# Letter Health Consultation

Evaluation of Lead and Polychlorinated Biphenyl Concentrations Detected at the

POWELL LEAD SITE

BIG STONE GAP, WISE COUNTY, VIRGINIA

**Prepared by**
**Virginia Department of Health**

August 31, 2016

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

**Health Consultation: A Note of Explanation**

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

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

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Prepared By:

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Division of Environmental Epidemiology
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# COMMONWEALTH of VIRGINIA

**Department of Health – Office of Epidemiology**

MARISSA J. LEVINE, MD, MPH
STATE HEALTH COMMISSIONER

PO BOX 2448
RICHMOND, VA 23218

TTY 7-1-1 OR
1-800-828-1120


August 31, 2016

Myles Bartos
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 3
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Bartos,

The Virginia Department of Health (VDH) appreciates the opportunity to review the results of the lead and polychlorinated biphenyls (PCBs) soil samples collected by the U.S. Environmental Protection Agency (EPA) from the Powell Lead site area in Big Stone Gap, Virginia. Under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), we have evaluated the health impact that exposure to the lead and PCBs in soil at the mound, playground, and area east of the mound could have on the community members, particularly children six months to seven years old and have drawn three conclusions:

- We conclude that exposure to the lead and PCBs in soil at the *mound is currently not expected to harm people's health*. We base this conclusion on the inaccessibility of the mound soil due to a thick vegetative cover and a recently constructed fence that surrounds the mound further limiting exposure.
- We conclude that exposure to lead and PCBs in the *playground soil is not expected to harm people's health*. We base this conclusion on the substantial grass cover and asphalt at the playground that limit children exposures to the soil at the site. Average PCB concentrations found in the playground soil are lower than a long-term health based comparison value. Further, calculated blood lead levels, using a highly conservative scenario to predict child blood lead levels, were below the current Centers for Disease and Control and Prevention (CDC) child blood lead reference level.
- We conclude that contaminants in *soil east of the mound are not expected to harm the health of trespassers*, because potential exposure to soil is extremely limited. We base this conclusion on multiple site visits where no signs of human activity were observed. The majority of the area is covered with grass and exposed soil is occupied by trucks, trailers, and roll-offs making access to the soil limited.

VDH recommends evaluating the potential for health effects resulting from the exposure to lead and PCB in soils in the mound and area east of the mound soil if the property uses changes. We will share the information regarding exposure on data east of the mound with Virginia Occupational Safety and Health Administration to ensure workers are aware of any potential risks from possible exposures.

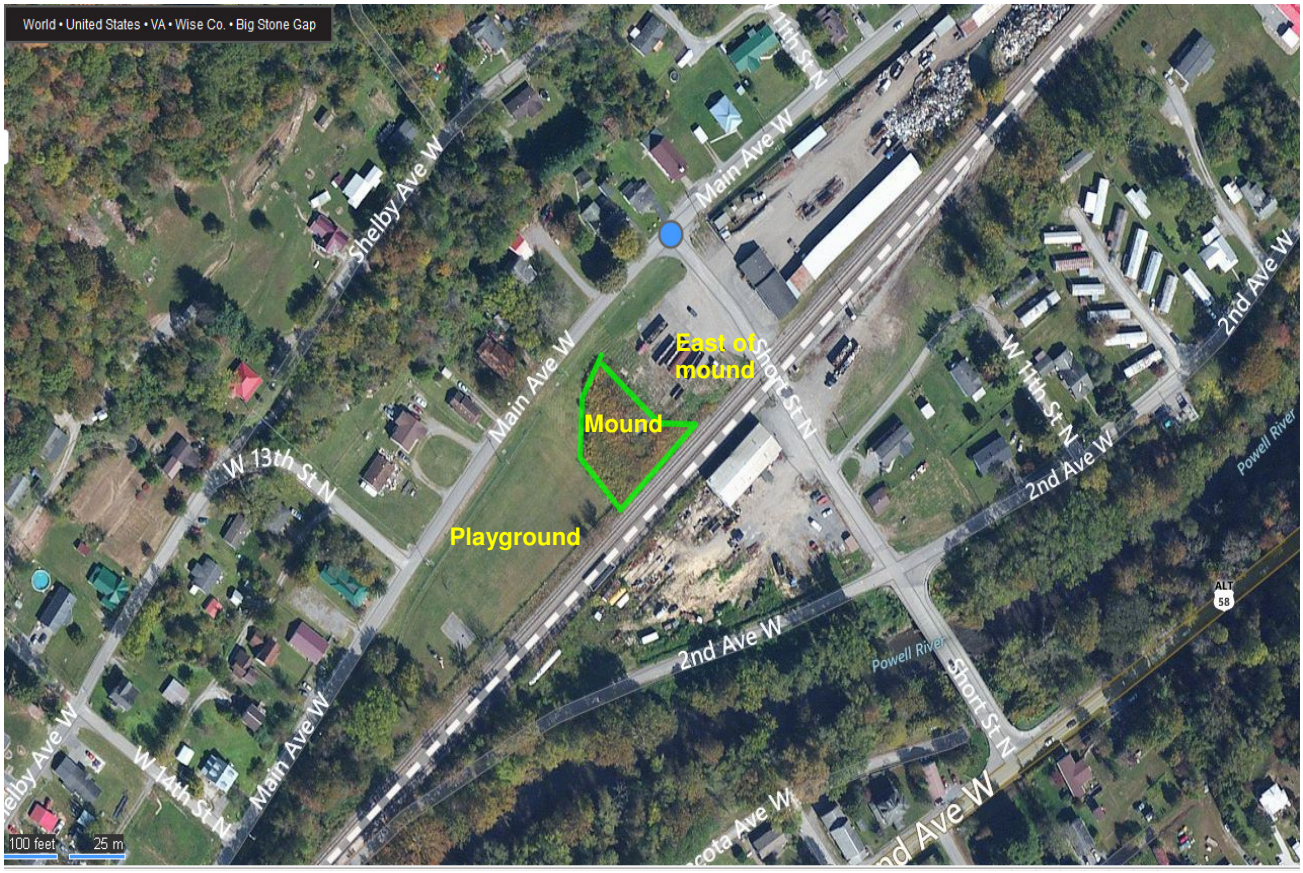
Even though the predicted blood lead levels were below the CDC reference value, there is no known safe level of lead in children's blood. CDC and ATSDR suggest reducing lead exposures wherever possible by following precautionary measures such as washing hands after activity that places someone in contact with the soil.

## BACKGROUND AND STATEMENT OF ISSUES

The Powell Lead Site is owned by Robinette Scrap Metal Processing Corporation (RSMPC). It is located near the intersection of Short Street N. and Main Avenue W. in Big Stone Gap, Wise County, Virginia. A report provided to the Virginia Department of Emergency Management (VDEM) indicated that scrap metal and drums were buried at the site. The buried material is covered with soil and dense vegetation and is referred to as the *mound,* which initiated the investigation. The mound is approximately 161 feet long, 6 feet high, and 86 feet wide (Figure 1). There is a chain link fence on one side of the mound separating it from the playground. In August-September 2014 RSMPC constructed a chain link fence that restricts access to the mound from all sides.[1] According to local residents, the mound was a dump for cracked batteries, broken transformers, and construction debris. Pieces of transformers, battery casings, scrap metal, construction debris, and oil stained soil were observed in the soil outside of RSMPC fence-line during a November 2013 site visit by Virginia Department of Environmental Quality (DEQ), EPA and VDEM. Anecdotal reports indicate that there may have been dumping in the area of the playground. This information along with a request from VDEM for assistance prompted EPA to collect environmental samples at the site, which includes the mound, area east of the mound, and adjacent playground.

[1] Francisco Cruz. Personal communication to Dwight Flammia. August 26, 2014.

**Figure 1. Area map of Powell Lead Site and surrounding community**




(*Source:* Bing Maps 2014*)*

VDH contacted VDEM and the local health department in Wise County for assistance with identifying potential receptors at the site who may be exposed to contaminants in the soil in and around the mound and playground. The local health department, in agreement with VDEM, told VDH that exposure to soil in the mound would be difficult given the amount of dead vegetation covering it in the winter and the dense vegetation growing on the mound during the rest of the year (see Figure 2 in the Attachment).

The local health department reported that the playground adjacent to the mound was used for youth organized sports. The field is used from March to May for softball practice (girls, ages 10-13) five days a week for two hours each practice. From mid-July to Labor Day, the field is used for football practice (boys, ages 8-10) four days a week for three hours each practice. In addition, the playground includes jungle gym equipment and a small basketball court that may be used by children six years and younger while siblings practice sports. The playground is well covered with grass throughout the playing field and jungle gym area, and the small basketball court is covered with asphalt (see Figure 3).

The area east of the mound is an active gravel/dirt parking spot for tractor trailers and roll-offs (see Figure 4). The rest of the area to the east is covered with grass, limiting contact with the soil. There is no indication that the area east of the mound is frequented by any members of the

commuity or trespassers, and worker exposure is limited to boot contact with bare spots infrequently when loading or unloading trailers and roll-offs.[2]

## DISCUSSION

### *Environmental Soil Sampling and Results*

Soil samples (0 to 6 inches deep) were taken from the playground, the mound, and east of the mound. The soil samples were sent to an EPA-assigned laboratory for the determination of soil lead and Aroclor (PCB mixture) concentrations. Table 1 summarizes the concentrations of contaminants in soil samples taken from the mound and east of the mound. Contaminant concentrations in playground and background samples are summarized in Table 2. Where duplicate samples were taken from the same location only the highest concentration reported is discussed.

#### *Mound*

In March 2014, X-Ray Fluorescence (XRF) was used to screen soil samples from the mound for lead. Samples (0 to 6 inches deep) from six locations were collected for laboratory determination of soil lead and multiple Aroclors. Table 1 summarizes the analytical results of the six sampling sites from the mound.

Lead was found in each of the six laboratory samples at concentrations ranging from 62 milligrams per kilogram (mg/kg) to 1,880 mg/kg. The lowest and highest XRF lead results for the six samples were 11 to 1,267 mg/kg, respectively. The laboratory results are all higher than the XRF screening data possibly due to uneven sample area or debris, etc., and/or moisture in the field screened samples.

Aroclors 1242 and 1254 were detected in samples submitted for laboratory analysis and were found at concentrations ranging from non-detect to 11 mg/kg and 20 mg /kg, respectively.

#### *Area East of the Mound*

In January and June 2015, soil samples were collected from multiple locations east of the mound's fence line. Samples were collected from six locations in January and seven locations in June. This was done to determine the extent of contamination east of the mound and towards the parking/roll-off storage. Samples (0 to 6 inches deep) were collected for laboratory determination of soil lead and Aroclors. Table 1 summarizes the analytical results of the sampling sites area east of the mound.

Lead was found in all of the samples at concentrations ranging from 105 mg/kg to 1,550 mg/kg. Aroclors 1242 and 1254 were the only two Aroclors detected in samples submitted for laboratory analysis. Aroclor 1242 was detected in 5 out of 13 samples with concentrations ranging from non-detect to 1,270 mg/kg. Aroclor 1254 was detected in all 13 samples with concentrations ranging from non-detect to 4,900 mg/kg.

[2] Personal communication. Robert Helverson to Dwight Flammia. June 8, 2016.

**Table 1. Contaminant concentrations in soil from the mound and adjacent area east of the mound**

| Contaminant (mg/kg) | | Mound | | | | East of the Mound | | | | Health Comparison Values |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Number of Detects (total samples) | Arithmetic Average[a,b] | Low | High | Number of Detects (total samples) | Arithmetic Average[a,b] | Low | High | |
| Lead | Lab Result | 6(6) | 870 | 62 | 1,880 | 13(13) | 430 | 105 | 1,550 | See Note[c] |
| | XRF | 6(6) | 504 | 11 | 1,267 | | | | | |
| Aroclor 1242 | | 3(6) | 2.3 | ND | 11 | 5(13) | 488 | ND | 1,270 | 0.35[d] |
| Aroclor 1254 | | 5(6) | 5.8 | ND | 20 | 13(13) | 1,320 | ND | 4,900 | |

(*Source:* EPA) Soil samples collected were the top six inches. **ND=**not detected. **Shaded=**not collected. **XRF=** X-Ray Fluorescence.

[a]Duplicates were not used to calculate averages or included in total samples collected.

[b]To calculate averages, half the detection limit was used for Aroclors (0.017 mg/kg) and lead (0.5 mg/kg) samples reported as non-detect.

[c]There is no health comparison value for lead. EPA composite worker soil screening level for lead is 800 mg/kg.

[d]ATSDR CREG (cancer risk evaluation guideline) for total PCBs in soil is 0.35 ppm. No soil CREG exists for Aroclor 1242. The chronic EMEG (environmental media evaluation guideline) for children for Aroclor 1254 is 1ppm; however, this is greater than the soil CREG for total PCBs. Thus, the total PCB soil CREG is used for all Aroclor mixtures in this assessment.

*Playground*

In June 2014, the playground was sampled using XRF in a 25-foot grid with 102 grid nodes. Using the highest XRF screening values, 18 soil samples (0 to 6 inches deep) were collected for laboratory analysis of lead and multiple Aroclors. Table 2 shows the comparison of the 18 samples that had both XRF and laboratory lead analysis.

Lead was detected in 17 of the 18 laboratory samples at concentrations ranging from non-detect to 141 mg/kg. XRF lead determinations ranged from 33 to 149 mg/kg. Correlation between XRF *in situ* samples and laboratory results was 0.894. Aroclor 1260 was detected in 14 of the 18 samples at concentrations ranging from non-detect to 0.37 mg/kg. Aroclors 1242 and 1254 were not detected in the playground samples.

*Background Sample*

A background soil sample (0 to 6 inches deep) was collected from a location approximately 50 feet to the north of the mound from an area that appeared to have undisturbed, native soil. The concentration of lead in the background sample was 28 mg/kg via XRF and 88 mg/kg via laboratory analysis. Aroclor 1260 was present at a concentration of 0.03 mg/kg; however, Aroclors 1242 and 1254 were not detected in the background sample.

**Table 2. Contaminant concentrations in the playground and background soil samples**

| Contaminant (mg/kg) | | Playground | | | | Background Sample | Health Comparison Values |
|---|---|---|---|---|---|---|---|
| | | Number of Detects (total samples) | Arithmetic Average[a,b] | Low | High | Concentration | |
| Lead | Lab Result | 17(18) | 78 | ND | 141 | 28 | See Note[c] |
| | XRF | 18(18) | 87 | 33 | 149 | 88 | |
| Aroclor 1260 | | 14(18) | 0.07 | ND | 0.37 | 0.03 | 0.35[d] |

(*Source:* EPA) Soil samples collected were the top six inches. **ND=**not detected. **XRF=** X-Ray Fluorescence.
[a]Duplicates were not used to calculate averages or included in total samples collected.
[b]To calculate averages, half the detection limit was used for Aroclors (0.017 mg/kg) and lead (0.5 mg/kg) samples reported as not detected.
[c]There is no health comparison value for lead. ATSDR uses the IEUBK model to estimate a child blood lead level and compares the estimated level to the CDC reference blood lead level of 5 µg/dL.
[d]No soil CREG exists for Aroclor 1260. ATSDR CREG for total PCBs in soil is 0.35ppm. Thus, the total PCB soil CREG is used for all Aroclor mixtures in this assessment.

### *Public Health Implications*

Contaminants in the environment can only impact human health if individuals are exposed to them and they are present at sufficient concentrations. VDH examines exposure pathways and determined whether the concentration of a contaminant in the environment is of concern. To properly assess the human health threat associated with exposure to contaminated soil, it is important to evaluate surface soil data.[3] The general public is exposed to the surface soil (0-3 inches below the surface) and contaminant concentrations found at this depth are preferred for determining any public health impact. The soil samples were collected from 0-6 inches below the surface. Average, low, and high XRF playground lead results, which are representative of the concentrations in the ground surface, correlated well with playground lead laboratory results (0-6 inches). This provides some evidence that the lead concentration in the upper 0-3 inches of soil may be similar to what was found in the samples collected 0-6 inches.

*Exposure Pathway*

An exposure pathway can be defined by five key elements: a source of contamination (e.g., Powell Lead Site); an environmental transport medium (e.g., soil); a point of exposure (e.g., mound and playground); route of exposure (e.g., ingestion); and exposed population (e.g., children playing). These elements determine to what extent exposures may have occurred, may be occurring, or may occur in the future (Table 3).

A *completed* exposure pathway exists if all five elements of a pathway are present. A *potential* exposure pathway exists if one or more of the elements may not be present, but information is

[3] [ATSDR] Agency for Toxic Substances and Disease Registry. 2009. Health Consultation, Hetzell Playground Site. [last updated 2009 November 5, last accessed 2014 October 22]. Available from: http://www.atsdr.cdc.gov/HAC/pha/pha.asp?docid=315&pg=1.

insufficient to eliminate or exclude the element. An e*liminated* exposure pathway is when one or more of the elements is absent.[4]

Before the mound became heavily vegetated, people could have been exposed to the contaminants in the soil in the past. Therefore, a *potential exposure pathway* exists for past exposure to soil contaminants at the mound. Although a potential past exposure may exist, past data such as contaminant soil concentrations, mound use, and vegetation coverage are not available to adequately address any past public health implications.

Present and future exposure to soil contaminants at the mound is an *eliminated* exposure pathway because the mound is covered with heavy vegetation preventing direct contact with the soil and the mound is now enclosed by a fence restricting future access.

Past, present and future exposure to soil contaminants east of the mound is a *potential* exposure pathway because access to the area is not restricted. The majority of the area is covered with grass and exposed soil is occupied by trucks, trailers, and roll-offs making access to the soil limited. VDH has not received any reports that children in the community play or use the area east of the mound for any activities; however, trespassers are a potentially exposed population. Grass and vegetation that covers the rest of the area east of the mound would further reduce potential exposure to contaminants in the soil.

Past, present, and future exposure to soil contaminants at the playground is a *completed* exposure pathway.

**Table 3. Exposure pathways summary for exposure to contaminants at Powell Lead site**

| Source[a] | Media | Exposure Point | Exposure Route | Receptor Population | Time Frame | Exposure Status |
|---|---|---|---|---|---|---|
| Powell Lead Site | Soil | Mound | Dermal Contact & Ingestion | Community | Past<br>Present<br>Future | Potential<br>Eliminated<br>Eliminated[b] |
| Powell Lead Site | Soil | East of Mound | Dermal Contact & Ingestion | Community trespassers | Past<br>Present<br>Future | Potential<br>Potential<br>Potential |
| Powell Lead Site | Soil | Playground | Dermal Contact & Ingestion | Community (specifically children) | Past<br>Present<br>Future | Complete<br>Complete<br>Complete |

[a]Other sources of contaminants may be responsible for contaminants detected in soil at playground.
[b]If land use changes, this pathway should be reevaluated for potential exposures.

[4] [ATSDR] Agency for Toxic Substances and Disease Registry. 2005. Public Health Assessment Guidance Manual. Atlanta: US Department of Health and Human Services.

*Contaminant evaluations*

This health consultation evaluates exposure to contaminants in the playground soil and soil east of the mound. The contaminants in the mound are not evaluated further because present and future exposures to contaminants in the mound have been eliminated.

VDH uses ATSDR's comparison values (CVs) to evaluate soil sample contaminant concentrations. CVs are media-specific concentrations used to identify contaminants that require additional evaluation. They are derived using standard default exposure assumptions and are not site-specific. For contaminants detected below their respective CVs, exposure is not anticipated to result in adverse health effects. Concentrations above CVs do not mean that adverse health effects occurred or will occur, but that further investigation is needed. Therefore, the CVs should not be used to predict the occurrence of adverse health effects. CVs used to evaluate contaminants at Powell Lead Site include ATSDR's environmental media evaluation guide (EMEG) for children and cancer risk evaluation guides (CREGs). EMEGs represent concentrations of substances in water, soil, and air to which humans may be exposed during a specified period of time (acute, intermediate or chronic) without experiencing non-cancerous adverse health effects. CREGs are media-specific comparison values that are used to identify concentrations of cancer-causing substances that are unlikely to result in a significant increase of cancer rates in an exposed population. ATSDR develops CREGs using EPA's cancer slope factor or inhalation unit risk, a target risk level ($10^{-6}$), and default exposure assumptions. The target risk level of $10^{-6}$ represents an estimated risk of one excess cancer cases in an exposed population of one million.

*Polychlorinated biphenyls*

The concentrations of Aroclor 1260 found in the playground soil was compared to ATSDR's CREG (0.35 mg/kg for total PCBs). ATSDR does not have a non-cancer CV for total PCBs; therefore, VDH uses ATSDR's chronic child EMEG for Aroclor 1254 (1.0 mg/kg) to screen Aroclor 1260 concentrations in soil. One playground soil sample had an Aroclor 1260 concentration (0.37 mg/kg) that exceeded the CREG and not the EMEG. The average playground Aroclor 1260 soil concentration was 0.07 mg/kg. For long-term public health exposure evaluation to soils in a scenario such as at this playground, it is most appropriate to consider all of the available soil results and the overall average exposure to the contaminant in the soil. The average playground soil concentration for Aroclor 1260 was well below the CREG. In addition, the presence of vegetation on the playground further reduces the risk of child exposure to Aroclor 1260.

The concentrations of Aroclor 1242 and 1254 found in the area east of the mound were above ATSDR's CREG. For an occasional (1 time per month for 6 years) older child (11-16 years) trespasser the lifetime excess cancer risk[5] for exposure to total PCBs could be as high as $1.6 \times 10^{-5}$. This risk is likely much lower as trespassing this area has not been reported. Younger

[5] Lifetime Excess Cancer Risk (LECR) = (Exposure Dose x Oral Slope Factor x Exposure Duration) / Averaging Time = (0.000106 mg/kg/day x 2 mg/kg/day$^{-1}$ x 6 years) / 78 years = $1.6 \times 10^{-5}$
Exposure Dose = (Sum of average PCB concentrations x Ingestion Rate x Exposure Frequency x conversion factor) / Body weight = ((1,320 + 488 mg/kg) x 100 mg/day x 0.033 years x $1x10^{-6}$) / 56.8 kg = $1.1 \times 10^{-4}$ mg/kg/day

children are assumed to be under closer supervision at the playground area and are not expected to trespass the area east of the mound.

*Lead*

Neither ATSDR nor the EPA has developed a minimal risk level (MRL) or reference dose (RfD) for exposure to lead. Therefore, the usual approach of estimating human exposure to an environmental contaminant and then comparing this dose to a health based comparison value cannot be used. Since children are more susceptible to the adverse health effects from lead than adults, VDH assessed the public health implications of lead exposure using the EPA's IEUBK lead model for children. This model is designed to predict the probability that children age six months to seven years old who regularly play in areas with soil lead contamination could be exposed to lead at levels high enough to raise their average blood lead levels above a reference level (currently 5 µg/dL).[6] This general model's assumptions are as follows:

- Exposure every day to the same soil concentrations from age 6 months to 7 years
- Exposure to the average soil levels found in area of interest
- Exposure to other sources of lead (air, water, dust, diet, paint, etc…) is consistent with default (or typical) values.

Several site specific exposure conditions make the IEUBK model not a good fit for evaluating exposures at this site (See Limitations for additional discussion). Specifically, the children that use the field for organized sports are all older than 7 and only use the field for a few months out of the year.

However, it is likely that younger children (ages 2 to 6 years) visit the playground and use the jungle gym equipment. Using the average soil concentrations for the playground (78 mg/kg) and default model parameters for time outdoors, ventilation rate, lung absorption, diet intake, water consumption, and house dust, average blood lead concentrations for children in each age group were predicted (Table 4). Even when using daily exposures in the model (which may not be occurring) the predicted levels are below CDC's current reference level of 5 µg/dL.[7] In addition, the actual blood lead levels are expected to be lower because the model does not take into account that the playground is covered with grass which further reduces exposure to the lead in the soil.

[6] This new reference level is based on the population of children aged 1-5 years in the U.S. who are in the top 2.5% of children when tested for lead in their blood. Currently that is 5 µg/dL.

[7] [CDC] Centers for Disease Control & Prevention. 2016. What Do Parents Need to Know to Protect Their Children? [updated 2016 March 15; accessed 2016 June 15]. Available from: http://www.cdc.gov/nceh/lead/ACCLPP/blood_lead_levels.htm.

**Table 4. IEUBK model parameters and calculated blood lead levels for children playing near Powell Lead Site**

| Age (years) | House Dust Lead conc. (µg/g) | Time Outdoors (hrs./day) | Ventilation Rate ($m^3$/day) | Diet Intake (µg/day) | Water consumption (L/day) | Total Lead from Dust and soil ingested (µg/day) | Total Lead Intake (µg/day) | Calculated Blood Lead Level (BLL) (µg/dL)* | Probability of BLL exceeding 5 µg/dL (%) |
|---|---|---|---|---|---|---|---|---|---|
| .5 – 1 | 65 | 1.000 | 2.000 | 2.260 | 0.200 | 1.74 | 3.23 | 1.8 | 1.4 |
| 1-2 | 65 | 2.000 | 3.000 | 1.960 | 0.500 | 2.75 | 4.68 | 2.0 | 2.3 |
| 2-3 | 65 | 3.000 | 5.000 | 2.130 | 0.520 | 2.76 | 4.85 | 1.8 | 1.6 |
| 3-4 | 65 | 4.000 | 5.000 | 2.040 | 0.530 | 2.78 | 4.86 | 1.7 | 1.1 |
| 4-5 | 65 | 4.000 | 5.000 | 1.950 | 0.550 | 2.07 | 4.17 | 1.5 | 0.5 |
| 5-6 | 65 | 4.000 | 7.000 | 2.050 | 0.580 | 1.87 | 4.11 | 1.3 | 0.2 |
| 6-7 | 65 | 4.000 | 7.000 | 2.220 | 0.590 | 1.77 | 4.11 | 1.2 | 0.1 |

The average (78 mg/kg) soil lead concentration from the site was used. 4 µg/L was used for concentration of lead in drinking water. 0.1 µg lead/$m^3$ was used as concentration of lead in outdoor air. Default model bioavailability and rates were used. *All calculated blood lead levels are well below CDC's reference level of 5 µg/dL.

The children using the field for organized sports are eight years and older; therefore, as stated earlier, the model is not designed to evaluate these older children's exposure to lead in the playground area. Since children less than six years of age are at greater risk of higher blood lead levels,[8] and the model predicts their average blood levels below the current CDC reference level, these similarly exposed older children are unlikely have higher blood lead levels from their exposure. However, since there is no known safe level of lead in children's blood, CDC and ATSDR suggest reducing lead exposures wherever possible by using precautionary measures such as hand washing.

Children six years old and younger are not known to trespass the area east of the mound, and for similar reasons stated above for the older children playing on the field, the IEUBK model was not used to estimate BLL for possible exposure to that contaminated soil.

*Worker exposure*

The potential for workers to come into contact with lead and Aroclors in soil east of the mound is extremely low and is limited to boot contact. Also, it appears that the trailers and roll-offs are there for months at a time and workers have not been seen east of the mound during multiple site visits by EPA; therefore, the frequency of exposure is extremely low.[9] The amount of exposure depends on the workers practice. VDH does not have any knowledge if RSMPC has educated workers to prevent exposure to contaminants in soil on the property. Trucks, trailers, roll-offs and vehicles parked east of the mound, along with grass and vegetation will limit exposure to contaminants in the soil. Paving or the addition of gravel to bare soil east of the mound would further reduce any exposure to contaminants in this area. VDH recommends sharing the data east of the mound with Virginia Occupational Safety and Health Administration to ensure workers are aware of any potential risks from possible exposures.

[8] Holstege, C., Rowden , A., Huff, S., and O'Malley, R. 2015. Pathophysiology and etiology of lead toxicity. [updated 2015 December 9; accessed 2016 June 15]. Available from: http://emedicine.medscape.com/article/2060369-overview.

[9] Personal communication. Myles Bartos to Dwight Flammia. June 15, 2016.

## LIMITATIONS

### *Soil depth*

Community members generally come into contact with surface soil that is 0-3 inches below the surface. The playground and mound soil samples were collected from 0-6 inches below the surface. If the soil concentrations between 3-6 inches below the ground surface were vastly different than those from 0-3 inches, mixing the soil together would not be a good representation of what people could be exposed to on the surface.

### *XRF results*

EPA screened soil samples from the mound and playground using XRF. XRF instruments are typically used to measure lead in soil at depths less than 2 millimeters, and in dust and paint samples. Due to limitations on precision and accuracy, *in situ* analyses are used to screen samples. However, correlation between XRF and laboratory results is typically between 0.85 and 0.97, and results were within that range in this evaluation.

### *IEUBK for children six months to 7 years old*

The IEUBK model estimates the blood lead levels of children six months to seven years old. It is not intended to be used to estimate blood levels for exposure periods of less than three months, or for scenarios in which a higher exposure occurs less than once per week or varies irregularly.[10] However, we used conservative exposure data to estimate the blood lead levels.

## CONCLUSIONS

VDH concludes that exposure to the lead and PCBs in soil at the mound is currently not expected to harm people's health. We base this conclusion on the inaccessibility of the mound soil due to a thick vegetative cover and a recently constructed fence that surrounds the mound further limiting exposure.

VDH concludes that exposure to lead and PCBs in the playground soil is not expected to harm people's health. We base this conclusion on the substantial grass cover and asphalt at the playground that limit children exposures to the soil at the site. Average PCB concentrations found in the playground soil are lower than a long-term health based screening value. Concentrations were below health-based comparison values. Further, calculated blood lead levels, using a highly conservative scenario to predict child blood lead levels, were below the current CDC child blood lead reference level.

VDH concludes that contaminants in soil east of the mound are not expected to harm the health of trespassers, because potential exposure to soil is extremely limited. We base this conclusion on multiple site visits where no signs of human activity were observed. The majority of the area

[10] [EPA] US Environmental Protection Agency. 2002. Overview of IEBUK Model for lead in children. Washington, DC. EPA#PB99-9635-8. [accessed 2016 June 15]. Available from: https://semspub.epa.gov/work/HQ/174574.pdf.

is covered with grass and exposed soil is occupied by trucks, trailers, and roll-offs making access to the soil limited.

## RECOMMENDATIONS

VDH recommends evaluating the potential for health effects resulting from the exposure to lead and PCB in soils in the mound and area east of the mound soil if the property uses changes. We will share the information regarding exposure on data east of the mound with Virginia Occupational Safety and Health Administration to ensure workers are aware of any potential risks from possible exposures.

Even though the predicted blood lead levels were below the CDC reference value, there is no known safe level of lead in children's blood. CDC and ATSDR suggest reducing lead exposures wherever possible by following precautionary measures such as washing hands after activity that places someone in contact with the soil.

We trust that the above information will be of help to you. Should you have any additional questions please contact Dwight Flammia by phone at (804) 864-8187 or by email: dwight.flammia@vdh.virginia.gov.

**Authors**

Dwight Flammia, Ph.D.
Public Health Toxicologist
Virginia Department of Health
Richmond, VA 23219

Egbe Egiebor, Ph.D.
Health Assessor
Virginia Department of Health
Richmond, VA 23219

**Attachment**
**Site Photos**

**Figure 2. Picture of the mound and fence separating it from the playground. The mound is the area in the foreground covered in tall, brown vegetation in the winter**


(*Source:* EPA Site Photo 2014*)*

**Figure 3. Photograph of Playground Area**


*(Source:* EPA Site Photo 2014*)*

**Figure 4. Photograph of roll-off area east of the mound**

*(Source:* EPA Site Photo 2015*)*