

Health Assessment for



LIPARI LANDFILL

LIPARI, NEW JERSEY

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



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ADDENDUM
HEALTH ASSESSMENT
LIPARI LANDFILL
PITMAN, NEW JERSEY

Prepared by:
Office of Health Assessment
Agency for Toxic Substances and Disease Registry (ATSDR)

BACKGROUND

The ATSDR was requested by the U.S. Environmental Protection Agency (EPA) Region II to assist in the development and evaluation of an air monitoring program and associated environmental contaminant levels that will be protective of the local residential populace during the remedial action to be taken as a result of the July 11, 1988, Record of Decision (ROD) for the off-site Lipari landfill areas.

The remedial action involves dewatering of the Chestnut Branch Marsh and excavation of contaminated marsh soils, followed by thermal desorption of organic contaminants in a rotary kiln drier. Although the final treatment of organic vapor off-gases from the drier still has to be determined, a carbon adsorption process will likely be used.

DOCUMENTS REVIEWED

1. Lipari Landfill Superfund Site Record of Decision for the Off-Site Areas, EPA, July 11, 1988.
2. Hazaga, D., Fields, S., Clemons, G. P. Thermal Treatment of Contaminated Soils. Presented at the 5th National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C., November 7-9, 1984.
3. Webster, D. M. Pilot Study of Enclosed Thermal Soil Aeration for Removal of Volatile Organic Contamination at the McKin Superfund Site, Journal of the Air Pollution Control Association, 36:1156-1163, 1986.
4. Letter from Norman Anderson, Maine Department of Human Services, to Georgi Jones, Center for Environmental Health, Centers for Disease Control, dated August 22, 1985, Subject: McKin Dump Site, Gray, Maine.
5. Memorandum from Peter R. Kahn, Air Section, Environmental Services Division, to David Webster, Superfund Section, Waste Management Division, dated April 30, 1986, Subject: Soil Aeration Pilot Study Report, McKin Site, Gray, Maine.

6. Memorandum from Karen L. Blackburn, Chemical Mixtures Assessment Branch, to David Webster, Superfund Branch, Region I, dated May 19, 1986, Subject: Health-Related Criteria for Indicator Compounds at the Gray, Maine, Hazardous Waste Facility.
7. Air Monitoring Petroleum Area Soils Pilot Study, McKin Site, Gray, Maine, Canonie Environmental, March 1987.
8. Memorandum from Acting Director, Office of Health Assessment, to Marilyn DiSiro, Public Health Advisor, EPA Region I, dated May 30, 1986, Subject: McKin Site, SI-86-092, Gray, Maine.
9. Memorandum from David Webster, McKin Site Manager, to Merrill Hohman, Director, Waste Management Division, dated June 30, 1986, Subject: Review of Soil Aeration Pilot Study and Soil Profiling at the McKin Superfund Site, Gray, Maine.
10. Letter from Irene Fanelli, Canonie Engineers, to Steve Serian, EPA Region I, dated October 3, 1986, Subject: McKin Site Health and Safety Plan and Air Monitoring Procedures.
11. Letter from Irene Fanelli, Canonie Engineers, to David Webster, Superfund Branch, EPA Region I, dated February 25, 1986, Subject: Air Monitoring Program at McKin Site.
12. Letter from Robert Lieckfield, Clayton Environmental Consultants, Inc., to Irene Fanelli, Canonie Engineers, Inc., dated February 18, 1986, Subject: Qualifications, Methods, and Quality Assurance Procedures for Sampling Program.
13. Memorandum from Georgi Jones, Superfund Implementation Group, to John E. Figler, Public Health Advisor, EPA Region I, dated June 17, 1985, Subject: McKin Dump Site Clean-up Activities.
14. Letter from John Sevee, E. C. Jordan Consulting Engineers, to David Webster, Waste Management Division, EPA Region I, dated June 11, 1985, Subject: Air Concentration Calculations.

DISCUSSION

The remedial alternative proposed in the July 11, 1988, ROD for the off-site Lipari Landfill areas involves dewatering the Chestnut Branch Marsh area, clearing of vegetation, excavation, staging, and disposal of contaminated soil, and soil replacement, compaction, and restoration of the marsh. Dewatering of the marsh will be accomplished by collecting and pumping leachate from the marsh to an on-site pretreatment facility. Concern was expressed that nearby residents could be exposed to contaminant emissions during the cleanup operations. Contaminated vapors and dust may be released into the atmosphere during various phases of the remedial action, including soil excavation, operation of the thermal treatment unit, collection and

pumping of contaminated leachate, and transport of materials across the site (loss of materials during transport and mechanical dispersion of contaminated soils due to vehicular movement).

Review of the information provided to ATSDR indicates that soil and leachate of the Chestnut Branch Marsh are contaminated with volatile and semi-volatile organic and inorganic compounds. Volatile organic compounds (VOCs) which were frequently detected in marsh soils include benzene (100 ppb), acetone (820 ppb), total xylenes (600 ppb), ethyl benzene (160 ppb), and carbon disulfide (33 ppb).

VOCs which were frequently detected in leachate samples collected from the marsh include benzene (3,900 ppb), 1,2-dichloroethane (1,525 ppb), methylene chloride (3,366 ppb), acetone (21,000 ppb), 4-methyl-2-pentanone (22,000 ppb), ethyl benzene (900 ppb), toluene (8,900 ppb), and total xylenes (3,800 ppb).

The high volatilization potential of these compounds indicate that they may be readily released to the atmosphere from soil or leachate and be a source of exposure to remedial workers and nearby residents.

Samples of marsh soil and leachate indicate contamination by semi-volatile and inorganic compounds. Semi-volatile organic compounds frequently detected in marsh soils include bis(2-chloroethyl)ether (7,400 ppb), di-n-butyl phthalate (2,800 ppb), bis(2-ethylhexyl)phthalate (560 ppb), and naphthalene (260 ppb). Inorganic compounds detected include chromium (96 ppm), nickel (112 ppm), lead (424 ppm), and arsenic (65 ppm).

Semi-volatile organic compounds frequently detected in leachate include bis(2-chloroethyl)ether (27,852 ppb), phenol (9,468 ppb), naphthalene (4,200 ppb), isophorone (190 ppb), and 4-chloroaniline (670 ppb). Inorganic compounds detected in leachate samples include arsenic (228 ppb), beryllium (302 ppb), chromium (1,670 ppb), lead (12,000 ppb), zinc (6,690 ppb), and nickel (1,250 ppb).

Semi-volatile organic and organic compounds adsorb to soil particles to varying degrees depending on the organic and clay content of the soil. Contaminated soils may be released to air as dust during excavation or transport within the work area and be a source of potential exposure to remedial workers and nearby residents. Release of semi-volatile compounds to air from contaminated leachate is dependent primarily on the volatilization potential of the contaminants and the concentration of contaminants in the leachate medium. Generally, semi-volatile organic compounds exhibit a lower volatilization potential than VOCs.

The ROD for off-site contamination states that the impact on the health and safety of workers and nearby residents will be closely monitored during remedial actions and, if necessary, measures will be taken to reduce volatile emissions. Because the ROD does not provide explicit

information on how remedial actions will be conducted at the site, a specific air monitoring program cannot be defined at this time. A general air monitoring strategy can be established, however, whether and to what extent these guidelines are applicable to the site can only be determined when the following information is available:

(1) boundaries/size of work areas and location of thermal treatment equipment and leachate pretreatment facility (relative to residential populations), (2) type of field analytical equipment (and associated limits of detection and quantification for organic compounds) to be used for monitoring, and (3) specific thermal treatment equipment and on-site pretreatment facility and operations to be used.

A general strategy includes air monitoring in three areas: (1) the immediate work area, especially in areas where contaminant releases are likely to occur (e.g., thermal treatment unit, soil excavation area), (2) the perimeter of the work area, and (3) residential areas. Continuous real-time sampling should be performed for organic compounds and particulates at each of the three monitoring areas when work is in progress. A portable organic vapor detector may be used, however, quantitative samples should also be collected within the breathing zone (4 to 6 feet above ground surface) at the perimeter and residences, especially during the first phase of remediation. At a minimum, 8-hour or 24-hour quantitative air samples should be collected. Analyses of these samples will provide data on actual air contaminant concentrations relative to the soil and leachate contaminant concentrations during remediation and will supplement the sampling data obtained using portable organic vapor detectors. If monitoring is conducted using portable instruments, the instruments should be calibrated using pure air and then adjusted for background levels (upwind of the work area) of the indicator organic compound. ATSDR recommends using benzene as the indicator compound for monitoring organic vapor emissions at the site.

A wind direction and flow monitor should also be installed with an appropriately timed recorder at each monitoring area. Dust suppression procedures should be used while work is in progress to control dust generation and prevent migration of contaminants to residential areas.

The following levels are recommended as being protective of public health for the site-specific conditions and remedial activities proposed for the site. These levels are applicable when performing continuous real-time air monitoring using portable organic vapor detectors:

1. If organic vapor concentrations exceed 1 ppm above background levels in the residential area or exceed 2 ppm above background levels at the perimeter for 15 minutes, remedial activities should be stopped until engineering measures are taken to control and reduce organic vapor levels.

2. If organic vapor concentrations exceed 5 ppm above background levels for the work area for a period of 15 minutes, remedial activities should be temporarily stopped and the site safety plan should be reevaluated to ensure that workers are protected.
3. The EPA has developed an Ambient Air Quality Standard for particulate matter (less than 10 micrometers in diameter) of 150 ug/m^3 for a 24-hour period. If particulate levels measured with high-volume samplers exceed this standard, remedial activities should be stopped until adequate measures are taken to control and reduce dust generation.

Reports of unusual odors, symptoms such as eye irritation, nausea or headaches should also be evaluated whether or not the field instruments register significant changes in contaminant concentrations.

The recommended levels for organic vapor analysis and particulates were determined by considering known contaminant concentrations and toxicity, and the types of field measurement instruments likely to be used at the site. The toxicity information for the contaminants detected in off-site soils and leachate is provided in Table 1.

The American Conference of Governmental Industrial Hygienists (ACGIH) has developed Threshold Limit Values (TLV's) as acceptable exposure concentrations to workers for an 8- to 10-hour work day and a 40-hour work week. The ACGIH cautions against using TLV's to calculate ambient air quality values for protecting public health. However, in circumstances where ambient air quality data are not available, health assessors frequently divide the TLV (time-weighted average) by a time conversion factor to develop acceptable exposure levels for the general population.

The EPA has developed quantitative measures for exposures to noncarcinogens that are not expected to result in adverse health effects in humans. These include the Reference Dose (RfD), the Acceptable Intake Subchronic (AIS) value, and the Acceptable Intake Chronic (AIC) value.

The AIC and AIS values are based primarily on animal studies (and human studies where available) of chronic and subchronic exposure, respectively. The RfD is also derived from animal and human studies and assumes chronic lifetime exposure.

The EPA has also developed Cancer Potency Factors (CPF's) to define upperbound estimates of cancer risk based on continuous lifetime exposure to carcinogens. In performing public health evaluations, EPA often uses a level of 10^{-6} (1 in 1 million) risk to define an acceptable level of lifetime exposure to carcinogens. Although scientific information is not available to define the effects of short-term exposure to carcinogens, given the uncertainty in mechanisms of carcinogenic action, carcinogenic effects may result from a single

or short-term exposure. While not directly applicable to exposure conditions at this site, the CPF can be used to define guidelines for protecting public health.

The EPA has established an Ambient Air Quality Standard of 150 ug/m^3 (PM10) for a 24-hour exposure to total particulate matter less than 10 micrometers in diameter. Although the PM10 value does not reflect contaminant concentrations of particulate matter, the particulate standard can be evaluated relative to the concentration and toxicity of soil and leachate contaminants to define potential public health concerns.

Workers and residents may be exposed while remedial action is in progress. This potential exposure period is expected to be longer than the exposure period considered in deriving the AIS and shorter than the exposure period considered in deriving the AIC value. The TLV may be more applicable than either the AIS or the AIC values in terms of the implied exposure period.

Ideally, levels protective of public health should be based on relevant toxicity values such as the TLV, AIS/AIC, or CPF values. However, practical limitations of field analytical equipment may preclude defining levels protective of public health based solely on the TLV, AIC/AIS, or CPF value. Exposure levels estimated from TLV's or CPF's for contaminants detected at the site are likely to be lower than the lowest limits of detection and quantification of field instruments such as portable organic vapor detectors. Because quantitative analyses of all samples collected during continuous monitoring may not be feasible, it is realistic to assume that for some of the air samples collected, analyses for organic vapors will be restricted to achievable limits of detection for portable instruments or 1 ppm (in benzene equivalents) above background concentration. The recommended levels for air monitoring reflect these limitations in contaminant detection and quantification.

To determine whether potential human exposure to contaminated particulates is of concern for workers and residents of the site, existing air quality standards for particulates were considered together with health-based toxicity information for contaminants detected in the marsh soils. Soil contaminants which are most likely to be a source of particulate exposure include the semi-volatile organic compounds and inorganic compounds. Based on available analytical information, there is not a public health concern for exposure to contaminated soils which become airborne. Because reported concentrations of soil contaminants may not be representative of contaminant concentrations for all areas where remedial action will take place, measures should be implemented during the remedial action to control dust generation and minimize any potential exposure to contaminated particulates. The reduction in particulate levels that can be achieved by using adequate dust control measures during remedial action was evidenced at a Superfund site in Gray, Maine (3), where the method of remediation was similar to that proposed for the Lipari site.

CONCLUSIONS

The remedial action proposed for the off-site Lipari landfill areas may result in potential exposures to workers and nearby residents via inhalation of contaminated organic vapors or dust. The selected remedial alternative for the site involves excavation of contaminated soils of the Chestnut Branch Marsh, followed by thermal desorption of organic contaminants, and collecting and pumping of contaminated leachate to an on-site pretreatment facility. A general strategy for conducting air monitoring during the remedial action has been provided with recommended levels for organic vapors and particulates protective of public health. Explicit information on how remedial actions will be conducted at the site and the type of field analytical instruments that will be used to perform air monitoring is needed before a comprehensive air monitoring program can be developed. The type of field analytical equipment used will determine to a large extent whether levels protective of public health are limited to the lowest limits of detection for portable organic vapor detectors or whether more conservative levels based on the TLV, AIC/AIS, or the CPF value can be adopted.

RECOMMENDATIONS

1. Establish a definitive approach for performing the selected remedial alternative, including: (a) type of thermal treatment process, on-site pretreatment facility, and air sampling equipment to be used, and (b) boundaries/sizes of work areas and location of thermal treatment and pretreatment equipment relative to residential areas.
2. Establish air monitoring areas, such as work, perimeter, and residential areas.
3. Determine upwind and downwind air quality before the remedial action is begun to determine baseline air quality values and background concentrations.
4. Provide continuous, real-time monitoring for organic vapor and particulate concentrations while work is in progress. Collect quantitative (e.g., continuous, 8-hour, 24-hour) samples and analyze samples for volatile organic compounds at the perimeter and residences periodically during the remedial process, in particular during the first phase of remediation.
5. Monitor meteorologic parameters such as wind direction and wind speed humidity, and temperature during the period of remediation.
6. Implement measures to control dust generation during the process for excavating and treating soil.

Table 1. Toxicity Information for Contaminants Detected in
Off-Site Soils and Leachate, Lipari Landfill, New Jersey

	<u>AIS</u> <u>(mg/kg/d)</u>	<u>AIC</u> <u>(mg/kg/d)</u>	<u>CPF</u> <u>(mg/kg/d)</u> ⁻¹	<u>TLV-TWA</u> <u>(mg/m³)</u>
<u>Volatile Organic Compounds</u>				
Benzene			2.90E-02 (I)	3
Acetone	1.00E+00 (0)	1.00E-01 (0)		1,780
Toluene	1.00E+00 (I)	1.00 (I)		375
Ethyl Benzene	1.00E+00 (0)	1.00E-01 (0)		435
1,2-DCA			9.10E-02 (I)	40
Methylene Chloride		6.00E-02 (0)	1.40E-02 (I)	350
Carbon Disulfide		1.00E-01 (0)		30 (skin)
Total Xylenes n(o-,m-,p- isomers)	7.00E-01 (I)	4.00E--01 (I)		435
<u>Semi-Volatile Organic/Inorganic Compounds</u>				
BCEE			1.10E+00 (I)	30
Di-n-Butyl Phthalate	1.00E+00 (0)	1.00E-01 (0)		
BEHP		2.00E-02 (0)		5
Naphthalene	4.00E-01 (0)	4.00E-01 (0)		50
Phenol	4.00E-01 (0)	4.00E-02 (0)		19 (skin)
Isophorone		1.50E-01 (0)	4.10E-03 (0)	25
4-Chloroaniline			3.50E-02 (I)	
Chromium. (VI & compds)	2.50E-02 (0)	5.00E-03 (0)	4.10E+01 (I)	0.05
Nickel (refinery dust)	2.00E-02 (0)	2.00E-02 (0)	8.40E-01 (I)	0.1