Health Consultation

HOLTRACHEM MANUFACTURING COMPANY

ORRINGTON, PENOBSCOT COUNTY, MAINE

EPA FACILITY ID: MED000242701

AUGUST 21, 2006

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Exposure Investigation and Consultation Branch

Table of Contents

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Agency for Toxic Substances and Disease Registry
ATTN: Records Center
1600 Clifton Road, NE (Mail Stop E-60)
Atlanta, GA 30333

Summary and Statement of Issues

The Agency for Toxic Substances and Disease Registry (ATSDR) was asked by the Maine Department of Health and Human Services (ME DHHS) and Maine Department of Environmental Protection (ME DEP) to provide public health advice regarding public exposure to mercury during the demolition and remediation of the HoltraChem Manufacturing Company site (HoltraChem) in Orrington, Maine [1]. ATSDR staff reviewed the Air Monitoring Program mercury emission values set by ME DEP and we agree that 300 nanograms per cubic meter (0.300 micrograms per cubic meter) mercury at the property line will be protective of public health. Staff also reviewed the Industrial Source Complex Short Term version 3 (ISCST3) modeling by ME DEP Air Program of the potential off-site mercury concentrations during the 6 phases of site remediation [2,3]. Based on the modeled concentrations at off-site receptors, ATSDR classifies current and potential future off-site mercury concentrations during remediation as no apparent public health hazard. Air monitoring will be conducted during remediation.

Background

Site Description and History

The HoltraChem Manufacturing Company closed in September 2000. The town of Orrington now owns the 235 acre site. The town obtained the property through foreclosure for back property taxes. Mallinckrodt built the original chlor-alkali plant that opened in 1967. Because they are one of the potentially responsible parties (PRP), Mallinckrodt has taken over the closure and remediation of the plant. In the past the plant has been named International Minerals and Chemicals Corporation, LCP Chemicals and Plastics, and Linden Chemical and Plastic.

The plant is located on a bluff near the banks of the Penobscot River. Most of the land is heavily forested north and south of the plant area. There are residences on the bank of the river south of the site, the Ferry Road residences, as well as on the bank across the river. The northeast portion of the HoltraChem property extends from the river eastward to Route 15 or the homes along the west side of Route 15. Directly east of the plant area is Penobscot Energy Recovery Corporation (PERC), a municipal waste-to-energy facility. There are several homes along Route 15 on the other side of PERC.

There are 2 gated entrances into HoltraChem. There are fences in areas that are accessible. Some steep areas along the river are not fenced. No evidence of trespassing were seen or reported during the ATSDR site visit.

Closure of the plant is in progress. Equipment in the Cell Building has been decontaminated and taken off-site for recycling or disposal. The PRP is currently decontaminating and removing the tanks and piping. The next project will be dismantling the Cell Building.

The remediation phase will address the 5 landfills, waste water treatment plant, and contaminated soil and sediment. Chronic spillage of sodium hydroxide has created a plume of caustic ground water between the plant and PERC that is intercepted and treated to prevent it from discharging to the stream. Spills, mostly of process brine, in the manufacturing area have created a plume of mercury-contaminated ground water that is partially captured at a river-side extraction well. The collected groundwater from both areas is pumped to the wastewater treatment system where it is treated and after treatment, discharged to the Penobscot River. The portion of the plume that is not captured presumably discharges to the river. There is very little ground water contamination from the landfills.

Demographics

Approximately 2545 people live within 1 mile of the site boundaries. The site location and additional demographic information on the population in the area are shown in Figure 1, the GIS map. The area is rural and predominantly white.

Community Health Concerns

One of the primary health concern related to the HoltraChem facility is whether health effects will occur from the mercury emissions during the demolition of the buildings and tanks and digging up the 5 landfills and processing their contents. City officials would like to develop part of the HoltraChem property before the site remediation is completed. They propose building an industrial park area, referred to as the Orrington Development. However state officials are concerned that mercury exposures may be too high in the proposed industrial park during remediation of the 3 landfills near the area to be developed.

Discussion

A decision has not been made as to which media at the HoltraChem site will be addressed or by what means. Media under consideration include soils, sediment, sludge, and groundwater. Possible remedial measures range from leaving some media undisturbed to disposal in an onsite management unit to removal and disposal in an offsite facility. ME DEP staff asked ATSDR to look at several different options to see if any of the different scenarios would cause public exposure to mercury concentrations that could be a public health concern. DEP staff requested our evaluation to use in their decision making process to determine how to safely remediate the site. The screening model (SCREEN3) run by DEP staff projected mercury concentrations would be above levels of public health concern if the landfills were excavated.

In September 2005, ATSDR staff toured the HoltraChem site and residential areas near the facility. After viewing the area, the contours of the land, and vegetation that exists, ATSDR staff recommended that state staff use U.S. Environmental Protection Agency (EPA) regulatory air dispersion models rather than the screening model to project the off-site mercury concentrations during the proposed remediation activities. The EPA regulatory model allows for site-specific meteorology rather than a worst case estimate and allows for better definition of some site specific operations.

Proposed Site Remediation

The DEP project team presented 4 remedial options to the Office of the Commissioner [4]. These are:

Option 1 – Excavate all soil and sediment, treat Cell Building soil to remove elemental Hg; dispose of concentrate at offsite hazardous waste landfill; excavate Landfill 2 only; chemically stabilize sludge to meet EPA landfill disposal restrictions; place all material in unlined onsite management unit with no leachate collection; intercept, collect, and treat contaminated groundwater for a minimum of 30 years.

Option 2 – Excavate all soil, all landfills, and sediment, treat Cell Building soil to remove elemental Hg; dispose of concentrate at off-site hazardous waste landfill; chemically stabilize all landfill sludge; place low-mercury soil, sediment, and stabilized sludge in unlined on-site landfill with no leachate collection; intercept, collect, and treat contaminated groundwater for a minimum of 30 years.

Option 3 – Excavate all soil, all landfills, and sediment, treat Cell Building soil to remove elemental Hg; dispose of concentrate at off-site hazardous waste landfill; chemically stabilize all landfill sludge; place low-mercury soil, sediment, and stabilized sludge in lined on-site landfill with leachate collection; intercept, collect, and treat contaminated groundwater for a minimum of 30 years.

Option 4 – Excavate all soil, all landfills, and sediment, treat Cell Building soil to remove elemental Hg; ship sludges and Cell Building concentrate to off-site hazardous waste landfill without further onsite treatment; ship all other material offsite for disposal in industrial landfill; intercept, collect, and treat contaminated groundwater for a minimum of 30 years.

DEP staff project that Options 1 and 4 can be completed in two years. Cell Building soils would be treated and disposed during Year 1, as would sediments and plant area soils. During Year 2, landfill sludges would be excavated, stabilized, and disposed onsite for Option 1 (only Landfill 2) or excavated and transported offsite in Option 4 (all 5 landfills).

Options 2 and 3 which require removal and treatment of all five landfills were estimated to require an additional year. Year 1 activities would be as previously stated. Years 2 and 3 would be devoted to excavation, stabilization, and onsite disposal of the landfills. It is assumed that Landfills 1 and 2 would be excavated and treated during Year 2 and the remaining landfills during Year 3 [4]. All options propose a phased approach where only one landfill is excavated at a time.

The state does not have analytical data from the contents in the 5 landfills. DEP staff obtained data from other chlor-alkali plants that used the same or similar processes as HoltraChem to estimate the concentration mercury in the HoltraChem landfills. DEP staff assumed all the mercury is elemental to make their estimated mercury concentrations conservative. ATSDR's conclusions and recommendations are based on the assumption that the state's estimates are conservative and that the actual fence line and off-site mercury annual average concentrations will not exceed 1 order of magnitude greater than the estimated values.

Estimates of mercury emissions were made by breaking the project into component operations and evaluating the emissions from each, based upon mercury concentrations, exposed surface areas, and duration. The estimates showed that greater than 95% of the mercury mass emitted during remediation would originate from excavation and stockpiling of Cell Building soils and landfill sludges, washing of Cell Building soils, stabilization of landfill sludge, and placement of these in an onsite disposal unit. The remaining activities, including truck loading and off loading, onsite movement of media, and stockpiling of treated soils were found to be minimal in comparison, so emissions from these operations were not included in the modeling [4].

To reduce mercury emissions DEP staff propose to build a large fabric-covered enclosure, a temporary structure, equipped with air handling and off gas treatment over the entire Cell Building after removal of the roof and walls of its upper level. This will reduce the emissions when the high-mercury soils underneath the building are excavated and processed for disposal in either a new on-site landfill or transported to a commercial landfill. Sludges excavated from the landfills can also be stockpiled and processed within this enclosure. Based on data from other sites where these structures have been used, it is estimated that emissions would be reduced 95% [4].

Maine DEP Approach to Air Dispersion Modeling

Estimates of Source Flux Rates

Estimates of mercury emissions were made by separating the proposed remediation into component tasks and evaluating the emissions from each task, based on mercury concentrations expected in the media, exposed surface areas, and the tasks' durations. Estimates were based on monitoring results from the 1999-2002 decommissioning of a chloralkali plant in British Columbia. This plant was similar to the Orrington HoltraChem plant in terms of its operation, size, and the British Columbia climate.

The estimates showed that greater than 95% of mercury mass emitted during remediation would originate from only a few activities: excavation and stockpiling of Cell Building soils and landfill sludges; treatment of Cell Building soils; stabilization of landfill sludges; and placement of these media in an onsite management unit (MU). Emission from the remaining tasks, including truck loading and offloading, onsite movement of media, and stockpiling of treated soils were found to be minimal by comparison and were not considered in the modeling.

Emission Control Measures

It was assumed that to minimize mercury emissions, operations with the highest estimated release rates would be conducted within a temporary, fabric-covered building equipped with air handling and treatment of the offgases. This building would, in fact, be erected over the Cell Building after its upper level was removed, so that emissions from concrete demolition and soil excavation could be contained. Thereafter, soil and sludge stockpiling and treatment would also take place within the building. Based on data from other sites where similar containment measures were used, it was estimated that the untreated flux rates could be reduced by 95%.

At this stage of remedial design, enclosing the landfills during excavation was not considered feasible. However, it was felt that emissions could be minimized by limiting the area of the working face open at any time. In addition, it was assumed that excavation would not take place during nighttime hours, usually the periods of greatest atmospheric stability, when thermal mixing and dispersion is at a minimum. During the overnight period, the landfill mercury flux rate was assumed to be 5% of the daytime rate. This estimate is considered conservative as it is still more than an order of magnitude higher than flux chamber measurements made on a similar chloralkali sludge. Finally, it was assumed that only one landfill would undergo excavation at any time.

Modeling Data/Inputs

Maine DEP staff used the most current version of the Industrial Source Complex Short Term (ISCST3) dispersion model in the EPA regulatory mode to simulate mercury dispersion from the HoltraChem site. The ISCST3 dispersion model is an EPA developed and approved model that utilizes various user-provided inputs in order to predict concentrations and depositions. Examples of inputs include source/facility information, meteorological data, and topography. The ISCST3 model was chosen for this analysis because it can predict concentrations using data readily available at MEDEP. In addition, MEDEP is most familiar with the ISCST3, as it is typically considered to be one of the standard "workhorse" regulatory models, given its wide range of modeling capabilities.

A valid 5-year hourly meteorological off-site database was used in the refined modeling. The wind data was collected at a height of 13.00 meters at the Bangor International Airport (BIA). This location was a DEP meteorological site during the 5-year period 1985-1989.

This dataset was chosen over other candidate sites because of its proximity (within 4 kilometers of HoltraChem), its availability for processing and its high degree of data recovery. Although the meteorological monitoring station at HoltraChem had collected one full year of data, a 5-year period of meteorological data is recommended by EPA to ensure that the worst-case meteorological conditions (i.e., those that predict the highest concentrations) are adequately represented in the model results. Comparison of the wind roses from the HoltraChem and BIA sites showed that dispersion patterns for the two sites would likely be similar; therefore, the BIA data for the years 1985-1989 were used.

Receptor Grid

For the initial modeling runs, where the objective was only to "scope" the maximum offsite mercury concentrations and their locations, a large receptor grid was constructed. This grid, comprised of over 5,700 receptors, blanketed a 4-kilometer square with the HoltraChem site at its center. Receptor nodes on the 400-acre HoltraChem property were eliminated, as the initial modeling focus was on offsite impacts.

For subsequent runs, all receptors were eliminated except those of specific interest, to obtain detailed concentration and exceedance frequency information at these locations. The targeted receptors were:

- Nearest residence on Ferry Road (approx. 1500' S of the site)
- Penobscot Energy Recovery Facility (PERC, abutting the site on the SE)
- Proposed Town of Orrington development area (on HMC property to the NE)
- Nearest residence on Rte 15 (approx. 1200' E of site)
- Weatherbee-McGraw school (across Penobscot River, approx. 1800' W of site)
- Nearest residence across Penobscot River (approx. 1200' W of site)

Modeling receptor information was derived from MEDEP GIS files.

Emissions Source Scenarios

The combination of sources with the greatest potential for offsite impact was considered simultaneous emissions from 1) enclosed soil processing, 2) excavation of any single landfill, and 3) onsite filling of the MU with treated media. Accordingly, five source scenarios were modeled to simulate each of the five landfills in combination with soil processing and MU filling, and a sixth scenario was modeled with only emissions from soil processing and MU filling:

- Scenario 1: Landfill 1 plus Cell Bldg and MU
- Scenario 2: Landfill 2 plus Cell Bldg and MU
- Scenario 3: Landfill 3 plus Cell Bldg and MU
- Scenario 4: Landfill 4 plus Cell Bldg and MU
- Scenario 5: Landfill 5 plus Cell Bldg and MU
- Scenario 6: Cell Bldg and MU only

It was assumed that emissions from the Cell Building and the MU would be constant 24 hours per day, seven days a week during the construction season. However, as previously described, it was assumed that landfill emission would be reduced to 5% of daytime strength between 9 PM and 7 AM. Landfills were also assumed to emit seven days a week throughout the construction season. For modeling purposes, a May 1st through November 30th construction season was assumed. The Cell Building was modeled as a point source, while landfills and the MU were modeled, respectively, as 30m x 30m and 50m x 50m area sources.

<u>Modeling Results</u>

In the initial "scoping" runs, it was found that the highest offsite mercury concentrations were, as expected, at the receptors closest to the emissions sources: at the HoltraChem property line. However, the modeling showed that maximum annual concentrations at all offsite locations were below levels of health concern.

The modeling results for the subsequent runs, which focused on specific receptors, are presented in Tables 1 through 6. These show the maximum 24-hour and annual average concentrations for each receptor and source scenario for each of the five years of meteorological data modeled. The annual average concentration at any of the selected receptors and for any combination of sources is more than an order of magnitude below levels of health concern.

Toxicological Evaluation of Air Modeling Results

The predicted maximum annual average elemental mercury concentration, 0.0135 micrograms per cubic meter ($\mu g/m^3$) (range: 0.0001 $\mu g/m^3$ – 0.0135 $\mu g/m^3$) was over an order of magnitude below the chronic inhalation comparison value (0.200 $\mu g/m^3$) that ATSDR uses as a screening level to select contaminants for further analysis [5]. Contaminants below comparison values are not further evaluated. ATSDR uses comparison values developed on the most sensitive toxic effect for each specific chemical to screen contaminants for further evaluation. Neurotoxicity is the most sensitive indicator of adverse effects in humans exposed to elemental mercury and methylmercury.

ATSDR has established a comparison value (0.2 μg/m^3), called an inhalation minimum risk level (MRL) for chronic exposures to elemental mercury. The MRL represents a level of exposure that ATSDR believes to be safe to all populations, even to sensitive populations. For inhalation of elemental mercury, the MRL is based upon an adult working population and is considered by ATSDR to also be sufficiently protective of neurodevelopmental effects in developing embryos/fetuses and children, the most sensitive subgroups for elemental mercury toxicity. This MRL was developed based on a neurological response in some workers exposed to an average mercury concentration of 26 μg/m^3, although it is likely that the exposures before measurement may have been much higher [6]. This was considered a minimal lowest observed adverse effect level (LOAEL); a no observed adverse effect level (NOAEL) was not determined in this study. EPA has also issued a comparison value, called a reference concentration, of 0.3 μg/m^3, based on the same study [7]. These chronic comparison values are derived to apply to individuals as if they were exposed continuously for greater than a year. Actual site exposures are likely to be less. Although these comparison values are considered protective of developmental effects, additional information is presented for transparency and to describe the uncertainty.

Elemental mercury may affect neurological development in experimental animals exposed *in utero* by maternal inhalation or neonatal inhalation at high elemental mercury concentrations [8,9,10]. If the mechanisms of action producing developmental toxicity in animals occur in humans, elemental mercury is likely to produce developmental effects in human populations exposed to equivalent concentrations. The estimated environmental exposure levels at HoltraChem are over 3 orders of magnitude below laboratory animal exposure levels and below levels associated with health effects in humans. ATSDR and EPA have made no estimate of dose response for developmental effects of elemental mercury.

There remains some uncertainty regarding potential *in utero* effects from elemental mercury exposures because of the limited information from epidemiological studies, limited pharmacokinetic data, and the severity of the potential hazard. Reports of human mercury inhalation during pregnancy are limited and often the environmental concentrations are not reported and follow-up was not detailed. Nevertheless, these case reports may be the best indicators available because they report actual exposures during pregnancy that resulted in normal births [11,12].

For perspective, ambient air concentrations of mercury have been reported to average 0.01- 0.02 μg/m^3, with higher concentrations in industrialized areas. However, a rural area reported a mean of 0.002 μg/m^3 [13,14]. Most of the modeled average annual emissions from HoltraChem during the remediation were in this range or below. Based on the data from the ISCST3 model, we conclude that mercury concentrations in off-site areas will not be a public health hazard. However, if any development occurs within 1 mile of the site or new analytical data show that mercury concentrations in site materials are higher than used in the model, the modeling should be re-run and the potential public health hazard evaluated.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

In this health assessment, we use health-screening values that are protective of children who play outside and occasionally eat dirt. From the conservatively estimated mercury concentrations and environmental data that are available, we conclude that inhalation of ground-level concentrations of mercury in the community will not be a health hazard.

Conclusions

The projected mercury emissions from the proposed remediation scenarios present no apparent public health hazard. This conclusion is based on only 1 landfill being open for remediation at a time and modeled emissions—not environmental data.

Excavation of the landfills should proceed cautiously with increased frequency of air monitoring for mercury until analytical data on the type of mercury and its concentration are obtained and evaluated.

Recommendations

Increased frequency of mercury air monitoring should be implemented when each landfill is initially opened, until air monitoring shows that mercury levels are consistently below levels of health concern. Then resume current mercury monitoring and ambient air sampling programs during all phases of site remediation.

Since the conclusions are based on modeling of projected emissions, not measured emissions, the modeling should be re-run and the data evaluated to determine if public exposures will be adversely affected, if (1) analytical data from materials in the landfills show that the mercury present is different or its concentration is higher than estimated, (2) more than one landfill will be open at a time, (3) the hours or months of operation change, (4) any development is proposed within 1 mile of the plant before completion of the excavation of the 5 landfills, or (5) any other changes occur that could affect the off-site concentrations of mercury.

Public Health Action Plan

If additional environmental data become available that could affect ATSDR's conclusions and recommendations in this public health consultation, ATSDR or ME DHHS will review the data and provide public health advice if asked and it is appropriate.

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Tables

Table 1: Ferry Road Receptor

Maximum 24-Hour Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.07451	0.06969	0.09846	0.20892	0.18021
Scenario 2	0.02772	0.02213	0.18430	0.01711	0.03108
Scenario 3	0.09551	0.03507	0.02894	0.03043	0.04217
Scenario 4	0.04706	0.02992	0.02057	0.02517	0.03532
Scenario 5	0.03152	0.03048	0.01381	0.06906	0.03181
Scenario 6	0.01499	0.14790	0.00529	0.00860	0.00731
Maximum Annual Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.00679	0.00688	0.00707	0.00597	0.00760
Scenario 2	0.00146	0.00120	0.00094	0.00118	0.00114
Scenario 3	0.00296	0.00238	0.00148	0.00150	0.00338
Scenario 4	0.00232	0.00202	0.00128	0.00130	0.00264
Scenario 5	0.00202	0.00180	0.00099	0.00144	0.00199
Scenario 6	0.00038	0.00040	0.00026	0.00040	0.00032

Table 2: PERC Receptor

Maximum 24-Hour Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.08586	0.20400	0.19786	0.09553	0.12112
Scenario 2	0.06352	0.10206	0.03409	0.06704	0.09661
Scenario 3	0.09243	0.12901	0.11131	0.07101	0.07921
Scenario 4	0.04522	0.08546	0.06942	0.12376	0.10645
Scenario 5	0.09345	0.06798	0.07287	0.04802	0.07058
Scenario 6	0.01895	0.01675	0.02247	0.02696	0.02170
Maximum Annual Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.01086	0.01236	0.00973	0.00863	0.01155
Scenario 2	0.00453	0.00354	0.00205	0.00276	0.00370
Scenario 3	0.00757	0.00807	0.00882	0.00637	0.00663
Scenario 4	0.00576	0.00660	0.00548	0.00468	0.00637
Scenario 5	0.00511	0.00490	0.00321	0.00318	0.00543
Scenario 6	0.00112	0.00095	0.00089	0.00102	0.00108

Table 3: Orrington Development Receptor

Maximum 24-Hour Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.06494	0.04583	0.05727	0.0363	0.05602
Scenario 2	0.16892	0.09716	0.15835	0.11178	0.35104
Scenario 3	0.05454	0.0814	0.06921	0.04519	0.08783
Scenario 4	0.05105	0.08915	0.07493	0.04359	0.05986
Scenario 5	0.05806	0.07705	0.2036	0.05855	0.07753
Scenario 6	0.04448	0.04314	0.05194	0.02593	0.04922
Maximum Annual Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.00493	0.00415	0.00455	0.0047	0.00542
Scenario 2	0.01572	0.01182	0.01255	0.01285	0.01444
Scenario 3	0.00549	0.00567	0.00563	0.00577	0.00642
Scenario 4	0.00614	0.00629	0.0065	0.00648	0.00701
Scenario 5	0.00799	0.00749	0.00922	0.00821	0.0086
Scenario 6	0.00277	0.00285	0.00337	0.00318	0.00386

Table 4: Route 15 Receptor

Maximum 24-Hour Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.05150	0.04515	0.04896	0.08076	0.05188
Scenario 2	0.08167	0.12186	0.09222	0.07706	0.08093
Scenario 3	0.10975	0.06359	0.09300	0.08091	0.07683
Scenario 4	0.06111	0.07946	0.06369	0.08617	0.06538
Scenario 5	0.06053	0.11872	0.07188	0.07315	0.06201
	0.04099	0.04131	0.04798	0.05780	0.03356
Maximum Annual Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.00624	0.00659	0.00661	0.00755	0.00574
Scenario 2	0.00782	0.00863	0.00893	0.00864	0.00580
Scenario 3	0.00904	0.00777	0.00743	0.00714	0.00764
Scenario 4	0.00759	0.00782	0.00699	0.00669	0.00781
Scenario 5	0.00632	0.00803	0.00712	0.00657	0.00637
Scenario 6	0.00316	0.00422	0.00423	0.00382	0.00338

Table 5: Weatherbee-McGraw School Receptor

Maximum 24-Hour Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.01488	0.02773	0.01292	0.01906	0.02328
Scenario 2	0.01173	0.00920	0.00807	0.00980	0.01185
Scenario 3	0.01769	0.01261	0.01667	0.01363	0.01789
Scenario 4	0.01603	0.00945	0.01890	0.01106	0.03017
Scenario 5	0.02305	0.00896	0.01790	0.01021	0.04456
Scenario 6	0.00211	0.00552	0.00215	0.00780	0.00399
Maximum Annual Mercury Concentrations (µg/m³)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.00070	0.00076	0.00046	0.00078	0.00094
Scenario 2	0.00035	0.00027	0.00023	0.00045	0.00039
Scenario 3	0.00053	0.00040	0.00037	0.00064	0.00059
Scenario 4	0.00050	0.00037	0.00037	0.00059	0.00060
Scenario 5	0.00050	0.00036	0.00037	0.00054	0.00063
Scenario 6	0.00009	0.00008	0.00005	0.00016	0.00012

Table 6: Opposite Bank Residence Receptor

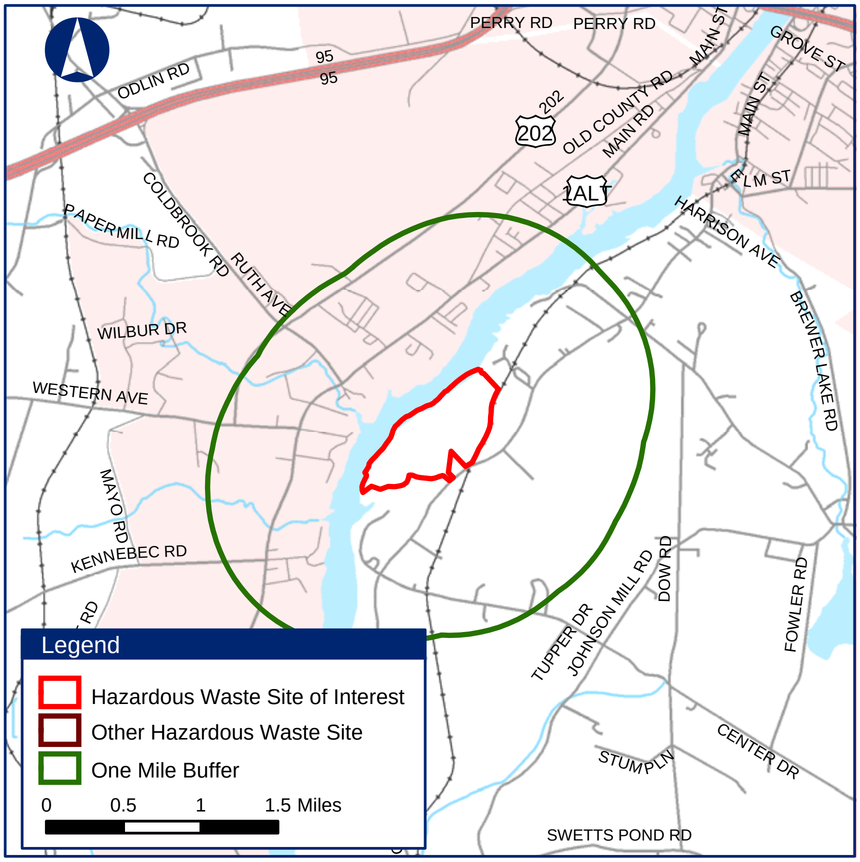
Maximum 24-Hour Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.05642	0.08051	0.03923	0.22537	0.07444
Scenario 2	0.01945	0.01240	0.02181	0.01464	0.03526
Scenario 3	0.06227	0.02554	0.04736	0.02920	0.10622
Scenario 4	0.06033	0.02807	0.04533	0.02359	0.07671
Scenario 5	0.02901	0.03325	0.03425	0.01605	0.02864
Scenario 6	0.00375	0.00704	0.00575	0.01048	0.00722
Maximum Annual Mercury Concentrations (µg/m^3)					
	1985	**1986**	**1987**	**1988**	**1989**
Scenario 1	0.00228	0.00252	0.00153	0.00324	0.00276
Scenario 2	0.00065	0.00049	0.00047	0.00080	0.00078
Scenario 3	0.00133	0.00102	0.00104	0.00140	0.00165
Scenario 4	0.00110	0.00097	0.00091	0.00115	0.00137
Scenario 5	0.00078	0.00097	0.00077	0.00092	0.00103
Scenario 6	0.00016	0.00014	0.00010	0.00028	0.00022

Figure 1: GIS Map

Int Minerals And Chemicals Corp

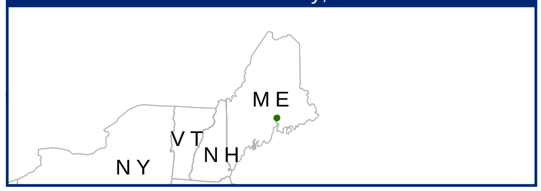
Orrington, ME

EPA Facility ID: MED000242701



Base Map Source: Geographic Data Technology, May 2005.
Site Boundary Data Source: ATSDR Public Health GIS Program, May 2005.
Coordinate System (All Panels): NAD 1983 StatePlane Maine East FIPS 1801 Feet

Site Location: Penobscot County, ME



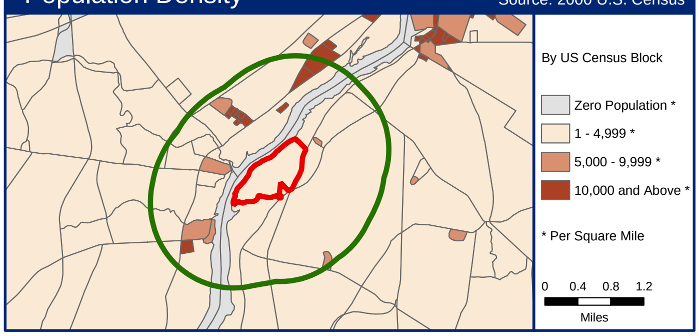
Demographic Statistics
Within One Mile of Site*

Total Population	2,545
White Alone	2,507
Black Alone	7
Am. Indian & Alaska Native Alone	6
Asian Alone	7
Native Hawaiian & Other Pacific Islander Alone	0
Some Other Race Alone	4
Two or More Races	15
Hispanic or Latino**	11
Children Aged 6 and Younger	208
Adults Aged 65 and Older	354
Females Aged 15 to 44	512
Total Housing Units	1,057

Demographics Statistics Source: 2000 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

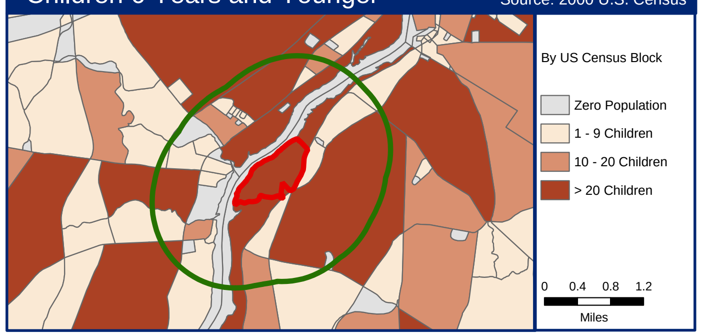
Population Density

Source: 2000 U.S. Census



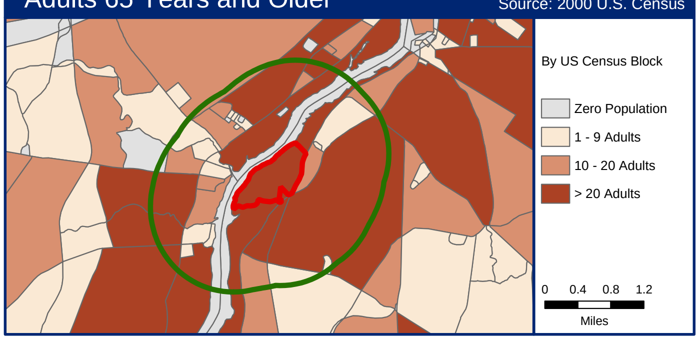
Children 6 Years and Younger

Source: 2000 U.S. Census



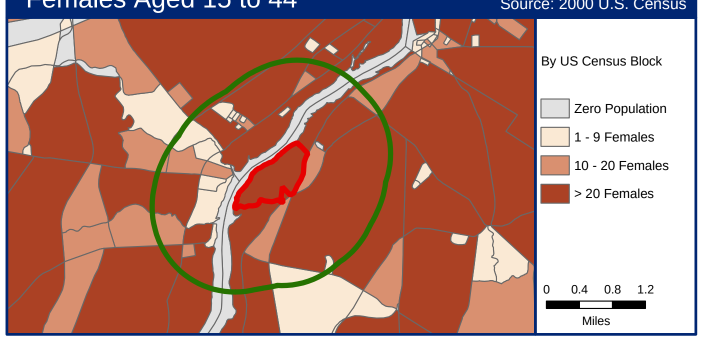
Adults 65 Years and Older

Source: 2000 U.S. Census



Females Aged 15 to 44

Source: 2000 U.S. Census



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