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Office of
Emergency and
Remedial Response

EPA/ROD/R01-85/015
November 1985

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Superfund Enforcement Decision Document:

Winthrop Landfill, ME

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

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15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The Winthrop Landfill consists of two contiguous parcels of 11 acres, witn approximately 9.5 acres located along the western shore of Annabessacook Lake in the Town of Winthrop, Maine. The site was initially used in the 1920s as a sand and gravel pit. In the 1930s, parts of the site became the Winthrop Town Dump, accepting mixed municipal, commercial, and industrial wastes. The site received hazardous substances between the early 1950s and mid 1970s. It is estimated that more than 3 million gallons of chemical wastes, mostly complex organic compounds including resins, plasticizers, solvents, and other process chemicals were disposed at the site. Wastes were openly burned until 1972, and landfilling occurred from 1972 until 1982.

The selected remedial action for this site includes: the extension of an alternate water supply to residences in close proximity to the landfill; construction of a chain link fence around the landfill, and imposition of deed restrictions prohibiting use of the landfill for activities other than the remedial action; prohibition of ground water withdrawls for purposes other than remedial action; prohibition of excavation in the landfill, except for residential construction or remedial action; quarterly sampling of monitoring points in sensitive areas; grading and placement of a RCRA cap over the entire landfill; completion of engineering design work (geologic, hydrogeologic, and treatability pilot studies); and establishment of an Alternate Concentration Limit (ACL) (See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision Winthrop Landfill, ME (EDD) Contaminated Media: gw Key contaminants: organics, solvents, toluene		

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EPA/ROD/R01-85/015
Winthrop Landfill, ME (EDD)

16. ABSTRACT (continued)

for each contaminant in the ground water based on RCRA Section 264.94(b) criteria. If the ACL is exceeded, installation and operation of an interceptor system and construction and operation of a water treatment facility northeast of the landfill will be implemented. Total capital cost for the selected remedial alternative is estimated to be $6,000,000. Operation and maintenance for the recommended alternative is estimated at $42,000 per year if the ACL is not exceeded. Should the ACL be exceeded, operation and maintenance of the ground water extraction and treatment system, along with monitoring and cap maintenance, will cost between $360,000 and $1,480,000 per year, depending upon the method used to treat the contaminants. Under the terms of the Consent Decree, Inmont Corporation and the Town of Winthrop will provide funding for operation and maintenance at the site.

ENFORCEMENT DECISION DOCUMENT

REMEDIAL ALTERNATIVE SELECTION

Site: Winthrop Landfill, Winthrop, Maine

Documents Reviewed

I am basing my decision, principally on the following documents describing the analysis of the cost and effectiveness of the remedial alternatives for the Winthrop site:

- Final Draft Remedial Investigation, Winthrop Landfill, Winthrop, ME, (Volumes 1 and 2) CH_2M-Hill, June 1983.
- Addendum Remedial Investigation, Winthrop Landfill, Winthrop, ME, (Volume 3) CH_2M-Hill, January 1984.
- Draft Feasibility Study Report, Winthrop Landfill, Winthrop, ME, CH_2M-Hill, January 1985.
- Final Draft Endangerment Assessment, Winthrop Landfill, GCA, January 1985.
- CERCLA §106 Administrative Order on Consent, between Inmont Corporation, Town of Winthrop, Maine Department of Environmental Protection, and U.S. EPA, Docket #84-1041, dated June 1984.
- Responsiveness Summary (attached).
- Summary of Alternative Selection (attached).
- Settlement Documents including a Consent Decree and Remedial Action Work Plan (attached).

Description of Proposed Remedy

Note: Areas referred to below are shown on the attached figure.

1. Completion of an alternate water supply to residences in close proximity to the landfill (Areas 1 and 2 as shown on Figure 1, attached).
2. Construction of a chain link fence around the landfill, and imposition of deed restrictions prohibiting use of the landfill for activities other than the remedial action.
3. Prohibition of groundwater withdrawals for purposes other than remedial action in Areas 1, 2 and 3, and in the landfill.

4. Prohibition of excavation in Areas 1, 2 and 3 and in the landfill. except for residential construction or remedial action.

5. Quarterly sampling of monitoring points in sensitive areas (including the cattail marsh, the brook, the lake, and elsewhere) consistent with provisions of the Resource Conservation and Recovery Act (RCRA) §264 Subpart F.

6. Grading and placement of a cap over entire landfill, having an in place permeability of not less than 1×10^{-6} CM/Sec and consistent with RCRA, 40 C.F.R. §264.310. Grading and placement of a cap over Area H having an in place permeability of not less than 1×10^{-7} CM/Sec and consistent with RCRA, 40 C.F.R. §264.310.

7. Completion of engineering design work to include the following:

Study	Purpose
A. Geologic and hydrogeologic investigations including additional seismic work, full scale pump tests, and groundwater flow models calibrated to the results of the pump tests.	°To determine the full northern extent of the bedrock trough underlying the landfill and extent of contamination within the trough. °To determine the need for, design and location of additional monitoring points. °To determine the design parameters and placement of the interceptor system called for in item 8 below.
B. A treatability pilot study and an evaluation of treated contaminated groundwater discharge options.	°To determine the design parameters for the treatment facility called for in item 9 below. °To determine the most environmentally sound discharge option that will meet applicable water quality standards.
C. A mitigation plan for floodplains and wetlands.	°To assure compliance with floodplain and wetland requirements.

C. (Continued) °To mitigate and minimize potential harm to floodplains and wetlands.

8. Establishment of an Alternate Concentration Limit (ACL) for each contaminant in the groundwater based on RCRA Section 264.94(b) criteria. If the ACL, once established, is exceeded, elements 9 and 10 below must be implemented. If the ACL is not established, then the groundwater protection standard above which elements 9 and 10 must be implemented will be the background level of each contaminant in groundwater.

   As an interim measure, if a discharge of contaminants from the landfill is detected in Annabessacock Lake at levels that exceed an interim standard based on relative risk, items 9 and 10 below must be implemented.

9. Installation and operation of an interceptor system in or near the landfill as necessary to extract contaminated groundwater.

10. Construction and operation of a water treatment facility northeast of the landfill to lower the concentration of contaminants in the extracted groundwater to levels below the ACL or background levels as appropriate.

Operation and maintenance will be required for this remedial alternative and will include the following:

1. Costs for sampling and analysis during the continued monitoring.

2. Maintenance of the monitoring wells.

3. Maintenance of the cap.

4. Operation of the interceptor well system as necessary.

5. Operation of the water treatment facility as necessary.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan 40 C.F.R. Part 300, (NCP), I have determined that providing an alternate water supply, capping the landfill, extracting and treating groundwater and other measures as described above at the Winthrop site is a cost-effective remedy that provides adequate protection of public health, welfare, and the environment.

The State of Maine has been consulted and concurrs with the settlement agreement which reflects the approved remedy described in this EDD. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action. Agreement has been reached between EPA and the responsible parties based on the selected remedy under which the responsible parties will undertake all activities described in this EDD, including operation and maintenance.

Nov 22, 1985
DATE

Paul Keough, acting
MICHAEL R. DELAND
REGIONAL ADMINISTRATOR, EPA-REGION I

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION
FOR
WINTHROP LANDFILL, WINTHROP, MAINE

October 24, 1985
U.S. Environmental Protection Agency
Boston, Massachusetts

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SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

Winthrop Landfill, Winthrop, Maine

Site Description and History

The Winthrop Landfill consists of two contiguous parcels having surface areas of 11 acres and approximately 9.5 acres respectively located along the western shore of Annabessacook Lake in the Town of Winthrop, Maine. The 11 acre parcel is currently owned by the Town of Winthrop, and was owned and operated by the Town during the period in which the landfill received municipal and industrial wastes, including hazardous substances. Although some boundary lines are indispute, a large portion of the 5.5 acre parcel was owned and operated, and is currently owned by Everett and Gloria Savage.

The site was initially used in the 1920's as a sand and gravel pit. In the 1930's parts of the site became the Winthrop Town Dump, accepting mixed municipal, commercial, and industrial wastes. Wastes were openly burned until 1972, when landfilling was begun. Landfilling ceased in 1982.

There are approximately 21 homes in close proximity to the landfill most of which obtained their drinking water from individual residential wells prior to 1984. Concern over the landfill was aroused when volatile organic chemicals were detected in one residential well south of the landfill in 1980. In addition to its impact on groundwater, concern exists over the potential impacts of the landfill upon a 11.5 acre sphagnum bog to the east of the site, a 6 acre cattail marsh to the north of the site, and upon 1,420 acre Annabessacook Lake. In addition, Annabessacook Lake is in the upper reaches of the Cobbossee Watershed; the lower reaches of the watershed provide backup municipal water supplies for the City of Augusta, Maine.

The site received hazardous substances between the early 1950's and mid 1970's. It is estimated that more than 3 million gallons of chemical wastes, mostly complex organic compounds including resins, plasticizers, solvents, and other process chemicals were disposed at the site. Free liquid wastes were dumped and burned primarily in Area B, and wastes in drums were dumped primarily in Areas A and G (see Figure 3-2). An additional unknown volume of chemical waste was buried or dumped in Areas B and H.

Under a CERCLA §106 Administrative Order by Consent, in the summer and autumn of 1984, the Town of Winthrop and Inmont Corporation installed a permanent alternate water supply to most of the residents in the proximity of the landfill.

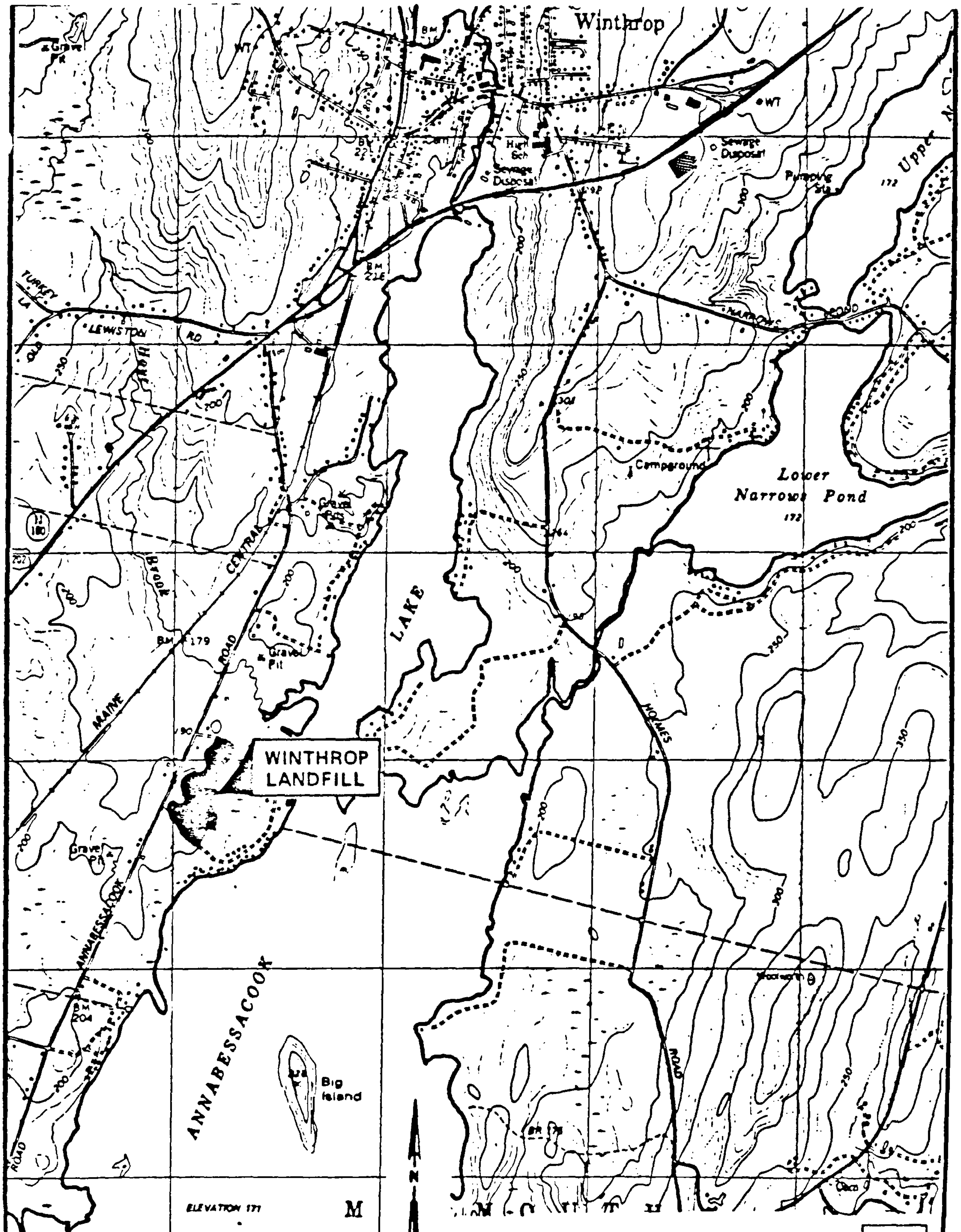

Figure 3 – 1
Location of the Winthrop Landfill

CH2M HILL

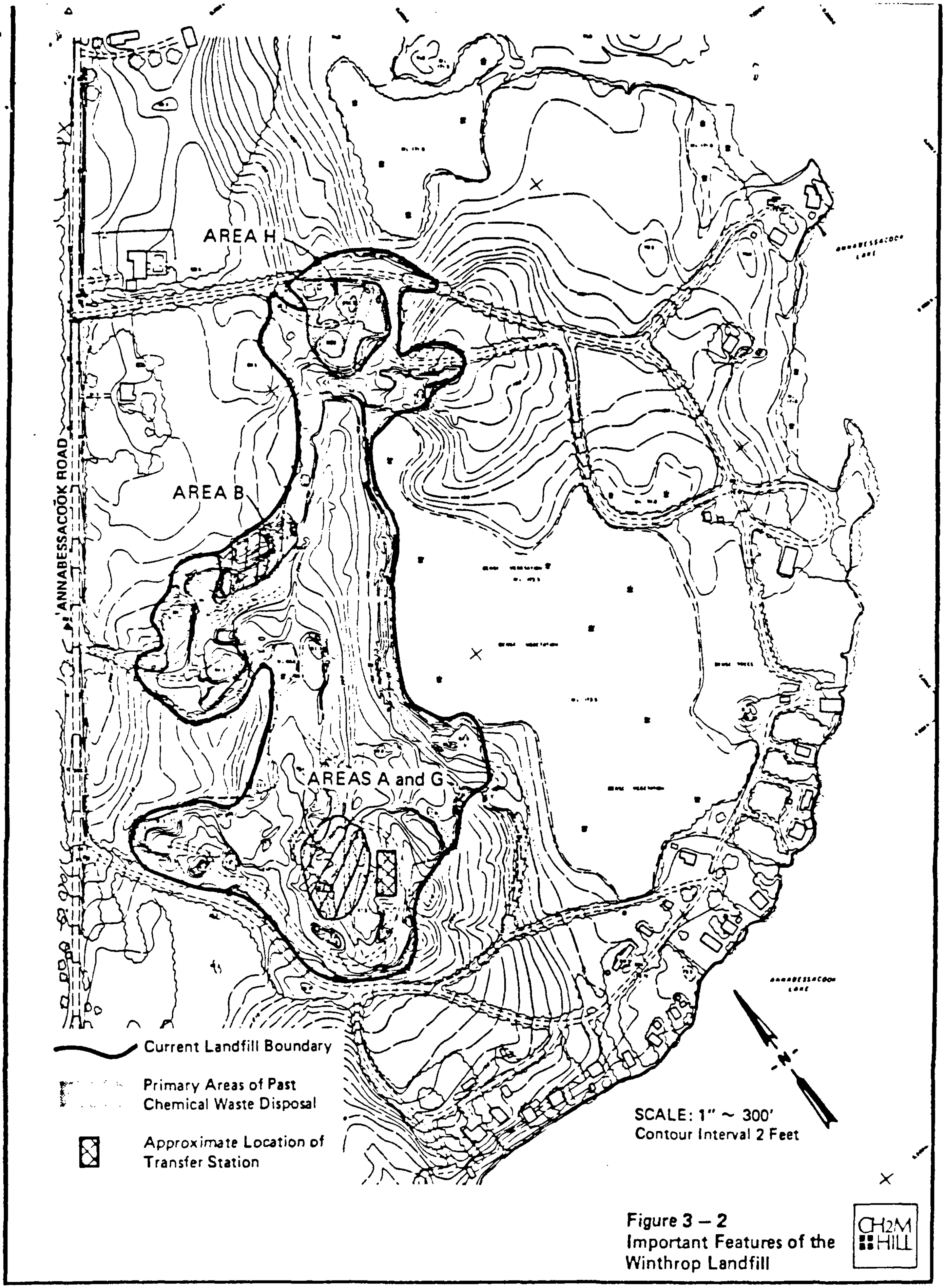

Figure 3 – 2
Important Features of the Winthrop Landfill

CH2M HILL

Current Site Status

The ground surface at the crest of the landfill is generally between elevations 190 and 210 feet above mean sea level (msl), about 20 to 40 feet higher than Annabessacook Lake. Elevations along the low ridge paralleling Annabessacook Road range from about 200 to 220 feet (msl).

Surface drainage from the site is ultimately to Annabessacook Lake, which lies south and east of the landfill. The lake, a controlled reservoir used primarily for recreation, is located in the Cobbossee Watershed; lower reaches of this watershed provide backup municipal water supplies for Augusta, Maine.

Most of the surface drainage from the landfill is to a large sphagnum bog lying east of the landfill; the bog drains through a small ditch and culvert to the lake. Surface drainage from a small area at the northeastern tip of the landfill is to a cattail and reed marsh, which also drains to Annabessacook Lake.

Annabessacook Road is situated on a low ridge northwest of the landfill. Areas southeast of this ridge drain directly to the lake and bog.

Much of the northeastern part of the site is underlain by a deep bedrock trough containing as much as 150 feet of sediments; the deeper parts of the trough contain up to 100 feet of coarse, permeable sands and gravels. The trough extends northeast of the landfill, but its full extent is not known. A bedrock ridge divides the northeastern and southwestern parts of the site. The bedrock surface drops steeply to the south of the ridge, where thick, coarse, permeable sediments again overlie bedrock. Bedrock highs and relatively thin sediments occur along Annabessacook Lake and Annabessacook Road. East of the axis of the bedrock trough, shallow sediments are primarily clay-silts; shallow sediments grade to fine sands west of the axis.

The general direction of groundwater flow on the site is toward Annabessacook Lake. However, the flow patterns on the site are extremely complex in detail and are subject to seasonal and other temporal variations; these variations are caused by, among other factors, seasonal fluctuations in the rainfall and lake levels. Figure 3-7, a schematic east-west cross section of groundwater flow systems on the site, indicates some of this complexity. Specific flow systems of particular interest (i.e., flow systems which are contaminated or potentially contaminated) are discussed below.

Contaminants attributable to the Winthrop Landfill are found in groundwaters northeast, east, and south of the landfill. Primary contaminants are volatile organic compounds, found in total concentrations up to more than 400 ppm. Organic contaminants present in highest concentration (between 1 and 300 ppm)

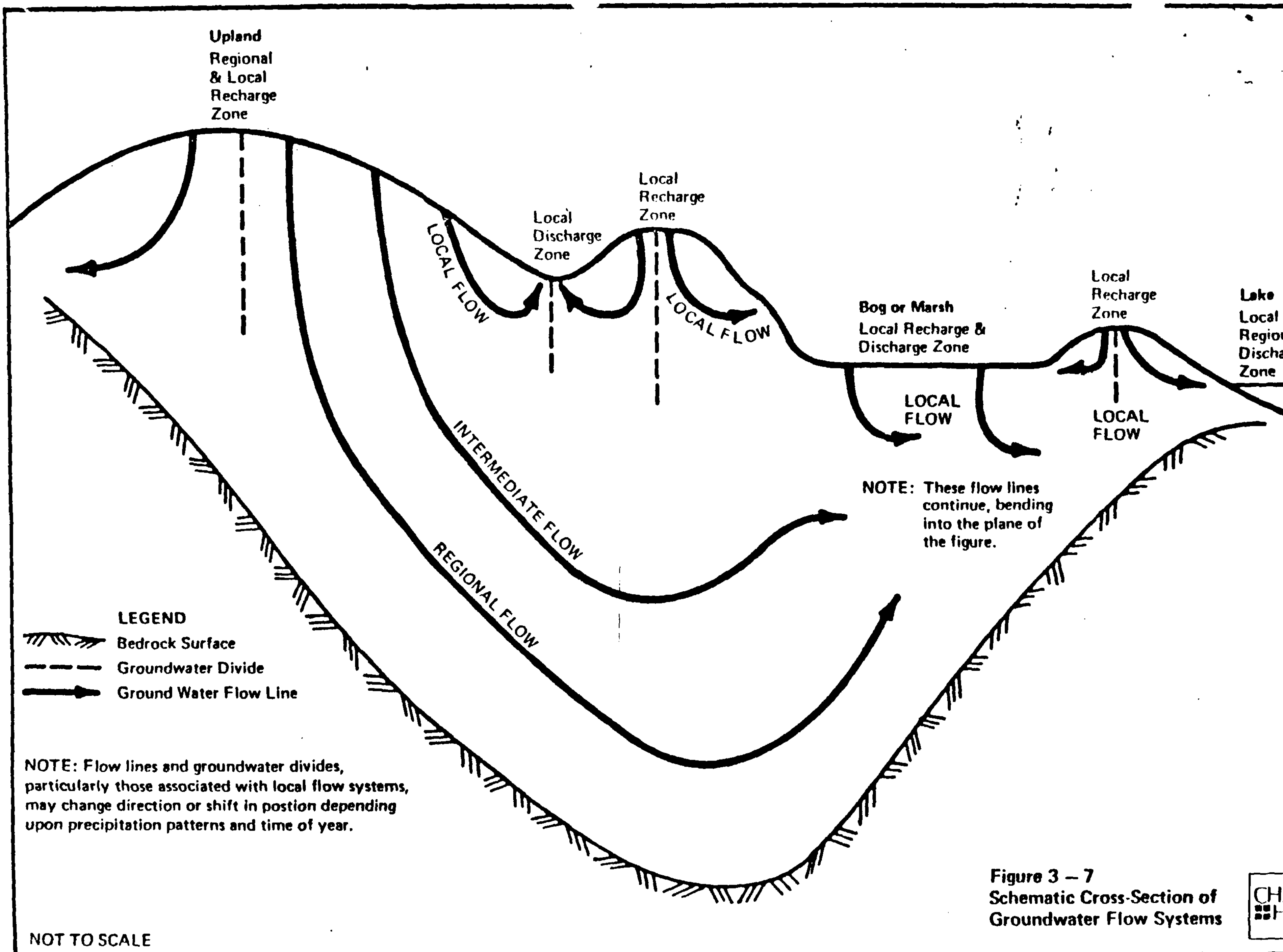

Figure 3 – 7
Schematic Cross-Section of
Groundwater Flow Systems

include dimethyl formamide (DMF), methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), acetone, toluene, and tetrahydrofuran. All of these are solvents known to have been used by industries disposing of wastes at the site, and all but DMF are RCRA-listed hazardous wastes [40 C.F.R., 261.31, 261.33(f)].

Low concentrations of organic contaminants are found sporadically in surface waters and sediments adjacent to the landfill. Some of this contamination is attributable to the landfill, but some is of uncertain origin.

The primary mechanisms of contaminant migration in groundwater are diagrammed in Figure 3-8, a schematic east-west cross section of the site. Three contaminated areas of particular concern are described below.

Bedrock Trough

Important sampling points in the bedrock trough are five monitoring wells at locations 9, 10, 11, and 15.

As shown schematically in Figure 3-9, a deep, regional flow system in the bedrock trough is contaminated with organic compounds from the landfill. The source of the contaminants may be liquid chemical waste dumped along the western margin of the landfill (Area B). Contaminants are migrating northeasterly at least as far as a deep well at location 15, but the full northeasterly extent of contamination is not known. Contaminants in this flow system do not currently discharge to Hoyt Brook. The discharge zone for the flow system lies northeast of location 15, probably in Annabessacook Lake.

Although most of the contamination in the deep, regional flow system appears to be confined to the bedrock trough, the hydrology of this system is such that some flow lines may at times turn fully eastward and pass beneath the strip of residential land east of the sphagnum bog. Changes in the flow direction could be affected for example, by seasonal or other temporal changes in the local flow systems along the shore of the lake. Accordingly, there is a potential for contamination of groundwater beneath this strip of residential land.

Northeastern Tip of Landfill, Cattail Marsh, and Hoyt Brook

Important sampling points are wells at locations 10, 11, 14 and 15; two surface water/sediment stations in the cattail marsh; and three surface water/sediment stations in Hoyt Brook.

As shown schematically in Figure 3-10, organic contaminants are entrained in shallow, local flow systems at the northeastern tip of the landfill. The source of the contaminants appears to be waste deposited in a steep-sided mound at the northeastern end of

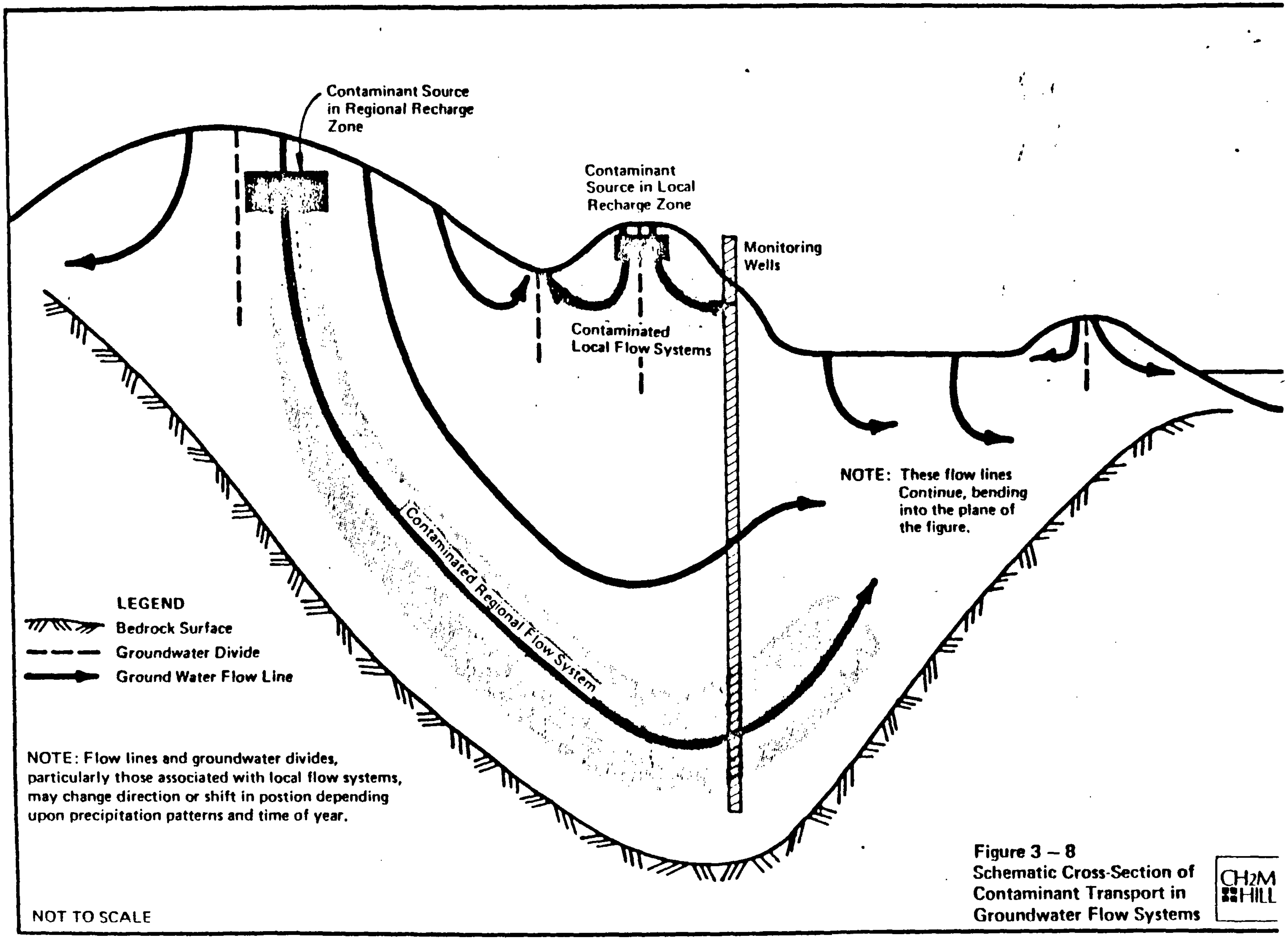

Figure 3 – 8
Schematic Cross-Section of
Contaminant Transport in
Groundwater Flow Systems

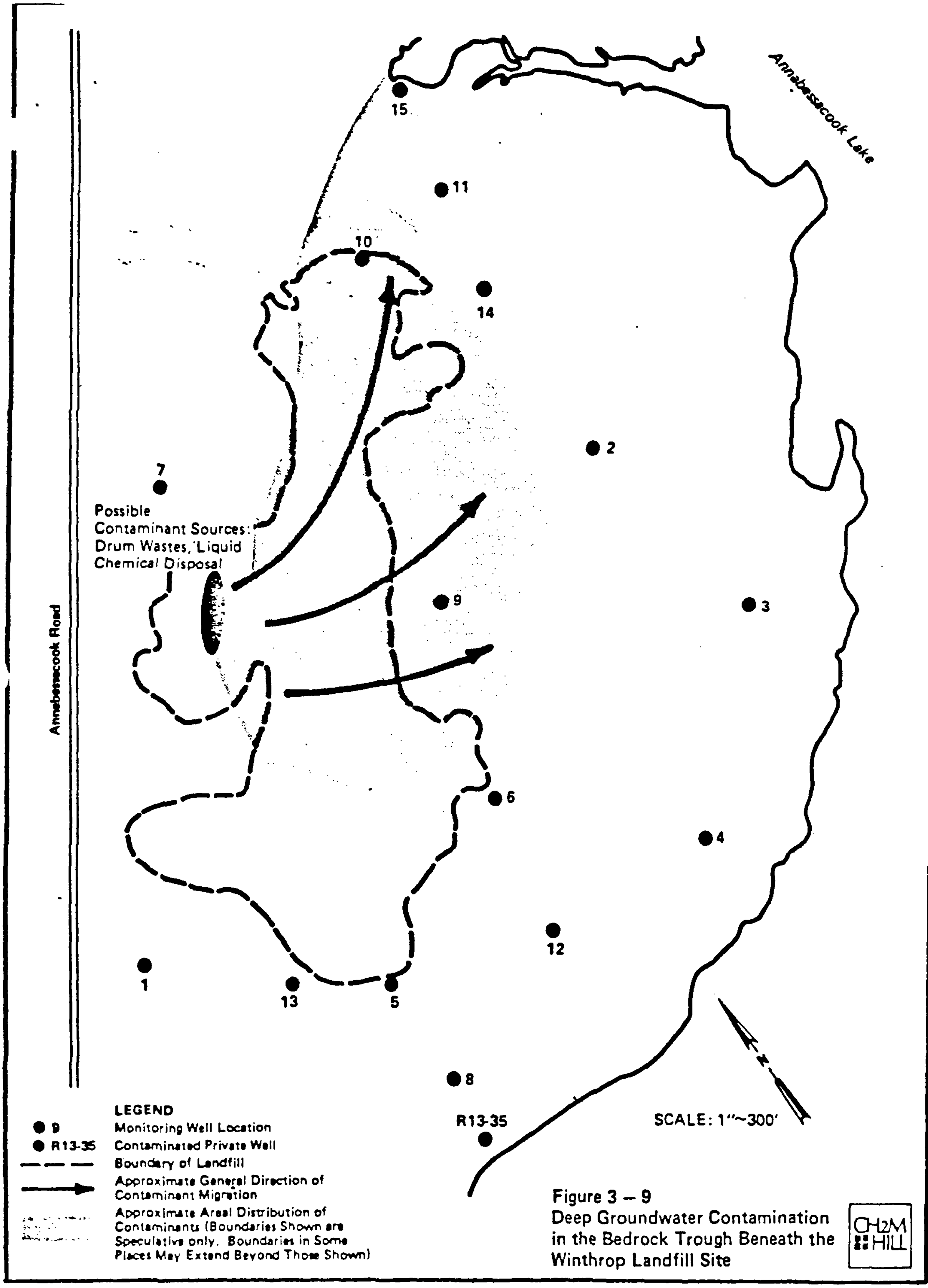

Figure 3 – 9
Deep Groundwater Contamination in the Bedrock Trough Beneath the Winthrop Landfill Site

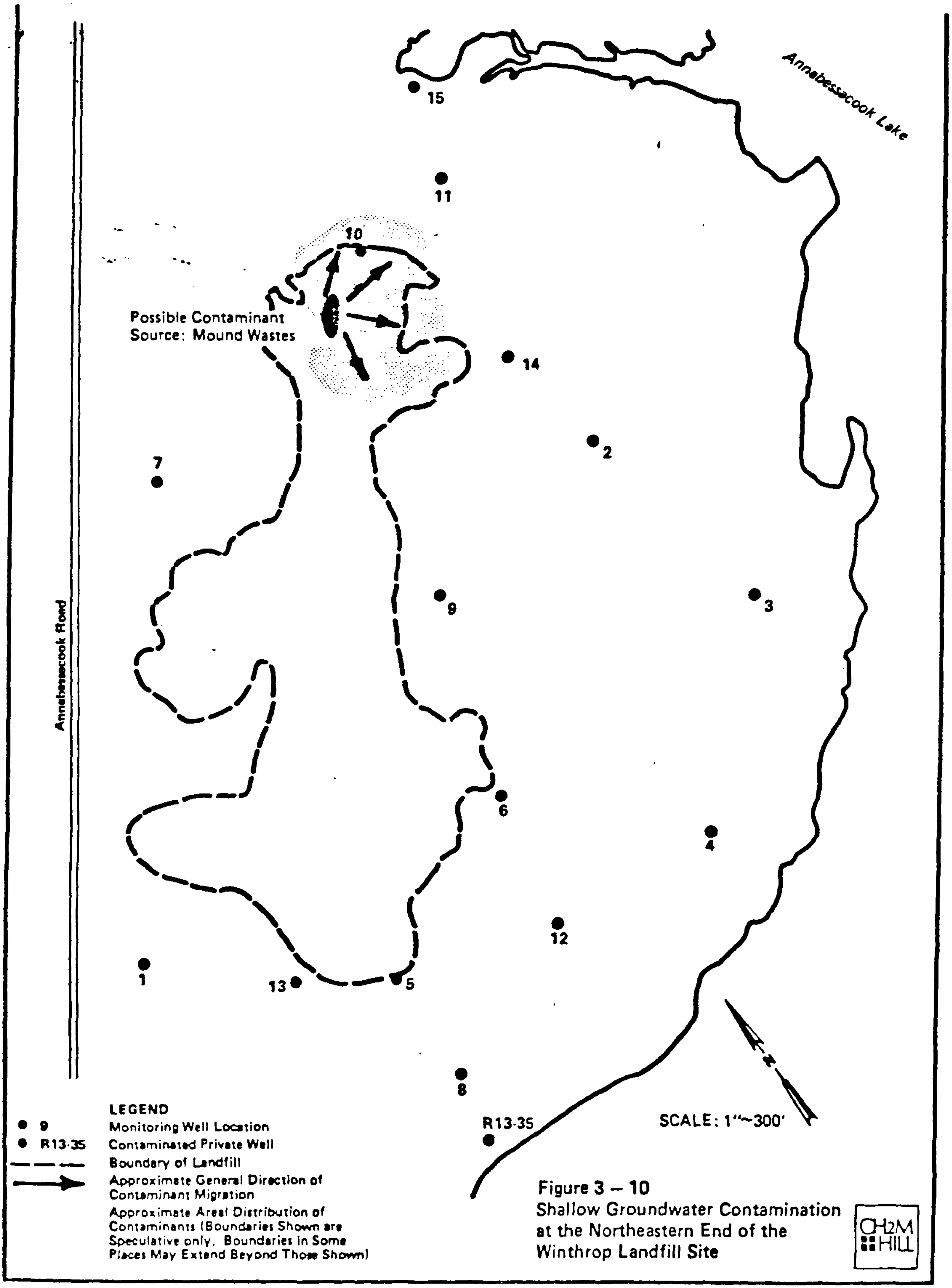

Figure 3 – 10
Shallow Groundwater Contamination at the Northeastern End of the Winthrop Landfill Site

of the landfill adjacent to the cattail marsh and other low-lying areas; some contamination attributable to the landfill has been detected in the marsh, and there are allegations of occasional surface seeps of leachate along the margins of the mound.

Southeastern End of Landfill

Important sampling points at the southeastern end of the landfill are monitoring well locations 5, 8, and 13; residential well R 13-35; and three surface water/sediment stations in Annabessacook Lake.

As shown schematically in Figure 3-11, organic contaminants are entrained by groundwater passing out of the southwestern end of the landfill and flowing southward into the deep sediments beneath the residential area adjacent to Annabessacook Lake. A possible souce of the contaminants is the drummed wastes reported to be buried near the southwestern end of the landfill (Areas A and G). The hydrology of this end of the landfill is such that contaminants may leave the landfill in intermittent pulses depending on seasonal variations in the lake. One deep residential well is contaminated, and the potential for contamination of other wells is high. The discharge zone for the contaminants is Annabessacook Lake; low concentrations of contaminants have been found in lake sediments at one location south of the landfill.

Risk Assessment

The major threat to human health from the release of hazardous substances present at the site is the ingestion of contaminated groundwater. Continued off-site migration of contaminants through movement of groundwater known to be highly contaminated at the landfill boundary, presents a potential health and environmental risk to Annabessacook Lake, Hoyt Brook, and the wetlands. Other routes of exposure to the contaminants (air, soil, surface water) may also present risks to human health and the environment according to the Endangerment Assessment performed in the Feasibility Study. This Endangerment Assessment is summarized below.

People who drink from contaminated residential wells over their lifetime (70 years) will increase their lifetime risk of developing cancer by greater than 1 in 100,000 based on levels of carcinogens present in residential well R 13-35. The levels of contaminants other than carcinogens in the residential well are individually and additively below health advisory levels that will protect against toxic effects of individual compounds. No human data are available on combined effects of organics. However, their effects are assumed to be at least additive in the absence of other data.

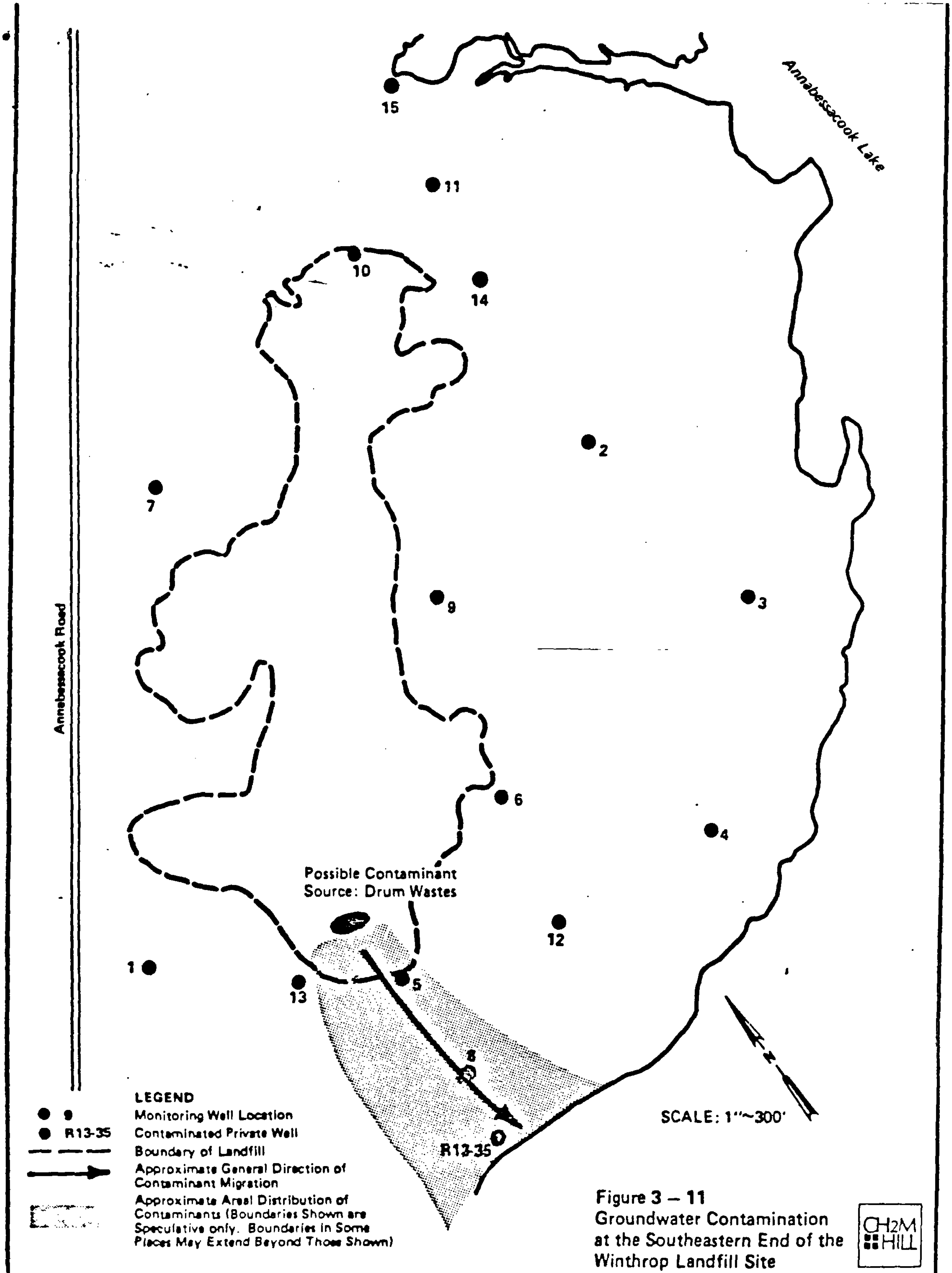

Figure 3 – 11
Groundwater Contamination at the Southeastern End of the Winthrop Landfill Site

Ingestion of groundwater over a 70 year lifetime with the levels of carcinogens found in monitoring well 5A will increase lifetime carcinogenic risks by greater than 1 in 10,000. Monitoring well 5A is hydrologically upgradient from the drinking water wells. Increased carcinogenic risks would be incurred if groundwater resources in the area of well 5A were developed and used for human consumption. Future use of groundwater for human consumption in the northern area of the site would also increase carcinogenic risks as well as risk of toxic effects from toluene, MIBK and DMF.

Risks from direct contact with uncovered wastes especially by young children who ingest soils as a result of putting their hands in their mouths is a possible route of exposure to contaminants.

Aquatic organisms, especially in the cattail marsh, are exposed to organics from the site. These organisms include micro-organisms (algae and protozoans), insects, amphibians, reptiles, and small fish. Birds and mammals, such as raccoons and other animals that feed on small fish, may also be exposed to much lower levels of chemicals because of dilution and volatilization. Aquatic micro-organisms and fish can suffer toxic effects to their reproductive systems and reduced survival if some of the contaminants found in the monitoring wells at levels known to be toxic to these organisms discharge to the wetland areas or the lake.

Levels of phthalate and adipate esters in the cattail marsh are higher than levels known to be toxic to aquatic micro-organisms. Levels of other chemicals present in the marsh, bog, and lake are lower than levels toxic to fish and micro-organisms. Phthalates are highly toxic to aquatic organisms, with acute toxic effects to reproductive functions at levels as low as 3ppb (EPA, 1980). Based on the levels of phthalates present, it is possible that some injury to aquatic organisms in the marsh may have occurred and may continue to occur.

In summary, there may be an imminent and substantial endangerment to the public health or welfare or the environment because of the actual release and/or threatened continued release of hazardous substances from the Winthrop Landfill, including the following:

1) Endangerment to the public health through ingestion of contaminated groundwater.

2) Endangerment to the public health through physical contact with wastes.

3) Endangerment to the aquatic organisms in the wetlands through the discharge of contaminants to these surface waters.

4) Endangerment to birds and mammals and to the public health through exposure (dermal contact and ingestion) to contaminants in the wetlands, lake, or brook.

5) Endangerment to the environment, i.e. the wetlands, lake, and brook, and groundwater through the continued contamination of groundwater and the migration of contaminated groundwater off-site.

Enforcement Analyses

Potentially responsible parties (PRP's) include Inmont corporation as a generator, the Town of Winthrop, Everett Savage, as owners and operators of the landfill, and possibly James Siragusa as an owner. Dr. Siragusa did not reply to a notice letter issued by EPA informing him of his potential liability.[1] Everett Savage replied to a notice letter expressing an interest in cooperating with EPA in the cleanup. The Town of Winthrop and Inmont Corporation each replied to their respective notice letters by expressing a strong interest in participating in both the design and implementation of the remedial action.

The Winthrop Landfill is also a municipal facility and §104(e)(3) of CERCLA requires a minimum 50% cost share by the State for a fund financed remedial action. The State of Maine has indicated that it is unable or unwilling to contribute its required 50% or more if EPA were to undertake the cleanup. The EPA and the State of Maine formally began negotiating with the PRP's on May 29, 1985. As of September 30, 1985, EPA and ME DEP had reached an agreement with the PRP's on their implementation of the selected remedial action.

Imont Corporation, during the public comment period, submitted a proposal to do as a first phase the following:

1. Provide institutional controls. (Public water supply and limited and use restrictions).

2. Regrade and cover the landfill, and restrict access to the landfill by erecting a fence.

3. Cap Area H.

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[1] Dr. James Siragus was issued a notice letter because a possible interpretation of a deed would make him a past owner of part of the landfill. However, according to Everett Savage, Dr. Siragusa no longer asserts ownership of the parcel in question.

4. Conduct further studies to define the bedrock trough which underlies the site.

5. Institute a monitoring program.

6. Conduct preliminary design investigations for a cutoff wall to be installed at the southern end of the landfill.

7. Conduct preliminary design investigations for a groundwater pumping and treatment system.

If the monitoring program indicates that a predetermined "trigger level" of contaminant concentration is exceeded, the Inmont proposal called for a second phase, installation of a cutoff wall along the southern end of the site. Finally, based again on some "trigger level" of contaminants, Inmont would implement a third phase, installation and operation of a groundwater pumping and treatment system.

Inmont's proposal differed from the selected remedy in the following respects:

1. Institutional Controls. EPA's remedy calls for more stringent institutional controls including fencing the entire landfill, prohibition of groundwater withdrawals and prohibition of excavation in Areas 1,2,3, and the landfill. Inmont proposed restricted groundwater use in Area 1, no large groundwater withdrawals in Areas 1,2, and 4, restrictions on land use at the landfill, and fencing of Area H.

2. Regrade and Cover Landfill. Inmont proposed to cover the landfill in accordance with Maine's closure requirements for municipal landfills. The selected remedy requires that the cover design also meet the requirements of RCRA §264 Subpart N and G. Specifically, EPA's selected remedy calls for a cap that includes a vegetative layer, a frost protection layer, a drainage layer, a hydraulic barrier, and provisions for appropriate gas control. Inmont further proposed to place a less permeable cap over Area H. Area H, under the selected remedy, would have to meet the RCRA §264 requirements and have a more impermeable hydraulic barrier than the rest of the landfill.

3. Monitoring Program. Inmont proposed to monitor quarterly for 10 years for volatile organics. The selected remedy requires monitoring in accordance with §264 Subpart F of RCRA, i.e. quarterly monitoring for contamiants found to be present at the site during the RI/FS, and annual monitoring for priority pollutants for a period of 30 years.

4. Engineering Design Work. Each of the design studies in the selected remedy were included in Inmont's proposal proposal with the exception of the wetlands mitigation study. In addition, Inmont proposed to do sediment sampling in Annabessacook Lake.

5. Control of the Southern Plume. Installation of a cutoff wall along the bedrock lip south of the site was proposed by Inmont to control the movement of contaminants along the southern groundwater regime. The selected remedy includes extension of the interceptor well system to the southern end of the landfill if needed to stop southern migration.

6. Groundwater Extraction, Treatment and Discharge. Except as noted in paragraph 5, above, the provisions for groundwater extraction, treatment, and discharge are essentially the same in Inmont's proposal and in the selected remedy.

ALTERNATIVES EVALUATION

The Feasibility Study has addressed both source control remedial actions and off-site remedial actions. Source control actions are appropriate since substantial concentrations of hazardous substances remain at or near the area where they were originally located and inadequate barriers exist to retard the migration of hazardous substances into the environment (40 C.F.R. §300.68(e)(2) of the NCP). Off-site remedial actions were also evaluated, since contaminants have migrated beyond the area where they were originally located. As identified in the National Contingency Plan, the objective of the evaluation of alternatives is to select the "lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare or the environment" (40 C.F.R. §300.68(j)). With certain exceptions that are consistent with EPA policy, the adequacy of protection of public health, welfare, and the environment posed by each alternative will be determined based on the alternative's attainment of the substantive provisions of other Federal public health and environmental standards.

Accordingly, the specific objectives for the remedial response at the Winthrop Landfill site, in order of priority, are as follows:

1. To protect public health by providing uncontaminated water supplies for residents of Area 1, in which groundwater supplies are currently contaminated, and of Area 2, in which there is potential for contamination of groundwater supplies.

2. To protect public health by minimizing the potential for human contact (i.e. inhalation, ingestion, or dermal contact) with contaminants. Locations where direct contact with contaminants is of particular concern are the northeastern tip of the landfill and Area 3. Contact with groundwater in Areas 1 and 2 may pose a direct threat if not controlled. Mining of sand and gravel resources or construction involving deep foundations in any of these areas would also pose a threat if direct human contact with contaminated soil or groundwater occured.

3. To protect the environment by minimizing the potential for discharge to Annabessacook Lake, Hoyt Brook, the sphagnum bog, and the cattail marsh of contaminants already in the groundwater and contaminants which continue to be released from the landfill.

4. To minimize further degradation of groundwater resources. The sand and gravel aquifer in the bedrock trough is of primary concern; the sand and gravel aquifer south of the landfill is also of concern.

An additional objective, which is an integral part of all seven of these objectives, is to minimize any threat to the environment or public health that might be presented by implementation of the remedy. For example, some kinds of uncontrolled construction activities could conceivably cause more damage to the environment than they would remedy. In addition, some remedial activities could temporarily increase the potential for human exposure to contaminants.

Alternatives Considered

The following remedial technologies which may be apppropriate for the Winthrop Site were considered in the FS:

1. Institutional and Infrastructural Technologies

   ° no action

   ° land use restrictions, including fencing, groundwater use restrictions, and/or excavation restrictions

   ° alternate water supply, including treatment of local supplies and/or municipal supply

   ° continued monitoring including quarterly monitoring

2. Source Control Technologies

   ° surface barriers, includes regrading and vegetating and/or capping with an hydraulic barrier

   ° subsurface barriers, includes various configurations of a slurry trench wall

   ° encapsulation, includes a combination of surface and subsurface barriers

3. Removal and Treatment or Disposal Technologies

   ° solid waste excavation and treatment, includes excavation of wastes and contaminated soil and on-site incineration

- ° solid waste excavation and removal, includes excavation of wastes and contaminated soil and transportation off-site to a secure landfill

- ° groundwater extraction and treatment includes installation of an interceptor system and treatment of the groundwater by air stripping and/or carbon adsorption.

From the various remedial technologies a total of twenty remedial action alternatives were assembled and are described below. Several of the alternatives which involve extraction of contaminated groundwater also entail options for either air stripping (Option A) or carbon adsorption (Option B), so that the total number of alternatives with options is twenty-six. The alternatives are logical assemblages of one or more site-specific technologies, and constitute several proposed remedial actions that meet one or more of the remedial response objectives.

Figure 6-2 presents a summary matrix of all twenty alternatives and the technologies which compose the alternatives. Each alternative is numbered at the top of the figure and the technologies are listed along the left margin of the figure. The technology components of a particular alternative are indicated by the dots in the column beneath the number of the alternative.

Figure 6-2 also summarizes capital and O&M (Operation and Maintenance) costs for each technology and each alternative. The present worth of each alternative is also estimated. The estimates are comparative estimates that reflect cost differences between alternative measures, but that do not necessarily represent the actual costs of the alternatives.

ALTERNATIVE 1. NO ACTION

No remedial actions are taken, and the site remains in its present condition. The alternative is a baseline alternative required by USEPA guidance, against which all other alternatives are to be compared. The objectives for site remediation, described earlier, are based on the conclusion that the current and future potential risks to public health, welfare, and the environment are unacceptable. These risks were identified in the Endangerment Assessment and in the Current Site Status section of this document. The No Action alternative provides no source control measures and no measures to minimize and mitigate the off-site migration of contaminants. As such, it will not reduce leachate generation and subsequent migration of contaminants into groundwater and local surface water. Therefore, this alternative will not reduce the public health threat from ingestion and dermal contact. In addition, the no action alternative will not protect the environment by minimizing contaminant discharges to the groundwater, wetlands, lake, and brook.

In summary, the no action alternative would not achieve adequate control of source material and would not minimize nor mitigate

		COSTS ($ in thousands)		ALTERNATIVE																									
	TECHNOLOGY	Capital Costs	O&M Costs	1	2	3	4	5	6	7	8	9*	10	11	12	13	14A	14B	15A	15B	16A	16B	17A	17B	18A	18B	19A	19B	20
INFRASTRUCT. AND INSTITUTIONAL	NO ACTION	N/A	N/A	●																									
	CONTINUED MONITORING	N/A	22.2			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	LAND USE RESTRICTIONS	25	N/A				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	ALTERNATE WATER SUPPLY	322	N/A		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
CONTROL	REGRADE LANDFILL	532	19											●			●	●	●	●	●	●					●	●	
	CAP AREA H	133	2											●			●	●	●	●	●	●							
	CAP LANDFILL	2,041	19												●														
	CUTOFF WALL, SOUTH END OF LANDFILL	570	N/A																●	●			●	●	●	●			
	CUTOFF WALL, EXCEPT NE END OF LANDFILL	2,400	N/A																		●	●					●	●	
	ENCAPSULATE LANDFILL	9,229	19													●													●
REMOVAL & TREATMENT OR DISPOSAL	EXCAVATE AREA H, INCINERATE	7,172	N/A					●				●											●	●			●	●	
	EXCAVATE AREAS A AND G, INCINERATE	1,412	N/A							●		●											●	●					
	EXCAVATE AREA H, DISPOSE OFFSITE	13,572	N/A						●				●												●	●			
	EXCAVATE AREAS A AND G, DISPOSE OFFSITE	1,612	N/A								●		●												●	●			
	INTERCEPT GROUNDWATER, TREAT ONSITE (GAC/Air Stripping)	665 / 645	324 / 304														●	●	●	●	●	●	●	●	●	●	●	●	●
TOTAL CAPITAL COST (millions $)				0	0.3	0.3	0.3	7.5	13.9	1.8	2.0	8.3	15.5	1.0	2.4	9.6	1.7	1.7	2.2	2.2	4.1	4.1	9.5	9.6	16.7	16.8	11.1	11.1	10.2
TOTAL ANNUAL O&M COSTS (millions $)				0	0	.02	.02	.02	.02	.02	.02	.02	.02	.04	.04	.04	.35	.37	.35	.37	.35	.37	.33	.35	.33	.35	.35	.37	.37
PRESENT WORTH (millions $) **				0	0.3	0.5	0.6	7.7	14.1	2.0	2.2	8.5	15.7	1.4	2.8	10.0	4.9	5.1	5.5	5.7	7.3	7.5	12.6	12.8	19.8	20.0	14.4	14.6	13.7

* The total capital costs for incineration of Areas H, A, and G is less than the sum of the capital costs for incineration of Area H and Area A and G separately because of economics of scale.

**Based on a 30 year investment at an annual interest rate of 10 percent.

All costs are order of magnitude estimates (-50 to +100 percent); see text.

Figure 6 – 2
Summary of Cost Estimates for Remedial Alternatives

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the threat of harm to human health, welfare, or the environment as required under 40 C.F.R. §300.68(h)(2) of the NCP. Therefore, this alternative was eliminated from further detailed evaluation.

ALTERNATIVE 2. ALTERNATE WATER SUPPLY

A municipal water supply is constructed for residents of Areas 1 and 2. No other actions are taken. The purpose of this alternative is to provide an uncontaminated water supply for residents of Areas 1 and 2. Because the installation of municipal water supply is complete to residences in Area 1 and most of Area 2, and because provision of uncontaminated water is a primary response objective, an alternative water supply is included as a component of the remaining 18 alternatives. An alternative water supply alone, however, does not protect public health by minimizing direct contact with contaminanats. It also will not adequately protect the environment, since off-site migration of contaminanats into groundwater and surface water will continue to occur. As with the no action alternative, therefore, this alternative was dropped from further consideration because it does not satisfy the requirements of the NCP (40 C.F.R. §300.68(h)(2)).

ALTERNATIVE 3. ALTERNATIVE WATER SUPPLY, CONTINUED MONITORING

Municipal water is supplied to residents of Areas 1 and 2, and quarterly sampling is undertaken at crucial monitoring points on and around the site, especially in the bedrock trough, along the lake, and in the lake itself. This alternative does not provide the same level of protection of public health, welfare or the environment as alternative 4 below, which is equal in cost. Furthermore, this alternative does not constitute adequate control of source material thereby allowing further degredation of the groundwater and discharge of contaminants to the surface waters. It also allows the potential for direct human contact with contaminants. This alternative has been dropped from further consideration since it fails to address certain critical objectives.

Monitoring is essential to gauging the effectiveness of any of the remaining remedial alternatives. Monitoring may indicate the need for additional remedial action, or suggest that the selected action has been effective. Therefore, continued monitoring is included as a mandatory component of all subsequent alternatives.

ALTERNATIVE 4. ALTERNATIVE WATER SUPPLY, LAND USE RESTRICTIONS CONTINUED MONITORING

Municipal water is supplied to residents of Areas 1 and 2, Area H is restricted, and groundwater withdrawals and excavation are prohibited or restricted in and adjacent to the site. Monitoring is performed to detect any deterioration of conditions which might dictate the need for additional remedial actions, or an improvement of conditions which might allow reduction in the level of restriction. The primary purpose of the alternative is to provide uncontaminated water to residents and to limit the potential for inadvertent human ingestion of or contact with contaminants.

While this alternative does not fulfill all of the remedial response objectives of protecting the groundwater and the environment, it was retained for further more detailed evaluation because it is protective of public health.

None of the remaining alternatives is intended to immediately remove all contaminants from the site and surrounding areas. Therefore, all remaining alternatives must incorporate restriction of groundwater withdrawals and of excavation in order to meet the objective of minimizing further direct contact with contaminated groundwater and soils.

ALTERNATIVE 5. EXCAVATE/TREAT AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

An estimated 50,000 cubic yards of wastes and contaminated soil are excavated from Area H and incinerated on-site over the course of approximately one year. Migration of contaminants from other areas of the site continues unimpeded, so an alternate water supply, monitoring, and land use restrictions are provided as in Alternative 4. The purpose of this alternative is to eliminate one major source of contaminants and reduce the potential for human ingestion of, or contact with, contaminants. A disadvantage of this alternative is that it will take nearly two years to implement. Because of economies of scale, the estimated cost for incinerating wastes from both Area H and Areas A and G is only about ten percent greater than the cost of incinerating wastes from Area H alone. Consequently, the added assurance of protection derived from burning wastes from both locations was judged to make Alternative 9 more cost-effective than Alternative 5. However, contaminants migrating off-site, from areas outside Area H through the groundwater will continue to endanger the wetlands, lake, and brook. Since this alternative leaves two major objectives unmet, it has been dropped from further consideration.

ALTERNATIVE 6. EXCAVATE/REMOVE AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

The wastes and contaminated soil are excavated from Area H (as for Alternative 5), but are then removed to a secure landfill for disposal. The advantage of off-site disposal is that the wastes may be removed from the site relatively quickly. The disadvantages are that the costs are higher than incineration, the wastes are not destroyed, and there is an increased risk of environmental contamination and public exposure due to spillage during transport.

Section 101(24) of CERCLA states that the remedy or remedial action "does not include off-site transport of hazardous substances or the storage, treatment destruction, or secure disposition off-site...unless such actions (a) are more cost-effective than other remedial actions, (b) will create new capacity to manage...hazardous substances..., or (c) are necessary to protect public health or welfare or the environment from a present or potential risk which may be created by further exposure to the continued presence of such substances or materials." This alternative is nearly twice as expensive as the incineration alternative 5 above, will create no new storage capacity, and is no more protective of public health or welfare or the environment than other remedial alternatives considered in the FS. Based on this reason, as well as those outlined in alternative 5 above, this alternative was dropped from further consideration.

ALTERNATIVE 7. EXCAVATE/TREAT AREAS A AND G, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

An estimated 2000 barrels and associated contaminated soil are excavated with backhoes from Area A and G for incineration on-site. Other contaminant sources remain, so an alternate water supply is constructed. The purpose of the alternative is to eliminate one major source area and reduce the potential for human ingestion of or contact with contaminants.

Excavation and incineration of wastes from Areas A and G only was judged to be a relatively costly and ineffective option. Although the wastes at this location may contribute to the contamination of both the area south of the landfill and the regional flow system, other waste sources are certainly involved in the regional contamination and may be involved in the contamination south of the landfill. Consequently, two major objectives, minimizing damage to the groundwater and protection of the environment will not be addressed. Alternative 7 was eliminated from further consideration.

ALTERNATIVE 8. EXCAVATE/REMOVE AREAS A AND G, ALTERNATVE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

The barrels and contaminated soil are excavated as for Alternative 7, but are removed to a secure landfill for disposal. The advantage of short implementation time must be weighed against higher cost and risk of environmental contamination and public exposure due to spillage during transport. A further disadvantage is that the wastes are not destroyed. Thus the weaknesses of Alternatives 6 and 7 remain, while the remedy also does not adequately protect public health since risk of human contact during transportation remains. This alternative was therefore dropped from further consideration.

ALTERNATIVE 9. EXCAVATE/TREAT AREAS A, G, AND H; ALTERNATE WATER SUPPLY; AND USE RESTRICTIONS; CONTINUED MONITORING

The wastes and contamined soil in Area H and the drums and contaminated soil in Areas A and G are excavated and incinerated. Contaminants currently in the groundwater and from other sources continue to migrate, so an alternative water supply is provided. The purpose of the alternative is to eliminate two major sources of contamination and reduce the potential for human contact with or ingestion of contaminants. Because this alternative satisfied to a degree a majority of the remedial objectives, it was retained for further evaluation.

ALTERNATIVE 10. EXCAVATE/REMOVE AREAS A, G, AND H; ALTERNATE WATER SUPPLY; LAND USE RESTRICTION; CONTINUTED MONITORING

The wastes and contamined soil in Area H and drums and contaminated soil in Areas A and G are excavated as for Alternative 9, but are removed to a secure landfill for disposal. The advantages of relatively short implementation time must be weighed against higher cost and the risk of environmental contamination and public exposure due to spillage during transport. A further disadvantage is that the wastes are not destroyed. This alternative does not minimize potential human contact, protect the environment, or minimize groundwater degredation (see Alternative 6). For these reasons, this alternative was dropped from further consideration.

ALTERNATIVE 11. REGRADE LANDFILL, CAP AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A clay cap, approximately 1.3 acres in area, is constructed over Area H. The primary purpose of the alternative is to limit potential human contact with contaminants and to reduce migration of contaminants from Area H to the groundwater and cattail marsh. In recognition of the fact that Area H may require a different surface barrier than the remainder of the landfill, this alternative was retained for further evaluation.

ALTERNATIVE 12. CAP ENTIRE LANDFILL, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A clay cap, approximately 21 acres in area, is constructed over the entire landfill, which is then revegetated to protect the cap. Diversion ditches around and across the site direct runoff to the cattail marsh and sphagnum bog. The primary purpose of this alternative is to reduce infiltration to the entire site, thus reducing migration of contaminants off-site. A secondary purpose is to reduce the potential for human dermal contact with contaminants. Because groundwater could still flow laterally into and out of the landfill, this alternative would not protect the environment or the groundwater and thus fails to meet two major objectives.

ALTERNATIVE 13. COMPLETE LANDFILL ENCAPSULATION, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A 4,200-foot slurry wall, ranging in depths from 20 to 130 feet, is constructed around the entire landfill. The enclosed area is covered with a surface seal, as described in Alternative 12. The primary purposes of this alternative are to significantly reduce infiltration to the entire landfill and to reduce groundwater movement into or out of the landfill, minimizing migration of contaminants from the site.

Alternate water supplies and land use restrictions are continued until such time, if ever, that the monitoring program indicates that all significant contamination beyond the boundaries of the landfill has been removed or dispersed by natural processes.

While this alternative would minimize future off-site migration of contaminants, it would not address the discharge into surface water of contaminants that have already migrated off-site. This alternative does meet most of the objectives specified, since contaminationn will not spread. It is far less cost effective than Alternative 20, however, since 20 presents substantially greater environmental protection for small additional costs. Because Alternative 20 does provide for treatment of the already contaminated groundwater off-site, it has substantially greater health and environmental benefits. The additional cost of implementing Alternative 20 over this alternative is small compared to the environmental effectiveness. This alternative was therefore eliminated in favor of the more comprehensive alternative 20.

ALTERNATIVE 14. GROUNDWATER EXTRACTION, REGRADE LANDFILL, CAP AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A groundwater extraction well (or wells) is installed in the axis of the bedrock trough, with a screened interval through the zone of coarse sediments, from approximately 60 to 120 feet in depth. The well is capable of pumping an estimated design requirement of

500 gallons per minute (gpm), or 0.72 million gallons per day (mgd). The extracted groundwater is treated either by an air stripping system (Option A) with carbon adsorption treatment of the contaminated airflow, or by direct carbon adsorption (Option B). Treated effluent is discharged directly to Hoyt Brook or Annabessacook Lake. The entire landfill is regraded and Area H is capped and revegetated as described for Alternative 11.

This alternative is a more complex version of Alternative 11, with the addition of an extraction well. The purpose of the well is to intercept the deep contamination migrating out of the landfill. A secondary purpose of the well is to intercept contaminated groundwater now downgradient of the landfill and migrating toward Annabessacook Lake. The well will enable this alternative to meet the objective of minimizing groundwater degredation. In addition, the pumping may be sufficient to affect the position of the groundwater divides east and south of the landfill, lessening the potential for migration of contaminants off-site to the east and south.

The estimated cost of Alternative 16 was about 50 percent greater than the estimated cost Alternative 14, which is within the range of accuracy (-50 to + 100 percent) of the estimates. The additional cost is for an extended slurry wall which would prevent migration of contaminants to the south and east. Because of the hydrogeologic complexity of the site, the added assurance of control provided by the extended cutoff wall included in Alternative 16 was judged to be a significant, cost-effective benefit. Alternative 14 was therefore eliminated in favor of Alternative 16.

ALTERNATIVE 15 - CUTOFF WALL AT SOUTHEAST END OF LANDFILL, GROUNDWATER EXTRACTION, REGRADE LANDFILL, CAP AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A 900-foot slurry wall, ranging from 30 to 50 feet in depth, is installed across the southeast end of the landfill. As in the case of Alternative 14, a groundwater extraction well is installed, the landfill is regraded, and Area H is capped and revegetated.

This alternative is a more complex version of Alternative 14, with the addition of a cutoff wall at the southeastern end of the landfill. The purpose of the cutoff wall is to provide a fixed local groundwater divide, assuring that contaminants are unable to migrate southward from the landfill. Alternate water supplies and land use restrictions are continued until the monitoring program indicates that contamination of areas east and south of the landfill is no longer a problem.

The estimated cost of Alternative 16 was about 25% greater than the estimated cost of Alternative 15, which is within the range of accuracy of the estimates. The additional cost is for extending the slurry wall to further prevent migration of contaminants to the east. Because of the hydrogeologic complexity of the site, the added assurance of control provided by the extended cutoff wall was judged to be a significant cost effective benefit. Alternative 15 was therefore eliminated in favor of Alternative 16.

ALTERNATIVE 16 - EXTENDED PARTIAL CUTOFF WALL, CAP AREA H, GROUNDWATER EXTRACTION, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A 4,700-foot slurry wall, ranging in depth from 10 to 90 feet, is constructed completely around the landfill and sphagnum bog, but is not constructed across the bedrock trough at the northeast tip of the landfill. A groundwater extraction well is installed as described for Alternative 14, with similar treatment options. Area H is capped and revegetated. This alternative fully satisfied remedial response objectives 1, 2 and 4 on pages 16 and 17. It only partially satisfied objective 3, to minimize the potential for discharge of contaminants to surface waters, however, because discharge of contaminants to the bog from shallow dispersed sources in the landfill is only minimally prevented. Because this alternative satisfied a majority of the remedial objectives, however, it was retained for further evaluation.

ALTERNATIVE 17 - EXCAVATE/TREAT AREAS A, G, and H; CUTOFF WALL AT SOUTHEAST END OF SITE; GROUNDWATER EXTRACTION; ALTERNATE WATER SUPPLY; LAND USE RESTRICTIONS; CONTINUED MONITORING

The wastes and contaminated soil in Area H and the drums and contaminated soil in Area A and G are excavated and incinerated onsite, as for Alternative 9. A 900-foot slurry wall is constructed across the southeast end of the site, and a groundwater extraction well is installed as described for Alternative 15.

This alternative combines the attributes of Alternative 9 with an extraction well and cutoff wall. The major source of contaminants at the site are excavated for treatment. The cutoff wall across the southeast end of the site constitues a local groundwater divide, further protecting areas to the south of the landfill, as in Alternative 15. Alternate water supply is continued until monitoring indicates that areas around the landfill are free of significant contamination. Alternatives 17 and 19 involve excavation and incineration of wastes from the site; both include groundwater extraction/treatment and a cutoff wall. The differences in the alternative are that (1) Alternative 17 include a cutoff wall only along the southeast edge of the landfill, whereas Alternative 19 includes an extended wall that acts as a "bag," (2) Alternative 17 involves excavation and incineration of wastes from Area H and Areas A and G, whereas alternative 19 incinerates the waste from Area H only, and (3) the estimated cost of Alternative 19 is about 11 percent greater than the estimated cost of Alternative 17.

As with Alternative 15, however, Alternative 17 does not fully minimize the potential for discharge of contaminants from shallow dispersed sources within the landfill to the sphgagnum bog. There are potential adverse environmental and public health impacts associated with this alternative, including the possibility of unacceptable air emissions and the possibility of direct human contact during excavation prior to incineration.

The added assurance of groundwater control provided by the extended cutoff wall was judged to be a significant, cost-effective benefit of Alternative 19 when compared to this alternative. Excavation and incineration of waste from Areas A and G was judged to be unnecessary if the extended cutoff wall and groundwater extraction system were in place. Alternative 17 was therefore screened from further consideration and Alternative 19 was retained for detailed evaluation.

ALTERNATIVE 18 - EXCAVATE/REMOVE AREAS A,G, AND H; CUTOFF WALL ACROSS SOUTHEAST END OF SITE; GROUNDWATER EXTRACTION; ALTERNATE WATER SUPPLY; LAND USE RESTRICTIONS; CONTINUED MONITORING

This alternative is identical to Alternative 17, with the exception that the excavated material is not incinerated but is transported offsite to a secure landfill for disposal. The advantage of relatively short implementation time must be weighed against higher cost and the increased risk of environmental contamination and public exposure due to possible spills during transport. An additional disadvantage is that the wastes are only removed, not destroyed. This remedy therefore does not minimize the potential direct human contact and does not minimize the potential for discharge of contaminants from shallow dispersed sources within the landfill to the sphagnum bog. For these reasons, this alternative was eliminated.

ALTERNATIVE 19 - EXTENDED PARTIAL CUTOFF WALL; EXCAVATE/TREAT AREA H; GROUNDWATER EXTRACTION; ALTERNATE WATER SUPPLY; LAND USE RESTRICTIONS; CONTINUED MONITORING

This alternative is identical to Alternative 16, except that Area H is excavated and treated (incinerated) onsite rather than capped. This alternative fully satisfied remedial response objectives 1, 2 and 4 on pages 16 and 17. It only partially satisfied objective 3, to minimize the potential for discharge of contaminants to surface waters, however, because discharge of contaminants to the bog from shallow dispersed sources in the landfill is only minimally prevented. Because this alternative satisfies the remedial response objectives to protect public health, welfare, and the environment, however, it was retained for further considerations.

ALTERNATIVE 20 - COMPLETE LANDFILL ENCAPSULATION; GROUNDWATER EXTRACTION; ALTERNATE WATER SUPPLY; LAND USE RESTRICTIONS; CONTINUED MONITORING

This alternative is a combination of Alternative 13 (encapsulation), with a groundwater extraction and treatment system. The primary purposes of this alternative was (1) to significantly reduce the infiltration to the entire landfill and groundwater movement into or out of the landfill, and (2) to intercept and treat contaminated groundwater beyond the boundaries of the site in the bedrock trough. In this way, all objectives would be met.

By contrast with the other alternatives which employ extraction and treatment, Alternative 20 uses extraction primarily to capture contaminants already offsite to the northeast. The extraction system also provides additional assurance that any leaks from the containment to the trough will be controlled. Because this alternative satisfies the remedial response objectives, it was retained for further consideration.

Detailed Evaluation of Remaining Alternatives

The six remaining remedial alternatives are No. 4, 9, 11, 16, 19 and 20. Note that all the components of Alternative 4 are included in the other 5 alternatives. These six remedial alternatives which survived the screening process are described and evaluated in detail in the FS. The National Contingency Plan [40 C.F.R. 300.68(1)] requires that the evaluation include the following features:

a) refinement and specification of alternatives in detail, with emphasis on use of established technology;

b) detailed cost estimation, including distribution of costs over time;

c) evaluation in terms of engineering implementation, or constructability;

d) an assessment of each alternative in terms of the extent to which it is expected to effectively mitigate and minimize damage to, and provide adequate protection of, public health, welfare, and the environment, relative to the other alternatives analyzed; and

e) an analysis of any adverse environmental impacts, methods for mitigating these impacts, and costs of mitigation.

Table 8-2 summarizes the technical comparison of the six alternatives, i.e. engineering implementation, operation and maintenance. Table 8-3 summarizes the comparison of the effects of the six alternatives i.e. effects upon public health, welfare and the environment, and any adverse environmental impacts. The costs for the six alternatives are summarized in Table 8-13.

The six alternatives went through the detailed analysis as follows:

ALTERNATIVE 4. ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

Municipal water is supplied to residents of Areas 1 and 2, Area H is restricted, and groundwater withdrawals and excavation are prohibited or restricted in and adjacent to the site. Monitoring is performed to detect any deterioration of conditions which might dictate the need for additional remedial actions, or an improvement of conditions which might allow reduction in the level of restriction. The primary purpose of the alternative is to provide uncontaminated water to residents and to limit the potential for inadvertent human ingestion of or contact with contaminants.

Alternative 4, at a present worth of $600,000, is relatively inexpensive when compared to the other remaining alternatives. It is a proven technology that is easily implemented in approximately four months. Implementation of this alternative would not have adverse environmental impacts.

Alternative 4 does protect public health by providing an uncontaminated water supply to residences whose groundwater residential wells are contaminated or may potentially be contaminated. It does not, however, minimize the potential for human contact with wastes in the landfill, minimize the potential for discharge of contaminants to surface water, or minimize the further degredation of the groundwater.

This alternative was therefore eliminated because it does not provide protection of public health or the environment relative to other considered alternatives.

Table 8-2
TECHNICAL COMPARISON OF REMEDIAL ALTERNATIVES

Alternative	Proven Technologies?	Routinely Used?	Construction Difficulty	Construction Months	Operation and Maintenance Difficulty	Operation and Maintenance Time	Special Technical Problems	Additional Studies Required	Primary Response Objectives Met	Effectiveness of Response in Meeting Primary Objectives
Infrastructural and Institutional (4)	Yes	Yes	Low	4	Low	Long	None.	None.	1, 2.	Highly effective, depending on citizen cooperation and effectiveness of regulatory authorities.
Incineration (9)	Yes	No	High	8	High	Short	Potential for continuous adjustment of operating practices to meet performance objectives.	None.	1, 2, 5.	Highly effective; eliminates both major shallow contaminant sources.
Surface Control (11)	Yes	Yes	Low	4	Low	Long	None.	None.	1, 2.	Highly effective; controls one major shallow contaminant source.
Control and Pumping (16B)	Yes	Yes	Medium	5	Medium	Potentially Very Long	Treatability of DMF, THF. Potential prolonged operation of pumping and treatment system.	Slurry wall compatibility. Pumping testing and monitor wells in deep aquifer. Treatability testing of groundwater.	1, 2, 3, 4, 6, 7.	Highly effective if treatability problem solved; controls both major shallow contaminant sources and captures and treats major deep contaminants.
Incineration, Control, and Pumping (19B)	Yes	Some	Medium	8	High	Potentially Very Long	Constant adjustment of incinerator operating practices to meet performance objectives. Treatability of DMF, THF. Potential prolonged operation of pumping and treatment system.	Slurry wall compatiability. Pump testing and monitor wells in deep aquifer. Treatability testing of groundwater.	1, 2, 3, 4, 6, 7.	Very highly effective if treatability problem solved; eliminates one major shallow contaminant source, controls another, and captures and treats major deep contaminants.
Encapsulation (20) and Pumping	Yes	Yes	High	6	Low	Long	Great depth of excavation. Unfavorable soil properties. Keying of deep segments into bedrock. Fractured bedrock. Treatability of DMF, THF.	Slurry wall compatibility. Pump testing and monitor wells in deep aquifer. Treatability testing of groundwater.	1, 2, 3, 4, 5, 6, 7.	Very highly effective, controls all major contaminant sources, captures and treats major deep contaminants.

Note that all alternatives incorporate all components of the I&I Alternative (Number 4).

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Table 8-3
SUMMARY COMPARISON OF EFFECTS OF REMEDIAL ALTERNATIVES

Alternative	Primary Response Objectives Met	Major Effects Upon Public Health and Welfare: Beneficial	Major Effects Upon Public Health and Welfare: Adverse	Major Effects Upon the Environment: Beneficial	Major Effects Upon the Environment: Adverse	Inadequacies of Alternative
*Infrastructural and Institutional (4)	1,2	Greatly reduces potential for human contact with contaminants, especially in potable water in Areas 1 and 2.	Severely restricts land uses, esp. groundwater use, mining, other excavations. Prohibits continued occupation or use of Area H.	None.	None.	Does not remove or control contaminant sources or offsite contamination.
Incineration (9)	1,2,5	Eliminates potential for human contact with contaminants in and around Area H. Decreases potential for human contact south of landfill.	Temporary increase of exposure risk during excavation and incineration. Temporary abandonment of transfer station. Emissions from incinerator.	Eliminates source of discharge to cattail marsh. Eliminates some sources for bog, south flow system, deep flow system, Annabessacook Lake.	Temporary risk of increased migration to marsh, bog during excavation. Leaching from stockpile.	Does not remove or control deep and/or dispersed contaminants or offsite contamination.
Surface Control (11)	1,2	Reduces potential for human contact with contaminants in and around Area H. Slightly reduces potential for contact in remainder of landfill.	Temporary dust and noise. Temporary abandonment of transfer station.	Reduces potential for discharge to cattail marsh. Reduces potential for exposure and transport of contaminants by erosion.	Potentially alters water balance of bog.	Does not remove or control Areas A & G, deep and/or dispersed contaminants, offsite contamination.
Control and Pumping (16B)	1,2,3, 4,6,7	Greatly reduces potential for human contact with contaminants throughout the site and offsite. May allow relaxation of land use restrictions (Alternative 4).	Major, temporary increase in dust and noise. Substantial temporary interruption of normal residential traffic. Temporary, slightly increased risk of exposure to contaminants. Aesthetic effects of treatment facility.	Greatly reduces potential for discharge of contaminants to most of the environment of the site. Permanently removes some deep contaminants from beneath landfill and in trough.	Potentially alters water balance of surface waters nearby, except Annabessacook Lake. Destruction of some forested areas.	Does not control or remove potential unidentified, shallow, dispersed sources discharging to bog.

Table 8-3
SUMMARY COMPARISON OF EFFECTS OF REMEDIAL ALTERNATIVES
(Continued)

Alternative	Primary Response Objectives Met	Major Effects Upon Public Health and Welfare		Major Effects Upon the Environment		Inadequacies of Alternative
		Beneficial	Adverse	Beneficial	Adverse	
Incineration, Control, and Pumping (19B)	1,2,3, 4,6,7	Same as 16B, but even more beneficial because destroys a major shallow waste source (Area H).	Same as 16B, but greater increase of risk of exposure to contaminants because of excavation of Area H.	Same as 16B, but added benefit in cattail marsh and bog from destruction of waste in Area H.	Same as 16B, but also temporary risk of migration to marsh and bog during excavation. Leaching from stockpile.	Same as 16B.
Encapsulation and Pumping (20)	1,2,3,4, 5,6,7	Greatly reduces potential for human contact with contaminants throughout the site and offsite. May allow relaxation of land use restrictions (Alternative 4).	Major, temporary increase in dust and noise. Interruption of normal residential traffic. Temporary increased risk of exposure to contaminants. Temporary abandonment of transfer station. Aesthetic effects of treatment facility.	Greatly reduces potential for discharge of contaminants to entire environment of site. Permanently removes some deep contaminants in trough.	Destroys at least 2 acres of bog. Potentially alters water balance of bog. Potentially alters water balance of surface waters nearby, except Annabessacook Lake. Destruction of some forested areas.	None.

*Effects of the I&I Alternative (Number 4) apply to all other alternatives as well, except where noted.

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Table 8-13
SUMMARY COST COMPARISON

Alternative	Capital Cost[a]	Annual O&M Cost[a]	Present Worth[b]
Infrastructural & Institutional (4)	$347,000	$22,200	$557,000
Incineration (9)	$8,330,000	$22,200	$8,540,000
Surface Control (11)	$1,010,000	$41,000	$1,400,000
Control and Pumping (16B), Option 1	$4,070,000	$365,000	$7,510,000
Control and Pumping (16B), Option 2	$5,230,000	$1,490,000	$19,200,000
Incineration, Control, and Pumping (19B), Option 1	$11,100,000	$365,000	$14,600,000
Incineration, Control, and Pumping (19B) Option 2	$12,300,000	$1,490,000	$26,300,000
Encapsulation and Pumping (20), Option 1	$10,240,000	$365,000	$13,680,000
Encapsulation and Pumping (20), Option 2	$11,395,000	$1,490,000	$25,399,000

[a]All cost estimates are Order-of-Magnitude level estimates, i.e., the cost estimates have an accuracy of -50 to +100 percent; see text.

[b]Present worth based on a 30-year period at 10 percent interest.

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ALTERNATIVE 9. EXCAVATE/TREAT AREAS A, G, AND H; ALTERNATE WATER SUPPLY; LAND USE RESTRICTIONS; CONTINUED MONITORING

The wastes and contaminated soil in Area H and the drums and contaminated soil in Areas A and G are excavated and incinerated. Contaminants currently in the groundwater and from other sources continue to migrate, so an alternative water supply is provided. The purpose of the alternative is to eliminate two major sources of contamination and reduce the potential for human contact with or ingestion of contaminants.

Excavation of buried hazardous materails (solid waste, drums, contaminated soil) is a reliable, established technology in routine use throughtout the United States. Excavation of wastes (from Area H and Areas A and G) at the Winthrop site is not expected to pose any special technical difficulties. Safety and drainage control protocols for this type of operation are also established and in widespread use.

Problems exist with incineration, however, as compared with other techniques. The incinerator and associated facilities require a highly trained, dedicated staff and a high degree of mechanical attention throughout the period of operation. Moreover, because knowledge of the characteristics of the potential waste stream from the landfill can only be derived from monitoring information peripheral to the landfill, from documentary evidence, and from eyewitness reports, the exact nature of the waste stream is unknown and unpredictable incineration difficulties may occur. The amount of time, expense, and difficulty associated with this alternative in uncertain.

Potential adverse environmental impacts of this alternative are the possibility of unacceptable air emissions during incineration and the need to transport and dispose of the ash remaining after incineration.

Other adverse effects associated with the alternative include the possibility of human contact during excavation and stockpiling prior to incineration, and the possibility of release of contaminants to the environment during excavation and stockpiling.

This alternative will do nothing to remove or control contamination which is dispersed throughout the landfill or which has migrated off-site. Consequently, contamination of the deep sediments in the bedrock trough will persist, allowing continued endangerment to the environment through potential contamination of Annabessacook Lake, and degradation of groundwater resources. In addition, any shallow dispersed sources of contamination in the landfill will continue to pose a potential threat to the sphagnum bog.

This alternative was eliminated on the basis that it does not adequately meet the response objective for protection of public health, welfare and the environment relative to the other alternatives (40 C.F.R. §300.68(i)(2)(d), and may have adverse environmental impacts (40 C.R.F. §300.68(i)(2)(e)).

ALTERNATIVE 11. REGRADE LANDFILL, CAP AREA H, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

A clay cap, approximately 1.3 acres in area, is constructed over Area H. The primary purpose of the alternative is to limit potential human contact with contaminants and to reduce leaching of contaminants from Area H into the groundwater and cattail marsh.

Regrading, capping, and revegetation are proven technologies in routine use throughout the world, and will present no special difficulties at the Winthrop site. The Surface Control Alternative is not physically or mechanically complex, can be rapidly implemented with standard construction equipment, and will pose minimal danger to workers and residents during construction. Reliabililty is very high with proper maintenance.

Adverse environmental effects of regrading and capping are likely to be minimal and limited to the short term. These effects are generally associated with the traffic of heavy equipment and construction materials: noise and dust, interruption of the normal flow of residential traffic. The response will also require the abandonment of the transfer station at the south end of the landfill. Another potential adverse effect of this alternative is to alter the water balance of the sphagnum bog by increasing the runoff of surface water from the landfill to the bog. This impact could be mitigated by implementing drainage controls to direct excess runoff to Hoyt Brook or Annabessacook Lake.

Regrading the landfill and capping Area H will be effective in minimizing the potential for human contact with the contaminants. It will retard discharge of contaminants from Area H to the cattail marsh, sphagnum bog and deeper aquifer.

Alternative 11 will do nothing to control contaminant sources other than Area H or to control contaminants which have already migrated off-site. Consequently, contamination in the bedrock and to the south of the landfill will persist, allowing continued potential contamination of Annabessacook Lake and degradation of groundwater resources. In addition, any shallow dispersed sources of contamination in the landfill will continue to pose a potential threat to the sphagnum bog.

This alternative was eliminated on the basis that it does not adequately meet the responsible objectives for protection of public health, welfare and the environment relative to the other alternatives (40 C.F.R. §300.68(i)(2)(d)), and may have adverse environmental impacts (40 C.F.R. §300.68(i)(2)(3)).

ALTERNATIVE 16. EXTENDED PARTIAL CUTOFF WALL, CAP AREA H, GROUNDWATER EXTRACTION, ALTERNATE WATER SUPPLY LAND USE RESTRICTIONS, CONTINUED MONITORING

A 4,700-foot slurry wall, ranging in depth from 10 to 90 feet, is constructed completely around the landfill and sphagnum bog, but is not constructed across the bedrock trough at the northeast tip of the landfill. A groundwater extraction well is installed as described for Alternative 14, with similar treatment options. Area H is capped and revegetated.

This alternative will be highly effective in meeting most of the remedial response objectives. The alternative does not fully minimize the discharge of contaminants to the sphagnum bog as the alternative includes only minimal means (regrading) to limit potential migration of contaminants into the bog from shallow sources in the bulk of the landfill. This alternative may also have adverse environmental impacts from destruction of some portion of the wetlands during construction of the slurry wall.

There is also some uncertainty in the constructability of a slurry wall at the depths required by this alternative. The alternative allows the discharge of contaminants to the sphagnum bog from any unidentified shallow dispersed sources outside Area H in the landfill. Thus Alternative 16 was eliminated due to the adverse environmental impacts and uncertainty associated with its implementation 40 C.F.R. §300.68 (i)(2)(C and E) and due to its failure to protect the environment by minimizing the discharge of contaminants to the bog.

Because this alternative is effective in meeting the remedial response objectives for protection of public health, welfare, and the environment with the exception of minimizing contaminant migration to the bog, and because it may be easily modified to limit the adverse environmental impacts and provide even greater protection, a revised version of Alternative 16 was considered and is discussed on pages 36 and 37.

ALTERNATIVE 19. EXTENDED PARTIAL CUTOFF WALL, EXCAVATE/TREAT AREA H GROUNDWATER EXTRACTION, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

This alternative is identical to Alternative 16, except that Area H is excavated and treated (incinerated) onsite rather than capped.

Problems associated with effects to construction on the wetlands remain. In addition the discharge to contaminants to the sphagnum bog from any identified shallow dispersed sources in landfill is only minimally prevented. The destruction of the major shallow waste source (Area H) permanently eliminates this waste, rather than controlling it. The problems associated with incineration of mixed municipal wastes, as described under Alternative 9 above, remain. At a present worth of $14.6 million, this alternative is twice as expensive as Alternative 16, and provides no greater protection against the offsite migration of contaminants from areas other than Area H. For this reason, as well as those reasons described in Alternatives 9 and 16 above, this alternative was eliminated.

ALTERNATIVE 20. COMPLETE LANDFILL ENCAPSULATION, GROUNDWATER EXTRACTION, ALTERNATE WATER SUPPLY, LAND USE RESTRICTIONS, CONTINUED MONITORING

This alternative is a combination of Alternative 13 (encapsulation), with a groundwater extraction and treatment system. The primary purposes of this alternative are (1) to signficantly reduce infiltration to the entire landfill and groundwater movement into or out of the landfill and (2) to intercept and treat contaminated groundwater beyond the boundaries of the site in the bedrock trough.

Alternative 20 was eliminated due to the questionable constructability of the cutoff wall at the depth required in this alternative and adverse environmental effects associated with installation in the wetlands. The cutoff wall would need to be keyed into bedrock in places at depths greater than 100 feet. Further construction difficulties would be present in some areas due to extreme coarseness of some of the native materials and their tendency to enter the slurry trench. The fractured bedrock surface beneath the site will limit the effectiveness of the encapsulation in controlling deep migration of contaminants. The construction of the cutoff wall will result in the destruction of at least two acres of the bog. There is also a potential for alternation of the water balance in the remaining portion of the bog due to increased runoff.

Summary of Detailed Evaluation

In all of the alternatives involving groundwater treatment there is the issue of the treatability of two of the contaminants, DMF and THF. Pending the results of the treatability study, a conservative approach was presented in the FS to evaluate the treatment strategy. A conclusive treatability study to be done during design was considered an essential addition to any remedial action involving groundwater treatment.

Because none of the above alternatives fully satisfies all of the remedial response objectives defined on pages 15 and 16 to adequately protect public health, welfare and the enviroment, several modifications of Alternative 16 were proposed after the completion of the FS. These modifications were made to address the following response objectives and other criteria for evaluationnn of remedial alternatives which were inadequately addressed by Alternative 16.

1) To minimize the potential for future discharge of contaminants to Annebessacook Lake, the sphagnum bog, the cattail marsh, and Hoyt Brook (response objective).

2) To minimize further degradation of groundwater resources (response objective).

3) To attain the public health and environmental standards contained in other relevant and applicable federal statutes (EPA policy).

4) To limit the adverse environmental impacts of Alternative 16, and assure its engineering implementation and constructability (criteria in the NCP, 40 C.F.R. §300.68(i)(2)).

The proposed modifications of Alternative 16 are described below:

1) Elimination of the slurry wall. The slurry wall was eliminated because of its potential adverse impacts on the wetlands and its questionable constructability at the required depths (criteria in the NCP). The purpose of the slurry wall, to limit offsite migration, could be accomplished by extension of the groundwater extraction system without adverse environmental impacts.

2) Upgrading of the landfill cover. A clay cap is proposed for the entire landfill including a vegetative layer, a first protection and drainage layer, a hydraulic barrier, and provisions for gas control. This cap will minimize the migration of contaminants to the surface waters and will minimize further degredation of the groundwater (response objectives). An additional less permeable layer is to be installed over Area H to further minimize the migration of leachate into the cattail marsh. This cap shall be consistent with RCRA 40 C.F.R. §264.310(a) (EPA policy).

3) Alternate Concentrations Limit (ACL) demonstration. A demonstration for each constituent found in the groundwater will be made to determine the effect of each contaminant on the lake, brook, and wetlands, and on the human receptors who use these surface waters for fishing and swimming. The ACL demonstration will not include drinking water effects since the groundwater use restrictions will be in place. This demonstration will indicate the need for, type and extent of groundwater extraction and treatment. It will minimize the potential for future discharge of contaminants to surface waters by establishing definite limits to the levels of contaminants above which further remedial action, groundwater extraction and treatment, will be taken (response objective).

4) Other additional studies. Additional studies will be added to Alternative 16 to enhance its design and proper engineering implementation. These studies include seismic work to define the full extent of the bedrock trough, lake sediment sampling and analysis, groundwater treatability studies, and development of a plan to mitigate the effects of construction of the remedy upon the wetlands.

For purposes of further discussion, the modifications of Alternative 16 as described above shall be referred to as Alternative 16(II). Alternative 16(II) satisfies all of the remedial response objectives, all of the criteria in the NCP, and EPA policy.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

Current EPA policy is that Feasibility Studies should consider relevant and applicable environmental laws and and regulation as the measure that used to determine the adequacy of remedial actions. The Winthrop Feasibility Study did not consist of full compliance alternative that also satisfied the criteria in the NCP, 40 C.F.R. §300.68(i)(2). In concept Alternative 20, total encapsulation with groundwater treatment would comply with RCRA, but would also have adverse environmental impacts upon the environment (40 C.F.R. §300.68(i)(2)(e) and doubtful reliability (40 C.F.R. §300.68(i)(2)(c).

The Alternative 1(II), which combines portions of screened alternatives, is being proposed as the implementation alternative consistent with RCRA. This alternative includes full RCRA site closure and groundwater extraction and treatment. This alternative also mitigates in a cost effective manner the present and potential adverse impacts to the surrounding wetlands. The laws and regulations that are applicable to proposed alternative are as follows:

- Resource Conservation and Recovery Act (RCRA), Part 264.
- Executive Order 11990 (Wetlands) and 11988 (Floodplains) and

  Guidance outlined under 40 C.F.R. Part 6, Appendix A.
- Clean Water Act
- Clean Air Act
- Safe Drinking Water Act

The following Federal and State laws, local laws and guidances are applicable to the proposed alternative:

- State Water Quality Standards
- Pretreatment Standards for Discharge into Publicly Owned Treatment Work
- Federal Ambient Water Quality Criteria
- Health Advisories
- EPA Groundwater Protection Strategy

The Alternative 16(II), which combines portions of screened alter natives, is being proposed as the implementation alternative that is consistent with RCRA. This alternative includes full RCRA site closure and groundwater extraction and treatment. This alternative also mitigates in a cost effective manner the present and potential adverse impacts to the surrounding wetlands.

The proposed alternative will include site closure, capping and post closure care accordance with 40 C.F.R. Part 264 Subpart G, F, and N.

Specifically the cap will be designed in accordance with Section 264.310(a) to:

1. Provide long term minimization of infiltration of liquids through the closed landfill;

2. Function with minimum maintenance;

3. Promote drainage and minimize erosion or abrasion of the cover;

4. Accomodate settling and subsidence so that the cover's integrity is maintanined;

5. Have a permeability less than or equal to the permeability of any bottom liner or subsurface soils.

The cap installation will be performed as specified in §264.303. The landfill will be surveyed and a notice placed in the deed and to the local land authority as specified in §264.119 and §264.120.

The applicable closure requirements in §264 Subpart G will be addressed. Decontamination/disposal of equipment, certification by a professional engineer, and site security will be provided as specified in §264.114 - §264.117. Post-closure care and groundwater monitoring in accordance with 40 C.F.R. Subparts F and G and Subpart N, §264.310(b) will be provided RCRA regulations, §264 Subpart F groundwater protection require the establishment of a groundwater protection standard. The standard is established according to §264.94(a) at: background, maximum contaminant levels (MCLs) or ACL. ACLs are site specific limits that are protective of public health and the environment. The requirements for an ACL are in §264.94(b). If an ACL is exceeded at the site, corrective action must be expeditiously implemented. Due to the lack of information regarding the extent of contaminant migration within the bedrock trough, further hydrogeoligic information needs to be generated concurrent with the groundwater interceptor and treatment system design. The time to perform the treatability study, and further hydrogeologic analysis will allow concurrent ACL establishment. Quarterly groundwater monitoring must be performed specified in §264 Subpart F.

Wetlands/Floodplains Impacts

An assessment of wetland and floodplain impacts was performed and is appended to the EDD. This assessment recommended that specific mitigation measures be implemented. The assessment concluded that the overall effects of this remedial action on the wetlands would be beneficial, and that the adverse effects associated with the cap could be minimized through careful planning and construction. As part of the recommended alternative, an engineering study will be performed during remedial design to determine how the mitigation will be undertaken.

Other Laws

Annebessacook Lake is classified as a "Great Pond" and is therefore not able to receive the discharge of treated water under Maine's water quality standards. The recommended alternative will therefore consider various additional discharge options including discharge to Hoyt Brook, and discharge to the Winthrop sewer system. The final discharge point of treated groundwater will be selected during remedial design. The following standards will be used to evaluate the discharge options:

a) Underground Injection Control (UIC) Regulations

b) State Water Quality Standards

c) National Pollutant Discharge Elimination System

d) Pretreatment Standards (for discharge to a publicly owned treatment works)

COMMUNITY RELATIONS

On March 13, 1985, the EPA held a public hearing in Winthrop, Maine to receive comments on the remedial investigation and feasibility study for the Winthrop Site. Comments were received from Inmont Corporation, the Winthrop Landfill concerned Citizens Action Group, Representatives of U.S. Senators Mitchell and Cohen and U.S. Congressman McKernan, the Maine DEP, the Maine Department of Human Services, the Annabessacook Lake Improvement Association, the Cobbossee Watershed District, the Winthrop Conservation Commission, the National Resources Council of Maine, and five individuals.

Regarding the selection of a remedial alternative for the site, the speakers desire fencing of the site and excavation of drums. They want the landfill covered, but differ as to the exact placement and type of cap.

They requested that prior to the selection of a containment wall, further data be provided on the extent and characteristics of bedrock at the south end of the landfill, and on the compatibility of contaminants found at Winthrop with proposed walls. Before they evaluate the extraction and treatment alternative, speakers desire more information on ground flow, levels of groundwater contaminants, and the specific location of treated groundwater discharge. Major concerns raised regarding proposed water ans wastes treatment alternatives are that incineration and air stripping may adversely effect human health (air pollution), and that incineration is largely an untested technology which would be used at this site on an uncharacterized waste stream.

Six speakers (including one PRP) proposed their own alternatives for cleanup of the landfill. The majority endorsed a phased approach to site cleanup, in which results of an initial sampling or remedial measure that located signficiant contamination and/or determined a risk to human health or the environment would trigger a subsequent phase of remediation. Most of these alternatives incorporated some combination of technologies described in the FS report.

Most participants stated that the Endangerment Assessment is inadequate and unacceptable. They stated that the Assessment lacked data on the impacts of contaminants upon biota and human health, that it did not define the extent of contamination that poses a risk to health or the environment, and that it did not cite specific data regarding risks from contract with various media at the site. Several speakers would like EPA to allow more state and local agency supervision of the cleanup process. They emphasized that they strongly support a cleanup and not a mere containment of waste at the landfill.

RECOMMENDED ALTERNATIVE

Section 300.68(j) of the National Contingency Plan (NCP) states that the appropriate extent - of remedy shall be determined by the lead Agency's selection of the alternative that is technologically feasibile and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare and the environment. Based on the evaluation of the RI/FS, the comments from Inmont Corporation, EPA policy and guidance, and comments from the public, local officials and the state of Maine, EPA has determined and the ME DEP has agreed that the following remedy meets the NCP criteria for evaluation of alternatives, satisfies all of the remedial objectives, and is consistent with other relevant and applicable environmental laws:

1. Extension of alternate water supply;

2. Fence and landfill use control;

3. Groundwater use control in Areas 1,2, and 3;

4. Excavation control in the landfill and Areas 1,2, and 3;

5. Monitoring Program;

6. Landfill cap and site closure;

7. Engineering studies;

8. Establishment of ACL, and if the ACL is exceeded;

9. Groundwater Interceptor System; and

10. Groundwater Treatment System.

OPERATION AND MAINTENANCE

Operation and maintenance for the recommended alternative is estimated at $42,000 per year if the ACL is not exceeded. Costs include sampling, analysis, and cap maintenance. Inmont and the Town have agreed to do long term operation and maintenance, and their respective responsibilities are outlined in Appendix A of the Consent Decree.

Should the ACL be exceeded, operation and maintenance of the groundwater extraction and treatment system, along with the monitoring and cap maintenance, will cost between $360,000 and $1,480,000 per year, depending upon the method used to treat the contaminants. In any event, under the terms of the Consent Decree Inmont and the town will be providing the operation and maintenance.