

# Public Health Assessment for

BEACON HEIGHTS LANDFILL NATIONAL PRIORITIES LIST (NPL) SITE

BEACON FALLS, CONNECTICUT

CERCLIS NO. CTD072122062

JANUARY 26, 1989

**U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES**  
**Public Health Service**  
**Agency for Toxic Substances and Disease Registry**



## THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.



## SUMMARY

The Beacon Heights Landfill National Priorities List (NPL) Site is located in Beacon Falls, Connecticut. From the 1920's to 1979, municipal and industrial wastes were disposed of at the landfill. Leachate from the landfill has migrated into the local groundwater aquifers. Two residential wells to the northwest of the site have been contaminated with site-related contaminants. This site is of potential public health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in Human Exposure Pathways Section below, human exposure to benzene, chlorobenzene, chloroethane, and methylene chloride may have occurred via ingestion, inhalation, and direct dermal contact with contaminated groundwater. No health study follow-up is indicated at this time.

## BACKGROUND

The 83-acre Beacon Heights Landfill NPL Site is atop a ridge within the lower Naugatuck Valley. The landfill site is approximately two miles east of the intersection of Connecticut Routes 8 and 2 in Beacon Falls, Connecticut; see Appendix Figure I. Hockanum Brook, located one-half mile northwest of the landfill, flows into the Naugatuck River two miles to the west of the site. A steep downward slope, approximately 200 feet high, is to the west and north of the site. An apple orchard is located approximately 600 feet northwest of the NPL site.

The Beacon Heights Landfill received municipal and industrial wastes from the 1920's to 1979. From the 1920's to 1970, the original six-acre "Betkoski Dump" accepted a variety of wastes: municipal, rubber, plastic, and industrial chemicals and sludges. In 1970, the landfill area was expanded to approximately 30 acres. The waste material was no longer burned, and cover material was placed over the waste. A planned cell-lift procedure was started at the landfill in 1973. Daily and final cover material was placed over the waste.

The Beacon Heights Landfill was listed on the U.S. Environmental Protection Agency's (EPA) NPL on December 21, 1983. An EPA-approved Remedial Investigation (RI) was begun in February of 1984 and finished in April 1985.

In 1984, benzene was detected in two residential wells. The Connecticut Department of Health Services notified the occupants of the two residences that their well water was unfit for human consumption. Bottled water has been provided to these residences by the Connecticut Department of Health Services since 1985.

A Record of Decision (ROD) was signed by the EPA Regional Administrator for Region I on September 23, 1985. The ROD requires the excavation of the Betkoski Dump and other contaminated soils for consolidation with the main landfill prior to closure. A cap will be placed over the main landfill to meet Resource Conservation and Recovery Act requirements, including: gas venting (with air pollution controls if determined necessary during design), fencing of the site, more extensive groundwater monitoring, and stormwater management controls. The ROD also requires the installation of a perimeter leachate collection system and a means of treating the leachate before being discharged. In addition, the local public drinking water supply has been extended to residents near the site as a requirement of the ROD.

All of the residential wells were resampled in 1986. No additional residential wells were shown to be contaminated.

#### ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

##### A. ON-SITE CONTAMINATION

Table I lists the contaminants of concern on-site at the Beacon Heights Landfill NPL Site. The concentrations at which the contaminants were found in each of the environmental media are presented. The sampling of the environmental media was conducted from 1984 through 1985.

##### B. OFF-SITE CONTAMINATION

Table II lists the contaminants of concern found off-site of the Beacon Heights Landfill NPL Site. The concentrations at which the contaminants were found in each environmental media are presented. The sampling of the environmental media was conducted from 1984 through 1985.

##### C. PHYSICAL HAZARDS

A steep grade exits to the north and west of the site. This grade could be a physical hazard to anyone at the site.

#### DEMOGRAPHICS

Approximately 44 homes are within a half mile of the site along Skokorat and Blackberry Hill Road, see Appendix Figure II. The nearest residences are approximately 1,000 feet to the north and west of the site. All of these local residences use groundwater as the drinking water supply source.

TABLE I  
 CONTAMINANTS OF CONCERN ON-SITE  
 BEACON HEIGHTS LANDFILL NPL SITE  
 BEACON FALLS, CONNECTICUT

<u>Contaminant</u>	<u>Range in ppb</u>
Leachate Seeps	
Benzene	<5-25,100
Chlorobenzene	<5-5310
Chloroethane	<10-1420
Methyl ethyl ketone	<10-6090
Bis (2-chloroethyl) ether	<10-4680
Lead	<1.8-22
Groundwater	
Benzene	<5-850
Chlorobenzene	<5-797
Chloroethane	<10-131
Bis (2-chloroethyl) ether	<10-4360
Methylene chloride	<5-380
Surface Water	
Benzene	<5-49
Bis (2-chloroethyl) ether	<10-420

ppb: Parts Per Billion

TABLE II

CONTAMINANTS OF CONCERN OFF-SITE  
BEACON HEIGHTS LANDFILL NPL SITE  
BEACON FALLS, CONNECTICUT

<u>Contaminant</u>	<u>Range in ppb</u>
Groundwater	
Benzene	<5-480
Chlorobenzene	<5-340
Chloroethane	<10-49
Methylene chloride	<5-500

ppb: Parts Per Billion



The Beacon Heights Landfill NPL Site is located within the Town of Beacon Falls. The population of Beacon Falls was 1,500 in 1980. Most of the residents in Beacon Falls rely upon the public drinking water system for potable water.

## EVALUATION

### A. SITE CHARACTERIZATION (DATA NEEDS AND EVALUATION)

#### 1. Environmental Media

The groundwater under and near the site appears to flow towards the north-northwest. However, insufficient groundwater monitoring was conducted during the RI to adequately determine the groundwater flow pattern in the area. Monitoring wells were not placed completely around the site. The major strike and dip of the bedrock is to the southeast. Only one monitoring well cluster was placed in that direction.

#### 2. Land Use and Demographics

Sufficient general information has been provided to the Agency for Toxic Substances and Disease Registry (ATSDR) concerning the effected population at the NPL Site. Information on the local residential population, age, sex, socioeconomic status, and ethnic background would have been advantageous in determining the presence of any sensitive subpopulations.

Information on the recreational use of the Hockanum Brook near the site would have been advantageous. This type of information is used to evaluate the potential for human exposure.

#### 3. Quality Control and Quality Assurance

ATSDR was not provided with Quality Assurance and Quality Control (QA/QC) information for the Beacon Heights Landfill NPL Site. The sampling data provided to ATSDR were footnoted with QA/QC indicators (u, j, b). This would tend to indicate that QA/QC was performed for samples taken at this site.

### B. ENVIRONMENTAL PATHWAYS

In order to better understand how the contaminants of concern seem to have migrated, the environmental setting will be discussed first. The contamination in each environmental media will then be discussed.

The Beacon Heights Landfill NPL Site is atop a hill near Beacon Falls, Connecticut. The soils on-site have been disturbed during landfill operations. It is believed that the waste was placed on or near the bedrock and covered with the excavated soil. Soil at the top of hills in

the Beacon Falls area are normally thin, less than 60 inches, and classified as a very stony to extremely stony fine sandy loam or gravelly sandy loam. This permits the rapid infiltration of any leachate into the underlying bedrock. A water table aquifer does exist in the soil media, but it is limited to areas in the valley where the soil is much thicker. Some residents in the valley obtain their potable water from the water table aquifer. The water table aquifer discharges to the Hockanum Brook.

The bedrock that underlies the NPL Site is the undifferentiated Hartland Formation. This formation is predominately a schist with localized gneissic zones. The Hartland Formation is faulted and jointed. Mapping of the joint faces depicted two dominant joint sets. The average strike for each set of joints is N30°E and N25°W with near vertical dips.

The Hartland Aquifer is semi-confined and flows through the fractures and joints in the Hartland Formation. Groundwater monitoring data indicate that the groundwater in the Hartland Aquifer flows towards the north and northwest at the northern boundaries of the NPL Site and recharges the water table aquifer in the valley. The Hartland Aquifer is used by most of the local residents for their source of potable water. Insufficient groundwater monitoring was conducted to the south and east of the NPL Site in order to determine if all the groundwater beneath the NPL Site flows towards the north and northwest. The mapping of the joints indicate that it is possible for the groundwater to flow to the south and east of the Beacon Heights Landfill.

Analyses of samples taken of the leachate generated by the landfill and groundwater seem to show that contaminants from the landfill have migrated into both the water table and Hartland Aquifer; see Table I. This contamination has moved towards the north and northwest of the site and entered two residential bedrock aquifer wells. Benzene has been detected in both residential wells at levels of 48 and 131 parts per billion (ppb). Methylene chloride was also detected in one of these residential wells at 500 ppb. The total extent of groundwater contamination has not been delineated since an insufficient number of monitoring wells were installed towards the south and east of the site. Contamination from the landfill could be migrating in that direction along the dominant joint sets of the Hartland Formation. The known groundwater contamination towards the north and northwest of the site could contaminate other residential wells in the area.

Some leachate has seeped into the small tributary of Hockanum Brook which drains the site. Analyses of surface water samples show that the contaminant concentrations fall below the detection limits by the time the tributary flows into the Hockanum Brook. Analyses of sediment samples taken in the tributary and Hockanum Brook did not detect any contamination of a health concern.

Analyses of soil samples taken on-site and at the leachate seep areas, off-site, did not detect any contamination of a health concern. It is not



anticipated that there is significant off-site soil contamination, because the boundaries of the NPL Site incorporates all of the landfills and some buffer area. Also, no contamination of a health concern was detected in the sediment just off-site. No soil contamination of a health concern was detected in the buffer area.

Analytical results for the quantitative air sampling conducted on-site indicate that there are no airborne organic or particulate contaminants of a health concern.

No crops or livestock are grown at the Beacon Heights Landfill NPL Site. Access to the landfill is restricted; therefore, it is not likely that the general public would wander onto the landfill and consume wild plants. The contaminants of concern detected in the surface water and groundwater are not known to bioaccumulate in fish or plants; therefore, it is not anticipated that fish taken in the Hockanum Brook or apples taken from the orchard would contain contaminants of concern.

#### C. HUMAN EXPOSURE PATHWAYS

It is not possible to determine when the exposure to groundwater contamination began, since groundwater monitoring data are not available prior to 1984. Groundwater samples of residential wells in 1984 detected benzene in two wells. These findings prompted the Connecticut Department of Health Services to notify the occupants of the two residences that their well water was unfit for human consumption. These residences have been provided with bottled water by the Department since 1985.

The well water is the primary exposure pathway at the Beacon Heights Landfill NPL Site. The local population used the groundwater for drinking and cooking purposes until the contamination was discovered. Bottled water has been used by the impacted residences since the discovery of contamination. Untreated water continues to be used for sanitation purposes. As a result of this pathway, the public near the NPL Site may have been exposed to the contaminants of concern, see Table II, via ingestion, dermal contact, and inhalation of volatilized contaminants.

The groundwater contamination could migrate into other residential wells. However, actions of the September 1985 ROD should prevent future human exposure to groundwater contamination for most residents to the north and west of the Beacon Heights Landfill NPL Site. The municipal water distribution system has been extended, and most residences to the north and west of the site have been connected to the waterline. A few residents have refused to be hooked up to the municipal waterline and will continue to use their private wells. These private wells are currently not contaminated. Therefore, the residents who have refused municipal water are presently not at risk via the groundwater exposure pathway. In the future, the unconnected homes could be hooked up to municipal water if the homeowners change their minds.



Trespassers onto the NPL Site would not likely be exposed to significant amount of contaminants because their visits would usually be of a short duration and infrequent.

Children at play or residents who come into contact with the tributary of Hockanum Brook could accidentally ingest small quantities of benzene or bis (2-chloroethyl) ether contaminated water. However, this exposure pathway would not be expected to present a significant health risk because of the small quantities of water ingested and because of the infrequency of occurrence.

#### PUBLIC HEALTH IMPLICATIONS

To date only benzene, chlorobenzene, chloroethane, and methylene chloride have been detected in off-site groundwater, see Table II. Benzene and methylene chloride have been detected in two residential wells. It is these four compounds that the general public near the Beacon Heights Landfill NPL Site may have been exposed to.

The concentrations of benzene in contaminated drinking water wells in the area are such that inhalation or ingestion exposures via drinking, cooking, or bathing would be of public health concern. Although information is inadequate to estimate the health effects from dermal exposure to benzene, skin penetration is known to occur. There is no evidence from animal studies that different routes of administration (exposures) of benzene qualitatively alter its toxicity (Klaassen et al., 1986).

In humans, the adverse effects of benzene include blood dyscrasias, aplastic anemia, and leukemia. It is likely in both cases that benzene metabolites initiate the disease process (Klaassen et al., 1986). Benzene damages bone marrow and results in a decrease in circulating erythrocytes, thrombocytes, and leucocytes. When all three types of cells have been reduced and there is an absence of functional bone marrow, the disorder is termed aplastic anemia (Klaassen et al., 1986). Leukemias are acute or chronic diseases that are classified according to the cell type involved. They are characterized by increased leukocyte production in hemopoietic tissues, other organs, and usually in the blood. The leukemia most commonly associated with benzene exposure is acute myelogenous leukemia. This kind of leukemia is characterized by an increased number of cells morphologically similar to the myeloblast (Klaassen et al., 1986).

Long-term exposure to chlorobenzene in potable water could impact the liver and kidneys of the exposed human population. The observed hepatotoxicity is probably caused by metabolic conversions of chlorobenzene to an epoxide and subsequent reaction with cellular macromolecules. Studies conducted by the National Toxicology Program

(NTP) indicate that there is a weak dose-related incidence of hepatic neoplastic nodules in male rats. The NTP concluded that this provided "some, but not clear evidence of carcinogenic activity in male rats." Adequate epidemiological evidence is not available concerning the carcinogenicity of chlorobenzene in humans (National Academy of Sciences, 1977 and 1983).

Long-term exposure to methylene chloride has also been associated with mild liver toxicity, as evidenced by cytoplasmic vacuolation, increased fat content, and multinucleated hepatocytes. Acute exposure to methylene chloride has been associated with impairment in function of the central nervous system and liver and kidney effects. Based on the weight of evidence from animal studies, methylene chloride was classified by EPA as a probable human carcinogen. However, metabolic data indicates that there are species differences and that risks to humans are probably lower than those determined for laboratory animals (ATSDR, 1987).

Chloroethane has not been associated with any human health effects as a result of chronic oral exposure. Animal studies, however, have reported possible renal damage as a result of chloroethane exposure in potable water. Inhalation of chloroethane can produce headache, dizziness, incoordination, stomach cramps, and eventual loss of consciousness. In high concentrations, not found at this site, cardiac arrest could occur (Sittig, 1985).

#### CONCLUSIONS AND RECOMMENDATIONS

This site is of potential public health concern because of the risk to human health resulting from possible exposure to hazardous substances at concentrations that may result in adverse health effects. As noted in Human Exposure Pathways Section above, human exposure to benzene, chlorobenzene, chloroethane, and methylene chloride may have occurred via ingestion, inhalation, and direct dermal contact with contaminated groundwater. Actions of the September 1985 ROD should prevent future human exposure to groundwater contamination for most residents to the north and west of the Beacon Heights Landfill NPL Site.

In order to protect the public health, ATSDR recommends the following:

1. A complete study of the groundwater quality, flow characteristics, and usage should be conducted to the south and east of Beacon Heights Landfill NPL Site. Specific off-site groundwater flow pathways, such as bedding plane fractures, faults, and lithology boundary flows, should be evaluated. Monitoring wells should be placed appropriately to determine off-site contaminant flow.
2. A well survey should be conducted to the south and east of the Beacon Heights Landfill NPL Site to confirm that there are no wells in the path of off-site contaminant migration.



3. Consideration should be given to adopting institutional controls to prevent future installation and use of potable water supply wells in the contaminated portion of the aquifer.

4. The few residents who have refused to be hooked up to municipal water should have their private wells tested periodically for site related contaminants.

In accordance with the Comprehensive Environmental Response, Compensation, Liability Act of 1980, as amended, the Beacon Heights Landfill NPL Site has been evaluated for appropriate follow-up with respect to health effects studies. Although there are indications that human exposure to off-site contaminants may have occurred in the past, this site is not being considered for follow-up health studies at this time because no current exposure is occurring and no test is available to evaluate past exposures

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#### REFERENCES

##### ATSDR Files

ATSDR, Toxicological Profile for Methylene Chloride, Draft, December, 1987.

Klaassen, Curtis D., Mary O. Amdur, and John Doull, Editors. 1986. Casarett and Doull's Toxicology, third edition. New York, New York.

National Academy of Sciences, Drinking Water and Health, Washington, D.C., 1977.

National Academy of Sciences, Drinking Water and Health, Volume 5, Washington, D.C., 1983.

NUS Corporation, Remedial Investigation Report, Beacon Heights Landfill Site, Beacon Falls, Connecticut, April 1985.

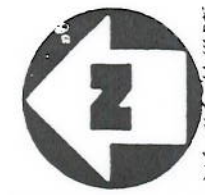
NUS Corporation, Feasibility Study Report, Beacon Heights Landfill Site, Beacon Falls, Connecticut, August 1985.

Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals and Carcinogens, second edition, Noyes Publications, Park Ridge, New Jersey, 1985.

U.S. Environmental Protection Agency, Superfund Record of Decision: Beacon Heights, CT, September 23, 1985.

APPENDIX





BASE MAP IS A PORTION OF U.S.G.S. NAUGATUCK, CONN. QUADRANGLE ( 7.5 MINUTE SERIES, 1964, PHOTO REVISSED 1972 )  
 CONTOUR INTERVAL 10'

CONNECTICUT  
 QUADRANGLE LOCATION

**LOCATION MAP**  
**BEACON HEIGHTS LANDFILL SITE, BEACON FALLS, CT**

SCALE: 1" : 2000'

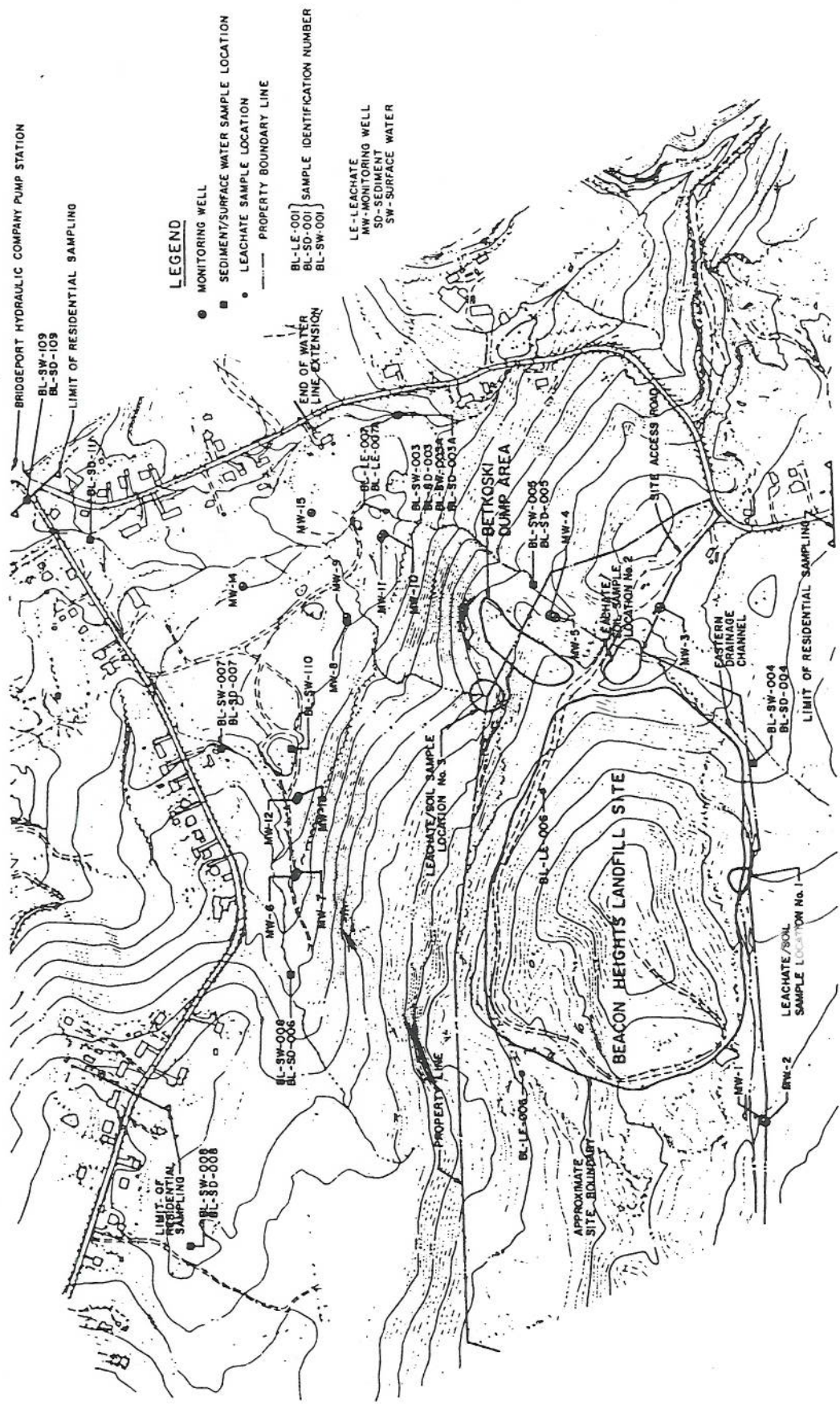
Appendix Figure I

Source: RI Report, 1985



A Halliburton Company





- LEGEND**
- MONITORING WELL
  - SEDIMENT/SURFACE WATER SAMPLE LOCATION
  - LEACHATE SAMPLE LOCATION
  - - - PROPERTY BOUNDARY LINE
  - BL-LE-001 SAMPLE IDENTIFICATION NUMBER
  - BL-SD-001
  - BL-SW-001

LE-LEACHATE  
 MW-MONITORING WELL  
 SD-SEDIMENT  
 SW-SURFACE WATER



Appendix II  
 SITE PLAN  
 BEACON HEIGHTS LANDFILL SITE, BEACON FALLS, CT

Source: RI Report, 1985 SCALE: 1" = 400'

