



Public Health Assessment for

**PETERS CARTRIDGE FACTORY
KINGS MILL, WARREN COUNTY, OHIO
EPA FACILITY ID: OHD987051083
MARCH 24, 2006**

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE**

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.

Agency for Toxic Substances & Disease Registry Julie L. Gerberding, M.D., M.P.H., Administrator
Howard Frumkin, M.D., Dr.P.H., Director

Division of Health Assessment and Consultation.... William Cibulas, Jr., Ph.D., Director
Sharon Williams-Fleetwood, Ph.D., Deputy Director

Health Promotion and Community Involvement Branch.....Susan J. Robinson, M.S., Chief

Exposure Investigations and Consultation Branch.....Susan M. Moore, Ph.D., Chief

Federal Facilities Assessment Branch.....Sandra G. Isaacs, B.S., Chief

Superfund and Program Assessment BranchRichard E. Gillig, M.C.P., Chief

Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Additional copies of this report are available from:
National Technical Information Service, Springfield, Virginia
(703) 605-6000

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: <http://www.atsdr.cdc.gov>

PUBLIC HEALTH ASSESSMENT

PETERS CARTRIDGE FACTORY
KINGS MILL, WARREN COUNTY, OHIO
EPA FACILITY ID: OHD987051083

Prepared by:

The Health Assessment Section
Of the Ohio Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

TABLE OF CONTENTS

TABLE OF CONTENTS	2
SUMMARY	3
PURPOSE AND HEALTH ISSUES	5
BACKGROUND	5
SITE LOCATION AND HISTORY	5
REGIONAL HYDROGEOLOGY AND GROUNDWATER RESOURCES	6
DISCUSSION	7
PREVIOUS SITE INVESTIGATIONS IN PARCEL A	7
1987 ENVIRONMENTAL SITE ASSESSMENT	7
SCREENING SITE INSPECTION	8
EXPANDED SITE INSPECTION REPORT 1999	9
ODH HAS WALKOVER APRIL 2005	11
POTENTIAL EXPOSURE PATHWAYS	11
CHILDRENS HEALTH CONSIDERATIONS	16
CONCLUSIONS	16
RECOMMENDATIONS	17
PUBLIC HEALTH ACTION PLAN	18
PREPARED BY	18
REFERENCES	19
FIGURES	20
APPENDIX A	21
APPENDIX B	22

SUMMARY

The Peters Cartridge Factory (PCF) site is a former ammunition manufacturing facility located in Kings Mills, Warren County, Ohio. The site was proposed for the National Priorities List of the country's most contaminated hazardous waste sites in 2003. The main concerns at the site are the possibility that groundwater contamination could impact nearby municipal drinking water supplies and that surface water run-off has impacted the Little Miami River, a State and National Scenic River, and a heavily used sport fishery and recreational resource.

The PCF manufactured ammunition from 1887 to 1944. The primary product was fixed, loaded shotgun shells and semi-smokeless ammunition. During manufacture of lead shot, molten lead was poured down the shot tower and over a series of screens, until small lead pellets were formed. The pellets were combined with gunpowder and placed into shell casings to form ammunition. Since 1944 the site has been home to several commercial businesses that have primarily used the facilities for storage and small scale commercial operations.

Environmental contamination was originally discovered at the site in 1991 when Ohio EPA was investigating a nearby facility. Ohio EPA approached the PCF owners to inquire if there were any monitoring wells on site that could be used as background wells for their other investigation. The site owners presented Ohio EPA with an environmental report that indicated lead contamination of the groundwater beneath the PCF site at levels up to 3,840 parts per billion (ppb) and in on-site soils up to 33,500 parts per million (ppm).

Additional site investigations were completed in 1996 and 1999 in which further on-site and off-site environmental sampling was conducted. On-site sampling indicated the presence of lead, mercury, and Freon-113 in the on-site groundwater at elevated levels. Freon-113 was released to the environment by Lenscrafters who leased the site during the 1990s for eyeglass production. Elevated levels of lead, mercury and other metals were also discovered in soils across the site. Off-site samples collected included sediments from the Little Miami River and fish caught in the river. Sampling indicated the presence of lead, mercury, and copper in the river sediments at elevated levels. Fish samples contained elevated levels of mercury. However, this contamination could not be linked to the PCF site because mercury was found in fish collected from the river both upstream and downstream of the PCF site.

The PCF site currently poses an “*Indeterminate Public Health Hazard*” to workers, residents, and visitors who may visit the site and surrounding area. While elevated levels of contaminants have been detected in on-site soils and groundwater and in off-site sediments in the past, it is unknown what the full extent of the contamination is and whether people are actually being exposed to the contamination at the present. Residents in the area may receive their drinking water from residential wells. The PCF receives its water supply from a municipal source and is not using on-site groundwater for consumption. It is unlikely that contamination from the site has reached surrounding

residential wells because of the distance of the nearest residence to the site. Low levels of lead have recently been detected in the easternmost production well in the adjacent Hamilton-Deerfield well field 1,500 feet west of the PCF site. The extent of the groundwater contamination at the site has not been fully characterized. The Health Assessment Section (HAS) of the Ohio Department of Health recommends that the environmental contamination be fully characterized at both on and off-site locations including soils, groundwater, and, in the Little Miami River, surface water, sediments, and fish.

A recent Ohio Department of Health site visit to PFC indicated the presence of a number of potential physical hazards to trespassers on-site. These include a deep open trench adjacent to an out building between the Bikeway and the Little Miami River and easy access to dilapidated, dangerous buildings from the adjacent Bikeway (Figure 5). It is recommended that these areas be fenced to eliminate risk of injury or accident to trespassers at the site.

PURPOSE AND HEALTH ISSUES

The Peters Cartridge Factory (PCF) site is a former ammunition manufacturing facility on the south bank of the Little Miami River near Kings Mills, in Warren County, Ohio. In 2003, the PCF site was proposed for inclusion on the National Priorities List (NPL) of the most contaminated sites in the country. The site was proposed for the NPL because of a confirmed release of lead and mercury to surface water and the potential for impacts on a heavily-used fishery. Additional considerations were given to groundwater contamination and the potential impacts on nearby municipal drinking water supplies. As part of the inclusion on the NPL, the Agency for Toxic Substances and Disease Registry (ATSDR) is required by a congressional mandate to complete a public health assessment evaluating the threat to public health posed by all NPL sites. The Health Assessment Section (HAS) of the Ohio Department of Health has had a cooperative agreement with ATSDR since 1990. As part of that agreement, HAS agreed to take the lead in completing the public health assessment. This public health assessment will evaluate environmental data, demographic data and community concerns for the site. It will identify pathways of exposure and make conclusions and recommendations for additional actions that may be necessary to protect public health.

BACKGROUND

Site Location and History

The PCF site is a former ammunition manufacturing facility located at 1414 Grandin Road in Kings Mills, Warren County, Ohio. The site is divided into two distinct parcels. Parcel A is the developed portion of the site that contains six structures and covers about 14 acres on the floodplain of the Little Miami River. Parcel A was the main munitions manufacturing area within the site. Parcel B consists of 56 acres of hilly, wooded terrain located south/southwest of the developed portion of the site (Figure 1). Sometime in the past, Peters Cartridge constructed munitions bunkers in Parcel B which were used in the testing of ammunition. Parcel A is now commercially managed and the property is subleased to smaller tenants for commercial businesses. The site is bordered to the north by the Little Miami River, a state and federally-designated Scenic River, and the Little Miami Scenic Trail, a paved hiking and bicycle trail built in the right-of-way of the former Little Miami Railroad. The site is bordered to the east by Grandin Road and to the south and west by the Kings Mills Military Reservation (KMMR). The KMMR is located approximately 120 feet above the site on top of a bluff overlooking the Little Miami River. KMMR is a site that has been investigated by the Ohio Environmental Protection Agency (Ohio EPA) for alleged environmental infractions. The remaining area surrounding the site is largely rural with the nearest residence being about 0.25 miles north and south of the site. However, several new large housing developments are being built off of Striker Road 0.5 miles south of the PCF site.

The PCF manufactured ammunition from 1887 to 1944. The primary product for the factory was fixed, loaded shotgun shells and semi-smokeless ammunition. The site was originally founded as a companion facility to the King Powder Company which was

located directly across the river from the PCF facility. In 1934, the facility was purchased by Remington who continued to manufacture ammunition until the facility was closed as part of a consolidation effort in 1944. During the manufacturing of the lead shot, molten lead was poured down the shot tower over a series of screens until pellets were formed. The pellets were then combined with gunpowder and placed into shell casings to complete the process (PRC, 1996). E.I. DuPont Nemours and Company (DuPont) owned a majority interest in Remington during this time and has been named by U.S. EPA as a potentially responsible party at the site (Personal Comm., Ohio EPA).

In 1944, the PCF facility was purchased by Columbia Records who used the facility to mix plastics and press records. In 1950, the site was purchased by Seagram's Distillery, and the buildings were used as warehouses. From 1970 until 1979 the facility was vacated and frequently vandalized. In 1979, the property was purchased by Landmark Renaissance Associates (Landmark). Landmark refurbished some of the on-site buildings and nominated the structures for the National Register of Historic Places in 1984 (Landmark, 1984). In the 1990s, Parcel A was renamed the Kings Mills Commerce Park, and several small businesses leased space from the company. From 1987 until 1993, Lenscrafters, a manufacturer of eyeglass frames and lenses, occupied parts of the site. During their tenancy, Lenscrafters disposed of Freon-113 into an on-site septic system, contaminating on-site soils. Freon-113 contaminated soils and the septic system were removed in January 1993 (PRC, 1996). Parcel B remains an undeveloped wooded area.

Ohio EPA discovered the PCF site in 1991 while attempting to locate existing monitoring wells to be used as background sampling locations for a nearby hazardous waste investigation (PRC, 1996). Ohio EPA approached Landmark to inquire about the existence of any on-site monitoring wells. Landmark provided Ohio EPA with a site assessment report that was completed in 1987. As part of the assessment, three groundwater monitoring wells were installed. The report revealed the presence of lead contamination in the on-site soils at levels up to 33,500 ppm and in the on-site groundwater up to 3,840 ppb. After discovering the lead contamination, Landmark was advised by their consultant to pave over the contaminated soils. The bare soil was paved in 1993 (PRC, 1996).

Regional Hydrogeology and Groundwater Resources

The former PCF is located on a low, gently sloping stream terrace on the flood plain of the Little Miami River (elevation 622 ft), just south of and across the river from residential portions of Kings Mill. The site is situated at the foot of a ravine created by a stream flowing northwest and down-cutting the steep bedrock slope immediately south and somewhat east of the facility. The surrounding highland areas (elevations 750 + feet) to the north (Kings Mills) and south (rural and residential areas along Grandin and Striker Roads) are underlain by clay-rich soils and shale and thin limestone bedrock that are poor sources of groundwater. Drinking water wells in these areas have yields of less than three gallons per minute (Walker, 1986; ODNR well logs).

The PCF is underlain by 2 to 10 feet of fill (primarily boiler ash, cinders, and slag), 15 to 25 feet of silty clay, and 5 to 10 feet of moist sand and gravel, overlying blue shale and thin limestone bedrock (PRC Environmental, 1994; 1996). The bedrock surface ranges from 30 to 35 feet below the ground surface (bgs) and slopes down to the northwest towards the Little Miami River (LMR). Shallow (less than 40 feet deep) on-site wells obtain low groundwater yields (less than 5 gallons per minute) from shale and limestone bedrock (PRC 1994; ODNR well logs). Groundwater flow in the bedrock on-site is to the west-northwest toward the Little Miami River (QSource Engineering, 1987).

Immediately west and southwest of the PCF along the western edge of the adjacent Kings Mills Military Reservation, the Little Miami River gorge opens out into a deeper buried bedrock valley with a thicker sequence of silty clay and water-bearing sand and gravel 60 to 70 feet thick. The Warren County Water Department operates six production wells along the Little Miami River in this area that provide drinking water to approximately 15,500 people in adjacent portions of Deerfield and Hamilton townships. These wells are located 0.3 miles west-southwest and down-gradient of the PCF. Many of the production wells obtain drinking water from shallow depths at a rate up to 1,600 gallons per minute from sand and gravel layers only 20 to 50 feet below ground surface (ODNR well logs). The potential yield of the entire well field is 2.75 million gallons per day. Groundwater flow in the buried valley fill in this area would naturally be to the southwest following the course of the river. However, pumping of the well field production wells likely creates a cone-of-depression under the well field, pulling groundwater towards the well field in a radial manner. It is unknown whether or not the PCF is within the capture zone of the Hamilton-Deerfield well field. There are three other public well fields within 2 miles of the site serving 6,500 people; Lebanon, South Lebanon, and the Sod Farm (Ohio EPA, 1999). There are approximately 504 private wells within a 4 mile radius of the site that serve about 1,379 people (PRC, 1994).

DISCUSSION

Previous Site Investigations in Parcel A

1987 Environmental Site Assessment

In 1987, an environmental site assessment was conducted of the Kings Mills Commerce Park (former PCF). During that investigation, an irrigation well west of building 6 (Figure 2) was sampled and analyzed for metals. Lead was detected in the sample at 3,840 ppb. The sample contained large amounts of sediment which may have impacted the results. The well was resampled in December 1987 after being filtered to remove the sediment. No lead was detected in the subsequent sample.

During the 1987 environmental site assessment, three groundwater monitoring wells were installed to aid in determining the direction of groundwater flow and to look at the distribution of lead across the site. Lead was only detected in one of the three wells at a concentration of 52 ppb in MW-3 which was located at the base of the former shot tower (Figure 2).

In addition to sampling the irrigation well, soil samples were collected from various locations on the site. Nine trenches were dug on-site and samples were collected from 1, 4, 8, and 12 feet deep and analyzed for metals. Lead was detected in all nine trenches at levels ranging from 71 to 33,500 ppm. Lead was detected at all depths with the highest levels of lead being discovered in the top four feet of soil. The highest level of lead detected in the top one-foot of soil was 7,250 ppm. No samples were collected from the top six inches of soil that would be considered surface soil. The highest levels of lead in the soil were found near the former shot tower where the lead shot was made. Based on the appearance of the soil excavations it appears that much of the site has been used for disposal of boiler ash and slag (QSource Engineering, 1987). In 1993, most of the property was paved in order to prevent lead-contaminated soil from being washed from the site in surface water runoff.

Screening Site Inspection

In 1996, PRC Environmental Management Inc. was hired by U.S. EPA to do a site screening inspection. The purpose of the site screening inspection was to assign the site a Hazard Ranking System score. The Hazard Ranking score is used to determine if the site meets qualifications to be placed on the National Priorities List of Superfund hazardous waste sites (NPL). If the Hazard Ranking score exceeds a certain score then the site is eligible to be placed on the NPL. The results of the site screening inspection gave the PCF site a score that qualified the site for inclusion on the NPL. This ranking was based on the presence of lead in the groundwater and lead and mercury in the Little Miami River which is a known sport fishery and recreational resource in the area.

As part of the investigation, PRC collected four soil samples from on-site locations in addition to three sediment samples from the Little Miami River (Figure 3). Soil samples were analyzed for inorganic constituents, which included metals. Groundwater samples were collected from two on-site monitoring wells and from two municipal drinking water wells from the Hamilton-Deerfield wellfield located approximately ½ mile downstream (west) of the PCF site (Figure 4).

Results of the on-site soil samples indicated that lead and mercury were present at elevated levels in the surface soils (2 to 8 inches below ground surface). Lead was detected from 145 to 860 ppm, and mercury was detected from 44.3 to 265 ppm. Mercury was used on the site in the production of a mercury fulminate primer that was used during the ammunition making process. Lead and mercury were also detected in the sediment samples of the Little Miami River at levels ranging from 436 to 446 ppm for lead and from 1.4 to 6.9 ppm for mercury. HAS uses a screening level of 400 ppm for lead in residential settings and public access areas where children are present. While most of the site was paved to prevent surface water run-off, there were several areas where the pavement had eroded and run-off was evident (PRC, 1996). Surface water leaves the site through a series of underground cement box culverts and drains into the Little Miami River.

Two on-site groundwater wells (MW-1 and MW-2) were sampled and analyzed for inorganic constituents. MW-3 could not be sampled because it was covered during the paving process. No lead or mercury was detected in the on-site monitoring wells. In addition to the two on-site wells, two municipal water supply wells from the Hamilton-Deerfield well field were sampled. The municipal wells in question obtain water from sand and gravel deposits at depths of 20 to 50 feet below ground surface with production wells in the well field pumping an average of 2.75 million gallons per day. Lead was detected in one of the municipal water wells at 4 ppb which is below the level of 15 ppb that U.S. EPA considers safe for drinking water. According to public works officials, lead had previously not been detected in the affected well (PRC, 1996). It is unknown if there is any connection between the lead in the well and the PCF site.

Expanded Site Inspection Report 1999

In 1999, an expanded site investigation was conducted by Ohio EPA to further define the extent of contamination associated with the PCF site. During the investigation Ohio EPA collected 63 soil samples, 24 sediment samples, 5 groundwater samples, and 12 fish tissue samples from fish collected from the Little Miami River.

Groundwater samples were collected in May 1999 from two on-site monitoring wells (MW-1 and MW-2), two municipal wells from the Hamilton-Deerfield well field, and one sample collected by Geoprobe® from just west of building six (Figures 3 and 4). Geoprobe® samples are collected by driving a tube into the ground until the water table is reached and then a water sample is extracted using a small disposable bailer or a mechanical pump. Groundwater samples were analyzed for volatile organic compounds, polycyclic aromatic compounds, pesticides/PCBs, metals and cyanide. Analytical results from the on-site monitoring wells indicated that Freon-113 was detected at low levels in both wells. Freon-113 was released through the septic system while Lenscrafters was a tenant at the site. Freon-113 was also detected in the Geoprobe® groundwater sample at a concentration of 65 ppb. In addition to Freon-113, lead was detected in MW-1 at 2.9 ppb. Copper, zinc, and mercury were also detected in MW-1 at 7.1, 24.9, and 0.35 ppb respectively. Zinc was detected in MW-2 at 13.5 ppb. Metals detected at elevated levels in the Geoprobe® groundwater sample included lead at 249 ppb, copper at 898 ppb and zinc at 1650 ppb. These results may be artificially elevated due to the presence of high levels of suspended solids in the samples.

Lead was detected in the nearest downgradient Warren County production well at a concentration of 5 ppb but was not detected in the duplicate sample collected. This is below the presumed safe exposure concentration of 15 ppb. No other constituents were detected at elevated levels in the municipal well field.

A total of 53 soil and sediment samples were collected during the ESI for screening of metal contaminants using X-ray Fluorescence (XRF). Most of these screening samples were collected in Parcel A and were concentrated in the areas known to have been active industrial areas. Approximately 40 surface soil (0 to 6 inches) and sediment screening samples were collected from Parcel A. From the 53 screening samples, nine soil samples

and seven sediment samples were selected for additional laboratory analyses all from Parcel A.

Sediment samples were collected from the Little Miami River and also from several drainage ditches flowing from the PCF site to the river (Figure 3). Sediment samples were analyzed for VOCs, PAHs, pesticides/PCB, and metals. Copper was detected in a drainage ditch crossing the site (Ditch 3) at 45.7 ppm. This level is considered to be slightly elevated according to Kelly and Hite (1984), exceeds the Ontario lowest effect for benthic life level (Persaud et. al. 1994) and is elevated according to Ohio guidelines (Ohio EPA 1996). Lead was detected in the Little Miami River sediments at 192, 332.5, 43, and 88 ppm. According to Kelly and Hite and Ohio EPA guidelines, 332.5 ppm is considered to be extreme. Mercury was detected in the river sediments at 1.4, 0.97, and 16.3 ppm, respectively. According to Kelly and Hite and Ontario, 16.3 ppm is considered to be extreme. Lead and mercury levels in sediments in adjacent portions of the Little Miami River elevated over background may pose an ecological threat to aquatic life but are unlikely to pose a health threat to recreators using the river and coming into incidental dermal contact through physical contact with river sediments. The “extreme and elevated” levels are based on the ability of the chemicals to cause harm to the ecology of the aquatic life and fish that inhabit the stream. The polycyclic aromatic hydrocarbons (PAHs), anthracene and (A,H) anthracene were also found on-site and in sediments.

On-site soil samples indicated that copper, lead, and mercury were detected at elevated levels. Copper was detected from 186 to 47,500 ppm. Lead was detected from 561 to 301,000 ppm, and mercury was detected from 5.2 ppm to 17.8 ppm. Typical background levels for lead in native soils in southwest Ohio is 11-16 ppm (Logan & Miller, 1983). Copper, lead, and mercury were detected at elevated levels in both on-site soils and off-site sediments. Their presence in both on and off site soils suggests that site contaminants are migrating into the surface water via surface water run-off. Numerous PAHs were found in one sediment sample from a ditch emptying into the Little Miami River, including anthracene (390 ppb) and dibenz(a,h)anthracene (350 ppb) [detection limit for both compounds is 330 ppb]. PAHs were not found in the downstream samples but were detected in two on-site soils samples, with anthracene up to 2,200 ppb and dibenz(a,h)anthracene at 9,200 ppb. However, the PAH levels found in the ditch are generally low, and there is no evidence that there is significant migration of these contaminants off-site. At these concentrations, the PAHs are not considered a threat to human health or the environment.

To evaluate whether the fish population in the Little Miami River has been impacted by contamination from the PCF site, Ohio EPA collected fish tissue samples in May 1999. Carp, bass, channel catfish, and flathead catfish were collected from the river with electroshocking gear. The samples were collected from four locations on the Little Miami River, two upstream, one adjacent to, and one downstream from the site. Fillet samples were analyzed for mercury, lead, cadmium, arsenic, selenium, pesticides, PCBs, and lipids (Ohio EPA, 1999). Mercury was detected in all of the fish tissue with values ranging from 128 ppb to 385 ppb. Mercury levels in fish were uniform up and downstream of in the Little Miami River with no evident “hot spots” in the vicinity of

PCF site. Ohio currently has a statewide fish consumption advisory for mercury in all water bodies. The recommendation in the advisory is that residents consume no more than one meal per week of fish caught in Ohio water bodies. Lead was not detected in any of the fish tissues. All other constituents were within acceptable levels for consumption.

Parcel B Site Contamination

Parcel B is a fifty-six (56) acre parcel of unimproved woodland which forms a border on the south, west, and east sides of Parcel A (Figure 2). Peters Cartridge constructed and used munitions bunkers on the steep slope of the valley wall in Parcel B. The remnants of the concrete bunkers and buildings can still be found scattered across the property. Fewer samples were taken in Parcel B than in Parcel A because of the difficulty accessing suitable sample locations and because most of the sampling effort was concentrated in the areas known to have been active industrial areas. Of the 53 soil and sediment samples were collected during the ESI for XRF screening approximately 7 surface soil (0 to 6 inches) and 5 sediment samples were collected from Parcel B. Using XRF screening for metal contamination, samples were selected for additional laboratory analyses. None of the samples collected in Parcel B were sent to the laboratory for additional analyses.

ODH HAS Walkover April 2005

As part of the Public Health Assessment for Peters Cartridge site, Ohio Department of Health, Health Assessment Section staff visited the PCF site on April 21, 2005. During the site walkover, a number of physical hazards were identified (Figure 5). The unfenced building fronting the Little Miami Scenic Trail (Building 1, Figure 2) shows ample evidence of vandalism and is in a dilapidated condition. There is a potential exposure to falling glass from broken windows and loose bricks from this building. At least one of the doorways was broken providing access into the building. Several of the sheet metal coverings for the windows on the lower floors of the building are partially detached and precariously hanging from the building. Miscellaneous debris from plant operations are piled in the more dilapidated areas of the complex. An open trench of unknown depth was discovered adjacent to an out building between the Trail and the Little Miami River immediately to the north of Building 1. A second open pit was observed east of the out building during a second HAS site visit on December 5, 2005. There is a gap in the fence at the western most corner of the property. HAS's concerns regarding these physical hazards observed at the site were forwarded to the Ohio EPA OSC on June 1, 2005 (see Appendix A).

Potential Exposure Pathways

For the public to be exposed to elevated levels of lead, mercury, and copper in and around the PCF site, they must first come into physical contact with the contaminated soils, sediment or groundwater. For an exposure pathway to be completed, contact with a contaminated media must occur. A completed exposure pathway consists of five main parts that must be present for a chemical exposure to occur. These include:

- a source of chemicals;
- environmental transport, which is a way for the chemical to move from its source (soil, air groundwater, surface water);
- a point of exposure, which is a place where people come into physical contact with the chemical (on-site, off-site);
- a route of exposure, which is how people come into physical contact with the chemical (drinking, eating, touching); and
- people who could be exposed, which are people likely to come into physical contact with site-related chemicals.

Physical contact with a chemical contaminant, in and by itself, does not necessarily result in adverse health effects. A chemical's ability to affect a resident's health is also controlled by a number of factors including:

- How much of the chemical a person is exposed to (the dose).
- How long a person is exposed to the chemical (the duration).
- How often a person is exposed to the chemical (the frequency).
- The toxicity of the chemical of concern.

Other factors affecting a chemical's likelihood of causing adverse health effects upon contact include the resident's:

- Past chemical exposure
- Smoking, drinking alcohol, or taking certain medications
- Current health status, sensitivity to certain substances
- Age
- Family medical history

Contamination at the PCF facility has been discovered in on-site soil and groundwater in Parcel A and in off-site soils and sediments in and along of the Little Miami River. Based on limited groundwater sampling, it appears that lead and mercury contamination in the groundwater is contained on-site. There are not any residential wells in the immediate vicinity of the facility limiting the likelihood that area residents are being exposed to contaminated groundwater from private wells. There are large yield production wells in the municipal well field less than 1,500 feet west of the site. It is unknown whether or not groundwater under the PCF site is being pulled into the Hamilton-Deerfield well field by pumping of these municipal water wells. Recent detection of low levels of lead in the easternmost production well raises a concern that contamination at PCF may be migrating offsite to the wellfield. Lead contamination has been discovered to be extensive in the on-site soils. Additional metals such as barium and copper have also been discovered at elevated levels in on-site soil. Most of the site was paved in 1993 which limited potential exposure to lead contamination. Some of the paving has eroded which has exposed some of the lead contaminated soil at the surface. The site is also fenced which limits exposure to on-site contamination, although the fence currently is in disrepair and does not prevent access to the site.

Adjacent to the PCF site, the Little Miami Scenic Trail runs along the Little Miami River and offers opportunities for hiking, bicycling, rollerblading, and horseback riding and has more than 750,000 visitors per year. For over 85 miles, the trail parallels the Little Miami State and National Scenic River, with the southern 50 miles of the trail being Ohio's only "trail-oriented" State Park. The Little Miami River is known for its sport fishery (smallmouth bass and rock bass) and 86 miles of canoe-able waters (at least 5 canoe liveries on the river).

Lead, mercury, and copper have been discovered at elevated levels in the sediments of the Little Miami River and in several drainage ditches leading from the PCF site to the river. There are very few residents in the immediate vicinity of the site so it is unlikely that residents and visitors are being exposed to contaminated sediments on a regular basis. The levels of mercury, lead, and copper in the river are considered potential hazards but are more likely to have an adverse ecological effect on the aquatic life in the river than cause adverse health effects in people who swim or wade in the river. Fish tissue sampling revealed mercury in the fish but the detection could not be directly related to the PCF site. Ohio has a statewide fish consumption advisory in place to protect citizens from mercury contaminated fish.

Public access to Parcel B appears to be more limited than Parcel A due to its location and its thick cover of trees and brush. Former munitions manufacturing activities also appear to have been much more limited for this parcel although there is little environmental sampling data available for review.

Public Health Concerns

No public health comments or concerns were received during the public comment period. However, the Warren County Commissioners requested a meeting with the Health Assessment Section of Ohio Department of Health to discuss their concerns about the site. This public meeting was held on December 5, 2005 with the Warren County Commissioners, the US EPA Region 5 Remedial Project Manager, Representative of DuPont, and ODH HAS staff. In addition to HAS's presentation to the commissioners a site fact sheet was produced for the public (See Appendix B). About 30 people including local government officials and concerned citizens were also in attendance. The Commissioners and the public had the following public health concerns and comments.

1. **Question:** How are the threats classified, such as, how does this site compare with the contaminants next to the river, a National and State Scenic River and the aquifer that is being used for drinking water as compared to the threat at the junior high school in Kings Mills that is reportedly only a threat if a child eats dirt day after day for six months before anything could happen do you classify the risk into different level of concern?
 - a. **Answer:** There is no typical site. Whenever there are possible exposures of contaminants to children involved at a site, there is an increased concern. When the contaminant is lead, with its known effects on

neurological development in children, the concern is elevated. A more conservative approach is taken at schools and a more conservative level of contamination is considered appropriate for these sensitive populations.

2. **Question:** Does the site pose a contaminant threat to the nearby Little Miami River, a National and State Scenic River (100 feet away) and are people that use the river and the bike-path for recreation being exposed to this contamination? Are the contaminants seeping into the river? Is the river safe?
 - a. **Answer:** Ohio EPA's data indicate that the site does not pose an imminent threat to individuals using the bikeway or the river. DuPont has tested the discharge points and the sediment analyses have indicated that the levels of contaminants detected are below regulatory cleanup levels.
3. **Question:** Who is checking on the levels of contaminants that may be migrating into the river or into the sediments from soil erosion or through the aquifer at the site? We are concerned with the migration of contaminants toward the Warren County well field. Was there any water and sediment sampling during this investigation? Warren County's hydrogeology consultant says that most of the water taken into the Warren County wells adjacent to the Peter's Cartridge Site comes from the Little Miami River.
 - a. **Answer:** Ohio EPA's data indicate that there is not an imminent threat to public health. DuPont has sampled three discharge points and an upstream and downstream location in the Little Miami River this summer. Area A is mostly paved and Area B is heavily vegetated with no stressed vegetation and soil erosion is not a significant issue. DuPont is testing the sediments. We know that this area is a critical area due to the heavy recreational use.
4. **Question:** Has there been monitoring of the groundwater and surface water at the inflow points to the Little Miami River for contamination since the Ohio EPA investigation in 1995?
 - a. **Answer:** Four wells were constructed by Ohio EPA, but construction details could not be found. DuPont abandoned the old wells and installed six new monitoring wells. Ohio EPA has not sampled the four monitoring wells since the ESI in 1999.
5. **Question:** Has it been determined that there is no threat from the site right now?
 - a. **Answer:** At the present time, there is insufficient information to determine the present impact on public health from the site. DuPont is presently collecting data at the discharge points. This data will assist ODH in determining whether the river is being impacted.

6. **Question:** How often is the Warren County well water tested for metals and is it tested on a regular basis?
- a. **Answer:** Warren County – Water from the well field is tested on a quarterly basis. The results do not indicate that contaminant concentrations are currently of concern. Detections of lead in the easternmost production well, the last several years, are below levels of health concern, however they appear to be increasing.
7. **Question:** Has Ohio Department of Health (ODH) sampled the sediment and water in the Little Miami River adjacent to the site for contaminant levels?
- a. **Answer:** Ohio Department of Health HAS does not collect samples, but is dependent on data collected by Ohio EPA, USEPA, and potentially responsible parties (PRPs). We review the data that is collected by other regulatory agencies. As of now, the data indicates that the site does not pose a threat to workers on site or to those using the bike trail. Our concern is that most of the data is old, collected in 2000 and 1995. ODH determined that, at this time, the site was an *Indeterminate Public Health Hazard* and that more current data is needed to assess public health threat and to define the extent of contamination. DuPont is currently in the process of collecting more current data on the extent of contamination. ODH is concerned that the site may pose a long term threat through; contaminants washing into the river and then taken to the adjacent well field; or then being taken up into fish and concentrating in the fish tissue. ODH is also concerned about the potential exposure of workers to on-site contaminants.
8. **Question:** How much involvement does the Ohio Department of Health have with determining where to sample in relation to the threats that may be posed to Warren County's well field?
- a. **Answer:** As stated in Ohio Department of Health's recommendations in the Public Health Assessment for the site: *Peter's Cartridge Factory should be fully characterized to determine the extent of the soil and groundwater contamination. Investigations should also take place in adjacent areas including the Little Miami Scenic Trail and the Little Miami River to determine the extent of contaminant migration*, if any. The ongoing site investigations being carried out by DuPont will hopefully provide the information needed to make an accurate assessment of health threats that may be posed by the site. One of the samples collected in the past had indicated that there was a very high level of lead in the groundwater, but this sample was from an unfiltered sample and the subsequent filtered samples have indicated that lead was not at levels of health concern. One of the things that will be assessed is the mobility of the contaminants in the soils and in the groundwater and the affect that pH

has on the mobility. The bedrock in the area is limestone which is basic (high pH). The groundwater, surface water, and soils are all strongly influenced by the bedrock and also tend to be basic in nature. Basic soils, which are found in this area, do not lend themselves to migration of dissolved metal contaminants (such as lead, mercury, and copper) into the groundwater or surface water. It is very important to determine how much of the lead, mercury and copper are moving in the groundwater and surface water, either dissolved in the water or attached to suspended particles, since the well field is approximately one third of a mile from the closest boundary of Peter's Cartridge Factory.

9. **Question:** Has Ohio EPA been monitoring the river and testing the fish?

- a. **Answer:** The last fish tissue sampling from the river was done in 1998 (sampling occurred in 1998 and the report was completed in 1999). The specific objective of this study was to establish the concentration of mercury, lead, and other bioaccumulative chemicals, in edible portions of upper and lower trophic level fish from the Little Miami River adjacent to the Peters Cartridge facility. At that time there was no evidence that site-related contaminants were impacting fish in the Little Miami River adjacent to the Peters Cartridge Factory site.

10. **Question:** Can we get the Ohio EPA to sample the fish tissue and won't that give us an indication of the contamination?

- a. **Answer:** After consultation between Ohio Department of Health and Ohio EPA, Ohio EPA has agreed to sample fish in the Little Miami River adjacent to the Peter's Cartridge Factory site in the Spring of 2006. The results from this sampling will likely be available the Spring of 2007. This sampling, depending on the results, may or may not demonstrate that the site is adversely impacting fish in the Little Miami River.

CHILDRENS HEALTH CONSIDERATIONS

ATSDR and HAS recognize the unique vulnerabilities of children exposed to environmental contamination and hazards. Children are especially sensitive to lead toxicity. As part of this health assessment, HAS considered the greater sensitivity of the children who live in the area and may visit the bike trail that runs parallel to the PCF site when drawing conclusions and making recommendations regarding health effects from exposure to chemicals and observed physical hazards at the site.

CONCLUSIONS

Parcel A of the PCF site currently poses an "*Indeterminate Public Health Hazard*" to workers, residents and visitors who may visit the site. Elevated levels of lead and copper have been detected in surface soils and sediments across the site and in the Little Miami

River. Interim measures were taken to cover on-site soils in 1993 when most of the site was paved. However, recent site investigations have shown that portions of the paving have eroded and the contaminated soils are visible at the surface. The level of exposure that is occurring with workers and visitors at the site is unknown.

Lead, mercury, and Freon-113 have been detected at elevated levels in the groundwater on-site. However, there are no residential wells in the immediate vicinity of the site. Based on limited groundwater monitoring, it appears that contamination is limited to the areas of the site where specific processes occurred. Lead was detected in a downstream municipal drinking water supply at 5.0 ppb which is below the U.S. EPA action level for public water supplies of 15 ppb. It is unknown if the PCF is the source of this lead in the public water supply.

Mercury was detected in fish in the Little Miami River, but the mercury could not be attributed to contamination from PCF, because mercury was detected in both upstream and downstream fish. Ohio currently has a fish consumption advisory that advises residents to restrict their consumption of Ohio fish in order to reduce their risk of mercury exposure. Parcel B of the PCF also poses an “*Indeterminate Public Health Hazard*” because, to date, no extensive environmental investigations have taken place. The area is heavily wooded and it is unlikely that residents and visitors are being exposed to potential contamination but the extent of contamination is unknown and should be investigated.

Unfenced portions of the site may pose a physical hazard to trespassers and people wandering off the nearby bike trail, because there are hanging pieces of sheet metal and glass, from broken windows, around buildings at the site. There are also some large holes in the area between the bike path and the river.

RECOMMENDATIONS

- The potentially responsible parties (PRPs) should fully characterize Parcel A to determine the extent of the soil and groundwater contamination. Investigations should also take place in adjacent areas including the Little Miami Scenic Trail and the Little Miami River to determine the extent of off-site contaminant migration.
- The property owners should investigate Parcel B to determine if any environmental contamination exists in the area and define the extent of any contamination that is discovered.
- Copper, lead, and mercury were detected historically at elevated levels in both on-site soils and off-site sediments. Their presence in both on and off-site soils suggest that site contaminants are migrating to the Little Miami River via surface water run-off.
- Repair fencing and restrict access to the site, especially the buildings and the open holes that are adjacent to the heavily used Little Miami River Bikeway.
- Post signs warning of the presence of hazardous material on the site.
- Periodic inspection of the site is advised to ensure that the site remains secure.

PUBLIC HEALTH ACTION PLAN

HAS will review any additional environmental data collected to determine if the site poses a health hazard to workers, visitors, and residents who visit the PCF site and surrounding area.

PREPARED BY

Eric R. Yates – Environmental Specialist
Peter J. Ferron – Environmental Specialist
Robert C. Frey Ph. D. – Principal Investigator

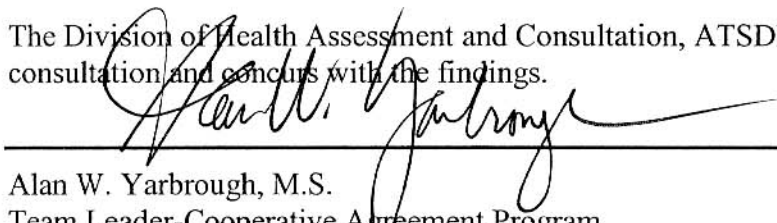
CERTIFICATION

This Public Health Assessment for the Peters Cartridge Factory was prepared by the Ohio Department of Health under cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the exposure investigation report was begun. Editorial review was completed by Cooperative Agreement Partner.



Robert B. Knowles, M.S., REHS
Technical Project Officer
CAT, SPAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with the findings.



Alan W. Yarbrough, M.S.
Team Leader-Cooperative Agreement Program
CAT, SPAB, DHAC, ATSDR

REFERENCES

KELLEY, M.H. and R.L. HITE. 1984. Evaluation of Illinois Stream and Sediment Data; 1974-1980. Illinois Environmental Protection Agency, Division of Water Pollution Control, Springfield, Illinois.

LANDMARK RENAISSANCE ASSOCIATES. 1984. National Register of Historic Places Nomination Form.

LOGAN, T. J. AND R. H. MILLER. 1983. Background Levels of Heavy Metals in Ohio Farm Soils. Ohio Agricultural Research and Development Center, Research Center Circular 275-83. 16p.

OHIO ENVIRONMENTAL PROTECTION AGENCY. 1996. Levels of Elevation in Sediments in Ohio, Based on Reference Sites Statewide. Division of Surface Water, Columbus, Ohio. 1996.

OHIO ENVIRONMENTAL PROTECTION AGENCY. 1999. Expanded Site Inspection Report, Peters Cartridge Factory Site. Prepared for the U.S. Environmental Protection Agency. September 29, 1999.

OHIO EPA. 1999. Fish Tissue Study of the Little Miami River. Peters Cartridge Company. Warren County. Ohio EPA Technical Report MAS/1999-8-1. Division of Surface Water. Columbus, Ohio. 1999.

PERSAUD, D., J. JAAGUMAYI, AND A. HAYTON. 1994. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ministry of the Environment, Public Information Centre, Toronto, Ontario.

PRC ENVIRONMENTAL. 1994. Screening Site Inspection Site Evaluation Report (for) Peters Cartridge Factory (also known as Kings Mills Technical Center), 1914 Grandin Road, Kings Mills, Ohio 45034. [US EPA ID. No. OHD987051083].

PRC ENVIRONMENTAL. 1996. Screening Site Inspection Report (for) Peters Cartridge Factory, 1415 Grandin Road, Kings Mills, Warren County, Ohio. [EPA ID No. OHD987051083].

QSOURCE ENGINEERING. 1987. Environmental Site Assessment, Kings Mills Technical Center, Kings Mills. Ohio. [for TransOhio Savings Bank]. December 21, 1987. 18 p. + attachments.

WALKER, A.C. 1986. Ground-Water Resources of Warren County. Ohio Department of Natural Resources, Division of Water. [Map].