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.

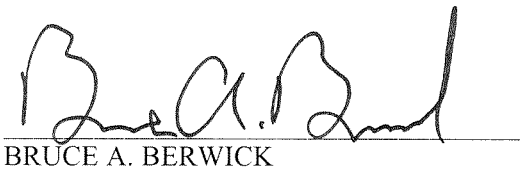
USACE issued an FS Report (USACE 2004) for the Groundwater OU at the Linde Site in October 2004 and an Addendum to the FS Report (USACE 2005) for the Groundwater OU at the Linde Site in September 2005. The PP (USACE 2006) for the Groundwater OU at the Linde Site was issued by USACE in May 2006. This 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.



BRUCE A. BERWICK
Brigadier General, U.S. Army
Commanding

29 Jan 2007
Date

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 x 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 x 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.

[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.

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FIGURES

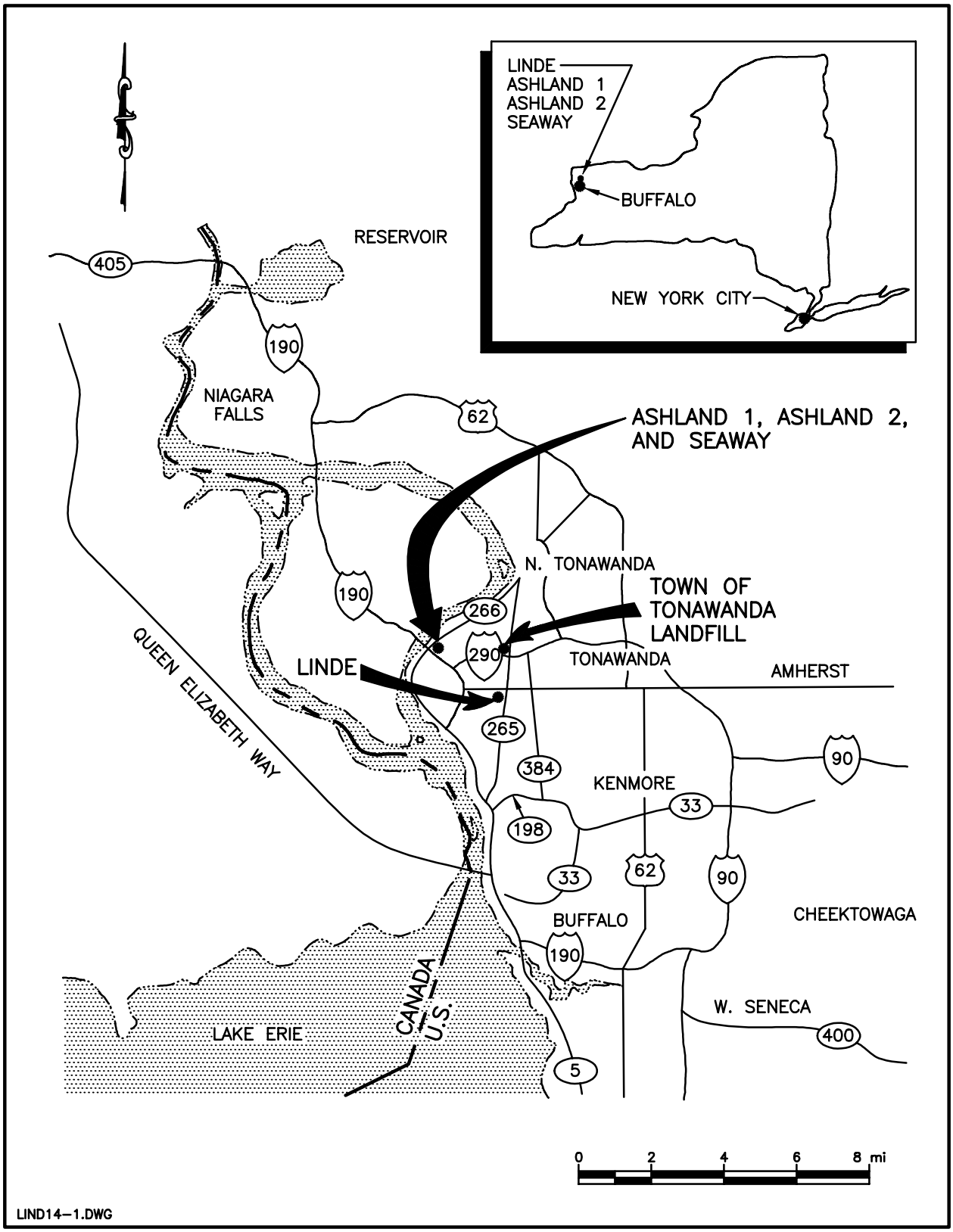
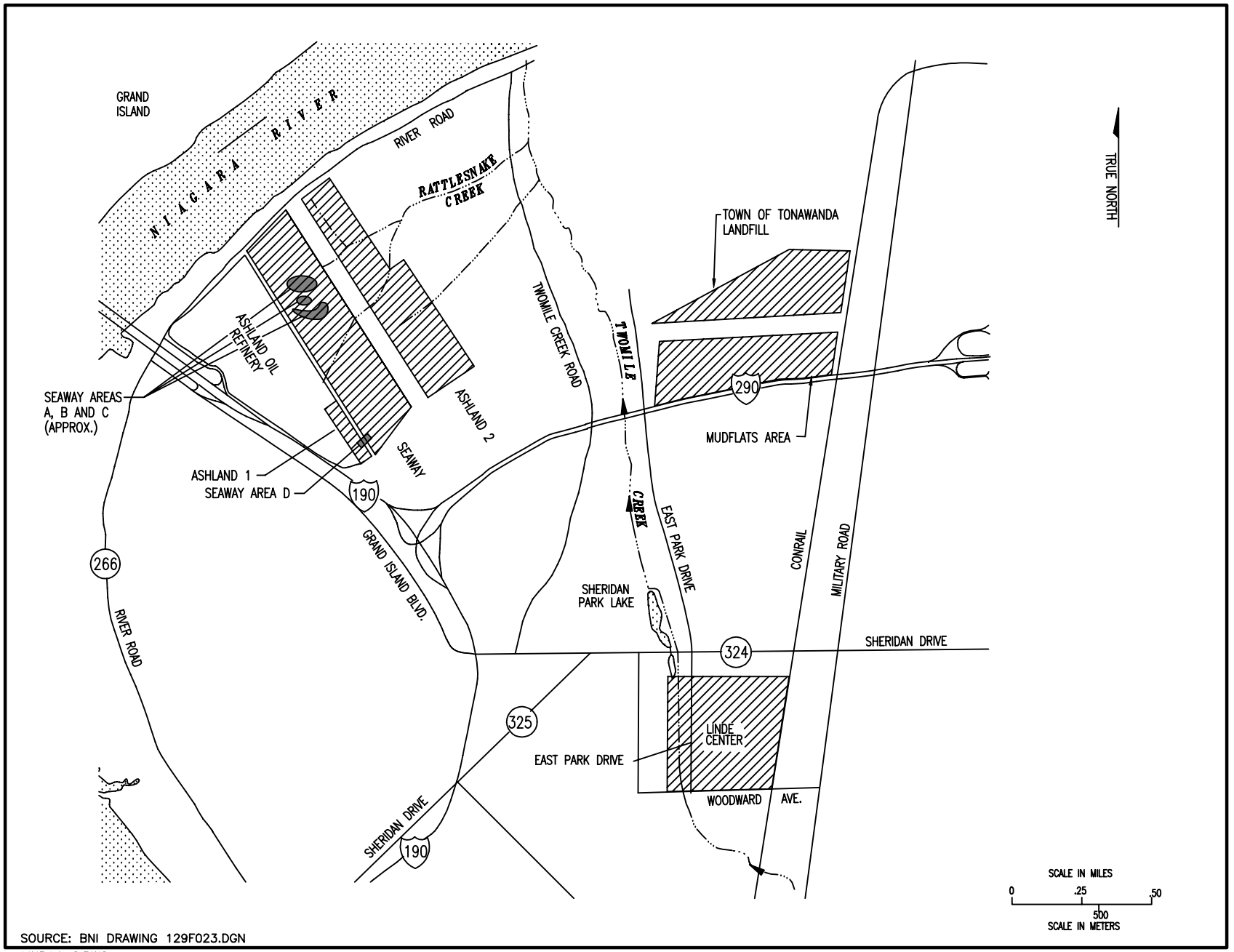


FIGURE 1

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

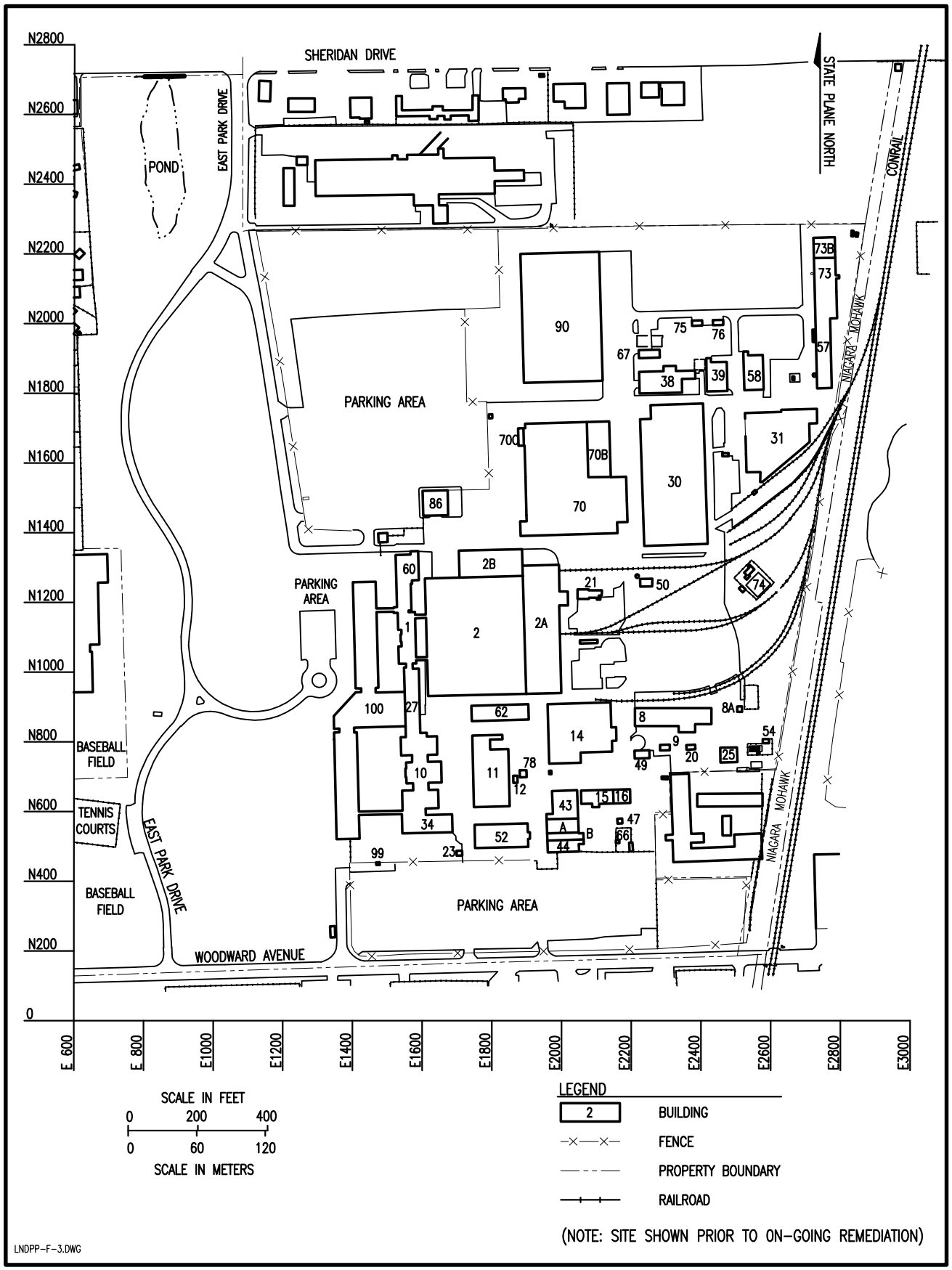


FIGURE 3
LINDE SITE LOCATIONS

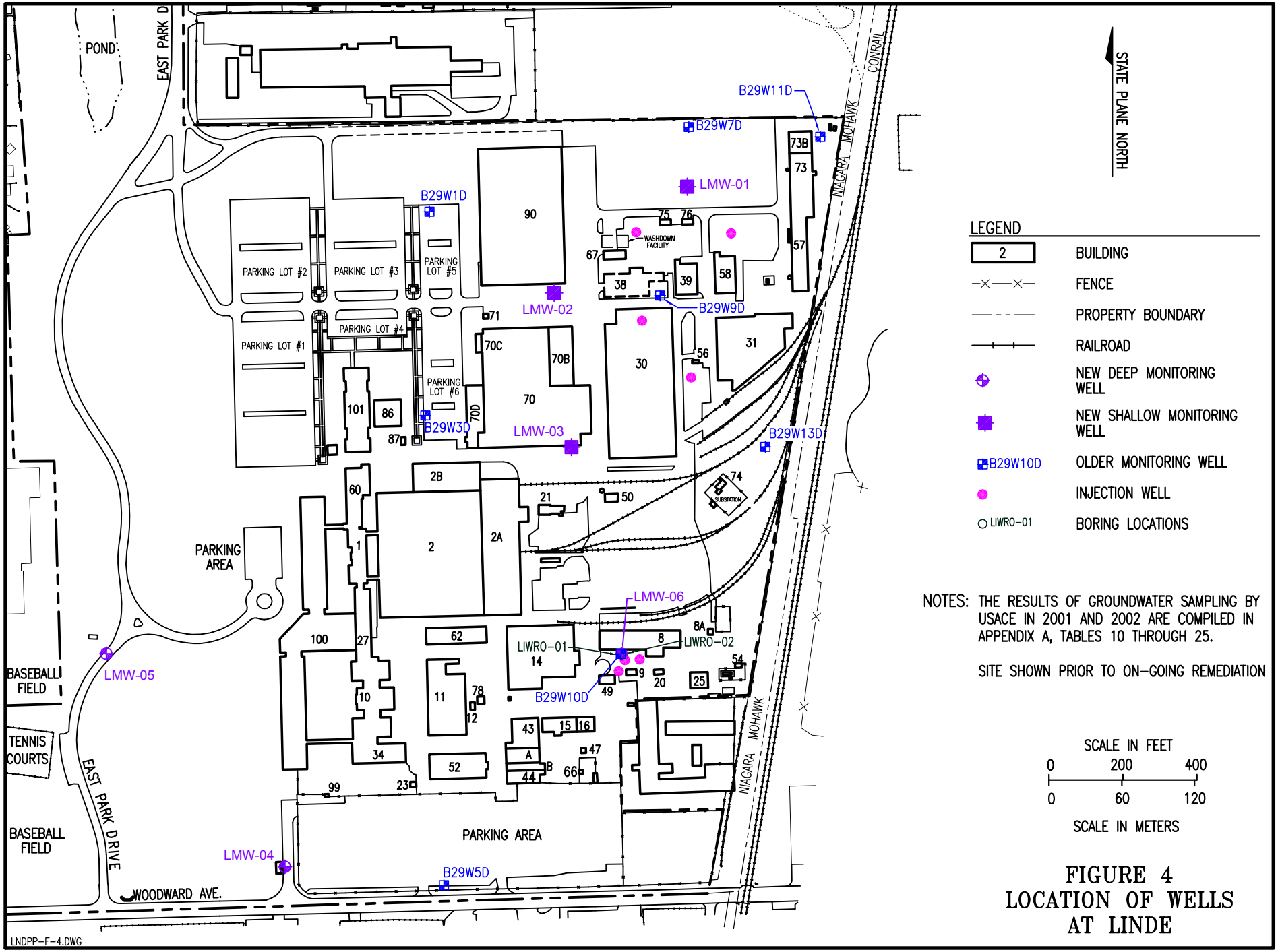


FIGURE 4
LOCATION OF WELLS AT LINDE

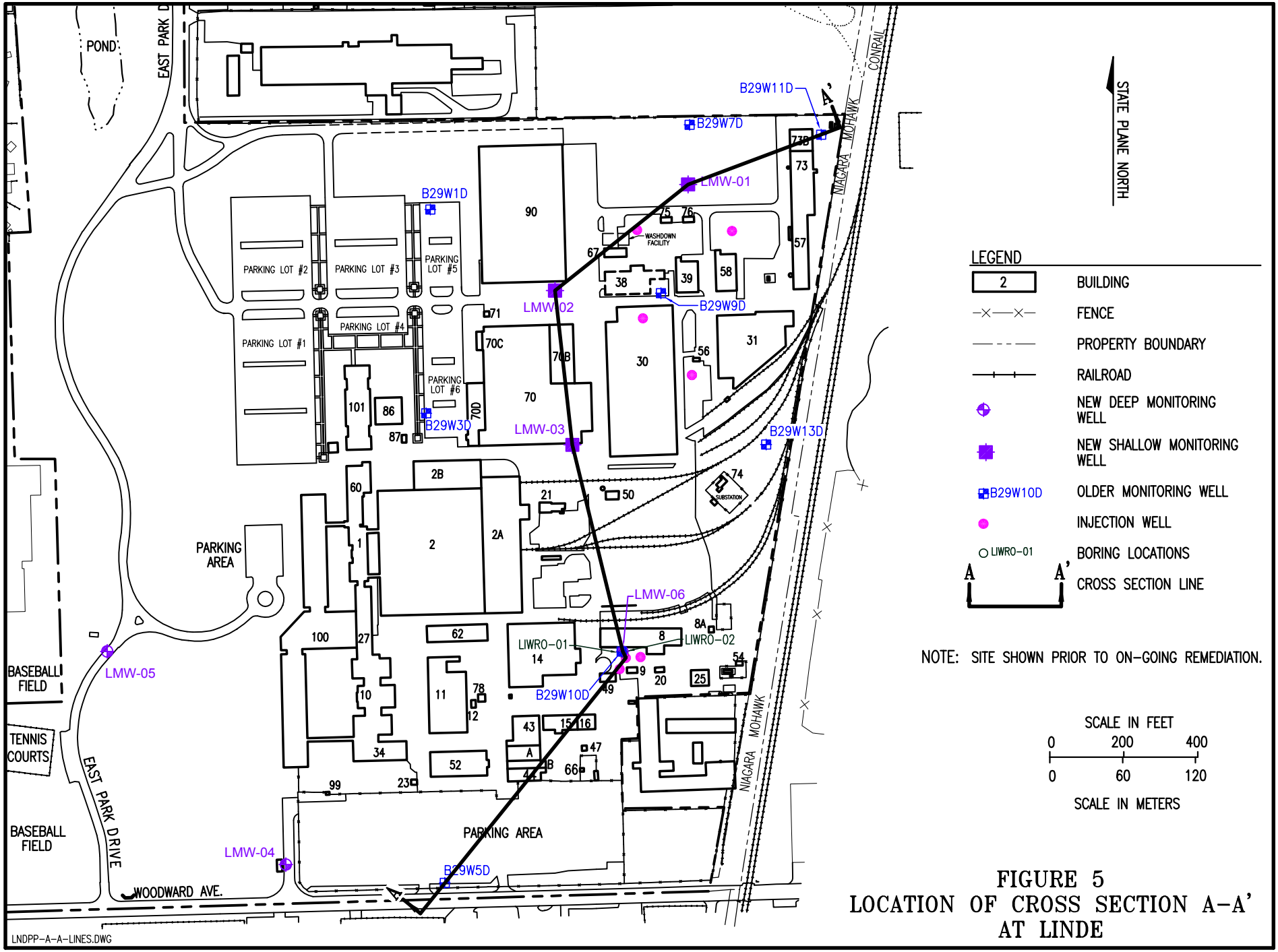
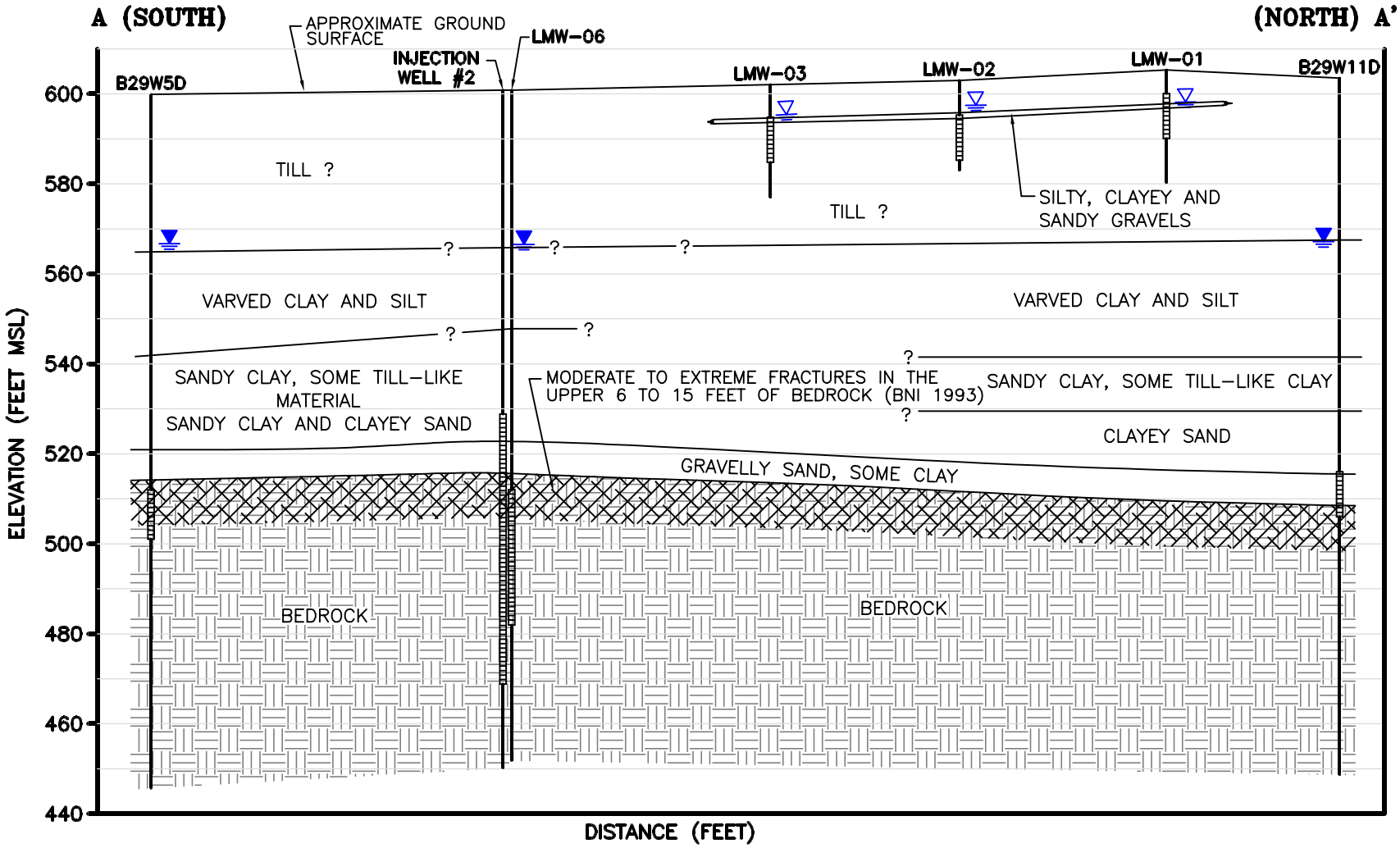


FIGURE 5
LOCATION OF CROSS SECTION A-A' AT LINDE



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

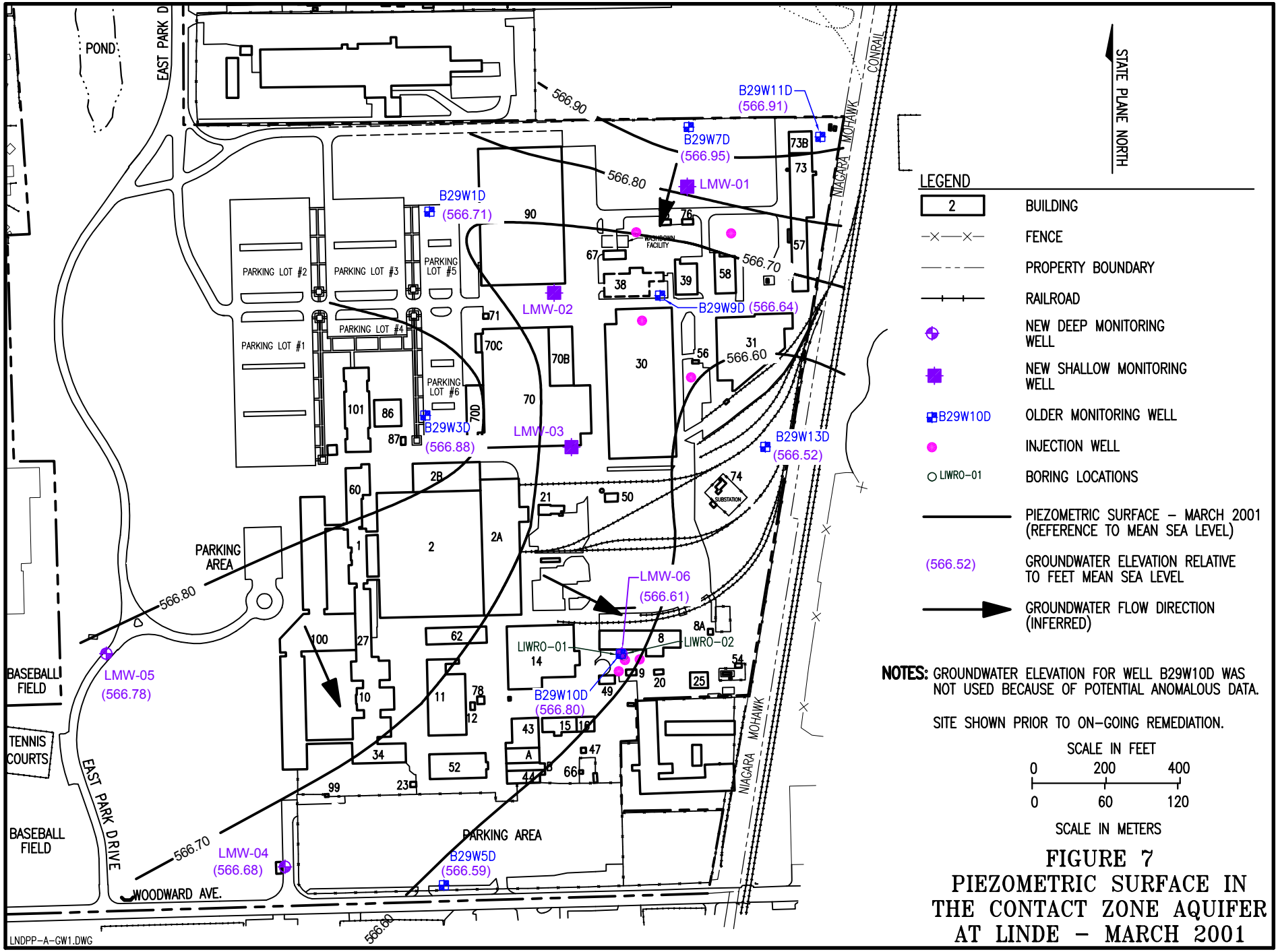


FIGURE 7
PIEZOMETRIC SURFACE IN THE CONTACT ZONE AQUIFER AT LINDE – MARCH 2001

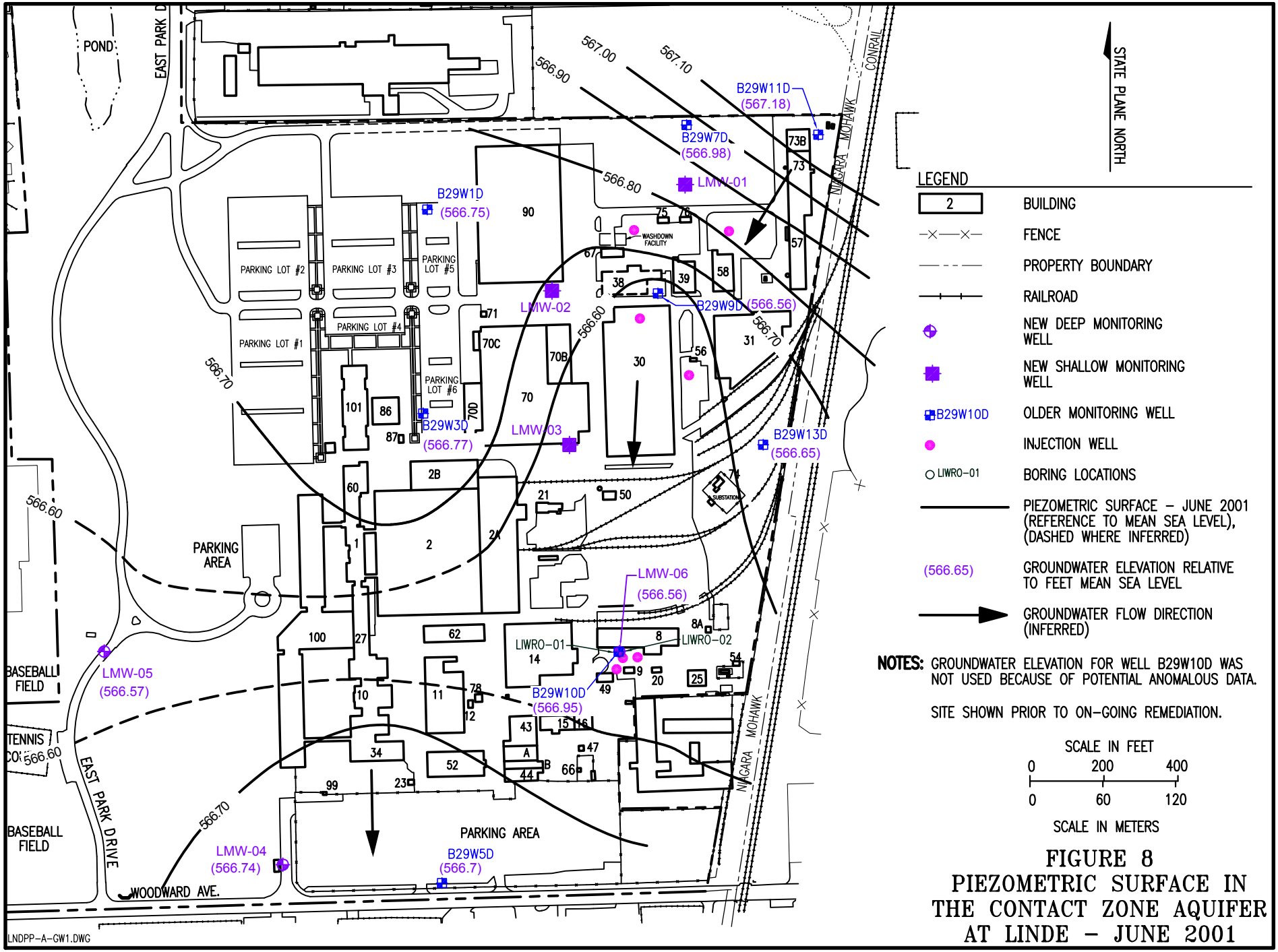


FIGURE 8
PIEZOMETRIC SURFACE IN THE CONTACT ZONE AQUIFER AT LINDE – JUNE 2001

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

Table of Contents

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),
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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,
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PUBLIC MEETING TRANSCRIPT

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

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PROPOSED PLAN FOR THE GROUNDWATER +

OPERABLE UNIT +

LINDE SITE + June 13, 2006

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

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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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P R O C E E D I N G S

LIEUTENANT COLONEL TIMOTHY TOUCHETTE: Thanks for coming everybody. I am Lieutenant Colonel Tim Touchette, Commander of the lower Great Lakes District of Buffalo. We are here today for the public meeting of the Linde Groundwater Proposed Plan. Let me just get through a few slides. I'm going to turn it over to the project manager who's going to run you through the rest of it. Next slide please.

Tonight's meeting, departments; we're going to describe the proposed plan for -- well, let me do something first.

I want to thank everybody for being here. I should recognize a couple of people so you all know who's in the crowd here. First, Congresswoman Slaughter's office, Cathy Lenihan is here; I think she's down front. We've got, from New York State Department of Environmental Conservation, Mr. John Mitchell and Kent Johnson. I think we're here somewhere, right? Over here and over here. And, obviously, the supervisor from the Town of Tonawanda, Mr. Ron Moline. I saw him here earlier. Sir.

SUPERVISOR MOLINE: Here, Colonel.

LIEUTENANT COLONEL TOUCHETTE: Thank you for being here. And then from Praxair, I think, Dennis, Dennis is here. Dennis Conroy is here. Is there anyone else I missed? Okay.

Let me go back to this again. The meeting, tonight we're going to go through the proposed plan for the Linde groundwater operable unit. And then, obviously, the reason it's a public meeting is that we seek public input. We have input by the 30th of June for consideration in the decision making process. This is just a preferred plan, a proposed plan. So, we need the input. Next slide please.

The agenda; these are the things we will cover. I will talk about the introduction, obviously, I just did that. The ground rules. And then Ray will take over, talk about the proposed plan, the presentation. And then we're going to ask for your formal comments in writing, and then we're going to have some time, at the end, for statements, and questions and answers.

Let me give just a couple of ground rules. You know, we need to make this an orderly meeting so that people who have something to

say have an opportunity to do that. And some of these rules are important. First of all, we asked folks, when they came in, if they could sign in on the cards when you came in if you had something to say. That way we can, kind of, put you in a Que, and get you up to speak and not miss anyone. We would ask that one person speaks at a time, so we have it a little orderly. And everybody get a chance to say what they need to say, or what they'd like to say. And speakers will be limited to five minutes, in order -- in case everyone in here wants to speak, that gives us an opportunity to do that without staying here past our time. And then, there's a microphone in the center here; we'd ask you all to use that so that your comments can be recorded, and we can all hear them.

And then, with that, I'm going to turn it over to Mr. Ray Pilon, he's the project manager for Linde.

MR. PILON: Okay. I want to thank everybody. My name's Ray Pilon. I'm the project manager for Linde. I've been the project manager since 1997. What I plan to do

today is run you through some of the things we've done. Explain the process. We call it a CERCLA process. I'll explain that.

I'll discuss some history, how the Linde site became contaminated. I'll explain the ground water investigation that we've completed over the years. And, we'll move on to the end to accept statements and questions.

FUSRAP was established in 1974. Department of energy was the initial federal agency that had responsibility for that. And that program was formed, basically, to investigate, and re-mediate radioactive contamination left over from government operations, mainly Manhattan engineering district, and the Atomic Energy Commission work. The FUSRAP mission statement is first and foremost, to protect human health and the environment. The Corp has been very successful in doing that at Linde, and all the other FUSRAP sites that the Buffalo district is responsible for.

We are supposed to execute this program in the most safe and effective manner. We've done that. I will show some man hours that we've

been able to achieve to insure safety. And, as I said before, we followed the CERCLA precess. That was directed by Congress in 1998. It's pretty much the process that EPA follows for CERCLA fund.

This is pretty much the process. It begins with determination of site designation. The Linde Site was designated into FUSRAP in 1980. Since that time, there's been preliminary assessments, site investigations, remedial investigations, feasibility studies, and various proposed plans for operable units. The Linde site has a groundwater operable unit. This is the last operable unit that the Corp is addressing for the Praxair/Linde site.

The Corp has issued proposed plans for building 14 and soils previously; and I will talk about that. We've issued records of decision.

So, we're at this stage here for groundwater, the proposed plan. This public meeting is to ask for public comments into the preferred alternative. And we will take those comments, analyze them. We'll prepare a response to everybody, and develop a record of

this decision.

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

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

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

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

and rods scheduled for the Tonawanda land fill this year.

The Linde site consists of 105 acres, which is currently owned by Praxair. It was formerly owned by Union Carbide. The number of buildings; we have the home school, in which we're located right now. Just located off to the west.

Manhattan engineering district, back in the 1940's, contracted with Union Carbide to process Uranium Ore as they brought ore's in on rail cars. And, they processed some separation of the ore's. And, as a result of that, there's contamination that's left behind. We had contamination in some buildings, in the soils, and in the groundwater.

In 1993, The Department of Energy came out in Tonawanda and developed the -- they completed the re-medial investigation, and had a proposed plan. As part of that plan, they had some preferred alternatives that weren't acceptable to the community. Basically, they -- the Ashland sites was the problem. They wanted to have a long term storage facility there, and public outcry resulted in DOE going

back and doing a reevaluation of those alternatives.

It's interesting to note, though, that in 1993 the Department of Energy pointed out that the natural conditions of the groundwater at Linde preclude any use for drinking or irrigation without treatment. And that's basically, because the natural conditions of the groundwater are high in sulfates and chlorides, and you couldn't use it. It's like a salty brine. So, if anybody wanted to develop the groundwater for use, they'd have to do treatment, and that's pretty costly. That was the determination in 1993.

1994, as I mentioned, because of the community outcry on the proposed plans, DOE went back and started to reevaluate the alternatives.

In 1997, Congress directed a change in federal responsibility for the agency's. They transferred the responsibility from the Department of Energy to the Army Corps of Engineers. In October 13th, 1997, we got a call that we're responsible, and we picked the ball up, and we've made some great accomplishments.

Keep in mind, it was October 13th, '97; we came in and we evaluated building 30. It was a large building that was sitting on site. There was some contaminated material inside. 100's of drums. We did an evaluation of it, made a recommendation to remove it. And that work began in '98, and was completed in 1999. This is a photo of the removal of building 30. We moved 4,200 tons from Tonawanda.

It was put in a train and sent out to licensed disposal facilities throughout the country. Picture of the gondola cars. That's what the waste was put in. These bags are -- material is loaded, the bags are sealed, and transported to the holding facility.

Also, you might have noticed there was 2,500 man -- or 25,000 man hours executed on that project without any incident; lost time accidents. So, that was done very safely.

While building 30 was being completed, we've continued with our feasibility study for the Linde site. And in 1999 I was on this stage presenting a proposed plan to you, many of you who are here. When we presented that, we said there's no reason to re-mediate

groundwater at that time. That was the findings then. Some of the community had concerns with some of the decisions, particularly building 14 and the groundwater. So, in the year 2000, we issued a record of decision to separate building 14, and the groundwater, and the operable units. And, we issued a record of decision that began cleaning up the contaminated soils on the site.

We've been digging contaminated dirt since 2000. We've been able to achieve 750,000 man hours safely. We've been working very safe. So, we've moved over 250,000 tons of contaminated materials out of New York since 2000.

We we're allowed to begin re-mediating soils. We went and reevaluated the groundwater operable unit, and the building 14 operable unit.

In 2001 we completed the feasibility study on building 14. The proposed plan was 2002, record of decision, following the CERCLA process that you saw. And record of decision decided to remove that building, and we completed that in 2004. This is a photo of the

former building 14; it no longer exists. There was a pilot laboratory for the Manhattan project. We safely worked 73,000 man hours dismantling that. And 14,000 tons of material was removed from the site. This was meticulously dismantled. It wasn't a mass demolition. It was taken apart very strategically.

Okay. As part of our commitment we also said we would reevaluate the groundwater. We met with USCPA in New York State, and developed a sampling plan. And we installed some additional wells to be able to characterize the groundwater within the Linde site.

We completed a feasability in 2004. And we had some comments on feasibility study. In addressing those, we determined that we needed to issue an addendum to that, that accessed the exposure pathways. And, that was issued last year. And we have the proposed plan that we released in May, and our comment period is expired on June 30th. And we're here presenting the preferred alternative.

To understand what -- how the groundwater got impacted, I want to go back to the 1940's

and explain the ore processing facilities, or activities that MED did. They brought the ore in on a rail car. It was unloaded. They started doing a process in which resulted in some waste products. We had liquid waste and solids, sludge like material. That sludge material was taken over the Ashland sites, and some of the material contaminated the soils that we're re-mediating now on site. The radium nuclides, or radium thorium and uranium. And the liquid waste was a problem.

What they did is they had 130,000,000 gallons generated as part of the process. The process went from about 1942 to 1946. When they started generating the waste, they disposed of the material in sanitary sewers. It was released in the sewers, and taken out to the Tonawanda Treatment Plant. And that went on from about 1942 to 1944.

In 1944, they changed the process a little bit, which elevated the Ph levels of the liquid discharge, which became very high in Ph. It was no longer suitable to discharge in sewers, so the government put in some injection wells. And, there was seven put in all together. They

ranged from 90 to 150 feet deep. They're down to bedrock. And, there's about 55 million gallons of that affluent pumped into the ground, down to the bedrock.

It was pumped, if you can imagine the bedrock's 90 to 150 feet deep. There's a clay layer, what they call the deep water Aquifer. As they pump the material down, there was a chemical reaction because the liquid was hot. When it reached the depth, the Uranium particles in the sewer -- in the sludge dropped out and kind of, clung to the clays in the bed rock. So, it's in a solid state down there. It's not in solution.

This slide here shows the various wells that we put in. The areas in pink. There are seven wells. Building 8, building 30, those have all been tested. We've also put in several monitoring wells surrounding the site, to collect additional samples to see if any of the material is moving. And then we also did some analysis on the chemical aspect of that.

This is a profile of a typical groundwater, excuse me, bedrock. It has the gray clays. This material is pumped down 150

feet. It's out of reach to the human population. As I said, we met with New York State DEC and USCPA about 2000/2001 to, kind of, reach agreement on what additional studies we needed to do so that we could go down a path that everybody would be happy.

We did have agreement on characterizing the site. The geology was sufficient. We agreed that additional information on groundwater was required. And we came up with a sampling plan that the agency has agreed was acceptable, meets technical requirements for the analysis.

In 2001 the Corps put in the 6 new monitoring wells, and we sampled the groundwater. And, we also did some sampling in 2002. All together there's three rounds of sampling. 2001 was seasonal, fall and -- spring and fall. And then 2002 was an additional round. We did analysis, and we determined that the natural occurring conditions of the groundwater, kind of matches what the USGS, US Geological Survey. They have a characterization of the area that meets that. It also confirms the high concentrations of the

Sulfates and the Chlorides that the Department of Energy identified in 1993.

And, the natural conditions are that nobody could use that water for any practical use without doing some treatment.

We did a geochemical computer modeling, technical model, kind of developed what the fate in transport of that groundwater was, to determine whether it was moving or not. And the results of that is, that's it's not moving very fast. It's within five feet.

It has not moved off site. And we, kind of determined that that material solutioned out, and it's solid down 150 feet below ground.

We also took a look at the surface soils up above, to see if the contaminates in the soils had a tendency to leach down into the groundwater. As I mentioned, we've been digging dirt up on the surface. We want to know if rain or any run off would migrate material down to the groundwater.

The results of that was no. There is no leaching effect going down to the groundwater, and that potential has been dismissed. As a result of the comments on our first feasibility

study, we went back; there was question on baseline risk assessments. We went back and we looked at the exposure pathways.

And basically, there's four, four elements that's required for an exposure pathway to be complete. The first one is, you have to have a source of the mechanism; that's the groundwater itself. And the injection wells, the environmental transport medium; that's the groundwater, and we have that.

The next one would be point of contact. A receptor, either environmental or human. That does not exist. The groundwater's 100 to 150 feet below ground. There's no point of contact that would exist for anybody to come in contact with that. And we also have to look at the route of exposure, such as ingestion, drinking. And we looked at that. Nobody's drinking the water. It's just sitting down, pretty much, below ground, and not causing any impact to anybody.

So, with that determination, if there's no completed exposures, we've determined that the Uranium solidified out. It's not in solution, it's not moving off site. So there's minimal

transport concerns.

We looked at current and future use. Right now the Town of Tonawanda is being furnished by municipal water supply. It wouldn't be practicable for anybody to try to sink a well in there for using the groundwater because of the natural conditions with the chlorides and sulfates. You'd have to put in expensive treatment to use it. And there's no direct exposure for drinking, breathing, or skin contact.

So, when we have to evaluate all that, we come up with the conclusions that transport's unlikely. There's no evidence of contamination has moved. And we know that the natural conditions, groundwater is such that you couldn't use it without treatment.

We know that the area is being served with municipal water supply. Town of Tonawanda's intake is on the Niagara River, which they're source is Lake Erie and the upper Great Lakes. There's a vast supply of fresh water for the community. So, there's no reasonable, or foreseeable use of the groundwater in the Town of Tonawanda.

So, since there's no point of contact, no exposure routes, there's no threat to any human health, or an environmental receptor. And we've determined that there's no action required to alleviate the groundwater. It provides safe and is protective now, since it's not being used, nor will be used.

Next, that's a preferred alternative that's presented in the proposed plan, the no action plan. We have a decision making schedule. Comments on the proposed plan are due by June 30th. We will close the comment period at the end of the day. And we plan on taking about three months to prepare a response and to do a summary and record of decision . So, if the community wants to send in public, written comments, we have until June 30th, close of business. We will send responses to every comment that we receive. And it will also be issued, in response to this summary, it will be attached to the record of decision.

If anybody needs additional information on the technical studies that have been used to form the basis of this, we have an administrative record established in the Town

of Tonawanda Library on Main Street. And there's also an administrative record at the Buffalo District. That has all the technical documents that support the decision.

And, with that, our address is 1776 Niagara Street, Buffalo, New York, 14207. Please feel free to send comments in to us. And we will accept them up until June 30th. And that's pretty much it for my presentation.

We can open it up for some statements or questions from the public. But, as the Colonel said, we would like to limit it to five minutes per person to allow everybody an opportunity to speak.

Any questions? Mr. Sweet?

MR. SWEET: Good evening. My name if Philip Sweet. I reside in the Town of Tonawanda. And, possibly, I would like to get a little more than five minutes, if possible, if you could open this up after the meeting. Firstly, I think your proposal is, you know, right down the line with what you have been talking. I would like to thank Representative Slaughter's office for being here. And, in particular, I would like to thank Lynn

Marinelli, chair of the Erie County Legislature, for taking up this issue.

I'd like to especially thank Mayor Polosi (sic), for showing an interest in what's going on with the cancer situation in the City, both City of Tonawanda and the Town of Tonawanda. And I'd also like to thank Supervisor Ron Moline, for being here this evening.

One quick question from you; is our community still being monitored for gamma radiation? As of two years ago, you had 21 on site Dosimeters. An additional one, they had to pump here at Holmes elementary. One at the Hillshire complex, and one at the -- Kenmore Mercy Hospital. Also, is Linde/Praxair still in the process of incineration of radium? I live two miles down from Linde/Praxair, and I want to know my air is still being monitored. Also, there's an extensive supply of ammorition 241, which happens to be an isotope of plutonium. What is the reason for such an extensive amount of ammorition 241, what is going on in that scenario? I would appreciate it if you could make some comments on that.

And also, in addition to that, as you

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

And, I appreciate making these comments, and I'd like to add something later on. Thank you very much.

MR. PILON: Okay. Let me address that. I think I can answer three of the questions that you had. One concerned the air monitoring around Linde. We do have 12 perimeter air monitors.

MR. SWEET: They're still there?

MR. PILON: Still there. They've been running since about 1998?

MR. SWEET: Why? Where are they still there?

MR. PILON: Just so that we can know if there's any release or any concerns. There's one on the roof of this school, Phil, so.

MR. SWEET: Are you doing any incinerations?

MR. PILON: There's no incineration that we're aware of.

MR. SWEET: High temperature incineration at Linde/Praxair.

MR. PILON: Nothing that we're aware of.

MR. SWEET: Where did all this ammorition 241 come from?

MR. PILON: The amorite.

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

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

MR. SWEET: Okay.

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

MR. SWEET: I know that.

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

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

MR. PILON: Yes, please do.

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

Tonawanda with a plan for addressing waste materials from the Manhattan project.

At that time the US Department of Energy suggested that a depository be established in the Town of Tonawanda so that not only nuclear waste from the Manhattan Project activity in this area, but also radioactive waste from other places, including Conway, New York, could be stored in one place and then monitored.

It was clear that the US Department of Energy had no intentions to remove material, and really wasn't too interested in what the public reaction was to the plan that they were presenting. This lead to the formation of an organization called CANT, the Coalition Against Nuclear materials in Tonawanda.

That coalition consisted of about 14 elected officials from local, State and Federal levels of government. And I'm not sure if this is good new or bad news, but I think I'm the only one of the 14 still, still in office, and still following the FUSRAP program.

As was pointed out in the presentation, the US Department of Energy , in short, was not very responsive to local concerns.

And, about 10 years ago Congress, wisely, put this program under the jurisdiction of the US Army Corps of Engineers. And during the 9 or 10 years the Corps has had jurisdiction, tremendous progress has been made. And, I think, there are a number of reasons for that progress. The military and civilian leadership of the Corps, in the Buffalo region, has been outstanding. Always placing a top priority on public health and welfare, and protecting the environment. Doing an excellent job communicating with public officials, and with other government agencies, like the DEC, and the New York State Department of Health.

I think another key reason why progress has been made during these ten years is because of the tremendous cooperation from Praxair, particularly under the leadership of Dennis Conroy, as site manager.

Another key factor has been the US Army Corps of Engineers contractor. Ray made reference to 750,000 hours of work without lost time. Obviously, working in an environment where great care has to be taken every day. I think Canada was and continues to be a factor

in the success of the last ten years. And finally, and most important, the support what the public with the program laid out by the Corps of engineers. Mr. Pilon alluded, very briefly, to the sites that have been cleaned up. And, I'm pleased to hear that they're going to acknowledge that formally later in the year. They've done a tremendous job with what I'll refer to as the Ashland sites. They've done a tremendous job cleaning up buildings here on Praxair property.

I'm confident that the plan being proposed for the groundwater aspect of this, a clean up is a sound one. So often decisions are made effecting public health and the environment that generations later are reviewed, questioned, and sometimes addressed through remedial actions. Obviously, that was true with decisions made in the 1940's regarding the radioactive waste, and the impact on the environment and public health.

I don't think anybody forty or fifty years from now, is going to be questioning the wisdom of moving 250,000 tons of radioactive material out of this town. I think that should be

applauded.

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

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

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

Lieutenant Commander Touchette, I wish you well in future assignments.

One question, Mr. Pilon, that I'd like to direct to you is in regard to future monitoring of the groundwater situation. Will there be monitoring of wells, or other methods of evaluating the decision into the future to make sure that there's no migration, or change there?

MR. PILON: the proposed plan does not include any monitoring wells.

MR. MOLINE: Pardon me?

MR. PILON: The proposed plan does not include monitoring in the future. It's pretty much no action, just leave the material down there.

MR. MOLINE: Obviously, I am not an expert in that field, but I think generally, when actions are taken, you like to stay up to date on any changes and assumptions that were made at a particular time. And I'm not sure how that can be handled given the depth that you have referred to on the plan that you have described. That's the only question that I would have. Thank you.

MR. PILON: Thank you.

MR. KRIEGER: My name is Ralph Krieger. I'm president of FACTS, Incorporated. Our organization fought very hard for this community. I worked for Praxair. The original plan was to dump everything down at the land fill. That was the original plan, in a 50 year old technology that was going to last 30 years. Our argument stands today. You can go to U.B., find out that this area is an earthquake prone area. All it takes is one to crack it, there's goes the drinking water for millions of people.

We're sitting on the Great Lakes. The comment was, Mr. Moline and Mr. Pilon. Well, there was other organizations that were involved in getting this stuff moved off and out of this community. Unfortunately, the groundwater and the subterranean water, is not going to be able to be moved. Common sense will tell you that.

However, I got a book from you guys, a little while back. It was very thick. There was supposed to be three permanent monitoring wells put on the Linde site, that will be owned by the Federal government. Mr. Moline is

absolutely right. We can't predict five years, ten years down the road, corrosion, soil movement, land movement, and even an earthquake. We are prone to them. Not great ones, but we are prone to them. They could cause a structural change. We're still sitting on the Great Lakes.

Congress passed a law, and all the Congressmen and Senators in New York State have signed on to it, to clean up the Great Lakes along with Canada. Over a million dollars. There ain't much sense in cleaning up the Great Lakes if it's going to break loose an go back in there. And they don't filter out radioactive material in water treatment facilities.

If anybody wants to take the time to do a little research on medical expenses for the public in the Buffalo area, go do it. I think you'll be very surprised the amount of sicknesses that are in the Buffalo area, not dealing with Praxair. We we're a heavy industry during the war. Very heavy industry. You don't want to even go over to Niagara Falls with the contamination that's going on over

there.

All that's going in our water, the drinking water for millions of people. Everybody should remember that. Unfortunately, the war was the war, things happen. They needed the uranium. Now, we're going to have to deal with it.

One of the things that I would recommend, that the Praxair site be monitored continuously. Because, you're not going to be able to clean it up. I know for a fact, we put a deep well pump, forty feet, out by building 38. Before I left the project, we had to pull that deep well pump. It was a sump pump to keep the water away from the tubs. When we pulled that, you guys were on the property, the DOE was on the property; there was radioactive material on that pump. Where did that come from? Was that leaking up or leaking back? That was a brand new pump. It was put in in the 1970's. I know, because I put it in.

That water was being pumped, not in the sanitary sewers, but waste sewers. That was going where? Niagara River. Those are no longer there.

My other question is; what about building 31? What's happening with 31, and building 8?

MR. PILON: I'm not familiar with the replacement of the pump that you're talking about, but building -- the material over at building 38, was, has been re-mediated down to clay, natural clay. All that soils that was contaminated around building 38 has been removed. So, if that pump was contaminated it's been re-mediated.

MR. KRIEGER: The question remains now, what's happening with building 31 and building 8.

MR. PILON: Okay. Building 31 is on our schedule to remove that. We have indication that the soils beneath it are contaminated, and that's being scheduled for removal.

MR. KRIEGER: Okay.

MR. PILON: And building 8 has been surveyed and the results, right now, are inconclusive, whether it has to be removed or not. We have not found any indication of contamination on building 38.

MR. KRIEGER: The question --

MR. PILON: Or building 8.

MR. KRIEGER: One more question. Did you, in your survey, either you or the DOE. I don't recall ever seeing it. The mercury? Ever found any mercury?

MR. PILON: When we removed building 14, we had some mercury that was disposed of. We have to handle that as a separate waste stream. And, it was taken to a facility that could accept it. So, we did have some mercury at building 14.

MR. KRIEGER: There was some mercury there?

MR. PILON: Un-huh.

MR. KRIEGER: the reason I ask that question, I'm going to be getting involved with some people in Washington on mercury and coal burning generation. And mercury is a big concern on that in the area. And we burn coal at Linde.

MR. PILON: Okay. It's part of the Corps responsibility, when we dispose of material, we have to test it. Not only for radio nuclides, but for other constituents that may require certain permitting facilities to accept it. There's a waste profile developed, and if mercury's on there we have to handle mercury

separately, just like asbestos or any other contaminate concern; we would address it responsibly, and dispose of it in a responsible manner. Okay.

MR. McCORMICK: Dave McCormick, City of Tonawanda. I came here, I thought we were going to talk about all the sites in the area. But, it's good to hear about what you've done here at Linde and with the groundwater, you know, down 150 feet. And you're monitoring it, and you know, you know what's going on. You're cleaning the site up.

But, you did just bring up something that I'm a little nervous about. I live in the City of Tonawanda. There is a land fill up there. They don't dig down 150 feet and start throwing contamination, you know, in the ground. They just start stacking it up. My question is, I live down hill from that site. And last year I attended a meeting at the City of Tonawanda council meeting, and the Mayor and a couple of councilmen said that they got nothing to worry about at that site. My question is, if it's not 150 feet in the ground, and it's ground level, and if we're stacking that, the pile up,

the runoff; do me and my children have something to worry about, my family? About the, you know, the radar -- I mean, the smoke detectors that are not in the ground 150 feet. Obviously, they're at ground level.

And the mayor and a couple of councilmen said we have nothing to worry about last fall. And I brought that question up to them, and now I'm starting to hear it, like, maybe there might be a problem there. Is it safe? That's my question.

MR. PILON: I'm sorry. That site's a mile and a half up north. I know the Corps of Engineers did complete a remedial investigation, and they did not find FUSRAP type of material that we're cleaning up at Linde, in that landfill.

We know there's americium there from an old smoke detector factory, but that's not the responsibility of the Corps of Engineers. New York State DEC, I think, has been involved in that, with the Department of Health. And, I think, they're working with the Town for a closure plan on the landfill. But, I can't speak for the Town's closure plan on the

landfill. I'm sure whatever it is is going to be protective, and I would expect that from being responsible for that landfill.

Any other questions? Mr. Sweet?

MR. SWEET: This is a question addressed to Colonel Touchette. And I wonder if he could comment on this. When I talked to him, last year, at the city of Tonawanda meeting, concerning depleted uranium. And in this handout sheet it refers to Major Doug Rock, PHD, US Army, retired. He's was called in by General Swartzkoff Gulf war one. And he's speaking out on the depleted uranium issue. And I wonder if he could comment, because Major Rock states, the army is required by US Law to treat all person's effected and all area's contaminated, by radioactive uranium emissions; US Army regulations AR70048, from TB91300.278. There are no if's or but's about it.

I would like to go on the list as the first one to be tested for this. Our community has been reluctant to come out. We have experienced much tragedy. We are involved in this cluster cancer dilemma, door to door.

And, this thing has turned political. It

needs to be addressed. If what Doug Rock, Major Rock states is true, then we should follow the law. We should let our residents come forward, and be tested. We're out there. We're testing the water, we're testing the air. We need to test the community.

And, let me say, in particularly in children. I am the children's voice. There's nobody I have heard, speaking out for our children. They're little babies. They are very fragile. Their bodies cannot take the stress of low level radiation. This is what we're talking about.

Doctor Rosalee Bertel, has commented on this situation. She is ready and able to come into this community, and advise on the subject. But, again, I would like the Colonel, if you could Colonel, to make a few comments. And, I think you very much.

LIEUTENANT COLONEL TOUCHETTE: I'll just speak loud here. Oh, no, I'll get a mic. I think I remember that discussion last year. The, I believe, that the depleted uranium that was refereed to by the gentleman you quoted is from M1A1 tank rounds. That's a munition that

has been used in the past, and was used recently in operations, I believe, or perhaps, in the former Yugoslavia. And there was a, there was an initiative by the army to recapture those rounds. The ones that have been expended can see what effects, if any, they had on the soldiers, or the people they effected. That is a separate issue from this. The FUSRAP program does not give us -- The Corps of Engineers works on two things. The authority given to us by Congress, so that the appropriation, which is the money that helps us along. No where in our authority are we given the mandate to go do testing. So, we do not do that. It is not part of our program.

MR. SWEET: I think that what you say is true. However, Major Rock has been speaking out to Congress. He has the support of Congress. And I believe congresswoman Slaughter's office, is going to become involved in this. And I think it's an issue that goes right in to Washington. And eventually, hopefully, it will come back this way. Thank you.

MR. PAPURA: Mr. Sweet I just wanted to

correct one small part. My name is Tom Papura. I'm assisting on the project.

MR. SWEET: Yes.

MR. PAPURA: At no time was any depleted uranium ever processed or utilized at this site. So, that's a separate issue, like the Colonel says. This was natural uranium ore that was brought in, extracted out of the material. So, this is separate issue. So, there's no reason that we would want to be bothered to test for people, you know, for exposure to depleted uranium, it's a whole separate issue.

MR. SWEET: Oh, but not against barium. Any uranium munitions.

MR. PAPURA: There are no munitions at this site sir. There was no munitions processed at this site. This was strictly uranium ore, extracted to be further processed in other locations, in support of the Manhattan engineer district, in hopes of producing a bomb. Sir, this has nothing to do with munitions.

MR. SWEET: I think that this is an issue that Congress needs to take up, because we're in a dilemma. We're in a neighborhood cancer

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

MR. PILON: Okay. Any body else?

MR. PILOZZI: Thank you. Ron Pilozzi, City of Tonawanda. Earlier there was a question posed about the land fill that borders on the City of Tonawanda. Obviously, that's a big concern of ours. And, I think, when the question was posed, there's a dichotomy there. There's two problems. Number one, the problem of americium that, obviously, was not part of the MED situation. But, it's also my understanding that there is radioactive sites along our border, within that land fill that comes from the MED situation. And, I think, unless I heard you wrong; you said that that had nothing to do with MED. Am I right or am I wrong?

MR. PILON: Well, the Corps of Engineers did complete a remedial investigation. My understanding, that the results of that investigation, there's no elevated MED material that would have a trigger action for any response. There's a proposed plan coming out later this year that the re-mediate investigation has been released, and the data's

been provided to New York State, and I believe, the Town and the City. Jim?

MR. CARSTON: Jim Carston, I am the program manager for FUSRAP for the Buffalo District. The Tonawanda landfill that you are referring to, DOE did locate some materials there in Mud Flats area as well. So, we reinvestigated those areas. There is some MED like material there. It doesn't have the same characteristics of the material that we've been cleaning up for Linde. We have done the investigations. The future land use there is a landfill. The state is working with the Town on capping that landfill. We've done some evaluations, and the conclusion, we think there, is that once that landfill is completed, and they put a cover over it, it can not pose any risk to human health or the environment. There will be a, as Ray mentioned, a meeting similar to this later this year.

I believe it's around September, where we will present that no action proposed plan, to basically find nothing to do there, similar to the groundwater here. Because there's no risk to the health and the environment, but that's

something that we actually need to address. Does that answer your question, sir?

MR. SWEET: Thank you.

MR. PILON: If there are no more questions.

MR. SCHAFER: I am Tom Schafer, a member of FACTS, Incorporated. Former employee of Union Carbide Linde. My father was also a former employee at Linde and Praxair. I heard you mention that you're going to tear down building 31. Okay. I have a report from Bechtel Corporation on the radiation levels of 31. And there's a lot of people that are familiar with energy employees occupational illness program. Well, on the list of ailments for radiation exposure, they have listed heart as one of the conditions. And my father was denied that claim. And, in this report, his office, he was being bombarded with gamma from the floor, the walls, the ceiling. Plus his office had sealed windows and a air conditioner that recirculated just the air in the room. Now, I was wondering if you would help me fill the report out so I could resubmit this claim. I'm asking your help.

MR. PILON: I don't know what we can do for

you. The information on building 31 is available. The occupational exposure program that you talk about is being administered by the Department of Labor. And it's really not the agencies mission --

MR. SCHAFER: You couldn't write a letter stating that his office was, would jeopardize anybody's health?

MR. PILON: I think that the Department of Labor has consultants on staff that are doing dose recreation for that program. And, I think your issue is really with the Department of Labor. They have consultants doing reconstruction of the doses of the employees. And, if your father was turned down, there must be a basis for it. I mean, I don't know. But, you know, we could give you the -- you probably have the phone number for the, I think they have a help line.

Okay. So, we can get you the -- there's a help line. It's a 1-800 number that goes in to the occupational expo -- or exposure from the Department of Labor. Maybe if you explained the problem with them, and they can help you. But, we're not really in the business of

recreating doses. That's being handled by the Department of Labor.

Anyone else? All right. Thank you. I appreciate you coming out. It's a beautiful night. We're ending a little early so you can enjoy the day. I encourage, if you want to send in written comments, please do so by June 30th. Thank you.

(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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ATTACHMENTS

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Fax (716) 877-1261

town of tonawanda

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 16JNW06

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

New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
Bureau of Hazardous Waste and Radiation Management, 9th Floor
625 Broadway, Albany, New York 12233-7258
Phone: (518) 402-8594 • **FAX:** (518) 402-9024
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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