EPA/ROD/R02-95/260
1995

# EPA Superfund
# Record of Decision:

**WARWICK LANDFILL**
**EPA ID: NYD980506679**
**OU 02**
**WARWICK, NY**
**09/29/1995**

# RECORD OF DECISION

WARWICK LANDFILL SITE
TOWN OF WARWICK
ORANGE COUNTY, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
NEW YORK, NEW YORK

## DECLARATION FOR THE RECORD OF DECISION

**SITE NAME AND LOCATION**

Warwick Landfill, Town of Warwick, Orange County, New York

**STATEMENT OF BASIS AND PURPOSE**

This decision document presents the selected remedy for the second operable unit (OU-2) for the Warwick Landfill site (the Site), located in the Town of Warwick, Orange County, New York, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. §§ 9601-9675, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision document explains the factual and legal basis for selecting the remedy for the Site. The information supporting this remedial action decision is contained in the administrative record for the Site. The administrative record index is attached (Appendix III).

The New York State Department of Environmental Conservation concurs with the selected remedy (Appendix IV).

**DESCRIPTION OF THE SELECTED REMEDY - NO FURTHER ACTION**

This operable unit represents the second of two operable units for the Site. It addresses the fate and transport of the contaminants in the groundwater emanating from the Site. The United States Environmental Protection Agency (EPA) in consultation with the State of New York has determined that site-related groundwater contamination is limited and does not pose a significant threat to human health or the environment; therefore, remediation is not appropriate. This determination is based on the Operable Unit Two (OU-2) Remedial Investigation and the fact that the Operable Unit One (OU-1) remedy will be implemented. The major portions of the OU-1 remedy include the construction of a landfill cap to further reduce infiltration and/or leaching of contaminants into the groundwater and/or wetlands and the implementation of a residential well monitoring program.

**DECLARATION**

In accordance with the requirements of CERCLA, as amended, and the NCP, it has been determined that no further remedial action protects human health and the environment at the Site, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action and is cost- effective. The principal threats at the Site are being addressed through the OU-1 remedial action, which includes the installation of a landfill cap to further reduce infiltration or leaching of contaminants into the groundwater and wetlands and the implementation of an environmental monitoring program.

A review of the remedial action pursuant to CERCLA 121(c), 42 U.S.C. §9621(c), will be conducted five years after the commencement of the remedial action for OU-1 to ensure that the remedy continues to provide adequate protection to human health and the environment, since the OU-2 remedy will result in hazardous substances remaining on-site above health-based levels.

<IMG SRC 0295260>

_____ _____

Jeanne M. Fox Date
Regional Administrator

RECORD OF DECISION
DECISION SUMMARY

WARWICK LANDFILL SITE
TOWN OF WARWICK
ORANGE COUNTY, NEW YORK

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
NEW YORK, NEW YORK

**TABLE OF CONTENTS**

**SITE NAME, LOCATION AND DESCRIPTION**

The Warwick Landfill site (Site) is located approximately one and one-half miles northeast of the Village of Greenwood Lake in the Town of Warwick, Orange County, New York (see Figure 1). The Site is approximately three-fourths of a mile north of State Route 17A and fronts Penaluna Road on its western boundary between Old Tuxedo Road and Old Dutch Hollow Road. No buildings exist on the landfill property except for the remnants of a brick structure. The landfill mound transects a small valley and occupies approximately 19 acres of a former 26-acre leasehold area. This leasehold is a portion of a 64-acre parcel of property.

The Village of Greenwood Lake is a semi-rural residential community located approximately forty miles northwest of New York City. Total population of the Village of Greenwood Lake is estimated to be 3,000. The Town of Warwick has a population of approximately 25,000. The majority of the population around the Warwick landfill is on private wells.

Elevations within one mile of the Site range from 700 feet to a little more than 1300 feet above mean seal level (msl). Broad upland areas are generally underlain by massive rocks. Valleys represent zones of less resistant bedrock and shearing along faults. The dominant features comprising the Site consist of a north-south trending wetlands valley spanned by the northeast trending landfill mound. Maximum relief throughout the Site is approximately 60 feet. A review of existing flood insurance maps indicated that no portions of the Site are located in either the 100- or 500-year flood zone.

The area surrounding the Site is generally wooded with clusters of residential homes, all of which utilize private wells as their source of drinking water. The two homes closest to the Site are approximately 250 feet south of the landfill boundary and 300 feet northeast of the landfill boundary, respectively.

The landfill mound is sparsely vegetated with grasses and small shrubs supporting small mammals (rats, cottontail rabbits and opossum) and some avifauna (bluebirds, robins). Contiguous to the landfill mound are two wetland areas: an emergent marsh/scrub-shrub wetland, approximately nine acres in size, in the southeast; and a smaller, palustrine, forested scrub-shrub, deciduous wetland, approximately three to four acres in size, to the northwest. Upland habitats surround both wetlands.

An unnamed intermittent stream drains the small wetlands area on the northwest side of the Site and flows north into a creek (named North Brook for convenience) that flows westward and then southward into Greenwood Lake. An unnamed perennial stream (named South Brook for convenience), located along the perimeter of the landfill's southeast side, flows southward into the larger wetlands area, eventually flowing south and west into Greenwood Lake (see Figure 2). Greenwood Lake is designate( a Class "A" (potable drinking water source) water body by the New York State (NYS) Department of Environmental Conservation (DEC). The wetlands and streams draining the site area do not support fishing or other recreational activities. Howeve, they are a suitable habitat for small aquatic wildlife, such as frogs and turtles.

Two aquifers exist beneath the Site. The overburden aquifer is comprised of two major components: unstratified till deposits, consisting of a mixture of clay, silt, sand, gravel, and boulders of varying size, shape, and permeability and stratified drift deposits or sandy outwash. The bedrock aquifer generally consists of moderately fractured quartz-plagioclase gneiss, hornblende-feldspar gneiss, and amphibolite.

**SITE HISTORY AND ENFORCEMENT ACTIVITIES**

The Site was owned and farmed by the Penaluna family from 1898 to the mid-1950s, when the Town of Warwick leased the property from the Penaluna family and utilized it as a refuse disposal area. The facility accepted waste from the Town of Warwick, which includes the Villages of Florida, Warwick and Greenwood Lake, and other surrounding towns in Orange County. Evidence indicates that there was some disposal of hazardous waste materials at the landfill during this time. The Town of Warwick operated the landfill until 1977.

In April 1977, the Site was leased from the property owner, Mrs. Millie Mae Penaluna, by Grace Disposal and Leasing, Ltd. (Grace Disposal), Harriman, New York. On July 15, 1977, Grace Disposal was granted a permit to operate the refuse disposal area by the Orange County Department of Health. Under Grace Disposal's operation, municipal wastes and industrial hazardous wastes/sludges were disposed of in the landfill.

In 1978, the State of New York took over the regulation of landfills from the counties. In February 1978, trace Disposal submitted an application to NYSDEC to operate the Warwick Landfill. A Draft Environmental Impact Statement (DEIS) was compiled for a NYSDEC Solid Waste Management Facility operation permit at the Site by P. Joseph Corless, Consulting Engineers, Inc. on December 27, 1978. The DEIS findings indicated that approximately 300,000 cubic yards of refuse per year were handled at the landfill for an unspecified duration. It also concluded that leachate and surface run-off generated at the Site did not measurably affect surface water and groundwater n the area, and also, that the water quality of the stream which drains the wetland area south of the Site was in compliance with NYS surface water standards. However, the DEC requested additional information from the applicant which included the drilling and water sampling of on-site monitoring wells and boring and analyses of on-site soils.

In 1979, in response to concerns of local citizens who had reported observations of suspicious dumping activities at the landfill, DEC and EPA collected and analyzed two leachate samples at the Site. The results indicated the presence of heavy metals, phenols, and various volatile organic compounds (VOCs), some of which exceeded the NYS drinking water standards and EPA maximum contaminant levels. Based on the results of these samples and the fact that Grace Disposal did not perform the additional tasks necessary for the submittal of an adequate DEIS within a reasonable time period, the application to operate the landfill was denied by DEC on September 4, 1979, and the landfill was ordered to be closed. Pursuant to a New York State court order, the Site was covered, graded, and closed by Grace Disposal. On June 11, 1980, DEC was notified that a Certificate of Dissolution had been filed by Grace Disposal.

In 1984, ownership of the property was transferred to Orange County for nonpayment of back taxes. It was conveyed from Orange County to Newburgh, New York Developers in November 1986.

In March 1985, a preliminary assessment/site inspection, including a field investigation, was performed by Woodward-Clyde Consultants, Inc. for DEC. The information generated was utilized to prepare a Hazard Ranking System (HRS) assessment of the Site. Based upon the HRS score, the Site was proposed for inclusion on EPA's National Priorities List (NPL) of uncontrolled hazardous waste sites in 1985 and was added to the NPL in March 1989.

In 1987, the property was transferred to the current owners, L&B Developers, Inc. On March 22, 1991, a notice of federal lien was filed at the Orange County Courthouse in Goshen, New York, which provides a lien in favor of the United States against the property comprising the Site for all costs and damages for which L&B Developers, Inc. is liable to the United States pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

On December 28, 1988, EPA sent special notice letters to a number of potentially responsible parties (PRPs) at the Site, namely parties that EPA had determined were responsible for contributing to the contamination found at the Site. These PRPs included: All County Environmental Services Corporation, All County Resource Management Corporation, Ford Motor Company, Grace Disposal & Leasing, Ltd., Instrument Systems Corporation/Lightron corporation, International Paper, I.S.A. of New Jersey, Inc., L&B Developers, Jones Chemicals, Nepera, Inc., New York University Medical Center, Reichhold Chemicals, Inc., Round Lake Sanitation Corporation, and Union Carbide Corporation. The special notice letters informed these parties of their potential liability at the Site and afforded them the opportunity to undertake the remedial investigation and feasibility study (RI/RS) for the Site.

Subsequently, on February 27, 1991, based on newly received information, EPA sent general notice letters to Georgia Pacific Corporation and the Town of Warwick, informing them of their status as PRPs.

Since EPA did not receive any good faith proposal from the PRPs to undertake or finance the RI/FS, EPA

contracted Ebasco Services, Inc. to perform this work, using Superfund monies. Field work for the RI/FS began in August 1989 and was completed in February 1991.

From September 1989 until November 1990, as part of the RI, residential well sampling was conducted by EPA and NYS Department of Health (DOH), which indicated levels of VOC contamination above NYS and federal drinking water standards. As a result, DOH and DEC fitted those affected households with granular activated carbon units. Four residential wells are currently fitted with these units which are regularly sampled by DEC.

In June 1991, EPA signed a Record of Decision (ROD) for OU-1, which included a landfill cap as a source control measure, gas venting and provision of granular activated carbon filters on certain residential wells as an interim measure. In addition, because some VOCs and metals were identified in the groundwater above federal and NYS drinking water standards, the ROD also specified a supplemental investigation of the fate and transport of the contamination, designated as OU-2.

On February 28, 1992, after failing to receive any good faith offers to undertake the OU-1 remedial work, EPA issued a Unilateral Order to six PRPs [Ford Motor Company, Georgia-Pacific Corporation, I.S.A. in New Jersey, Inc., Round Lake Sanitation Corporation, Union Carbide Corporation and Town of Warwick] to perform the remedial design and remedial action (RD/RA) called for in the OU-1 ROD. Certain of the PRPs formed a group known as the Warwick Administrative Group (WAG) to perform the remedial work at the Site. The WAG hired Geraghty and Miller, Inc. (G+M) to perform the remedial design work.

On September 28, 1992, EPA issued an Administrative Order on Consent to four PRPs [Ford Motor Company, Georgia-Pacific Corporation, Reichhold Chemicals, Inc. and Union Carbide Corporation] to perform the supplemental RI groundwater investigation. The OU-2 RI was also conducted by G+M.

On April 9, 1993, EPA issued a second UAO for the OU-1 RD/RA to five additional PRPs [International Business Machines Corporation, International Paper Company, Nepera, Inc., Reichhold Chemicals, Inc. and Revere Smelting and Refining Corporation], requiring that they cooperate and coordinate with the other PRPs in conducting the work.

**HIGHLIGHTS OF COMMUNITY PARTICIPATION**

The RI report and the Proposed Plan for Operable Unit Two (OU-2) were released for public comment on July 28, 1995. These documents were made available to the public in the EPA Docket Room in Region II, New York and the information repositories at the NYSDEC in Albany, New York, the Warwick Town Hall, Warwick, New York and Greenwood Lake Village Hall, Greenwood Lake, New York. A press release announcing the availability of these documents was issued on July 28, 1995. The 30-day public comment period was set by EPA to end on August 27, 1995.

An extension to the public comment period was requested by the Dutch Hollow Homeowners Association (DHHA) which is the Technical Assistance Grant (TAG) recipient at the Site. An extension has been granted to afford the DHHA's technical advisor sufficient opportunity to review and comment on the RI, the risk assessment and the Proposed Plan. The public comment period closed on September 26, 1995.

During the public comment period, EPA held a public meeting to present the RI, the risk assessment report and the Proposed Plan, to answer questions, and to accept both oral and written comments. The public meeting was held at the Greenwood Lake Middle School, Greenwood Lake, New York on August 15, 1995. At this meeting, representatives from EPA and DOH answered questions about the Site and the proposed no further action remedy and received comments from the local citizens. Comments and responses to those comments received during the public meeting and public comment period are included in the Responsiveness Summary (see Appendix V).

**SCOPE AND ROLE OF OPERABLE UNIT**

EPA has divided the remedial work necessary to mitigate both off-site and on-site contamination stemming from the Site into two operable units. The first operable unit addresses the control of

the source of contamination at the Site. The June 1991 ROD for OU-1 selected the capping of the landfill as the appropriate source control response action. The purpose of this action is 1) to minimize the infiltration of precipitation into the landfill, thus reducing the quantity of water percolating through the landfill materials which will minimize the leaching of contaminants and reduce the downgradient migration of contaminants and 2) to minimize any further contamination of the wetlands and drainage channels, which ultimately drain into Greenwood Lake.

OU-1 also provides for 1) point-of-use treatment, as an interim, precautionary measure, for four nearby residential wells which exhibited low levels of contamination to eliminate the risk to area residents and 2) an ongoing residential well monitoring program, including septic tank sampling. In addition, the impacts of the Site on the adjacent wetlands, groundwater and air will be monitored as part of the OU-1 operations and maintenance plan.

The OU-1 RD for the cap was recently completed. The subsequent construction and installation of the cap should begin in the Spring of 1996.

The objective of the RI and risk assessment for OU-2 was to characterize further the fate and transport of the contaminants in the groundwater and, specifically, to:

- define the hydrogeologic and hydraulic characteristics of the landfill
- sample the monitoring wells
- define potential contamination sources
- implement a residential well monitoring program
- determine human health risks at the Site

Also, during the OU-2 RI, additional sampling of surface water and sediments was performed to characterize the landfill contamination further.

The selected remedy for OU-1 and the OU-2 RI, risk assessment and Proposed Plan serve as the basis for the OU-2 groundwater remedy.

**SITE CHARACTERISTICS**

Between March 1993 and September 1994, various sampling events were conducted by G+M. These investigative events, which were performed as part of both the OU-1 RD and OU-2 RI, included: installation of landfill piezometers, monitoring wells, and borings; groundwater monitoring well and residential well sampling; landfill seep surveying and mapping; off-site seeps and surface water bench marking; leachate sampling; wetlands' surface water and sediment sampling; landfill gas and ambient air sampling; and residential septic tank sampling.

Topography

The Site is located in the Hudson Highlands, consisting primarily of Precambrian-age gneiss. Elevations across the Site range from approximately 890 feet above mean sea level (msl) in the northeast to approximately 860 feet above msl in the southwest. Along the northwestern and southeastern boundaries of the landfill, the site topography slopes downward to approximately 825 and 820 feet above msl, respectively. Elevations within 1 mile of the site range from approximately 650 to 1,300 feet above msl.

North Brook and South Brook originate along the northwestern and southeastern boundaries of the landfill (see Figure 2). The upper reaches of both brooks are intermittent. The landfill comprises a small portion of these drainage basins and contributes runoff to both North Brook and South Brook. Wetlands flank the landfill along its northwestern and southeastern boundaries. Fill soil and some refuse are present in the wetlands adjacent to the Site and will be addressed in the OU-1 remedy.

The geology of the Site area is complex and consists of three significant units: (1) competent, massive, crystalline bedrock; (2) sandy, glacial outwash, i.e., stratified drift or the layered deposits emplaced

by glacial streams; and, (3) dense, silty, glacial till, i.e., primarily an unstratified deposit emplaced down-wasting of sediment-laden ice. The manmade landfill material consists of refuse, silt and daily and final cover soil.

The bedrock in the Site area is a fairly continuous, massive igneous body, consisting of various gneiss formations. The bedrock has high concentrations of iron, magnesium and calcium minerals. As a result of the natural movement of groundwater through the bedrock formation, numerous minerals dissolve out of it; this action is referred to as chemical-weathering. Pockets of chemically- weathered bedrock exist within and to the northeast of the Site area. The variability in depth to the top of the weathered bedrock suggests that it is isolated in areal extent. In addition, a 16-foot interval of predominantly physically weathered rock exists both in the Site area and south of the landfill. The weathered bedrock consists of fractured gneiss, overlain by sandy outwash. Bedrock is present west of the landfill where silty till directly overlies the bedrock.

The overburden deposits in the Site area are glacial in origin and vary greatly in composition and thickness and consist of sandy outwash and silty till. Overburden thickness north of the landfill is approximately 70 feet. To the east and north of the landfill, overburden is either absent or it occurs in thin pockets because competent bedrock either outcrops or occurs a few feet below ground surface in that area. Overburden thickness increases to the west with greater than 90 feet of silty till.

Sandy outwash is present north and south of the landfill. The thickness of the sandy outwash south of the landfill ranges from approximately 25 to 40 feet. A wedge of dense, facility till is also present west of the landfill. The silty till rests on bedrock.

The landfill material, in most areas, overlies bedrock. At one location, a 4-foot thick pocket of physically weathered bedrock occurs between the landfill material and the lowered bedrock. The maximum thickness of refuse is approximately 50 feet and occurs in the southern section of the landfill. In the northern section of the landfill, the maximum thickness of refuse is approximately 30 feet. The landfill soil cover is approximately 2 feet thick. The cover soil typically consists of a poorly sorted silt with varying percentages of clay, sand, and gravel. The entire landfill is capped with this cover soil, which was also placed over the area that is currently the northern section of the southern wetlands.

Hydrogeology

The hydrogeologic regime of the Site area is complex. Groundwater occurs within fractures in massive, crystalline cock, isolated pockets of chemically-weathered bedrock, dense, silty till, sandy outwash, and landfill material (refuse and silty soil). Topographic relief and the variable transmissivity of the geologic media combine to produce a complex groundwater flow system in the site area.

Groundwater flow in the shallow bedrock is mostly towards the southwest, moving from the residential area northeast of the landfill towards the landfill. Continuous water-level monitoring, which was conducted in monitoring wells located between the Site and the northeast residential area (see Figure 2), did not indicate any influences on the ground water flow in the shallow bedrock from residential well pumping. The residential areas in other locations did not have any contamination above NYS drinking water standards in their wells, including those in the southwest of the landfill.

The downward vertical gradients in the bedrock located northeast of the Site would facilitate the movement of groundwater from the shallow bedrock to the deep bedrock, if they were connected by an open borehole. As a result of the open borehole method of construction, some of the residential wells, located northeast of the landfill, may act as a conduit for contaminant migration from the shallow bedrock to the deep bedrock. Often in these mostly open hole wells, the shallow bedrock would not be isolated (cased off) from the deep bedrock, thus groundwater could flow downward. Downward flow could also be enhanced by well-pumping, especially in low-yield, high-drawdown wells.

A summary of the hydrogeologic conditions for the Site are as follows:

- The landfill is situated in a groundwater discharge environment, i.e., perched leachate and lower leachate primarily flows to North and South Brooks and their associated wetlands.

- Shallow bedrock groundwater moves from the residential area northeast of the landfill towards the landfill.

- There is limited hydraulic connection between the shallow bedrock groundwater and the deep bedrock groundwater.

- The hydraulic properties (i.e., hydraulic heads and lower hydraulic conductivity) of the shallow bedrock minimizes the movement of leachate to the north and northeast.

- The bedrock beneath the Site will tend to limit the vertical movement of leachate, because of its low vertical hydraulic conductivity. The well yield, hydraulic conductivity, boring logs, and downhole geophysical well log data indicate that groundwater flow at depth is limited.

- The natural hydrogeologic conditions combined with the construction techniques [well casing extending only a few feet into competent rock] of deep residential wells (typically 300 feet or greater) produce conditions that allow for the downward vertical migration of shallow bedrock groundwater to depths of 300 feet or more. Since the residences are serviced by septic systems near the surface, the existence of this pathway is further supported by the presence of coliform bacteria, which is not usually found at depth, in upgradient residential well samples. In addition, the existence of this pathway is further supported by the distribution of chlorinated organic compounds in the upgradient bedrock groundwater, i.e., the highest concentrations of chlorinated organics detected upgradient were in the shallow bedrock groundwater.

Groundwater Sampling and Analytical Results

As part of the OU-1 RI/FS, fifteen groundwater monitoring wells were installed, eight wells in the overburden aquifer and seven in the bedrock aquifer (see Table 1); a number of piezometers were also installed. Three rounds of groundwater samples were collected from the monitoring wells. Residential wells in the area were also sampled (see Table 2).

As part of the OU-1 RI/FS, sampling and analyses of both the monitoring and residential wells indicated that various organic and inorganic contaminants exceeded federal and NYS drinking water standards.

The OU-1 ROD, as an interim remedy, specified that certain residential wells be provided with activated carbon filtration units on an as needed basis. The OU-1 ROD also specified that a supplemental groundwater investigation be conducted in order to define better the hydrogeologic and chemical conditions at the Site and, ultimately, to ensure that area residents are protected from any potential site-related contaminants, particularly those in the groundwater.

As part of the OU-2 RI, ten additional monitoring wells (shallow, intermediate and deep) were installed on-site and off-site to monitor both upgradient and downgradient groundwater quality at the Site (see Table 1). As indicated above, the hydrogeologic investigation revealed a complex scenario. In the overburden, the downgradient flow is southeasterly, southwesterly and northwesterly from the landfill; this stems primarily from the geometry of the aquifer formation and the configuration of the landfill itself. The actual discharge of the overburden aquifer to adjacent wetlands and streams, however, occur mainly in the northwesterly and southeasterly directions, since the groundwater, moving in the southwesterly direction, meets a till layer which acts as a dam and forces it along the front to the northwest or the southeast. For the shallow bedrock, the majority of the groundwater flow is in the southwesterly direction. The hydrogeologic conditions indicate that areas northeast and northwest of the landfill proper are upgradient of the landfill proper. Downgradient locations in the shallow bedrock can generally be defined as south and southwest of the landfill. From the selective zone yield tests indicate that water transmission decreases with depth. The deep bedrock was not determined not be a high yield aquifer and was not the subject of the OU-2 RI. Information from local drillers indicate that some residential wells may be in the bedrock aquifer, but there are indications that the yields for these

wells is not as high as for those which are located in the more water-producing shallow bedrock.

Two rounds of groundwater sampling (upgradient and downgradient) were conducted in December 1993 and August/September 1994. On-site and off-site monitoring wells were sampled for a broad spectrum of contaminants, including VOCs, semi-VPCs, pesticides, PCBs, and inorganics. Also, during September 1994, as specified under the OU-1 ROD, a residential well sampling program was initiated; twenty-four homes were sampled for VCCs and inorganics (see Table 2).

Various VOCs were detected above the federal and NYS standards in seven monitoring wells during the two rounds of sampling (see Table 3). Maximum concentrations are reported here. During the first round, 2-butanone was estimated at 100 :g/l (upgradient), 1,1-dichloroethene was detected at 6.8 :g/l (upgradient), 1,1-dichloroethane was detected at 7.2 :g/l (upgradient), 1,1,1-trichloroethane (TCA) was detected in two wells at 17 and 65 :g/l, respectively (upgradient). During the second round, 1,1-dichloroethylene was detected at 12 :g/l (upgradient), 1,1-dichloroethane was detected at 8 :g/l (upgradient), 2-butanone was detected at 31 :g/l (upgradient), toluene at 6 :g/l (upgradient), TCA was detected at 5, 9 and 75 :g/l (upgradient) and chloromethane was detected at 28 :g/l (downgradient). Benzene was detected in two wells at 4 :g/l (downgradient) and one well at 2 :g/l (downgradient); these levels are above the NYS Class GA standard of 0.7 :g/l. The detection and quantification limit for benzene varied for each sampling round but were generally less than 1 :g/l.

For the residential well sampling, only two wells had any VOCs detected above NYS standards (see Table 4). Chloroform was detected in one residential well at 7 :g/l (the NYS Class GA standard is 5 :g/l). TCA was detected in one of the residential wells at 32 :g/l (NYS standard is 5 :g/l). However, this well is fitted with a carbon filter unit; the TCA was not detected in the drinking water after treatment with the carbon filter unit. With the exception of benzene and chloromethane, VOC contamination was not found in downgradient wells above federal and NYS drinking water standards. Available data and information indicate that the low level VOC-contamination present in four residential wells (all upgradient) is not landfill-related. These wells were determined to be situated upgradient of the landfill.

Various inorganic compounds were detected at or above federal and NYS primary drinking water standards in both upgradient and downgradient monitoring and residential wells (see Table 3). During the first round of sampling, chromium was detected above the NYS Class GA standard of 50 :g/l at eight monitoring wells: three upgradient wells had levels of 85; 205 and 442 :g/l with an average concentration of 244 :g/l, and five downgradient wells had levels ranging from 58 to 1250 :g/l with an average concentration of 384 :g/l. During the second round of sampling, chromium was detected above the NYS standard at five monitoring wells. Two upgradient wells had levels of 75 and 148 :g/l with an average concentration of 111 :g/l; three downgradient wells had levels of 60, 99 and 216 :g/l with an average concentration of 125 :g/l. For each sampling round, the filtered data showed levels well below the NYS standard. In all but one case, the chromium levels decreased in the second round of sampling. The residential well sampling identified only two detections of chromium, both well below NYS standards. These levels seem to indicate that chromium is naturally occurring in the formation, i.e., background levels, since it is found at comperable levels, both upgradient and downgradient of the landfill. The levels of metals detected in the samples tend to directly depend on the amount of suspended sediment (turbidity) in the samples. Since this excessive turbidity is believed to be an artifact of sampling, these higher levels are not representative of true in-situ levels in the aquifer or levels which would be found at the tap of a residential well.

Lead was also detected in both upgradient and downgradient monitoring well samples. During the first round of sampling, lead was detected above the federal action level of 15 :g/l in five monitoring wells: three upgradient wells (ranging from 36.7 to 290 :g/l) and two downgradient wells (20.5 and 2.5 :g/l). During the second round of sampling, lead was detected above the federal standard at four monitoring wells: three upgradient wells (ranging from 37.2 to 80.5 :g/l) and one downgradient well (35.4 :g/l). During the residential well sampling, lead was also detected above the federal action level in six wells (17.3 to 88.4 :g/l), all of which are located upgradient of the landfill.

DOH has resampled those residential wells previously identified with lead levels above the federal action

level and has determined that the presence of lead is related to household plumbing sources. DOH has advised area residents to run their tap water prior to use for potable purposes.

In both sampling rounds, manganese was detected in almost all monitoring wells above the NYS secondary drinking water standard of 300 :g/l. Manganese ranged between 2.2 :g/l and 19,700 :g/l; comparable levels were found in both upgradient and downgradient monitoring wells. These levels appear to be representative of background conditions in the area. The subsequent risk discussion further explains that the manganese does not present a health risk.

Iron was also detected in numerous upgradient and downgradient wells above the secondary drinking water standard of 300 :g/l. The range of levels was 32.8 to 414,000 :g/l for upgradient groundwater and 78.4 to 79,700 :g/l for downgradient groundwater.

As indicated above, some of the monitoring and residential wells showed somewhat elevated levels of iron and manganese; however, the federal and NYS secondary standards for iron and manganese are based on aesthetic properties and are intended to prevent potential problems, such as poor taste, odor and staining of plumbing fixtures and do not specifically present a health hazard.

Since most of these contaminants presented here have isolated hits at or above NYS standards, no plumes could be delineated for organic or inorganic contaminants. A summary of the contaminants in the downgradient wells that exceeded NYS standards and upgradient concentrations is presented in Table 5.

As discussed in the section below, sampling data from privately-owned septic systems, which identified numerous VOCs, including toluene and 1,1-dichloroethane, indicate that the septic systems are a likely source of the contamination that is present in the residential wells.

Surface Water, Sediment, Leachate and Septic System Sampling and Analytical Results

As part of the OU-1 RD, G+M conducted two rounds of surface water and sediment sampling in June 1993 and April 1994; the data is further identified in the Ecological Reports (August 1994). The sampling was segregated into three zones with respect to the landfill: upstream, adjacent and downstream. The surface water sampling showed V0Cs, semi-VOCs and metals, as well as numerous non-detects among all contaminants. The maximum VOC levels included chlorobenzene (2 :g/l-adjacent) and ethylbenzene (16 :g/l-adjacent); no VOCs were detected downstream. The maximum semi-VOC levels included bis(2-ethylhexyl)phthalate (15 :g/l-upstream, 9 :g/l-adjacent and 5 :g/l-downstream) and 4-methylphenol (2 :g/l-upstream, 29 :g/l-adjacent). The maximum metal levels included aluminum (3660 :g/l-upstream, 4160 :g/l-adjacent and 172 :g/l-downstream), iron (5630 :g/l-upstream, 40,900 :g/l-adjacent and 1800 :g/l-downstream), magnesium (4320 :g/l-upstream, 33,800 :g/l-adjacent and 12,800 :g/l-downstream), manganese (317 :g/l-upstream, 2960 :g/l-adjacent and 1800 :g/l-downstream) and sodium (7550 :g/l-upstream, 145,000 :g/l-adjacent and 22,200 :g/l-downstream). In general, the detected levels for all contaminants, except for iron and manganese, were within NYS standards.

The sediment sampling indicated the presence of VOCs, semi-VOCs and metals. The maximum VOC levels included 2-butanone (0.044 mg/kg-upstream, 0.57 mg/kg-adjacent and 0.005 mg/kg-downstream) and methylene chloride (0.004 mg/kg-upstream and 0.63 mg/kg-adjacent). The maximum semi-VOC levels included various PARs, chrysene at 9.2 mg/kg-downstream, fluoranthene at 20 mg/kg-upstream, 5.7 mg/kg-adjacent and 26 mg/kg-downstream and bis(2-ethylhexyl)phthalate at 0.16 mg/kg-upstream, 1.3 mg/kg-adjacent and 0.3 mg/kg-downstream. Various metals were detected in all three zones of sediment sampling and, in general, were at levels within NYS criteria.

In December 1993, one round of leachate sampling was performed from the landfill piezometers. The maximum VOC levels included benzene (24 :g/l), ethylbenzene (42 :g/l), xylene (200 :g/l), toluene (34 :g/l) and chlorobenzene (32 :g/l). The maximum semi-VOC levels included various PAHs: fluoranthene-0.2 :g/l and pyrene-170 :g/l. The maximum metal levels included barium (3630 :g/l), chromium (616 :g/l) , cobalt (289 :g/l), iron (1.94 x 106 :g/l), lead (4870 :g/l), manganese (9750 :g/l) and nickel (591 :g/l). The maximum pesticide levels included alpha-chlordane (0.76 :g/l), gamma-chlordane (0.51 :g/l), 4,4'-DDE (0.14 :g/l) and 4,4-DDT (0.083 :g/l). Aroclors 1242 and 1254 (PCBs) were detected at 2.5 and

5.2 :g/l, respectively.

Eleven residential septic systems were sampled, several of which were found to contain very high levels of VOCs (see Table 6). Concentrations of contaminants in some systems were so high that the certain contaminants could not be analyzed at reasonable detection limits (e.g., the detection limit for 1 1,1-TCA in RS-29 was 92,000 :g/kg). The maximum concentrations of VOCs detected included: PCE at 1400 :g/l, 1,1-DCA at 1 ,000 :g/l, chlorobenzene at 1,200,000 :g/kg and toluene at 160,000 :g/kg. These concentrations were several orders of magnitude higher than any other levels collected in any other media during the study. An effort was made to compare the levels found in the septic systems with the levels foundin the residential wells in this same neighborhood. It is noted, however, that the levels of contaminants found in the residential wells were very low; aside from 32 :g/l of 1,1,1-TCA found in PW-11 and 7 :q/l of chloroform found in RW-5, none of the other residential well had levels of contaminants at concentrations greater than 4 :g/l. Nonetheless, this comparison indicated that several of the septic system contaminants or their breakdown products were also present in some of the residential wells. For example, septic system RS- 37 contained 1400 :g/l of PCE (breakdown products 1,1-DCE and 1,1 DCA) while nearby residential well PW-11 contained 3 :g/l of 1,1-DCE and 4 :g/l of 1,1-DCA. RW-37, which is located on the same property as RS-37, contained 1 :g/l of 1,1-DCA. These data suggest that the septic systems are the likely cause of the contamination in the residential wells. This is further supported by the presence of coliform bacteria ir several residential wells, including RW-37. Coliform bacieria often an indicator of human waste, is typically found in eptic systems.

Consistent with the implication that the septic systems are the cause of the contamination in the overburden aquifer and resulting contamination of the residential wells, is the fact that MW-10S contained the highest level of contaminants of any of the residential or monitoring wells located upgradient of the Site (round 2 sampling results: 75 :g/l of 1,1,1-TCA, 12 :g/l of 1,1-DCE, 8 :g/l of 1,1-DCA). This shallow well s screened about 20-30 feet below grade, across the street and domgradient of RS-37.

In addition, as a result of concerns expressed during the comment period of the OU-1 Proposed Plan regarding sample analysis for the presence of glycol ethers in groundwater, samples obtained from four residential wells, six monitoring well and eleven septic systems were analyzed for these compounds specifically 2-methoxy ethanol and 2-methoxy ethanol acetate. These compounds were selected because of their high toxicity relative to the glycol ether group of compounds. EPAs National Exposure Research Laboratory/Characterization Research Division, formerly known as the Environmental Monitoring Systems Laboratory/Las Vegas, developed an analytical method to analyze for glycol ethers. The analyses showed that the two glycol ether compounds were not detected (detection limit of 60 :g/l) in any of the ten groundwater samples or the eleven septic system samples. In addition, further analysis of the septic system samples detected phenols, chlorinated benzenes, e.g., chlorobenzene (4000 :g/l), polynuclear aromatics and toluene (350 :g/l). As indicated by the previous septic system sampling, some of these compounds were detected in nearby residential wells. These results further indicate that the septic systems present a potential source of contaminants to the private residential drinking water wells.

**SUMMARY OF SITE RISKS**

Based upon the results of the RI and the Baseline Ambient Air Monitoring Program Report, a Baseline Risk Assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site if no remedial action were taken.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario. Hazard Identification identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. Exposure Assessment estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these

exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed. Toxicity Assessment determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). Risk Characterization summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

The baseline risk assessment began with selecting contaminants of concern which would be representative of site risks. These contaminants included benzene, isopropylbenzene, chloromethane, aluminum, antimony, chromium, cobalt, manganese, nickel, and vanadium in the groundwater and benzene and methylene chloride in the ambient air. Several of the contaminants are known to cause cancer in laboratory animals and are suspected or known to be human carcinogens.

Current federal guidelines for acceptable exposures are an individual lifetime excess carcinogenic risk in the range of 10-4 to 10-6 which can be interpreted to mean that an individual may have a one in ten thousand to a one in a million increased chance of developing cancer as result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site.

Four exposure pathways were evaluated for OU-2 under possible on-site present and future land use conditions, i.e., exposure to groundwater and air emissions to individuals residing at the perimeter of the landfill. No scenario was evaluated for residing on the landfill. These exposure pathways were evaluated separately for adults and children. The exposure pathways considered under both current and future uses include inhalation of ambient air, ingestion of groundwater from the overburden and bedrock aquifers, dermal contact with groundwater while showering, and inhalation of chemicals while showering. Risks calculated for these pathways do not take into account any reductions in air and groundwater chemical concentrations which are expected to result from the OU-1 capping. It should also be noted that the residential well data was not utilized in the risk calculations, because wells in which contaminants were found were all considered to be upgradient of the Site.

No unacceptable carcinogenic risks, either for adults or children, were found for exposure to groundwater. The greatest risk for adults and children would result from groundwater ingestion at 3.2 x 10-7 and 1.1 x 10-7, respectively (see Tables 7 and 8). Cancer risks from exposure to groundwater in the bedrock aquifer are attributable primarily to benzene through direct ingestion.

For ambient air, the primary contaminant of Concern is methylene chloride. No unacceptable carcinogenic risks, either for adults or children, were calculated. The greatest risk for adults and children are 2.2 x 10-7 and 8 6 x 10-7, respectively (see Table 9).

To assess the overall potential for noncarcinogenic effects posed by more than one contaminant, EPA has developed hazard index (HI). The HI measures the assumed simultaneous subthreshold exposures to several chemicals which could result in an adverse health effect. When the HI exceeds 1.0, there may be concern for potential noncarcinogenic health effects.

Noncarcinogenic risks for adults and children are attributable primarily to manganese through direct ingestion see Tables 10 and 11). The non-carcinogenic risk shows a total HI from the bedrock groundwater pathway is 0.7 for an adult and 1.4 for a child. For the overburden groundwater pathway, the total HI for an adult is 0.08 and for a child is 0.2. For the air pathway, the total HI for an adult is 0.4 and for a child is 0.9 (see Table 12).

As indicated above, the results of the baseline risk assessment show that, for all exposure pathways evaluated, the only total noncarcinogenic risk with a calculated HI greater than 1.0 is for the child receptor through ingestion of bedrock groundwater (see Table 11); this HI is directly related to manganese, which is considered an essential nutrient. The manganese dose received by the child from consumption of bedrock groundwater is lower than that which would be Supplied by a common over-the-counter multivitamin supplement.

The overall summary results for carcinogenic and non-carcinogenic risks are presented in Table 13.

Ecological Risk Assessment

The results of the ecological investigations performed under the OU-1 RD and the OU-2 RI support the conclusions identified in the OU-1 RI. The environmental assessment evaluated potential exposure routes of the Site contamination to terrestrial wildlife and aquatic life. However, because of the low concentrations of contaminants detected, lack of potential bioaccumulation, absence of fishing and other recreational activity, and absence of known endangered species, it was concluded that potential environmental impacts were minimal and, as a result, the environmental assessment was not quantified. The wetlands in the vicinity of the Site were delineated.

The need to minimize the disturbance of these wetlands habitats via migration of contaminants from the landfill, as well as, via any future remediation activities, was identified as an important factor that was considered in the selection of the OU-1 landfill capping remedy. It is noted that the capping remedy will, in general, significantly reduce leachate generation and will eliminate leachate seeps, which are the most significant source of contamination to the adjacent streams and wetlands.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is significant uncertainty as to the actual levels present. Also, environmental chemistry analysis error can stem from several sources including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment.

As a result, the baseline risk assessment provides upper bound estimates of the risks to populations near the Landfill and is highly unlikely to underestimate actual risks related to the Site. More specific information concerning public health risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the OU-2 Risk Assessment Report.

**SUMMARY OF THE SELECTED NO FURTHER ACTION REMEDY**

Based on the findings of the OU-2 RI performed at the Site, EPA and DEC have determined that site-related groundwater contamination is very limited in extent, was not found to be the probable source of contamination in wells located northeast of the Site and does not pose any significant risk to human health and the environment.

The OU-1 remedial action, a landfill cap, will be constructed during 1996. Upon construction completion, the principal threats of the Site will have been addressed. The cap will further reduce infiltration or leaching of contaminants into the groundwater and wetlands. The implementation of an environmental

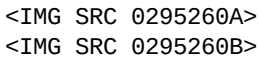
monitoring program, which will include sampling of the groundwater, ambient air, surface water, sediments and landfill gas will further ensure that the OU-1 and OU-2 remedies remain protective of human health and the environment.

**DOCUMENTATION OF SIGNIFICANT CHANGES**

There are no significant changes from the preferred remedy presented in the OU-2 Proposed Plan.

## APPENDIX I

## FIGURES



**APPENDIX II**
**TABLES**

**TABLE 1**

**GROUNDWATER MONITORING WELLS**

Zone/Flow Designation of Sampled Wells

| Bedrock Downgradient | Bedrock Upgradient | Overburden Downgradient | Overburden Upgradient |
|---|---|---|---|
| OU-2 | | | |
| MW-09D | MW-10D | WL-02S | MW-09S |
| MW-12 | MW-10I | WL-04S | WL-08S |
| MW-13 | MW-10S | WL-05S | |
| MW-14 | MW-11D | WL-06S | |
| WL-02D | MW-11S | WL-07SA | |
| WL-04D | WL-03D | WL-07SB | |
| WL-05D | | | |
| WL-08D | | | |
| OU-1 | | | |
| WL-GW01-02 | WL-GW03-02 | WL-GW02-01 | WL-GW01-01 |
| WL-GW01-12 | WL-GW03-12 | WL-GW02-11 | WL-GW01-21 |
| WL-GW01-22 | WL-GW03-22 | WL-GW02-13 (dup) | WL-GW08-01 |
| WL-GW02-02 | | WL-GW02-21 | WL-GW08-11 |
| WL-GW02-12 | | WL-GW04-01 | WL-GW08-21 |
| WL-GW02-22 | | WL-GW04-03 (dup) | |
| WL-GW04-02 | | WL-GW04-04-11 | |
| WL-GW04-12 | | WL-GW05-01 | |
| WL-GW04-21 | | WL-GW05-11 | |
| WL-GW04-22 | | WL-GW05-21 | |
| WL-GW05-02 | | WL-GW06-01 | |
| WL-GW05-12 | | WL-GW06-11 | |
| WL-GW05-22 | | WL-GW06-21 | |
| WL-GW06-02 | | WL-GW07-01 | |
| WL-GW06-12 | | WL-GW07-11 | |
| WL-GW06-22 | | WL-GW07-12 | |
| WL-GW08-02 | | WL-GW07-21 | |
| WL-GW08-12 | | WL-GW07-22 | |
| WL-GW08-22 | | | |

**TABLES 2**

**RESIDENTIAL WELLS**

Zone/Flow Designation of Sampled Wells

| Bedrock Downgradient | Bedrock Upgradient | Overburden Downgradient | Overburden Upgradient |
|---|---|---|---|
| OU-2 | | | |
| PW-01 | PW-06 | | |
| PW-02 | PW-07 | | |
| RW-06 | PW-08 | | |
| RW-18 | PW-11 RAW | | |
| | PW-13 | | |
| | PW-19 | | |
| | PW-22 | | |
| | PW-30 | | |
| | RW-04 RAW | | |
| | RW-05 | | |
| | RW-19 | | |
| | RW-23 | | |
| | RW-27 | | |
| | RW-29 | | |
| | RW-31 | | |
| | RW-32 | | |
| | RW-37 RAW | | |
| | RW-39 | | |
| | RW-40 | | |
| | RW-41 | | |
| OU-1 | | | |
| WL-RW06-01 | WL-RW02-01 | WL-RW01-01 | |
| WL-RW07-01 (dup) | WL-RW04-01 | WL-RW03-01 | |
| WL-RW10-01 | WL-RW04-01 | | |
| WL-RW11-01 | WL-RW08-01 | | |
| WL-RW12-01 | WL-RW09-01 (dup) | | |
| WL-RW13-01 | WL-RW14-01 | | |
| WL-RW16-01 | WL-RW15-01 | | |
| WL-RW17-01 | | | |
| WL-RW18-01 | | | |

**Table 3. Summary of Residential Well and Monitoring Well Groundwater Ouality, Warwick Landfill Site, Warwick, New York.**

| Constituent | Upgradient Groundwater Detection Frequency Detects/Total | Upgradient Groundwater Concentration Range Minimum (ug/L) | Upgradient Groundwater Concentration Range Maximum (ug/L) | Downgradient Groundwater Detection Frequency Detects/Total | Downgradient Groundwater Concentration Range Minimum (ug/L) | Downgradient Groundwater Concentration Range Maximum (ug/L) | NYSDEC Standards and Guidance Values (ug/L) | USEPA MCL (ug/L) |
|---|---|---|---|---|---|---|---|---|
| VOCs | | | | | | | | |
| 1,1,1-Trichloroethane | 15/35 | 0.3 | 75 | ND | ... | ... | 5 | 200 |
| 1,1-Dichloroethane | 9/35 | 0.3 | 8 | 1/33 | ... | 0.4 | 5 | NA |
| 1,1-Dichloroethene | 7/35 | 0.4 | 6.8 | ND | ... | ... | 5 | 7 |
| 1,2-Dichloroethane | ND | ... | ... | 1/33 | ... | 4 | 5 | 5 |
| 2-Butanone | 2/2 | 31 | 100 | ND | ... | ... | 50 GV | NA |
| Acetone | 1/2 | ... | 35 | ND | ... | ... | 50 GV | NA |
| Benzene | 1/35 | ... | 0.5 | 3/33 | 2 | 4 | 0.7 | 5 |
| Bromomethane | ND | ... | ... | 1/33 | ... | 0.6 | 5 | NA |
| Carbon disulfide | 2/35 | 0.1 | 2 | 2/33 | 1 | 1 | NA | NA |
| Chlorobenzene | ND | ... | ... | 3/33 | 2.9 | 5 | 5 | NA |
| Chloroethane | ND | ... | ... | 3/33 | 0.6 | 1 | 5 | NA |
| Chloroform | 1/31 | ... | 7 | ND | ... | ... | 7 | NA |
| Chloromethane | 1/35 | ... | 0.6 | 4/33 | 1 | 28 | 5 | NA |
| cis-1,2-Dichloroethene | ND | ... | ... | 1/33 | ... | 0.3 | 5 | 70 |
| meta and/or para-Xylenes | 1/35 | ... | 0.3 | 1/36 | ... | 1 | 5 for each | 10,000 (total) |
| ortho-Xylene | 1/35 | ... | 0.5 | 1/30 | ... | 0.3 | 5 | 10,000 (total) |
| Tetrachloroethene | 1/35 | ... | 0.3 | ND | ... | ... | 5 | 5 |
| Toluene | 4/35 | 0.3 | 8 | 3/33 | 0.1 | 0.6 | 5 | 1,000 |
| BNAs | | | | | | | | |
| 1,2-Dichlorobenzene | ND | ... | ... | 1/29 | ... | 0.5 | 4.7 | NA |
| 1,4-Dichlorobenzene | ND | ... | ... | 3/29 | 1 | 3 | 4.7 | NA |
| 4-Methylphenol | ND | ... | ... | 1/29 | ... | 0.6 | NA | NA |
| Napthalene | 1/15 | ... | 0.5 | 1/29 | ... | 2 | 10 GV | NA |
| Phenanthrene | 2/15 | 0.4 | 0.9 | ND | ... | ... | 50 GV | NA |
| Fluoranthrene | ND | ... | ... | 1/29 | ... | 0.8 | 50 GV | NA |
| Pyrene | ND | ... | ... | 1/29 | ... | 0.8 | 50 GV | NA |
| Chrysene | ND | ... | ... | 1/29 | ... | 0.5 | 0.002 GV | NA |
| Di-n-octylphthalate | 3/15 | 0.1 | 0.5 | 5/29 | 0.1 | 0.9 | 50 GV | NA |
| bis(2-Ethythexyl)phthalate | ND | ... | ... | 2/29 | 10 | 10 | 50 | NA |
| Dimethylphthalate | 2/15 | 0.4 | 0.8 | 2/29 | 0.5 | 2 | 50 GV | NA |
| Butyl benzyl phthalate | 1/15 | ... | 0.2 | ND | | | 50 GV | NA |
| Pesticides/PCBs | | | | | | | | |
| Methoxychlor | 1/15 | ... | 0.5 | ND | ... | ... | 35 | 40 |

See footnotes last page.

**Table 3. Summary of Residential Well and Monitoring Well Groundwater Quality, Warwick Landfill Site, Warwick, New York.**

| Constituent | Upgradient Groundwater Detection Frequency Detects/Total | Upgradient Groundwater Concentration Range Minimum (ug/L) | Upgradient Groundwater Concentration Range Maximum (ug/L) | Downgradient Groundwater Detection Frequency Detects/Total | Downgradient Groundwater Concentration Range Minimum (ug/L) | Downgradient Groundwater Concentration Range Maximum (ug/L) | NYSDEC Standards and Guidance Values (ug/L) | USEPA MCL (ug/L) |
|---|---|---|---|---|---|---|---|---|
| Metals; Total | | | | | | | | |
| Aluminum | 16/34 | 47.1 | 229,000 | 30/33 | 49.3 | 24,600 | NA | NA |
| Antimony | 4/35 | 0.4 | 1.4 | 6/33 | 0.44 | 35.0 | 3 GV | 6 |
| Arsenic | 6/35 | 1 | 59.2 | 7/33 | 1.2 | 7.3 | 25 | 50 |
| Barium | 11/35 | 7.8 | 1,290 | 29/33 | 6.2 | 1,160 | 1,000 | 2,000 |
| Beryllium | 5/35 | 1 | 17 | 3/33 | 1.5 | 6.8 | 3 GV | 4 |
| Cadmium | ND | ... | ... | 1/33 | ND | 3.5 | 10 | 5 |
| Calcium | 35/35 | 4,850 | 361,000 | 33/33 | 6,480 | 287,000 | NA | NA |
| Chromium | 10/35 | 6 | 442 | 23/33 | 3.2 | 1,250 | 50 | 100 |
| Cobalt | 8/35 | 3 | 277 | 16/33 | 4 | 59.7 | NA | NA |
| Copper | 27/34 | 9 | 653 | 23/33 | 4.9 | 77.3 | 200 | NA |
| Iron | 27/35 | 32.8 | 414,000 | 32/33 | 78.4 | 79,700 | 300 | NA |
| Lead | 28/35 | 1.3 | 290 | 25/33 | 1.0 | 35.4 | 25 | 15 AL |
| Magnesium | 35/35 | 1,250 | 130,000 | 33/33 | 1,910 | 106,000 | 35,000 GV | NA |
| Manganese | 21/35 | 2.2 | 19,700 | 28/33 | 4.1 | 17,100 | 300 | NA |
| Mercury | 1/35 | ... | 0.61 | ND | ... | ... | 2 | 2 |
| Nickel | 7/35 | 13.8 | 830 | 17/33 | 12 | 177 | NA | 100 |
| Potassium | 34/35 | 593 | 68,000 | 33/33 | 608 | 8,660 | NA | NA |
| Sodium | 35/35 | 1,950 | 124,000 | 33/33 | 1,730 | 336,000 | 20,000 | NA |
| Silver | 2/35 | 2 | 2.4 | 3/33 | 2.1 | 3.4 | 50 | NA |
| Vanadium | 6/35 | 9.2 | 3/5 | 9//33 | 5.4 | 51.0 | NA | NA |
| Zinc | 28/28 | 9.2 | 1,470 | 27/28 | 5.0 | 140 | 300 | NA |
| Selenium | 1/35 | ... | 5.0 | ND | ... | ND | 10 | 50 |
| Thallium | 2/35 | 1 | 1.3 | ND | ... | ... | 4 GV | 2 |
| Cyanide | ND | ... | ... | 2/27 | 15.6 | 20.5 | 100 | 200 |

| | |
|---|---|
| ug/L | Micrograms per liter |
| VOCs | Volatile organic compounds. |
| BNAs | Base/neutral acid extractable compounds. |
| PCBs | Polychlorinated biphenyls. |
| NA | Not applicable. |
| GV | Guidance value. |
| ND | Not detected. |
| NDC | Non-detectable concentration. |
| ! | Values apply to the sum of the isomers. |
| NYSDEC | New York State Department of Environmental Conservation. |
| MCL | Maximum contaminant level. |
| USEPA | U.S. Environmental Protection Agency. |
| AL | USEPA action level. |

Standards and guidance Values are for NYSDEC Class GA Groundwater.
Dissolved metal concentrations are shown in parentheses.

**Table 4. Summary of Residential Well Groundwater Quality, Warwick Landfill Site, September 1994, Warwick Landfill Site, Warwick, New York.**

| Constituent | Residential Well Groundwater Detection Frequency Detects/Total | Residential Well Concentration Range Minimum (ug/L) | Residential Well Concentration Range (ug/L) | NYSDEC Standards and Guidance Values (ug/L) | USEPA MCL (ug/L) |
|---|---|---|---|---|---|
| Metals: Total in ug/L | | | | | |
| Aluminum | 2 / 23 | 47.1 | 59.6 | NA | NA |
| Antimony | 3 / 24 | 0.4 | 0.53 | 3 GV | 6 |
| Calcium | 24 / 24 | 4,850 | 55,600 | NA | NA |
| Cooper | 22 / 23 | 7.4 | 533 | 200 | NA |
| Iron | 17 / 24 | 32.8 | 1450 | 300 | NA |
| Lead | 22 / 24 | 1.3 | 88.4 | 25 | 15 AL |
| Magnesium | 24 / 24 | 1,250 | 20,100 | 35,000 GV | NA |
| Manganese | 8 / 24 | 3.4 | 67.5 | 300 | NA |
| Potassium | 24 / 24 | 593 | 2630 | NA | NA |
| Sodium | 24 / 24 | 1,730 | 35,900 | 20,000 | NA |
| Vanadium | 1 / 24 | ... | 9.2 | NA | NA |
| Zinc | 20 / 20 | 7.4 | 347 | 300 | NA |
| Volatile Organic Compounds in :g/L | | | | | |
| 1,1,1-Trichloroethane | 8 / 24 | 0.1 | 32 | 5 | 200 |
| 1,1-Dichloroethane | 4 / 24 | 0.3 | 4 | 5 | NA |
| 1,1-Dichloroethene | 1 / 24 | ... | 3 | 5 | 7 |
| Carbon disulfide | 1 / 24 | ... | 2 | NA | NA |
| Chloroform | 1 / 24 | ... | 7 | 7 | NA |
| Tetrachloroethane | 1 / 24 | ... | 0.3 | 5 | 5 |
| Toluene | 1 / 24 | ... | 3 | 5 | 1,000 |

ug/L Micrograms per liter.
NA Not applicable.
GV Guidance value.
NYSDEC New York State Department of Environmental Conservation.
MCL Maximum contaminant level.
USEPA U.S. Environmental Protection Agency.
AL USEPA action level.
Standards and guidance values are for the NYSDEC Class GA Groundwater.

**Table 5** **Summary of Constituents Detected in Downgradient Groundwater Samples that Exceed New York State Class GA Groundwater Standards and Guidance Values and Maximum Upgradient Concentrations, Warwick Landfill Site, Warwick, New York.**

| Constituent | Downgradient Groundwater Detection Frequency: Greater Than Standards or Guidance Values Detects/Total | Downgradient Groundwater Concentration Range: Greater Than Standards or Guidance Values Minimum (ug/L) | Maximum (ug/L) | NYSDEC Standards and Guidance Values (ug/L) | | Maximum Upgradient Concentration (ug/L) | Number of Samples that Exceed Maximum Upgradient Concentration and Standard or Guidance Value | Wells that Exceed Maximum Upgradient Concentration and Standard or Guidance Value |
|---|---|---|---|---|---|---|---|---|
| VOCs | | | | | | | | |
| Chloromethane | 1/33 | ... | 28 | 5 | | 0.6 | 1 | WL-5S |
| Benzene | 2/33 | 2 | 4 | 0.7 | | 0.5 | 2 | WL-SD, WL-2D |
| BNAs | | | | | | | | |
| Chrysene | 1/29 | ... | 0.5 | 0.002 | GV | ND | 1 | WL-7Sa |
| Metals (Dissolved) | | | | | | | | |
| Antimony | 5/33 | 10.9 | 35.4 | 3 | GV | 32 | 2 | WL-2S, WL-4D |
| Iron | 6/33 | 398 | 26,600 | 300 | | 983 | 4 | WL-4S, WL-2D |
| Magnesium | 11/33 | 44,700 | 105,000 | 35,000 | GV | 23,800 | 11 | WL-2S, WL-4S, WL-2D, WL-4D, MW-9D, MW-13 |
| Manganese | 6/33 | 671 | 17,200 | 300 | | 212 | 6 | WL-2S, WL-4S, WL-2D |
| Sodium | 6/24 | 20,200 | 308,000 | 20,000 | | 64.200 | 3 | WL-2S, WL.4S, WL-2D |

ug/l Micrograms per liter.
VOCs Volatile organic compounds.
BNAs Base neutral/acid extractable organic compounds.
GV Guidance values.
ND Not detected.
**!** Constituents that exceed standards or guidance values and average upgradient concentrations were detected only in monitoring wells.
NYSDEC New York State Department of Environmental Conservation.

Standards and guidance values are for NYSDEC Class GA Groundwater.

**Table 5** **Summary of Constituents Detected in Downgradient Groundwater Samples that Exceed New York State Class GA Groundwater Standards and Guidance Values and Maximum Upgradient Concentrations, Warwick Landfill Site, Warwick, New York.**

| Constituent | Downgradient Groundwater Detection Frequency: Greater Than Standards or Guidance Values | Downgradient Groundwater Concentration Range: Greater Than Standards or Guidance Values | | NYSDEC Standards and Guidance | | Maximum Upgradient | Number of Samples that Exceed Maximum Upgradient Concentration | Wells that Exceed Maximum Upgradient Concentration and Standard |
|---|---|---|---|---|---|---|---|---|
| | Detects/Total Values and Standard or Guidance | Minimum (:g/L) | Maximum Concentration (:g/L) | | | | Guidance Value | Value |
| Metals (Total) | | | | | | | | |
| Antimony | 3/33 | 28.5 | 35 | 3 | GV | 1.4 | 3 | MW-9D, WL-4D, WL-2S |
| Chromium | 8/33 | 58.2 | 1,250 | 50 | | 442 | 1 | WL-7SA |
| Sodium | 12/33 | 20,100 | 336,000 | 20,000 | | 124,000 | 6 | WL-2D, WL-4S, WL-2S |

ug/L Micrograms per liter.
VOCs Volatile organic compounds.
BNAs Base neutral/acid extractable organic compounds.
GV Guidance values.
ND Not detected.
**!** Constituents that exceed standards or guidance values and average upgradient concentrations were detected only in monitoring wells.
NYSDEC New York State Department of Environmental Conservation.

Standards and guidance values are for NYSDEC Class GA Groundwater.

**Table 6** **Summary of Organic Constituents Detected in Leachate, Uporadient Monitoring Well, Upgradient Residential Well, and Residential Septic System Samples, Warwick Landfill Site, Warwick, New York.**

| Constituent | Range of Leachate Concentration1 (ug/L) | Range of Upgradient Groundwater Concentrations2 (ug/L) | Range of Residential Septic System Concentrations3 (ug/L and/or ug/kg) |
|---|---|---|---|
| Volatile Organic Compounds | | | |
| Methylene chloride | 2 to 5 | ND | ND (2U (ug/L) to 92,000U (ug/kg)) |
| 2-Butanone | 7 to 55 | 31 - 100 | 6 (ug/kg) to 110 (ug/kg) |
| Benzene | 2 to 24 | 0.5 | 72000 (ug/kg) |
| Toluene | 1 to 33 | 0.3 to 8 | 15 (ug/kg) to 160,000 (ug/kg) |
| Chlorobenzene | 13 to 32 | ND | 960 (ug/kg) to 1,200,000 (ug/kg) |
| Ethylbenzene | 2 to 42 | ND | 15 (ug/kg) |
| Xylene (total)4 | 10 to 200 | 0.8 | 42 (ug/kg) |
| 2-Hexanone | 3 | ND | ND (13U (ug/kg) to 92,000U (ug/kg)) |
| 4-Methyl-2-pentanone | 25 | ND | ND (5U (ug/kg) to 92,000U (ug/kg)) |
| 1.2.Dichloroethene (total)5 | 2 | ND | ND (0.5 U (ug/L) to 92,000U (ug/kg)) |
| Acetone | 15 | 35 | 4 (ug/L) to 280 (ug/kg) |
| 1,1,1-Trichloroethane | ND | 0.3 to 75 | ND (0.5U (ug/L) to 92,000U (ug/kg)) |
| 1,1.Dichloroethene | ND | 0.4 to 6.8 | ND (0.5U (ug/L) to 92,000U (ug/kg)) |
| 1,1-Dichloroethane | ND | 0.3 to 8 | 17000 (ug/L) |
| Chloroform | ND | 7 | 200 (ug/L) to 17,000 (ug/kg) |
| Carbon disulfide | ND | 0.1 to 2.0 | 27 (ug/kg) to 130 (ug/kg) |
| Tetrachloroethene | ND | 0.3 | 1400 (ug/L) |
| Chloromethane | ND | 0.6 | ND (0.5U (ug/L) to 92,000U (ug/kg)) |

See last page for footnotes.

**Table 6** **Summary of Organic Constituents Detected in Leachate, Upgradient Monitoring Well, Upwadient Residential Well, and Residential Septic System Samples, Warwick Landriff Site, Warwick, New York.**

| Constituent | Range of Leachate Concentrations1 (ug/L) | Range of Upgradient Groundwater Concentrations2 (ug/L) | Range of Residential Septic System Concentrations3 (ug/L and/or ug/kg) |
|---|---|---|---|

1 Leachate concentrations include the results for aqueous samples collected from landfill piezometers and landfill seeps. Sampling was conducted in 1990 and 1993.

2 Upgradient groundwater concentrations include the results for aqueous samples collected from resideniial wells and off site monitoring wells. Sampling was conducted in 1993 and 1994.

3 Residential septic system concentrations include the results for non-aquentas and aqueous samples collected from the sludge at the bottom of the septic tanks. Sampling was conducted in 1994.

4 When applicable, individual xylene results were added together to make total xylene.

5 When applicable, results for cis- and trans-1,2-dichlorethene were added together to make total 1,2-dichlorethene.

6 Residential wells and residential septic systems were not sampled and analyzed for semivolatile organic compounds or pesticides and polychlorinated biphenyls.

ug/L Micrograms per liter.

ug/kg Micrograms per kilogram.

[] The range of non-detected values is shown in brackets.

U Constituent analyzed but not detected above the indicated detection limit.

ND Not detected.

TABLE 7

Adult Cancer Risks from Exposure to Unfiltered Ground Water

| Compound | Ground Water Ingestion Oral Dose (mg/kg-day) | Ground Water Ingestion Oral Slope Factor (mg/kg-day)-1 | Ground Water Ingestion Oral Risk | Ground Water Dermal Oral Dose (mg/kg-day) | Ground Water Dermal Oral Slope Factor (mg/kg-day)-1 | Ground Water Dermal Oral Risk | Ground Water Inhalation. Inhalation Dose (mg/kg-day) | Ground Water Inhalation. Inhalation Slope Factor (mg/kg-day)-1 | Ground Water Inhalation. Inhalation Risk |
|---|---|---|---|---|---|---|---|---|---|
| **Bedrock** | | | | | | | | | |
| Benzene | 1.10e-05 | 2.90c-02 | 3.19c-07 | 4.62c-07 | 2.90c-02 | 1.34c-08 | 1.34c-08 | 2.91e-02 | 9.58c-09 |
| Isopropylbenzene | 4.38e-05 | NA | ... | 7.00c-08 | NA | ... | 1.31e-06 | NA | ... |
| Aluminum | 3.80e-02 | NA | ... | 6.08c.05 | NA | ... | 0.00 | NA | ... |
| Antimony | 4.11e.06 | NA | ... | 6.51c-09 | NA | ... | 0.00 | NA | ... |
| Chromium | 8.21e-04 | NA | ... | 3.28c-06 | NA | ... | 0.00 | NA | ... |
| Cobalt | 2.02e-04 | NA | ... | 1.62c.07 | NA | ... | 0.00 | NA | ... |
| Manganese | 2.71e-02 | NA | ... | 4.34c-05 | NA | ... | 0.00 | NA | ... |
| Nickel | 5.66e-04 | NA | ... | 1.13c-07 | NA | ... | 0.00 | 8.40e-01 | 0.00 |
| Vanadium | 1.51e-04 | NA | ... | 2.42c.07 | NA | ... | 0.00 | NA | ... |
| TOTAL | | | 3.19e-07 | | | 1.34e-08 | | | 9.58e-09 |
| **Overburden** | | | | | | | | | |
| Chromoethane | 9.00e-05 | NA | ... | 7.56e-07 | NA | ... | 2.70e-06 | 3.90e-03 | 1.05e-08 |
| Antimony | 2.23e-06 | NA | ... | 3.57e-09 | NA | ... | 0.00 | NA | ... |
| Chromium | 4.08e-03 | NA | ... | 1.63e-05 | NA | .... | 0.00 | NA | ... |
| Total | | | 0.00e+00 | | | 0.00e+00 | | | 1.05e-08 |

Notes:

NA Not available.
-- Slope Factor is not available, thus risk is not calculated.

**TABLE 8**

**Child Cancer Risks from Exposure to Unfiltered Ground Water**

| Compound | Ground Water Ingestion Oral Dose (mg/kg-day) | Ground Water Ingestion Oral Slope Factor (mg/kg-day)-1 | Ground Water Ingestion Oral Risk | Ground Water Dermal Oral Dose (mg/kg-day) | Ground Water Dermal Oral Slope Factor (mg/kg-day)-1 | Ground Water Dermal Oral Risk | Ground Water Inhalation Inhalation Dose (mg/kg-day) | Ground Water Inhalation Inhalation Slope Factor (mg/kg-day)-1 | Ground Water Inhalation Inhalation Risk |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Bedrock | | | | | |
| Benzene | 366e-06 | 2.90e-02 | 1.06e-07 | 1.12e-07 | 2.90e-02 | 3.25e-09 | 2.20e-07 | 2.91e-02 | 6.39e-09 |
| Isopropylbenzen: | 146e-05 | NA | -- | 1.70e-08 | NA | -- | 8.76e-07 | NA | -- |
| Aluminum | 1.27e-02 | NA | -- | 1.48e.05 | NA | -- | 0.00 | NA | -- |
| Antimony | 1.37e-06 | NA | -- | 1.60e-09 | NA | -- | 0.00 | NA | -- |
| Chromium | 2.74e-04 | NA | -- | 7.97e-07 | NA | -- | 0.00 | NA | -- |
| Cobalt | 6.74e-05 | NA | -- | 1.05e-05 | NA | -- | 0.00 | NA | -- |
| Nickel | 1.89e-04 | NA | -- | 2.75e-08 | NA | -- | 0.00 | 8.40e-01 | 0.00 |
| Vanadium | 5.03e-05 | NA | -- | 5.86e-08 | NA | -- | 0.00 | NA | -- |
| TOTAL | | | 1.06e-07 | | | 3.25e-09 | | | 6.39e-09 |
| | | | | Overburden | | | | | |
| Chloromethane | 3.00e-05 | NA | -- | 1.83e-07 | NA | -- | 1.80e-06 | 3.90e-03 | 7.02e-09 |
| Antimony | 7.44e-07 | NA | -- | 8.66e-10 | NA | -- | 0.00 | NA | -- |
| Chromium | 1.36e-03 | NA | -- | 3.96e-06 | NA | -- | 0.00 | NA | -- |
| TOTAL | | | 0.00e+00 | | | 0.00e+00 | | | 7.02e-09 |

Notes

NA Not available.
-- Slope Factor is not available, thus, risk is not calculated.

**TABLE 9**

**Adult Cancer Risks from Exposure to Contaminants in Ambient Air**

| Compound | Dose (mg/kg-day) | Inhalation Slope Factor (mg/kg-day)-1 | Risk |
|---|---|---|---|
| Benzene | 2.62e-04 | 2.91e-02 | 7.61e-06 |
| Methylene Chloride | 8.44e-03 | 1.64e-03 | 1.38e-05 |
| TOTAL | | | 2.15e-05 |

Child Cancer Risks from Exposure to Contaminants in Ambient Air

| Compound | Dose (mg/kg-day) | Inhalation Slope Factor (mg/kg-day)-1 | Risk |
|---|---|---|---|
| Benzene | 1.05e-04 | 2.91e-02 | 3.04e-06 |
| Methylene Chloride | 3.38e-03 | 1.64e-03 | 5.54e-06 |
| TOTAL | | | 8.58e-06 |

**TABLE 10**

**Adult Hazard Quotients and Hazard Indices from Exposure to Unfiltered Ground Water-**

| | Ground Water Ingestion | | | Ground Water Dermal | | | Ground Water Inhalation | | |
|---|---|---|---|---|---|---|---|---|---|
| Compound | Dose (mg/kg-day) | Oral Reference Dose (mg/kg-day) | HQ | Dose (mg/kg-day) | Oral Reference Dose (mg/kg-day) | HQ | Dose (mg/kg-day) | Inhalation Reference Dose (mg/kg-day)-1 | HQ |
| | | | | Bedrock | | | | | |
| Benzene | 2.56e-05 | NA | -- | 1.08e-06 | NA | -- | 7.69e-07 | 1.71e-03 | 4.50e-04 |
| Isopropylbenzene | 1.02e-04 | 4.00e-02 | 2.55e-03 | 1.63e-07 | 4.00e-02 | 4.09e-06 | 3.06e-06 | NA | -- |
| Aluminum | 8.87e-02 | 1.00e+00 | 8.87e-02 | 1.42e-04 | 1.00e+00 | 1.42e-04 | 0.00 | 1.43e-03 | 0.00 |
| Antimony | 9.59e-06 | 4.00e-04 | 2.40e-02 | 1.53e-08 | 4.00e-04 | 3.84e-05 | 0.00 | NA | -- |
| Chromium | 1.92e-03 | 1.00e+00 | 1.92e-03 | 7.66e-06 | 1.00e+00 | 7.66e-06 | 0.00 | NA | -- |
| Cobalt | 4.72e-04 | 6.00e-02 | 7.87e-03 | 3.78e-07 | 6.00e+02 | 6.29e-06 | 0.00 | 5.71e-06 | 0.00 |
| Manganese | 6.33e-02 | 1.40e-01 | 4.52e-01 | 1.01e-04 | 1.40e-01 | 7.23e-04 | 0.00 | 1.43e-05 | 0.00 |
| Nickel | 1.32e-03 | 2.00e-02 | 6.60e-02 | 2.64e-07 | 2.00e-02 | 1.32e-05 | 0.00 | NA | -- |
| Vanadium | 3.52e-04 | 7.00e-03 | 5.05e-02 | 5.64e-07 | 7.00e-03 | 8.05e-05 | 0.00 | NA | -- |
| Hazard Index | | | 6.93e-01 | | | 1.01e.03 | | | 4.50e-04 |
| | | | | Overburden | | | | | |
| Chloromethane | 2.10e-04 | 4.00e-03 | 5.25e-02 | 1.76e-06 | 4.00e-03 | 4.41e-04 | 6.30e.06 | NA | -- |
| Antimony | 5.21e-06 | 4.00e-04 | 1.30e-02 | 8.30e-09 | 4.00e-04 | 2.08e-05 | 0.00 | NA | -- |
| Chromium | 9.52e.03 | 1.00e+00 | 9.52e-03 | 3.81e-05 | 1.00e+00 | 3.81e-05 | 0.00 | NA | -- |
| Hazard Index | | | 7.50e-02 | | | 5.00e-04 | | | 0.00e+00 |

Notes:

HA Hazard Quotient
NA Not available.
-- Reference Dose is not available, thus HQ is not calculated.

**TABLE 11**

**Child Hazard Quotients and Hazard indices from Exposure to Unfiltered Ground Water**

| | Ground Water Ingestion | | | Ground Water Dermal | | | Ground Water Inhalation | | |
|---|---|---|---|---|---|---|---|---|---|
| Compound | Dose (mg/kg-day) | Oral Reference Dose (mg/kg-day)-1 | HQ | Dose (mg/kg-day) | Oral Reference Dose (mg/kg-day)-1 | HQ | Dose (mg/kg-day) | Inhalation Reference Dose (mg/kg-day)-1 | HQ |
| | | | | Bedrock | | | | | |
| Benzene | 5.13e-05 | NA | -- | 1.57e-06 | NA | -- | 3.08e-06 | 1.71e-03 | 1.80e-03 |
| Isopropylbenzene | 2.04e-04 | 4.00e-02 | 5.11e-03 | 2.38e-07 | 4.00e-02 | 5.95e-06 | 1.23e-05 | NA | -- |
| Aluminum | 1.77e-01 | 1.00e+00 | 1.77e-01 | 2.07e-04 | 1.00e+00 | 2.07e-04 | 0.00 | 1.43e-03 | 0.00 |
| Antimony | 1.92e-05 | 4.00e-04 | 4.79e-02 | 2.23e-08 | 4.00e-04 | 5.58e-05 | 0.00 | NA | -- |
| Chromium | 3.83e-03 | 1.00e+00 | 3.83e-03 | 1.12e-05 | 1.00e+00 | 1.12e-05 | 0.00 | NA | -- |
| Cobalt | 9.44e-04 | 6.00e-02 | 1.57e-02 | 5.50e-07 | 6.00e-02 | 9.17e-06 | 0.00 | 5.71e-06 | 0.00 |
| Manganese | 1.27e-01 | 1.40e-01 | 9.04e-01 | 1.47c-04 | 1.40e-01 | 1.05e-03 | 0.00 | 1.43e-05 | 0.00 |
| Nickel | 1.64e-03 | 2.00e-02 | 1.32e-01 | 3.84e-07 | 2.00e-02 | 1.92e-05 | 0.00 | NA | -- |
| Vanadium | 7.04e-04 | 7.00e-03 | 1.01e-01 | 8.21e-07 | 7.00e-03 | 1.17e-04 | 0.00 | NA | -- |
| Hazard Index | | | 1.39e+00 | | | 1.48e-03 | | | 1.80e-03 |
| | | | | Overburden | | | | | |
| Chloromethane | 4.20e-04 | 4.00e-03 | 1.05e-01 | 2.57e-06 | 4.00e-03 | 6.42e-04 | 2.52e-05 | NA | -- |
| Antimony | 1.04e-05 | 4.00e-04 | 2.60e-02 | 1.21e-08 | 4.00e-04 | 3.03e-05 | 0.00 | NA | -- |
| Chromium | 1.90e-02 | 1.00e+00 | 1.90e-02 | 5.55e-05 | 1.00e+00 | 5.55e-05 | 0.00 | NA | -- |
| Hazard Index | | | 1.50e-01 | | | 7.28e-04 | | | 0.00e-00 |

Notes:

HQ Hazard Quotient
NA Not available.
-- Reference Dose is not available, thus HQ is not calculated.

**TABLE 12**

**Adult Hazard Quotients and Hazard Index from Exposure to Contaminants in Ambient Air**

| Compound | Dose (mg/kg-day) | Inhalation Slope Factor (mg/kg-day)-1 | Hazard Quotient |
|---|---|---|---|
| Benzene | 6.11e-04 | 1.71e-03 | 3.57e-01 |
| Methylene Chlroide | 1.97e-02 | 8.60e-01 | 2.29e-02 |
| Hazard Index | | | 3.80e-01 |

Child Hazard Quotients and Hazard Index from Exposure to Contaminants in Ambient Air

| Compound | Dose (mg/kg-day) | Inhalation Slope Factor (mg/kg-day)-1 | Hazard Quotient |
|---|---|---|---|
| Benzene | 1.47e-03 | 1.71e-03 | 8.58e-01 |
| Methylene Chloride | 4.73e-02 | 8.60e-01 | 5.50e-02 |
| Hazard Index | | | 9.13e-01 |

**TABLE 13**

**Summary of Total Excess Lifetime Cancer Risks***

| | Adult | Child |
|---|---|---|
| Ingestion of Bedrock Ground Water | 3 x 10-7 | 1 x 10-7 |
| Dermal Contact with Bedrock Ground Water While Showering | 1 x 10-8 | 3 x 10-9 |
| Inhalation of Volatiles from Bedrock Ground Water While Showering | 1 x 10-8 | 6 x 10-9 |
| Total Cancer Risk from Bedrock Ground Water Pathways | 3 x 10-7 | 1 x 10-7 |
| Ingestion of Overburden Ground Water | -- | -- |
| Dermal Contact with Overburden Ground Water While Showering | -- | -- |
| Inhalation of Volatiles from Overburden Ground Water While Showering | 1 x 10-8 | 7 x 10-9 |
| Total Cancer Risk from Overburden Ground Water Pathways | 1 x 10-8 | 7 x 10-9 |
| Inhalation of Air | 2 x 10-5 | 9 x 10-6 |
| Total Cancer Risk from Air Pathway | 2 x 10-5 | 9 x 10-6 |

Note:

* Risks from ground water are for downgradient wells, and are virtually the same for and unfiltered water.

-- Cancer risks judged to be below levels of concern. Concentration of potential carcinogens in downgradients wells were substantially less than regulatory criteria, or less thant detected in Upgradient wells.

Summary of Hazard Indices*

| | Adult | Child |
|---|---|---|
| Ingestion of Bedrock Ground Water | 0.7 | 1.4 |
| Dermal Contact with Bedrock Ground Water While Showering | 0.001 | 0.002 |
| Inhalation of Volatiles from Bedrock Ground Water While Showering | 0.005 | 0.002 |
| Total Hazard Index from Bedrock Ground Water Pathways | 0.7 | 1.4 |
| Ingestion of Overburden Ground Water | 0.08 | 0.2 |
| Dermal Contact with Overburden Ground Water While Showering | 0.0005 | 0.0007 |
| Inhalation of Volatiles from Overburden Ground Water While Showering | -- | -- |
| Total Hazard Index from Overburden Ground Water Pathways | 0.008 | 0.2 |
| Inhalation of Air | 0.4 | 0.9 |
| Total Hazard Index from Air Pathways | 0.4 | 0.9 |

Note:

* Risks from ground water are for downgradient wells, and are virtually the same for filtered and unfiltered water.

-- Inhalation RfDs are not available for the indicator volatiles of concerns, thus Hazard Index values were not calculated.

**APPENDIX III**

**ADMINISTRATIVE RECORD INDEX**

WARWICK LANDFILL SITE
OPERABLE UNTT TWO
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.5 Operable Unit One Information

P. 100001 - 100028 - Plan: Final Residential Well Monitoring proaram Work Plan. Warwick Landfill Site, Warwick, New York, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, February 1994.

P. 100029 - 100039 - Letter to Mr. Damian Duda, New York/Caribbean Superfund Branch I, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Christopher J. Motta, C.P.G., Principal scientist/Project Manager, Geraghty & Miller, Inc., and Mr. Gregory K. Shkuda, Ph.D., Senior Associate/Project Officer, Geraghty & Miller, Inc., re: Residential Well Monitoring Program, Warwick Landfill Site, Warwick, New York, March 31, 1994. (Attached: Table 1: Summary of Residential Well and Septic System Reconnaissance Activities as of March 29, 1994, Warwick Landfill Site, Warwick, New York, prepared by Geraghty & Miller, undated.) (Note: Pages 100031 - 100039 are CONFIDENTIAL and are located in the Superfund Records Center located at 290 Broadway, 18th Floor, N.Y., N.Y. 10007-1866.)

P. 100040 - 100126 - Report: Baseline Ambient Air Monitoring Program Report, Operable Unit One Remedial Design, Warwick Landfill Site, Warwick. New York, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, September 1994.

P. 100127 - 100128 - Letter to Mr. Damian Duda, New York/Caribbean Superfund Branch I, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Christopher J. Motta, C.P.G., Principal scientist/Project Manager, Geraghty & Miller, Inc., and Mr. Gregory K. Shkuda, Ph.D., Senior Associate/Project Officer, Geraghty & Miller,

Inc., re: Remedial Design, Warwick Landfill Site, Warwick, New York, September 2, 1994.

P. 100129 - 100130 Letter to Mr. Damian Duda, New York/Caribbean Superfund Branch I, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Scott W. Golla, Staff Scientist, Geraghty & Miller, Inc., Mr. Christopher J. Manager, C.P.G., Principal Scientist/Project Manager, Geraghty & Miller, Inc., Mr. Gregory K. Shkuda, Ph.D., Senior Associate/Project Officer, Geraghty & Miller, Inc., and Mr. David L. Trozzo, Associate/Program Technical Director, Air Quality Services, Geraghty & Miller, Inc., re: Remedial Design, Warwick Landfill Site, Warwick, New York, September 16, 1994.

P. 100131 - 100138 Letter to Mr. Damian Duda, New York/Caribbean Superfund Branch I, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. John E. Messinger, Staff Scientist, Geraghty & Miller, Inc., Mr. Christopher J. Motta, C.P.G., Principal Scientist/Project Manager, Geraghty & Miller, Inc., and Mr. Gregory K. Shkuda, Ph.D., Senior Associate/Project Officer, Geraghty & Miller, Inc., re: Warwick Landfill Site, Warwick, New York, Residential Well Monitoring Program, March 9, 1995. (Attached: 1 Table 1: Summary of Residential Well Ranking for the First Round of the Residential Well Monitoring Proqram, Warwick Landfill Site, Warwick, New York, prepared by Geraghty & Miller, Inc., undated; 2. Table 2: New York State and Federal MCLs for Constituents Detected in Residential Well Samples, Warwick Landfill Site, Warwick, New York, prepared by Geraghty & Miller, Inc., undated; 3. Table 3: Residential Wells Scheduled to be Sampled During the Second Round of the Residential Well Monitoring Program, Warwick Landfill Site, Warwick, New York, prepared by Gerachty & Miller, Inc., undated.) (Note: Pages 100136 - 100138 are CONFIDENTIAL and are located in the Superfund Records Center at 290 Broadway, 18th Floor, N.Y., N.Y. 10007-1866.)

P. 100139 - 100139 Letter to Mr. James Petty, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, July 18, 1995.

P. 100140 - 100140 Letter to Ms. Bernice Patterson, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, July 18, 1995.

P. 100141 - 100141 Letter to Ms. Carol Munsey-Strawder, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, July 18, 1995.

P. 100142 - 100142 Letter to Ms. Alice Dolson, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, July 18, 1995.

P. 100143 - 100143 Letter to Ms. Carol Munsey-Strawder, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, August 2, 1995.

P. 100144 - 100144 Letter to Ms. Alice Dolson, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, August 2, 1995.

P. 100145 - 100145 Letter to Mr. James Petty, from Mr. Michael J. Kadlec, Public Health Specialist II (Env.), Bureau of Environmental Exposure Investigation, Office of Public Health, State of New York Department of Health, re: Water samples collected from well, August 2, 1995.

## 3.0 REMEDIAL INVESTIGATION - OPERABLE UNIT TWO

### 3.1 Sampling and Analysis Plans

P. 300001 - 300135 - Plan: Final Field Operations Plan. Operable Unit Two, Remedial Investigation/Feasibility Study, Warwick Landfill Site, Warwick Neww York, Volume I of III, Field Sampling and Analysis Plan, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, February 1993.

P. 300136 - 300255 - Plan: Final Field Operations Plan, Operable Unit Two, Remedial Investiation/Feasibility Study, Warwick Landfill Site, Warwick New York, Volume II of III, Quality Assurance Project Plan, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, February 1993.

P. 300256 - 300337 - Plan: Final Field Operations Plan, Operable Unit Two, Remedial Investigation/Feasibility Study. Warwick Landfill Site. Warwick New York. Volume III of III, Health and safety Plan, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, February 1993.

### 3.3 Work Plans

P. 300338 - 300450 - Plan: Final Work Plan, Operable Unit Two, Remedial Investiaation/Feasibility Study, Warwick Landfill Site, Warwick, New York, prepared by Ebasco Services Incorporated, prepared for U.S. EPA, January 1992.

### 3.4 Remedial Investigation Reports

P. 300451 - 300588 - Report: Ecological Reports, Operable Unit One Remedial Design, and Operable unit Two Remedial Investigation, Warwick Landfill Site, Warwick, New York, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administative Group, August 1994.

P. 300589 - 300602 - Report: ENVIRON Corporation Qualifications Statement, prepared ENVIRON Corporation, prepared for U.S. EPA, November 1994.

P. 300603 - 300740 - Report: Final Remedial Investigation Report, Operable Unit Two, Warwick Landfill Site, Warwick. New York, Volume I of II, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, July 1995.

P. 300741 - Report: Final Remedial Investigation Report,
301044 Operable Unit Two, Warwick Landfill Site, Warwick, New York, Volume II of II, prepared by Geraghty & Miller, Inc., prepared for The Warwick Administrative Group, July 1995.

3.5 Correspondence

P. 301045 - Memorandum to Hr. Ken W. Brown, Manager,
301046 Technology Support Center, Technology Transfer and Technical Support Branch, U.S. EPA, from Mr. Steven M. Pyle, Chemist, Methods Research Branch, QAD, U.S. EPA, Office of Researeh and Development, re: Transmittal of Letter Report, Feasibility of Using Direct Aqueous Injection (DAI) for the Determination of Cellosolves in Aqueous Samples, February 12, 1992.

P. 301047 - Letter to Mr. Doug Garbarini, Eastern New
301053 York/Caribbean Superfund Section I, Emergency and Remedial Response Division, U.S. EPA, from Mr. Christopher J. Motta, Senior Scientist/Project Manager, Geraghty & Miller, Inc., and Mr. Bruce S. McClellan, Project Director/Project Officer, Geraghty & Miller, Inc., re: Field Operations Plan, Operable Unit Two, Remedial Investigation/Feasibility Study, Warwick Landfill Site, Warwick, New York, October 26, 1992.

P. 301054 - Memorandum to Ms. Julie Allen, Remedial Project
301054 Manager, U.S. EPA, Region II, from Mr. Kenneth W. Brown, Manager, Technology Support Center, U.S. EPA, Office of Researeh and Development, re: Analytical Support for the Warwick Landfill, February 17, 1993.

P. 301055 - Letter to Ms. Julia Allen, Eastern New
301056 York/Caribbean Superfund Section I, Emergency and Remedial Response Division, U.S. EPA, from Hr. Christopher J. Motta, C.P.G., Principal Scientist, Geraghty & Miller, Inc., and Mr. Gregory S. Shkuda, Ph.D., Senior Associate, Geraghty & Miller, Inc., re: Warwick Landfill Site, Warwick, New York, Submission of the Final Field Operations Plan (Final FOP) for Operable unit Two of the Warwick Landfill site, March 1, 1993.

P. 301057 - Letter to Mr. Paul Montney, Georgia-Pacific, from

301060 Ms. Julia E. Allen, Project Manager, Eastern New York/Caribbean Section I, U.S. EPA, re: Groundwater Samples for Glycol Ether Analyses at Warwick Landfill Superfund Site, Warwick, New York, May 13, 1993. (Attached: Feasibility of Using Direct Aqueous Injection (DAI) for the Determination of Cellosolves in Aqueous Samples, undated.)

P. 301061 - 301066 Letter to Ms. Janet Cappelli, New York/Caribbean Superfund Branch I, Emergency and Remedial Response Division, U.S. EPA, Region II, from Mr. Christopher J. Motta, Principal Scientist/Project Manager, Geraghty & Miller, Inc., ard Mr. Gregory K. Shkuda, Ph.D., Senior Associate/Project Officer, Geraghty & Miller, Inc., re: Warwick Landfill Site, Warwick, New York, Proposed Modifications for the OU-2 Remedial Investigation and the OU-1 Remedial Design, August 25, 1993.

P. 301067 - 301076 Memorandum to Regional Administrators, Regions I-X, from Mr. Richard J. Guimond, Assistant Surgeon General, USPHS, Acting Assistant Administrator, U.S. EPA, Washington, D.C., re: New Policy on Performance of Risk Assessments During Remedial Investigation/ Feasibility Studies RI/FS)

Conducted by Potentially Responsibility Parties (PRPs), September 1, 1993.

P. 301077 - 301078 Letter to Mr. Mark Granger, Project Manager, Eastern New York/Caribbean Section II, U.S. EPA, Region II, from Mr. William P. Eckel, Senior Chemist, Disposal Safety Incorporated, re: Threshold Concentrations of Glycol Ethers in Ground Water, March 22, 1994. (Attached: Drinking Water Threshold Concentrations Based on Subchronic and Chronic Oral Reference Doses for Glycol Ethers (all doses in Micrograms pre liter: ppb), prepared by Disposal Safety Incorporated, March 22, 1994.)

P. 301079 - 301079 Memorandum to Mr. Damian Duda, Remedial Project Manager, U.S. EPA, Region II, from Mr. Kenneth W. Brown, Director, Technology Support Center, U.S. EPA, Office of Researeh and Developlent, re: Warwick Sample Analyses Results, February 3, 1995.

5.0 RECORD OF DECISION

5.1 Record of Decision

P. 500001 - 500096 Record of Decision, Warwick Landfill Site, Town of Warwick, Orange County, New York, Prepared by U.S. EPA, Region II, June 27, 1991.

7.0 ENFORCEMENT

7.2 Endangerment Assessments

P. 700001 - 700112 Report: Baseline ]Risk Assessment for Operable Unit Two, Warwick Landfill, Warwrick New York, prepared by ENVIRON Corporation, prepared for Pitney, Hardin, Kipp & Szuch, July 1995.

P. 700113 - 700218 Report: Addendum A to Baseline Risk Assessment, prepared by Ms. Cindy F. Kleiman, Senior Consultant, ENVIRON Corporation, and Mr. Stephen T. Washburn, Principal, ENVIRON Corporation, prepared for Mr. Doug Garbarini, Chief, Eastern New York/Caribbean Section I, U.S. EPA, Region II, July 25, 1995.

7.3 Administrative Orders

P. 700219 - 700256 Administrative Order on Consent for Remedial Investigation/Feasibility Study, Operable Unit No. 2, Index No. II CERCLA-20214, prepared by U.S. EPA, Region II, September 28, 1992.

P. 700257 - 700264 Amendment to Administrative Order on consent, Index No. II-CERCLA-20214, prepared by U.S. EPA, Region II, May 16, 1995.

P. 700265 - 700270 Administrative Order Directing Compliance with Request for Access, Index No. II CERCLA 94-0201, prepared by U.S. EPA, Region II, date illegible.

7.8 Correspondence

P. 700271 - 700273 - Memorandum to Mr. Stephen D. Luftig, Acting Director, Office of Emergency and Remedial Response, U.S. EPA, Region II, from Ms. Kathleen C. Callahan, Director, Emergency and Remedial Response Division, re: PRP Performance of Risk Assessment During the Operable Unit Remedial Investigation/Feasibility Study at the Warwick Landfill Superfund Site, Orange County, New York, December 9, 1994.

P. 700274 - 700274 Memorandum to Ms. Kathleen C. Callahan, Director, Emergency and Remedial Response Division, U.S. EPA, from Mr. Stephen D. Luftig, Acting Director, Office of Emergency and Remedial Response, re: Acknowledgment of Region II Consultation for PRP Request to Perform the Baseline Risk Assessment at the Warwick Landfill Superfund Site, December 28, 1994.

P. 700275 - Letter to Mr. Damian Duda, Emergency and Remedial
700276 Response Division, U.S. EPA, Region II, from Mr. Stephen T. Washburn, Principal, ENVIRON Corporation, and Ms. Cindy F. Kleiman, Senior Consultant, ENVIRON Corporation, re: Warwick Landfill Risk Assessment, May 5, 1995.

10.0 PUBLIC PARTICIPATION

10.9 Proposed Plans (SOP, FOP)

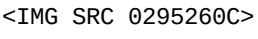
P. 10.00001 - Plan: Superfund Proposed Plan, Warwack Landfill
10.00009 Site, Town of Warwick, Orange county, New York, prepared by U.S. EPA, Region II, July 1995.

P. 10.00010 - Letter to Ms. Kathleen Callahan, Director,
10.00010 Emergency & Remedial Response Division, U.S. EPA, Region II, from Mr. Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation, New York State Department of Environmental Conservation, re: Proposed Remedial Action Plan, Warwick Landfill Site, July 26, 1995.

**APPENDIX IV**

**NYSDEC LETTER OF CONCURRENCE**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
59 Wolf Road, Albany, New York 12233



Micheal O. Segate
Commissioner

SEP 29 1995

Ms. Kathleen Callahan
Director
Emergency & Remedial Protection Division
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

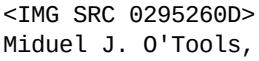
Re: Warwick Landfill Site Operable Unit 2 ID No. 336014
Record of Decision

Dear Ms. Callahan:

The New York State Department of Environmental Conversation has reviewed the record of decision for the Warwick Landfill site. The Department concurs with the selected remedy of no further action as it is detailed in the above-referenced document.

If you have any questions, please contact Mr. Jonathan Greco, of my staff, at (518) 457-3976.

Sincerely,



Miduel J. O'Tools, Jr.
Director
Division of Hazardous Waste Remediation

**APPENDIX V**

**RESPONSIVENESS SUMMARY**

**WARWICK LANDFILL SUPERFUND SITE**

## INTRODUCTION

A responsiveness summary is required by Superfund regulation. It provides a summary of citizens' comments and concerns received during the public comment period, and the United States Environmental Protection Agency's (EPA's) and the New York State Department of Environmental Conservation's (NYSDEC's) responses to those comments and concerns. All comments summarized in this document have been considered in EPA's and NYSDEC's final decision for the selected remedy for the Warwick Landfill site (Site).

## SUMMARY OF COMMUNITY RELATIONS ACTIVITIES

Community involvement at the Site has been strong. EPA has served as the lead Agency for community relations remedial activities at the Site.

The Proposed Plan for the Site was released to the public for comment on July 28, 1995. This document, together with the Remedial Investigation report, the Baseline Risk Assessment and other reports, was made available to the public in the Administrative Record file at the EPA Docket Room in Region II, New York, and in the information repository at the Warwick Town Hall, 132 Kings Highway, Warwick, New York and the Greenwood Lake Village Hall, Church Street, Greenwood Lake, New York. The notice of availability for the above-referenced documents was published in the Sunday Times Herald Record on Aucust 13, 1995 and the Greenwood Lake and West Milford News on At gust 9, 1995. The public comment period on these documents was open from July 28, 1995 to August 27, 1995. At the public meeting, the Dutch Hollow Homeowners Association (DHHA) requested a thirty (30) day extension to the public comment period. This extended the comment period until September 26, 1995.

A meeting with town officials was held on August 15, 1995 to discuss EPA's preferred remedy. That evening, EPA conducted a public meeting at the Greenwood Lake Middle School, Greenwood Lake, New York to discuss the Proposed Plan for Operable Unit Two and to provide an opportunity for the interested parties to present oral comments and questions to EPA.

Attached to the Responsiveness Summary are the following Appendices:

Appendix A - Proposed Plan

Appendix B - Public Notices

Appendix C - August 15, 1995 Public Meeting Attendance Sheets (Not Available)

Appendix D - August 15, 1995 Public Meeting Transcript

Appendix E - Letters Submitted During the Public Comment Period

## SUMMARY OF COMMENTS AND RESPONSES

Comments expressed at the August 15, 1995 public meeting and written comments received during the public comme period have been categorized as follows:

- Operable Unit Two (OU-2) Remedy Selection
- Hydrogeology/Groundwater

- Alternate Water Supply
- Residential Well Monitoring Program
- Nature and Extent of Contamination
- Risk and Health Assessment
- Property Values

A summary of the comments and EPA's responses to the comments is provided below.

A. Operable Unit Two Remedy Selection

Selected Remedy

Comment 91: One commenter expressed concern that EPA cannot guarantee that groundwater problems will not occur in the future. The commenter, as well as DHHA's Technical Assistance Grant (TAG) advisors, also insisted that the residential well are vulnerable to contamination regardless of the source.

EPA's Response: EPA has determined that the low levels of contamination found in residential wells northeast of the landfill are not landfill-related because these homes are hydraulically upgradient of the landfill. Also, residential wells located downgradient of the Site did not show any contamination. Once the landfill is capped, the amount of precipitation-induced leachate will be significantly reduced, which will further diminish any likelihood that these homes will be impacted by Site-related contaminants in the future. While EPA cannot guarantee that residential wells in the vicinity will not be impacted by groundwater contamination, the Agency believes that it is unlikely that any potential future contamination would be site-related.

Comment #2: One commenter was concerned that the installation of a landfill cap will only serve to slow down generation/production of the rainwater-induced leachate from the landfill and will not prevent the migration of contamination already present in the water table.

EPA's Response: Upon construction of the landfill cap under OU-1, the principal threats, namely, precipitation-induced leachate and leachate seeps, of the Site will have been addressed. While the groundwater beneath the Site will not be contained, the landfill cap will be very effective in significantly reducing the amount of infiltration (and subsequent production of leachate) and be protective of the adjacent wetlands. Furthermore groundwater sampling results indicate that groundwater contamnation is not significant enough to warrant groundwater containment, collection or treatment.

Comment #3: One commenter inquired if EPA had a contingency plan with respect to future contamination in place. Another commenter inquired if the landfill will be monitored.

EPA's Response: After construction of the landfill cap, an operations and maintenance (O+M) plan for the Site will be implemented. Part of the post-construction activities will include a sampling program for air, groundwater, sediment, surface water and landfill gas to ensure that the remedy remains protective of human health and the environment over the long term.

Comment #4: Some Commenters expressed concern that the placement of the landfill cap could cause a change in the direction of groundwater flow, thus redirecting the flow of contamination into areas which were previously uncontaminated. They also expressed concern that there is no guarantee that all wells around the landfill will be safe in the future.

EPA's Response: The installation of the cap will not affect the direction of groundwater flow, since the hydrogeologic gradients will not change (See also EPA's response to Comment #1).

Comment #5: DMHA's TAG advisors, as well as many commenters, expressed concern that the preferred remedy of No Further Action was not cost-effective. They indicated that connection to a public water supply (at a cost of $2 million) should have priority over the $16 million that EPA is willing to spend on the cap, which includes $2.5 million for the groundwater monitoring program. The installation of the public water supply would eliminate the need for groundwater monitoring. The TAG advisor had previously recommended, during the public comnent period for remedy selection for OU-1, that an alternate water supply would be the most comprehensive, cost-effective, risk-free, permanent
solution to groundwater contamination in the community.

EPA's Response: As a result of the OU-1 RI, EPA determined that a landfill cap would be required to protect human health and the environment. In addition, the data generated as part of the OU-1 RI did not support the action of providing an alternate water supply to homes in the vicinity of the Site where low levels of VOCs were detected in residential wells. As a precautionary measure, however, carbon filters were put on certain residential wells. Based on the results of the OU-2 RI, EPA determined that no groundwater remediation would be required at the Site. The latest capital construction cost estimate for the cap is approximately $4 million. The estimated present worth value of the cap, including operation and maintenance, is approximately $14 million. The estimated present worth of the groundwater monitoring and the residential wells is approximately $3.5 million. Irrespective of whether homes in the vicinity of the landfill are connected to a public water supply, groundwater monitoring would be required to ensure that the landfill cap is protective of human health and the environment because hazardous waste materials will remain on-site.

Remedial Investigation

Comment #6: Some commenters expressed concern that the EPA has engaged the cooperation of the potentially responsible parties (PRPs) during the investigations of the Site and that, as a result, these investigations were not conducted in a scientifically valid manner. According to the commenter, a valid study would have recommended the installation of in alternate water supply for the area.

EPAs Response. In applying an enforcement-first policy, in an effort to conserve federal funds, EPA negotiated an Administrative Order on Consent (AOC) with the PRPs to conduct the OU-2 RI and permitted them to hire their own contractor to perform the work. Attached to the AOC is a Statement of Work (SOW) which was prepared by EPA to ensure that the work would be performed in a scientifically valid manner. Base, on the SOW, a Work Plan, a Quality Assurance/Quality Control (QA/QC) plan, and a Field Operations Plan were developed to ensure a comprehensive RI which would define the extent of groundwater contamination at the Site. The PRPs employed a reliable contractor to conduct the investigation, whom EPA approved based on the contractor's technical expertise and experience.

EPA, including hydrogeologists and experts in the fields of risk assessment, wetlands, air and landfill caps, with the assistance of NYSDEC, reviewed and approved all plans and reports regarding the OU-2 RI. As part of their effort, EPA, with the assistance of NYSDEC, directed all aspects of the work by the PRPs and their contractor. EPA also hired its own contractor to oversee the work of the PRPs' contractor. EPA personnel and Agency contractors were in the field overseeing the PRPs work during all the major field activities. EPA's contractor split samples with the PRPs' contractor to verify the accuracy of their results. All data generated during the study was validated according to EPA guidelines. These aforementioned activities are typically followed by EPA at sites where the Agency oversees PRPs implementation of work.

Refer to EPA's previous response with regard to this comment that a valid study would have recommended an alternate water supply.

Comment #7: Some commenters expressed concern regarding the adequacy of the locations, numbers and depths of wells installed for the study.

EPA's Response: The decision to install an additional ten monitoring wells as part of the OU-2 RI, in addition to the twelve wells installed as part of the OU-1 RI, was based on the recommendations of EPA and NYSDEC hydrogeologists. As part of the OU-2 RI, all 22 monitoring wells, at depths varying from 10

to 324 feet, most of which are located in the shallow bedrock aquifer, were sampled. EPA believes that the number, location and depth of wells were adequate to determine the hydrogeologic nature of the Site area.

Comment #8: One commenter inquired if the monitoring wells and test results have been properly protected from contamination.

EPA's Response: All the monitoring wells installed during OU-1 and OU-2 were constructed in accordance with EPA guidelines for monitoring well construction to ensure that the wells were not contaminated when they were installed. In addition, all monitoring wells are kept locked to protect against any vandalism and tampering. The groundwater samples were collected, transported and analyzed according to strict EPA QA/QC and chain-of-custody procedures to ensure the environmental sampling data accurately reflect the contaminants present in the samples.

Other/miscellaneous

Comment #9: The DHHA was concerned that the public meeting was scheduled during peak vacation season, giving only two weeks advanced notice.

EPA's Response: EPA usually schedules a public meeting two weeks after the start of the public comment period; this allows the public 1) time to review the documents prior to the public meeting and 2) time to respond and submit additional comments after the public meeting presentation. In addition, in response to the DHHA request for additional time to review the technical documents and EPA's preferred remedy, EPA granted a 30-day extension to the public comment period. Although the public meeting was held during the summer, over sixty people were in attendance.

Comment #10: The DHHA expressed concern that its TAG advisors did not have sufficient time to review the OU-2 documents prior to the meeting and, thus, were not able to prepare or participate at the public meeting.

EPA's Response: EPA sent DHHA's TAG advisor the RI prior to the opening of the public comment period which began on July 28, 1995. The public meeting took place two weeks later on August 15, 1995. EPA offered to meet with the DMMA and its TAG advisors to discuss the OU-2 RI findings on EPA's OU-2 proposed No Further Action remedy. In addition, as noted above, EPA Granted a 30-day extension to the public comment period at the DHHA's request.

Comment #11: The DMHA expressed concern that EPA has not been responsive to its needs and has delayed the processing the extension of project period of the TAG.

EPA's Response: For the past two years, EPA made significant efforts to provide the DKHA and its TAG advisors with as much information as they required with respect to understanding the Site. These efforts included numerous telephone conversations and letters, transmitting technical data and information about the Site.

In December 1994, the DHHA had submitted a payment request to EPA. It was apparent from the payment request that the DHHA's TAG advisors had performed work after the expiration of the project period of the TAG. Prior to its December submittal, the DHHA had been notified by EPA through Several telephone conversations that its TAG project period would need to be extended. In January 1995, EPA notified the DHHA by letter that a request for extension to its TAG was necessary in order to process payments. Subsequently, the DHHA submitted the request for extension; however, the request was incomplete and more information was necessary before EPA could grant approval. After the supplemental information was received, EPA approved the extension request, and processed the related payment request. EPA had received no indication from the DHHA that its TAG advisors were not working on the project while EPA processed the TAG extension.

Comment #12: One commenter inquired if the landfill will be removed from the National Priorities List (NPL) after the capping, how long after capping would this take and if this is performed for all sites.

EPA's Response: The Site will likely be deleted from the NPL within a few years after construction of the cap. Ultimately, all sites will be deleted from the National Priorities List (NPL). Once a site has been deleted, however, EPA still has the authority to take remedial action if it is deemed necessary. EPA first proposes a site for deletion from the NPL, solicits comments on the proposed deletion, responds to these comments, and then recommends the Site for final deletion from the NPL.

Comment #13: DHHA's TAG advisors expressed concert that the OU-2, Proposed Plan does not consider possible future development.

EPA's Response: Future residential development was not evaluated for the landfill, since the OU-1 cap remedy precludes residential development of the landfill itself. Future residential development of the areas adjacent to the Site was evaluated in the risk assessment to determine the risks posed if potential future residents drilled wells in areas around the Site. The groundwater sampling results from the Site were used to represent the groundwater a hypothetical resident living adjacent to the landfill would consume. The future on-site and off-site residents were evaluated as if each were drinking two liters of the on-site/off-site groundwater for each year for 30 years Out of a 70-year lifetime. For this scenario, the risk was determined to be within EPA's acceptable risk range. There is no indication that any contaminant plume (organic or inorganic) is occurring off-site.

B. Hydrogeology/Groundwater

Comment #14: Some commenters inquired about the direction of groundwater flow and the potential impacts to the wetlands.

EPA's Response: The direction of groundwater flow varies, depending on which aquifer is being discussed. For the most part, the shallow bedrock aquifer contains the majority of the water used in thearea and the direction of groundwater flow is to the southwest. The groundwater in the overburden aquifer flows in many directions as a result of complex hydrogeology. Impacts to the wetlands from the Site can be described as minimal, because of low concentrations of contaminants measured in the wetlands, lack of evidence of potential bioaccumulation of contaminants, absence of fishing and other recreational activities, and absence of any known endangered species.

Comment #13: Some commenters expressed concern regarding the pump test; their concern was specifically related to whether the use of only two wells northeast of the landfill was sufficient from a statistical perspective to make an assessment of groundwater flow, particularly the potential for flow to the northwest or northeast, and whether the wells were appropriately located, (i.e., the wells may not have been installed in the same portion of the aquifer from which the residential wells draw their water).

EPA's Response: Although only two deep bedrock monitoring wells were utilized, information gathered from these wells was just a small portion of the data used to determine the direction of groundwater flow. Numerous monitoring wells and piezometers were installed and sampled, and numerous residential wells to the northeast were sampled. This information indicators that the groundwater moving to the southwest would have to overcome a significant gradient in order to flow north. The data generated from both the OU-1 RI and the OU-2 RI indicate that the landfill is not the source of the low levels of contamination found in the residential wells.

Comment #16: One commenter inquired as to the difference between a shallow well and a deep well.

EPA's Response: For the Site, the shallow wells range from 6 to 45 feet, and the deep wells range from 45 to 324 feet.

C. Alternate Water Supply

Comment #17: Most commenters and DHHA's TAG advisors expressed strong support for the implementation of an alternate public water supply system, since they believe it would be cost-effective and would be beneficial for health.

EPA's Response: The OU-2 RI indicates that the low levels of site-related groundwater contamination do not pose unacceptable risks to human health and the environment and fully supports the preferred No Further Action remedy. The limited groundwater contamination, the direction of groundwater flow way from the residences in the northeast and the fact that contamination does not appear to be migrating off-site confirm that there is no technical basis for selecting an alternate water public supply system as a remedy.

Comment #18: Some commenters were concerned that the Superfund program, as related to the Site, could not protect the Village of Greenwood Lake's (VGL's) public water supply system.

EPA's Response: EPA believes that it is unlikely that the Site could have a negative impact on the VGL aquifer system, which is situated nearly 1 1/2 miles downgradient of the Site. As part of the OU-2 RI, ten downgradient monitoring wells were sampled. The resulting data indicated very low levels of VOCs and some levels of inorganics above New York State (NYS) standards; there is no indication of a contaminant plume migrating off-site. The risks posed by the Site were within EPA's acceptable risk range. The VGL's public water supply is monitored for a variety of parameters by the New York State Department of Health (NYSDOH) under the state public water supply standards, as are all public water supplies serving more than 25 persons. Some of these wells will be included in the monitoring program to be conducted after the construction of the cap to ensure that contamination is not migrating from the Site.

D. Residential Well Monitoring Program (RWMP)

Comment #19: The DHHA expressed concern that the residential well program was not complete, that everyone within the radius of the study was not properly contacted and that registered letters were not sent to the residents.

EPA's Response: EPA believes that the RWMP is a comprehensive effort to obtain residential well quality data fron all homes in the vicinity of the Site. The RWMP was developed by the PRPs's contractor and was reviewed and approved by EPA and NYSDEC. The study area was defined as one-quarter mile from the landfill boundary in all directions. One of the activities conducted as part of the RWMP was a thorough canvassing of the residents within the study boundary. The canvassing effort involved door-to-door interviews with residents, telephone calls and mailings which included a well survey, access agreement and a stamped return envelope, to those property owners who could be contacted and were within the study area. Prior to sampling the residential wells, an access agreement was executed by the homeowner.

However, in an effort to further expand the number of participants in the program, EPA and the PRPs' contractor recently performed a follow up door-to-door survey of many of the residents in the area and transmitted registered letters. The response to this latest effort to contact residents will be reflected by expanding the number of residential wells to be included during the third sampling event. EPA and the PRPs have also contacted the Town of Warwick to secure tax and ownership information about properties which have been abandoned or are seasonally occupied.

Comment #20: Two commenters expressed concern that they were contacted, but their well was not sampled.

EPA's Response: EPA assured these residents that they would be contacted in the future to arrange for the sampling of their wells. EPA also requested at the public meeting that if any other residents within the one-quarter mile radius were not contacted, or if anyone had knowledge of others within the one-quarter mile area that had not been contacted, to provide that information to EPA. (Note: As of the date that his ROD is being issued, EPA has not been contacted by any additional parties.)

Comment #21: Two commenters expressed concern that their wells would not be sampled, since they were outside of the one-quarter mile radius. They requested information on companies that perform residential well sampling and analysis, and the fee for these activities. These commenters also expressed concern regarding groundwater filters and their effectiveness.

EPA's Response: NYSDOH has indicated that it has a list of various companies which test private well

water; this information can be accessed by calling NYSDOH's Environmental Laboratories Approval Program at (518) 447-4197. Also, NYSDOH indicated that it may perform some isolated sampling for those residents who are concerned about their drinking water supply.

Carbon filter units are very effective in removing VOCs from residential water supplies; reverse osmosis units are effective where metals contamination is a concern. Sampling for lead is also suggested in homes with children and pregnant women. The costs of such sampling can range from $500 to $2000, depending onthe number and type of contaminants analyzed.

Comment #22: One commenter inquired if EPA will notify the residents if their drinking water is contaminated and what the time frame was for the receipt of the sampling results.

EPA's Response: EPA transmitted the first round of residential well data with a letter to each resident; the letters and data were also transmitted to NYSDOH. The letter outlined the specific details of the data, and identified any contaminant that was detected above NYS or federal standards. In such cases, the NYSDOH would assess the necessity for any remediation of the water supply. For example, during the first round of the RWMP sampling, lead was detected above the federal action level; the NYSDOH subsequently resampled those wells to verify the presence of lead above standards in those wells. The subsequent data showed lead levels below the federal action level. EPA will follow these procedures for all future rounds of the RWMP. The validated data should be received by EPA within two to three months after the sampling event and be mailed to residents shortly thereafter.

Comment #23: One commenter expressed concern over an unpleasant odor in her drinking water.
EPA's Response: EPA and the PRPs' contractor visited the resident; the hot water did have an odor, the cold did not. It is noted, however, that the resident's well is currently connected to a carbon filter unit, and the RWMP slampling showed no contamination above NYS standards. EPA contacted the NYSDOH to follow up on the matter.
Comment #24: One commenter and the DHHA's TAG advisors expressed concern that the carbon filter units would be removed from the affected residential wells.

EPA's ReJponse: NYSDEC has indicated to EPA that the Department does not intend to remove the units.

E. Nature and Extent of Contamination

Comment #25: Commenters inquired as to the number of septic systems sampled, the kind of chemicals that were found in the septic systems, and how these chemicals got into the septic systems.

EPA's Response: Eleven septic systems were sampled. Numerous VOCs were detected in the septic systems, including toluene, chlorobenzene and 1,1-dichloroethane. While it is uncertain how these chemicals got into the septic systems, these and other compounds are typically found in household products such as polish/polish removers, paints, paint thinners, automotive degreasers, etc. Also, past practices for cleaning septic systems utilized products, such as solvents and degreasers, which contained the contaminants detected in the septic systems.

Comment #26: Some commenters inquired as to the correlation between septic systems and well contamination, and expressed concern that the septic systems are not the sole source of contamination in residential wells. They suggested that the septic systems discharges would be small in comparison to the vast quantity of material disposed in the landfill.

EPA's Response: On some properties the well and septic system are fairly close together providing conditions which are potentially conducive to cross contamination. Wells need not be on the same property as a contaminated septic system to be impacted. A septic system could contaminate several wells on neighboring properties. It is also noted that the residential wells in the area draw water from the bedrock aquifer. These wells are typically cased only for a portion of their depth to allow as much water to infiltrate into the well as possible so that the well yield is adequate. However, this construction can also serve as a potential conduit for transport of contaminants across one area of the bedrock into a deeper portion of the bedrock where the well is screened.

While EPA agrees that septic systems may not be the Sole source of contamination in residential wells, EPA has determined, through the RI hydrogeologic study, that groundwater impacting the residential wells flows away from the northeast residential area. Although it is believed that significant qantities of waste may have been disposed at the landfill, groundwater beneath and downgradient of the landfill has shown limited contamination, and there is no direct correlation shown between landfill contaminants and the residential well contamination. In addition, contamination of an aquifer at the low Levels detected in the residential wells can result from the discharge of very small quantities of contaminants. Given the levels of contaminants found in the septic systems to the northeast of the landfill, it would be quite reasonable to find low level groundwater contamination in this area.

Comment #27: One commenter inquired as to how one could differentiate if the septic system contaminated the groundwater or if the groundwater contaminated the septic system.

EPA's Response: Both liquids and sediments in the septic systems were sampled. The levels of contamination found on the septic system sediments were extremely high in comparison to groundwater monitoring well data or residential well data. Cross-contamination from septic systems to residential wells is a common problem. Coliform bacteria, which is found in waste produced by the human body, was also detected in residential wells, and, by its nature, is always found in septic systems. This fact provides additional evidence that septic discharges have migrated into residential wells.

Comment #28: One commenter inquired if the residents received questionnaires regarding the use of their septic systems and the possible discharge of any contaminants into the systems.

EPA's Response: No formal survey was performed. EPA does not have information on the types of materials residents have added to their septic systems or if outside contractors have cleaned out their septic systems. EPA did provide some of the residents with a fact sheet on septic system maintenance and did caution the residents regarding the impacts of disposal of inappropriate liquids to their septic systems.

Comment #29: One commenter expressed concern about whether the residential wells were located a safe distance from septic systems, assuming that 100 feet was the required distance between a private water supply well and a septic system, including the leach field.

EPA's Response: In this case, it appears as though the spacing may not have been adequate. However, regardless if the spacing, residents that have both a residential well and a septic system should be cautious about the types of materials that they dispose of via their plumbing system, as well as the types of materials they use to maintain these systems. The sanitary codes that have been set up in local communities or states identify how far the wells should be from the septic system. The original intent of this sanitary code buffer zone was to prevent bacteria, e.g., E. coli, from migrating from the septic tanks to the wells; these concerns pre-dated concerns regarding organic solvent contamination of groundwater and residential wells. EPA is not responsible for establishing these codes. The local health department should be able to provide additional information regarding best management practices for the installation of residential wells and septic systems.

Comment #30: One commenter suggested that since the solvents showing up in the septic systems are highly evaporative, they would tend to volatilize before showing up in a residential well, unless large quantities were placed in the septic systems.

EPA's Response: While it is true that VOCs such as those found in the septic systems due tend to volatilize, they so adsorb to suspended or fixed organic materials, dissolve in water, and dissolve in other solvents. Since the presence of very low concentrations of these contaminants in drinking water present a health concern, even small quantities of these solvents can cause significant groundwater contamination problems. The levels found in the septic systems appear to have been high enough to cause the problems found in the residential wells northeast of the landfill.

Comment #31: One commenter expressed concern that benzene was detected in monitoring wells sampled as

part of the OU-1 RI.

EPA's Response: Benzene was detected in two on-site monitoring wells in OU-1 above the NYS drinking water standard of 0.7 :g/l. The careinogenic risks identifiedin the OU-1 risk assessment were within EPA's acceptable risk range. During OU-2, benzene was detected in three downgradient wells and one upgradient well; all detected levels were well below the NYS drinking water standard. The OU-2 risk assessment showed that risks posed from benzene and other contaminants are within EPA's acceptable risk range.

F. Risk and Health Assessment

Characterization and Scope of the Risk Assessment

Comment #32: DHHA's TAG advisor expressed concern that the risk assessment ignores the fact that actual residents are close to the Site.

EPA's Response: The remedial investigation report, based on extensive hydrogeologic investigations, determined that the VOC-contaminated residential wells present near the Site are upgradient of the landfill, and, therefore, are not affected by any landfill contamination. The downgradient residential wells showed no VOC contamination. Ambient air and soil/gas sampling results indicated that residents would not be exposed to significant levels of VOCs.

Comment #33: DHHA's TAG advisor expressed concern that combined exposures to contaminated water and air that may potentially occur in the future were not taken into account. They also expressed concern of the likelihood of receptors being impacted by both VOCs in the ambient air and VOCs volatilizing during the use of contaminated groundwater (e.g., ingestion and showering).

EPA's Response: For carcinogenic risk, ambient air pathways were used in calculating potential cancer risks. Assuming that the same individuals were exposed through all exposure pathways at chemical concentrations identified, the addition of groundwater-derived cancer risks to the ambient air risks would not affect, the conclusions of the risk assessment.

For noncarcinogenic risks, the Hazard Indices (HIs) from the overburden exposure pathways are minor relative to the HIs from ambient air and thus combining pathways would not affect the overall risk. The overall HIs from bedrock groundwater and ambient air are similar in magnitude; however, it is not appropriate to add the two values, since the contaminants of concern do not affect the same target organs.

Selection of Data on Chemical Contamination

Comment #34: DHHA's TAG advisor expressed concern that the risk assessment relied solely on OU-2 RI data rather than data from both the OU-2 and the OU-1 RIs.

EPA's Response: EPA felt it appropriate to represent existing Site conditions and, therefore, utilized the most recent sampling data as used in the baseline risk assessment. The OU-1 data was not entirely dismissed, since it was used to assist in determining the list of chemicals of concern (COCs) for the risk assessment. Any chemical that was found more than once in the OU-1 and OU-2 data sets was included in the initial list of COCs. As a conservative measure, if the most recent OU-2 sampling did not detect a chemical that showed up previously in the OU-1 data, it was included as a chemical of concern at one half the detection limit. The practice of using one half the detection limit when a chemical is not detected in a sampling event to calculate exposure point concentrations is recommended in the EPA's Risk Assessment Guidance for Superfund (RAGS) document and is discussed in the Guidance for Data Useability in Risk Assessment (Part A).

Comment #35: DHHA's TAG advisor expressed concern that the trimming of chemicals found at the Site to a small list of indicator chemicals was contrary to EPA guidance.

EPA's Response: The bedrock aquifer sampling detected 50 compounds and the overburden sampling detected 29 compounds. The procedures utilized in preparing the risk assessment to reduce the list of COCs are recommended in the RAGS guidance and are used in the majority of risk assessments prepared by and for EPA. These procedures direct the risk assessment to concentrate on the chemicals that are contributing the majority of the risks and recommend the elimination of chemicals that are considered essential nutrients such as calcium and magnesium, or which are indicative of background conditions or are detected infrequently.

Comment #36: DHHA's TAG advisor expressed concern that the elimination of chemicals that were detected below regulatory standards is not clear.

EPA's Response: This comment was also expressed by EPA during the preparation of the risk assessment. In order to clarify this, the risks including the chemicals that were eliminated were recalculated based on their presence below MCLs. As a result, the revised total excess lifetime cancer risk for adults remained essentially unchanged (3 x 10-7 vs. 4 x 10-7) and for children the risk remained the same (1 x 10-7). For adults and children exposed to the overburden groundwater, the risk remained the same at 1 x 10-8. As such, the revised assessment showed that the risks would still fall within the acceptable risk range.

Comment #37: DHHA's TAG advisor expressed concern that chemicals were eliminated as a result of selective zone sampling and were in conflict with EPA guidance.

EPA's Response: The OU-1 and the OU-2 risk assessments determined that the overburden and bedrock aquifers were separate and distinct. These aquifers are not considered "zones" but two separate entities with different hydrogeologic characteristics, chemistry and contaminants. If a compound was not detected more than once in the overburden aquifer in both the OU-1 and OU-2 RIs, it was not considered a COC for the overburder aquifer. The same holds true for the bedrock aquifer. This approach is consistent with EPA guidance.

Comment #38: DHHA's TAG advisor expressed concern that the no-observed-adverse-effect-level (NOAEL) identified in, the risk assessment should not be expressed as a conservative estimate of a threshold dose for the exposed population.

EPA's Response: EPA scientists responsible for verifying noncarcinogenic toxicity information evaluate all risk studies to determine the viability of the NOAEL for use in determining a safe RfD for the general population. However, when deriving the related RfD, EPA divides the NOAEL by one or more conservative uncertainty factors to account for the variation in the general population, i.e., sensitive subpopulations. This is particularly important when extrapolating from animals to humans or when a NOAEL is derived from a subchronic study.

Comment #39: DHHA's TAG advisor expressed concern that the use of a dietary Reference Dose (RfD) for manganese is not justified and misleads the information presented in EPA's intergrated risk information system or IRIS.

EPA's Response: The most up-to-date EPA guidance relating to the systemic toxicity of manganese was used at the time the risk assessment was prepared (July 1995). At that time, it was standard practice to use the dietary RfD instead of the water RfD for the groundwater ingestion pathway, based on tie reevaluation of a critical study (Kondakis) for the water RfD. The information regarding the use of the dietary RfD for the ingestion of groundwater was recommended by EPA's National Center for Environmental Assessment in Cincinnati. The risk assessment, used the dietary RfD in the noncancer risk calculations. After this risk assessment was finalized, a revised methodology for evaluating manganese was developed. A review of this methodology indicates that dietary sources of manganese should be separated from nondietary sources, such as contaminated groundwater and soil. The dietary RfD remains viable with a modifying factor to account for the nondietary intakes of manganese. 2,000 :g/l of manganese in drinking water remains a potential concern as expressed by EPA scientists responsible for assessing manganese toxicity in groundwater. (Some monitoring well samples did indicate manganese levels above this concentration.) However, it is critical to note that there are currently no residents consuming site-related groundwater,

nor at levels above the NYS standards of 300 :g/l. The groundwater samples taken from the private wells showed manganese levels ranging from approximately 3 to 60 :g/l. All of these samples were below the NYS's Class GA groundwater standards of 300 :g/l for manganese. Manganese has been found in the groundwater both upgradient and downgradient of the site, indicating that it is an element occurring naturally in the underlying aquifers, resulting from the geologic conditions in the formations. Manganese is also a landfill leachate component that is contributing to the high levels found in the groundwater at the edges of the landfill. Under regular conditions, the levels expected in downgradient wells would be well below this level, since the set of circumstances to warrant this have not been realized at the Site, i.e., there is no apparent off-site migration. EPA's long-term monitoring program will include sampling and analysis of downgradients residential wells; manganese will be one of the contaminants evaluated in
that monitoring program.

Comment #40: DHHA's TAG advisor expressed concern RfDs were used to evaluate inhalation exposures instead of the more recent reference concentration (RfC) values.

EPA's Response: As recommended in RAGS, the RfCs Were used in the evaluation of inhalation exposures and were converted to RfD units for convenience. The RAGS Part A guidance States that RfD values for inhalation exposures expressed as inhaled intakes (mg/kg-day) are converted to a concentration in air (mg/m3) using a human body weight of 70 kg and an inhalation rate of 20 m3/day.

Selection of Exposure Pathways for Analysis

Comment #41: DHHA's TAG advisor expressed concern that the discussion of exposure pathways ignores the potential ingestion of VOCs in household air, in particular exposure to benzene.

EPA's Response: The contamination of household air, including inhalation, by the VOC pathway was evaluated in this risk assessment and was assessed according to Part A of RAGS. Benzene was included as a COC in all of the groundwater pathways, including inhalation. The inhalation of volatiles while showering exposure pathway evaluated the potential risks from the inhalation of volatile organic compounds found in both the overburden and bedrock groundwater; the evaluation indicated that the resultant risks were well within EPA's acceptable risk range. Even if it were assumed that an individual showerel for 24 hours a day, the risk would increase by two orders of magnitude and still remain within EPA's acceptable risk range. In addition, ambient air and soil/gas sampling results indicated that appreciable quantities of VOCs would not migrate off-site into residences. Ambient air and landfill gas monitoring will be conducted after the construction of the cap to ensure protection
of human health and the environment.

Comment #42: DHHA's TAG advisor expressed concern that the disaggregation of HIs by toxic effects is not clear.

EPA's Response: The risk assessment shows the HIs are segregated by health effects across the network of major body organs/systems and do consider the entire set of toxic effects. For example, chromium is shown to affect each of the four organ systems identified in the risk assessment.

G. Property Values

Comment #43: Some commenters expressed concern that property values were being reduced as a result of the landfill presence, yet taxes were increasing.

EPA's Response: The eventual deletion of the Site from the NPL, once the landfill cap is installed, should alleviate the stigma that a Superfund Site may create in communities with the resulting negative effect on property values. The results of EPA's investigation with respect to the groundwater should also help to alleviate concerns.

Comment #44: On a related matter, one commenter expressed concern that the Site was located in a Toxic Waste Zone and that, as the distance from the Site increases, property values should increase.

EPA's Response: The landfill itself is part of the Superfund Hazardous Waste Site. EPA defines a "site" based upon any contamination that has emanated from the site. Since no plume of contamination has been defined, the landfill is the only part classified as the Site. A Superfund Hazardous Waste Site relates directly to an "area of contamination"; the term Toxic Waste Zone" is not employed by EPA in the Superfund Program. The OU-2 ROD will affirmatively address the issue that there are no impacts from the landfill on the surrounding community. This information will be available onto the real estate and banking community.

Comment #45: Some commenter expressed concern that , although some property across Penaluna Road from the Site is being offered for public use, the Town of Warwick will not consider the proposal as a result of its proximity to the Site. This is contrary to EPA's assessment that no contamination, airborne and groundwater, is coming from the Site.

EPA's Response: EPA is aware of capped landfills which have been put back into public use. EPA is unaware that the property being offered has any hazardous waste issues associated with it although EPA-suggests that the area should be investigated prior to its reuse. EPA has determined through sampling, however, that this property has not been impacted by the Site. Assuming that the property has also not been impacted by current activities being conducted there, EPA's risk assessment, showing no unacceptable risks, indicates that it could be available for any use that the Town deems appropriate. However, EPA does not recommend that the property be developed for recreational use until construction of the cap has been completed.

**APPENDIX A**

**PROPOSED PLAN**

Superfund Proposed Plan

Warwick Landfill Site

<IMG SRC 0295260E>

Town of Warwick, Orange County, New York

EPA - Region II

July 1995

PURPOSE OF PROPOSED PLAN

This Proposed Plan identifies a no further action remedy for the second operable unit (OU-2) at the Warwick Landfill Superfund site (the Site), located in the Town of Warwick, Orange County, New York. The Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA), as the lead agency, with support from the New York State (NYS) Department of Environmental Conservation (DEC). EPA is issuing the Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f) of the National Contingency Plan (NCP).

This Proposed Plan is being provided as a supplement to the Remedial Investigation (RI) report to inform the public of EPA's and DEC's preferred no further action remedy and to solicit public comments on this action. As a result of the RI and risk assessment findings, no other remedial alternatives were considered; therefore, a Feasibility Study was not necessary.

The no further action remedy, as described in the Proposed Plan, is the preferred remedy for the Site.
remedy
Changes to the preferred remedy or a change from the preferred remedy to another remedy may be made, if public comments or additional data indicate that such a change will result in a more appropriate remedial action.
at the
The final decision regarding the selected remedy will be Greenwood
made after EPA has taken into consideration all public comments. Therefore, we are encouraging public comment on this Proposed Plan and the RI report.

Copies of the RI report, Proposed Plan, and other supporting documentation are available at the following repositories:

Warwick Town Hall
132 Kings Highway
Warwick, New York 10990
Tel. (914) 986-1120

Greenwood Lake Village Hall
Church Street
Greenwood Lake, New York 10925
Tel. (914) 477-9215

U.S. Environmental Protection Agency
Emergency and Remedial Response Division
290 Broadway
New York, New York 10007-1866

New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dates to remember:
MARK YOUR CALENDAR

July 28 to August 27, 1995
Public comment period on proposed

selected.

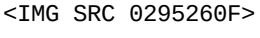
August 15, 1995
Public meeting to be held at 7:00 PM

Greenwood Lake Middle School,

Lake, New York.

## COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI report has been made available to the public for a public comment period which concludes on August 28, 1995.



Pursuant to Section 117(a) of CERCLA, a public meeting will be held during the public comment period at the Greenwood Lake Middle School, Orange County Highway 5, Lakes Road, Greenwood Lake, New York on August 15, 1995 at 7:00 P.M. to present the conclusions of the RI, to further elaborate on the reasons for recommending the preferred remedial alternative, and to receive public comments.

Documentation of the final remedy selection will be presented in the Record of Decision (ROD) after consideration of all the public comments. Comments will

be summarized in the Responsiveness Summary section

of the ROD.

All written comments should be addressed to:

Damian J. Duda
U.S. Environmental Protection Agency
Emergency and Remedial Response Division
290 Broadway, 20th Floor
New York, New York 10007-1866

SITE BACKGROUND

The Site is located approximately one and one-half miles northeast of the Village of Greenwood Lake in the Town of Warwick, Orange County, New York. The Site is approximately three-fourths of a mile north of State Route 17A and fronts Penaluna Road on its western boundary, just north of Old Tuxedo Road (see Map). No buildings exist on the landfill property, except for a small partially demolished brick structure. The landfill mound transects a small valley and occupies approximately 19 acres of a 64-acre pareel. An unnamed intermittent stream drains a small wetlands area on the northwest side of the Site and flows north into a creek that flows westward and then southward into Greenwood Lake. Another stream is located on the landfill's southeast side and flows southward into a large wetlands area which is drained by an unnamed perennial stream that flows south and west into Greenwood Lake. The area surrounding the Site is generally hilly with clusters of houses and wooded areas.

WARWICK LANDFILL SITE MAP

The Site was owned and farmd by the Penaluna family from 1898 to the mid-1950s, when the Town of Warwick leased the property from the Penaluna family and utilized it as a refuse disposal area. The facility accepted municipal wastes from the Town of Warwick, which includes the Villages of Florida, Warwick and Greenwood Lake, and other surrounding towns in Orange County.

The facility also accepted waste materials from industries in the areas; some of these materials contained hazardous substances. The Town of Warwick operated The landfill until 1977.

In April 1977, the Site was leased from the property owner, Mrs. Millie Mae Penaluna, by Grace Disposal and Leasing, Ltd. (Grace Disposal), Harriman, New York. On July 15, 1977, Grace Disposal was granted a permit to operate the refuse disposal area by the Orange County Department of Health. Information, available to EPA, indicates that large volumes of industrial waste materials, containing hazardous substances, were disposed of in the landfill at this time.

In the Spring of 1979, in response to concerns of local citizens who had reported suspicious dumping activities, DEC collected and analyzed leachate samples from the Site; the analysis showed some heavy metals, phenols and volatile organic compounds (VOCs). Shortly thereafter, Grace Disposal was issued a temporary restraining order by the New York State Supreme Court, pending a town request for an injunction to close the landfill until state and town ordinances were satisfied.

Pursuant to a DEC order, the Site was covered, graded, and closed by Grace Disposal. On June 11, 1980, DEC was notified that a Certificate of Dissolution had been filed by Grace Disposal. Examination of aerial photographs indicated that the landfill had increased significantly in size during the late 1970s.

In September 1983, DEC contracted with Woodward-Clyde Consultants, Inc. to perform a preliminary investigation of the landfill. Subsequently, in March 1985, a field investigation program was performed; surface water, sediment, soil and groundwater samples were analyzed. The results indicated that the groundwater was relatively free of contaminants and that some phenols were found in the surface water. The complete results of this investigation are summarized in the RI report for the first operable unit (OU-1) for the Site, located in the Site repository.

In 1985, the Site was proposed for inclusion on EPA's National Priorities List. (NPL) of uncontrolled hazardous waste sites and was added to the NPL in March 1989.

On December 28, 1988, sent EPA sent "special notice" letters to a number of potentially responsible parties (PRPs), namely, parties that EPA had determined were responsible for contributing to the contamination found at the Site. The letters afforded the PRPs the opportunity to conduct an RI/FS. EPA did not receive any good faith proposals from the PRPs to undertake or finance the study. Therefore, the necessary work was performed by EPA's contractor, Ebasco, Inc., beginning in August 1989.

From August 1989 until May 1990, the field investigation for the OU-1 RI was performed, which included air monitoring, a radiological survery, geophysical survey, surface water, sediment and leachate sampling, monitoring well and residential well sampling and a hydrogeologic survey of the aquifers below the Site.

From September 1989 until November 1990 during the RI for OU-1, residential well sampling, conducted by EPA and NYS Department of ilth (DOH), indicated levels of VOC-contamination above NYS and federal drinking water standards. As a result, DOH and DEC fitted those affected households with granular activated carbon units. Four residential wells are currently fitted with these units which are regularly sampled by DEC.

In June 1991, EPA signed a Record of Decision for OU-1, which included a landfill cap as a source control measure, gas venting and provision of granular activated carbon filters on certain residential wells as an interim measure. In addition, because some VOCs and metals were identified in the groundwater above federal and NYS maximum contaminant levels (MCLs) the ROD also specified a supplemental investigation of the fate and transport of the contamination, designated as OU-2.

On February 28, 1992, after failing to receive any good faith offers to undertake the OU-1 work, EPA issued a Unilateral Order to six PRPs to perform the remedial design and remedial action called for in the OU-1 ROD.

In 1984, ownership of the property was transferred to Orange County for non-payment of back taxes. The title was transferred from Orange County to the Newburgh, New York Developers in November 1986. In 1987, the property was transferred to the current owners, L and B Developers.

The PRPs hired Geraghty and Miller Inc. (G + M) to perform the remedial design work.

On April 9, 1993, EPA issued a second UAO for the OU-1 remedial design and remedial action to five additional PRPs, requiring that they cooperate and coordinate with the other PRPs in conducting the work.

On September 28, 1992, EPA issued an Administrative Order on Consent to four PRP's to perform the

supplemental groundwater investigation. The RI for this supplemental groundwater study was also prepared by G + M and is discussed in subsequent sections of this Proposed Plan.

## SCOPE AND ROLE OF OPERABLE UNIT ONE AND OPERABLE UNIT TWO

EPA has divided the remedial work necessary to mitigate contamination stemming from the Site into two operable units. The major component of OU-1 is landfill capping which addresses the source of contamination at the Site. Currently, the remedial design phase of the cap is nearing completion; the remedial action to construct and install the cap should begin within the next few months. As an interim, precautionary measure, OU-1 also provides for point-of-use treatment for four nearby residential wells which had exhibited low levels of contamination, as well as, an ongoing residential well monitoring program. OU-2 is the subject of this Proposed Plan and addresses the further characterization of the fate and transport of the contaminants in the groundwater. The remedial action identified as the selected remedy for OU-1 and this Proposed Plan serve as the basis for the no further action remedy for the groundwater.

## REMEDIAL INVESTIGATION SUMMARY

Between March 1993 and September 1994, various sampling events were conducted by G + M. These investigative events performed under both the OU-1 RD and the OU-2 RI/FS included: installation of landfill piezometers, monitoring wells, and borings; groundwater monitoring well and residential well sampling; landfill seep surveying and mapping; off-site seeps and surface water bench marking; leachate sampling; wetlands' surface water and sediment sampling; landfill gas and ambient air sampling; and residential septic tank sampling.

### Topography

Two streams, North Brook and South Brook, originate along the northwestern and southeastern boundaries of

the landfill. The upper reaches of both brooks are intermittent. The landfill comprises a small portion of these drainage basin areas therefore, the landfill runoff contributes to the water in North Brook and South Brook. Wetlands flank the landfill along its northwestern and southeastern boundaries. Fill soil and some refuse are present in the wetlands adjacent to the Site.

### Geology

The geology of the Site area is complex and consists of three significant units: (1) competent, massive, crystalline bedrock; (2) sandy, glacial outwash; and, (3) dense, silty, glacial till. The manmade landfill material consists of refuse, silt and daily and final cover soil.

The bedrock in the Warwic Landfill Site area is a fairly continuous, massive igneous body, consisting of various gneiss formations. The be bedrock has high concentrations of iron, magnesium and calcium minerals. As a result of the natural movement of groundwater through the bedrock formation, numerous minerals dissolve out of it; this action is referred to as chemical-weathering. Isolated pockets of chemically-weathered bedrock exist within and to the northeast of the Site area. The variability in depth

to the top of the weathered bedrock suggests that it is isolated in areal extent. In addition, a 16-foot interval of predominantly physically weathered rock exists both in the Site area and south of he landfill. The weathered bedrock consists of fractured gneiss, overlain by sandy outwash. Bedrock is present west of the landfill where silty till directly overlies the bedrock.

The overburden deposits in the Site area are glacial in origin and vary greatly in composition and thickness and consist of sandy outwash and silty till. Overburden thickness north of the landfill is approximately 70 feet. To the east and in some areas north of the landfill, overburden is either absen or it occurs in thin pockets because competent bedrock either outcrops or occurs a

The Site is located in the Hudson Highlands, consisting primarily of Precambrian-age gneiss. Elevations across the Site range from approximately 890 feet above mean sea level (msl) in the northeast to approximately 860 feet

above msl in the southwest. Along the northwestern and southeastern boundaries of the landfill, the site topography slopes downward to approximately 825 and 820 feet above msl, respectively. Elevations within 1 mile of the site range from approximately 650 to 1,300 feet above msl.

few feet below ground surface in that area. Overburden thickness increases to the west with greater than 90 feet of silty till.

Sandy outwash is present worth and south of the landfill.

The thickness of the sand' outwash south of the landfill ranges from approximatel, 25 to 40 feet. A wage of dense, silty till is also present west of the landfill. The silty till rests on bedrock.

The landfill material, in most areas, overlies bedrock. At one location, a 4-foot thick pocket of physically weathered bedrock occurs between the landfill material and the lower bedrock. The maximum thickness of refuse is approximately 50 feet and occurs in the southern section of the landfill. In the northern section of the landfill, the maximum thickness of refuse is approximately 30 feet. The landfill soil cover is approximately 2 feet thick. The cover soil typically consists of a poorly sorted silt with varying percentages of clay, sand; and gravel. The entire landfill is capped with this cover soil. The cover soil was also placed over the area that is currently the northern section of the southern wetlands.

Hydrogeology

The hydrogeologic regime of the Site area is complex. Groundwater occurs in competent, massive, crystalline rock; isolated pockets of chemically-weathered bedrock; dense, silty till; sandy outwash; and landfill material (refuse and silty soil). Topographic relief and the variable transmissivity of the geologic media combine to produce a complex groundwater flow system in the site area.

Groundwater flow in the shallow bedrock is mostly towards the southwest, moving from the residential area northeast of the landfill towards the landfill. Continuous water-level monitoring, which was conducted in monitoring wells located between the Site and the northeast residential area, did not indicate any influences on the groundwater flow in the shallow bedrock from residential well pumping.

The downward vertical gradients in the bedrock located northeast of the Warwick Landfill would facilitate the movement of groundwater from the shallow bedrock to the deep bedrock, if they were connected by an open borehole. As a result of the open borehole method of construction, some of the residential wells, located northeast of the landfill, may act as a conduit for contaminant migration from the shallow bedrock to the cleep bedrock. Often in these mostly open hole wells, the

! The landfill is situated in a groundwater discharge. environment, i.e., perched leachate and lower leachate flows to North and South Brooks and their associated wetlands.

! Leachate that potentiall could flow to the sandy outwash, which is present lorth and south of the landfill, is intercepted by North an, South Brooks.

! Shallow bedrock groundwater moves from the residential area northeast of the landfill towards the landfill.

! There is limited hydraulic connection between the shallow bedrock groundwater and the deep bedrock groundwater.

! The hydraulic properties (i.e., hydraulic heads and lower hydraulic conductivity) of the shallow bedrock prevent the movement of leachate to the north and northeast.

! The bedrock beneath the Site will tend to limit the vertical movement of leachate, because of its low vertical hydraulic conductivity and decreasing horizontal conductivity with depth. The potential for widespread landfill-related impacts to groundwater is low.

! The natural hydrogeologic conditions combined with the construction techniques [well casing extending only a few feet into competent rock] of deep residential wells (typically 300 feet or greater) produce conditions that allow for the downward vertical migratron of shallow bedrock groundwater to depths of 300 feet or more. Since the residences are serviced by septic systems near the surface, the existence of this pathway is further supported by the presence of coliform bacteria, which is not usually found at depth, in upgradient residential well samples. In addition, the existence of this pathway is further supported by the distribution of chlorinated organic compounds in the upgradient radient bedrock groundwater, i.e., the highest concentration of chlorinated organics detected upgradient, as well as at the Site, were in the shallow bedrock groundwater.

shallow bedrock would not be isolated (cased off) from the deep bedrock, thus groundwater could flow downward. Downward flow could also be enhanced by well-pumping, especially in low-yield, high-drawdown wells.

A summary of the hydrogeologic conditions for the Site are as follows:

! The well yield, hydraulic conductivity, boring logs, and downhole geophysical well log data demonstrate that groundwater flow at depth is limited.

Antimony, iron, magnesium, managense and sodium are naturally occurring in the crystalline rocks and the overburden of the Hudson area. As a result of

chemical and physical weathering, these metals can be transmitted to groundwater in dissolved and particulate form.

Groundwater Sampling and Analytical Results

As part of the OU-1 RI/FS, fifteen groundwater monitoring wells were installed, eight wells in the overburden aquifer and seven in the bedrock aquifer. Three rounds of groundwater samples were collected from the monitoring wells. Residential wells in the area were also sampled.

Sampling and analyses of both the monitoring and residential wells indicated that various organic and inorganic contaminants exceeded federal and NYS drinking water standards. As an interim remedy, the OU-1 ROD specified that certain residential wells be provided with activated carbon filtration units on an as needed basis. The OU-1 ROD also specified that a supplemental groundwater investigation be conducted in order to define better the hydrogeologic and chemical conditions at the Site and, ultimately, to ensure that area residents are protected from any potential site-related contaminants, particularly those in the groundwater.

As part of the OU-2 RI, seven additional monitoring wells (shallow, intermediate and deep) were installed on-site and off-site to monitor both upgradient and downgradient groundwater quality at the Site. The hydrogeologic investigation indicated a complex scenario. In the overburden, the downgradient flow is southeasterly, southwesterly and northwesterly from the landfill; this stems primarily from the geometry of the aquifer formation and the configuration of the landfill itself. The actual discharge of the overburden aquifer to adjacent wetlands and streams, however, occurs mainly in the northwesterly and southeasterly directions, since the groundwater, moving in the southwesterly direction, meets a till layer which acts as a dam and forces it along the front to the northwest or the southeast. For the shallow bedrock, the majority of the groundwater flow is in the southwesterly direction. The hydrogeologic conditions indicate that areas northeast and northwest of the landfill proper are upgradient of the landfill proper. residential well sampling program was initiated. Twenty-four homes were sampled or VOCs and inorganics. Some inorganic and volatile contamination was found in both monitoring and residential wells.

Various VOCs were detected above the federal and NYS standards in seven monitoring wells during the two rounds of sampling. Maximum concentrations are reported here. During the first round, 2-butanone was estimated at 100 :g/l (upgradient), 1,1-dichloroethene was detected at 6.8 :g/l (upgradient), 1,1-dichloroethane was detected at 7.2 :g/l (upgradient), 1,1,1-trichloroethane (TCA) was detected in two wells at 17 and 65 :g/l, respectively (upgradient). During the second round, 1,1-dichloroethylene was detected at 12 :g/l (upgradient). 1,1-dichloroethane was detected at 8 :g/l (upgradient), 2-butanone was detected at 31 :g/l (upgradient), toluene at 6 :g/l (upgradient), TCA was detected at 5, 9 and 75 :g/l (upgradient) and chloromethane was detected at 28 :g/l (downgradient). Benzene was detected in two wells at 4 :g/l. (downgradient), one well a 2 :g/l (downgradient), one well at 0.5 :g/l (upgradienl and was estimated in a third well at 0.2 :g/l (downgradient). These levels are above the NYS Class GA standar, of non-detect for benzene; the detection and quantification limit for benzene varied for each sampling round but were generally less that 1 :g/l. For the residential well sampling, only two wells had any VOCs detected at ove NYS standards. Chloroform was detected in one residential well at 7 :g/l (the NYS Class GA standard is 5 :g/l). TCA was detected in one of the residential wells at 32 :g/l (NYS standard is 5 :g/l). However, this well is fitted with a carbon filter unit; the TCA was not detected in the drinking water after treatment with the carbon filter unit. With the exception of benzene and chloromethane, VOC contamination was not found in downgradient wells above federal and NYS drinking water standards.

Various inorganic compounds were detected at or above federal and NYS primary drinking water standards in both upgradient and downgradient wells. During the first round of sampling, chromium was detected above the NYS Class GA standard of 50 :g/l at eight monitoring

Downgradient locations can generally be defined as south and southwest of the landfill.

Two rounds of groundwater sampling were conducted in December 1993 and August/September 1994. On-site and off-site monitoring wells were sampled for a broad spectrum of contaminants, including VOCs, semi-VOCs,

pesticides, PCBs, and inorganics. Also, during September 1994, as specified under the OU-1 ROD, a

wells: three upgradient hac levels of 85, 205 and 442 :g/l with an average concentration of 244 :g/l, and five downgradient wells had levels, ranging from 58 to 1250 :g/l with an average concentration of 384 :g/l. During the second round of sampling, chromium was detected above the NYS standard al five monitoring wells. Two upgradient wells had levels of 75 and 148 :g/l with an

average concentration of 111 :g/l; three downgradient wells had levels of 60, 99 a and 216 :g/l with an average

concentration of 125 :g/l. For each sampling round, the filtered data showed levels-well below the NYS standard. In all but one case, the chromium levels decreased in the second round of sampling. The residential well sampling identified only two detections of chromium, both well below NYS standards. These levels seem to indicate that chromium is naturally occurring in the formation, i.e., background levels, since it is found at comparable levels, both upgradient and downgradient of the landfill. These levels also relate directly to turbidity and high suspended solids in the samples and are not necessarily representative of the quality of the groundwater.

Lead was also detected in both upgradient and downgradient monitoring well samples. During the first round of sampling, lead was detected above the federal action level of 15 :g/l in five monitoring wells: three upgradient wells (ranging from 36.7 to 290 :g/l) and two downgradient wells (20.5 and 32.5 :g/l). During the second round of sampling, lead was detected above the federal standard at four monitoring wells: three upgradient wells (ranging from 37.2 to 80.5 :g/l) and one downgradient well (35.4 :g/l). During the residential well sampling, lead was also detected above the federal action level in six wells (17.3 to 88.4 :g/l), all of which are located upgradient of the landfill. The New York State Department of Health (NYSDOH) is currently resampling some of the affected residences to confirm the presence of lead. NYSDOH believes that the lead levels most probably relate directly to household plumbing sources.

In both sampling rounds, manganese was detected in almost all monitoring wells above the NYS secondary drinking water standard of 300 :g/l. Manganese ranged between 2.2 :g/l and 19,700 :g/l; comparable levels were found in both upgradient and downgradient monitoring wells. These levels appear to be representative of background conditions in the area. The subsequent risk discussion further explains that the manganese does not present a risk.

Iron was also detected in numerous upgradient and downgradient wells above the secondary drinking water standard of 300 ug/l. The range of levels was 32.8 to

potentials problems, suct as poor taste, odor and staining of plumbing fixtures and do not specifically present a health hazard.

Since most of the contaminants presented here have isolated hits at or above NYS standards, no plumes could be delineated for organic or inorganic contaminants. Available data and information indicate that the low level VOC- contamination present in the four residential wells (all upgradient) is not landfill-related and that the sampling data from privately-owned septic systems, which identified numerous VOCs, including toluene and 1,1-dichloroethane, indicate a potential for contamination of the associated resident wells.

Surface Water, Sediment and Leachate Sampling and Analytical Results

As part of the OU-1 RD, G + M conducted two rounds of surface water and sediment sampling in June 1993 and April 1994. The sampling was segregated into three zones with respect to the landfill: upstream, adjacent and downstream. The three segments showed comparable results. The surface water sampling showed VOCs, semi-VOCs and metals, as well numerous non-detects among all contaminants. The maximum levels included: VOCs-chlorobenzene (2 :g/l-adjacent) and ethylbenzene (16 :g/l-adjacent); semi-VOC-bis(2-ethyhexyl)phthalate (15 :g/l-upstream, 9 :g/l-adjacent and 5 :g/l-downstream) and 4-methylphenol (2 :g/l-upstream, 29 :g/l-adjacent); and, metals-aluminum (3660 :g/l-upstream, 4150 :g/l-adjacent and 172 :g/l-downstream), iron (5630 :g/l-upstream, 40,900 :g/l-adjacent and 1800 :g/l-downstream), magnesim im (4320 :g/l-upstream, 33,800 :g/l-adjacent and 12,800 :g/l-downstream), manganese (317 :g/l -upstream, 2960 :g/l-adjacent and 1800 :g/l-downstream) and sodium (7550 :g/l-upstream, 145,000 :g/l-adjacent and 22,200 :g/l-downstream). In general, the detected levels within NYS standards, with iron and manganese being the exceptions. No VOCs were detected downstream.

The sediment sampling indicated the presence of VOCs. semi-VOCs and metals. The maximum levels included:

414,000 :g/l for upgradient groundwater and 78.4 to 79,700 :g/l for downgradient groundwater.

As indicated above, some of the monitoring and residential wells showed somewhat elevated levels of iron and manganese; however, the federal and NYS secondary standards for iron and manganese are based on aesthetic properties and are intended to prevent

VOCs-2-butanone (0.044 mg/kg-upstream, 0.57 mg/kg-adjacent and 0.005 mg/kg-downstream) and methylene chloride (0.004 mg/kg-upstream and 0.63 mg/kg-adjacent); semi-VOCs-various PAHS (chrysene at 9.2 mg/kg-downstream and fluoranthene at 20 mg/kg-upstream, 5.7 mg/kg-adjacent and 26 mg/kg-downstream) and bis(2-ethylexyl)phthalate at 0.16 mg/kg-upstream, 1.3 mg/kg-adjacent and 0.3 mg/kg-(downstream). As expected, various metals were

detected in all three zones of sediment sampling and, in general, at levels were within NYS criteria.

In December 1993, one round of leachate sampling was performed from the landfill piezometers. Maximum concentrations included: VOCs-benzene (24 :g/l), ethylbenzene (42 :g/l), xylene (200 :g/l), toluene (34 :g/l) and chlorobenzene (32 :g/l); semi-VOCs-PAHs, fluoranthene-0.2 :g/l and pyrene-170 :g/l; metals-barium (3630 :g/l), chromium (616 :g/l), cobalt (289 :g/l), iron (1.94 x 106 :g/l), lead (4870 :g/l), manganese (9750 :g/l) and nickel (591 :g/l); pesticides-alpha-chlordane (0.76 :g/l), gamma-chiordane (0.51 :g/l), 4,4'-DDE (0.14 :g/l) and 4,4-DDT (0.083 :g/l); and, Aroclor-1242 and 1254 (PCBs) were detected at 2.5 and 5.2 :g/l, respectively. Except for some of the pesticides and PCBs, the levels detected were within NYS standards.

The maximum concentrations of VOCs detected in the residential septic tank systems included 1,1-dichloroethane (17,000 :g/l), toluene (12,000 :g/l) and chlorobenzene (1.2 x 106 :g/l). In some cases, the same VOCs were also found in the nearby residential wells. These results indicate that the septic systems may present a potential source of contaminants to the private residential drinking water wells. In addition, as a result of concerns expressed during the comment period of the OU-1 Proposed Plan regarding the potential impact of glycol ethers on groundwater quality, four monitoring wells, six residential wells and 11 residential septic systems were sampled for glycol ethers, specifically 2-methoxy ethanol and 2-methoxy ethanol acetate. These glycol ethers were of concern because of their toxicity. These samples were analyzed by EPA's National Exposure Researeh Laboratory/Characterization Research Division (NERL/CRD), formerly Environmental Monitoring Systems Laboratory (EMSL)-Las Vegas. The analyses showed that the two glycol ether compounds were not detected (detection limit of 60 :g/l) in any of the ten groundwater samples nor the eleven septic system samples. However, the analysis of the septic system materials did identify phenols, chlorinated benzenes, e.g., chlorobenzene (4000 :g/l), polynuclear aromatics and toluene (350 :g/l). Some of these compounds were

associated with current an, future site conditions. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site, if no remedial action were taken.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario. Hazard Identification identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. Exposure Assessment estimates the magnitude of actual and/of potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed. Toxicity Assessment determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects response). Risk Characterization summarizes and combines outputs of the exposure and toxicity a assessments to provide a quantitative assessment of site-related risks.

The baseline risk assessment began with selecting contaminants of concern which would be representative of site risks. These contaminants included benzene, isopropylbenzene, chloromethane, aluminum, antimony, chromium, cobalt, manganese, nickel, and vanadium in the groundwater and benzene and methylene chloride in the ambient air. Several of the contaminants are known to cause cancer in laboratory animals and are suspected or known to be human carinogens.

Four exposure pathways were evaluated under possible on-site present and future land use conditions. These exposure pathways were evaluated separately for adults and children. In addition, exposure of workers, in the future event of construction activities on the landfill, was evaluated. The exposure pathways considered under both current and future uses include inhalation of ambient air, ingestion of ground water from the overburden and bedrock aquifers, dermal contact with ground water while

detected in nearby residential wells. These results further indicate that the septic systems may present a potential source of contaminants to the private residential drinking water wells.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks showering, and inhalation of chemicals while showering. Risks calculated for these pathways do not take into account any reductions in air and ground water chemical concentrations resulting from the OU-1 capping. It should also be noted that the residential well data was not utilized in the risk calculations, since these wells were considered to be upgradien of the Site.

Current federal guidelines for acceptable exposures are an individual lifetime excess-carcinogenic risk in the range of 10-4 to 10-6 which can be interpreted to mean that an individual may have a one in ten thousand to a one in a million increased chance of developing cancer as result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site.

No unacceptable carcinogenic risks, either for adults or children, were found for exposure to groundwater. The greatest risk for adults and children would result from groundwater ingestion at 3.2 x 10-7 and 1.1 x 10-7, respectively. Cancer risks from exposure to groundwater in the bedrock aquifer are attributable primarily to benzene through direct ingestion.

For ambient air, the primary contaminant of concern is methylene chloride. No unacceptable carcinogenic risks, either for adults or children, were calculated. The greatest risk for adults and children are 2.2 x 10-5 and 8.6 x 10-6, respectively.

The results of the baseline risk assessment indicate that, for the exposure pathways evaluated, no unacceptable carcinogenic risks were calculated. All risks fell within EPA's acceptable risk range of 10-4 to 10-6.

To assess the overall potential for noncarcinogenic effects posed by more than one contaminant, EPA has developed a hazard index (HI). The HI measures the assumed simultaneous subthreshold exposures to several chemicals which could result in an adverse health effect. When the HI exceeds 1.0, there may be concern for potential noncarcinogenic health effects.

Noncarcinogenic risks are attributable primarily to manganese through direct ingestion. The non-carcinogenic risk shows a total HI from the bedrock groundwater pathway for an adult of 0.7 and 1.5 for a child. For the overburden groundwater pathway, the total HI for both an adult and a child is less than 1.0. For the air pathway, the total HI for both an adult and a child is less than 1.0.

Ecological Risk Assessment

The results of the ecological investigations performed under OU-1 and OU-2 by G + M support the conclusions identified in the OU-1 RI. The environmental assessment evaluated potential exposure routes of the Site contamination to terrestrial wildlife and aquatic life. However, because of the low concentrations of contaminants detected, lack of potential bioaccumulation, absence of fishing and other recreational activity, and absence of known endangered species, the environmental assessment was not quantified. The wetlands in the vicinity of the Site were delineated. The need to minimize the disturbance of these wetlands habitats via migration of contaminants from the landfill, as well as, via any future remediation activities, was identified as an important factor that was considered in the selection of the OU-1 landfill capping remedy.

SUMMARY OF THE PREFERRED NO FURTHER ACTION REMEDY

Based on the findings of the OU-2 RI performed at the Site, EPA and DEC have determined only limited contamination present appears to be the result of sources other than the Warwick Landfill and that a no further action remedy is protective of human health and the environment.

The OU-1 remedial action a landfill cap, will be constructed during 1996. Upon completion, the cap will reduce the groundwater and leachate contaminant levels. The associated operation and maintenance plan will include groundwater, ambent air and landfill gas monitoring to ensure further that the existing population are protected from any further contamination and that the OU-1 remedy remains protective of human health and the environment.

Based on the findings on he OU-2 RI, the contamination of the residential wells upgradient of the Site was determined not to be site-related. It is noted, however, that the NYSDOH is currently resampling some residences to confirm the presence of lead, most likely

The results of the baseline risk assessment indicate that, for all exposure pathways evaluated, the only total noncarcinogenic risk with a calculated HI greater than 1.0 is for the child receptor through ingestion of bedrock groundwater, related directly to manganese, which is considered an essential nutrient. The manganese dose received by the child from consumption of bedrock groundwater is lower than that which would be supplied by a common over-the-counter multivitamin supplement. related to household plumbing sources.

It is important to note that the remedy described above is the preferred remedy for OU-2 for the Site. The final selected remedy will be documented in the ROD, only after consideration of all comments on the preferred remedy addressed in the Proposed Plan and RI report.

**APPENDIX B**

**PUBLIC NOTICES**

<IMG SRC 0295260G>EPA
THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

announces

PREFERRED REMEDY

WARWICK LANDFILL SITE
VILLAGE OF GREENWOOD LAKE, TOWN OF WARWICK,
ORANGE COUNTY, NEW YORK

The U.S. Environmental Protection Agency (EPA) recently completed a Remedial Investigation (RI) for the Second Operable Unit (OU-2) for the Warwick Landfill site (Site) in Warwick, New York. The OU-2 addresses the groundwater at the Site. Based on the previous work conducted at the Site to date, EPA is announcing a preferred remedy for No Further Action.

Before selecting a final remedy, EPA will consider written and oral comments on this preferred remedy. All comments must be received on or before August 27, 1995. The final decision document will include a summary of public comments and EPA responses.

EPA will hold an informational public meeting on August 15, 1995, at 7:00 p.m., at the Greenwood Lake Middle School located on Lakes Road in Greendwood Lake, New York, to discuss the finding so the RI and the preferred remedy.

The Remedial investigation report, Proposed Plan, and other site-related documents can be consulted at the information repositories listed below:

Warwick Town Hall
132 Kings Highway
Warwick New York 10990

Greenwood Lake Village Hall
Church Street
Greenwood Lake, New York 10925

Written comments on the preferred remedy should be sent to:

Damain J. Duda, Remedial Project Manager
U.S. Environemntal Protection Agency
200 Broadway, 20th Floor
New York, New York 10007

Written comments must be received at the above address on or before August 27, 1995.

GREENWOOD LAKE AND WEST MILFORD NEWS

8/9/95

<IMG SRC 0295260H>EPA
THE UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

announces

PREFERRED REMEDY

WARWICK LANDFILL SITE
VILLAGE OF GREENWOOD LAKE, TOWN OF WARWICK,
ORANGE COUNTY, NEW YORK

The U.S. Environmental Protection Agency (EPA) recently completed a Remedial Investigation (RI) for the Second Operable Unit (OU-2) for the Warwick Landfill site (Site) in Wirwick, New York. The OU-2 addresses the groundwater at the Site. Based on the previous work conducted at the Site to date, EPA is announcing a preferred remedy for No Further Action.

Before selecting a final remedy, EPA will consider written and oral comments on this preferred remedy. All comments must be received on or before August 27, 1995. The final decision document will include a summary of public comments and EPA responses.

EPA will hold an informational public meeting on August 15, 1995, at 7:00 p.m., at the Greenwood Lake Middle School located on Lakes Road in Greendwood Lake, New York, to discuss the finding so the RI and the preferred remedy.

The Remedial investigation report, Proposed Plan, and other site-related documents can be consulted at the information repositories listed below:

Warwick Town Hall
132 Kings Highway
Warwick New York 10990

Greenwood Lake Village Hall
Church Street
Greenwood Lake, New York 10925

Written comments on the preferred remedy should be sent to:

Damain J. Duda, Remedial Project Manager
U.S. Environemntal Protection Agency
200 Broadway, 20th Floor
New York, New York 10007

Written comments must be received at the above address on or before August 27, 1995.

SUNDAY TIMES HERALD RECORD

8/13/95

**APPENDIX C**

**AUGUST 15, 1995 PUBLIC MEETING**

{NO ATTENDANCE SHEETS AVAILABLE}

**APPENDIX D**

**AUGUST 15, 1995 PUBLIC MEETING TRANSCRIPT**

ORIGINAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

AGENDA
Public meeting for he
Warwick Landfill Superfund Site
at the Greenwood Lake Middle School
Greenwood Lake, New York

Tuesday, August 15, 1995
7:00 P.M.

I. INTRODUCTION by STEVE KATZ,
Community Relations Coordinator
U.S. EPA, Region II

II. SUPERFUND OVERVIEW by DOUG GARBARINI,
Superfund Section Chief
Eastern NY Section
U.S. EPA, Region II

III. SITE BACKGROUND by DAMIAN DUDA,
Remedial Project Manager
U.S. EPA, Region I

IV. HYDROGEOLOGIC SUMMARY
by GREGORY SHKUDA, Ph.D.,
Geraghty & Miller, Inc.

V. RESULTS OF REMEDIAL INVESTIGATION

by DAMIAN DUDA,

VI. QUESTIONS AND ANSWERS

ALSO PRESENT: MICHAEL J. KADLEC,
Department of Health

MEISTER REPORTING SERVICE
11 Raymond Avenue
Poughkeepsie, New York 12603
(914) 473-5656

(HEARING)

MR. KATZ: Thank you for coming this evening. My name is Steve Katz, I am Community Relations Coordinator of U.S. EPA Region II.

We are here tonight to discuss the Warwick Landfill Superfund Site, specifically the second part of the operable unit dealing with groundwater and investigation into that.

With me tonight at my far right is Mike Kadlec, he is with tke New York State Department of Health. He will be talking a little bit about some lead problems that you heard about in the proposal. To his left is Doug Garbarini; he is a Superfund supervisor To my immediate right is Damian Duca, the engineer for the EPA that is in charge of the landfill.

As you see, at some point tonight there are background materials that we have. There is also a sign-in sheet. If you haven't already done so, just print your name and address on it. That's how

we continue to get more information about the site.

There is also other, more detailed, in-depth background information about how we came to a proposal for the Warwick Landfill. That information is available at local repositories. Those documents are being maintained at the Warwick Town Hall and at the Greenwood Lake Town Hall and also, I believe, at the New York State Department of Environmental Conservation in Albany.

All of the material -- all the public documents that EPA does is released locally, so you can take a look and purview them if you have more questions.

As part of this hearing, a public comment period that goes with the EPA's proposal is due on August 27th. This meeting is part of that public commentary tonight. It is part of the proposal to solicit public comment and feedback.

As you see, there is a

(HEARING)

stenographer here at the end of the table. What you say here tonight are considered comments as part of that public comment period. We can also use this to be more informed about it and you can write in your comments until the 27th of August.

I would ask that you save all your questions until after the presentation. It will probakly take about 35 minutes or 40 minutes. Just come to the front, one at a time, and just state your name into the microphone. You just have to speak clearly so that the stenographer can get you on tape.

That's about it for the ground rules. I would like to move things along quickly, so I will turn things over to Doug Garbarini who will just talk a little bit about how the Superfund process works.

MR. GARBARINI: Thank you, Steve, and thank you everyone for coming out here tonight. I just want tc give a ten-

(HEARING)

or fifteen-minute background of the Superfund process and the program. A number of you have been following the Warwick site for years out here, and you are probably somewhat familiar with it.

Just to start off, Superfund was enacted in Albany in 1980 with the passage of the Comprehensive Environmental Response, Compensation, and Liability Act -- which is a mouthful -- and that's why it is always wise to say Superfund. And basically Congress passed CERCLA as a result of various hazardous waste sites and their potential impacts coming to national attention, most notably with the Love Canal which was one of the big ones that was in the press quite a bit at that time.

Now, the federal government or state government really had no means of dealing with these sites, so Congress passed Superfund. And basically what it does is it gave EPA a means of dealing with these sites, and it gave us a

(HEARING)

Superfund or super pot of money that could be used to investigate and cleanup various hazardous waste sites that were on the EPA National Priorities List around the country. It also gave EPA some enforcement tools to forces the parties that are responsible for the contamination to clean up -- either clean up the contamination, to pay for the cleanup of the contamination or give EPA the ability to go back after them and recoup costs that EPA had extended in evaluating or cleaning up a site.

So, back in 1980, Congress and a lot people thought that that was going to be a relatively quick program. It wasn't going be complex. They thought we might be dealing with a few hundred sites.

They thought perhaps they might be picking up a few drums, maybe putting a cap over contaminated areas, and basically the program may last a number of years, maybe five years or something like that.

(HEARING)

As time arose, we began to see how complex the process was and that we had thousands of those sites to deal with, and a lot of these areas had never really been dealt with before in terms of cleanups.

So, in 1986, Congress reauthorized Superfund, recognizing the complexity of the program. Whereas in 1980 Congress passed a five year program with a funding level of approximately 1.6 billion dollars, in 1986 Congress realized the program was more complex, that it was going to last for a long time; and they passed Superfund for another five years, this time at a funding level of about 1.5 billion dollars a year.

They also gave us some more effective enforcement tools to try get those parties, the potentially responsible parties, to undertake more of the cleanups, and these enforcement tools have been very helpful for us in the last

few years. Close to 70 percent of the actions that have been initiated have been initiated by the responsible parties.

Now, if we were just dealing with this Superfund or pot of money, we wouldn't have enough money to go around for the cleanups, so it is very important that we get the responsible parties to pay for their fair share.

Currently, Superfund is up for reauthorization. Congress has been dealing with trying to reauthorize the program for the last couple of years. We're hoping that it will be reauthorized this year, but there are no guarantees. The important thing is that congress continues to give us money to implement the program. If it is not reauthorized this year, as long as we have money, we can continue with the program. And there is a bill before the House that the House is putting through right now that would give us a billion dollars fo next year.

(HEARING)

Now, a billion dollars is not a whole lot of money in Superfund terms, so there wouldn't necessarily be enough money to handle all the studies and all the cleanups. So what we are doing now is going through the proces of prioritizing all of our sites so that the worst sites can be dealt with first. Take care of the risks that present the most significant problems first and then work your way down the list.

Hopefully, Congress will give us enough money so that we can handle the screening that's ongoing right now. This really shouldn't impact on the Warwick Landfill, because the responsible parties are currently paying for both the remedial investigation that we are here to discuss tonight as well as the capping of the landfill, which the design we expect to be finalized in the next week or so.

So how does a site get to become a Superfund National Priorities List

site? The first step in the process is basically to go through what we call the remedial phase. We discover signs and then rank them and use what is called the Hazard Ranking System. If a site scores a certain level, it is deemed to pose a significant enough hazard to warrant more federal investigation.

There are approximately 35,000 sites that are on the EPA preliminary list or Superfund list. We've looked at over 30,000 of those to date across the country, and there are currently 1,287 that are on the National Priorities List.

Today we have already deleted -- that means completed all action and basically given a stamp of approval -- to 77 sites. We actually removed those from the National Priorities List.

When a site is on the National Priorities List, it is then eligible for EPA to utilize the Superfund pot of money to investigate or cleanup the site, and it's also now eligible for EPA to utilize

enforcement tools in trying to get the responsible parties to cleanup the site.

We go through an established report determining whether there are any acute health threats assocciated with the site, and if there are, we do what's called the remedial removal action.

Now, removal action is a lesser known portion of a program which has been highly, highly successful. We've conducted a removal action on the National Priorities List sites, and they were conducted anywhere there were acute health threats. We've conducted them for more than 3,500 sites, as I've said, and a number of those have been on the National Priorities List sites.

Now, what we do subsequently, we get into the remedial phase of the program. And in certain circumstances, what we do is divide the site up into what we call separate operable sites, as Steve had relayed to you before. If we think the program should be on an

expedited basis, we try and move forward with that portion of the site rather than letting another area slow down our remedial efforts.

In the case of the Warwick Landfill cap, we selected a remedy for that cap. And rather than slow that decision down, we decided that we would move the hydrogeological groundwater remedial investigation portion of the study onto another track or another operable unit, and we're here tonight to discuss the followup results from that investigation.

Now, back a few years ago, we had conducted a whole lot of groundwater work, and we had come to some preliminary conclusions and felt relatively comfortable with those conclusions, but we decided that we would come back out here and do more significant investigation just to confirm the preliminary conclusions that we had reached back then. We collected samples,

(HEARING)

we tried to determine the nature and extent to the contamination at the site, we looked at the levels of the contaminants, the toxicity of those contaminants, we looked at the exposure to the contamination, and we put this all together in what's called the Risk Assessment, and we decided bether the risks that were posed by the site are acceptable or unacceptable. And in cases where the risks are unacceptable, we have to figure out a way to alleviate those risks so that they are now acceptable.

And we undertake what's called a Feasibility Study where we look at different alternatives and different technologies for cleaning up various median sites so that they no longer present a threat to human health or the environment.

Following the Feasibility Study, we come out with a proposed plan with preferred alternatives. I should mention that in certain instances we will not

conduct a Feasibility Study if the Remedial Investigation reveals that the risks are already at acceptable levels. There would be no need to conduct a Feasibility Study.

In either instance, we would then move forward with the proposed plan, and we are here to discuss the proposed plan for the Walkill Landfill site tonight.

The proposed plan jusit basically lays out some of the Remedial Investigation results and says, Here's EPA's proposed alternative for remediating the site, whether that be an active alternative or whether we say that we don't think any further action is necessary.

We have a 30-day public comment period, we hold a public meeting, we solicit your comments whether they be in writing or verbally. We go back to our offices at the end of the comment period and basically respond to all comments that we received in writing in a summary

(HEARING)

that's called the Responsiveness Summary.

This Responsiveness Summary becomes part of a larger document which is called a Record of Decision. It's signed by the highest ranking official in the EPA's Region II Offices that being the Regional Administrator.

In cases where we do select an active remedy, we would move into the construction phase. So, for instance, for the first operable unit, we selected the capping of the landfill.

The construction phase includes the remedial design. So, for instance, for the landfill, we would determine the area to be capped, we would look to see if there are impacts to wetlands and how to mitigate the potential impacts to the wetlands. We decide what kind of materials we want to cap the site with and how thick those materials should be. We look at the grading of the cap of the landfill, we look at the drainage off the landfill, those sorts of things.

(HEARING)

Finally, we get into the remedial action where you actually start moving the dirt around and actually implementing the remedy. Subsequent to the remedial action, we go through phases that are basically called the site close out and monitoring.

If there is continued monitoring necessary at the site, we will do that on a periodic basis for as long as it is necessary. And finally we go through site deletion.

Just to give you a general feel for time frames and costs, it's taking on the order of about 11 years for EPA to move from the start of the Remedial Investigation through completion of construction on Superfund sites. And we really don't have a standard or typical Superfund site either. Some of them are a half-acre planning facilities, some of them could be 200-square-mile mining facilities located somewhere -- are located in urban areas or are located in

rural areas.

In general, the average costs for remediating a Superfund site is on the order of 25 to 30 million dollars. Again, there may be some sites where we don't need to take action, where may be some sites where our action runs a few hundred thousand dollars. But, on average, we are looking at 5 to 30 million dollars.

We have to date in New York State -- I think we spent about 400 million dollars of fund money for activities in New York State, and we've recovered or settled with responsible parties for about 800 million dollars in costs for a total of about 1.2 to 1.3 billion dollars of money have been bumped into the program from various sources in New York State. And in New York State, just as an overview, we're dealing with about 87 National Priorities List sites now. The National Priorities List sites were the ones on the federal list. The

(HEARING)

State of New York also deals with several hundred sites in their own program.

So, with that closing, I will turn it over to Damian to give an overview of the Remedial Investigation.

MR. DUDA: My name is Damian Duda, and I work for the New York Superfund program in New York City.

I am here to talk about the proposed plan for Operable Unit Two to the Warwick Landfill.

I just put up here an overview of the landfill itself, which is in orange, and some properties in the northwestern section and Nelson Road, just to give you an idea of the area, and there are two wetlands as identified here (indicating).

The Warwick Landfill also known as the Penaluna Landfill, is located one and a half miles northeast of the Village of Greenwood Lake in the Town of Warwick. It basically occupies about 19 acres on a 64-acre parcel with Penaluna

Road on the western boundary.

Wetlands, as I have indicated, are in the northwestern an southeastern parts of the landfill -- and there are two streams which I showed -- there are two streams that I showed on the previous map that are unnamed, but they represent two landfill runoff areas that actually drain into the Greenwood Lake area.

The geology of this site is complex and consists mostly of bedrock; sandy, glacial outwash; and dense, silty, clay.

The manmade landfill material, the refuse -- some of it was actually dumped in the landfill -- overlining the bedrock basically is refuse, silt, and daily and final cover soil with bedrock outcropping in the northwest area of the landfill. The maximum thickness of the refuse is about 30 feet in the northern section of the landfill and 50 feet in the southern section.

The entire landfill itself is

capped up by about two feet of soil cover consisting of silt, clay, sand, and gravel.

Until the '50s, the Warwick Landfill area was owned in part by the Penaluna family. From the mid-50s until 1977, the Town of Warwick leased the property as a refuse disposal area for municipal and industrial wastes.

In 1978, the Grace Disposal Company leased the site for continued landfill operations. But in 1979, the New York DEC collected and analyzed leachate samples from the site which showed some contamination of metals and volatile organic compounds.

Later in 1979, subject to a DEC order, the landfill was closed and graded and covered.

In September 1983 to '85, Woodward-Clyde performed a preliminary investigation of the landfill which showed some limited contamination, and that's per what Doug Garbarini spoke

earlier.

In '85 it was proposed for the National Priorities List; and in 1989 it was formally listed. And he current owners of the property are the L & B Developers.

I would like to just go on and do a brief overview of Operable Unit One. And it was decided back in 1991 that the major component of that remedy was a landfill cap which addressed the source of contamination of the site.

Currently, the Remedial Design is nearing completion, which should be completed within the next couple of weeks. The EPA expects that a construction contract will be on board by the end of the year or the beginning of next year. That's nonspecifically identified at this point.

There are point-of-use treatments for four affected residences in the area and is ongoing. There is a residential well monitoring program, which includes

septic tanks sampling which is also ongoing and -- (brief interruption). And one thing that the Operable Unit Two also identified was that we would further characterize the hydrology and the groundwater in the area.

The current activities under Operable Unit Two -- which this proposed plan addresses as Doug spoke of earlier -- addresses the groundwater investigation. It also further defines the hydrogeologic and hydraulic charateristics of the landfill and further sampling of 22 monitoring wells, to be exact. It further defines potential contamination sources, it further examines the groundwater quality for glycol ethers, and it also determines the human health risks at the site.

I just wanted to go ever a few enforcement activities that we've done on the site regarding PRPs, the potentially responsible parties. In December '88, the EPA sent special notice letters to a

number of potentially responsible parties -- known as PRPs -- giving them the opportunity to conduct an RI/FS at the site or a Remedial Investigation Study.

In August '89, with no PRP offers, the EPA used Super und monies -- as Doug spoke of earlier -- to proceed with the Remedial Investigation Feasibility Study for Operable Unit One with our contractor, Ebasco, Incorporated.

From August '89 until May of '90, Ebasco conducted a field investigation for Operable Unit One. And from September '89 to November '90, EPA and the Department of Health, New York State Department of Health, also sampled 42 residential wells. With respect to that, as an interim measure, four wells required point-of-use treatment systems, and they were fitted with these activated carbon filters.

Now, I would like to ask Greg Shkuda from Geraghty & Miller, the PRPs

(HEARING)

contractor, to discuss the hydrogeologic investigation at this site.

MR. SHKUDA: Okay. As Damian said, the object of the Opertble Unit Two investigation was to further define the groundwater flow in the area surrounding the landfill. As Damian mentioned, there are 22 wells that were installed; and additionally, there were a number of residential wells that were sampled as part of this program. I believe it is in excess of 24 residential wells that were sampled.

And just not to bore everybody, but to make sure we all understand how groundwater moves, groundwater moves similar to water moving through a hose; that is, from high pressure to low pressure. We determine the pressure of the amount of force that water is under by installing a well.

This blue line here represents a well (indicating). The well is installed, it's developed; that is, we

pump water out of the well to make sure that we are sampling the groundwater. We have a surveyor come out to measure the top of that well with respect to sea level, and then we measure the depth of the water.

So we take all 20 wells, and we repeat that for each and every one of the wells, and then map out where there are places that are high pressure, and where there are areas where there are low pressures or lower heads of water. Water then flows from that high-pressure area to the low-pressure area.

Now, as Damian described, this is a fractured rock system, so the water flows in between the fractures and the rock, not in the pores of the rock or in between the pores in the soil, but in between the individual fractures.

If you do that for the Warwick Landfill, you can determine the way the water generally moves in the upper portion of the bedrock formation. This

is where the majority of our wells are completed. We have some that are completed deeper, and I will show you that later. But in general, measuring the water elevation in each of those 20 wells that were installed during Operable Unit One and Operable Unit Two, you can determine that the water generally flowed from the northeast to the southwest across the landfill.

Now, that was one of the objects of this study. Now, in order to confirm that, there was a chemical sampling done. Samples were collected from, as I said, residential wells as well as the monitoring wells that were installed.

Now, from studies that were completed by the United States Geologic Survey Map in 1980, landfills are known to produce a number of contaminants that are associated with landfills. These contaminants are ammonia, because we have a lot of food that contains amino acids and it's reduced to ammonia, they produce

a lot of iron; they produce a lot of sulfate; they produce a lot of chloride.

So if we are to collect samples and look at the concentration of what are called leachate indicators -- and this is an overhead demonstrating he results from this study (indicating) -- we can compare the results from wells that were upgradient in the northwest to wells that are downgradient in the southwest to test whether our understanding of the flow system is correct.

As you can see here -- and you can focus on anyone of these (indicating); but let's focus on ammonia since it is very common to landfills of this type. The ammonia concontrations in the groundwater to the northeast are not detected. When we get onto the landfill itself, the ammonia concentration -- if you look at PZ 1, for example, which is on the landfill itself -- it jumps up to 83 milligrams per liter. As we go down to the southwest, the ammonia again is

nondetectable.

You do look at similar things. You can look at cloride, you can look at TDS, which total dissolved solids, and they tell the same story. The water is uncontaminated by these materials or it has been at a low level. It gets higher as you go passed the landfill. And as you get downgradient to the landfill, the contaminants are, again, reduced to near background levels. This, we believe, is a confirmation of our understanding of the flow system based upon the groundwater elevation.

Now, finally, we talk about a number of wells that were installed, and we just want to look at the wells that were installed in relationship to the overall flow system. And when we install the wells, we collected geologic samples, and we are able to define what's rock and what's overburdened and what's refuse.

The top picture is a view from the northeast to the southwest through

the access of the landfill; the bottom picture is a shot from east to west across the landfill. Most of the wells -- and most of the wells that we completed are through the refuse or just into the top.

We have completed wo wells that are in excess of 300 feet deep to the northeast of the landfill.

The typical household well in this area, according to the local drillers, is in excess of 300 feet. Those wells tested clean. As so if you look at this in relation to the end of the scale here (indicating), you can see that a well that's 300 feet s going to be somewhere in this vicinity (indicating), well below any possible interaction between the fill material and the groundwater.

MR. DUDA: I would like now to talk about the overview of the Remedial Investigation that was done.

Between March '93 and September

(HEARING)

'94, basically, a contractor performed groundwater monitoring well and residential well sampling, landfill seep survey and mapping, leachate sampling, surface water and sediment sampling in the wetlands, landfill gas and ambient air sampling which had to do with the landfill itself, and residential septic tank sampling.

The sampling results for the surface water sediment and leachate sampling indicated that in June 1993 and April '94, two rounds of surface water and sediment samplings were conducted. Three zones of the surface water was sampled with respect to the landfill, and basically it was upstream with the landfill adjacent stream and downstream in the landfill.

In general, the surfuce water sampling results indicated that the levels were within New York State standards, although iron and manganese where a little higher as to be expected,

and there were volatile organic compounds detected downstream.

In general, the sediment and wetlands sampling indicated levels within New York State criteria.

In December '93, leachate sampling was performed from the landfill piezometers; and, in general, levels were detected within New York State standards.

It is important to note that the landfill cover, the landfil cap, will prevent any further contamination.

There was also septic system sampling in September '94 a part of a residential well monitoring program. And the residential septic tank systems were sampled and analyzed, and numerous VOCs were detected. The contaminants found there were similar to those found in nearby residential wells, and these results indicated a possibility or potential septic systems presenting a source of contaminants to the private residential drinking water wells.

(HEARING)

With respect to the groundwater sampling for Operable Unit One, there were 15 groundwater monitoring wells installed: Eight in the overburder aquifer and seven in the bedrock. And three rounds of groundwater samples were collected from these wells during Operable Unit One.

Some limited exceedances of the New York State federal drinking water standards were found. And also, this is one of the reasons that we did the 42 residential wells in the are sampling and activated carbon filters were supplied for those affected residences, and they are currently being used.

The residential well monitoring program, which is part of Operable Unit One, was -- the first sampling round was conducted in September '94, and 24 homes within a quarter mile radius of the landfill were sampled for VOCs and inorganic or metals.

It is important to note the

construction type for thes residential wells is mostly open hole, and, as Greg indicated, most of them are over 300 feet deep.

The results of this sampling indicated that only two wells upgradient of the landfill had VOC contamination slightly above New York State standards, and one of those wells had a carbon filter unit on it which prevented it from any further contamination.

In the first round of the residential well monitoring sampling, lead was detected in six wells, upgradient of the landfill, above the federal action level. Detection of this lead is most probably related directly to contamination of the household plumbing sources.

Specifically related to this lead issue, I would like to have Mike Kadlec from the New York State DOR speak a little bit about that.

MR. KADLEC: My name is Mike

(HEARING)

Kadlec, I'm with the New York State Department of Health and Bureau of Environmental Disclosure Investigation.

And what we do is we look at a Superfund investigation and work plan and make sure that the information that's being collected at these sites is going to give us the information that we need to make sure the public is not coming into contact with any sort of chemicals from the landfill.

Now that I'm a public health specialist, it's my job to make sure that the chemicals are not getting from the landfill to the people around the landfill. Andwe do this by looking at the samples that were collected, at the results that were obtained, and we compare them to New York State drinking water standards, for example

Now, there's two issues at this landfill that sort of brought me into this whole process. The first one was volatile orgainic chemicals that were

found in some of the homeowner wells around the landfill.

Now, the geologist at the New York State Cooperative Environmental Conservation explained to -- I'm not a geologist -- explained to me how the groundwater was moving away from these houses, and how there are some septic tanks in the area that have contaminated these wells with volatile organic chemicals.

Now, I want everybody to know that the filters that were placed on these wells will not be removed until it can be shown in four monitoring events over a year that the levels of the chemicals in the wells are below 50 percent of the drinking water standards.

Now, another problems that had arisen was that lead was found in some of these houses. Now, it's a common problem for water to leach lead out of a plumbing system in the older houses that used lead sodder and stuff like that. And the way

that we determine if the lead is actually in the groundwater or if it's coming from the houses is we take a first-draw sample after the water has been sitting in the pipes, test that for lead; and then we take a sample after the water has been flushed for 10 minutes, you let the water run for 10 minutes, and take another sampling.

Now, the difference between these two will give you an idea of how much lead is coming from the pipe in the houses. Now, we did these tests on the houses that had lead levels above drinking water standards, an what we found out is that in doing these flush samples, we found out that lead was coming from the plumbing in these houses, not from the landfill.

So, looking back at he investigation that I did, I an say that the volatile organic chemlcals in the wells may not be coming from the landfill at all. According to what the geologist

told me, it's coming from the septic tanks in the area.

Now, I want you to be assured that the filters will stay in place as long as drinking waters ar exceeded. And concerning the lead issue, now, this is a common problem in New York State for lead to be leached out of the plumbing.

And the only thing that we would recommend for those people have lead sodder in the plumbing in their houses is to let the water run for about 10 minutes before using it.

I think that's all that I have to say.

MR. DUDA: I would ike to talk a little bit about the actual groundwater monitoring well sampling that was conducted during the Remedial Investigation. I had indicated there were 15 wells originally; we also included another 10 additional monitoring wells monitoring the upgradient and downgradient groundwater quality in

(HEARING)

December '93. And in August/September '94, two rounds of groundwater sampling were conducted at 22 monitoring wells for volatile organic compounds, semi-volatile organic compounds, pesticides, PCBs and inorganics, a wide range of compounds.

We found limited exceedances of the New York State VOC standards in seven monitoring wells, all of them upgradient of the landfill during the two rounds of sampling. The result of the groundwater sampling indicated that the majority of contamination was found in the upgradient bedrock aquifer. And volatile organic compounds were found at comparable levels in upgradient and downgradient to monitoring wells -- I mean various inorganic compounds -- those are metals, not volitale organic compounds.

Also, since we really didn't find any major contamination at th site, it basically indicated isolate hits here and there. There were no flumes or large swathes of contamination that could be

found for both organic or inorganic contaminants at the site.

I would now like to talk a little bit about the summary of site risks that were determined in the health risk assessment. Basically, a Baseline Risk Assessment estimates the human health and ecological risk which could result in contamination there were no remedial action done at the site. So that's the worst-case scenario.

Current guidelines for acceptable exposure for an individual for cancer risk can be interpreted as basically one in ten thousand to one in one million increased of developing cancer as a result of site-related exposure over a 70-year life span.

There is a four-step process for assessing site-related human health risks for reasonable exposure scenario.

Basically, this is the way risk assessments are done. We collect data and evaluate it, and then we do an

exposure assessment which analyzes which pathways residents are being expected; then a toxicity assessment of the contaminants of concern and an overall risk characterization. Baseline on this risk assessment, the Baseline Risk Assessment was conducted to estimate those risks with respect to current future conditions, and the overall risks at the site were all determined to be acceptable.

The exposure pathway that was determined were four different ones: Four for groundwater -- or three for groundwater, ingestion, dermal contact, and inhalation while showering. And then we also had an air risk exposure pathway.

The carcinogenic risks or cancer risks for the adult and child for all of them were all acceptable wit in EPA acceptable risk range. And then noncarcinogenic risk was acceptable for all of them. There is a caveat on the ingestion for children on the

noncarcinogenic risks because with basically related to ingestion through manganese, and the noncarcinogenic risks shows a hazard index for children at 1.5, and the level that we normally try to find is 1.0. But this particular risk is related directly to manganese, which is considered an essential nutrient, and in which case the manganese dose received by child drinking bedrock groundwater is actually lower than which would be supplied by a common over-the-counter multivitamin supplement.

So, in summary, I'd like to just go over the no-further-action remedy which is proposed for this meeting. Basically, based on the findings of the OU-2 RI formed at the site, EPA and the New York Department of Environmental Conservation returned a no-further action is protective of human health in the environment.

The low-level contamination of the residential wells from the site are

determined not to be landfill related.

And, once again, I would just like to show you on the map that the groundwater flow determination was defintely in the southwest. And most of the area of sampling was up in the northeast corner (indicating), which is in the upgradient portion of the site.

The sampling data from the privately-owned septic system indicated a potential for contamination associated with residential wells. And the OU-1 remedial action, which is the landfill cap, should be constructed during next year, and that should prevent any further potential contamination to the groundwater or adjacent wetlands. And continued ongoing monitoring, once the landfill is in place, the groundwater, ambient air, landfill gas, surface water, and sediments will insure that the existing population are protected from any future potential contaminations.

That's pretty much my

(HEARING)

presentation.

MR. KATZ: We will keep the overhead. Some people had problems hearing, so we will keep the overhead up another moment or two.

Obviously, there is no point in comimg up to a microphone that's not plugged in, but if we just take your questions one at a time and state your name for the lady at the end.

We are required to respond to your comments, and we want to respond to your comments, but it's difficult unless we get them down.

MR. GEORGE WEBER: My name is George Weber, I am co-chair of the environmental group of the Dutch Hollow Homes.

We would like to read a formal statement. Everybody has got a copy of this, so we will go on the record with it.

Dutch Hollow Homeowner's Association's complaints and concerns

with the EPA's handling of the Warwick Landfill Superfund case.

One: The remedial report which the EPA is basing their final decision upon has been conducted by a company hired by the parties responsible for the dumping.

The company, Geraghty & Miller, Incorporated, works for the Warwick administrative group for the parties named in the EPA suit taking part in the dumping of the Warwick Landfill. Based upon Geraghty & Miller's work, the EPA has concluded that no further action is necessary to protect groundwater in our community. We strongly question the wisdom of this decision. We believe that an alternate water supply is the only solution to guarantee a safe supply of water.

Two: The EPA scheduled this meeting during peak vacation season, giving only two weeks advanced notice. Many families in the community are away

(HEARING)

during this time. The minimum amount of time for advanced notice should have been at least one month.

Three: Under the Superfund system, the EPA allows PRPs -- that's potentially responsible parties -- to play a much larger role in the decision-making process that it does the residents of the affected community.

PRPs and their consultants negotiated in private with the EPA all aspects throughout the entire process. This includes investigation, cleanup, remedial designs, et cetera.

The residents and their advisors have very limited access to this process. PRPs get to agree on proposal before the residents or their advisors are given access. This has giving the PRPs an enormous amount of influence and advantage.

Our TAG -- which stands for Technical Assistance Grant -- advisors have not been given adequate time to

thoroughly evaluate these reports.

The remedial report was sent to our TAG advisor just 20 day prior to this meeting and just before he was due to leave for a week's vacation. The Risk Assessment Report was sent to the groundwater TAG advisor and did not arrive in his hands until Friday p.m. this August 11th. Consequently, the risk assessment TAG advisor did not receive the report until Monday P.M. August 14th, which is yesterday afternoon.

Five: The EPA's oversight of the entire testing procedure has been spotty. The amount of direct oversight on their part is questionable.

In the latest round of testing within the one-quarter mile radius of the landfill, only approximately 20 wells have been tested. Notification of well testing was attempt by telephone and/or posting of notices on homeowner doors rather than by certified mail. Some homeowners had stated that they had never

received notification. Consequently, homeowners who have desired testing of their wells have not received it.

Six: The EPA has been less than responsive in dealing with Dutch Hollow Homeowner's Association officers and our TAG advisors.

Many phone calls to the EPA have gone unreturned. An EPA administrative snafu delayed the renewal ot our TAG grant depriving us of the services of our TAG advisors for approximately six months.

Seven: The EPA's priorities are wrong, both from an economic and an environmental standpoint.

The EPA has designated the solid waste aspect of the cleanup is Operable Unit One, and the groundwater aspect is Operable Unit Two.

The EPA is emphasizing the wrong aspect of its plan. The alternate water supply initiative -- at an estimated cost of 1.5 to 2 million dollars -- should

have been given top priority to the landfill cap at an estimated cost of 16 million dollars implemented as a followup remedy. Instead, they have given the landfill cap priority and have given the alternate water supply no consideration whatsoever.

Eight: The EPA, the PRPs, and Geraghty & Miller, Incorporated, cannot guarantee that other groundwater problems will not occur in the future.

Some wells northeast of the landfill are contaminated. This shows that other wells in the area are vulnerable to contamination, regardless of the source.

The installation of a landfill cap will only serve to slow town the rainwater-induced leachates from the landfill. It will do nothing to stop contamination already present in the water table, and its installation may very well redirect the flow of contamination into areas which were

previously uncontaminated.

There is no guarantee that all wells around the landfill will be safe in the further. This includes any new wells that are installed.

The final Baseline risk Assessment does not give a clean bill of health in its present form. Our advisors are studying it carefully, having just received it, and they have already identified some serious mistakes in calculations.

I received a FAX today from my TAG advisor; it has limited information based on the amount of time that it's had to evaluate the report, but I can read it to you.

(Reading from document) The Baseline Risk Assessment for Operable Unit Two embodies serious technical errors. Moreover, EPA's characterization of the risks to children from consumption of contaminated groundwater is misleading and improperly dismissive of a risk that

(HEARING)

EPA's own procedures as well as scientific consensus indicates to be an appropriate focus of the concern.

Many chemicals that are essential nutrients at tiny doses, such as manganese, are toxic at higher doses. Moreover, the fact that the sale of dietary supplements is essentially unregulated by FDA means that one can easily become poisoned by consuming doses of vitamins and minerals that are commonly sold over the counter.

Numerous cases of such poisoning have been documented, and children are particularly at risk for such a poisoning.

Recent legislation has specifically attempted to address this gap with regulatory protections as a safeguard.

Basically, what the TAG advisor had told me was they're comparing apples to oranges. They're using food-grade levels to measure contaminant in the

groundwater.

And now we would like to say something about the alternate water supply process.

The alternate water supply proposal: In 1991 our TAG -- again, Technical Assistance Grant -- advisors recommended an alternate water supply as the most comprehensive and cost-effective solution to groundwater contamination in the community.

A study conducted by Geraghty & Miller, Incorporated, for the Town of Warwick has shown an alternate water supply initiative to be feasible.

The Village of Greenwood Lake Board of Trustees has expressed its support for us to tie into heir municipal water supply when their water infiltration plant goes on line. The EPA has refused to consider this alternative.

Advantages and the disadvantages of an alternate water supply. The advantages are: The measure is

conceptually simple. The measure is 100 percent effective in reducing the risk of being exposed to landfill contamination via the residential water supply. The measure would provide community peace of mind and help to resource property values which have suffered a reduct on due to the presence of the landfill. The measure is permanent. The measure provides the greatest amount of protection to the community for the least amount of expenditure.

Disadvantages: The homeowner or landlord would be required to pay the cost and time and property into the new system; that cost is yet unknown. And the homeowner or landlord will then have a regular water bill to pay of anywhere from $.50 to $1.00 a day.

It should be noted that if the PRPs would have agreed to provide our community with an alternate water supply up front when our TAG advisor recommended it four years ago, they probably would

(HEARING)

have saved money on legal fees and investigative work.

We do not concede that the sole source of the threat to our wells are a septic system. We believe the landfill will continue to pose a threat. We, therefore, demand that the PRPs agree to provide an alternate water supply, if this is the wish of the majority of the people in the community. We ask them to do this regardless of whether they think this is technically necessary. We think the PRPs owe it to us, considering all the hardship which the presence of this landfill has put us through.

One thing is clear, they owe this community something. The EPA obviously thinks that the PRPs have lived up to the letter of the law. We disagree and believe that they have fallen far short of living up to the spirit of the law as well.

Thank you.

MR. GARBARINI: Thank you,

(HEARING)

George. You said a lot these. I don't know if I can responded to each and every comment. But I certainly appreciate your concerns, and I think one of the things I'm hearing loud and clear are, and aside from concerns about health risks, is property values. And if I was in your situation, I think I would also have similar concerns. But I think one of the other more important points that you did make is that regardless of whether this was necessary or not, you think it should be done. And unfortunately the way the Superfund program is done, we need to have a scientifically-sound study that's been conducted, and we need to rely on sound science in order to make such decisions or expend such money.

MR. GEORGE WEBER: We understand. All we are asking is, Can you guarantee us that we are not going to have a problem in the future with this? Can you offer us a guarantee? Can you guarantee that our property values aren't going to

(HEARING)

continue to drop? You can't. You can't.

What we're asking you to do is give us something that will guarantee that at a pittance of what you're spending on that cap. Okay. The very fact that you're putting the cap in, okay, scientifically could cause a shift in the direction of the water. That in itself should be a reason to put in an alternate water supply. We don't understand the logic involved here.

Our TAG advisors asked you four years ago for this. He stated it, it's is his reports. I don't -- from my standpoint as a homeowner, I don't understand the logic.

We are not interested in bureaucracy. We have to live here. We are the ones that put our homes up for sale, we drink the water. It's always there, and we don't care -- you know, you can throw every scientific study in our face, but the fact is that that stuff is there. And I defy anybody here to tell

(HEARING)

me really what's under there and how much is there. And anybody here that can get up and give me a guarantee that that's not going to leach into our ground eventually, get up and tell me that now.

Is anybody here willing to take risk? Put it in writing?

(No response)

MR. GEORGE WEBER: I rest my case.

MR. GARBARINI: I think you already realize that you do have a problem with certain wells, and the indications that we have is that that contamination is likely coming from septic systems in the area.

MR. GEORGE WEBER: I think --

MR. GARBARINI: Just to respond. I think we heard you loud a clear back in 1991, and we had conducted a ground/air investigation back in 1991, and we had reached some preliminary

conclusions. And we had heard all of you very loudly and clearly, and we decided at that point in time that we should do additional investigatory work before we reached a decision on this operable unit. And we've gone through that and we spent a whole lot -- we haven't spent a whole lot of money, but the responsible parties have, and they've done this work under significant oversight.

The New York State Department of Health and New York State Department of Environmental Conservation at varies groups within EPA all review the plans that are necessary before we can go out into the field, before the PRP goes out into the field to conduct his studies.

We've all reviewed those and made sure that they were up to stuff. And then when we go out into the field, we hire another contractor, our own contractor, Ebasco Services to oversee the work that's done. When samples are collected, we split samples with the

responsible parties, and those results -- we see their sampling result. Then when we get their results, we compare them, and everything looks as good as you can expect from that perspective.

MR. GEORGE WEBER: You can't give us a guarantee?

MR. GARBARINI: You already have some contamination in the wells, and we believe that contamination is likely due to the septic tanks. I can't guarantee it.

AUDIENCE PARTICIPANT: "Likely." That s the key word, "likely."

MR. GARBARINI: As I said, we came out, we spent a couple of more years investigating the groundwater flow and the whole hydrogeologic regime, and we concluded that the direction of groundwater flow is away from those homes in the northeast.

We spent a whole lot of money investigating this. And I hear your concerns. I would very much like to be

(HEARING)

able to say, Sure, we'll put in an alternate water supply. It's only 2 million dollars. We spending billions of dollars on Superfund. The problem is, the law doesn't allow us to do that unless we have evidence --

MR. GEORGE WEBER: How many monitoring wells did you use?

MR. GARBARINI: We have 22 monitoring wells that were --

MR. GEORGE WEBER: How deep are they?

MR. GARBARINI: They are at various depths. Some of them are at deep bedrock, most them are in the overburden, in the shallow bedrock in the overburden.

MR. JAMES STRAWDER: My name is James Strawder, I live on 786 Nelson Road. (Inaudible from the audience).

MR. KADLEC: That was the New York State Department of Environmental Conservation. They are the ones that basically pay for the monitoring wells.

I want to assure you that if your

drinking water is above drinking water standards for less than a year, monitoring it four times in that year, I will not let them remove the filters from the well.

MR. JAMES STRAWDER: You state that -- (inaudible from the audience).

MR. KADLEC: Yeah, the DEC is running into a problem. There's a big problem with this. Who's going to pay for the filter? If the pollution isn't coming form the landfill, the the State has to absorb that cost. And that's a big problem right now, considering the political climate. But, I can assure you that if your water is above drinking water standards, I will not let them remove those filters.

MR. JAMES STRAWDER: (Inaudible) They even stopped the service on it about two years ago. (Inaudible from the audience)

MR. KADLEC: This is a problem that New York State is running into.

(HEARING)

There is nobody really to pay for them now, but -- I'm sorry, go ahead.

You're complaining the water smells like?

MS. ALICE DOLSON: My water smells like fish.

MR. KADLEC: That's hydrogensulfide. That can be a problem in some natural aquifers, most likely.

MS. ALICE DOLSON: I can't drink that water.

MR. KADLEC: That's a common problem with some wells it's hydrogen sulfide.

MR. GARBARINI: The stenographer is having some problems hearing. Please come down and talk.

MR. JOHN MESSINGA: My name is John Messinga. I would like to correspond with what George Weber said. The Dutch Home Association, members of the community, many, many people express doubts over the Superfund's ability to cleanup and maintain the integrity of the

water supply system. I read from your own journal, "Uncertainty: Risk assessment is not an exact science. While EPA tries to estimate risks as accurately as possible, there are many sources of uncertainty in a risk assessment."

We have to live here. We have children here. I hope that your people are safe, your loved ones are safe when you go home tonight. But these people here are living here every single day.

You say you do monitoring once every six months, once every three months. Does that guarantee that the water supply is continuously clear?

Gentlemen, we are worried. We are asking for one-and-a-half to 2 million dollars to protect the community permanently. I can't see that as being such a problem when you say to us the average cost of the Superfund cleanup is 20 or 25 million dollars.

And thank you.

(HEARING)

MR. GARBARINI: Just to respond to your question, we are in the unfortunate position of having volumes of data before us that are indicating that the groundwater is flowing in the opposite direction, that the impacts to the residential wells are from the septic tanks. And unfortunately we need to have -- we can't have documentation like that on the record if we're going to offering to implement an alternate water supply. We need to have documentation and information that you have been impacted or you will be impected in the future. And all the data that we have indicates just the opposite.

I can understand your concern, but that's as much as I can offer you at this point, and I appreciate you comments.

MR. ROBERT BLY: My name is Robert Bly. Let me just get this straight. You said you foud the contamination away from where these wells

(HEARING)

are contaminated?

MR. GARBARINI: We have found the direction of the groundwater flow -- as Damien had on the map, and we will put it back up there -- is towards the southwest rather than the northeast.

MR. ROBERT BLY: Where the wells are contaminated?

MR. GARBARINI: That s correct.

MR. ROBERT BLY: The southwest wetland is contaminated where it's flowing?

MR. GARBARINI: There is some limited contamination there, yes.

MR. ROBERT BLY: And nobody's well is going to be contaminated by those people living down there?

MR. GARBARINI: There is no indication that that that would be true.

MR. ROBERT BLY: Is the contamination flowing that way?

MR. GARBARINI: The sampling that we have done, there is no way we could let that happen.

(HEARING)

MR. ROBERT BLY: Where is that going?

MR. GARBARINI: When it flows in that direction, the wetland serve as a natural cleansing material, and that's why we try to preserve it in some instances. So contamination in the wetlands --

MR. ROBERT BLY: It is all going to the wetlands?

MR. GARBARINI: It s not all going to the wetlands, we haven't found significant levels leaving the site.

MR. ROBERT BLY: Thank you.

MR. ROY PIATELLA: My name is Roy Piatella.

Number one, the groundwater flow in the town water supply is through the aquifer in the village area. I don't see that delineated on the map. Can you please explain where it is in reference to this land in the aquifer? And number two, is it just some firm's sampling of the town water supply?

(HEARING)

MR. DUDA: I can address the public water supply sampling. Are you asking if there was sampling done?

MR. ROY PIATELLA: I m asking: Where is the aquifer in relation to groundwater flow?

MR. DUDA: I wouldn' know that.

MR. ROY PIATELLA: Does anyone know that?

MR. SHKUDA: (Inaudible) It fills up the valley.

MR. ROY PIATELLA: Okay.

MR. SHKUDA: To the best of my knowledge, it is about a mile away with the closest well that we have downgradient.

MR. ROY PIATELLA: What type of scientific evidence do we have of the boundaries of that access?

MR. SHKUDA: That's in the literature.

MR. ROY PIATELLA: Okay. So, is there potential for contamination to flow to that aquifer and potentially

contaminate the village drinking water? Can someone comment on that?

MR. SHKUDA: First of all, you have more than a mile of spice in between that. May I finish?

MR. ROY PIATELLA: Yes, sir.

MR. SHKUDA: In that mile there is going to an enormous amount of water moving into the town. At this point we're not detecting contaminants involved in the New York State or feteral drinking water standards. So, if there are low levels already, and I add clean water to that intervening mile, the concentration, by anybody's determination, has to go down. They will degraded, they will be absorbed.

So the chances of that happening are very small. That will be part of this remediation. It calls for continued monitoring to make sure that it is indeed the case, and that will be carried out.

MR. ROY PIATELLA: The point I would like to make. As you say, it's a

mile to a mile and a quarter to the aquifer. Just to let you know, it has been leaching for 20 years we assume, generally. My question is for this gentleman, are the residents to spend a thousand dollars sampling the town water supply?

MR. KADLEC: I would like to comment on that. The public water supply is monitored quarterly. Every few months a sample is taken and sent off to the Department of Health to make sure that none of the chemicals are in the groundwater.

MR. ROY PIATELLA: Can you explain what they are monitored for?

MR. KADLEC: They're monitored for volatile organic compounds, which is a wide variety. Actually, New York State uses more stringent standards than the federal guidelines. They have their own chemical guidelines that are followed that are actually more stringent than the methods that we have.

(HEARING)

MR. ROY PIATELLA: You take those samplings on a quarterly basis?

MR. KADLEC: Yes. The Division of Water is responsible for that.

MR. ROY PIATELLA: The more question I have is: I heard you talk about the ambient air sampling. Secondly, in the 1992 report put out by the New York Department of Health, they talk about the potential fo VOC fumes going into residential basements. Do you have any type of sampling in residential basements of the BOCs in the household and in the air?

MR. SHKUDA: There as a gas sampling -- a subsurface gas sampling that was completed and it is part of this investigation. We went around the landfill to determine whether there was gas coming towards any of residences, especially in the northeast which is the closest to the proximate ones. There was no gas detected in the rock and there is no pathway from the landfil to those

(HEARING)

residences at this time, as far as we could see.

MR. KADLEC: I would like to make just a quick statement too. At other sites around the state where this is a problem with the vapors going into the basements, normally that's in a case of where there is an actual free product flume, when there is so much of a chemical present that it actually creates its own liquid aquifer or whatever that you would call it. It has to be very concentrated in a liquid form for the vapors to get into basements.

MR. ROY PIATELLA: I sounds like we are very confident that there are no problems with fumes in the residential areas?

MR. KADLEC: I'm pretty confident about that.

MR. ROY PIATELLA: Were you doing confirmation sampling? Can I go on the record with that? I think there may be something we can do for the residents.

(HEARING)

Thank you.

MR. DUDA: Thank you.

MR. JAMES RILEY: Hi, my name is James Riley, I am a homeowner on Alexander Road. I don't know if anybody on our road -- we have about 20 homes that have deep wells. I didn't see any indication that they were there.

MR. DUDA: The residential well monitoring program was within a quarter-mile boundary of the landfill, and that particular location is outside that quarter mile, and that was determined as a result of the OU-1 Remedial Investigation. We decided that the quarter mile would be an appropriate response area to monitoring the residential wells.

MR. JAMES RILEY: The determination of the hydrolic gradient that was done -- this gentleman here is the geologist -- was there any consideration taken into the fact that the test wells that were created were for

(HEARING)

a very short duration attempting to determine whether there were contaminated wells and some of the other are pumped on a daily basis and this might interfere with the pathways deep in those wells as to where the hydrolic gradient might actually occur?

MR. GARBARINI: That was certainly considered, and I'll let Greg address that.

MR. SHKUDA: The map that is there is naturally under pumpage. We didn't look into the question that you are asking, whether the people that were on Nelson Road could change that gradient by pumping their wells.

We conducted a study for three days, and we recorded more levels in the monitoring wells that are between the landfill and Nelson Road. There were two sets of monitoring wells, they're at the top of the bedrock (Inaudible) deep zone. During that three-day period, there was no impact from pumping and no change in

the water levels in those wells from any pumpage on Nelson Road. So, it is clear to us there is no induced gradient to flow from the landfill to Nelson Road when residents are pumping their wells.

MR. JAMES RILEY: The other point is, just like -- my assumption is that the monitoring wells and testing the wells have been properly protected. In other words, you establish the possible deep aquifer for the shallow pollutants that are in that landfill. Are they properly grounded and protected and going to be protected from a long period of time so that it doesn't go off into the deep aquifer where it necessarily has a chance to seep into there?

MR. DUDA: Yes. All the wells that where put into the Operable Unit One and Operable Unit Two were all instructed under EPA guidelines for the proper grouting and casing, and they are all under lock and key. And during the future monitoring, they will be protected

(HEARING)

against any damage.

MR. JAMBS RILEY: Where was that monitoring program?

MR. DUDA: We don't have that setup at the moment. That's part of the operation and maintenance plan for the cap, and we'll basically get into the monitoring plan as a result of that. And EPA and New York State DEC and the TAG advisors will all have a chance to comment on that as well.

I am not quite sure when that will be coming into effect, but that probably won't be until we get the design completed and the remedial action out of the way.

Also, the existing monitoring with respect to the residential wells, which is currently ongoing, and we will be getting the results of the second round of sampling -- is it 27 homes now? and the monitoring and the program itself will be continued, if there is contamination.

(HEARING)

Also, with respect to that, I know that you indicated that all the people within the quarter-mile boundary -- I think there were 67 properties -- there was a very serious attempt to contact all of those individuals. There were solve individuals who did decline to participate in the plan. And the 24 individuals -- 27 individuals we currently have are all fairly responsive. And for anyone else -- we have a list of properties; if anyone else would like to be on that list that is in that quarter-mile boundary, please let me and I will make sure that you will be in our next sampling.

MR. JAMES RILEY: From the results of the sampling that are shown here, even in the landfill site itself, as a result of those samplings, is this landfill going to be removed from the Superfund site after the capping?

MR. GARBARINI: Yes. The site would be deleted. There would be

continued monitoring. And when you go through the deletion process, it doesn't mean that EPA no longer has the ability to take action on the site. Even though you deleted a site from the list, it sort of removes the stigma of the site on the surrounding community, but we are still able to take action if it is deemed necessary.

MR. JAMES RILEY: How long after that capping is done?

MR. GARBARINI: It would probably be a few years after the capping is done.

MR. JAMES RILEY: A few years based on continued monitoring?

MR. GARBARINI: Well, we basically have to get through the deletion procedure. Given the fact that we have been studying the site for so long -- we have to go through the process of writing a close-out report then we have to propose the site for deletion from National Priorities List, and then we have to finally delete it. So that

(HEARING)

process could be as short as a year. So perhaps maybe within a year after that, we would sign off on the capping.

MR. JAMES RILEY: Do you do that with all sites?

MR. GARBARINI: Ultimatley with all sites, yes.

MR. JAMES RILEY: And this particular site?

MR. GARBARINI: We would like to cap it and then have it deleted from the National Priorities List, yes, so that people could say, We had a hazardous waste site in our community, it has been investigated, it's been capped, it's been handled, and it has been deleted from the National Priorities List.

MR. JAMES RILEY: As far as the TAG advisors, are they going to be given time for written-comment period? What's the period for written comments?

MR. GARBARINI: We originally had a comment period that was due to expire on the 30th, I believe -- August 27th,

(HEARING)

I'm sorry -- and we have had a request from the TAG group of the Dutch Hollow Homeowner's Association that we extend the comment period. And I think we will be extending it. We would like to talk to them about the length of the extension.

MR. JAMES RIELY: Thank you.

MR. GARBARINI: Thank you.

MR. BOB ZIMMER: My name is Bob Zimmer, I am a resident of the community. I wanted to followup a little bit with something to increase my understanding about the groundwater flow in the area. I was wondering if you might be able to answer this: Before it was presented that most of the residential wells in the area were greater than 300 foot in depth, and also Geraghty & Miller stated that they had two wells about that depth. Is most of the study of the potential for groundwater flow from the landfill to the residential wells based on those two wells?

(HEARING)

MR. SHKUDA: No, it is based on all 20 wells. The statemeny that I made regarding the wells is what the local drilling contractors have told us. We have asked the residents and required as part of the work plan to try to determine residential well caps. No one was able to provide us with specific information.

Wells are too old, they weren't there when they were constructed, people weren't aware of how deep the well was, but that's what the local drillers have told us. The flow system that we determined is the shallow bedrock, that's where most of the wells are.

MR. BOB ZIMMER: What's the difference between a shallow well --

MR. SHKUDA: It varies. Within -- let's say within the upper hundred feet of the bedrock surface. Most of the wells are there most of the water is there. That's wheel most of the water occurs in this formation (indicating). Most of the fractures are

(HEARING)

present and therefore the greatest potential for water movement and action as a source of water.

The work we did on the two deep wells that we installed indicated that there was very, very little water down as deep as 300 feet. And as little as in certain areas as a tenth of a gallon a minute, which is well below any useful amount of water that you could use for a residence.

We have determined -- as I said, this is a shallow flow system.

MR. BOB ZIMMMER: It is a deep flow system that I'm most considered, but especially Greenwood Lake as a community.

MR. SHKUDA: Our study area is the area surrounding the lane fill, specifically in this case. The issue for OU-2 was the residences was lot more detail, after the focus of our study in question. That was the focus of our study. We were not asked to study Greenwood Lake or Greenwood Lake supply

(HEARING)

system. I can't answer those questions, I don't know.

MR. BOB ZIMMER: Focusing on the map to the northeast. Understood, it is not known at this time, but given the fact that some of the wells might be that deep, and being it's a fractured bedrock flow system, couldn't contaminants travel or migrate from the landfill to those residential wells?

MR. SHKUDA: Again, water doesn't flow up hill.

MR. BOB ZIMMER: A pumping condition is not necessarilly uphill.

MR. SHKUDA: As I explained previously to the other genlteman who asked the question, we studied that very issue.

MR. BOB ZIMMER: Using two wells.

MR. SHKUDA: That's correct. But if they are the closest wells to that community, if I do not observe the effect --

MR. BOB ZIMMER: There is very

(HEARING)

few fractures that deep in the bedrock.

MR. SHKUDA: That's correct.

MR. BOB ZIMMER: The wells that you tested might not be the ones that feed those residences.

MR. SHKUDA: That's correct, they may not be.

MR. BOB ZIMMER: So here is a possibility that the land could affect deep wells into the northeast?

MR. SHKUDA: We have no data to indicate that.

MR. BOB ZIMMER: No, you don't need any data, but the potential is there.

MR. SHKUDA: Yes. And there is also a potential that the book can fall off the table, but until I realize that potential, it has no potential.

MR. BOB ZIMMER: I just want to know if the potential is there or not.

MR. SHKUDA: I can't disagree with you, there is a potential. But think about this: I have a hallow flow

(HEARING)

system where most of my water is traveling to the southwest --

MR. BOB ZIMMER: Do you have figures?

MR. GARBARINI: Could you just give him a chance to finish up his response..

MR. SHKUDA: For water to move against that gradient, I have to overcome that. I don't See how that's possible.

MR. BOB ZIMMER: Materials don't necessarily travel even against the gradient?

MR. SHKUDA: That's correct, but there is no evidence whats ever that they are present.

MR. BOB ZIMMER: Allow me to change topics slightly. Did you do -- I saw in the Remedial Investigation that some work was done on the continuous monitoring of the wells. Did any of that encompass what groundwater flow patterns might change or what might happen in a rainstorm, a heavy type-storm situation?

(HEARING)

MR. SHKUDA: In this setting, groundwater levels in all the wells are going to be impacted the same. It is not going to selectively rain on the landfill in one area and omit raining on the northeastern residence. So, certainly, in the three-day tests -- I don't recall if there was a rain storm there -- it wasn't, it was dry. So ther certainly is an impact on water levels as we get less rain, they do fall, but they fall uniformly.

MR. BOB ZIMMER: Well, you don't know that. You don't have any data to support that. You don't know if the system acts uniformally under a storm?

MR. SHKUDA: That's in the literature. I don't have to study that. You can look at the USGS studies of aquifers throughout the country. That's just a fact. (Inaudible) That's literature information.

MR. BOB ZIMMER: I disagree.

MS. CATHY MARCHESE: My name is

(HEARING)

Cathy Marchese, I live on 799 Nelson Road. I just wanted to know what you based your survey on? I like behind the dump, and I'm just looking at how many people you had tested, and out of 20 -- it was 20 people out of how many people were you supposed to test in the beginning in a quarter-mile radius?

MR. DUDA: I think it was 67 potential properties.

MS. CATHY MARCHESE: And how many did you test?

MR. DUDA: Twenty-four.

MS. CATHY MARCHBSE: Because I was live behind it, and I was never tested. I was notified once.

MR. GARBARINI: What did you do when youwere notified?

MR. JOE MARCHESE: Actually, somebody came to the house to take the test, and they never got back to us. He said he wanted the first sample in the morning, they never got to us, they never came back.

(HEARING)

I have two children. What would I lose by having this man come in to test my water? Believe me, I deal with it every day. There is no way you're going to tell me if there is contamination in the ground, and you can prove that there is contamination in the ground, there is no way you can tell me that it is not going down into the ground.

This gentleman mentioned that there is not that much water that deep. My well is 290 feet deep, and we get four gallons a minute. This gentleman over here stated that he saline -- I don't know -- in his water. I live right across the street, two houses down. If there is something that critical in the well, don't you come out and send somebody to test your well?

I feel that you guys already made up your mind, and anything we say is not going to influence that.

MS. CATHY MARCHESE: Before this meeting, I had talked to some of my

(HEARING)

neighbors and asked them if they were tested, and they said no, they said they wasn't.

MR. GARBARINI: As as mentioned before, we did go through a notification process, we went door to door, flyers were handed out, notices were given. And unfortunately, in this situation -- well, we will have to take a look into.

MS. CATHY MARCHESE: I had spoken to you the other day.

MR. GARBARINI: Right.

MS. CATHY MARCHESE: How did you make your conclusion when you don't have all the facts?

MR. JOE MARCHESE: That would people have against knocking at your door and saying you're going to test the water so your kid might not or you might not get sick?

MR. GARBARINI: Believe it or not, 10 or 15 people said they did not want their homes sampled.

MR. JOE MARCHESE: This should be

(HEARING)

something that is controlled. This is drinking water. This is something that should be controlled by the State. What are you going to say? When you know it is contaminated water, you are not going to let me test it? I'm going to says that's okay? You are going to let that person drink that water?

It seems that nobody is making an effort. The decision was already made; and all this -- because there is no fingers to point to, who is going to pay up for the cleanup? There will be no cleanup.

MR. GARBARINI: No, that's not the case. First of all, there was a program that was done. We can't force people to let us sample their wells. They own their properties. We can't force them to allow us to sample.

As far as not being able to point the fingers at anyone to have a cleanup, I mean, we have got some responsible

parties on the line, currently, to cap

(HEARING)

the landfill and to cleanup the site. So there are people paying for the cleanup. But in order for us to put in an alternate water supply in, we need to have an indication that the residential wells up in that area are being impacted by the landfill. And we don't have that evidence at this point in time.

MR. JOE MARCHESE: There is no way that you can tell me that there was someone down to test our wells, there is no way. That is false. I would have been all over that caller.

I have had my water tested privately. We never tested for the right thing. You get a result back, and there are certain things, and people spend $200. You know what to test for, we don't know what to test for. You get the tests, you know what's in the ground, not us; if we don't pinpoint, we don't see it.

MR. GARBARINI: We can take a look into what happened to your

residence, and you can be sure that we will pull a sample up. If you are within that quarter-mile radius, which you are saying you are, we will make sure we get a sample from your well.

MS. CATHY MARCHESE: And also my neighbor, she wasn't notified.

MR. JOB MARCHESE: There are houses being built.

MR. DUDA: If there was a new owner, we wouldn't know about it.

MS. CATHY MARCHESE: Well, what about the survey?

MR. DUDA: Well, the survey is based on the quarter-mile radius within the landfill.

MS. CATHY MARCHESE: I am in --

MR. DUDA: The property owners that we have on the list, we have contacted them. Some of them we can't even get the contact to, because there is no one there. It is a summer residence, there is nobody around to contact. But the group of people that we've gotten

have been cooperative, and we have sampled their wells, and we have presented their data, and have sent them letters regarding their sampling, and we have been very respronsive with respect to the sampling of their homes.

We're not trying to segregate anybody out of the system. If there was some sort of an error that you should be on the list and you're not or that you were contacted and there no followup, then that will be looked into.

MR. JOE MARCHESE: It seems like the less people, the better the odds; the less people you take --

MR. DUDA: That wasn 't done here. We didn't deliberate go out and take a limited number of homes. We went through the entire list of propetries that we had, which was 67 properties, and we have found 24 recipients. It wasn't like we took an isolated grouping of people and said we want to sample your well and not yours.

(HEARING)

MR. GARBARINI: That's the idea behind the quarter mile too.

MR. DUDA: We wanted to sample everyoune within that quarter mile. And like Doug Garbarini said, we can't force people to do that.

MR. GARBARINI: We will look into your situation, and we will make sure that we collect a sample.

MS. CATHY MARCHESE: Before you make a decision?

MR. GARBARINI: I can't promise you that.

MS. CATHY MARCHESE: I have two small children. What's not to guarantee? I want clean drinking water.

MR. GARBARINI: We will look into it, and we will make sure that we collect a sample from your residence. I promise you that.

MR. JOHN HUNTER: Good evening. My name is John Hunter, and I am a potential home buyer in this area, maybe potential home buyer, I am not sure at

(HEARING)

this point.

A couple of things that were mentioned that I would like to talk about. In your risk assessment, have you done any political assessmemt of the cancer rates within this area within the last 20 years?

MR. GARBARINI: Has EPA done that? No, I don't believe to. I don't believe anyoune has, but I can't say for sure that that hasn't been done. But none have been conducted for the Warwick Landfill.

We do the risk assessment process and we also conduct what's called a health assessment, which is done by the New York State Department of Health and the federal agencies of Toxic Substances and Diseases Agency. Those two things have been done.

MR. JOHN HUNTER: As a government employee, I am ashamed that that hasn't been done. We have had 11 years to do that. I'm not here to banish you.

(HEARING)

MR. GARBARINI: It if not something that we would typically do. If there is a request, sometimes the State Health Department will perform those studies, but there is a long request for different communities that are looking to have those studies conducted.

MR. KADLEC: Right new the list is somewhere between two and six years for a cancer study.

MR. JOHN HUNTER: There is something that has been mentioned initially is that there's being a lot of money spent on this issue, and we know that there are guidelines that you gentlemen must follow. But the action to bring this to a resolve is to bring in an alternate water source. It seems, based on my short knowledge here, that there has been work with agencies or with the people involved in this, possibly the agencies responsible for bringing this waste into the site at midnight -- and I just have this perception about this.

(HEARING)

When you talk about perceptions, property values around here are a reality, and it should be part of their decision making process, whether that's a scientific basis or not. The fact that there is a firm engaged in this that as something to do with the responsible parties, I think that is a poor judgment on the part of the United States goverment.

MR. GARBARINI: I think that's a pretty flagrant comment.

MR. JOHN HUNTER: I think that was poor judgment. It may be allowed within the law, but on the basis that it doesn't appear that the home owner's association had has adequate response or participation to alleviate that perception, I think that's something that in hindsight you gentlemen may have to live with.

The fact remains is that a reasonable alternative is the alternate water source that has been proposed that seems to be an economical issue for all

(HEARING)

of us, for current homeowner and future homeowners. And the fact that the agency, whether it says that you have to wait for a request to do a clinical study of cancer rates within an given area -- and that is something that came out of the Love Canal issue, the increased cancer rates, I believe.

I would think that the agencies would be talking to each other, and after 11 years, this data would have been presented. Again, some of my comments may be viewed harshly. I'm not here to banish you. I think those statistics are out there, they just hadn't been done.

MR. GARBARINI: I think just to respond to your first comment about using -- we are not using a potential responsible parties to conduct the work, we are using a contractor that relies on various parties to pay their bills, basically. Geraghty & Miller, they are a highly reputable consultant, especially in the field of groundwater

investigation.

And as I said before, we have a contractor that we hire that directly oversees their work. There are numerous state and federal agencies that review all the plans and direct the contractors to how the study is to be conducted, and then we go and we validate everything.

As I mentioned, we split samples with the contractor to make sure that their sample results are coming back similar to ours. We are out there in the field checking up on their work. And this is the way we do business.

MR. JOHN HUNTER: Just one last question. I don't believe two homes to the northeast is a statistical valid number to make an assessment of whether there is any flows going in the upgradient direction or to the northwest or northeast.

Though it may seem odd what the gentleman said, that there were only two wells that were tested to the northeast.

(HEARING)

I don't know based on just those limited samples -- I just don't have a good feeling. I have more of a sense that you got 30 percent of the wells within the quarter-mile area, but to the northeast of the area, I don't feel that those two wells -- at least that was my understanding.

MR. SHKUDA: There are many more wells that were tested. There are just two at depth that were monitoring wells. But residential wells to the northeast, with the responses that we were able to locate, there were samples collected from those wells, and they were tested. So there are many more than two. I can't recall offhand how many, but we tested as many as would allow us. We can only do what we are allowed.

MR. JOHN HUNTER: And my last question: You stated earlier that you may not be able to go onto the property. Isn't it reasonable that there is a health concern, which I believe there is

here, that the state or the federal government can mandate testing in the area without approaching the rights of the homeowners'?

MR. GARBARINI: It is certainly not with the level of concern that we have.

MR. JOHN HUNTER: I think that's the concern here.

MR. GARBARINI: I imagine if there is significant enough concern that the Health Department could say that we should go in there and collect a sample, but I think the level of concern would have to be much, much, much higher than the level of concern that we have here. That's not to say that we aren't concerned about all those residential wells up to the northeast of the site.

MR. JOHN HUNTER: Thank you.

MR. GARBARINI: Thank you.

MR. ROY PIATELLA: Roy Piantella. Just one last thing. The wells for the residents that were not there, I want to

(HEARING)

know, is ithat all possible or you to state that you will do that survey again for those poor unfortunate people that are not here right now to talk about sampling? Can you at least do that, is it possible?

MR. GARBARINI: You're talking about the residential well monitoring?

MR. ROY PIANTELLA: Can you just go back and review those 40-some odd people that weren't contacted or didn't respond?

MR. DUDA: We can't get into the well unless there is someone on the property.

MR. ROY PIATELLA: I am asking if you can try and contact the residents.

MR. DUDA: We could try and contact the residents again, yeah. And I think we have gotten some more residents from the last round of sampling. I am not quite sure how many more residents, but we have gotten a few more people.

MR. ROY PIATELLA: Was that

(HEARING)

people by telephone call or certified letter?

MR. DUDA: We did a personal canvasing around the entire neighborhood, and it would probably be by letter or phone call, that type of thing.

MR. ROY PIATELLA: Thank you.

MR. DUDA: Sure.

MR. JOE MARCHESE: You said that you would look into the testing?

MR. GARBARINI: We will test your well.

MR. JOE MARCHESE: Okay. How long does it take?

MR. GARBARINI: How long does it take to get the results back?

MR. JOE MARCHESE: Yeah.

MR. GARBARINI: The test itself, it would be a short period of time on a given day, actually, to collect the sample. I am not sure how much we could have it, but generally we give 30 to have 45 days to analyze the sample and then we have to validate the data, so it could

(HEARING)

take a couple more weeks after that. So it will probably be a couple-month process.

MR. JOE MARCHESE: Isn't there a chance you could send it out certified mail to those people that weren't there or the new houses on the block? This was in '91. The house was built before that and the well was sitting, they weren't living in the house. The wells where sitting there. So this was, again, a Catch-22. There was no one really to test the well, but now there are some.

MR. GARBARINI: If you know of people that are in the quarter mile -- if you take a look at the map and you know people that are within the quarter-mile radius, they can contact us, and we'll give it some consideration.

MR. ROY PIATELLA: You said you will consider it, or you will contact them?

MR. KATZ: These are people that we might not have included in this

(HEARING)

before, these are additional people that we might have not included. So, obviously, what we are hearing is that there are people we don't even know about that do exist.

MR. DAVID DUCKWORTH: My name is David Duckworth, I live on 716 Nelson Road. I am not within the quarter mile. I have a wife that's pregnant with two kids. In order to figure out what is being done on this site, what type of a test can I do on my water at my own expense? Where is the cheapest place to go to have it tested? And that am I testing for?

MR. KADLEC: I'm sorry, I missed your question. I was talking to Rich here about sampling. Could you repeat it?

MR. DAVID DUCKWORTH: I have a pregnant wife and two young children. I am probably three-eighths of a mile away from this dump site at 716 Nelson Road. At my own expense, if I have to, what do

(HEARING)

I test for and where can I have it done?

MR. KADLEC: The tests that you would probably be looking fool would be lead, that would be a major issue if your wife is pregnant, heavy metals and stuff like that. Some of the problems that were in other wells were VOCS, volatile organic compounds they're called.

Now, you have to understand all the wells that were sampled, only four of them had shown that the levels were above drinking water standards. Now, over time those levels have been decreasing also of these wells that were taken.

Now, You can seek our private individual labs that would do it. I can't really give you the name or recommend any labs to do it or you, being from the State, but if you look in a big city yellow pages under "Environmental," they may be able to do something.

MR. DUDA: You might want to contact the Orange County Department of

(HEARING)

Health, they will be able to help to identify some people that could come in and take samples of your well.

MR. DAVID DUCKWORTH: Will it cost $1,400 like I am hearing?

MR. KADLEC: I don't know the cost of it, personally.

MR. GARBARINI: You would definitely be talking about a couple of hundred dollars, anyway.

MR. DAVID DUCKWORTH: The other alternative is to just get he filter. Is the carbon filter going to guarantee that my water is going to be safe?

MR. GARBARINI: The carbon filter is affective for organic contaminants, but would not necessarily be effective for heavy metals --

MR. KADLEC: Like lead. It is usually a reverse osmosis along with a chelating agent. What they do is they put in sodium hydroxide or some sort of salt that would cause the metal to percipitate out. But that is very

(HEARING)

expensive and you can't really do it a homeowner basis really.

The only thing that I could recommend is if you are worried about heavy metals in your drinking water, run the water for a while.

MR. DAVID DUCKWORTH: What about the filters?

MR. KADLEC: The volatile organic chemicals are taken out with the carbon filters.

MR. DUDA: I just want to reiterate that any volatile organic compound contamination we found is very low, and it only exceeded New York standards in two wells, one of which already has a filter on it. So we really feel that the contamination is exceedingly minimal, and in cost of the homes were basically not detected for those compounds.

As Mike indicated before with respect to the lead, those homes have all been resampled and have shown exceedingly

(HEARING)

decreased levels of lead within the federal standards, which is a very, very small number, so...

MR. GARBARINI: Also, just to reiterate, the lead can be a particular problem for pregnant women and for children. You may just want to take a sampling for the lead.

MR. DUDA: We are going to take a two-minute break for the stenographer here.

(Brief break)

MR. KATZ: We are ready to start. Again, whoever has a question, feel free to address us.

MR. KEVIN CAPBION: I have been attending the homeowner's association meetings for several years, and a few years ago, if my memory serves me correctly -- and a few folks here confirmed that tonight -- the EPA itself drilled wells on and off the landfill

site. I understood at the meeting that an EPA person presented themselves that traces of benzene and other chemicals were dectected in the EPA-drilled wells. First of all, I would like to know whether or not that was correct or not.

Second of all is that it's 1995, and we're looking at 1.5 to 2 million dollars to put in an alternate water supply for potentially contaminated wells either now or in the future. I don't understand what the problem is with the 2 million dollars compared witt the 16 million dollars.

I don't know about anybody else here, but taxes have not gone down in the Town of Warwick in this particular zone that we're talking about, and I don't see that changing. It is probably only going to go up. They are talking about coming out and reassessing the values of the homes, taxes are more likely to go up.

Everytime I go for a refinancing of my home, the surveyors cone out, and

(HEARING)

the topic of the toxic landfill keeps popping up, which is not helping the value at all or the resale value. An alternate water supply is not only going to benefit everyone's health in the future and the community, but it improvements everyoune's home values.

I don't understand, if the board here is to address any of those issues and the home values themselves, but more so than the home values, it is the health now of the participants in he community and in the future of all of those living here.

MR. GARBARINI: Damian is taking a look to see if he finds any benzene results.

MR. KEVIN CAPBION: It was benzene.

MR. DUDA: That contamination was part of the first study you're talking about; right?

MR. KEVIN CAPBION: This was very early on.

(HEARING)

MR. GARBARINI: If he can't find it now, we will just respond to it in our Responsiveness Summary.

MR. KEVIN CAPBION: I realize I am not within the quarter mile of the dump, but we are pretty much, in my area, which is towards the school here getting down towards Loweman. We have not been approached at all to have our wells tested in any shape or form. I get my own personal testing done, but the type of chemicals that you're locking at, I understand those tests cost well into the thousands of dollars to have them tested, which I imagine the EPA has the funds allocated to do. I personally do not, so I don't know personally what you can do to test for certain traces of chemicals that could be contaminants to my home.

MR. GARBARINI: I don't know what more I can say about the alternate water supply. I am beginning to sound like a broken record. There is really nothing that we can do about it without evidence

(HEARING)

that the contamination is moving in that direction and the contamination that had been found in the wells, that it is actually from the Superfund site. All indications are that the levels that were found in those wells are dripping. There are carbon filters, as we mentioned here.

MR. KEVIN CAPBION: Did you just indicate that the wells have been contaminated from the Superfund site?

MR. GARBARINI: No, they have not been.

MR. KEVIN CAPBION: I thought that's what you said.

MR. GARBARINI: I might have said that, but that's not what I intended. No, we have no indication that the contamination in those welll is from the Superfund site. If we had that knowledge, then we would be able to take action and propose that we implement an alternate water supply.

MR. KEVIN CAPBION: Are you talking about the 24 wells that you

(HEARING)

tested yourselves, or are you talking about the wells that were tested previously?

MR. GARBARINI: Both

MR. KEVIN CAPBION: Both. They have found traces of chemicals that are naturally found in the area itself?

MR. GARBARINI: That s right.

MR. KEVIN CAPBION: There is no indication as to where they ame from?

MR. GARBARINI: There was septic sampling done.

MR. KEVIN CAPBION: Does benzene come from chemicals that are associated with cleaning materials?

MR. GARBARINI: Absolutely. Very significant levels were found in the septic systems themselves, very significant levels. And a lot of the solvents in the past, too, have been used to clean out septic systems, or for different home remedy produces that were utilized for cleaning out septic systems in the past, solvents and decreasers to

(HEARING)

make the systems work more effectively.

MR. KEVIN CAPBION: I have nothing further to say, other than what I do remember hearing at previous meetings, that EPA presented and examined the results themselves.

MR. GARBARINI: Yeah. And that there was some benzene found?

MR. KEVIN CAPBION: Benzene is the one that stuck out in my mind, I think right off the bat.

MR. GARBARINI: We aren't saying that there isn't contamination in some of the monitoring wells. We aren't saying that at all. And we did ha e some exceed the state and federal standards in some of the monitoring wells. But the contamination is spotty, an it's infrequent, and we can't delineate any further contamination.

MR. KEVIN CAPBION: That does the EPA consider the number I issue at hand? Is it the contamination of drinking water? I can't imagine exactly what the

(HEARING)

other concerns might be for the residents in the community itself, but an alternative water supply does sound like the most aggressive situation to be taken to remedy any situation that could occur.

MR. GARBARINI: Yeah. If we knew that the landfill was impacting residential water supplies, we would be able to take such an action, but we don't have that information.

MR. KEVIN CAPBION: You don't have the information that the landfill has contributed to those chemicals?

MR. GARBARINI: That's right. I don't know what more I can say.

MR. KEVIN CAPBION: Thank you.

MR. GEORGE WEBER: I have another question. This is the New York State Department of Health 1992 Health Assessment for the Warwick Landfill. In here it says that originally that there were nine wells in the area that were contaminated, and I'm assuming that the

(HEARING)

reason that we are not mentioning the nine wells now but the four is that four of them -- there is only for that's above New York State drinking water samples; correct?

MR. KADLEC: Yes.

MR. GEORGE WEBER: Okay. Now, of those nine wells, assuming that each home has a septic systeml from your testing, how many septic systems are contaminated?

MR. GARBARINI: We will check that for you. Do you have a followup question also?

MR. GEORGE WEBER: Yes. How many are contaminated? Is the contamination coming from one septic system contaminating four wells or our septic systems contaminating individual wells?

MR. GARBARINI: We could say that there were several septic systems that did have significant levels of orgainic contaminants.

MR. GEORGE WEBER: Can you trace that directly -- I mean --

(HEARING)

MR. GARBARINI: Can we point? No, we can't point.

MR. GEORGE WEBER: Do you have an idea where the contamination is coming from?

MR. GARBARINI: Well we have some septic systems that do have very significant levels of contaminants up in that northwest area, yes, so we have an idea.

MR. GEORGE WEBER: Right. I am not arguing that. Let me rephrase the question. Basically, what I am asking, okay, is that you're saying that there was contamination coming from the septic systems, okay, and originally there were nine wells that were contaminated from the septic systems --

MR. GARBARINI: Well I'm not sure -- you're basing your statement that we have nine contaminated we is based on the 1992 report. We're dealing a couple of data sets from 1994, I believe.

MR. GEORGE WEBER: I m not

(HEARING)

arguing that. But what I'm saying is that is originally, though, that there were nine wells that were contaminated. Okay.

I'm trying to see the correlation between the septic systems and the well. Whether you -- (brief pause) -- the other thing is, how can you be sure that the contamination is not coming from the landfill into the septic system?

When you say "the septic system," are you talking about a leach field? Are you talking about an old septic system?

MR. GARBARINI: You're using the term "septic system" as a generic catagory. Some of those are just basically cesspools, I guess. And some of them may have active septic systems.

AUDIENCE PARTICIPANT: How can you tell if it is the septic system contaminating the water, or the water contaminating the septic system?

MR. GARBARINI: Because as you know, you just looked at some of the

levels of contamination found in those septic tanks, and they are extremely high in comparison to groundwater sampling or anything that was found in residential wells.

MR. KADLEC: And the're -- I think they're above the ground too, the septic systems.

MR. GARBARINI: You have to understand that cross-contamination from septic systems to residential wells is a very, very common problem. Speaking from -- years ago, when you were about to purchase a residence, you had to analyze -- if you had a septic system and a residential well, you had to analyze the well for bacteria, E. coli, things like that. This is before we really saw solvents and organic toxic contaminants as being most of your problem.

And, in fact, some of the sampling that we did last year in the septic tanks and in the wells indicated bacteria in the wells. You may ask,

(HEARING)

Well, where in the heck is the bacteria coming from? Probably from the same place that the organic compounds are coming from, from the septic systems.

MR. GEORGE WEBER: Are you saying that you're absolutely certain that those wells are contaminated from septic systems?

MR. GARBARINI: I would say that that's a likely source, and it is a much more much likely -- much, much more likely source.

MR. GEORGE WEBER: But you're not sure?

MR. GARBARINI: I can't be sure of that.

MR. GEORGE WEBER: That's all I wanted to know.

MR. ROY PIATELLA: One followup question that I have. On the septic systems, when you did find the solvents, and assuming that's the DCE and TCA -- was that the solvent that was found in the septic systems?

(HEARING)

MR. KADLEC: What?

MR. ROY PIATELLA: DCE? TCA?

MR. KAKLEC: All of the above.

MR. ROY PIATELLA: All of the above. Okay. Was there any type of questionnaire put to those residents as to how that may have gotten there? I am not aware that those solvents would be in a septic system. What would he source of the solvents be? Unless they flush a particular solvent down their toilet -- and I don't know how many people generally would do that. I know I have never dumped a solvent down my toilet. Did you do any type of survey or investigation on that?

MR. GARBARINI: Well, just generally, going back years ago, people used to use solvents to clean out septic systems to remove a lot of the grease that was impacting on the fields and things like that. So someone could have had a contractor come in and lean out their septic when they were having some

(HEARING)

problems. I don't know. Maybe they didn't necessarily just flush it down the toilet.

MR. ROY PIATELLA: What kind of solvents?

MR. GARBARINI: Degreasers, I believe they were, and they could be found in some Rid-X -- yeah, Rid-X was one of those. And if those contaminants themselves were in the cleaning mixture, those contaminants may be daughter products or breakdown products of contaminants that were used. So as these things decay or they reacted to other compounds, they can breakdown into other products. So there is that link for those contaminants.

MR. ROY PIATELLA: Was that question asked of the residents?

MR. DUDA: We didn't do a septic tank survey specifically on the residents.

MR. GARBARINI: What we did do is we did send literature out to the

(HEARING)

residents.

MR. ROY PIATELLA: Just to put on the record, does that mean -- this may be something you may want to think of, a simple question to the residents and then followup with the people, Did have a cleaning service? I'm sure they know, and that question could be asked, and then maybe that could help delineate whether it's from a landfill or from some cleaning products.

MR. GARBARINI: Just to add to that too, we've heard other stories about people doing auto repair work and things like that up in that area too, and obviously repair shops do use a lot of degreasers and solvents also.

MR. ROY PIATELLA: Exactly. And I think if you pose some type of question or survey of the residents, you may be able to actually find that out.

MR. GARBARINI: Thank you. Maybe we will followup with that.

MS. BRIDGET ENRIGHT: My name is

(HEARING)

Bridget Enright. Of the wells that were contaminated, what type of septic systems do they have? Did you determine that? Whether it was a closed system or cesspool system?

MR. DUDA: We don' know that.

MR. GARBARINI: What do you mean by a "closed system?"

MS. BRIDGET ENRIGGT: Were they a contained system? And where was the location of the septic system in relation to the well? Could you actually determine that?

MR. GARBARINI: By the "contained system, you mean the tank itself?

MS. BRIDGET ENRIGHT: Yes.

MR. GARBARINI: The wouldn't be contained, necessarily, because they don't have a field, so there would still be discharged.

MS. BRIDGET ENRIGHT: So you would have to determine whether it was a cesspool that they were using in the old houses?

(HEARING)

MR. GARBARINI: We're not sure whether it would make that much of a difference, but, no, that wasn't determined. We could look into that.

MS. BRIDGET ENRIGHT: Would that make a difference?

MR. DUDA: We didn't make a determination of how close the well was to the individual homeowner's septic tank or another homeowner's septic facility. They are fairly close together on some of those homes, and, you know, it's not guaranteed that one septic talk is only going to affect one well, it would affect other wells.

We sampled 11 septic systems. Whether they were cesspools or tanks, I'm not sure. We could certainly look into how the samples were taken. I think most of them were sediment-type samples from the actual septic tank or cesspool facility. And in most cases we did find some organic contamination in those septic tanks, which can relay back to the

(HEARING)

water supply, because we're not sure exactly what the drainage system is for those septics tanks either.

As far as the drain fields, when they were put and how functional they are; you have to understand too, that a lot of that area is rather hilly and high terrain, so there's not going to be a lot -- I mean, things are going to drain pretty well off those people's homes from some of the area up there. I am not sure exactly of all the values, but it is much higher area up there than the landfill.

MR. GARBARINI: When you are dealing with tanks, like Damian said, if you're sampling the septic tank, you obviously have a pretty good idea of where the tank is itself. You may not not know where the fields are, that's a little bit harder to discern.

And the other thing too, that comes into play here is the actual construction of the residential wells

(HEARING)

themselves, because sometimes if they generally aren't cased the full length of the well -- because you want to allow as much water to infiltrate into the well as possible so you have a good field. So that also serves as an increased conduit or a possibility of transporting contaminants across the shallow bedrock into the deeper bedrock into the well.

MS. BRIDGET ENRIGHT: Okay. Thank you.

MR. THOMAS WINKLER: My name is Thomas Winkler. I would like to know what the EPA's contingency is. Maybe you can share that with us.

MR. GARBARINI: The contingency plan? I guess what we will be doing is there will be ongoing monitoring after the cap is put in place, there will be monitoring -- operation maintanence and a monitoring program in place.

If we find any problem, we can always come back and take corrective action as necessary.

(HEARING)

MR. THOMAS WINKLER: That was my next question. I think we have learned in this town is what is uphill must come downhill, and we learned that in the septic systems you found benzene and you also you found dichloroethene and trichloroethene at acceptable levels. And I would like to know what happens when those low levels exceed acceptable levels, what is your plan?

MR. GARBARINI: What would the corrective action be?

MR. THOMAS WINKLER: Yes.

MR. GARBARINI: Well, there is no indication that those level ever will exceed groundwater or drinking water standards, nor will that they will exceed them to the extent that there will be any action required. It's very unlikely that we would ever dig up the landfill.

You could understand, we are dealing with a 19-acre landfill, quite a bit of material. In the last operable unit we selected a remedy for the

(HEARING)

landfill itself. We did do a lot of work to try and look for any hot-spot contamination, buried drums or whatnot. That's what our guidance call for us to do.

We did geophysical work, we put borings through the landfill, we put in test-bit trenches, and we didn't find anything. That doesn't necessarily mean that there isn't anything there, but we did a good, sound scientific job and we followed the EPA guidelines as to how we are to evaluate landfills.

MR. THOMAS WINKLER: Is it possible that you have contaminants sealed in drums?

MR. GARBARINI: I would think that most of the drums would have corroded by now, but that's also a possibility, yes.

MR. THOMAS WINKLER: You are saying there's nothing to worry. It's not going to exceed?

MR. GARBARINI: We don't foresee

(HEARING)

a problem at this point. There will be monitoring of the landfill.

MR. THOMAS WINKLER: There will be?

MR. GARBARINI: Yes, there will be monitoring of the landfill. Thank you.

MR. THOMAS WINKLER: Thank you.

MR. DUDA: Does anyoune have any further comments?

MR. ED MATEA: My name is Ed Matea, I live on Alexander Road. The testing for wells -- for individual monitoring of wells, testing basically for E. coli bacteria, things like that, if you want to test it for the type of contaminants that you guys are talking about, it is very costly. I was wondering if I might suggest that for a continued monitoring, perhaps the EPA can provide the local residents with sterile containers and then they can collect their own samples periodically for testing of their own wells.

(HEARING)

I would very much like to have my well tested. I took the samples, but when I saw the price tag, it just wasn't in the budget. I sure there are some other people like myself just outside the quarter-mile radius that may concerns about our wells.

MR. GARBARINI: I understand your concern. There are -- generally, if you're going to get the full gamut of testing done, you're right, it will run you a thousand dollars or so

MR. ED MATEA: Whereas, most of us are well acquainted with having tests on our own wells through the due process of collecting the sterile containers and having all different types of water tests on our wells testing for E. Coli bacteria and septic contaminants.

MR. GARBARINI: Unfortunately, just to answer your question directly, I don't think that would be something that we would be able to do.

MR. KADLEC: You run into a lot

(HEARING)

of liability, also, when it comes to chain of custody and having an officer take the sample.

MR. ED MATEA: Basically, what you would do is you would provide us with an indication that if we did get a positive result --

MR. KADLEC: That is true.

MR. ED MATEA: And it would give the homeowners a lot of peace of mind. It might be a little costly, but it would calm the fears that a lot of people have. Basically, when I sat back here and listened -- and I understand your position, but I am nothat all convinced that your study is conclusive at all.

I am in the construction business, and I am somewhat familiar with well drilling, and what I hard earlier -- I have heard assertions made here about water not running uphill, except that is just not so, water does travel uphill.

It is virtually impossible to

predict the flow of water. If you have 12 wells here, the only thing that we could all manage to agree on is that you cannot predict what's going on with the water underground.

I just had a well drilled on my property. It's 400 feet deep. I had it drilled within the year, it' maybe three-quarters of a mile from the site. There was no bedrock detectable at all, no subbedrock, no detectable bedrock of any kind. All we had was unformed rock at 400 feet. This is vitually an unusable well. We couldn't find any water at all. Three feet away, you can get an entirely different result.

You can drill a well one way under the ground and then ten feet away drill another well and get a totally different composition. It's a complete roll of the dice.

There are some generalities, but I think 20 holes in the ground over an 18-acre area is really not sufficient to

(HEARING)

determine anything.

Again, not to say that it's not a difficult task, but the problem is that you're about to close the door on this issue. We had some dealings with EPA and DEC and it strikes me that you are about to close the doors on this issue.

For instance, you're talking about -- are you aware of the fact that BOCA (phonetic) has established regulations for separations -- for minimum separations, land area separations for individual septic and well?

MR. GARBARINI: I knew that there were some requirements.

MR. ED MATEA: The separations are a result of people who are equally qualified, like yourselves, to determine how far a well has to be from a septic field to avoid contamination. Now, you're saying that all the cases you've tested where there was contamination in the well, that it originated from the

(HEARING)

septic field? Either every system that you tested was a noncompliant system or there was something wrong.

MR. GARBARINI: How long have those regulations been in effect?

MR. KADLEC: The sanitation regulations are for E. coli bacteria, and the distance away from the wells --

MR. ED MATEA: That's for cross-contamination fluids?

MR. KADLEC: Right. But, in this case, we're looking at volatile organic chemicals which are very different, they travel though the groundwater very differently than -- the reason septic tanks are supposed to be a certain length away -- the sanitation codes do not take into consideration --

MR. ED MATEA: I know for a fact that the separations are specific, I know they are to avoid E. coli contamination.

MR. KADLEC: I think that was in terms of bacteria.

MR. ED MATEA: If you tested the

(HEARING)

number of systems, and in every case that you had contaminants in the well casing, you also found contaminants in the septic tank, then there is something amiss. Either all the systems you tested were not complying or the codes were insufficient.

MR. GARBARINI: I don't think we are even saying that the contamination that we found in a given well was related necessarily to a septic system from that same property. That's not what we are saying. We are not pinpointing contamination of one property.

MR. ED MATEA: Looking at your map up on the screen I see 18 acres, 50 feet deep, millions of cubic feet -- I was 42 years old, and I remember having seen that site when it was open, when it was still active. The material they went in there was unbelievable to anybody.

And for you to guys to draw the conclusion that the million of cubic feet of material are in close proximity

to the well shaft, and you draw the conclusion that the contaminants came from a little tiny septic tank a few hundred feet away --

MR. GARBARINI: We are talking about contaminants in those wells to the northeast. And I don't think you should really belittle the site, because we felt back in 1991 that we had a database that indicated the very conclusion that we are presenting here today. And we went out and we made sure that we did a couple of years of pretty intense in investigation from that before we came out here, and we told that, Hey, we're arriving at the same conclusion. And we have a lot of people who have looked at the data who are hydrogeologists who are trained in this field, and we haven't heard anyoune tell us anything different.

MR. ED MATEA: I don't think there is a person in this took, that doesn't have some reservations with regard to the conclusions.

(HEARING)

MR. GARBARINI: I am not talking about having reservations. I mean, there is always an element of doubt.

MR. ED MATEA: I am not try to belittle it at all. What I am trying to say is that it is inconceivable to me that someone as knowledgable about the area can sit here and look at that map and come to the conclusion that the contamination of the well was the results of somebody dumping a bottle of paint thinner down his toilet.

MR. GARBARINI: We are talking about levels of contamination that we're finding on site, we are taking about groundwater flow, we are taking about people cleaning things in their home with paint thinner, we are talking about other allegations that we've have about different types of home repir shops that have been in business up here.

MR. ED MATEA: What I am driving at is why do you feel that his is unique to this area?

(HEARING)

MR. GARBARINI: Because of several years and several million dollars of study that have gone into this.

MR. ED MATEA: That all these people in the northeast section are given to throwing paint thinner in their toilets?

MR. GARBARINI: No. If you would have listened to what we had said and if you read the reports, you can thoroughly examine what our conclusions are.

MR. ED MATEA: And were were no wells that you found were contaminated where there was not contamination in the septic system on that site as well? Are are you saying that they all would have been contaminated from certain systems that are originated on other properties but not from the landfill?

MR. GARBARINI: That's right. That's what all the data has indicated. That's correct.

MR. ED MATEA: I am surprised you can say that and look at the map.

(HEARING)

MR. GARBARINI: I rely on hydrogeologists that are exterts, and this is what they are telling me, and I feel confident.

MR. ED MATEA: And your experts are telling you that water doesn't travel up hill.

MR. GARBARINI: I am not talking just about -- I am not talking about people -- I am not here to debate with you. I have to rely on hydrogeologists to tell me what the story is, people trained in that field.

MR. ED MATEA: I don't blame you for putting some stock in the reports that you have been handing out. What I am saying is that you seem to disregard a great source of other input here when it comes to balancing your assessment.

MR. GARBARINI: I appreciate that. I think I just want to add one thing there. As I said, the investigation that we conducted back in 1991 and completed in 1991 basically lead

(HEARING)

us to the same conclusions that were drawn. But we did not feel comfortable drawing the conclusions back then.

As I said before, we decided to go forward with another investigation and focus in on not just the the contamination that's found in and around the site, but also the movement of groundwater just so we could feel comfortable at arriving at what we're proposing tonight.

It was not something that was just done overnight at all.

MR. JERRY SUMMER: My name is Jerry Summer, I live in Warwick. And I have a few questions that you may or may not be able to answer, but they seem to be festering over the 20-odd years.

You telling these people here that the contaminants that are flowing in their septic systems seemed to be destroying their drinking water somewhat.

Twenty years of looking back and seeing 18-wheeler trucks coming up

dripping with sludge and contaminants from Ford Motor and whatever other places that they were picked up from and dumping them in the site there, and 24 hours a day of this kind of thing happening, day after day after day. And the EPA at that particular time said they didn't want anything to do with it. This is not you fellows, because you're much to young for that, you don't go back that far. But, nevertheless, this was happening and the people in the town were responsible. They looked to you, but you people didn't seem to feel that this was something that you could address. So the years passed and somebody said we are going to close it and seal it. Of course, in your own records I'm sure you'll see that the liners are leaking just like the one in Wallkill is going to be leaking. We don't want to secure that one, because, after all, we took the politicians out of here, sent them to the county to do the same thing with Wallkill, and we are

(HEARING)

going to wind up with the save problem.

We are going to blame the benzene on the people that paint their cars with or a cup of paint thinner or something like that, but the tons and tons of stuff that's in the landfill has absolutely nothing to do with it.

And I will tell you a secret about the Easter Bunny and the guy in the red suit, because if you believe in that, then you believe in this. And I think it's I pretty unfair that you should address these people here in a way that you are doing without giving them the opportunity to give them at least to get a -- you're spending 16 million dollars on gobbledygook and you wouldn't give these people an opportunity to test their water free.

After that, another 2 million dollars -- I know it's not within your realm because, after all, if we put our blinders on, we don't have to see the other agencies and this is what makes a

bureaucracy a bureaucracy.

Sixteen million dollars is fine 2 million dollars on water, that's not good. And these people here are going to suffer with it, whether it in their land value, or whether it is their home resale, or whether they are doing to build another house, or their children have to drink contaminated water because perhaps they can't afford the thousand dollars that are necessary to test it.

Thank you.

MR. KATZ: Any other questions or comments? Okay, I think if there are no other questions or comments, I think we could just sort of close.

MR. GEORGE WEBER: I am requesting that formally that we get a 30-day extension on the comment period? And I would like also to get a copy of the minutes of this meeting for the Dutch Hollow Homeowner's Association, and a copy of the list of people that came here.

(HEARING)

MR. KATZ: Yes.

MR. GARBARINI: As I mentioned earlier to Bob, I was hoping that maybe we could have some discussions about the extension of the comment period. If you wouldn't mind --

MR. GEORGE WEBER: I am going by what our TAG advisors said. I'm pretty sure that they are going to need 30 days, plus the fact, we would like to give, the opportunity for everybody in the community to have a say.

As I said, this took place at the worst possible time in the summer. It is peek vacation time. Give people a chance to get back from vacation, so that everybody can have a say.

Thanks.

MR. GARBARINI: You can talk with your TAG advisor and see if there is something we can work out. We will give an extension, but we would like to see if we have the time.

MR. GEORGE WEBER: Like I said,

it is for the people in the community who are away on vacation.

MR. GARBARINI: Any other comments or questions?

AUDIENCE PARTICIPANT: Is there a document or summary of the wells that were tested, when they tested, the dates thereof?

MR. DUDA: All of that information on the recent testing was in the Remedial Investigation report, which is in the repository. It's Appendix D of the second volume, and it does indicate when the wells were sampled. It doesn't indicate who the homeowner is, and that was done for obvious reason.

AUDIENCE PARTICIPANT: Did you happen to find out through our documents there the previous EPA findings? Is that a follow-up that you are willing to provide to us?

MR. GARBARINI: I don't know that I understood the question.

AUDIENCE PARTICIPANT: As I

mentioned earlier, I had been attending the meeting, and EPA said they tested wells and found chemicals. I would like to know if you are going follow that up to say what were the contamiants?

MR. DUDA: I'm sure that's in the repository. That was in the 42 well sampling that was done back in '92, and that's the filtration systems that were put on the homes that were as a result of that sampling. That information is in the repository.

AUDIENCE PARTICIPANT: Does that say that the findings were from any wells in the area or the EPA-drilled wells?

MR. DUDA: Those would be residential wells. The EPA-drilled wells, that information is also in the respository in the Operable Unit One Final Investigation Report, which is in the page report back in 1991. The data from the monitoring wells taken then is in that report. That's all documented.

MR. ROGER LIDDLE: My name Roger

(HEARING).

Liddle, I live 717-A Nelson Road. I would like to know just how far would I have to live from this toxic waste zone not to be considered in a toxic waste zone?

MR. GARBARINI: We don't necessarily prescribe toxic waste zones, but as we have been saying, we don't see any evidence of contamination leaving the landfill heading in the northeast direction.

MR. ROGER LIDDLE: So, what you are saying, then, is the wells that you drilled within a quarter mile radius are in this toxic waste zone; outside of that, we are not in a toxic waste zone?

MR. GARBARINI: The landfill site itself is part of the Superfund Hazardous Waste Site, and the way we define "site" is based upon any contamination that has emanated from the site. So if groundwatering flowing in a south west direction, and there is a flume of contamination there, that would be

considered part of site. But we don't define a toxic waste zone.

As far as we can tell, none of the residences up in that area have been impacted by the landfill.

MR. ROGER LIDDLE: The problem is that it leaves me in a Catch-22 situation, because the Town of Warwick wants their taxes from people, whether I live in a toxic waste zone or not.

Number two, there is a stigma to the property and it lowers the property values.

And number three, there are no guidelines as to how far this really extends.

I spoke to realtors, and they are not going to take chances, so they allow beyound what this contamination area might be in order to protect themselves.

I was told personally that we're not going to take a chance. So now they are going out two or three les or four miles, it depends upon the realtor

because, he doesn't want to be sued if he sells a piece of property to something. So he is four miles away from the site, and he is going to tell perspective buyers that, Well, you're in toxic waste zone and that adds a stigma to the property and lowers the value. So now nobody is making a commitment here and the homeowners are stuck with this. They are also stuck with the concerns about contamination recently in their wells.

I hate to repeat what other people have said, but it certainly seems that it would solve everybody's problems -- whether you lived a quarter of a mile away or five mile away -- is to put in water from the Town of Greenwood Lake. If they are willing to do it, spend the 2 million dollars on that. It would solve everybody's problems and bring everybody's property values up to where they belong, and everybody would walk away happy.

I know I'm repeating what other

(HEARING)

people said, but that is the solution.

That is very simple. You don't have to be a rocket scientist or anything like that. It's a simple solution.

MR. GARBARINI: I hear what you're saying. If you were able to do it by law, I would be happy to do it, but we're aren't.

I think -- your concerning about the property values. If you have real estate agents that are saying this to you, tell them to give us a call, and we'll tell them that -- I think there's a good story to be told from our investigation. Aside from not getting an alternate water supply, we're saying that the landfill is not impacting the homes to the northeast. You can tell the real estate agents that. They can call us, and we'll tell them the same thing. We'll tell them what our study involves here and that's what our study reveals. I think the sooner that the site is capped and it is deleted from the

(HEARING)

National Priorities List site, the last stigma you will have associated with the site in terms of property values and things like that.

MR. ROGER LIDDLE: How far would I have to be from site -- a mile, a half a mile --for you to say this?

MR. GARBARINI: We'll say it for any of the those homes that are to the northeast of the landfill. If you live up in that are, regardless of whether you are a quarter of a mile, three-eights of a mile, have the real estate agent call us. We'll vouch for that.

MR. ROGER LIDDLE: Is your phone number included on this piece of paper? Because that's the problem. Everybody want their piece of the pie and we are struck with the stigma and our home values are done. And the realtors aren't going to take a chance and say that you're not in a toxic waste zone, because they're going to get sued.

MR. DUDA: Actually I have

received numerous phone call from real estate agents inquiring about property and inquiring about the landfill, and basically I've indicated that what Doug had said is that we don't see that the landfill is impacting the residential wells in your area, and they're asking us for that information.

And we don't make political -- this area isn't a political area, it is a hazardous waste site, and it'is not really a political zone of that sort. The real estate agents may take that and amplify it to create a zone of some sort, but when we speak with them and I speak with them, I don't really talk in those terms, "hazardous waste site" as to the extent of contamination. And that's basically what we will tell them, if they have further questions.

MR. ROGER LIDDLE: Now, the realtor told me was they were not going to commit from any how far away is far enough. They are going to draw their own

conclusion, and they are making that rate probably what it should be.

MR. GARBARINI: I think when we finally arrive at a record ecision, assuming that it's the same thing that we are proposing tonight, you will be able to tell the real estate developers, the EPA spend how many years studying this, they went back and studied the groundwater again they; are saying that there are no impacts to residential wells in the northeast. And they're going to cap the landfill, it should be capped by the end of 1996, and then they are going to go through the process of weening the site from the National Priorities List. So there is sort of a positive story that you can start telling them at this point, assuming the conditions stay the same.

MR. ROGER LIDDLE: You have a very nice map up here. Couldn't we get some sort of a map to give the professional people. We can have all get a map of the zone marked where the toxic

waste area is and then put zones out from that as to maybe Zone A, Zone B a little bit closer to the toxic wast area, and D maybe could possibly become contaminated, and work it so that we have a safe zone. Say zone C is now a safe zone, and we know that homes in that area are not affected by this and give this to the realtor, because they have no guidelines.

They come to me telling that you made the commitment. You wouldn't tell you them anything, so it is left up to their own judgment, and their judgment is let's make a big an area as possible so we don't get sued, and that's where we are at.

MR. GARBARINI: I think, now that our study is complete and we are going through the proposed plan process -- now obviously, if the situation stays the same, we will be able to affirmatively tell them that we don't see any impacts from the landfill on the surrounding community.

(HEARING)

We will be moving forward with this proposed plan as it is, and the TAG advisor doesn't uncover some horrible mistake that we have made.

MR. ROGER LIDDLE: You keep saying that it's outside your jurisdiction of whatever to have water brought in to Greenwood Lake spending 2 million dollars. Where could we get it up in that area?

MR. GARBARINI: I think it would have to be Greenwood Lake, the village, or the Town of Warwick that comes for it. That would be funneled through the village?

MR. GIL SHAPIRO: Through the State of New York. (Inaudible)

MR. GARBARINI: From the federal government to the State of New York.

MR. GIL SHAPIRO: The Orange County Health Department sent me a survey.

MR. GARBARINI: The Orange County Health Department sent you a survey.

(HEARING)

MR. DUDA: Orange County Health Department has been involved in with this site over the years. They were one of the first organizations to indicate that there was some problem out there.

MR. ROGER LIDDLE: The only problem is in the groundwater.

MR. GIL SHAPIRO: (Inaudible)

MR. GARBARINI: It is not that there are no airborne contaminants, but the levels that are found are acceptable.

MR. ROGER LIDDLE: (Inaudible)

MR. DUDA: Once the andfill cap is in place, those are probably -- if there are potential airborne contaminants, those will be ddressed in the section of the landfill with respect to landfill gas vents and that type of thing.

MR. GARBARINI: If I could ask you one favor. She missed what you said before.

MR. GIL SHAPIRO: My name is Gil Shapiro, and I am from Greenwood Lake. I

know there are going to be monitors put in place supposedly between the aquifer -- between the landfill and Greenwood Lake itself. Will there be monitoring one and a half miles supposedly between the landfill and Greenwood Lake itself.

MR. GARBARINI: We had not envisioned a need for putting in additional wells in that area.

MR. GIL SHAPIRO: I am asking about monitoring wells in that area. I think it's important. One mile away and one and a half miles, that it will filter out any impurities supposedly before it's too late.

I remember in 1991 we discussed what came into the lake at that point, and we looked at the report on it. At the time, I was the Mayour of Greenwood Lake, so I had no way of receiving it.

I feel that monitoring should be done for the sake of the people of the Village of Greenwood Lake and for the

aquifer that would environmentally supply you water to the rest of the town.

And the only discuss on I said before that would be missing was the six, seven months ago we engaged n a survey and we requested the Department of Health for a revolvong fund monies that has been coming in from government and raising one billion dollars a year for any easement that there might go to the state, and the state would give it to the communities that would need it. And there was roughly 3,000 communities across the country that would be include in that, and I know Greenwood Lake is one of them.

Thank you

MR. GARBARINI: Thank you. I understand that there was some sort of study done for Orange County in terms of water supply?

MR. GIL SHAPIRO: That's for another night.

MR. DUDA: Just as another little response. This area here (indicating),

(HEARING)

which is in the southwest section of the landfill (indicating), there are three deep wells which basically would intercept part of the landfill to the Greenwood Lake acquirer, and all three of those wells showed little or no contamination. Just for your information.

There are wells that are south of the landfill, a direct path through the Greenwood Lake area.

MS. KAREN BLOCK: My name is Karen Block, I live in Old Dutch Hollow Street. This is, I think, indicative of the sort of problem that this landfill has created in this areas that is, there was a piece of property -- it was one of these -- it came it was local newspaper, and it seems that somebody wanted to donate a sizable piece of land to be used for recreational purposes in this community. And it seems like a dying issue. Rumor has it, reason it is dying and propably will remain a dead

(HEARING)

issue is that nobody wants to take the responsibility of the potential liability of having play space that might be contaminated or, you know, the children either eat dirt and they die or they will drill a well and children will be poisoned.

You can tell people that it's okay, you can live here, you can build here, you can continue to drink the water here. But what happens in a small community that has practically no land that's usable, usable space? If the local community, Warwick, is not willing to take the responsibility for this tainted piece of property, because they're refusing to accept your judgments as so definitive that they don't fear a future liability. We're stuck with it. Once again, we have no place to go and nothing to do.

And you can -- your tests and your studies are not protective enough for this community. You are not

(HEARING)

definitive enough. You are not saying, Okay, everything we do now s absolutely, perfectly safe, nobody in the future can ever claim that it's the fault of this landfill, it's the fault of the water, the dirt. Unless you're willing to take the responsibility, we're stuck with it and, you know, we just going around in circles, and we're getting nowhere fast. And you can go home to your safe homes, or perhaps you will find a landfill that has hidden in your backyard

MR. GARBARINI: Just to respond to that, as you were talking about recreational space and things like that, I was just thinking about the town that I live in, which is down in Westchester County, Croton-on-the-Hudson. We have a couple of state hazardous waste sites in our community, and one of them, the Croton Point Landfill, was recently capped, and it has been seated there are and bike paths and walking paths and everything else on top of it. And the

(HEARING)

way it was planned is that it is going to be bringing a lot of different species of birds and things like that. But having walked that site a couple of times now, I was very impressed that people were willing to put something like that into recreational use.

MS. CATHY MARCHBSE: Would you tell Warwick -- would you accept this piece of property and turn it into recreational use?

MR. DUDA: It is her where there is a wood chipping facility now (indicating).

MS. CATHY MARCHESE: Yes.

MR. DUDA: Would Warwick be willing --

MS. CATHY MARCHESE: Would you tell Warwick, Yeah, it is a good idea, you can take it, don't worry? If anybody sues you 15 years from now, tell them to send them to us. We will tell them it's okay.

MR. GARBARINI: There has been no

(HEARING)

use of the property, that we know of, that would be any reason for concern.

MS. CATHY MARCHESE: Would you put it that on the record?

MR. GARBARINI: I would want to know a little bit more about what's going on there right now, because of the wood chipping -- I would be willing to talk to the town and ask them to talk to to the folks maybe they war involved in the Croton Point Landfill Restoration, just say, hey, there's has been a very positive response to what's been done down there, and that's part of the county park system. So I would be willing to talk to them.

MR. DUDA: Also, we don't have any information that the landfill ever went across Penaluna Road. So, that property -- we really don't know much about that property, and currently there is a somewhat industrial facility on that property now. So I'm not quite sure what the situation is with respect to possible

(HEARING)

contamination from that facility that's there now.

MS. CATHY MARCHESE: Oh, so, now it is contaminated -- it is here from --

MR. DUDA: I'm just saying, we don't know anything about that property, and we can't make any judgment on that property.

MR. GARBARINI: Based upon its proximity to the landfill, obviously, you would want to be cautious. but would that be a reason not to use the property at all? I don't see any reason for that.

MS. CATHY MARCHESE: Unfortunately, that's what Greenwood Lake has been in the mist of. As the young gentleman pointed, a few years I bought a house, and I was told by the real estate agent, Oh, by the way, I can't sell you this property until I tell you that you happen to be in a mile and a half of a toxic waste dump. And it is like, oh, am I?

And then I had my lawyer check

(HEARING)

with somebody in the EPA four years ago who told my lawyer, oh, don't worry about, this is not a big thing. So four years ago the BPA was already deciding that this wasn't -- even though it was still on the Superfund list. And before whatever testing you did, EPA had already made up its mind that the landfill wasn't a big issue, So, it seems to me that it being on the list and off the list have. more to do with politics than the studies that come afterwards, several million dollars later, it is whether or not people should keep it on the list, whether or not choose to keep it on list. That's my perception.

MR. GARBARINI: No. We have standards and procedures and guidance that we need to follow in conducting site investigations and determine what sort of cleanups are necessary in deleting sites, so it's not political.

There may be some force at some point in time where people are really

(HEARING)

concerned about a hazardous waste site in their community and they drum up a lot of political support to get it on the list so that it can be cleaned up. I'm not saying that doesn't happen or hasn't happened in the past. But once the site is on the list, we have procedures that we have follow before we can do it

MR. DUDA: And, also, one other thing. There is landfill cap that's going to be on that property. So obviously it's going to be in a much better place once the landfill cap is on.

MR. GARBARINI: Yeah, I would not recommend that anybody do anything necessarily for recreational purposes on the property that you have been talking about until the cap is done.

MS. CATHY MARCHESE: You did feel, unless the property has been despoiled through activities that piece of property, you don't feel that across the street would impact on that piece of property, and you could tell

(HEARING)

that Warwick and whoever the lawyers are in charge of that?

MR. GARBARINI: Yes,

MR. CATHY MARCHESE: Okay. Thank you.

MR. GARBARINI: Thank you.

MR. TONY HOUSTON: Ny name is Tony Houston as in Houston. I am a resident of the Town of Warwick. I live in the Hamlet of Bell Vail (phonetic). I am the supervisor of the Town of Warwick.

And just for the record, there is no Town of Greenwood Lake.

A while ago there was a map on the screen and someone -- I think it may have been Damian -- was pointing to an area. Could we recreate that now, the map? And then pointing to the area.

MR. DUDA: (Complies)

MR. TONY HOUSTON: Don't lose that picture. Now, there is a map with a tan area that is the Warwick Landfill, and the arrow is the direction of what, exactly?

(HEARING)

MR. DUDA: Groundwater flow.

MR. TONY HOUSTON: Now, pointing to this wood chipping lot, this potential recreation site?

MR. DUDA: (Complies

MR. TONY HOUSTON: Where he pointed very briefly, for the second time -- he didn't want to stuck around too long -- was right of the point of the arrow, which is the water flow from the tan landfill.

Thank you.

MS. CATHY MARCHESE: Where people were drinking their water in their homes, you can't have a recreation site. You can't have it both ways. You cannot tell a community it is okay to drink the water from the well, but it is not okay to put a recreation site there. It is one or the other. Okay. Either it is okay to put the recreation site and drink the water --

MR. KADLEC: In a recreation site, the exposure that you're going to

(HEARING)

have is to the soil and to the grass; but in a groundwater situation your drinking something being drown up from that depth.

MS. CATHY MARCHESE: You are saying the groundwater is fine?

MR. KADLEC: I'm saying that the wells that were sampled, the groundwater is fine.

MS. CATHY MARCHBSE: So you're saying that the groundwater is fine and that the topsoil is okay, because there is nothing airborne; correct? So, therefore, you're saying that it is all safe. That's your basis, that's the basis of your -- that's what your telling Greenwood Lake.

The bottom line is don't worry about it, it's all okay. Therefore you shouldn't be telling us it is a bad choice for a recreation site because it's polluted, and in the same breath, Warwick shouldn't be supporting the claim that it is not necessary to take water from Greenwood Lake wells to supply homes.

(HEARING)

There should be an alternate water source. You can't argue both cases. It's one or the other. It is either it is okay to have wells in the area, or you need an alternate water source.

MR. GARBARINI: I think what we could say is that from what we could tell there aren't unacceptable risks that would be posed by such use of the property, but we have no idea as to what has been going on in there the last couple of years with the wood chipping and everything else.

MS. CATHY MARCHESE: It has nothing to do with activities on that site?

MR. GARBARINI: There are a lot of other considerations that go into decisions to whether a town would like to use that property for whatever use. And that's not something that we are speaking about, we are just telling you what the risks that are posed from the Superfund site.

(HEARING)

I don't want to comment on whether or not that would be appropriate, but from what we could tell is that there wouldn't be a problem with that.

MS. BETTY QUICK: My name is Betty Quick, I live in Warwick; not in the Dutch Hollow section.

I can't match the people that have spoken before in knowledge or elloquence, but I can ask a question which, based on researeh you're done, might be useful to all of us in Warwick.

Now, I understand that there was contamination in the septic systems to the northeast, correct? Ant that you believe that the contamination in the wells in that area came not from the landfill but from septic systems; is that correct?

MR. GARBARINI: That's correct.

MS. BETTY QUICK: Okay. Now, I worked in a civil engineers office for about a year doing drafting and I remember we had rules. A hundred feet

between the septic system, including the leach field and the wells, and it was greater than that if the well -- where the well was drilled, a litthe bit down was a better place for the septic system. And, of course, then there were buffers between any bodies of water, streams, or ponds, as I recall, at least a hundred feet.

And my question -- which you should be able to answer, based on your research -- is how far were these septic system from the wells? Obviously, it wasn't far enough for a safe drinking-water supply. And how it seems to me that this is knowledge that would be useful. It would be userful to our building inspector.

Maybe the standards should be changed. If these were not built according to standards, or if they were built according to standards and there was contamination from septic systems to wells, then I would like to know and have

other people in the Town of Warwick and Orange County to know what is a safe distance? How can this be avoided?

I might mention, I'm not assuming that this is true that that's were the contamination came, but whether it is or not, this would be very useful information.

MR. KADLEC: I can answer that. The sanitary codes that were setup tells you how far the wells should be from the septic system. It was setup to try to prevent bacteria from going from the septic tanks to the wells.

Now, in this case, we have organic solvents, which are very mobile across the top of the groundwater table.

Now, the standards do not take into consideration what organic solvents would do if they left the septic tank and traveled towards a well. Because normally you wouldn't really expect to find organic solvents inside the septic tanks.

(HEARING)

A lot of people used that to clean the septic tanks out and maybe dump solvents down the drain or something like that. But it's not something that is normally considered when you established these codes.

MS. BETTY QUICK: It would seem to me that your job, I think, is to protect the environment, and to seems to me a good task for you would be to say, Look, these standards aren't good enough. This is what you need. Maybe a hundred years ago, if they had standards then, all they had to worry about was E. coli.

MR. KADLEC: Right. It's kind of hard to do, because in a community situation, how far is acceptable? The most common problem with contamination from a septic system is with bacteria. But solvents, organic solvent, isn't really a common problem. So, you have to sort of have a trade off.

MS. BETTY QUICK: Maybe what I am hearing is that we need a public water

(HEARING)

supply.

MR. KADLEC: Maybe, but the only problem is, the contamination in the wells, the four wells -- there were only four wells that had levels higher than New York State standards -- that's it -- at any time. And those levels have been decrease over the last four or five years. They've come way down. Now --,

MS. BETTY QUICK: Does that mean that the people stopped dumping solvents down their toilets?

MR. KADLEC: It may be.

MS. BETTY QUICK: Do you have any way of knowing?

MR. KADLEC: By looking at the decreasing levels in the drinking water, I may make an asumption that, perhaps, nobody using the solvents in the septic tanks anymore, but I can't really prove it.

MS. BETTY QUICK: It's nice that it's decreasing, but I'm wondering why people changed their habits. Did you

(HEARING)

educate them?

MR. KADLEC: The EPA sent out a fact sheet educating the people about not disposing of solvents in this septic tanks, and stuff like that, if I am correct.

MR. GARBARINI: I think people are generally more aware of the problems associated with the uses of organic solvents and things like that in general.

We have all the warnings on the labels these days. It says "Appropriate Disposal" and such and such, and do not dump down septic systems and things like that.

MS. BETTY QUICK: I would like to know what those distances are, which I assume you would have, based on your research. And I also would like to say, the more I think about it, it seems as though publicly-supplied water would eliminate a lot of problems and can began inexpensive way to deal with what may be a dump that's contaminating groundwater

(HEARING)

because of either present of future problems for wells in the area.

MR. GARBARINI: Thank you very much.

MR. GEORGE KLUWE: My name is George Kluwe, I live in the Village of Greenwood Lake. My concern is the integrity of the wells in the village. Naturally, they are talking about a viable alternate to the water supply. What guarantees do you have that our water supply in the village is not going to be contaminated? The contaminatiuon by the landfill is going to put us in a serious situation. Now, can you guarantee me that we are not going to be affected by it?

MR. GARBARINI: It's always tough when you put people in the position of making a guarantee. But based upon all the evidence we have and what all the hydrogeologists looked at and are telling us, I can say that it's highly unlikely. What we do have is we have the wells that

(HEARING)

Damian pointed that should intercept any contamination that's coming off site.

MR. GEORGE KLUWE: You're just making the statement that you are not going to --

MR. KADLEC: But the water is tested, the water supply is tested.

MR. GEORGE KLUWE: That's wonderful. I am not sure we will be very happy five years from now.

MR. GARBARINI: What I started to mention before is that there someone -- the planner from your office. I forget his name now. Ron Water. He had mentioned a study that had been done back in -- it was done back in January that looked at the aquifer. It was done for the Orange County Water Supply.

MR. GEORGE KLUWE: Yeah.

MR. GARBARINI: What I am saying is, perhaps, if he feels that he would like to see us do some additional work, maybe he can make some recommendations, maybe in the initial monitoring wells or

(HEARING)

something like that.

MR. GEORGE KLUWE: He is the chairman of the planning board.

MR. GARBARINI: He seemed to be familiar with the study, and I'm just raising it because he had raised it to us this afternoon.

MR. GEORGE KLUWE: Are you guaranteeing us that we are not going to have a water supply contamination?

MR. GARBARINI: I don't think that's a fair question. I can tell you that indications are enough that I would be willing to wager on it. Can I guarantee it? I am not willing to answer that, I guess.

MR. GEORGE KLUWE: These people have to live in this community, and they want to go to sleep at nigh and wake up in the morning with a clear mind.

MR. GARBARINI: If you have some technical concerng that you would like us to address, or if you feel you would like us to put in a monitoring well in a

(HEARING)

certain location, we could give that some consideration. If you gives some sort of sound approach to try to alleviate further concerns that you might have, we would be willing to address that.

MR. GIL SHAPIRO: On the report that came through from the Orange County Water Authority (inaudible) organization using county monies to continue their so-called work. They did a groundwater study of the county. It was done through various engineering firms, and it was done such as, Hello, Mayour, what well are you using now and what capacity? Thank you.

MR. GARBARINI: I guess, regardless, we are proposing a monitoring program here.

MR. GIL SHAPIRO: (Inaudible)

MR. GARBARINI: If you had some suggestions, we definitely would be willing to address them. I am not making any guarantees, but if there is something -- say, if there is another

(HEARING)

monitoring well that we could put in close the landfill that you fell would do the trick, something like that, we would give it some consideration.

MR. GIL SHAPIRO: I thank you for your time.

MR. GEORGE WEBER: The solvents that you're talking about that are showing up in the septic systems, wouldn't these solvent be highly evaporative?

MR. GARBARINI: A lot of them are volatile.

MR. GEORGE WEBER: That kind of concentration are we talking about that you are detecting in the septic system?

MR. GARBARINI: Very high.

MR. GEORGE WEBER: How much volume of the materials would you say would have to go into a septic system to cause that kind of contamination?

MR. KADLEC: You would have to know what kind of solvent that was put into it and we don't know that.

(HEARING)

MR. GEORGE WEBER: Well, what kind of solvents are you detecting?

MR. KADLEC: TCA, DCE, dichloroethane, tolune.

MR. GEORGE WEBER: What's the level of one of those chemicals? What level would you have to find? In your estimation, would it be like gallons or several gallons?

MR. GARBARINI: We would have to take a look at the data. We can take a look at the data and answer that question for you.

MR. DUDA: What exactly is your question?

MR. GEORGE WEBER: You say that you are finding these substances in the septic system. Now, if they are volatile, they would tend to evaporate; right?

MR. GARBARINI: They don't just tend to evaporate, they tend to absorb organic materials, they tend to dissolve in water, and they tend volatilize.

(HEARING)

MR. GEORGE WEBER: Is it like somebody going over and pouring a cup of it down the septic system, or more likely are you talking about gallons or larger amounts?

MR. GARBARINI: We just can't answer that. We need to know more information, what the volume of the system is.

MR. KADLEC: They measure in parts per million, which means it's like say one hundred parts -- on hundred atoms of this compound for a million of other atoms of other compounds.

Now, if you don't know the total volume of the septic tank, then it is hard to calculate how much of the original solvent actually went in, because you're just measuring a small volume of this. And you can't really calculate, unless you know the complete volume of the septic tank. So unless some sort of survey was done to figure out exactly what the volume of each

(HEARING)

these septic tanks were, it rould be kind of almost possible to tell how much of the solvent was was originally dumped in.

MR. GARBARINI: We would have to know when it was dumped it, what else is there.

MR. GEORGE WRBER: I will take it up with TAG advisor. Thank you.

MR. DUDA: Any further comments or questions?

(No response)

MR. DUDA: At this time, I think we will close the meeting, but just be aware that any comments that you have can be sent directly to myself, Damian Duda, and the information is in the proposed plan with my address. And the comment period is until August 27th, if it is not extended.

MR. GARBARINI: It's likely that we will extend the comment period, we just need to determine the length of that

(HEARING)

extension at this point.

Please feel free to get your comments in to Damian as soon as possible. I would appreciate that.

We appreciate you all coming out tonight. Thank you very much.

(The Hearing was concluded at 10:40 p.m.)

C E R T I F I C A T I O N

I, KATHERINE DiLORENSO, A Shorthand Reporter and Notary Public in and for the State of New York, do hereby certify that I recorded stenographically the proceedings herein at the time and place noted in the heading hereof, and that the foregoing is an accurate and complete transcript of same to the best of my knowledge and belief.

<IMG SRC 0295260I>

KATHERINE DiLORENZO

Dated: August 25, 1995

**APPENDIX E**

**LETTERS SUBMITTED DURING THE PUBLIC COMMENT PERIOD**

Disposal
Safety
Incorporated

To: George Weber, Dutch Hollow Homeowners Association

From: Steven Amter, Disposal Safety Inc.
John Young, Hampshire Research Institute

Date: September 16, 1995

Subject: Comments on USEPA's Proposed Plan for Operable Unit 2

Notice: This report has been prepared solely for the guidance of Dutch Hollow Homeowner's Association in interpreting information available to them. Other users should satisfy themselves independently as to facts and conclusions contained herein. In particular, such users should refer to original sources of information rather than to this report. This report is not intended for use in any real estate or other transaction, and should not be used or relied upon for such purposes.

Summary

- The Baseline Risk Assessment for the Warwick Landifil seriously underestimates the risks posed by the ingestion of ground water contaminated with manganese.
- Contrary to EPA's statement in the proposed plan, the elevated managanes concentrations detected in certain monitoring wells should not be attributed to background conditions.
- The aquifer that provides the sole source of ground water for residents around the Warwick Landfill is vulnerable to contamination.
- EPA OSWER Directive No. 9355.7-04 states that appropriate remedies for Superfund sites should consider reasonably anticipated future residential development. The proposed plan fails to do this.
- EPA's proposed no-further-action remedy is not cost effective when compared to the option of providing an alternative source of water.
- The four activated carbon water treatment units installed on residential wells northeast of the landfill should not be removed.

1660 L Street NW, Suite 510
Washington, DC 20036
(202) 293-3993

G. Weber, September 16, 1995

Introduction

In July, 1995, EPA release Superfund Proposed Plan, Warwick Landfill Site, which proposes that no further action be taken for Operable Unit 2. The proposed plan is base on the results of the Remedial Investigation (RI) and Baseline Risk Assessment (RA).

The proposal for no further action is based on two major conclusions in the remedial investigation for OU-2 performed by the PRP's consultant, Geraghty & Miller. The first finding is that the source of contamination in residential wells northeast of has not been caused by the landfill. The second is that although the landfill does degrade local ground-water quality, the RA prepared by Environ Corp. for the PRPs shows that ground water poses only a low level of risk to neighbors of the landfill.

Based on our review, we conclude that the RA is deeply flawed and underestimates risk to present and future users of ground water. Therefore, EPA's proposed no-futher-action remedy is not sufficiently protective of human health. Protective measures are necessary, and providing an alternative source of drinking water remains the most cost effective approach.

The Risk Assessment underestimates risk

As discussed in detail in the accompanying comments (attached) by Dr. John Young of the Hampshire Research Institute, the RA contains serious technical errors and highly questionable judgements. It cannot be considered conservative, or even realistic for the Warwick Landfill Site.

The key flaw is the inappropriate use of procedures for estimating risks from ingestion of high levels of manganese found in the ground water at the site. The study is consistent with neither current nor upcoming EPA guidance, and it inappropriately assumes that residents do not have other sources of manganese exposure. Most critically, it has been firmly established from human epidemiological data that the levels of manganese found in some of the monitoring wells are associated with increased neurological disorders in human beings. Dr. Young contacted current and former EPA scientists responsible for assessing manganese risks; they expressed concern over ground water contaminated with greater than 2 mg/l, as is the case at the Warwick Landfill. Dr. Young concludes that the hazard index calculated in the RA is underestimated by a two to three times.

The Risk Assessment calculated a hazard index of 1.5 for ingestion of ground-water. EPA regulations generally require that remedial actions be considered whenever the Hazard Index exceed a value of 1. The proposed plan dismisses this finding, stating that elevated manganese is "representative of background conditions." This conclusion is poorly supported. As shown in Figure 2-12 of the RI, the highest manganese concentrations were found in leachate seeps at the landfill. Furthermore, the monitoring wells with the highest dissolved manganese (wells MW-2S, MW-2D, and MW-4S) were all located in areas downgradient of the landfill. There is no doubt that these wells are tapping ground water that flows from the landfill.

Residential well water is vulnerable to contamination

Whatever the origin of the chemicals in the residential wells northeast ast of the landfill -- septic tanks, the landffil, or some other source - the very fact that a number of wells around the landfill have shown measurable quantities of a variety of organic and inorganic contaminants proves that residential wells tapping the bedrock aquifer are extremely vulnerable to contamination. This means that current or potential threats to ground water must not be taken lightly. Given that non-negligible risks are associated with contaminated ground water from the landfill (see Dr. Young's attached comments), EPA's no-further-action remedy is insufficiently protective of the only local source of potable water.

G. Weber, September 16, 1995

Future residential development needs to be considered

Although EPA has concluded that the contamination found in existing residential drinking water wells is not derived from the landfill, the proposed no-further-action remedy does not consider possible future residential development. An appropriate remedial plan must also provide for the reasonable anticipated future development in other areas around the landfill. For example, if residential wells were drilled between monitoring well clusters MW-2 and MW-8 (east of Penaluna Road along the northwest portion of the landfill), they would likely contain elevated manganese.

EPA OSWER Directive No. 9355.7-04 states that future land use should be considered in Superfund remedy selection. The directive states (page 7):

> In general, remedial action objectives should be developed in order to develop alternatives that would achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as is possible underline in original].

The OU-2 remedy should explicitly address reasonably anticipated future residential development because portions of the site have ground water which poses an unacceptable (Hazard Index greater than 1) risk under a residential use scenario, and here is currently no other water supply. In failing to consider future development, EPA's proposed remedy is not sufficiently protective of human health.

The OU-2 proposed no-further-action remedy is not cost effective

EPA recognizes that engineered solutions to environmental problems often result in some degree of uncertainty as to whether the solutions are effective over time. A standard way to mitigate residual uncertainty is to perform on-going environmental monitoring after the remedy is in place. Since it often lasts for years, even decades, a ground-water monitoring program can be quite costly.

The Record of Decision for Operable Unit 1 provides for ground-water quality monitoring as part of the remedy. The proposed plan for Operable Unit 2 states (page 9) that the "operation and maintenance plan [for the landfill cap] will include ground-water... monitoring to ensure further that the existing population are protected from any future contamination and that the OU-1 remedy remains protective of human health and the environment."

According to Table B-8 of the OU-1 Final/Feasibility Report, Warwick Landfill Site (Ebasco Services Incorporated, February, 1991), the 30-year cost of ground-water monitoring, excluding residential wells, is approximately $2.5 million dollars. The present value cost is approximately 50% less. Monitoring costs would be substantially higher if some residential wells were aim included; we would argue that under a no-further-action remedy, residential monitoring would be absolutely required, particularly for new residential wells in vulnerable areas.

Providing an alternative source of drinking water by connecting with the Greenwood Lake water system would be more cost effective than EPA's proposal. We estimate that this option would cost approximately $1 - 2 million dollars, but would actually eliminate the need for costly ground-water monitoring. Furthermore, an alternative water system is more effective than on-going monitoring:

- It would completely eliminate all uncertainty concerning the safety of the present and future water supply.

- It is an immediate and permanent solution that does not require continued regulatory oversight.

- The measure maximizes community peace-of-mind and acceptance of the remedy.

Additional comment

It has come to our attention that NYSDEC intends to remove the granulated activated carbon units that have been treating ground water at four residential wells northeast of the landfill because it believes that the contamination originates from a source or sources other than the landfill. This is a misguided decision. If there remains even a trace of uncertainty concerning the origin of some or all of the contaminants - and we believe such uncertainty exists - then EPA, NYS, or the PRPs should continue to fund the units.

If all parties refuse to support the necessary water treatment, then other arrangements should be made to minimize the financial burden to the residents. This can be done at no cost to NYSDEC. NYSDEC State should offer to sell the units to the residents at an appropriate depreciated price, minus the cost State's estimated cost of removal (which it would have to pay if it removed the units). This would prevent a discruption of service, and drastically reduce the cost to the residents from what it would be if they had to pay a private company to install a new treatment systems.

HAMPSHIRE RESEARCH INSTITUTE
1600 CAMERON STREET
SUITE 100
ALEXANDRIA, VIRGINIA 22314

MEMORANDUM

From: John S. Young, Ph.D., Scientific Director JS/
To: Steven Aretar, Disposal Safety Incorporated
Date: September 15, 1995
Re: Comments on Baseline Risk Assessment for Operable Unit Two, Warwick Landfill, Warwick, New York, prepared by ENVIRON Corporation, and dated July 1995.

Notice

The following comments are provided to Disposal Safety, Inc, for the uses of the Dutch Hollow Homeowners' Association in interpreting information available to it. Other users should satisfy themselves independently as to the facts and conclusions contained herein. Such users should refer to original sources of information, rather than to this document. This document is not intended for use in any real estate or other transaction, and should not be used or relied upon for such purposes.

General Comment.

This document contains numerous scientific and technical errors, some of which are documented below. The correction of some of these errors would not substantially alter the conclusions of the document. Other errors, however, lead the document to substantially underestimate the ranks associated with this site. In particular, use of groundwater from this site as a source of drinking water could pose a substantial risk to human health.

Specific Flaws In the Analysis:

Characterization and Scope of the Risk Assessment Problem.

The assessment claims to address "hypothetical" residents (pp. ES-I, II-9, II-12, VIII-1), but ignores the fact that there are actual residents in very close proximity the site perimeter, who may be exposed to any air releases and who are simultaneously consuming groundwater from contaminated aquifers. There is no justification for the authors' asserting conservatism on this basis. A prudent approach, given the facts of this site, would be to consider combined exposures to contaminated air and watch. Neither is the response to EPA's comment (#20) in the letter from Kleiman and Washburn to EPA convincing.

Similarly, separate evaluation of risks to adults and children (pp. ES-3, VI-5, VII-2-VII-4, VIII-1, VIII-2) are conducted, with no concentration of the combined risk of childhood and adult exposure. This is contrary to standard practice, where one would examine a six-year childhood exposure followed by 24 years of exposure under adult conditions. Even that may underestimate true exposures and risk of children growing up in close proximity to such a site.

The assessment misstates risk estimates as "upper bounds" (p. II-10). Using "Reasonable Maximum Exposure" (RME) estimates clearly does not generate upper bound estimates of risk.

Selection of Data on Chemical Contamination

The reliance of the authors on data developed by Geraghty and Miller (G&M) (IV-1, VI-1 - VI-2) to set exposure point concentrations, excluding both Ebasco and NYSDOH data, is highly questionable. While this approach deals with more current data, those limited data are not necessarily more representative of site conditions. This procedure entails a significant loss of information, and biases data with any errors that are specific to G&M data.1 This leads to an unjustified decreased estimate of site-related risks. At minimum, risks should be evaluated with and without Ebasco and NYSDOH data. Use to one-half of the G&M detection limit for chemicals that were detected by Ebasco (IV-2) (presumably at higher concentrations) is highly questionable.

---

1 For example, the blanks, for the G&M data appear to have been collected inappropriately (IV-4).

The severe trimming of chmeical found at this site to a small list of indicator chemicals (ES-2, IV-1 **!** 1V-2); is in direct contradiction of EPA guidance (Risk Assessment Guidance for Superfund [RAGS], Section 5.9, p. 5-20). Maintaining all chemicals through the assessment would certainly be manageable; ENVIRON's data manipulation has saved trivial effort that the potential cost of underestimating risk, a fact that the authors fail to acknowledge. It bears remembering that the field work for this site performed Ebasco noted not only benzene, but also chloromethane, 1,4-dichlorobenzene, ethylbenzene and xylencs as being elevated in bedrock groundwater (11-7).

Moreover, the specific decision rules used by ENVIRON to eliminate chemicals from the analysis is highly questionable. For example, the elimination of chemicals that were not detected more than once in each zone of contaminated groundwater in each sampling event (IV-2): would exclude a chemical that had been found more than once in groundwater in each of two independent sampling rounds. This is clearly inappropriate and in conflict with explicit EPA guidance. Similarly, low frequency of detection (IV-3 - IV-4) not adequate to drop chemical, if some reason to believe present (e.g. present in Ebasco data). EPA guidance states explicitly a series of criteria that must a be met to exclude chemical from analysis based on detection frequency:

Consider the chemical as a candidate for elimination frnm the quantitative risk assessment if: (1) it is detected frequently in one or perhaps two environmental mental media, (2) it is not detected in any other sampled media or at high concentrations, and (3) there is no reason to believe the chemical may be present. (RAGS 5.9.3)

This language clearly does not support the elimination of chemicals based on a low frequency of detection within a particular medium, and especially not within part of a medium.

The elimination of chemical where downgradient concentration are less than upgradient concentrations (1V-2 - 1V-3) is only appropriate to the extent that a clear gradient client can be delineated with confidence in this admittedly complex groundwater regime.

In terms of the number of chemicals affected, ENVIRON's trimming of the list of indicator chemicals is extreme. For example, in bedrock groundwater, 25 of 26 organic chemicals have been eliminated, as well as 11 of 23 inorganic chemicals. In the overburden aquifer, 5 of 6 organics, and 20 of 23 inorganics, have been dropped from the analysis.

The elimination by ENVIRON of chemicals that were detected at levels below regulatory standards confuses two parts of Superfund process, compliance with substantive ARARs and risk assessment. In some cases, chemical present regulatorily aceepeted level may be associated with non-trivial risks.

For example (Table IV-2): In the bedrock aquifer, of 50 chemicals, 36 were eliminated from consideration. Only eight of those were eliminated because the downgradient concentrations were less than upgradienl concentrations. Many of the eliminations are based upon selective reliance on the data of Geraghty and Miller, rather that considering the entire history of sampling at the site. It is clearly inappropriate to use the data of Geraghty and Miller, in preferene to earlier work, for selecting chemicals, simply because they are more recent. A cogent discussion indicating clear superiority of the of Geraghty aad Miller data needs to be presented, if indeed it is possible to develop such an argument. As the authors note, (VI-2), the data are variable.

This deficiency in addressing site-related chemicals was apparently also noted in EPA's comments, and is addressed in the letter from Kleiman and Washburn to EPA dated July 25, 1995 (comment #4).

Estimation of Toxic Hazard Data

The document makes the unwarranted statement that the NOEL is a conservative estimate of threshold dose of the population and under study (V-3). This is completely unjustified. The judgment of the conservatism of the NOAEL requires a detailed consideration of the entire design of the study, including the spacing of doses, the statistical power of the experimental design, and the sensitivity of the measure of toxicity employed.

The use of dietary, rather than water-based Reference Dose (RfD) for manganese is not justified, and has the (admitted) effect of significantly decreasing risk estimates (ES-3; V-4, VIII-9 - VIII-11)). As noted (ES 3 - ES-4), exposure levels from groundwater alone. (discounting the many other sources of manganese in the diet) may exceed recommended intakes for adults. Exposure (dose) levels in children are significantly higher than those for adults (nearly double). Indeed, oral manganese doses from groundwater that were lower than those predicted in Tables A-3, and A-4, and less than one half of those reported in Table A-7, and Table A-8 for children, were found to be associated with a significant increase in neurological impairments in humans as is quite clearly noted in IRIS. Indeed, the concentration of manganese in groundwater noted in this risk. assessment (Table VI-1) is higher than that found to be associated with neurological impairments in humans.

ENVIRON's discussion in Section VIII is at best a misleading presentation of the information in IRIS. It ignores the fact that the study by Kondakis et al, found not only a NOAEL but also a LOAEL, and that exposures at Warwick exceed the LOAEL for human beings found in that study. The statement on age-related effects gives the impression that the populations were not adequately matched, which is not correct; non-specific age-related effects would not be expected to differ between the populations in the study, and the effects of manganese are still significant when age and sex are controlled for.
ENVIRON also selectively reports the decreased sensitivity of children, while ignoring the increased sensitivity of infants. Similarly, discussion of acceptable total managanese intakes ignores the fact that this population; like most Americans, would be expected to receive substantial doses of manganese from their diet.

It is true that EPA has determined that the extent of the difference between water and dietary RfDs for manganese may not be as large as the 28-fold ratio reported it IRIS. The Agency has determined that there are problems with setting a separate water RfD on the basis of the study by Kondaki et al., because concomitant dietary exposure levels were not precisely known. However, there is no evidence that dietary exposure differed between the groups studied by Kondakis, nor that their dietary exposures were in excess of those that would be expected in the population at Warwick.

EPA's current proposal (which should be entered in IRIS in October, 1995) is that for water-based exposures, one would modify the dietary RfD for manganese by a factor of three. In the present study, if appropriate standard exposure factors are used (rather than the idiosyncratic values applied by ENVIRON), this would yield a Hazard Quotient for a child for Manganese alone of more than three. For a child who remains on site to be exposed after the age of six, the total hazard quotient is approximately five.

It is also important to note that both the (former) EPA employee contracted by ENVIRON, and the current EPA Manager for the manganese RfD indicated that they would be concerned about exposure to a water supply containing two milligrams of manganese per liter, as is the case at Warwick.2

It bears stressing that this is not a matter of extrapolation from animals studies, or of the application of unreasonable safety factors. People who have consumed groundwater with levels of manganese comparable to those seen at this site have an elevated incidence of neurological impairment. This can not be considered a reasonable risk by any toxicological standard.

For inhalation exposures, RfDs are used to evaluate inhalation exposures, instead of the more current Reference Concentration (RfD) values. In some cases, RfD values were derived from RfCs. This non-standard practice is nowhere explained or justified.

Selection of Exposure Pathways for Analysis

The discussion of exposure pathways ingores significant exposure pathways that are commonly evaluated for domestic use of groundwater. For example, it ignores contamination of household air by volatiles (ES-1, II-2, III-1, VI-1), a common path of exposure to contaminants in household water. (The work of Adelman an others has shown thathe exposures and risks from general contamination of household may be as much as 10-fold higher than the shower inhalation risk or the ingestion risk for volatiles.) In this, the assessment repeats an error of the OU-1 assessment, noted at that time.

This major oversight is particularly notable as benzene ingestion was a key source of carcinogenic risk; standard methods would indicate that risks at this site have therefore been underestimated, perhaps by an order of magnitude.

---

2 Telephone conversations between U.S. Young (HRI). S. Velazquez (formely EPA) and R. Benson (EPA), 9/12/95.

HRI Review of ENVIRON Risk Assessment Warwick, NY

The atmospheric dispersion model ISC-LT2 was apparently used to model air emissions (G&M). While this modeling is not the responsibility of the authors of the present document, they should be aware that the user manual for ISC2 contains explicit cautions on use of the model within 100 meters of a point source, and notes that for area sources, the alogrithm does not adequately represent source-receptor geometry if the separation between a source and a receptor is less than the length of the side of the area source. Thus, the air modeling is not appropriate to support any conclusion that exposures to air emissions will be acceptable.

Quantification of Expsoure and Risk

As noted above, a highly truncated list of chemicals was used for the calculation of exposure point concentrations, exposures, and risks. This constriction of the analysis, in direct contradiction of EPA guidance, means that site-related risks may be significantly underestimated.

The calculation of exposures and doses from concentrations contains fundamental errors that are quite startling. Also, as noted asbove, it ignores the explicit policy of EPA that inhalation exposures should be calculated in terms of inhaled concentration, which is then compared to a reference concentration. The simple calculation of an inhaled dose, as performed here, ignores critical issues of pulmonary physiology that underlay EPA's decision to switch to the use of RfCs in evaluating inhalation exposures.

More importantly, the calculations use for exposure to shower air are flatly wrong, and the procedure employed by ENVIRON ignores fundamental principles of chemistry and (Table VI-5). ENVIRON appears to be assuming that persons are simply inhaling the shower water. In reality, exposure to volatile chemicals in a shower, as well as in general household air, reflects a transfer of mass, and concentrations in air will be critically dependent upoh the water flow rate through the shower and the volume of the bathroom (as well as time spent in the bathroom after showering). This fundamental error is completely unacceptable in any risk assessment. Simple, well-validated models of shower volatilization are readily available.

The consequences of ENVIRON's bizarre approach to evaluating inhalation exposures in the shower can be found in Table A-2, where the shower inhalation risks from benzene are determined to be only one thirty-third of those from direct ingestion. This is a radical departure from the normal pattern found in dozens, if not hundreds, of risk assessments. Using reasonable models of showering exposure, inhalation in the shower has generally been found to produce risks essentially equal to those of direct ingestion.

Even further, these risks (both those from ingestion and from inhalation in the shower) are typically found to be an order of magnitude lower than risks associated with general contamination of household air (see numerous publications by T. McKone, or J. Andelman).

The procedure uscd to disaggregate Hazard Indices by toxic effects (pp. VII-2 - VII-3, Table VII-3) are not made adequately explicit; but appear to be based solely upon the critical effect for each compound, which is not a scientifically justified procedure. Rather, the entire set of toxic effects caused by a chemical must be considered in developing organ-specific hazard indices.

Implications of Methodological Deficiencies for Risk Estimates

The combination of inappropriate exclusion of chemicals, and the use of non-standard, non-conservative exposure parameters, tend to lead ENVIRON's report to underestimate hazard quotients by 30%, and cancer risks by 60%, as indicated by the letter from Kleiman and Washburn to EPA.

The inappropriate calculation of shower inhalation exposures, and the failure to consider contamination of household air, have more significant consequences on risk estimates from ground water contmnination. The former would lead to underestimating cancer risks by approximately one-half, while the latter results in cancer estimates that are underestimated by approximately an order of magnitude.

The most significant departure front acceptable scientific practice is the use of the dietary RfD for manganese. As noted above, concentrations of manganese in ground water comparable to, and even less than, those found at this site, appear to cause significant neurological impairment in a human population drinking the water. It is neither scientifically justified nor prudent to ignore the high levels of manganese contamination in an aquifer that is currently being used as a source of drinking water by nearby residents.

<IMG SRC 0295260J>

September 22, 1995

EPA Emergency Response and Remedial Division
Mr. Damian J. Duda, Remedial Project Manager
290 Broadway, Floor 20
NY, NY 10007-1866

RE: Warwick Landfill

Mr. Duda:

Is my water safe? I don't know - and neither will you 10 years from now! Despite your attempts to study his issue to death, I live here and must use this water! The same contaminants you say are coming from septic tank were dumped into the landfill by the PRPs. Why should I believe your new studies and not your old studies?

Along with my neighbors, I demand an alternate water supply! Our Technical Assistance Grant Advisor outlines alid points to substantiate this demand. I want safe water. The only way I can be assured of this is with an alternate water supply - requested 6 years ago and a much cheapel way to answer everyones concerns now and in the long run.

<IMG SRC 0295260K>
Robert and Margi Ley
RR 4 Box 505
Monroe, NY 10950

September 22, 1995

Mr. Damian J. Duda
EPA Remedial Project Manager
Emergency Response and Remedial Division
290 Broadway, Floor 20
NY, NY 10007-1866

RE: Warwick Landfill Superfund Site

Mr. Duda:

I live on Penaluna Road. While my water has been tested twice (I am still waiting for the results of the second test taken FIVE months ago), I am still unsure about the quality of my water. I must resort to buying water for consumption - an extra expense that is not welcome. I am also a homeowner who has taken a great loss on the value of my home due to this landfill and suffer with my neighbors the stigma of living near the "Penaluna Dump". I have tried putting my home on the market only to have real estate people tell me "...but of course you live near the dump... people don't want to come to look at your house...". I have also been told that I would have to take much less than the home is worth if I want to get someone interested.

I do not agree with your findings. The report by our Technical Assistance Grant Advisor outlines my reasons. I totally agree with the other members in my homeowners association in demanding my rights to safe water. The only way we can be assured of this is with an alternate water supply. This has been our demand from the beginning. During this time of economic upheaval in the government, wouldn't it be wise to propose a plan to your EPA Heads that would save the government a great deal of money? I am sure we all agree that government rules and regulations are not always the most beneficial to the government or the beneficiaries. The alternate water supply is the best answer for us. Please do not shut us out!!

<IMG SRC 0295260L>
Mary B. Sutphin
RD 4 Box 506
Monroe, NY 10950
914-986-5673

September 13, 1995

Angela Geehern
Box 430, R.D.#4
Old Dutch Hollow Road
Monroe, New York 10950

Damian Duda
Remedial Project Manager
U.S.E.P.A., Region 2
290 Broadway
New York, N.Y. 10007-1866

Dear Mr. Duda,

I am extremely upset and disappointed by the E.P.A's decision concerning the Penaluna - Warwick Landfill in Warwick, New York. As a resident of Warwick and a homeowner whose residence is less than a mile and a half from this toxic dump I am outraged by my government's lackadaisical attitude towards this time-bomb in our backyard that threatens the health and well-being not to mention the property values of this small community.

Is that the problem Mr. Duda? Is this community too small to warrant our government's concern? Although millions of dollars are spent to protect the Spotted Owl, human beings, far from an endangered species, cannot expect the same protection. Would the clean-up have been different if the dump was in an upper-class community, or in close proximity to the White House? You and I both know the answer to this question.

As for your experts who claim that groundwater contaminates detected in area wells are caused by septic systems - because everyone knows us country bumpkins like to flush paint thinner down our toilets-we have experts that call your claims ludicrous. Why do your experts opinions carry clout whereas our experts in-depth studies of the groundwater carry no weight what-so-ever?

An alternate water supply is the only solution to any possibility of present or future groundwater contamination, yet the E.P.A. will not even consider this $2 million expenditure when they're ready to spend $15 million + to cap the dump, which will only slow the spread of toxins. This is governmental bureaucracy at it's best!

I have worked hard to have this dump cleanel up since I first moved into this community 17 years ago. You've spent millions of our tax dollars already with all your studies over the part 11 years, since we were placed on the Superfund list, and this present E.P.A. plan for clean-up is the best you can come up with? Other communities beware! The two biggest lies in this country are "The check is in the mail" and "I'm from the government and I'm here to help you".

If you think we will accept your decision, forget it. I for one will continue to fight for an alternate water supply because I'm tired of being afraid to have my children wash with or drink from my well. My family has spent thousands of dollars on bottled water and water filters over the years.

Please restore my faith in our government and reconsider your decision in this matter. We are working class people who thought we had obtained the American dream when we bought our home. This dream has turned into a nightmare.

Sincerely,

<IMG SRC 0295260M
Angela Geehern

cc; President William Clinton
Governor George Pataki
Honorable Ben Gilman
Senator Alfonse D'Amato
Robert Gaydos- Times Herald Record
Ron Nowak- Greenwood Lake News

September 20, 1995

Mr. Damian Duda
Remedial Project Manager
U.S. EPA Region 2
290 Broadway
New York, NY 10007-1866

Dear Mr. Duda:

I feel compelled to express my disappointment with your recent presentation on August 15, 1995 regarding the Warwick Landfill and your probable intent not to go forward with plan to provide a guaranteed safe water supply for deserving residents.

Let me tell you why:

First, I have had similar experiences with various environmental agencies, i.e. EPA, DEP, BCUA, etc. I can assure you that your not the first persons to discover strategic scheduling of meetings and announcements. This is a common ploy and a thinly veiled attempt to preempt the TAG group's contradictory point of view.

Second, any school child could see that your study was bound to produce a false-negative. Had you truly been interested in determining actual risk, you could have simply brought in a track hoe excavator, exposed several areas and analyzed the unearthed material. This could have been done for a fraction of the cost and may have also provided physical evidence of liability i.e. labeled vessels, etc.

Last, to have involved the allegedly liable parties in any way is hopelessly naive. No so called PRP should have bee privy to any info regarding intent or design. They have alread, demonstrated their flagrant lack of concern for the "little guy".

This executive impotence is precisely the sort of thing that will bring about an end of the EPA.

I have always supported you folks in principal. Please reconsider your ill-fated position.

Regards,

<IMG SRC 0295260N>
Ed Matero
144 Alexander Road
Manroe, NY 10950

Damian Duda
Remedial Project Manager
U.S. EPA Region 2
290 Broadway
New York, NY 10007-1866

September 21, 1995

Dear Mr. Duda,

I went on record at the EPA meeting of 8-15-95, stating my reservations of the EPA's handling of the Warwick Landfill Superfund Site, as well as my support for our TAG advisor's recommendation of an alternate water supply as the most comprehensive and cost effective solution to the teat of contamination from the landfill.

EPA and Geraghty & Miller Inc. insist that septic systems are responsible for the contaminated wells near the landfill. However, when I questioned representatives of the EPA and Geraghty & Miller Inc. as to which septic systems were believed to be fouling which wells, they claimed that they did not have the data available to answer the question. You stated that the EPA had not made a determination as to how far the septic systems are from the wells.

The critiques of Geraghty & Miller's study of the landfill by Steven Amter of Disposal Safety Inc., and Dr. John Young of Hampshire Researeh Institute, strengthen my reservations of the EPA decision.

Dr. Young criticizes Geraghty & Miller's study for it's inappropriate exclusion of chemicals, and the use of non-standard, non-conservative exposure parameters, which lead the report to underestimate the hazard quotients by 30%, and cancer risks by 60%. This alone should be enough to call Geraghty & Miller's study into serious question, however our TAG advisor's critiques reveal additional faults in the report, too numerous to mention in this letter.

Under present circumstances, it is little wonder why citizens have lost confidence in their government. We have been told that the law will not permit EPA to give our community an alternate water supply, because in EPA's opinion, the contaminated wells are not site related. The Dutch Hollow Home Owners Association Inc. strongly contests this assertion. Based upon our TAG advisor's critique, and our own common sense, we find Geraghty & Miller's report, as well as the EPA decision, to be tragically flawed.

Eight years ago, my wife and I left New York City and purchased our home in Warwick. We thought that we had found the American dream. What we found was a nightmare. All that we wish to do now is to sell our home, and move back to New York City. We have been told by Realtors that our propetry is worth considerably less due to the presence of the landfill.

The EPA decision not to provide our community with an alternate water supply, has confirmed our opinion that our property values will never fully recover, and that we will not find peace of mind until our home is sold and we have left the area.

I do not suffer under the illusion that my letter will cause the EPA to reconsider it's decision.  I must however exercise my democratic right to express my opinion.

Respectfully,

<IMG SRC 0295260O>
George S. Weber
Chairman-Environmental Committee
Dutch Hollow Home Owners Association Inc. - Warwick, NY
RD 4, Box 545
Old Dutch Hollow Road
Monroe, NY 10950
914-986-8290

cc:
   President William J. Clinton
   Vice President Al Gore
   Honorable Daniel Patrick Moynihan
   Honorable Alfonse D'Amato
   Honorable Benjamin A. Gilman
   EPA Administrator Carol M. Browner

**ROD FACT SHEET**

SITE

Name: Warwick Landfill
Operable Unit: OU-2 (groundwater)
Location/State: Warwick, Orange County, New York
EPA Region: II
HRS Score (date): 29.41 (March 1989)
NPL Rank (date): 1022 (February 1991)
EPA I.D.: NYD980506679

ROD

Date Signed: September 29, 1995
Selected Remedy:No Further Action

LEAD: Potentially responsible party:
Warwick Administrative Group
Primary EPA Contact:Damian J. Duda (212)637-4269
Secondary EPA Contact:Douglas Garbarini (212) 637-4269
Primary PRP Contact: Christopher J. Motta
Geraghty and Miller, Inc.
(201) 909-0700

WASTE

Type and media:

Soils/leachate: VOCs - benzene, chlorobenzene, xylenes
Inorganics- aluminum, arsenic, barium, chromium, lead, manganese.

Groundwater: VOCs - 1,1,1-trichloroethane, benzene,
Inorganics - aluminum, antimony, arsenic, manganese.

Origin: Contamination originated from illegal disposal of hazardous materials at this landfill.