

**Five-Year Review Report
Love Canal Superfund Site
City of Niagara Falls
Niagara County, New York**

**Prepared by
U.S. Environmental Protection Agency**

September 2008



EXECUTIVE SUMMARY

This is the second five-year review for the Love Canal Superfund site (Site), located in the City of Niagara Falls, Niagara County, New York. The primary selected remedies for the Site include the following: 1) containment of wastes within the Love Canal landfill (LCL) via capping, leachate collection and treatment and long-term operation, maintenance and monitoring (OM&M) and 2) excavation, treatment and off-site disposal of contamination found in surrounding properties, sewers, creeks and other wastes. Normal residential use is allowed for properties located within Areas 4 through 7 of the Emergency Declaration Area (EDA), surrounding the fenced LCL. Properties in the EDA Areas 1 through 3 are suitable for commercial or light industrial use.

Based upon the results of this review, the U.S. Environmental Protection Agency concludes that the remedies implemented at this Site adequately control exposures of Site contaminants to human and environmental receptors to the extent necessary for the protection of human health and the environment. The continued OM&M at the Site ensures that there are no exposures of Site-related hazardous materials to human or environmental receptors.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name (from WasteLAN): Love Canal		
EPA ID (from WasteLAN): NYD000606947		
Region: 2	State: NY	City/County: Niagara Falls/Niagara
SITE STATUS		
NPL status: <input type="checkbox"/> Final <input checked="" type="checkbox"/> Deleted <input type="checkbox"/> Other (specify)		
Remediation status (choose all that apply): <input type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Constructed <input checked="" type="checkbox"/> Operating		
Multiple OUs? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Construction completion date: 09/29/1999	
Are portions of the site and/or investigated adjacent properties in use or suitable for reuse? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A (site involves groundwater plume and not real property)		
REVIEW STATUS		
Lead agency: <input checked="" type="checkbox"/> EPA <input type="checkbox"/> State <input type="checkbox"/> Tribe <input type="checkbox"/> Other Federal Agency		
Author name: Damian Duda		
Author title: Remedial Project Manager	Author affiliation: EPA	
Review period:** 09/30/2003 to 09/30/2008		
Date of site inspection: April 16, 2008		
Type of review: <input type="checkbox"/> Post-SARA <input checked="" type="checkbox"/> Pre-SARA <input type="checkbox"/> NPL-Removal only <input type="checkbox"/> Non-NPL Remedial Action Site <input type="checkbox"/> NPL State/Tribe-lead <input type="checkbox"/> Regional Discretion		
Review number: <input type="checkbox"/> 1 (first) <input checked="" type="checkbox"/> 2 (second) <input type="checkbox"/> 3 (third) <input type="checkbox"/> Other (specify)		
Triggering action: <input type="checkbox"/> Actual RA Onsite Construction at OU #____ <input type="checkbox"/> Actual RA Start at OU#____ <input type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input type="checkbox"/> Other (specify)		
Triggering action date (from WasteLAN): 09/30/2003		
Is the site protective of public health? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> not yet determined		
Does the report include recommendation(s) and follow-up action(s)? <input type="checkbox"/> yes <input checked="" type="checkbox"/> no <input type="checkbox"/> not yet determined		
Is human exposure under control? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> not yet determined		
Is contaminated groundwater under control? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> not yet determined		
Is the remedy protective of the environment? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> not yet determined		

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (continued)

Issues, Recommendations and Follow-Up Actions

The remedies have been implemented and are functioning as intended by the Site decision documents. There are no additional actions required. The ongoing operations, maintenance and monitoring (OM&M) program is part of the selected remedy. As expected by the decision documents, the OM&M activities are subject to routine modifications and/or adjustments.

This report does include a suggestion for decommissioning some of the Site's monitoring wells (see Table 4). There are no recommendations or follow-up actions necessary to protect public health or the environment.

Protectiveness Statement

The implemented remedies for the Love Canal Superfund site protect human health and the environment. There are no exposure pathways that could result in unacceptable risks and none expected as long as Site property uses remain consistent with the Site's engineered, access and institutional controls that are properly operated, monitored and maintained.

LIST OF IMPORTANT ACRONYMS

CDC	Centers for Disease Control
CNF	City of Niagara Falls
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DHHS	U.S. Department of Health and Human Services
DM	EPA 1982 Decision Memorandum
DOI	U.S. Department of the Interior
EDA	Emergency Declaration Area
EMS	1982 Environmental Monitoring at Love Canal Study
ESD	Explanation of Significant Differences
EPA	U.S. Environmental Protection Agency
FCOR	Final Close Out Report
FEMA	Federal Emergency Management Agency
GSHI	Glenn Springs Holding, Inc.
HD	NYSDOH Decision on Habitability of the EDA
LTMP	Long-Term Monitoring Program
LC	Love Canal
LCARA	Love Canal Area Revitalization Agency
LCHS	1988 Love Canal EDA Habitability Study
LCL	Love Canal Landfill
LCTF	Love Canal Leachate Collection and Treatment Facility
MATA	Maintenance and Technical Assistance Cooperative Agreement
NAPL	Non-Aqueous Phase Liquid
NFBE	Niagara Falls Board of Education
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operation and Maintenance
OM&M	Operations, Maintenance and Monitoring
OCC	Occidental Chemical Corporation
ORD	Office of Research and Development
PACA	Property Acquisition Cooperative Agreement
PCD	1989 Partial Consent Decree
PCOR	Preliminary Close-Out Report
PRP	Potentially Responsible Party
RAR	Remedial Action Report
RPM	Remedial Project Manager
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TRC	Love Canal Technical Review Committee

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U.S. Environmental Protection Agency
Region II
Emergency and Remedial Response Division
Five-Year Review

Love Canal Superfund Site
City of Niagara Falls, Niagara County, New York

I. Introduction

This is the second five-year review for the Love Canal Superfund site (Site), located in the City of Niagara Falls, Niagara County, New York. The primary selected remedies for the Site include the following: 1) containment of wastes within the Love Canal landfill (LCL) via capping, leachate collection and treatment and long-term operation, maintenance and monitoring (OM&M) and 2) excavation, treatment and off-site disposal of contamination found in surrounding properties, sewers, creeks and other Love Canal wastes. Normal residential use is allowed for properties located within Areas 4 through 7 of the Emergency Declaration Area (EDA) surrounding the fenced LCL. Properties in the EDA Areas 1 through 3 require remediation to allow for residential use. *are suitable for commercial/light industrial use.*

This review was conducted by Damian Duda, the U.S. Environmental Protection Agency (EPA) Region II, Remedial Project Manager (RPM) for the Site. A five-year review is required at this Site because hazardous substances, pollutants or contaminants remain at the Site above levels that do not allow for unlimited use and unrestricted exposure. It is the policy of EPA to conduct five-year reviews of pre-SARA remedies which result in hazardous substances remaining on-site. The containment of the LCL was a pre-SARA decision. The purpose of a five-year review is to ensure that the implemented remedies protect human health and the environment and that they function as intended by the Site decision documents. This report will become part of the Site file.

This review covers the period from September 30, 2003 to September 30, 2008. The trigger for this five-year review is the signature date of the last five-year review.

The lead agency for this review is EPA Region II.

II. Site Chronology

Chronology of Site Events	
Event	Date
President Carter issued the first Emergency Declaration at the Love Canal landfill (LCL).	August 1978
Construction of the LC leachate collection system and treatment facility (LCTF)	October 1978 - December 1979
President Carter issued the second Emergency Declaration at the LCL. The Emergency Declaration Area (EDA) surrounding the LCL was established.	May 1980
Love Canal Area Revitalization Agency (LCARA) created to revitalize the EDA.	June 18, 1980
The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) enacted. A National Priorities List (NPL) of Superfund sites established.	December 1980
NYSDEC assumes control of LCTF from Elia Construction Company. Conestoga Rovers and Associates Remain as Consultant.	March 1981
Love Canal site proposed to the National Priorities List (NPL).	1981
EPA issued <u>Environmental Monitoring at Love Canal</u> study.	May 1982
EPA issued a <u>Decision Memorandum: Cooperative Agreement with the State of New York for Love Canal</u> (1982 DM) a precursor to the Superfund Record of Decision (ROD).	July 1982
EPA opened Public Information Office in Niagara Falls to manage Superfund sites in the Niagara Falls area.	September 1982
New York State Department of Environmental Conservation (NYSDEC) opened Public Information Office (PIO) in the EDA.	March 1983
EPA initiated Love Canal EDA Habitability Study (LCHS).	1983
Love Canal Superfund site was added to the NPL.	1983
Rings I and II homes and 99 th Street School, surrounding and near the LCL, demolished.	June 1983
EPA established multi-agency Love Canal Technical Review Committee (TRC) [EPA, Centers for Disease Control, NYSDOH and NYSDEC].	August 1983
Collection system cleaned [high pressure] by OH Materials with NYSDEC oversight.	1983

NYSDEC installed 40-acre high-density polyethylene liner cap on the LCL.	November 1984
Modifications made to the LCTF	December 1984
EPA issued a ROD (ROD 1985) to remediate the EDA sewers and Black Creek and Bergholtz Creek.	May 1985
Superfund Amendments and Reauthorization Act (SARA): Section 312 Provisions for Love Canal: Love Canal EDA Habitability Study (LCHS), Property Acquisition and Maintenance and Technical Assistance Cooperative Agreements (PACA/MATA).	1986
Sewer sediments' remediation.	1986-1987
Construction of new Administration Building on LCL.	1987
EPA entered into first cooperative agreement with LCARA to implement the PACA mandates of Section 312 of SARA.	June 1987
EPA issued ROD (ROD 1987) to address final disposal of sewer and creek sediments.	October 1987
EPA issued a ROD (ROD 1988) for the 93 rd Street School selected remedy [separate study].	September 1988
The NYS Commissioner of Health issued a Decision on Habitability of the EDA, determining that EDA Areas 1-3 were nonhabitable but available for commercial/industrial use and EDA Areas 4-7 were deemed habitable.	September 1988
Creek sediments remediation: 1) dewatered, 2) stabilized and 3) bagged at 93 rd Street School staging facility. Previously remediated sewer sediments bagged in this operation.	1987-1989
All dewatered, stabilized and bagged sewer and creek sediments stored at Occidental Chemical Corporation's (OCC) Niagara Falls Main Plant.	1989-1998
OCC and EPA sign partial consent decree for OCC to perform part of the Love Canal cleanup activities.	May 1989
EPA entered into second cooperative agreement with LCARA to implement the MATA mandates of Section 312 of SARA.	May 1989
EPA published an Explanation of Significant Differences (1989 ESD) to 1985 and 1987 RODs.	1989
Rehabilitated EDA homes offered for sale by LCARA.	1990
EPA issued an amendment (1991 Amendment) to the 1988 ROD for the 93 rd Street School to excavate soils and dispose of off-site.	May 1991

Programmable Logic Controller (PLC) system installed at LCTF to operate field pumps, holding tank and process tanks.	Summer 1991
Collection system high pressure cleaned and videotaped with NYSDEC oversight.	November 1991
93 rd Street School soils' remediation completed, as identified in the 1991 Amendment.	September 1992
NYSDEC closed its PIO in the EDA.	March 1993
NYSDEC cost recovery settlement with OCC: \$130 million.	1995
OCC begins operation of LCTF monitoring program and issuance of O&M reports.	April 1995
EPA cost recovery settlement with OCC: \$129 million plus interest.	March 1996
EPA issued the second ESD (ESD 1996), authorizing thermal treatment and/or land disposal of Love Canal waste materials at off-site commercial incinerator and landfill.	November 1996
OCC shipped bagged Love Canal wastes for final disposal.	February 1998- August 1999
EPA issued the third ESD (1998 ESD), granting a treatability variance to OCC to eliminate the requirement that the stored Love Canal waste materials containing dioxin at concentrations between 1 ppb and 10 ppb be incinerated.	December 1998
Love Canal Preliminary Close-Out Report [construction completion]	September 1999
Bagged Love Canal wastes incineration [completed].	October 1999
Five-Year Review Site Inspection	June 2003
LCARA, as an agency of NYS, formally dissolved by NYS statute	August 27, 2003
Five-Year Review Report issued	September 30, 2003
Remedial Action Report for LCARA	September 30, 2003
Love Canal Final Close Out Report	March 4, 2004
Love Canal Superfund Site was deleted from the NPL	September 30, 2004
Second Five-Year Review Site Inspection	April 10, 2008

III. Background

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Site Location and Physical Descriptions

The Site is in an urban area in the southeast corner of the City of Niagara Falls (CNF), approximately 1/4 mile north of the Niagara River in Niagara County, New York (see Figure 1). Approximately 2000 people are located within a mile of the Love Canal landfill (LCL), and 10,000 people live within 3 miles. The area is served by a public water supply system; the CNF water treatment plant serves 55,000 people.

History of Contamination

The Site includes a 3,200 feet by 80 feet canal section (one of two discontinuous sections) that was excavated by William T. Love in the late 1800s for a proposed hydroelectric power project which was subsequently abandoned. Between 1942 and 1952, the Hooker Chemicals & Plastics Corporation (now Occidental Chemical Corporation (OCC)) disposed of approximately 22,000 tons of drummed and liquid chemical wastes, including polycyclic aromatic hydrocarbons, halogenated organics, pesticides, chlororobenzenes and trichlorophenols, containing dioxin, in the abandoned canal, which subsequently became known as the Love Canal Landfill (LCL). In 1953, the LCL was covered with soil and deeded by Hooker Chemicals to the CNF Board of Education (NFBE).

Subsequently, the surrounding area near the covered LCL was extensively developed with the construction of numerous homes and an elementary school (99th Street School). Problems with odors and residues in the basements and backyards of the affected properties were first reported in the 1970's. Also, during the 1970's, unusually high precipitation in the region caused the water table within the LCL to rise, which allowed contaminants to spread laterally in surficial soils and along utility bedding, eventually seeping into the basements of nearby homes. Various studies, conducted at this time, verified that numerous toxic chemicals had migrated into the surrounding area directly adjacent to the original disposal area. Dioxin and other contaminants also migrated from the LCL to the sanitary and storm sewers which extended outside the LCL boundaries, some with outfalls into nearby Black, Bergholtz and Cayuga creeks, as well as the Niagara River. Extensive investigation of the groundwater was conducted via the numerous monitoring wells, both on-site and off-site. Levels of contaminants of concerns were found not to be of concern outside the area of the LCL.

In 1978, the New York State Department of Health (NYSDOH) identified more than 80 chemicals in the LCL and adjacent soils. The two rings of homes (239 properties), *i.e.*, those directly abutting the LCL and those areas across the street from the houses abutting the LCL, were subsequently identified as Ring I and Ring II, respectively.

Initial Response

In August 1978, further sampling prompted the New York State (NYS) Commissioner of Health to order the closure of the 99th Street School and to recommend that pregnant women and children under two years of age who lived in the Rings I and II homes evacuate the area

immediately and that residents avoid the use of their basements as much as possible and avoid consuming home-grown produce. An eight-foot-high chain-link fence was installed around the LCL and the Rings I and II homes.

Also, in August 1978, President Carter issued the first of two Emergency Declarations at the Site. The first emergency declaration provided Federal funding for remedial work to contain the chemical wastes at the Site and for the relocation of the Ring I and Ring II residents.

In May 1980, President Carter issued the second Declaration of Emergency at the Site. This emergency declaration specifically established the Emergency Declaration Area (EDA), the approximately 350-acre neighborhood surrounding the LCL, and authorized \$20 million of Federal funds for the purchase of homes. The Federal Emergency Management Agency (FEMA) disbursed these funds and, together with the New York State Department of Environmental Conservation (NYSDEC), relocated hundreds of the affected families. As a result, approximately 950 families, of the more than 1,050 families affected, were evacuated from a 10-square-block area surrounding the LCL.

In December 1980, the contamination problems discovered at the LCL and other sites led to Congress enacting the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address thousands of hazardous waste sites nationwide. The law established a "Superfund" Trust Fund based on excise taxes from crude oil and certain commercially-produced chemicals. Based on state referrals, EPA began a National Priorities List (NPL) of sites requiring comprehensive cleanup.

Basis for Taking Action

Early in 1978, NYSDOH and NYSDEC contacted EPA for technical assistance. EPA and NYSDOH sampled indoor air and stream sediments, biota, groundwater and surface water. NYSDOH also sampled sumps, and EPA evaluated ambient air and storm sewers around the LCL. This additional sampling showed significant chemical contamination in private homes adjacent to the LCL.

In 1981, EPA proposed the addition of the Site to the NPL, making it available for funding under the Superfund legislation. The Site was added to the NPL in 1983.

In 1982, the U.S. Department of Health and Human Services and NYSDOH determined that the homes in the EDA outside Ring I and Ring II could be reoccupied. This decision was based on data presented in the May 1982 Environmental Monitoring at Love Canal Study (EMS), prepared by EPA's Office of Research and Development (ORD), which evaluated the nature and extent of contamination throughout the EDA, including air, soils, groundwater, surface water, sediments and biota sampling. However, because the ORD study was heavily criticized, EPA initiated additional study activities in 1983 to determine the habitability of the EDA. This effort represented the early work of what became known as the Love Canal EDA Habitability Study (LCHS), which is described below.

In addition to the investigations described above, there were other field investigations and studies conducted at the Site, which included the following:

- Malcolm Pirie - Environmental Information Document - Site Investigations and Remedial Action Alternatives - Love Canal [October 1983] (evaluated contamination in creeks and sewers and alternatives for remediation).
- CH2M Hill - Love Canal Sewer and Creek Remedial Alternative Evaluation and Risk Assessment [March 1985] (evaluated risks posed by contamination in creeks and sewers, further evaluated alternatives for remediating the creeks and presented a proposed remedial action plan). This report represented the Feasibility Study for the May 1985 Record of Decision (1985 ROD).
- E.C. Jordan - Long-Term Monitoring Program Design for the Love Canal Remedial Project [August 1985] (evaluated groundwater contamination and effectiveness of the barrier drain/cap system). During 1985-87, hundreds of monitoring wells were installed.
- LCHS [May-July 1988] (evaluated indoor air and soil contamination in the EDA and comparison neighborhoods, using the developed habitability criteria).
- 93rd St. School Remedial Investigation and Feasibility Study (RI/FS) [March 1988] (evaluated the nature and extent of contamination at the 93rd St. School and alternatives for remediating this contamination).

EDA Habitability, Property Acquisition and Maintenance and Technical Assistance

In August 1983, EPA, in order to address Congressional concerns raised by the 1982 EMS, established the multi-agency Love Canal Technical Review Committee (TRC) to act as a management group to provide interagency coordination and oversight for further remedial and habitability activities for the Site. The TRC was comprised of senior-level representatives from EPA, the Centers for Disease Control, NYSDOH and NYSDEC. The principal task of the TRC was to determine the habitability of the EDA surrounding the Site. The EDA was subsequently divided into seven distinct sampling areas.

In order to insure that the criteria for habitability were technically sound and to assist in the actual development of the criteria, the TRC convened a group of scientists, consisting of experts in various fields. For the habitability criteria, the experts reviewed environmental data, executed and planned remedial measures and published and unpublished health studies. Various EPA contractors were involved in the preparation of this study, including CH2M Hill for sampling analysis, management and preparation of the report and PRC, Life Systems and ACER for peer review of the study design and final report.

The 1986 Superfund Amendments and Reauthorization Act (SARA) to CERCLA included specific provisions for the Site. These provisions were identified in Section 312 of SARA which addressed significant program aspects of the Site, including:

- Completion of a study of the habitability of the EDA, *i.e.*, the LCHS.
- Acquisition of those properties which were not eligible for government acquisition under the FEMA acquisition program.

- Maintenance of property acquired under the FEMA and SARA acquisition programs.
- Provided technical assistance to the LCARA¹ to facilitate its efforts to revitalize the EDA.

The LCHS was completed during May-July 1988. In September 1988, using the results of the CHS, the NYS Commissioner of Health issued a Decision on Habitability (HD), which identified appropriate land uses for the seven designated areas of the EDA. Areas 1-3 were declared not suitable for residential use, *i.e.*, nonhabitable, but were suitable for commercial/industrial use. Areas 4-7 were deemed habitable, *i.e.*, suitable for residential use.

In 1987, EPA entered into the first of two cooperative agreements with LCARA to implement the mandates of Section 312 of CERCLA. The Property Acquisition Cooperative Agreement (PACA) dealt with LCARA's EDA property acquisition program and is documented in EPA's September 1996 Remedial Action Report for the Site. Under the PACA, LCARA purchased approximately 100 properties. Prior to this, LCARA purchased approximately 500 properties under the FEMA acquisition program.

In 1989, EPA entered into the second cooperative Agreement with LCARA to implement the maintenance and technical assistance (MATA) mandates of Section 312 of CERCLA. Under the MATA agreement, EPA provided LCARA with funds to maintain improved and unimproved EDA properties. While the majority of these funds were used to maintain EDA homes slated for rehabilitation, a portion of the funds were also used to demolish deteriorated EDA homes that presented safety concerns or a net loss to the overall property value. Under the MATA program, over 250 homes were demolished. EPA closed out the MATA grant in May 2003.

EPA's technical assistance has supported LCARA's efforts to revitalize the EDA. The offices of LCARA were located in the EDA, and LCARA's Board of Directors conducted monthly meetings in a public forum on the progress of the revitalization of the EDA. The final meeting of the LCARA Board was held in May 2000. LCARA sold approximately 260 homes in the areas slated for residential use and prepared a master plan for the areas slated for commercial/industrial use. Since its original mission of rehabilitating the EDA was completed, LCARA, an agency of NYS, was formally abolished, effective August 31, 2003, by a June 2003 act of the NYS legislature.

Records of Decision Findings

In July 1982, the EPA Region 2 Administrator issued a Decision Memorandum: Cooperative Agreement with the State of New York for Love Canal (1982 DM); this document was a precursor to the 1985 ROD. The 1982 DM documented the work that had been performed by NYSDEC, approved additional Federal funding and identified a phased approach for conducting eight additional tasks, which included the following:

- Undertake Site containment via an expanded leachate collection system and/or other containment option.
- Investigate/remediate contamination in the north end storm and sanitary sewer system.
- Investigate/remediate contamination in Black and Bergholtz creeks.

¹ A New York State Agency which was designated as the lead agency in the rehabilitation effort of the properties in the Love Canal EDA. LCARA was also identified in Section 312 of the SARA Amendments.

- Investigate/remediate contamination in the south end storm sewers.
- Investigate/remediate contamination in the western sanitary sewers and life stations.
- Develop long-term monitoring to ensure the effectiveness of the cleanup activities.
- Investigate/remediate 102nd Street outfall.
- Prepare summary document with conclusions.

In 1983, please note that the original leachate collection system was not extended but was high pressure cleaned to ensure that it continued to perform, according to specifications.

EPA issued the 1985 ROD with a selected remedy to remediate the sediments in the sewers and the creeks in the EDA. This ROD called for:

- hydraulically cleaning the sewers;
- dredging and hydraulically cleaning the Black Creek culverts;
- removing Black and Bergholtz creeks' sediments with dioxin concentrations exceeding one part per billion (ppb);
- construction of an on-site interim storage facility for the creek and sewer sediments; and,
- remediation of the 102nd Street outfall area. (Please note that this action was subsequently addressed under the remedial action performed on the 102nd Street Landfill Superfund site).

In October 1987, EPA issued a second ROD (1987 ROD) and selected a remedy to address the destruction and disposal of the dioxin-contaminated sediments from the sewers and creeks. This ROD called for:

- construction of an on-site facility to dewater the sewer and creek sediments and to contain the dewatered sediments;
- construction of a separate on-site facility to treat the dewatered sediments through high temperature thermal destruction;
- on-site thermal treatment of the residuals stored at the Site from the leachate treatment facility and other associated Love Canal waste materials; and,
- on-site disposal of any nonhazardous residuals from the thermal treatment or incineration process.

In 1989, EPA published an ESD (1989 ESD) to the 1985 and 1987 RODs, which specified that creek sediments were to be dewatered at creek side, placed in polyethylene bags and then transported to OCC's Niagara Falls Main Plant for temporary storage, pending construction of a high temperature thermal destruction unit at that plant. In addition, other Love Canal wastes, including the sewer sediments and other remedial wastes originally targeted for thermal treatment at the Site, were also to be thermally treated at OCC's Niagara Falls Main Plant rather than at the Site. In 1989, OCC, the United States and the State of New York entered into an agreement, *i.e.*, a partial consent decree (PCD), filed in U.S. District Court, to implement these modifications to the 1985 and 1987 RODs.

In November 1996, EPA issued a second ESD (1996 ESD) for the 1987 ROD. This ESD authorized thermal treatment and/or land disposal of the stored Love Canal waste materials at an off-site commercial incinerator and landfill rather than at OCC's Niagara Falls Main Plant.

In December 1998, EPA issued the third ESD (1998 ESD) which provided notice that EPA was granting a treatability variance to OCC to eliminate the requirement that the stored Love Canal waste materials containing dioxin at concentrations between 1ppb and 10 ppb be incinerated. As a result of this variance, these materials could be disposed at a commercial hazardous waste landfill without treatment. Materials containing dioxin at concentrations greater than 10 ppb were required to be incinerated with residues approved for disposal to landfill.

In September 1988, EPA issued a third ROD (1988 ROD) for the Site, which selected a remedy for contaminated soils at the 93rd Street School. The selected remedy included the following actions:

- excavation of approximately 7500 cubic yards of contaminated soil adjacent to the school;
- on-site solidification and stabilization of the contaminated soils; and,
- return of the stabilized soils to the excavated area.

After the issuance of the 1988 ROD, the NFBE raised concerns that leaving the treated soils on-site would limit its options for reuse of the property. In May 1991, EPA issued an amendment to the 1988 ROD (1991 Amendment), which modified the remedy and called for excavation and off-site disposal of the contaminated soils.

IV. Remedial Actions

Between 1978 and 1982, various remedial cleanup measures were conducted at the Site by NYSDEC and its contractors. As indicated above, these specific remedial activities were formally memorialized and documented by EPA in its 1982 DM. The 1982 DM was a precursor to the 1985 ROD and also identified necessary further remedial measures. These future cleanup measures were specified in the various Records of Decision, discussed above, which were issued subsequent to EPA's 1982 DM.

Improvements to the Containment System

By June 1983, the Rings I and II homes and the 99th Street School, adjacent to the LCL, had been demolished. Some of the remedial actions, specified in the 1982 DM, were completed by 1985. In 1985, NYSDEC installed the 40-acre cap [expanding from the original 22-acres, covered by the original 3-foot clay cap], consisting of high-density polyethylene liner which was then covered by 18 inches of clean soil and seeded for grass. In December 1984, technical and structural modifications were made to the LCTF. These actions are documented in the Final Report Love Canal Remedial Action Project - Northern and Central Sectors, November 1985.

Removal of Contaminated Creek and Sewer Sediments

The remediation of the contaminated sewers was performed during 1986 and 1987. A total of 68,000 linear feet of storm and sanitary sewers were cleaned. An on-site facility was constructed to dewater sewer contaminants. From 1987 until 1989, Black and Bergholtz creeks were

dredged of approximately 14,000 cubic yards of sediments. Clean soils and riprap was placed in the creek beds, and the banks were replanted with grass. These two remedial actions conformed with the portions of the 1985 ROD, requiring the removal of dioxin-contaminated sediments

from the creeks and sewers. Some additional sewer cleanup work was completed in 1987. The creek work is documented in the Final Engineering Report - Love Canal Black and Bergholtz Creeks Remediation, October 1990.

Short-Term Remedial Projects

In November 1988, 10 cubic yards of dioxin-contaminated soils were removed from a location in EDA Area 2, identified as Lot C on 100th Street. These excavated soils were drummed and stored at the Site, prior to final disposal off-site.

In September 1993, three other short term projects were also completed: 1) the Frontier Avenue Sewer Project required excavation and disposal of contaminated pipe bedding and replacement with new pipe and bedding--excavated materials have been transported for off-site thermal treatment and/or land disposal. Also, a small section of the Frontier Avenue sewer which ran along the outskirts of the containment system was rerouted in 1992; 2) the EDA 4 Project required the excavation and disposal of a hot spot of pesticide contaminated soils in the EDA Area 4 with backfill with clean soils; excavated materials were disposed of off-site; and 3) the Love Canal Cap Repair required the liner replacement and regrading of a portion of the cap. These actions are documented in the Remedial Action Report for the Love Canal Site: EDA 4, Frontier Avenue/100th Street and the Love Canal Cap Repair, September 1993.

Interim Storage and Treatment/Disposal of Creek and Sewer Sediments and Other Love Canal Waste Materials

The treatment and disposal of the sewer and creek sediments represents the last remedial action that was completed for the Site. In 1988, concurrent with the excavation of the creek sediments by Severson Environmental, Inc., contractor to NYSDEC, OCC's contractor, Conestoga-Rovers & Associates Limited, received the sediments at a staging area near the 93rd St. School. At this staging area, the creek sediments were dewatered, stabilized, bagged and transported to OCC's Niagara Falls Main Plant for temporary storage in its RCRA-permitted storage buildings, awaiting thermal treatment and/or land disposal. The sewer sediments and other Love Canal wastes targeted for treatment under the 1987 ROD were also bagged and transported for storage to OCC's Niagara Falls Main Plant. A total of 15,496 bags, representing approximately 39,000 cubic yards of Love Canal waste materials, were stored at OCC's Niagara Falls Main Plant. In February 1998, OCC began shipping the bagged Love Canal wastes from its storage facilities for disposal. In August 1999, the last remaining bags of wastes were shipped for ultimate disposal, either for thermal destruction or for landfilling at facilities outside of New York State. Of these, 10,262 bags were directly land disposed in a Subtitle C facility at the Grassy Mountain Landfill, Utah. The remaining 5,234 bags were incinerated at Deer Park, Texas and Originate, Utah, prior to land disposal of the ash residue in Subtitle C facilities at Deer Park, Texas and Grassy Mountain, Utah, respectively. This Remedial Action was completed in August 1999 and is documented in the March 2000 Remedial Action Report (RAR): Final Treatment/Disposal of Love Canal Sewer and Creek Sediments and Other Remedial Wastes.

In 1992, the contaminated soils at the 93rd Street School were excavated; these materials were used for alternate grading material below the final cap that was installed at the 102nd Street Landfill Superfund site. This remedial action was completed in September 1992 and is documented in the September 1992 Final Report for the Remediation of the 93rd Street School Site.

V. Operation, Maintenance and Monitoring

The operation, maintenance and monitoring (OM&M) of the remedial systems at the Site is to ensure that there is no off-site migration of chemical contaminants from the Site. Remedial operations first began in October 1978 with the installation of a barrier drain along the east and west sides of the south section of the LCL. The barrier drain was later extended to completely encompass the LCL. The barrier drain, designed to intercept the shallow lateral groundwater flow, consists of a trench that is 15-to-25 feet deep and 4 feet wide. Within the trench are 6-inch and 8-inch diameter perforated clay tile drains, centered in 2 feet of uniformly sized stone which is overlain to the surface with sand. Lateral trenches filled with sand were excavated perpendicular to the barrier drain in the direction of the LCL. The tile drain is graded toward a series of manholes and wet wells (PC-1A/PC-2A North/Central and wet well 7 and 8) where the leachate is collected. The well collection system consists of two sectors: the North/Central Collection System and the Southern Collection System. The leachate is then pumped from the wet wells to two underground holding tanks (PC-3A North/Central and PC-3 South) where it is held prior to being treated at the on-site treatment facility and subsequently discharged into the CNF sanitary sewer system. Quarterly effluent sampling is conducted. All results were well below the permitted discharge limits.

Responsibility of the OM&M of the Site was transferred from NYSDEC to OCC in April 1995. Since July 1, 1998, OCC's responsibility at the Site has been carried out by Glenn Springs Holdings, Inc. (GSHI) (a subsidiary of Occidental Petroleum Corporation). To date, there have been 13 annual reports prepared by or on behalf of OCC, which cover OM&M activities from 1995 through 2007.

GSHI, in coordination with its contractor, CRA, manages the day-to-day OM&M activities at the Site. NYSDEC oversees GSHI's OM&M activities and provides direction to GSHI on the scope and extent of the annual monitoring and reporting tasks, include the following: groundwater monitoring at various wells on or around the Site; groundwater elevation measurement at piezometers located around the Site; operation and maintenance of the leachate collection and treatment system; and, an annual performance assessment of the leachate collection and treatment facility (LCTF) and the barrier drain system.

The OM&M report that is completed by GSHI examines the long-term monitoring program (LTMP) that is in effect for the Site. The LTMP examines hydrogeologic and chemical data from the Site in order to evaluate the effectiveness of the containment system.

~~Currently, there are 153 active monitoring wells for the Site (132 overburden and 21 bedrock).~~

Currently, there are 153 active monitoring wells for the Site (132 overburden and 21 bedrock). There are also 71 inactive wells which have been proposed for decommissioning. In order to cover all 153 active monitoring wells in and around the Site, a different group of about 30-40 wells is sampled each year. This round-robin technique allows for the complete array of bedrock and overburden monitoring wells to be sampled over a period of years. Some wells, located on-site, are routinely sampled every year, *i.e.*, MW-10135.

Water levels are measured through various piezometers in and around the Site. The piezometers show the overburden groundwater flow conditions. Overall, the groundwater level data shows that groundwater flow direction in the vicinity of the barrier drain is towards the barrier drain. The barrier drain is successfully capturing horizontal groundwater flow from the LCL and is also drawing groundwater from outside the drain.

Sludges and sediments (classified as non-aqueous phase liquids or NAPLs) are received from the base of the pump chambers and LCTF clarifier. All collected NAPL is eventually sent out to a permitted facility for incineration. In 2004, the outside NAPL sludge storage tanks were demolished, since they were no longer needed, as a result of the decrease in NAPL production over the years.

Hazardous wastes that are generated at the Site include: 1) spent carbon from the treatment process, 2) debris, filters and personal protective equipment, 3) NAPL and other sludges [from both LCL and 102nd Street Landfill] and 4) soils and debris from sampling activities. These wastes are transported to a permitted incinerator and/or landfill for final disposal.

NYSDEC performs yearly oversight sampling and overview of operations at the LCTF. The NYSDEC Division of Environmental Remediation presents the oversight information, including split sampling data, in an Inactive Hazardous Waste Site Operations and Maintenance Review report.

During the 2003-2007 period, NYSDEC concluded that, for both inside and outside the containment area, that the LC remedy continues to be effective. Split sampling occurs at select monitoring wells, as chosen by NYSDEC. NYSDEC split-sampled five wells in June 2007; and, in order to confirm the 2007 data, the same wells were again sampled in June 2008. Wells were tested for volatile organic compounds (VOCs), semi-VOCs and organochlorine pesticides. The 2007 data showed some pesticide contamination at or below detection limits in five monitoring wells [MW-10205C, MW-3257, MW-5221, MW-8106 and MW-9205], located outside the containment area. The 2008 data showed a substantial reduction in contamination from the 2007 sampling event.

Historically, LC-10135 has been the most contaminated of the various monitoring wells located within the LC containment area. LC-10135 is also used as a comparison well in order to confirm that any presence of low levels of contamination in other monitoring wells is not necessarily indicative of a problem with the remedy. The 1992-2007 data from long-term monitoring well MW-10135 are shown in Figure 2. The groundwater in the vicinity of this well is effectively captured by the leachate collection system.

In 2007, the data from three other long-term monitoring wells (MW-10210A, MW-10210B and MW-10210C), located off-Site to the south, showed at or below detection limits for Site constituents, similar to previous years (see Figures 3-5).

Table 1 presents the 2007 summary of detected compounds in sampled monitoring wells. Compounds, detected during 2007, were found to be at similar concentrations to those compounds detected in previous years.

Overall, for the years 2003-2007, NYSDEC and GSHI recommended various maintenance, repair and replacement corrective actions. These maintenance activities were performed by GSHI. NYSDEC found that the remedy continued to remain effective. Table 2 presents a summary of maintenance activities performed during 2007.

The 2007 OM &M Report data results show that there has been no significant change in chemical concentration conditions and that the barrier drain system is successfully capturing leachate from the Site and preventing off-site migration of contamination. Hence, monitoring results continue to confirm that the remediation and containment system, *i.e.*, the leachate collection and treatment system, is functioning properly.

GSHI has initiated a Global Positioning System (GPS) survey of all active wells. The GPS can be used at any time under all weather conditions. Further survey information will be compiled during future years and evaluated. The evaluated data will then be integrated into a geographic information system (GIS). A GIS makes it possible to integrate information that is difficult to associate through any other means. The information can then be visualized through different mapping techniques.

Similar data and information have been recorded for the previous years' O&M reports. The latest O&M report provides a thorough overview of data and other information that continues to show that the LCTF is performing as designed.

Figure 6 shows the extent of the groundwater sampling program for 2007. This figure shows an areawide view of the Site and identifies the locations of the select monitoring wells which were sampled, as configured both inside and outside of the containment area. As discussed above, approximately 30-40 monitoring wells are sampled each year on a rotational basis, thus not all monitoring wells shown were sampled each year of the five-year period from 2003-2007.

VI. Progress Since Last Five-Year Review

The first five-year review concluded that the remedies implemented at this Site adequately control exposures of Site contaminants to human and environmental receptors to the extent necessary for the protection of human health and the environment. There has been no significant change in chemical and hydrological conditions at the Site. The barrier drain is successfully capturing leachate from the Site and preventing off-site migration of chemicals. The remediation system is functioning as designed. Continued monitoring at the Site ensures that no exposures to human or environmental receptors will occur in the future.

The cap, the fence, the Site drainage system, the leachate collection and treatment system and the monitoring wells are all intact and in good repair. Monitoring wells on the Site and surrounding the Site indicate that contaminated groundwater and NAPL releases from the LCL are being contained by the collection and treatment system. Proper institutional controls are in place.

The Site has ongoing operations, maintenance and monitoring activities. As expected by the decision documents, these activities are subject to routine modifications and/or adjustments. However, there were no recommendations or follow-up actions necessary to protect public health or the environment.

VII. Five-Year Review

Five-Year Review Team

The agency's Five-Year Review team consisted of Damian Duda (RPM), Angela Carpenter (Supervisor), Marian Olsen and Chuck Nace (risk assessors), Rob Alvey (hydrogeologist), George Shanahan (attorney) and Mike Basile (Community Involvement Coordinator).

Community Notification and Involvement

EPA published a notice on April 20, 2008 in the *Niagara Gazette*, the local newspaper, notifying the community of the five-year review process. The notice indicated that EPA would be conducting the second five-year review of the remedy for the Site to ensure that the implemented remedy remains protective of public health and the environment and is functioning as designed. It also indicated that once the five-year review is completed, the results will be made available in the EPA Public Information Office, the local Site repository, located in Buffalo, New York. In addition, the notice included the RPM's address, telephone number and e-mail address for questions related to the five-year review process for the Site.

Document Review

In order to provide a thorough assessment of the LC project, Appendix C at the conclusion of this report provides a list of the major documents that were produced during the roughly 20-year period of activities conducted at the Site. Many of these documents have been referenced during the preparation of this Five-Year Review report.

Monitoring and Data Review

The LC treatment system consists of clarification of the collected leachate in order to separate out sediments and NAPLs from the contaminated wastewater; bag filtration; and, carbon treatment, prior to the discharge of the treated wastewater to the CNF sanitary sewer system under a permit issued by the CNF. Any collected sludges and NAPLs have been sent off-site to OCC's permitted CNF liquids incinerator or to RCRA-permitted incinerators in states outside New York.

As part of the permit requirements, CNF and GSHI personnel completed an annual verification sampling; quarterly effluent sampling was also performed. The sample results were submitted to the CNF and Federal and State agencies; analytical results were below CNF's permitted limits for the sampled parameters during all events. The leachate collection system continues to function as designed, drawing groundwater toward the underground drain system from both the landfill and the surrounding area beyond the cap.

The effectiveness of the LC containment system has been monitored for more than 25 years. An extensive array of 153 monitoring wells currently exists around the containment area. The leachate collected in the barrier drainage system is treated by an on-site activated carbon system. The treated wastewater is discharged to the CNF Wastewater Treatment Plant, according to specified discharge limitations. Extensive monitoring data from the various perimeter monitoring wells, which ring the capped LCL, indicate that the containment system is working effectively. Monitoring will continue to be conducted indefinitely.

The 2007 data indicate that there was no significant change in chemical and hydrological conditions at the Site. The barrier drain is successfully capturing leachate from the Site and preventing off-site migration of chemicals. The remediation system is functioning as designed: 3,663,300 gallons of leachate were treated and discharged from the Site, of which 3,363,226 gallons of leachate were collected on-site and the remaining 300,074 gallons were collected from the adjacent 102nd Street Landfill Superfund site. Table 3 shows the monthly volumes of groundwater treated from 2003-2007. Operations and maintenance activities during the past five years have been mostly routine in nature. The collection system has maintained inward gradients and has been effective in preventing chemical migration. The LCTF has met all conditions of the sewer use discharge permit.

Site Inspection

A Site visit and inspection was conducted on April 10, 2008. The Site inspection team included the following personnel: from EPA: Damian Duda (Site RPM), Chuck Nace and Marian Olsen (risk assessors) and Rob Alvey (hydrogeologist); from NYSDEC: Brian Sadowski and Jeff Konsella; from NYSDOH: Matt Forcucci; and, from GSHI: Scott Parkhill, Clint Babcock and Brian Downie. GSHI prepares the Love Canal Annual Report and the Love Canal Operations/Monitoring Report.

The Site's landfill cap and LCTF, which include the Operations and Administration Buildings, were inspected. A walk-through inspection was completed through both buildings, identifying the various segments of the collection, treatment and discharge process. It was noted during the treatment process tour that very little sludge or NAPL is being collected. The bag filters are changed twice-a-year, and one of the two carbon beds is changed out every other year. The entire process treats and discharges approximately 150-175 gallons per minute (gpm), up to approximately three to four millions gallons per year, as reflected in the annual O&M reports.

The participants also performed a walk-through across the LCL cap and inspected some of the monitoring wells and piezometers, as identified in the O&M Sampling Plan, both immediately within the Site fence line and outside the Site fence line in the EDA. The inspection team also performed a drive-through of the EDA revitalization area, assessing EDA Areas 1-7. The 93rd

Street School site was also identified. Community baseball fields are now located in the area where the 93rd Street School building once stood. The dredged Black and Bergholtz creeks within EDA Areas 4 and 5 were also identified.

Also, there were some discussions that focused on improving the habitat for wildlife on the landfill cap. Ideas that were discussed included planting wildflowers, installing nesting boxes for birds and, perhaps, less frequent grass mowing to provide better habitat for wildlife. While these types of activities would be supported by the Agency, as long as the cap is not compromised and the monitoring wells are accessible, the Agency cannot require that these improvements be implemented. We do, however, recommend that GSHI consult with non-profit organizations, such as the Wildlife Habitat Council (<http://www.wildlifehc.org/>), to explore ideas for habitat improvement. EPA and NYSDEC should be consulted prior to implementing any habitat improvement to ensure that there are no issues associated with the implemented remedies.

EPA and NYSDEC also expressed concern to GSHI personnel that isolated instances of dumping of household and commercial trash are occurring throughout Areas 2 and 3. This matter will be addressed through the local community. No community interviews were conducted during the Site inspection.

Institutional Controls

The NFBE is the owner of the containment area of Site property, *i.e.*, within the fenceline. The CNF granted NYS a permanent easement on the Site property, providing NYS with exclusive use and occupancy of the Site property. NYS, pursuant to a 1994 Consent Decree, granted OCC exclusive use and occupancy of the Site property for the purpose of providing continued O&M for the remedy of the Site. OCC will retain exclusive use and occupancy as long as the Consent Decree is in effect. Under the direction of NYSDEC, OCC, through Glenn Springs Holdings, Inc. (GSHI) and Conestoga Rovers and Associates, Inc. (CRA), performs the OM&M of the remedy and maintains the day-to-day operations for the Site, pursuant to the 1994 Consent Decree with NYS and the 1996 Consent Decree with the United States.

EDA Areas 1 through 3 remain limited to commercial and/or industrial use. The institutional controls on Areas 2 and 3 are maintained by zoning and deed restrictions in order to comply with the original HD. The deeds for these properties require that NYSDEC be notified both when these properties are sold and when these properties are being considered for any other use than commercial and/or light industrial. The deeds also indicate that all identified use limitations and restrictions shall run with the land and bind the current owner and any successors in perpetuity or until such time as NYSDEC shall determine that such institutional controls are no longer necessary for the protection of public health and the environment. As such, if any use, other than what is specified above, is considered, a minimum of six inches of surface soil must be removed and a minimum of six inches of new clean soil must be placed back on the property before any such use can be initiated. These properties are currently owned by various real estate developers. Area 1 is owned by the CNF. The CNF will notify EPA and NYSDEC when any reuse is planned for Area 1. EDA Areas 4 through 7 remain suitable for normal residential use without any restrictions.

VIII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the 1985 ROD (including the 1982 Decision Memorandum precursor to that ROD), the 1987 ROD, and the 1988 ROD (and 1991 Amendment thereto) and the 1989, 1996 and 1998 ESDs.

The remedies involved a number of actions, including installation of a landfill cap, fencing, site drainage, a leachate collection and treatment system and monitoring wells to identify contaminant concentrations at the edge of the LC property. The remedies described above are all intact and in good repair.

The CNF supplies the community with a public water supply. The groundwater is effectively captured by the leachate collection system. Monitoring wells, both on the Site property and surrounding the Site, indicate that contaminated groundwater and NAPL released from the LCL are being contained by the collection and treatment system and that exposures to the contaminated groundwater, on-site, are not occurring.

Institutional controls in the form of deed restrictions are in place on the vacant parcels of land in EDA Areas 2 and 3 to comply with the original HD, identifying commercial/industrial use only, unless the parcels are remediated. The land uses in Areas 1 to 3 are limited to commercial/industrial. This control is maintained by zoning and deed restrictions. (Areas 4 to 7 have unrestricted land uses.)

These actions have interrupted the direct exposure pathways of direct contact with the contaminated groundwater and soils. The remedies are functioning as intended in the RODs described above.

From an ecological perspective, the remedial actions that have taken place at the Site have eliminated exposure to ecological receptors, which is one of the goals of the decision documents. Therefore, the remedial actions are functioning, as intended, for the ecological interests at the Site.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and remedial action objectives used at the time of the remedy still valid?

Soils: : The 2003 Five-Year Review identified the processes and procedures used to develop the 1988 LCHS which evaluated exposures to Love Canal contaminants in soils and air at the LCL and at the surrounding properties in the EDA. This study was developed subsequent to the various remedial actions that had already been conducted at the Site, including the installation of a cap and fencing. The resulting HD defined the term "habitable" as suitable for normal residential use without any restrictions. As part of the LCHS, samples of soils and residential indoor air were evaluated to identify evidence of chemical contamination in the EDA; these results were compared to areas outside the EDA.

In addition, as described above (see Section IV), other remedial actions also were conducted in other areas of the Love Canal neighborhoods. Deed restrictions were ultimately placed on properties in EDA Areas 2 and 3 that did not meet the criteria for habitability under a residential scenario without further remediation. Areas 2 and 3 exceeded the comparison criteria for habitability although to a lesser extent than Area 1 which is owned by the CNF. The combined remedial actions and deed restrictions have interrupted potential exposures to the Love Canal contaminants.

Groundwater: The LCHS Report indicated that initial remedial actions taken at the Site, including 1) containing Site contaminants; 2) limiting discharges to the groundwater, surface water or atmosphere; 3) covering the landfill with a 3-foot-thick compacted clay cap to reduce infiltration of water from rain and snowmelt and to retard the formation of leachate and contaminated surface runoff; and, 4) cleaning and plugging the sewers within Rings I and II and removing them from further service to prevent the spread of additional contamination from man-made pathways into nearby creeks and the Niagara River. The final phase of remediation which cleaned up areas affected by chemicals that had moved off-site into the EDA sewers and creeks, addressed then-existing and potential routes of exposure and reduced potential cancer risks and non-cancer health hazards to individuals from exposures at the Site. The ongoing OM&M at the Site continue to interrupt exposures to the contaminated groundwater. In addition, as an extra layer of protection, residents in the area receive their drinking water from the CNF public water supply. Both NAPLs and groundwater contamination are being "contained" on-site. There is an extensive barrier drain and monitoring system to ensure that groundwater contamination is contained.

Vapor intrusion: Buildings on-site include project administration offices and the leachate treatment facility. The closest residential buildings to the site are over 100 feet away. Vapor Intrusion was evaluated using EPA's Soil Vapor Intrusion Guidance (<http://www.epa.gov/correctiveaction/eis/vapor.htm>). Pursuant to this guidance, inhabited buildings located more than 100 feet laterally or vertically from known or interpolated soil gas or groundwater contaminants are screened from further consideration for monitoring for soil vapors. Based on the distance to the nearest residences, further evaluation of vapor intrusion is not deemed necessary. Also, indoor air sampling was performed as part of LCHS which did not find any indoor air issues within the homes in the EDA.

The 1985 ROD identified only one remedial action objective (RAO) for the Site: a cleanup goal of one part per billion (ppb) for dioxin in soils and sediments. This RAO is consistent with the current Office of Solid Waste and Emergency Response (OSWER) directive, signed on April 13, 1998 (OSWER Directive 9200.4-26) for this contaminant.

Ecological risk assessments were not conducted for the Site-proper nor for any of the operable units. However, through the course of the remedial actions taken at the Site, any potentially completed pathways have been interrupted. Currently, there are no completed pathways for ecological receptors. Given that contaminated soils and debris were excavated, consolidated and capped, the potential for exposure to ecological receptors has been eliminated. Since these actions have resulted in interrupting the exposure pathways for ecological receptors, the remedial action objectives used at the time of the remedy are still valid.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Based on the evaluation of the potential exposures to human and ecological receptors at the Site, there is no new information that has been developed that could call into question the protectiveness of this remedy.

IX. Technical Assessment Summary

The implemented remedies at the Site protect public health and the environment. The leachate collection and treatment system is in good repair and in good operational order. Access to the Site is controlled within the fenced LCL, and extensive monitoring indicates that there are no exposures of contaminated materials to human or ecological receptors. Sewers and creeks were cleaned of Site contaminants.

EDA Area 1 is a vacant parcel owned by the CNF. Prior to any redevelopment in this area, the CNF will apprise EPA and NYSDEC about its intended use. The vacant parcels in EDA Areas 2 and 3 are properly zoned. They also have deed restrictions in place, limiting development to commercial/light industrial uses and requiring notice to NYSDEC before lease or conveyance of the properties. These properties have been sold to real estate developers. EPA and NYSDEC will review any planned development in these areas in order to ensure that the deed restrictions are enforced. EPA and NYSDEC will be particularly sensitive to any projected development which may involve children, *e.g.*, daycare facilities and schools. As discussed above, Areas 1 to 3 are limited to commercial/industrial, and Areas 4 through 7 remain suitable for unrestricted residential use.

X. Issues, Recommendations and Follow-up Actions

The remedies have been implemented and are functioning as intended by the Site decision documents. There are no additional actions required. The ongoing operations, maintenance and monitoring (OM&M) program is part of the selected remedy. As expected by the decision documents, the OM&M activities are subject to routine modifications and/or adjustments.

This report does include a suggestion for decommissioning some of the Site's monitoring wells (see Table 4). There are no recommendations or follow-up actions necessary to protect public health or the environment.

XI. Protectiveness Statement

The implemented remedies for the Love Canal Superfund site protect human health and the environment. There are no exposure pathways that could result in unacceptable risks and none expected as long as Site property uses remain consistent with the Site's engineered, access and institutional controls that are properly operated, monitored and maintained.

XI. Next Five-Year Review

The next Five-Year Review for the Love Canal Superfund site should be completed before September 2013.

Approved:


George Paylou, Acting Director
Emergency and Remedial Response Division

9/29/08
Date

APPENDIX A

TABLES

TABLE 1
SUMMARY OF DETECTED COMPOUNDS
2007 LONG-TERM MONITORING PROGRAM
GLENN SPRINGS HOLDINGS, INC.
LOVE CANAL

<i>Overburden Wells</i>	<i>Well</i>	<i>VOCs</i>	<i>SVOCs</i>	<i>Pesticides/PCBs</i>
3151	B-I	Well No Longer Available Destroyed		
7120	B-I	U	1	U
7130	A	U	1	1
7132	A	U	1	U
7155	B-I	U	U	U
7161	B-I	U	U	U
8106	X	U	U	U
8110	B-I	U	U	U
8120	B-I	U	U	1
8130	B-I	U	U	U
8140	B-I	U	1	U
9110	B-I	U	U	U
9115	B-I	U	1	1
9120	B-I	U	U	U
9125	B-I	U	1	U
9130	B-II	U	2	U
9140	B-I	1	1	U
10105	B-II	U	1	U
10135	A	15	11	12
10147	B-I	U	1	U
10174A	B-I	U	U	U
		<hr/>	<hr/>	<hr/>
		16	22	15
 <i>Bedrock Wells</i>				
3257	X	U	U	U
5221	X	U	U	1
6209	X	1	U	U
7205	A	U	U	1
8210	A	U	U	U
9205	A	U	2	U
9210	A	U	1	U
10205	A	U	1	U
10215	X	U	U	U
10270	X	3	U	1
10272	A	1	U	U
10278	A	2	U	U
10210A	A	1	U	U
10210B	A	1	U	1
10210C	A	U	U	U
10225A	A	1	U	U
10225B	A	1	U	U
10225C	A	1	1	1
		<hr/>	<hr/>	<hr/>
		12	5	5
 Total # of Detections				
		<hr/>	<hr/>	<hr/>
		28	27	20

Notes:

U/U = Duplicate analyses.

U = No parameters detected at or above detection limits.

A = Annual Well

B-I = Bi-Annual Well Group I

B-II = Bi-Annual Well Group II

X = Additional Well

N/M = Not Monitored

TABLE 2

2007 LOVE CANAL MAINTENANCE AND ACTIVITIES GLENN SPRINGS HOLDINGS, INC.

- QIS performed internal/external inspections on tanks and vessels.
- Annual inspection of the back-flow preventers.
- Repair to DDSF Building overhead door.
- Replace valves on carbon bed.
- Maintenance of flowerbeds and shrubs along Colvin Blvd. and Frontier Avenue.
- Replacement of Variable Frequency Drive (VFD) for the filter feed pump.
- Replacement of Pump Chamber 2A level transmitter.
- Replace PC-2 Pump.
- Front gate sensor loop replaced.
- Entry door hinges replace on Treatment Building and Administration Building.
- Upgrades to lighting in Treatment Building started.

TABLE 3

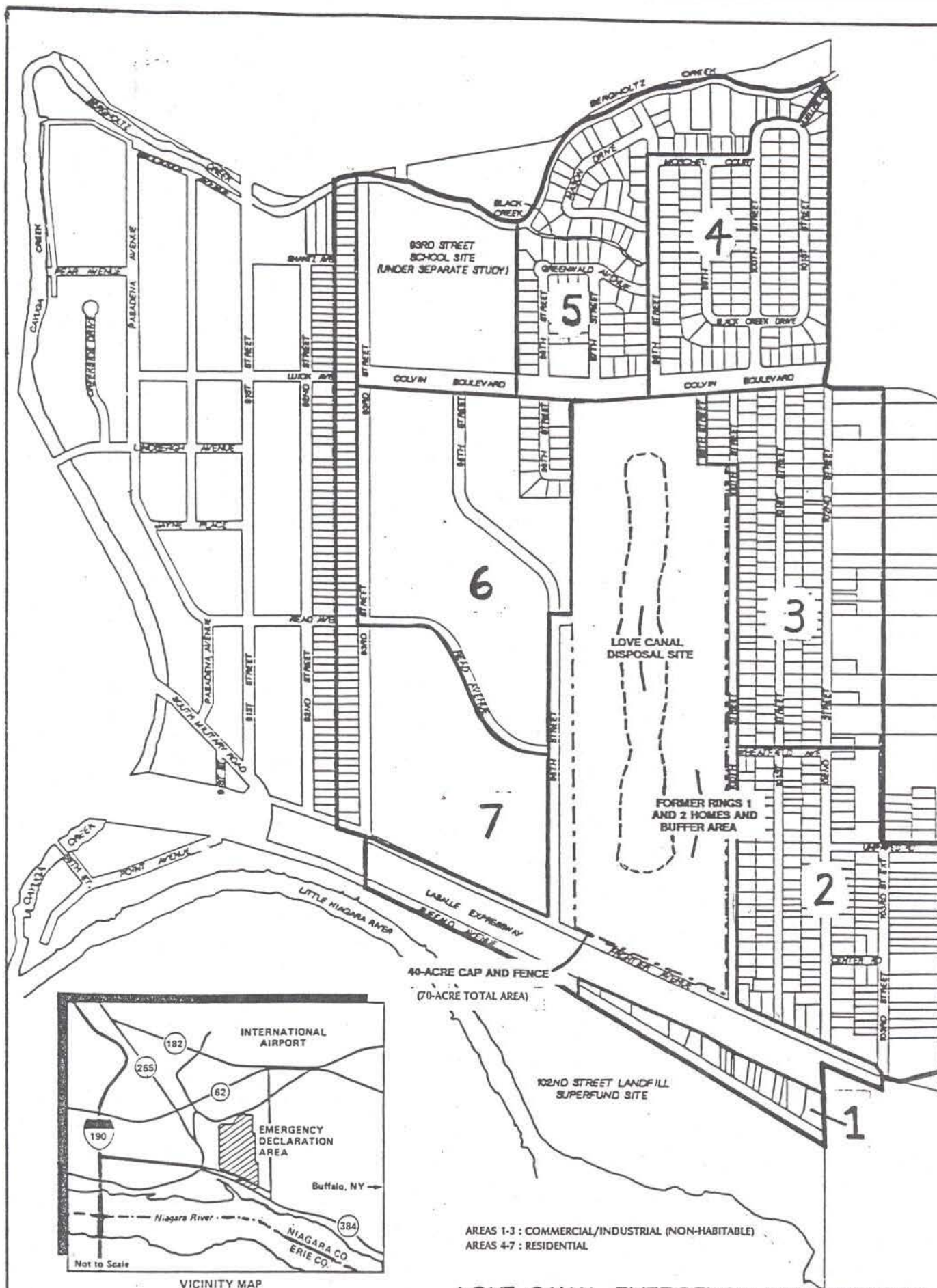
MONTHLY VOLUMES OF GROUNDWATER TREATED
LOVE CANAL LEACHATE TREATMENT FACILITY
GLENN SPRINGS HOLDINGS, INC.

		Volume (gal)												
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
January	Gross (1)	597,650	474,330	337,720	700,070	335,700	495,800	396,900	488,900	419,400	309,200	841,400	855,900	993,400
	Net (2)	-	-	-	-	335700	280364	282480	422682	374123	260171	796,518	817,305	970,918
	Days (3)	N/A	N/A	N/A	N/A	N/A	21	20	21	14	10	17	16	20
February	Gross	202,235	252,450	456,800	539,838	270,100	480,400	560,000	663,700	266,300	330,000	440,200	437,300	216,600
	Net	-	-	-	-	270,100	368,492	468,863	608,116	231,049	291,082	401,137	405,124	174,776
	Days	N/A	N/A	N/A	N/A	N/A	21	19	20	13	9	11	9	7
March	Gross	385,910	331,690	520,600	615,133	409,300	505,500	616,400	364,900	721,500	1,038,400	698,900	436,800	582,500
	Net	-	-	-	-	321558	290501	493476	316696	667337	986332	667,105	402,047	560,237
	Days	N/A	N/A	N/A	N/A	N/A	23	21	21	17	21	13	13	16
April	Gross	132,790	615,350	184,400	437,817	555,200	675,600	352,300	689,700	432,800	800,400	805,300	184,800	447,200
	Net	-	-	-	-	296,535	547,926	262,946	629,683	380,745	767,982	769,514	155,028	420,133
	Days	N/A	N/A	N/A	N/A	N/A	20	20	20	16	17	14	6	14
May	Gross	123,140	513,310	126,850	139,600	401,500	473,300	311,200	589,500	425,400	326,500	183,400	121,800	323,200
	Net	-	-	-	-	123790	335331	207580	532251	379299	294612	156,846	93,394	297,471
	Days	N/A	N/A	N/A	N/A	N/A	20	17	20	14	10	5	4	12
June	Gross	125,300	251,400	210,630	99,800	323,500	632,200	202,200	395,100	367,900	253,200	160,800	130,700	173,300
	Net	-	-	-	-	63,658	486,721	132,132	347,485	303,576	208,659	118,979	104,449	148,638
	Days	N/A	N/A	N/A	N/A	N/A	20	16	14	13	9	6	5	4
July	Gross	132,400	113,300	96,810	130,200	143,600	333,900	182,200	194,500	187,700	137,700	92,600	195,500	129,100
	Net	-	-	-	-	104649	184955	111941	145344	142849	111217	78,234	183,084	99,026
	Days	N/A	N/A	N/A	N/A	N/A	20	16	16	11	7	3	5	6
August	Gross	112,910	146,700	223,390	138,300	230,600	437,100	267,200	151,300	158,600	301,900	98,800	322,440	120,800
	Net	-	-	-	-	97,423	286,925	194,821	107,928	114,497	269,934	55,055	293,900	106,040
	Days	N/A	N/A	N/A	N/A	N/A	23	18	17	8	10	5	10	5
September	Gross	111,200	310,550	116,790	95,200	232,100	209,600	144,900	148,600	105,800	484,800	317,900	249,160	68,400
	Net	-	-	-	-	62759	82263	81619	94401	60350	435482	284,315	213,343	49,041
	Days	N/A	N/A	N/A	N/A	N/A	20	16	12	7	12	8	7	4
October	Gross	491,440	532,360	326,100	71,500	283,400	264,300	438,500	154,600	211,000	135,700	486,300	919,200	173,000
	Net	-	-	-	-	175,837	134,248	348,153	108,226	157,120	94,476	445,560	892,734	141,650
	Days	N/A	N/A	N/A	N/A	N/A	20	18	13	9	4	10	18	8
November	Gross	641,210	393,730	346,550	46,200	491,800	250,900	250,400	360,800	356,800	211,400	524,600	691,800	90,100
	Net	-	-	-	-	344145	132728	194481	306258	310650	186999	494,443	658,765	77,506
	Days	N/A	N/A	N/A	N/A	N/A	17	16	14	12	5	14	14	3
December	Gross	235,900	499,540	524,760	73,800	695,500	522,600	555,300	549,600	692,300	674,400	502,000	510,400	345,700
	Net	-	-	-	-	397,912	421,149	475,856	496,556	643,735	622,403	476,165	492,900	317,790
	Days	N/A	N/A	N/A	N/A	N/A	17	18	15	14	14	12	12	8
Total	Gross	3,292,085	4,434,710	3,471,400	3,087,458	4,372,300	5,281,200	4,277,500	4,751,200	4,345,500	5,003,600	5,152,200	5,055,800	3,663,300
	Net	-	-	-	-	2594066	3551603	3254348	4115626	3765330	4529349	4,743,871	4,712,073	3,363,226
	Days	N/A	N/A	N/A	N/A	N/A	242	215	203	148	128	118	119	107
Monthly Average	Gross	274,340	369,560	289,280	257,288	364,358	440,100	356,458	395,933	362,125	416,967	429,350	421,317	305,275
	Net	-	-	-	-	216172.1667	295966.9167	271195.6667	342968.8333	313777.5	377445.75	395,323	392,673	280,269
	Days	N/A	N/A	N/A	N/A	N/A	20	18	17	12	11	10	10	9
Rainfall Inches		33.99	48.22	41.17	38.77	34.08	42.2	35.18	39.74	37.15	41.73	39.07	44.41	35.12

NOTES: (1) Gross: Total Treated; As of March 1999 Treatment at LCTF included leachate collected from 102nd Street Landfill Site.
 (2) Net: LC (Love Canal) Treated; Total treated less received from 102nd Street.
 (3) Days: Number of days Treatment Facility discharged to the sanitary sewer.
 N/A Not Available

APPENDIX B

FIGURES



SOURCE:
EDA BOUNDARIES TAKEN FROM NEW YORK STATE
REAL PROPERTY TAX LAW ARTICLE 17, SECTION 1702

AREAS 1-3 : COMMERCIAL/INDUSTRIAL (NON-HABITABLE)
AREAS 4-7 : RESIDENTIAL

LOVE CANAL EMERGENCY DECLARATION AREA
NIAGARA FALLS, NEW YORK

SCALE: 1"=750' (SEVEN EDA
NEIGHBORHOODS)

LEGEND

— EMERGENCY DECLARATION AREA (EDA) BOUNDARY

Figure 1

FIGURE 2

LOVE CANAL LONG-TERM MONITORING WELL 101035

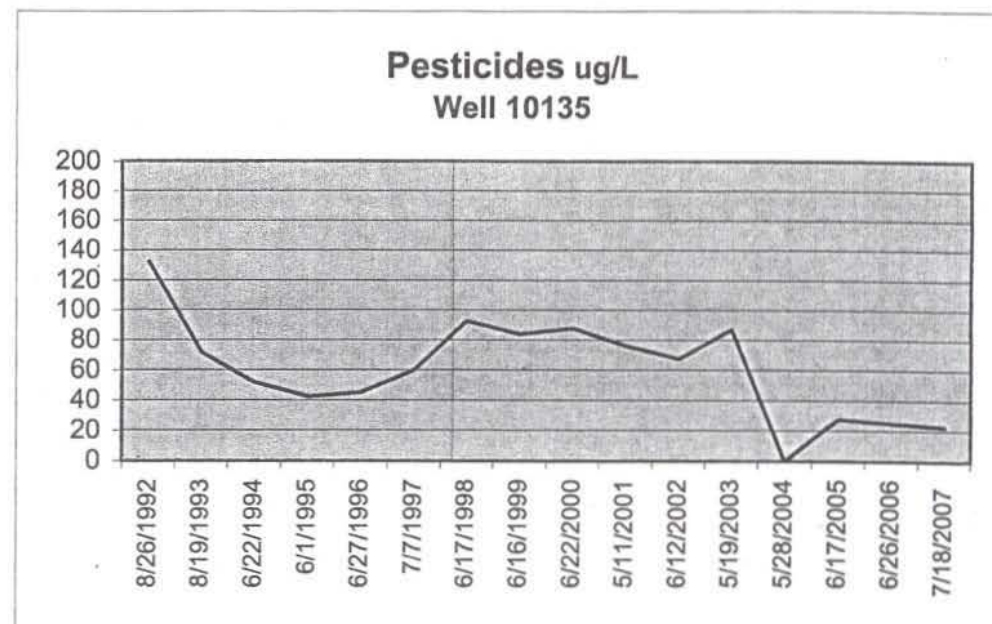
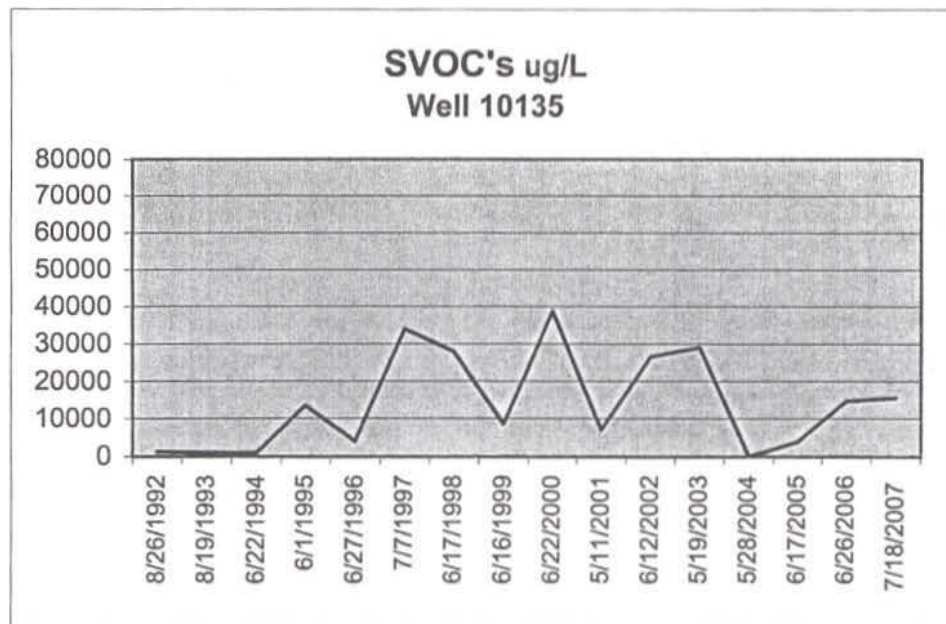
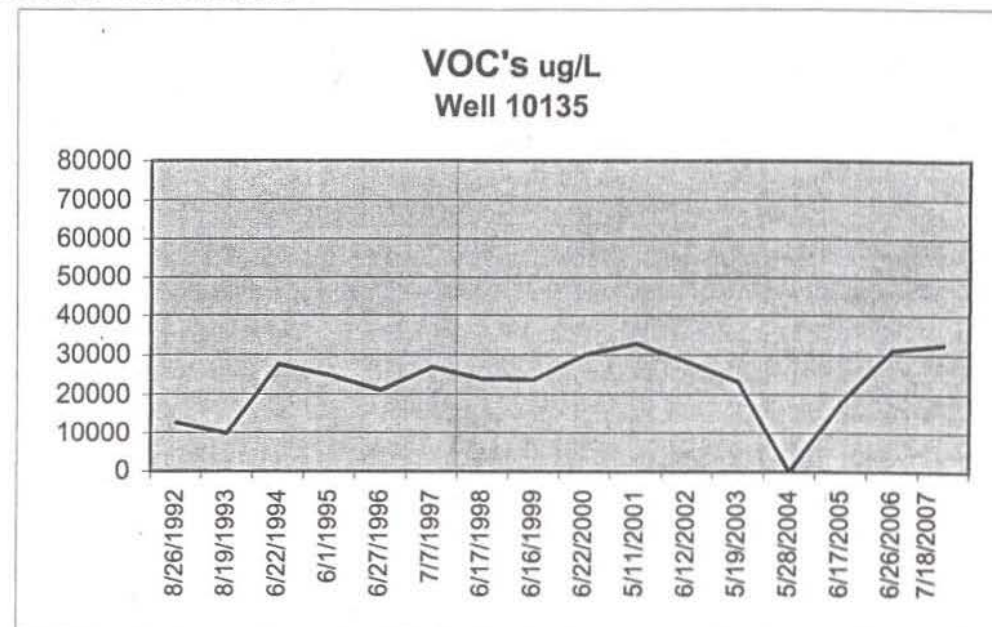
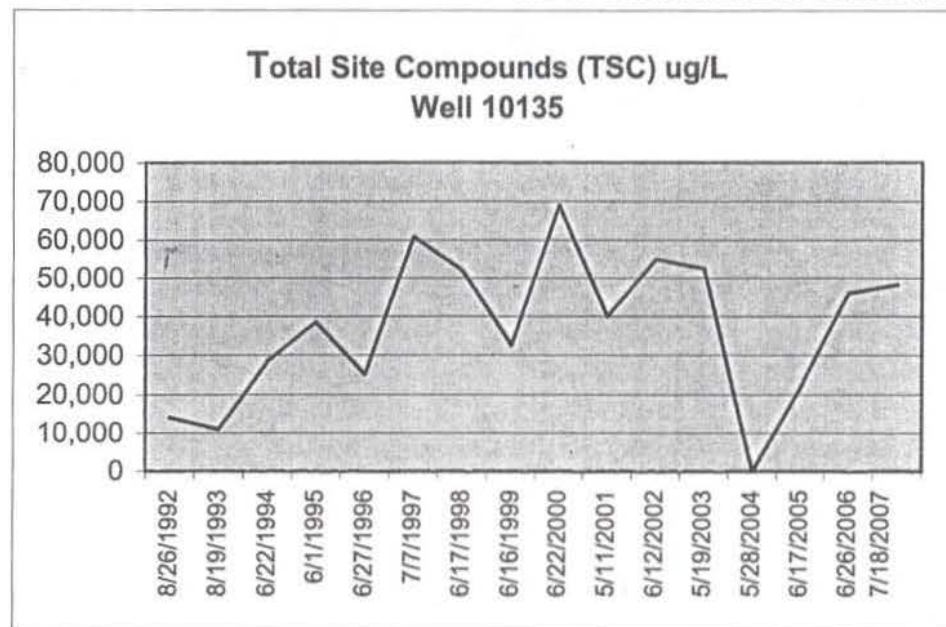


FIGURE 3

LOVE CANAL LONG-TERM MONITORING WELL 10210A

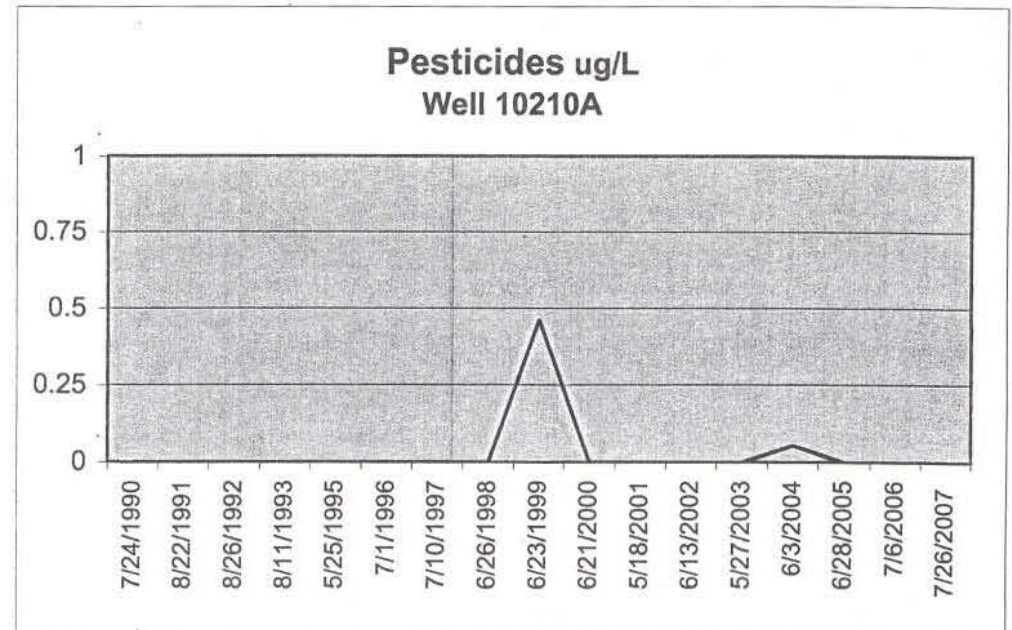
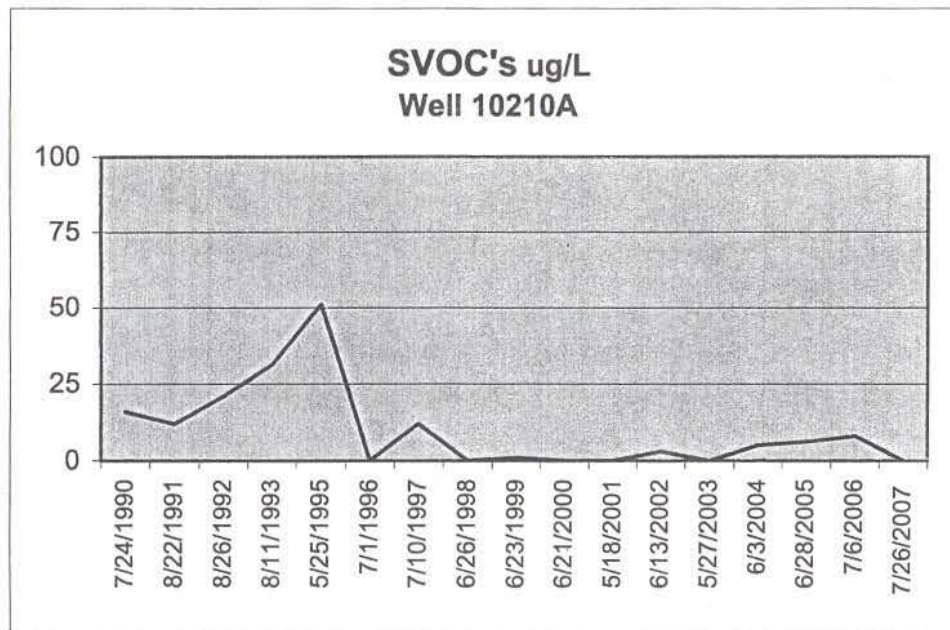
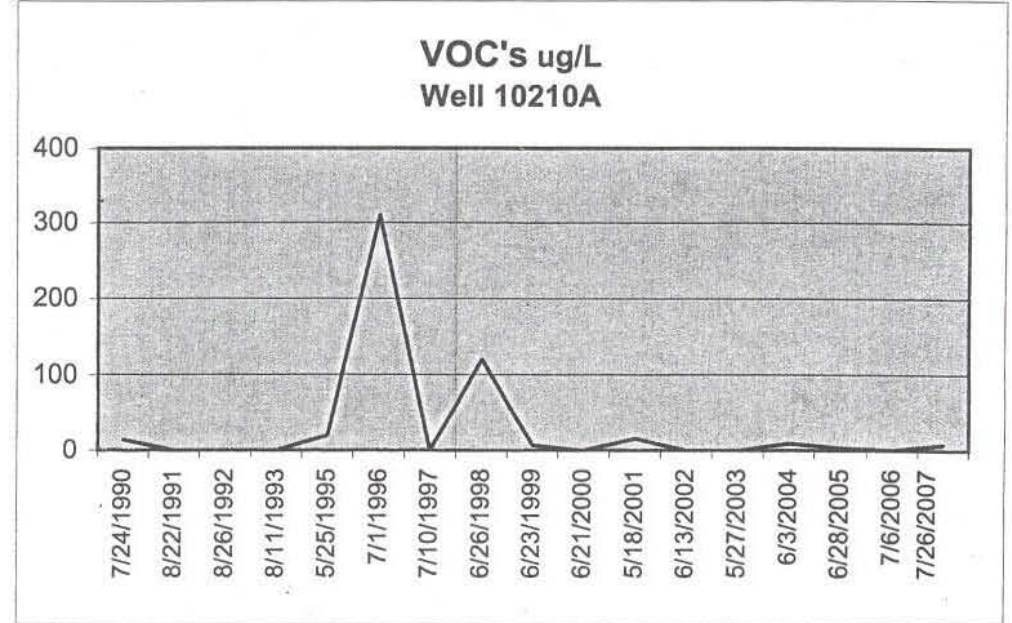
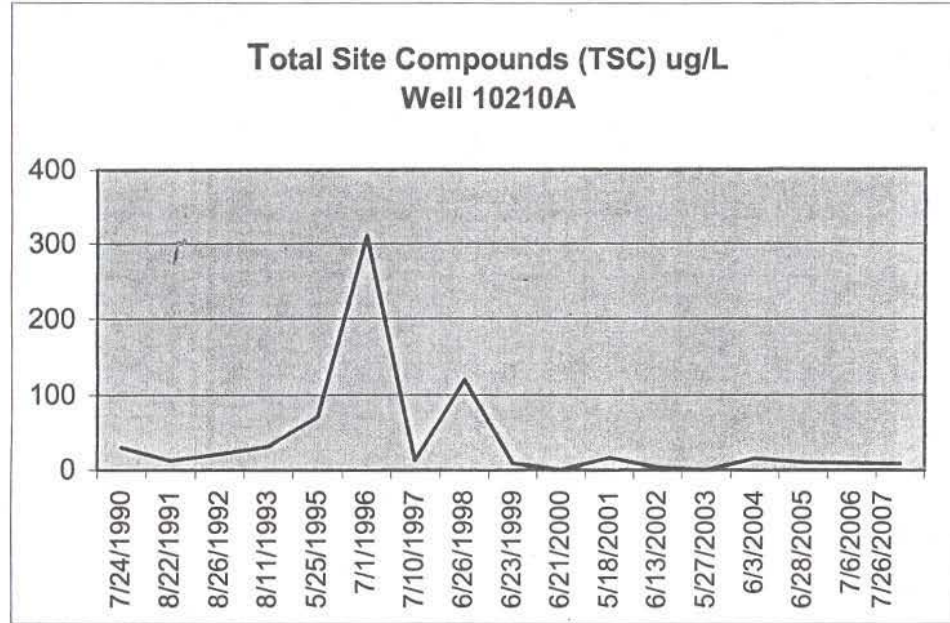


FIGURE 4

LOVE CANAL LONG-TERM MONITORING WELL 10210B

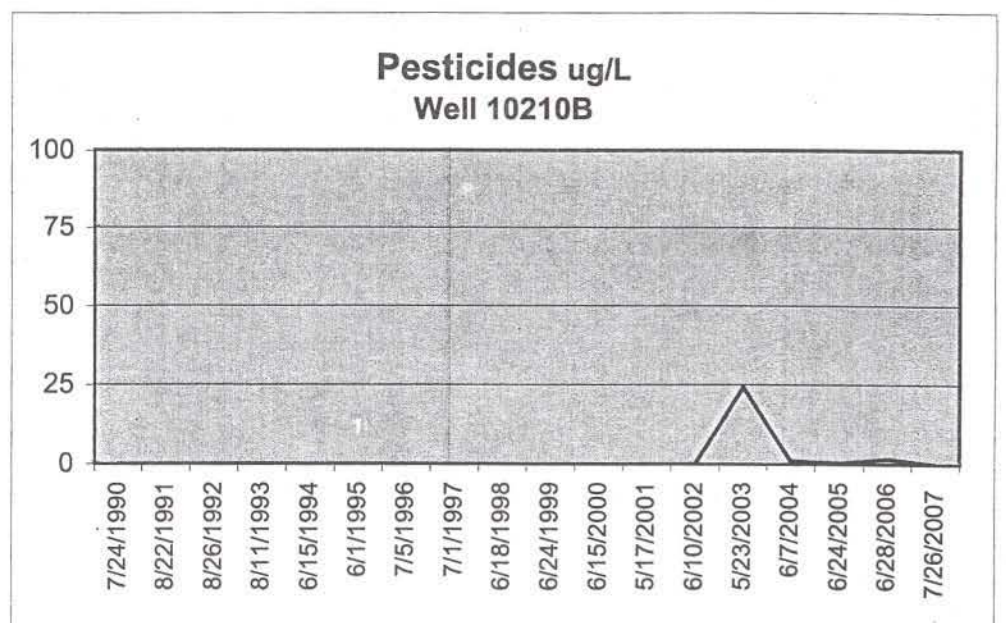
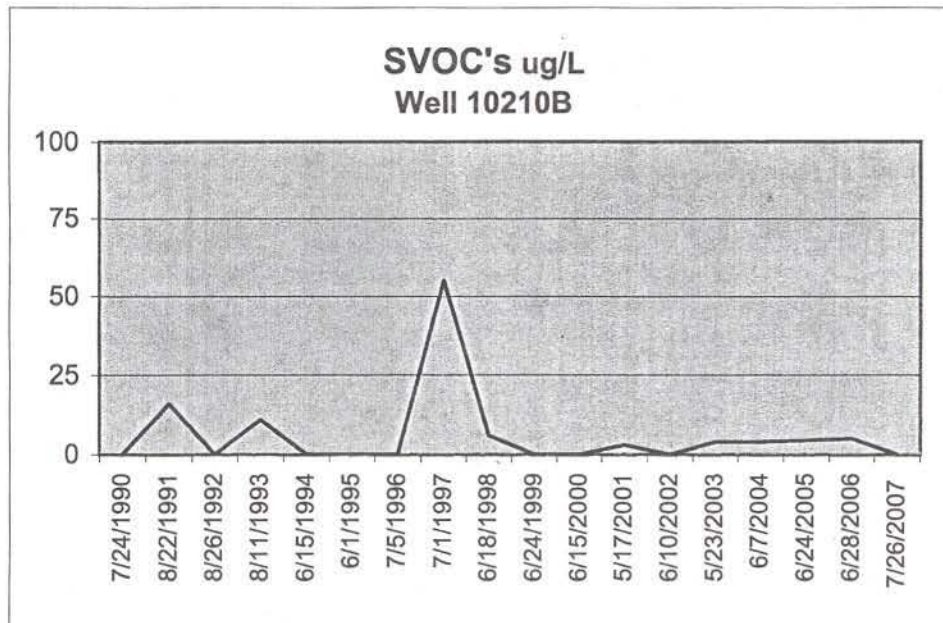
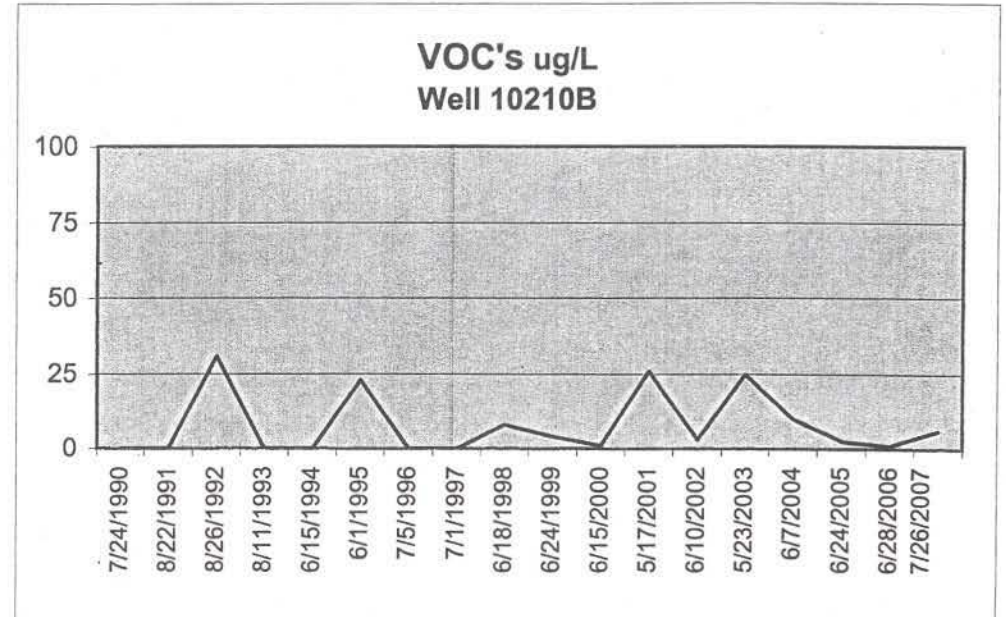
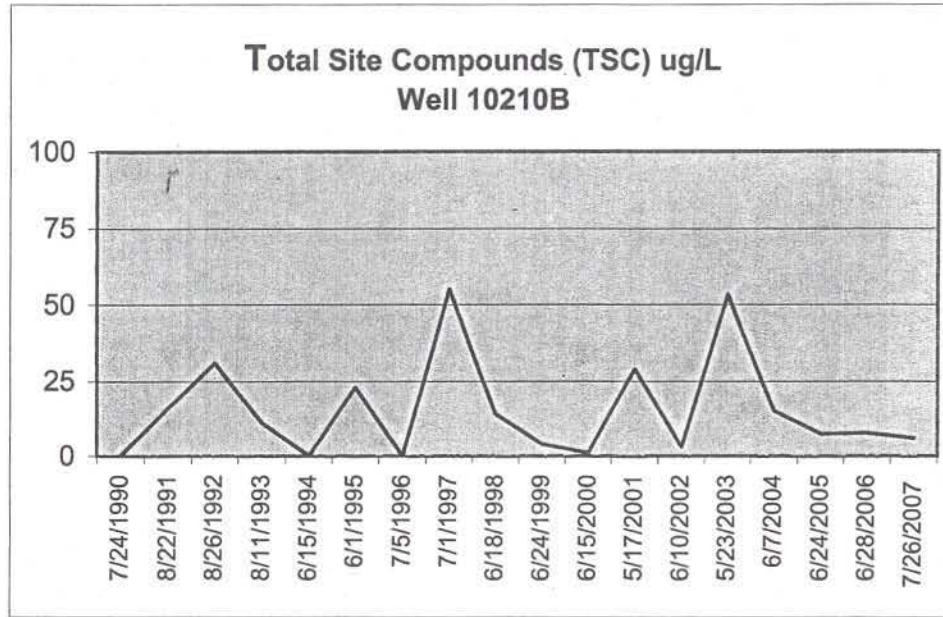
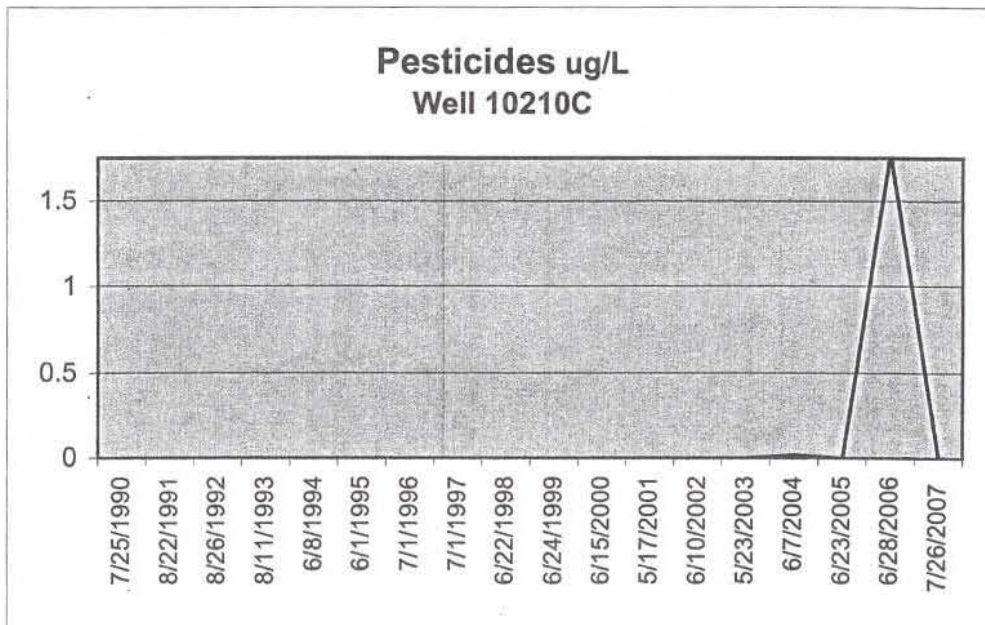
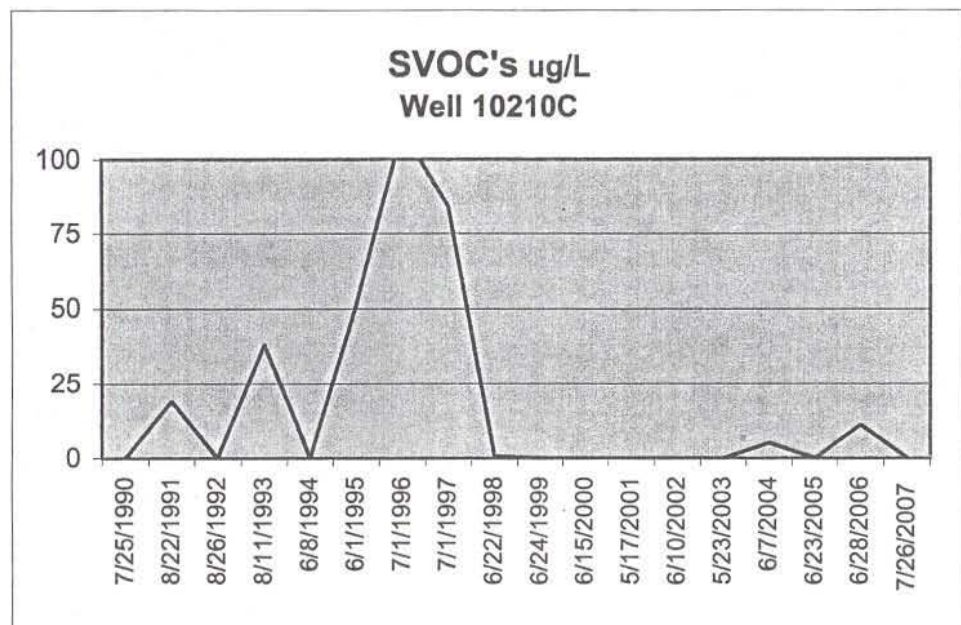
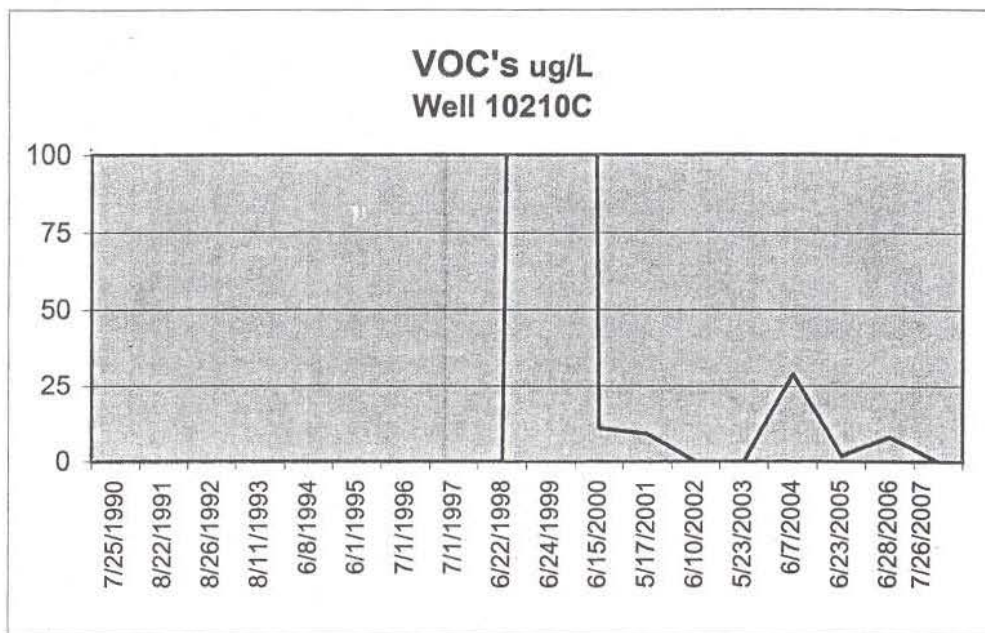
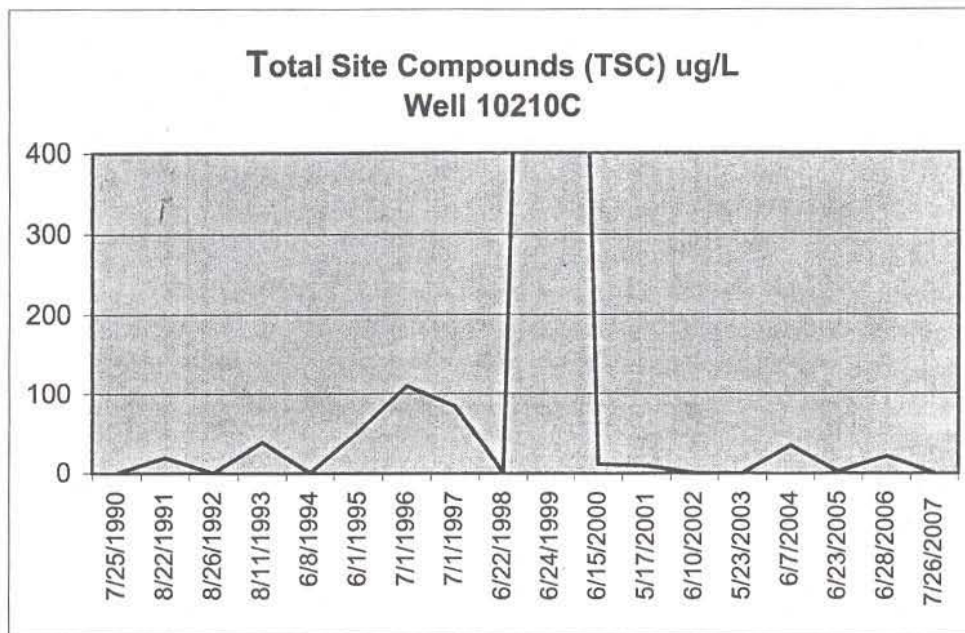
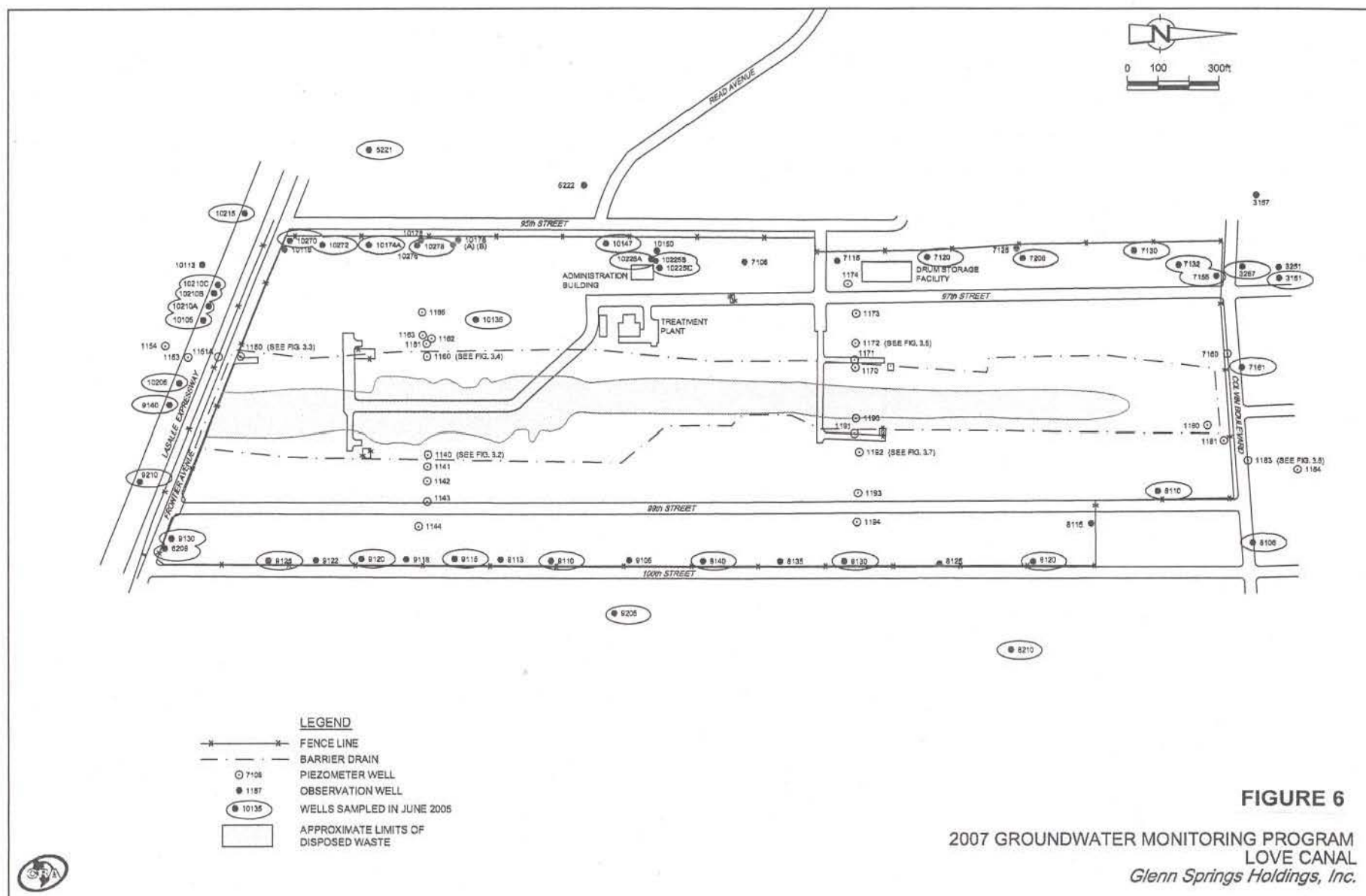


FIGURE 5

LOVE CANAL LONG-TERM MONITORING WELL 10210C





APPENDIX C

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<u>TABLE 4: Other Comments and Suggestions on Maintenance and Monitoring</u>	
<u>Comment</u>	<u>Suggestions</u>
Some of the existing monitoring wells are no longer necessary for monitoring purposes.	Identify those monitoring wells that would be slated for decommissioning and perform the action.