

Public Health Assessment for

**GRAND STREET MERCURY SITE
HOBOKEN, HUDSON COUNTY, NEW JERSEY
CERCLIS NO. NJ0001327733
NOVEMBER 27, 1998**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry**



PUBLIC HEALTH ASSESSMENT

GRAND STREET MERCURY SITE

HOBOKEN, HUDSON COUNTY, NEW JERSEY

CERCLIS NO. NJ0001327733

Prepared by:

**Hazardous Site Health Evaluation Program
Consumer and Environmental Health Services
Division of Environmental and Occupational Health
New Jersey Department of Health and Senior Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

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

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

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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.

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:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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ACRONYMS

Agency for Toxic Substances and Disease Registry - ATSDR

Environmental Protection Agency - EPA

New Jersey Department of Health and Senior Services - NJDHSS

New Jersey Department of Environmental Protection - NJDEP

Hoboken Board of Health - HBH

Hudson Regional Health Commission - HRHC

Grand Street Artists Partnership - GSAP

Grand Street Mercury Site - GSMS

SUMMARY

This Public Health Assessment serves to evaluate the public health issues associated with the Grand Street Mercury Site (GSMS), which has recently been proposed for addition to the National Priority List (NPL). NPL or "Superfund" Sites represent those hazardous waste sites which are associated with significant public health concern in terms of the nature and magnitude of contamination present, and the potential to adversely impact the health of populations in their vicinity.

The human exposure pathways associated with known contaminated environmental media within or associated with the GSMS have been evaluated and actions have been taken and/or planned that are consistent with the protection of the public health. At the GSMS, the known contaminated media include: soil; indoor air; and building.

The Grand Street Mercury Site (GSMS) is located at 720 and 722-732 Grand Street, Hoboken, Hudson County, New Jersey. The Site consists of a former industrial building converted into 16 residential/studio spaces (722-732 Grand Street), one townhouse previously used as office space (720 Grand Street), and a parking lot.

During renovation of a fifth floor unit in January 1995, puddles of mercury were observed in the subfloor. The Grand Street Artists Partnership (GSAP) hired an environmental company to conduct air monitoring of the building for mercury contamination. Based upon the results of air monitoring, the company recommended remediation of mercury contamination in the building. From March through October 1995, the GSAP initiated measures to clean up the mercury contamination found on the fifth floor. In September 1995, a representative of the Hudson Regional Health Commission (HRHC) visited the site and observed the mercury contamination and on-going remediation on the fifth floor of the building.

On November 2, 1995, a resident reported mercury contamination on the fourth floor of the building to the Hoboken Board of Health (HBH). On November 8, air monitoring for mercury was performed in two units located on the fourth floor. Mercury was detected in air at levels exceeding USEPA standards for mercury. On December 22, 1995, representatives of the Hudson Regional Health Commission (HRHC) and the HBH requested the Agency for Toxic Substances and Disease Registry (ATSDR) and the New Jersey Department of Health and Senior Services (NJDHSS) to assist in evaluating the public health impact of mercury contamination in a condominium building located at 722 Grand Street in Hoboken, New Jersey. A site visit was conducted by representatives from the NJDHSS. During the site visit, air monitoring was conducted using a real time mercury vapor monitoring instrument.

On December 27, 1995, personnel from the HBH and HRHC collected urine samples from 31 people. Samples were analyzed for total mercury, specific gravity, and creatinine by the NJDHSS laboratory. Mercury concentrations in the samples ranged from 3-102 $\mu\text{g/L}$, and 20 of 29 samples from residents (69%) had mercury concentrations equal to or greater than 20 $\mu\text{g/L}$. Mercury levels in urine samples

from six children ranged from 7.0-67.3 µg/L; five of these samples contained mercury above 20 µg/L.

On December 29, the HBH, HRHC, and the NJDHSS/ATSDR met with residents to provide them with results of the urine tests and to assist them in interpreting the urine and air mercury results. Based on the levels of contaminants observed, residents were urged to relocate as soon as possible. The ATSDR/NJDHSS completed a Health Consultation for the GSMS on January 3, 1996. The HBH issued an order which resulted in evacuation of the building and relocation of the residents by USEPA. All residents had vacated the building by January 11, 1996.

On January 22, 1996, ATSDR issued a Public Health Advisory proclaiming an imminent public health hazard posed to residents of 722 Grand Street from past, current, and potential future exposures via inhalation, direct dermal contact and possible ingestion of metallic (elemental) mercury and mercury vapor. ATSDR recommended that the following actions should be taken: 1) Dissociate the public as soon as possible from mercury exposure in the 722 Grand Street building; 2) Ensure that residents' belongings would be free of mercury contamination before they were to be removed from the building; such possessions could have continued to expose residents of 722 Grand Street, contaminate other areas, and expose other members of the public.

On March 21, 1996, the USEPA approved an Action Memorandum to conduct an emergency removal action at the GSMS in Hoboken, New Jersey. On December 23, 1996, USEPA proposed the Grand Street Mercury Site (GSMS) for inclusion on its National Priorities List (NPL). In April 1997, USEPA completed a Baseline Risk Assessment for the GSMS. USEPA completed a Focussed Feasibility Study in July 1997, that analyzed remedial alternatives for the GSMS. On September 30, 1997, USEPA issued a Record of Decision (ROD). The major components of the selected remedy include: 1) permanent relocation of the former residents of the GSMS; 2) continuation of temporary relocation of the former residents until permanent relocation has been implemented.

Access to all buildings on the GSMS has been secured by USEPA and remediation is on-going. The ATSDR and the NJDHSS consider the GSMS to have represented a public health hazard in the past. Based upon the site data, adults and children were likely exposed to mercury in the building at levels of public health concern. Subsequent to interim remedial measures conducted by the USEPA and relocation of residents, the site is evaluated by the ATSDR and the NJDHSS to present no apparent public health hazard, as currently the exposure pathway has been interrupted. The remedial activities specified in the USEPA's work plan, when implemented and completed, are sufficient to address remaining concerns of the ATSDR and the NJDHSS regarding the GSMS and are consistent with protection of the public health.

BACKGROUND

The ATSDR and the NJDHSS have completed several health consultations for the GSMS between 1995 and 1996. This public health assessment will evaluate and summarize the activities undertaken and or planned by the ATSDR and the NJDHSS.

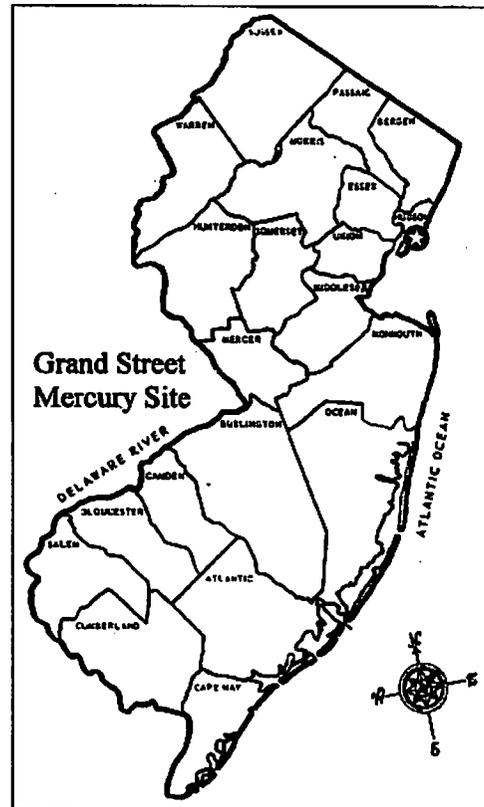
A. Site Description And History

The Grand Street Mercury Site (GSMS) is located at 720 and 722-732 Grand Street, Hoboken, Hudson County, New Jersey (see inset). The Site consists of a former industrial building converted into 16 residential/studio spaces (722-732 Grand Street), one townhouse previously used as office space (720 Grand Street), and a parking lot. The building is approximately 100 feet by 175 feet, five stories high and has approximately 55,000 square feet of interior floor space. The townhouse has approximately 4,000 square feet of interior floor space.

The Site was the location of various manufacturing and industrial businesses prior to 1993. Previous owners of the property have included the General Electric Vapor Lamp Company (1911 to 1939), the General Electric Company (1939 to 1948), the Cooper-Hewitt Electric Company (1910 to 1911 and 1948 to 1955, tenant from 1955 to 1965), and the Quality Tool and Die Company (1955 to 1979).

The Cooper-Hewitt and General Electric Company manufactured mercury vapor lamps at the Site. Mercury associated with the manufacture of the vapor lamps is presumed to have been the primary source of mercury contamination throughout the building. Lamps of this type were produced at the site from 1910 to 1965.

The Quality Tool and Die Company manufactured precision tools at the Site. In 1990, the owner of Quality Tool and Die Company filed for a cessation of operations under the New Jersey Environmental Cleanup and Responsibility Act (ECRA) statute. The remediation included removal of an underground storage tank and surrounding soil which contained petroleum hydrocarbons and covering the parking lot with an asphalt cap. The property was sold to the Grand Street Artists Partnership (GSAP). The GSAP divided the building into 16 units and sold the units to individual partners. Residents moved into newly renovated apartments and artist studios in mid- to late- 1994.



During renovation of a fifth floor unit in January 1995, puddles of mercury were observed in the subfloor. The GSAP hired an environmental company to conduct air monitoring of the building for mercury contamination. Based upon the results of air monitoring, the company recommended remediation of mercury contamination in the building. From March through October 1995, the GSAP initiated measures to clean up the mercury contamination found on the fifth floor.

In September 1995, the Hudson Regional Health Commission (HRHC) inspected the site to observe mercury remediation activities. On November 2, 1995, a resident on the fourth floor reported mercury contamination. On November 8, air monitoring for mercury was performed by GSAP's environmental contractor in two units located on the fourth floor. Mercury was detected in air at levels exceeding USEPA standards for mercury.

In November and December 1995, urine samples were taken from five residents by their private physicians. Results from three of the tests were provided to ATSDR on December 15 for review. Two of these samples had elevated mercury concentrations (36 µg/L and 65 µg/L) that exceed those found in unexposed populations (<20 µg/L). Both of these elevated samples were from young children.

In November 1995, the Hoboken Board of Health (HBH) was notified by one of the residents that a mercury contamination problem existed and the HBH's assistance was requested. On December 22, 1995, representatives of the HRHC and the HBH requested the Agency for Toxic Substances and Disease Registry (ATSDR) and the New Jersey Department of Health and Senior Services (NJDHSS) to assist in evaluating the public health impact of mercury contamination in the condominium building. A site visit was conducted by representatives from NJDHSS. During the site visit, air monitoring was conducted using a real time mercury vapor monitoring instrument.

On December 27, 1995, personnel from the HBH and HRHC collected urine samples from 31 people; 29 samples were from individuals who lived in the building, and 2 samples were obtained from owners of one unit who had worked in their unit but had never lived there. Samples were analyzed for total mercury, specific gravity, and creatinine by the NJDHSS laboratory. Mercury concentrations in the samples ranged from 3-102 µg/L, and 20 of 29 samples from residents (69%) had mercury concentrations equal to or greater than 20 µg/L. Mercury levels in urine samples from six children ranged from 7.0-67.3 µg/L; five of these samples contained mercury above 20 µg/L. On December 27, 1995, USEPA surveyed 15 units, the attached townhouse, and hallways on each floor. Air concentrations of mercury were measured at several locations in each unit at heights of six inches and five feet above the floor.

The HBH issued an order which resulted in the evacuation and relocation of the building's residents by the USEPA. All residents had vacated the building by January 11, 1996.

On March 21, 1996, the USEPA approved an Action Memorandum to conduct an emergency removal action at the GSMS in Hoboken, New Jersey. On December 23, 1996, USEPA proposed the Grand Street Mercury Site (GSMS) for inclusion on its National Priorities List (NPL). In addition, in April 1997, USEPA completed a Baseline Risk Assessment for the GSMS. USEPA completed a Focussed Feasibility Study in July 1997, that analyzed remedial alternatives for the GSMS. On September 30, 1997, USEPA issued a Record of Decision (ROD). The major components of the selected remedy include: 1) permanent relocation of the former residents of the GSMS; 2) continuation of temporary relocation of the former residents until permanent relocation has been implemented; 3) historic preservation mitigation measures for the building at the Site, as appropriate; 4) gross mercury decontamination of the buildings at the Site including recovery of available mercury, whenever possible; 5) abatement of friable asbestos in all buildings at the Site; 6) removal and recovery of reusable fixtures and recyclable scrap metal and other building components; 7) demolition of the two buildings at the Site using measures to minimize releases of mercury into the environment; 8) removal and off-site disposal of all demolition debris; 9) sampling of soils at the Site; 10) excavation and off-site disposal of contaminated soils; 11) sampling of soils at off-site adjacent locations; 12) sampling of groundwater at the Site; and, 13) assessment of off-site soil and groundwater data to evaluate future remedial action.

Previous ATSDR/NJDHSS Activity:

Health Consultation by ATSDR/NJDHSS:

The ATSDR and the NJDHSS completed a Health Consultation for the GSMS on January 3, 1996 (please refer to Appendix 3).

The following conclusions were made in the Health Consultation: " 1) Based on the results of indoor air mercury surveys, urine mercury analyses, and the presence of pools of elemental mercury in the floors, ATSDR and NJDHSS conclude that the building at 722 Grand Street poses an imminent public health hazard; 2) Visible mercury contamination has been detected under the fifth floor of the building. Testing of the air space above cracks and holes in floors and walls of lower units indicates that mercury contamination may have migrated further throughout the building; 3) Mercury has been detected in indoor air samples at concentrations that exceed a level of public health concern; 4) Elevated concentrations of mercury have been detected in urine samples from residents. The urinary mercury concentrations in 20 of 29 residents exceeded the range (0-20 µg/L) for an unexposed adult population. The elevated concentrations of mercury detected in the residents may be associated with subtle neurological changes." In summary, the ATSDR/NJDHSS categorized the GSMS in 1996 as an imminent public health hazard because of the risk to human health resulting from exposure to mercury at concentrations that may result in adverse health effects. Recommendations were made to conduct the following activities: " 1) ATSDR and NJDHSS recommend that the residents be

disassociated from further residential exposure to mercury; 2) Federal, State, and local health and environmental agencies should assist the residents in complying with the HBH and HRHC recommendation to relocate residents of the building in a safe and orderly manner; 3) Current and former residents who have not yet had their urine mercury level tested should do so in order to assess their degree of exposure.”

In addition to the 1996 Health Consultation, on January 27, 1996, ATSDR at the request of EPA, evaluated the level of mercury in indoor air for occupational use of the building. ATSDR recommended 0.025 mg per cubic meter of mercury in air to be protective of human health for occupational exposure.

Public Health Advisory by ATSDR:

On January 22, 1996, ATSDR issued a Public Health Advisory proclaiming an imminent public health hazard posed to residents of 722 Grand Street from past, current, and potential future exposures via inhalation, direct dermal contact and possible ingestion of metallic (elemental) mercury and mercury vapor (please refer to Appendix 2).

This public health advisory was issued by the ATSDR in response to a request for assistance from Region II USEPA, the NJDEP, the NJDHSS, the HRHC, and the HBH. As a result of this request, ATSDR and NJDHSS provided technical support in reviewing environmental and biological data and provided a health consultation for the HRHC and the HBH. ATSDR and NJDHSS, with concurrence from HRHC and HBH, had concluded that the presence of visible metallic mercury in one of the building unit's subflooring, the levels of mercury vapor detected in living space air, and elevated mercury levels in occupants' urine samples, warrant the issuance of a public health advisory.

ATSDR had determined that an imminent health hazard was posed to occupants of this building. ATSDR recommended that following actions should be taken: “1) Dissociate the public as soon as possible from mercury exposure in the 722 Grand Street building; 2) Ensure that residents' belongings are free of mercury contamination before they are removed from the building; such possessions can continue to expose residents of 722 Grand Street, contaminate other areas, and expose other members of the public.”

B. Site Visit

On December 22, 1995, NJDHSS officials conducted a site visit to the 722 Grand Street building. During the visit, the officials observed pools of mercury at several locations in the subflooring of the fifth floor. A survey of mercury vapors was performed during the visit using a Bacarach Mercury Vapor Analyzer. Surveying was performed on floors 3, 4, and 5. The maximum levels of mercury vapor detected for floors 3, 4, and 5 were ≤ 0.01 mg/cubic meter, 0.045 mg/cubic meter, and 0.050 mg/cubic meter, respectively (instrument detection limit: 0.01 mg/cubic meter) indicating the presence of mercury vapor at levels of public health concern.

C. Demographics, Land Use, And Natural Resource Use

The Grand Street Mercury Site (GSMS) is located at 720 and 722-732 Grand Street, Hoboken, Hudson County, New Jersey. There were 37 people living in the building as of December, 1995. The surrounding area is primarily residential in character, lightly mixed with commercial and industrial properties. Hoboken High School is located across the street to the northeast. The population surrounding the Site is approximately 80,000 within a mile radius. Residents in the vicinity of the Site use public water as their source of drinking water. A summary of population statistics calculated using an area-proportion spatial analysis technique, within one mile of the GSMS is presented in Appendix 1.

D. Community Health Concern Evaluation

In order to gather information on community health concerns, NJDHSS contacted the HBH, HRHC, and the USEPA.

The community concerns related to GSMS were many including effects of site related contaminants on neighboring properties, potential health effects associated with exposure to site related contaminants, especially for children living at GSMS, and potential mercury contamination at 410 Eighth Street, an industrial building across the street from the GSMS.

On December 29, 1995, the HBH, HRHC, and the NJDHSS/ATSDR met with residents to provide them with results of the urine tests and to assist them in interpreting the urine and air mercury results. Based on the levels of contaminants observed, the health agencies urged residents to relocate as soon as possible. On January 4, a fact sheet (Mercury Exposure and Health, 722 Grand Street, Hoboken), prepared by NJDHSS, was provided to each resident. The fact sheet included information on the types of mercury, how the residents' of 722 Grand Street were exposed to elemental mercury, health effects of elemental mercury exposure, medical follow-up planned by ATSDR/NJDHSS, and possible activities to be conducted by ATSDR/NJDHSS (please refer to Appendix 4). On February 2, 1996, Physician Education was conducted by NJDHSS at Bayonne Hospital for Grand Street Mercury Site, Hoboken. Approximately thirty five physicians attended the seminar. The Hudson County Resource Guide prepared by NJDHSS and Case Studies in Environmental Medicine (Exposure History and Mercury) prepared by ATSDR was given to physicians.

There is a potential for exposure to mercury at a building located across the road from GSMS at 410-8th Street. The building was tested by the USEPA in the summer of 1996 and high levels of elemental mercury vapor were detected. The four story building contains several small businesses. Additional information is needed to adequately address the exposure pathway at this site. Should future data indicate a need, this pathway will be evaluated.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The data in this section list the site contaminants of concern. ATSDR and NJDHSS evaluate these contaminants in the subsequent sections of the Public Health Assessment to determine whether exposure to them has public health significance. ATSDR and NJDHSS select and discuss these contaminants based upon the following factors:

1. Concentrations of contaminants on and off the site.
2. Comparison of on-site and off-site concentrations with health assessment comparison values for (1) non-carcinogenic endpoints and (2) carcinogenic endpoints.

Comparison values for Public Health Assessments are contaminant concentrations in specific media that are used to select contaminants for further evaluation. EPA's Reference Dose (RfD) and Reference Concentration (RfC) are estimates of the daily exposure to a contaminant that is unlikely to cause adverse health effects. The environmental contamination section includes sampling data from a variety of media sources including: soil; air; and building. Contaminants of concern are selected by comparing contaminant levels detected at the site to public health assessment comparison values. Selected contaminants are further evaluated in subsequent sections of the Public Health Assessment to determine whether exposure to these contaminants are likely to result in harmful health effects in humans.

A. On-site Contamination

Soil

In April 1996, USEPA collected on-site soil samples from the parking lot and sediment samples from the building to determine the nature and extent of mercury contamination. Mercury was detected in every soil sample at concentrations ranging from 0.77 to 290 milligrams of mercury per kilogram of soil (mg/kg). The highest concentrations of mercury were detected next to the building. The USEPA also collected sediment samples from floor drains and sump pits in the basement of the building. The results indicated presence of mercury in all of the floor drains and sump pits, ranging in concentrations from 36 to 2,540 mg/kg.

Air Monitoring in Buildings

Using a Jerome Model 411-X portable mercury analyzer, a private consultant (Enpak Services) surveyed the building in March 1995. The analytical range of the instrument was between 0.001-0.888 mg/m³. Detectable levels of mercury vapors were found on floors 3, 4, and 5. In breathing zone areas, the highest level of mercury detected was 0.005 mg/m³ (fifth floor); in source areas, the highest level of mercury was 0.888 mg/m³, which was found in the subflooring of a fifth floor unit.

On December 22, 1995, NJDHSS officials conducted a site visit to the 722 Grand Street building. During the visit, a survey of mercury vapors was performed during the visit using a Bacarach Mercury Vapor Analyzer. Surveying was performed on floors 3, 4, and 5. The maximum levels of mercury vapor detected for floors 3, 4, and 5 were ≤ 0.01 mg/cubic meter, 0.045 mg/cubic meter, and 0.050 mg/cubic meter, respectively (instrument detection limit: 0.01 mg/cubic meter) indicating the presence of mercury vapor at levels of public health concern.

On December 27, 1995, using a Jerome 431 Mercury Vapor Analyzer, USEPA staff surveyed 15 units, the attached townhouse, and hallways on each floor. Air concentrations of mercury were measured at several locations in each unit at a height of 6 inches and 5 feet above the floor. Detectable levels of mercury vapor (up to 0.013 mg/m^3) were found in 9 apartment units. Detectable concentrations of mercury were not found in the hallways. USEPA personnel observed two separate puddles of mercury on a tar layer in the subflooring of a fifth floor apartment unit.

The USEPA initiated periodic air monitoring throughout the building in January 1996, which is ongoing. Almost 2,000 air samples have been collected, and approximately seventy percent of those samples identified mercury in air throughout the main building and townhouse. The concentrations of mercury in air ranges from nondetect to 0.3 mg of mercury per cubic meter of air.

Sampling of Building Structures

The USEPA used X-Ray Fluorescence technology to identify the extent to which mercury may have penetrated wooden components in the roof and wooden support beams in three condominium units. The results indicated mercury contamination ranging from 0.790 to 6,300 mg/kg, throughout these structural components. The USEPA also used X-Ray Fluorescence technology to identify the extent to which mercury may have penetrated exposed brick walls. The USEPA collected samples from 14 locations on the fourth and fifth floors. The results indicated mercury contamination ranging from 39.8 to 9,110 mg/kg, throughout these structural components.

B. Off-Site Contamination

Soil

The USEPA collected soil samples from a residential yard and basement adjacent to the GSMS. The average concentration detected was below USEPA's residential risk-based concentration standard of 23.5 mg/kg (ranging in concentrations from 5.5 mg/kg to 30.4 mg/kg).

C. Physical and Other Hazards

On-going actions by USEPA have secured and stabilized the site. To address physical hazards on-site, USEPA has boarded and/or secured all points of access to the building.

PATHWAYS ANALYSIS

To determine whether nearby residents or residents at the site are exposed to site related contaminants, ATSDR/NJDHSS evaluate the environmental and human components that lead to human exposure. This pathways analysis consists of five elements: (1) a source of contamination; (2) transport through an environmental medium; (3) a point of human exposure; (4) route of human exposure; and (5) an exposed population. The ATSDR/NJDHSS classify exposure pathways into three groups: (1) "completed pathways", that is, those in which exposure has occurred, is occurring, or will occur; (2) "potential pathways", that is, those in which exposure might have occurred, may be occurring, or may yet occur; and (3) "eliminated pathways", that is, those that can be eliminated from further analysis because one of the five elements is missing and will never be present, or in which no contaminants of concern can be identified. A summary of the pathways for the GSMS are discussed below. See **Table I**.

A. Completed Exposure Pathways

Past Residential Air Pathway

Air monitoring in the building has indicated the presence of elevated concentrations of mercury. In addition, pools of elemental liquid mercury have been observed under floor boards on the fifth floor, which indicates that there is a substantial reservoir of mercury in the building. Site data and information indicate that a completed exposure pathway via inhalation did exist at the GSMS in the past. Currently this pathway is interrupted as residents have been relocated.

Table I. Completed Exposure Pathways

EXPOSURE PATHWAY ELEMENTS					TIME
SOURCE	ENVIRONMENTAL MEDIA	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	
GSMS	Air	Indoors (residences)	Inhalation	Residents	Past

PUBLIC HEALTH IMPLICATIONS

A. Toxicological Evaluation

Introduction

In this section, NJDHSS will discuss the health effects in persons exposed to specific contaminants. To evaluate health effects, ATSDR has developed a Minimal Risk Level (MRL) for contaminants commonly found at hazardous waste sites. The MRL is an estimate of daily human exposure to a contaminant below which non-cancer, adverse health effects are unlikely to occur. MRLs are developed for each route of exposure, such as ingestion and inhalation, and for the length of exposure, such as acute (less than 14 days), intermediate (15 to 364 days), and chronic (greater than 365 days). ATSDR presents these MRLs in the Toxicological Profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status. In the following discussion, NJDHSS used ATSDR Toxicological Profiles for the contaminants of concern at the site. The NJDHSS will use a USEPA Reference Concentration (RfC) as a health guideline, when a MRL is not available.

Air Exposure

Indoor air mercury levels in the breathing zone ranged from non-detectable to 0.05 mg/m³. At other residential properties contaminated with mercury, ATSDR has recommended that indoor air mercury levels should be below 0.0003 mg per cubic meter in order to protect human health. Mercury levels above 0.0003 mg/m³ exceed ATSDR's chronic Minimal Risk Level (MRL) and EPA's Reference Concentration (RfC). Therefore, indoor air levels in the breathing zone at the Grand Street property exceed an acceptable level. At floor level, where children might crawl and play, mercury levels were even higher. Gross mercury contamination inside the 722 Grand Street building is the likely source of mercury exposure, with exposures occurring primarily by inhalation of contaminated indoor air.

B. Health Outcome Data Evaluation

Associations between urinary mercury levels and health effects have been studied in adults with occupational exposures to mercury. Urine mercury concentrations of 20-100 µg/L may be associated with subtle neurological changes, even before overt symptoms occur. Early signs and symptoms of exposure to mercury might include decreased responses on tests of nerve conduction, brain-wave activity, and verbal skills. Urine concentrations of mercury in unexposed adults were less than 20 µg/L. This level was exceeded by 69% of the residents of the building, which indicates that they were being exposed to levels of mercury of health concern. Based on the elevated urine mercury levels, ATSDR offered clinical evaluations to building residents at the Environmental and Occupational Health Sciences Institute (EOHSI) Clinical Center in Piscataway, New Jersey. These evaluations included medical testing and follow-up urine mercury analyses. Individual results are confidential and were provided only to the participants.

CONCLUSIONS

- (1) Based on the results of indoor air mercury surveys, urine mercury analyses, and the presence of pools of elemental mercury in the floors, ATSDR and NJDHSS concluded that the building at 722 Grand Street posed an imminent public health hazard. Mercury has been detected in indoor air samples at concentrations that exceed a level of public health concern.
- (2) Elevated concentrations of mercury have been detected in urine samples from former residents. The urinary mercury concentrations in 20 of 29 residents exceeded the range (0-20 $\mu\text{g/L}$) for an unexposed adult population. The elevated concentrations of mercury detected in the residents were in a range potentially associated with subtle neurological changes.
- (3) The ATSDR and the NJDHSS consider the GSMS to have represented a public health hazard in the past. Based upon the site data, adults and children were likely exposed to mercury in building at levels of public health concern. Subsequent to interim remedial measures conducted by the USEPA and relocation of residents, the site is evaluated by the ATSDR and the NJDHSS to present no apparent public health hazard as currently the exposure pathway has been interrupted.
- (4) The remedial activities specified in the USEPA's work plan, when implemented, should be sufficient to address concerns of the ATSDR and the NJDHSS regarding the GSMS and are consistent with protection of the public health.

RECOMMENDATIONS

Cease/Reduce Exposure

Based on the ATSDR public health advisory, USEPA's action to relocate residents and completely restricting the access to GSMS have eliminated the site related exposure.

Site Characterization

Results of the on-going remedial activities and environmental monitoring program should be periodically reviewed for public health significance when available. Should the data indicate a change in site conditions, it will be evaluated within the context of potential public health implications.

PUBLIC HEALTH ACTION PLAN (PHAP)

The Public Health Action Plan (PHAP) for the Grand Street Mercury Site contains a description of the actions to be taken by ATSDR and/or NJDHSS at or in the vicinity of the site subsequent to the completion of this Public Health Assessment (PHA). The purpose of the PHAP is to ensure that this PHA not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR/NJDHSS to follow up on this plan to ensure that it is implemented. The public health actions undertaken by ATSDR/NJDHSS are as follows:

Public Health Actions Completed by ATSDR/NJDHSS:

- (1) Environmental data and proposed remedial activities have been evaluated within the context of human exposure pathways and relevant public health issues.
- (2) Urine samples collected from residents were analyzed for total mercury, specific gravity, and creatinine by the NJDHSS laboratory.
- (3) ATSDR issued a Public Health Advisory proclaiming an imminent public health hazard posed to residents of 722 Grand Street from past, current, and potential future exposures via inhalation, direct dermal contact and possible ingestion metallic (elemental) mercury and mercury vapor.
- (4) The NJDHSS has prepared a site specific fact sheet for the GSMS which was made available to residents, local health agencies, and other interested parties.
- (5) Physician education, in the form of Grand Round Case Presentation was conducted at Bayonne Hospital. Case Studies in Environmental Medicine (Exposure History and Mercury) and Hudson County Environmental Resource Guides for Health Care Professionals, were provided to area physicians.
- (6) ATSDR arranged for medical evaluations of building residents at the Environmental and Occupational Health Sciences Institute (EOHSI) Clinical Center in Piscataway, New Jersey. Results of these evaluations are confidential.

Public Health Actions Planned by ATSDR/NJDHSS:

This document will be provided to the HBH and HRHC. ATSDR will provide an annual follow up to this PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this PHA, and will be provided to persons who request it.

CERTIFICATION

The Public Health Assessment for the Grand Street Mercury site was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was begun.



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Superfund Site Assessment Branch (SSAB)
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ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Public Health Assessment, and concurs with its findings.



Richard Gillig
Acting Chief, SSAB, DHAC, ATSDR

DOCUMENTS REVIEWED

1. **Pollution Report, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, October 31, 1997.**
2. **Record of Decision, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, October 6, 1997.**
3. **National Priorities List (NPL) Update, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, September 1997.**
4. **Superfund Proposed Plan, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, July 1997.**
5. **Community Relations Plan, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, July 1997.**
6. **ATSDR Record of Activity, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, January 27, 1997.**
7. **National Priorities List Nomination, Grand Street Mercury Site, Hoboken, Hudson County, USEPA, November 18, 1996.**
8. **Mercury Exposure Among Residents of a Building Formerly Used for Industrial Purposes, New Jersey, 1995 - MMWR, CDC, U.S. Department of Health and Human Services, May 24, 1996.**
9. **Public Health Advisory, Grand Street Mercury Site, Hoboken, Hudson County, ATSDR, January 22, 1996.**
10. **Mercury Exposure and Health, Grand Street Mercury Site, Hoboken, Hudson County, ATSDR, January 4, 1996.**
11. **Health Consultation, Grand Street Mercury Site, Hoboken, Hudson County, ATSDR/NJDHSS, January 3, 1996.**
12. **Memorandum from Jerry Fagliano, NJDHSS to Greg Ulirsch, ATSDR (Analysis of Urine Mercury Data from 722 Grand Street, Hoboken, New Jersey), January 2, 1996.**
13. **Agency for Toxic Substances and Disease Registry, Toxicological Profile for Mercury, May 1994.**

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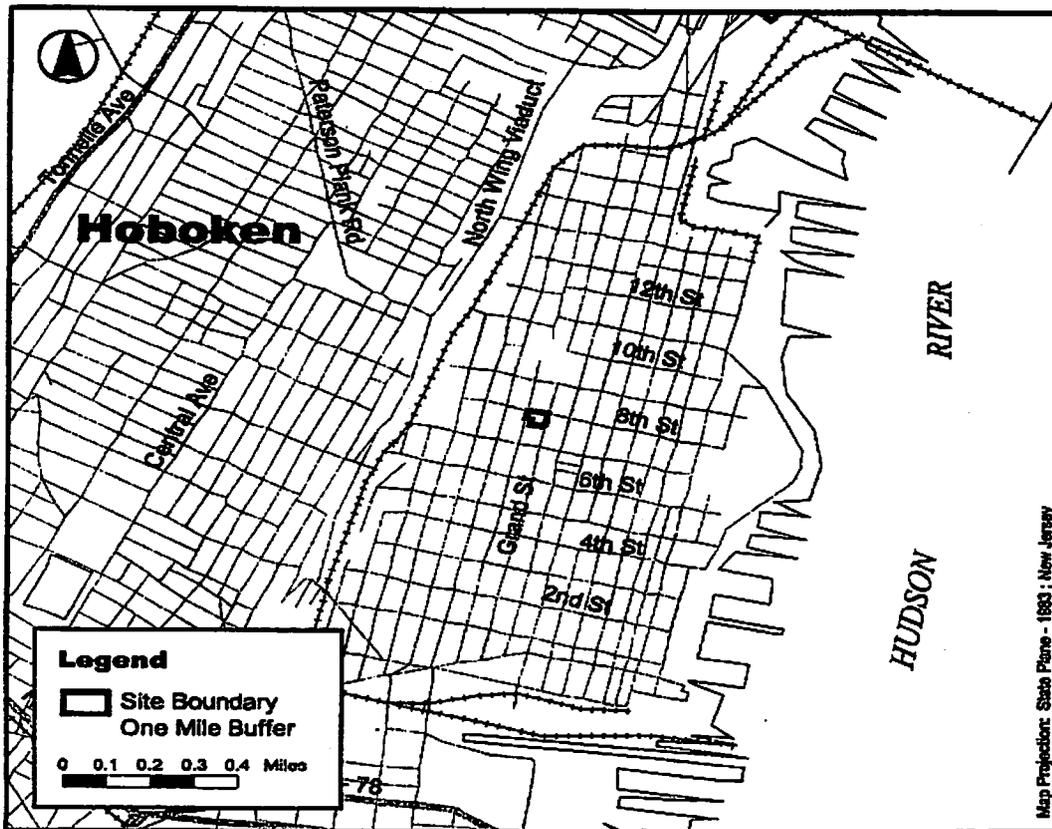
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Appendix 1 - Demographic Information

Grand Street Mercury Site

Hoboken, New Jersey
CERCLIS No. NJ0001327733



Base Map Source: 1995 TIGER/Line Files

INTRO MAP



Hudson County, New Jersey

Demographic Statistics Within One Mile of Site*

Total Population	80420
White	59835
Black	4614
American Indian, Eskimo, Aleut	186
Asian or Pacific Islander	4796
Other Race	10989
Hispanic Origin	32540
Children Aged 6 and Younger	6906
Adults Aged 65 and Older	8320
Females Aged 15 - 44	21833
Total Housing Units	36221

Demographics Statistics Source: 1990 U.S. Census
 *Calculated using an area-proportion spatial analysis technique

Appendix 2 - Public Health Advisory

PUBLIC HEALTH ADVISORY

FOR

722 GRAND STREET (A288)

HOBOKEN, HUDSON COUNTY, NEW JERSEY

JANUARY 22, 1996

**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**

INTRODUCTION

This public health advisory is to notify the Environmental Protection Agency (EPA), the State of New Jersey, the town of Hoboken, and the public of an ongoing imminent health hazard. This hazard is associated with the past, current, and potential future exposures to mercury present in the building and residences of 722 Grand Street located in Hoboken, New Jersey. This public health advisory is issued by the Agency for Toxic Substances and Disease Registry (ATSDR) in response to a request for assistance from Region II EPA, the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Department of Health (NJDOH), the Hudson Regional Health Commission (HRHC), and the Hoboken Health Department (HHD). As a result of this request, ATSDR and NJDOH have provided technical support in reviewing environmental and biological data and providing a health consultation for the HRHC and the HHD [1]. ATSDR and NJDOH, with concurrence from HRHC and HHD, have concluded that the presence of visible metallic mercury in one of the building unit's subflooring, the levels of mercury vapor detected in living space air, and elevated mercury levels in occupants' urine samples, warrant the issuance of a public health advisory.

The 17 residential living/working condominium units and attached townhouse in the 722 Grand Street structure are included in this advisory. There are indications, however, that additional areas, contiguous to the 722 Grand Street building, may need further public health evaluation. ATSDR has determined that an imminent public health hazard is posed to occupants of this building based on the following: 1) urine mercury levels in samples collected from 29 of the 37 occupants by HRHC and HHD on December 27, 1995; 2) breathing zone air mercury levels as determined by EPA Region II on December 27, 1995, and NJDOH on December 22, 1995; 3) breathing zone air mercury levels in selected units (monitored by private consultants in March and November of 1995); and 4) results of November and early December 1995, mercury urine levels in samples from selected residents (from their private physician). The health agencies stress that although liquid metallic mercury has been observed in one unit and in the subflooring of the 5th floor, environmental (air) and biological (urine) data indicate that exposure is occurring throughout the building. Furthermore, the nature of mercury vapors and liquid mercury (i.e., mobility) makes every unit in the building subject to future contamination at levels possibly higher than have been detected by mercury vapor analysis to date. Therefore, this public health advisory applies to all building occupants. The major route of human exposure to the mercury in this building is inhalation of mercury vapor. Secondary routes of exposure include dermal contact with mercury vapors or liquid mercury, and possible ingestion of liquid mercury.

The National Contingency Plan (40 CFR Part 300.400-420) describes the types of activities required and authorized in response to a hazardous substance release at a potentially hazardous site. These activities include notification of a release (section 300.404(f)(1)), evaluation of the site (section 300.410), and factors to be considered related to a removal action (section 300.415). These factors include the migration of contaminants, the threat of fire or explosion, and other events that could threaten public health. In accordance with Section 300.425 and based on the public health implications of the site, ATSDR believes that this site be considered for inclusion on the EPA National Priorities List, and/or use other statutory, regulatory or administrative authorities, as appropriate, to further characterize the areas of concern and take necessary action. ATSDR recommends that actions be taken to:

1. Dissociate the public as soon as possible from mercury exposure in the 722 Grand Street building.
2. Ensure that residents' belongings are free of mercury contamination before they are removed from the building; such

possessions can continue to expose residents of 722 Grand Street, contaminate other areas, and expose other members of the public.

BACKGROUND

The 722 Grand Street building/property is located in the City of Hoboken, Hudson County, New Jersey. Formerly an industrial property, the five-story structure, with attached townhouse, was recently renovated into condominium units and artists studios [2]. Commercial/industrial occupants of the building included the General Electric Vapor Lamp Company (1920 - 1939), the General Electric Corporation (1939 - 1945), the Cooper-Hewitt Corporation (1948 - 1955), and the Quality Tool and Dye Company (1955 - 1993) [3].

This is a brick building with wooden floors and solid wood floor supports. Renovation included the installation of a new elevator, and installation of new plumbing and electrical conduits throughout all floors. There are four living units on each floor [2]. Residential occupation of the building began in mid to late 1994. Currently, there are 37 occupants in this building.

In early 1995, during renovation of one of the fifth floor units, pools of mercury were observed in the subflooring. Subsequently, the tenants' association hired a private contractor to remediate the contamination. During the remediation, some mercury-contaminated debris was removed from the unit [2]. In March 1995, a consultant performed a mercury vapor survey of several units on the 1st through 5th floors [4]. Detectable levels of mercury vapor were found on the 3rd, 4th, and 5th floors. In breathing zone areas, the highest level of mercury was $5 \mu\text{g}/\text{m}^3$ (5th floor); in source areas, the highest level of mercury was $888 \mu\text{g}/\text{m}^3$ (found in subflooring on the 5th floor).

In late 1995, a 4th floor resident observed drops of mercury in his living space, including on stove and counter top surfaces. The remediation contractor subsequently performed some cleanup of the unit. In November 1995, several residents hired a different consultant to conduct a mercury air survey in their units and common areas of the building [2]. Mercury vapor levels in breathing zone air samples in the 3rd floor unit ranged from $4 - 9 \mu\text{g}/\text{m}^3$, and from $24 - 77 \mu\text{g}/\text{m}^3$ at wall and floor openings. Mercury vapor levels in the breathing zone air from the 4th floor ranged from $7 - 21 \mu\text{g}/\text{m}^3$, and from $14 - 26 \mu\text{g}/\text{m}^3$ at wall and floor openings. Common areas of the 3rd through 4th floors detected mercury vapor from $12 - 18 \mu\text{g}/\text{m}^3$. Through their private physicians, these residents underwent urine mercury testing in late November and early December of 1995. Mercury results ranged from 11 to 65 micrograms (μg) of mercury per liter (L) of urine ($\mu\text{g}/\text{L}$). Urine concentrations of mercury in unexposed adults are less than $20 \mu\text{g}/\text{L}$ [8].

At the request of HHD and HRHC, two additional air mercury surveys were conducted: by NJDOH on December 22, 1995; and, by EPA Region II on December 27, 1995 [5]. The December 27 sampling was conducted after residents had been encouraged to increase ventilation and lower heat to reduce possible exposures to mercury vapors. The December 22 survey was conducted on the 3rd through 5th floors. The maximum levels of mercury detected on these floors were $10 - 50 \mu\text{g}/\text{m}^3$ (detection limit of the Bacarach Mercury Vapor Analyzer is $10 \mu\text{g}/\text{m}^3$). The December 27 sampling event surveyed 15 units, an attached townhouse, and hallways on each floor. Air was sampled in the breathing zone (approximately five feet above the floor) and approximately 6 inches above the floor. Mercury was detected in nine units at levels up to $13 \mu\text{g}/\text{m}^3$. Visible puddles of mercury were observed between the second and third layer of wood flooring of a fifth floor condominium unit [5]. Detectable airborne concentrations of mercury were not found in the hallways (detection limit of the Jerome 421 Mercury Vapor Analyzer is $1 \mu\text{g}/\text{m}^3$).

On December 27, 1995, the HHD and HRHC collected urine samples from 31 persons for total mercury and creatinine analyses: 29 samples were from residents and

two samples were from workers who had made repairs in the building. Results of total mercury analysis indicated mercury levels ranging from 3-102 $\mu\text{g/L}$ (the 3 $\mu\text{g/L}$ sample was a unit owner who does not reside in the building). Twenty of the urine samples contained mercury concentrations equal to or greater than 20 $\mu\text{g/L}$ [6]. Five of the 6 children tested had urine mercury concentrations greater than 20 $\mu\text{g/L}$ [6]. Mercury levels in urine, adjusted for creatinine, ranged from 3 to 134 $\mu\text{g mercury/gram creatinine}$ [6].

During the December 27 urine collection, building occupants were encouraged by the HRHC and HHD to increase the ventilation in their homes and lower their heat to reduce their possible exposures to mercury vapor. They were also encouraged to relocate. On December 29, 1995, the HHD, HRHC, and NJDOH met with occupants of 722 Grand Street to provide them with results of their individual urine analysis and to assist them in interpreting the health implications of these results and the air mercury results. The residents were also advised of the health agencies concerns and encouraged to relocate as soon as practicable. On January 4, 1996, ATSDR, NJDOH, EPA, NJDEP, HHD, City of Hoboken, and the HRHC met with the residents to present the findings of the ATSDR and NJDOH health consultation and to discuss relocation issues.

BASIS FOR THE ADVISORY

This public health advisory is being issued based on the following:

1. An imminent public health hazard is posed to residents of 722 Grand Street from past, current, and potential future exposures via inhalation of mercury vapors, with minor exposure by direct dermal contact, and possible ingestion of liquid mercury. There are indications, however, that additional areas, contiguous to the 722 Grand Street building, may need further public health evaluation.
2. The potential exists for mercury-contaminated possessions to be taken out of the building; such possessions can continue to expose residents of 722 Grand Street, contaminate other areas, and expose other members of the public.

Mercury has been detected in indoor air at concentrations that exceed a level of public health concern. The most significant human exposure route of metallic mercury is inhalation of the vapors. Exposure is also possible through direct dermal contact with or ingestion of liquid mercury. Because mercury vapors are heavier than air, they tend to be concentrated near the floor or ground. Therefore, children are especially at risk of mercury vapor inhalation.

The central nervous system is a key target for mercury toxicity, and both neurologic and psychologic effects can result from exposures to elemental mercury. Fine tremors in the fingers, eyelids, and lips are early signs of mercury toxicity. With increasing exposure, tremors in the hands and arms may interfere with precise movements and impair skills such as handwriting. Common psychological symptoms of mercury toxicity include depression, irritability, exaggerated response to stimuli, excessive shyness, insomnia, and emotional instability.

Associations between urinary mercury levels and health effects have been studied in adults with occupational exposures to mercury. Urine mercury concentrations of 20-100 $\mu\text{g/L}$ are associated with subtle neurological changes, even before overt symptoms occur [7,8]. Early signs and symptoms of exposure to mercury might include decreased responses on tests of nerve conduction, brain-wave activity, and verbal skills. Early indications of tremors might also be observed upon testing. At higher urinary mercury concentrations (100-500 $\mu\text{g/L}$), effects become more severe, and psychological symptoms such as

irritability, depression, memory loss, and other nervous system disorders may appear [7,8].

Indoor air mercury levels in the breathing zone ranged from non-detectable to $50 \mu\text{g}/\text{m}^3$. At floor level, concentrations as high as $888 \mu\text{g}/\text{m}^3$ were detected. At other residential properties contaminated with mercury, ATSDR has recommended that indoor air mercury levels should be below $0.3 \mu\text{g}/\text{m}^3$ ($0.0003 \text{ mg}/\text{m}^3$) in order to protect human health [9,10]. Mercury levels above $0.3 \mu\text{g}/\text{m}^3$ exceed ATSDR's chronic Minimal Risk Level (MRL) and EPA's Reference Concentration (RFC). Therefore, indoor air levels in the breathing zone at the Grand Street property exceed an acceptable level. At floor level, where children might crawl and play, mercury levels were even higher.

Urine concentrations of mercury in unexposed adults are less than $20 \mu\text{g}/\text{L}$ [8]. Because mercury is naturally occurring in the environment, a "small" amount (mean $4\text{-}5 \mu\text{g}/\text{L}$; upper limit $20 \mu\text{g}/\text{L}$) in the urine is considered normal [8]. This level was exceeded by 69% of the residents of the building who were tested, which indicates that they are being exposed to mercury at levels of health concern. Urinary concentrations of mercury (as $\mu\text{g}/\text{L}$) can be influenced by the rate of urinary output. To correct for variations in urinary output, the concentration of creatinine was also determined in the samples, and the mercury concentrations were calculated as μg mercury/gram creatinine. Among the residents of the building, the normalized urinary concentrations of mercury ranged from 3 to $134 \mu\text{g}/\text{gram}$ creatinine. In occupational exposure studies, urine mercury concentrations of $50\text{ - }100 \mu\text{g}/\text{gram}$ of creatinine were associated with increased tremors and impaired eye-hand coordination [11]. In addition, urine mercury levels of $>25 \mu\text{g}/\text{gram}$ of creatinine were associated with renal tubule effects, as evidenced by increased urinary levels of certain proteins [12].

The occurrence of high levels of mercury in the urine of 69% of the residents tested indicates that they are being exposed through a common source, rather than through occupational or other off-site sources. Gross (liquid) mercury contamination inside the 722 Grand Street building is the likely source of mercury exposure, with exposures occurring primarily by inhalation of contaminated indoor air. Moreover, analysis of the urine mercury results indicates that for those persons who reported spending fewer hours in the building, and those who reported living in the building for a shorter time, had lower urine mercury levels than others [13]. Where gross (liquid) mercury contamination is present in the units, secondary exposure could occur by dermal absorption or by direct oral ingestion.

The health agencies stress that although liquid metallic mercury has been observed in one unit and in the subflooring of the 5th floor, environmental (air) and biological (urine) data indicate that exposure to mercury is occurring throughout the building. Furthermore, the nature of mercury vapors and liquid mercury (i.e., mobility) makes other units in the building subject to future contamination at levels possibly higher than have been detected by mercury vapor analysis to date. Therefore, the health concern applies to the building and its occupants.

CONCLUSIONS

1. Based on the results of indoor air mercury surveys, urine mercury analyses, and the presence of pools of elemental mercury in the subflooring of one 5th floor unit, ATSDR concludes that the building at 722 Grand Street poses an ongoing imminent public health hazard. There are indications, however, that additional areas, contiguous to the 722 Grand Street building, may need further public health evaluation.
2. Visible mercury contamination has been detected under the 5th floor of the building. Testing of the air space above cracks and holes in floors

and walls of lower units indicates that mercury contamination has migrated further throughout the building.

3. Mercury has been detected in indoor air samples at concentrations that exceed a level of public health concern.
4. Elevated concentrations of mercury have been detected in urine samples from residents. The urinary mercury concentrations in 20 of 29 residents exceeded the range (0-20 $\mu\text{g/L}$) for an unexposed adult population. The elevated concentrations of mercury detected in the residents may be associated with subtle neurological changes and renal tubule effects.
5. The potential exists for mercury-contaminated possessions to be taken out of the building; such possessions can continue to expose residents of 722 Grand Street, contaminate other areas, and expose other members of the public.

RECOMMENDATIONS AND ACTIONS TAKEN OR PLANNED

The ATSDR recommends that the regulatory/enforcement agencies (EPA, NJDEP, and/or the City of Hoboken) take the following actions with continued cooperation and coordination with the health agencies (ATSDR, NJDOH, HRHC, and HHD):

1. Dissociate the public as soon as possible from mercury exposure in the 722 Grand Street building.
2. Ensure that occupants' belongings are free of mercury contamination before they are removed from the building.
3. Consider the 722 Grand Street building/property for inclusion on the EPA National Priorities List, and/or use other statutory, regulatory or administrative authorities as appropriate to further characterize the areas of concern and take necessary action.

OTHER RECOMMENDATIONS

1. All permanent occupants of the building, including infants and children, should be referred, without delay, for evaluation by a physician with expertise in environmental and occupational health. The purpose of the referral is to identify and follow-up any abnormalities of immediate clinical significance, particularly those that may be related to mercury exposure.
2. A systematic assessment of the exposed population, using ATSDR's basic test batteries for kidney dysfunction and neurobehavioral disorders in adults and children, should be considered after the most urgent concerns--such as eliminating exposures and diagnosis and treatment of any abnormalities of immediate clinical significance--have been addressed.

ATSDR, NJDOH, EPA, NJDEP, HRHC, and HHD have or will perform the following actions:

1. ATSDR and NJDOH are available, upon request, to assist the enforcement/regulatory agencies in providing public health input into risk management decisions.
2. ATSDR and NJDOH will continue to provide health consultations to review environmental, health outcome, and community health concern

information and determine appropriate additional health follow-up actions.

3. NJDOH, under a cooperative agreement with ATSDR, will work with the HHD and HRHC to continue health professional education to advise local health care providers and public health professionals of the nature and possible consequences of exposure to metallic (elemental) mercury. The education effort will include providing information on routes of human exposure to metallic mercury, symptoms of exposure, and testing and treatment. Furthermore, ATSDR will provide technical consultation to HHD and NJDOH on the support needed by residents in response to relocation and personal health concerns.
4. NJDOH, under a cooperative agreement with ATSDR, will work with the HHD and HRHC to continue community health education efforts. This will include the identifying and providing support for the special needs of the affected tenants of the building.
5. The Environmental and Occupational Health Institute of New Jersey, in cooperation with ATSDR and NJDOH, will provide to all permanent occupants of the building, including infants and children, an immediate clinical evaluation of their exposures to mercury.
6. ATSDR and NJDOH, working with HHD, will provide a urine analysis for mercury to current and former residents who did not previously provide a urine sample.
7. ATSDR and NJDOH will provide to the residents, once relocated, follow-up urine sampling and analysis until levels of mercury in urine fall below 20 $\mu\text{g/L}$.
8. HHD has issued the necessary orders or legal action, as required, to ensure dissociation of the occupants from the building (exposure elimination). All agencies assisted in the dissociation of the residents from the building.
9. HHD served as the point of contact for public agencies, affected residents, the media, and the public while the residents vacated the building, but is no longer acting in that capacity.
10. The town of Hoboken provided for initial security of the building while the residents vacated the building, but that function is now being performed by EPA.
11. HRHC will provide technical support and advice to the HHD and other agencies, as requested.
12. HRHC will assist with air monitoring activities at the site, as required.
13. EPA and NJDEP will provide screening and logistics regarding the identification of contaminated personal belongings.
14. NJDOH will respond to health questions from former workers at the 722 Grand Street building (including employees of General Electric and Quality Tool and Dye Corporations, and construction contractors involved with building renovation). Those who inquire will be asked about medical and exposure history, be sent information on consequences of mercury exposure and a list of occupational medical specialists, and be offered urine mercury testing.

For additional information, please contact ATSDR at the following address:

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2. "Mercury Vapor Survey 722 Grand Street, Hoboken, New Jersey," November 8, 1995. Prepared by Detail Associates, Inc., Englewood, NJ.
3. Personal Communication, Gary Garetano, Assistant Director, Hudson Regional Health Commission, January 2, 1996.
4. Rough Draft: "An Industrial Hygiene Survey of Mercury Levels Conducted at 720-732 Grand Street, Hoboken, NJ, March 11, 1995," ENPAK Services.
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13. "Analysis of Urine Mercury Data from 722 Grand Street, Hoboken, NJ: Creatinine-Adjusted Data," January 5, 1996. Memorandum from Jerald Fagliano, NJDOH, to Gregory Ulirsch, ATSDR.

Appendix 3 - Health Consultation

HEALTH CONSULTATION

722 GRAND STREET (A288)
HOBOKEN, NEW JERSEY
January 3, 1996

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

in cooperation with the
New Jersey Department of Health

Concurrence

Director, DHAC, ATSDR (E32) 
Acting Chief, EICB, DHAC (E32)  EAS
Chief, SSAB, DHAC (E32) 

BACKGROUND AND STATEMENT OF ISSUES

On December 22, 1995, representatives of the Hudson Regional Health Commission (HRHC) and the Hoboken Health Department (HHD) asked the Agency for Toxic Substances and Disease Registry (ATSDR) and the New Jersey Department of Health (NJDOH) to assist in evaluating the public health impact of mercury contamination in a condominium building located at 722 Grand Street in Hoboken, New Jersey.

The building was formerly used for industrial operations. Previous occupants of the building include the General Electric Vapor Lamp Company (1920-1939), General Electric Corporation (1939-1945), Cooper-Hewitt Corporation (1948-1955), and the Quality Tool and Dye Company (1955-1993). The Quality Tool and Dye Company sold the building to a group of investors who formed a condominium association. After renovations and the construction of apartments and artist studios, residents began moving into the building in mid to late 1994. There are currently 37 people living in the building.

During renovation of one of the 5th floor units in January 1995, pools of mercury were observed in the subflooring. Subsequently, the tenant's association hired a private contractor to remove mercury contamination. In March of 1995, Enpak Services conducted a mercury vapor survey of several units. In late 1995, residents of one unit reported seeing drops of mercury in their living spaces (i.e., on the oven and kitchen countertop). In November 1995, the owners of two units hired Detail Associates to survey for mercury vapor in their units and in common areas of the building. At the request of the HHD and HRHC, two additional surveys of air mercury levels in the building were performed -- one by the New Jersey Department of Health on December 22, 1995, and the second by the U.S. Environmental Protection Agency (EPA) - Region 2 on December 27, 1995.

Concurrent with the EPA survey (December 27), the NJDOH conducted an Exposure Investigation. Staff from HRHC and HHD collected urine samples from 31 residents of the building. Under the cooperative agreement between the Agency for Toxic Substances and Disease Registry (ATSDR) and the NJDOH, the samples were analyzed at the New Jersey State Laboratory.

In late November and early December, several residents with health concerns contacted private physicians. Urine samples were collected from five individuals at that time and analyzed for mercury.

On December 29, 1995, officials of HHD and HRHC gave the residents the results of their urine analyses for the December 27

samples. In addition, officials of HHD, HRHC, NJDOH, and ATSDR provided information about the health effects of exposure to mercury and information about the magnitude of mercury contamination in their building. A fact sheet was provided to each resident (Attachment 1).

Environmental Testing

March 1995:

Using a Jerome Model 411-X portable mercury analyzer, a private consultant (Enpak Services) surveyed the building in March 1995 [1]. Mercury levels were measured in areas of suspected or possible contamination, usually in areas where mercury droplets were reported or at wall-floor interfaces. Cracks, separations, or depressions that might hold small mercury drops were given priority. In addition, mercury levels were measured at a height of about five feet (breathing zone) above the floor. Sleeping areas and food storage or food preparation areas were given a high priority for breathing zone sampling. The analytical range of the instrument was between 0.001-0.888 mg/m³. Detectable levels of mercury vapors were found on floors 3, 4, and 5. In breathing zone areas, the highest level of mercury detected was 0.005 mg/m³ (fifth floor); in source areas, the highest level of mercury was 0.888 mg/m³, which was found in the subflooring of a fifth floor unit.

November 1995:

In November 1995, a private consultant (Detail Associates) used a Jerome 411 Gold Film Mercury Vapor Analyzer to survey indoor air in two condominium units and common building areas [2]. Testing was conducted at wall and floor openings and in the breathing zone in various rooms of the two units. Both units were reportedly warm, and the windows were closed. Mercury vapor levels in breathing zone air samples in the 3rd floor unit ranged from 0.004 - 0.009 mg/m³, and levels ranged from 0.024 - 0.077 mg/m³ at wall and floor openings. Mercury vapor levels detected in breathing zone air samples from the 4th floor unit ranged from 0.007 - 0.021 mg/m³, and levels ranged from 0.014 - 0.026 mg/m³ at wall and floor openings. The common area (stairway) was drafty, and the windows were open during the survey. The results recorded in these common areas were as follows:

3rd Floor	0.013 mg/m ³
4th Floor	0.013 - 0.018 mg/m ³
5th Floor	0.012 - 0.015 mg/m ³

December 22, 1995:

On December 22, 1995, a NJDOH official conducted a site visit to the 722 Grand Street building. During the visit, the official observed pools of mercury at several locations in the subflooring of the fifth floor. A survey of mercury vapors was performed during the visit using a Bacarach Mercury Vapor Analyzer. Surveying was performed on floors 3, 4, and 5. The maximum levels of mercury vapor detected for floors 3, 4, and 5 were $\leq 0.01 \text{ mg/m}^3$, 0.045 mg/m^3 , and 0.050 mg/m^3 , respectively (instrument detection limit: 0.01 mg/m^3 .)

December 27, 1995:

Using a Jerome 431 Mercury Vapor Analyzer, EPA staff surveyed 15 units, the attached townhouse, and hallways on each floor. Air concentrations of mercury were measured at several locations in each unit at a height of 6 inches and 5 feet above the floor. Detectable levels of mercury vapor (up to 0.013 mg/m^3) were found in 9 apartment units. Detectable concentrations of mercury were not found in the hallways. EPA personnel observed two separate puddles of mercury on a tar layer in the subflooring of a fifth floor apartment unit.

Biological Testing

In addition to the environmental testing performed on December 27, 1995, personnel from the HHD and HRHC collected urine samples from 31 people; 29 samples were from residents and 2 samples were from workers who had done repairs in the building. The residents were asked to provide a first void urine sample on the morning of December 27. After collection, the samples were placed on ice and taken to the New Jersey State Laboratory in Trenton, New Jersey. Samples were analyzed for total mercury and creatinine. Mercury concentrations in the samples ranged from $3\text{-}102 \text{ } \mu\text{g/L}$, and 20 of 29 samples from residents (69%) had mercury concentrations equal to or greater than $20 \text{ } \mu\text{g/L}$. Mercury levels in urine samples from six children ranged from $7.0\text{-}67.3 \text{ } \mu\text{g/L}$; five of these samples contained mercury above $20 \text{ } \mu\text{g/L}$. The collective data from the urine analyses are presented in Attachment 2.

In late November¹ and early December 1995, five residents provided urine samples to their private physicians for analysis. Results from three of the tests were provided to ATSDR for review. Two of these samples had elevated mercury concentrations ($36 \text{ } \mu\text{g/L}$ and $65 \text{ } \mu\text{g/L}$) that exceed those found in unexposed populations ($<20 \text{ } \mu\text{g/L}$). Both of these elevated samples were from young children.

Discussion

Air monitoring in the building has indicated the presence of elevated concentrations of mercury. In addition, pools of elemental liquid mercury have been observed under floor boards on the fifth floor, which indicates that there is a substantial reservoir of mercury in the building. Some of the residents have reported seeing droplets of mercury in their units. In addition, high concentrations of mercury have been detected in the air space above cracks and holes in the floor where elemental mercury might collect.

The central nervous system is a key target for mercury toxicity, and both neurologic and psychologic effects can result from exposures to elemental mercury. Fine tremors in the fingers, eyelids, and lips are early signs of mercury toxicity. With increasing exposure, tremors in the hands and arms may interfere with precision movements and impair skills such as handwriting. Common psycho-pathological symptoms of mercury toxicity include depression, irritability, exaggerated response to stimuli, excessive shyness, insomnia, and emotional instability.

Associations between urinary mercury levels and health effects have been studied in adults with occupational exposures to mercury. Urine mercury concentrations of 20-100 $\mu\text{g/L}$ are associated with subtle neurological changes, even before overt symptoms occur [5,6]. Early signs and symptoms of exposure to mercury might include decreased responses on tests of nerve conduction, brain-wave activity, and verbal skills. Early indications of tremors might also be observed upon testing. At higher urinary mercury concentrations (100-500 $\mu\text{g/L}$), effects become more severe, and psychological symptoms such as irritability, depression, memory loss, and other nervous system disorders may appear [5,6].

Indoor air mercury levels in the breathing zone ranged from non-detectable to 0.05 mg/m^3 . At floor level, concentrations as high as 0.888 mg/m^3 were detected. At other residential properties contaminated with mercury, ATSDR has recommended that indoor air mercury levels should be below 0.3 $\mu\text{g/m}^3$ (0.0003 mg/m^3) in order to protect human health [3,4]. Mercury levels above 0.3 $\mu\text{g/m}^3$ exceed ATSDR's chronic Minimal Risk Level (MRL) and EPA's Reference Concentration (RfC). Therefore, indoor air levels in the breathing zone at the Grand Street property exceed an acceptable level. At floor level, where children might crawl and play, mercury levels were even higher.

Urine concentrations of mercury in unexposed adults are less than 20 $\mu\text{g/L}$ [5]. This level was exceeded by 69% of the residents of the building, which indicates that they are being exposed to

levels of mercury of health concern.

The occurrence of high levels of mercury in the urine of 69% of the residents indicates that they are being exposed through a common source, rather than through occupational or other off-site sources. Gross mercury contamination inside the 722 Grand Street building is the likely source of mercury exposure, with exposures occurring primarily by inhalation of contaminated indoor air. Where gross mercury contamination is present in the units, additional exposure could occur by dermal absorption upon skin contact with elemental mercury, or by direct oral ingestion.

Some residents have asked whether eating mercury-contaminated fish could be responsible for their elevated urinary mercury levels. Mercury in fish is in the form of methyl mercury, which is metabolized differently than elemental mercury. In the human body, methyl mercury is excreted primarily in the bile and feces, rather than in the urine. Therefore, the urine mercury levels that were observed cannot be explained by the consumption of mercury contaminated fish.

Conclusions

- (1) Based on the results of indoor air mercury surveys, urine mercury analyses, and the presence of pools of elemental mercury in the floors, ATSDR and NJDOH conclude that the building at 722 Grand Street poses an imminent public health hazard.
- (2) Visible mercury contamination has been detected under the fifth floor of the building. Testing of the air space above cracks and holes in floors and walls of lower units indicates that mercury contamination may have migrated further throughout the building.
- (3) Mercury has been detected in indoor air samples at concentrations that exceed a level of public health concern.
- (4) Elevated concentrations of mercury have been detected in urine samples from residents. The urinary mercury concentrations in 20 of 29 residents exceeded the range (0-20 $\mu\text{g}/\text{L}$) for an unexposed adult population. The elevated concentrations of mercury detected in the residents may be associated with subtle neurological changes.

Recommendations

- (1) ATSDR and NJDOH recommend that the residents be disassociated from further residential exposure to mercury.
- (2) Federal, State, and local health and environmental agencies should assist the residents in complying with the HHD and HRHC recommendation to relocate residents of the building in a safe and orderly manner.
- (3) Current and former residents who have not yet had their urine mercury level tested should do so in order to assess their degree of exposure.

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Lynn C. Wilder, CIH

Gregory V. Ulirsch

James Pasqualo, NJDOH

References

- (1) Enpak Services; An Industrial Hygiene Survey of Mercury Levels conducted at 720-732 Grand Street; March 11, 1995.
- (2) Detail Associates, Inc.; Mercury Vapor Survey - 722 Grand Street; November 8, 1995.
- (3) J.M. Malecki et al; Mercury Exposure in a Residential Community - Florida, 1994; Morbidity and Mortality Weekly; 44(23); pages 436-443; June 16, 1995.
- (4) C. Taueg et al; Acute and Chronic Poisoning from Residential Exposures to Elemental Mercury - Michigan, 1989-1990; Morbidity and Mortality Weekly; 40(23); pages 393-395; June 14, 1994.
- (5) Agency for Toxic Substances and Disease Registry; Case Studies in Environmental Medicine - Mercury Toxicity; March 1992.
- (6) Agency for Toxic Substances and Disease Registry; Toxicological Profile for Mercury (Update); TP-93/10; May 1994.

**Urine Mercury Testing
722 Grand St., Hoboken, N.J.**

December 29, 1995

- * The presence of visible liquid mercury and measurable mercury vapor in the air in the building prompted the Hoboken Board of Health to assess exposure to the residents. Residents submitted urine specimens on Wednesday, December 27 which were analyzed by the New Jersey Department of Health Laboratory.
- * The urine tests show that exposure to mercury at levels of health concern has occurred in all parts of the building.
- * The attached table shows the possible signs and symptoms of mercury exposure associated with the range of values detected.
- * Federal, state and local health officials recommend that residents plan to relocate as soon as practical. It is not healthy to continue living in this building indefinitely.
- * Mercury vapor can adhere to clothing, furniture and other materials. All possessions within the apartments will need to be screened for mercury contamination before removal from the building, so as not to contaminate other locations.
- * Meanwhile, health officials recommend limiting time spent in the building. Ventilating apartments will act to temporarily reduce mercury vapor levels in the air, but this is not an effective long-term solution.
- * Residents concerned about their health are encouraged to seek medical attention. Personal physicians may contact specialists at the Environmental and Occupational Health Clinical Center (Robert Wood Johnson Medical School, University of Medicine and Dentistry of New Jersey) in Piscataway for consultation or an appointment at (908) 445-0123.
- * Health and environmental officials will meet with residents next week to determine appropriate resources for safe relocation.

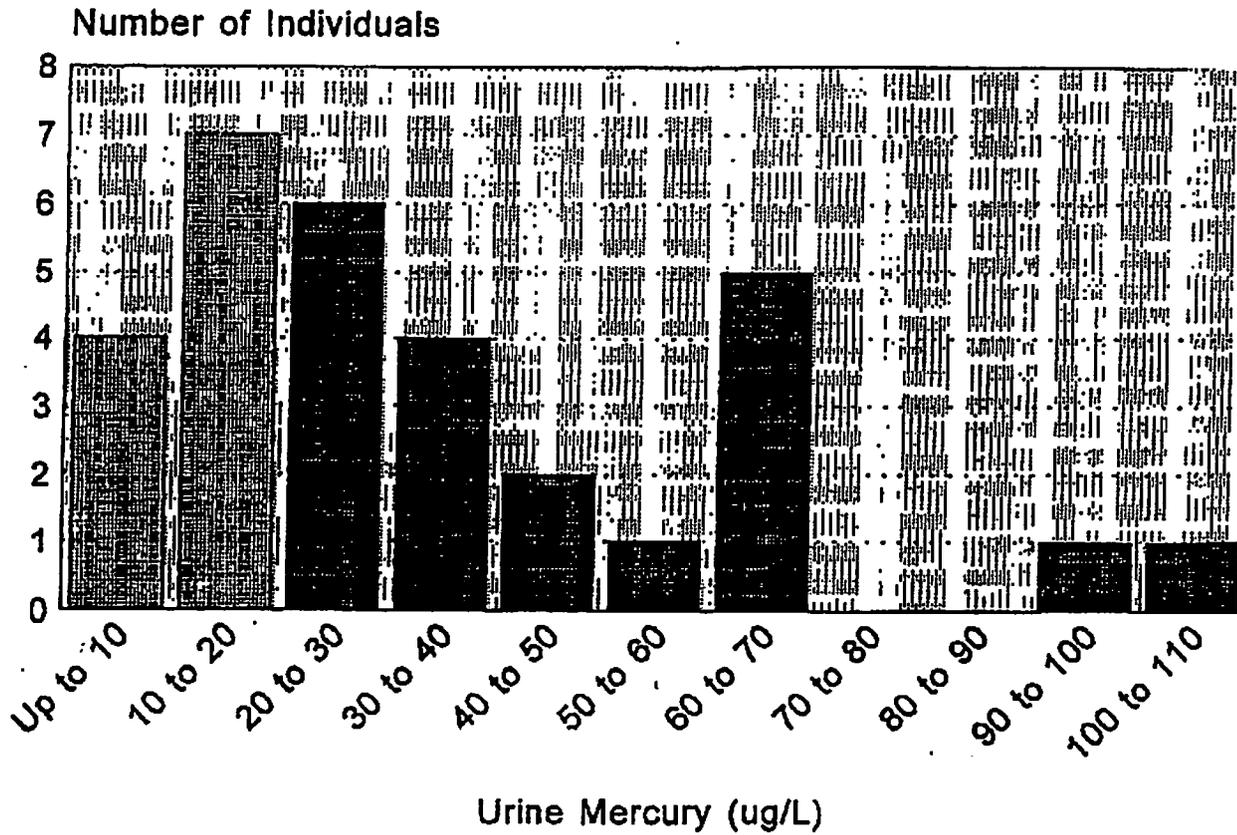
Hoboken Board of Health
Hudson Regional Health Commission
New Jersey Department of Health
U.S. Agency for Toxic Substances and Disease Registry

INTERPRETING YOUR URINE MERCURY TEST

Urine Mercury Concentration (in $\mu\text{g/L}$)*	Possible Signs and Symptoms
0 to 20	None (in non-hypersensitive individuals)
20 to 100	Abnormalities on neurophysiological and neuropsychological tests Early signs of tremor
Over 100	Irritability, depression, memory loss, minor tremor Early signs of disturbed kidney function

* $\mu\text{g/L}$: micrograms of mercury per liter of urine

Urine Mercury Test Results 722 Grand St., Hoboken, N.J.



* A value of 20 ug/L is considered the upper limit of normal in adults.

Mercury Exposure and Health 722 Grand Street, Hoboken

New Jersey Department of Health

January 4, 1996

The Agency for Toxic Substances and Disease Registry (ATSDR) and the New Jersey Department of Health (NJDOH) have issued a health consultation on 722 Grand Street, Hoboken, New Jersey, for residents, the Hoboken Board of Health, and the Hudson Regional Health Commission. The consultation states that mercury is present at levels that pose an imminent health hazard to the residents of 722 Grand Street. Visible mercury contamination, as well as mercury measured in the building's air and in urine among residents, have resulted in the Hoboken Board of Health's recommendation that residents vacate these premises. This fact sheet reviews the health basis for the consultation and recommendation, and lists future health actions planned for residents.

What is mercury?

Mercury is a naturally occurring element. It is found in three different forms:

- elemental (also known as metallic),
- organic, and
- inorganic.

Mercury's form affects its toxicity and its biological fate. This fact sheet focuses on elemental mercury, because this is the form which has been found at 722 Grand Street.

Elemental mercury, which is found in some thermometers, appears as a heavy, bright silver liquid that can give off mercury vapor in the air at room temperature. Beads of liquid mercury can break into many smaller beads. Because it is a liquid it can flow into cracks and spread throughout an area. It does not break down in the environment.

How were residents of 722 Grand Street exposed to mercury?

The residents' exposures to elemental mercury at 722 Grand Street could have occurred three ways: inhalation of mercury vapor, skin absorption, and accidental ingestion. Inhalation is the most likely way that

residents received nearly all of their exposures to mercury. Much of the mercury vapor that is inhaled enters the bloodstream, and from there it is carried to other parts of the body.

It is important to note that, because mercury vapor is heavier than air, it will accumulate in air near the floor, in a child's breathing zone. Anyone who handled mercury, either accidentally or during renovation, may have absorbed some mercury through the skin. It is unknown how much elemental mercury is absorbed through the skin, but is probably little. Eating or smoking while handling mercury could have resulted in accidental ingestion. Children may have also accidentally swallowed mercury through their normal hand-to-mouth activities. Mercury that is swallowed is not easily absorbed by the body, and nearly all mercury taken into the body this way is quickly eliminated through feces.

It is also important to note how residents and others ARE NOT exposed to mercury. Handling biological fluids from exposed residents will not result in mercury exposure (e.g., changing a diaper). Physical contact with building residents will not spread mercury contamination to others, assuming residents are not wearing extremely contaminated clothing. Any illnesses or symptoms caused by mercury exposure are not

contagious.

What are the health effects of elemental mercury exposure?

Chronic exposure to mercury vapor affects the nervous system. Higher exposures are more likely to cause symptoms than lower exposures. Central nervous system signs which can occur when urine mercury levels are higher than 100 ug/l include psychological changes, insomnia, loss of appetite with weight loss, excessive shyness, emotional instability, irritability, headache, and short-term memory loss. Tremor is characteristic of exposure, and may affect the fingers, eyelids, lips, hands and arms. Effects at lower levels (between 20 and 100 ug/l) can include decreased responses on tests of nerve conduction, brain wave activity, and verbal skills. Children may be more susceptible to mercury's effects.

Not everyone who is exposed to mercury will have all the signs and symptoms of mercury exposure.

What medical follow-up actions are planned by the ATSDR and the NJDOH?

Most residents of 722 Grand Street have had urine tested for mercury performed by the NJDOH. Residents who have not are urged to contact the Hoboken Board of Health to arrange for this test. The NJDOH will continue to offer free urine testing for residents after they vacate the premises, at time periods to be determined within the next two weeks.

The ATSDR is funding free medical evaluations for the residents of 722 Grand Street at the Environmental and Occupational Health Clinical Center, University of Medicine and Dentistry of New Jersey/Robert Wood Johnson Medical

School and Rutgers University, in Piscataway. If you have not already done so, please contact the clinic to schedule your evaluation as soon as possible.

Residents may, of course, consult with their own physicians. If your physician would like additional information about mercury exposure, the NJDOH can provide physicians with written materials about mercury toxicity.

Are there any plans regarding former workers at these premises?

The NJDOH will work with any individual who has been employed on these premises either recently or in the past, and attempt to evaluate whether the individual may have had exposure to mercury. Employers of such individuals may also call for consultation. Contact Eileen Senn of the NJDOH Occupational Health Services at (609) 984-1863.

Where can I get more information?

For residents and their physicians

Hoboken Board of Health
Frank Sasso, Health Officer
(201) 420-2375

NJDOH Environmental Health Services
Jerry Fagliano
(609) 984-2193

For clinical evaluations of residents

Environmental and Occupational Health
Clinical Center
(908) 445-0123

This factsheet is supported in part by funds from the Comprehensive Environmental Response, Compensation and Liability Act trust fund through a cooperative agreement with the Agency for Toxic Substances and Disease Registry, Public Health Service, US Department of Health and Human Services.

Appendix 4 - Mercury Exposure and Health

Mercury Exposure and Health 722 Grand Street, Hoboken

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