TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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15. SUPPLEMENTARY NOTES	

16. ABSTRACT

The Ottati and Goss/Great Lakes Container Corporation site (O&G/GLCC) is located in Kingston, New Hampshire west of Route 125. The study area for the RI/FS includes the 35-acre O&G/GLCC site, a marsh area east of Route 125 and Country Pond adjacent to the marsh area. North Brook and South Brook drain the marsh at its interface with Country Pond. From the late 1950s through 1967, Conway Barrel & Drum Company (CBD) owned the site and performed drum reconditioning operations. The reconditioning operations included caustic rinsing of drums & disposal of the rinse water in a dry well near South Brook. As a result of State concerns regarding the proximity of the dry well to South Brook and complaints of resulting South Brook and Country Pond pollution, CBD established leaching pits in an area removed from South Brook. The State's Water Supply and Pollution Control Commission (WSPCC) reported onsite runoff and seepage from the leaching pits draining into South Brook and eventually into Country Pond. Reports included fish kills in Country Pond, dying vegetation along South Brook, and skin irritation of swimmers in Country Pond. In May 1973, International Mineral & Chemical Corporation (IMC) purchased the drum and reconditioning pland and owned and operated it until 1976. Beginning in 1978, heavy sludges (approximately thirty 55-gallon drums/month) from the wash tank and drum drainings, as well as residues from incinerator operations, were brought to the O&G site for processing. After the O&G operations
(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Ottati & Goss/Great Lakes, NH First Remedial Action - Final Contaminated Media: gw, sw, soil, sediment Key contaminants: VOCs, ABN, PCBs, pesticides, metals, cyanide		

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RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

Site: Ottati & Goss/Great Lakes Container Corporation

Kingston, New Hampshire

Documents Reviewed

I am basing my decision concerning the appropriate remedial alternative for the Ottati & Goss/Great Lakes Container Corporation Site (O&G/GLCC Site) primarily on the following documents. A substantial number of additional documents are included in the administrative record as well.

1. O&G/GLCC Remedial Investigation/Feasibility Study, Volumes I-VII, August 1986, prepared by Goldberg-Zoino and Associates, Inc.

2. Summary of Remedial Alternative Selection.

3. Community Relations Responsiveness Summary.

4. December 1985 Opinion in United States, et al. v. Ottati & Goss, Inc., et al

5. Testimony and Exhibits introduced in United States, et al. v. Ottati & Goss, Inc., et. al

6. Public Comments

7. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986.

8. The National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, November 20, 1985.

Description of Preferred Remedial Alternative

- Excavation of approximately 5,000 cubic yards of PCB contaminated soil and sediments followed by destruction of contaminants by incineration.

- Aeration (low temperature thermal stripping) of approximately 14,000 cubic yards of contaminated soils.

- Installation of groundwater extraction and treatment system with discharge of treated groundwater to upgradient groundwater, and possibly, to local surface waters.

- Site grading and disposal of contaminated GLCC building materials.

- Site Cover

- Installation of groundwater monitoring system, drinking water surveillance program, and Country Pond monitoring system.

° Operation and Maintenance

Maintenance will include lawn mowing of the grass cover system, clearing obstructions from the site stormwater drainage systems, and regrading of the site as necessary. Monitoring will include sampling and analysis of upgradient and downgradient monitoring wells; of surface waters including Country Pond; and of area private water supply wells.

Declaration

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA or the 1986 Act), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R Part 300. I have determined that at the O&G/GLCC Superfund Site, the selected remedial alternative is cost-effective, consistent with a permanent remedy and provides adequate protection of public health and welfare and the environment.

The State of New Hampshire has been consulted and concurs with the selected remedial alternative.

I have determined that the action being taken is consistent with Section 121 of SARA and is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

The action will require operation and maintenance activities to ensure continued effectiveness of the remedial alternative as well as to insure that the performance objectives meet applicable state surface and groundwater quality criteria.

1/16/87
Date

Regional Administrator

The authority to sign this Record of Decision under the 1986 Superfund Amendments has not yet been delegated by President Reagan. This ROD will become effective upon my receipt of such delegation.

1/16/87
Date

Regional Administrator

SITE DESCRIPTION AND SUMMARY OF REMEDIAL ALTERNATIVE SELECTION FOR THE OTTATI & GOSS/GREAT LAKES CONTAINER CORPORATION SITE

January 16, 1987
US EPA
Boston, Massachusetts

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SITE DESCRIPTION AND SUMMARY OF REMEDIAL ALTERNATIVE SELECTION FOR THE OTTATI & GOSS/GREAT LAKES CONTAINER CORPORATION SITE

SITE LOCATION AND DESCRIPTION

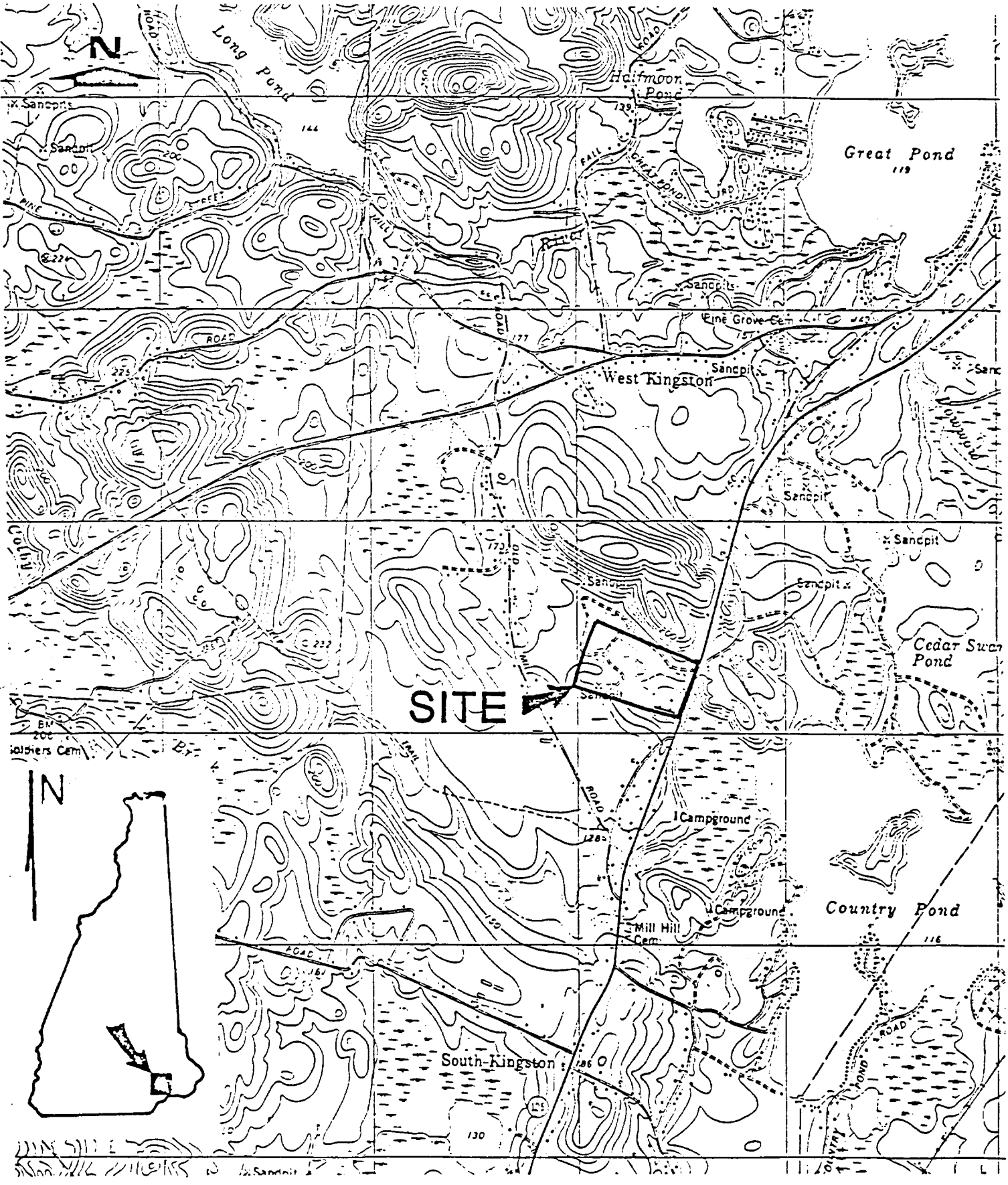
The Ottati & Goss/Great Lakes Container Corporation (O&G/GLCC) site was placed on the National Priorities List on September, 1981. The site is located immediately west of Route 125 in Kingston, New Hampshire, as shown on Figure 1. The entire site, depicted on Figure 2, consists of approximately 35 acres. The site is bounded on its easterly side by Route 125 and is traversed by an Exeter-Hampton Electric Company power line easement. Approximately 28 acres of the site are owned by the Senter Transportation Co. (Senter) with the remaining 5.88-acre portion currently owned by Great Lakes Container Corporation (GLCC). The GLCC property contains a one-story cinder block building. Senter Transportation leased an approximately one-acre parcel in the southwestern portion of the site to the Ottati & Goss, Inc. in 1978.

The site occupies an east-west trending topographic valley which drains to the east toward a marsh area east of Route 125. Site topographic relief is on the order of 10 feet, decreasing from a ground surface elevation of approximately 135 to 140 feet above mean sea level at its westerly edge to approximately 125-130 feet just west of the Route 125 embankment.

Two brooks traverse the site to the north and south. North Brook flows eastward near the northerly boundary of the site through a culvert beneath Route 125 and into the marsh adjacent to Country Pond. South Brook flows eastward near the southerly edge of the site, through a culvert beneath Route 125 and into the marsh. These brooks drain several marshy areas of seasonally ponded surface water on-site.

The study area for the RI/FS includes the O&G/GLCC site, a marsh area east of Route 125, and Country Pond adjacent to this marsh area. The marsh is somewhat triangular in shape and wooded, with an area of approximately 40 acres. Three small brooks were observed draining the marsh at its interface with Country Pond, the northern-most of which is North Brook.

The O&G/GLCC site is underlain by 20 to 50 feet of soil deposits consisting of fill, glacial outwash, glacial ice contact deposits, and glacial till. Fill materials appear to be granular and to locally contain buried drums and drum fragments. Outwash and ice contact deposits consisted of sands and gravels and are considered to comprise a relatively permeable overburden aquifer. Glacial till underlying the aquifer, while relatively less permeable than other unconsolidated deposits, was not observed in all borings and is not considered very restrictive of groundwater flow between the overburden aquifer and underlying bedrock. Bedrock, to the depth investigated (30 to 40 feet below the bedrock/overburden contact), was observed to consist of schist with pegmatite and

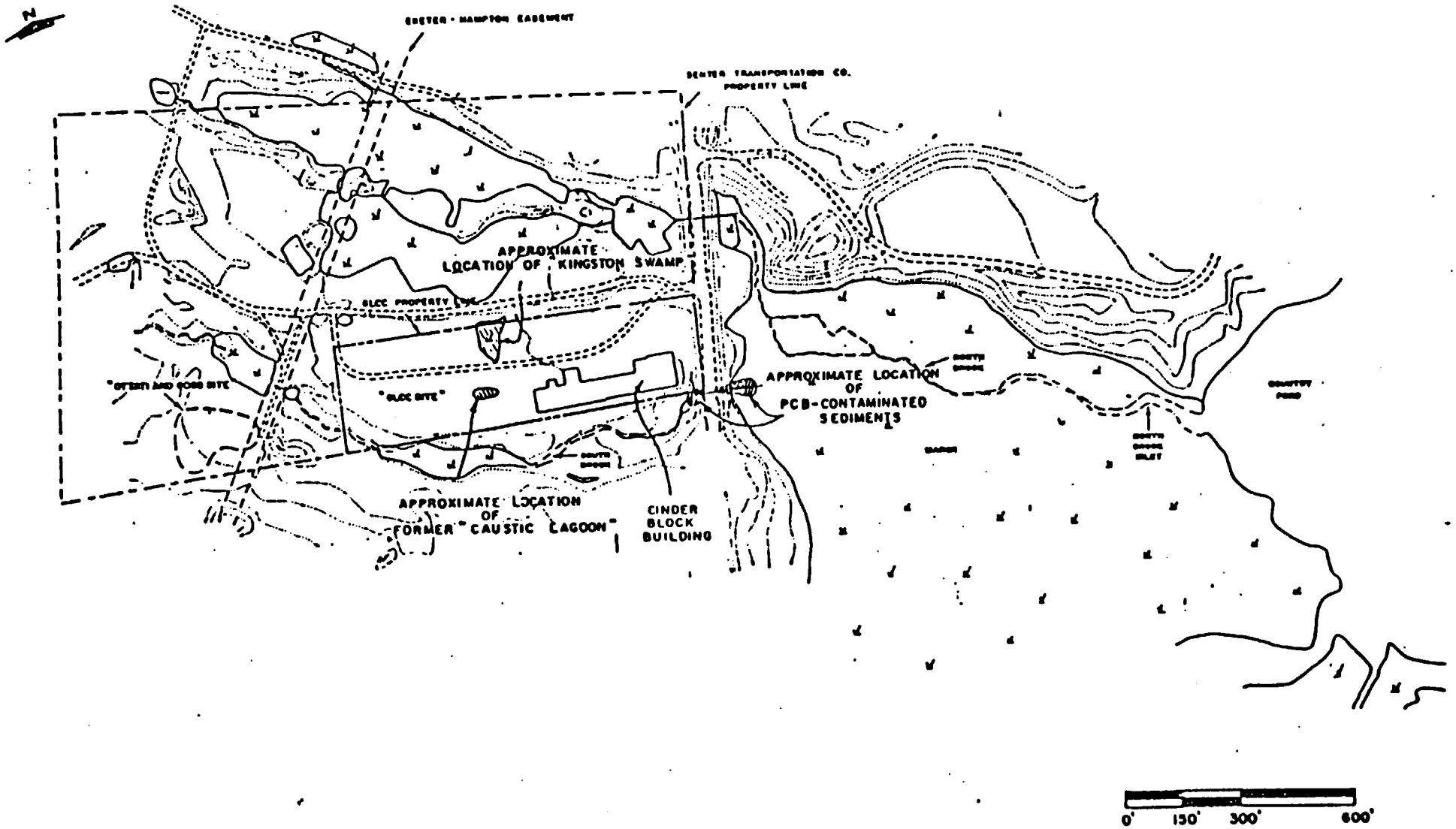


LOCUS PLAN

O &G/GLCC SITE

KINGSTON, N.H.

Figure 1



SITE PLAN

O &G/GLCC SITE
KINGSTON,N.H.

FIGURE 2

granite intrusions. The schist was observed to be slightly weathered and slightly to moderately fractured. The pegmatite and granite encountered in the rock cores were observed to be fresh to slightly weathered, and fractured to a similar degree as the schist. Permeability of the bedrock was generally observed to be low to very low.

Bedrock topographic data contained in the Remedial Investigation/ Feasibility Study indicate that a Y-shaped trough or depression trending to the east underlies the site west of Route 125 with the 2 "forks" portion of the GLCC site. Available data suggest this depression continues to the east of Route 125. A possible bedrock high was observed in the north central portion of the marsh.

Groundwater within the overburden aquifer beneath the O&G/GLCC site flows to the northeast across the site toward the topographic low associated with North Brook. Upon approaching North Brook, flow becomes southeasterly. Overburden groundwater flow converges and flows under Route 125 at the eastern edge of the site. Southeasterly groundwater flow continues within the marsh area east of Route 125 toward Country Pond.

On-site, where ice contact deposits predominate, the rate of groundwater flow was estimated at approximately 60-240 feet per year. In the marsh area, where more permeable outwash deposits predominate, the rate of groundwater flow was estimated at approximately 110 to 330 feet per year.

Both upward and downward hydraulic pressure gradients between the bedrock and the overburden, as well as within the bedrock, were observed at various locations around the site. The presence of significant downward gradients in some areas, together with the lack of a continuous impermeable soil layer between overburden and bedrock, indicates the potential for localized migration of overburden aquifer contaminants into bedrock.

Groundwater is the present drinking water source in the study area. Water is supplied by individual residential wells deriving water from unconsolidated bedrock aquifers. To date, no residential well contamination has been attributed to the site. There is presently no state or municipal restriction of groundwater use in the vicinity of the site.

Groundwater, surface water, and soil/sediment contamination is identified both on and off site. The major classes of compounds detected include volatile organic compounds (VOCs), acid and base/neutral (ABN) extractable organic compounds, polychlorinated biphenyls (PCBs), and metals.

SITE HISTORY

Portions of the site have been used for drum reconditioning operations and for disposal of hazardous materials since at least the late 1950's. The following summary of site history and plant operations is based on discussions with personnel from the U.S. EPA, New Hampshire Water Supply and Pollution Control Commission (WSPCC), and the U.S. Department of Justice; depositions and court testimony from ongoing litigation (United States, et al. vs. Ottati & Goss, Inc., et al.); and the Findings of Fact.

From the late 1950's through 1967, drum reconditioning operations were performed on the present GLCC site by the Conway Barrel and Drum Company (CBD), owned by Messrs. James and Daniel Conway. Available information concerning site operations of the CBD is limited. A State of New Hampshire Water Pollution Board (WPB) memorandum dated September 28, 1961, indicated that the CBD was established in 1959 for the purpose of reconditioning drums. WSPCC files indicate that reconditioning operations included caustic rinsing of drums and apparent disposal of the caustic rinse water in a dry well in the vicinity of South Brook. The location of the dry well was not documented.

As a result of State concerns regarding the proximity of the dry well to South Brook and complaints of resulting South Brook and Country Pond pollution, CBD established a "leaching pit" in an area removed from South Brook. This pit is commonly referred to as the "caustic lagoon" and was located on the property approximately 150 feet to the west of the existing cinder block building. The approximate location of the former caustic lagoon is shown on Figure 2.

A review of WSPCC files indicated numerous complaints against CBD by area residents. These complaints focused on on-site runoff and seepage from leaching pits draining into South Brook and eventually into Country Pond. Complaints included reports of fish kills in Country Pond, dying vegetation along South Brook, and skin irritation of swimmers in Country Pond.

In 1967, Messrs. Leroy Boudreaux and Daniel Conway formed the Kingston Steel Drum Company (KSD) which continued site operations until 1973. The KSD operations consisted of reconditioning both open head and closed head drums.

For open head drums, residues were emptied into 55 gallon drums which were reportedly hauled away from the site. Emptied drums were then passed through an incinerator to burn off remaining residues and subsequently brought into the plant for sand blasting, dedenting, and lining operations.

Reconditioning operations for the closed head drums differed from those for the open head drums. The closed head drums were pre-flushed and then rinsed with a caustic rinse solution. The drums were then washed in a dilute hydrochloric acid solution, sand blasted, and dedented. Caustic rinse water was disposed of in the previously described caustic lagoon located approximately 150 feet to the west of the cinder block building.

As described in a March 28, 1973 International Mineral and Chemical Corporation (IMC) memorandum, the caustic lagoon was a barbell shaped pond averaging approximately 25 feet in width, 100 feet in length and 3 feet in depth. An oil layer 1-1/2 feet thick was reported to cover the lagoon. According to the IMC memorandum, in 1973 the caustic lagoon received approximately 4,000 gallons/day of caustic rinse water.

Another small pond, commonly referred to as the "Kingston Swamp" was described in the same 1973 IMC memorandum as being generally circular in shape, approximately 100 feet in diameter and 1 foot deep. The approximate former location of the "Kingston Swamp" is shown on Figure 2.

In May 1973, KSD was purchased by IMC, who owned and operated the drum reconditioning plant from 1973 until 1976. With some modifications, IMC continued drum reconditioning in a manner similar to KSD, though apparently on a larger scale. Modifications apparently included measures intended to reduce the potential for pollution at the site. In the March 28, 1973 IMC memo, three potential pollution sources were identified by IMC prior to its purchase of the site. These included the caustic lagoon, the "Kingston Swamp", and spill water, including floor washings and building rinse water from the north side of the plant which eventually discharged into South Brook. Water samples collected in March 1973 by IMC indicated degraded water quality in the caustic lagoon, "Kingston Swamp", and on-site drainage into South Brook at Route 125.

The "Kingston Swamp" was reportedly backfilled in 1973 and the caustic lagoon was backfilled in 1974. Oil separation equipment was installed and IMC, and later GLCC, stored "deoiled" and "oily" wastes from the closed head drum process in separate on-site holding tanks.

Heavy sludges (approximately thirty 55-gallon drums per month) from the wash tanks and drums drainings, as well as residues from incinerator operations, were brought to the O&G site for "processing" beginning in 1978. After the O&G operations ceased, in June 1979, GLCC continued processing these sludges on-site in a manner similar to the O&G process. GLCC reconditioning

operations ceased in July 1980. A large number of drums were reportedly removed by GLCC in 1981.

Between July and December 1984, IMC performed drum excavation and removal operations at the GLCC site. These operations included excavating large portions of the GLCC site where drum burial was suspected based on previous test pit excavations, geophysical data, and court testimony. The O&G site was operated by Ottati and Goss, Inc., Mr. Louis Ottati, and Mr. Wellington Goss, from March 1978 through June 1979. During this time, site operations consisted of "processing" hazardous materials brought to the site in drums. This processing apparently involved emptying the contents of the drum in the box of a dump truck and mixing the wastes with sawdust and lime. The mixed waste and sawdust was then placed in dumpsters and reportedly removed from the site.

Material processed at the site allegedly included sludges from the GLCC site. On July 1, 1979 the New Hampshire Bureau of Solid Waste Management ordered the owners and operators of the O&G site to remove the drums and cease site operations. Between December 1980 and July 1982, EPA processed and removed approximately 4000 drums of waste from the O&G site. IMC, the owner and operator of the KSD drum reconditioning plant from 1973 to 1976, performed drum excavation and removal operations between July and December 1984. All stockpiled contaminated soils were removed from the site by June 1985. The total volume of contaminated soils, drums, and metal debris removed was approximately 12,800 tons. However, results of the Remedial Investigation (RI) indicate that additional drum fragments, crushed drums, and contaminated soil remain on the site.

CURRENT SITE STATUS

Goldberg-Zoino & Associates (GZA), under contract with the New Hampshire Water Supply and Pollution Control Commission, completed a Remedial Investigation/Feasibility Study (RI/FS) for the O&G/GLCC Site in August 1986. Data collected in the RI and in previous studies done by Ecology and Environment (E&E), under contract with EPA; P.E. LaMoreaux and Associates (PELA), consultants to GLCC; Roy F. Weston (RFW), consultants to GLCC; and Camp, Dresser & McKee (CDM), consultants to International Minerals and Chemical Corporation; were used to describe the nature and extent of contamination. Contamination sources, contaminant transport, environmental receptors impacted and suspected risks posed by contaminants are evaluated in the Remedial Investigation/Feasibility Study Report. The following is a brief summary of the types and concentrations of contaminants detected in soil, sediment, groundwater, surface water, and air.

° Soil

Elevated concentrations of VOCs, PCBs, ABNs, metals and cyanide have been observed in on-site soils at numerous locations on one or both of the O&G/GLCC portions of the site. At least four

major VOC contamination (high of 870,000 ppb) source areas have been identified; the GLCC caustic lagoon area, the "Kingston Swamp" area, an area immediately east of the cinder block building on the GLCC site, and the O&G site. Of the VOCs identified at the O&G/GLCC site, four of the contaminants are probable or known carcinogens. They are: trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, and benzene. Sampling performed subsequent to the IMC removal identified maximum concentrations of trichloroethylene of 3,900 ppb and tetrachloroethylene of 160,000 ppb in the vicinity of the caustic lagoon. A further discussion of these carcinogens is included in the Management of Migration Remedy. Due to past waste disposal practices at the site, it is likely that additional localized contaminant source areas exist. The observation of buried drums in the upper 6 feet of soil at numerous locations indicates the potential for concentrated "point" sources for VOCs, and perhaps, other contaminants.

PCBs were observed in soils over a wide area of the site. The highest PCB concentrations (143,000 ppb) were observed in the "Kingston Swamp" and caustic lagoon areas.

ABN compounds (high of 19,000 ppb) were observed in on-site soils at numerous locations in concentrations on the same order as VOCs, although there is no apparent correlation in terms of spatial distribution between ABNs and VOCs. The mobility of ABNs in groundwater or surface water is limited due to their propensity to absorb onto finegrained soil particles. Many metals and cyanide were observed at elevated concentrations in on-site soils; highest concentrations were observed in areas of suspected past disposal activity. As with VOC contamination, past practices at the site suggest that additional, localized contaminant source areas are likely present. Although both arsenic and nickel have been observed at elevated concentrations in groundwater downgradient of the site, arsenic concentrations in on-site soils did not exceed those observed at presumed background sampling points.

° Surface Water and Sediments

The principal contaminants of concern transported in surface waters in North and South Brooks are dissolved VOCs (high total VOC concentration of 500 ppb) in surface waters and sediments (high total VOC concentration of 6,000 ppb) in the vicinity of the North Brook inlet to Country Pond. These VOC concentrations appear to be related to upward discharge of contaminated groundwater. Despite the presence of VOCs in pond water and sediments in the vicinity of the North Brook inlet, volatilization and pond dispersion characteristics likely account for the lack of detection of VOCs in other areas of the pond.

Also of concern is the apparent transport of PCB-contaminated South Brook sediments into the marsh area, where up to 14,000 ppb of PCBs has been reported by EPA, based on the results of sampling performed in May 1980.

° Groundwater

The groundwater contaminants of principal concern at the O&G/GLCC site are VOCs, arsenic, and nickel, iron and manganese. ABNs appear to be highly attenuated relative to VOCs. PCBs/pesticides were not observed in groundwater downgradient of the site.

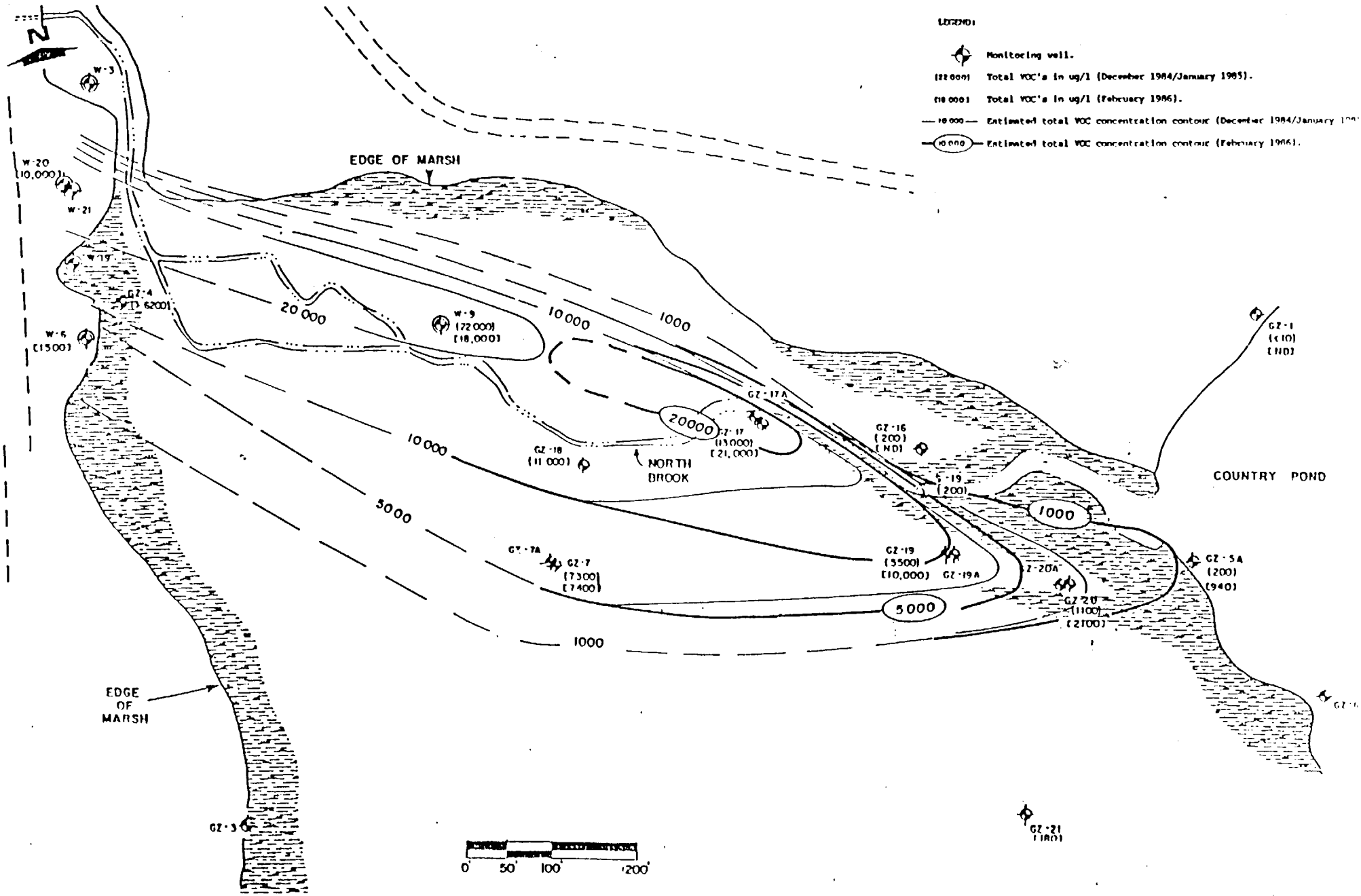
VOC groundwater contamination arises from numerous on-site source areas, most notably the O&G site, the caustic lagoon area, the "Kingston Swamp" area, and the area east of the GLCC cinder block building. Total VOC concentrations in groundwater in these areas generally have exceeded 10,000 ppb. The Court found the O&G plume moves generally from southwest to northeast and then parallel to North Brook and towards Route 125 and the marsh.

Individual contaminant plumes generated on-site would merge due to converging groundwater flow. East of Route 125, the plume appears to be limited to the northern third of the marsh area. Contaminants within the marsh are estimated to be migrating at a rate of 110 to 330 feet/year, have crossed the marsh area and impacted groundwater at the western edge of Country Pond. Total VOC concentrations in the western half of the marsh are on the same order but somewhat lower than those observed on-site. Figure 3 shows the distribution of VOCs off-site in the marsh.

Data concerning the spatial distribution and migration of arsenic and nickel in groundwater, though limited in quantity, suggest that these contaminants are migrating off-site in groundwater.

° Air

In February 1981, EPA collected eight 2- to 24-hour air samples in the vicinity of the O&G/GLCC site using either a tenax or a charcoal trap. Samples were analyzed for VOCs by GC/MS. The data provided in Appendix H of the RI/FS indicate no detectable levels of VOCs, with a detection limit of 50 ppb. GZA monitored air quality on- and off-site during site drilling operations using an organic vapor analyzer (OVA). VOC background concentrations both on-site and off-site were observed to be on the order of 0.2 to 0.4 ppm (200 to 400 ppb) during the September to December 1983 field exploration program. Since this concentration is near the detection limit of the OVA instrument, the above estimates may be considered to be a conservative estimate of background ambient air conditions prevalent both on- and off-site. The lack of discernible difference in on-site and off-site background OVA readings suggests that emissions of organic vapors during the site exploration program occured at concentrations below approximately 200 ppb. Though data are limited, it appears that the threat to human or environmental receptors posed by emissions of contaminants to the atmosphere is minimal. However, circumstances that alter existing site conditions, such as excavation of on-site materials or extensive remedial activity, should be accompanied by an air quality monitoring program to protect on-site and off-site receptors and to provide additional data concerning this potential contaminant migration pathway.



DISTRIBUTION OF TOTAL VOLATILE ORGANICS

(DECEMBER 1984-FEBRUARY 1986)

O &G/GLCC SITE

KINGSTON, N.H.

FIGURE 3

RISK ASSESSMENT

A baseline risk assessment was conducted to evaluate the risk to public health and the environment associated with the O&G/GLCC site in the absence of remedial action. The risk assessment was developed as follows: identify contaminants of concern; describe pathways of exposure associated with site contaminants; estimate levels of exposure and determine populations potentially exposed; characterize potential risks to humans and the environment.

Contaminants of Concern

A variety of different chemicals were found at the site, including volatile organic compounds (VOCs), acid and base/neutral (ABN) compounds, metals, cyanide, and PCB/pesticides. Many of these contaminants occur at substantial concentrations on-site, but considerably fewer have been observed to be migrating off-site. The VOCs appear to be the most mobile of site contaminants. VOCs have been observed in downgradient groundwater, surface water and sediments. PCB/pesticides, ABN compounds, metals, and cyanide appear to be less mobile. Possible exceptions include arsenic and nickel, where data suggest downgradient migration. ABN compounds have been detected at relatively high levels in the marsh area. PCB/pesticides have not been observed in downgradient groundwater or surface water. PCBs have been identified in the ppm range in South Brook sediments on-site and within the marsh area, as well as in on-site soils.

The various chemicals found on and off-site may cause a variety of different adverse health effects, depending upon the type of chemical and the concentration found. Some of the compounds present are known or suspected human carcinogens, such as benzene, arsenic, tetrachloroethylene, trichloroethylene and 1,2,dichloroethane, whereas other compounds may cause kidney and liver disorders and other adverse effects if chronic exposure to sufficient levels occurs.

Exposure Pathways/Exposure Populations

There are a variety of potential pathways of exposure to chemicals at the O&G/GLCC site. The following pathways were evaluated: ingestion of groundwater by contact with contamination in overburden, bedrock or Country Pond; ingestion of contaminated food, primarily focusing on fish consumption; inhalation of contaminated vapors or particulates from the site, dermal contact with contaminated soils, sediment or water on or off-site; ingestion of or dermal contact with contaminated media by birds and wildlife visiting the site.

EPA believes that based upon the risk assessment and the information available, the on-site soils present a direct contact risk. The soils also pose a risk as a source for the contaminated groundwater. The contaminated groundwater on-site and in the marsh pose a human health risk to anyone who drinks the water. The PCBs in the sediment also pose a human health risk through ingestion.

Risk Characterization

High levels of contamination are present on site, and have migrated in the groundwater east of Route 125 to where the marsh and Country Pond meet, as well as under the Pond itself. The Court has found that many of the chemicals are present on site in concentrations much higher than acceptable levels. Sampling data from the the RI/FS show that many hazardous substances in the soil and groundwater continue to be present in concentrations substantially above acceptable limits. Humans and biota may be exposed to these concentrations through ingestion, inhalation and dermal contact. Although on site risks were not quantified, they are potentially significant, as the site is accessible to humans and wildlife. This is particularly so since the site has the potential to be developed. Although most of the on site soil data indicates subsurface contamination, this does not preclude exposure, as areas of contaminated soils may be disturbed now or in the future, resulting in an opportunity for exposure. Moreover, surface contamination existed in the past, and such contamination may continue to be present.

For the groundwater ingestion pathways, results of sampling performed on groundwater on site and in the marsh revealed levels of various contaminants at concentrations to present a considerable risk if the site was ever developed and a person installed a well and consumed the water.

DEVELOPMENT OF ALTERNATIVES

The remedial alternatives for the O&G/GLCC site were developed and evaluated using the "Guidance on Feasibility Studies under CERCLA" and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 C.F.R. § 300.68 as guidance. To the extent that it was both possible and appropriate at least one alternative was developed in each of the folloiwng categories, as required by 40 C.F.R. § 300.68(f)(1) of the NCP:

1. Alternatives specifying off-site storage, destruction, treatment, or secure disposal of hazardous substances at a facility approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable EPA standards (e.g., Clean Air Act, Toxic Substances Act).

2. Alternatives that meet all applicable or relevant federal public health or environmental standards, guidance, and advisories.

3. Alternatives that exceed all applicable or relevant federal public health or environmental standards, guidance, and advisories.

4. Alternatives that meet CERCLA goals but do not attain all applicable or relevant federal public health or environmental standards, guidance, and advisories.

5. No action alternatives.

Prior to the development of alternatives, the Feasibility Study performed an evaluation of general response actions and technology screening for inclusion in proposed remedies applicable to the O&G/GLCC site. General response actions are broad response categories based on the findings of field work conducted. Technology screening considers the waste-limiting (waste characteristics that limit the effectiveness or feasibility of a technology) and site-limiting (site characteristics such as soil permeability that preclude the use of a technology) factors unique to the O&G/GLCC site, and the level of technical development for each technology.

The screening of the various technologies was based on the following criteria:

1. The technology must be reliable, based either on successful implementation at other hazardous waste sites, or in comparable applications;

2. The technology must be technically feasible, reliable, and applicable to site conditions and waste characteristics at the O&G/GLCC site, based on engineering judgement; and

3. The technology must be capable, by itself, or in conjunction

with other alternatives, of addressing at least one of the FS objectives.

Technologies that did not meet all of the above criteria were excluded from further consideration.

Table 1 lists the various technologies that were considered appropriate for evaluation at this site. Technologies which emerged from this screening process were then combined into source control and management of migration alternatives. As a result, eighteen (18) remedial action alternatives, as specified on Table 2, were developed for evaluation.

INITIAL SCREENING

The eighteen (18) remedial alternatives have been subjected to an initial screening consistent with 40 C.F.R. § 300.68(g)(1), (2), and (3) of the NCP to narrow the list of potential remedial actions for further detailed analysis. The initial screening process eliminated the following twelve (12) alternatives:

1. Alternatives 1A and 1B

   - 300.68 (g)(3); Do not effectively contribute to protection of public health and welfare.

2. Alternatives 2 - Alternative 6

   - 300.68(g)(3); Do not address off-site migration of contaminated groundwater. As a result, do not effectively contribute to the protection of public health and welfare.

3. Alternative 8

   - 300.68(g)(3); Is not considered effective in addressing on-site source contamination.

4. Alternative 9

   - 300.68(g)(3); Is not considered effective in controlling on-site contaminant release.

5. Alternatives 10A & 10B

   - 300.68(g)(2); Is not considered acceptable engineering practice since subsurface conditions are not conducive to the successful use of a soil/bentonite wall.
   - 300.68(g)(3); Use of cap not considered sufficient in controlling release of contaminants and does not effectively contribute to protection of public health.

6. Alternative 11

   - 300.68(g)(3); Is not considered effective in removing continued release of on-site contamination and thus not protective of public health and welfare.

TABLE 1
SUMMARY OF TECHNOLOGY SCREENING
LISTING OF REMEDIAL TECHNOLOGIES

- SURFACE WATER CONTROLS
  - Grading
  - Revegetation
  - Diversion and Collection Systems
- LEACHATE & GROUNDWATER CONTROLS
  - Capping
  - Groundwater Pumping
  - Containment and Barriers
- GAS MIGRATION CONTROLS
  - Gas Collection
- EXCAVATION & REMOVAL OF WASTE & SOIL
  - Excavation and Removal
  - Grading
  - Capping
  - Revegetation
  - Cover
- REMOVAL & CONTAINMENT OF CONTAMINATED SEDIMENTS
  - Sediment Removal
- IN-SITU TREATMENT
  - Soil Aeration
- DIRECT WASTE TREATMENT
  - Incineration
  - Biological Treatment
  - Physical and Chemical Treatment
  - Solid Handling and Treatment
- LAND DISPOSAL
  - Landfills
- CONTAMINATED WATER SUPPLIES & SEWER LINES
  - Alternative Drinking Water Supplies

° LAND USE RESTRICTIONS

- Restrict Site Access/Security Fencing
- Deed Restrictions
- Land Use Restrictions

° ENVIRONMENTAL MONITORING

- Groundwater
- Surface Water
- Air
- Fish

TABLE 2

LISTING OF REMEDIAL ALTERNATIVES

ALTERNATIVE NUMBER	DESCRIPTION
1A	No action
1B	No action; with site monitoring
1C	No action; with site monitoring and land use restrictions
2	RCRA GLCC site cap; O&G source excavation and relocation
3	RCRA GLCC site cap; O&G source excavation and relocation; and disposal or aeration on-site of highly contaminated soils, wastes, and sediments
4	RCRA GLCC site cap; O&G source excavation and relocation; and complete perimeter soil/bentonite cutoff wall
5	RCRA GLCC site cap; O&G source excavation and relocation; and upgradient soil/ bentonite cutoff wall
6	RCRA GLCC site cap; O&G source excavation and relocation; and upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soil, wastes, and sediments
7	RCRA GLCC site cap; O&G source excavation and relocation; and upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soil, wastes, and sediments
8	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation
9	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; disposal or aeration on-site of highly contaminated soil, waste, and sediments

10A	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; perimeter soil/bentonite cutoff wall
10B	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; upgradient soil/bentonite cutoff wall
11	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; upgradient groundwater interceptor trench
12	Groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soil, waste, and sediments
13	Alternate water supply; groundwater extraction and treatment; RCRA GLCC site cap; O&G source excavation and relocation; upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soil, waste, and sediments
14	Complete removal of on-site and off-site hazardous soils, waste, sediments, groundwater, with off-site disposal
15	Excavation and on-site treatment of contaminated soils, wastes, and sediments; groundwater extraction and treatment; site cover

DETAILED EVALUATION OF ALTERNATIVES

A detailed evaluation of each of the six (6) alternatives remaining after the initial screening was conducted in the RI/FS consistent with 40 C.F.R. § 300.68(h) of the NCP. For each alternative, the following factors, as appropriate, were considered:

(1) Detailed cost estimation, including operation and maintenance costs, and distribution of costs over time;

(2) Evaluation in terms of engineering implementation, reliability, and constructibility;

(3) An assessment of the extent to which the alternative is expected to effectively prevent, mitigate, or minimize threats to, and provide adequate protection of public health and welfare and the environment. This included an evaluation of the extent to which the alternative attains or exceeds applicable or relevant and appropriate federal public health and environmental requirements. Where the analysis determined that federal public health and environmental requirements are not applicable or relevant and appropriate, the analysis, as appropriate, evaluated the risks of the various exposure levels projected or remaining after implementation of the alternative under consideration;

(4) An analysis of whether recycle/reuse, waste minimization, waste biodegration, or destruction, or other advanced, innovative, or alternative technologies is appropriate to reliably minimize present or future threats to public health or welfare or the environment;

(5) An analysis of any adverse environmental impacts, methods for mitigating these impacts, and costs of mitigation.

The remaining alternatives after preliminary screening are: 1C, 7, 12, 13, 14, and 15. A description of these final alternatives is included on Table 3. Table 4 lists the capital and present worth costs for these alternatives.

Alternative 1C - No Action, with Land Use Controls and Water Quality Monitoring. The no-action alternative at the O&G/GLCC site consists of allowing the site to remain in its existing condition. However, actions would be undertaken to limit the potential risks posed by the site to public health and the environment. These actions include instituting land use controls (security fencing around the site) and a water quality and fish (environmental) monitoring program. The environmental monitoring program would allow periodic reassessment of public health and environmental risks posed by the site, and would include annual sampling of all bedrock wells within an approximate 1.5 mile radius of the site. It is anticipated that the environmental monitoring program would extend for at least the first ten (10) years following site closure and would be extended if warranted.

Table 3

REMEDIAL ALTERNATIVES PASSING
PUBLIC HEALTH AND ENVIRONMENTAL SCREENING

Alternative	Description
1C	No Action; with site monitoring and land use restrictions.
7	Upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soils, wastes and sediments; RCRA GLCC site cap; O & G source excavation and relocation.
12	Upgradient groundwater interceptor trench; disposal or aeration on-site of highly contaminated soils, wastes, and sediments; groundwater extraction and treatment; RCRA GLCC site cap; O & G source excavation and relocation.
13	Alternative 12, plus an alternate water supply.
14	Complete removal of on-site and off-site hazardous soils, wastes, and sediments to an off-site RCRA facility.
15	Excavation and on-site treatment of contaminated soils, wastes, and sediments; groundwater extraction and treatment; site cover.

Notes:

1. Alternatives 1C through 15 include provisions for periodic environmental quality monitoring and land use controls as discussed in Sections 2.2.2 and 2.2.3 of the FS.

2. Alternatives 7, 12 and 13 include on-site disposal or aeration of highly contaminated soils as follows:

   a. VOC concentrations greater than 1 ppm and PCB concentrations greater than 50 ppm; aeration of soil to reduce VOC concentrations to less than 1 ppm followed by disposal in a RCRA landfill on-site.
   b. VOC concentrations greater than 1 ppm and PCB concentrations less than 50 ppm: aeration of soil to reduce VOC concentrations to less than 1 ppm followed by on-site disposal under a RCRA cap.
   c. VOC concentrations less than 1 ppm and PCB concentrations greater than 50 ppm: soil disposed in an on-site RCRA landfill.

d. VOC concentrations less than 1 ppm and PCB concentrations less than 50 ppm: soil left in place to be covered by a RCRA cap.
e. Marsh sediments in drainage swale to the east of Route 125 to be removed to residual PCB concentrations of 1 ppm or less. PCB material disposal on-site in a RCRA landfill.

3. Alternative 15 includes on-site treatment to an acceptable residual soil concentration via incineration.

TABLE 4

REMEDIAL ALTERNATIVES PASSING
PUBLIC HEALTH AND ENVIRONMENTAL SCREENING

ALTERNATIVE		CAPITAL COST (x $1000)	PRESENT WORTH (x $1000)
1C	No Action.	202	1,029
7	Upgradient groundwater interceptor trench; disposal or on-site aeration of highly contaminated soil, wastes and sediments; RCRA cap over GLCC site; O&G source excavation and relocation.	4,150	5,543
12	Upgradient groundwater interceptor trench; disposal or on-site aeration of highly contaminated soil, wastes and sediments; groundwater extraction and treatment; RCRA cap over GLCC site O&G source excavation and relocations	6,713	10,499
13	Similar to Alternative 12 plus an alternative water supply.	10,787	14,358
14	Complete excavation and removal of on-site and off-site contaminated soils, wastes, and sediments to an off-site RCRA facility.	33,878	34,705
15	Excavation and treatment of contaminated soils, wastes, and sediments; groundwater extraction and treatment; site cover.		
	Estimated 1×10^{-4} cancer risk:	12,073	14,825
	Estimated 1×10^{-5} cancer risk:	14,023	17,759
	Estimated 1×10^{-6} cancer risk:	16,298	20,847
	Estimated 1×10^{-7} cancer risk:	25,723	31,236

Notes:

1. Costs are estimated with an accuracy of -30 to +50 percent.
2. Present worth estimates are based on a 10% discount rate.
3. Capital costs include 25% indirect costs for design and engineering and construction contingencies.
4. Alternatives 12 and 13 assume 4 years of groundwater extraction and treatment at 100 gpm.
5. Refer to the text and Appendix D for assumptions made in estimating costs.

The no-action alternative is not appropriate because it would not do anything to permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances at the site. Precipitation at the site would continue to leach mobile contaminants such as VOCs from source areas. VOC levels in site soils and groundwater would decrease over time due to dilution from precipitation and natural attenuation mechanisms. The rate of attenuation would be difficult to predict. However, on-site soils and groundwater are not expected to approach background levels for mobile constituents (VOCs) within 30 years. In addition, non-mobile constituents such as heavy metals and PCB's would likely remain essentially at currently observed levels indefinitely.

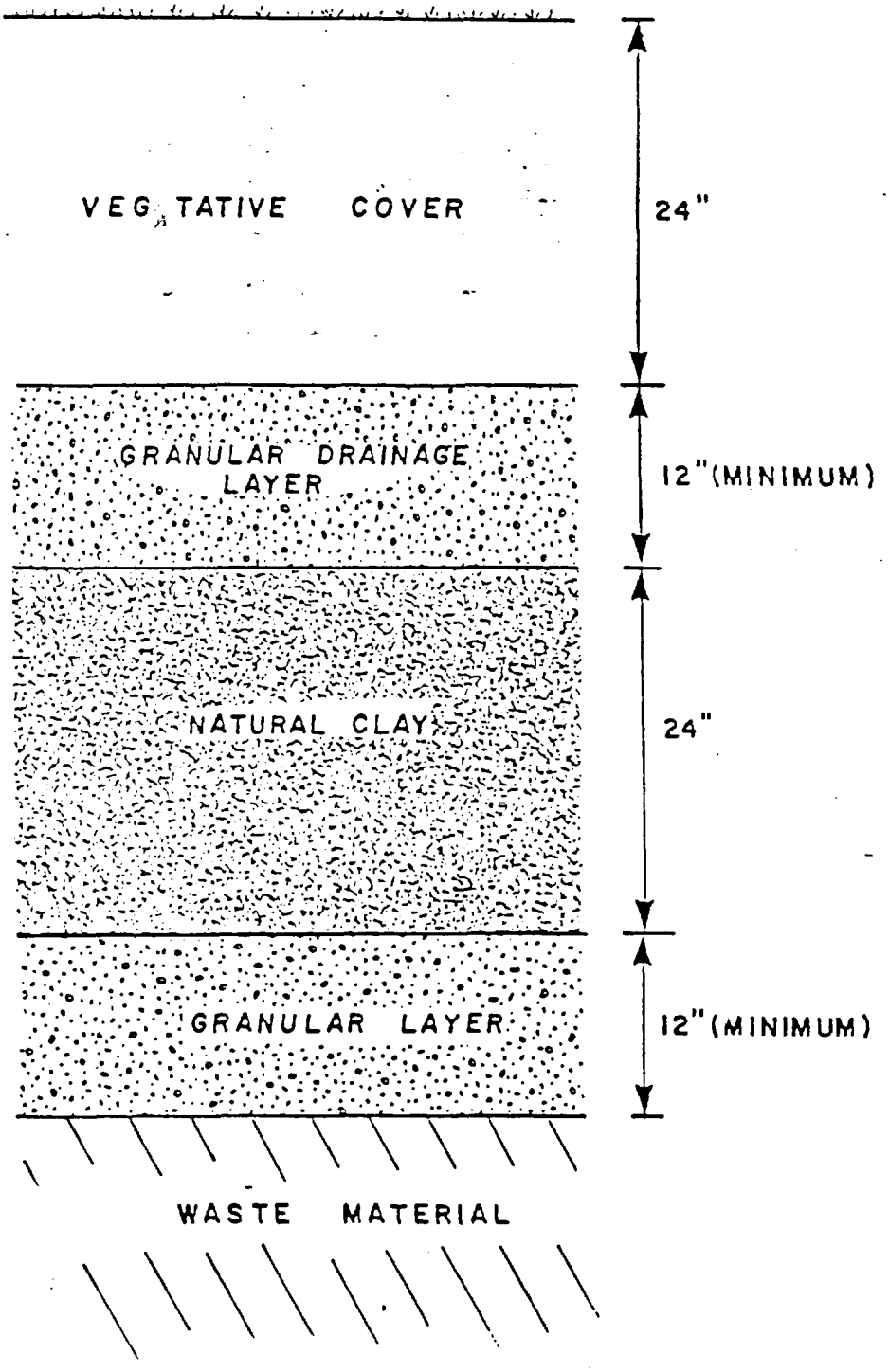
Alternative 1C would not be consistent with the technical requirements of the Resource Conservation and Recovery Act (RCRA). In particular, RCRA requires that waste and waste residues to be removed at closure or capped as a landfill. Also, this alternative does not meet the RCRA groundwater protection regulations in 40 CFR § 264, which require cleanup to background, MCLs, or ACLs.

Without effective source control, it is likely that on site and downgradient groundwater quality would remain at levels on the same order as currently observed for the next 20 to 30 years. The more concentrated portion of the marsh VOC plume east of Route 125 would continue to migrate and would be anticipated to reach Country Pond in approximately 3 years. The capital cost is estimated to be $202,000. The annual operation and maintenance cost (O&M) is estimated to be $133,000. The present worth is $1,029,000, assuming a 10 percent discount rate.

Alternative 7 - GLCC Site Cap; O&G Source Excavation and Relocation; Upgradient Groundwater Interceptor Trench; and On-Site Aeration or Disposal of Highly Contaminated Soil, Waste and Sediments.

Alternative 7 includes GLCC site capping, O&G source excavation and relocation, construction of an upgradient groundwater interceptor trench, and on-site aeration or treatment of highly contaminated soil, waste, and sediments as source control measures. GLCC site capping would be performed consistent with RCRA technical standards. The upgradient trench is intended to maintain groundwater levels within the GLCC site at or near seasonal low levels. In addition, this alternative includes the land use controls and environmental monitoring program as described in Alternative 1C.

Construction of a GLCC site cap and interceptor trench would significantly reduce the infiltration of precipitation into the site soils, and reduce the rate of groundwater migration across the GLCC site. Figure 4, which is a conceptual RCRA cap profile, shows that a cap would provide a minimum of 6 feet of clean

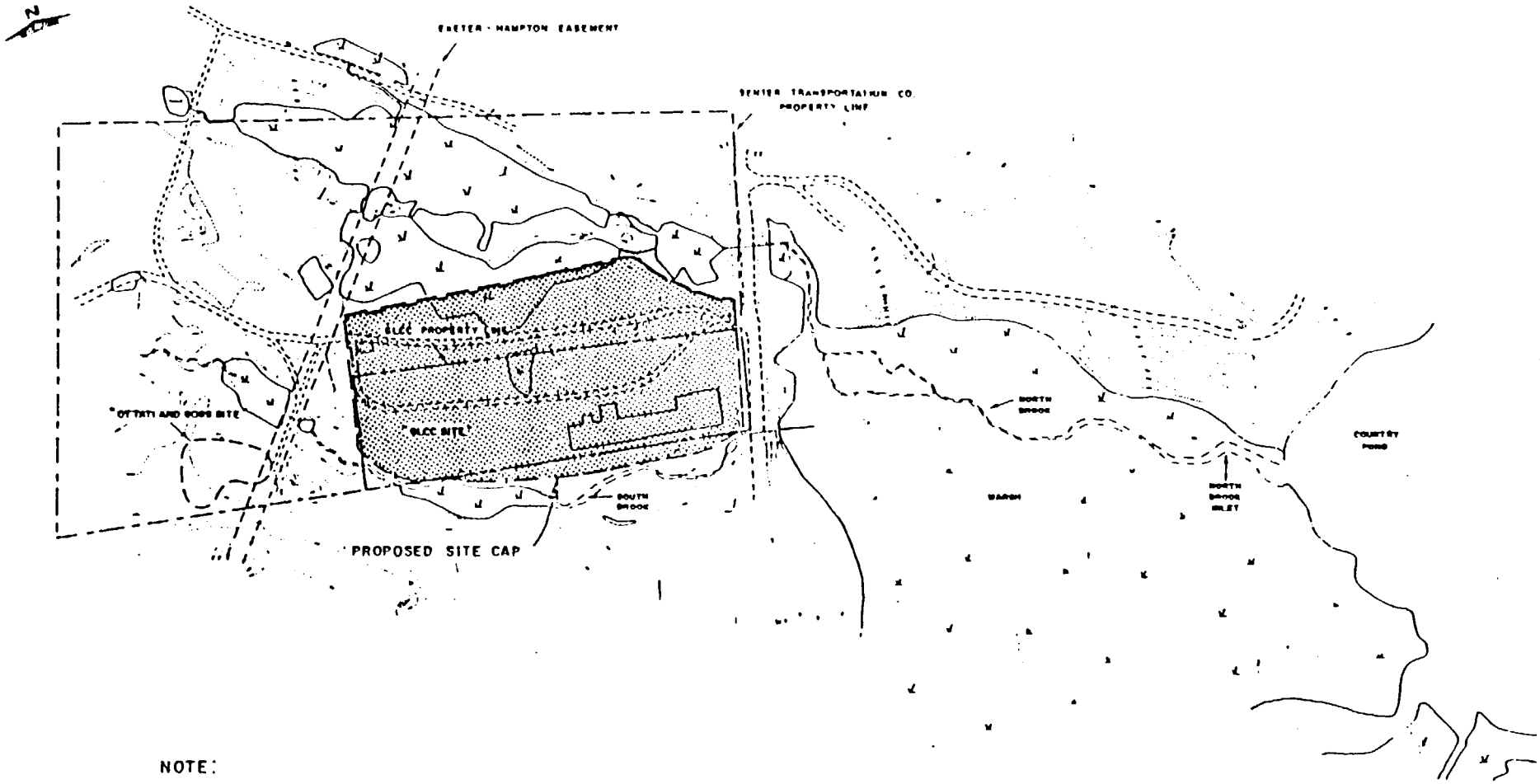


RCRA CAP PROFILE (CONCEPTUAL)

O &G/GLCC SITE

KINGSTON,N.H.

FIGURE 4



NOTE:

1) THE PROPOSED AREAL EXTENT OF THE SITE CAP IS CONCEPTUAL AND IS INTENDED FOR ALTERNATIVE EVALUATION ONLY.

PROPOSED AREAL EXTENT OF SITE CAP

O &G/GLCC SITE
KINGSTON, N.H.

FIGURE 5

material as a barrier between on-site contaminants and the ground surface. With proper maintenance, the useful life of a RCRA cap is considered to be at least 30 years. The proposed areal extent of the site cap is shown on Figure 5. The cap area would be the same under Alternatives 7, 12, and 13.

On-site disposal or aeration would involve excavation and removal of highly contaminated waste, soil and sediments from identified source areas. Materials with total VOC concentrations greater than 1 ppm, and less than 50 ppm of PCBs, would be aerated to reduce total VOC concentrations to less than 1 ppm before placement beneath the GLCC site cap. Materials with greater than 50 ppm of PCB's, would either be placed within a newly constructed on-site double-lined RCRA landfill or transported off-site to a licensed PCB treatment or storage facility. The decision to dispose the PCB material on-site or off-site would depend on the relative costs as well as environmental, public health, and institutional consideration. Figure 6 shows the identified areas for source removal which would apply for Alternatives 7, 12, 13, and 14.

Alternative 7 is expected to have significant long-term environmental benefits beyond the no action alternative. Exposure of biota to on-site contaminants would be effectively eliminated through on-site source control measures, particularly site capping, which would place a 6-foot thick barrier of soil between wastes and the ground surface. By capping contaminated soil on-site, off-site transport of contaminated sediments to North or South Brook would be effectively eliminated. This should eliminate further accumulation of PCB-contaminated sediments in South Brook, halt the further deposition of PCB-contaminated sediments in the marsh, and limit the off-site transport of VOC's and heavy metals by the surface water pathway. By limiting the transport of contaminants to these surface water resources, it is expected that the adverse impacts on both the surface water flora and fauna would be reduced.

There would be a direct impact to the South Brook wetland from channelling South Brook. Construction of the lined open channel would entail destruction of approximately one acre of wetland area along with flora and biota living within the South Brook wetland channel. Site reconnaissance of the South Brook wetland area indicates that oak, red maple, low bush small cranberry, princes pine, check berry, white pine, eastern hemlock, maple leaf viburnum, and partridge berry could all potentially be adversely affected or destroyed within the limited area. The site reconnaissance also indicates that the South Brook wetland does not support a large fish or wildlife population.

Adverse impact to portions of the South Brook wetland outside of the main channel can be limited by careful liner construction which would be confined primarily to the channelled area. It is likely that, over time, some vegetation would be naturally re-

established in the channel and along edges of the channel previously disturbed by liner construction operations. Therefore, considering the small area and observed limited functional value of the South Brook wetland as discussed in the wetlands assessment, the overall impact is limited.

PCB sediments in South Brook east of Route 125 would be removed and contained on-site in a RCRA landfill. The total quantity of PCB sediments east of Route 125 is estimated to be approximately 50 cubic yards, and is estimated to extend approximately 100 feet out into the marsh. Therefore, the impact to the marsh wetland is anticipated to be minimal.

Construction of the site cap would entail destruction in the southern portion of the North Brook wetland area on-site. Because very little vegetation beyond sparse grasses and light bush was observed within this limited area, the impact to the North Brook wetland is considered insignificant. No construction would be required elsewhere in the North Brook wetland.

North Brook and South Brook surface water quantities would increase as a result of runoff from the capped area. The increase in runoff is anticipated to have a beneficial impact to both wetland areas via provision of additional water. North Brook and South Brook surface water quality would also be improved by effectively eliminating offsite transport of contaminated surface runnoff and by channelling South Brook.

Groundwater intercepted by the interceptor trench will be discharged to South Brook, resulting in increase surface water flow to the Country Pond area at this point. It is anticipated that discharge from the interceptor pipe will be on the order of 5 gpm. Considering the large size of the marsh, it is anticipated that only beneficial impacts, if any, would result from this small additional discharge of clean water.

Impact of the wetland areas due to sedimentation from excavation and construction activities is anticipated to be insignificant if proper erosion and sedimentation controls, including siltation fences or temporary siltation ponds, are carefully constructed.

Limiting excavation and construction activities to drier times of the year would also serve to limit erosion and sedimentation. By reducing further contaminant contributions to site groundwater, natural attentuation processes would gradually improve on-site and downgradient water quality. It is estimated that maximum VOC concentrations in the wetlands would be reduced by approximately an order of magnitude within a period of 20 to 30 years after institution of effective on-site source control measures. In the meantime, conditions discussed in the baseline wetlands assessment would likely prevail.

During this period and beyond, overburden groundwater resources within and in the vicinity of the estimated limits of plume migration would remain unusable. Overburden groundwater contamination within this area would continue to provide a potential source of degradation of bedrock aquifers in the area.

Alternative 7 would allow the concentrated portion of the VOC contaminant plume within the wetlands to continue its easterly migration toward Country Pond. The projected impact of this portion of the plume on Country Pond would result in further degradation of Country Pond sediments, water quality, and biota. As discussed in the baseline risk assessment, this impact would likely result in detectable levels of VOC's in Country Pond surface water (10 to 100 ug/l) as well as increased exposure levels to Country Pond biota and fauna.

The RCRA cap and landfill would be designed consistent with RCRA technical standards. Since hazardous wastes would remain on-site, both closure and post-closure requirements for a hazardous waste disposal facility, 40 CFR § 264, Subpart G, and 40 C.F.R. § 264.310 would be relevant and appropriate. This alternative does not comply with RCRA groundwater protection regulations, 40 CFR § 264, Subpart F, since this alternative does not provide for a corrective action program to address existing groundwater contamination at the site. RCRA siting standards for a disposal facility (40 CFR § 264.18) include requirements that the site be located outside a 100-year floodplain and more than 200 feet from an active fault would be applicable to the on-site landfill. These requirements are likely achievable at the site. However, because PCB-contaminated soils (greater than 50 ppm) would be disposed on-site, disposal would also be subject to mroe stringent requirements set forth in the Toxic Substance Control Act (TSCA - 40 CFR § 761).

In addition to RCRA requirements, PCB waste landfill under TSCA is required to have a 50-foot separation distance between the landfill liner and the seasonal high groundwater table (40 CFR § 761.75(b)(3)). This requirement could not be met at the O&G/GLCC site, where the seasonal high groundwater table is generally within 5 feet of ground surface. Exceptions to this requirement can be granted provided that no consequent adverse impacts be demonstrated.

Because the removal of contaminated sediments from the wetland is provided for, Alternative 7 would be in compliance with Executive Order 11990 (wetlands). Further, no designed discharge of waste is anticipated to occur to the wetland.

The capital cost is estimated to be $4,150,000. The annual O&M costs are estimated to be $193,000. The present worth is $5,543,000 assuming a 10 percent discount rate.

Alternative 12 - GLCC Site Cap; O&G Source Excavation and Relocation; Groundwater Extraction and Treatment; Upgradient Groundwater Interceptor Trench; Limited On-Site Aeration or Disposal of Highly Contaminated Soils, Waste, and Sediments. The GLCC site cap, O&G source excavation and relocation, a groundwater interceptor trench, and on-site disposal and treatment of source materials discussed previously for Alternative 7 would be provided as source control measures. To mitigate the effects of contaminants which have already entered the groundwater, a groundwater extraction and treatment program would be undertaken.

Groundwater extraction and treatment is a common and successful remedial technology at hazardous waste sites. The areas that groundwater would be extracted from are the same as those previously described under Alternative 8. The proposed groundwater treatment train shown on Figure 7 was developed specifically for the O&G/GLCC site. The useful life of this alternative is expected to be at least 30 years. Assuming effective source control, groundwater reclamation goals, once achieved, should last indefinitely. The operation and maintenance requirements (O&M), however, for groundwater extraction and treatment are much greater than for Alternatives 1C and 7. Additional environmental benefits and concerns relevant to Alternative 12, beyond those of Alternative 7, are discussed below.

Soils: Environmental pathways associated with on-site soils would be significantly reduced through construction of a RCRA cap and O&G source excavation and relocation.

Air: Groundwater treatment would likely result in volatile organic air emissions due to the air stripper. However, these emissions could be controlled with a vapor recovery unit. Other treatment processes are not expected to have significant air emissions.

Wetlands: Construction of an access roadway for drilling of groundwater extraction wells could adversely affect the marsh wetland area via destruction of wetland vegetation beneath the roadway fill. Characteristic plant species observed in the marsh wetland including highbush bluberry, white oak, red maple, reeds, cattails, and meadow sweet could all be impacted. It is unlikely that construction of an access roadway would adversely impact flood storage of the marsh wetland due to the relatively limited areal extent of the roadway fill and the anticipated east-west roadway alignment which would not serve to dam water behind the fill. Further assessment of the roadway impact on the marsh during the pilot scale design phase may be warranted. If further studies indicate detrimental impact, the roadway could be excavated from the marsh, and marsh vegetation reestablished once groundwater extraction and treatment has been completed.

Groundwater: While the actual extent of groundwater reclamation would be established through institutional requirements discussed below, groundwater quality beneath and downgradient of the site would be substantially improved. Contaminated groundwater that is likely to be discharged to Country Pond and the North Brook inlet would be reduced as would further off-site plume migration during the life of the groundwater extraction program.

Reducing overburden groundwater contamination, as well as performing limited on-site groundwater extraction from bedrock, would reduce future exposure of bedrock groundwater to site contaminants. In addition, overburden extraction and on-site source control actions, would reduce the potential for downward hydraulic gradients that would otherwise cause contaminant migration into bedrock.

Surface Waste: By intercepting contaminated groundwater prior to its discharge into Country Pond, contaminant levels in Country Pond water and sediments would likely remain at levels similar to those presently observed.

In addition to the institutional requirements previously discussed for Alternative 7, additional requirements for groundwater extraction and treatment would be satisfied. This alternative would allow RCRA groundwater protection regulations, 40 CFR § 264, Subpart F, to be met, which would not be achievable under Alternative 7.

The Clean Water Act would be applicable to surface water discharge of treated groundwater. The technical requirements for obtaining a NDPES permit for discharge to surface water would likely prevail prior to such a discharge being implemented. The decision to select surface water discharge of treated effluent instead of groundwater discharge would be made from groundwater treatability studies.

The capital cost is estimated to be $6,713,000. The annual O&M cost is estimated to be $948,000. The present worth is estimated to range between $10,499,000 for a treatment duration of 4 years to $14,959,000 for a treatment duration of 25 years.

Alternative 13 - GLCC Site Cap; O&G Source Excavation and Relocation; Groundwater Extraction and Treatment; Upgradient Groundwater Interceptor Trench; limited Excavation and On-Site Treatment or Disposal of Highly Contaminated Soils, Waste, and Sediments.

Alternative 13 is identical to Alternative 12 with the addition of the immediate development of the alternate water supply system for the area 1 mile west of the site and 1.5 miles north, south, and east of the site.

Anticipated environmental impacts of the response are similar to those discussed for Alternative 12. In addition, the construction of an alternate water supply system would effectively eliminate risks associated with ingestion of and washing in contaminated groundwater. Also, eliminating the withdrawal of bedrock groundwater within the study area would prevent diversion of contaminated groundwater to new or existing bedrock wells, reducing the risk of migration of contaminants with bedrock groundwater.

The implementability of the proposed water supply system cannot be fully assessed until the hydrogeologic studies are completed. There is no assurance that a suitable overburden groundwater resource would be found within the immediate area. If this were the case, a groundwater resource some distance away from the study area would have to be considered. Water may have to be purchased and transported from the nearest existing municipal water supply system in Exeter, NH or Haverhill, MA, which are approximately 10 miles away.

An additional environmental concern would be the short-term inconvenience to area residents during installation of water distribution pipes. The disruption would include noise and dust from construction operations.

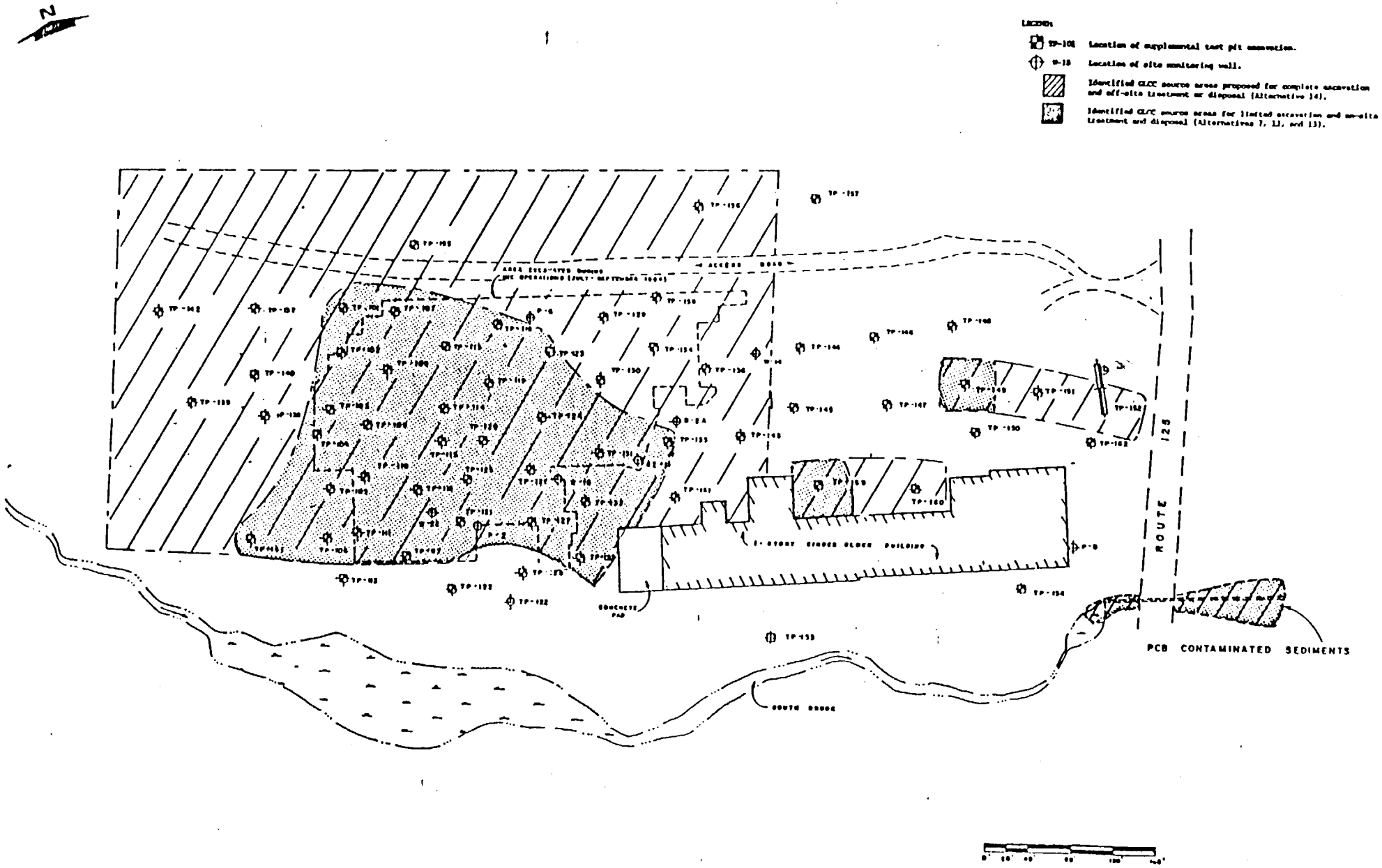
In addition to the institutional requirements specified under Alternative 12, an alternate water supply would also be subject to drinking water standards promulgated under the Safe Drinking Water Act (SDWA).

The capital cost is estimated to be $10,787,000. The annual O&M cost is estimated to be $913,000. Variations in the durations of groundwater extraction and treatment result in a present worth ranging between $14,358,000 (4 year duration) and $19,130,000 (25 year duration).

Alternative 14 - Complete Removal of On-Site and Off-Site Hazardous Soils, Wastes and Sediments to an Off-Site RCRA Facility. This alternative would involve the complete removal of all contaminated on-site and off-site soils (marsh sediments). Based on available test pit data, approximately 54,000 cubic yards of contaminated soils, waste, and sediments would be excavated and transported off-site in accordance with RCRA standards to a licensed RCRA treatment, storage, or disposal facility. This alternative would also include the demolition of existing site structures and removal of underlying contaminated soils. The extent of the area to be excavated is shown in Figure 6.

The removed material would be replaced by an equal volume of clean soil. Following soil replacement, the site would be graded, loamed, and seeded.

With the complete removal option, less stringent land use controls may be appropriate. For instance, limited on-site development may be considered but there may be no need for a security fence.

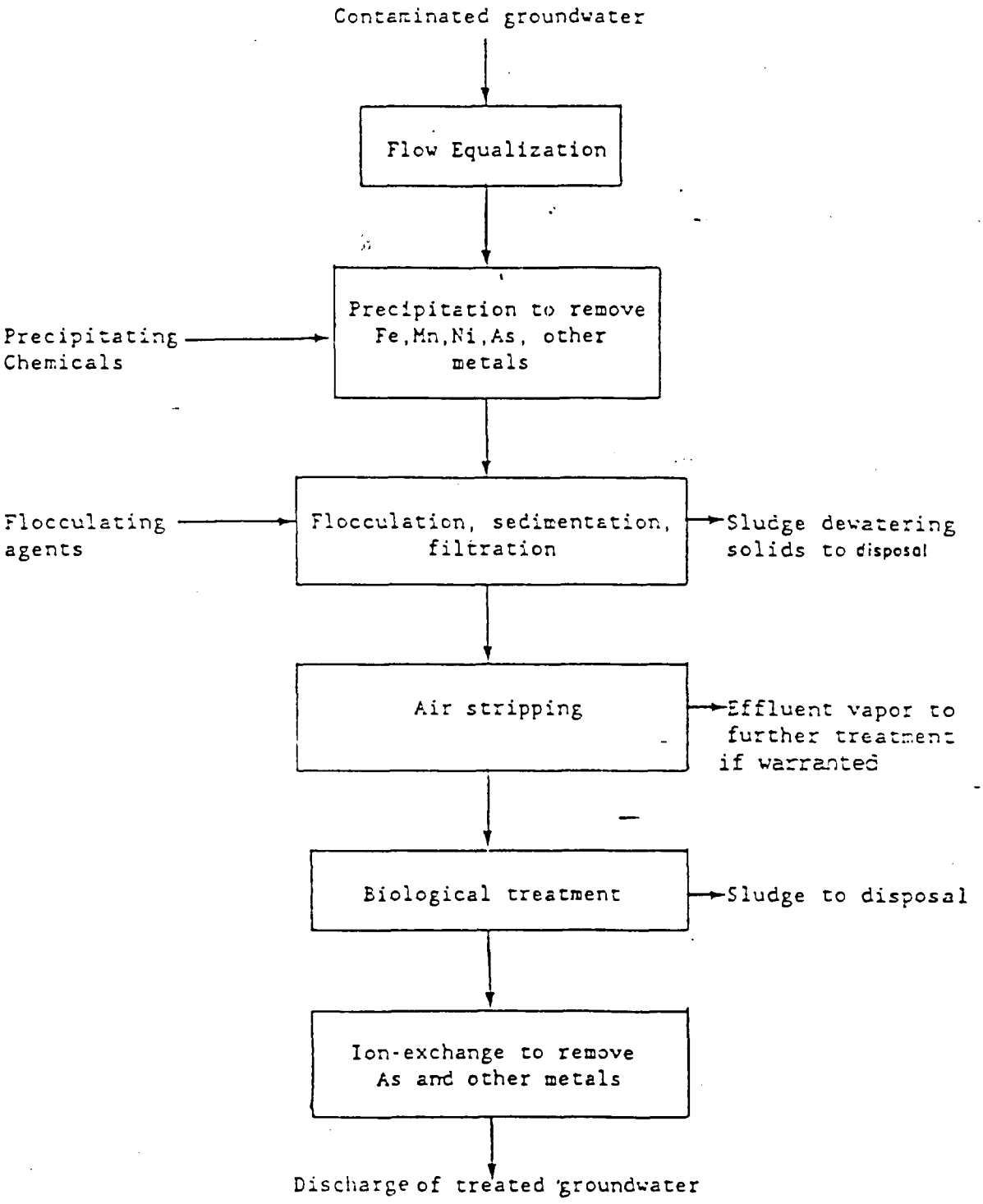


IDENTIFIED AREAS FOR SOURCE REMOVAL

O &G/GLCC SITE

KINGSTON, N.H.

FIGURE 6



GROUNDWATER TREATMENT TRAIN (CONCEPTUAL)

FIGURE 7

O &G/GLCC SITE

KINGSTON, N.H.

Environmental effects of Alternative 14 are similar to those discussed for Alternative 7. Additional impacts are discussed below.

The complete removal of surficial soils from the site would be a substantial operation that would require extensive on-site activity. This on-site activity would require careful management to control the discharge of VOC's and fugitive dust to the air. Protection of the environment would be addressed through an air monitoring program as well as through control of excavations.

A potential concern would be possible off-site environmental impacts due to the transport of waste materials to a suitable RCRA/TSCA facility. Considerable off-site transportation of waste materials would occur, with the potential risk of accidents that may result in discharge of contaminated materials to the environment. It is estimated that 2,500 truckloads of contaminated material would leave the site onto Route 125.

Alternative 14 is a complete removal option. From a public health and environmental perspective, this alternative is similar to Alternative 7, in that the on-site contaminant source would be effectively eliminated. Off-site contaminants, with the exception of contaminated sediments, would largely be left as is.

This alternative would create greater risk of short-term exposures than Alternative 7. The large amount of excavation and transport of contaminated materials could result in particulate and vapor dispersion. This risk could be addressed through design of excavation procedures and an air monitoring program.

The off-site transportation and disposal operations under this alternative would be subject to RCRA regulations 40 CFR § 262 and 263, and in the case of PCB contaminated soils, 40 CFR § 761 of the TSCA regulations. Relevant RCRA and TSCA regulations include requirements for containerization, manifesting, and transportation of excavated materials. The excavation operations would be conducted in accordance with relevant OSHA regulations. The removal operations may also be subject to disposal facility closure requirements, 40 CFR § 264, Subpart G.

Alternative 14, however, would not be consistent with RCRA groundwater protection regulations, 40 CFR § 264, Subpart F, since the existing on-site and off-site groundwater contamination would not be addressed.

The capital cost is estimated to be $33,878,000. The annual O&M cost is $133,000. The present worth is $34,705,000, assuming a 10 percent discount rate.

Alternative 15 - Excavation and On-Site Treatment of Contaminated Soils, Wastes and Sediments; Groundwater Extraction and Treatment. This alternative would involve the excavation of contaminated materials from the entire O&G/GLCC site, and on-site treatment of these contaminated materials via incineration. All soils, wastes, and sediments

containing PCB concentrations greater than 50 ppm and VOC concentrations greater than that deemed "acceptable" would be incinerated. The selected level of acceptable residual soil contamination would be based upon the evaluation of the corresponding estimated cancer risk for the leaching of residual contamination from on-site soils and migration of contaminants in the groundwater to the marsh/pond interface.

Estimates of the quantities of contaminated material that must be excavated to achieve an acceptable on-site residual soil contamination level were made by employing a two-phased contaminant transport model. Additional soil survey studies would be required to accurately assess the extent of contaminated soils. Nevertheless, the following estimated residual soil contaminant concentrations and excavation quantities are considered useful for order of magnitude estimates, and are summarized for comparison purposes.

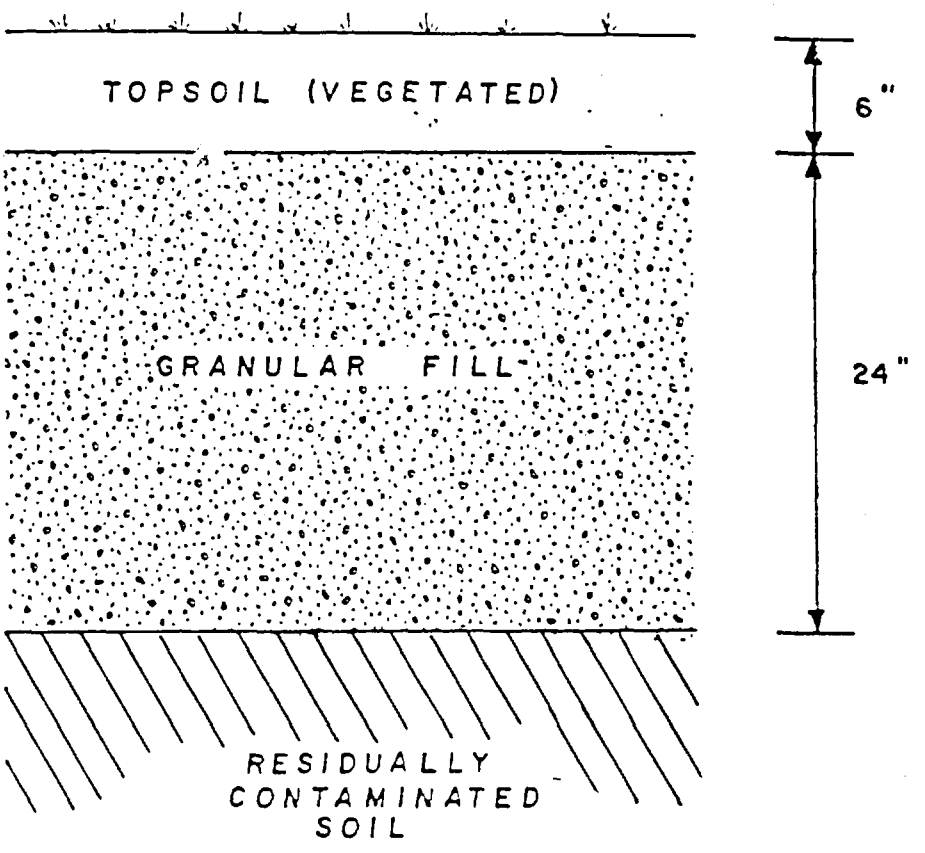
Estimated cancer risk level at the marsh/pond interface	Estimated total residual VOC concentration in on-site soils (ppb)	Estimated amount of soil to be excavated on-site (cubic yards)
10^{-4}	70,000	12,000
10^{-5}	7,000	18,000
10^{-6}	700	25,000
10^{-7}	70	54,000

Once excavation and incineration operations are completed, the site would be graded and covered. Figure 8 shows a conceptual profile of the site cover.

In addition to the source control measures described above, Alternative 15 includes groundwater extraction and treatment. The locations of groundwater extraction wells and the treatment processes would be the same as described for Alternative 12. However, the groundwater treatment goals would include a consideration of the on-site soil contamination treatment goals; i.e. groundwater treatment goals corresponding to a range of cancer risk levels attributed to the groundwater at the marsh/pond interface.

The following minimum number of contaminated aquifer volumes and extraction/treatment times were estimated to be required based on simple dilution theory and are considered useful for order of magnitude comparison purposes.

Estimated Cancer Risk Level at Marsh/Pond Interface	Estimated Number of Contaminated Aquifer Volumes to be Pumped and Treated	Estimated Minimum Treatment Time (years)
10^{-4}	2 - 3	2 - 3
10^{-5}	3 - 5	3 - 5
10^{-6}	5 - 7	5 - 7
10^{-7}	7 - 10	7 - 10



- NOT TO SCALE -

SITE COVER PROFILE (CONCEPTUAL)

FIGURE 8

O &G /GLCC SITE
KINGSTON, N.H.

No additional environmental impacts are anticipated beyon those already discussed for each respective response action in previous sections.

Alternative 15 involves the reduction of on-site soil and groundwater contamination to residual contaminant concentration levels within a defined risk level.

Also, the extraction and treatment of groundwater would reduce increased risk due to contaminant migration through the aquifer to a level consistent with the degree to on-site source control.

Depending on the level of residual soil contamination that will remain on-site, RCRA closure and post-closure requirements may be appropriate. This alternative would also be subject to the requirements for groundwater extraction and treatment previously discussed under Alternative 12. Also, this on-site incineration alternative would have to satisfy 40 CFR § 264. In particular, Subpart O of this regulation in regard to incinerators would apply.

The capital cost of this alternative ranges from $12,073,000 for an estimated 10^{-4} cancer risk to $25,723,000 for an estimated 10^{-7} cancer risk, while the annual O&M is estimated to be $893,000. The present worth of this alternative ranges from $14,825,000 to $31,236,000.

RECOMMENDED ALTERNATIVE

Section 300.68 (i) of the National Contingency Plan (NCP) states that the appropriate extent of remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment.

In order to meet the objectives of site remediation, both a source control remedy and a groundwater remedy are necessary since neither can provide adequate protection of public health, welfare and the environment without the other.

EPA has determined that the following combination of source control and groundwater remedies meets the governing legal requirements:

Source Control Remedy

The removal of contaminated soil (source control) is necessary to minimize the migration of contaminants into groundwater and any risk associated with direct contact with these soils.

The selected source control remedy involves excavation of approximately 19,000 cubic yards of contaminated soil and treating these soils on-site. Soils with PCBs levels above 20 ppm will be incinerated. (Based on available data this is thought to be approximately 5000 cubic yards). Soil with less the 20 ppm PCB but with concentrations of total volatile organics compounds (VOCs) above 1 ppm will be treated by an aeration process which will reduce the VOC's to acceptable levels. This process will also provide for positive controls on any releases of these contaminants to the atmosphere such that any emmissions are protective of public health and the environment. The "low temperature thermal stripping" system similar to that being piloted at the McKin CERCLA site in Gray, Maine, is recommended for use at this site (Based on available data this is estimated that approximately 14,000 cubic yards will be treated in this manner).

Incineration is a proven treatment process for PCBs and other organic compounds. Incineration is a high temperature process that results in most cases in the destruction to insignificant levels of the compounds. The costs and level of treatment provided by incineration are not warranted for all contaminated soil at the O&G/GLCC. The treatment time and the cost make it cost effective and protective of public health and the environment to treat the low-level and non-PCBs soils by aeration.

The aeration (low temperature thermal stripping) process recommended is considered an innovative or advanced technology because of its lack of timed field demonstration. The evaluation of this system in terms of engineering reliability implementation and constructability (40 C.F.R. §300.68 (h)(2)(iii)) has revealed this alternative to be technically sound; it is expected to be appropriate to reliably minimize present or future threats to public health or welfare or the environment

(40 C.F.R. §300.68(h)(2)(v)). The results of several pilot studies at heavily contaminated defense facilities have demonstrated a greater than 99.99% removal of volatile organic compounds from contaminated soils. Aeration is increasingly being used for the clean-up of volatile organic contaminated soils at several industrial and defense sites. The McKin CERCLA site in Gray, Maine is successfully utilizing this process in pilot scale and a similar process has been selected for soil treatment at the Metaltech Aerosystems NPL site in New Jersey. In addition, this system is also being considered at the Tinkham's Garage Site in Londonderry, NH.

The areas of excavation of the soils from the O&G site and from the areas of GLCC site are shown in figure 6. The cost estimate for the source control remedy can be found in Table 6.

Total volatile organic contaminants (VOCs) and PCBs will be used as indicators for excavation for the soil for remediation. Clean-up levels for the soil contamination are based on aquifer remediation goals and direct contact risk. The soil clean-up levels for VOCs are intended to result in the minimization of the potential for further releases to groundwater. The soil clean-up levels for PCBs are health and environmentally based.

EPA's rationale for selection of 1 ppm for total volative organic contaminants as a source control "action level" is based upon the information and data presented in the RI/FS regarding soil and groundwater contamination. Based upon the relative concentrations of the contaminants of concern, identified in this section, and the TVOC concentrations found in the groundwater and on-site soils, EPA believes that this level is consistent with the groundwater remediation goals. In addition the 1 ppm level is one which can be readily and efficiently attained and monitored using standard field instrumentation and construction techniques. The FS states that based on existing data 14,000 cubic yards of VOC contaminated soil above 1 ppm or 50 ppm PCBs lie within the identified source areas. The FS conservatively estimates an additional 5,000 cubic yards will be identified during the pre-excavation soil survey. The soil excavation volume is approximate and is based on limited field data. EPA believes that the volumes to be excavated based on the target levels, 1 ppm VOCs and 20 ppm PCBs will be approximately 19,000 cubic yards. Refinement of the estimate will be performed during the pre-excavation soil survey which will be conducted as the first phase of the source control. Should the results of this survey indicate that the contaminant distribution is such that the 1 ppm TVOC level is not appropriate, EPA will reevaluate this portion of the remedy.

Remediation of soil source areas will be evaluated in terms of the reduction in levels of VOCs with the underlying assumption that treatment to the target level for this parameter will result in nonhazardous levels of other contaminants.

The site will be graded, filled as necessary, covered and revegetated to insure that the migration of any residual contamination will be minimized and to prevent direct contact. The proposed cover design is shown in Figure 8. The extent of the area to be covered will be determined after the pre-excavation survey. Relevent post-closure requirements of RCRA will be performed: groundwater monitoring, site inspection and site maintenance.

Post-closure activities are felt to be necessary due to the inability to totally remove all areas of contaminated soil. Implementation of the remedy will include on-site sampling utilizing a grid system, with frequency and grid size to be determined during design, based on previously collected data.

The soil treatment will be performed consistent with applicable or relevant and appropriate requirements. The incineration of the PCB contaminated soil will be performed consistent with RCRA 40 CFR 264 Subpart O and TSCA 40 CFR 761.70. A test burn will be performed prior to full scale operation.

Air emission testing will be conducted during the test burn and ash samples will be analyzed following the completion of the test burn to confirm that both are protective of public health and the environment. The test burn will be designed to operate under worst case conditions to conservatively represent full-scale incineration emissions and ash content. The test burn will be designed to include each of the various soil types (including a soil sample from the most contaminated areas on the site) and will be carried out in full compliance with relevant state and federal requirements. Treatment of the PCB contaminated soil will be consistent with the excavation criteria of 20 ppm. The excavation criteria of 20 ppm has been determined to be at a risk level that is appropriately protective of public health and the environment for this site. Based on the data obtained during the trial burn, a demonstration will be performed consistent with the RCRA delisting evaluation procedures.

Attached to this ROD are the assumptions and calculations utilized to formulate the health based soil clean-up level for PCBs. EPA feels that the assumptions and factors utilized to calculate the recommended health based excavation criteria of 20 ppm are appropriate for this site and are consistent with EPA draft guidance (Development of Advisory Levels for Polychlorinated Biphenyls (PCBs) Cleanup" prepared by the Exposure Assessment Group, Office of Health and Environmental Assessment 5/86).

The excavation level for the PCB contaminated sediment will be 1 ppm, which EPA has determined to be necessary because it conservatively reflects concentrations that could occur in fish and other aquatic organisms. The use of a conservative limit is necessary due to the potential for bioaccumulation in the food chain.

The proposed aeration process is an enclosed system and air emissions will be controlled. The aeration transfers the contaminants to an air stream which then passes through a fume incinerator or after burner. It is expected that the burner will destroy up to 99.99% of the contaminants. The vented air stream will then be vented to a stack. The air generated will meet applicable RCRA air emission standards.

The soil aeration will be performed consistent with RCRA requirements. As stated for PCBs the soil treatment level will be based on the excavation criteria, of 1 ppm for total volatile organics. Based on the results of the pilot study a demonstration will be performed consistent with the RCRA delisting procedures that the treatment residual is safe for placement at the site. The treatment system will be operated at peak efficiency and VOC removal should in most cases exceed the excavation criteria. A pilot study will be conducted to demonstrate whether the aeration process and its air release controls are effectively removing the contaminants and to ensure that the air emissions and the residual soils are protective of public health and the environment. The pilot study will be designed to operate under worst case conditions to conservatively represent full scale operation. The pilot study will be designed to include each of the various soil types (including a soil sample from the most contaminated area on the site) and will be carried out in full compliance with relevant state and federal requirements.

EPA will perform an evaluation based on the results of the incinerator and aeration pilot studies to verify the costing data used in the feasibility study and any additional costing data used in preparation of this ROD. EPA will make a determination based on the costing data from the pilot studies that it is cost-effective to treat the low PCB soils by aeration.

PCB contamination in on-site wetlands (including portions of South Brook at Route 125) above 1 ppm will be excavated. This will result in short term adverse impacts on the wetlands. However, this impact is not considered significant and wetlands are expected to recover quickly. This will result in compliance with Executive Order 11990 and the Fish & Wildlife Coordination Act.

In addition to the legal requirements discussed elsewhere, the Clean Air Act and Executive Order 11990 (Protection of Wetlands) are applicable or relevant and appropriate.

The estimated capital and operation and maintenance costs for this remedy can be found in Table 6.
The implementation of this remedy will be as follows:

- Decontamination and removal of existing site structures.

- Design and implementation of soil sampling plan to determine areas and depths of excavation.

- Excavation of approximately 19,000 cubic yards of soils above the target levels of 20 ppm of PCBs or 1 ppm of VOCs.

- Excavation of sediment in South Brook and marsh areas to 1 ppm of PCBs.

- Ambient air quality monitoring during remedial activities to ensure that offsite pollutant concentrations do not reach unacceptable levels. A detailed monitoring program including onsite action levels, site perimeter monitoring, and collection of meteorological data will be performed.

  Acceptable site perimeter levels and onsite action levels will be developed based on applicable standards and guidance from EPA and the Centers for Disease Control. Action levels are the ambient levels which will trigger specific responses such as applying additional control measures to the remedial processes or that may temporarily cause activities to cease at the site.

- Treatment by incineration of all soils with PCBs above the target level of 20 ppm. Prior to full scale incineration a trial burn will be performed to demonstrate that ash levels and air emissions will be protecti e f public health and the environment.

- Treatment by aeration (low temperature thermal stripping) process of approximately 14,000 cubic yards. Prior to full-scale operation of the aeration system a pilot study will be performed to demonstrate that treatment levels and air emissions are protective of public health and the environment.

- Evaluation of the incineration test burn and aeration pilot study will include a cost-effectiveness analysis to ensure that the costs utilized as a basis for this ROD were appropriate. In the event the cost data needs to be revised a determination will be made whether aeration is cost-effective given the need to incinerate the PCB contaminated soil.

- Treated soil will be replaced and regraded. The site will be covered to provide adequate drainage, minimization of infiltration and protection from direct contact.

- On-site and off-site water quality monitoring will be performed to verify that the major source areas have been sucessfully excavated.

- Post-closure care including site inspection and maintainence will be performed.

Management of Migration Remedy

The chosen remedy involves the removal/extraction of contaminated groundwater and the onsite treatment with discharge back to the groundwater. A description of this remedy is as follows:

- extraction of contaminated groundwater from the following areas:
  (a) contaminant source areas on the O&G/GLCC site, including the O&G site, the caustic lagoon, Kingston Swamp, and the area east of the GLCC building;
  (b) Route 125;
  (c) The marsh area downgradient of the GLCC Site;
  (d) From the deep bedrock well R-4 near the border of the site with Route 125.

- Extracted groundwater will then be treated onsite to meet the State of New Hampshire requirements, Part 410, Protection of Groundwater, N.H. Code of Administrative rules. The treatment components will be determined during design after the performance of treatability studies. The treated groundwater will then be discharged back to the groundwater on-site to the extent technically feasible. Additional discharge will be to surface water and will meet the relevant water quality criteria and National Pollutant Discharge Elimination System (NPDES) requirements.

- Groundwater extraction and treatment will proceed for five years, from the date of implementation. Upon achievement of the target levels or five years, whichever is sooner, an evaluation will be performed to insure that the target compounds were appropriate and if the target levels have not been achieved if they are technically feasible. Achievement of the target levels will be defined as continuously meeting target levels for identified contaminants of concern for a period of 3 years at the Route 125 monitoring boundary and at the onsite monitoring wells that are selected during design to determine onsite water quality.

- Monitoring of wetlands onsite will be conducted to insure no detrimental impacts from the extraction of groundwater for treatment. If negative impacts are observed, the rate of groundwater removal will be decreased to the point that these wetlands are not adversely impacted.

- Onsite and offsite monitoring will be implemented consistent with RCRA §264.100(d), which requires the establishment of a monitoring program to assess the impact of the remedial alternative.

- Off-site residential wells will be monitored during the implementation of the remedial action. The frequency and parameters to be monitored will be determined during design.

Present worth, capital and operation and maintenance costing data can be found in Table 5. The costs developed for the groundwater treatment system were based on the various treatment units as shown on Figure 7. The final treatment scheme will be developed upon the completion of pilot and treatability studies.

It is EPA's policy to develop and evaluate groundwater remediation alternatives which will achieve cleanups within a lifetime cancer risk range of 10^{-4} to 10^{-7} (1 in 10,000 to 1 in 10,000,000). In the selection of an alternative and associated risk range, EPA typically takes into account the following factors:

1. site and groundwater characteristics

2. cost, reliability, speed, and technical feasibility of each alternative

3. current use and anticipated future need for the groundwater

4. effectiveness and reliability of institutional controls that might be used as part of a remedy

5. public acceptability of the options; and

6. ability to provide an alternative water supply

Based upon an evaluation of these factors, EPA has selected a risk range of 10^{-5} as appropriate for groundwater remediation at the Ottati and Goss/GLCC site.

In addition to the indicator compounds, the proposed treatment scheme provides for the treatment of arsenic and other metals as a result of sampling which showed elevated levels on-site. The need for the ion-exchange unit or a comparable unit to treat arsenic and other metals will be evaluated upon the completion of pilot studies.

The selection of indicator compounds to be utilized for aquifer clean-up is based on the relative composition of the contaminated groundwater, the toxicity of the compounds and their treatability. The calculation assumes additivity of risk and does not take into account interactions of compounds in a mixture. The following compounds will be utilized as indicator compounds at the site: 1,2 dichloroethane, trichloroethylene, tetrachloroethylene, and benzene.

The following table provides concentrations associated with a 10^{-5} risk level for each of the four contaminants of concern and individual and overall risk level associated with a 5 ppb concentration for each of the contaminants. This calculation is based on risk levels associated with the compounds from EPA's Office of Drinking Water and the Cancer Assessment Group (CAG) F.R. Vol. 50, No. 219, p. 46880-46933, November 13, 1985). The risk levels utilized are based on drinking water consumption only. The assumptions and calculations are consistent with the methodology in the Water Quality Criteria.

	Concentration Associated with 10^{-5} Risk Level	Cancer Risk Level Associated with 5 ppb
1,2 dichloroethane	3.8	1.3×10^{-5}
trichloroethylene	26	1.9×10^{-6}
tetrachloroethylene	6.7	7.5×10^{-6}
benzene	13	3.8×10^{-6}
		2.6×10^{-5}

EPA has determined it is necessary to remediate groundwater to the target levels both on-site and off-site. The Route 125 boundary and on-site wells to be selected during design will be used as the monitoring points to determine compliance with the target levels.

EPA has determined that treated groundwater discharge upgradient of the site is necessary, as recommended in the feasibility study. The discharge upgradient will aid in the efficiency of aquifer reclamation. In addition, upgradient groundwater discharge will reduce the risk of any potential impact of surface water bodies. Discharge to surface water would approach the natural brook flow rates (North and South Brook) and could result in an impact to either of the Brooks and/or the downgradient marsh.

In addition to the legal requirements discussed elsewhere, the applicable or relevant and appropriate Federal and State air requirements will be complied with for any air releases from the groundwater treatment system.

TABLE 5

Recommended Alternative Cost Summary

Management of Migration Alternative - Groundwater Extraction and Treatment

INITIAL CAPITAL COSTS

Extraction Wells	$100,000	
Pumps & Piping	$225,000	
Access Road to Marsh	$137,500	
Treatability Studies	$62,500	
Equalization	$175,000	
Precipitation/Flocculation	$400,000	
Air Stripping	$130,000	
Biological Treatment	$250,000	
Ion Exchange	$1,075,000	
Air Quality Monitoring	$7,500	
	$2,562,500	

OPERATION AND MAINTENANCE (O&M) COST

Total annual cost including Pumping, Maintenance, Labor, etc.	$755,000	
Environmental Monitoring	$100,000	
	$855,000	
Present Worth O&M costs	$3,250,000	(Assumes 5 year treatment)
Total Alternative Costs	$5,812,500	

TABLE 6

Recommended Alternative Cost Summary

Source Control Alternative - Aeration (low temperature thermal stripping) and incineration

INITIAL CAPITAL COSTS	
Demolition Pre-Excavation	$300,000
Site Preparation	25,000
Pre-incineration Studies	75,000
Aeration Pilot Studies	175,000
Incineration System (1)	2,430,000
Aeration System (2)	2,625,000
Site Cover	400,000
TOTAL INITIAL CAPITAL COST	$6,030,000

OPERATIONS AND MAINTENANCE (O&M) COST	
On-Site Treatment System	$650,000
Site Maintenance	90,000
Material Handling	50,000
Monitoring and Analysis	90,000
TOTAL ANNUAL O&M COSTS	$ 880,000
PRESENT WORTH O&M COSTS	$2,400,000
Annual Costs for Post-Closure Monitoring Upon Completion of Remedy(3)	$100,000
PRESENT WORTH POST-CLOSURE	$950,000
*TOTAL ALTERNATIVES COSTS	$9,380,000

*Based on estimated quantity of 19,000 yd^3

(1) Costs based on mobile incinerator and include all costs, including O&M, in this item.

(2) Costs for this item include excavation and all other pertinent items for this system.

(3) Costs for this item are based on the assumption that post-closure would be required for 30 years.

VI. Rationale For EPA's Selection of Its Preferred Alternative

A. Legal Requirements

1. The Legal Requirements That Govern This ROD

By virtue of section four of the Superfund Amendments and Reauthorization Act of 1986 (SARA) (enacted October 17, 1986), EPA's remedial alternative must meet the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 et seq., as amended by SARA, and the requirements of its governing regulations, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. 1/ Accordingly, the Agency has selected a remedy that is consistent with its governing statute, including the cleanup standards in section 121 of SARA, and its regulations.

2. The Substantive Legal Requirements Themselves

Under its legal authorities, EPA's responsibility at Superfund sites is to undertake remedial actions that are necessary in order to protect the public health or welfare or the environment. 42 U.S.C. § 9604(a)(1); SARA § 121. In section 121 of SARA, Congress provides two guidelines for the Agency to follow in selecting remedies that are adequately protective.

First, in Section 121(b), Congress creates an extremely strong statutory preference for remedial actions in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants or contaminants. In assessing various permanent solutions, EPA must specifically address the long-term effectiveness of the different alternatives. EPA shall at a minimum take into account:

(A) the long-term uncertainties associated with land disposal;
(B) the goals and requirements of RCRA;
(C) the persistence, toxicity, mobility and propensities to bioaccumulate of the hazardous substances and constituents;
(D) the short and long term potential for adverse health effects from human exposure;
(E) long-term maintenance costs;
(F) the potential for future remedial action costs if the alternative remedial action in question were to fail; and
(G) the potential threat to human health and the environment associated with excavation, transportion, and redisposal, or containment.

Congress prescribes that, in choosing its final remedy, EPA must select a remedial action that uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

Further, in section 121(d), Congress provides that EPA's remedial action, when complete, must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws (such applicable or relevant and appropriate requirements sometimes will be referred to as ARARs). Examples of such laws considered in this document are RCRA, TSCA, and State standards.

B. Legal Requirements Applied To This Site

The discussion in the sections above and the data in the RI/FS establish that substantial amounts of hazardous substances currently are present on site, in the groundwater and in the soil; that many of these hazardous substances are present in high concentrations; and that several are potential carcinogens. These high concentrations potentially pose several types of risks. The groundwater is unusable as a drinking water source because of the contamination. In addition, the contaminated soil may pose a risk through direct contact. Third, the VOC-contaminated soil also poses an indirect risk; if left unremediated, the VOCs will continue to migrate into the groundwater and prolong and exacerbate the groundwater contamination. In short, the site in its current condition presents a threat to human health and the environment in several ways.

1. A Treatment-Based Remedy Is Appropriate For This Site

EPA has three basic options for addressing the risk to human health and the environment that the site presents. First, there is a no option alternative. Under this option, the Agency would fence the site and otherwise prevent access to it. In addition, the Agency would monitor residential drinking water wells in close proximity to the site to ensure that they are not being adversely affected. EPA's remedy would do nothing to eliminate or minimize the various types of threats themselves.

EPA rejects this no action approach for four related reasons. First, this approach would not adequately protect human health or the environment. Institutional controls are unreliable to prevent exposure to a site, especially over a substantial period of time. This inadequacy is of particular concern in this case since presently the site is relatively remote and trespassers might well go unnoticed. In the future, a problem could occur for the opposite reason. The general vicinity of the site could undergo rapid development if it follows the trend in other parts of southern New Hampshire. The greater amount of human activities in the area of the site would pose problems in preventing access and exposure to the site.

Second, this approach does not comply with ARARs. A no action alternative would not comply with either RCRA, TSCA, or State standards. 2/

Third, Section 121(b) of SARA requires that the Agency select remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances to the maximum extent practicable. As is discussed elsewhere, other alternatives which better satisfy this statutory preference are available for this site. The no action alternative is at the opposite end of the spectrum in terms of permanence from this statutory preference.

Finally, in addition to protecting human health, a second EPA statutory mandate is to protect the environment. See e.g., SARA § 121. A no action remedy which includes institutional controls to prevent access to the contaminants is clearly not the cost effective way of protecting the environment. Section 101(8) of CERCLA defines "environment" to include groundwater within the United States. As was noted above, the contaminated groundwater under the site once was usable and it is part of an aquifer that currently is being used. Protecting the environment under CERCLA includes both preventing additional environmental harm and restoring the "harmed" environment to a usable state. Institutional controls would be completely ineffective in accomplishing this goal.

In short, the Agency's rationale for rejecting a no action alternative is as follows. First, such a remedy would be unreliable and of questionable effectiveness in terms of protecting human health. Second, such a remedy would be totally ineffective in terms of protecting the environment. Third, such a remedy does not comply with relevant and appropriate requirements. Finally, no action is exactly what Congress did not intend to encourage in creating a strong statutory preference for remedies that destroy wastes.

EPA's other two options for eliminating or minimizing the risk that the site presents are (1) to contain the hazardous substances, or (2) to destroy or significantly reduce the toxicity, mobility, or volume of these hazardous substances. 3/ EPA has selected the option of permanently and significantly reducing the toxicity of the wastes as the appropriate remedy for the site because such a remedy would be a more reliable approach for protecting human health and the environment, especially in light of the conditions at this site. Such a remedy also is appropriate because it is consistent with SARA's statutory mandate that the Agency select permanent remedies to the maximum extent practicable.

This site is a relatively small site located in an area where future use of the site for development is a realistic possibility. The soil at the site contains several hazardous substances. Several of these hazardous substances, including a number of the VOCs and PCBs, are extremely toxic. Some of the VOCs are carcinogens or suspected carcinogens. Moreover, the VOCs are unusually mobile and the PCBs are unusually persistent hazardous substances. Further, the continued presence of these substances on site will exacerbate the already high levels of contaminants in the groundwater; this contamination prevents the present use and will prevent the future use of the groundwater as a drinking water source.

A remedy based on treatment of these hazardous substances in the soil will minimize soil contamination and ensure no human contact with soil that is contaminated at unsafe levels, by significantly reducing the toxicity of the contaminants. This soil treatment will have the additional benefit of assisting the cleanup of the groundwater by eliminating the continuing source of contamination from leaching of hazardous substances from the soil into the groundwater.

EPA also believes that the remedy of pumping and treating the groundwater will significantly reduce groundwater contamination and permit the eventual use of the groundwater beneath the site for drinking water. Futher, cleaning up the groundwater will eliminate a possible source of contamination to off site surface waters and groundwater.

Finally, this remedy satisfies the statutory mandate that EPA select a remedial action that is protective of human health and the environment and that is a permanent solution to the maximum extent practicable.

In contrast, the alternative of capping the VOCs and landfilling the PCBs is not an appropriate remedy. Over the long-term there are no guarantees that such containment will remain effective. Further, containment will not remove the soil contamination; leaching of these contaminants into the groundwater, particularly the VOCs, would continue, although at a reduced rate compared to present, unremediated conditions. Failing to treat the groundwater would render the groundwater on site unusable for drinking water for a substantial period of time. In addition, the groundwater would be a continuing source of contamination to off site surface waters and groundwater.

In short, based upon several factors, including (1) the greater reliability and, hence, the greater protectiveness, of the treatment-based approach, (2) the need for reliability in light

of the substances present at the site, and (3) the strong statutory preference for permanent remedies, EPA's treatment-based remedy is the appropriate remedy for this site.

2. Level and Type of Treatment

(a) Groundwater Contamination

Portions of 40 C.F.R. Subpart F are relevant and appropriate because they address situations similar to the site, notably, situations where hazardous wastes are present in both the soils and the groundwater. Subpart F of RCRA provides that groundwater must be cleaned up to background, to MCLs, or to risk-based alternate concentration limits (ACLs). The Agency thinks it appropriate to restore the groundwater on site, as well as the groundwater off site, to drinking water quality. As noted above, this is an aquifer that is used as a drinking water source now, and whose use can be expanded by cleaning up this site. 4/ Thus, risk-based levels need to be established throughout the site as well as off site to ensure that all potentially usable groundwater is of drinking water quality. At this site, EPA selected a cancer risk level of 10^{-5} for the groundwater (EPA's remedy also will clean up noncarcinogens in the groundwater, such as metals, to drinking water standards).

EPA determined that its remedy should clean up the groundwater under the site to a 10^{-5} cancer risk range based upon several factors. First, EPA considered the Agency's Groundwater Protection Strategy (GWPS) (Office of Ground-Water Protection, August 1984). The GWPS provides guidance concerning how different groundwaters throughout the country should be classified and to what extent cleaning up a particular groundwater is appropriate, given where it fits in the classification scheme. Second, EPA considered the Agency's Draft Guidance on Remedial Action for Contaminated Groundwater at Superfund Sites (October 1986), and the Agency's approach to the Millcreek Superfund site, in determining that it should consider the 10^{-4} - 10^{-7} range of risk levels in selecting a risk level for the groundwater at the O & G site. Finally, the Agency determined that it should clean up the groundwater to a 10^{-5} risk level based upon the particular conditions at this site.

EPA's GWPS guides the Agency in setting policies on groundwater protection, depending on the designated or potential use of the groundwater. The Preamble to the NCP lists the GWPS as one of

the criteria, advisories, and procedures that should be considered in developing a remedy. 50 Fed. Reg. 47949 (Nov. 20, 1985). The GWPS provides that EPA's policy on groundwater protection should consider the highest beneficial use to which particular groundwater can presently or potentially be put. GWPS at 5. The GWPS defines protection policies (i.e., policies concerning levels of protection and cleanup) for three classes of groundwater, based on their respective value and their vulnerability to contamination. Id. Class I groundwater is special groundwater that is irreplaceable (i.e., no reasonable alternative source of drinking water is available to substantial populations) or ecologically vital (i.e., the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat). Id. at 5-6.

Class II groundwaters include groundwaters that are current or potential sources of drinking water and waters having other beneficial uses. Class III groundwater is not considered to be a potential source of drinking water and to be of limited beneficial use (i.e., groundwater that is heavily saline or is otherwise contaminated beyond levels that could be cleaned up). To fit into Class III, groundwater also cannot migrate to Class I or II groundwater or have a discharge to surface water that could cause degradation. Id.

Here, the groundwater that underlies the site is Class II groundwater. This groundwater is considered to be a current drinking water source since groundwater is used for drinking water within a two mile radius of the site. Except for the contamination caused by the site, the groundwater in the area is of drinking water quality. The natural condition of the groundwater makes it possible to develop the area, including installation of drinking water wells in the future. There were operational drinking water wells on site in the 1950's and 1960's. This groundwater also migrates to Class II groundwater that is being used as a drinking water source now.

EPA's Superfund Public Health Evaluation Manual (OERR 1986) establishes that in selecting a risk level for groundwater that is or may be used as a drinking water source, EPA should use a carcinogenic risk range of 10^{-4} to 10^{-7} (1 in 10,000 to 1 in 10,000,000). Id. at 101. See also the Millcreek Rod (issued on May 7, 1986 by EPA Region 3), and the Millcreek Memorandum from Winston Porter, EPA Assistant Administrator for OSWER, dated May 24, 1986. The Millcreek Memorandum indicates that the goal of achieving a 10^{-6} cancer risk level within a short period of time (one to five years) should be used as a point of departure in analyzing a range of alternatives. Memo at 2. In selecting an appropriate risk level at this site, and a time frame for

reaching it, EPA took the following major factors into account:

1. Site and groundwater characteristics;

2. Cost, reliability, speed, and technical feasibility of each alternative;

3. Anticipated future need for the groundwater;

4. Effectiveness and reliability of institutional controls that might be used as part of a remedy;

5. Public acceptability of the options; and

6. Ability to provide an alternative water supply.

Concerning the appropriate cancer risk level, EPA has selected 10^{-5} for the groundwater throughout the site and in the groundwater that has migrated off site. The 10^{-5} levels for 1,2 dichloroethane, trichloroethylene, tetrachloroethylene, and benzene individually are 3.8 ppb, 26 ppb, 6.7 ppb, and 13 ppb, respectively. These levels approach the limits of monitoring capability. The concentrations discovered in the soil after the IMC cleanup and in the groundwater to date for these substances are well above these acceptable concentrations. For example, for 1,2 dichloroethane, measured levels include 790 ppb (groundwater), for trichloroethylene, 3,900 ppb (soils), 3710 ppb (groundwater), for tetrachloroethylene, 160,000 ppb (soils), 9400 ppb (groundwater), and for benzene, 1,400 ppb (soils), 500 ppb (groundwater)(higher levels in the soil than those listed above were discovered before the IMC cleanup; such higher levels may have been missed during the cleanup and may continue to be present on site even though they were not discovered during the post-IMC cleanup sampling).

For several reasons, EPA rejects a level of 10^{-4}. The following concerns, many of which are interrelated, are among the most significant. First, EPA anticipates that there may be a future need for this aquifer, including the contaminated portion of it. This is a Class II aquifer, that is, parts of it are used as a source of drinking water source, and the contaminated portion of this aquifer has the potential to be used as a drinking water source. Given the hydrogeologic uncertainties at the site, EPA does not think it is prudent to select a risk level that, if met everywhere, will produce a barely adequate drinking water supply. This is particularly true since no alternate water supply system is in place, although one potentially could be installed, at considerable expense. In addition, should the aquifer be used by private homeowners, it probably would be without the benefit of treatment or consistent monitoring. Based upon all of these factors, EPA does not believe that a 10^{-4} level would leave an

adequate margin for error. EPA has ruled out levels of 10^{-6} and 10^{-7} at this time because, under the circumstances of this site, the 10^{-5} level is adequately protective, and therefore it would not be cost effective to clean up beyond that level. Moreover, 10^{-5} for the substances involved is at the limits of monitoring ability. As a result, it is technical infeasible to clean up beyond that level.

The final issue concerning the groundwater is to determine the appropriate way to clean it up so that it attains a 10^{-5} risk level. In addition to SARA's emphasis on restoration, EPA's policies support active restoration in this case. As noted above, the aquifer system is a Class II aquifer; it is currently used as a drinking water source, and the contaminated portion of the aquifer may be needed as a drinking water source in the future. In addition, as noted above, an alternative water supply is not currently available. Third, high concentrations are present in groundwater that may be used, and the groundwater is not likely to clean itself up through natural attenuation in the foreseeable future.

Given these facts, and the mobile and toxic nature of the constituents, there would be significant long-term uncertainties associated with either natural attenuation or containment, and both a short and long-term potential for adverse health effects from human exposure if either approach is adopted and then fails, particularly if the site is developed. There also would be a possibility of future remedial action costs. The public also has demanded usable water quickly. In its comments, the local citizens group, WASTE, made clear its grave concerns about the need for an assured drinking water source, asking not only for a total, rapid cleanup, but also for an alternate water supply as an added precaution. All of these facts, in addition to the fact that effective technologies are available to treat the contaminants in the groundwater, support a need for rapid restoration.

(b) Soils

(i) VOCs

A remedial action is required for two types of soil contamination that are on site. Concerning the volatile organic compounds (VOCs), actions are necessary to achieve short-term and long-term groundwater objectives, notably restoring the groundwater for use as a potential drinking water source. The Millcreek Memorandum (at page 3), among other documents, reflects EPA's approach of designing a source control remedy consistent with the need to clean up groundwater. EPA's goal in selecting a remedial action for the source is to achieve a 10^{-5} risk level in the groundwater on the site. EPA will clean up a sufficient quantity of soils to sufficiently low concentrations to accomplish

this objective. The volume of soils to be remediated depends on variables such as the mass and distribution of contaminants in the soils. As part of the remedy, a pre-excavation survey will be done that will lead to a refined assessment of the mass and distribution of contaminants in the soils. EPA has costed out this portion of the remedy based upon GZA's estimates as to the volume of contaminated soils, and upon its assumption that the soils will need to be treated to 1 ppm total VOCs. The Agency will refine its cost projections once it has completed design.

As is discussed above, the Agency has selected a treatment-based remedy for this site because it provides a greater degree of protectiveness, and because its selection would comply with EPA's statutory mandate to select permanent remedies where practicable. Thermal aeration is the cost effective remedial technology for cleaning up the VOC soils. 5/ The Agency prefers thermal aeration to the rototilling type of aeration. The former would be much more efficient and reliable and hence it is more likely to be effective. It also is safer in terms of its potential emissions into the atmosphere. Consequently, the Agency has costed out its remedy on the basis that it will use thermal aeration. Nevertheless, during design, EPA will consider proposals using rototilling and other aeration technologies as well as thermal aeration proposals. The Agency will make a final decision as to the type of aeration to use based upon the effectiveness and safety of these technologies when used under the specific conditions present at this site.

(ii) PCB Soils

PCB-contaminated soils also are present on site. Reducing the concentration of PCBs to a level of 20 ppm would adequately protect human health and the environment, based upon EPA Guidance (Development of Advisory Levels for Polychlorinated Biphenyls (PCBs) Cleanup, prepared by the Exposure Assessment Group, Office of Health and Environmental Assessment, May 1986), and the site-specific analysis contained in the October 29, 1986 memorandum that is included in the administrative record. With respect to the PCBs in the sediments, EPA has selected a concentration of 1 ppm. This limit is a conservative one that is based upon potential risks to birds and wildlife.

As noted above, the permanent remedy of thermal destruction (incineration) rather than a containment alternative is preferable for several reasons. Incineration is a proven treatment process for PCBs and other organic compounds. It is a high temperature process that in most cases destroys the compounds. With incineration, there will be none of the long-term uncertainties that would exist if the PCBs (which are unusually persistent and

toxic) were capped, covered, landfilled, or merely left alone. Similarly, EPA will not need to worry about long-term maintenance costs, about the potential for adverse health effects if containment fails, or about the need for additional expenditures if land disposal were tried and it failed. EPA projects that approximately 5,000 cubic yards will need to be incinerated. The Agency has developed its costs on this basis. This figure will be refined during the design phase of the remedy. The Agency will make a final decision as to the type of incineration to use based upon the effectiveness and safety of these technologies when used under the specific conditions at this site.

3. Applicable or Relevant and Appropriate Requirements

(a) Groundwater

In determining the applicable or relevant and appropriate requirements for remedial actions involving contaminated surface water or groundwater, the most important factors to consider are the uses of the water and the purposes for which the potential requirements are intended.

The actual or potential use of water, and the manner in which it it used, will determine what kinds of requirements may be applicable or relevant and appropriate. For Class III-type groundwater that cannot be used for drinking because of high salinity or severe contamination, drinking water standards are neither applicable nor relevant and appropriate. If the groundwater or surface water is always treated at the well-head or at a treatment facility, drinking water standards apply at the tap. Groundwater or surface water that is directly used for drinking must, however, be cleaned up to drinking water levels.

For contaminated groundwater, the applicable or relevant and appropriate standard will generally be the RCRA Groundwater Protection Standard (Part 264, Subpart F). The Groundwater Protection Standard allows setting a level at background, at a protective alternate concentrations limit (ACL), or, for a small set of chemicals, at a specified concentration limit. For Superfund purposes the ACL is generally most appropriate, based on the use of the groundwater.

For water that is intended to be used for drinking, the point of departure for setting an ACL should generally be the Maximum Contaminant Levels (MCLs) set under the Safe Drinking Water Act. Of course, where the groundwater being cleaned up will be supplied directly to 25 or more households, MCLs are legally applicable. Otherwise, MCLs are generally the most appropriate standard

for actual or potential drinking water.

The levels to which groundwater will be cleaned up at this site are at the limits of monitoring ability. The statute requires that the remedial action comply with MCLGs where they are relevant and appropriate. Because the levels selected in this remedy are already at the limits of our monitoring ability, the question of whether MCLGs are relevant and appropriate at this site need not be reached. The levels do meet the proposed MCLs that have been established for the indicator chemicals.

State groundwater regulations are relevant and appropriate for this site. State groundwater regulations require that EPA's remedy treat the groundwater to achieve a 10^{-6} cancer risk level for trichloroethylene and tetrachloroethylene at Route 125. See Ws 410.05(e), 410.09, and 302.08. Consequently, the State requirements constitute an independent basis for cleaning up the groundwater at Route 125 to a 10^{-6} level for these substances. As noted above, EPA's remedy will treat the groundwater on the site, as well as at Route 125, so that the trichloroethylene and tetrachlorethylene levels are each 5 ppb, which is a 10^{-6} cancer risk level.

(b) Soils

RCRA's closure requirements are relevant and appropriate for the contaminated soil. EPA's remedy, when complete, will comply with these requirements. If EPA's remedy does not satisfy these requirements, the Agency will consider what additional action (if any) is needed.

TSCA is relevant and appropriate concerning the PCBs greater than 50 ppm under the circumstances of the release or threatened release at this site. Accordingly, EPA has selected a remedial alternative that attains the level of control required under TSCA. TSCA requires that PCB-contaminated soils above 50 ppm be incinerated or landfilled. 40 C.F.R § 761.60(a)(4). TSCA's 50 ppm limit is not a risk or health-based standard. EPA's remedy is health based and will exceed this standard.

CONCLUSION

The soil and groundwater at the Ottati and Goss Superfund site contain high concentrations of a wide variety of hazardous substances. Because these hazardous substances are present, the site poses a threat to human health and the environment. EPA's three primary options for addressing this risk are (1) to allow the risk to continue to exist but to prevent access to it by imposing land use controls (the "no action" option); (2) to minimize the risk by capping the contaminated soil; and (3) to

minimize the risk by treating the hazardous substances to levels that are protective of human health and the environment.

EPA has selected the third option as its remedy. EPA has a high level of confidence that by significantly reducing the toxicity of the hazardous substances present at the site, this remedy will be effective in minimizing the risk that the site poses. Neither of the other options will achieve a similar result of reducing the toxicity of the waste. Hence, particularly over the long term, EPA's treatment-based remedy is significantly more reliable than either alternative option. In short, the major reason EPA has decided to treat the wastes is that the Agency believes that this remedy will do the best job of protecting human health and the environment.

EPA's decision that a treatment-based approach is the appropriate remedy for this site is supported by ARARs and by the Agency's governing statutory scheme. Section 121(b) of SARA requires that the Agency select treatment-based remedies to the maximum extent practicable. This extremely strong statutory preference for remedies that permanently and significantly reduce the toxicity of hazardous substances buttresses EPA's view that a permanent remedy is the appropriate solution to the risk this site presents. This is particularly true given the relatively small size of the site and the extremely toxic, persistent and mobile character of many of the hazardous substances located on the site.

Finally, EPA's treatment-based remedy also meets the statutory mandate of cost effectiveness. The cost of this remedy is $14,700,000. Other iterations of the treatment-based remedy (for example, alternative 15 in the RI/FS provides for incinerating the VOC-contaminated soils as well as the PCB-contaminated soil), would cost considerably more.

FOOTNOTES

1/ Section 4 of SARA provides that unless otherwise specified, the effective date of the 1986 amendments is their date of enactment (October 17). Thus, in general, the provisions in SARA apply without qualification to this ROD. Section 121(b)(2) contains an exception to this general rule, providing that a ROD issued within 30 days of SARA's enactment need only comply with the section 121 cleanup standards to the "maximum extent practicable." Because the Agency is not issuing this ROD within 30 days of SARA's enactment, the section 121 standards apply without being subject to this "maximum extent practicable" limitation. In any event, EPA's remedy complies with section 121.

2/ RCRA's Part 265 also contains standards for managing hazardous waste, but, as the Preamble indicates, it is the Part 264 standards, which are designed to be RCRA's ultimate standards, which guide CERCLA remedial actions.

If hazardous waste remains at the facility after closure, "post closure" care requirements are triggered for several types of RCRA facilities. These "post closure" requirements also may be relevant and appropriate to the circumstances of a Superfund site.

3/ As noted above, the RI/FS's final screening discussed six options. Three of these options are essentially those discussed above. Two of the remaining three are variations of the three discussed above, while the final alternative provides for disposing of all of the contaminated soil off site.

4/ 40 C.F.R. Subpart F provides that levels should be set at a "point of compliance", that is, at the boundary of the facility. This approach is not appropriate in a case such as this, where the Agency has decided to cleanup the groundwater on site. Concerning section 121(d)(2)(B)(ii)'s apparent limited authorization to set ACLs by assuming a point of exposure beyond the boundary of the facility, this provision allows the Agency, in its discretion, to set ACLs at a point beyond the boundary of the facility. First, this provision is inapposite because on site groundwater contamination needs to be cleaned up. Moreover, this site does not meet the three conditions for setting such ACLs. First, concerning the condition contained in section 121(d)(2)(B)(ii)(II), based upon the record, EPA is not prepared to conclude that the existing measurements or projections establish that there is or will be no statistically significant increase of such constituents from such groundwater in such surface water at the point of entry or at any point where there is reason to believe accumulation of constituents may occur downstream.

EPA also does not believe that subparagraph (III)'s requirement that the remedial action include enforceable measures that will

preclude human exposure to the contaminated groundwater at any point between the facility boundary and all known and projected points of entry of such groundwater into surface water can be met. Exposure to the contaminated groundwater could occur in the marsh between the site boundary and Pond, in wells that could be installed along the sides of the marsh, and in the outlet to the Pond. EPA does not believe that any current measure will preclude human exposure in these areas.

In short, EPA believes that Congress intended that ACLs using a point of exposure beyond the facility boundary only be used when the Agency has a high degree of confidence that all of the three 121(d)(2)(B)(ii) conditions are present at a site, and when the groundwater under the site itself is not going to be cleaned up. Here, EPA does not believe that these three conditions exist, and it also intends to clean up the groundwater under the site. Consequently, the Agency believes that setting ACLs beyond the site boundary is not appropriate. Such a position is buttressed by the State requirement that Route 125 should be the compliance point.

5/ EPA believes that the proper role for cost effectiveness is in comparing the cost of different alternatives that would achieve the same result. For example, both aeration and incineration would achieve the result of reducing the level of VOCs in the soil to acceptable levels, and EPA selected aeration because of the Agency's belief that aeration would be less costly. It is not appropriate, or necessary, to compare the cost of aerating the VOC-contaminated soils to the cost of capping these soils, or to compare the cost of incinerating the PCB-contaminated soils to the cost of landfilling them, because a cap or landfill would not achieve the same result as a treatment-based remedy. In this case, the difference in cost would not be dispositive in any event.

OPERATION AND MAINTENANCE

Operation and maintenance (O&M) are those costs required to operate and maintain the remedial action throughout its lifetime. This activity ensures the litetime effectiveness of the remedial alternative selected.

The estimated capital, O&M and present worth costs for the recommended alternative are detailed on Tables 5 and 6.

State Role

The state's role in this federal lead site is multiple. The state reviews documents to determine if they are in compliance with applicable state laws and provides comments on all EPA funded studies at the site. The state of New Hampshire concurs with EPA's chosen remedy for the clean up of the O&G/GLCC site located in Kingston, New Hampshire. The State of New Hampshire will provide:

- 10 percent of the capital costs of the chosen remedy
- 10 percent of the operation and maintenance costs for the chosen remedy throughout the remediation process.
- 10 percent of costs associated with the monitoring of residential wells in use off site for the first year.
- 100 percent of costs associated with monitoring of residential wells and environmental monitoring in Country Pond.

SCHEDULE*

Sign Record of Decision.	January 16, 1987
Project design, to include treatability studies.	June 1, 1987
Begin construction of on-site soil treatment facilities and groundwater treatment system.	July 1, 1988
Construction complete.	June 1, 1989
Begin on-site excavation and groundwater extraction and treatment.	August 1, 1989
EPA evaluates groundwater treatment for consistency with remedial objectives.	August 1, 1994

* EPA would follow this projected schedule if this were a Fund lead site. Due to the pending litigation, it is not certain that this remedy will be implemented according to this schedule.

COMMUNITY RELATIONS

Throughout the site's history community concern and involvement has been high. Local concern has focused on the health hazards associated with the soil and groundwater contamination. Also there is a wider, regional concern about the contamination of surface waters, particularly nearby Country Pond. The primary desire among local citizens and officials is that the site be cleaned up as soon as possible and Country Pond is protected from contaminants migrating from the site.

Local citizens have organized a group called "We Agree - Save The Environment, Inc." (WASTE, Inc.). This group has been active with state and local officials, as well as national organizations such as the Environmental Defense Fund and the Izack Walton League. In addition, local and state officials including members of the Legislative Delegation, the Governor and his staff, and members of the Congressional Delegation and their staffs, have been actively involved in and are interested in site activities.

Throughout the RI/FS, EPA and the State of New Hampshire have been involved in litigation with five potentially responsible parties; International Minerals and Chemical Corporation (IMC), which currently owns the GLCC site, and four firms collectively known as the Generators (General Electric Company, Lilly Industrial Coatings, Inc., Solvents Recovery Services of New England, and K.J. Quinn & Company, Inc.)

A public informational meeting to describe the FS alternatives was held at the Kingston Town Hall in Kingston, on September 4, 1986. The meeting was well attended by citizens, local officials and legal representatives of potentially responsible parties. On September 18, 1986 a public hearing was held at the same location to record comments by any interested parties. Comments were given by WASTE Inc., Senator Warren Rudman, New Hampshire State Representative David A. Welch, Hartley Bailey, resident of Newton Junction, the Town of Newton Board of Selectmen, Congressman Robert C. Smith, the selectmen of the Town of Kingston, Mr. Vautier, an interested citizen, International Minerals and Chemical Corporation (IMC), and Mr. Hannigan, citizen of Kingston. Written comments were also received from all of the above mentioned, the four generators and the Town of Amesbury, Massachusetts Board of Health during the remainder of the comment period. The formal, three week comment period to accept oral and written comments on the feasibility study alternatives took place from September 4, 1986 until September 25, 1986.

A second comment period was held to receive public comments on the Preferred Remedy from October 29, 1986 until November 21, 1986. At the request of community members, EPA extended the public comment period until December 5, 1986. Written comments were

received from WASTE, Inc., International Minerals and Chemical Corporation (IMC), the four firms collectively known as the Generators (General Electric Company, Lilly Industrial Coatings, Inc., Solvents Recovery Services of New England, and K.J. Quinn and Company, Inc.) and the firm of Bracken and Baran, representing Senter Transportation Company, Inc., Concord Realty Trust, Bernard Senter and Sally Senter- owners of part of the Ottati & Goss/Great Lakes Container Corporation Site.

Comments received during the comment periods and EPA's responses are included in the attached Responsiveness Summary. The Responsiveness Summary also contains a section on remaining community concerns, which summarizes questions the community raised during the RI/FS process, but were not submitted as formal comments. These are concerns that the EPA and the State should be aware of as they prepare to undertake remedial design and construction at the Ottati & Goss/Great Lakes Container Corporation Site.

Both WASTE and the Kingston Health Department (KHD) requested that an alternative water supply and additional wells be installed down gradient of the site for groundwater extraction and treatment to prevent migration of contaminants into private water supplies. WASTE and KHD believe these two actions should take place immediately, and be funded with emergency response funds.

U.S. Representative Robert C. Smith commended the FS objectives and emphasis on achieving permanent treatment. He stated his support for the request that a health study be conducted. He also urged EPA to take steps to ensure the quality of public health and to continue to monitor the water quality status for residential wells and Country Pond.

U.S. Senator Warren Rudman stated his support for the community efforts at the site and urged EPA to cleanup and treat soil and groundwater, implement a health survey and provide an alternative water supply where necessary.

U.S. Senator Gordon J. Humphrey stated it is time for EPA to take action in the implementation of a remedial plan. Senator Humphrey urged EPA to give thorough consideration of the recomendations of WASTE.

New Hampshire State Representative David A. Welch stated his full support for the recomendations of WASTE and urged all possible haste in actions to protect the public health and welfare.

The Town of Amesbury, Massachusetts expressed concern with the procedures which will be used to control the potential pollutant

release during the final remedial action steps. The town proposed that a monitoring network be established throughout the downstream waterways to ensure the quality of the water supply.

Mr. Hartley Bailey of Newton Junction, New Hampshire expressed concern that fish tested in Country Pond for contamination in 1984 and 1986 have not been tested for VOCs. Mr. Bailey stated that such tests would give a better indication of the depth of VOCs than the surface tests for VOCs which have been previously performed. Mr. Bailey also stated that state officials had promised to conduct VOC tests on the fish tested for other contaminants in 1986 but have failed to keep that promise.

Mr. Charles Hannigan of Kingston, New Hampshire urged EPA to take action and clean up the site. Mr. Hannigan expressed concern that too many studies, and not enough action, had taken place.

Mr. Duke Vautier of Pelham, New Hampshire commented that incineration below 3500°F leaves contaminated ash. Mr. Vautier suggested that EPA consider a pyrolysis process that would exceed 5000°F.

ENFORCEMENT ANALYSIS

The Ottati & Goss site is currently in litigation. The United States filed a complaint on May 18, 1980. The court bifurcated the trial. A 116 day trial on liability took place between December 5, 1983, and June 13, 1985. In its decision dated December 9, 1985, the Court concluded that the following defendants are liable for some or all of the hazardous substances present at the site:

Great Lakes Container Corporation
International Minerals & Chemical Corporation
Louis Ottati Sr.
Wellington Goss
Ottati & Goss, Inc.
Geochem
Senter Transportation Co.
General Electric Co
Concord Realty Trust
Bernard Senter
Sally Senter
K.J. Quinn Co.
Lewis Chemical Co.
Solvents Recovery Service of New England
Lilly Industrial Coatings, Inc.

The Court has scheduled the trial on remedy and damages to begin on February 2, 1987. The United States has had some preliminary settlement discussions with various defendants. It is not possible at this point to predict whether or when the United States will achieve a settlement with one or more of the defendants.

October 27, 1986

Permissible PCB concentration in soil, Ottati & Goss/GLCC, Kingston, NH

Pi-yun Tsai, Sc.D., Environmental Toxicologist
Water Supply Branch

Paul Marchessault, Site Manager
Superfund Branch

This is the follow up to our meeting of 10/23/86 regarding the derivation of a permissible PCB concentration in soil for the source areas clean-up at the Ottati & Goss/GLCC site. This memo includes clarification for concerns raised in the meeting.

Basic assumptions used in the calculation are: the most susceptible population at risk of exposure are 1.5 - 4 year old children and soil ingestion is considered the major contributor among all possible routes of exposure.

Assuming the clean-up goal is an incremental lifetime cancer risk of 10^{-5}, the permissible PCB concentration in soil for residential area is 20 ppm. Alternatively, if this site is considered as a non-residential area and the frequency of exposure for children visiting the area of contaminated soil is assumed to be 70 days per year (twice a week for 35 weeks excluding inclement weather), the permissible PCB concentration in soil is approximately 70 ppm.

$$\frac{10^{-5}}{4.34 \times 0.2\ g/day \times 10^{-3}\ g/Kg \times 30\% \div 17\ kg \times 245\ days/365\ days \times 3.5\ yr/70\ yr}$$

$$\simeq 20\ ppm$$

where:

- 10^{-5}: Assumed lifetime cancer risk level for clean-up goal
- 4.34: Cancer risk potency for PCB expressed as $(mg/kg/day)^{-1}$
- 0.2 g/day: Daily soil ingestion (not applicable to children with pica)
- 10^{-3} g/Kg: Conversion of g to Kg of soil ingestion
- 30%: Absorption rate of PCB in soil from GI tract
- 17 Kg: Average body weight for 1.5 - 4 years old
- 245/365: Yearly frequency of exposure (35 weeks per year excluding inclement weather)
- 3.5/70: Fraction of the lifetime for potential exposure

Since exposure through dermal absorption and inhalation (of PCB in ambient air and air particulates) are not incorporated in the calculation, the permissible PCB concentration in soil could be lowered than what is presented. Compared to soil ingestion, dermal absorption of PCB from contaminated soil is considered insignificant. Inhalation of PCB emitted from contaminated soil to the ambient air and suspended particulates might contribute as much health risk as that from ingestion of contaminated soil.

OTTATI & GOSS/GREAT LAKES CONTAINER CORPORATION SITE

Kingston, New Hampshire

RESPONSIVENESS SUMMARY

The U.S. Environmental Protection Agency (EPA) held two public comment periods from September 4, 1986 until December 5, 1986 for interested parties to comment on EPA studies and plans for the Ottati & Goss/Great Lakes Container Corporation Site (O&G/GLCC) in Kingston, New Hampshire. The first public comment period was held from September 4, 1986 until September 25, 1986 for interested parties to comment on EPA's draft Feasibility Study (FS). The draft FS examines and evaluates methods for cleaning up hazardous waste identified at the site.

The second public comment period was held from October 29, 1986 until November 21, 1986. At the request of community members, EPA extended the comment period to December 5, 1986. The second public comment period allowed interested parties to comment on EPA's Preferred Alternative for cleaning up hazardous waste identified at the site.

The Agency opened a third public comment period on December 23, 1986 to allow the public to comment on a groundwater model of the site. The Agency has yet to receive all of the comments on this model. A supplement to this Responsiveness Summary will be issued once all comments have been received and responses prepared.

A responsiveness summary is required by Superfund policy for the purpose of providing EPA and the public with a summary of citizen comments and concerns about the site, and EPA's responses to those concerns.

The community relations responsiveness summary prepared for the O&G/GLCC site is divided into the following sections:

I. Overview. This section lists the proposed remedial alternatives as presented in EPA's draft FS, and outlines EPA's prefered alternative as presented in EPA's.

II. History of Community Involvement and Concerns. This section provides a brief history of community interest and concerns regarding the O&G/GLCC site.

III. Summary of the Major Comments Received during the Public Comment Periods and EPA Responses to Those Comments. This section categorizes written comments received from all interested parties during the three public comment periods for the O&G/GLCC Site.

IV. Remaining Community Concerns. This section summarizes present public concerns as expressed at a recent public meeting.

I. OVERVIEW

A draft Feasibility Study (FS) for the O&G/GLCC site was completed in August, 1986. The draft FS outlined eighteen possible remedial alternatives for the site. Each alternative was reviewed for health and environmental impacts. Twelve alternatives were removed from consideration because they did not meet the following FS objectives:

- to maintain safe drinking water supplies for nearby residents;
- to prevent or reduce exposure to site contaminants so that risks to human health are avoided;
- to prevent or reduce off-site releases of contaminants from on-site sources;
- to comply with state and federal requirements; and
- to continue to monitor and control the site, in order to study the long-term effectiveness of the selected clean-up alternative.

Of the six remaining alternatives that met these objectives, all included environmental monitoring to insure that site conditions were as expected; and land use controls to minimize public exposure to contaminants. Five of the six alternatives (the "No Action" alternative being the exception) recommend that alternate water supplies be provided if monitoring demonstrates that drinking water wells are in danger of contamination. The six alternatives are summarized in detail below. Their numbers correspond to their listing in the draft FS.

Alternative 1C - No Action

Federal regulations require the consideration of a "No Action" alternative as part of the Feasibility Study. This alternative would allow the site to remain as it is presently. Land use controls alone would be used to limit exposure to contaminants. Environmental monitoring would be conducted to keep the State and EPA aware of any change in releases from the site. The estimated capital cost for this alternative is $0.2 million.

Alternative 7 - Source Control

This alternative would involve limited source removal and capping at the GLCC site and source excavation at the O&G site. Volatile contaminants in excavated soils would be removed by aeration. Excavated soils containing PCBs would be encapsulated and placed in an on-site EPA-approved RCRA landfill. An interceptor trench would be installed to reduce future movement of contaminants in the

groundwater. The concentration of contaminants in groundwater would decrease gradually over time with this alternative. Small areas of wetlands would be destroyed by excavation. Remaining wetlands would improve as a result of this alternative, due to a reduced concentration of contaminants and an increase in surface water. The estimated capital cost for this alternative is $4.2 million.

Alternative 12 - Source Control with Groundwater Treatment

This alternative is the same as Alternative 7, including capping of the GLCC site, with the addition of groundwater extraction and treatment. This alternative would therefore have the additional benefit of reducing the impacts of contaminants currently in the groundwater. However, additional wetlands would be temporarily affected. This would result from building an access road for drilling groundwater extraction wells. The estimated capital cost for this alternative is $6.7 million.

Alternative 13 - Source Control With Groundwater Treatment and an Alternate Water Supply

This alternative is the same as Alternative 12, with the addition of a new water supply system for nearby residents. In this alternative, the water supply would be provided immediately. Other alternatives (except for "No Action") include an alternate water supply only after the need is shown by environmental monitoring. Private well sampling and testing undertaken during the Remedial Investigation and Feasibility Study (RI/FS) did not reveal any contamination which could be attributed to the site. However, this alternative responds to the uncertainty of predicting future groundwater movement, particularly in the bedrock aquifer. The estimated capital cost for this alternative is $10.8 million.

Alternative 14 - Complete Source Removal

With this alternative, all contaminated materials would be completely removed and sent off-site. Removed materials would be replaced with clean soil. Small areas of wetlands would improve as a result of this alternative. Less strict land use controls would be needed, because contaminants would be removed from the site. Identification and complete removal of all contaminated material may be difficult. This alternative would involve greater worker exposure to contaminants because it involves more excavation. Additional controls would be needed to prevent air-borne emissions, and to prevent accidents due to increased truck traffic off-site. The estimated capital cost of this alternative is $33.9 million.

Alternative 15 - Source Control with Groundwater Treatment

This alternative would include excavation of selected contaminated source areas and incineration. Incinerated materials would be placed back in excavated areas. A site cover would be installed over remaining contaminated materials. The site cover would prevent contact with contaminated soils. These actions will reduce future release of contaminants into the environment. Groundwater extraction and treatment would reduce the impacts of contaminants currently in the groundwater. Harm to wetlands would not be greater than those described for other alternatives. The extent of source excavation and incineration will be based on a decision of an acceptable level of contamination to remain in on-site soils. That level will in turn be based upon the acceptable concentration of contaminants in the groundwater at the edge of Country Pond. The estimated capital cost of this alternative ranges from $12.1 million to $25.7 million depending on the amount of soil that would be excavated and incinerated.

After examining these site alternatives, and based on public comments received, EPA has recommended a remedy which is a combination of several of these alternatives.

Preferred Alternative

The preferred alternative includes excavation and incineration of selected contaminated source areas, aeration of 14,000 cubic yards of soil to remove volatile contaminants, and groundwater extraction and treatment. The estimated capital cost of this alternative is $8.7 million.

II. HISTORY OF COMMUNITY INVOLVEMENT AND CONCERNS

The Ottati & Goss/Great Lakes Container Corporation site covers thirty-five acres in Kingston, New Hampshire. About one acre in the southwestern part of the site was leased to Ottati & Goss, Inc. (O&G) in 1978. About six acres in the southeastern part of the site are currently owned by Great Lakes Container Corporation (GLCC).

From the late 1950s through 1981, the southeastern part of the site was used for drum reconditioning operations. Used chemical drums were cleaned with a caustic rinse solution. The caustic rinse liquid was then disposed of in this area (the "GLCC site"). Other waste materials were also stored or disposed of in this area, or taken to the southwestern portion (the "O&G site") for processing and storage.

The O&G/GLCC site was listed on the National Priorities List (NPL), a list of the nation's most toxic waste sites requiring remediation under federal law, in September, 1981. Water and soil data about the site were collected by the New Hampshire Water Supply and Pollution Control Commission (WSPCC), EPA, and contractors to EPA and to GLCC. A review of this data and additional data gathered during a remedial investigation conducted by Goldberg-Zoino & Associates (GZA), contractors to the WSPCC, in the fall of 1983 found on-site and off-site contamination of soil, surface water, groundwater, and sediments. Contaminants include volatile organic compounds (VOCs), metals, cyanide, polychlorinated biphenyls (PCBs), and other compounds.

Throughout the site's history community concern and involvement has been high. Local concern has focused on the health hazards associated with the soil and groundwater contamination. Also, there is wider, regional concern about the contamination of surface waters, particularly nearby Country Pond. The primary desire among local citizens and officials is that the site be cleaned up as soon as possible and Country Pond is protected from contaminants migrating from the site.

Local citizens have organized a group called, "We Agree - Save The Environment, Inc." (WASTE, Inc.). This group has been active with state and local officials, as well as national organizations such as the Environmental Defense Fund and the Izack Walton League. In addition, local and state officials, including members of the Legislative Delegation, the Governor and his staff, and members of the Congressional Delegation and their staffs, have been actively involved in and are interested in site activities.

Throughout the RI/FS, EPA and the State of New Hampshire have been involved in litigation with five potentially responsible parties: International Minerals and Chemical Corporation (IMC), which currently owns the GLCC site, and four firms collectively known as the Generators (General Electric Company, Lilly Industrial Coatings, Inc., Solvents Recovery Services of New England, and K.J. Quinn & Company, Inc.).

III. SUMMARY OF MAJOR COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD ON THE FEASIBILITY STUDY AND EPA RESPONSES TO THESE COMMENTS

Many of the comments that EPA received address the "worst case" analysis and whether of not the site poses a threat to human health and the environment in the vicinity of Country Pond. EPA addresses these comments individually in the responses that follow. EPA also notes that they are irrelevant to EPA's selection of a remedy in this case. EPA's remedy is based upon the need to clean up the site, based upon the extremely high concentrations of a wide variety of wastes on the site itself, and consistent with applicable or relevant and appropriate legal requirements.

Comments of WASTE, Inc. on the Feasibility Study

1. Comment: WASTE is concerned that selected soil treatment, rather than all soil treatment will not afford optimum protection of the public health.

   Response: During the design phase of the remedial action, an extensive grid system of the site will be developed. Sampling for contaminants within the grid will identify whch source areas on the site must be excavated and treated. EPA feels that this system will identify the contaminated areas and afford the optimum protection of public health and welfare.

2. Comment: WASTE is concerned that, when EPA is excavating soil, volatile compounds will escape into the air. WASTE proposed that a bubble be placed over the area to prevent this from occurring, similar to the one being employed at the Lipari Landfill site in New Jersey.

   Response: The proposed use of a "bubble" at the Lipari Landfill in New Jersey was evaluated as an alternative in order to potentially mitigate the release of any volatile organic compounds (VOCs) off the site. However, this alternative at the Lipapri Landfill was rejected based on the potential increased risk level to workers constantly working inside the "bubble."

   An extensive air monitoring system will be installed on the site to ensure acceptable air emission standards are not exceeded. If at any time air emissions exceed acceptable levels, soil processing will be terminated and re-evaluated by EPA.

3. Comment: WASTE proposed that if an infrared process proved infeasible for reasons other than cost effectiveness, that alternate innovative technologies be considered, including Advanced Electric Reactor (AER) and Plasmic Arc.

   Response: Under Alternative 15, the Feasibility Study stated that if infrared incineration pilot studies proved unfeasible, contaminated soils should be aerated and placed beneath a GLCC site cap or a RCRA landfill. The recommended alternative, however, states that pilot studies for various types of incineration alternatives will be evaluated during design. Since incineration is a proven technology, the use of incineration rather than a cap or landfill will occur.

4. Comment: WASTE commented that cost effective remedies should never outweigh consideration of human safety.

   Response: This comment is based upon a flawed premise. EPA's goal is to select remedies that protect human health, as well as the environment.

5. Comment: WASTE commented that an EPA approved PCB-RCRA landfill cannot legally be employed at this site.

Response: The recommended alternative does not include the construction of a PCB-RCRA landfill on the site. PCB contaminated soils will be treated by incineration.

6. Comment: WASTE proposed that any groundwater treatment system employ an after burner for toxic vapors, rather than a vapor recovery unit. A vapor recovery unit cannot remove VOCs and a carbon filter in such systems is in and of itself a hazardous waste.

   Response: The proposed treatment system is only conceptual at this time. Prior to full-scale operation a pilot study will be performed to ensure that treatment levels and air emissions are protective of public health and the environment.

7. Comment: WASTE proposed that the GLCC building be demolished and the debris treated. WASTE is concerned that this be done in a manner that reduces the possibilities of airborne VOCs and PCB particles.

   Response: The recommended alternative requires the entire GLCC bulding to be demolished. Tests will be performed on the building to determine the extent of contamination. The portions of the GLCC bulding which are contaminated will be incinerated on-site.

   The remaining portions, which do not show any contamination, will either be taken off-site or crushed and disposed of on-site. Care will be exercised in the demolition of the building to ensure the potential release of any contaminants is minimal.

8. Comment: WASTE proposed that all on-site and off-site wells be continuously monitored in order to ensure that any changes in contaminant levels are accurately recorded.

   Response: The recommended alternative calls for the sampling of both on-site and off-site wells. At this time, the need for continuous monitoring is not anticipated. However, the use of periodic monitoring (every 3-6 months) will be performed. If warranted, the need for more frequent sampling will be evaluated.

9. Comment: WASTE proposed that an expanded, pre-excavation soil survey be conducted because monitoring data from perimeter wells suggests the maximum estimate of contaminant soils may be underestimated.

   Response: Prior to the initiation of any on-site remedial actions, an extensive soil survey will be conducted during the design phase. This will involve dividing the site into grid areas and sampling within the grids. If the results indicate contamination is above acceptable levels, the soils in that particular grid will be excavated and treated. Thererfore, the final amount of soil to be treated will not be finalized until the design phase.

10. Comment: WASTE proposed that a health survey be implemented immediately.

Response: As previously stated, EPA and the Centers for Disease Control (CDC) do not believe that a health survey is appropriate at this time for this site. The environmental sampling results and the small population size present at the site would give negative or inconclusive results in a health study.

11. Comment: WASTE requested that an independent technical advisor be provided to the community by EPA.

Response: The Superfund Amendments and Reauthorization Act of 1986 contains a new provision for grants for technical assistance to citizens. The Law states: "The President may make such grants available to any group of individiuals which may be affected by a release or the threatened release at any facility which is listed on the National Priorities List under the National Contingency Plan (NCP)." It is expected that citizens will be able to apply for such grants in the spring/summer of 1987. In addition, an advanced notice of rule making concerning these is expected to be published in the Federal Register this winter. EPA will invite the public to comment on the notice, and provide any input into the Technical Assistance program at this time.

12. Comment: WASTE proposed, as an Emergency Response Action, that additional wells be installed down-gradient of the site for groundwater extraction and treatment. WASTE contends that the projected time frame for implementation of a marsh groundwater treatment system increases potential health risk and the possibility of contaminating existing private water supplies.

Response: The need for an immediate groundwater extraction and treatment system cannot be justified at this time. However, the movement of the groundwater plume will continue to be monitored by EPA and/or the State.

13. Comment: WASTE proposed, as an Emergency Response Action, that an alternative water supply be installed immediately. WASTE contends that data shows a migration of heavy metals, VOCs and ABNs in quantities sufficient to warrant such action.

Response: Based upon the data in the RI/FS an alternative water supply cannot be justified at this time. However, the selected remedy includes an extensive monitoring program for water supply wells and groundwater in the site area and if such monitoring indicates contamination or increased potential for contamination of existing supplies, the need for an alternate supply will be reconsidered.

Comments of Public Officials on the Feasibility Study

1. Comment: The Kingston Health Department (KHD) favored WASTE's request for an Emergency Response Action for groundwater extraction and treatment. KHD noted that wells must also be placed hydraulically downgradient of the contaminant plumes.

   Response: As stated in the reponse to "WASTE's" same concern, existing monitoring data indicates that there is no surface water contamination and therefore no existing threat to the residents of Country Pond. Continued monitoring by the New Hampshire Water Supply and Pollution Control Commission will occur to ensure that the extent of the groundwater contamination is carefully followed.

2. Comment: The Kingston Health Department favored WASTE's request for an Emergency Response Action to supply an alternative water supply. KHD proposed that the water supply should include all dwellings within 1.5 miles of any part of the site or contaminant plume.

   Response: Based upon the date in the RI/FS, an alternative water supply cannot be justified at this time. However, the selected remedy includes an extensive monitoring program for water supply wells and groundwater in the site area and if such monitoring indicates contamination or increased potential for contamination of existing supplies, the need for an alternate supply will be reconsidered.

3. Comment: The Kingston Health Department favors an immediate epidemilogical study of area residents within 1.5 miles of any part of the site or contaminant plumes.

   Response: EPA and the Centers for Disease Control (CDC) do not believe that an epidemiological study is appropriate at this site. The environmental sampling results and the low population near the site would give a negative or inconclusive result in an epidemiologic analysis.

4. Comment: The Kingston Selectmen urged EPA to consider strongly the comments they received on the FS. The Selectmen's spokesman also commented that if the contaminant plume will reach the marsh adjacent to Country Pond within the next year, that immediate action be taken by means of groundwater extraction and treatment for the benefit of public health.

   Response: All comments received on the Feasibility Study were

taken into consideration. Continued monitoring of the down gradient wells will be performed during the design phase of the proposed remedial action.

5. Comment: Mark L. Scaison, an Agent of the Amesbury, Massachusetts Board of Health submitted that he supports Alternative 15, but expressed concern over how long it might take to commence remedial work. Mr. Scaison also urged EPA to (1) consider expanding the soil treatment area; (2) begin a health survey; (3) consider more extensive water and soil testing downstream of the site. Mr. Scaison also endorsed WASTE proposals to:

   (1) use a bubble during site excavation;
   (2) use after burners for vapors, rather than vapor recovery units;
   (3) demolish and dispose of the GLCC building; and
   (4) provide an independent technical advisor.

   Response: The amount of soil estimated to be excavated will be better refined during the design phase. Detailed surveys and sampling will be conducted both on-site and off-site to better define the extent of contamination. The endorsement of WASTE's proposals is acknowledged and is responded to under the WASTE comments in this document.

6. Comment: U.S. Representative Robert C. Smith commended the FS objectives and emphasis on achieving permanent treatment. He stated his support for the request that a health study be conducted. He also urged EPA to take steps to ensure the quality of public health and to continue to monitor the water quality status of residential wells and Country Pond.

   Response: Consistent with EPA policy, EPA will seek a rapid and permanent site cleanup. The quality of public health is a major concern, and the selected EPA remedy includes provision for both on-site and off-site long term groundwater montoring of wells.

7. Comment: U.S. Senator Warren Rudman stated his support for the community efforts at the site and urged EPA to (1) cleanup and treat soil and groundwater, (2) implement a health survey, and (3) provide an alternative water supply where necessary. He further urged prompt action on a cleanup.

   Response: The selected remedy includes both a cleanup of on-site contaminated soils and a groundwater extraction and treatment system. The immediate need for both a health survey and an alternate water supply cannot be justified at this time based on the data in the Feasibility Study. Long term groundwater monitoring will be performed at various locations to ensure health of the residents is not threatened. EPA will seek as rapid a cleanup of the site as is feasible.

8. Comment: U.S. Senator Gordon J. Humphrey stated it is time for

EPA to take action in the implementation of a remedial plan. Senator Humphrey urged EPA to give thorough consideration to the recommendations of WASTE Inc., and stated his preference for WASTE's modifications to Alternative 15.

Response: EPA concurs that a remedial plan be implemented as soon as possible. The comments of WASTE have been thoroughly evaluated and considered in the selection of the remedy.

9. Comment: The Newton, New Hampshire Board of Selectman stated their full support of the recommendations of WASTE, Inc. and urged EPA to implement the two emergency responses requested by WASTE.

Response: As previously stated in response to these two concerns, the need for an immediate groundwater extraction and treatment system and alternative water supply cannot be justified under an emergency response action. However, continued sampling and monitoring will closely determine the extent of groundwater contamination.

10. Comment: The Town of Amesbury expressed concern with the procedures which will be used to control the potential for pollutant release during the final remedial action steps. The town proposed that a monitoring network be established throughout the downstream waterways to ensure the quality of the water supply.

Response: During the remedial action at the site, an extensive air and groundwater monitoring system network will be installed in order to minimize the potential of any releases during site cleanup.

12. Comment: New Hampshire State Representative David A. Welch stated his full support for the recommendations of WASTE, and urged all possible haste in actions to protect the public health and welfare.

Response: EPA has carefully considered of the comments from WASTE, and consistent with EPA policy, EPA will seek a rapid cleanup of the site.

Comments of Concerned Citizens on the Feasibility Study

1. Comment: Mr. Hartley Bailey of Newton Junction, New Hampshire expressed concern that fish tested in Country Pond for contamination in 1984 and 1986 had not been tested for VOCs. Mr. Bailey stated that such tests would give a better indication of the depth of VOCs than the surface tests for VOCs which have been previously performed. Mr. Bailey also stated that state officials had promised to conduct VOC tests on the fish tested for other contaminant in 1986 but have failed to keep that promise.

Response: Based upon information from the New Hampshire Water Supply and Pollution Control Commission (WS&PCC), it is their understanding that the accumulation of VOCs in the fish tissue would be unlikely. Consequently, their sampling efforts have focused on toxicants (mercury and PCBs) which would be expected to bioaccumulate in fish tissue and which had been detected in an earlier fish study conducted for Goldberg, Zoino and Associates.

The NH WS&PCC has indicated however, that if information becomes available which indicates a potential for VOC bioaccumulation exists, they will be willing to test for VOCs for any additional fish tissue monitoring at Country Pond.

2. Comment: Mr. Charles Hannigan of Kingston, New Hampshire urged EPA to take action and cleanup the site. Mr. Hannigan expressed concern that too many studies, and not enough action, had taken place.

   Response: EPA is aware that the completion of the Remedial Investigation/Feasibility Study is a long process. However, due to the complexity of the site, it is necesssary to evaluate the extent of contamination. EPA will seek a rapid cleanup of the site.

3. Comment: Mr. Duke Vautier of Pelham, New Hampshire commented that incineration below 3500°F leaves contaminated ash. Mr. Vautier suggested that EPA consider a pyrolysis process that would exceed 5000°F.

   Response: Although the Feasibility Study evaluated infrared incineration, various types of incineration techniques will be evaluated during the design phase. Upon completion of pilot studies, the most feasible incineration technique will be selected.

Comments of Potentially Responsible Parties on the Feasbility Study

General Electric Company, Lilly Industrial Coating Inc., Solvents Recovery Services of New England, and K.J. Quinn & Company, Inc. (the Generators) commissioned an evaluation of the RI/FS by the firm S.S. Papadopulos & Associates, Inc. (SSP&A). The comments of SSP&A are presented below.

1. SSP&A Comment: The location of domestic wells that are within a 1.5 mile radius of the site are shown on Figure 23 of the RI. Given the locations of these wells relative to the site and the knowledge of groundwater flow from the site to points of discharge, it is virtually impossible for groundwater from the site to reach any of these wells, except perhaps the Buzzwell well (see RI Figure 23). Even the Buzzwell well, however, appears to be located such that the groundwater in the well would be derived from areas to the north and northwest that are not affected by the O&G/GLCC site. Thus, it is highly unlikely that even this well could be affected by the site.

   Response: GZA maintains that Country Pond serves as the primary point of discharge for contaminated groundwater flow from the site. Under the worst case scenario, Country Pond could become contaminated via discharge of contaminated groundwater emanating from the site. The basis for these assumptions, and the estimated worst case impact, are described in the RI. Therefore, the basis of this comment lies in determination of whether or not it is "possible" for Country Pond water to reach any well within 1.5 miles of the site.

   GZA concurs that a substantial portion of groundwater flow to the well would be derived from upgradient locations, and that the percentage of upgradient groundwater flow to the well would increase with distance from Country Pond. However, it is likely that ambient flow gradients within proximity of Country Pond would be very low, as has been observed in the easterly portion of the marsh downgradient from the O&G/GLCC site. Consequently, it is anticipated that some percentage of the well recharge would also be derived from Country Pond.

   GZA estimates that for a well located within 50 feet of Country Pond, it is probable that at a typical domestic well pumping rate of 3 gallons per minute and a pumping time of 30 minutes to 1 hour, recharge to the well from Country Pond would be between 10 to 20 percent of the total groundwater flow to the well. This percentage could increase at distance closer to Country Pond, or as a result of longer pumping times or higher pumping rates. It is likely that

at distances much beyond 50 feet from Country Pond, infiltration from Country Pond would be limited unless higher pumping rates and longer pumping durations than typically prevail for domestic wells were used. In addition, Dr. Guswa's report describes another possible route of exposure.

2. SSP&A Comment: It is worth noting that analyses of samples from residential wells in 1983 and 1984 show no contamination related to the O&G/GLCC site (see RI, Tables 32 & 33). GZA has conceded that there is "no conclusive evidence of contamination of overburden drinking water wells in the area" (RI, p.98). Almost 30 years has elapsed since discharge from the site to groundwater may have first occurred. The lack of contamination related to the site in residential wells after almost 30 years strongly supports the conclusion that groundwater from the site will not reach these wells.

   Response: Much remains unknown about the complex disposal history at the site, including dates, durations, and amounts of contaminant disposal. It is possible that discrete plumes of unknown magnitude and concentration could have discharged to Country Pond at some time in the past due to a previous disposal event, or group of events on-site. No groundwater or surface water data exist prior to 1983 to confirm or disprove whether previous contamination may have been present in off-site wells. It is also possible that adsorption could be retarding the solute front as it is transported toward Country Pond.

3. SSP&A Comment: The reality of the situation is that a large portion of the VOCs will discharge to South Brook, North Brook, and swampy areas along North Brook and east of Highway 125 and will not persist in the subsurface environment as far as Country Pond.

   Response: Water quality data collected by GZA from sampling points located in the marsh over the period from December 1984 to February 1986 indicates that a large portion of the VOCs do not discharge to South Brook, North Brook and swampy areas along North Brook and east of Route 125, but instead are migrating in a plume beneath the peat toward Country Pond. Evidence of this transient condition is provided by the pronounced increases in VOCs observed from December 1984 to February 1986 in monitoring wells which lie east of well W-9.

Additionally, triaxial permeability testing performed on samples of peat indicate that the low hydraulic conductivity and transmissivity of the peat in the marsh restricts groundwater discharge within the marsh. The transient plume condition is depicted graphically on Figure 30 of the RI Addendum report.

4. SSP&A Comment: The conservation of mass approach requires an estimate of the total quantity of contaminants in soil and ground water. This estimate is essential to adequately describe the magnitude of a long-term contamination problem at any site, but the RI makes no estimate of this quantity.

   Response: An estimate of the total mass of contaminants remaining on-site is not presented in the RI/FS because it is regarded as an unquantifiable unknown. This is a result of the fact that much still remains unknown about the quantities of contaminants disposed at the site over the approximately 30 year history of the disposal operations, and the complex site usage patterns during this time. Subsequent excavation of soils on-site has added further variability to the aerial and vertical distribution of on-site contamination.

5. SSP&A Comment: The worst case risk assessment by GZA for overburden wells (RI, pp. 98-99) is estimated based on the assumption that the average concentrations of VOCs that will exist in groundwater at the marsh/pond interface for 70 years are represented by the highest concentrations of VOCs ever measured in any monitoring well east of Highway 125 (well W-9 in November 1983), and that average concentrations in overburden wells will be 1/50 of those occurring in ground water at the marsh/pond interface.

   These two assumptions cannot be logically supported with the available data and, because of this, the risks estimated at the overburden wells are meaningless. SSP&A estimates the time-weighted average at well GZ-5 to be 2,900 ppb over a 70-year period. This is 12 times less than the 34,000 ppb that was measured at W-9 in November 1983, and therefore, more than an order of magnitude less than the value used by GZA to calculate risks to human receptors at the overburden wells for a 70-year period.

   Response: The time weighted average of 2,900 ppb for GZ-5 estimated by SSP&A, is based on what, in EPA's opinion, are unconservative estimates. In particular, considerably higher quantities of VOCs may be present in site soils. The bulk of the SSP&A's estimate of the 1400 kg of VOCs present in site soils come from the SSP&A estimated 7000 cubic yards of soil containing an average of 100 ppm of VOCs. However, Table 45 of the RI Addendum report indicates the presence of soils containing total VOCs with concentration of at least 870 ppm. Table 45 also indicates 3 of the 8 samples analyzed had total VOC concentrations significantly greater than 100 ppm. Thus, in EPA's opinion, the actual quantity of VOCs

remaining in the unsaturated zone may be at least an order of magnitude higher than values represented by SSP&A. Considerable additional masses of VOCs may also be present in the form of undetected "hotspots," contained wastes, or free product. EPA elected to conservatively assume in its worst case estimate that a sufficient mass of source material would remain on-site indefinitely as source material for the marsh plume. This assumption requires that a considerably greater mass of VOCs would be present on-site than estimated by SSP&A. However, based on the above discussion, it is reasonable to conservatively assume such may be the case. As such, it is EPA's opinion that the worst case assumption is valid, particularly in light of the need to be conservative on issues that have significant public health implications.

6. SSP&A Comment: The conclusion reached by SSP&A about an average VOC concentration of 2,900 ppb over 70 years at GZ-5 (Comment 5) is not surprising in light of the available data. A review of Figures 15 and 30 in the Remedial Investigation shows that observed VOC concentrations at well W-9 in late 1983 and in 1984 and 1986 were higher than those observed at almost all other on-site and off-site monitoring wells. Therefore, it is not probable that the maximum concentrations observed at W-9 could persist at the marsh/pond interface for 70 years, especially when it is noted that the time it takes for groundwater to flow from Highway 125 to GZ-5 is only 10 years (p. 13 of Remedial Investigation Addendum). Based on this flow rate it is easy to envision that groundwater from all parts of the site will reach the marsh/pond interface in much less than 70 years and, therefore, that the average concentrations of VOCs in groundwater at the marsh/pond interface will reflect an integration of upgradient conditions and will not be equal to the maximum observed concentration. In addition, it should be noted that total VOC concentrations at W-9 have steadily declined during the past three years from >34,000 ppb in November 1983, to 24,000 ppb in December 1983, to 22,000 ppb in March 1985, and to 18,000 ppb in February 1986.

   Response: EPA agrees that it is not probable that maximum observed levels at W-9 would persist at the marsh pond interface for 70 years. However, this assumption was used as a reasonable upper bound for the worst case scenario given the uncertain quantities of VOCs remaining in upgradient source areas, as discussed previously. Further, the significance of the observed decrease in total VOC concentrations at W-9 over a 2-year period cannot be fully assessed without additional data over time.

7. SSP&A Comment: The average VOC concentration in overburden wells for a 70 year period was assumed to be 1/50 of the groundwater concentration at the marsh/pond interface. The logic used to derive this factor is flawed.

   The factor is derived by comparing VOC concentrations measured at overburden wells GZ-1, GZ-2 and GZ-3 to those measured at well GZ-5 at the marsh/pond interface. No volatile organic chemicals have been detected in most samples analyzed from GZ-1, GZ-2 and GZ-3 and, therefore, the ratio of VOC concentrations in the GZ-1,

GZ-2 and GZ-3 to those in GZ-5 is 0.0, and not 0.02 (1/50) as reported in the RI (p. 99). It should be noted that in December 1983, 821 ppb of 1,1-dichloroethane, 479 ppb of toluene, 364 ppb of ethylbenzene, 304 ppb of xylene, and 1,170 ppb of tetrahydrofuran were reported at GZ-5. If the 0.02 factor was correct, the following concentrations should have been reported at GZ-1 and GZ-2: 16 ppb of 1,1-dichloroethane, 10 ppb of toluene, 7 ppb of ethylbenzene, 6 ppb of xylene, and 23 ppb of tetrahydrofuran.

Response: It is not true that "no VOCs have been detected in GZ-1, GZ-2, and GZ-3." Table 13 of the RI indicates 5 VOCs were detected at trace levels (total of less than 50 ppb) in December 1983 in both GZ-2 and GZ-3. Acetone was also detected in GZ-1 (28 ppb).

EPA has not implied that the 0.02 factor is an absolute fact. Instead it is clearly stated on page 99 of the RI that "The current ratio of VOCs observed between GZ-5 and GZ-1 and GZ-2 of approximately 0.02, is based upon an assumed possible maximum concentration of 50 ppb at GZ-1 and GZ-2 (5 VOCs present at the analytical detection limit of 10 ppb) compared to VOC concentrations of 2700 ppb observed at GZ-5."

8. SSP&A Comment: Wells GZ-1 and GZ-2, which are located along the shoreline of Country Pond, were sampled and analyzed by the WSPCC Laboratory in November 1983, December 1983, March 1985 and February 1986, and by the EPA in December 1983. Results from these four sampling events are reported in the Remedial Investigation, and in each well no VOCs were detected on three of the sampling events. In the sample taken from GZ-1 in 1985, benzene and toluene were reported to be present at less than the detection limit, and in the sample from GZ-2 in December 1983. trans-dichloroethylene, trichloroethylene, benzene, and two-xylene isomers were reported to be present at less than the detection limit. Note that of these five compounds, only the xylenes have been detected at greater than 110 ppb at GZ-5, and that trichloroethylene has not been detected at GZ-5. Well GZ-3 was sampled twice in December 1983, and in one of the samples, ethyl benzene, toluene, acetone, and xylene isomers were reported to be present at less than the detection limit. Additionally, CDM water quality data from GZ-1, GZ-2 and GZ-3 indicate no VOCs are present.

False positives, that is, the detection of VOCs at trace levels when none are present, is not uncommon in samples from monitoring wells. Sample contamination can occur from the sampling equipment, transportation procedures, and/or the analytical laboratory. False negatives can also occur because of incorrect sampling and/or analysis procedures. The probability of one false positive in four sampling events is very high, but the probability of three false negatives in four sampling events is extremely small. Therefore, given the available data one must conclude that there is no evidence of contamination at the overburden wells. (Relevant data on trip, field, and sampling blanks, and laboratory quality assurance are not reported in the Remedial Investigation so that quantification of the probabilities is not possible.)

Response: The December data may be a "false positive." However, in EPA's experience wells lying near the margins of a VOC plume, often fluctuate between trace detection and no detection of VOCs. This may be responsible for the seemingly anomalous December 1983 data. However, given the proximity of the wells, particularly GZ-1, to the plume, and the fact that at least one round of data indicates low level contamination, the conservative assumptions made for the worst case condition in the risk assessment are considered reasonable.

9. SSP&A Comment: Assuming, for sake of argument, that contaminants reportedly detected in samples from wells GZ-1 and GZ-2 were actually present, it is unreasonable to assume simultaneously, at the detection limit of 10 ppb, which would be highly unlikely. Given the uncertainty regarding the samples from wells GZ-1 and GZ-2, 25 ppb is a much more reasonable estimate of the probable maximum concentration of VOCs.

The ratio method, in addition to being flawed conceptually, is inconsistently applied to the available data in the RI. Rather than being applied to one set of data, the ratio is derived and applied to the highest concentrations measured in either the November 1983 or December 1983 sampling round. For example, the ratio between GZ-2 and GZ-5 is derived by dividing the assumed concentration at GZ-2 in December (50 ppb), by the measured concentration in GZ-5 in November (2,700 ppb). If the December data had been used for GZ-5 (3,900 ppb), the factor would be 0.013. If November data had been used for both GZ-2 and GZ-5, the factor would be 0.0. Then, when the ratio is applied to data from W-9, November 1983 data are used, except for tetrachloroethylene, for which December 1983 data were used. This is a critical step because most of the calculated risk comes from the calculated tetrachloroethylene concentration, and tetrachloroethylene was not detected in November 1983 at well W-9.

Response: The uncertainties in risk assessments are clearly set forth in the RI, particulary in section 10.6. The risk assessment requires a number of assumptions to be made with regard to uncertainties. These assumptions include dose-response extrapolations, amount of consumption, as well as exposure concentrations. In fact, it is indicated on page 111 of the RI that probably the most significant uncertainty is that associated with the worst case exposure conditions.

Because of the uncertainties, the risk assessment should be considered accurate, at best, to an order of magnitude. As such, discussions of whether 50 ppb or 25 ppb represents a more reasonable worst case estimate, in EPA's opinion, are academic. EPA's consistent philosophy in developing its worst-case assumptions was to be conservative in protecting public health.

10. SSP&A Comment: The ratio method of comparing concentrations at GZ-1, GZ-2, and GZ-3 to those at GZ-5 flawed because there is no physical reason why the concentration should be related, as groundwater flow does not occur from any areas containing VOCs toward GZ-1, GZ-2, and/or GZ-3. The water-level contour maps in the Remedial Investigation (Figures 13, 14 and 29) can be used to estimate the direction of groundwater flow. The direction of groundwater flow, as is shown by the arrows on the figures, is perpendicular to the contours of equal water levels, from higher levels toward lower levels. At GZ-1, flow is from the northwest, where groundwater is not contaminated, toward Country Pond. At GZ-2, flow is from the southwest, where groundwater is also not contaminated, toward Country Pond. At GZ-3, flow is generally from the west, where groundwater is not contaminated. There is no scientifically sound rationale for predicting that these wells will become contaminated with VOCs from the GLCC plume.

    Response: EPA disagrees with SSP&A's conclusion. As groundwater flows beneath Country Pond, groundwater flow would stagnate as hydraulic heads equilibrate with the pond water level. In such an environment, chemical diffusion provides a mechanism of contaminant migration in directions other than the flow paths shown on Figures 13, 14 and 29 of the RI. Chemical diffusion of VOCs could occur within the western portion of Country Pond. Further, VOC migration toward monitoring and supply wells near pond margins would occur as the wells are pumped and induce flow of groundwater from beneath Country Pond.

    Along with chemical diffusion and pumping, there is a third physical mechanism to explain migration of contaminants to areas outside those predicted by a strict interpretation of theoretical flow paths. This mechanism is hydrodynamic dispersion, a process by which water and accompanying contaminants are dispersed laterally and vertically at water flows around soil grains within an aquifer. Thus as discussed above, there are three commonly accepted, scientifically sound mechanisms to predict that wells along the margins of Country Pond could be impacted by site contaminants.

11. SSP&A Comment: The worst case assessment by GZA for Country Pond (RI, pp. 99-100) is estimated by assuming that VOC concentrations in the pond will be 50 ppb for 70 years. This assumption is justified by noting that if groundwater containing VOC concentrations of 10,000 to 20,000 ppb discharges at a rate of 10,000 to 70,000 gallons per day from the marsh to Country Pond, and is mixed with the 13 million gallons per day of water that flows into Country Pond, the VOC concentration in Country Pond would be in the range of 10 to 100 ppb. However, the authors have failed to determine if there is sufficient quantity of VOCs remaining in soil and groundwater on-site and off-site to allow VOC concentrations in Country Pond to average 50 ppb for 70 years.

Given the assumptions presented in the RI, almost 63,000 kg of VOCs must discharge into Country Pond to result in an average VOC concentrations of 50 ppb for 70 years. This represents 9 times the quantity of VOCs estimated by SSP&A to be in on-site soils and on-site and off-site ground waters (Worksheets A and B). The worst case average concentration in Country Pond should be 5.6 ppb and not 50 ppb.

Response: As discussed previously, the actual quantity of VOCs remaining in source areas is highly uncertain and could be an order of magnitude or more higher than estimated by SSP&A. Thus, EPA believes its estimate provides a reasonable, conservative worst case estimate.

12. SSP&A Comment: The RI assumes that wells within 200 feet of Country Pond would obtain their water from Country Pond, and that the concentrations of VOCs in these wells would be equal to the concentrations in Country Pond. This assumption is not supported by available hydrologic data. Country Pond is a groundwater discharge area and, therefore, groundwater flow is from the wells adjacent to the pond toward the pond, and not vice versa. The small pumping rates typical of domestic wells would not be sufficient to reverse the direction of ground water flow in the glacial aquifers adjacent to the pond and cause water from the pond to move into the wells.

Response: The Remedial Investigation states that in the case of well contamination via migration of contaminants discharged into Country Pond and wells surrounding Country Pond, it is considered reasonable that the population potentially exposed includes users of both overburden and bedrock wells within approximately 200 feet of the shore of Country Pond. The contaminant migration pathways would be infiltration of contaminated water from the pond and from adjacent overburden sand and gravel aquifers as well as interconnected bedrock aquifers. There are also local intermediate and regional systems of groundwater flow that may facilitate contaminant migration. While EPA agrees this is conservative we believe it is appropriate since we are dealing with matters concerning public health.

13. SSP&A Comment: The Remedial Investigation report (pp.94, 100-101) implies that the direction of groundwater flow in the bedrock is unknown. Therefore the RI concludes (p. 94): "... selecting an area to represent contaminant bedrock is somewhat subjective. However, an area extending approximately 1-1/2 miles to the north, east, and south of the site, and approximately 1 mile to the west of the site is considered appropriate."

This is nonsense, and is akin to concluding that the direction of groundwater flow in the overburden aquifer is unknown. Seventeen monitoring wells have been completed in the bedrock, and numerous water level measurements have been made. All of the water level data that have been collected from the bedrock wells indicate that flow is toward Country Pond. There are no data to support the conclusion that groundwater in the bedrock flows toward the west in and around the study area.

Response: EPA concurs that available bedrock data indicates a natural flow component in an easterly direction, as discussed in sections 7.2.1 of the RI and 5.3 of the RI addendum report.

Groundwater flow in bedrock is discontinuous and occurs predominantly within bedrock fractures. Even with an apparent easterly regional flow direction, local flow directions will be controlled by fracture orientation. Local flow directions could vary within fractures up to 90 degrees from the regional flow direction. This is the basis for EPA concluding that bedrock wells other than those directly east of the site are potentially at risk. The comment suggesting a comparable ability to predict overburden aquifer and bedrock flow patterns is not appropriate.

The uncertainty in bedrock flow patterns is further accentuated by the effects of pumping of the numerous private bedrock wells in the area. Heavy withdrawal of water from these wells can locally result in significant alteration of natural flow directions, further dispersing a bedrock contaminant plume.

14. SSP&A Comment: Beyond the fundamental considerations of groundwater flow directions, it is not appropriate, when risks over a 70-year period are being calculated, to use the highest concentration measured in December 1983 and subsequent sampling rounds. The concentrations of VOCs in all of the bedrock monitoring wells located in the vicinity of the site that have been sampled more than once (R-2B, R-3A, R-4A, R-4B, 4B and 4C) have declined with time. So the changes have been dramatic. These data suggest that the VOC concentrations in the bedrock wells are decreasing rapidly, and that the 70-year time weighted average concentration will be much less than the concentration observed at 4C in December 1983. The 70-year time-weighted average concentration will be at least an order of magnitude less than the concentration used in the risk assessment.

Response: The considerable uncertainty in predicting a worst-case exposure estimate for bedrock contamination is acknowledged. However, the rationale used to develop a worst case scenario for water quality conditions in bedrock is consistent with the conservative approach to developing such a scenario in light of potential public health impacts.

15. SSP&A Comment: The calculations detailed in Appendix E of the SSP&A report on soil excavation volumes required to achieve various risk levels are incorrect. Appendix E states that if 7.9 kg (17.5 lbs) of volatile organic chemicals (VOCs) remain in the soil on-site and are leached out over 70 years, the level of cancer risk to a human receptor is 1.49×10^{-7} (pp. 10/17). Because cancer risks are assumed to be linear with respect to quantity of VOCs, the following relationship can be developed between quantity of volatile organic chemicals in on-site soil and risks to a human receptor at the marsh/pond interface:

Risk Level	Total Quantity of VOCs Remaining in Soil (kg)
1×10^{-4}	5,300
1×10^{-5}	530
1×10^{-6}	53
1×10^{-7}	5.3

The volume of soil that needs to be excavated to reduce total VOCs in the soil to 5,300, 530, 53 and 5.3 kg can be estimated from the data in Worksheet A. Since the total mass of VOCs in soils are only 1,400 kg, no excavation is required to achieve a total of 5,300 kg. To achieve a total mass of 530 kg, it is necessary to remove an additional 1,100 yd of soil with an average VOC concentration of 100 ppm, and 5,300 yd of soil with an average VOC concentration of 38 ppm. To achieve a level of 5.3 kg of VOCs in the soil, all but 9,000 yd of soil with an average VOC concentration of 0.4 ppm need to be excavated.

Response: As indicated in the response to comment 4, GZA did not estimate the quantity of contaminant mass remaining in on-site soils. This quantity is unknown due to the long and complex disposal history at the site.

Except for the premise that the existing on-site contaminant mass is known, EPA agrees that the mathematical basis for the soil volume calculations is sound. However, these calculations imply that well defined isopleths of contaminant concentration exist at the site, and immediate segregation and completely efficient excavation are possible. Available site data strongly indicate that this will not be the case and that, with several noted exceptions, contaminants are dispersed more or less randomly accross the site. These issues are clearly stated on page 15/17 of Appendix E of the FS.

GZA's estimates of the amount of soil that will require excavation to achieve an acceptable residual contaminant concentration took into consideration the complex areal and vertical distribution of contaminants on-site. Because efficient segregation of soils with contaminant concentrations above and below an acceptable limit will be difficult, it is likely that excavation of soils above an acceptable residual contaminant concentration will also result in excavation of soils below the acceptable residual contaminant concentration. It is anticipated that the excavation efficiency will be improved by a detailed pre-excavation soil survey.

16. SSP&A Comment: The estimates of risk and corresponding soil volumes in the RI/FS are based on three assumptions that cause risks to be overstated by at least an order of magnitude:

- The assumption about the total quantity of VOCs in soils that likely overestimate the actual mass;
- the assumption that all VOCs reach the marsh/pond interface in the ground water system; and
- the assumption that the ratio of 0.02 is appropriate for calculating concentrations at receptor wells.

Response: Please refer to comments 15, (5 and 6), and 7, respectively for responses to these issues.

17. SSP&A Comment: Point of use treatment, carbon filters at the wellhead would be a much more cost-effective means of treating bedrock well contamination than a centralized water distribution system.

Response: Carbon filters are not effective in removing VOCs such as acetone, THF, methanol and other low molecular weight water soluble compounds observed in contaminated groundwater at the O&G/GLCC site.

18. SPP&A Comment: The monitoring requirements for bedrock wells are unreasonable (p. 67 of FS). If monitoring is required, only bedrock wells between the site and Country Pond should be monitored.

Response: The inherent uncertainties in bedrock flow patterns are discussed in sections 7.2, 9.2.1.2, and 10.4 of the RI as well as in Sections 2.2.2.1 and 2.2.2.2 of the FS. While the level of risk is difficult to estimate, bedrock wells within 1 to 1 1/2 miles of the site are potentially at risk. Lack of a monitoring program for these wells, in our opinion would not adequately protect public health due to the uncertainties associated with groundwater flow in the vicinity of the site, as discussed in response 13.

19. SSP&A Comment: The proposed trench west of South Brook would be ineffective in controlling groundwater levels in the vicinity of the proposed soil disposal area. In fact, the trench may be no more effective than South Brook is at present.

Response: No rationale for the ineffectiveness of the trench is provided. As such it is not possible to respond to this comment.

The firm of Lowenstein, Sandler, Brochin, Kohl, Fisher & Baylan submitted comments prepared by B. Tod Delaney as part of the Generator's joint comments on the RI/FS. Mr. Delaney's comments are presented below.

20. Delaney Comment: In the GZA report the description of IR incineration states the following: "From the secondary furnace exhaust gases are then passed through a heat exchanger and a scrubber prior to discharge through an exhaust stack." Obviously, if IR incineration does result in reduced levels of particulate in the exhaust, it is not a significant enough decrease to make scrubbing unnecessary. Further in the same paragraph the report states that preheated air is blown into the primary furnace. This is supplemental air and contradicts their previous statement that none is required in IR incineration. This air would increase turbulence in the combustion chamber and should contribute to increased particulate levels. Thus, it is hard to justify the use of IR incineration on the contention that it would result in reduced air emissions and not require supplemental air.

Response: GZA stated in the FS that IR incineration technology "... is anticipated to provide adequate control of incineration parameters with the reduced likelihood for air contaminant emissions." (emphasis added). GZA clearly stated in the FS that air emissions controls were required for the IR incineration system.

GZA stated that supplemental fuel and technologies, and IR technology did not require large amounts of combustion air. GZA did not state that combustion air was not required. In fact, GZA stated that availability of fuel and combustion air was required for the secondary combustion furnace.

21. Delaney Comment: GZA identified the following three criteria in screening the alternatives:

1. technology must be reliable based either on successful implementation at other hazardous waste sites, or in comparable applications;

2. the technology must be technically feasible and applicable to site conditions at the O&G and GLCC sites, based on engineering judgment; and

3. the technology must be capable by itself or in conjunction with other alternatives, of addressing at least one of the FS (Feasibility Study) objectives listed in Section 1.3.

Although incineration is a viable technology considering the three criteria that GZA set up to evaluate the treatment technologies, IR incineration would require extensive preconditioning of the waste material prior to its introduction to the incineration system and this preconditioning and materials handling would be costly and would cause material to become airborne through volatilization and the physical process of crushing and grinding. None of these issues were discussed in the GZA study.

Response: Some conditioning of the soil would be required prior to IR incineration. Drum fragments, roots, and other particles over 2 inches in diameter would have to be separated for both IR, incineration or disposal.

It is also noted that available site information indicates that roots and drum fragments are not extensively distributed through site soils. Therefore extensive preconditioning of the soil prior to incineration may not be required.

22. Delaney Comment: The costs associated with these types of processes would be difficult to assess at the present time since crushing and grinding of hazardous material containing roots, metal, and other foreign objects has not yet been attempted at hazardous waste sites. Thus there are no data currently available to indicate whether or not IR incineration is an appropriate technology to use for incineration of low BTU soils contaminated with volatile organics

which require pretreatment. Further, cost data for IR incineration in such a situation are not available.

Response: IR incineration has been employed on a commercial and pilot scale at approximately 25 sites. IR incineration of soils has been successfully implemented at several sites, and is currently contemplated for the Tibbetts Road Superfund site in Barrington, New Hampshire and the Baird and McGuire Superfund site in Holbrook, Massachusetts. Cost data for IR incineration is available.

23. Delaney Comment: Of concern is the lack of inclusion for study of other on-site treatment systems, in particular insitu treatment systems in the GZA study. GZA states in the Remedial Technologies Section that because in-situ treatment technology involving the treatment of contaminated sediments, soils, wastes, or groundwater in place is not fully developed for general application at hazardous waste sites, it was not considered appropriate for the treatment of site contaminants. If this logic were uniformly applied throughout the RI/FS, the IR incineration technology would have to be eliminated as a remedy also because IR incineration is not fully developed. It has been used to treat hazardous waste contaminated soil on a pilot scale basis only.

Response: As previously stated, IR incineration technology has been demonstrated in approximately 25 mobile and commercial applications.

24. Delaney Comment: An in-situ treatment technology not mentioned in the GZA study that has recently gained acceptance with a number of regulatory agencies including California, Florida, and the EPA is the vacuum extraction system (VES). This is an in-situ treatment process that has been found to be very effective in removing volatile organics from the unsaturated zone.

According to the data in the GZA study, the soil porosity and permeability suggests that the soil conditions are well suited to the vacuum extraction technique. Additionally, the chemical compounds that are present on the site are volatile organics and would therefore be readily amenable to removal through this process. This process, not evaluated in the GZA report, should at least have been considered as a viable engineering alternative to the IR incineration technique recommended by GZA.

Response: IR incineration was considered because of its applicability to the treatment of volatile organic compounds (VOCs) and other non-volatile organic compounds such as PCBs, acid extractable and base neutral extractable compounds. The VES system would appear to be unsuitable for the treatment of non-volatile organic compounds such as PCBs and therefore is not considered appropriate for the O&G/GLCC site.

25. Delaney Comment: The combination of a vapor extraction system utilizing and enhancing the naturally occurring bacteria at the O&G/GLCC sites coupled with limited removal of the most contaminated areas should provide a viable alternative to those methods studied and selected by GZA. These methods would require a minimum of site disturbances.

These technologies have been accepted by EPA at other hazardous waste sites, at least on a demonstration basis, have been used at a number of industrial waste sites, and have proved successful not only from an economic standpoint. Further information on the vapor extraction process and the insitu biological treatment process can be found in a number of current publications with which GZA should be familiar.

Response: GZA reviewed the in-situ treatment technologies in the preparation of the FS as previously stated, the VES system appears to be unsuitable for the treatment of semi-volatile organic compounds and PCBs that are present in soil at the O&G/GLCC site.

The firm of Bingham, Dana & Gould submitted the comments on the RI/FS on behalf of General Electric Company, Lilly Industrial Coatings, Inc., Solvents Recovery Services of New England and K.J. Quinn & Company, Inc. (the Generators) The comments are presented below.

26. Generators Comment: The RI/FS completely ignores a substantial amount of site data collected by Camp Dresser & McKee, a consultant to IMC, and Geraghty & Miller, a consultant to the Generators. This includes at least three rounds of water quality data and at least two sets of data concerning soil quality. All of this data was offered in evidence during Phase I of the trial and therefore was available to EPA, the State and GZA. The reliability of this data collected by well-respected contractors has never been challenged. It would be arbitrary and capricious to evaluate the need for a remedy based upon an RI/FS that ignores this volume of reliable data.

Response: Groundwater data from the generators was considered as it was made available to GZA during the course of the RI study. Those data were generally considered redundant since the time periods separating GZA's sample rounds from those of the generator's was somewhat limited. Further, these data as well as data provided by the generators after the initial submittal of the draft RI did not reveal trends of change that would significantly alter conclusions drawn in the RI.

Although time of sampling would not affect soil sampling results, soil data provided by the generators was generally limited in areal extent. Consequently that data did not actually provide additional coverage of the site. In some instances the generators soil data provided more detailed information with a limited area. Although this data appeared to be useful in terms of showing spatial variation of contaminants it was not necessarily sufficient to determine separate source areas.

Hydrogeologic studies conducted by CDM and Geraghty & Miller were reviewed by GZA. These studies were the result of a computer simulation of groundwater flow conducted by CDM and a "deductive" model conducted by Geraghty & Miller.

Based on review of the reports it appeared that each report was limited in terms of needed data base. Consequently, it appeared that the complex models that were implemented for those studies may have relied heavily on assumptions to form input data bases thus limiting the applicability of the results.

27. Generators Comment: The RI/FS relies on largely outdated monitoring data. Although the study was commenced in September 1983 and not completed until August 1986, GZA relies primarily on data collected in or before December 1983 in the RI and risk assessment. But for some limited March 1985 data (that is never even discussed in the RI/FS), there is a significant and unexplained data gap of two and one-half years between the December 1983 data and the limited December 1985-February 1986 groundwater quality data summarized in Volume II. This data gap and the age of the bulk of the data relied upon (see, e.g., Table 23) severely diminishes the utility of the RI/FS as a basis for evaluating present conditions at and around the sites, trends between 1983 and 1986, or probable future conditions.

Response: The data "gap" is only 1 year and 3 months (December 1983 to March 1985). This represents the time period between original RI studies and studies conducted for the RI addendum. The subsequent data is relied upon for supporting the conclusion that the marsh plume is transient and not at steady-state condition; as such, it is considered integral to the findings of the RI and the risk assessment. This situation is discussed thoroughly in the RI addendum report text and depicted on Figure 30.

EPA disagrees that the data gap diminishes the utility of RI/FS. Given the extensive, approximately 30 year disposal history at the site, and the relatively slow advective transport rates observed at the site and in the marsh, the time span between sampling events is considered reasonable as a basis for analysis.

28. Generators Comment: The "worst case" assumptions upon which the Exposure Assessment is premised are unreasonable and without any scientific basis. In many instances, the bases for the assumptions are not even mentioned. At key points in the Assessment, there appear to have been deliberate and misleading manipulations of data in order to exaggerate exposure levels.

Responses: GZA has supported assumptions presented in the RI/FS with available data. Data have been presented and analyzed in accordance with generally accepted scientific and engineering practices which, unequivocally, do not include "deliberate and misleading manipulations of data. See also response to comments 5 and 6.

29. Generators Comment: The Exposure Assessment pyramids worst case assumptions one on top of the next without acknowledging that it is doing so. This causes the exposure concentrations and excess

cancer risk calculated by GZA to be grossly exaggerated as a matter of probabilities, even if each of the assumptions is "reasonable." Contrary to policy, GZA does not attempt to estimate the likelihood that its worst case scenario will occur.

Response: Initially, two scenarios for risk assessment were developed to take into considerations the uncertainty associated with the movement of contaminated groundwater toward the pond. The observed case was a representation of the risk posed by the site at present, as well as sometime in the future if the site was at steady state, in other words, if no further net movement of contaminants was expected. The worst case scenario was developed to represent a possible future condition if contaminants continued to move toward the pond and if migration in bedrock did occur. Both of these scenarios were thought to be possible with the data available at the initiation of the risk assessment. Further investigations at the site showed that, in fact, contaminants were closer to the pond than previously thought and would eventually reach the pond. This additional information suggested that the Observed Case Scenario was not likely to be representative of future conditions, at least for those pathways related to the movement of contaminant in the overburden. However, as this scenario resprented an estimate of risk based on current conditions it was still included in the risk assessment as a basis for comparison, and as a lowerbound, if attenuation between the marsh and the pond in the migration of contaminants in bedrock did occur. The worst case scenario then became a more likely representation of possible future conditions. At this point, the scenario probably should have been renamed, as it certainly did not represent an estimation of the worst case risk associated with the site.

30. Generators Comment: Nothing in the Remedial Investigation supports a conclusion that the Ottati & Goss plume will reach the drinking water wells, the marsh-pond interface, or even cross Route 125; the ultimate fate of the Ottati & Goss plume is not even discussed. Thus, there is no basis in the record to support the adoption of a remedy designed to mitigate the Ottati & Goss plume.

The Remedial Investigation is apparently premised on an assumption that the Ottati & Goss plume will reach the marsh-pond interface. However, there is no analysis in either the RI or the FS to support this assumption. There is a discussion of the use of a contaminant transport model at pp. 24-27 of the FS. This does not purport to analyze what really happens to the Ottati & Goss plume. First, it does not address the Ottati & Goss plume. Second, it assumes no attenuation except by dilution in the aquifer itself. In fact, the RI recognizes that there is significant discharge of the Ottati & Goss plume into South Brook. RI at 69.

Response: The RI considered the O&G site as part of the overall O&G/GLCC site. As such, no distinction was made in separating the ultimate fate of contaminants leaving the "GLCC" site from those leaving the "O&G" site. EPA's position regarding the O&G plume

is that it has currently migrated onto the western portion of the GLCC site. Groundwater flow patterns depicted on Figures 13 and 14 indicate that the O&G plume's projected flow path will follow that of the GLCC plume into the wetlands and toward Country Pond. It is evident that some attenuation will occur through a number of attenuation mechanisms.

31. Generators Comment: GZA assumes that the plume will impact the residential overburden wells. It defines an "area of potential groundwater impact" which it reflects on Figure 23. GZA acknowledges itself that this is a "worst case" representation. Then it assumes impact on any well within 200 feet of the area. Nowhere does GZA attempt to explain either the scientific basis for additional assumption that residential wells could pump in groundwater from 200 feet away. Thus, GZA's assessment cannot be presumed reasonable, even on a worst case basis. It is purely arbitrary.

This is demonstrated further by the report from Papadopulos & Associates submitted by the Generators. It states at p. 5 that it is "virtually impossible" for contamination from the plume to reach the residential overburden wells and it explains why this is so.

Response: The Remedial Investigation states that in the case of well contamination via migration of contaminants discharged into Country Pond and wells surrounding Country Pond, it is considered reasonable that the population potentially exposed includes users of both overburden and bedrock wells within approximatgely 200 feet of the shore of Country Pond. The contaminant migration pathways would be infiltration of contaminated water from the pond and from adjacent overburden sand and gravel aquifers as well as interconnected bedrock aquifers. There are also local intermediate and regional systems of groundwater flow that may facilitate contaminant migration. While EPA agrees this is conservative we believe it is appropriate since we are dealing with matters concerning public health.

32. Generators Comment: In estimating exposure concentrations, GZA assumes that concentrations at GZ-5 at the marsh-pond interface will equal those at W-9. For a precise value to use in its calculations, GZA used 34,000 ppb, the total VOCs in W-9 in November 1983. The use of this data provides an unrealistic "worst case" character to the overall estimate because this is not only the highest VOC concentration ever observed in W-9 but, based on the data contained in Table 52 and 61 of the RI Addendum, is the highest concentration ever observed in any of the marsh overburden wells. The VOC concentration in W-9 was only 18,000 ppb in February 1986. It has declined steadily since its peak from 34,000 ppb in November 1983 to 24,000 ppb in December to 22,000 ppb in Janunary-March 1985 to 18,000 ppb in February 1986. See Tables 52 and 61. It is arbitrary to ignore the most recent data and to pick the highest-ever value when concentrations, in fact, are decreasing steadily.

Response: The time weighted average of 2,900 ppb for GZ-5 estimated by SSP&A, is based on what, in EPA's opinion, are unconservative estimates. In particular, considerably higher quantities of VOCs may be present in on-site soils. The bulk of the SSP&A's estimate of the 1,400 kg of VOCs present in site soils come from the SSP&A estimated 7,000 cubic yards of soil containing an average of 100 ppm of VOCs. However, Table 45 of the RI Addendum report indicates the presence of soils containing total VOCs with 3 of the 8 smaples analyzed had total VOC concentrations significantly greater than 100 ppm. Thus, in EPA's opinion, the actual quantity of VOCs remaining in the unsaturated zone may be at least an order of magnitude higher than the values represented by SSP&A. Considerable additional mesas of VOCs may also be present in the form of undetected "hotspots", contained wastes, or free product. GZA elected to conservatively assume in this worst case estimate that a sufficient mass of source material would remain on-site indefinitely as source material for the marsh plume. This assumption requires that a considerably greater mass of VOCs would be present on-site than estimated by SSP&A. However, based on the above discussion, it is reasonable to conservatively assume such may be that case. As such, it is our opinion that the worst case assumption is valid, particularly in light of the need to be conservative on issues that have significant public health implications.

Further, the significance of the observed decrease in total VOC concentrations at W-9 over a 2-year period cannot be fully assessed without additional data over time.

33. Generators Comment: GZA then assumes no attenuation between W-9 and GZ-5. W-9 is closer to Route 125 than to GZ-5 at the marsh-pond interface. This is a totally unrealistic assumption as some attenuation is certain. The court so found, based on expert testimony. 630 F. Supp. at 1388. Moreover, the RI Addendum acknowledges some discharge into the peat layer which would produce attenuation, particularly in the North Brook inlet area. RI Addendum at 13, 19. This is upgradient of where GZ-5 is located, assuming there is a flow path between W-9 and GZ-5. Thus, GZA's assumption that GZ-5 will have the same concentrations as the single highest concentration ever recorded at W-9 incorporates several unrealistic assumptions.

Response: Some attenuation will undoubtedly occur. However, under the assumption of confined flow conditions, the attenuation is not likely to be significant relative to the risk assessment discussed in section 10.6 of the RI. It should also be noted that February 1986 data indicates that the plume is continuing to migrate towards Country Pond.

34. Generators Comment: GZA assumes that concentrations in the residential wells will be equal to future concentrations at GZ-1, GZ-2, and GZ-3. This conclusion implies that these wells are downgradient of the plume. This is not the case. GZA's water level contour maps (Figures 13, 14, and 29) demonstrate that at GZ-1, the flow is from the northwest where the groundwater is not

contaminated. At GZ-2 and GZ-3, the flows are from the southwest and west, respectively. Neither of these areas are contaminated. Thus, there is no scientifically sound basis for assuming that these wells will be contaminated by the plume or for using concentrations in them as part of a ratio to predict exposure levels in residential wells. See Papadopulos Report at 13-14.

Response: EPA disagrees with SSP&A's conclusion. As groundwater follows beneath Country Pond, groundwater flow would stagnate as hydraulic heads equilibrate with the pond water level. In such an environment, chemical diffusion provides a mechanism of contaminant migration in directions other than the flow paths shown on Figures 13, 14 and 29 of the RI. Chemical diffusion of VOCs could occur within the western portion of Country Pond. Further, VOC migration toward monitoring and supply wells near pond margins would occur as the wells are pumped and induce flow of groundwater from beneath Country Pond.

Along with chemical diffusion and pumping, there is a third physical mechanism to explain migration of contaminants to areas outside those predicted by a strict interpretation of theoretical flow paths. This mechanism is hydrodynamic dispersion, a process by which water and accompanying contaminants are dispersed laterally and vertically at water flows around soil grains within an aquifer. Thus as discussed above, there are three commonly accepted, scientifically sound mechanisms to predict that wells along the margins of Country Pond could be impacted by site contaminants.

35. Generators Comment: Even assuming that the concentrations in the residential wells will equal those in GZ-1 and GZ-2, GZA's worst case estimate of concentrations in GZ-1 and GZ-2 is based on unsupportable flim-flam, an apparently deliberate manipulation of data. GZA assumes that the "current ratio" between GZ-5 and GZ-1 and GZ-2 will be maintained after the one-time highest W-9 concentrations reach GZ-5. GZA calculates this ratio at .02. This ratio is key to the entire exposure assessment and risk assessement; the higher the ratio the higher the exposure level and the higher the risk.

GZA manipulated the data in three ways. Each of the ways serves to inflate the ratio. The ratio is based upon "an assumed possible maximum concentration" in GZ-2 of 50 ppb divided by a concentration in GZ-5 of 2,700 ppb. GZA does not disclose in its analysis that it took the numerator of the ratio from the December 1983 sampling round in November 1983. This inflated the ratio in two ways. First, if GZA had used only November figures, the ratio would have been zero as GZ-2 and GZ-5 were completely free of contaminants in that round. Second, if it had done the more logical thing and used December data for both, its ratio would have been only about .01 (.0128) because VOCs in December were higher than in November (3,900 ppb vs 2,700 ppb). The third manipulation was the application of the ratio to the November concentrations for W-9 (which were assumed to be present at GZ-5). These concentrations were considerably higher than in December (34,000 ppb vs 24,000 ppb), resulting in a higher exposure level.

GZA's manipulation of data to inflate the ratio is actually even worse than described above. GZA also fabricated the numerator of the ratio. As stated above, GZA used 50 ppb. The only support for using this number is that on one occasion, in December 1983, 5 VOCs were found in GZ-2, each at a reported level of "<10 ppb" which was the detection limit for those chemicals in that sampling round. Assuming that these trace readings were not the result of sampling or laboratory error, they show only that there was a total concentration in the range of 0 to 50 ppb. GZA simply assumed the total concentration was 50 ppb. Increasing the numerator increased the ratio and further exaggerated GZA's estimates of concentrations in the wells.

Response: The uncertainties in risk assessments are clearly set forth in the RI, particulary in section 10.6. The risk assessment requires a number of asumptions to be made with regard to uncertainties. These assumptions include dose-response extrapolations, amount of consumption, as well as exposure concentrations. In fact, it is indicated on page 111 of the RI that probably the most significant uncertainty is that associated with the worst case exposure conditions.

Because of the uncertainties, the risk assessment concludes that the risk assessment should be considered accurate, at best, to an order of magnitude. As such, discussions of whether 50 ppb or 25 ppb represents a more reasonable worst case estimate, in EPA's opinion, are academic. EPA's consistent philosophy in developing its worst-case assumptions was to be conservative in protecting public health.

GZA has supported assumptions presented in the RI/FS with available data. Data have been presented and analyzed in accordance with generally accepted scientific and engineering practices which, unequivocally, do not include "deliberate and misleading manipulations of data."

36. Generators Comment: If the data were assumed valid, the highest concentration level that could reasonably be assumed is 25 ppb. See the Papadopulos Report at 12. If GZA had applied the ratio in a consistent way to December 1983 data, the estimated exposure levels would have been reduced as follows:

	Case 1 (GZA) (ppb)	Case 2 (ppb)
1, 2-dichloroethane	1	0.13
trichloroethylene	14	2.60
tetrachloroethylene	23	7.30
benzene	1	0.22
chlorobenzene	1	0.31
arsenic	3	0.10
TVOC	50	25.00

In fact, GZA should not have assumed any level of contaminants in GZ-1 or GZ-2 in November 1983. Those wells were tested one month later, in December 1983, at a detection limit of 2 ppb and no volatiles were found. They were retested in February 1986 at a detection limit of 1 ppb and they were still clean. The Papadopulos Report concludes at 11-12 that this is strong evidence that the December 1983 readings were false positives. GZA itself has concluded that the December readings are invalid. It questions "whether any significance can be attached to those trace levels (in December 1983)," RI at 98, and to state in the RI Addendum at 30 that the December 1983 data "was anomalous" and that the leading edge of the plume has not reached the wells.

Given this admission by GZA, the use of the ratio is clearly improper. Without the ratio, there is no basis in the RI/FS for the estimation of exposure at overburden residential wells set forth in Table 35 and no basis for the quantitative risk assessment set forth in Table 39. Reliance upon those assessments by EPA would be arbitrary and capricious.

Response: EPA acknowledges the anomalous nature of the December 1983 data; however, this does not eliminate the concern for VOCs being present at the margin of Country Pond below detection limits or that higher levels could be drawn into the wells under conditions of active pumping of residential water supply wells located near the pond margin. GZA's assumption that concentrations were present at detection limits was used to represent a conservative upper bound estimate of risk. Assuming zero concentrations at the plume margin would clearly be unacceptable as a basis for a worst case estimate of public health risks. It should also be noted that the worst case assumption is based on future migration of the overburden plume. As such, the fact that available data suggest the plume has not reached wells GZ-1 or GZ-2 does not indicate this would be the case under the worst case scenario.

The uncertainties in risk assessments are clearly set forth in the RI, particulary in section 10.6. The risk assessment requires a number of assumptions to be made with regard to uncertainties. These asumptions include dose-response extrapolations, amount of consumptions, as well as exposure concentrations. In fact, it is indicated on page 111 of the RI that probably the most significant uncertainty is that associated with the worst case exposure conditions.

37. Generators Comment: GZA's exposure assessment assumes people will drink every day for seventy years two liters of water having the concentrations calculated on the basis of the implausible worst case assumptions described above. See Table 39.

The assumption that any one person will drink this much water from these wells every day for seventy years is itself a worst case assumption. But even more unreasonable is the assumption that concentrations will remain consistent for seventy years at a level as high as that stated in Table 39.

As shown above, the concentrations set forth in table 39 were based on a series of worst case assumptions, many of which were unreasonable on their face. One of the assumptions is that concentrations will reflect the November 1983 concentrations in W-9. These concentrations were the highest ever recorded in a marsh overburden monitoring well. The "seventy year" assumption is premised, therefore, on a subsidiary assumption that this one-time highest peak will persist for seventy years.

This assumption is absurd. Concentrations in W-9 have never been so high since. As discussed above, the most recent reading, in February 1986, shows a reduction in concentration at W-9 since 1983 of almost 50% (34,000 ppb to 18,000 ppb) with steady declines during that period. GZA also acknowledges a reduction in source strength on the GLCC site, making it even more unlikely that W-9 concentrations will be maintained. See RI Addendum at 29.

Response: The assumption of 2 liters per day for 70 years is set forth in EPA guidelines and is admittedly conservative. It is consistent with the use of conservative assumptions wherever possible in assessing risks to public health. In EPA's opinion such an approach is warranted in light of the limited information available in assessing the impacts of industrial chemicals on public health.

EPA agrees that it is not probable that maximum observed levels at W-9 would persist at the marsh pond interface for 70 years. However, this assumption was used as a reasonable upper bound for the worst case scenario given the uncertain quantities of VOCs remaining in upgradient source areas, as discussed previously. Further, the significance of the observed decrease in total VOC concentrations at W-9 over a 2-year period cannot be fully assessed without additional data over time.

38. Generators Comment: GZA's unsupported assumption of constant levels of contaminants violates EPA's guidance on the subject. The Superfund Public Health Evaluation Manual provides that the highest concentration values may be used only when doing short-term exposure analysis. Manual at 47 and 54. For long-term assessments, the Manual requires the use of "a 70-year time-weighted average." Manual at 54. The RI/FS contains no such weighted average. GZA's failure to perform such an averaging renders the exposure and risk assessments useless as a basis for EPA decision-making on the need for a remedy, even if all the other worst case assumptions were accepted.

GZA's failure to provide a weighted average greatly exaggerates exposure levels. Papadopulos & Associates has prepared the 70-year time weighted average that GZA neglected to do. Although itself based on conservative assumptions, the analysis shows a weighted average of only 2,900 ppb instead of the 34,000 ppb that GZA simply assumed based on a one-time peak. See Papadopulos Report at 89. When the corrected ratio described at p. 22 supra is applied to this long-term average, the exposure concentrations are substantially reduced from those estimated by GZA.

	Case 1 (GZA) (ppb)	Case 3 (ppb)
1, 2-dichloroethane	1	.02
trichloroethylene	14	.31
tetrachloroethylene	23	.88
benzene	1	1
chlorobenzene	1	.04
arsenic	3	.01

Response: In light of uncertainties of the mass of contaminants remaining on)site, EPA does not believe the "weighted average" of 2,900 ppb is appropriate as a worst case. Considering available data it is reasonable as a worst case to assume that a sufficient mass of VOCs would remain on-site to maintain the plume at currently observed levels.

39. Generators Comment: GZA hypothesizes a second exposure route to the overburden wells. It assumes that wells within 200 feet of the pond could pump in contaminated pond water with a total concentration of 50 ppb distributed as shown in Table 35. This hypothesis actually involves two separate assumptions: first, that residential wells could pump in pond water, and, second, that the water would be contaminated to the assumed level of 50 ppb. Neither assumption is reasonable.

There is no support in the RI/FS for the assumption that residential wells will pump in water from the pond. As discussed in the Papadopulos Report at 15, this assumption is contrary to the available hydrogeologic data.

GZA's projected concentration level of 50 ppb is also unreasonable. It fails to consider the mass of contaminants remaining to the west of Country Pond. Even when conservative assumptions are used to estimate the mass of contaminants in the soil and groundwater, the highest estimate that can be made for concentrations in Country Pond is 5.5 ppb. See the Papadopulos Report at 14-15.

Even common sense compels the conclusion that GZA's Country Pond scenario is foolish. It ignores the significance of the "Observed Case." Country Pond has been tested regularly since at least 1980. Nothing more than trace concentrations have ever been detected and these have been found only rarely and may be attributable to other sources.

Response: The comment pertaining to the ability of wells located within 200 feet of Country Pond to draw significant quantities of recharge from Country Pond is discussed previously. Please refer to comment 12.

The issue concerning the mass of contaminants remaining west of Country Pond was also addressed previously in the response to comment 5.

The "Observed Case" has not been ignored but was considered separately in the risk assessment. The worst case is based on continued migration of the concentrated portion of the plume toward Country Pond, resulting in a significantly greater impact on Country Pond water quality than presently observed.

40. Generators Comment: The RI/FS also fails to provide a basis for a conclusion that there is a threat to residential bedrock wells.

GZA's analysis suffers from the same flaws found in its analysis of the overburden wells. Its worst case assumptions are unrealistic and unsupported by any scientific data. The assumptions are then pyramided so that the exposure assessment is totally distorted.

GZA assumes a zone of potential impact extending one and one-half miles to the north, east and south of the site and one mile to the west of it. It gives no reason for this assumption other than it includes the locations of the bedrock wells that have been sampled in the past years (RI at 94).

In fact, there is no realistic threat of any impact on these wells. Data collected from seventeen monitoring wells shows a flow to the east and discharge to Country Pond. There is almost no probability of flow in random directions. See Papadopulos Report at 16-18.

Response: Groundwater flow in bedrock is discontinuous and occurs predominantly within bedrock fractures. Even with an apparent easterly regional flow direction, local flow directions will be controlled by fracture orientation. Local flow directions could vary within fractures up to 90 degrees form the regional flow direction. This is the basis for the conclusion that bedrock wells other than those directly east of the site are potentially at risk. The generators' comment suggesting a comparable ability to predict overburden aquifer and bedrock flow patterns is not appropriate.

The uncertainty in bedrock flow patterns is further accentuated by the effects of pumping of the numerous private bedrock wells in the area. Heavy withdrawal of water from these wells can locally result in significant alteration of natural flow directions, further dispersing a bedrock contaminant plume.

41. Generators Comment: There is no scientific basis for assuming that the contaminant concentrations in bedrock wells will persist over a seventy year time span. To the contrary, the RI Addendum itself establishes that this assumption cannot be justified. Data collected in 1985 and 1986 from the R-wells shows:

1. Substantially lower levels of concentrations than those found in GZ-4C in December 1983, and

2. A decline in concentrations between 1985 and 1986.

GZA acknowledges that this data 'suggests' improvement in deep bedrock water quality at the site." RI Addendum at 30. This is directly inconsistent with an assumption that the concentrations detected as well GZ-4C will persist for seventy years.

GZA's assumption is further undercut by Papadoupulos' analysis discussed above showing that there are not sufficient contaminants left onsite to permit a plume to maintain its concentration over seventy years.

In short, GZA's bedrock scenario is arbitrary and is contradicted by site data.

Response: While lower VOC concentrations were observed in the R-wells, EPA considers a worst scenario case based on the highest levels observed in any one bedrock well to be a reasonable worst-case assumption. The scenario is based on a direct fracture conduit leading from the site to an off-site well. While it can be argued that this scenario is unlikely, it does provide a reasonable upper bound to the risks posed. In fact, "worse" worst case scenarios involving bedrock fractures providing conduits for contaminant migration from more concentrated overburden plume areas to off-site wells could also be postulated.

While the quantitative value of worst case risk posed to residential bedrock wells can be debated, it can be argued that some level of risk is posed to these wells based on the documented on-site bedrock contamination. It is our opinion that this risk should be addressed either through long term monitoring, groundwater remediation, or both.

42. Generators Comment: The RI/FS arbitrarily ignores a vast amount of data concerning harmless discharge of the O&G plume to the North Brook wetlands and GZA failed to study site conditions to see if a separate remedy was appropriate. While acknowledging that the North Brook wetlands is downgradient from the Ottati & Goss site, RI Addendum at 32, the RI/FS wetlands assessment contains no information as to "soil types, seasonal fluctuations in water level, and water quality" in the North Brook wetlands. Id. This wetlands assessment was conducted on February 14, 1986, well after the record was fully developed as to the discharge of the Ottati & Goss plume into the North Brook area. See id. at 31. In addition, GZA performed over 50 peat probes and took six samples of peat for analysis. Id. at 8. Not one of the probes nor any of the peat samples analyzed came from the North Brook area where the Ottati & Goss plume discharges. See Figures 27 and 28. It appears that GZA consciously avoided collecting samples and accumulating further data verifying the discharge of the Ottati & Goss plume into the North Book wetlands to the west of Route 125. The failure to study this area despite the extensive evidence in the record that it is a discharge area for the Ottati & Goss plume cannot be characterized as anything other than arbitrary and capricious and is a direct result of GZA's refusal to analyze the Ottati & Goss site separately.

Response: The RI makes no conclusion that the contaminant plume for the O&G site discharges in North Brook.

43. Generators Comment: No evidence in the record indicates a PCB contamination problem at the Ottati & Goss site. No evidence in the record indicates that GZA found a PCB problem in soil at the Ottati & Goss site. GZA identified action levels of 50 ppm in soil and 1 ppm in sediment for PCBs. See RI/FS, Volume VII at 21-22. No analysis of Ottati & Goss soil found PCBs at even 1 ppm let alone 50 ppm. See RI/FS, Volume 1, Figure 16. In addition, none of the many analyses of groundwater at the Ottati & Goss site or in its plume indicates any PCB contamination of groundwater caused by the site. Surface water analyses also near the Ottati & Goss site give no indication that PCB contaminants are of any concern.

Response: This reference to available data and its indications is correct.

44. Generators Comment: There are absolutely no data in the record to indicate arsenic present at the Ottati & Goss site and that any remedy to treat or remove arsenic is appropriate for that site or its groundwater contaminant plume. The RI/FS fails to acknowledge this obvious conclusion from the data because it fails to analyze the remedies for the Ottati & Goss site separately from the remedies for the GLCC site. This misreading of the data is arbitrary and capricious and cannot be justified.

Response: Table 10 of the RI indicates that arsenic is present in soils at the Ottati & Goss site. Results of soil analyses from test pits TP-20, TP-21, and TP-22 indicate arsenic concentrations ranging from 7.3 to 13 ppm.

45. Generators Comment: The data indicate also that no remedy for metals is required for the Ottati & Goss site. We first note that the only well within the Ottati & Goss plume ever analyzed for metals or inorganics is well GZ-12 in 1983. To the extent the RI/FS relies on one sampling round from one well cluster within the Ottati & Goss plume to justify an expensive treatment system for metals, we believe the RI/FS to be arbitrary and capricious. If one analysis from one well within a plume were sufficient data on which to base a decision on the appropriate remedy, the many different samples taken from the numerous wells at various times would have been unnecessary. Using this approach to design remedies, the RI/FS could have been published years earlier.

Response: The selected remedy is not predicated on metals found at the O&G portion of the site. Further the RI/FS considered the O&G/GLCC site in total as it was listed in the National Priorities List. Therefore, it is not cost-effective to consider multiple treatment systems to address water quality conditions in multiple areas around the site and its environs.

46. Generators Comment: While no remedy requiring a treatment system for metals can be justified on the one analysis of GZ-12 for inorganics, that analysis does indicate the absence of a metals problem. All compounds analyzed for were detected below any drinking water standards set by EPA, with the exception of one analysis of nickel in well GZ-12B. See RI/FS, Table 6. Nickel was found in well GZ-12B at 0.1 mg/l. This concentration is the same concentration that was found as background for nickel in upgradient groundwater wells. See RI/FS, Table 7 (nickel upgradient at 0.1 mg/l.) This data cannot justify a metals treatment system for the Ottati & Goss groundwater plume.

In addition, a comparison of surface water analyses for metals in South Brook upgradient of the Ottati & Goss site at sampling location S-16 and downgradient from the Ottati & Goss site at sampling location S-17 show further that there is no health risk relating to metals at the Ottati & Goss site. December 1983 data show no significant increase between upgradient and on-site surface water contamination by metals. The only on-site surface water metal contamination in excess of drinking water standards is again nickel at 0.1 mg/l. Upgradient surface water samples were, amazingly, not analyzed for nickel. The concentration on-site at sampling location S-17, however, is identical to background groundwater concentration level for nickel. RI/FS, Table 7. These data provide no basis for a metals treatment system for the Ottati & Goss site. To ignore this data and impose on the Ottati & Goss Generators the costs of constructing and operating a metals treatment system is arbitrary and capricious. If any treatment system for metals is at all appropriate, it is necessary only to treat the GLCC plume.

Response: As is widely recognized, a goal of the RI/FS was to present remedial alternatives which address conditions on and around the entire O&G/GLCC site. Therefore, it is not cost-effective to consider multiple treatment systems to address water quality conditions in multiple areas around the site and its environs.

47. Generators Comment: The actual data concerning soil contamination remaining at the Ottati & Goss site is also grossly overestimated in the RI/FS and skews the analysis concerning the need for and evaluation of remedies. GZA assumes an average concentration of 100,000 ppb. However the data contained in the RI, Table 15 indicate that a realistic average concentration of contaminants in the Ottati & Goss soil is approximately 1,000 ppb. See Papadopulos Report at 23. This lower estimated average is more realistic based not only on the data in Table 15 but also on data previously supplied to EPA by Camp Dresser & McKee and Geraghty & Miller concerning HNu surveys over extensive areas of the Ottati & Goss site. Using all available data concerning Ottati & Goss soil contamination, and assuming worst case that the entire one-acre site is contaminated to a depth of three feet, one must conclude that the level of residual contamination in the soil is minimal and that certainly the entire one acre to a depth of three feet need not be removed for treatment and relocation as the RI/FS concludes.

Response: The estimated average contaminant concentration of 100,000 ppb at the O&G site is conservative, not a gross over-estimate. It was used to indicate the necessity for excavation and treatment of contaminanted O&G soils in regard to Alternative 15. The level of contamination (100,000 ppb vs. 10,000 ppb) is not a significant factor in assessing the need for excavation and treatment of O&G soils given the soil treatment goals stated for Alternative 15, the limited data available, and the stated limitations of the soil excavation and treatment estimates. It is anticipated that an extensive pre-excavation soil survey conducted prior to remediation would refine these estimates substantially.

48. Generators Comments: Even if one were to conclude that the minimal soil contamination at the Ottati & Goss site needed to be addressed, the RI/FS drastically overestimates the amount of soil to be removed to bring the residual contamination to "acceptable" levels. The RI/FS determines acceptable average concentrations of residual soil contamination that will lead to acceptable health risks. It erroneously assumes, however, that all soil with concentrations in excess of the acceptable average must be removed. This crucial error vastly overestimates the amount of soil to be removed.

The appropriate calculation is to determine that quantity of soil that will reduce the remaining average concentration to the acceptable level. See Papadopulos Report at 20-24. Using realistic average concentration estimates for the Ottati & Goss site, there is no health risk from the soils remaining there. Even under extreme, assumed worst case conditions, only a very small amount of soil would be removed from the Ottati & Goss site. The failure of the RI/FS to analyze this issue properly is arbitrary and capricious.

Response: As indicated in the response to comment 4, GZA did not estimate the quantity of contaminant mass remaining in on-site soils. This quantity is unknown due to the long and complex disposal history at the site.

Except for the premise that the existing on-site contaminant mass is known, EPA agrees that the mathematical basis for the soil volume calculations in the Papadopulos Report is sound. However, these calculations imply that well defined isopleths of contaminant concentration exist at the site, and immediate segregation and completely efficient excavation are possible. Available site data strongly indicate that, with several noted exceptions, contaminants are dispersed more or less randomly across the site. These issues are clearly stated on page 15/17 Appendix E of the FS.

GZA's estimates of the amount of soil that will require excavation to achieve an acceptable residual contaminant concentration took into consideration the complex areal and vertical distribution of contaminants on-site. Because efficient segregation of soils with contaminant concentrations above and below an acceptable limit will be difficult, it is likely that excavation of soils above an acceptable residual contaminant concentration will also result in excavation of soils below the acceptable residual contaminant concentration. It is anticipated that the excavation efficiency will be improved by a detailed pre-excavation soil survey.

49. Generators Comment: Two of the soil remediation alternatives discussed in the RI/FS make no engineering sense, are contrary to EPA policy and are extremely inefficient. The most glaring one is the RI/FS' consideration of soil remediation through a two-step process of soil treatment, either by IR Incineration or aeration, and then placement in a RCRA landfill or under a RCRA cap to be constructed on the GLCC site or at a RCRA landfill off-site. See FS at 28, 59-60, 62, 65. The RCRA landfill is designed as an environmentally safe means of disposal of hazardous wastes. The RCRA regulations set out design and construction standards that must be met and operating procedures that must be followed at great expense. See 40 C.F.R. 264.300-.317. Similar expensive provisions accompany construction of any RCRA cap. See FS, Figure 6.

Response: The comment misstates the limited on-site aeration or disposal of soil discussed in the FS. This remedial response did not consider the use of IR incineration. The limited treatment remedial action was developed in discussions with State and EPA officials to satisfy remedial response objectives including compliance with Federal requirements such as EPA guidance and RCRA technical standards.

50. Generators Comment: Assuming that contaminated soils at the Ottati & Goss site and GLCC site are hazardous waste and appropriate for disposal in a RCRA landfill or under a RCRA cap, it makes no sense to spend a significant amount of time, labor and money treating the soil, either by aerating it or putting it through an IR Incinerator, if it will only be placed thereafter in a RCRA landfill or under a RCRA cap anyway. If the soil treatment systems are at all cost-effective, they will be removing contaminants from the soil. Treatment prior to disposal in the RCRA landfill or under a RCRA cap means that appropriately treated, and therefore decontaminated, soil will be placed there needlessly. The burdensome and expensive construction and operation and maintenance costs for the RCRA landfill or cap, therefore, become unnecessary and not cost-effective. If disposal of the soil in a RCRA landfill or under a RCRA cap after treatment is necessary because it remains a hazardous waste, then the treatment systems of the soil serve no purpose and are not cost-effective. In either case, this combination of remedies is inconsistent with the National Contingency Plan.

Response: The comment misstates the limited on-site aeration or disposal remedial action discussed in the FS. IR Incineration was not considered for soil under this remedial response. For further discussion, please refer to response 49.

51. Generators Comment: Assuming any kind of soil treatment were necessary for the soils at the Ottati & Goss and GLCC sites, IR incineration is definitely not cost-effective or appropriate as a soil treatment remedy. IR incineration has never been used to treat hazardous waste contaminated soil. Its only prior application to hazardous waste contaminated soil treatment was at the Times Beach, Missouri dioxin site as a pilot study. Given the

rejection in the RI/FS of other technologies because of their pilot scale status, see RI/FS, Volume VII, Table 3 (rejecting molten salt and pyrolysis/starved combustion because of pilot scale status), it is arbitrary to approve of the IR Incineration process, which has also only been used to treat hazardous waste soil on a pilot scale.

Response: Information provided by Shirco Infrared Systems indicates that IR Incineration systems have been used in over 25 commercial and mobile incinerator applications. The IR incineration system has also been selected by EPA to incinerate soils at the Tibbetts Road superfund site in Barrington, New Hampshire and the Baird and McGuire Superfund site in Holbrook, Massachusetts.

52. Generators Comment: The pilot study of the IR incineration process at Times Beach by an EPA contractor indicates the inappropriateness of this technology for the soils at the Ottati & Goss and GLCC sites.

Response: EPA is not aware of information relative to the IR incineration technology that would indicate that the IR incineration technology is unsuitable for soils at the O&G/GLCC site.

53. Generators Comment: IR incineration is even more unsuited for the Ottati & Goss and GLCC sites than it was found to be for Times Beach. The IR Incinerator requires that soil be placed in one-inch lifts on a conveyor belt that takes the soil to the infrared lamps within the incinerator. Loading the soil onto the conveyor belt is only cost-effective when one is dealing with homogeneous soils that are very well sorted. The poorly sorted soils at the Ottati & Goss site and GLCC site will require extensive and expensive sorting to assure that the soil is properly prepared and placed on the conveyor in the one-inch lifts required. This pre-sorting is very labor intensive and will require some use of heavy equipment and much work by hand, making the process not cost-effective. Given the amount of pre-sorting activity required, significant volatilization of contaminants will occur before the soil even enters the incinerator, thus making the IR incineration process even less cost-effective. See generally Delaney Report.

Response: Some conditioning of the soil would be required prior to IR incineration. Drum fragments, roots, and other particles over 2 inches in diameter would have to be separated for both IR incineration or disposal.

It is also noted that available site information indicates that roots and drum fragments are not extensively distributed through site soils. Therefore extensive preconditioning of the soil prior to incineration may not be required.

54. Generators Comment: A final disadvantage to the IR incineration process that is not discussed in the RI/FS is what is to be done with the residual soil left after incineration. The IR incineration process will, in effect, bake the soil and turn it into a fine sand-like material that will easily be blown all over the area. Fugitive dust emissions are a significant problem that the RI/FS fails to consider.

Response: Fugitive dust emissions are recognized as an engineering consideration in the design of the full scale soil treatment systems. The remedy therefore includes a pilot scale treatability study prior to conducting full scale treatment of soils.

55. Generators Comment: The NCP requires that CERCLA remedies consider applicable or relevant and appropriate federal standards. See 40 C.F.R. 300.68 (f), (ii) and (iv). The corrective action provisions that GZA relies upon are not applicable, relevant or appropriate for the sites. The corrective action provisions are contained in 40 C.F.R. 264.100 and .101. The 264 provisions are applicable to facilities that treat, store or dispose of hazardous waste. At such facilities, EPA imposes under 40 C.F.R. 264.100 permit conditions that the owner or operator of the facility, must take corrective action. In fact, each of the regulatory provisions in this subpart imposes obligations on the owner or operator of the facility usually through the facility's permit. See 40 C.F.R. 264.90 through .101.

These provisions are inapplicable to the Ottati & Goss/GLCC sites. The record indicates that no treatment, storage or disposal has taken place on the sites for years. In any event, none of the Generators at Ottati & Goss and GLCC is an owner or operator subject to the corrective action provisions. To treat the Ottati & Goss and GLCC sites as currently operating facilities that require an RCRA permit is an error.

Response: Please refer to the Record of Decision concerning EPA's view of the role of these regulations concerning this site.

56. Generators Comment: As a general matter, GZA appears to assume that it must disregard any remedy that does not include groundwater capture and treatment. GZA concludes, without explanation, that the RCRA groundwater protection regulations contained in 40 C.F.R. 264, Subpart F, apply to the sites. See FS at 70 and 83. Not only is this legal conclusion erroneous, but it is misapplied to the Ottati & Goss and GLCC sites. When understood properly, the RCRA groundwater protection standards are not applicable, relevant or appropriate to this situation. In addition, even if they were applicable or appropriate, the corrective action provisions of the groundwater protection standards do not mandate groundwater remediation.

Nor are these standards "relevant and appropriate." The groundwater protection standards are designed to apply to facilities that will be accepting for processing or disposal hazardous wastes for a good deal in the future. The standards seek to prevent deterioration of groundwater quality beyond the background limits present at the time the facility permit is issued. See 40 C.F.R. 264.94(a)(1).

This situation is no way analogous to the situation present at the Ottati & Goss and GLCC sites. Those sites do not now and will not in the future accept additional hazardous waste for processing or disposal. GZA admits that background water quality is not attainable technologically. Under these conditions, it is contrary to law and arbitrary and capricious to apply to groundwater protection provisions and the corrective action requirements to these sites.

Response: EPA's rationale for why RCRA is relevant and appropriate is included in Section VI of the ROD.

57. Generators Comment: No metals or arsenic are found at the O&G site above drinking water standards. Therefore, the inclusion of floceulation, sedimentation, filtration and ion exchange in the treatment system for the Ottati & Goss plume is unfounded and arbitrary. Based on the data in the record, the only plausible engineering reason for including the metals treatment systems at all is the supposed harmful effect of iron on any air stripper that might be deemed necessary to treat volatile organic contaminants. Normally, the iron concentration found in groundwater is insufficient to cause the iron to plate out onto the air stripper packing and clog it. Any air stripper that might be used can be designed to eleimate the harmful effects of metals on the packing by, for example, adjusting the amount of water or air used in the stripper or by cleaning the air stripper packing with an acid bath solution quarterly to remove any metal plated there. Nothing in the data in the record suggests any engineering reason for including the metals treatment systems of floceulation, sedimentation, filtration and ion exchange in any treatment system concerning the Ottati & Goss plume.

Response: Pretreatment of groundwater to remove metals that may interfere with subsequent unit treatment processes is a well-established, widely used unit process.

Ion exchange was not proposed to remove iron and manganese prior to air stripping. Ion exchange was considered as a unit process that may be required to attain arsenic treatment goals. It is anticipated that these issues would be clarified during pilot treatability studies.

58. Generators Comment: The biological degradation rotating disk remedy is generally in use with sewage where there is a high enough biological oxygen demand (BOD) and a high enough carbon content in the sludge for it to work effectively. There is no evidence in the record to indicate that either the BOD or the carbon content at the Ottati & Goss or GLCC sites will be sufficient for this treatment method. The technology is also labor intensive. It requires a plant operator and continuous oversight. Finally, this technology generates a sludge that will itself have to be disposed of in an environmentally safe manner.

Response: Activated sludge has also been considered for the biological treatment unit process. EPA stated in the FS that the final choice of the biological treatment process would depend on the result of pilot treatability studies.

59. Generators Comment: Included in the RI/FS discussion of groundwater treatment remedies is a proposal for monitoring bedrock water supply wells within a mile and one-half radius north, south and east bond one mile west of the sites. See FS at 30. This is unnecessary. There is no evidence of any bedrock water supply well that is contaminated because of the Ottati & Goss or GLCC

sites. Monitoring to the north, west and south of the sites is particularly inappropriate. Flow is to the east, toward Country Pond; there is no evidence that the flow direction is random.

Response: EPA concurs that available bedrock data indicates a natural flow component in an easterly direction, as discussed in sections 7.2.1 of the RI and 5.3 of the RI addendum report.

Groundwater flow in bedrock is discontinuous and occurs predominantly within bedrock fractures. Even with an apparent easterly regional flow direction, local flow directions will be controlled by fracture orientation. Local flow directions could vary within fractures up to 90 degrees from the regional flow direction. This is the basis for the conclusion that bedrock wells other than those directly east of the site are potentially at risk. The generators' comment suggesting a comparable ability to predict overburden aquifer and bedrock flow patterns is not appropriate.

The uncertainty in bedrock flow patterns is further accentuated by the effects of pumping of the numerous private bedrock wells in the area. Heavy withdrawal of water from these wells can locally result in significant alteration of natural flow directions, further dispersing a bedrock contaminant plume.

60. Generators Comment: There is evidence of bedrock contamination from other sources. Analysis on several occasions of the True bedrock well and on one occasion of the Carruthers bedrock well has shown the presence of dichlorobenzene at between 10 and 88 ppb. See RI, Table 32. These contaminants did not come from the sites. See RI at 74, 94, 98, 100 and 108.

Response: EPA agrees.

61. Generators' Comment: Another potential groundwater remedy considered is the construction of an upgradient groundwater interceptor trench to minimize groundwater flowing onto the GLCC site and to reduce leachate. FS at 20. Figure 9 indicates that the trench would run upgradient from and approximately parallel to South Brook. The depth of the trench would be between ten and twenty feet below ground level. Id.

This alternative is also inappropriate in light of actual site conditions. The greatest source of leachate by far is infiltrating precipitation. An upgradient groundwater interceptor trench without preventing infiltration will do little to minimize leachate. If used with an infiltration penetration system, it will do even less. The trench as designed is at best a partial groundwater discharge point. Its shallow depth and location assure that it will serve no purpose different than South Brook does already as a partial discharge area for groundwater. Construction and operation costs to build, in effect, a second South Brook are not cost-effective and cannot be justified by engineering principles.

Response: The proposed interceptor trench is intended to be a partial groundwater discharge point. The construction of such a trench is intended to function in a manner similar to South Brook but more efficiently. Firstly, reducing the amount of groundwater

flowing through contaminated portions of the site would reduce the mass flux of contaminated groundwater leaving the site. Secondly, constant rising and falling of the groundwater table is in itself a mechanism which leaches contaminants from source area soils. A trench penetrating 10 to 20 feet into the overburden would dampen the water table fluctuations at the site. It is necessary to augment the trench system by limiting infiltration of precipitation and snowmelt incident to source areas; consequently, it was proposed that a clay cap be constructed over a portion of the site, to be used in conjunction with the interceptor trench. The cap would serve to limit leachate generation from the infiltration of precipitation.

62. Generators Comment: To the extent the upgradient trench captures a significant amount of groundwater, other areas of the aquifer will begin to supply groundwater to the GLCC site. As shown on Figure 9, the groundwater interceptor trench presents no physical barrier to prevent the diversion of groundwater from the Ottati & Goss site to enter, contrary to its natural flow, the GLCC site. No remedial purpose justifies this distortion of the natural flow.

Responses: The purpose of the trench was not to present a barrier between the O&G and GLCC sites. Further, available data indicate that groundwater likely does flow naturally from the O&G site to the GLCC site.

63. Generators Comment: Although the most common type of contaminant in the Ottati & Goss soil is volatile organic compounds, the RI/FS fails to analyze whether aeration of the soil to remove the contaminants is an appropriate remedy. At the McKin, Maine CERCLA site, soil aeration was considered appropriate treatment of soil contaminated with volatile organics. This remedy should have been considered in the RI/FS for Ottati & Goss.

Response: EPA's selected remedy includes aeration of VOC contaminated soils.

64. Generators Comment: Another treatment technology not mentioned in the RI/FS that has been used to treat solvent contaminated soil is soil vapor extraction.

Response: IR incineration was considered because of its applicability to the treatment of volatile organic compounds (VOCs) and other non-volatile organic compounds such as PCB's, acid extractable and base neutral extractable compounds. The VES system would appear to be unsuitable for the treatment of non-volatile organic compounds such as PCB's and therefore is not considered appropriate for the O&G/GLCC site. EPA has selected aeration as the remedy for the VOC soils, for the reasons stated in the ROD.

65. Generators Comment: Another technology that has been used at CERCLA sites for remediation of acetone and methyl ethyl ketone treatment is in-situ biological degradation.

Response: The O&G/GLCC site contains many other contaminants in the groundwater in addition to acetone and MEK. In-situ degradation

of contaminants in the groundwater was considered in the FS. However, due to the numerous VOCs and ABNs observed in the groundwater at the O&G/GLCC site, previous applications of limited in-situ biodegradion of limited numbers of VOCs such as acetone and MEK, was not deemed to be sufficiently developed for application in the more complex O&G/GLCC groundwater regime.

66. Generators Comments: The RI/FS fails to evaluate three means of capturing the Ottati & Goss plume for treatment. While a downgradient interceptor trench for the GLCC plume is discussed, the RI/FS never evaluates the appropriateness of a groundwater interceptor trench for the Ottati & Goss plume separately.

Two other methods for capturing the Ottati & Goss plume are not even mentioned in the RI/FS. CERCLA sites such as the New Lyme, Ohio site, have used a perimeter wellpoint/vacuum wellpoint system to contain and capture a contaminant plume. The limited size of the Ottati & Goss plume and its relatively slow movement suggest that this remedial alternative should be analyzed. The ROD summary that has used this alternative is attached and made part of the record.

Technology has developed in the construction dewatering field that suggest that a wellpoint groundwater extraction system along the plume center line should have been considered as a remedial alternative in the RI/FS. The dewatering technology has been shown to be technically feasible on countless construction projects and, assuming that the plume center line can be adequately defined, bears investigation.

Response: The above issues concerning the most efficient ways to physically extract contaminated groundwater will be addressed in the conceptual design.

67. Generators Comment: The RI/FS discussion of groundwater remedies fails to consider as an appropriate remedy in place of the alternate water supply a system of activated carbon filters for use at each household that has a contaminated well.

Response: Carbon filters are not effective in removing VOCs such as acetone, THF, methanol and other low molecular weight water soluble compounds observed in contaminated groundwater at the O&G/GLCC site.

67a. Generators Comment: There is no evidence to support the GZA assertation that on-site contaminants probably represent a significant risk. There is an ingestion risk only if you assume that people eat significant amounts of dirt.

Response: The O&G/GLCC risk assessment identified on-site conditions as a source of potentially significiant risk for several reasons. Soil, sediment and surface water concentrations on-site are high for a number of contaminants. The site is accessible to both humans and wildlife, thus presenting a potential source of exposure as there are residents in close proximity to the site. Obviously, the frequency and duration of vists to the site is unknown. In addition, the extent of contact with soil, surface water and sediment and the extent of soil ingestion are unknown. As a result, exposure could not be quantified with any degree of confidence. However, the fact that exposure concentrations are high on-site and the fact that activity patterns of nearby residents and wildlife may reasonably result in exposure, led to the conclusion that the site represented a potentially significant risk. The fact that most of the soil data is subsurface (1-2 feet), and the site has been covered with a 6 inch soil layer does not preclude exposure. Surface soil concentrations have not been adequately characterized, and disturbance of the soil surface now or at some time in the future (depending on the land use), may result in contaminant concentrations at the surface. Finally, the site has harmed groundwater and continues to pose a threat to the environment in this regard. In addition, on-site contaminants would pose a risk if the site is developed.

67b. Generators Comment: GZA's worst case assumptions for exposure to maximum concentrations for seventy years is unlikely because it is unlikely that the allegedly exposed population will live in this location for seventy years or drink two liters of unheated local well water every day.

Response: The population can be expected to be a mix of ages, and at any point of time at which exposure is initiated there is a subset of the population that would be exposed for 70 years. It cannot be assumed that no such subpopulation is likely to exist, or that turnover will eliminate the possiblity of exposure over this time period.
There are no data that indicates residents in the area of the O&G/GCLL site consume 2 liters of water per day. However, based on available data on human consumption patterns in general, this was considered a reasonable asumption.

67c. Generators Comment: In assessing the risk created by eating Country Pond fish GZA assumed ingestion of 6.5 grams of fish per day for a period of 70 years. This assumption is an unsupported estimate.

Response: Discussions with the New Hampshire Fish and Wildlife Department indicated that fishing did occur in the pond; although no data are available on the extent. In addition, no data are available on fish consumption patterns in the area. The 6.5 grams per day of fish consumed is a common assumption used and is based on national data. While, it may not be strictly applicable to this site, it is in fact a low value for fish-eaters, who may consume

100 grams of fish per day or more. It is not possible to say that this exposure route does not exist based on the available data. In addition, assuming 6.5 grams per day of fish consumption from Country Pond, is a reasonable assumption, at least for some subpopulation.

67d. Generators Comment: In assessing the risk created by eating Country Pond fish GZA incorrectly assumed that fish bio-accumulate VOCs.

Response: It is true, that no significant bio-accumulation over water concentrations would be expected, as their bioconcentration factors are generally less than five. However, low concentrations of these compounds can be expected, when exposed to low water concentrations.

67e. Generators Comment: GZA's risk assessment assumes that 1,2-dichloroethane, trichloroethylene (TCE), tetrachloroethylene, benzene, chlorobenzene, and arsenic are human carcinogens.

Response: Trichloroethylene and tetrachloroethylene have been classified by EPA scientists in the EPA weight of evidence category of B2 as being a probable human carcinogen. This classification reflects their belief that these compounds have sufficient evidence of carcinogenicity in animals, but inadequate evidence of carcinogenicity in humans. Arsenic has been classified in the EPA weight-of-evidence category of A as human carcinogen. A classification of A represents sufficient evidence from epidemiologic studies to support a casual association between exposure and cancer. EPA's guidelines for carcinogen risk assessment state that "agents that are judged to be in the EPA weight-of-evidence stratification Groups A and B would be regarded as suitable for quantitative risk assessment." The evidence for the carcinogencity of chlorobenzene is more limited. EPA has classified this in Category C for limited of carcenogenicity in animals. EPA guidance states that Category C compounds would be judged on a case-by-case basis. All factors considered, it was deemed a reasonable assumption to include this compound as a carcinogen in the quantitative risk assessment.

67f. Generators Comment: Even assuming one or more of these components are human carcinogens at some level, it is a questionable premise that there is no threshold for their carcinogenic effect.

Response: For carcinogens, it has been EPA's policy for a number of years to assume that there is no threshold below which an effect will not occur. As a result, the compounds are evaluated by considering the probability of effect and a determination as to whether that probability is acceptable.

67g. Generators Comment: The RI/FS ignores, and, in many respects, is inconsistant with the Court's Findings of Fact. It would be unfair, contrary to law and arbitrary and capricious for EPA to rely on factual conclusions in the RI/FS that are inconsistent with the Court's findings.

Response: It is the responsibility of EPA to evaluate the site and remedies besed upon scientific information it has obtained in its studies as well as other sources of reliable information. Generally, this comment raises a legal issue which the United States believes is more appropriately addressed in briefs and arguments to the Court.

International Minerals & Chemical Corporation (IMC) submitted the following comments on the Feasibility Study.

68. IMC Comment: No measurable concentrations of chemical compounds were found in Country Pond and there is no evidence that any resident has or is in danger of having their drinking water contaminated from the site.

Response: Much remains unknown about the complex disposal history at the site, including dates, durations, and amounts of contaminant disposal. It is possible that discrete plumes of unknown magnitude and concentration could have discharged to Country Pond at some time in the past due to a previous disposal event, or group of events on-site. No groundwater or surface water data exist prior to 1983 to confirm or disprove whether previous contamination may have been present in off-site wells. It is also possible that adsorption could be retarding the solute front as it is transported toward Country Pond.

69. IMC Comment: Approximately 50% of the contamination now east of Rt. 125, and of future migration of what is now west of Rt. 125 will be dissipating in dilution via surface water; 30 percent will move upward from the outwash sand and gravel below the marsh into the peat of the marsh where it will be slowly dissipated through natural processes; 20% will be dispersed under the peat without surfacing, and no measurable concentration for these chemicals will enter the waters of Country Pond.

Response: Water quality data collected by GZA from sampling points located in the marsh over the period from December 1984 to February 1986 indicates that a large portion of the VOCs do not discharge to South Brook, North Brook and swampy areas along North Brook and east of Route 125, but instead are migrating in a plume beneath the peat toward Country Pond. Evidence of this transient condition is provided by the pronounced increased in VOCs observed from December 1984 to February 1986 in monitoring wells which lie east of well W-9.

Additionally, triaxial permeability testing performed on samples of peat indicate that the low hydraulic conductivity and transmissivity of the peat in the marsh restricts groundwater discharge within the marsh. The transient plume condition is depicted graphically on Figure 30 of the RI Addendum report.

70. IMC Comment: The only measurable concentrations of contaminants in Country Pond (September 1982) were probably caused by the EPA clean-up/crushing pit operation in May-July 1982.

Response: In EPA's opinion this is unlikely, since, if any surface water discharge from the drum crushing operation had occurred, it would have been into South Brook. This brook does not flow into North Brook or into Country Pond but dissipates in the marsh east of Route 125. If discharge had occurred to groundwater, the time of travel for groundwater from this vicinity to North Brook, or to Country Pond, would be measured in terms of years, not months.

71. IMC Comment: The worst case presentation for drinking water consists of indefensible manipulation of irrelevant data. Specific comments include the following points:

71a. Sub Comment: Using the maximum recorded concentrations at W-9, 900 feet from the marsh/pond interface, assuming that this concentration will reach the interface as represented by GZ-5 in 3 to 4 years, is clearly an error. If this were a reasonable assumption, the current recorded concentrations at GZ-5 should equal the values at W-9 in 1981, 1982. This is clearly not the case since the current concentration at GZ-5 remains at least an order of magnitude below the 1981 and 1982 concentrations at W-9 and the mix of contaminants is completely different.

Response: This assumption is based on a worst case scenario. However, results of calculations presented in Table 48 estimate that groundwater from W-9 would reach the marsh/pond interface in approximately 10 years. As such, it is not clear why current GZ-5 levels would equal those of 1981-1982 at W-9.

It has also been noted repeatedly throughout the RI and RI Addendum that times for groundwater and contaminant transport are estimated. The pronounced increases in contaminant concentrations in monitoring wells downgradient of W-9 for December 1984 to February 1986 is consistent with a transient condition with the plume continuing to migrate toward Country Pond.

71b. Sub Comment: The assumption that contaminant concentrations at GZ-1 and GZ-2 will increase with the same ratio with the same constituents in the same percentage is based on one recorded concentration and is insupportable.

Response: The RI/FS does not suggest that the 0.02 factor is an absolute fact. Instead it is clearly stated on page 99 of the RI that "The current ratio of VOCs observed between GZ-5 and GZ-1 and GZ-2 of approximately 0.02, is based upon an assumed possible maximum concentration of 50 ppb at GZ-1 and GZ-2 (5 VOCs present at the analytical detection limit of 10 ppb) compared to VOC concentrations of 2,700 ppb observed at GZ-5."

71c. Sub Comment: The use of 70 years for computations of lifetime exposure is unwarranted. Ten years should be the maximum time period used based on simple mass balance and an amount of contamination remaining on site.

Response: The complex, uncontrolled nature of chemical disposal practices over a period of approximately 30 years coupled with removal actions at the site during the RI/FS has rendered accurate calculation of the mass of contaminants remaining on-site or down-gradient of the site nearly impossible at this time. Therefore, under the worst case scenario, it is not unreasonable to assume that contaminant concentrations currently observed in monitoring wells in the marsh could be sustained for 70 years, or that higher levels could be sustained over a shorter duration.

Although unlikely, it is conceptually and mathematically possible to use a period of exposure of 10 years rather than 70. However, leaching of contaminants from the site in a shorter time period would produce higher contaminant concentrations for a given mass of contaminant. Because risk calculations are linear, the resulting risk estimate would be the same.

71d. Sub Comment: Assuming that the non-detected results of Country Pond surface water, with detection limits of <10, <5, and <1 ppb (see Pg 98) are increased from 5 ppb to 50 ppb on the same basis as the results at GZ-5 were assumed to increase by an order of magnitude is clear error. Using current EPA guidelines the most probable case in the pond would be "non detected," and the worst case would be the detection limit.

Response: EPA is not sure what guidelines the commenters are referring to or exactly the point the commenter is making. Regardless, it should be noted that EPA has found low levels of contaminants in Country Pond.

71e. Sub Comment: The assumption that the mix of contaminants in the pond will be the same as W-9 in 1983 is without justification based on the fact that no contamination has been found in the pond since the EPA Cleanup in 1982.

Response: The justification is provided by evidence that the contaminant plume is migrating toward Country Pond. As such, VOC levels in Country Pond would be expected to increase in the future. This has been more fully supported in response to comments 2 and 3.

71f. Sub Comment: The postulated "worst case" concentration in the surface water of Country Pond is attempted to be justified by assuming that 10,000 to 70,000 gpd of groundwater at concentrations ranging from 10,000 ppb to 20,000 ppb will reach the pond without attenuation. Data presented in Vol. II of the RI clearly shows that this is not the case as is discussed in later sections of this comment. Up-welling of substantial quantities of contaminated water through the peat in the western and central portions of the marsh with cleansing of the water in the peat is intentionally ignored.

The average concentrations in the groundwater passing beneath Route 125 is significantly less than 10,000 ppb when stratification of the plume is considered, and adsorption in the outwash sands and gravels is ignored. All of these conditions are known to exist, are substantiated by data in the RI, and refute the excessive assumptions used to create the "worst case."

Response: Upwelling of substantial quantities of contaminated water through the peat in western and central portions of the marsh with cleansing of the water in the peat is not intentionally ignored. Groundwater flow and quality data, as well as data generated by triaxial permeability and column adsorption testing of peat samples from the marsh indicates that a relatively small portion of contaminated groundwater flow (and hence a relatively small portion of the VOC mass flux) is actually discharging through the peat. This condition is described in more detail in the RI Addendum report.

EPA concurs that plume stratification and attenuation by adsorption in the outwash sands and gravels were not considered in formulation of the worst case scenario. However, there is not sufficient data available to quantify plume stratification, and attenuation by adsorption. With regard to adsorption, the mechanism acts to retard a solute front and would have little effect on the eventual mass of contaminants which would discharge to either the wetlands or to Country Pond.

72. IMC Comment: The risk estimates developed for the consumption of edible fish tissue are unwarranted by the facts and unsupported by substantial evidence based on analytical data presented in Appendix I.3.5. Analytical results presented in the RI indicate that no contamination was present in Country Pond (except during the 1982 EPA discharge event). It is therefore, impossible for fish to bio-accumulate volatile or toxic compounds if they are not present to begin with. This conclusion is supported by the fish analysis performed by ERCO during 1984 which found no contamination. Further the assumptions used to develop the calculated concentration of contaminants in Country Pond are invalid, and are only included to put unsubstantiated fear in the heart of the Country Pond angler. Although, "no detectable concentration of volatile organics are present in the pond water" (Vol. 1 page 101, GZA), the observed case for pond water VOC were based on the highest concentrations of VOCs observed (in 1980?) 100 feet upstream (M-5) of the pond. The worst case is generated on the proportion of compounds observed at W-9, which is some 900 feet away from the Pond in the middle of the marsh. It was then assumed that a total of 500 ppb is present. This is ten times greater than the worst case GZA estimated concentration ever calculated for in the pond itself. The fish concentration were generated from theses assumptions using theoretically derived bio-concentration factors. Clearly the assumptions have no basis in fact and should be considered invalid. Thus the risks presented for consumption of fish caught from Country Pond should not be accepted as valid, since the true and substantiated risks are zero (0.0) based on analytical fact.

Response: See response to Risk Assessment comments.

73. IMC Comment: The RI states: "Observed groundwater flow patterns within the marsh, which suggest significant groundwater discharge is limited to the eastern margin of the marsh and the North Brook inlet area."

This conclusion based on data introduced on pg. 12 Vol. II of the RI which concludes that convergent flow and reductions in gradient between well GZ-17 and the Pond is result of an increase in transmissivity and discharge within the wetlands. The RI makes no mention of the fact that vertically upward gradients have been measured (table 47 vol. II) in the west side of the marsh and that discharge into the marsh has been observed on several occasions in this area. The Court finding indicated that 50 percent of the groundwater flow beneath Route 125 would discharge in the west side of the marsh.

Using data from Vol. II of the RI, estimates of the relative amounts of flow in various sections of the marsh can be made. These data include bedrock elevations (Figure 33), peat thickness (Figure 28) and groundwater gradients (29) as well as hydraulic conductivities cited in Section, 4.3.2. Three zones are used as an example; the first at the western edge of the marsh, (W-19 to GZ-4), the second in the vicinity of W-9 and the third in the vicinity of GZ-5 (eastern edge of the marsh). Using the saturated thickness of all unconsolidated deposits except peat above bedrock to determine transmissivity, and using an average value of hydraulic conductivity of 60 ft/day adopted in the RI, Vol. II pg. 13, there would in fact be a decrease in transmissivity between the western edge of the marsh and the eastern edge. The lowest value is in the center of the marsh where the greatest peat thickness occurs. Using the above transmissivity ratios and the gradients from Figure 29, which show an eight-fold decrease in gradient from the west side of the marsh to the east side, results in the following required discharge percentages:

West side	69% of flow beneath Rt. 125
Central portion	21% of flow beneath Rt. 125
Discharge under pond	10% of flow beneath Rt. 125

This can be compared to the findings of the Court which concluded the following:

West side discharge to streams	50% of flow beneath Rt. 125
Discharge through peak in Marsh	30% of flow beneath Rt. 125
Discharge under Pond	20% of flow beneath Rt. 125

The total calculated flux beneath Route 125 using the GZA adopted hydraulic conductivity of 60 ft/day and the plume width of 275 feet (Figure 30, RI, Vol. II) together with the gradients and saturated thickness from the above referenced figures is approximately 24,000 gpd, 80% of the minimum value of 30,000 gpd cited in the RI.

As a "worst case," the same procedure can be used with a range of hydraulic conductivity from 30 ft/day to 90 ft/day as cited in the RI Vol. II, pg. 13, assuming the highest values at GZ-5, the lowest at the western edge, and the average in the central portion. This results in the following required discharge percentages:

West Side	48% of flow beneath Rt. 125
Central portion	20% of flow beneath Rt. 125
Discharge under pond	32% of flow beneath Rt. 125

Thus the data presented in the RI requires that significant discharge occur in and at the western side of the marsh. The conclusion that "significant discharge is limited to the eastern margin of the marsh and North Brook inlet area" is clearly error. It is also inconsistent with the RI, Vol. I pg. 82-84 which describes significant discharge to waters in the central and western sections of the swamp. The resulting error is thereafter used to increase the "risk" at the marsh/pond interface, thereby fatally flawing the risk assessment.

Response: In fact the RI specifically addresses the measured vertically upward gradients in Vol II, Section 4.3.3, Page 2. With regard to observed discharges of groundwater at the western edge of the marsh, such discharges are, as IMC noted, occasional. GZA has observed such discharges and found them to occur generally after precipitation events during times of the year when the water table is high. Consequently the mechanism that produces such "springs" is likely a temporary rise in water table at the peat-outwash contact. Such discharges produced limited quantities of groundwater likely not greater than 10% of the total groundwater flow passing beneath Rt. 125 during the time when they are active. GZA estimates that these discharges occur on the order of 10% of the year. Therefore this discharge accounts for little more than 1% of the flow passing beneath Rt. 125 on a yearly basis.

With regard to IMC's estimate of transmissivities beneath the marsh, it appears that adequate bedrock elevation data are not available that would allow the determination of outwash aquifer thickness beneath the marsh. Although detailed peat thickness data are available, they are not useful for the purpose of determining spatial variation in outwash thickness without bedrock surface elevation data of similar detail. As such, the estimates of "required" discharge percentages presented by IMC are speculative.

74. IMC Comment: The RI states: "Limited peat permeability data suggests that the peat may be too impermeable to allow significant upward groundwater discharge through much of the marsh area."

This conclusion is based on data introduced on pg. 12, Vol. II of the RI which cites the results of permeability tests on the peat. The test data is presented in the RI, Vol. II Appendix I.3.3. A review of the data indicates the following:

a. Four tests were run on samples from depths of 2 to 3 feet.
b. The tests were run at effective confining pressures ranging from 72 pounds per square foot (PSF) to 720 PSF.
c. The dry unit weight for one sample was 7.7 to 7.9 PCF, with a water content of 722 to 712%.

Based on the above data, the total unit weight of the peat would be approximately 63.7 PCF and the buoyant unit weight would be approximately 1.3 PCF. The effective confining pressure in situ is the buoyant unit weight times the depth, assuming the water table of the marsh is essentially at the ground surface. Where upward gradients occur it would in fact be lower. At a depth of

3 feet (the deepest sample) the effective confining pressure would be approximately 4 PSF (maximum) or 18 to 180 times less than that used in the laboratory tests.

Increasing the effective confining pressure results in squeezing of water from the peat, thus reducing the porosity (or void ratio) of the peat. Since peat is highly compressible, significant reductions in porosity (or void ratio) can occur as the material consolidates. Reductions is porosity result in reductions of hydraulic conductivity. The results of the permeability tests confirm this conclusion and this conclusion is also reached, in the RI, Vol. II, pg. 12.

Based on theoretical relationships between void ratio, effective confining stress and permeability, it is estimated that the permeability of the samples tested would be one to two orders of magnitude higher than the test results at the in situ effective stress, the larger increase being for the results at the highest effective stress. This coupled with the tendency in all soils testing laboratories to test the "worst" sample because it is easier to handle, suggests that the values used in the analysis presented in Section 4.3.5, Vol. II of the RI are inordinately low. Use of the realistic values of peat permeability would increase the calculated upwelling flows to percentages equal to or greater than the estimates presented in the preceding section.

Response: A second peat sample had a total unit weight of 71.6 as indicated in Appendix I.3.3. Thus the average buoyant unit weight of the two values is 5.2 pcf. Further, in GZA's experience, the unit weight of peat increases with depth due both to increasing confining pressures as well as decreasing grain size as the peat degrades after deposition. As such, a range is confining pressures of 72 to 144 psf is considered reasonable on the average for a peat unit which is 5 to 25 feet thick.

As a practical matter, it is not feasible to run a falling head test with confining pressures of less than 72 psf.

75. IMC Comment: It is stated: "Peat VOC contaminant concentrations data, which suggest that significant adsorption of VOCs within the peat has not been occuring within the marsh at a rate sufficient to support a steady state condition."

This issue is discussed in Sections 4.4.2 of the RI, Vol. II pages 16-18. This section discusses tests on peat adsorptive capacity as well as results of VOC tests on peat. The RI concludes (pg. 18) that the peat has significant adsorptive capacity and that the measured values of VOC in the peat are significantly lower than the maximum. On pg. 19 Vol. II, RI, it is concluded that a relatively small portion of the VOC mass passes through the peat since the measured VOCs in the peat are 0.7 ppm versus an average annual increase of 6 to 13 ppm if all of the VOC passed throught the peat.

The results of the tests on the peat are included in Vol. VI Appendix I.3.3. This section includes tests on samples taken by both GZA and CDM: however all samples were tested by Cambridge Analytic Associates using the same test procedure. Discussions with personnel

from Cambridge Analytic Associates indicate that the procedure used would not account for significant amounts of VOC adsorbed onto the peat and that the values reported would essentially represent the VOC mass in the pore water.

If the results presented by GZA reflect the concentration in the pore water, then the total VOC concentration in the sample can be estimated using the appropriate partition coefficients. For the sample at GZ-17, a total VOC concentration of 108 ppm. Note also that none of the GZA samples were taken at the bottom of the peat where the highest VOC concentrations would be expected.

From the earlier points, it was shown that 20 to 30% of the flow beneath Rt. 125 upwells through the peat. Using the figures on pg. 19, Vol. II of the RI this would result in an annual increase in VOC concentration in the peat of 1.5 to 3 ppm/yr. Applying this to the average of the measured values, adjusted for adsorption, this represents 9.3 to 18.7 years of upwelling. For the maximum value it represents 36 to 72 years of upwelling. The durations would increase further if VOC concentrations along the peat/outwash contact were used.

Response: EPA believes that the techniques used were appropriate for the conclusions drawn.

76. IMC Comment: Regarding the movement of contamination in the bedrock, the data in the RI strongly suggests that the flow and distribution of contamination within the bedrock is indeed predictable and that it follows the same pattern as the overburden deposits. The following points are presented in support of this conclusion.

1. Nowhere in the site or downstream of the site have contaminants been found in the bedrock except where they have also been found in the overburden.

2. Concentrations decrease with depth in the rock and do not exceed levels in the overburden. Generally concentrations in the rock are 1 to 2 orders of magnitude lower an that in the overburden.

3. The hydraulic conductivity of the rock where contamination has been found is generally 1 to 2 orders of magnitude lower than that of the overburden.

4. Based on 2 and 3 above, the mass flux in the rock is 2 to 4 orders of magnitude less than that in the overburden. Based on the result of the calibrated DYNTRACK mass transport model, this would represent .02 to 2 lbs/yr. passing beneath Rt. 125.

5. Contamination levels in the deep rock wells dropped considerably between the 1985 and 1986 measurements. Vertically upward gradients were also observed in most of the rock wells. This suggests natural flushing of contaminants in the rock is currently occurring.

6. Based on the above, no mechanism for contamination entering the rock has been found. On pg. 28, Vol. 2, RI, it is concluded that at least locally downward gradients into the rock occur since contamination is found there. While this may occur in the upper zones of the rock at the overburden interface, it is unlikely at depth in the rock. More likely this is induced contamination from the overburden as a result of an inadequate seal in the wells or as a result of downward flow through the rock during the testing and sampling of the wells. Up to 35 gpm was pumped from the rock during the packer tests. Since the effective porosity of the rock is extremely low, very high velocities would occur despite the low values of hydraulic conductivity measured.

7. No contamination of any bedrock well in the vicinity of the site, attributable to the sources of the site, has been found.

From these points, it is concluded that the risks associated with the bedrock contamination are 2 to 4 orders of magnitude lower than those of the overburden contamination and that the only receptor for bedrock contamination is the outwash gravels below the peat in the marsh which extends under Country Pond which is the dominating influence for all groundwater flow in the watershed.

Response: EPA concurs that groundwater flow in the upper bedrock is more predictable than in deeper levels. However, data are not available to conclude that the deeper bedrock is not at risk and has not already been contaminated.

While EPA concurs that the risks of impact of area bedrock groundwater are probably low, it is EPA's opinion that ignoring the risks may not adequately protect public health. Please refer to response to Comment 13.

77. IMC Comment: A simple numerical analysis was used by GZA to attempt to explain the nature of contaminant movement from the Ottati & Goss site. From field data, GZA estimated that the average groundwater flow from the site was about 120 ft./day and contaminant transport was 50-100 ft/day. Specifically, GZA tested two cases of minimum and maximum influence of South Brook for a range of hydraulic conductivities and recharge rates.

Essentially they concluded that South Brook can significantly affect groundwater flow, and that discharge to the brook is a likely explanation for slow contaminant movement. These conclusions are correct as far as they go.

IMC previously has demonstrated that the adsorption of the contaminants on soils is an additional explanation for retarded movement of the contaminant plume. The GZA effort did little to create further support for these conclusions which can be seen readily in the groundwater elevation and contaminant concentrations at monitoring wells in the area. As admitted by GZA, the "model" it relied on was not calibrated in any fashion. Rather, a crude matching of extent of contaminant movement was performed based on GZA's concept of which contaminants in wells were from the O&G site. The description of the efforts, also, made no attempt to determine the percentage of mass discharge into South Brook (with groundwater) to further support their conclusions.

The results of the numerical analysis were not used in any way to assess the contaminant movement from the GLCC site.

Response: Since this comment reiterates conclusions, assumptions and limitations stated in Section 9.2 of the RI, no further response is warranted.

78. IMC Comment: The GZA calculations of the dilution of contamination from Route 125 to Country Pond is a highly conservative effort which ignores many attenuating mechanisms. These including discharge of contaminants into the marsh, biodegradation (which would be significant) adsorption (especially on the peat), volatilization and subsequent loss to the atmosphere. It further assumes that the leaching of contaminants from soil takes place at a uniform rate over 70 years. All of the mechanisms listed above and dilution of contaminant sources by infiltrating rainwater indicate that a decaying source strength would provide a better representation. The rate of groundwater flux under Route 125 is about 50 percent lower than CDM's estimate under average conditions (GZA-43,200 gpd vs. CDM-100,000 gpd). This would lower the starting concentration at Route 125 by one-half. All of the above would argue that the concentrations at Country Pond are overestimated by GZA. Additionally, while the calculations are mathematically correct, the back-up materials supporting the contaminant transport calculations (pgs. 4/17-7/17) are often inaccurately stated.

Finally the calculations are based on concentrations of tetrachloroethylene which is a constituent for which neither IMC nor any other defendant has been found responsible.

Response: As stated and explained in response to comment 3, EPA does not regard the discharge of contaminants to the marsh as a significant attenuation mechanism. Additionally, bio-degradation was not considered due to extreme uncertainties in quantifying this attenuation mechanism. It also should be noted that the products of biodegradation can be more toxic and dangerous that the parent product. Vinyl chloride ia a product of the biodegradation of trichloroethylene. Vinyl chloride has been reported in wells GZ-13, W-9, W-21, and W-22. Volatilization is not regarded as a viable attenuation mechanism in saturated flow. Adsorption in outwash sands will retard a solute front, but will have little impact on attenuation of the contaminant mass.

Although a decaying source strength would indeed be more representative of actual leaching conditions, it is superfluous to this model. The objective of this model was to estimate mass flux of VOCs from the site using a mass balance analysis with regard to risk. Since risk calculations are linear over a 70-year period, for a given mass of contaminant, a decaying source would produce the same risk as a constant source.

GZA's interpretation of the quantity of groundwater flow beneath Route 125 is consistent with the data and is therefore considered valid.

79. IMC Comment: In the period 1982 to 1984, CDM, on behalf of IMC, developed and calibrated DYNFLOW/DYNTRACK groundwater flow and mass transport models of the site, which quantified flow rates, source strengths, source locations and flow directions. The results of the modelling work by CDM were presented to the Court during the first phase of the trial, and incorporated in the Court's findings.

There is no data in the RI/FS which refutes the model results nor any analysis in the RI/FS which is more rigorous than the calibrated models. The model results were available to GZA and yet no reference to or use of the CDM model results appears in the RI/FS.

The DYNFLOW/DYNTRACK model results quantify the source loadings, contaminant distribution by source, and contaminant loadings on the marsh and Country Pond as shown on Screens 55 and 57 through 61 as presented to the court. These results are consistent with all data on the site, not just arbitrarily selected data, and these results clearly show no risk. Query: is this why they were not used?

Instead, in one instance, GZA used "a conceptual computer model" not intended to rigorously model the groundwater at the site, but rather "to assess conceptually whether the observed O&G plume migration was reasonable ... A computer model was not developed for the GLCC site" p. 68, Vol. I. In another instance, which is more critical to the conclusions of the RI/FS, GZA used an analytical model which it admitted "due to the necessary simplifying assumptions employed in this model, accuracy of the results is limited;" (FS, Vol. VII, pg. 26).

The DYNFLOW/DYNTRACK model is extensively used by and/or relied upon by EPA at other similar hazardous waste sites, as was made known to the Federal District Court. EPA imposes confidentiality restrictions which prevents CDM from advising IMC at which sites the system is being used, but EPA Washington, D.C. well knows, if this RI/FS is ever reviewed by higher EPA authority than Region I, and the reviewing Court will know at the close of evidence.

Response: Having reviewed this application of the DYNFLOW/ DYNTRACK model during the development of the RI it was EPA's opinion that the model did not offer additional insight into site conditions. Further, DYNFLOW/DYNTRACK codes are proprietary codes that have not been released to the public for peer review and have not been exhaustively tested. As stated in a previous response, it was decided to use a numerical model which was less sophisticated than the DYNFLOW model since it required less demanding input data. Consequently, proportionally more real data was available as input data. This results in less chance of producing invalid data due to speculation on the input parameters. It should be noted that even though the calibration of the model approximates actual flow conditions, the basic assumptions on which the input parameters are based may not be valid. Therefore it follows that conclusions about site conditions may be

invalid if based on those same assumptions. Further, data developed subsequent to preparation of this model, and discussed in detail in the RI Addendum report, indicate that a transient flow condition exists at the site, with a contaminant plume currently migrating through the marsh toward Country Pond.

80. IMC Comment:

Alternative 7 should be rejected for the following reasons:

1. The proposed cap and upgradient groundwater interceptor trench will slow natural flushing and degradation of presently contaminated groundwater.

2. According to GZA (V.VII, Table 3, Part C) a trench is "to be considered both to collect contaminated groundwater downgradient of the site as well as clean groundwater upgradient of the site." This necessitates two results: 1) local gradients will indeed be affected, changing the hydrologic character of the area, and 2) contaminated water will be mixed with clean water and discharged as surface water directly to the environment.

3. The effectiveness of the trench is questionable in that if it is not successfully constructed it may permit "underflow beneath" (GZA V.VII, Appendix B, p.7) the trench, thereby failing to keep groundwater at or near seasonal low elevations.

4. According to GZA (V.VII, p. 78) "some bedrock blasting may be necessary to establish desired trench elevations". If taken to bedrock, the trench could lead to cross-contamination of the bedrock by contaminated overburden. An example similar to this was the contamination initially present in GZA bedrock wells after installation which tested clean during a second sampling.

5. Aeration may violate air emission standards, and is similar to the technique CDM used which GZA claims was unsuccessful (GZA V.II sec 3.4.4 p.7).

6. For the volatile organic compound trichloroethylene the soil concentration which will give a cancer risk level of 10^{-6} is 60 ppm. For the other compounds charged to IMC, the soil concentration would have to be substantially higher than 60 ppm, to have a comparable cancer risk level. Therefore, the soil criteria of 1 ppm for removal and/or treatment appears to be without basis.

7. Extraction of O&G site material and disposition of that material in a constructed landfill on the GLCC site is inappropriate as it is taking contamination from one property and placing it on another.

Response:

1. EPA has not adopted this alternative's cap or trench proposal and therefore will not respond to the criticism of these aspects of this alternative.

2. The reference is taken out of context. Table 3 refers to trenches as a general remedial technology and not specifically the proposed trench. There was no intent to recommend a single trench to intercept upgradient and downgradient groundwater. EPA agrees that such a system would be clearly unacceptable.

3. This condition is an acknowledged limitation which would be addressed in conceptual design.

4. Since the trench would be upgradient of the site, cross-contamination is not a significant concern with proper design.

5. Aeration operations would be performed consistent with applicable regulations and would be monitored as discussed in the FS.

6. It is not clear what the basis is for the 60 ppm criteria.

7. This is a legal distinction. EPA, in the RI/FS, has considered the O&G/GLCC site as a single site as listed in the National Priorities List. In that context, the comment is not relevant.

81. IMC Comment: Alternative 12 should be rejected for the following reasons:

Comments for Alternative 7 apply. In addition, the need of groundwater treatment is not warranted since the migration of contamination to Country Pond or off-site of IMC's marsh has not been demonstrated. Therefore, this alternative should be rejected.

Response: Groundwater contamination has been documented at monitoring well GZ-5 which is in Country Pond, at the marsh pond interface. The prospect for continued contaminant migration through the marsh to Country Pond is documented in the RI addendum report. Morover, a groundwater remedy is needed to eliminate the human health and environment risk that the site itself currently presents.

82. IMC Comment: Alternative 13 should be rejected for the following reasons:

Comments for Alternative 12 apply. With regard to the development of an alternative water supply the conclusion of this need is unwarranted by the fact that no residential wells are contaminated, and the court has found, on all the evidence that there is no threat of contamination of these wells.

Response: EPA agrees that there is no evidence that residential wells are currently impacted by site contaminants. However, EPA disagrees that the potential future threat can be discounted, based on:

- observed contaminant migration from the site toward Country Pond; this transient condition will result in discharge of VOCs to Country Pond in concentrations which may adversely affect overburden wells near Country Pond.

- observed contamination of groundwater in bedrock on-site and off-site; and uncertain bedrock groundwater flow patterns under the influence of pumping residential wells.

The above-mentioned conditions may not warrant implementation of an alternate water supply at the site, but a remedial response addressing these conditions and the potential threat to nearby residential wells should be considered for implementation.

83. IMC Comment: Alternative 14 should be rejected for the following reasons:

Comments for Alternative 13 apply.

1. For the volatile organic compound trichloroethylene the soil concentration which will give a cancer risk level of 10^{-6} is 60 ppm. For the other compounds charged to IMC, the soil concentration would have to be substantially higher than 60 ppm, to have a comparable cancer risk level. Therefore, the soil criteria of 1 ppm for removal and/or treatment appears to be without basis.

2. Conclusion unwarranted by the facts.

3. Not consistent with EPA position of source control.

Response:

1. The basis for the 60 ppm criterion is not clear.
2. It is not clear what conclusion is referenced.
3. EPA has extensively reviewed the RI/FS. Our understanding is that this alternative is consistent with FS guidelines and in fact is mandated for consideration.

84. IMC Comment: Alternative 15 should be rejected for the following reasons:

The technology proposed for incineration is not proven technology and is probably inappropriate due to the presence of low level PCB contamination. The technology has not been reported to have been successfully employed elsewhere in this country, to our knowledge.

Response: IR incineration has been employed on a commercial and pilot scale at approximately 25 sites. IR incineration of soils has been successfully implemented at several sites, and is currently contemplated for the Tibbetts Road Superfund site in Barrington, New Hampshire and the Baird and McGuire Superfund site in Hollbrook, Massachuesetts. Cost data for IR incineration is available.

85. IMC Comment: The IMC site clean-up work commissioned by IMC was performed from July through December 1984 and was undertaken to remove current and potentially future sources of contamination from the GLCC site. The major sources of contamination were anticipated to be drums with contents buried by others before 1973 and/or after 1976. Random, intact drums, crushed drums, miscellaneous debris, and highly to visibly contaminated soils were removed from the site. Contrary to GZA's assertions that "the excavations were not successful in locating areas of staged drums", the excavations disproved EPA claims of there being many hundred such "staged" drums, and located and removed the only two caches of "staged drums" that were on site, both obviously being of recent (post-1976) burial. Groundwater sampling data from before (CDM-1984) and after (GZA-1986) these excavations indicate that there was a decrease of high concentrations of VOCs in wells downgradient of the excavation site in accordance with excavation goals.

Response: The excavations referenced above in quotes are the pre-excavation test pits, not the general excavation of the site. In EPA's opinion, insufficient time has elapsed to assess the impact of the removal operations on groundwater quality. Post-excavation work performed by GZA (Section 3.0 of RI Addendum) indicates significant quantities of source material remain on-site.

86. IMC Comment: The data presented in Table 44 and Table 45 are insufficient to determine the degree of contamination remaining on the site. The levels of contamination in the soil were reduced. Table 45 (GZA V.II) lists contaminants found remaining at several test pits dug under the supervision of GZA. No methylene chloride was found. 1,1,1-trichloroethane was found in 3 of 8 samples with a maximum concentration of 11 ppm; trichloroethylene was found in 1 of 8 samples with a maximum concentration of 50 ppm; toluene was found in 6 of 8 samples with a maximum concentration of 77 ppm. The major contaminant, found in all samples, was xylene which had a maximum concentration of 730 ppm, averaging 177 ppm.

Response: Data are sufficient to assess the need for remediation and approximate costs for appropriate actions. The full degree of contamination will become more apparent during actual remediation.

87. IMC Comment: Also of note is that all GZA laboratory analyzed samples were taken at least at a depth of 4 feet or greater. A review of Table 44 indicates that the majority of high OVM readings were taken at a depth of 2 feet or greater. No data were presented to demonstrate surface contamination (<2 feet). GZA states (v. II, p. 5) that during test pit operations they segregated loam and surface soils after their removal and then receovered backfilled test pits with those same soils to prevent contaminated underlying soils from "direct exposure at the ground surface." If this surface layer of soil is "clean" enough to act as a deterrent to surface exposures of contamination, there is no justification for a costly and potentially redundant surface cover.

Response: The surface soil removed is the off-site loam cover brought to the site by IMC after their excavation operations. Six inches of loam are not considered an effective long term barrier against surface exposure to contaminants present at the site.

88. IMC Comment: GZA analytical data is inadequate for the purposes for which used because:

1. The RI/FS does not present or utilize data gathered by CDM in sampling rounds in September 1983, July/August 1984, December/January 1985. In addition, data and results of field investigations in November 1983 and by E.B. Fitzgerald and P.M. Williams are ignored.

2. Information contained in the report entitled "Groundwater Study, Kingston Steel Drum Site, Kingston, N.H." dated September 1984 and prepared by Peter J. Riordan was not recognized.

3. Wells B-1, B-2, B-4 and B-5 were never sampled by GZA.

4. Sampling rounds performed by GZA in 1985 and 1986 were of a very limited nature and therefore present an incomplete picture from which to reach conclusions and set forth the results presented.

Response: Please refer to comments 26 and 79 for responses to items 1 and 2, respectively.

With regard to item 3, the locations of monitoring locations B-1, B-2, B-4 and B-5, did not offer significant additional areal coverage considered necessary to arrive at conclusions regarding site conditions.

Sample rounds performed for the RI in 1985 and 1986 are limited in nature due to the purpose for which they were performed. Since on-site conditions had been previously characterized these later sample rounds were conducted to further assess groundwater quality conditions in shallow bedrock and the marsh. These data served the purpose for which they were collected, and indicated that the shallow bedrock was impacted by disposal operations at the site, and that the marsh plume is in a transient groundwater flow condition.

Summary of Major Comments Received during the Public Comment Period on the Prefered Alternative and EPA Responses to these Comments

1. Comment: IMC and the Generators have commented that various portions of the RI/FS are in conflict with the findings of the district Court in the first phase of the trail. IMC states that EPA is bound by those findings and that EPA has waived its right to appeal them.

   Response: At trial, the United States opposed the specific findings of fact at issue and respectfully preserves its right to appeal them. The United States has not waived its right to appeal these findings because no final judgement has yet been issued by the Court. Accordingly, any appeal of these factual findings would be interlocutory.

2. Comment: Separate remedies should be proposed for the Ottati & Goss site and for the Great Lakes Container Corporatiion site.

   Response: The two sites are in fact interrelated. The history of the two sites shows that Mr. Ottati and Mr. Goss began their drum reconditioning operation after working at the Great Lakes Container Corporation site. The two are physically adjacent and the soil on each is contaminated with volatile organic compounds. Contaminants from both sites have entered the same aquifer. Moreover, as the Court found, the Ottati & Goss plume crosses the northwest corner of the Great Lakes Container Corporation site and moves toward the marsh in the same direction as the Great Lakes Container Corporation plume. Therefore, the groundwater contamination originating from the Ottati & Goss site contributes to the contamination of the aquifer as a whole and the contaminated soil remaining on the Ottati & Goss site potentially contributes to further contamination of the groundwater moving toward the marsh. The two sites are listed jointly on the National Priority List. To treat them separately may result in additional and duplicative expense by installing separate facilities or conducting separate operations where unified facilities and operations are more cost-effective.

3. Comment: IMC states that the Court found it was not responsible for or liable for releases into the environment from the Great Lakes Container Corporation site which occurred prior to May 1973. IMC also commented that it was not liable for any release into the environment from the Ottati & Goss site. The Generators further comment that the RI/FS discusses remedial measures for arsenic and other metals which they claim not to have sent to the Ottati & Goss site.

   Response: The purpose of the RI/FS is not to assign responsibility, but to propose a remedy for conditions, regardless of the legal responsibility of any party. The RI/FS discusses remedies for all contaminants of concern, not liability. However, as a matter of law, the liable parties should be held responsible for remedial costs incurred at a site to which they sent their wastes unless they show divisible harm.

4. Comment: The Generators commented that institutional controls have been arbitrarily rejected by EPA as a matter or politics and policy.

   Response: EPA did not arbitrarily reject institutional land-use controls at the O&G/GLCC site. The use of institutional controls to protect the public from potential exposure and groundwater contamination rests within the discretion of the Agency. At the O&G site, as set forth in the ROD, EPA has determined that groundwater treatment is appropriate and should be undertaken at the site under SARA. As a consequence, the Agency has decided not to rely upon institutional controls. Significantly, the Agency is never required to use institutional controls. Rather, such controls may be used in certain circumstances that are not presented by this site.

   As noted in the ROD, a permanent remedy is practicable at this site. Consequently, EPA has selected such a remedy, rather than institutional controls, which would not significantly reduces the volume, toxicity or mobility of the hazardous substance, pollutants, or contaminants found at the O&G/GLCC site.

5. Comment: The Generators commented that there is a legal basis for applying land-use and institutional controls at this site. The NCP provides that remedial action for contaminated groundwater include "restrictions on the use of groundwater to eliminate potential exposures." 40 C.F.R. § 300.68(j)(1). Furthermore, the NCP authorizes the use of fences and other methods to maintain site security. 40 C.F.R. § 300.68(j)(4). Finally, institutional controls are in no way discouraged by Section 121 of SARA.

   Response: As stated in the comment above, Section 121 of SARA directs EPA to adopt permanent remedies to the maximum extent practicable and reflects a Congressional preference for remedies which significantly reduce the volume, toxicity, or mobility of hazardous substances. Contrary to the generators' assertion, EPA believes that this new Congressional directive does in fact discourage the use of institutional controls when such controls are not used in conjunction with a remedy that permanently and signficantly reduces the volume, toxicity and mobility of hazardous substances, pollutants, and contaminants. EPA believes that institutional controls may be appropriate in some circumstances (e.g., if it is not practicable to clean up a site and therefore institutional controls are the only way to prevent access to the contamination), but that they are not appropriate here.

6. Comment: The Generators comment that there is ample precedent for using institutional and land-use controls as part of the remedy at a number of sites, including the Second Remedial Action at the Charlevoix Site, ROD dated 9/30/85, the Second Remedial Action at the Western Processing Site, ROD dated 9/25/85, and the Remedial Action at Olean Well Field Site, ROD dated 9/24/85. See also EPA ROD Reports.

Response: Institutional controls have been employed at other sites including the three Superfund sites specifically mentioned in comments addressing the Preferred Remedy at the O&G/GLCC site. The Regional Administrator's decision to approve a remedy at a given site is based upon site specific conditions. Moreover, each of those RODs was adopted prior to the effective date of the revised NCP, February 18, 1986, or the effective date of SARA, October 17, 1986.

While both the Olean Well Field and Western Processing RODs envision the use of institutional or land-use controls, such controls are only to be implemented in conjuction with, not in place of, ground water extraction and treatment. Moreover, unlike the O&G/GLCC ROD, these RODs do not address the final remedy at their respective sites; they both stress the final remedy at their respective sites; they both stress the need for subsequent operable units. The Olean Well Field ROD calls for treating groundwater to an MCL of 5ppb for TCE, the same target level advocated in the O&G/GLCC ROD. That ROD only recommends instituting land-use controls to restrict the withdrawal of groundwater for drinking water purposes where MCLs are exceeded. The decision to adopt institutional controls as the central component of the Second Remedial Action at the Charlevoix Site was based upon three site characteristics not present at the O&G/GLCC site: (1) an abundant, alternative water supply, namely Lake Michigan, (2) contamination that upon entering Lake Michigan is not expected to pose a significant risk to public health or the environment; and (3) hydrology such that the pump and treat remedy will take 30 years.

7. Comment: The Generators commented that the site will not be developed for six reasons: (1) its long history of industrial uses and its status as an abandoned gravel pit; (2) the water table is very high under the site and the site is subject to seasonal flooding; (3) the marsh is heavily wooded and seasonally submerged under one foot of standing water; (4) the site would require extensive drainage and filling before development will take place; (5) a permit would be needed to dredge and fill the marsh; and (6) the close proximity of the Austin Powder company limits land use within 1000 feet of the company and makes the property undesirable for residential use.

Response: The site's long history does not prevent future use. Correspondence received from the State indicates the site is zoned residential, and it is located in an area of rapid development. EPA believes that there is a potential that the site will be developed despite its previous use. Second, the water table will not preclude development. The site has been used in the past and there is no reason to assume that it will not be used in the future. Developers or others could always bring in fill to address the water table concern. Third, the marsh would be difficult to develop in its present state. But, it is still possible that such development will occur. Concerning the need for a permit to dredge the marsh, to the extent that a permit would be required, it is possible that an interested party would obtain such permitting. Finally, the Austin Powder issue is discussed in comment 95.

Comments Related to the Risk Assessment for the Feasibility Study

Introduction

There were many comments received regarding the risk assessment developed for the O&G/GLCC site. These comments have been carefully reviewed. This section was written to respond to these comments as a group, as the majority of comments fell into a few major categories of concern which will be addressed in turn.

In order to derive an estimate of risk, three major components are needed. The first component is an estimate or measurement of an exposure concentration at the receptor location, for example, an estimate of drinking water concentrations at a residential well. Second, data on or estimates of exposure factors are needed, such as the quantity of water consumed from a residential well and over what time period. Third, an indication of toxicity or hazard is required in order to evaluate the exposure (such as consumption of well water) experienced by the person or persons. This indication may be in a variety of forms, such as drinking water standards or health advisories. For carcinogens, it is EPA's policy to assume that there is no threshold below which an effect will not occur. As a result, suspected carcinogenic compounds are evaluated by considering the probability of effect. The comments on the baseline risk assessment conducted as part of the O&G/GLCC Remedial Investigation were directed primarily toward assumptions in these three areas: the derivation of exposure concentrations; the choice of exposure factors; and the validity of toxicity indicators used for this evaluation. Comments on the first area, derivation of exposure concentrations, are related to estimates of contaminant transport and have been addressed earlier in the responses regarding the hydrogeologic analysis. The following responses address the major risk assessment related issues raised in the comments.

The Worst Case Scenario

Some commenters felt that the consideration of a worst case scenario is not consistent with EPA's current "Guidelines for Exposure Assessment"*, that the assumptions made were unreasonable, and that the worst case assumptions were compounded in each step of the risk assessment to result in a "grossly exaggerated" estimate of risk. Initially, the two scenarios for risk assessment were developed to take into consideration the uncertainty associated with movement of contaminated groundwater toward the pond. The observed case was a representation of the risk posed by the site at present, as well as sometime in the future if the site was at steady state, in other words, if no further net movement of contaminants was expected. The worst case scenario was developed to represent a possible future condition if contaminants continued to move toward the pond and if migration in bedrock did occur. Both of these scenarios were thought to be possible based on the data available at the initiation of the risk assessment. Further investigations at the site showed

*Federal Register 51: 34042, September 24, 1986.

that, in fact, contaminants were closer to the pond than previously thought and would eventually reach the pond. This additional information suggested that the Observed Case was not likely to be representative of future conditions, at least for those pathways related to the movement of contaminant in the overburden. However, as this scenario represented an estimate or risk based on current conditions it was still included in the risk assessment as a basis for comparison, and as a lower bound, if attenuation between the marsh and the pond in the overburden was significantly greater than expected, and if no migration of contaminants in bedrock did occur. The worst case scenario is, in fact, a more likely representation of possible future conditions.

One comment indicated that worst-case assessments are not encouraged by the guidelines. This is true, however, the guidelines do encourage the assessor to err on the side of public health. In "Guidelines for Exposure Assessment", in the section regarding worst-case estimates, it is stated, "the Agency will err on the side of public health when evaluating uncertainties where data are limited or nonexistent".* The "worst case scenario" did not truly represent a worst case risk assessment. It was the intent of this risk assessment to represent the "worst condition" than can reasonably occur. This is primarily done in situations where no data are available to indicate that a less conservative assumption is more likely. In other words, if uncertainty exists about future conditions, it is EPA's intent to protect public health in the event of the worst condition that could reasonably occur. The basis for the use of exposure concentrations under the worst case scenario is described in the RI Report and is further discussed in the preceding responses regarding hydrogeologic analysis of the site.

It should be pointed out that the two scenarios differed only in assumptions about exposure concentrations. The exposure factors and the toxicity indicators used were the same in both scenarios. If an absolute worst case was the intent of the risk assessment, the exposure factors could have been adjusted for the worst case scenario. As no such adjustment was made, the pyramiding of worst case assumptions mentioned by the commentors was only applicable to the estimates of exposure concentrations. EPA would agree that by piecing together various conservative assumptions the ultimate result may be more conservative than any one of the pieces, however, we do not argue that this makes the rationale totally improbable. Rather, EPA believes the exposure case presented in the RI/FS is, in fact probable, albeit conservative.

Some comments indicated that assumptions made in the risk assessment, particularly the worst case scenario, were unreasonable. Most of the assumptions mentioned were related to the estimates of exposure concentrations and have been addressed in the hydrogeologic related responses. Concerns regarding other assumptions will be discussed specifically in this section. Some comments stated that some of the assumptions lacked a scientific basis. This may be true, however, there is little or no "scientific basis" for many of the

*Federal Register 51: 34053, September 24, 1986.

assumptions required in an exposure and risk assessment, particularly when applied to a specific site. EPA has developed a list of standard values to use in daily intake calculations (Draft Superfund Public Health Evaluation Manual, December 18, 1985, page 75). The guidance states that "if more accurate site-specific information is available, it can be used to give a better representation of risk at the site." At this site, this site-specific information was not available, and therefore standard values were used. For example, there are no data that indicate residents in the area of the O&G/GLCC site consume 2 liters of water per day. However, based on available data on human consumption patterns in general, this is considered a reasonable assumption. The commentors did not provide alternative assumptions with any greater scientific validity than those used in the risk assessment.

Estimation of Cancer Risk

One commentor questioned the validity of the assumptions inherent in the risk assessment regarding the carcinogenicity of certain compounds as well as the unit risk factors used for those compounds. Specifically, the carcinogenicity of tetrachloroethylene, trichloroethylene, 1, 2-dichloroethane, chlorobenzene, and arsenic to humans was questioned. Trichloroethylene, tetrachloroethylene, and 1,2-dichloroethane have been classified by EPA scientists, in the EPA weight of evidence category of B2, as probable human carcinogens. This classification reflects that these compounds have sufficient evidence of carcinogenicity in humans. Arsenic has been classified in the EPA weight of evidence category of A, as a human carcinogen. A classification of A reflects sufficient evidence from epidemiologic studies to support a casual association between exposure and cancer. EPA's guidelines for carcinogen risk assessment state that "agents that are judged to be in the EPA weight of evidence classification Groups A and B would be regarded as suitable for quantitative risk assessment."* The evidence for the carcinogenicity of chlorobenzene is more limited. EPA has classified this in Group C as a possible human carcinogen, as there is limited evidence of carcinogenicity in animals. EPA guidance states that Category C compounds should be judged on a case-by-case basis. For this analysis, it was considered reasonable to include this compound as a carcinogen in the quantitive risk assessment.

In a related issue, one commenter suggested that the unit risk factors for the volatile organic compounds should be reduced by a factor of 10 based on pharmacokinetic data for trichloroethylene. The unit risks for these compounds used in the O&G/GLCC baseline risk assessment have been derived by EPA's Cancer Assessment Group. The Draft Superfund Public Health Evaluation Manual states that these toxicity values are the best available and are to serve as a consistent source for Superfund public health evaluations.

Risk from On-Site Conditions

One comment received stated that there was no significant on-site

*Federal Register 51: 33996, September 24, 1986.

risk and no need of a remedy. The basis that was given for this assertion was lack of evidence that children frequent the site, lack of contamination of surface soils, and the unlikely event of exposure to substantial doses from contact with soils on the site.

The O&G/GLCC risk assessment identified on-site conditions as a source of potentially significant risk for several reasons. Soil, sediment and surface water concentrations on-site are high for a number of contaminants.

The site is accessible to both humans and wildlife, thus presenting a potential source of exposure as there are residents in close proximity to the site. Obviously, the frequency and duration of visits to the site is unknown. In addition, the extent of contact with soil, surface water and sediment and the extent of soil ingestion are unknown. As a result, exposure could not be quantified with any degree of confidence. However, the fact that exposure concentrations are high on-site and the fact that activity patterns of nearby residents and wildlife may reasonably result in exposure, led to the conclusion that the site represented potentially significant risk. The fact that most of the soil data is sub-surface (1-2'), and the site has been covered with a 6" soil layer does not preclude exposure. Disturbance of the soil surface now or at sometime in the future (depending on the land use) may result in contaminant concentrations at the surface.

Duration of Exposure

Comments were received about the assumption of lifetime exposure in the baseline risk assessment. A discussion of the duration of time over which concentrations may be assumed to persist in groundwater given a continuous source was provided in the responses regarding the hydrogeologic assumptions. In addition, however, the comment stated that few adult residents would live 70 years beyond the onset of exposure as most of the residents in the area are likely to be adults 35 years old or older. As stated in the Draft Superfund Public Health Evaluation Manual (p. 54) "for purposes of evaluating individual risks for the no-action alternative at Superfund sites, groundwater concentrations should be estimated for at least 70 years. This period is selected because it approximates an average human life span, and it is the basis for establishment of acceptable chronic chemical intake (values)." It is assumed that the population will remain relatively stable, ie., those leaving will be replaced by those coming in, and that as a whole the population has the potential for lifetime exposure.

Exposed Population

Comments were received that suggested that the populations potentially exposed were smaller than those indicated in the baseline risk assessment. The extent to which the plume has been defined properly has been addressed previously. It was also suggested that summer residents, campers, workers outside the area would be exposed to lesser extent than year-round residents in the area 24 hours/day. This is true and reduced exposures for these populations could have

been estimated. However, there is a sub-population potentially exposed at the levels estimated in the baseline risk assessment. It is not EPA practice to calculate the number of individuals expected to get cancer, based on the increase in risk, above background, posed to individuals at the site.

Risk from Fish Consumption

The estimated risks associated with fish consumption were questioned by one commenter. The possibility of fish consumption as well as the amounts consumed were criticized. Discussions with the N.H. Fish and Wildlife Department indicated that fishing did occur in the pond, although no data are available on the extent. In addition, no data are available on fish consumption patterns in the area. The 6.5g/day of fish consumed is a standard assumption used and is based on national data. While, it may not be strictly applicable to this site, it is in fact a low value for fish-eaters, who may consume 100 g fish/day or more.* It is not possible to say that this exposure route does not exist, based on the available data. The assumption of 6.5 g/day was considered to be reasonable, in the absence of more detailed site-specific information. The commenters also questioned the likelihood of the accumulation of volatile organics in fish. It is true that no significant bioaccumulation over water concentrations would be expected, as the bioconcentration factors of these contaminants are generally less than five. However, low concentrations of these compounds can be expected in the fish tissue as they are detected in low concentrations in surface water.

Sampling has shown no detectable levels of volatiles in fish at 10-15 ppb detection limits, however, sampling has been limited. Estimated concentrations in fish were used initially, as no data were available. They were included in the risk assessment as the fish sampling was not sufficient to conclude a lack of contamination. The estimates were based on surface water concentrations observed at M-5. While little surface water contamination has been observed at M-4, further out in the pond volatiles have been observed in the sediment, further substantiating the possibility of low level fish contamination, at least in a limited area.

Alternative Risk Assessment Values

One commenter presented some alternative risk calculations for groundwater exposures. The aggregate risk under a variety of alternate assumptions ranged from 1.5×10^{-7} to 4.2×10^{-6}. The conclusion was that these risks are so low that they do not justify a groundwater remedy. This is not the case for several reasons. First, there is considerable uncertainty in any estimates of risk, as much as an order of magnitude as stated by the commenter. Second, EPA takes into account many different factors when determining the need for clean-up at a site. In the feasibility study, remedial

*Pao, EM, Fleming, KH, Guenther,PM et al. Foods Commonly Eaten by Individuals: Amount Per Day and Per Eating Occasion. USDA Home Economics Research Report, no.44, 1982.

alternatives are developed to reduce chemical concentrations at the site to levels associated with a carcinogenic risk range of 10^{-4} to 10^{-7}. Based on a detailed analysis of the site, EPA must determine which risk level is appropriate, and may choose a more or less conservative level as a result of uncertainties regarding the site.

Arsenic Risk Assessment

Questions raised regarding the carcinogenicity of arsenic have been addressed previously. Two additional comments were received relating to the arsenic risk assessment. First, it was suggested that the arsenic found in down-gradient wells "may derive from natural or man-made sources other than the O&G/GLCC site." Soil data on-site do not show levels exceeding presumed background soil levels as stated in the report. However, down-gradient groundwater levels show an increase over upgradient levels, and also seem to indicate higher concentrations closer to the site. Based on this data, although limited, arsenic was included in the quantitative risk assessment. Second, a commenter pointed out an apparent error in the arsenic calculation shown on Table 39. There is not an error in the calculation. The unit risk value for arsenic given on that page is presented incorrectly. It should be 1.5×10^{-2} $(ug/kg/day)^{-1}$ as shown in Table 29 of the RI. Using this unit risk value, the estimated excess lifetime risk of cancer is correct as shown in Table 39.

Chemicals Addressed in the Risk Assessment

One commenter suggested that selective changes were made of the compounds used to calculate excess cancer risk. The baseline risk assessment states that the chemicals specifically identified for each exposure pathway were considered in the risk assessment evaluation. Therefore, the same set of chemicals was not used throughout the risk assessment as a whole. A set of relevant compounds was identified for each pathway and followed through to develop the risk characterization for that specific exposure pathway.

SUMMARY OF THE MAJOR COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD ON THE PREFERRED REMEDY FROM OCTOBER 29, 1986 TO DECEMBER 5, 1986 AND EPA RESPONSES TO THESE COMMENTS.

The firm of Goodwin, Procter & Hoar submitted comments on behalf of General Electric Company, Lilly Industrial Coatings, Inc., Solvents Recovery Services of New England, and K.J. Quinn & Company, Inc. (the Generators).

89. Comment: The Generators commented that the Ottati & Goss plume does not present a risk because the Ottati & Goss plume does not cross under Route 125 and will never reach Country Pond, much less any drinking well.

Response: Please refer to responses to Generators' comments 30 and 42 on FS. In addition, the Ottati & Goss plume presents a risk to human health and the environment on the O&G and on the GLCC property.

90. Comment: The Generators commented that the GLCC plume does not present a risk because ground-water contamination will be dissipated by the natural processes of dilution, surface water discharge, volatization and attenuation in the peat marsh.

Response: Please refer to responses to Generators comments 3 and 73 on FS, and to Response 89 above.

91. Comment: The Generators commented that the Court's Findings are binding for purpose of review of EPA's Preferred Remedy.

Response: The United States believes that the Court ruled that its Findings are binding for Phase 2 of the litigation.

92. Comment: The Generators commented that the "worst-case" exposure assessment relies on a pyramiding of speculative and unjustified assumptions that contradict both the data and accepted scientific principles.

Response: Please refer to previous responses on risk assessment.

93. Comment: The Generators commented that limits on site access and institutional land-use controls would fully protect the public against any risk from on-site contamination.

Response: Section 121(b) of SARA states that the selection of a remedial action be protective of human health and the environment, is cost effective, and utilizes permanent solutions and alternative treatment technologies. The EPA does not believe that limits on site access and the use of institutional controls are permanent remedies to protect human health and the environment. See the ROD generally for a response to this comment.

94. Comment: The Generators commented that EPA's lack of action to limit access to the site and the marsh are proof that

EPA has exaggerated the risk from exposure to contaminated soil and ground water on the site.

Response: Based on the previous removal of all barrels and the covering of the site with clean gravel, it is not felt the short-term risk exposure is significant. In addition, EPA's remedy is not based upon the existence of a current risk to public health, but rather a potential for future risk should the site or areas in proximity of the site be developed.

95. Comment: The Generators commented that for numerous reasons there is no realistic likelihood that the site will ever be developed for residential property.

Response: The Generators claim that the site's proximity to the Austin Powder Company where explosives are stored brings it within the scope of "RSA 158:8 which limits land use within 1,000 feet of the manufacture and storage of explosives." The Generators have misstated both the citation and substance of the relevant statute. RSA 158:8, identified by the generators as the controlling law, was repealed in 1955. The applicable statute, RSA 158:9 prohibits the storage of explosives in any "dwelling house, tenement house, apartment building, office building, shop or store, or in or within 500 feet of any building used in whole or in part as a school, theater, church, public building or other place of public assembly." In any case, whatever the actual distance limitations are, they would not prevent the use of the O&G/GLCC site for residential purposes. The regulations applicable to the storage of explosives operate to limit the amount of explosives that Austin Powder can store rather than to limit the use to which the O&G/GLCC property can be put.

96. Comment: The Generators commented that institutional and land use controls are a viable component of a remedy for the site, and that EPA has arbitrarily rejected them as a matter of politics and policy.

Response: As previously stated, the use of only institutional controls is not considered by EPA to be a permanent remedy. Therefore, the selected remedy must address both the soil and groundwater contamination on and off site.

97. Comment: The Generators commented that CERCLA as amended does not require that all remedies satisfy any particular performance standards.

Response: EPA agrees that SARA does not specify standards that have to be attained. SARA requires that at the completion of the remedial action, a level or standard of control be attained that complies with legally applicable or relevant and appropriate standards, requirements, criteria or limitations. The determination of the relevant and appropriate standards, requirements, criteria or limitations

is made on a site specific basis and is based on the circumstances of the release or threatened release of such hazardous substance or pollutant or contaminant.

98. Comment: The Generators commented that the National Contingency Plan does not require that a remedy satisfy any particular performance standards.

Response: The NCP (November 1985) is in the process of being revised to reflect the amendments to SARA. The NCP §300.68 (i) requires the selection of a remedy that attains or exceeds applicable or relevant and appropriate Federal public health and environmental requirements that have been identified for the site.

99. Comment: The Generators commented that water quality criteria established under the Clean Water Act are neither relevant or appropriate to this site.

Response: Please see the ROD for a discussion of the role of Water Quality Criteria.

100. Comment: The generators commented that Maximum Contaminant Level Goals under the Safe Drinking Water Act are neither relevant, or applicable to this site.

Response: See the discussion of MCLGs in the ROD for EPA's view as to the role of MCLGs in connection with this site.

101. Comment: The Generators commented that RCRA regulations regarding ground-water monitoring requirements (40 C.F.R. 264.100) and ground-water concentration limits (40 C.F.R. 264.94) are inappropriately applied to the site.

Response: EPA believes that the RCRA groundwater monitoring requirements and concentration limits are relevant and appropriate. The waste disposal activities at the site were sufficiently similar to RCRA disposal activities and the groundwater protection requirements should be attained. See the ROD for a discussion of this issue.

102. Comment: The Generators commented that RCRA regulations regarding surface impoundments (40 C.F.R. Part 264 K) are inappropriately applied to the site.

Response: See the ROD for a discussion of this issue.

103. Comment: The Generators commented that Alternate Contaminant Level provisions in SARA 121(d)(2)(B)(ii) are appropriate and should have been used by EPA.

Response: Concerning Section 121(d)(2)(B)(ii)'s apparent limited authorization to set ACLs by assuming a point of exposure beyond the boundary of the facility, this provision

allows the Agency, in its discretion, to set ACLs at a point beyond the boundary of the facility. First, this provision is inappropriate because on-site groundwater contamination needs to be cleaned up. Moreover, this site does not meet the three conditions for setting such ACLs. First, concerning the condition contained in Section 121(d)(2)(B)(ii)(II), based upon the record, EPA is not prepared to conclude that the existing measurements or projections establish that there is or will be no statiscally significant increase of such constituents from such groundwater in such surface water at the point of entry of at any point where there is reason to believe accumulation of constituents may occur downstream.

EPA also does not believe that subparagraph (III)'s requirement that the remedial action include enforceable measures that will preclude human exposure to the contaminated groundwater at any point between the facility boundary and all known and projected points of entry of such groundwater into surface water can be met. Exposure to the contaminated groundwater could occur in the marsh between the site boundary and Pond, in wells that could be installed along the sides of the marsh, and in the outlet to the Pond. EPA does not believe that any of the current measures will preclude human exposure.

In short, EPA believes that Congress intended that ACLs using a point of exposure beyond the facility boundary only be used when the Agency has a high degree of confidence that all of the three 121(d)(B)(ii) conditions are present at a site, and when the groundwater under the site itself is not going to be cleaned up. Here, EPA does not believe that these three conditions exist, and it also intends to clean up the groundwater under the site. Consequently, the Agency believes that setting ACLs beyond the site boundary is not appropriate. Such a position is buttressed by the State requirement that Route 125 should be the compliance point.

104. Comment: The Generators commented that New Hampshire Water Quality Standards cited in the Preferred Remedy are neither relevant or appropriate. The Generators further stated that the State of New Hampshire has not consistently applied these standards to other Superfund remedial actions in the State.

Response: Please see the ROD for a discussion of State standards.

105. Comment: The Generators commented that EPA's selection of the 1ppm-VOC soil criterion surpasses the 10^{-5} risk level EPA is applying and reduces the risk level to approximately 10^{-6}.

Response: EPA's selection of a 1ppm VOC soil level appears to be inconsistent with the results of the "model" used in the

RI/FS because the point(s) at which the groundwater to cleanup goals at to be met differ. The "model" in the RI/FS uses the marsh/pond interface as the compliance point whereas the Preferred Remedy requires that the groundwater under the site meet the groundwater cleanup levels. Thus the reduction in soil cleanup goals. EPA believes that the lppm is consistent with the selected groundwater cleanup goals.

106. Comment: The Generators commented that the use of uncontrolled tilling-type aeration will be effective in achieving a soil treatment goal of 7 ppm and will not pose a public health problem from VOC emissions.

Response: The use of this type of aeration to achieve a level of 7 ppm may be feasible. However, EPA has set the soil level criterion of 1 ppm, not 7 ppm. EPA is not certain that the tilling-type aeration process would be able to achieve the 1 ppm soil residual. In addition, EPA believes that uncontrolled releases from this type of operation could present a public health hazard.

107. Comment: The Generators commented that a pilot survey of mechanical aeration is unnecessary since EPA already has information on the performance of the McKin-type system.

Response: It is possible that an extensive pilot study for the aeration system may not be required. All previous pilot data will be reviewed to determine the extent of future pilot studies. However, sound engineering practices would dictate that a pilot study be conducted to develop detailed design criteria.

108. Comment: The Generators commented that the use of the McKin-type aeration system is unnecessary because of the remote nature of the site from human receptors, and the rapid, natural dispersion of the VOCs.

Response: EPA does not share the Generator's belief that the site is remote. The area does contain residential and commercial establishments which would potentially be affected by air emissions. Please also refer to response to Generators comment 18 in the FS.

109. Comment: The Generators commented that the initial step of the ground-water treatment train will remove substantial amounts of arsenic and other inorganics and heavy metals and therefore ion-exchange would be redundant.

Response: The proposed treatment train is only conceptual. Treatability studies prior to design will be necessary to determine which unit processes will be necessary to achieve the level of treatment required.

110. Comment: The Generators commented that arsenic detected in the ground water is probably of natural origin.

Response: At on-site locations GZ-11, GZ-12, and GZ-13 in Table 7 of the RI report indicate average concentrations are over 50 times higher than arsenic concentrations at upgradient location GZ-8. Additionally, arsenic concentrations at these locations exceed EPA Primary Drinking Water Standards. Elevated concentrations of arsenic have also been observed immediately downgradient of the site. Therefore, it is likely that the arsenic observed on-site and downgradient of the site is not of natural origin. Please also refer to response to related comment 44.

111. Comment: The Generators commented that since pentavalent arsenic occurs in nature more commonly in the United States than the trivalent arsenic, which Dr. Calabrese testified as being of greater cancer concern, EPA needs to determine what type of arsenic was found at the site.

Response: Although it may be useful to determine which type of arsenic is located on-site, discussion with Dr. Calabrese indicated that it is not essential to perform additional testing.

112. Comment: The Generators stated that Kenneth Carr testified that, at present, he is unable to say that there is any present harm to fish and wildlife in the marsh or in the pond.

Response: The statement is incorrect that Mr. Carr testified that there is no present risk or harm to fish and wildlife at the site. He did testify that he had formed a scientific opinion whether fish and wildlife are presently being harmed by contaminants emanating from the site (Page 203 Carr deposition).

113. Comment: The Generators stated that Kenneth Carr's testimony and existing data weaken EPA's position on the risk to fish and wildlife in the marsh.

Response: Mr. Carr testified that he was unable to say whether or not there was any harm to fish and wildlife in the marsh and pond (page 204 Carr deposition). This is based on his opinion that studies have not been conducted to address the question. However, Mr. Carr did state that the potential for harm to fish and wildlife exists (pages 184-185 of deposition), and the general lack of data regarding interactions or additive effects of certain toxins is cause for concern regarding potential damages to fish and wildlife (pages 82, 91, 99, 100, 155, 173-175 of deposition).

114. Comment: The Generators stated that Joanne Perwak testified that she used GZA's exposure estimates and projections in writing the Baseline Risk Assessment without assessing these estimates and therefore, could not appraise the probability of the "worst case" scenario occurring.

Response: Arthur D. Little, Inc. had a subcontract with GZA to conduct a risk assessment for the O&G/GLCC site. GZA was to provide input to Arthur D. Little regarding contaminant transport and concentrations. Ms. Perwak, who was primarily responsible for the work, is a risk assessment specialist and is not qualified to evaluate their assumptions regarding the migration of contaminants from the site and the resultant concentrations. Nor was Arthur D. Little, Inc. asked to function in a review capacity for GZA's work in this area. As a result, Ms. Perwak could not appraise the probability of the "worst case" scenario occuring, at least as far as the derivation of exposure concentrations is concerned.

International Mineral & Chemical submitted the following comments.

115. Comment: IMC commented that the term "worst case" is not defined in the RI/FS or EPA guidance documents, but that, by most accepted definitions of "upper bound" and "best estimate", EPA has overstated the "worst case".

Response: The meaning of the term worst case is defined in the risk assessment document. As a result, comparison with various "common" interpretations of the term is irrelevant EPA cannot have overstated "worst case". Perhaps the commenter meant to suggest that EPA's "worst case" estimate overstates a "best estimate". The terminology is confusing. It was the intent of the risk assessment to represent the "worst condition" that could reasonably occur. As uncertainty existed about future conditions, it is the intent to protect public health in the event of the worst condition that could reasonably occur.

116. Comment: IMC commented that EPA has selectively used available information to support its position and has ignored testimony, exhibits and the Court's Findings in U.S. et al. vs. Ottati & Goss, Inc. et al.

Response: EPA has not based this ROD on selective information, but, on all available information including testimony and exhibits introduced in United States v. Ottati & Goss, Inc., and all comments submitted to the EPA on the Preferred Remedy. All of these documents are part of the administrative record. EPA believes that the information in the administrative record supports its remedy under the applicable or relevant and appropriate legal standards. At trial, the United States opposed certain findings of fact and preserves its right to appeal them.

117. Comment: IMC commented that EPA has not responded to comments on the RI/FS submitted by IMC and the Generators.

Response: All of the previous comments submitted by IMC and the

118. Comment: IMC commented that there is no reference in the Preferred Remedy to the "best estimate" of risks and exposures which are most likely to occur.

Response: See previous risk assessment comments.

119. Comment: IMC commented that the "observed case" was not considered in selecting the Preferred Remedy.

Response: EPA's rationale for remedy selection is contained in Section VI of the Record of Decision. The "observed case" as well as the potential future case were considered in the selection process.

120. Comment: IMC commented that EPA omitted field data collected by CDM under contract to IMC in the RI/FS. (p.15)

Response: Please refer to response to Generators comment 26 on FS.

121. Comment: IMC commented that values for volatile vapor scans and VOC sample analysis of test pits are unrepresentative because recorded values and the samples that were analyzed do not represent average conditions.

Response: IMC is correct in observing that VOC scanning and analysis data do not represent "average" conditions in the excavated test pits. However, EPA believes that this does not preclude the extent to which the data are representative of the site conditions. EPA's intent was to characterize soil conditions at specific depth intervals, generally two and four feet below the ground surface. As such, screening techniques were employed to characterize general VOC content in strata encountered at these depths. Recorded readings were not necessarily indicative of the highest observed reading but were intended to be representative of conditions within the specific depth interval. The result of such an approach was that an essentially random VOC scanning survey was performed with respect to the soil conditions in the specified depth intervals across the site.

GZA's observations indicated that average conditions within individual test pits were not readily definable since the fill is not uniformly contaminated, often with significantly contaminated soil juxtaposed with relatively clean soil. For this reason it is possible that significantly contaminated soil existed in the test pits at depth intervals which were not tested as part of the VOC scanning survey.

For the purposes of site remediation, these data indicate that contaminated soil remains over the greater portion of the site which likely continues to

serve as source areas for groundwater contamination. The fact that such contaminated zones are discontinuous would affect the final quantity of soil in need of remediation and not the actual need for remediation.

122. Comment: IMC commented that the planned excavation depicted on Figure 6 of the Preferred Remedy is not based on a systematic investigation, but rather on a mere assumption that source contaminants "may" be found. IMC also commented that the planned O&G excavation is not shown on Figure 6 of the Preferred Remedy.

Response: The planned excavation area shown on Figure 6 of the Preferred Remedy is intended to depict the general area within which VOC concentrations which are at or greater than 1 ppm. This area has been characterized using the

data generated from an organic vapor meter (AID Model 580) field screening and GC/MS analyses conducted on selected samples during the post-IMC clean-up test pit exploration program.

EPA acknowledges that soils with VOC concentrations less than 1 ppm may be found within the area depicted on Figure 6 of the Preferred Remedy, as indicated in the response to the previous comment. This condition is a result of the complex disposal history, usage patterns and clean-up efforts at the site. However, data do not exist which allow greater resolution of the area (or areas) within which soils with VOC concentrations at or above 1 ppm exist. Therefore, the clean-up area presently depicted on Figure 6 of the Preferred Remedy is considered reasonable and likely conservative with respect to available site data. GZA has stated in the FS report that a systematic soil survey should be conducted prior to excavation and treatment A final determination as to how much soil must be excavated and treated will be made after the soil survey has been completed.

123. Comment: IMC commented that, according to Papadopulos' comments of September 1986, the estimate of average concentration of VOC's at the O&G site is in error by an order of magnitude.

Response: Please refer to Generators comment 47 on FS.

124. Comment: IMC commented that CDM has shown that current representative concentrations in the soil at GLCC site is half the maximum used by GZA.

Response: This comment pertains to IMC's comment concerning values for volatile vapor scans and VOC sample analysis of test pits by GZA. IMC contends that these values and analyses are unrepresentative because recorded

values and the samples that were analyzed do not represent average conditions.

As indicated above, IMC is correct in observing that VOC scanning and analysis data do not represent "average" conditions in the excavated test pits. However, EPA believes that this does not preclude the extent to which the data are representative of the site conditions. EPA's intent was to characterize soil conditions at specific depths intervals, generally two and four feet below the ground surface. As such, screening techniques were employed to characterize general VOC content in strata encountered at these depths. Recorded readings were not necessarily indicative of the highest observed reading but were intended to be representative of conditions within the specific depth interval. The result of such an approach was that an essentially random VOC scanning survey was performed with respect to the soil conditions in the specific depth intervals across the site.

GZA's observations indicated that average conditions within individual test pits were not readily definable since the fill is not uniformly contaminated, often with significantly contaminated soil juxtaposed with relatively clean soil. For this reason, it is possible that significantly contaminated soil existed in the test pits at depth intervals which were not tested as part of the VOC scanning survey.

For the purposes of site remediation, these data indicate that contaminated soil remains over the greater portion of the site which likely continues to serve as source areas for groundwater contamination. The fact that such contaminated zones are discontinuous would affect the final quantity of soil in need of remediation and not the actual need for remediation.

125. Comment: IMC commented that using the values presented in the RI/FS, a total mass for TVOC is calculated to be 1400 kg while CDM values produced a calculated mass of 674 kg.

Response: Please refer to Generators comment 5 and related comment 4 on FS.

126. Comment: IMC commented that the RI/FS estimate of the flow beneath Route 125 (43,200 gpd) is below the average flow calculated by the DYNFLOW calibrated flow model (100,000 gpd).

Response: Please refer to IMC's comment 78 on FS.

127. Comment: IMC commented that EPA estimates of down-gradient concentrations are in error by a factor of two since EPA did not use the calibrated mass transport model.

Response: Please refer to IMC's comment 78 on FS.

128. Comment: IMC commented that only 20% of the contaminated water passing beneath Route 125 reaches the marsh/pond interface not 100% as assumed in the RI/FS, and that this is supported by testimony of Dr. Guswa, Mr. Sanborn of GZA, and the Court's Findings.

Response: Please refer to response to comment 73 on FS. In deposition testimony Mr. Sanborn had indicated somewhat less than 100 percent of the contaminated groundwater passing beneath Route 125 would reach the marsh/pond interface; however, for purposes of the worst case exposure assessment characterization, assuming that 100 percent of the contaminated groundwater would reach the marsh/pond interface was a conservative but, in the context of the worst case scenario, reasonable assumption.

The RI/FS does not make any explicit assumptions regarding how much of the water reaches the pond as groundwater discharge or surface water flow which results from groundwater discharge to the marsh of North Brook. This particular RI/FS calculation was done to make a worst-case estimate of the mass of contaminants which could reach the pond. This calculation, and the underlying assumptions, were not used in any manner to estimate groundwater concentrations at the marsh/pond interface.

129. Comment: IMC commented that EPA overestimated exposure concentrations by a factor of at least fifty because the ratio of contaminant concentrations between well GZ-5 and potential human receptors (represented by wells GZ-1 and GZ-2) is actually 0 not 1/50.

Response: Please refer to responses to Generators comments 5, 7, 8, 9 and 11 on FS.

130. Comment: IMC commented that EPA overestimated the calculated excess lifetime cancer risk by a factor of ten as noted in Dr. Jaeger's comments on the RI/FS.

Response: Please refer to responses to risk assessment.

131. Comment: IMC commented that there exists no credible evidence that TCE is a carcinogen.

Response: Please refer to responses to risk assessment.

132. Comment: IMC commented "the low dose extrapolation model used by EPA... is acknowledged universally as one that usually overstates risks."

Response: The EPA dose-extrapolation model may be considered as more conservative than other models, but it is not "acknowledged universally as one that usually overstates risks". This statement implies that the true risk is known and there is no general agreement as to which extrapolation model best represent human risk from chemical exposure. The unit risks used in the risk assessment were developed by EPA and are recommended in the Superfund Public Health Evaluation Manual in order to provide a consistent basis for health assessments. Deviation from them can be justified on a site-specific basis, but not such basis is available for the O&G/GLCC site.

133. Comment: IMC commented that EPA, in calculating risks at the upper confidence limit rather that the maximum likelihood estimate, overestimated risk by a factor of two.

Response: Please refer to responses to risk assessment.

134. Comment: IMC commented that human exposure to the compounds at the O&G/GLCC site cannot be continuous for a lifetime.

Response: Human exposure for a lifetime (70 years) was used to estimate risk and associated clean-up levels. GZA agrees that human exposure to the compounds at the O&G/GLCC site may not be continuous for a lifetime. However, this is superfluous with respect to risk calculations. It was assumed that all soil contaminants will be leached from the unsaturated zone within 70 years, which would result in a full lifetime exposure as defined in the Baseline Risk Assessment. Leaching of contaminants from the site in a shorter time period would produce higher contaminant concentrations, with a reduced exposure time. Because risk calculations are linear (at the contaminant concentrations considered in this analysis), the resulting risk estimate would be the same. Contaminant leaching periods of greater than the maximum lifetime exposure of 70 years would result in lower contaminant concentrations and hence, offer a less conservative analysis.

Please also see responses to Generators comments 5, 6 and 11 on FS.

135. Comment: IMC commented that EPA overestimated human exposure to contaminants through the consumption of fish since 1) VOCs do not concentrate in the edible portion of fish and 2) that EPA overestimated fish consumption.

Response: It is true that no significant bioaccumulation to levels greater than water concentrations would be expected for VOC's, as their bioconcentration factors are generally less than five. However, low concentrations of these compounds may be expected in fish exposed to low water concentrations.

No data are available on fish consumption patterns in the area, although discussions with the N.H. Fish and Wildlife Department indicated that fishing did occur in the pond. The 6.5 g/day of fish is a common assumption used and is based on national data. While it may not be strictly applicable to the site, it is in fact, a low value for fish-eaters who may consume 100 g/fish/day or more. It appears that 6.5 g/day does not overestimate fish consumptions, at least for some subpopulation.

136. Comment: IMC commented that, since tetrachloroethylene has never been found at the marsh/pond interface, the excess lifetime cancer risk attributed to tetrachloroethylene is zero.

Response: Tetrachloroethylene has been observed in groundwater both on-site and in the marsh. Therefore, migration of tetrachloroethylene from the marsh and the site to the marsh/pond interface is considered probable. Regardless, the remedy selected provides for clean-up of ground water both on and off site to a 10^{-5} risk level.

137. Comment: IMC commented that the total mass of TVOC used in the FS has been inflated by GZA. The RI/FS fails to consider simple mass balance requirements.

IMC asserts that based on the results of calibrated groundwater flow and mass transport models of the study area by CDM, which were accepted as reasonable representations of the system by both the Court and, now, by the government's expert witness Guswa, a total mass of 10,000 kg TVOC entered the groundwater over a 30 year period of operation. This results in a average input of 333.3 kg/yr. Based on data in the FS, the inflated estimate of TVOC remaining on-site is 1400 kg. Distribution of this mass over a 70 year period results in an input of 20 kg/yr, over 1 order of magnitude less than has previously occurred, during 30 years of operation. There is consequently no basis for assuming that contamination of these site will worsen. Even assuming no natural attenuation of the source and a uniform rate of input (as was done by EPA in the RI/FS), thirty years from now downstream contamination can only be 6% of what it is now, better by over an order of magnitude.

Response: GZA did not estimate the quantity of contaminant

mass released into the on-site soils and ground water over the approximately 30-year time period during which contaminant disposal took place, nor did GZA estimate the quantity of contaminant mass remaining in on-site soils. Both of these quantities are considered unknowns due to the long and complex disposal history at the site.

Please also refer to responses to Generators comments 4, 5, and 15 on FS.

138. Comment: IMC commented that no control measures are required to achieve the required excess lifetime cancer risk at the marsh/pond interface and at any potential human receptors as indicated in its comments on the RI/FS.

Response: Please refer to Generators comment 15 on FS.

139. Comment: IMC commented that EPA is implying, through innuendo, that the presence of benzene, tetrachloroethylene, trichloroethylene, arsenic and other compounds at the O&G/GLCC sites are of greater risk to human health than in fact they are.

Response: This comment appears to question the carcinogenicity of tetrachloroethylene, trichloroethylene, chlorobenzene, and arsenic to humans. Of these, trichloroethylene and tetrachloroethylene have been classified by EPA scientists in the EPA weight of evidence category of B2 as being probable human carcinogens. This classification reflects their belief that these compounds have sufficient evidence of carcinogenicity in animals, but inadequate evidence of carcinogenicity in humans. Arsenic has been classified in the EPA weight-of-evidence category of A as a human carcinogen. The classification of A represents sufficient evidence from epidemilogic studies to support a casual association between exposure and cancer. EPA's guidelines for carcinogen risk assessment state that "agents that are judged to be in the EPA weight-of-evidence classification Groups A and B would be regarded as suitable for quantatitiv risk assessment." The evidence for the carcinogencity of chlorobenzene is more limited. EPA has classified this in Category C for limited evidence of carcinogenicity in animals. EPA guidance states that Category C compounds would be judged on a case-by-case basis. All factors considered, it was deemed a reasonable assumption to include this compound as a carcinogen in the quantitative risk assessment.

140. Comment: IMC commented that the "worst case" is based on unreasonable assumptions concerning bedrock, well, and Country Pond contamination.

Response: Please refer to responses to Generators comments 13,

14 and 41 in regard to assumptions concerning bedrock contamination. Please refer to responses to comments 4, 5, and 15 in regard to estimates concerning the quantity of contaminant mass remaining on-site. Please refer to responses to comments 5,7,8,9, and 11 in regard to assumptions concerning estimates of Country Pond surface water contamination. Please refer to response to comment 70 concerning measured surface water contamination in Country Pond. Finally, please refer to response to comment 72 regarding contamination of Country Pond fish.

141. Comment: IMC commented that the proposed remedy has not been proven to be feasible since there are no analyses which evaluate the process from an engineering or scientific basis.

Response: Alternatives were developed only to a degree which would allow for an assessment of effectiveness and cost which is consistent with the purpose of a feasibility study. EPA maintains that groundwater extraction, as well as the components of the proposed groundwater treatment train, are proven technologies. Therefore, additional or more specific engineering analyses exceed the intended scope of the feasibility study, and are considered more appropriate for the design phase of the project.

142. Comment: IMC commented that the proposed cleanup would seriously damage the marsh since the peat deposits are unstable and compressible and that flooding may occur due to a general settling of the entire marsh.

Response: EPA agrees that settlement of peat in the marsh is a consideration with respect to groundwater extraction and treatment in the marsh area. This issue will be addressed fully in the design and pilot scale treatability studies.

143. Comment: IMC commented that no data in the RI/FS indicates the presence of downward gradients.

Response: Vertical gradients between groundwater in bedrock and the overburden have been observed as downward, from the overburden to the bedrock, as well as upward, from the bedrock to the overburden. The observed vertical gradients are considered indicative of a potential for flow between the two media. Data from Tables 4 and 5 of the RI report (Vol I) indicate that there is considerable spatial and temporal variability in vertical hydraulic gradients in bedrock in the study area. Both upward and downward gradients between bedrock and overburden have been observed. Marsh and pond bedrock monitoring points (GZ-4 and GZ-5) have consistently shown a slight upward flow gradient on the order of 0.004 to 0.006 ft/ft, indicating a potential

for bedrock groundwater discharge into the overburden east of Route 125. For on-site monitoring points, GZ-8 has consistently shown a strong downward flow gradient (up to 0.04 ft/ft) while GZ-11 has consistently shown a strong upward flow gradient (up to 0.17 ft/ft). GZ-12 has exhibited both upward and downward flow gradients.

While upward flow gradients appear to predominate,

contamination observed within bedrock supports the conclusion that, at least locally, downward hydraulic gradients occur.

144. Comment: IMC commented that EPA figures for site conditions are pre-1984-1985 data, that they are maximum concentrations not averages, and that the concentration of benzene (950 ppb) is resultant of EPA's crushing pit/cleanup activity in May-July 1982.

Response: EPA agrees that the contaminant concentration values for site conditions stated in the Preferred Remedy are maximum concentrations, not averages, and that these values are primarily based on pre 1984-1985 data.

145. Comment: IMC commented that the ground-water treatment and extraction should not be employed at the site since it has not been proven to be technically feasible.

Response: Aternatives were developed only to a degree which would allow for an assessment of effectiveness and cost which is consistent with the purpose of a feasibility study. EPA maintains that groundwater extraction, as well as the components of the proposed groundwater treatment train, are proven technologies. Therefore, additional or more specific engineering analyses exceed the intended scope of the feasibility study, and are considered more appropriate for the design phase of the project.

146. Comment: IMC commented that VOC soil concentrations presented as being on site in the Preferred Remedy are exaggerated and not current.

Response: EPA agrees that VOC soil concentrations presented as being on-site are more representative of pre-IMC clean-up levels. Nevertheless, the calculations presented in the FS report regarding estimates of on-site soil clean-up levels, associated risks, and quantity estimates are based on post-IMC clean-up test pit data and on contaminant concentrations observed in marsh groundwater monitoring wells.

147. Comment: IMC commented that EPA overstated the concentrations of

VOCs in the water and sediments of North and South Brooks.

Response: The Preferred Remedy is based on risks associated with estimates of the quantities of VOC's remaining on-site, and in the groundwater beneath the site and beneath the marsh, and not on water and sediment sampling from North and South Brook.

The organization W.A.S.T.E., Inc. (We Agree -- Save the Environment) submitted the following comments.

148. Comment: W.A.S.T.E., Inc. commented that any permanent remedy selected must take precedence over, and not be tied to, any legal proceeding.

Response: Although this case is in litigation the selection of a remedy must be protective of public health, welfare, and the environment. It is the opinion of EPA that the selected remedy is permanent and was selected irrespective of any ongoing legal proceedings.

149. Comment: W.A.S.T.E., Inc. commented that the Federal government is not required to attain a remedial action through court procedure.

Response: The selected remedy was chosen under the requirements of SARA, and not as part of a legal settlement.

150. Comment: W.A.S.T.E., Inc. commented that the recommended treatment of selected soils will not afford optimum protection of public health.

Response: Please refer to previous WASTE comment 1 on FS.

151. Comment: W.A.S.T.E., Inc. commented that the Preferred Remedy lists a risk level of 10^{-5} while the generally considered "maximum acceptable risk level" is 10^{-6}.

Response: The acceptable risk levels which EPA evaluates are in the 10^{-4} to 10^{-7} risk range. The risk level which is determined is on a site specific basis after evaluating many various factors particular to a site.

152. Comment: W.A.S.T.E., Inc. commented that leaving a PCB concentration of 20,000 ppb will provide a continued threat to the Class A aquifer below the site and to Country Pond.

Response: The threat posed by PCB's is considered to be primarily due to on-site dermal contact, and the transport from the site to the marsh and Country Pond in surface water sediments. This threat has been addressed by source control measures including the planned incineration of on-site

soils with PCB concentrations greater than 20 ppm, and by covering remaining on-site soils with clean granular fill, loam, and a vegetative cover.

153. Comment: W.A.S.T.E., Inc. commented that any remaining PCB contaminants will pose a threat to future development of the site.

Response: Please refer to Record of Decision.

154. Comment: W.A.S.T.E., Inc. commented that any contaminants remaining in the soil will continue to percolate into groundwater and impede any groundwater treatment that may be initiated.

Response: Residual contaminants would continue to leach from the site to the groundwater beneath the site subsequent to remediation, and consequently would enter the groundwater treatment train. However, the volume of infiltrating precipitation which would serve as the transport mechanism for residual contaminants in on-site soils is anticipated to be small compared to the volume of groundwater which will be treated (less than 20 percent based on an average precipitation infiltration of approximately 15 inches per year over the site and a saturated thickness of 20 feet). Additionally, leaching of residually contaminated soils would only occur to groundwater extracted from beneath the site, which is estimated to be less than one-third of the total volume of groundwater to be treated based on an estimate of the amount of contaminated groundwater on-site to an estimate of the total volume of contaminated groundwater. Finally, because soil treatment goals are consistent with groundwater treatment goals in that both seek to achieve an incremental lifetime cancer risk of 10-5 or less, leaching of residual soil contamination is not expected to continue to engender groundwater contamination in concentrations that will require treatment. Therefore, leaching of residual contaminants from on-site soils is not anticipated to present an impediment to groundwater treatment.

155. Comment: W.A.S.T.E., Inc. commented that the proposed soil treatment process will not properly remove ABNs and metals since the attention afforded VOCs does not guarantee the removal of other toxic materials. (p.2)

Response: It is anticipated that the incineration process will be effective in the removal of ABN's and VOC's. It is recognized that incineration will not destroy metals, but that the placement of the treated soil under the site cover will serve to isolate the metals and reduce the potential for human exposure. ABN's

and metals are not considered a threat at this site.

156. Comment: W.A.S.T.E., Inc. commented that the proposed soil treatment may produce dioxin from its precursors which are present on site.

Response: The incineration process to be utilized here is similar to that which has been used to destroy dioxin. Thus, assuming proper operation, dioxin would not be a by-product of the high temperature soil treatment. The aeration process does not raise soil temperatures to levels which would be conducive to the creation of dioxin.

157. Comment: W.A.S.T.E., Inc. commented that the proposed source control remedy for treatment of soil contamination is a partial, not permanent, corrective measure.

Response: EPA considers the source control remedy to be a permanent remedy in the context of SARA requirements. Please refer to the Record of Decision.

158. Comment: W.A.S.T.E., Inc. commented that the proposed groundwater treatment to remove VOCs does not address the problem of ABNs, Cresol, Phenols, Naphthalene, and other chemicals found in the marsh.

Response: As indicated in the Preferred Remedy, components of the groundwater treatment train have not been determined at this time, but rather will be determined during design after evaluation of the performance of treatability studies. Nevertheless, the groundwater treatment trains proposed in the FS address groundwater contamination in aggregate, including VOC's, ABN's, Cresol, Phenols, Naphthalene, metals and other chemicals found in the marsh groundwater.

159. Comment: W.A.S.T.E., Inc. commented that the rejection of Maximum Contaminant Level Goals in favor of Maximum Contaminant Levels reduces the degree of safety for the public health and welfare and therefore MCLG's should be used in determining a remedial action.

Response: Please refer to Section VI of the Record of Decision.

160. Comment: W.A.S.T.E., Inc. commented that the release of treated groundwater on site to surface water may hasten contaminant migration into Country Pond.

Response: Groundwater discharged to on-site surface waters would be treated to drinking water standards prior to discharge. Therefore, the release of treated groundwater on-site to surface water is not anticipated to hasten contaminant migration to Country Pond.

161. Comment: W.A.S.T.E., Inc. commented that the discharge of treated marsh ground water up-gradient of the site may cause the contaminant plume to expand.

Response: An upgradient groundwater discharge operation would be concurrent with groundwater extraction and treatment operations. Since groundwater extraction would be achieved via groundwater extraction wells, contaminated groundwater would remain within the cone of influence of these wells, with groundwater flow radially inward toward the well. Therefore discharge of treated marsh groundwater upgradient of the site is not anticipated to cause the contaminant plume to expand.

162. Comment: W.A.S.T.E., Inc. commented that the Preferred Remedy gives no indication of discharge locations.

Response: Specific discharge locations will be addressed during the design phase.

163. Comment: W.A.S.T.E., Inc. commented that the use of MCLG's would eliminate possible conflict with existing law, in particular, WS 410.14, N.H. Code of Administrative Rules.

Response: The State of New Hampshire has concurred with this remedy and has not advised us of any such conflict.

164. Comment: W.A.S.T.E., Inc.commented that the plume is moving towards Country Pond and that current data supported a need for an immediate emergency response to prevent potential short- and long-term adverse health effects from human exposure to contaminants.

Response: Please refer to WASTE comments 12 and 13 on FS.

165. Comment: W.A.S.T.E., Inc. requested that it be provided a $50,000 technical assistance grant with a waiver of contribution.

Response: Please refer to WASTE comment 11 on FS.

166. Comment: W.A.S.T.E., Inc. commented the use of the term, "this R.O.D.", in the Preferred Remedy has created confusion concerning the meaning and intent of the Preferred Remedy, since the Preferred Remedy is not a "Record of Decision".

Response: As previously stated in EPA's letter of November 25, 1986 to WASTE, there were several references in the Preferred Remedy to a ROD. Unfortunately, this was an oversight and all references to a ROD should have been changed to Preferred Remedy.

167. Comment: W.A.S.T.E., Inc. commented that the legal proceeding in the Federal District Court are determining EPA's course of action and that meaningful input from the public has been excluded. W.A.S.T.E. further stated that they have been unable to obtain pertinent information to assess the Preferred Remedy because EPA asserts that such information, if released, could adversely effect the Government's legal case against the polluters.

Response: The selected remedy at this site is being developed based upon the technical and scientific information gathered from this site. EPA is not aware of withholding any pertinent technical information from WASTE.

168. Comment: W.A.S.T.E., Inc. commented that Alternative 15 with modifications presented by W.A.S.T.E., Inc. is the only permanent remedy presented to date.

Response: EPA has selected a remedy which we belive to be consistent with the provisions of CERCLA, as amended by SARA, and its governing regulations, the National Oil and Hazardous Substances Pollution Contingency Plan.

The firm of Bracken and Baran submitted comments on behalf of Senter Transportation Company, Inc., Concord Realty Trust, Bernard Senter and Sally Senter (Senter).

169. Comment: Bracken and Baran commented that no drinking water wells down-gradient of the site are at risk from any possible future contamination.

Response: Please refer to responses to Generators comments 1,2, and 12, and to responses to related comments 3,5,6, and 13 on FS.

170. Comment: Bracken and Baran commented that wells are not likely to be drilled on the Senter land because of the proximity of the site to an explosive storage area, Austin Powder Company. In addition please refer to response to comment 95.

Response: The very small explosive storage area could easily be moved or eliminated in the future. As a result, EPA must consider the possibility for the potential of development on the site.

171. Comment: Bracken and Baran commented that they are negotiating with Austin Powder to insure that the Senter land will not be developed at any future time.

Response: Please refer to Section VI of Record of Decision regarding discussion on institutional controls.

172. Comment: Bracken and Baran commented that since the development of the site is unlikely, the proposed remedy for cleaning up the aquifer is unnecessary.

Response: The O&G/GLCC site to the west of Route 125 is zoned "rural residential" by the Town of Kingston under an ordinance passed on March 14, 1978 (Article VII Section 7.40). According to that zoning designation, the site may be developed for either residential use of industrial use. Industrial development is permitted, however, only after it has first been recommendaton by the board of selectmen and then approved at a town meeting. The only restrictions on residential development are the normal requirements that building, well and septic system permits be obtained from appropriate state and local agencies.

The Country Pond Marsh lying to the east of Route 125 was designated a Wetlands Conservation District by the town. As such development is prohibited without prior approval by the town. In any case, as a wetland, any excavaton, filling, or construction in the Country Pond Marsh is prohibited under RSA 483-A without a permit from the new Hampshire Wetlands Bourd would have to find either that the area was of marginal ecological, hydrogeological, and aesthetic value as a wetland or that the development proposed would not significantly alter its character as a wetland.

173. Comment: Bracken and Baran commented that they are willing to place deed restrictions on their land to prevent development on the land shown to be contaminated or which overlays polluted ground water.

Response: Please refer to response to comments concerning use of institutional controls.

IV. REMAINING COMMUNITY CONCERNS

This section describes commmunity concerns that EPA and the State of New Hampshire should be aware of as they prepare to undertake the remedial design & remedial action at the Ottati & Goss/Great Lakes Container Coporation Site.

A. Groundwater Monitoring Concerns

The movement of the contaminant plume and its potential impact on Country Pond and residential wells is of great concern within the community. Continued monitoring of groundwater movement will remain a central concern of the community throughout the remedial action.

B. Health Concerns Regarding Country Pond

Residents have expressed concern about the possible health effects of eating fish caught in Country Pond. While EPA answered that it is now safe to eat these fish, it is expected that this question will be raised again.

C. Concerns about Future Use

Residents have expressed concern that any remedial action short of a complete removal will leave the site vulnerable to future problems. It is expected that this issue will remain a central concern.

Residents are also concerned about future commercial and residential development of the area.

D. Involvement in the cleanup process

Residents have stated that they want to be involved in the cleanup process, whether the cleanup is conducted solely by EPA or by the PRPs under oversight from EPA.

GLOSSARY

Aeration - exposing contaminated material to the air and allowing the volatile contaminants to evaporate.

Aquifer - An underground layer such as sand or gravel that can store and supply water, called groundwater, to wells and springs.

Bedrock - A general term for the solid rock that underlies soil or other surface materials.

Capital cost - The initial cost of implementing a remedial alternative.

Capping - Cover for an area of contamination which consists of a layer or layers of relatively impermeable material, such as clay. Capping prevents direct exposure, and keeps rain from seeping through contaminated materials and into the groundwater.

Caustic - Able to burn, corrode, dissolve, or otherwise eat away by chemical action. Caustic materials can be used as cleansing agents.

Encapsulation - To enclose material within a casing or cap.

Environmental monitoring - Sampling air, water and fish to confirm the effectiveness of the selected alternative.

Excavation - Digging out contaminated soils and other materials from the ground.

Feasibility Study (FS) - A Study which evaluates possible cleanup alternatives for a Superfund site.

Groundwater - Water found beneath the earth's surface that can be used for many purposes such as irrigation or drinking water.

Groundwater extraction - Taking contaminated groundwater out of the ground to remove contaminants.

Groundwater interception - Collecting clean groundwater to prevent it from moving through the site. At this site, an interceptor trench is considered as a way to keep clean groundwater away from contaminants.

Groundwater treatment - Removing contaminants from groundwater, after groundwater extraction.

Incineration - Burning materials at high temperatures to destroy contaminants.

Land use controls - Controlling on-site and off-site activities to prevent interference with the selected alternative. Land use controls include fences, warning signs, and deed restrictions.

Off-site - Beyond the boundary of the actual site.

On-site - Within the boundary of the actual site.

Polychlorinated biphenyls (PCBs) - A type of man-made chemical consisting of a very stable arrangement of carbon, hydrogen, and chlorine that generally do not break down when exposed to water, heat, electricity, or natural environmental forces. Due to this stability, PCBs last for a very long time in the environment.

RCRA landfill - A disposal site which complies with the EPA regulations for the Resource Conservation and Recovery Act (RCRA), which regulates hazardous waste management. RCRA landfills are required to have an impermeable liner which isolates contaminated substances from the environment.

Remedial action - Response actions that stop or substantially reduce a release or threat of a release of hazardous substances that are serious but not an immediate threat to public health.

Remedial investigation (RI) - A study designed to collect and analyze the data necessary to define the type and extent of contamination at a Superfund site.

Remedial investigation/feasibility study (RI/FS) - The remedial investigation is usually performed at the same time as the feasibility study. Together they are usually referred to as the RI/FS.

Volatile organic compounds (VOCs) - Substances containing carbon which vaporize upon exposure to air. Long-term exposure to volatile organics may cause adverse health effects.

Wetland - Land or areas such as swamps or tidal flats where the level of water in the soil is at, or above the land surface for most of the year.

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

SITE: Ottati & Goss/Great Lakes Container Corporation
Kingston, New Hampshire

Declaration

I now have received the delegated authority to sign the Record of Decision for the Ottati & Goss/Great Lakes Container Corporation Superfund site. I hereby reaffirm the Record of Decision for the site that I signed on January 16, 1987 prior to my receipt of such delegated authority. In reaffirming this decision, I have considered the public comments submitted to EPA after the January 16, 1987 Record of Decision was issued.

5/8/87
Date

Michael R. Deland
Regional Administrator

OTTATI & GOSS/GREAT LAKES CONTAINER CORPORATION SITE

KINGSTON, NEW HAMPSHIRE

RESPONSIVENESS SUMMARY SUPPLEMENT

On January 16, 1987, the U.S. Environmental Protection Agency (EPA) signed a Record of Decision (ROD) for the Ottati & Goss/Great Lakes Container Corporation Site (O&G/GLCC) located in Kingston, New Hampshire. As part of the ROD, a Responsiveness Summary was also issued for the purpose of providing the public with a summary of citizen comments and concerns about the site, and EPA's responses to those concerns.

When the ROD and Responsiveness Summary were issued, it was noted that a public comment period on a groundwater model prepared for the site was opened, and the Agency had not received all of the comments on the model.

The attached Responsiveness Summary Supplement responds to the major public comments received by EPA for the groundwater model.

COMMENTS RECEIVED FROM WASTE, INC. ON THE GROUNDWATER MODEL

1. COMMENT: WASTE commented that the Guswa report supports the 1981 WASTE position that contamination may be flowing in the groundwater far beyond the marsh downstream of the O&G/GLCC site.

   Response - Dr. Guswa's opinion regarding the possibility that contaminated groundwater may be flowing beneath Country Pond is based on and supported by the following factual information:

   1. The EPA-funded Remedial Investigation/Feasibility Study reports that on two separate occasions, groundwater and surface water elevation data have been collected for the eastern edge of the marsh and Country Pond. One of these measurement periods (December 1983) indicated that the Country Pond elevation was greater than the groundwater levels measured at the eastern edge of the marsh (well GZ5a). Under these conditions, Country Pond would provide recharge to the groundwater system and groundwater in the vicinity of the GZ5 well cluster would flow laterally and/or downward through the unconsolidated material and could not discharge upward into Country Pond.

   2. Groundwater elevations have been measured in well GZ5a on seven occasions between November 1983 and November 1984. The elevation of Country Pond was also measured on seven occasions during the same time period. These data, which are summarized below, are based on Government Exhibit G-512 and Mr. Riordan's September 1984 Expert Report of the Ottati and Goss/Great Lakes Container Corporation litigation and were used by Dr. Guswa during his trial testimony of April 21, 1987.

	Water Elevation	
Date	GZ5a	Country Pond
11/09/83	116.3	115.8 (Gauge 1)
11/10/83	115.6	NM
11/14/83	115.7	115.8 (Gauge 1)
12/06/83	NM	114.9 (Gauge 2)
12/16/83	NM	116.7 (Gauge 2)
12/28/83	115.9	116.1 (Gauge 2)
01/27/84	115.7	NM
02/14/84	115.8	NM
04/24/84		116.8 (117.0 Gauge 1, 116.6 Gauge 2)
11/27/84	115.3	115.1
Average	115.8	115.9

   These data indicate that the average measured water level for Country Pond was greater than the average measured water level for well GZ5a.

In addition to the Country Pond and GZ5a water level measurements, there are water level data available for Trickling Falls Dam, which is located at the eastern edge of Pow Wow Pond, approximately three miles downstream of Country Pond. Government Exhibit 637B of the Ottati and Goss/Great Lakes Container Site litigation summarized the Trickling Falls Dam water level measurements for the period July 1977 through November 1986. These data are summarized below to indicate how frequently the Trickling Falls Dam water elevations exceed 115.9 feet, which is the second highest groundwater elevation measured at well GZ5a.

Year	Number of Measurements	No. of Measurements Greater than 115.9 ft.	% of Measurements Greater than 115.9 ft.
1977	26	0	0
1978	52	10	19
1979	52	13	25
1980	49	19	39
1981	45	23	51
1982	49	19	39
1983	51	17	34
1984	51	17	34
1985	44	22	50
1986	35	25	71

Trickling Falls Dam is located three miles downstream and at a lower elevation than Country Pond. Since 1980, the Trickling Falls Dam water elevation has exceeded 115.9 feet approximately 45 percent of the time. These water level data indicate that surface water elevations of Country Pond may frequently exceed the groundwater elevations measured in well GZ5a, and that Country Pond may frequently act as a groundwater recharge boundary.

3. Contaminated groundwater exists at the base of the unconsolidated aquifer at the eastern edge of the marsh. Samples have been collected from well GZ5b on three occasions (November 1983, December 1983 and January 1984). These samples are representative of groundwater at the base of the unconsolidated aquifer. Chemicals which have been found in the groundwater samples include benzene, toluene, ethylbenzene, 1,1 dichloroethane, 1,2 dichlorethane, 1,2 trans dichlorethylene, acetone, xylene, methyl ethyl ketone, methyl isobutyl ketone and tetrahydrofuran.

4. Contemporaneous sampling of wells GZ5a and GZ5b have shown that higher concentrations are found in the deeper well (GZ5b) which is screened at the bottom of the unconsolidated deposits (Guswa, 1987, P. A-14, A-15). Well GZ5b is a Barcad sampler, which provides a discrete or point measurement of water quality at the base of the unconsolidated material. This type of sampler is typically used to analyze vertical stratification of contaminant plumes. The limited sampling interval is specifically designed to collect a water sample which is representative of a specific vertical position within the aquifer.

In summary, the measured water level data indicates that an assumption that all groundwater which flows beneath the marsh must discharge into Country Pond is improper, and the chemistry data indicates that contaminated groundwater is found at the base of the aquifer beneath the western edge of Country Pond. Groundwater at the base of the aquifer is less likely to discharge into the pond than is groundwater at the top of the aquifer. Consequently, there is a potential for contaminated groundwater to flow beneath Country Pond. The existing data, however, are not sufficient to quantify the actual or potential risk to any residential wells. Such determination would require additional information regarding groundwater flow directions and rates, as well as chemical attenuation, beyond the eastern edge of the marsh.

The Guswa report also contained groundwater flow and chemical transport model analyses. These model analyses were designed to evaluate the potential for long-term increases in chemical concentration at the eastern edge of the marsh and were not used to evaluate flow beneath Country Pond. Several simplifying assumptions were made for these analyses and the assumptions were appropriate for the intended analyses. The model analyses, however, were not designed to be an explicit evaluation of the potential for contaminated groundwater to flow beneath Country Pond and have not been used to make such an evaluation.

2. COMMENT: WASTE commented that according to the report prepared by GeoTrans, the analysis of 20-year vs. 70-year chemical log concentration indicates no reduction of pollutants will occur by means of natural attenuation.

Response - The GeoTrans model analyses should not be interpreted to indicate that there will be no reduction of concentration by means of natural attenuation. The GeoTrans model analyses were designed to evaluate the potential for long-term increases in chemical concentration at the eastern edge of the marsh. One of the simplifying assumptions which was made to facilitate this analysis was that natural attenuation, by processes such as biodegradation, would not occur. The basis for this assumption and its consequence are described on Pages 39 and 40 of the Guswa report and are summarized as follows:

"The current distribution of groundwater contamination is the result of a long-term interaction among many processes and factors. These include chemical loading rates from various sources and physio-chemical processes which affect chemical concentrations. These physio-chemical processes which have been described previously by many investigators include dilution, dispersion, retardation, volatilization and biodegradation. All of these processes act, in a general sense, to reduce chemical concentration in the downgradient direction. Biodegradation is an exception to that general rule in that the biological degradation and consequent reduction in concentration of one chemical results in

the creation of and consequent increase in concentrations, of a second chemical. This may be a significant exception if the daughter product of the biodegradation process is more toxic or harmful than the parent chemical.

With the exception of dilution and dispersion, the physio-chemical processes are chemical dependent. That is, the rate of reaction and general effectiveness of these processes to reduce downgradient concentrations may be negligible for some chemicals and for other chemicals they may have a significant effect. Dilution and dispersion, however, affect all chemicals equally. Consequently, to evaluate the potential for long-term increases in concentration at the eastern edge of the marsh, initial analyses were made with the assumption that dilution and dispersion were the only processes affecting chemical concentration. Longitudinal and transverse dispersivity values were 25 feet and 10 feet, respectively. If long-term increases in chemical concentration were unlikely under that assumption, then long-term increases would also be unlikely if the other attenuating processes were active (with the possible exception of biodegradation)."

Given that the model analyses include the simplifying assumption that natural attenuation by physio-chemical processes such as biodegradation would not occur, the model results should not be interpreted to indicate that there would be no such attenuation. Rates of attenuation are chemical dependent. For some chemicals, attenuation may be noticeable within a few years, while for other chemicals, the rates of attenuation may be so low that noticeable changes will not be recognizable for decades.

3. COMMENT: WASTE commented on the possibility that a breakout of pollutants had occurred in February 1979 in Country Pond. They stated that the water level measurements recorded at the Trickling Falls Dam on February 21, 1979, the lowest recorded since the severe drought of 1977, provided optimum hydrogeological conditions that would allow a chemical contaminant breakout to occur.

   Response - It is not possible to evaluate groundwater flow conditions based only on water level measurements at the Trickling Falls Dam on February 21, 1979. Additional information on groundwater elevations is required to conclude what the potential fate of contaminants might have been.

COMMENTS RECEIVED FROM INTERNATIONAL MINERALS AND CHEMICAL CORPORATION (IMC) ON THE GROUNDWATER MODEL

1. COMMENT: IMC submitted a general comment concerning the fate of the contaminant plume beneath the marsh area. The IMC comment summarizes and paraphrases material contained in the GeoTrans report and discussed by Dr. Guswa during his depositions. IMC summarizes Dr. Guswa's report and testimony as concluding that the contaminant plume beneath the marsh will decrease in concentration, with the exception that transient "bubbles" of various chemicals may cause localized increases in concentration, and that long-term increases in contamination levels at the eastern edge of the marsh are unlikely.

Response - Within his report and during his deposition, Dr. Guswa expressed his opinion that it is unlikely that chemical concentrations at the eastern edge of the marsh would increase for an extended period of time. He also expressed his opinion that recently observed increases in concentration of chemicals at the eastern end of the marsh (e.g. acetone and tetrahydrofuran) were a transient or temporary increase in concentration resulting from a slug of contaminants moving through the groundwater system (Guswa, 1986, P. 10, Plates 12 and 15). These transient or temporary increases in concentration at the eastern edge of the marsh are likely to occur for other chemicals as well. The increases result from several factors, such as past variations in loading rates at the various source areas and relative groundwater velocities and natural attenuation rates for individual chemicals.

Dr. Guswa also expressed his opinion that these temporary or transient increases at the eastern edge of the marsh may persist for several years and would be accompanied by a general decrease in chemical concentration at the western edge and central portions of the marsh (Guswa, Deposition January 19, 1987). This general reduction in chemical concentration would occur as the result of the cessation of active on-site waste disposal activities. The rate of concentration reduction is also chemical specific and may not be noticeable for several years.

2. COMMENT: IMC commented on reductions in chemical concentrations which have occurred at wells W-9 and W-20, the two wells located in the marsh which have historically shown the highest levels of contamination. In addition, IMC provided graphs of TVOC versus time to demonstrate the concentration reductions.

Response - The time history plot of TVOC at well W-9 provided by IMC shows a reduction in concentration from 20,000 ppb in 1981 to approximately 18,500 ppb in 1986. Intermediate analyses have had higher as well as lower concentrations than 18,500 ppb. The variations result from increases and decreases of individual compounds between various sampling rounds as well as variations in parameters analyzed for. Analysis of concentration trends for individual constituents at well W-9 (Guswa, December 1986, Page A-64) shows that some chemical concentrations (e.g. acetone) show a decreasing trend; others (e.g. phenol) show an increasing trend and still others (e.g. benzene, ethylbenzene) appear to be unchanged. Similarly, for well W-20 some chemicals (e.g. 1,2 trans dichloroethylene) show a decreasing trend while other chemicals (e.g. ethylbenzene) appear to be unchanged.

Use of an undefined parameter, such as TVOC, can be misleading with respect to drawing conclusions about trends in chemical concentration. As has been used by various parties in this investigation, TVOC is merely the arithmetic sum of the specific volatile chemicals included in various analyses. The confusion results, in part, from variations in analysis protocols among sampling events. Some analyses have not included as many volatile compounds as other analyses have. Consequently, the totals can differ simply as a result of the variations in parameters

analyzed. For example, water quality analyses for wells W-9 and W-20 (Guswa, 1986, Pages A-64, A-74) show variations in analysis protocols that would result in TVOC changes of several thousand parts per billion simply because some chemicals were not analyzed for in several of the sampling and analysis rounds.

3. COMMENT: IMC provided comments regarding the reported measured water level elevations at Trickling Falls Dam and Country Pond. Their comment includes a discussion of the reliability of the measured surface water level data and a comparison with groundwater levels at the edge of Country Pond.

   Response - IMC correctly points out that there was confusion regarding the dates of various water level measurements. The details of dates and measured water elevations were clarified through the recent testimony of Mr. Greg Morley of GZA and Government Exhibit 512 and are summarized herein.

   Figure 12 and Tables 4 and 5 of the RI, Volume I present graphical and tabular summaries of water elevation data. The graphical summary shows measured groundwater elevations, groundwater elevation contours, and measured surface water elevations of December, 1983. Tables 4 and 5 list the measured groundwater elevations for the various monitoring wells. Table 4 indicates that groundwater levels were measured on December 15-16, 1983. Government Exhibit 512 shows that groundwater elevations for well cluster GZ5 were made on December 28, 1983, not December 15-16. These data also indicate that the Country Pond water elevation on December 28, 1983 was 116.1 feet elevation. Mr. Morley also testified that the Country Pond water elevation was also measured on December 15-16 and had an elevation of 116.7 feet. Consequently, the apparent Country Pond water elevation discrepancy alluded to by IMC represents two different pond elevation measurements which are both believed to be correct.

   The latter half of the IMC comment suggests that the December water level data indicate a southwesterly groundwater flow direction from Country Pond toward the marsh as a result of a short term condition of Country Pond's elevation being higher than groundwater elevations measured in well cluster GZ-5. This alternative interpretation is incorrect for several reasons:

   1. The IMC interpretation is based on groundwater level measurements from wells GZ-1, GZ-2, GZ-6 and well cluster GZ-5. Of these four, only wells GZ-5 and GZ-6 provide information about groundwater elevations beneath Country Pond. Consequently, these two wells are the only ones which can be used to evaluate vertical flow directions.

   2. Secondly, the regional groundwater flow direction is eastward from the Ottati and Goss/Great Lakes Container Corporation site toward Country Pond. Figure 12 of the RI, Volume I and Figure 29 of the RI, Volume II demonstrate this fact. The IMC interpretation, which

considers only the groundwater elevations from wells GZ-1, GZ-2, GZ-5 and GZ-6 is inappropriate because the alignment of the wells is not appropriate for analyzing easterly flow components. The consequences of using a limited subset of available data is best illustrated by example. Figure 12 of the RI, Volume I also contains water level data for wells W-22, P-4, W-15 and P-2. These wells are located on a northerly trending line which extends from the vicinity of the caustic lagoon toward a small pond at the western end of North Brook. If one were to use only the water elevations from these wells to interpret groundwater flow directions, then one would conclude that groundwater flows northerly from the vicinity of the caustic lagoon toward the northwest corner of the GLCC property and toward the small pond at the western end of North Brook. This postulated flow direction is parallel to the groundwater elevation contours shown on Figure 12 of the RI, Volume I and is perpendicular to the actual groundwater flow direction in this portion of the Ottati and Goss/Great Lakes Container Corporation site. The flow direction, based on those four wells, is obviously incorrect.

IMC further states that the research of the U.S. Geological Survey regarding the interaction between groundwater flow and lakes (Winter, 1976, 1978, 1983) is not relevant to Country Pond.

The Geological Survey research is entirely relevant to Country Pond because:

1. It states very simply that many factors affect groundwater flow directions in the vicinity of lakes.

2. The data which are necessary to evaluate the groundwater flow directions in the vicinity of Country Pond have not been collected. Consequently, it is improper for IMC to conclude that all groundwater, including the contaminated groundwater, found at the base of the aquifer at well GZ5b discharges into Country Pond.

4. COMMENT: IMC stated that "Dr. Guswa's opinion that there is a "potential" for contaminated water to "possibly" "jeopardize" residential wells at the outlet area is not supported, nor is it supportable."

   Response - Please refer to response to Comment 1 from WASTE, Inc.

5. COMMENT: IMC commented that the Guswa report has overestimated the mass flux beneath Route 125. The IMC comments cite several reasons why they believe the mass flux has been overestimated. These comments are summarized as follows:

   a. The concentrations shown on the plates do not reflect the 1986 measurements;... IMC cites decreasing trends in TVOC at wells W-22, W-20 and W-9 as a basis for their comment.

   b. The contouring on Plates 1-16 appears to be based on an inappropriate interpolation scheme.

c. Average block concentrations are based on an arithmetic mean and that a logarithmic mean would have been more appropriate.

d. Vertical stratification of the contaminant plumes is neglected.

Response - The Guswa report makes the following comment regarding the area concentration plots.

a. "The shape and position of the contours reflect consideration of groundwater flow directions, location of known chemical source areas and the amount of sampling and analysis at specific locations. Notwithstanding these complicating factors, it is believed that Plates 1 through 16 are a reasonable representation of the current extent of groundwater contamination by the various chemicals" (pages 13 and 14). The "complicating factors" have been described by most, if not all of the site investigators. These factors include sampling errors, analysis errors, natural fluctuations in concentration owing to seasonal variations in groundwater recharge as well as release rates of different chemicals and the effects of variations in well screen length.

Of particular importance to Section a. of the IMC comment is consideration of the amount of sampling and analysis at specific locations. For example, Page A-64 of the GeoTrans report summarizes the sampling and analysis history for 19 compounds at well W-9. Similar tables were prepared for each well in the study area and were included in the report to provide the basis for the estimated concentration plots. All of the sampling and analysis data was considered in preparation of the estimated concentration plots in an attempt to identify trends in concentration and avoid over-reliance on a single sampling event.

IMC included three plots of TVOC to illustrate what they refer to as clear trends in decreasing concentration on and downstream of the GLCC site. Their time history plot for well W-9 shows that in 1981 the reported TVOC was 20,000 ppb and in 1986 the reported TVOC was approximately 18,500 ppb. Intermediate sampling rounds have had TVOCs of greater than 30,000 ppb to as low as 15,000 ppb. Consequently, the 1986 TVOC is lower than the TVOC for some earlier sampling rounds and higher than the TVOC for other earlier sampling rounds. The variation in TVOC between 1981 and 1986 does not represent a clear trend of decreasing concentration.

The IMC plot of TVOC at well W-22 suggests a dramatic reduction in concentration since May 1981. Review of the sampling and analyses history for well W-22 (Guswa, 1986, P. A-76) shows that this apparent trend results from extreme variation in concentrations of a few compounds (particularly acetone) and that other compounds do not demonstrate such a dramatic reduction. For example, there have been eight analyses for trichloroethylene between 1981 and 1986. The reported February 1986 value is greater than five of the previous values and less than two of the previous values and the concentrations trend evidenced by these data is probably best characterized as "unchanged" rather than "clearly decreasing."

b. The contaminant distribution of the Ottati and Goss/Great Lakes Container Corporation site results from a complex waste disposal history, whose details are not known. The selected contour intervals and their general position are based primarily on the location of sampling points and the frequency of measurements. Given the numerous interacting factors which effect the current contaminant distribution, and the fact that many of the factors are unknown, there is no "appropriate interpolation scheme."

c. Similar to the previous response, the observed chemical concentrations are the result of many factors and processes, not all of which are known. Given the general uncertainties that are considered in determining the estimated concentrations for each chemical, an arithmetic mean or estimated average value is neither more nor less than reliable than a logarithmic mean.

d. Stratification of the contaminant plume is not represented in Plates 1 through 16 (Guswa, 1986), but it was considered in the preparation of the plates. There are four unconsolidated deposit wells in relatively close proximity to Route 125. These are GZ-13, W-20, W-21 and W-19. Screened intervals for these wells are 40 feet, 4 feet, 17 feet and 20 feet, respectively. Of these four wells, highest concentrations are typically found in GZ-13 (a long-screened well) and W-20 (a short-screened well). Lower concentrations tend to be found in wells W-21 and W-19. A fifth well, GZ-4a (screened length of 38 feet), is located near well W-19 and tends to have concentrations which are similar to wells GZ-13 and W-20. The general chemical pattern is one of higher concentrations in the interior wells. Consequently, an enclosing contour interval was selected which was not as high as the highest measured concentration, nor as low as the lowest measured concentration. For example, reported February 1986, toluene concentrations for for each of the wells were:

GZ-13	3500 ppb
W-20	2397 ppb
W-21	26 ppb
W-19	375 ppb
GZ-4a	3000 ppb

A 2000 ppb contour line was drawn around all five wells. The decision made regarding the selection of a contour interval and the position of the contour line is appropriate for the intended and actual use of the information.

6. COMMENT: IMC commented regarding overestimation of the total mass of TVOC passing beneath Route 125 in the overburden.

Response

1. CDM used the Guswa calculated water flux of 50,000 gpd and CDM estimated average 1983 to 1986 concentrations to calculate an average mass flux of 164 kg/year. This mass flux is 50 percent lower than the Guswa estimate. If CDM, however, used the

Riordan (1984) estimated water flux of approximately 100,000 gpd and the CDM estimated average 1983 to 1986 concentration, then CDM would have calculated an average mass flux of 328 kg/year. This is almost identical to the Guswa estimate of 331 kg/year.

2. IMC states that the measured 1986 concentrations at well W-20 showed a 25 percent decrease from the 1983 to 1986 average. They conclude that this single sampling event is sufficient to conclude that the estimated 1986 volatile organic chemicals loading beneath Route 125 should be reduced by an additional 25 percent. This conclusion is inconsistent with trends of individual constituents at well W-20 as well as chemical data for well GZ-13 which is located upgradient of and adjacent to Route 125. For well W-20, concentrations of many of the volatile organic chemicals have decreased between 1983 and 1986 although some concentrations appear to be unchanged (Guswa, 1986, Page A-74). Measured concentrations for individual constituents in well GZ-13 appear to have remained unchanged or increased slightly between 1983 and 1986 (Guswa, 1986, Page A-33).

   There is no reason to believe that the chemistry data from well W-20 is more or less reliable than the chemistry data from well GZ-13. Consequently, it is improper to rely solely on the data from well W-20 and to ignore the data from well GZ-13 to hypothesize trends in mass loading rates across Route 125.

3. IMC makes reference to 1984 estimates of mass flux done by CDM (Riordan, 1984). These calculations indicated a mass flux (excluding xylenes) of about 78 kg/year. They conclude that the 1984 CDM model analyses indicates that the Guswa estimate is too high by a factor of four.

   The CDM analysis was based on model calculations. During his Phase I deposition testimony, Mr. Riordan indicated that transport model calibration criteria included an order of magnitude (factor of 10) uncertainty (Riordan deposition, January 13, 1984, P. 375; September 13, 1984, P. 43). The range of uncertainty implicit in the CDM model analyses is greater than the discrepancy with the Guswa estimate.

7. COMMENT: IMC makes several comments regarding the hydraulic properties and boundary conditions incorporated into the groundwater flow model. The comments relate to:

   a. a systematic bias in model calibration and the consequent effect on model calculated gradients beneath Route 125, as well as surface discharge east of Route 125, and

   b. model boundary specification at the eastern edge of the model grid.

Response

a. Model calculated gradients in the immediate vicinity of Route 125 are less than have been observed. In the vicinity of North Brook, the model calculated gradients are approximately 80 percent of observed gradients (well B-4a to W-3). Near South Brook the calculated gradient is approximately 20 percent of the observed gradient. Intermediate between North and South Brooks, the model calculated hydraulic gradient between wells W-14 and W-19 is approximately 80 percent of the observed gradient between the two wells. At a smaller scale, however, the calculated gradient is about 35 percent of the observed gradient (GZ-13 to W-19). The discrepancy results from:

   - calculated water levels immediately west of Route 125 which are lower than observed, and

   - calculated water levels immediately east of Route 125 which are higher than observed.

   The CDM comments suggest that the discrepancy results principally from boundary condition specification, namely:

   - not accounting for "added discharge from small swamps west of Route 125 on North Brook, nor the added recharge in the ponded areas near GZ-13, P-6," and

   - only allowing discharge along the course of North Brook east of Route 125.

   Given that the large scale gradients generally agree (80 percent) but the small scale gradients do not agree as well (35 percent), it appears that the gradient discrepancy across Route 125 may be the result of localized conditions which are not incorporated into the model. This may include localized groundwater recharge rates from surface water bodies west of Route 125, groundwater discharge to surface water bodies east of Route 125, and/or localized variations in the water transmitting properties such as hydraulic conductivity or saturated thickness of the material in close proximity to Route 125.

   IMC further comments that the combination of boundary conditions and hydraulic properties used in the model suppresses vertical movement and inhibits groundwater discharge to surface water. This comment is a misrepresentation of model calculations. Model calculations indicate a significant amount of groundwater discharge to surface water. Additional simulations made using alternative parameters and boundary conditions also result in a significant amount of groundwater discharge to surface water bodies. The parameter and boundary condition variations result in local variations in discharge rates, but the overall pattern is similar for the various simulations. Approximately 35 to 40 percent of model discharge occurs west of Route 125, 30 to 40

percent occurs in the marshy area east of Route 125 and the remainder 25 to 30 percent discharge to Country Pond or as lateral flow beneath Country Pond. The apportionment of model discharge to Country Pond or as lateral flow beneath the pond is sensitive to the boundary condition defined at the eastern edge of the model and cannot be reliably quantified.

b. The IMC comment states that the boundary specification of zero vertical gradient beneath Country Pond is not representative of the "upward gradient, which would naturally occur at this point under average conditions." The easternmost location of vertical gradient information is well cluster GZ-5. Four periods of contemporaneous surface water and groundwater elevations indicate upward as well as downward gradients at the eastern edge of the marsh. There is no factual information which may be analyzed to evaluate vertical flow directions beneath Country Pond at the position of the eastern edge of the model grid. Consequently, no conclusions can be drawn regarding what constitutes a natural average condition beneath the pond.

   The specification of a hydrostatic condition (no vertical gradient) at the eastern edge of the modeled area results in a model calculated constant upward gradient at the eastern edge of the marsh. Consequently, contrary to the IMC comment that the model may force water to stay beneath the pond, it may, in fact, force too much water to discharge to the pond. Resolution of this issue requires water level information which does not exist. As a result of this limitation, Dr. Guswa pointed out in his deposition (Guswa, January 19-20, 1987) that the model calculations could not be used to evaluate groundwater flow beneath Country Pond.

8. COMMENT: IMC commented that the particle track analyses state that GLCC particles discharge into brooks or Country Pond before reaching the model boundary and only O&G particle tracks reach the eastern boundary of the model.

   Response - The purpose of the particle tracking or streamline analysis is stated in the report (Guswa, 1986, P. 28). The particle tracks show groundwater flow paths from specified locations. During deposition, Dr. Guswa described the discharge points of various particles (Guswa January 19-20, 1987) and also indicated that it was not proper to draw conclusions regarding flow beneath Country Pond from these analyses. The IMC comment regarding "inappropriate boundary condition" is in error as the existing water level data indicates both vertically upward and vertically downward flow. Consequently, a zero vertical gradient boundary specification may be more appropriate than an arbitrary assumption that all groundwater must discharge upward into Country Pond.

9. COMMENT: IMC commented regarding the hypothetical chemical transport simulations which had been made to evaluate the potential for a long-term increase in concentration at the eastern edge of the marsh. They provide general as well as specific comments regarding those analyses.

Response - IMC correctly states that the simulations were not intended to represent actual site conditions, but were designed to test a hypothesis regarding long-term concentration increases at the eastern edge of the marsh. To facilitate the analysis, several simplifying assumptions were made. The simplifying assumptions were appropriate for the intended analysis, but would not necessarily be appropriate for other analyses. IMC correctly states, however, that the analyses were intended to simulate TCE and ethylbenzene. The analyses were not intended to represent specific chemicals as they did not include chemical specific parameters. The analyses were intended to simulate an areally extensive plume and a plume of less extensive distribution. Two alternatives were selected because the observed variations in areal extent could be the result of many factors including loading history, volume of release and chemical transport properties. The observed ethylbenzene and TCE plumes were chosen to be representative of the two conditions to be evaluated.

Specific IMC comments are addressed as follows:

a,b. The "estimated" TCE plume (Guswa, 1987, Plate 4) does not necessarily overstate the current distribution of mass. The plate shows estimated TCE concentrations within areas of what is believed to be generally contiguous contamination.

IMC further states that the simulated plume shows a greater lateral extent than any data or the CDM model. The model calculations do show greater lateral spreading than is known to occur, particularly in the area of GZ-1. This condition does not affect the intended purpose or result of the simulation. This is a condition, however, which would need to be evaluated prior to doing site or chemical specific transport analysis. For the record, however, it should be pointed out that the CDM analyses of total volatile chemical transport show calculated concentrations of 10 to 100 ppb for well GZ-1 (Riordan, 1984, Figure 2.17 and 2.18).

c.d. Non-producibility of high concentrations in the marsh and caustic pit area may be the result of not including chemical retardation and not exactly replicating source loading rates.

e. Page 40 of the Guswa report states that hypothetical loading rates were used for the evaluation.

f. The IMC comments that GZ-12, P-10, and P-3 demonstrate a consistent trend of increasing concentration is inconsistent with the reported water quality data for these wells (Guswa, 1986, P.A-30, A-46 and A-52). The data for these wells show increases in concentration for some chemicals, decreases for other chemicals and an unchanged condition for still other chemicals.

10. COMMENT: IMC makes additional miscellaneous comments regarding the worst case nature of the simulations contained in the model.

Response - As stated on Pages 39 and 40 of the Guswa report, the objective of the analysis was to evaluate the potential for long-term sustained increases in concentration at the eastern edge of the marsh. Several simplifying assumptions regarding loading rates and physio-chemical processes and factors were made to facilitate the analyses..."initial analyses were made with the assumption that dilution and dispersion were the only processes affecting chemical concentration. If long-term increases in chemical concentration were unlikely under that assumption, then long-term increases would also be likely if other attentuating processes were active (with the possible exception of biodegradation)."

COMMENTS RECEIVED FROM S.S. PAPADOPULOS AND ASSOCIATES, INC. (SSP&A) ON THE GROUNDWATER MODEL

1. COMMENT: SSP&A commented regarding the potential for groundwater flow beneath Country Pond. The comment stated that the Guswa opinion that contaminated groundwater could be flowing beneath a residential area at the northeastern edge of Country Pond is a hypothesis not supported by data in the report and there is no discussion of the likelihood of contaminants under the pond. In addition, there is no discussion of whether such movement could impact any wells. SSP&A believes this hypothesis is theoretical speculation and not supported by available data.

Response - Please refer to response to WASTE comment Number 1.

2. COMMENT: SSP&A comment that "the concept that the contaminant plume at the edge of the Country Pond will somehow move beneath the pond, rather than discharging into the pond, is inconsistent with fundamental physics of groundwater flow."

Response - It is the SSP&A comment, not the concept that contaminants could flow beneath Country Pond, that is inconsistent with the fundamental physics of groundwater flow (as well as subsequent sections of its own report; SSP&A, 1987, P. 21). SSP&A has assumed that all groundwater flowing toward Country Pond must discharge into Country Pond and they have ignored the well established literature regarding local and regional groundwater flow systems (Freeze and Cherry, 1979; Toth, 1963; Freeze and Witherspoon, 1967) and groundwater flow in the vicinity of surface water bodies (Winter, 1983, 1978 and 1976). This literature clearly indicates that assumptions that all groundwater beneath a surface water body must discharge into that surface water body are likely to be erroneous.

SSP&A comment on Page 21 of their report that the supposedly theoretical speculation of Dr. Guswa must be balanced with practical considerations. This is exactly what was done by Dr. Guswa when he

concluded that there was a possibility that contaminated groundwater could flow beneath Country Pond toward the northeastern edge of the pond. The practical considerations and factual information are:

1. Four contemporaneous periods of surface water and groundwater level measurements indicate that there can be both upward groundwater flow toward the pond and downward flow of water from the pond to the groundwater system.

2. Even if there were a continual upward gradient from the groundwater system toward the pond, not all of the groundwater would necessarily discharge into the pond. This is true regardless of whether or not the pond water levels are artificially controlled. Groundwater at the base of the aquifer is less likely to discharge to the pond than groundwater from the top of the aquifer.

3. Measured chemical concentration data (wells GZ-5a, GZ-5b; Guswa 1986, P. A-14 and A-15) indicate that contaminated groundwater is found at the base of the aquifer beneath the western edge of Country Pond.

Dr. Guswa's opinion regarding the possibility of flow of contaminated groundwater beneath Country Pond is consistent with fundamental physical principles and the existing factual information. Whether or not such condition poses an actual threat to residential wells cannot be evaluated with the information available. The fact that the information necessary to make the evaluation has not been collected and is not available, however, does not mean the condition could not occur.

3. COMMENT: SSP&A commented regarding the analysis of groundwater flow from the Ottati & Goss site. Three general topics which they address include the specified permeability (hydraulic conductivity) of the glacial deposits, model calculated rates of groundwater recharge along South Brook and the hydrologic effects of a marshy area located south of North Brook.

Response - The hydraulic conductivity values used for glacial deposits west of Route 125 ranged from 0.4 feet per day for "till" or "till-like" material and the ice-contact/outwash deposits were subdivided into three zones with hydraulic conductivity values of 15, 50, and 125 feet per day, respectively. These values were derived during model calibration. The variations reflect the natural gradation from the generally lower permeability till and ice contact deposits to the higher permeability outwash material.

Model calculated net groundwater recharge along South Brook was approximately 30 gallons per minute. This net recharge results from model calculated groundwater discharge at the eastern and western ends of South Brook and groundwater recharge along the central portion of the brook. Along the marshy area north and east of the

Ottati & Goss site including the South Brook pond, average infiltration rate is about 2.5 gallons per minute. The higher value calculated for South Brook pond results from a combination of hydraulic parameters and model discretization or subdivision of the stream elevation. For example, comparison of model calculated infiltration rates for South Brook Pond and the two immediately adjacent blocks shows a model calculated net infiltration rate of 0.8 gpm for the block west of the pond and a net groundwater discharge of 1.4 gpm for the block east of the pond. This results in an average recharge rate of 2.6 gpm for the three blocks. The model calculated net infiltration rate along South Brook north and east of the Ottati & Goss site vary locally, but demonstrate groundwater discharge along the southern edges of the stream blocks and groundwater recharge along the northern edge of the blocks as well as to the underlying blocks. The local variations in the model calculated infiltration rates will have localized effects on model calculated flow directions but will not have a significant effect on the overall pattern of groundwater flow from the Ottati & Goss site.

The SSP&A comments also refer to a marshy area located south of North Brook and north of the Ottati & Goss/Great Lakes Container Corporation sites. They indicate that not explicitly including the marshy area as a groundwater discharge location seriously affects the reliability of analysis and interpretations of groundwater flow directions from the Ottati & Goss site. They base their interpretation that the marsh area is a groundwater discharge location on the basis of water level measurements made in wells GZ-9 and GZ-9a. Water levels have been measured in these wells on at least three occasions (Guswa, 1986, Page 29) and have shown a water level elevation difference of 2.5 inches (0.2 feet) which indicates an upward flow component at this location. Two nearby well clusters (B4 and B5) also provide vertical water level information. These well clusters indicate consistent downward flow components and alternating upward and downward flow components, respectively. Chemistry data from the well clusters (Guswa, 1986, Pages A-4, A-5, A-6, A-7, A-23 and A-24) indicate that contaminated groundwater is found at various depths in the aquifer and for well clusters B4 and B5 the higher concentrations are found in the deeper wells.

Field observations (Greg Morley, 1987, personal communication) have indicated that the marshy area is not wet year round and that the periodic dampness may represent poor surface drainage rather than groundwater discharge. All these data indicate that the assumption of a continuous upward flow component and continuous groundwater discharge to the marsh may not be representative of actual field conditions.

To evaluate the hydrologic consequences of the assumption, however, an alternative simulation which essentially defined the marshy area to be a groundwater discharge area was made. The results of the simulation indicated that the model calculated recharge to the marshy area was essentially balanced by a reduction in model calculated discharge to the area of North Brook, such that the total model calculated groundwater discharge west of Route 125 was approximately the same as was calculated without explicitly including the marshy area.

4. COMMENT: SSP&A raised several comments regarding the chemical transport analyses for certain contaminants, trichloroethylene and ethylbenzene, which had been made to evaluate the potential for long-term chemical concentration increases at the eastern edge of the marsh.

Response - SSP&A apparently misunderstood the intent of the chemical transport analysis. As described in the report (Guswa, 1986 Page 40) and discussed during deposition (Guswa, January 19-20, 1987) the chemical transport analyses were not intended to be, nor are they, representative of specific chemicals or actual site conditions. Some of the simplifying assumptions which were made to analyze the potential for long-term increases at the edge of the marsh would not be appropriate for site-specification or chemical-specific analysis (see EPA response to IMC comment 9).

With respect to various contour plots of chemical concentration SSP&A correctly states that the manually contoured plots and related assumptions and limitations (Guswa, 1986, Plates 1 through 16, Page 7 and 8) are more representative of Dr. Guswa's opinion regarding the extent of chemical contamination than are the computer generated plots.