Third Five-Year Review Report

for

Ottati & Goss/Kingston Steel Drum Superfund Site

Kingston,

Rockingham County, New Hampshire

December 2003

PREPARED BY:

United States Environmental Protection Agency
Region 1
Boston, Massachusetts

Approved by: **Date:**

12-29-03

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LIST OF ACRONYMS AND ABBREVIATIONS

ACRONYM	DEFINITION
1,2-DCA	1,2-dichloroethane
cis-1,2-DCE	cis-1,2-dichloroethylene
ABNs	acid/base/neutral compounds
ADL	Arthur D. Little, Inc.
AGQS	Ambient Groundwater Quality Standards
ARAR	Applicable or Relevant and Appropriate Requirement
CDB	Conway Barrel and Drum Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601 *et seq.*
CFR	Code of Federal Regulations
COC	Contaminant of Concern
ECC	Environmental Chemical Corporation
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
FS	Feasibility Study
GLCC	Great Lakes Container Corporation
HDPE	high-density polyethylene
IMC	International Minerals Corporation
KSD	Kingston Steel Drum
LTTD	low temperature thermal desorption
M&E	Metcalf & Eddy
MCLs	Maximum Contaminant Levels
NCP	National Contingency Plan, 40 CFR Part 300
NHDES	New Hampshire Department of Environmental Services
O&G	Ottati and Goss
O&M	operations and maintenance
OU1	Operable Unit 1

ACRONYM	DEFINITION
OU2	Operable Unit 2
OU3	Operable Unit 3
OU4	Operable Unit 4
PCE	perchloroethylene
PCBs	polychlorinated biphenyls
PRP	potentially responsible party
RAC	Response Action Contract
RCRA	Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et seq.*
RI	Remedial Investigation
ROD	Record of Decision
SDWA	Safe Drinking Water Act, 42 U.S.C. §§ 300f *et seq.*
SVOCs	Semivolatile Organic Compounds
TCE	trichloroethylene
TSCA	Toxic Substances Control Act, 15 U.S.C. §§ 2601 *et seq.*
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

EXECUTIVE SUMMARY

The Ottati & Goss/Kingston Steel Drum Superfund Site (the Site) is located in the lower Merrimack River Valley/Coastal Plain portion of southeastern New Hampshire approximately 8 miles north of Haverhill, Massachusetts, and approximately 3 miles south of the center of Kingston, New Hampshire. The Site is also known as the Ottati & Goss/Great Lakes Container Corporation Site. The Site consists of four operable units. Operable Unit 1 (OU1) refers to Potentially Responsible Party (PRP) lead cleanup of soil in the Ottati & Goss (O&G) portion of the Site which was completed in 1989. Operable Unit 2 (OU2) refers to the PRP lead groundwater design. In 1993, USEPA, the State of New Hampshire, and a large group of PRPs entered into a settlement which resulted in a Consent Decree that funded USEPA and NHDES for continuing work at the site. Any costs in excess of the settlement amounts would be financed through federal and state Superfund money. As a result of the settlement, OU2 was terminated and was superseded by Operable Unit 3 (OU3), which was designated to complete the groundwater remediation. Operable Unit 4 (OU4) was designated to complete the remediation of soil and sediments in the Kingston Steel Drum (KSD) portion of the Site. Because the KSD portion of the Site is also commonly called the Great Lakes Container Corporation (GLCC) area, this review uses the term "GLCC/KSD" area to describe it. This five-year review addresses OU1 (O&G soil), OU3 (groundwater), and OU4 (building demolition and GLCC/KSD soil and sediments).

Contaminants of concern in Site groundwater include: volatile organic compounds (VOCs) (benzene, trichloroethylene, perchloroethylene and 1,2 dichloroethane) and possibly arsenic and nickel. Polychlorinated biphenyls (PCBs) were the primary contaminant of concern in the soil and sediments, although high levels of VOCs, semivolatile organic compounds (SVOCs) and metals were also found. Surface waters transported contaminants of concern (notably PCBs) east via surface water bodies into the Country Pond Marsh area.

The remedy for the Site includes the clean up of groundwater to drinking water quality using pump and treat technology, and the clean up of soil and sediment to levels protective of the environment and of human health under anticipated future Site uses. Soil and sediments were remediated on site using thermal desorption or disposed off site. Institutional controls (land use restrictions) are part of the remedy to ensure that the future use of the property formerly owned by GLCC (and now controlled by the State of New Hampshire) is restricted to commercial uses with no day care. The soil remedy for the O&G portion of the Site (OU1) was completed in 1989. OU2 was terminated in 1993 and superseded by OU3. The building removal (OU4, Phase 1) was completed in 1994, followed by the soil and sediment remedy for the GLCC/KSD portion of the Site (OU4, Phase 2) in October 2002. Land use restrictions required by the OU4 Phase 2 remedy are not yet implemented, and the groundwater remedy (OU3) is not yet underway.

This is the third five-year review for the Site. The review is a statutory review because the selected remedy will, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure.

The five-year review concluded that the remedies at OU1 (O&G soil) and OU4 (Phase 2, GLCC/KSD soil and sediments) currently protect human health and the environment, because the remediation of soil and sediments has been completed to cleanup levels for PCBs and total VOCs that were established to be protective of human health and protective of the environment under current site uses. OU1 soil was remediated to a total VOC cleanup level of 1 mg/kg based on protection of groundwater. Accessible soil on the former GLCC/KSD property was remediated to a total PCB cleanup level of 20 mg/kg, which was derived to be protective under commercial uses, and a total VOC cleanup level of 1 mg/kg, which was derived based on protection of groundwater. Some areas within OU4 could not be excavated to meet total PCB and/or total VOC cleanup levels, but these areas are in locations that are not currently accessible (that is, greater than 8 feet below ground surface and below the water table, and/or very close to the Route 125 embankment). Accessible soil on residential properties that abut the former GLCC/KSD property was remediated to a total PCB residential cleanup level of 3 mg/kg which has been determined to be protective of human health. Wetland areas east of Route 125 have been remediated to a total PCB cleanup level of 10 mg/kg established to be protective of the environment.

In order for the remedy at OU4 to be protective in the long-term, institutional controls (land use restrictions) must be put in place to limit future site uses of the former GLCC/KSD property to commercial and prevent residential use or use for day care facilities under commercial site use. The Site is currently unused, with the upland area of OU4 surrounded by a fence, and the wetlands have been restored. The wetlands have been remediated to meet environmental protection standards and are not believed to require additional restrictions to be protective of human health. A site-wide risk assessment is planned prior to the next five-year review that will take into account the post-excavation sampling results from the OU4 remedial action (including the areas where cleanup levels were not met), possible additional soil sampling for a broader suite of analytes, and groundwater data collected since the completion of the OU4 remedial action.

The remedy at OU3 (groundwater) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Site groundwater is not being used, no structures are located over the plume, and nearby residential wells are routinely monitored by NHDES. No exceedances of MCLs for site-related contaminants have been detected by the NHDES residential monitoring program. Pre-design activities for the OU3 remedy are scheduled to begin in early 2004. Hence, the remedial actions at all Operable Units are either protective or will be protective upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Ottati & Goss/Kingston Steel Drum

EPA ID *(from WasteLAN)*: NHD990717647

Region: I	**State:** NH	**City/County:** Kingston/Rockingham

SITE STATUS

NPL status: : Final ☐ Deleted ☐ Other (specify) _____

Remediation status (choose all that apply): : Under Construction ☐ Operating ☐ Complete

Multiple OUs?* : YES ☐ NO	**Construction completion date:** ___ / ___ / _____

Has site been put into reuse? ☐ YES : NO

REVIEW STATUS

Lead agency: : EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Richard Goehlert

Author title: Remedial Project Manager	**Author affiliation:** EPA Region I

Review period:** _12 / _11/ __1998____ to _12__ / _11_ / 2003_

Date(s) of site inspection: __7_ / _28_ / _2003_____

Type of review:
: Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☐ 2 (second) : 3 (third) ☐ Other (specify) _____

Triggering action:
☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____
☐ Construction Completion : Previous Five-Year Review Report
☐ Other (specify) _____

Triggering action date *(from WasteLAN)*: _12_ / _11_ /1998 _____

Due date *(five years after triggering action date)*: _12_ / _11_ / ___2003___

* ["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, cont'd.

Issues:

(1) Groundwater contamination at the Site has not yet been addressed through remedial actions.
(2) Institutional controls to restrict future site uses of the GLCC/KSD portion of the Site to commercial (with no day care allowed) are not yet in place.
(3) A site-wide human health risk assessment is needed.

Recommendations and Follow-up Actions:

(1) Pre-design groundwater sampling to initiate OU3 remedial action is scheduled to occur during early 2004. EPA and NHDES should continue to implement the groundwater remedy.
(2) Institutional control implementation for the former GLCC/KSD property is targeted for 2004.
(3) A site wide risk assessment is planned that will use the confirmatory soil/sediment sampling results from the remedial actions, possible additional soil sampling for a broader suite of analytes, and groundwater data collected after completion of the OU4 remedial action. It is scheduled to be performed before the next five-year review in 2008.

Protectiveness Statement(s):

OU1 and OU4: The remedies at OU1 (O&G soil) and OU4 (GLCC/KSD soil and sediments) currently protect human health and the environment because the remediation of accessible soil and sediments has been completed to cleanup levels derived to be protective of human health and protective of the environment. Soil exceeding cleanup levels remains in some areas at depth (greater than 8 feet below ground surface and below the water table). In order for the remedy to be protective in the long-term, institutional controls (land use restrictions) must be put in place to limit future site uses. The specific nature of required institutional controls are to be decided upon and implemented in 2004. The Site is currently unused, with the upland area of OU4 surrounded by a fence, and the wetlands have been restored. The wetlands have been remediated to meet environmental protection standards and are not believed to require additional restrictions to be protective of human health.

OU3 and OU2: The remedy at OU3 (groundwater) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Site groundwater is not being used, no structures are located over the plume, and residential wells are routinely monitored by NHDES. Pre-design activities for the OU3 remedy are scheduled to begin in early 2004. OU2 was superseded by OU3, and hence there is no protectiveness statement for OU2.

Comprehensive Protectiveness Statement: The remedial actions at all Operable Units are either protective or will be protective upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

Other Comments: None.

SECTION 1.0
INTRODUCTION

The purpose of this five-year review is to determine whether the remedies for the Ottati & Goss/Kingston Steel Drum Site are protective of human health and the environment. The methods, findings, and conclusions of this review are documented in this Five-Year Review report. In addition, Five-Year Review reports identify issues found during the review, if any, and present recommendations to address them.

EPA Region I has conducted this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). Section 121(c) of CERCLA 42 USC § 9621(c) states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

EPA Region I - New England conducted this statutory five-year review for the Ottati & Goss/Kingston Steel Drum Superfund site in Kingston, New Hampshire. Technical support for this review, including a draft report, was conducted by Metcalf & Eddy (M&E) under the Response Action Contract (RAC) (Contract No. 68-W6-0042). Work was begun in June 2003 and completed in December 2003.

The Ottati & Goss/Kingston Steel Drum (O&G/KSD) Site consists of four operable units. Operable Unit 1 (OU1) refers to Potentially Responsible Party (PRP) lead cleanup of soil in the Ottati & Goss portion of the Site which was completed in 1989. Operable Unit 2 (OU2) refers to the PRP lead groundwater design which was not completed due to a settlement in 1993. In 1993, USEPA, the State of New Hampshire, and a large group of PRPs entered into a settlement which resulted in a Consent Decree that funded continued EPA and NHDES work at the site. Any costs in excess of the settlement amount would be funded by Superfund monies. As a result of

the settlement, OU2 was terminated and was superseded by Operable Unit 3 (OU3), which was designated to complete the groundwater remediation. Operable Unit 4 (OU4) was designated to complete the remediation of soil and sediments in the Kingston Steel Drum (KSD) portion of the Site. The KSD portion of the Site is also called the Great Lakes Container Corporation (GLCC) portion of the Site in some documents. Throughout this review, the term GLCC/KSD will be used to refer to this portion of the Site. This five-year review addresses OU1, OU3, and OU4. OU2 was a PRP lead design for groundwater remediation that was not completed and was replaced by OU3.

This is the third five-year review for the Ottati & Goss/Kingston Steel Drum Site. This review is required by statute because the selected remedy will, upon completion, leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. The trigger date for the initial five-year review was the initiation of the remedial actions at the Site in November 1988. The trigger for this statutory review is the signature date of the previous Five-Year Review report on December 11, 1998.

SECTION 2.0
SITE CHRONOLOGY

The chronology of the Site, including all significant site events and dates is included in Table 1. A site plan is presented in Figure 2 of Attachment 1.

Table 1: Chronology of Site Events

Event	Date
Drum reconditioning operations were conducted on the GLCC/KSD portion of the Site.	1959 through 1980
Two lagoons established for the disposal of caustic liquid waste from the drum reconditioning operations were backfilled on GLCC/KSD portion of the Site	1973 and 1974
A hazardous materials processing and storage facility was operated on the O&G portion of the Site	March 1978 through July 1979
EPA conducted emergency removal actions on the O&G portion of the Site, including the removal of approximately 4,000 drums	December 1980 through July 1982
Final listing on EPA National Priorities List	September 8, 1983
PRP removal actions on the GLCC/KSD portion of the Site, including the removal of drums and contaminated soil	June 1984 through June 1985
Completion of Remedial Investigation/Feasibility Study	August 1986
Record of Decision is issued for entire site	January 16, 1987
Several PRPs entered into a Consent Decree with EPA addressing the cleanup of soil on the O&G portion of the Site (OU1) and groundwater design and remediation (OU2) to be performed by the PRPs	November 1988
PRP lead cleanup of 4,700 cubic yards of contaminated soil at OU1 was completed	1988 through 1989

Table 1: Chronology of Site Events	
Event	**Date**
EPA, New Hampshire Department of Environmental Services (NHDES), and the remaining PRPs entered into a settlement which resulted in a Consent Decree that funded continued EPA and NHDES work at the Site. All claims which the United States had for injunctive relief (response activities) and costs (past and future) against the potentially responsible parties at the site were resolved, with few exceptions. OU2 (PRP lead groundwater remediation) was terminated and replaced by OU3 (Superfund lead groundwater remediation).	Consent Decree entered December 22, 1993 (modified by the Court on July 19, 1994)
Under OU4, Phase 1, the large building which housed drum reconditioning operations on the GLCC/KSD portion of the Site was demolished. Hazardous materials and toxic substances were removed from the facility for disposal. Several underground storage tanks were also removed from this area.	September 1993 through February 1994
A preliminary design of the groundwater pump and treat system for OU3 was completed. Construction of the treatment system was put on hold to evaluate the potential for natural attenuation of the groundwater contamination.	September 1996
An Explanation of Significant Differences (ESD) was issued which addressed a change in the treatment technology to be used to remediate OU4 Phase 2 contaminated soil and sediment. The ESD also restricted future use of the former GLCC/KSD property to commercial uses, and addressed an increase in the amount of soil to be excavated and treated. Cleanup levels for total PCBs were defined for various areas of the Site, based on an updated ecological risk assessment and the change in future land use of the former GLCC/KSD property to commercial use without day care.	September 28, 1999
OU4 Phase 2 Remedial Design was completed	September 6, 2000
State of New Hampshire acquires the former GLCC/KSD property	Fall 2000
Remediation of contaminated soil and sediment at OU4 and site restoration activities	February 2001 through October 2002

Table 1: Chronology of Site Events	
Event	**Date**
EPA prepared a letter indicating that the remedial approach for the OU4 east/wetland soil had changed.	September 19, 2001
Issuance of an ESD addressing a modification in the handling of OU4 residual materials.	February 7, 2002
Final site inspection for OU4 Phase 2 construction completion	October 1, 2002
Final Remedial Action Report for OU4 Phase 2 is issued	March 28, 2003
Completion of the first Five-Year Review for the Site	December 1993
Completion of the second Five-Year Review for the Site	December 1998

SECTION 3.0
BACKGROUND

3.1 PHYSICAL CHARACTERISTICS AND LAND AND RESOURCE USE

The Ottati and Goss/Kingston Steel Drum Site is located in the lower Merrimack River Valley/Coastal Plain portion of southeastern New Hampshire approximately eight miles north of Haverhill, Massachusetts, and approximately three miles south of the center of Kingston, New Hampshire (see Figure 1 in Attachment 1).

The Site is comprised of three distinct sections. The first is a 5.88 acre parcel referred to as the Great Lakes Container Corporation and Kingston Steel Drum (GLCC/KSD) area. The State of New Hampshire agreed to take this parcel by eminent domain, since no owner of record was available to implement the institutional controls. The State of New Hampshire registered a deed for taking the property in the fall of 2000. The second area is 29 acres and is owned by the Senter Transportation Company and Concord Realty Trust. One acre of this parcel was leased to Ottati and Goss, Inc. (O&G), and now this entire 29-acre parcel is referred to as the O&G portion of the Site. The third section is a 23-acre marsh located east of the GLCC/KSD section, located between Route 125 and Country Pond. This parcel was purchased by the IMCERA Group Inc., in 1984 and the section is referred to as Country Pond Marsh. The three areas are shown on the Site plan presented as Figure 2 in Attachment 1. The O&G portion is shown in greater detail on Figure 3 in Attachment 1.

The Site is situated northwest of Country Pond, in a northwest-southeast trending valley. The Site straddles New Hampshire (NH) State Route 125. The Site slopes to the east, from a maximum elevation of 250 feet on a hill on the northwest side of the Site to 116 feet, the average elevation of Country Pond (Riordan, 1984). The valley floor east of Route 125 consists of a triangular shaped marsh of approximately 40 acres. The marsh extends into Country Pond, which is drained by two small brooks. To the west of NH Route 125, the Site is an upland area of approximately 35 acres that is drained by two small streams on the north and south sides of the valley (North and South Brook, respectively). The streams are channeled under Route 125 via a north and south culvert and discharge directly into the marsh. In addition, there are two small ponds (30 to 60 feet in diameter) located in the uplands of the Site. East of Route 125, a well defined channel for North Brook is evident through most of the marsh, from the culvert to the discharge point into Country Pond. The South Brook channel is less well defined after it flows through the south culvert, and eventually becomes indistinguishable a few hundred feet after discharging to Country Pond Marsh.

Country Pond has been estimated by the New Hampshire Fish and Game Department to have an area of approximately 255 acres and an average depth of 14 feet (GZA, 1986). There are three basins which comprise the pond (northwestern, eastern and southern). Each basin is adjacent to a central island. The Site is located adjacent to the northwestern basin.

Country Pond acts as a local hydraulic sink, receiving both surface and groundwater discharges. Streams flow into Country Pond on the north, south, east and west shores. The outflow is located beneath a concrete bridge on the northeast side of the Pond (GeoTrans, 1986). The elevation of Country Pond is controlled by the Trickling Falls Dam, located approximately three miles downstream (GeoTrans, 1986). The elevation of the pond has historically ranged from 115 feet to 117 feet (GZA, 1986; GeoTrans, 1986).

Surficial (overburden) deposits in the vicinity of the Site include Pleistocene glacial deposits and recent alluvial and organic deposits. Recent deposits at the Site consist of organic deposits, alluvium and artificial fill materials which were remediated as part of OU4. Organic deposits consisting of a fibrous peat are present in several areas of the Site, including areas of Country Pond Marsh that were remediated as part of OU4.

Groundwater is found at the Site in the unconsolidated glacial deposits as well as the underlying bedrock. Groundwater exists in stratified drift deposits (sand and gravel) which form the overburden aquifer for most of the Site. Groundwater is also present in the bedrock underlying the Site. Groundwater is contained and transmitted in interstices such as joints and fractures in weathered and unweathered bedrock.

3.2 HISTORY OF CONTAMINATION

From the late 1950's through 1967 the Conway Barrel and Drum Company (CDB) owned the Site and performed drum reconditioning operations in the GLCC/KSD portion of the Site. The reconditioning operations included caustic rinsing of drums and disposal of the rinse water in a dry well near South Brook. As a result of South Brook and Country Pond pollution, CDB established two leaching pits (lagoons) in areas removed from South Brook. Kingston Steel Drum, the operator of the facility from 1967 to 1973, continued the same operations as CDB.

In 1973 International Minerals and Chemicals Corporation (IMC) purchased the drum and reconditioning plant and operated it until 1976. The lagoons were reported to be filled in 1973 and 1974. The property was purchased in 1976 by the Great Lakes Container Corporation. Beginning in 1978, the Ottati and Goss Company operations consisted of “processed hazardous materials brought to the Site in drums.” Heavy sludges from the wash tank and from drainings, and residues from incinerator operations at GLCC, were transported to the O&G Site for processing. The O&G operations ceased in 1979. GLCC continued the drum reconditioning operation on its portion of the Site, until July 1980.

3.3 INITIAL RESPONSE

Beginning in 1980, a number of investigations and remedial activities have been conducted at the Site. From December 1980 to July 1982, EPA conducted emergency removal actions and processed and removed over 4,000 drums from the O&G portion of the Site. IMC conducted similar operations at the GLCC/KSD portion of the Site, removing drums and soil from the Site between July 1984 and June 1985. The total removal included: 12,800 tons of soil, drums, and

metals; 101,700 tons of flammable sludge and 6,000 gallons of flammable liquid. The Site was secured with fencing in 1988.

Remedial Investigation / Feasibility Studies (RI/FS) were completed under a Cooperative Agreement with the New Hampshire Water Supply and Pollution Control Commission in 1986. The RI/FS conclusions were as follows:

- Soil throughout the Site was contaminated with volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), acid/base/neutral compounds (ABNs), metals and cyanide at high concentrations at numerous locations.

- Surface water in North and South Brooks and Country Pond contained dissolved VOCs.

- Sediments in North and South Brooks and the marsh contained VOCs and PCBs.

- Groundwater contaminated with VOCs, arsenic, nickel, iron and manganese was evident in several plumes. The plumes appeared to merge into one plume which migrated under Route 125 and the Country Pond Marsh, eventually discharging into Country Pond.

- There were no significant airborne contaminants.

In January 1987, EPA issued a Record of Decision (ROD) for the Site which evaluated 18 alternatives and recommended excavating about 19,000 cubic yards of soil and treating it on site using incineration and thermal aeration. The ROD also recommended mitigation of groundwater by extraction and treatment and re-injection of the treated groundwater; demolition and disposal of above ground and below ground structures including the building, utilities, and underground storage tanks; and long term monitoring of the Site. The ROD did not divide the Site into separate operable units when defining the remedial actions to be taken.

In 1988 and 1989 several PRPs excavated and treated about 4,700 cubic yards of soil contaminated with VOCs at the O&G portion of the Site. The treatment was by thermal desorption (thermal aeration in the ROD). This work was designated as OU1. The groundwater design that was being performed by the PRPs was designated as OU2.

In 1993, the EPA, NHDES, and the PRPs entered into a Consent Decree. This agreement resulted in most parties contributing to a cash settlement, thus rendering the remainder of the costs at the Site to be paid for by the Federal Superfund. Two operable units, OU3 and OU4, were defined to complete the remediation. OU3 would address the groundwater contamination, while OU4 would address building demolition (Phase 1) and the soil and sediment contamination (Phase 2). OU1 had already been completed, and OU2 was superseded by OU3.

Phase 1 of the OU4 remedial action was completed in February 1994 and included the following demolition activities: 1) asbestos abatement; 2) building debris removal and disposal; 3) sampling and analysis; 4) utilities removal; 5) removal of above-ground and underground storage

tanks; 6) contaminated soil and sediment disposal; and 7) installation of a high-density polyethylene cover over the southeast portion of the former building (ADL, 1994).

In September 1999, EPA issued an Explanation of Significant Differences (ESD) relevant to soil and sediment remedial work for OU4 in the GLCC/KSD area (Phase 2 of the OU4 remedial action). Differences that altered the ROD included: 1) increasing the volume of soil to be remediated; 2) increasing the area to be remediated; 3) replacing the remedial technology; 4) altering the future use of the former GLCC/KSD property; and 5) adjustments to cleanup levels for PCBs in various areas of the Site, based on intended future uses and updated risk assessments.

On September 19, 2001, the EPA announced that the remedial method for the Country Pond Marsh remediation had changed. Sediments and soil from Country Pond Marsh were to be disposed at permitted off-site disposal facilities instead of being treated on site by low-temperature thermal desorption (LTTD) methods.

On February 7, 2002 the EPA signed a second ESD indicating a change in the disposal method for the LTTD process residual materials consisting of filter cake material. The ROD had indicated that all LTTD residuals would be disposed of by incineration; this second ESD changed the disposal of the residuals to a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill facility (ECC, 2003).

Environmental Chemical Corporation (ECC) was contracted by the U.S. Army Corps of Engineers – New England District (USACE) to complete Phase 2 of the OU4 remedial action, which included the OU4 soil and sediment excavation, LTTD treatment, and restoration activities. Photos of the remedial and restoration activities are presented in Attachment 3. Between August 2001 and June 2002, 72,347 tons of PCB and VOC-contaminated soil (not including oversized material > 2-inches), were excavated from the GLCC/KSD area of the Site and treated in an on-site LTTD plant. Prior to treatment, debris (including drums, concrete, metal, wood, timbers, and tires) was removed from the soil and disposed off site. Prior to disposal, representative wipe samples were collected from the debris to confirm that PCB concentrations were not above disposal facility acceptance criteria.

The treated soil was sampled and analyzed as it exited the LTTD system, prior to placement back on the Site. All oversized materials (> 2-inches) were washed and placed back on site. Composite confirmation soil samples of the excavation floor and side walls were collected to determine whether PCBs and VOCs were below applicable cleanup limits.

Between October 2001 and February 2002, approximately 9,143 tons of sediment from the Country Pond Marsh were excavated, transported and disposed of as non-hazardous waste at a RCRA Subtitle D disposal facility. Approximately 492 tons of sediment were transported and disposed of as PCB hazardous waste (Toxic Substances Control Act) at a RCRA Subtitle C landfill facility. Confirmatory soil samples from the excavation floor verified the removal of contaminated soil and sediment. The Country Pond Marsh remediation was divided into two

areas, a thirty-inch deep excavation area and a six-inch deep excavation area. A total of six acres of wetland in Country Pond Marsh were remediated and restored.

Site restoration activities included backfilling, grading, seeding, vegetative plantings, and fence installation. Remediated areas of Country Pond Marsh were reconstructed and South Brook, which had been diverted during the remediation, was restored between May 2002 and September 2002. In June 2002, thirteen groundwater monitoring wells were installed at ten locations at the Site.

Other restoration activities included removing utilities, construction of permanent access roads, installation of a new chain-link fence with gates, reseeding, and removal of the South Brook diversion swale and recharge galleries. The OU4 remedial action is described in the Final Remedial Action Report (ECC, 2003).

3.4 BASIS FOR TAKING ACTION AT THE SITE

In 1986, EPA completed the RI/FS and the ROD was issued on January 16, 1987. The RI indicated that groundwater under the Site was contaminated above drinking water standards and a significant amount of soil and sediments were contaminated above levels protective of human health and the environment. Air was not identified as a media of concern at the Site.

Contaminants of concern in the groundwater that were noted in the ROD included: VOCs (benzene, trichloroethylene, perchloroethylene and 1,2-dichloroethane), arsenic, and nickel. Several sources of contamination were identified including the O&G area, the caustic lagoon, and "Kingston Swamp" area and an area identified as being "east of the GLCC cinder block building." Total VOC concentrations in groundwater were reported to be in excess of 10,000 ppb.

PCBs were the primary contaminant of concern in the soil and sediments, although high levels of VOCs, semivolatile organic compounds (SVOCs) and metals were also found. Source areas included the GLCC caustic lagoon area, the area immediately east of the GLCC cinder block building, and the O&G area. Surface waters transported contaminants of concern (notably PCBs) east via surface water bodies into the Country Pond Marsh area. Surface waters were also contaminated via contaminated groundwater discharge. Up to 14,000 ppb of PCBs were reported in site sediments.

The remedy for the Site as outlined in the ROD included the cleanup of groundwater to drinking water quality using pump and treat technology, and the clean up of soil and sediment to levels protective of human health and consistent with the groundwater cleanup. For soil, 20 ppm was established as a cleanup level for PCBs, and 1 ppm was established as a cleanup level for total VOCs. The cleanup level for PCBs in soil was based on direct contact exposures, while the total VOC cleanup level was derived to minimize the potential for further releases of VOCs to groundwater. Soil cleanup levels were not established in the ROD for contaminants other than PCBs or total VOCs, with the underlying assumption that treatment to the target level for total

VOCs would also result in nonhazardous levels of other contaminants. The ROD cleanup level for PCB-contaminated sediments was established at 1 ppm (more stringent than the soil cleanup level of 20 ppm), because of the potential for bioaccumulation of PCBs in the food chain. The technology chosen for the soil and sediment included excavation and incineration for the PCB-contaminated material, and thermal desorption for the VOC-contaminated material. The PCB cleanup levels and the remedial technologies were later modified by Explanations of Significant Differences as described in Section 4.2.3.

For groundwater, a level of 5 ppb was established as a cleanup level for each of four identified indicator compounds: benzene, trichloroethylene, perchloroethylene, and 1,2-dichloroethane. Five ppb is also the federal Safe Drinking Water Act Maximum Contaminant Level (MCL) for each of these compounds. The technology chosen for groundwater remediation is the installation of a groundwater pump and treatment system.

SECTION 4.0
REMEDIAL ACTIONS

4.1 REMEDY SELECTION

The EPA ROD for the Site was signed on January 16, 1987. The ROD specified remedial activities to be implemented at the Site to mitigate contaminated soil, sediment, and groundwater. The ROD did not divide Site soil, sediment and groundwater into separate operable units, but the ROD did establish different PCB cleanup levels for soil vs. sediments. During 1988, several PRPs entered into a Consent Decree with EPA addressing the cleanup of soil on the O&G portion of the Site (OU1) and groundwater remediation (OU2). Approximately 4,700 cubic yards of contaminated soil at OU1 were remediated during a PRP lead cleanup from 1988 through 1989. Following a second Consent Decree in 1993 involving EPA, NHDES, and remaining PRPs, two operable units, OU3 and OU4, were defined to complete the remediation. OU3 would address the groundwater contamination, while OU4 would address building demolition and the soil and sediment contamination. OU1 (cleanup of soil in the O&G area) had already been completed by 1993, and OU2 was superseded by OU3.

This section outlines the selected remedies for Operable Units 1, 3, and 4. Within Section 4, the GLCC/KSD and O&G portions of the Site are sometimes referred to as the upland area, and the 23-acre marsh located east of the GLCC/KSD section is referred to as the wetland/marsh area.

4.1.1 Operable Unit 1

The remedial objectives for OU1 are:

- Minimize the effects of source area contaminants on groundwater quality; specifically, remove contaminated soil to eliminate precipitation seepage through the source areas and contaminant infiltration into groundwater;

- Meet or exceed all applicable or relevant federal public health or environmental standards, guidance, and advisories; and

- Minimize potential impacts of implementing the selected source control remedy on adjacent surface waters and wetlands.

The selected source control remedy for OU1 (O&G soil) consisted of the following components:

- Excavation of contaminated soil with total VOC concentrations of 1 ppm or more (and 0.1 ppm or more for 1,2-dichloroethane, benzene, trichloroethylene, or perchloroethylene), and on-site treatment by aeration (low temperature thermal desorption);

- Reuse of treated soil as backfill;

- Grading and placement of four inches of sandy loam, followed by hydroseeding to restore grass;

- Off-site disposal of process residuals, stumps, logs, and drums uncovered during excavation;

- Ambient air quality monitoring during excavation and on-site treatment, to ensure that off-site contaminant concentrations in air did not exceed the air quality standards established for the project.

4.1.2 Operable Unit 3

The remedial objectives for OU3 are:

- Minimize risks to human health associated with potential future consumption of and direct contact with groundwater;

- Minimize migration of contaminants in groundwater such that groundwater discharging to Country Pond is not harmful to human health or aquatic ecological systems;

- Meet or exceed all applicable or relevant federal public health or environmental standards, guidance, and advisories; and

- Minimize potential impacts of implementing the selected management of migration alternative on adjacent surface waters and wetlands.

The selected remedial alternative for OU3 consisted of a management of migration remedy, including installation of a groundwater extraction and treatment system at the Site. Groundwater extraction wells are to be located within source areas, along the eastern boundary of the GLCC/KSD property (*i.e*. along Route 125), and within the marsh area downgradient of the source areas. The ROD indicates that treated water is to be discharged to upgradient groundwater and possibly surface water. Groundwater extraction and treatment has been specified to occur for a period of five years from the date of implementation. At that time, an evaluation of the technical feasibility of the remedy achieving target contaminant levels is to be conducted, if target levels have not been attained. Achievement of target levels has been defined as the continuous detection of specified contaminants of concern at or below target concentrations for a period of three years at the Route 125 Site boundary and at selected on-site monitoring wells.

The management of migration remedy also includes the following components:

- Monitoring on-site wetlands to ensure that groundwater extraction is not negatively impacting the wetlands (*e.g.* lowering water levels within the wetland)

- Initiating a long-term groundwater monitoring program of on-site and off-site monitoring wells;

- Monitoring residential wells during implementation of the remedy. The frequency and parameters of the monitoring are to be determined during design. Residential wells have been monitored annually for VOCs by NHDES since 1992.

4.1.3 Operable Unit 4

The remedial objectives for OU4 are:

- Eliminate future risks to human health through direct contact with contaminants by removing contaminated soil and sediment;

- Minimize the effects of source area contaminants on groundwater quality; specifically, remove contaminated soil to eliminate precipitation seepage through the source areas and contaminant infiltration into groundwater;

- Meet or exceed all applicable or relevant federal public health or environmental standards, guidance, and advisories; and

- Minimize potential impacts of implementing the selected source control remedy on adjacent surface waters and wetlands.

The selected source control remedy for OU4 consisted of the following components:

- Excavation of approximately 5,000 cubic yards of PCB-contaminated soil and sediment from the upland area, South Brook, and the marsh areas and on-site treatment by incineration. Within the upland areas, soil with detected concentrations of PCBs above 20 ppm would be excavated and treated. For sediments within South Brook and the marsh areas, the ROD sets the action level for PCBs at greater than 1 ppm. [Post-ROD remedy changes in volumes, treatment methods, and cleanup levels were made via two ESDs as described in Section 4.2.3.]

- Excavation of an estimated 14,000 cubic yards of contaminated soil and sediment with total VOC concentrations of 1 ppm or more and on-site treatment by aeration (low temperature thermal desorption). [Refer to Section 4.2.3 for description of remedy changes in the ESDs.]

- Decontamination and removal of existing structures on site;
- Reuse of treated soil as backfill within the upland area;
- Regrading and revegetation of the upland areas to minimize the migration of and prevent direct contact with any residual contamination;
- Air emissions testing during on-site treatment to ensure compliance with applicable Resource Conservation and Recovery Act (RCRA) air emission standards;
- Ambient air quality monitoring during excavation activities to ensure that off-site contaminant concentrations in air do not exceed applicable standards; and
- Post-construction activities consisting of groundwater monitoring, site inspections, and site maintenance.

4.2 REMEDY IMPLEMENTATION

OU1 remedy implementation was performed by three PRPs in 1988 and 1989. In a Consent Decree signed by EPA, NHDES and a group of PRPs during 1993, cash settlements were provided by PRPs and it was decided that remaining investigative and remedial actions would be conducted under the Federal Superfund program.

4.2.1 OU1 Remedy Implementation

Pursuant to a Consent Decree entered on November 13, 1987, three PRPs (General Electric Company, Solvents Recovery Service of New England, and Lilly Industrial Coatings, Inc.) performed response actions at the O&G portion of the site. Canonie Environmental Services Corporation completed a "proof-of-process study" for the low temperature thermal aeration process in the fall of 1988 and was granted approval for full-scale operation from EPA on December 15, 1998. Full-scale operation occurred on December 16, 1998, then shut down for the winter, and resumed from April 6, 1989 to May 3, 1989 (Canonie, 1989).

A backhoe was used to excavate VOC-contaminated soils. The excavation area is shown in Figure 3 of Attachment 1. The excavated material was screened to remove rock and debris greater than 1.5 inches in size. A total of approximately, 4,700 cubic yards of soil, 1,500 cubic yards of cobbles and boulders, and 35 tons of stumps, logs, protective clothing, crushed drums, and other debris were excavated.

The contaminated soil was treated on-site using low temperature thermal aeration. Treated soil was transported to a staging area where confirmation samples were collected. Confirmation samples were collected every hour during processing. Half of the samples collected each day were analyzed and if the average total VOC concentration was less than 1 mg/kg and the individual concentrations of 1,2-dichloroethane, benzene, trichloroethene, and perchloroethene

were less than 0.1 mg/kg, the treatment of the soils from that day was considered acceptable. If the average concentrations exceeded the cleanup levels, then the remaining half of the samples were analyzed and all results from that day were averaged. If the average was below the cleanup levels, the treatment was considered acceptable. If the average was above the cleanup levels, all soil treated that day was reprocessed.

The cobbles and boulders were spread out and tilled until the VOC content of the air immediately above the material was less than 1 ppm above background, as determined by an Organic Vapor Analyzer. Once the 1 ppm level was met, the cobbles and boulders were returned to the excavation.

Samples were collected from the excavation at 20-foot intervals along the excavation perimeter at depths of 2 feet and 4 feet below the ground surface. These samples were analyzed for VOCs. If a sample exceeded the 1 mg/kg total VOC cleanup level, additional soil was excavated and treated. The new excavation perimeter was then sampled to make sure that soils containing greater than 1 mg/kg total VOCs were excavated and treated.

Eight soil borings were performed to verify that cleanup levels were met along the western boundary of the excavation. Samples from the 0 to 1.5 foot interval and the 3 to 4.5 foot interval were analyzed for VOCs. Samples from one boring were also analyzed for PCBs. PCBs were not detected in the samples and VOCs were less than 1 mg/kg in all of the borings.

During the "proof-of-process study" and full-scale remediation, ambient air monitoring was conducted at the site. A pre-determined action level was set that required operations to shut down if total VOCs exceeded 5 ppm for a period of at least 20 minutes. The action level was not exceeded during remediation.

Site demobilization and Operable Unit 1 closure was completed on August 1, 1989.

4.2.2 OU3 Remedy Implementation

During September 1996, the design of the groundwater extraction and treatment system under OU3 was completed. However, a review of the historical groundwater data during the design phase indicated that groundwater contaminant concentrations had decreased since 1988. Within localized areas where source removal actions had been conducted, contaminant concentrations in groundwater were detected at lower concentrations than levels detected prior to those actions. Subsequent groundwater data review and modeling suggested that upon the removal of source areas for groundwater contamination, remaining groundwater contamination at the Site may naturally attenuate to acceptable levels within a period of ten years. Further review of the data and modeling concluded that additional field work would be required to evaluate the attenuation of contaminated groundwater at the Site. Therefore, implementation of the groundwater extraction and treatment system was postponed and further investigative activities were conducted.

Recent evaluations of Site conditions and groundwater sampling data have indicated that natural attenuation of groundwater contamination is not likely to achieve desired goals within a reasonable time frame. The groundwater extraction and treatment design is currently being reviewed, and a pump test and treatability study to determine the effectiveness of the selected remedial technology in treating contaminated groundwater at the Site is planned for spring 2004.

4.2.3 OU4 Remedy Implementation

Phase 1 of OU4 (building demolition) was completed in 1994 at a cost of about $1.9 million. The remedial design to address contaminated soil and sediments under OU4 Phase 2 was completed during September 2000. Remedial activities for OU4 Phase 2 were initiated during February 2001 and completed during October 2002. Operation and Maintenance (O&M) activities are ongoing. Soil with PCB concentrations above 20 mg/kg (a cleanup level judged protective of future commercial uses) has been removed to a depth of 8 feet below ground surface. Institutional controls need to be established to limit future activities on the former GLCC/KSD property to commercial uses only. The overall cost of the OU4 Phase 2 remedy was approximately $19,000,000. The remedial actions for OU4 are discussed below. Site photos that show the progress of remedial activities are presented in Attachment 3.

Phase 1 - Building Demolition

During 1993 and 1994, EPA demolished and removed the building which housed drum reconditioning operations on the GLCC/KSD portion of the Site. The facility was decontaminated prior to demolition, which included the removal and disposal of RCRA Subtitle C hazardous materials and toxic substances regulated under the Toxic Substances Control Act (TSCA). Additionally, regulated non-hazardous (RCRA Subtitle D) materials associated with the building demolition, including sediment, sludge, concrete, steel, and wood debris, were removed and disposed. In total, approximately 3,229 tons of demolition and 11,535 gallons of liquid waste and sludge were removed from the Site. A temporary cap consisting of a high-density polyethylene (HDPE) cover was installed over the area formerly occupied by the building. The purpose of the cap was to serve as a temporary measure to reduce infiltration through contaminated soil, thereby minimizing the potential for contaminant mobilization to groundwater, until the contaminated soil could be addressed under future remedial activities.

Phase 2 - Excavation and Treatment as a Source Control Remedy

Prior to the initiation of remedial activities on Site, EPA signed an Explanation of Significant Differences on September 28, 1999 indicating several changes to the source control remedy as specified in the ROD. The first change noted in the ESD was an increase in the amount of contaminated soil to be excavated and treated from the GLCC/KSD (upland) portion of the Site based on the discovery of contaminated soil under and around the demolished building footprint that had not previously been identified. The ROD had estimated that 5,000 cubic yards of PCB-contaminated soil from the GLCC/KSD area and sediment from the South Brook and wetland/marsh area required remediation. The discovery of the additional contaminated soil

increased the total to 14,000 cubic yards. The second change increased the wetland/marsh area requiring excavation and treatment from 3,500 square feet to approximately 5 acres, based on sediment sampling data collected after the issuance of the ROD.

Additionally, the cleanup level for sediments in the wetland/marsh area, east of Route 125, was changed due to the results of a site-specific Ecological Risk Assessment (ERA) conducted by EPA and its contractor in cooperation with the US Fish and Wildlife Service (ADL, 1997a and 1997b). The ERA concluded that 70% of the total PCBs sediment risk could be eliminated (resulting in a hazard quotient of < 1.5 throughout the 60-acre marsh) if brook and wetland sediments with PCB contamination greater than 10 ppm in a five-acre area were excavated. The cleanup level of 1 ppm total PCBs, that had been previously established for sediments in the ROD, was retained for a small portion of South Brook - the section at the entrance of the culvert that carries the brook underneath Route 125.

The third change identified on-site thermal desorption followed by off-site incineration of hazardous waste removed from the soil and sediment as the preferred remedial technology to treat PCB-contaminated soil and sediment, instead of on-site incineration as specified in the ROD. The last change specified in the ESD restricted future land use of the former GLCC/KSD property to commercial use without day care. Since no owner of record was available to implement these institutional controls, the State of New Hampshire agreed to take the property by eminent domain and restrict Site usage to commercial use only. The State of New Hampshire registered a deed for taking the property in the fall of 2000. The total PCB cleanup level for the former GLCC/KSD property was kept at the ROD cleanup level of 20 ppm total PCBs, consistent with protection of human health under a commercial use scenario. For two other areas adjacent to the former GLCC/KSD property boundary, where institutional controls are not planned, a soil cleanup level of 3 ppm total PCBs was established to be protective under residential use.

Environmental Chemical Corporation (ECC) was contracted by the U.S. Army Corps of Engineers - New England District (USACE) to conduct the OU4 Phase 2 remedial activities. During April and May 2001, ECC excavated forty test pits on the upland portion of the Site to confirm the limits of the previously delineated excavation areas and provide a more accurate estimate of the amount of contaminated soil to be excavated and treated. This work was conducted prior to the commencement of any Site infrastructure activities to ensure that soil requiring remediation would remain accessible. Site infrastructure and control activities, including construction of a recharge gallery, staging areas, and access roads, as well as installation of treatment equipment, trailers, utilities, erosion control barriers, and temporary fencing, began during May 2001. Additionally, South Brook was temporarily diverted to North Brook during these activities through the construction of a rip rap drainage swale. The purpose of the diversion was to minimize the volume of water discharging to the wetland/marsh area during excavation and restoration activities. Several groundwater monitoring wells located within the excavation limits were abandoned prior to the start of excavation activities.

Remediation of Upland Areas

Approximately 48,000 cubic yards of PCB and VOC-contaminated soil and sediment were excavated from the upland area and treated on site between August 2001 and June 2002. Considering that this amount excludes the volume of 2-inch oversized material that was screened out prior to treatment within the low temperature thermal desorption (LTTD) unit, the total amount of soil excavated from the upland area has been estimated at 58,000 cubic yards.

Soil was excavated from east to west across the upland portion of the Site to a depth of approximately 8 feet below ground surface, unless a contaminant source area was identified. Excavation limits were confirmed by the collection of composite samples from the floor and sidewalls of open excavations. If contaminant concentrations above cleanup levels were detected within confirmatory samples, the floor and/or sidewalls were typically further excavated and re-sampled. One floor sample was collected for every 625 square feet and sidewall samples were collected every 12 linear feet of excavation perimeter. All samples were analyzed for PCBs and VOCs. For upland areas adjacent to the former GLCC/KSD property boundary (for which institutional controls are not planned), samples were also analyzed for arsenic and lead.

Some floor confirmation soil sample results from areas within the former GLCC/KSD property boundary were found to exceed cleanup levels for total PCBs and/or total VOCs, but the samples were collected from greater than 8 feet below ground surface and also below the groundwater table elevation. Additional excavation was not conducted because of the depth of the exceedances, and because the OU3 remedial action will address VOC contamination in groundwater. Floor sample results from four excavation areas located immediately north of the former GLCC/KSD property boundary were above residential cleanup levels, but sidewall sample results for these areas were below cleanup levels. Sidewall samples from one grid location immediately west of the Route 125 embankment also exceeded cleanup levels for PCBs and VOCs. The excavation was not continued along this sidewall, however, because it might have compromised the embankment and highway stability if excavation had proceeded any further (ECC, 2003). A site-wide risk assessment is planned prior to the next five-year review that will take into account the post-excavation sampling results from the OU4 Phase 2 remedial action (including the areas where cleanup levels were not met, and the likely uses of these areas), possible additional soil sampling for a broader suite of analytes, and groundwater data collected since the completion of the OU4 remedial action.

Excavated soil was transported to the LTTD system, where materials greater than 2 inches in diameter were screened out. Remaining materials were passed through the LTTD system where soil was heated to temperatures sufficient to cause contaminants to volatilize and desorb (physically separate) from the soil. The contaminated gas stream was then condensed, with subsequent contaminant removal from the liquid stream and concentration into a filter cake. Although the 1999 ESD stated that the filter cake would be incinerated off site, an ESD signed by EPA on February 7, 2002 allowed for disposal of the filter cake off site at a RCRA Subtitle C landfill facility. This change was made to take advantage of a sizable cost savings.

Treated soil was conditioned with water to reduce dust and transferred to soil bins for temporary storage. One sample was collected and analyzed for VOCs and PCBs per 100 tons of treated

soil, to determine if treatment limits had been met. Ten percent of the treated soil samples were also analyzed for the RCRA metals. Upon receipt of analytical results indicating that the material was acceptable for reuse, the treated soil was used as backfill on the former GLCC/KSD property. If contaminant concentrations within the treated material failed to meet treatment limits, the soil was re-processed in the LTTD unit. Materials too large to be processed in the LTTD unit (those greater than 2 inches in diameter) were decontaminated by EPA-approved rinse/washing methods and then used as backfill in the upland portion of the Site. No treated soil was placed beyond the former GLCC/KSD property boundary. Off-site bank-run borrow soil was used to backfill excavations in areas beyond the former GLCC/KSD property boundary.

Three discrete drum debris areas were identified north of the upland portion of the Site, on the adjacent property. Debris, including piles of drum carcasses, lids, and scrap metal, was removed from the area and transported off site for disposal at a RCRA Subtitle D landfill. Soil within the footprint of the debris areas was excavated to depths of 6 to 12 inches below ground surface and treated in the LTTD unit. Analytical results of confirmatory samples collected within the excavation did not indicate the presence of contaminants above cleanup or regulatory levels.

Air emissions testing of the exhaust from the LTTD unit and ambient air quality monitoring conducted during the OU4 Phase 2 remedial activities were in compliance with applicable standards.

Remediation of Wetland/Marsh Areas

The 1999 ESD stated that thermal desorption would be used to treat wetland/marsh sediments, as well as upland soil, if the sediments were found to be suitable for LTTD treatment. It was found that the high organic and moisture contents of the wetland/marsh sediments would make the materials difficult to treat with the LTTD technology. Therefore, it was determined that the sediments were not suitable for LTTD treatment, and EPA prepared a letter dated September 19, 2001 stating that sediments would be disposed off site at permitted disposal facilities instead. Sediments with total PCB concentrations less than 50 ppm were designated for transport to a RCRA Subtitle D landfill, and those with PCB concentrations of 50 ppm or more would be sent to a RCRA Subtitle C facility.

The wetland/marsh area was divided into two sections for excavation activities. The western portion of the wetland/marsh area was to be excavated to a depth of 30 inches below ground surface. The eastern portion, however, would only be excavated to 6 inches below grade. The total excavation area within the wetland/marsh area was increased from approximately five acres to six acres due to the presence of PCB-contaminated sediments found outside of the perimeter of the 6-inch excavation area delineation during pre-excavation sampling.

Between October 2001 and February 2002, approximately 11,300 cubic yards of sediment was excavated from the wetland/marsh area and disposed of as non-hazardous waste at a RCRA Subtitle D disposal facility. In addition, an estimated 610 cubic yards excavated from the area was transported and disposed of as PCB-contaminated hazardous waste at a RCRA Subtitle C

facility.

Excavated areas were backfilled to the original base grade with a wetland soil consisting of municipally derived compost (*i.e.*, yard waste) and bark fine matter, which was combined, screened, and homogenized to produce a very high organic content material. The backfill material was analyzed to ensure that it did not contain harmful chemicals and met certain physical requirements, such as organic content, pH, and grain size.

Site Restoration Activities

Site restoration of the wetland/marsh area was conducted concurrent with backfill of excavated areas since restoration included the construction of hummocks and hollows, habitat logs and stumps, and two ponds. Hummocks were constructed at higher grades to provide a root-zone area for trees and other plants. Hummock construction within the 30-inch excavation area consisted of backfill soil supported underneath by a criss-crossed pattern of 4 to 8-inch trees and limbs, known as pole logs. Within the 6-inch excavation area, the foundational use of pole logs was determined to be unnecessary and hummocks were constructed solely of backfill soil. Habitat logs and stumps were placed within the excavated and backfilled areas of the wetland/marsh, and ponds were constructed to provide habitat areas for wetland wildlife. A large pond, measuring approximately 0.25 acres, was constructed near the eastern limit of the 30-inch excavation area. The pond is approximately 2 feet deep at the center, and islands with logs and stumps were constructed at various locations within the pond. A small pond was also constructed in the northeastern portion of the 30-inch excavation area. Herbaceous vegetation was planted throughout the excavation areas and deciduous trees and shrubs were planted on the constructed hummocks within the area.

All access roads and staging areas within the wetland/marsh area were removed during Site restoration activities, with the exception of the access road along the Route 125 embankment, which was left in place as per the direction of EPA and NHDES to provide access for future monitoring operations. In order for this access road to remain, the South Brook culvert outlet was extended approximately 8 feet and a new head wall and outlet pad were constructed. The wetlands/marsh area was fenced along the side bordering Route 125 (the west side). The fence was also extended along the north and south sides, but the fence does not surround the entire wetlands/marsh area.

Site restoration activities conducted on the upland portion of the Site included the removal of utilities, the recharge gallery, and concrete decontamination pad and sump, construction of permanent access roads, placement of topsoil and turf application, installation of new chain link fencing and gates, and restoration of the South Brook area.

Perimeter fencing was installed to maintain Site control of the upland area. New chain link fencing was installed on all sections of the perimeter, with the exception of the east perimeter fence, which remained undisturbed through the remedial activities. Several access gates were installed to provide personnel and vehicular access to the Site for post-remediation monitoring

activities.

The South Brook area was also restored to its pre-construction conditions. The disturbed portion of the channel was fine graded and lined with natural stone to prevent erosion of underlying soil. Two habitat pools were constructed in the lower portion of South Brook and rip rap stone was placed in high velocity areas of the channel to prevent scouring and erosion. The temporary South Brook drainage diversion swale was removed and South Brook was routed along its original path.

Additionally, thirteen groundwater monitoring wells were installed during June 2002 within the upland and wetland/marsh areas to replace monitoring wells that had been decommissioned during remedial activities, or to provide a groundwater monitoring location in a new area of the Site.

Post-Remediation Activities

Post-remediation activities not associated with the O&M of the remedy included a final site inspection. The final inspection of the Site was conducted on October 1, 2002 and attended by representatives from the EPA, NHDES, USACE, ECC, and ENSR. A punch list of items requiring action was generated during the final inspection. All items on the list were completed by ECC shortly thereafter.

4.3 OPERATION AND MAINTENANCE

Remedial actions have not yet been conducted at OU3. Following completion of the source control remedy at OU4 in October 2002, limited O&M has been conducted at the Site. Continued operations at the Site include monitoring and maintenance activities associated with the uplands and restored wetlands areas of OU4. This monitoring was included through the end of the 2003 growing season as part of the OU4 construction project. There are no treatment systems on Site for OU4 that require on-going operation and maintenance.

Groundwater monitoring of on-site and off-site wells has been performed at the Site in 1996 by ADL, and by M&E in 1999 and 2000. The groundwater monitoring included sampling wells for VOCs, PCBs, metals, and natural attenuation parameters. Groundwater monitoring for VOCs using permeable diffusion bags (PDBs) was performed by EPA in 2002 and 2003. Additionally, NHDES monitors private water supply wells within the area of the Site. This monitoring has been conducted annually since 1992.

Initial maintenance activities conducted in the upland portion of the Site included the establishment of grass cover or turf. The turf establishment period was three months from the date of application. Other maintenance activities associated with the upland portion of the Site include the monitoring and maintenance of deciduous tree and shrub plantings in the South Brook area for a period of two growing seasons. Long-term monitoring and maintenance within this area is to be completed by the State of New Hampshire and includes grass mowing, access

road repair, erosion repair, and inspection and repair of fences and drainage structures.

Monitoring and maintenance of the wetland/marsh portion of the Site includes a plant establishment period of two growing seasons from the date of initial planting for all grass, trees, and shrubs. Bi-monthly groundwater elevation monitoring during the growing season, a vegetation monitoring report at the end of the growing season, an annual survey of established points on the hummocks and hollows, photographs, and wildlife documentation were also included in the monitoring requirements. The first monitoring event was conducted during the fall of 2002.

Two maintenance issues were defined during the fall 2002 maintenance activities. The first issue that had been on-going was the control of invasive and non-native wetland plant species, including cattail, purple loosestrife, and Japanese knotweed. After attempts to manually remove these species were unsuccessful, a permit was obtained from the New Hampshire Department of Agriculture for application of an herbicide and the herbicide was applied to prevent the invasive species from dominating the restored wetland/marsh area. The second issue that was noted during the fall 2002 maintenance issues was that several of the wetland and upland plants had died toward the end of the summer of 2002. The reasoning that these plants had not survived was at least partially attributed to drought conditions. During October 2002, the dead and dying plants were replaced with new plants.

SECTION 5.0
PROGRESS SINCE LAST FIVE-YEAR REVIEW

The last five year review for the Site was completed in December 1998. At that time, the remedy was judged to be not protective of human health and the environment. The remedial action for Phase 2 of OU4 had not yet been conducted at that time, and the remedial action for OU3 had been designed but not constructed. Additional sampling had been conducted to support development of the design documents for soil/sediment (OU4 Phase 2) and groundwater (OU3) remediation. The additional work suggested that changes to the remedies identified in the 1987 ROD might be warranted. The OU3 remedy was postponed to allow for completion of the source control (OU4) remedy first, and also to allow for additional groundwater monitoring to determine if groundwater concentrations would continue to decline. It was considered possible that a natural attenuation remedy would be feasible for OU3, rather than the pump-and-treat remedy identified in the ROD.

A re-evaluation of human-health-based soil cleanup levels for PCBs was conducted for the 1998 five year review. The re-evaluation indicated that the ROD cleanup level of 20 ppm total PCBs for the GLCC/KSD portion of the Site would not be protective under residential future Site uses. However, a 20 ppm total PCBs cleanup level was judged to be protective of human health if the future use of the former GLCC/KSD property was limited to commercial (with day care not allowed). A residential cleanup level of 3 ppm total PCBs was derived for two areas adjacent to the former GLCC/KSD property, so that land use restrictions for these other properties would not be required. An ecological risk assessment was completed for Country Pond Marsh that proposed a cleanup level for marsh sediments of 10 ppm total PCBs. For South Brook sediments near the culvert under Route 125, the total PCB cleanup level in the ROD of 1 ppm was retained.

The 1998 five-year review recommended that a Decision Document be prepared, with public input, to address the following issues:

1. Changing the on-site treatment technology for soil from incineration to thermal desorption, with off-site disposal of residual PCBs

2. Changing the future use of the former GLCC/KSD property to non-residential, with implementation of institutional controls through land use restrictions

3. Documenting the cleanup levels for PCBs that are protective of human health under non-residential Site uses

4. Documenting the cleanup levels for PCBs in the Country Pond Marsh that are protective of the environment

5. Development of a monitoring plan to evaluate the potential for monitored natural attenuation for groundwater contamination (OU3), and continued coordination with EPA's Office of Research and Development in Ada, Oklahoma

Since the 1998 five-year review, an Explanation of Significant Differences was issued in 1999 that changed the on-site soil treatment technology to thermal desorption, and revised the soil and sediment areas to be remediated to take into account data that were collected after the ROD was issued. The 20 ppm human-health-based soil cleanup level for PCBs was re-affirmed, based on application of institutional controls to limit future uses of the former GLCC/KSD property to commercial ones (the ROD had been based on residential future Site use). For portions of the site outside the former GLCC/KSD property boundary, a human health-based soil cleanup level of 3 ppm total PCBs was established to allow for residential use. The ecological (sediment) cleanup level for PCBs, which was based on an ecological risk assessment, was set at 10 ppm, except for sediment in South Brook at the entrance to the culvert under Route 125. For this latter area, the 1 ppm total PCB cleanup level originally established in the ROD was retained. Completion of the 1999 ESD addressed issues 1, 2, 3 and 4 identified above. However, the institutional controls described in the 1999 ESD are not yet in place. The institutional controls are planned to be in place during 2004.

An additional evaluation has been conducted regarding the groundwater remedy since 1998 (item 5). EPA plans to move forward with design of a pump-and-treat remedy in 2004, rather than change the remedy to monitored natural attenuation. Additional groundwater monitoring is planned for spring 2004, and a pump test and treatability study are also planned for spring 2004.

SECTION 6.0
FIVE-YEAR REVIEW PROCESS

This section describes the activities performed during the five-year review process and provides a summary of findings.

6.1 COMMUNITY NOTIFICATION AND INVOLVEMENT

An open house was held on August 25, 2001 at the Kingston Town Hall to discuss the OU4 Phase 2 remedial action activities that were planned and have since been completed. Interviews of local officials and nearby residents were performed in July 2003 to support this five-year review (see Section 6.5). On August 15, 2003, EPA issued a press release announcing that the five-year review was underway. The press release explained the status of the OU4 and OU3 remedial actions. The final Five-Year Review report will be provided to the Town and a press release will be issued to announce its availability.

6.2 DOCUMENT REVIEW

This five-year review consisted of a review of relevant documents for the Site including the ROD, two Explanations of Significant Differences, the Remedial Action Reports for OU1 and OU4, and two previous Five-Year Review Reports. See Attachment 2 for a list of documents that were reviewed.

6.3 DATA REVIEW

Groundwater monitoring has been performed both on and off the Site. Recent on-site groundwater monitoring was performed by ADL, M&E and EPA. Confirmatory soil sampling was performed as part of the OU1 and OU4 remedial actions. The groundwater and soil data are summarized in this section. The results of the most recent round of residential well monitoring by NHDES (September 2003) are also summarized.

6.3.1 Groundwater Data Review

M&E performed two rounds of groundwater sampling at the Site using low-flow techniques in November 1999 and November 2000. ADL performed one round of groundwater sampling at the Site using low flow techniques in August of 1996. During all three rounds, wells on both sides of Route 125 were sampled. In October 2002 and June 2003, EPA collected groundwater samples from Site monitoring wells, including thirteen newly installed monitoring wells. A total of 18 wells were sampled during both the October 2002 and June 2003 sampling rounds. Only three wells each round were sampled east of Route 125: W-20, GZ-04, and ME-8. The remaining wells were located west of Route 125, primarily along a north-south striking line just west of Route 125 and within the GLCC/KSD area.

EPA utilized passive diffusion bags (PDBs) to obtain the groundwater samples during the 2002

and 2003 rounds. In each well, the bags were distributed every 5 feet over the screened interval of each well sampled. The groundwater samples were collected in October 2002 and June 2003 and were analyzed for VOCs. Total VOCs for each sample depth were calculated for each well. In general the highest concentrations of VOCs are found in the central portion of the GLCC/KSD area near well GZ-11 and in the southwest corner of the GLCC/KSD area near ME-4A. At GZ-11 the highest total VOCs were 760 ppb in October 2002 and 12,770 ppb in June 2003. In ME-4A the highest total VOCs were 11,711 ppb in October 2002 and 6,985 ppb in June 2003.

This horizontal distribution of VOCs is consistent with the site disposal history as described in Section 3.0. The interval with the highest total VOCs at each location was plotted on a contour map for each round. The contour maps for the October 2002 and June 2003 rounds are presented as Figures 6 and 7. In addition, the vertical distribution of total VOCs is presented on a cross section for each monitoring round. The cross sections are presented as Figures 4 and 5.

The horizontal distribution of VOCs during each round suggests a narrow plume of groundwater contaminants in groundwater, which is consistent with previous sampling rounds. The plume ranged in width (north to south) approximately 350 to 375 feet during the October 2002 and June 2003 rounds conducted by EPA. The full downgradient extent of the VOC plume was not evaluated as part of the October 2002 and June 2003 investigations. Vertically, the distribution of VOCs appears to be well mixed, however concentrations of VOCs are slightly elevated in the more permeable strata.

Detected concentrations of VOCs for the two most highly contaminated wells, GZ-11A and ME-4A, are summarized in Attachment 4 for the June 2003 EPA sampling round. The detected concentrations are compared to New Hampshire Ambient Groundwater Quality Standards (NH AGQS) in the tables. Chlorinated solvents (PCE, TCE, vinyl chloride, and cis-1,2-DCE) and aromatic hydrocarbons (toluene, ethylbenzene, other alkyl benzenes) were detected in excess of the NH AGQS. Chlorobenzenes, xylenes, styrene, and naphthalene were also detected. The VOC analyte list and laboratory reporting limits are also included in Attachment 4.

6.3.2 Residential Well Data Review

Residential wells near the Site were most recently sampled by NHDES in September 2003, and the results were summarized in an October 30, 2003 memo. Typically NHDES samples 11 wells at 7 locations, but in September 2003 an additional 3 wells were sampled. Analysis was performed using EPA Method 524.2. Methyl-tert-butyl ether (MTBE), which is not a site-related contaminant, was detected at two locations at very low levels (1.3 to 2.8 ppb). 1,2-Dichlorobenzene was detected at a concentration of 1.0 ppb at one location that had not been sampled in 2002, because the homeowner was not at home. The MCL for 1,2-dichlorobenzene is 600 ppb. No other VOCs were detected in the September 2003 residential well water samples.

6.3.3 Soil Data Review

Operable Unit 1

Confirmation soil samples were collected from the excavation limits at depths of 2 feet and 4 feet below the ground surface in the O&G area of the Site. Eight soil borings were also performed along the western boundary of the excavation to verify that the cleanup levels had been met. Samples were collected from the soil borings at depths of 0 to 1.5 feet and 3 to 4.5 feet below the ground surface. All confirmation samples were analyzed for VOCs. A sample from one confirmation soil boring was also analyzed for PCBs. PCBs were not detected in the sample. All confirmation samples from the final excavation limits were below the 1 mg/kg total VOC cleanup level. The results are provided and discussed in the remedial action report for Operable Unit 1 (Canonie, 1989).

Operable Unit 4

Confirmation soil samples were collected from the excavation limits in the areas west (upland) and east (wetland) of Route 125. The results are provided and discussed in the Final Remedial Action Report for Operable Unit 4 (ECC, 2003). Samples were collected from both the bottom and sidewalls of the excavation for chemical analysis. Samples from the upland area were analyzed for PCBs and VOCs. Samples from South Brook area were also analyzed for arsenic and lead. Samples from the wetland area were analyzed for PCBs only.

The confirmatory soil results indicate that there are some PCB and VOC levels remaining on site that exceed the respective cleanup levels. The elevated residual PCB and VOC concentrations do not compromise the current protectiveness of the remedy, because they not located in areas that are currently accessible to humans. However, institutional controls will be required to maintain remedy protectiveness into the future. A site-wide risk assessment is also needed that will take into account the post-excavation sampling results from the OU4 remedial action (including the areas where cleanup levels were not met, and the likely uses of these areas), possible additional soil sampling for a broader suite of analytes, and groundwater data collected since the completion of the OU4 remedial action.

6.4 SITE INSPECTIONS

A limited site inspection was performed on July 28, 2003 by EPA, NHDES, and M&E to verify the security of the Site and to conduct in-person interviews (see Section 6.5). No signs of disturbance or trespassing were observed. A detailed site inspection was conducted on October 1, 2002 at the completion of OU4 Phase 2 remedial activities that included representatives of EPA, NHDES, the Army Corps of Engineers, and the remedial action contractor. A punch list of items was developed, and the punch list items were completed by the contractor shortly thereafter (ECC, 2003). Subsequent inspections of the restored wetlands have been performed by the remedial action contractor and efforts have been made to control invasive species. The next wetlands monitoring effort is scheduled for the end of the 2003 growing season (ECC,

2003). Groundwater monitoring was performed by EPA at the Site in October 2002 and June 2003. The next groundwater monitoring event is scheduled for early 2004.

6.5 INTERVIEWS

A series of interview questions was developed based on suggested questions in the EPA guidance for five-year reviews (USEPA, 2001). A list of interviewees was developed to include site abutters, local and state officials, and area residents who have previously participated in the NHDES yearly residential well sampling program. In addition, M&E interviewed Paul Lincoln, the project manager for NHDES; Chief Donald Briggs of the Kingston Police Department; and the Kingston Board of Selectmen.

Questions asked included:

1. What was the respondents' overall impression of the project to date;
2. What effects do site operations have on the surrounding community;
3. If the respondent was aware of any community concerns regarding the Site or its operation and administration;
4. Was the respondent aware of any events or incidents or activities at the Site such as vandalism, trespassing, or emergency responses from local authorities;
5. Did the respondent feel well informed about the Site and site activities;
6. Did the respondent have any comments, suggestions, or recommendations regarding the Site's management or operation.

A total of 12 interviews were conducted. A record of each interview was produced and has been included in this report. The interview records are included as Attachment 7. In general, the response from the public was favorable regarding EPA's current management of the project.

SECTION 7.0
TECHNICAL ASSESSMENT

This section discusses the technical assessment of the remedy and provides answers to the three questions posed in the EPA guidance for five-year reviews (USEPA, 2001).

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

The OU1 source control remedy (O&G soil) resulted in the removal and treatment of soil to the ROD cleanup level of 1 mg/kg total VOCs that was established to protect groundwater. Groundwater contaminant concentrations in the O&G area are declining, indicating that the OU1 remedy is functioning as intended. Cleanup levels for contaminants other than VOCs were not established for OU1, with the underlying assumption that treatment to the target level for total VOCs would also result in nonhazardous levels of other contaminants.

The OU4 source control remedy removed most of the soil and sediments that exceeded applicable cleanup levels, in the GLCC/KSD area, the South Brook area, and the Country Pond Marsh area. Soil cleanup levels were not established in the ROD for contaminants other than PCBs or total VOCs, with the underlying assumption that treatment to the target level for total VOCs would also result in nonhazardous levels of other contaminants. During remediation of the OU4 portion of the site, some soil exceeding PCB and/or VOC cleanup levels could not be excavated due to the proximity of the Route 125 embankment. Additionally, within discrete areas of OU4, contaminated soil at depths greater than 8 feet below ground surface was left in place. However, it was determined that the presence of this soil does not pose a threat to human health or the environment under current usage, because the soil is not accessible. Therefore, the OU4 remedy is still considered effective under current conditions.

Institutional controls for the former GLCC/KSD property, including the restriction of future use of the property to commercial without day care and the installation of perimeter fencing, have not yet been fully implemented. Fencing has been installed and currently the property is unused, but there is no land use restriction in place. Institutional controls must be maintained for the remedy to function as intended. A site-wide risk assessment is also needed that will take into account the post-excavation sampling results from the OU4 Phase 2 remedial action (including the areas where contaminated soil was left in place, and the likely uses of these areas), possible additional soil sampling for a broader suite of analytes, and groundwater data collected since the completion of the OU4 remedial action.

Groundwater and private well sampling has been conducted since the completion of the OU4 remedy. Remedial actions to address contaminated groundwater at the Site have not yet been implemented. Groundwater remedial actions are addressed under OU3, which has superseded OU2. A pump test and treatability study are currently scheduled to begin during spring of 2004. Final design of the groundwater remedy is expected to follow.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial

action objectives (RAOs) used at the time of remedy selection still valid?

7.2.1 Review of Human Health Risk Assessments and Toxicity Factors Serving as the Basis for the Remedy

No quantitative baseline human health risk assessment was performed for the Site prior to the ROD. However, a risk evaluation was performed as part of the ROD to develop cleanup levels for PCBs and total VOCs in soil and sediment, and for select VOCs [benzene, trichloroethylene (TCE), perchloroethylene (PCE) and 1,2-dichloroethane (1,2-DCA)] in groundwater. Five-year reviews conducted for the Site in 1993 and 1998 provide re-evaluations of the ROD cleanup levels. These re-evaluations used EPA risk assessment guidance current at the time of each review.

The current cleanup level of 20 ppm PCBs in soil for the former GLCC/KSD property is based on future "commercial use without day care" assumptions and corresponds to a carcinogenic risk of 1.5×10^{-5} and a noncarcinogenic hazard quotient of 1.1. Institutional controls in the form of land use restrictions are required to enforce nonresidential site use. The current cleanup level of 10 ppm PCBs for Country Pond Marsh sediment is based on potential ecological risk and was not previously evaluated for protectiveness relative to human health, because the wetland area is not accessed by humans, and is currently fenced on three sides. The residential cleanup level in soils for areas outside of the GLCC/KSD property is 3 ppm PCBs. For non cancer risk, the 1997 calculation is consistent with current guidance except for the exposed surface area value used. The current value is slightly lower (2800 cm^2 now vs. 2900 cm^2 then). This means that the non carcinogenic cleanup level is slightly more protective than originally calculated. All other values are identical to those that would be currently used. The cancer risk calculation for 3 ppm PCBs in soil using current guidance is 6×10^{-6}. Thus the residential cleanup levels remain protective. A cleanup level for total VOCs in soil and sediment was set at 1 ppm as a level protective of future impacts to groundwater. Groundwater cleanup levels were set at the Maximum Contaminant Levels (MCLs) (5 mg/kg for each target VOC), based on classification of the aquifer as a potential drinking water source. A drinking water monitoring program was established for the off-site residential wells.

The following provides an evaluation of discrepancies between current risk assessment guidance and guidance used to develop the cleanup levels and their impact on the protectiveness of the remedy. It is noted that this evaluation is limited in scope, and it is not intended to replace the need for the site-wide risk assessment that EPA plans to perform.

Changes in Exposure Pathways/Assumptions

The previous risk assessments did not evaluate human recreational exposures to sediment in Country Pond Marsh because the area is fenced on three sides and is not easily accessible or suitable for this purpose, because of physical hazards that impede access. The PCB cleanup level (10 ppm in sediment) was set at a level protective of ecological receptors. Since portions of these wetland areas could potentially be used for recreational purposes (or be trespassed) in

the future, a risk evaluation has been conducted as part of this five-year review to determine the degree of human health protectiveness associated with the sediment PCB cleanup level of 10 ppm that was applied to the wetlands east of Route 125. Currently this area is not used for recreation; however, the evaluation has been performed in case the situation changes, and to take into account that this area is not completely surrounded by a fence.

Calculations and assumptions used in this evaluation are provided in Attachment 5. The evaluation conservatively assumes that the sediment concentration of PCBs is 10 ppm throughout the entire area, and does not take into account that some areas of the marsh had lower sediment PCB concentrations, even before the remediation was performed, and that six acres of the marsh has had material removed and replaced. Reasonable maximum exposure assumptions used in the evaluation are consistent with current risk assessment guidance. Exposures to both young children and adults have been assessed. An exposure frequency of 78 days/year (three days per week for the warmest six months of the year) was used, indicative of an area with a high potential for recreational use. This assumption is also conservative, because high recreational use of this area is very unlikely. Based on these assumptions, the sediment cleanup level of 10 ppm PCBs would be associated with a carcinogenic risk of 6.6×10^{-6} and a noncarcinogenic hazard quotient of 1.3. The estimated risks do not exceed risk management criteria set forth in EPA policy. Therefore, the sediment PCB cleanup level is protective of recreational human exposures.

Groundwater at the Site may be used in the future as a source of potable water. Off-site residential wells continue to be monitored for site-related impacts. Cleanup levels for benzene, TCE, PCE and 1,2-DCA in groundwater were set at MCLs (5 ppb). Cleanup levels for VOCs in soil and sediment were set at a level protective of groundwater impacts, but were not attained at all locations as described in Section 4. Declining concentrations of indicator VOCs have been noted at the Site since source area soil removal was initiated. Groundwater treatment has not been initiated, but is planned to occur in the form of a pump and treat system. Based on this plan, the remedy is expected to be protective of human health since groundwater will ultimately be remediated to MCLs for VOCs and other contaminants in groundwater (e.g., PCBs), and there are no current routes of exposure. Residential wells in the vicinity of the Site will continue to be monitored for site-related impacts. The remedy, therefore, is currently protective with respect to groundwater.

The 20 ppm soil cleanup level for PCBs in the former GLCC/KSD property is based on future commercial land use (without day care) and was developed using risk assessment guidance current in 1997. Slight changes in the exposure assumptions for the commercial worker have occurred since 1997 which include a decrease in the soil ingestion rate (from 160 mg/day to 50 mg/day) and surface area exposed term (from 5,700 cm^2 to 3,300 cm^2), and an increase in the soil adherence factor (from 0.03 mg/cm^2-day to 0.2 mg/cm^2-day). Overall, these changes result in a slight decrease in the risk associated with the soil cleanup level. The carcinogenic risk associated with the 20 ppm PCB cleanup level is 1.2×10^{-5} and the noncarcinogenic hazard quotient is 0.8. Therefore, the PCB cleanup level for soil remains protective of human health, as long as deed restrictions preventing residential site use remain in place. Consideration of other

analytes as contributors to risk will be performed as part of the upcoming site-wide risk assessment. Soil cleanup levels were not established in the ROD for contaminants other than PCBs or total VOCs, with the underlying assumption that treatment to the target level for total VOCs would also result in nonhazardous levels of other contaminants. The site-wide risk assessment will serve as a check on this assumption, and also evaluate potential future risks for areas where cleanup levels could not be met.

Confirmatory results for soil indicate that there are some PCB and VOC levels remaining on site that exceed the respective cleanup levels. Soil levels in excess of cleanup criteria are present in a small number of locations at depths greater than eight feet below ground surface and well below the groundwater elevation. Sidewall samples collected at the property boundary, adjacent to Route 125, also exceed soil cleanup levels. Additional excavation could not be performed here because of concerns about undermining the Route 125 embankment. Since these locations would be associated with significantly less human accessibility, these locations with elevated residual contaminant concentrations do not compromise the current protectiveness of the remedy. The site-specific risk assessment will evaluate potential risks under certain possible future conditions of accessibility; *e.g.,* possible construction worker exposures, should invasive road work be needed on Route 125 in this area.

Some confirmatory samples were also analyzed for lead and arsenic. The detected levels of lead and arsenic are unlikely to be of concern for commercial receptors. Arsenic concentrations detected in soil confirmation samples were consistent with the New Hampshire background concentration (11 mg/kg). To support the OU4 Phase 2 remedial action, EPA derived a lead soil cleanup level for a commercial/industrial future site use of 870 mg/kg (see Attachment 6). Lead concentrations in soil confirmation samples were below this value, based on review of the OU4 Remedial Action Report figures (ECC, 2003). A re-evaluation of risks that takes into account the confirmatory soil results, as well as additional sampling results, will be performed as part of the upcoming site-wide risk assessment. The residual levels of elevated VOCs in soil are not expected to impact long-term groundwater quality, since an on-site groundwater extraction and treatment system will be installed and operated as part of the upcoming OU3 remedial action.

The soil cleanup level for total VOCs (1 ppm) was not based on direct contact human exposures, but was set at a level designed to be protective of groundwater. The specific limits for individual VOCs in soil (TCE 0.384 ppm; PCE 0.12 ppm; and benzene 0.11 ppm) are below risk-based levels for a commercial scenario, based on a 1×10^{-5} carcinogenic risk. The risk-based levels for these VOCs are 1.1 ppm, 34 ppm and 13 ppm for TCE, PCE and benzene, respectively. Therefore, the total VOC soil cleanup level is protective of direct contact commercial worker exposures. The TCE level would not be protective of direct contact residential exposures, reinforcing the need for continuing land use restrictions on the former GLCC/KSD property, preventing residential use.

Changes in Toxicity

Toxicity values (reference doses and cancer slope factors) for PCBs have not changed since the

previous five-year review conducted in 1998.

Summary and Conclusions

Because soil and sediments have been excavated to PCB and VOC levels that are protective of human exposures, the remedy is likely to be protective as long as institutional controls are put in place to prevent future residential Site use for the former GLCC/KSD property. Residual soil contamination remains but it is not currently accessible for human exposure. Off-site residential wells continue to be monitored for site-related contamination. Treatment is planned for on-site groundwater to restore the aquifer to drinking water quality, in compliance with MCLs. Overall, the remedy currently provides protectiveness against human health risks. However, institutional controls need to be established, residential well monitoring should continue, and a site-wide risk assessment for both commercial and residential areas is needed to more thoroughly evaluate remedy protectiveness under probable future Site uses. Consideration of additional analytes (other than PCBs and VOCs), and possibly additional sampling, are needed to support the site-wide risk assessment.

7.2.2 Review of Ecological Risk Assessments and Toxicity Factors Serving as the Basis for the Remedy

The 1994 ecological risk assessment (ERA) and follow-up technical memoranda for the Site (ADL, 1994; ADL, 1997a, 1997b) were conducted using a methodology which would generally comply with contemporary guidelines (EPA, 1997). The ERA consisted of collecting site surface water, sediment, and soil data; and modeled exposures to mink (*Mustela vison*), American woodcock (*Scolopax minor*), and short-tailed shrew (*Blarina brevisauda*). Site-specific soil: earthworm bioaccumulation factors (BAFs) were determined in order to improve the accuracy of modeled concentrations, which were later compared to toxicity reference values (TRVs). Models focused on site contaminants of concern which included PCBs, pesticides, and some metals. Exposure pathways were restricted to pesticides and PCBs. Sediment concentrations were compared to lowest effects levels (LEL) sediment benchmarks (Ontario Ministry for the Environment; Persaud et al. 1992, 1994) to assess general risk to the benthic macroinvertebrate community.

Assumptions, equations, and data used in the uptake models were reviewed to identify any significant changes that may have occurred since 1997. Dietary composition, home range values, and temporal factors used in the ERA have not changed. TRVs were also checked against recent toxicity data and were found to be within acceptable ranges. Additionally, understanding of physical features of the Site (for example, groundwater flow patterns, COCs, wildlife usage, and exposure pathways) have not changed. Therefore, ecologically-based cleanup calculations are still protective of the environment.

The implemented remedy consisted of excavating surface soil and sediment. Due to the general co-location of PCBs and other contaminants of concern (for example, chromium and lead), removal of PCBs is expected to also address risk from other COCs. Thus, the implemented

remedy is judged to be protective of the environment.

7.2.3 Changes in Applicable or Relevant and Appropriate Requirements and To Be Considered

The remedial work for OU1 and OU4 has been completed, and ARARs for soil contamination cited in the ROD (RCRA, TSCA, Clean Air Act, Executive Order 11990 - Protection of Wetlands, and the Fish and Wildlife Coordination Act) have been met.

The OU3 remedy (groundwater) is not yet underway. Groundwater-related ARARs that have been evaluated in the ROD include: the RCRA Groundwater Protection Standard; the Safe Drinking Water Act (SDWA) (40 CFR 141.11-141.16) Maximum Contaminant Levels (MCLs); the EPA's Groundwater Protection Strategy; and the New Hampshire Code of Administrative Rules Part 410 - Protection of Groundwater. New Hampshire's chemical-specific standards related to groundwater quality and discharges [Ambient Groundwater Quality Standards (AGQS), Env-Ws 1503.03, Adopted Rule 2/23/99], and New Hampshire rules governing emissions of toxic air pollutants [Regulated Toxic Air Pollutants, Env-A 1400] were not explicitly discussed in the ROD, but have been noted in subsequent design documents as standards relevant to the design of the groundwater remedy. Executive Order 11990 - Protection of Wetlands is also relevant, and it is noted in the ROD that design of the groundwater extraction system will need to consider the potential for adverse impacts to the restored wetlands because of groundwater withdrawal. Chemical-specific standards in relation to groundwater cleanup levels, groundwater treatment objectives, and air emissions are discussed further below.

Groundwater Cleanup Levels

The ROD specifies a target groundwater cleanup level of 5 ppb for each of four "indicator compounds": 1,2-dichloroethane, trichloroethylene, perchloroethylene, and benzene. The SDWA MCLs for these compounds are as follows (as of June 2003): 1,2-dichloroethane - 5 ppb; trichloroethylene - 5 ppb; perchloroethylene - 5 ppb; benzene - 5 ppb. Hence, the ROD target levels correspond to the current MCLs for the indicator compounds. The New Hampshire AGQS also correspond to the SDWA MCLs for each of the indicator compounds. Hence, there are no changes in the target cleanup levels for the indicator compounds as a result of changes in standards.

The ROD also identifies arsenic and nickel as metals that may be elevated in site groundwater, and indicates that additional evaluation of the need for treatment for metals would be performed upon the completion of pilot studies. Cleanup levels for arsenic and nickel are not established in the ROD. The SDWA MCL for arsenic has recently been established as 10 ppb. In 2004, further evaluations will be performed by EPA, in consultation with NHDES, to evaluate whether cleanup goals for arsenic or other metals are warranted. NHDES is undertaking the sampling of residential wells in the vicinity of the Site, to help assess whether the concentrations of metals detected in site groundwater are consistent with concentrations that would be expected in the absence of the Site.

Groundwater Treatment Objectives

The ROD notes that extracted groundwater will be treated to meet State of New Hampshire requirements and discharged back to site groundwater to the extent technically feasible. Surface water discharge is to be practiced only if recharge back to the Site is not feasible. The current New Hampshire requirements for recharge of extracted groundwater back to the Site are the New Hampshire AGQS, which as noted above are equivalent to the SDWA MCLs for the indicator compounds. For arsenic, the State plans to revise the AGQS to be equivalent to the recently established SDWA MCL for arsenic, which is 10 ppb. Currently, EPA and NHDES plan to use the 10 ppb value in the remedial design for OU3 as the treatment objective for arsenic, and values of 5 ppb for each of the indicator compounds. For other compounds that may be present and have AGQS, the AGQS will be the treatment objective.

Air Emissions

New Hampshire has established ambient air emission limits for a wide range of toxic air pollutants (Env-A 1400, Table 1450-1). Compliance with the ambient air limits needs to be demonstrated by the owner of any device or process which emits a regulated toxic air pollutant. The VOCs found in site groundwater are regulated toxic air pollutants. The design of the groundwater remedy will need to consider the potential for emissions of regulated VOCs to the ambient air as a result of groundwater extraction and treatment, and demonstrate compliance by one of the methods described in Env-A 1406.

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

There is no other information that calls into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

According to the data and reports reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD, as modified by the ESDs. Remedial actions for OU1 and OU4 have been completed. The remedy for OU3 (groundwater) is not yet completed. Residential well monitoring should continue to make sure that exposures to contaminated groundwater do not occur before the OU3 remedy is fully implemented.

The institutional controls required to maintain protectiveness for the OU4 remedy are not yet in place. Some soil contamination above OU4 cleanup levels was not removed because of its location at depth or near the Route 125 embankment. This soil contamination does not impact current protectiveness because it is not accessible under current Site uses. However, it will need to be evaluated as part of an upcoming site-wide risk assessment to be completed before the next five-year review. Other analytes will also need to be considered in the risk assessment, because the ROD/ESD cleanup levels were for PCBs and VOCs only, and were based on the underlying assumption that cleanup to these levels would also remove other contaminants to acceptable

levels. The PCB and VOC cleanup levels were reviewed for consistency with current risk assessment practice and found to be protective. A limited risk evaluation was also conducted to consider whether the ecologically-based PCB cleanup level for sediment would be protective of human health under a recreational use scenario, and that cleanup level (10 ppm total PCBs) was found to be protective. Based on this review and limited risk evaluation, it is concluded that the OU4 remedy is protective under current Site uses. However, as noted above, a full site-wide risk assessment is needed to confirm this conclusion, and evaluate future use scenarios with appropriate institutional controls. Also, the planned institutional controls for the former GLCC/KSD property must be implemented.

The ARARs cited in the ROD were met for the OU1 and OU4 remedial actions. ARARs that will need to be met for the OU3 remedy that were not explicitly described in the ROD have been identified and are being used as a design basis for the OU3 remedy. There is no other information that calls into question the protectiveness of the remedy.

SECTION 8.0
ISSUES

Based on the activities conducted during this five-year review, the issues identified in Table 2 have been noted.

Table 2: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Future use limitations on the former GLCC/KSD property to restrict uses to commercial (excluding day care) have not yet been implemented.	N	Y
Remedial actions to address groundwater contamination at the Site have not yet been implemented (i.e., the OU3 remedy is not completed).	N	Y
A site-wide risk assessment is needed to more thoroughly evaluate remedy protectiveness under probable future commercial and residential Site uses. Consideration of additional analytes (other than PCBs and VOCs), and possibly additional sampling, are needed to support the site-wide risk assessment.	N	Y

SECTION 9.0
RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, it is recommended that the actions listed in Table 3 be taken:

Table 3: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness	
					Current	Future
Institutional controls are not in place yet.	Formally establish institutional controls to restrict future GLCC/KSD property uses to commercial.	NH	EPA	2004	N	Y
Groundwater contamination has not been remediated.	Pre-design groundwater sampling to initiate remedy	EPA		12/2003	N	Y
A site-wide risk assessment is needed.	Evaluate possible additional sampling/analysis needs and perform risk assessment.	EPA		before next review (by 12/2008)	N	Y

SECTION 10.0
PROTECTIVENESS STATEMENTS

OU1 and OU4

The remedies at OU1 (O&G soil) and OU4 (GLCC/KSD soil and sediments) currently protect human health and the environment because the remediation of soil and sediments has been completed to cleanup levels protective of human health and protective of the environment, in areas that are accessible under current Site uses. OU1 soil was remediated to a total VOC cleanup level of 1 mg/kg based on protection of groundwater. The OU4 remedial action removed accessible soil and sediment that exceeded PCB/VOC cleanup levels, but some contaminated soil was left in place at depth (greater than 8 feet below ground surface), and in one area near the Route 125 embankment, to avoid undermining the highway. In order for the remedy at OU4 to be protective in the long-term, institutional controls (land use restrictions) must be put in place to limit future site uses of the former GLCC/KSD property to commercial and prevent residential use or use for day care facilities under commercial site use. A site-wide risk assessment is needed to more thoroughly evaluate remedy protectiveness for OU1 and OU4 under probable future commercial and residential Site uses. Consideration of additional analytes (other than PCBs and VOCs), and possibly additional sampling, are needed to support the site-wide risk assessment. The Site is currently unused, with the upland area surrounded by a fence (limiting human exposure), and the wetlands have been restored. The wetlands have been remediated to meet environmental protection standards and are not believed to require additional restrictions to be protective of human health.

OU3

The remedy at OU3 (groundwater) is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. Site groundwater is not being used and residential wells are routinely monitored by NHDES. Pre-design activities for the OU3 remedy are scheduled to begin in early 2004.

OU2

There is no protectiveness statement for OU2, because OU2 (PRP lead groundwater remediation) was terminated and replaced by OU3 (Superfund lead groundwater remediation).

Comprehensive Protectiveness Statement

The remedial actions at all operable units are protective or will be protective upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

SECTION 11.0
NEXT REVIEW

The next five-year review for the Ottati & Goss/Kingston Steel Drum Superfund Site is due in December 2008. The next five-year review should include a complete review of progress on the OU3 remedial action; a summary and review of the upcoming site-wide risk assessment; and a review of data generated from groundwater, surface water, residential well, and air monitoring to confirm that the remedial actions are protective of human health and the environment. The next review should also confirm that institutional controls are in place.