Health Assessment for

HELEN KRAMER LANDFILL

MANTUA TOWNSHIP, NEW JERSEY

CERCLIS NO. NJD980505366

APRIL 2, 1987

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

DEPARTMENT OF HEALTH & HUMAN SERVICES

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Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date APR 0 2 1987

From Environmental Engineer
Environmental Engineering Branch

Subject Health Assessment: Helen Kramer Landfill NPL Site (SI-87-026), Mantua Township, Gloucester County, New Jersey

To Mr. William Q. Nelson
Public Health Advisor
EPA Region II

Through: Director, Office of Health Assessment
Health Assessment Coordination Activity, OHA
Acting Chief, Environmental Engineering Branch

EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA), Region II, has requested that the Agency for Toxic Substances and Disease Registry (ATSDR) perform a health assessment of the subject site based on the Remedial Investigation (RI) Report, the Feasibility Study (FS), and the Record of Decision (ROD). We conceptually agree with the selected remedial alternative, since further migration of selected site contaminants into the air, surface, and groundwater should be minimized to reduce the potential public health threat.

SITE DESCRIPTION AND BACKGROUND

The Helen Kramer Landfill, a National Priority List site, is located in Mantua Township, Gloucester County, New Jersey, approximately one-quarter mile east of the residential community of Centre City. The site encompasses a 66-acre refuse area with three leachate collection ponds, an 11-acre stressed vegetation area, and a 3-acre wetland area located east-southeast of the center of the landfill.

The site is bounded on the north by a farmhouse and several occupied trailers, one located less than 100 feet north of the landfill. Beyond this area lies Jessups Mill Road, off which lie several residences to the

east and west. A stream known as Edwards Run essentially forms the eastern boundary and appears to drain most of the site. Edwards Run is primarily used for recreation and irrigation. Hidden Acres Township Park lies along Edwards Run about 4000 feet downstream of the landfill. Edwards Run continues on for 2.8 miles and flows into Mantua Creek, which is a tributary of the Delaware River. The southern portion of the site is bounded by Boody Mill Road off of which lie three trailers, two of which are occupied. The western boundary of the site is formed by a row of trees and brush and an open trench constructed to interrupt gas migration. West of the fence line is an 88-acre vegetable farm and two residences.

The Helen Kramer Landfill site was originally operated as a sand and gravel pit. The site became an operating landfill between 1963 and 1965, during which time landfilling was occurring simultaneously with sand excavation. Several types of wastes were deposited at the landfill during nearly 20 years of operation. These included municipal waste, septage, industrial wastes, and hospital wastes. Industrial wastes included sludges, waste oils, solvents, chemical intermediates, pesticides, plasticizers, acids and bases, heavy metals, catalysts, and paints and pigments; the bulk of these waste was disposed of without containment directly onto the landfill. Exposed hospital wastes were observed in several locations over the site; because of these sightings, related materials, including radioactive materials, are also suspected to be present.

DOCUMENTS REVIEWED

Remedial Investigation and Feasibility Study Final Report, Helen Kramer Landfill Site, Mantua Township, Gloucester County, New Jersey, prepared by R.E. Wright Associates, Inc., dated September 1986.

Record of Decision, Remedial Alternative Selection, for the Helen Kramer Landfill, Mantua Township, New Jersey, dated September 27, 1985, prepared by the Environmental Protection Agency, Region II.

CONTAMINANTS

The remedial investigations characterized current on-site contamination to consist primarily of organic compounds, pesticides, and heavy metals. Because there is some evidence that hospital wastes have been disposed in the landfill, contamination from radioactive material is possible although it has not been documented by the Geiger counter measurements taken around the site.

HUMAN EXPOSURE PATHWAYS

Under the no action alternative, the predominant potential human exposure pathways are ingestion of contaminated ground and surface water, inhalation of contaminated vapors, and direct contact with contaminated wastes, or soil. Bio-accumulation of contaminants in fish from Edwards Run has not been characterized, and therefore, the potential for human exposure through ingestion of contaminated fish tissue cannot be assessed.

ENVIRONMENTAL EXPOSURE PATHWAYS

Under the no action alternative, the potential and predominant environmental exposure pathways include contaminated air (i.e., landfill emissions, fugitive dust), surface water, groundwater, and soil.

DISCUSSION

Groundwater

The Mount Laurel/Wenonah Formation, a medium sand, underlies the site and ranges in thickness from 0 to 65 feet. Under the landfill the Mount Laurel, in easterly direction, thins and eventually truncates at Edwards Run causing a significant reduction in transmissivity. A reduction in permeability also occurs due to the predominance of fine-grained soils in the stream valley alluvium. Both of these characteristics cause a portion of the groundwater in the Mount Laurel at the site to flow through the alluvial valley and the remaining portion to leach out at the eastern toe of the landfill in 25 to 30 locations. As a result, there is a continuous

discharge of contaminated leachate and subsurface flow (i.e., groundwater that has either contacted the waste directly or has mixed with precipitated water that has percolated through the waste) into Edwards Run.

Fourteen monitoring wells have been installed at various locations and depths around the site perimeter to determine aquifer characteristics and define the extent of sub-surface contamination in the Mount Laurel. However, because of the aquifer properties described above (i.e., preferred groundwater migration routes) only three monitoring wells (wells X-3, X-4, We-7)and two leachate seep sampling locations (S-3, S-8) were selected to characterize the contamination Laurel below the site. The detection of contaminants in samples from the other wells around the perimeter of the landfill showed little or no contamination. The Remedial Investigation groundwater monitoring data show that parts of the water table aquifer (Mount Laurel) under the site are contaminated with both organic compounds and heavy metals, as indicated on the following listing:

CONTAMINANTS	SAMPLE LOCATION	MAXIMUM CONCENTRATION (ug/l)	COMPARISON STANDARDS (ug/l)
Arsenic	S-8	144	50 MCL
Chromium	S-3	35740	50/120 MCL/PRMCL
Lead	S-3	1000	50/20 MCL/PRMCL
Cadmium	S-3	142	10/5 MCL/PRMCL
1,1-dichloroethene	X-3	58	7 PRMCL
Toluene	X-4	100000	2000 PRMCL
1,2-dichloroethene	X-4	29000	70 PRMCL
1,2-dichloroethane	X-4	26000	5 PRMCL
1,1,1-trichloroethane	X-4	8400	200 PRMCL
Trichloroethene	X-4	19000	5 PRMCL
Benzene	X-4	3300	5 PRMCL
Chlorobenzene	S-8	360	60 PRMCL
Ethylbenzene	X-4	5400	680 PRMCL

The levels of both organic and heavy metals listed above for the on-site shallow water table aquifer (Mount Laurel) are high enough to render the water unsuitable for human consumption. These concentrations exceeded either EPA's Maximum Contaminant Level (MCL), or Proposed Recommended Maximum Contaminant Level (PRMCL), or both. Although the Mount Laurel Formation is used as a domestic drinking water aquifer in the area, the sampling and analytical results of domestic well water withdrawn from this aquifer did not indicate contamination. This is probably due to the groundwater movement characteristics of the Mount Laurel which flows eastward at a fairly rapid rate, away from all but one domestic well, and discharges into Edwards Run.

The Marshalltown Formation underlies the Mount Laurel and serves as a "leaky" confining unit between the Mount Laurel and the Englishtown Formation. The Englishtown Formation serves as a domestic water supply aquifer and for irrigation within one-half mile down-gradient of the site. Sampling and analytical results of monitoring and residential wells withdrawing from this aquifer did not indicate contamination. This is probably due to characteristics of the Englishtown, a "confined" (see below) aquifer whose piezometric surface is approximately 10 feet above the Marshalltown Formation, and the leakage characteristics between the Mount Laurel and the Englishtown. This leakage occurs vertically from the Mount Laurel to the Englishtown at a fairly slow rate over the site but then reverses itself in the area near and under Edwards Run. This gradient reversal causes leakage from the Englishtown through the Marshalltown and into Edwards Run. These characteristics decrease the migration potential of contaminants from the Mount Laurel into the Englishtown Formation. Five monitoring wells were installed around the perimeter of the landfill, in this aquifer, to define its characteristics and assess any landfill-related groundwater contamination. Of these wells, only one (X-4D) located on the eastern side of landfill near Edwards Run (a preferred groundwater migration route of the Mount Laurel) showed any signs of landfill-related contamination in this aquifer. Samples taken once from this well indicated contamination with

trans-1,2-dichloroethylene at 5 ug/l. However, it is unclear whether this contamination was caused by low level migration of contaminants from the Mount Laurel into the Englishtown or whether cross-contamination occurred between these two aquifers during the drilling process.

The Englishtown Formation is underlain by the relatively impermeable Woodburry Clay and Merchantville Formations (with a combined thickness of about 120 feet), which create an effective barrier between the Englishtown and the confined Magothy/Raritan Formations. The latter formations serve as a regional drinking water supply aquifer for the area and lie at a depth of approximately 220 feet below land surface (bls). Water quality tests performed on samples acquired from three wells which tap this aquifer within one-quarter mile of the site indicated that contamination of these wells has not occurred. No information is provided on the groundwater movement pattern of this aquifer or on the relative location between these deep wells and the landfill (i.e., up- or down gradient); therefore, no definite conclusions can be reached regarding contaminant migration into this aquifer, although given the site hydrogeology it is unlikely.

Based on the information provided (which is considered limited since monitoring wells were sampled twice at most), it appears that groundwater contamination is evident in portions of the upper water table aquifer (i.e., Mount Laurel) and possibly the "confined" Englishtown aquifer below the site. However, at present this exposure pathway does not exist since contamination of water supply wells, withdrawing from either of these aquifers, has not been documented in the area surrounding the site.

Surface Water

As previously discussed, the Mount Laurel aquifer discharges into Edwards Run as seeps and through the wetland areas on the eastern side of the landfill. Therefore, as can be expected, results of the sampling analysis

of surface water in Edwards Run also shows contamination with similar organics and inorganics found in the groundwater beneath the site, although at lower concentrations due to dilution in the stream. However, several contaminants were detected at concentrations exceeding EPA's proposed MCLs (i.e., 1,1-dichloroethene at 15 ug/l, trichloroethene at 6.5 ug/l, 1,2-dichloroethane at 62 ug/l, benzene at 8.7 ug/l; all average concentrations). The contamination appears to be greater in the sampling locations adjacent to the site. Sampling at Hidden Acres Park, located off Edwards Run about 4000 feet downstream of the landfill, and at other locations downstream of the landfill, did indicate contamination but at lower levels. However, there were indications that contamination appears to increase downstream (i.e., near the park).

Analytical results of samples from on-site surface water bodies (i.e., North Lagoon and Swamp) and seeps indicate that they are contaminated with low levels of various pesticides (e.g., alpha BHC at 0.021 ug/l, beta BHC at 0.018 ug/l) and a variety of organic and inorganic chemicals, similar to those found in groundwater. In many cases, the average concentration of the organic contaminants detected also exceeds EPA's MCLs, and/or water quality criteria.

Bioassay and Ames testing have been performed twice on the leachate entering Edwards Run. Both times the test results have indicated that such leachate was both toxic and mutagenic to the test specimens. No edible fish tissue sampling or analysis of resident fish populations were conducted; therefore, no conclusions can be made regarding human exposure due to consumption of native fish in Edwards Run.

Soils and Sediments

Soil samples were taken at 11 locations along the eastern periphery of the landfill. The sample analysis for inorganic constituents indicated normal concentrations of heavy metal species. The sample analysis for organic constituents indicated soil contamination with a variety of volatile, semi-volatile (xylenes over 9000 mg/kg, pentachlorophenol at 9.9 mg/kg,

bis(2-chloroethyl)ether at 7.4 mg/kg, bis(2-ethyl-hexyl) phthalate at 3.9 mg/kg), and the presence of PCBs (PCB-1254 at 14 mg/kg, PCB-1248 at 36 mg/kg). These concentrations do not appear to be of significant public health concern.

Analysis of samples from stream bed sediments indicated contamination with heavy metals such as those found in the groundwater on-site. Organic contamination was also detected, but at lower levels. Sediments from the Swamp and North Lagoon were also collected and analyzed showing similar inorganic contamination (i.e., heavy metals) and organic contamination with higher volatile constituents (i.e., ethylbenzene at 12 mg/kg). Based on the concentration of contaminants reported in soils and sediments, there does not appear to be an immediate public health threat through this environmental pathway. However, this pathway may serve as a future source of groundwater contamination through leaching and/or runoff.

Air

The results of an air sampling program performed in 1983 showed an increase in concentration above background of vinylidene chloride, benzene 1,2-dibromoethane, and toluene. Gross organic vapor analysis of the gases discharged from natural vents in the landfill showed sporadic levels of contamination. The organic vapor concentrations ranged from 0 to 300 ppm during drilling attempts through the landfill. However, no specific chemical species could be determined through this monitoring.

Landfill gas migration, primarily methane, was investigated using a flame ionization organic vapor analyzer. This study indicated that landfill gas has migrated into the unsaturated zone of the Mount Laurel Formation west of the site. Landfill gases are also being discharged to the atmosphere through vents and cracks that have formed on the surface of the landfill as a result of previous improper landfilling operations. Methane concentration immediately above these openings were found at explosive levels but then decreased within a few feet. This uncontrolled release of gas caused a series of fires at the site in 1981, during which volatile

organics (i.e., benzene at 1.86 ppm and trichloroethylene at 1.65 ppm) were detected by New Jersey Department of Environmental Protection (NJDEP) Hazardous Site Mitigation Administration in air samples taken at the site. The threshold limit value of 10 ppm was exceeded by hydrogen cyanide. Other contaminants such as cumene and xylene were also detected. At that time, the NJDEP determined that the short-term concentrations of volatile organics detected were low enough so as to not represent an acute public health threat.

Ambient air quality testing was performed by the NJDEP Hazardous Site Mitigation Administration in 1984. Air samples were taken in the vicinity of leachate pools and seeps around the site. Several organic contaminants similar to those found in surface and groundwater were detected above background but at concentrations in the low parts per billion range. These concentrations of organics in the air were generally two to three orders of magnitude below the American Conference of Govermental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or the National Institute for Occupational Safety and Health (NIOSH) Exposure Limits for occupational exposures.

CONCLUSIONS

Based on the sampling data and the hydrogeologic information obtained during the RI, it appears that groundwater is not a "current" human exposure pathway. Further, the East Greenwich Township has recently run a water line along Pine Mill/Boody Mill Road and Jessups Mill Road and required all residences on these roads to connect to and use township water. The potential for future exposure from groundwater use has been considerably reduced. Under the no action alternative, groundwater contamination would continue to an extent which cannot be accurately determined and consequently may become a potential public health threat in the future.

Due to the variability and the lack of sufficient downstream sampling events, no conclusions can be reached regarding the public health implications of exposure to surface water, sediments, and

bio-concentration of contaminants at Hidden Acres Township Park. However, because some organic contamination was detected in the stream along the park during the two sampling events, with less contamination upstream closer to the site, further examination of this potential human exposure route is warranted since the majority of the groundwater carried through the water table aquifer eventually discharges to Edwards Run.

The uncontrolled generation and release of landfill gas coupled with the volatilization and possible off-site migration of site contaminants may pose a potential public health threat to nearby residents and does warrant mitigation. Because wind direction is predominantly eastward toward Center City, about one-quarter mile east of the site, there is a future potential under the no action alternative, given an increase in atmospheric releases from the site, for exposure from inhalation by nearby residents within Center City. However, since no testing of air quality was conducted in the residential areas, and without an accurate determination as to the extent that contamination would be possible, such potential can not be assessed.

RECOMMENDATIONS

1. Conduct further monitoring of surface water, sediments, and bio-accumulation in fish tissue in the vicinity of Hidden Acres Park in order to properly assess the human health implications of these potential pathways at this location. The actual or potential health threat as a result of wading in or ingestion of fish taken from Edwards Run, if in fact these recreational uses occur, cannot be determined without such sampling. This monitoring should not be postponed until the remedial alternative is implemented since a determination should be made, as soon as possible, on whether or not this represents an immediate public health concern.

2. Quarterly monitoring of nearby domestic water supply wells should continue until the completion of the proposed remedy or until

connection to the public water supply line to determine whether or not ingestion of contaminated groundwater, due to further migration of site contaminants, poses a potential public health threat.

3. The access restriction portion of the selected alternative should include provisions to limit the future use of the site property and thereby reduce the potential for future exposure.

4. The capping portion of the selected alternative should consider the use of a transitional layer (preferably soil due to the expected settling of the cap) between the one foot gravel gas venting portion and the two foot clay cap to prevent "pipping," which could produce cap and gas collection system failure and thereby potential future exposure (i.e., inhalation of contaminated vapors).