proposed uses must follow the acquisition of a Performance Standards Use Permit. Performance Standards Uses are not permitted if they exceed New York State regulations or other standards listed in the zoning codes book, such as standards for noise, odor emission, dust emission, and vibrations, as measured at the individual property line.

Zoning in the vicinity of the Linde property includes a business district to the north, a low-density residential area to the west, and the Performance Standards District to the south and east.

Because the west boundary of the site abuts a residential zone, construction of an institution for human health care or treatment, or a dwelling unit, are not strictly prohibited in the Performance Standards Zoning District. However, given the past and current use of the Linde Site for industrial and commercial uses for more than 60 years, USACE has concluded that the reasonably anticipated future land use of the property will be for industrial/commercial purposes (USACE 2000).

1.4 Physical and Environmental Site Characteristics

The physical and environmental characteristics of the Linde Site are described in detail in the RI report (Bechtel National, Inc.[BNI] 1993), the FS report (DOE 1993c), the Addendum to the FS for the Linde Site (USACE 1999a), and the March 2000 ROD for the Linde Site (USACE 2000). An overview of physical and environmental characteristics of the Linde Site is presented in the following paragraphs.

The Linde Site is situated on a relatively flat, broad lowland east of Twomile Creek, a tributary of the Niagara River. The elevation of the ground surface at the Linde Site is approximately 600 feet (ft) above mean sea level (BNI 1993). Twomile Creek begins in a natural channel south of the Linde Site. Near the southern boundary of the Linde Site, flow in Twomile Creek is directed into twin subsurface box conduits which traverse the Linde Site, underground. Stormwater runoff from the Linde Site is collected in the facility's stormwater system and is discharged through two large flow control gates located on the downstream face of the concrete dam that impounds Sheridan Park Lake. Downstream of the Sheridan Park Dam, the natural channel of Twomile Creek conveys flow in a northerly direction to the Niagara River, approximately 2¼ miles north of the Linde Site (see Figure 2).

Mapping of regional glacial and bedrock geology indicates that the site area is situated on clayey glacial till and glaciolacustrine units directly overlying the Camillus Shale of the Salina Group. This bedrock formation is approximately 400 ft thick in the area and consists predominantly of gray, red, and green thin-bedded shale and massive mudstone. Interbedded with the shale and mudstone are relatively thin beds of gypsum, dolomite, and limestone.

Boring logs for eight (8) monitoring wells constructed at the Linde Site during the RI show that bedrock was encountered at depths ranging from approximately 82 to 96 ft (BNI 1993). In borings for the construction of three deep monitoring wells at the Linde Site in 2001, bedrock was encountered at depths ranging from approximately 72 to 85 ft (USACE 2003b). The locations of wells installed during the RI and wells installed by USACE in 2001 are shown in Figure 4. Based on numerous soil borings, the RI report indicates that the natural soils at the Linde Site appear to be covered by a fill layer ranging in thickness from 0 to 17 ft. The fill contains substantial quantities of slag and fly ash that were apparently brought on-site from local sources for grading purposes during the construction of the Linde facility (BNI 1993). Undisturbed soils that underlie the site are composed primarily of clay and sandy clay. These soils have low permeabilities precluding significant infiltration of precipitation.

Years of continuous industrial activity at the Linde Site have left only marginal areas for natural plant communities. The property provides minimal urban wildlife habitats, supporting only cosmopolitan species of birds and small animals (DOE 1993b).

A review of National Wildlife Inventory (NWI) maps (Tonawanda West and Buffalo Northwest quadrangles) identified no floodplains or wetlands at the Linde Site.

Except for occasional transients, no federally-listed or proposed endangered or threatened species under jurisdiction of the United States Fish and Wildlife Service (USFWS) have been sighted in the project area, and no listed or suspected critical habitats occur on the Linde Site (DOE 1993b).

Groundwater at the Linde Site is addressed in Sections 2 and 3, below.

1.5 Ongoing Remediation at the Linde Site

As noted above, remediation of soils and structures at the Linde Site, in accordance with the March 2000 Linde ROD, has been underway since June 2000. When the remedy for soils and structures was selected, USACE determined that the cleanup standards found in 40 Code of Federal Regulations (CFR) Part 192, the standards for cleanup of the uranium mill sites designated under the Uranium Mill Tailings Radiation Control Act (UMTRCA), and the Nuclear Regulatory Commission (NRC) standards for decommissioning of licensed uranium and thorium mills, found in 10 CFR Part 40, Appendix A, Criterion 6(6), are relevant and appropriate for cleanup of FUSRAP eligible COCs in soils at the Linde Site. The major elements of

this remedy involve excavation of soils with COCs (radium, thorium and uranium) above the soil cleanup levels, placement of clean materials to meet the other criteria of 40 CFR 192, and cleanup of contaminated surfaces in buildings with COCs above the surface cleanup levels.

The remedy selected in the March 2000 Linde ROD also involves the demolition/relocation of buildings necessary to remediate the site. The remediation addressed in the March 2000 Linde ROD also includes remediation of the adjacent Niagara Mohawk and CSX Corporation properties, where radioactive contamination has already been identified or may be identified as the remediation work is implemented. The remediation is limited to FUSRAP eligible COCs. The remediation plan also includes the removal of contaminated sediments from drainlines and sumps and the removal of contaminated soil from a blast wall structure located east of Building 58. Completion of site remediation addressed in the March 2000 Linde ROD is planned in 2009.

The remedy selected by USACE for the Building 14 OU at the Linde Site is referred to as Removal. Implementation of this remedy involved demolishing Building 14 and removing the building demolition debris from the Linde Site (USACE 2003a). The utility tunnel located beneath Building 14 was relocated to allow for removal of contamination within and around the tunnel structure. Building components and soils under the building were surveyed to identify materials and soils that were radioactively contaminated with COC (radium, thorium, and uranium) concentrations above the cleanup criteria. All materials and soils were disposed at permitted/licensed facilities. The Building 14 OU work was completed in 2005.

2. GROUNDWATER AT THE LINDE SITE AND INJECTION OF MED/AEC WASTES INTO LINDE SITE GROUNDWATER

Details of groundwater flow characteristics at the Linde Site and detailed descriptions of the injection of MED/AEC wastes into Linde Site groundwater are provided in the FS (USACE 2004), the RI report (BNI 1993), and the 1981 Aerospace report (Aerospace 1981). Relevant information is summarized below.

2.1 Site Stratigraphy and Groundwater

The descriptions of subsurface conditions (both geology and hydrogeology) provided in the RI report are based on subsurface investigations conducted by DOE.

The RI report divided the geologic units encountered during drilling activities into the two following categories:

- **Unconsolidated Material.** This refers to the sediments/fill that overlie the bedrock. At Linde, these units have generally been encountered in the following order from shallowest to deepest: fill, till, varved lacustrine clay, and coarse-grained fluvial or glaciofluvial deposits directly overlie the bedrock.

- **Bedrock.** The bedrock encountered during drilling activities at the four Tonawanda FUSRAP sites is composed of the siltstones, shales, and dolomites of the Silurian Salina Group. The upper 6 to 15 ft of the bedrock "showed moderate to extensive fracturing that in some cases were filled with gypsum."

To illustrate the relationship between the bedrock and the overlying unconsolidated sediments at the Linde Site, a cross-sectional drawing of the subsurface at the Linde Site was developed incorporating subsurface information from the RI report and information from the investigations conducted at the Linde Site by USACE in 2001. The location of this cross section, referred to as cross section A-A, is shown in Figure 5 and the cross section is shown in Figure 6.

In the RI report, the following three hydrostratigraphic zones were identified based on the results of the investigations conducted at the four Tonawanda FUSRAP sites:

- A **perched zone**, which is defined in the RI report as occurring within the fill and upper portion of the till.
- A **shallow, semi-confined system** that was encountered at the Linde Site between 7 and 9 ft bgs in borings LMW-01, LMW-02, and LMW-03, as shown in Figure 6.
- A **contact zone aquifer** that encompasses both basal unconsolidated materials and the underlying fractured weathered bedrock. Prior to the 2001 USACE groundwater investigation, only the contact-zone aquifer was characterized at the Linde Site with the installation of eight contact-zone aquifer monitoring wells. During the 2001 Linde Site groundwater investigation, three new monitoring wells, LMW-04, LMW-05, and LMW-06, were installed in the contact zone aquifer. See Figures 4 and 6.

For simplification in the USACE documents, groundwater in the shallow, semi-confined system is referred to as "shallow groundwater." The groundwater in the contact zone aquifer is referred to as "deep groundwater."

The RI report indicates that because of the low permeability of the glacial till and clays, very little infiltrating water percolates to the shallow groundwater; therefore, little contaminant transport takes place. Most of the infiltrated water moves horizontally through the relatively more conductive top fill layer. The shallow system is considered to be semi-confined because the clayey and sandy gravel component is surrounded by silty clay material that has lower hydraulic conductivity (less than 10^{-7} cm/s) (BNI 1993).

The RI report estimates that the basal glaciofluvial deposits directly overlying the bedrock have a hydraulic conductivity of 2.3×10^{-3} cm/s (2,400 ft/yr) based on published hydraulic conductivity data for silty sand. Using an effective porosity of 0.13 and a hydraulic gradient of 0.0003 ft/ft, the average linear groundwater velocity was calculated in the RI report to be 1.7 m/yr (5.5 ft/yr). Piezometric surface maps of the contact-zone aquifer show that there is no significant recharge or discharge for this aquifer at the Tonawanda Site (BNI 1993).

At the Linde Site, contaminated effluent was injected directly into the contact zone aquifer (the basal unconsolidated material and the underlying fractured bedrock). Groundwater flow conditions and adsorption in the rock matrix affect the transport of contaminants in this aquifer (BNI 1993). During the injection, wells plugged frequently due to precipitation of the materials injected into the wells once they contacted the dissimilar water chemistry in the aquifer.

The shale underlying the basal glaciofluvial deposits shows moderate to extensive fracturing in the top 6 to 15 ft. The RI report for the Linde Site notes that 35 constant-head packer tests were conducted at various depths in the bedrock. Twenty-eight of the packer tests at the Linde Site had no water “take” (no water flow through the packer apparatus). The RI report used only the seven packer test results showing water “take” to calculate a geometric mean hydraulic conductivity of 7.1×10^{-5} cm/s (80 ft/yr) for the bedrock at the Linde Site. The RI report assumed that the upper bedrock is equivalent to a porous

medium due to extensive fracturing in this region, and, assuming a porosity of 0.1 percent and a hydraulic gradient of 0.0003 ft/ft, estimated the linear velocity of the groundwater to be 24 ft/yr.

2.2 Groundwater Flow Direction – 2001 and 2002 Investigation

Groundwater elevations in eight historical wells and six monitoring wells installed by USACE in 2001 were measured in March and June 2001 prior to sampling. Figures 7 and 8 show the piezometric contours as determined from measuring the deep wells in March and June 2001. Since a complete set of water level measurements was not collected in August 2002, a piezometic surface map was not constructed for the August 2002 data.

The piezometric contours for the contact zone aquifer, as indicated in the figures, show the groundwater flow direction to generally be to the southeast in March 2001 and to the southwest in June 2001. There are some local anomalous readings, such as the difference in elevations in groundwater gauged in wells B29W10D and LMW-06, which are adjacent to one another. Monitoring wells B29W10D and LMW-06 are screened at different intervals, which may result in variations in groundwater elevations between these monitoring wells.) Overall, the hydraulic gradients across the site are small. The groundwater flow direction and gradient information for the deep aquifer obtained during June 2001 are generally consistent with the information reported in the RI report, which indicates that flow in the deep aquifer is to the southwest.

2.2.1 Shallow Wells

Groundwater elevation data are limited for the shallow wells. Groundwater elevations in the shallow wells are 25-30 ft above the groundwater elevations in the deep wells, which is consistent with the presence of a low conductivity layer separating the shallow and deep aquifers, as reported in the RI report.

2.3 Overview of Uranium Ore Processing and Effluent Disposal at the Linde Site in the 1940's

Tax mapping property information for the Town of Tonawanda indicates ownership of the property at the Linde Site location by Union Carbide, Linde Division, in 1936. Commercial industrial processes were being conducted at the Linde Site by the Linde Air Products Division of Union Carbide prior to MED/AEC-related operations in the 1940's. Union Carbide operations continued at the Linde Site after the MED/AEC-related activities ceased. In the 1990s, Praxair acquired the property and continued commercial industrial processes focusing on research and development (USACE 2000). Any FUSRAP remedial action at the Linde Site would not involve and would not respond to any releases to the groundwater, or other media at the site, except those which are authorized for response under the FUSRAP program and related to the historical site operations conducted by the Linde Air Products Company for the MED/AEC program.

As described in the RI report, uranium ore processing was conducted at the Linde Site by the Linde Air Products Company under an MED/AEC contract in the 1940's. Linde was selected for the contract because of the company's experience in the ceramics business, which involved processing uranium to produce the salts used to color glazes (BNI 1993). A three-step process was used to separate uranium from the uranium ores and tailings: in Step I, ores and occasional residues (from Step II operations and other MED/AEC-related processes) were processed to produce uranium oxide; in Step II, uranium oxide was converted to uranium dioxide; in Step III, uranium dioxide was converted to uranium tetrafluoride. Residues from Steps II and III were recycled, whereas Step I produced large amounts of liquid and solid

residue. The liquids were discharged into storm sewers, sanitary sewers and into the on-site injection wells. USACE has no knowledge of whether the wells used for disposal of the MED/AEC wastes were used for other waste disposal before, during or after the MED/AEC-related operations. USACE did not do a detailed investigation to determine whether there were other non-MED/AEC related uses of the injection wells, since there was more than enough documented evidence that they were used for MED/AEC-related activities and therefore, had to be addressed for FUSRAP eligible COCs. The history of injection of MED/AEC wastes into the deep groundwater at the Linde Site is documented in the 1981 Aerospace report (Aerospace 1981).

In April 1944, the company began disposing of the liquid wastes in on-site wells. From 1944 to 1946, seven on-site wells were used during various periods of time for disposal of the liquid wastes. Available information suggests that the wells would plug, overflow, and have to be cleaned or replaced.

The seven wells were located in two main areas: three wells located in the area of Plant No. 1 (present Building 8) and four wells located near the Ceramics Plant (the former Buildings 30 and 38). The locations of the former injection wells are shown in Figure 4. It is reported that the injection wells ranged from approximately 90 to 150 ft in depth and were drilled into bedrock. Neither the RI report nor other reports provide information on the volumes of effluent that were discharged to each of the individual injection wells but the RI report indicates that the total estimated volume of effluent discharged into the injection wells was approximately 55 million gallons.

The weekly averages of uranium oxide concentrations in the effluents analyzed from April 1944 to July 1946 (from progress reports) ranged between 0.011 and 0.064 grams per liter (g/L). It was estimated that approximately 12,000 pounds (lbs) of uranium oxide were discharged to the injection wells. The 1981 Aerospace report, the principal source of information on the injection of MED/AEC waste at the Linde Site, estimates that approximately 3 curies (Ci) of natural uranium were discharged to the subsurface at the Linde Site. While not specifically calculated in the Aerospace report, using these estimates and the estimated 55 million gallons of wastes discharged, the average concentration of natural uranium in the liquid wastes discharged to the subsurface would have been approximately 14,400 picocuries per liter (pCi/L).

The 1981 Aerospace report (Aerospace 1981) states that only limited data are available regarding the radium concentrations in the effluent injected. It was estimated that about 0.52 Ci, or about 0.5 grams, of radium was discharged to the injection wells at the Linde Site.

2.4 Contaminant Fate and Transport in Deep Groundwater as Described in the RI Report

The findings and conclusions concerning the fate and transport of wastes injected into deep groundwater at the Linde Site, as reported in the RI report, are detailed in the FS (USACE 2004) and summarized below.

As described above, the RI report indicates that approximately 55 million gallons of liquid waste effluent, containing approximately 12,000 lbs of dissolved uranium oxide, was injected into the subsurface at the Linde Site in the 1940s. The RI report states that this effluent, which contained primarily ions of sodium, sulfate, sodium carbonate, sodium bicarbonate, and chloride, was injected at a temperature of approximately 60°C (140°F). The RI report also indicates that minor concentrations of vanadium, cobalt, nickel, molybdenum, uranium, and radium were also present in the effluent. This liquid had a pH above 10 and a total dissolved solids (TDS) concentration greater than 20,000 parts per million (ppm).

The RI report notes natural formation water in the bedrock units contains significantly lower concentrations of the major ions and TDS; the water temperature is 12°C (54°F); and the pH is approximately neutral (7.0 to 7.5).

Based on the above scenario, the RI report concludes that the nature of the subsurface contamination is probably in the form of mineral precipitates of uranyl sulfates and carbonates in the fractures and pore space of the Salina Group shale. As detailed in Section 3.5, subsequent sampling and modeling by USACE has confirmed these conclusions by showing that immobile uranium oxide (uraninite) and hydroxide complexes are the preferred geochemical states in the contact-zone aquifer.

The RI report concludes that contamination in the contact zone (deep) aquifer is from well effluents at the Linde Site and only very soluble metals such as molybdenum were detected in this aquifer. As further described in Sections 4.1 and 4.2, the naturally elevated background concentrations of TDS and constituents such as sulfates in the deep groundwater at and in the vicinity of Linde are unacceptable absent any injection of wastes.

2.5 Contaminant Fate and Transport in the Perched and Shallow Groundwater as Described in the RI Report

The RI report states that the primary pathway of contaminant transport through subsurface soil is via the perched groundwater system. Because of the natural clays underlying the properties, vertical percolation of recharge water to the shallow groundwater system is minimal; therefore, the potential for contaminant migration to the shallow groundwater system is reduced. The RI report indicates that water infiltrating through the contaminated soils may leach contaminants and transport them to the perched groundwater system. The perched system, which follows the contour of the top of the natural clays, transports the contaminants to nearby discharge points in the surface drainage systems. The RI report indicates, however, that sampling of surface water at locations upstream and downstream of the Linde Site was conducted during site characterization activities in 1988 and 1989. Comparison of upstream and downstream sampling results show that surface water was not impacted by radionuclides from the site. These samples were taken prior to the remediation of soils that has been underway at the Linde Site since 2000. By removing tens of thousands of tons of soil contaminated with radionuclides from the site, USACE greatly reduced the potential for leaching of radionuclides to groundwater or contaminant discharge to surface water.

3. SUMMARY OF FINDINGS OF LINDE SITE GROUNDWATER INVESTIGATIONS BY USACE IN 2001 AND 2002

The investigations of Linde Site groundwater in 2001 and 2002 were conducted by USACE to supplement the information available in 1993 and address data gaps identified during meetings with NYSDEC representatives.

The principal investigation activities in 2001 included:

- construction of three new deep monitoring wells and three new shallow monitoring wells;
- two groundwater sampling events (March and June, 2001) conducted at the new and existing monitoring wells;
- analyses of field-filtered [with a 0.45 micron (μm) filter] groundwater samples from these wells for the presence of radionuclides and metals;

- analysis of unfiltered groundwater samples from these wells for the presence of radionuclides, metals, and general chemistry parameters; and
- collection of soil samples for radionuclide analyses and leaching tests.

The principal investigation activities conducted in 2002 included:

- groundwater sampling (August 2002) conducted at the new monitoring wells constructed by USACE in 2001 and selected older monitoring wells that were constructed by DOE;
- analysis of field-filtered and unfiltered groundwater samples from these wells for the presence of radionuclides and metals; and
- collection of soil samples for radionuclide analyses and leaching tests.

The investigations conducted and their findings are briefly summarized in the following sections. Additional details are provided in the USACE report, *Results of the 2001 and 2002 Groundwater Investigations at the Linde Site* (USACE 2003b).

3.1 Description of the Field Investigations in 2001

3.1.1 Investigation to Assess Deep Groundwater – Deep Monitoring Wells

Three deep monitoring wells were installed as part of the 2001 field investigation. New monitoring well LMW-06 is located near Building 8 in the vicinity of the former injection wells near Building 8. USACE reviewed site conditions and the locations of the existing deep monitoring wells and determined, in concurrence with NYSDEC and USEPA representatives, that two additional deep monitoring wells, LMW-05 and LMW-04, in addition to new well LMW-06, were required to better assess whether MED-related constituents in the injected effluent have had an unacceptable impact on water quality. New deep monitoring well LMW-05 is located approximately 1,800 ft southwest of the former injection wells near former Buildings 30 and 38. New deep monitoring well LMW-04 is located approximately 1,300 feet southwest of the former injection wells near Building 8. The locations of the three new deep monitoring wells installed in 2001, LMW-04, LMW-05, and LMW-06, are shown in Figure 4.

3.1.2 Investigations in 2001 to Assess Potential Impacts to Shallow Groundwater

To assess the potential for impacts to shallow groundwater, leaching tests and groundwater investigations were conducted as described below.

3.1.2.1 Soil Sampling and Leaching Tests – 2001 Investigations

Samples of the site soil during on-going soil remedial activities were collected in March 2001 and subjected to leaching tests to determine the potential impacts to shallow groundwater. The soil samples were analyzed for total activity of uranium, radium, and thorium isotopes and also subjected to a modified California Waste Extraction Test (WET), which is similar to the Toxicity Characterization Leaching Procedure (TCLP) test, using an organic acid leaching solution. The results of the analysis of the radionuclide concentrations in the soil and in the final extract solutions allow for a direct comparison between total and leachable activities (concentrations) providing an indication of the potential for contaminant mobility. Section 4.4 describes the results of the leaching tests.

3.1.2.2 Shallow Monitoring Wells – 2001 Investigations

Three shallow monitoring wells were installed in 2001 as part of the field investigation: LMW-01, LMW-02 and LMW-03. Borings were advanced to depths of 20 to 25 feet and the wells were installed with 10 ft screens. Subsurface conditions at the locations of these shallow wells are shown in Figure 6.

3.1.3 Downhole Gamma Scans – 2001 Investigations

After the new monitoring wells were installed, downhole gamma scanning was performed in the six new wells and the eight existing monitoring wells installed during the RI. The details of the downhole gamma scans are available in the report entitled *Borehole Geophysical Survey Report at the Linde FUSRAP Site, Tonawanda, New York* (Science Applications International Corporation [SAIC] 2002).

3.1.4 Groundwater Sampling and Analyses – 2001 Investigations

Groundwater samples were collected from five of the six newly installed monitoring wells and the eight existing monitoring wells in March and June 2001 (LMW-02 was not sampled in March and June 2001 due to slow recharge). Unfiltered and filtered samples were analyzed for the presence of radionuclides including radium isotopes, thorium isotopes, uranium isotopes, gross alpha radiation, gross beta radiation and total uranium. Unfiltered and filtered samples from the wells were also analyzed for the presence of target analyte list (TAL) metals. Unfiltered samples from the wells were also analyzed for general chemistry parameters.

3.2 Groundwater Investigations in 2002

The groundwater investigations at the Linde Site in 2002 included groundwater sampling and analyses, the analysis of soil samples and soil sample leaching tests as described in the following sections.

3.2.1 Groundwater Sampling and Analyses in 2002

In August 2002, groundwater samples were collected from five of the six monitoring wells that were installed at the Linde Site by USACE in 2001 (shallow wells LMW-01 and LMW-03, and deep wells LMW-04, LMW-05, and LMW-06), and three of the previously installed monitoring wells (deep wells B29W05D, B29W07D, and B29W09D).

Unfiltered and filtered samples were analyzed for the presence of radionuclides including radium isotopes, thorium isotopes, uranium isotopes, gross alpha radiation, gross beta radiation and total uranium. In addition, unfiltered and filtered samples from the wells were analyzed for the presence of TAL metals, boron and molybdenum.

3.2.2 Soil Sampling and Leaching Tests – 2002 Investigation

As in the investigations conducted in 2001, several samples of site soils were collected at the Linde Site in August 2002 and subjected to leaching tests. These tests were conducted to determine potential impacts to shallow groundwater. The results of leaching tests are described in Section 3.4.

3.3 Evaluation of Groundwater Results

The results of the groundwater sampling at the Linde Site in 2001 and 2002 are included in the FS report (USACE 2004) and associated addendum (USACE 2005).

The highest concentrations of constituents in deep groundwater considered to be present in the MED/AEC discharges to the deep groundwater at the Linde Site were detected in the general proximity of the former injection well locations. The highest concentrations of total uranium were 837 µg/L and 765 µg/L, respectively, in unfiltered samples from monitoring wells LMW-06 and B29W10D in March 2001, as shown in Table 1. In June 2001, only relatively low levels of total uranium were detected in samples from these wells. In August 2002, the unfiltered sample from LMW-06 showed a much lower concentration of total uranium than in March 2001. (Wells B29W10D and LMW-06 are located adjacent to one another and B29W10D was not sampled in August 2002.) These wells are located in the vicinity of the former injection wells near Building 8. With the exception of one anomalous reading in the sample from LMW-06 in March 2001, radium-226 (Ra-226) and radium-228 (Ra-228) levels were low (see Table 2). All thorium-232 (Th-232) and thorium-230 (Th-230) results were low (see Table 3). The highest concentration of molybdenum, also considered to be associated with the MED/AEC discharges to the deep groundwater at the Linde Site, was detected at 0.45 mg/L in well B29W09D, which is in the vicinity of the former injection wells located near former Buildings 30 and 38 (see Table 4).

As described above, the shallow groundwater at the Linde Site is separated from the deep groundwater by a thick clay layer. The MED/AEC wastes at the Linde Site were injected into the deep groundwater, and therefore, the injected waste would not be expected to impact the shallow groundwater. The results of analyses of shallow groundwater samples at the Linde Site show the highest concentration of uranium (total) in an unfiltered sample from MW-03 in March 2001. The results from the samples in June 2001 and August 2002 were slightly lower.

Soils and buildings contaminated during MED-related operations have been the subject of extensive remediation by USACE, thus removing potential sources for any future contamination of the shallow groundwater at the Linde Site. Based on the remediation of the soils and buildings and the results of the USACE investigations, USACE has determined that no further actions are necessary for addressing the shallow groundwater.

3.4 Results of Leaching Tests

3.4.1 Leaching Tests Conducted During Investigations in 2001

Five (5) soil samples (and one duplicate sample) were collected at the Linde Site on March 8 and 9, 2001. Two samples and one duplicate sample were collected from below the footprint of Building 30. Three samples were collected at a depth of 0.5 to 1.5 ft from an excavation near Building 73B.

These soil samples were subjected to the WET extractions to assess the potential for leaching. The WET test is aggressive and represents a worst case for leaching. The results found that the soils near Building 30, where various forms of the MED materials could be found (e.g., ore, residues, processed materials, uranium product, etc.), demonstrated that more of the uranium would leach from the soil than would from the soils around Building 73B under these aggressive conditions. The 2001 shallow groundwater results near Building 30 (LMW-03) show elevated levels of uranium whereas the results near Building 73B (LMW-01) do not. In both cases, the groundwater concentrations are much less than the leachate results from the WET extraction, which is expected, and better represents the potential for leaching under current

site conditions. Both the WET extraction results and the groundwater sampling results support the conclusion that there is some potential for leaching of radionuclides (uranium) from site soils currently being remediated under a separate CERCLA action.

3.4.2 Leaching Tests Conducted During Investigations in 2002

Four (4) soil samples (and one duplicate sample) were collected at the Linde Site in August 2002. Two samples and one duplicate sample were collected from below the footprint of Building 30, in an area (Class 1 area[1]) where active soil remediation activities (soil removal) have occurred or were ongoing by USACE. Two additional soil samples were collected from Class 2 areas, where soil remediation is not planned. These areas are located along the northern property line and east of Building 90.[2]

The samples were analyzed for isotopic radium, thorium, and uranium. The samples were also subjected to the CAL WET (using an extraction fluid of pH 5) and modified-WET extractions (using an extraction fluid pH of 7.95, which is an average of the actual pH measured in Site shallow groundwater in 2001 and 2002).

Soils subjected to the CAL WET extractions show the potential for leaching. Samples subjected to the modified - WET extractions show significantly less leaching potential (see Table 5).

The leaching test results suggest that there is potential for leaching of radionuclides (uranium) from site soils. It is noted, however, that the actual shallow groundwater concentrations of uranium are not significantly elevated. Given the extensive excavation and removal from the site of soil containing elevated levels of uranium and other radionuclides, potential sources for leaching of radionuclides to shallow groundwater are now greatly reduced and any potential for impacts are not significant.

3.5 Conceptual Model of Contaminant Fate and Transport Based on Current Information

3.5.1 Contact Zone Aquifer

The RI report concludes that liquid wastes containing radioactive constituents were injected into the subsurface in the 1940's and after injection moved under pressure through fractures in the bedrock and into the more permeable contact zone aquifer overlying the bedrock. The RI report further concludes that because the waste was higher in temperature and had a higher pH than the natural groundwater, the radioactive constituents in the waste precipitated to form relatively insoluble solid material within the bedrock fractures and contact zone formation. The RI report then describes the potential for transport of radioactive constituents within the fractured bedrock and contact zone as minimal due to immobility of the constituents and low hydraulic gradients in these formations. In summary, the RI report concludes that the radionuclides have precipitated from the groundwater and are now immobile (or mineralized) in the vicinity of the location where injection occurred. In the RI report, the field evidence of the conceptual model for the fate and transport of the injected radioactive constituents in the contact zone aquifer was limited, with only one set of validated groundwater sample results from one well (B29W10D) on one date.

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[1] Class 1 areas are areas that have, or had prior to remediation, the potential for radioactive contamination in excess of the cleanup criteria, or known radioactive contamination in excess of the cleanup criteria.

[2] Class 2 areas are areas that have not been remediated, that have a potential for radioactive contamination or known contamination, but are not expected to exceed the cleanup criteria.

The 2001 and 2002 field investigations at the Linde Site included the construction of three new deep wells to monitor groundwater quality in the deep aquifer and three rounds of deep groundwater sampling (two rounds included sampling of the three new deep wells and the eight existing deep wells; in the third round the three new deep wells and three of the existing deep wells were sampled).

The findings concerning the groundwater flow direction and hydraulic gradient in the deep aquifer (groundwater flow southwesterly at a low gradient) determined from June 2001 groundwater elevation measurements are consistent with the RI report. The groundwater elevation measurements in March 2001 suggest a more southeasterly groundwater flow direction in some portions of the Site. The August 2002 elevation measurements are inconclusive. Based on historical measurements and the June 2001 measurements, it is concluded that a general southwesterly groundwater flow direction exists in the deep aquifer.

The results of the March 2001 sampling show elevated levels of some of the radionuclides in the groundwater samples from wells LMW-06 and B29W10D, which are located near the former injection wells and in the sample from the LMW-05 which is located farther from the former injection wells. Elevated levels of radionuclides were not detected, however, in samples from these wells collected in June 2001. Subsequently, sampling at LMW-05 showed no elevated levels of radionuclides. The elevated levels of radionuclides detected in March 2001 at these three locations are attributed to the drilling method used to install the wells and the proximity of well B29W10D to new well LMW-06. It is concluded that the June 2001 and August 2002 samples are more representative of actual site conditions and elevated levels of radionuclides are not expected in the deep aquifer at the Linde Site except in the area immediately adjacent to the former injection wells. These findings are consistent with the description of the fate and transport of the radionuclides injected into the deep aquifer as described in the RI report.

The PHREEQC geochemical model was used to further predict the potential fate of the uranium discharged to the contact zone aquifer at the Linde Site in the 1940's. Site characterization data from the RI report and findings of the 2001 groundwater investigation were used in the modeling. The results of the modeling indicate that the soluble uranium present in the waste would precipitate as uranium oxides and hydroxides under the natural conditions in the contact zone aquifer. The modeling predicts that uranium solubility under site conditions is approximately 0.04 mg/L, or approximately 27 pCi/L. The evaluation further notes that groundwater monitoring shows high concentrations of uranium in monitoring well sediments (i.e., drilling residuals drawn into wells from the boreholes) and low concentrations of uranium in the groundwater, supporting the premise that uranium is remaining in the solid phase in Linde Site groundwater.

Estimates of the potential transport of uranium in the contact zone aquifer were made using a one-dimensional transport equation. Estimates assumed two cases, a single pulse source of uranium and a solubility-limited source. Based on these estimates, the assessment indicates that uranium should have been observed in monitoring wells during the 55 years since the injection occurred. Because the uranium has not been observed at the levels predicted, it is concluded that the premise is supported that the uranium has low solubility in the contact zone aquifer at the Linde Site. This is consistent with the findings of the RI Report.

3.5.2 Shallow Groundwater

The 2001 investigation at the Linde Site included the installation of three shallow monitoring wells and two rounds of sampling. Water quality data is not available for one of the wells (LMW-02), due to the low recharge rate for this well. The results from the shallow wells show no significant levels of radionuclides in the shallow groundwater.

Soil samples collected at the Linde Site were subjected to leaching tests. The California WET and modified California WET were used. The results show that under the aggressive test conditions employed by WET, radionuclides, especially uranium, may be leached from the soil. These conditions are considered to be more conservative than actual conditions at the site. It is noted that actual shallow groundwater concentrations of uranium were not elevated to the levels predicted from the aggressive soil leaching test results.

The March 2001 groundwater samples from the shallow wells were taken prior to remediation of the areas surrounding LMW-01 and LMW-03. The March 2001 soils samples had significantly elevated uranium concentrations. The CAL WET leaching analysis showed a high potential for leaching to groundwater, yet this was not supported by the groundwater analytical results.

Results of sampling and analyses of shallow groundwater for the presence of metals and general chemistry parameters shows the presence of elevated levels of sodium, chloride and TDS in shallow groundwater from LMW-01 and elevated levels of sulfate and TDS in shallow groundwater from LMW-03.

Given the extensive excavation and removal from the site of soil containing elevated levels of uranium and other radionuclides, potential sources for leaching of radionuclides to shallow groundwater are now greatly reduced and any potential for impacts are not significant.

4. POTENTIAL EXPOSURE SCENARIOS

A complete exposure pathway consists of the following four elements: (1) a source and mechanism of contaminant release to the environment (a receiving medium); (2) an environmental transport medium for a released contaminant; (3) a point of contact with a contaminated medium (an exposure point); and (4) a route of exposure (an exposure route). If any of these elements are missing, the pathway is incomplete and is not considered in an evaluation of potential threats to human health and the environment.

USACE reviewed the historical accounts of the discharge of FUSRAP eligible constituents to the deep groundwater at the Linde Site and determined that at that time (1940's) there was a release (by injection of liquid wastes) of FUSRAP eligible contaminants to the subsurface (the groundwater) and a medium for contaminant transport (also the groundwater) existed and still exists. Physical and chemical conditions in the deep groundwater have, however, precluded the transport of the FUSRAP eligible constituents, and groundwater sampling confirms that any elevated levels of FUSRAP eligible contaminants are detected only in the immediate vicinity of the historical injection wells.

Based on this understanding of subsurface conditions, the potential for a human point of contact (with FUSRAP eligible COCs in deep groundwater) and a human exposure route (to contaminants in deep groundwater) was assessed. Ingestion of drinking water and ingestion of produce irrigated with groundwater from the site, were addressed.

4.1 Drinking Water

To use deep groundwater at the Linde Site as a source of drinking water, a deep well or wells would first be required along with appropriate pumps and ancillary equipment. Assuming that there is a sufficient yield capability in a supply well, groundwater could be available at the source of the Linde Site.

As described below, the groundwater made available would not, however, be suitable for drinking without costly treatment.

An evaluation of upgradient (background) wells at the Linde Site indicates that without even considering wells potentially impacted by MED/AEC-related operations, groundwater at the Linde Site is naturally severely compromised. Relevant results of the June 2001 background sampling at the Linde Site are provided in the table below.

Background Wells

	Chloride	**Sulfate**	**TDS**	**Iron**	**Manganese**	**Aluminum**	**pH**
	mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**Mg/L**	
Secondary MCL	250	250	500	0.3	.05	0.05 to 0.2	6.5-8.5
Well ID							
B29W01D	330	2400	4100	0.35	0.04	0.21	9.02
B29W07D	1700	3650	8050	1.65	0.33	1.55	8.99
B29W11D	540	2600	4700	0.43	0.07	.049	8.48

While the results above demonstrate exceedances of Secondary Maximum Contaminant Levels (SMCLs) (i.e., secondary drinking water standards) rather than Primary MCLs, there are still very tangible impacts to using water that exceeds the secondary standards. Secondary standards were developed to address cosmetic and aesthetic effects in drinking water (such as taste, odor, tooth discoloration, staining, etc.). Waters with the concentrations demonstrated above can lead to laxative effects, scaling and/or corrosion in pipes, and staining of household fixtures, as well as add a salty taste to water. In particular, the scaling and corrosion effects may have significant economic implications.

The sulfate concentration in seawater is about 2,700 mg/L (USEPA 2003); seawater concentrations are present at the Linde Site. Further, sulfate is known to cause a laxative effect in adults at concentrations above the secondary standard, particularly when combined with high total dissolved solids. Additional material is referenced below, taken from *Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sulfate*, U.S. Environmental Protection Agency Office of Water (4304T), EPA 822-R-03-007, February 2003.

"The sulfate concentration in seawater is about 2,700 mg/L (Hitchcock 1975) and ranges from 3 to 30 mg/L in freshwater lakes (Katz 1977). Sulfate content in drinking water ranges from 0 to 1,000 mg/L in the United States (Trembaczowski 1991)."

"A health-based advisory for acute effects (absence of laxative effects) of 500 mg of sulfate/L is recommended. This value depends on the absence of other osmotically active materials in drinking water, which could lower the sulfate level associated with a laxative effect. Where the water contains high concentrations of total dissolved solids and/or other osmotically active ions, laxative-like effects may occur if the water is mixed with concentrated infant formula or a powdered nutritional supplement."

The document goes on to state that adults may adapt to high sulfate concentrations within a period of two weeks, however, there is no evidence to show that infants have the same capability.

Thus, the naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment. This is consistent with the findings of earlier reports for the Linde Site and the Tonawanda area and with the 1995 US Geological Survey (USGS) *Groundwater Atlas for the Lake Erie – Niagara River Basin* (USGS 1995).

The USEPA notes at its web site (http://www.epa.gov/safewater/consumer/2ndstandards.html) (USEPA 2005) that "Non-conventional treatments like *distillation*, *reverse osmosis* and *electrodialysis* are effective for removal of chloride, nitrates, total dissolved solids and other inorganic substances. However, these are fairly expensive technologies and may be impractical for smaller systems."

Removal of the background (or natural) chemicals in the groundwater at the Linde Site using these methods would also remove any of the FUSRAP eligible COCs from the groundwater. Thus, the 4th element necessary for exposure (a route for human exposure) is missing because the FUSRAP eligible COCs would be removed in any case where drinking water was contemplated. As a practical matter, use of this water for drinking is not reasonable since treatment costs are high and a more than ample supply of fresh water exists in Tonawanda since the source of supply in this area is the Niagara River. Therefore, USACE concludes that there is no current or future completed drinking water exposure pathway for groundwater at the Linde Site.

4.2 Irrigation Water

USACE also considered the possibility that groundwater at the Linde Site would be used for irrigation of edible produce. As in the case of the consideration of drinking water, the potential that groundwater could be pumped to surface for irrigation exists. Because of the naturally occurring levels of salts in the groundwater, however, the continued use of this water without treatment is not reasonable. "The critical concentration [of dissolved salts] in the irrigation water depends on many factors; amounts in excess of 700 mg/liter are harmful to some plants, and more than 2000 mg/liter of dissolved salts is injurious to almost all crops." (Linsley and Franzini 1979). Continued use of saline waters for irrigation may also ultimately impact the viability of a soil to support crops and may also impact the infiltration rate of soils (Koenig and Isaman 1997).

The natural background concentrations of these constituents (salts) in groundwater at the Linde Site would preclude continued use for irrigation without treatment. As a practical matter, use of this water for irrigation is not reasonable since treatment costs are high and a more than ample supply of fresh water exists in Tonawanda since the source of supply in this area is the Niagara River. Therefore, USACE concludes that there is no current or future completed irrigation water exposure pathway for groundwater at the Linde Site.

5. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public input was encouraged to ensure that the decision for the Groundwater OU at the Linde Site meets the needs of the local community in addition to being protective. The administrative record file contains all of the documentation used to support the decision and is available at the following locations:

U.S. Army Corps of Engineers
Public Information Center
1776 Niagara Street
Buffalo, NY 14207-3199

Tonawanda Public Library
333 Main Street
Tonawanda, NY 14150

As further detailed in Appendix A, a public meeting on the PP for Linde groundwater was held on June 13, 2005. At the meeting USACE explained the history of the Linde Site and the Groundwater OU, studies and investigations completed, areas of contamination, the decision proposed for Linde groundwater, and the schedule. The details of public comments received at the public meeting and written comments and responses to those comments are addressed in Appendix A, the Responsiveness Summary. The public meeting transcript is also included in Appendix A.

6. SCOPE OF CERCLA ACTION

As described in the foregoing sections of this ROD, USACE has determined that no CERCLA remedial action is warranted for the Groundwater OU at the Linde Site. This determination was made based on the findings of an evaluation concluding that there are no current or future pathways for exposure of human or environmental receptors to FUSRAP COCs in groundwater at the Linde Site. This conclusion is based on the USACE's determination that naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment, and treatment to remove the naturally occurring constituents would also remove any of the FUSRAP-eligible COCs that may be present. Since no actions are warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit.

7. SUMMARY OF SITE CHARACTERISTICS

As described in Section 3, the shallow and the deep groundwater comprise the Groundwater OU at the Linde Site and the shallow groundwater at the site is separated from the deep groundwater by a thick layer of clay. Extensive remediation of FUSRAP eligible contaminants in site soils and buildings has removed potential sources of contamination of shallow groundwater, and USACE has determined that no further action is warranted for the shallow groundwater at the Linde Site since potential sources of contamination have been removed. As also described in detail in Section 3, liquid wastes from MED/AEC-related operations were injected into the deep groundwater at the Linde Site in the early to mid-1940's. Extensive investigations of deep groundwater have been conducted at the Linde Site, including prior investigations by the DOE and the more recent USACE investigations described herein. USACE has also determined that no action is warranted for deep groundwater at the Linde Site.

8. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCES USES

As described in more detail in Section 1.3, the Linde Site is currently used for commercial and industrial purposes and industrial facilities have been present on the site for more than 60 years. USACE has concluded that the reasonably anticipated future land use of the property will be for industrial/commercial purposes (USACE 2000). USACE has assessed current and potential future uses of the groundwater resources at the site and has concluded that the shallow groundwater at the site would be of insufficient yield for any significant use. The USACE assessment of future uses of the deep groundwater at the Linde Site concluded that due to naturally occurring poor water quality any future significant use of this water would require extensive treatment. Use of the deep groundwater for drinking or other purposes such as irrigation is not considered reasonable since the treatment costs would be high and a more than ample source of supply, the Niagara River, is available.

9. SUMMARY OF SITE RISKS

As described in Section 4, USACE has concluded that there are no current or future pathways for exposure to FUSRAP eligible COCs in Linde Site groundwater. Accordingly, USACE has determined that groundwater at the site poses no significant risks to human health or the environment.

10. SELECTED REMEDY

The USACE, as lead agency, has determined that no action is necessary to protect public health or welfare or the environment. The NYSDEC does not concur. See NYSDEC letter postmarked 30 June 2006 included in the Attachments to Appendix A.

11. STATUTORY DETERMINATIONS

No CERCLA 121 statutory determinations are necessary for this ROD since USACE has determined that no remedial action is necessary under CERCLA and no remedy is being selected.

12. EXPLANATION OF SIGNIFICANT CHANGES

There were no significant changes to the PP based on comments received.

13. REFERENCES

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FIGURES

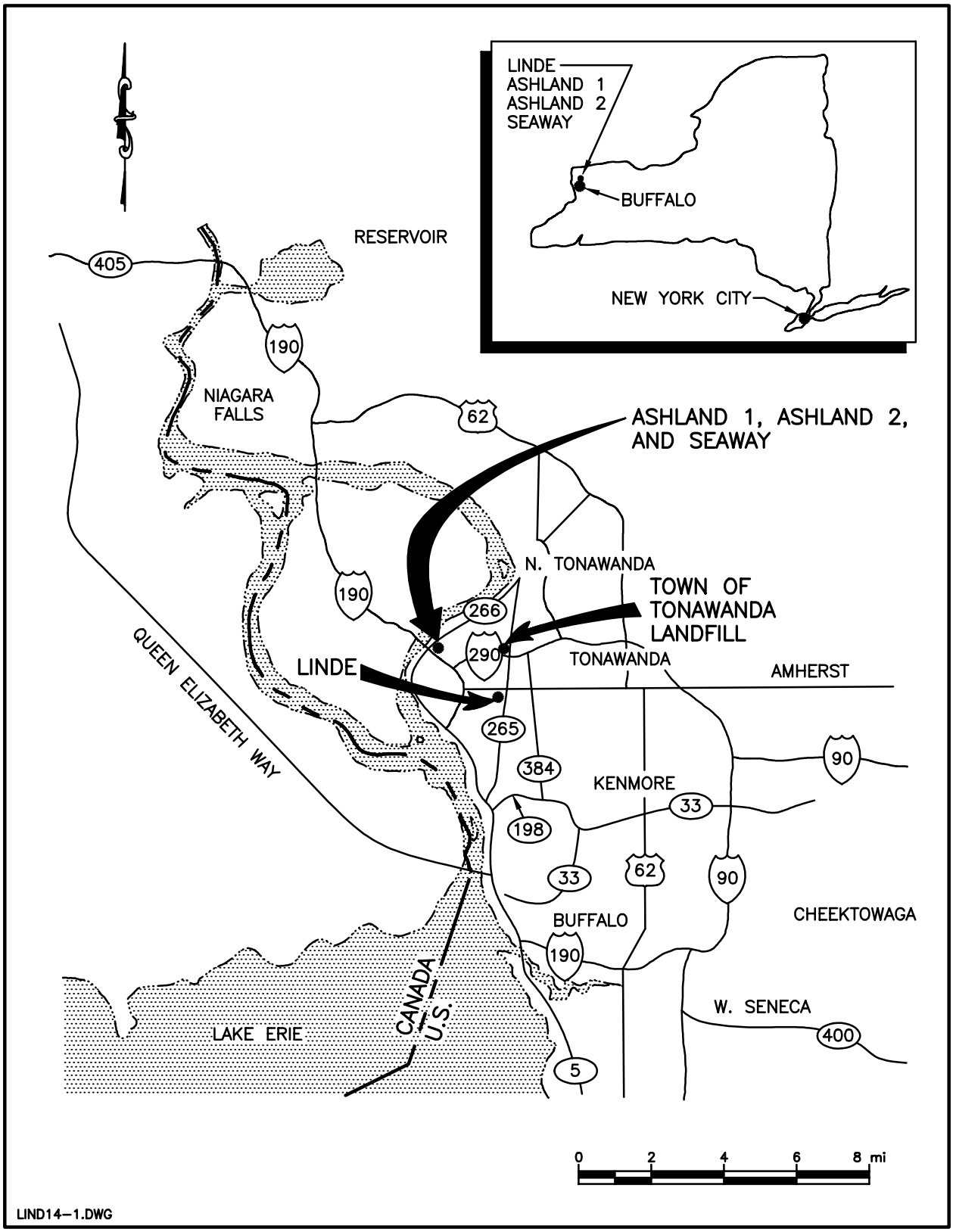
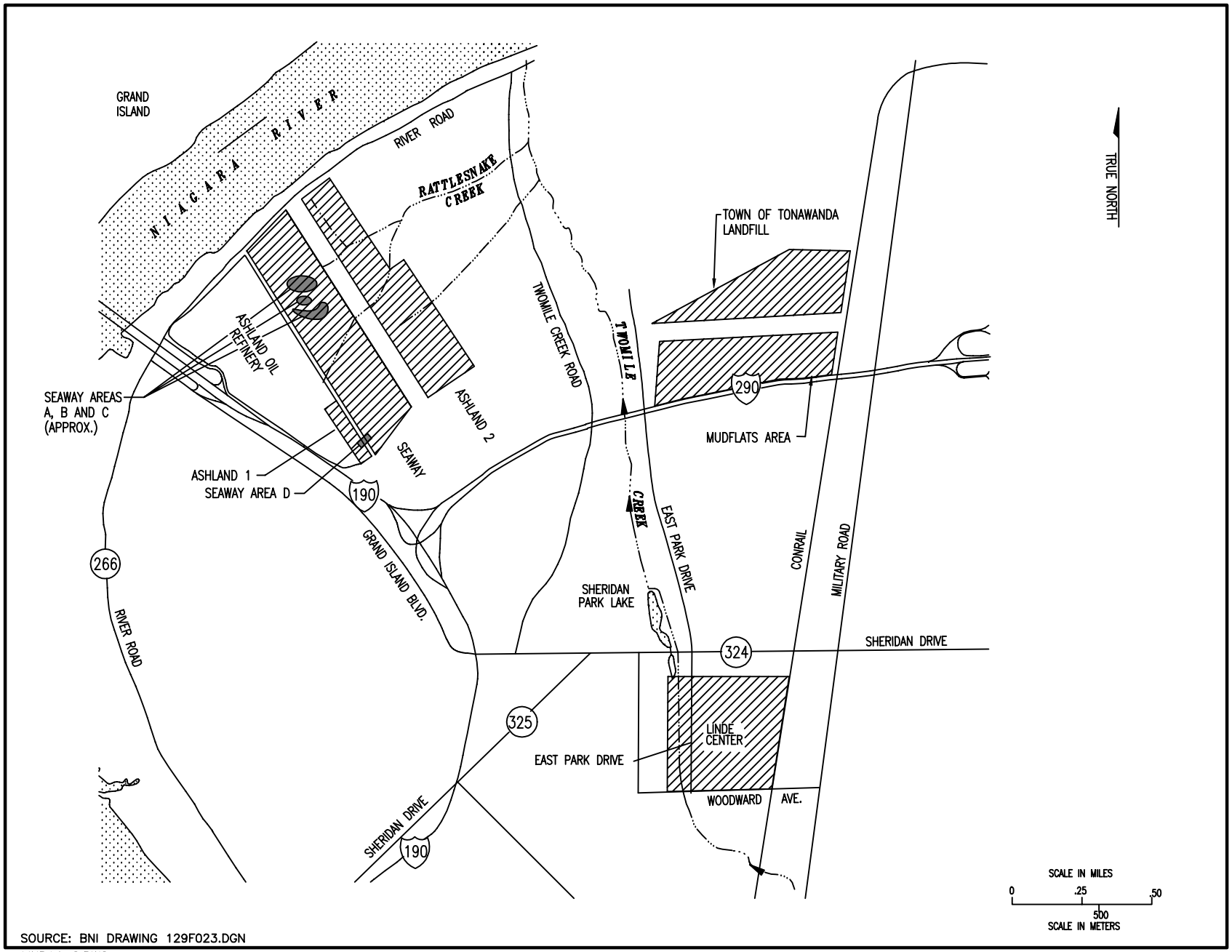


FIGURE 1

REGIONAL LOCATION OF THE TOWN OF TONAWANDA, NEW YORK AND THE ASHLAND 1, ASHLAND 2, SEAWAY, LINDE AND THE TOWN OF TONAWANDA LANDFILL SITES



SOURCE: BNI DRAWING 129F023.DGN

LIND14–2.DWG

FIGURE 2
LOCATIONS OF ASHLAND 1, ASHLAND 2,
SEAWAY, LINDE AND THE TOWN OF TONAWANDA LANDFILL SITES

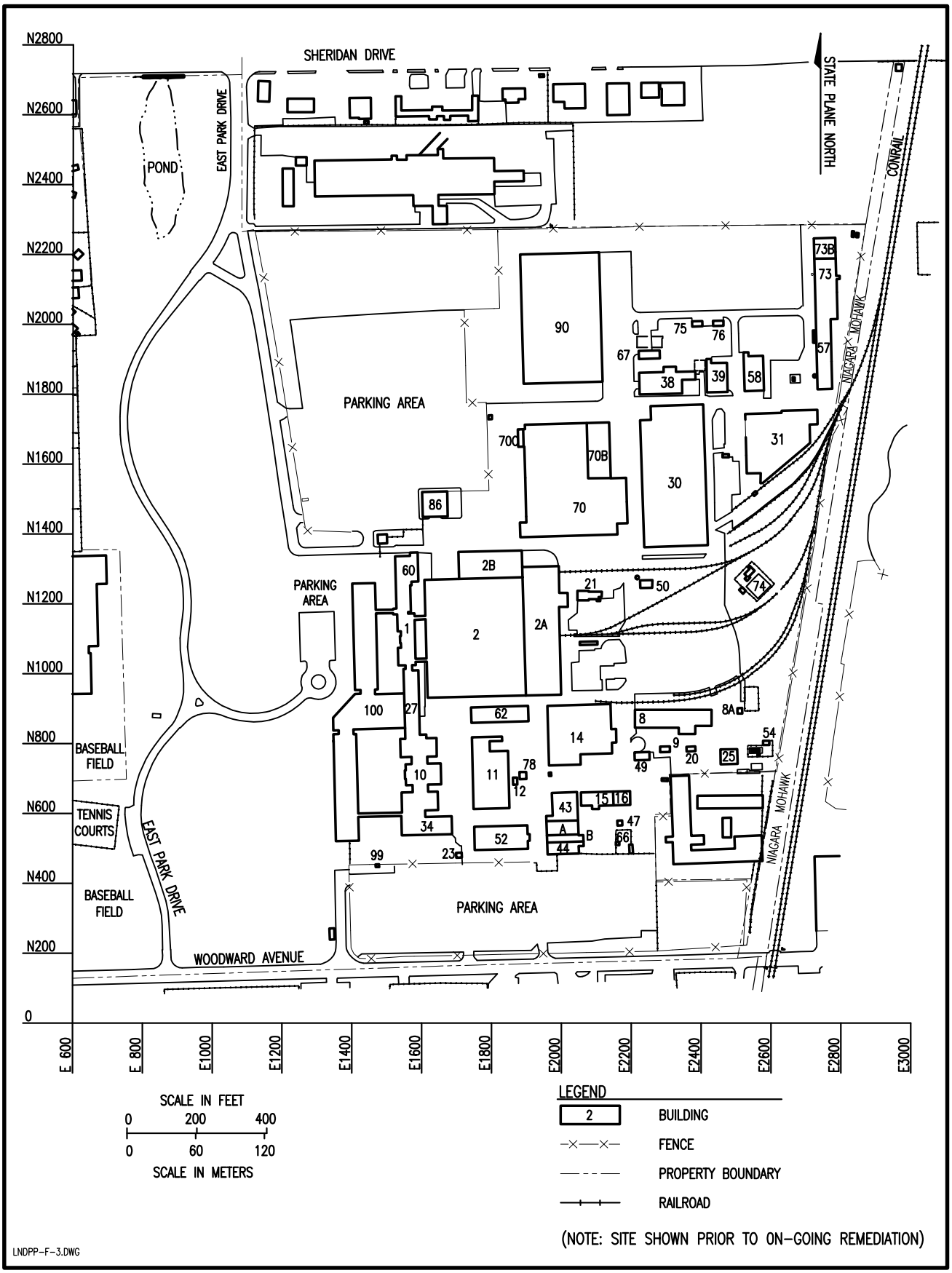
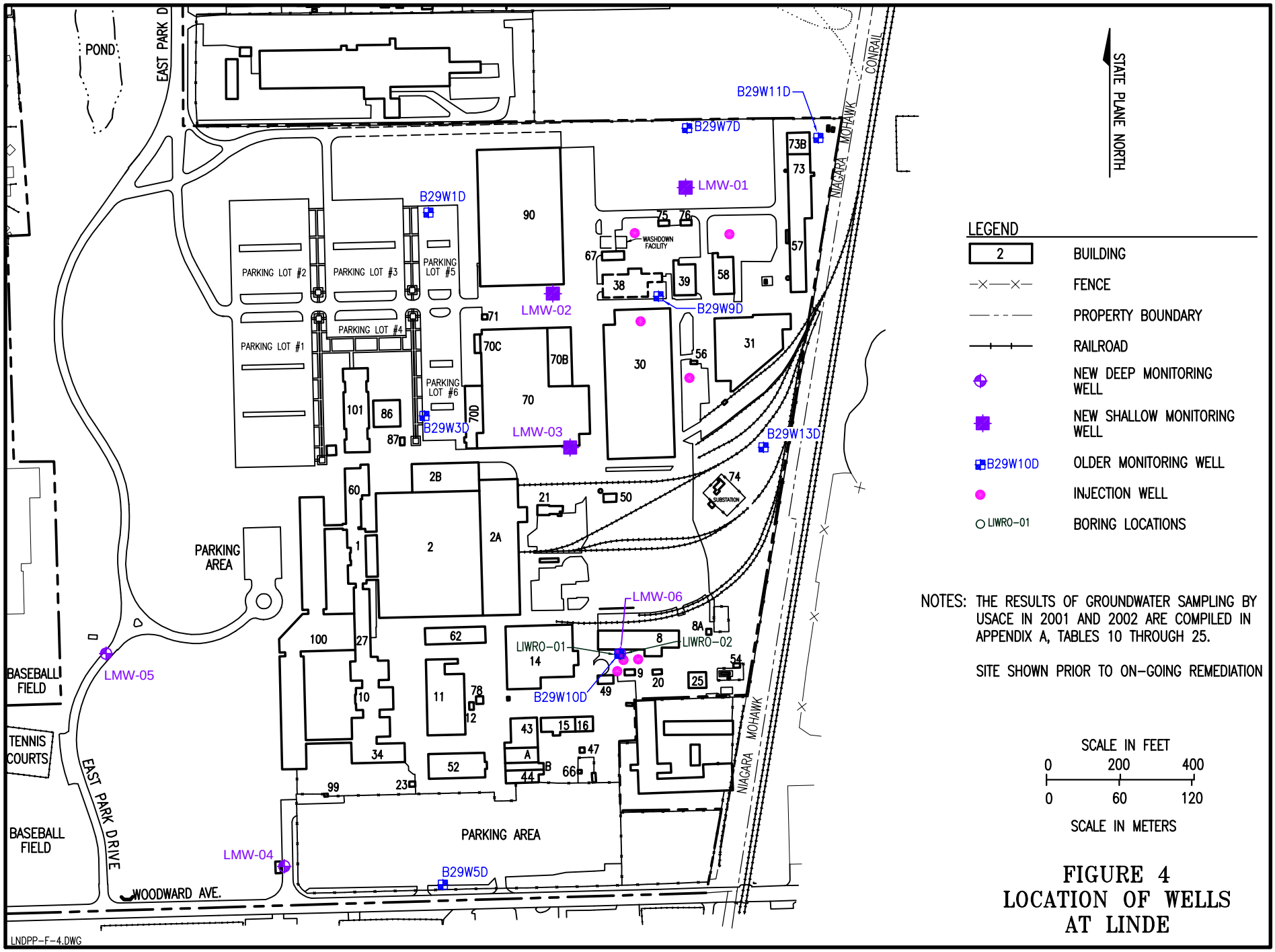


FIGURE 3
LINDE SITE LOCATIONS



NOTES: THE RESULTS OF GROUNDWATER SAMPLING BY USACE IN 2001 AND 2002 ARE COMPILED IN APPENDIX A, TABLES 10 THROUGH 25.

SITE SHOWN PRIOR TO ON-GOING REMEDIATION

FIGURE 4
LOCATION OF WELLS AT LINDE

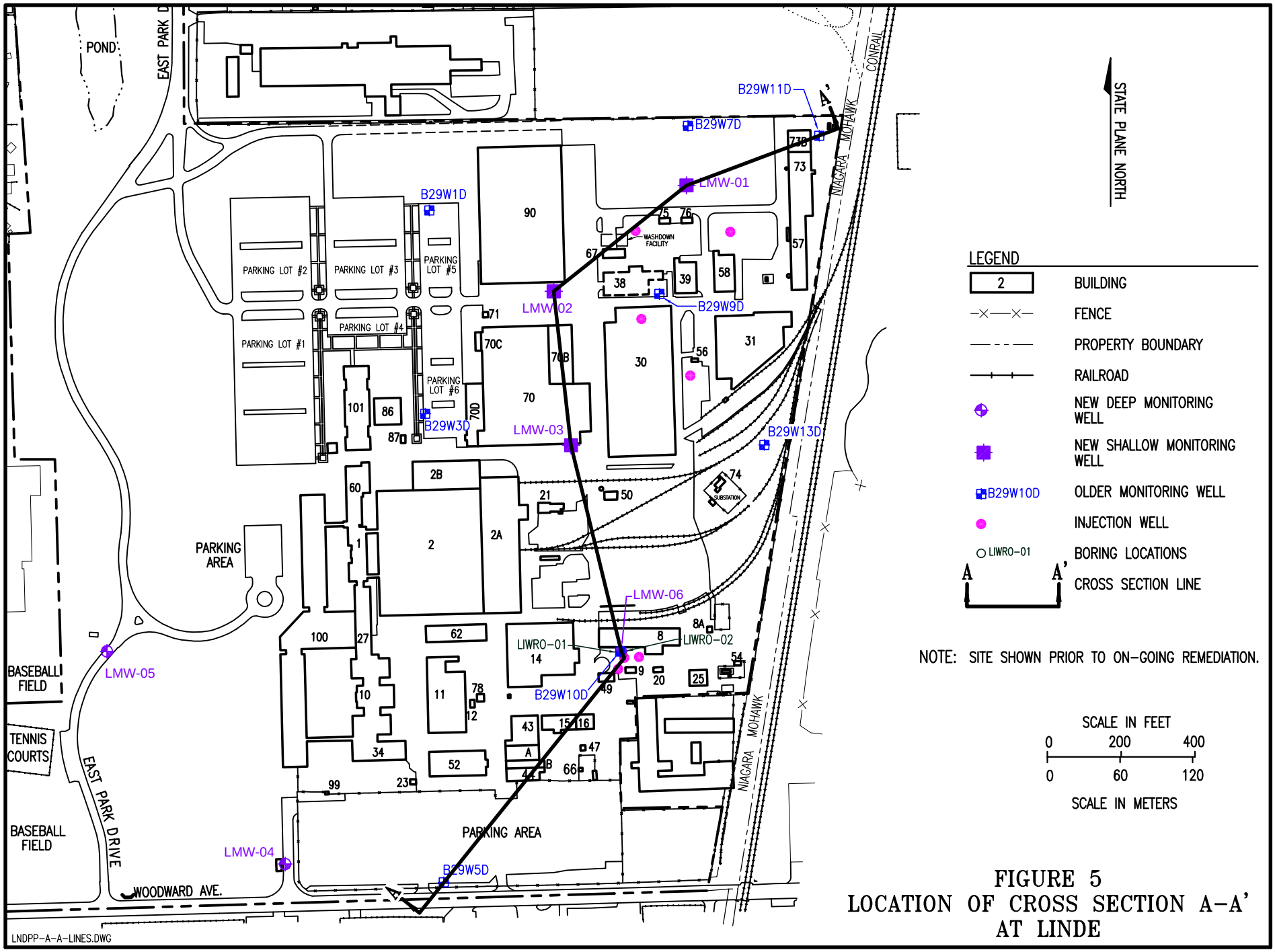
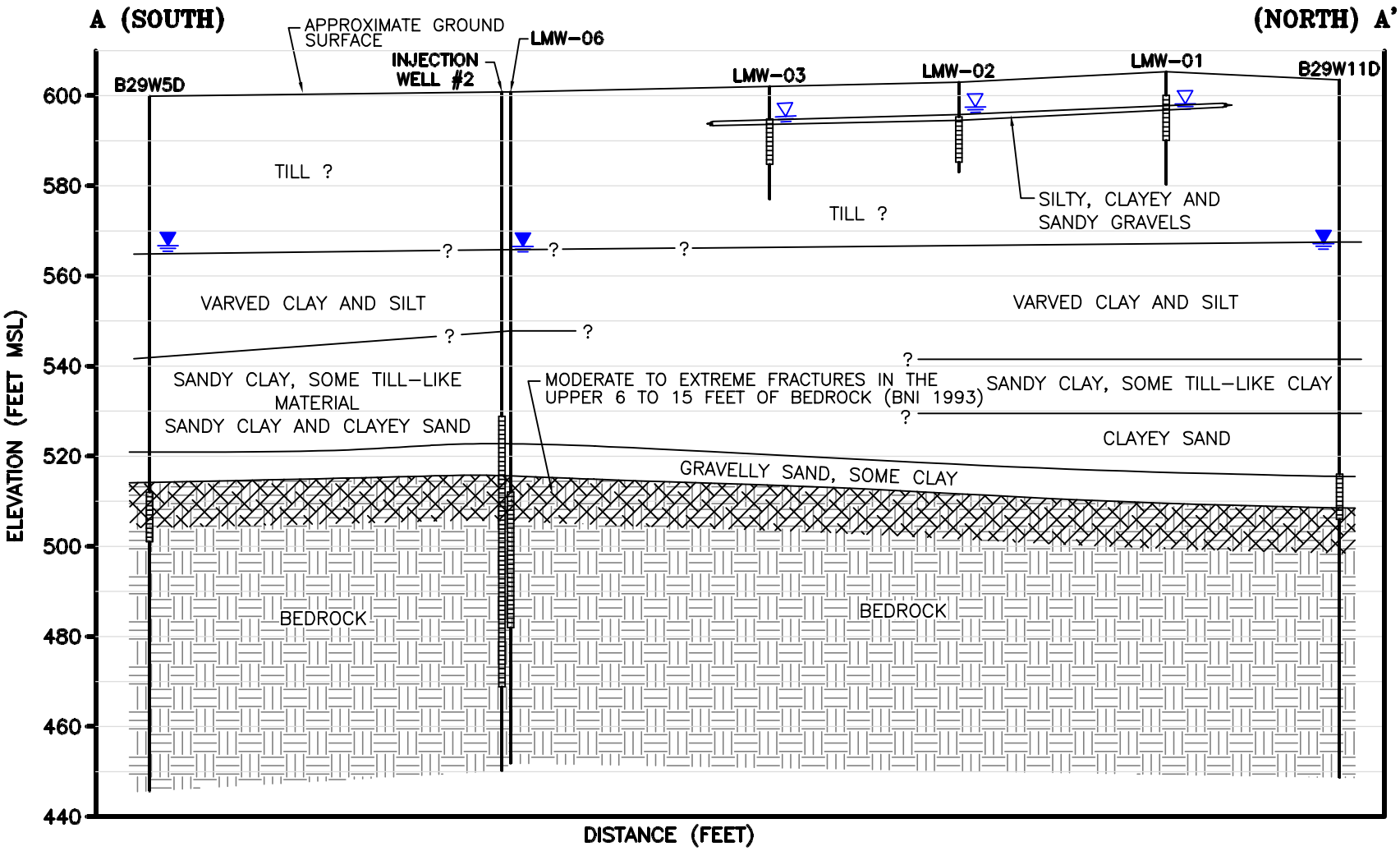
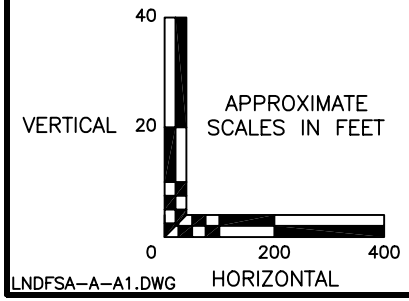


FIGURE 5
LOCATION OF CROSS SECTION A-A'
AT LINDE





LNDFSA-A-A1.DWG

LEGEND

- PIEZOMETRIC SURFACE, SHALLOW ZONE AQUIFER, JUNE 18 THROUGH JUNE 20, 2001
- PIEZOMETRIC SURFACE, CONTACT ZONE AQUIFER, JUNE 19 AND JUNE 20, 2001

NOTES:

1. SOURCE OF GEOLOGIC DATA (EXCEPT FOR WELLS LMW-01, LMW-02, LMW-03 AND LMW-06) FIGURE 3-29, BNI 1993.
2. ARTIFICIAL FILL ENCOUNTERED ACROSS THE LINDE SITE IN OTHER BORINGS AT DEPTHS RANGING FROM 0 TO 17 FEET BELOW GROUND SURFACE (BNI 1993).

FIGURE 6
CROSS SECTION A-A' AT LINDE

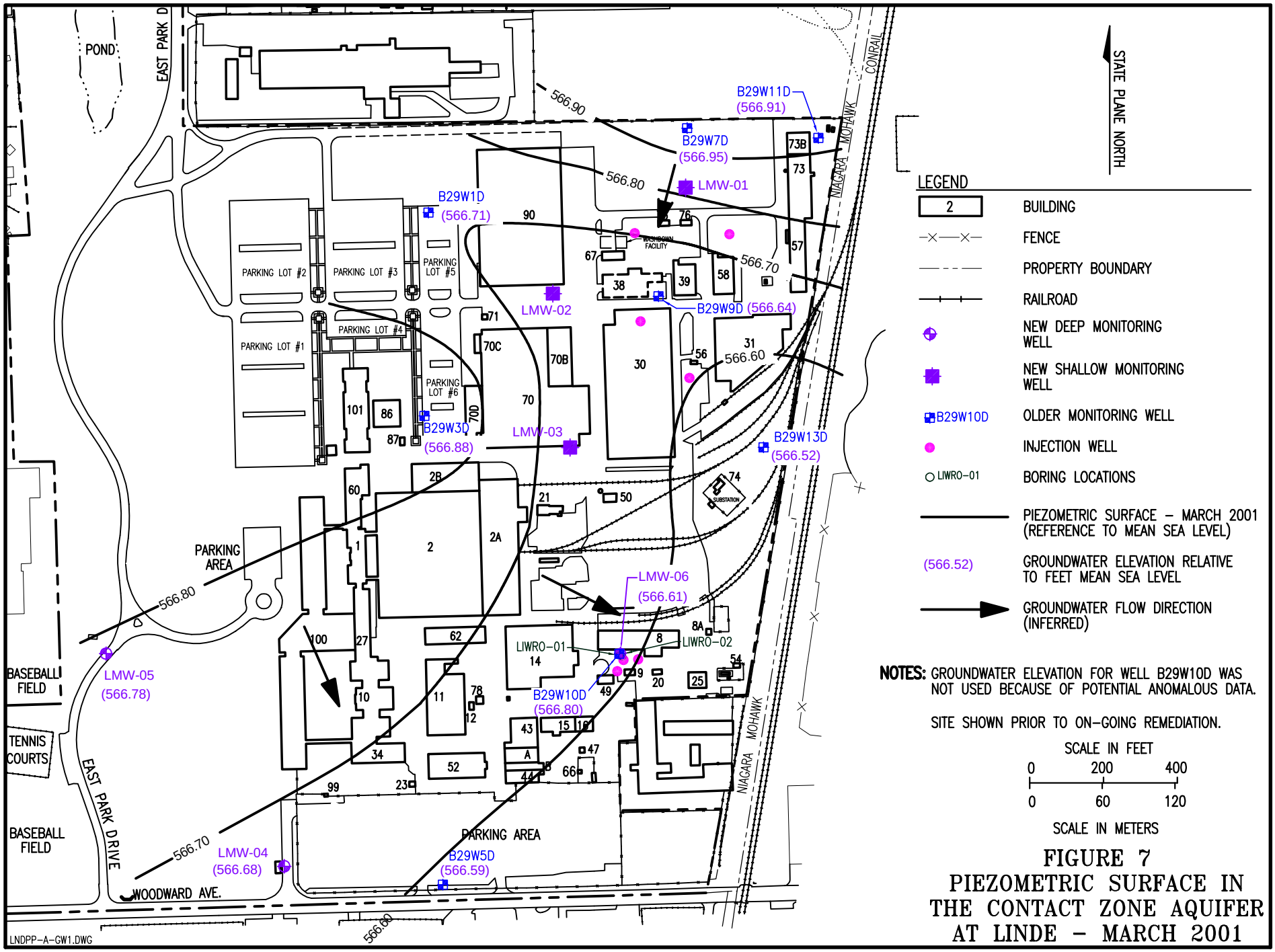


FIGURE 7
PIEZOMETRIC SURFACE IN THE CONTACT ZONE AQUIFER AT LINDE – MARCH 2001

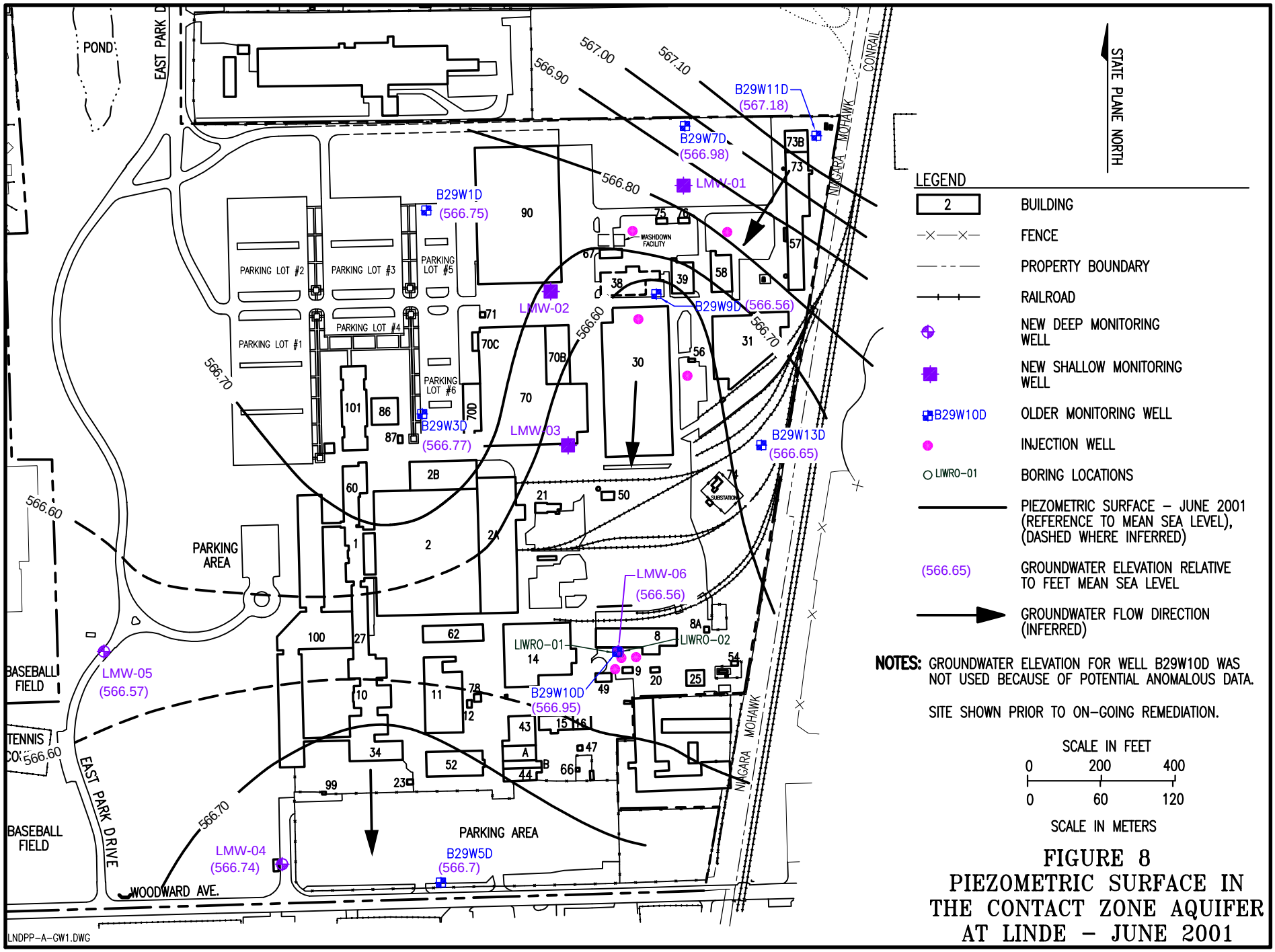


FIGURE 8
PIEZOMETRIC SURFACE IN THE CONTACT ZONE AQUIFER AT LINDE – JUNE 2001

TABLES

Table 1 - Sampling Results
Unfiltered and Filtered Samples From Deep Wells
Total Uranium

UNFILTERED	**Total Uranium**					
Units	µg/L	Qual	µg/L	Qual	µg/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**	
B29W01D	1.48		0.3		N/A	N/A
B29W03D	1.23		0.27		N/A	N/A
B29W05D	1.43		0.34		0.106	U
B29W07D	0.21		1.56		0.731	
B29W07D (DUP)	0.19		1.81		N/A	N/A
B29W09D	2.16		1.28		1.06	
B29W09D (DUP)	2.36		N/A	N/A	N/A	N/A
B29W10D	765		24.8		N/A	N/A
B29W11D	0.18		0.31		N/A	N/A
B29W13D	0.23		0.53		N/A	N/A
LMW-04	29		6.92		8.53	
LMW-04 (DUP)	N/A	N/A	6.23		N/A	N/A
LMW-05	26.6		8.9		9.04	
LMW-06	837		17.9		98.8	
LMW-06 (DUP)	N/A	N/A	N/A	N/A	97.2	

FILTERED	**Total Uranium**					
Units	µg/L	Qual	µg/L	Qual	µg/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**	
B29W01D	0.27		0.19		N/A	N/A
B29W03D	1.84		0.4		N/A	N/A
B29W05D	0.52		0.08		0.166	U
B29W07D	0.07		0.04		0.361	
B29W07D (DUP)	0.09		0.05		N/A	N/A
B29W09D	1.83		0.45		0.63	
B29W09D (DUP)	1.92		N/A	N/A	N/A	N/A
B29W10D	470		3.63		N/A	N/A
B29W11D	0.28		0.19		N/A	N/A
B29W13D	0.12		0.16		N/A	N/A
LMW-04	27.3		5.34		8.2	
LMW-04 (DUP)	N/A	N/A	6.39		N/A	N/A
LMW-05	18.1		6.73		7.79	
LMW-06	390		0.24		58.8	
LMW-06 (DUP)	N/A	N/A	N/A	N/A	62.9	

N/A means not applicable, sample was not collected for the date indicated.
Qual = Data qualifier included in report from the laboratory.
U means the result is less than the sample specific minimum detectable concentration

Table 2 - Sampling Results
Unfiltered and Filtered Samples From Deep Wells
Ra - 226 and Ra - 228

UNFILTERED	**Ra-226**						**Ra-228**					
Units	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**		**March 2001**		**June 2001**		**August 2002**	
B29W01D	0.723		0.637		N/A	N/A	1.8	J	1.53		N/A	N/A
B29W03D	1.23		0.854		N/A	N/A	2.07		-1.29	U	N/A	N/A
B29W05D	0.313	U	1.44		0.29	LT	1.01		0.68		1.06	
B29W07D	1.12		1.28		0.28	LT	0.2	J	1.7		0.84	LT
B29W07D (DUP)	0.309	U	1.05		N/A	N/A	0.59	J	1.37		N/A	N/A
B29W09D	0.509		0.51		0.19	Y1	0.71	J	1.35		1.12	
B29W09D (DUP)	0.637		N/A	N/A	N/A	N/A	0.8	J	N/A	N/A	N/A	N/A
B29W10D	2.69		0.35	U	N/A	N/A	-1	J	0.18		N/A	N/A
B29W11D	1.19		1.21		N/A	N/A	0.79	J	0.76		N/A	N/A
B29W13D	0.911		1.11		N/A	N/A	0.02	J	0.51		N/A	N/A
LMW-04	0.925		0.556	U	0.17		0.44	J	0.4		1.3	
LMW-04 (DUP)	N/A	N/A	0.373	U	N/A	N/A	N/A	N/A	-0.04		N/A	N/A
LMW-05	0.879		0.793		0.9	LT	4.5	J	3.6		1.28	
LMW-06	66.4		0.584		0.6	LT	3.6	J	1.99		1.38	
LMW-06 (DUP)	N/A	N/A	N/A	N/A	0.79	LT,Y1	N/A	N/A	N/A	N/A	1.38	

FILTERED	**Ra-226**						**Ra-228**					
Units	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**		**March 2001**		**June 2001**		**August 2002**	
B29W01D	0.453		0.52		N/A	N/A	0.62		0.25		N/A	N/A
B29W03D	1.4		1		N/A	N/A	1.38		2.14		N/A	N/A
B29W05D	0.533	U	0.55		0.24	LT	1.24		0.41		1.51	
B29W07D	0.426		0.448	U	0.09	U,Y1	0.98		0.39		1.42	
B29W07D (DUP)	0.279	U	0.558		N/A	N/A	0.58	J	0.63		N/A	N/A
B29W09D	1.03	U	0.529		0.3	LT	1.36		0.62		1.1	
B29W09D (DUP)	0.586		N/A	N/A	N/A	N/A	0.46	J	N/A	N/A	N/A	N/A
B29W10D	3.03		0.799		N/A	N/A	0.74	J	0.34		N/A	N/A
B29W11D	0.682		1.21		N/A	N/A	0.74	J	0.7		N/A	N/A
B29W13D	0.699		1.21		N/A	N/A	0.46	J	0.21		N/A	N/A
LMW-04	0.567		1.03		0.17		0.22	J	0.99		0.57	U
LMW-04 (DUP)	N/A	N/A	0.621		N/A	N/A	N/A	N/A	0.47		N/A	N/A
LMW-05	1.34		0.807		0.75	LT	0.93		0.21		0.47	U
LMW-06	1.34		1.01		0.69	LT,Y1	0.37	J	0.41		0.96	LT
LMW-06 (DUP)	N/A	N/A	N/A	N/A	0.57	LT,Y1	N/A	N/A	N/A	N/A	0.75	LT

N/A means not applicable, sample was not collected for the date indicated.
Qual = Data qualifier included in report from the laboratory.
U means the result is less than the sample specific minimum detectable concentration (MDC).
LT means the result is less than the requested MDC, but greater than the sample specific MDC.
Y1 means the chemical yield in control at 100-110%. Quantitative yield is assumed.
B means analyte concentration is greater than the Instrument Detection Limit (IDL), but less than the required reportable quantity.
DV Qual = Data qualifier determined during data validation by SAIC.

Table 3 - Sampling Results
Unfiltered and Filtered Samples From Deep Wells
Th - 232 and Th - 230

UNFILTERED	**Th-232**						**Th-230**					
Units	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**		**March 2001**		**June 2001**		**August 2002**	
B29W01D	0.38		0.032	U	N/A	N/A	0.63		0.36	LT	N/A	N/A
B29W03D	-0.003	U	-0.015	U	N/A	N/A	0.078	U	0.41	LT	N/A	N/A
B29W05D	0.09	U	0.007	U	0.019	U	0.52		0.098	LT	0.17	LT
B29W07D	-0.003	U	0.14		0.064		0.074	U	0.68	LT	0.43	LT
B29W07D (DUP)	0.034	U	0.174	LT	N/A	N/A	0.27		0.333	LT	N/A	N/A
B29W09D	0.034	U	0.119	LT	0.022	U	0.077	U	0.53	LT	0.22	LT
B29W09D (DUP)	0.003	U	N/A	N/A	N/A	N/A	0.097	U	N/A	N/A	N/A	N/A
B29W10D	0.51		0.019		N/A	N/A	8.1		0.154	LT	N/A	N/A
B29W11D	-0.01	U	0.071		N/A	N/A	0.3		0.49	LT	N/A	N/A
B29W13D	0.03	U	0.125	LT	N/A	N/A	0.03	U	0.41	LT	N/A	N/A
LMW-04	0.06	U	0.014		0.047	U	0.29	U	0.031	LT	0.109	
LMW-04 (DUP)	N/A	N/A	0.007	U	N/A	N/A	N/A	N/A	0.036		N/A	N/A
LMW-05	0.81		0.83		0.15	LT	1.21		1.8		0.29	LT
LMW-06	0.34	U	0.061	U	0.018	U	6.8		0.49	LT	0.18	LT
LMW-06 (DUP)	N/A	N/A	N/A	N/A	0.021	U	N/A	N/A	N/A	N/A	0.16	LT

FILTERED	**Th-232**						**Th-230**					
Units	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual	pCi/L	Qual
WELL	**March 2001**		**June 2001**		**August 2002**		**March 2001**		**June 2001**		**August 2002**	
B29W01D	-0.02	U	0.14	U	N/A	N/A	0.22		0.02		N/A	N/A
B29W03D	0.022	U	0.003		N/A	N/A	0.15		0.033	LT	N/A	N/A
B29W05D	-0.02	U	0.0083	LT	0.016	U	0.14		0.069	LT	0.17	LT
B29W07D	-0.004	U	0.005	U	0.076		-0.011	U	0.092	LT	0.12	
B29W07D (DUP)	-0.023	U	-0.009	U	N/A	N/A	0.135		0.05	LT	N/A	N/A
B29W09D	0.009	U	0.007	U	0.056	U	0.077	U	0.039	LT	0.22	LT
B29W09D (DUP)	-0.003	U	N/A	N/A	N/A	N/A	0.146		N/A	N/A	N/A	N/A
B29W10D	-0.013	U	0.004	U	N/A	N/A	0.12	U	0.089	LT	N/A	N/A
B29W11D	0.03	U	0.016		N/A	N/A	0.34	U	0.07	LT	N/A	N/A
B29W13D	-0.04	U	0.003	U	N/A	N/A	0.19	U	0.034	LT	N/A	N/A
LMW-04	-0.07	U	0.006	U	0.025	U	0.14	U	0.018		0.21	LT
LMW-04 (DUP)	N/A	N/A	0.014		N/A	N/A	N/A	N/A	0.03	LT	N/A	N/A
LMW-05	-0.021	U	0.021		0.079		0.12	U	0.026		0.077	
LMW-06	0.08	U	0.0057		0.066	LT	0.76		0.037		0.41	LT
LMW-06 (DUP)	N/A	N/A	N/A	N/A	0.019	U	N/A	N/A	N/A	N/A	0.15	LT

N/A means not applicable, sample was not collected for the date indicated.
Qual = Data qualifier included in report from the laboratory.
U means the result is less than the sample specific minimum detectable concentration (MDC).
LT means the result is less than the requested MDC, but greater than the sample specific MDC.
Y1 means the chemical yield in control at 100-110%. Quantitative yield is assumed.
B means analyte concentration is greater than the Instrument Detection Limit (IDL), but less than the required reportable quantity.
J means the results is estimated.

Table 4 - Sampling Results
Unfiltered and Filtered Samples from Deep Wells
Molybdenum

Unfiltered	Mar-01	Jun-01	Aug-02
Well Number	ug/L	ug/L	ug/L
B29W01D			NS
B29W03D			NS
B29W05D			
B29W07D	45	29	33
B29W07D (DUP)	48	33	NS
B29W09D	430	420	330
B29W09D (DUP)	440	NS	NS
B29W10D	250	220	NS
B29W11D			NS
B29W13D			NS
LMW-04		7	4
LMW-05			
LMW-06	370	150	270
LMW-06 (DUP)			270

Filtered	Mar-01	Jun-01	Aug-02
Well Number	ug/L	ug/L	ug/L
B29W01D			NS
B29W03D			NS
B29W05D	8		
B29W07D	46	31	36
B29W07D (DUP)	53	32	NS
B29W09D	420	420	340
B29W09D (DUP)	450	NS	NS
B29W10D	240	200	NS
B29W11D			NS
B29W13D			
LMW-04	21	4	
LMW-05			
LMW-06	370	150	240
LMW-06 (DUP)	NS	NS	240

Note: The results are given in ug/L or approximately parts per billion (ppb)
NS = Not sampled or not analyzed
Blank cell means not detected

Table 5 - Results of Soils and Leachate Analyses - August 2002 and March 2001 Samples

Matrix	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET
Analyte	**U-234**	**U-234**	**U-234**	**U-235**	**U-235**	**U-235**	**U-238**	**U-238**	**U-238**	**U-TOT***	**U-TOT***	**U-TOT***
Units	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**
Location												
August 2002 Samples												
Class 1 (Building 30 Post Remediation)	0.81	9.5	0.24	0.08	1.06	0.13	0.78	7.4	0.112	1.67	17.96	0.48
Class 1 (Building 30 Post Remediation) (Duplicate of above)	0.93	8	0.19	0.06	0.46	0.09	0.87	7.7	0.1	1.86	16.16	0.38
Class 1 (Building 30 Post Remediation)	0.84	9.5	0.09	0.06	0.53	0.034	0.80	7.7	0.049	1.70	17.73	0.17
Class 2	11.00	662	80	1.38	57	7.4	10.70	633	66	23.08	1352.00	153.40
Class 2	0.91	14.9	0.2	0.06	1.14	0.13	0.91	12.9	0.22	1.88	28.94	0.55
March 2001 Samples												
Bldg 30 Footprint	4,940	123,000	NA	228	7,000	NA	4,690	125,000	NA	9,858	255,000	NA
Bldg 30 Footprint	5,170	124,000	NA	291	7,300	NA	5,450	123,000	NA	10,911	254,300	NA
Bldg 30 Footprint	90	3,210	NA	4.19	195	NA	91	3,190	NA	185.19	6,595	NA
Bldg 73B Excavation	2.36	16.4	NA	0.18	0.83	NA	2.38	13.4	NA	4.92	30.63	NA
Bldg 73B Excavation	3.55	43	NA	0.21	1.9	NA	3.8	42.2	NA	7.56	87.1	NA
Bldg 73B Excavation	27.8	404	NA	2.55	16	NA	28.1	398	NA	58.45	818	NA

Matrix	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET	Soil	Cal WET	Mod Cal WET
Analyte	**Ra-226**	**Ra-226**	**Ra-226**	**Ra-228**	**Ra-228**	**Ra-228**	**Ra-226 + Ra-228**	**Ra-226 + Ra-228**	**Ra-226 + Ra-228**	**Th-230**	**Th-230**	**Th-230**
Units	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**	**pCi/g**	**pCi/L**	**pCi/L**
Location												
August 2002 Samples												
Class 1 (Building 30 Post Remediation)	1.18	15.4	0.02	0.76	19.1	0.04	1.94	34.50	0.06	0.88	14.5	0.36
Class 1 (Building 30 Post Remediation) (Duplicate of above)	1.02	15.9	0.03	0.87	21.9	-0.05	1.89	37.80	-0.02	0.92	14.5	0.31
Class 1 (Building 30 Post Remediation)	1.33	17.4	0.05	0.82	21.6	0.11	2.15	39.00	0.16	1.17	19.6	R
Class 2	2.51	22.2	0.06	1.09	16.4	0.17	3.60	38.60	0.23	2.13	55.1	0.289
Class 2	1.13	12	0	0.74	18.8	0.34	1.87	30.80	0.34	1.01	R	R
March 2001 Samples												
Bldg 30 Footprint	15.4	49.1	NA	2.05	0.17	NA	17.45	49.27	NA	75	1970	NA
Bldg 30 Footprint	16.7	37	NA	0.69	2.5	NA	17.39	39.50	NA	35.5	1940	NA
Bldg 30 Footprint	4.78	80.9	NA	0.83	2.7	NA	5.61	83.60	NA	4.05	123	NA
Bldg 73B Excavation	2.59	11.7	NA	1.9	8.7	NA	4.49	20.40	NA	2.58	6.66	NA
Bldg 73B Excavation	3.92	29.5	NA	0.72	3.3	NA	4.64	32.80	NA	3.84	68	NA
Bldg 73B Excavation	5.23	68.6	NA	1.31	5.3	NA	6.54	73.90	NA	11	299	NA

Notes:

Class 1 = Areas where active soil remediation (soil removal) has occurred or where active remediation is ongoing. Collected from Building 30 excavation (below slab).

Class 2 = Areas that laterally bound Class 1 areas and contain soils that are not impacted by radioactive materials above the action levels.

Cal WET = Leachate - California Waste Extraction Test. Extraction fluid pH = 5

Mod Cal WET = Leachate - Modified California Waste Extraction Test, performed August 2002 only. Extraction fluid pH = 7.95 (same as the groundwater).

*U-TOT = Σ U-234 + U-235 + U-238

R = Result rejected by during data validation

DUP = Duplicate sample taken

NA = Not applicable, test not conducted for the sample indicated

RECORD OF DECISION
GROUNDWATER OPERABLE UNIT
LINDE SITE, TONAWANDA, NEW YORK

APPENDIX A
RESPONSIVENESS SUMMARY

RECORD OF DECISION
GROUNDWATER OPERABLE UNIT
LINDE SITE, TONAWANDA, NEW YORK

APPENDIX A
RESPONSIVENESS SUMMARY

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Public Meeting Transcript, following responses to comments.

Attachments: Letter from the Town of Tonawanda, dated June 15, 2006 and letter from the New York State Department of Environmental Conservation (NYSDEC) postmarked 30 June 2006.

1. INTRODUCTION

On May 4, 2006, the Buffalo District, United States Army Corps of Engineers (USACE) issued a Proposed Plan (PP) for the Groundwater Operable Unit (OU) at the Linde Site in Tonawanda, New York. A public meeting was held on June 13, 2006 during which the USACE presented background information and its recommendation for Linde groundwater. During the meeting, the public was invited to submit comments and written comments were accepted through early July 2006. This Responsiveness Summary addresses the comments received from the public during the public meeting and the comment period.

As described in the Proposed Plan, USACE has concluded that no completed pathways exist for current or future exposure to FUSRAP eligible constituents of concern in Linde groundwater. USACE has therefore concluded that the Groundwater OU, at the Linde Site poses no current or future threat to human health or the environment and, therefore, no CERCLA action is warranted.

2. OVERVIEW OF PUBLIC INVOLVEMENT

On May 4, 2006, a letter announcing the release of the PP was sent to all the individuals identified on the official mailing list established for the Linde project. The mailing list includes over 300 individuals, including elected officials.

Legal advertisements announcing the June 13, 2006, public meeting on the Groundwater OU PP were placed in the Buffalo News, the Niagara Gazette, the Tonawanda News, the Ken-Ton-Bee, the Riverside Review, and the Metro Community News. Legal advertisements appeared in these newspapers on May 14, 2006, May 17, 2006 and June 4, 2006, respectively.

The public meeting was held on June 13, 2006 from 7 p.m. to 9 p.m. in the Holmes Elementary School Auditorium adjacent to the Linde Site.

Six members of the public indicated that they wanted to speak at the meeting. A court reporter was available at the meeting to record comments. At the meeting USACE explained the history of the Site and the Groundwater OU, studies and investigations completed, areas of contamination, the reasons no action is recommended and the schedule. Comments received at the public meeting and written comments are addressed in Section 3, below. The meeting transcript is included in this Appendix, after the responses to comments.

3. RESPONSES TO COMMENTS

At the public meeting conducted on June 13, 2006, 6 individuals provided comments on the PP. Comments by individuals at the public meeting and USACE responses to comments are addressed in Section 3.1, below. The transcript of the public meeting is provided at the end of this Appendix, for reference.

Any written comments received are included as attachments to this Appendix. Written comments were received from the Town of Tonawanda and the New York State Department of Environmental Conservation (NYSDEC). USACE responses to these comments are addressed in Section 3.2, below.

3.1 Responses to Comments, Public Meeting

3.1.1 Mr. Philip Sweet (meeting transcript, page 22)

Comment No. 1: Mr. Sweet, resident of the Town of Tonawanda, asked whether radiation monitoring is still being conducted in the community.

Response No. 1: Mr. Pilon responded (transcript, page 24) that there are twelve (12) perimeter air monitors operating at the Site since about 1998 and that the monitoring is conducted so that USACE would be aware of any releases.

Comment No. 2: Mr. Sweet asked if there was any high temperature incineration being conducted at Linde/Praxair.

Response No. 2: Mr. Pilon responded (transcript, page 24) that USACE is not aware of any incineration being conducted.

Comment No. 3: Mr. Sweet asked about Americium-241.

Response No. 3: Mr. Pilon responded (transcript, Page 25) that the Americium is material that is in the Tonawanda Landfill that is being closed by the Town and that the Americium is not part of the discussion for the June 13, 2006 public meeting.

Comment No. 4: Mr. Sweet also raised a question about depleted uranium (transcript, page 38).

Response No. 4: Lieutenant Colonel Touchette responded that depleted uranium is used in munitions and the depleted uranium is a separate issue and not a FUSRAP issue at Linde.

3.1.2 Mr. Ronald Moline, Supervisor, Town of Tonawanda (meeting transcript, page 25)

Comment stated in general (transcript pages 25-31). Mr. Moline questions if future monitoring of the groundwater wells or other methods of evaluating the decision will be required into the future to make sure that there is no migration or change at the site.

Response: Mr. Pilon responded, (transcript, Page 30) that the proposed plan does not include monitoring in the future.

USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible COCs in the affected groundwater. This conclusion is based on the USACE's determination that naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment, and treatment to remove the naturally occurring constituents would also remove any of the FUSRAP-eligible COCs that may be present. Since no actions are warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit. The federal government might be conducting reviews of the Linde Site due to the remedial actions being accomplished under the ROD for the soils operable unit. The need for those reviews will be dependent on the final outcome of those remediation efforts.

3.1.3 Mr. Ralph Krieger, President of FACTS, Inc. (meeting transcript, page 31)

Comment No. 1: Mr. Kreiger recommended (transcript, page 33) continuous monitoring of the Praxair Site.

Response No. 1: USACE is conducting continuous monitoring of potential releases to the air during ongoing remediation work and is conducting work in accordance with environmental laws and regulations to minimize any site impacts.

As in the above response to Mr. Moline, USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible COCs in the affected groundwater. This conclusion is based on the USACE's determination that naturally occurring concentrations of constituents in groundwater at the Linde Site preclude its use without treatment, and treatment to remove the naturally occurring constituents would also remove any of the FUSRAP-eligible COCs that may be present. Since no actions are warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit. The federal government might be conducting reviews of the Linde Site due to the remedial actions being accomplished under the ROD for the soils operable unit. The need for those reviews will be dependent on the final outcome of those remediation efforts.

Comment No. 2: Mr. Krieger also expressed concerns that radioactively contaminated materials are being left behind at the Site in Building 31 and Building 8.

Response No. 2: Mr. Pilon responded that complete remediation is being conducted at those locations.

Comment No. 3: Mr. Krieger also expressed concern about mercury contaminants.

Response No. 3: Mr. Pilon responded that USACE is responsible for proper handling and disposal of all materials generated during remedial actions at Linde and all handling and disposal is in accordance with applicable environmental laws and regulations.

3.1.4 Mr. Dave McCormick, City of Tonawanda (meeting transcript, page 36)

Comment: Mr. McCormick expressed concern about conditions at the Town of Tonawanda Landfill.

Response: In 1992 the DOE designated two properties, the Town of Tonawanda Landfill and the Mudflats Area into FUSRAP as a single Vicinity Property of the Linde Site. The DOE designation was based on DOE's discovery of radioactive material at the site that appeared to have similar characteristics to FUSRAP material. However, there is no record that the Vicinity Property was ever involved in Manhattan Engineer District or Atomic Energy Commission activities.

The Corps of Engineers completed a Remedial Investigation of the Tonawanda Landfill Site in January 2006. The Remedial Investigation found that risks to human health from FUSRAP-like material at the site are within CERCLA guidelines. Therefore, no remedial action is necessary for those FUSRAP-like materials.

3.1.5 Mr. Roy Pilozzi, Mayor, City of Tonawanda, (meeting transcript, page 42):

Comment: Mr. Pilozzi expressed concerns related to the Town of Tonawanda Landfill.

Response: As in the above response to Mr. McCormick, In 1992 the DOE designated two properties, the Town of Tonawanda Landfill and the Mudflats Area into FUSRAP as a single Vicinity Property of the Linde Site. The DOE designation was based on DOE's discovery of radioactive material at the site that appeared to have similar characteristics to FUSRAP material. However, there is no record that the Vicinity Property was ever involved in Manhattan Engineer District or Atomic Energy Commission activities.

The Corps of Engineers completed a Remedial Investigation of the Tonawanda Landfill Site in January 2006. The Remedial Investigation found that risks to human health from FUSRAP-like material at the site are within CERCLA guidelines. Therefore, no remedial action is necessary for those FUSRAP-like materials.

3.1.6 Mr. Tom Shafer, Member of FACTS (meeting transcript, page 44)

Comment: Mr. Schafer stated that his father was a former employee at Union Carbide Linde who was denied a health claim and wondered is USACE could help him resubmit the claim.

Response: Mr. Pilon responded that the Department of Labor is responsible for handling claims and suggested contacting representatives of that agency for assistance.

3.2 Responses to Written Comments

3.2.1 Response to the Letter from the Town of Tonawanda, Mr. Ronald Moline, Supervisor

Comment stated in general: The letter from Mr. Moline states that it is important to monitor the groundwater to determine any migration or change in contamination levels that would warrant additional study. A copy of Mr. Moline's letter is attached to this Appendix.

Response: Please see the above response to Mr. Moline's Comment No. 1 at the public meeting.

3.2.2 Response to NYSDEC Letter

The NYSDEC provided comments to USACE on the Proposed Plan in a letter received June 30, 2006. A copy of the letter is attached to this Appendix. The following responds to the NYSDEC comments.

Comment No. 1: The New York State Department of Conservation (the Department) has received the above referenced document concerning the Linde Site located in Tonawanda, Erie County, New York. The Department commends the USACE for its work on investigating and addressing the impacts of past Federal Government activities at this facility. As you are aware, the Department has worked with the USACE in the development and implementation of investigations of site groundwater.

Response No. 1: Comment acknowledged

Comment No. 2: The Department has reviewed the Proposed Plan and does not concur that the "No Action" alternative is sufficiently protective of human health and the environment.

From 1944 to 1946, the Linde Air Products Company, disposed approximately 55 million gallons of liquid waste in on-site wells. It is estimated that the discharges to the injection wells contained approximately 3 curies of natural uranium, 0.5 curies of radium and concentrations of vanadium, nickel, cobalt and molybdenum. It has been theorized that, due to the nature of the injected liquid wastes, the majority of the contaminants precipitated out of solution and into fractures and pore spaces of the receiving aquifer. The results of the remedial investigation tend to confirm this theory.

Sampling conducted as part of the remedial investigation does not indicate the current migration of high levels of contaminants from the facility. However, if the current belief that contaminants have precipitated into the bedrock is correct, a source of contamination remains beneath the facility. Because the long-term fate and potential migration of the precipitated radionuclides cannot be predicted with total assurance, long-term monitoring of site groundwater is desirable.

Response No. 2: USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible contaminants of concern in the affected groundwater. An exposure pathway requires 4 elements. These elements are: (a). a source and mechanism of contaminant release, (b). an environmental transport medium, (c). a point of contact, i.e. a receptor, (d). a route of exposure.

USACE has concluded that:

1. Uranium has precipitated out of solution and is in the solid phase within the aquifer (minimal release mechanism),
2. Groundwater moves extremely slow and the uranium migration is even slower because it will form solid minerals (minimum transport),
3. There is no current or anticipated future use of groundwater (no receptors),
4. There is no direct exposure to deep groundwater (no drinking, breathing, or skin contact),
5. There is no evidence that any contamination has moved off site,
6. Analysis confirms transport of material off site is unlikely,
7. Groundwater quality from natural conditions precludes any reasonable foreseeable use, without costly treatment,
8. The area is served with municipal water supply,
9. Municipal water supply is located near the Great Lakes which is the world's largest source of fresh water,
10. The Linde Groundwater Operable Unit poses no current or future threat to human health or the environment, and
11. No CERCLA action is warranted on the Linde Groundwater Operable Unit. Since no action is warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit.

The federal government will determine the requirement of conducting future 5-year project reviews based on the results of the remedial action initiated in 2000 that addresses contaminated soils and buildings. This determination will be made when the remedial action has been completed.

Comment No. 3: With respect to the future usage of site groundwater, New York State considers all groundwater to be a potential drinking water source. Although groundwater from the deep aquifer (Salina group shale) would require treatment prior to usage as drinking water, this treatment cannot be assumed. In addition, requirements of the town of Tonawanda and Erie County (with respect to installation and use

of public water supply wells) are not sufficient to preclude groundwater usage. In addition, although at this time, the radioactive contaminants have not migrated significantly, they may move in the future, if groundwater conditions change.

Response No. 3: Please see the above response to NYSDEC Comment No. 2.

Comment No. 4: Therefore, the Department considers a combination of institutional controls and long-term monitoring as necessary to provide satisfactory protection with respect to the groundwater operable unit at the Linde site.

Response No. 4: Please see the above response to NYSDEC Comment No. 2.

Comment No. 5: Finally, in section 2.2, the proposed plan repeats the conclusion from the Record of Decision for the Linde Site (2000) that the reasonably anticipated future land use of the property will be for industrial/commercia1 purposes. The Department did not concur with that conclusion when it was first presented in 1999, and our position remains the same. Given the fact that the surrounding area contains residences along with commercial and industrial buildings, residential use of this site is definitely a reasonable option in the future. We recommend that the proposed plan be revised accordingly.

Response No. 5: Revision to the Proposed Plan is not necessary.

As described in response to NYSDEC Comment No. 2, USACE has concluded that there are no completed exposure pathways to human or environmental receptors for any FUSRAP-eligible contaminants of concern in the affected groundwater. An exposure pathway requires 4 elements. These elements are: (a). a source and mechanism of contaminant release, (b). an environmental transport medium, (c). a point of contact, i.e. a receptor, (d). a route of exposure.

USACE has concluded that:

1. Uranium has precipitated out of solution and is in the solid phase within the aquifer (minimal release mechanism),
2. Groundwater moves extremely slow and the uranium migration is even slower because it will form solid minerals (minimum transport),
3. There is no current or anticipated future use of groundwater (no receptors),
4. There is no direct exposure to deep groundwater (no drinking, breathing, or skin contact),
5. There is no evidence that any contamination has moved off site,
6. Analysis confirms transport of material off site is unlikely,
7. Groundwater quality from natural conditions precludes any reasonable foreseeable use, without costly treatment,
8. The area is served with municipal water supply,
9. Municipal water supply is located near the Great Lakes which is the world's largest source of fresh water,
10. The Linde Groundwater Operable Unit poses no current or future threat to human health or the environment, and
11. No CERCLA action is warranted on the Linde Groundwater Operable Unit. Since no action is warranted, there is no need for further reviews and monitoring at the site with respect to the groundwater operable unit.

The federal government will determine the requirement of conducting future 5-year project reviews based on the results of the remedial action initiated in 2000 that addresses contaminated soils and buildings. This determination will be made when the remedial action has been completed.

PUBLIC MEETING TRANSCRIPT

UNITED STATES ARMY
CORPS OF ENGINEERS
BUFFALO DISTRICT
1776 NIAGARA STREET
BUFFALO, NEW YORK, 14207

+- +

PROPOSED PLAN FOR THE GROUNDWATER +

OPERABLE UNIT +

LINDE SITE + June 13, 2006

TONAWANDA, NEW YORK + 7:00 P.M.

+- +

PUBLIC MEETING
HELD AT HOLMES ELEMENTARY SCHOOL
325 Dupont AVENUE
TONAWANDA, NEW YORK 14150

APPEARANCES:

LIEUTENANT COLONEL TIMOTHY B. TOUCHETTE
DISTRICT OF BUFFALO COMMANDER

RAY PILON
PROJECT MANAGER

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1 P R O C E E D I N G S

2 LIEUTENANT COLONEL TIMOTHY TOUCHETTE:
3 Thanks for coming everybody. I am Lieutenant
4 Colonel Tim Touchette, Commander of the lower
5 Great Lakes District of Buffalo. We are here
6 today for the public meeting of the Linde
7 Groundwater Proposed Plan. Let me just get
8 through a few slides. I'm going to turn it
9 over to the project manager who's going to run
10 you through the rest of it. Next slide please.
11 Tonight's meeting, departments; we're
12 going to describe the proposed plan for --
13 well, let me do something first.
14 I want to thank everybody for being here.
15 I should recognize a couple of people so you
16 all know who's in the crowd here. First,
17 Congresswoman Slaughter's office, Cathy Lenihan
18 is here; I think she's down front. We've got,
19 from New York State Department of Environmental
20 Conservation, Mr. John Mitchell and Kent
21 Johnson. I think we're here somewhere, right?
22 Over here and over here. And, obviously, the
23 supervisor from the Town of Tonawanda, Mr. Ron
24 Moline. I saw him here earlier. Sir.
25 SUPERVISOR MOLINE: Here, Colonel.

1 LIEUTENANT COLONEL TOUCHETTE: Thank you
2 for being here. And then from Praxair, I
3 think, Dennis, Dennis is here. Dennis Conroy
4 is here. Is there anyone else I missed? Okay.
5 Let me go back to this again. The
6 meeting, tonight we're going to go through the
7 proposed plan for the Linde groundwater
8 operable unit. And then, obviously, the reason
9 it's a public meeting is that we seek public
10 input. We have input by the 30th of June for
11 consideration in the decision making process.
12 This is just a preferred plan, a proposed plan.
13 So, we need the input. Next slide please.
14 The agenda; these are the things we will
15 cover. I will talk about the introduction,
16 obviously, I just did that. The ground rules.
17 And then Ray will take over, talk about the
18 proposed plan, the presentation. And then
19 we're going to ask for your formal comments in
20 writing, and then we're going to have some
21 time, at the end, for statements, and questions
22 and answers.
23 Let me give just a couple of ground rules.
24 You know, we need to make this an orderly
25 meeting so that people who have something to

1 say have an opportunity to do that. And some
2 of these rules are important. First of all, we
3 asked folks, when they came in, if they could
4 sign in on the cards when you came in if you
5 had something to say. That way we can, kind
6 of, put you in a Que, and get you up to speak
7 and not miss anyone. We would ask that one
8 person speaks at a time, so we have it a little
9 orderly. And everybody get a chance to say
10 what they need to say, or what they'd like to
11 say. And speakers will be limited to five
12 minutes, in order -- in case everyone in here
13 wants to speak, that gives us an opportunity to
14 do that without staying here past our time.
15 And then, there's a microphone in the center
16 here; we'd ask you all to use that so that your
17 comments can be recorded, and we can all hear
18 them.
19 And then, with that, I'm going to turn it
20 over to Mr. Ray Pilon, he's the project manager
21 for Linde.
22 MR. PILON: Okay. I want to thank
23 everybody. My name's Ray Pilon. I'm the
24 project manager for Linde. I've been the
25 project manager since 1997. What I plan to do

1 today is run you through some of the things
2 we've done. Explain the process. We call it
3 a CERCLA process. I'll explain that.
4 I'll discuss some history, how the Linde
5 site became contaminated. I'll explain the
6 ground water investigation that we've completed
7 over the years. And, we'll move on to the end
8 to accept statements and questions.
9 FUSRAP was established in 1974.
10 Department of energy was the initial federal
11 agency that had responsibility for that. And
12 that program was formed, basically, to
13 investigate, and re-mediate radioactive
14 contamination left over from government
15 operations, mainly Manhattan engineering
16 district, and the Atomic Energy Commission
17 work. The FUSRAP mission statement is first
18 and foremost, to protect human health and the
19 environment. The Corp has been very successful
20 in doing that at Linde, and all the other
21 FUSRAP sites that the Buffalo district is
22 responsible for.
23 We are supposed to execute this program in
24 the most safe and effective manner. We've done
25 that. I will show some man hours that we've

1 been able to achieve to insure safety. And, as
2 I said before, we followed the CERCLA precess.
3 That was directed by Congress in 1998. It's
4 pretty much the process that EPA follows for
5 CERCLA fund.
6 This is pretty much the process. It
7 begins with determination of site designation.
8 The Linde Site was designated into FUSRAP in
9 1980. Since that time, there's been
10 preliminary assessments, site investigations,
11 remedial investigations, feasibility studies,
12 and various proposed plans for operable units.
13 The Linde site has a groundwater operable unit.
14 This is the last operable unit that the Corp is
15 addressing for the Praxair/Linde site.
16 The Corp has issued proposed plans for
17 building 14 and soils previously; and I will
18 talk about that. We've issued records of
19 decision.
20 So, we're at this stage here for
21 groundwater, the proposed plan. This public
22 meeting is to ask for public comments into the
23 preferred alternative. And we will take those
24 comments, analyze them. We'll prepare a
25 response to everybody, and develop a record of

1 this decision.

2 Okay. The good news is that the Corp has
3 been here since 1997. And we've had some good
4 success in re-mediating the site. As I said,
5 we've completed the investigations of the
6 groundwater. I will run through the history of
7 that, kind of tell what the results are.

8 And, we request your comments. Just so
9 everybody who's not familiar with Linde, this
10 square down here is the Linde site. The
11 Department of Energy, before we got involved,
12 they had the Tonawanda sites. It included
13 Linde, they had Ashland sites, Seaway, and
14 Ashland 1 and 2 in Seaway along River Road.
15 There's also a site up at the Tonawanda Land
16 Fill.

17 When the Corp got into the program in '97,
18 we kind of separated those out. The good news
19 is Ashland 1 and 2 have been successfully re-
20 mediated. They're going to have a celebration
21 this fall with dignitaries to celebrate that
22 success. So, those sites have been cleaned up.
23 We're on our way with the Linde site.

24 We expect to be out of -- complete with
25 remediation by 2009. And, the proposed plan,

1 and rods scheduled for the Tonawanda land fill
2 this year.
3 The Linde site consists of 105 acres,
4 which is currently owned by Praxair. It was
5 formerly owned by Union Carbide. The number of
6 buildings; we have the home school, in which
7 we're located right now. Just located off to
8 the west.
9 Manhattan engineering district, back in
10 the 1940's, contracted with Union Carbide to
11 process Uranium Ore as they brought ore's in on
12 rail cars. And, they processed some separation
13 of the ore's. And, as a result of that,
14 there's contamination that's left behind. We
15 had contamination in some buildings, in the
16 soils, and in the groundwater.
17 In 1993, The Department of Energy came out
18 in Tonawanda and developed the -- they
19 completed the re-medial investigation, and had
20 a proposed plan. As part of that plan, they
21 had some preferred alternatives that weren't
22 acceptable to the community. Basically, they
23 -- the Ashland sites was the problem. They
24 wanted to have a long term storage facility
25 there, and public outcry resulted in DOE going

1 back and doing a reevaluation of those
2 alternatives.
3 It's interesting to note, though, that in
4 1993 the Department of Energy pointed out that
5 the natural conditions of the groundwater at
6 Linde preclude any use for drinking or
7 irrigation without treatment. And that's
8 basically, because the natural conditions of
9 the groundwater are high in sulfates and
10 chlorides, and you couldn't use it. It's like
11 a salty brine. So, if anybody wanted to
12 develop the groundwater for use, they'd have to
13 do treatment, and that's pretty costly. That
14 was the determination in 1993.
15 1994, as I mentioned, because of the
16 community outcry on the proposed plans, DOE
17 went back and started to reevaluate the
18 alternatives.
19 In 1997, Congress directed a change in
20 federal responsibility for the agency's. They
21 transferred the responsibility from the
22 Department of Energy to the Army Corps of
23 Engineers. In October 13th, 1997, we got a call
24 that we're responsible, and we picked the ball
25 up, and we've made some great accomplishments.

1 Keep in mind, it was October 13th, '97; we
2 came in and we evaluated building 30. It was
3 a large building that was sitting on site.
4 There was some contaminated material inside.
5 100's of drums. We did an evaluation of it,
6 made a recommendation to remove it. And that
7 work began in '98, and was completed in 1999.
8 This is a photo of the removal of building 30.
9 We moved 4,200 tons from Tonawanda.
10 It was put in a train and sent out to
11 licensed disposal facilities throughout the
12 country. Picture of the gondola cars. That's
13 what the waste was put in. These bags are --
14 material is loaded, the bags are sealed, and
15 transported to the holding facility.
16 Also, you might have noticed there was
17 2,500 man -- or 25,000 man hours executed on
18 that project without any incident; lost time
19 accidents. So, that was done very safely.
20 While building 30 was being completed,
21 we've continued with our feasibility study for
22 the Linde site. And in 1999 I was on this
23 stage presenting a proposed plan to you, many
24 of you who are here. When we presented that,
25 we said there's no reason to re-mediate

1 groundwater at that time. That was the
2 findings then. Some of the community had
3 concerns with some of the decisions,
4 particularly building 14 and the groundwater.
5 So, in the year 2000, we issued a record of
6 decision to separate building 14, and the
7 groundwater, and the operable units. And, we
8 issued a record of decision that began cleaning
9 up the contaminated soils on the site.
10 We've been digging contaminated dirt since
11 2000. We've been able to achieve 750,000 man
12 hours safely. We've been working very safe.
13 So, we've moved over 250,000 tons of
14 contaminated materials out of New York since
15 2000.
16 We we're allowed to begin re-mediating
17 soils. We went and reevaluated the groundwater
18 operable unit, and the building 14 operable
19 unit.
20 In 2001 we completed the feasibility study
21 on building 14. The proposed plan was 2002,
22 record of decision, following the CERCLA
23 process that you saw. And record of decision
24 decided to remove that building, and we
25 completed that in 2004. This is a photo of the

1 former building 14; it no longer exists. There
2 was a pilot laboratory for the Manhattan
3 project. We safely worked 73,000 man hours
4 dismantling that. And 14,000 tons of material
5 was removed from the site. This was
6 meticulously dismantled. It wasn't a mass
7 demolition. It was taken apart very
8 strategically.
9 Okay. As part of our commitment we also
10 said we would reevaluate the groundwater. We
11 met with USCPA in New York State, and developed
12 a sampling plan. And we installed some
13 additional wells to be able to characterize the
14 groundwater within the Linde site.
15 We completed a feasability in 2004. And
16 we had some comments on feasibility study. In
17 addressing those, we determined that we needed
18 to issue an addendum to that, that accessed the
19 exposure pathways. And, that was issued last
20 year. And we have the proposed plan that we
21 released in May, and our comment period is
22 expired on June 30th. And we're here presenting
23 the preferred alternative.
24 To understand what -- how the groundwater
25 got impacted, I want to go back to the 1940's

1 and explain the ore processing facilities, or
2 activities that MED did. They brought the ore
3 in on a rail car. It was unloaded. They
4 started doing a process in which resulted in
5 some waste products. We had liquid waste and
6 solids, sludge like material. That sludge
7 material was taken over the Ashland sites, and
8 some of the material contaminated the soils
9 that we're re-mediating now on site. The
10 radium nuclides, or radium thorium and uranium.
11 And the liquid waste was a problem.
12 What they did is they had 130,000,000
13 gallons generated as part of the process. The
14 process went from about 1942 to 1946. When
15 they started generating the waste, they
16 disposed of the material in sanitary sewers.
17 It was released in the sewers, and taken out to
18 the Tonawanda Treatment Plant. And that went
19 on from about 1942 to 1944.
20 In 1944, they changed the process a little
21 bit, which elevated the Ph levels of the liquid
22 discharge, which became very high in Ph. It
23 was no longer suitable to discharge in sewers,
24 so the government put in some injection wells.
25 And, there was seven put in all together. They

1 ranged from 90 to 150 feet deep. They're down
2 to bedrock. And, there's about 55 million
3 gallons of that affluent pumped into the
4 ground, down to the bedrock.
5 It was pumped, if you can imagine the
6 bedrock's 90 to 150 feet deep. There's a clay
7 layer, what they call the deep water Aquifer.
8 As they pump the material down, there was a
9 chemical reaction because the liquid was hot.
10 When it reached the depth, the Uranium
11 particles in the sewer -- in the sludge dropped
12 out and kind of, clung to the clays in the bed
13 rock. So, it's in a solid state down there.
14 It's not in solution.
15 This slide here shows the various wells
16 that we put in. The areas in pink. There are
17 seven wells. Building 8, building 30, those
18 have all been tested. We've also put in
19 several monitoring wells surrounding the site,
20 to collect additional samples to see if any of
21 the material is moving. And then we also did
22 some analysis on the chemical aspect of that.
23 This is a profile of a typical
24 groundwater, excuse me, bedrock. It has the
25 gray clays. This material is pumped down 150

1 feet. It's out of reach to the human
2 population. As I said, we met with New York
3 State DEC and USCPA about 2000/2001 to, kind
4 of, reach agreement on what additional studies
5 we needed to do so that we could go down a path
6 that everybody would be happy.
7 We did have agreement on characterizing
8 the site. The geology was sufficient. We
9 agreed that additional information on
10 groundwater was required. And we came up with
11 a sampling plan that the agency has agreed was
12 acceptable, meets technical requirements for
13 the analysis.
14 In 2001 the Corps put in the 6 new
15 monitoring wells, and we sampled the
16 groundwater. And, we also did some sampling in
17 2002. All together there's three rounds of
18 sampling. 2001 was seasonal, fall and --
19 spring and fall. And then 2002 was an
20 additional round. We did analysis, and we
21 determined that the natural occurring
22 conditions of the groundwater, kind of matches
23 what the USGS, US Geological Survey. They have
24 a characterization of the area that meets that.
25 It also confirms the high concentrations of the

1 Sulfates and the Chlorides that the Department
2 of Energy identified in 1993.
3 And, the natural conditions are that
4 nobody could use that water for any practical
5 use without doing some treatment.
6 We did a geochemical computer modeling,
7 technical model, kind of developed what the
8 fate in transport of that groundwater was, to
9 determine whether it was moving or not. And
10 the results of that is, that's it's not moving
11 very fast. It's within five feet.
12 It has not moved off site. And we, kind
13 of determined that that material solutioned
14 out, and it's solid down 150 feet below ground.
15 We also took a look at the surface soils
16 up above, to see if the contaminates in the
17 soils had a tendency to leach down into the
18 groundwater. As I mentioned, we've been
19 digging dirt up on the surface. We want to
20 know if rain or any run off would migrate
21 material down to the groundwater.
22 The results of that was no. There is no
23 leaching effect going down to the groundwater,
24 and that potential has been dismissed. As a
25 result of the comments on our first feasibility

1 study, we went back; there was question on
2 baseline risk assessments. We went back and we
3 looked at the exposure pathways.
4 And basically, there's four, four elements
5 that's required for an exposure pathway to be
6 complete. The first one is, you have to have
7 a source of the mechanism; that's the
8 groundwater itself. And the injection wells,
9 the environmental transport medium; that's the
10 groundwater, and we have that.
11 The next one would be point of contact. A
12 receptor, either environmental or human. That
13 does not exist. The groundwater's 100 to 150
14 feet below ground. There's no point of contact
15 that would exist for anybody to come in contact
16 with that. And we also have to look at the
17 route of exposure, such as ingestion, drinking.
18 And we looked at that. Nobody's drinking the
19 water. It's just sitting down, pretty much,
20 below ground, and not causing any impact to
21 anybody.
22 So, with that determination, if there's no
23 completed exposures, we've determined that the
24 Uranium solidified out. It's not in solution,
25 it's not moving off site. So there's minimal

1 transport concerns.

2 We looked at current and future use.

3 Right now the Town of Tonawanda is being

4 furnished by municipal water supply. It

5 wouldn't be practicable for anybody to try to

6 sink a well in there for using the groundwater

7 because of the natural conditions with the

8 chlorides and sulfates. You'd have to put in

9 expensive treatment to use it. And there's no

10 direct exposure for drinking, breathing, or

11 skin contact.

12 So, when we have to evaluate all that, we

13 come up with the conclusions that transport's

14 unlikely. There's no evidence of contamination

15 has moved. And we know that the natural

16 conditions, groundwater is such that you

17 couldn't use it without treatment.

18 We know that the area is being served with

19 municipal water supply. Town of Tonawanda's

20 intake is on the Niagara River, which they're

21 source is Lake Erie and the upper Great Lakes.

22 There's a vast supply of fresh water for the

23 community. So, there's no reasonable, or

24 foreseeable use of the groundwater in the Town

25 of Tonawanda.

1 So, since there's no point of contact, no
2 exposure routes, there's no threat to any human
3 health, or an environmental receptor. And
4 we've determined that there's no action
5 required to alleviate the groundwater. It
6 provides safe and is protective now, since it's
7 not being used, nor will be used.
8 Next, that's a preferred alternative
9 that's presented in the proposed plan, the no
10 action plan. We have a decision making
11 schedule. Comments on the proposed plan are
12 due by June 30th. We will close the comment
13 period at the end of the day. And we plan on
14 taking about three months to prepare a response
15 and to do a summary and record of decision .
16 So, if the community wants to send in public,
17 written comments, we have until June 30th, close
18 of business. We will send responses to every
19 comment that we receive. And it will also be
20 issued, in response to this summary, it will be
21 attached to the record of decision.
22 If anybody needs additional information on
23 the technical studies that have been used to
24 form the basis of this, we have an
25 administrative record established in the Town

1 of Tonawanda Library on Main Street. And
2 there's also an administrative record at the
3 Buffalo District. That has all the technical
4 documents that support the decision.
5 And, with that, our address is 1776
6 Niagara Street, Buffalo, New York, 14207.
7 Please feel free to send comments in to us.
8 And we will accept them up until June 30th. And
9 that's pretty much it for my presentation.
10 We can open it up for some statements or
11 questions from the public. But, as the Colonel
12 said, we would like to limit it to five minutes
13 per person to allow everybody an opportunity to
14 speak.
15 Any questions? Mr. Sweet?
16 MR. SWEET: Good evening. My name if
17 Philip Sweet. I reside in the Town of
18 Tonawanda. And, possibly, I would like to get
19 a little more than five minutes, if possible,
20 if you could open this up after the meeting.
21 Firstly, I think your proposal is, you know,
22 right down the line with what you have been
23 talking. I would like to thank Representative
24 Slaughter's office for being here. And, in
25 particular, I would like to thank Lynn

1 Marinelli, chair of the Erie County
2 Legislature, for taking up this issue.
3 I'd like to especially thank Mayor Polosi
4 (sic), for showing an interest in what's going
5 on with the cancer situation in the City, both
6 City of Tonawanda and the Town of Tonawanda.
7 And I'd also like to thank Supervisor Ron
8 Moline, for being here this evening.
9 One quick question from you; is our
10 community still being monitored for gamma
11 radiation? As of two years ago, you had 21 on
12 site Dosimeters. An additional one, they had
13 to pump here at Holmes elementary. One at the
14 Hillshire complex, and one at the -- Kenmore
15 Mercy Hospital. Also, is Linde/Praxair still
16 in the process of incineration of radium? I
17 live two miles down from Linde/Praxair, and I
18 want to know my air is still being monitored.
19 Also, there's an extensive supply of ammorition
20 241, which happens to be an isotope of
21 plutonium. What is the reason for such an
22 extensive amount of ammorition 241, what is
23 going on in that scenario? I would appreciate
24 it if you could make some comments on that.
25 And also, in addition to that, as you

1 know, the City of Tonawanda, just recently,
2 within the last year or so, put up a huge, high
3 water tower. One of the primary objectives of
4 this tower is for safety, and to maintain
5 pressure. Many know, many residents know, and
6 as a former resident of the town of City of
7 Tonawanda, at various times the pumping
8 structure was shut down. Now, 50% of the water
9 was lost through the system, and I want to know
10 your perspectives on what would happen if a
11 pipe was deteriorated. Lays there for a period
12 of time. The pumps restart. Does it come in
13 to the community? Now, you have to look at
14 this issue of what was dumped in the
15 community, radium 226. Which was half the
16 worlds supply, I believe we sent it up to
17 Lewiston. Thorium 230, and uranium 238. Now,
18 on these papers that I passed out it shows you
19 the life span of these different radio
20 nuclides. And also, a comparison should be
21 made. We should go in to the human bio-
22 monitoring program that is shown by Doctor
23 Rosalee Bertel. And I think we need to come
24 together as communities, talk this situation
25 over, and see what we can do for the children.

1 And, I appreciate making these comments,
2 and I'd like to add something later on. Thank
3 you very much.
4 MR. PILON: Okay. Let me address that. I
5 think I can answer three of the questions that
6 you had. One concerned the air monitoring
7 around Linde. We do have 12 perimeter air
8 monitors.
9 MR. SWEET: They're still there?
10 MR. PILON: Still there. They've been
11 running since about 1998?
12 MR. SWEET: Why? Where are they still
13 there?
14 MR. PILON: Just so that we can know if
15 there's any release or any concerns. There's
16 one on the roof of this school, Phil, so.
17 MR. SWEET: Are you doing any
18 incinerations?
19 MR. PILON: There's no incineration that
20 we're aware of.
21 MR. SWEET: High temperature incineration
22 at Linde/Praxair.
23 MR. PILON: Nothing that we're aware of.
24 MR. SWEET: Where did all this ammorition
25 241 come from?

1 MR. PILON: The amorite.

2 MR. SWEET: It's a man made isotope.

3 MR. PILON: Okay. The amoritium that I
4 think that you're talking about, is material
5 that's in the Tonawanda land fill, which is not
6 part of the discussion here.

7 MR. SWEET: Okay.

8 MR. PILON: But, that was part of a smoke
9 detector factory --

10 MR. SWEET: I know that.

11 MR. PILON: -- that was generated years
12 ago. And that's, like I said, the purpose of
13 this meeting is to talk about Linde, the Linde
14 site, Linde groundwater. The Tonawanda land
15 fill, if anybody doesn't know, it's about a
16 mile and a half north of this site. And it's
17 being closed, I understand, by the Town.
18 They're under a closure plan.

19 MR. MOLINE: Mr. Pilon, is it all right if
20 I speak in the microphone here?

21 MR. PILON: Yes, please do.

22 MR. MOLINE: My name's Ron Moline,
23 supervisor, Town of Tonawanda. I was
24 supervisor in the mid 1980's when the US
25 Department of Energy appeared in the Town Of

1 Tonawanda with a plan for addressing waste
2 materials from the Manhattan project.
3 At that time the US Department of Energy
4 suggested that a depository be established in
5 the Town of Tonawanda so that not only nuclear
6 waste from the Manhattan Project activity in
7 this area, but also radioactive waste from
8 other places, including Conway, New York, could
9 be stored in one place and then monitored.
10 It was clear that the US Department of
11 Energy had no intentions to remove material,
12 and really wasn't too interested in what the
13 public reaction was to the plan that they were
14 presenting. This lead to the formation of an
15 organization called CANT, the Coalition Against
16 Nuclear materials in Tonawanda.
17 That coalition consisted of about 14
18 elected officials from local, State and Federal
19 levels of government. And I'm not sure if this
20 is good new or bad news, but I think I'm the
21 only one of the 14 still, still in office, and
22 still following the FUSRAP program.
23 As was pointed out in the presentation,
24 the US Department of Energy , in short, was not
25 very responsive to local concerns.

1 And, about 10 years ago Congress, wisely,
2 put this program under the jurisdiction of the
3 US Army Corps of Engineers. And during the 9
4 or 10 years the Corps has had jurisdiction,
5 tremendous progress has been made. And, I
6 think, there are a number of reasons for that
7 progress. The military and civilian leadership
8 of the Corps, in the Buffalo region, has been
9 outstanding. Always placing a top priority on
10 public health and welfare, and protecting the
11 environment. Doing an excellent job
12 communicating with public officials, and with
13 other government agencies, like the DEC, and
14 the New York State Department of Health.
15 I think another key reason why progress
16 has been made during these ten years is because
17 of the tremendous cooperation from Praxair,
18 particularly under the leadership of Dennis
19 Conroy, as site manager.
20 Another key factor has been the US Army
21 Corps of Engineers contractor. Ray made
22 reference to 750,000 hours of work without lost
23 time. Obviously, working in an environment
24 where great care has to be taken every day. I
25 think Canada was and continues to be a factor

1 in the success of the last ten years. And
2 finally, and most important, the support what
3 the public with the program laid out by the
4 Corps of engineers. Mr. Pilon alluded, very
5 briefly, to the sites that have been cleaned
6 up. And, I'm pleased to hear that they're
7 going to acknowledge that formally later in the
8 year. They've done a tremendous job with what
9 I'll refer to as the Ashland sites. They've
10 done a tremendous job cleaning up buildings
11 here on Praxair property.
12 I'm confident that the plan being proposed
13 for the groundwater aspect of this, a clean up
14 is a sound one. So often decisions are made
15 effecting public health and the environment
16 that generations later are reviewed,
17 questioned, and sometimes addressed through
18 remedial actions. Obviously, that was true
19 with decisions made in the 1940's regarding the
20 radioactive waste, and the impact on the
21 environment and public health.
22 I don't think anybody forty or fifty years
23 from now, is going to be questioning the wisdom
24 of moving 250,000 tons of radioactive material
25 out of this town. I think that should be

1 applauded.

2 Will anyone question the proposal to,
3 basically, leave groundwater in place, given
4 the fact that there seems to be no established
5 pathway, and no threat to the environment or
6 public health. I doubt it, but there's no
7 guarantee. I think, however, from looking at
8 the plan that you have put together, and made
9 available to the public, that you've done an
10 excellent job looking at the factors involved.
11 And looking at the viable options.

12 So, I support that program, and that plan,
13 and hope that you can move forward just as you
14 have moved forward with the other aspects of
15 the FUSRAP clean up. I'm very impressed by the
16 commitment of the US Army Corps of Engineers
17 for this FUSRAP program in our area.

18 We've gone through four changes in
19 military command. The Lieutenant Colonel is
20 going to be moving on very shortly. But, each
21 time there's a change, the commitment is there,
22 and I know that's due to the continuity
23 provided by the civilian staff, but it's also
24 due to the outstanding military leadership that
25 the Corps of Engineers has received. And

1 Lieutenant Commander Touchette, I wish you well
2 in future assignments.
3 One question, Mr. Pilon, that I'd like to
4 direct to you is in regard to future monitoring
5 of the groundwater situation. Will there be
6 monitoring of wells, or other methods of
7 evaluating the decision into the future to make
8 sure that there's no migration, or change
9 there?
10 MR. PILON: the proposed plan does not
11 include any monitoring wells.
12 MR. MOLINE: Pardon me?
13 MR. PILON: The proposed plan does not
14 include monitoring in the future. It's pretty
15 much no action, just leave the material down
16 there.
17 MR. MOLINE: Obviously, I am not an expert
18 in that field, but I think generally, when
19 actions are taken, you like to stay up to date
20 on any changes and assumptions that were made
21 at a particular time. And I'm not sure how
22 that can be handled given the depth that you
23 have referred to on the plan that you have
24 described. That's the only question that I
25 would have. Thank you.

1 MR. PILON: Thank you.

2 MR. KRIEGER: My name is Ralph Krieger.
3 I'm president of FACTS, Incorporated. Our
4 organization fought very hard for this
5 community. I worked for Praxair. The original
6 plan was to dump everything down at the land
7 fill. That was the original plan, in a 50 year
8 old technology that was going to last 30 years.
9 Our argument stands today. You can go to U.B.,
10 find out that this area is an earthquake prone
11 area. All it takes is one to crack it, there's
12 goes the drinking water for millions of people.
13 We're sitting on the Great Lakes. The
14 comment was, Mr. Moline and Mr. Pilon. Well,
15 there was other organizations that were
16 involved in getting this stuff moved off and
17 out of this community. Unfortunately, the
18 groundwater and the subterranean water, is not
19 going to be able to be moved. Common sense
20 will tell you that.
21 However, I got a book from you guys, a
22 little while back. It was very thick. There
23 was supposed to be three permanent monitoring
24 wells put on the Linde site, that will be owned
25 by the Federal government. Mr. Moline is

1 absolutely right. We can't predict five years,
2 ten years down the road, corrosion, soil
3 movement, land movement, and even an
4 earthquake. We are prone to them. Not great
5 ones, but we are prone to them. They could
6 cause a structural change. We're still sitting
7 on the Great Lakes.
8 Congress passed a law, and all the
9 Congressmen and Senators in New York State have
10 signed on to it, to clean up the Great Lakes
11 along with Canada. Over a million dollars.
12 There ain't much sense in cleaning up the Great
13 Lakes if it's going to break loose an go back
14 in there. And they don't filter out
15 radioactive material in water treatment
16 facilities.
17 If anybody wants to take the time to do a
18 little research on medical expenses for the
19 public in the Buffalo area, go do it. I think
20 you'll be very surprised the amount of
21 sicknesses that are in the Buffalo area, not
22 dealing with Praxair. We we're a heavy
23 industry during the war. Very heavy industry.
24 You don't want to even go over to Niagara Falls
25 with the contamination that's going on over

1 there.

2 All that's going in our water, the

3 drinking water for millions of people.

4 Everybody should remember that. Unfortunately,

5 the war was the war, things happen. They

6 needed the uranium. Now, we're going to have

7 to deal with it.

8 One of the things that I would recommend,

9 that the Praxair site be monitored

10 continuously. Because, you're not going to be

11 able to clean it up. I know for a fact, we put

12 a deep well pump, forty feet, out by building

13 38. Before I left the project, we had to pull

14 that deep well pump. It was a sump pump to

15 keep the water away from the tubs. When we

16 pulled that, you guys were on the property, the

17 DOE was on the property; there was radioactive

18 material on that pump. Where did that come

19 from? Was that leaking up or leaking back?

20 That was a brand new pump. It was put in in

21 the 1970's. I know, because I put it in.

22 That water was being pumped, not in the

23 sanitary sewers, but waste sewers. That was

24 going where? Niagara River. Those are no

25 longer there.

1 My other question is; what about building
2 31? What's happening with 31, and building 8?
3 MR. PILON: I'm not familiar with the
4 replacement of the pump that you're talking
5 about, but building -- the material over at
6 building 38, was, has been re-mediated down to
7 clay, natural clay. All that soils that was
8 contaminated around building 38 has been
9 removed. So, if that pump was contaminated
10 it's been re-mediated.
11 MR. KRIEGER: The question remains now,
12 what's happening with building 31 and building
13 8.
14 MR. PILON: Okay. Building 31 is on our
15 schedule to remove that. We have indication
16 that the soils beneath it are contaminated, and
17 that's being scheduled for removal.
18 MR. KRIEGER: Okay.
19 MR. PILON: And building 8 has been
20 surveyed and the results, right now, are
21 inconclusive, whether it has to be removed or
22 not. We have not found any indication of
23 contamination on building 38.
24 MR. KRIEGER: The question --
25 MR. PILON: Or building 8.

1 MR. KRIEGER: One more question. Did you,
2 in your survey, either you or the DOE. I don't
3 recall ever seeing it. The mercury? Ever
4 found any mercury?
5 MR. PILON: When we removed building 14, we
6 had some mercury that was disposed of. We have
7 to handle that as a separate waste stream.
8 And, it was taken to a facility that could
9 accept it. So, we did have some mercury at
10 building 14.
11 MR. KRIEGER: There was some mercury there?
12 MR. PILON: Un-huh.
13 MR. KRIEGER: the reason I ask that
14 question, I'm going to be getting involved with
15 some people in Washington on mercury and coal
16 burning generation. And mercury is a big
17 concern on that in the area. And we burn coal
18 at Linde.
19 MR. PILON: Okay. It's part of the Corps
20 responsibility, when we dispose of material, we
21 have to test it. Not only for radio nuclides,
22 but for other constituents that may require
23 certain permitting facilities to accept it.
24 There's a waste profile developed, and if
25 mercury's on there we have to handle mercury

1 separately, just like asbestos or any other
2 contaminate concern; we would address it
3 responsibly, and dispose of it in a responsible
4 manner. Okay.
5 MR. McCORMICK: Dave McCormick, City of
6 Tonawanda. I came here, I thought we were
7 going to talk about all the sites in the area.
8 But, it's good to hear about what you've done
9 here at Linde and with the groundwater, you
10 know, down 150 feet. And you're monitoring it,
11 and you know, you know what's going on. You're
12 cleaning the site up.
13 But, you did just bring up something that
14 I'm a little nervous about. I live in the City
15 of Tonawanda. There is a land fill up there.
16 They don't dig down 150 feet and start throwing
17 contamination, you know, in the ground. They
18 just start stacking it up. My question is, I
19 live down hill from that site. And last year
20 I attended a meeting at the City of Tonawanda
21 council meeting, and the Mayor and a couple of
22 councilmen said that they got nothing to worry
23 about at that site. My question is, if it's
24 not 150 feet in the ground, and it's ground
25 level, and if we're stacking that, the pile up,

1 the runoff; do me and my children have
2 something to worry about, my family? About
3 the, you know, the radar -- I mean, the smoke
4 detectors that are not in the ground 150 feet.
5 Obviously, they're at ground level.
6 And the mayor and a couple of councilmen
7 said we have nothing to worry about last fall.
8 And I brought that question up to them, and now
9 I'm starting to hear it, like, maybe there
10 might be a problem there. Is it safe? That's
11 my question.
12 MR. PILON: I'm sorry. That site's a mile
13 and a half up north. I know the Corps of
14 Engineers did complete a remedial
15 investigation, and they did not find FUSRAP
16 type of material that we're cleaning up at
17 Linde, in that landfill.
18 We know there's americium there from an
19 old smoke detector factory, but that's not the
20 responsibility of the Corps of Engineers. New
21 York State DEC, I think, has been involved in
22 that, with the Department of Health. And, I
23 think, they're working with the Town for a
24 closure plan on the landfill. But, I can't
25 speak for the Town's closure plan on the

1 landfill. I'm sure whatever it is is going to
2 be protective, and I would expect that from
3 being responsible for that landfill.
4 Any other questions? Mr. Sweet?
5 MR. SWEET: This is a question addressed
6 to Colonel Touchette. And I wonder if he could
7 comment on this. When I talked to him, last
8 year, at the city of Tonawanda meeting,
9 concerning depleted uranium. And in this
10 handout sheet it refers to Major Doug Rock,
11 PHD, US Army, retired. He's was called in by
12 General Swartzkoff Gulf war one. And he's
13 speaking out on the depleted uranium issue.
14 And I wonder if he could comment, because Major
15 Rock states, the army is required by US Law to
16 treat all person's effected and all area's
17 contaminated, by radioactive uranium emissions;
18 US Army regulations AR70048, from TB91300.278.
19 There are no if's or but's about it.
20 I would like to go on the list as the
21 first one to be tested for this. Our community
22 has been reluctant to come out. We have
23 experienced much tragedy. We are involved in
24 this cluster cancer dilemma, door to door.
25 And, this thing has turned political. It

1 needs to be addressed. If what Doug Rock,
2 Major Rock states is true, then we should
3 follow the law. We should let our residents
4 come forward, and be tested. We're out there.
5 We're testing the water, we're testing the air.
6 We need to test the community.
7 And, let me say, in particularly in
8 children. I am the children's voice. There's
9 nobody I have heard, speaking out for our
10 children. They're little babies. They are
11 very fragile. Their bodies cannot take the
12 stress of low level radiation. This is what
13 we're talking about.
14 Doctor Rosalee Bertel, has commented on
15 this situation. She is ready and able to come
16 into this community, and advise on the subject.
17 But, again, I would like the Colonel, if you
18 could Colonel, to make a few comments. And, I
19 think you very much.
20 LIEUTENANT COLONEL TOUCHETTE: I'll just
21 speak loud here. Oh, no, I'll get a mic. I
22 think I remember that discussion last year.
23 The, I believe, that the depleted uranium that
24 was refereed to by the gentleman you quoted is
25 from M1A1 tank rounds. That's a munition that

1 has been used in the past, and was used
2 recently in operations, I believe, or perhaps,
3 in the former Yugoslavia. And there was a,
4 there was an initiative by the army to
5 recapture those rounds. The ones that have
6 been expended can see what effects, if any,
7 they had on the soldiers, or the people they
8 effected. That is a separate issue from this.
9 The FUSRAP program does not give us -- The
10 Corps of Engineers works on two things. The
11 authority given to us by Congress, so that the
12 appropriation, which is the money that helps us
13 along. No where in our authority are we given
14 the mandate to go do testing. So, we do not do
15 that. It is not part of our program.
16 MR. SWEET: I think that what you say is
17 true. However, Major Rock has been speaking
18 out to Congress. He has the support of
19 Congress. And I believe congresswoman
20 Slaughter's office, is going to become involved
21 in this. And I think it's an issue that goes
22 right in to Washington. And eventually,
23 hopefully, it will come back this way. Thank
24 you.
25 MR. PAPURA: Mr. Sweet I just wanted to

1 correct one small part. My name is Tom Papura.
2 I'm assisting on the project.
3 MR. SWEET: Yes.
4 MR. PAPURA: At no time was any depleted
5 uranium ever processed or utilized at this
6 site. So, that's a separate issue, like the
7 Colonel says. This was natural uranium ore
8 that was brought in, extracted out of the
9 material. So, this is separate issue. So,
10 there's no reason that we would want to be
11 bothered to test for people, you know, for
12 exposure to depleted uranium, it's a whole
13 separate issue.
14 MR. SWEET: Oh, but not against barium.
15 Any uranium munitions.
16 MR. PAPURA: There are no munitions at this
17 site sir. There was no munitions processed at
18 this site. This was strictly uranium ore,
19 extracted to be further processed in other
20 locations, in support of the Manhattan engineer
21 district, in hopes of producing a bomb. Sir,
22 this has nothing to do with munitions.
23 MR. SWEET: I think that this is an issue
24 that Congress needs to take up, because we're
25 in a dilemma. We're in a neighborhood cancer

1 cluster, for one, and it needs to be addressed.

2 MR. PILON: Okay. Any body else?

3 MR. PILOZZI: Thank you. Ron Pilozzi, City

4 of Tonawanda. Earlier there was a question

5 posed about the land fill that borders on the

6 City of Tonawanda. Obviously, that's a big

7 concern of ours. And, I think, when the

8 question was posed, there's a dichotomy there.

9 There's two problems. Number one, the problem

10 of americium that, obviously, was not part of

11 the MED situation. But, it's also my

12 understanding that there is radioactive sites

13 along our border, within that land fill that

14 comes from the MED situation. And, I think,

15 unless I heard you wrong; you said that that

16 had nothing to do with MED. Am I right or am

17 I wrong?

18 MR. PILON: Well, the Corps of Engineers

19 did complete a remedial investigation. My

20 understanding, that the results of that

21 investigation, there's no elevated MED material

22 that would have a trigger action for any

23 response. There's a proposed plan coming out

24 later this year that the re-mediate

25 investigation has been released, and the data's

1 been provided to New York State, and I believe,
2 the Town and the City. Jim?
3 MR. CARSTON: Jim Carston, I am the program
4 manager for FUSRAP for the Buffalo District.
5 The Tonawanda landfill that you are referring
6 to, DOE did locate some materials there in Mud
7 Flats area as well. So, we reinvestigated
8 those areas. There is some MED like material
9 there. It doesn't have the same
10 characteristics of the material that we've been
11 cleaning up for Linde. We have done the
12 investigations. The future land use there is
13 a landfill. The state is working with the Town
14 on capping that landfill. We've done some
15 evaluations, and the conclusion, we think
16 there, is that once that landfill is completed,
17 and they put a cover over it, it can not pose
18 any risk to human health or the environment.
19 There will be a, as Ray mentioned, a meeting
20 similar to this later this year.
21 I believe it's around September, where we
22 will present that no action proposed plan, to
23 basically find nothing to do there, similar to
24 the groundwater here. Because there's no risk
25 to the health and the environment, but that's

1 something that we actually need to address.
2 Does that answer your question, sir?
3 MR. SWEET: Thank you.
4 MR. PILON: If there are no more questions.
5 MR. SCHAFER: I am Tom Schafer, a member
6 of FACTS, Incorporated. Former employee of
7 Union Carbide Linde. My father was also a
8 former employee at Linde and Praxair. I heard
9 you mention that you're going to tear down
10 building 31. Okay. I have a report from
11 Bechtel Corporation on the radiation levels of
12 31. And there's a lot of people that are
13 familiar with energy employees occupational
14 illness program. Well, on the list of ailments
15 for radiation exposure, they have listed heart
16 as one of the conditions. And my father was
17 denied that claim. And, in this report, his
18 office, he was being bombarded with gamma from
19 the floor, the walls, the ceiling. Plus his
20 office had sealed windows and a air conditioner
21 that recirculated just the air in the room.
22 Now, I was wondering if you would help me fill
23 the report out so I could resubmit this claim.
24 I'm asking your help.
25 MR. PILON: I don't know what we can do for

1 you. The information on building 31 is
2 available. The occupational exposure program
3 that you talk about is being administered by
4 the Department of Labor. And it's really not
5 the agencies mission --
6 MR. SCHAFER: You couldn't write a letter
7 stating that his office was, would jeopardize
8 anybody's health?
9 MR. PILON: I think that the Department of
10 Labor has consultants on staff that are doing
11 dose recreation for that program. And, I think
12 your issue is really with the Department of
13 Labor. They have consultants doing
14 reconstruction of the doses of the employees.
15 And, if your father was turned down, there must
16 be a basis for it. I mean, I don't know. But,
17 you know, we could give you the -- you probably
18 have the phone number for the, I think they
19 have a help line.
20 Okay. So, we can get you the -- there's a
21 help line. It's a 1-800 number that goes in to
22 the occupational expo -- or exposure from the
23 Department of Labor. Maybe if you explained
24 the problem with them, and they can help you.
25 But, we're not really in the business of

1 recreating doses. That's being handled by the
2 Department of Labor.
3 Anyone else? All right. Thank you. I
4 appreciate you coming out. It's a beautiful
5 night. We're ending a little early so you can
6 enjoy the day. I encourage, if you want to
7 send in written comments, please do so by June
8 30th. Thank you.
9 (Meeting concluded)

CERTIFICATE

I, THOMAS BAKER, certify that the foregoing transcript of proceedings in the Proposed plan for the Groundwater Operable Unit Linde Site, Tonawanda, New York. Public Meeting, was recorded utilizing a Sony BM-246, and transcribed via a Sony BM-246 transcribing and recording machine, and is a true and accurate record of the proceedings herein.

Signature Thomas Baker

Associated Reporting Service

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Date: 6/16/06

ATTACHMENTS

town of tonawanda

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Office of the Supervisor
RONALD H. MOLINE

June 15, 2006

Timothy B. Touchette
Lieutenant Colonel, Corps of Engineers
District Commander
1776 Niagara Street
Buffalo, New York 14207-3199
Attn: CELRB-PM-F

TBT 16JUN06

Dear Lieutenant Colonel ~~Touchette~~:

This letter is a follow-up to remarks made at the public meeting on June 13 at Holmes Elementary School on the Proposed Plan for the Groundwater Operable Unit at the former Linde FUSRAP Site and is intended as additional comments for the record on that subject. Although it has been determined that there is no exposure pathway to a human or environmental receptor in the affected groundwater, I believe it is important to verify and monitor this condition on a periodic basis, perhaps every ten years, if not more frequently, to determine if any migration or change in levels of contamination have occurred that would warrant additional study. Your consideration of this request will be greatly appreciated.

Sincerely yours,

Ronald H. Moline

RONALD H. MOLINE, SUPERVISOR
TOWN OF TONAWANDA

RHM:ram

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Denise M. Sheehan
Commissioner

Mr. Ray Pilon
Project Manager
USACE - Buffalo District
1776 Niagara Street
Buffalo, NY 14207

Dear Mr. Pilon:

Re: Proposed Plan - Groundwater Operable Unit
Linde Site, Tonawanda, New York

The New York State Department of Conservation (the Department) has received the above referenced document concerning the Linde site located in Tonawanda, Erie County, New York. The Department commends the USACE for its work on investigating and addressing the impacts of past Federal Government activities at this facility. As you are aware, the Department has worked with the USACE in the development and implementation of investigations of site groundwater.

The Department has reviewed the Proposed Plan and does not concur that the "No Action" alternative is sufficiently protective of human health and the environment.

From 1944 to 1946, the Linde Air Products Company, disposed approximately 55 million gallons of liquid waste in on-site wells. It is estimated that the discharges to the injection wells contained approximately 3 curies of natural uranium, 0.5 curies of radium and concentrations of vanadium, nickel, cobalt and molybdenum. It has been theorized that, due to the nature of the injected liquid wastes, the majority of the contaminants precipitated out of solution and into fractures and pore spaces of the receiving aquifer. The results of the remedial investigation tend to confirm this theory.

Sampling conducted as part of the remedial investigation does not indicate the current migration of high levels of contaminants from the facility. However, if the current belief that contaminants have precipitated into the bedrock is correct, a source of contamination remains beneath the facility. Because the long-term fate and potential migration of the precipitated radionuclides cannot be predicted with total assurance, long-term monitoring of site groundwater is desirable.

With respect to the future usage of site groundwater, New York State considers all groundwater to be a potential drinking water source. Although groundwater from the deep aquifer (Salina group

shale) would require treatment prior to usage as drinking water, this treatment cannot be assumed. In addition, requirements of the town of Tonawanda and Erie County (with respect to installation and use of public water supply wells) are not sufficient to preclude groundwater usage. In addition, although at this time, the radioactive contaminants have not migrated significantly, they may move in the future, if groundwater conditions change.

Therefore, the Department considers a combination of institutional controls and long-term monitoring as necessary to provide satisfactory protection with respect to the groundwater operable unit at the Linde site.

Finally, in section 2.2, the proposed plan repeats the conclusion from the Record of Decision for the Linde Site (2000) that the reasonably anticipated future land use of the property will be for industrial/commercial purposes. The Department did not concur with that conclusion when it was first presented in 1999, and our position remains the same. Given the fact that the surrounding area contains residences along with commercial and industrial buildings, residential use of this site is definitely a reasonable option in the future. We recommend that the proposed plan be revised accordingly.

Thank you for the opportunity to comment on the Proposed Plan. The Department looks forward to continuing to work with the USACE on remedial programs at the Linde site. If you have any questions or need additional information, please contact John Mitchell, of this Bureau, at (518) 402-8573.

Sincerely,

Edwin Dassatti, P.E.
Director
Bureau of Hazardous Waste & Radiation Management