

From: [Carol Armstrong](#)
To: [EP, SERO ECB](#)
Subject: [External] Bishop Tube Updates
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Mr. Armstrong,

Please find attached my written comments due 1/31/22 regarding the planned remediation of Bishop Tube HSCA site.

Let me know if you have difficulty opening the file, as I want to be sure to meet the deadline of today, 1/31/22 for filing the comments.

Thank you.

Carol L. Armstrong, Ph.D., ABN

Mnem Neuropsychology



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Mnem Neuropsychology

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31 January, 2022

Mr. Dustin A. Armstrong
Environmental Protection Specialist
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

Dear Mr. Armstrong

I am Carol Armstrong, Ph.D., a specialist in neuropsychology, a Fellow of the American Psychological Association and Society for Clinical Neuropsychology, and a Fellow of the National Academy of Neuropsychology. I have been on panels as a Scientific Reviewer for the National Institutes of Health and on international scientific research reviews, a professor of the Perelman Medical School of the University of Pennsylvania and a member of the University of Pennsylvania Abramson Cancer Center due to my research program on the neurocognitive and brain dysfunction resulting from brain cancers and therapeutic irradiation. I am also a neuroscientist who over 35 years researched and treated individuals with brain dysfunction and neurological injury caused by environmental toxic exposures including solvents and heavy metals. I live in a township near the headwater of the Valley Creek watershed where the Bishop Tube Hazardous Site is found alongside Little Valley Creek.

I have also carried out a research program at Children's Hospital of Philadelphia on brain development, the cognitive and emotional functions of the cerebellum, and the effects of cerebellar tumors and irradiation on the brain. I was a key investigator on a team of researchers who used cognitive studies and brain imaging to understand the changes in the cerebellum and cognition in these patients.

I have personally treated one of the brain cancer survivors who was raised in Village Way. This patient's cancer originated in neuronal and glial cells in the cerebellum; the cerebellum is a structure in the brain that matures earlier and has a steeper trajectory than the cerebral cortex, and its white matter continues to develop for several years after¹. Thus, this puts a child at especially heightened risk for environmental damage to cerebellar cells during the first three years of life. Furthermore, the solvents and heavy metals at Bishop Tube are capable of penetrating the placental boundary, and thus exposure can begin in utero, with even greater potential for damage of genes and proteins. The Village Way community is known as a cancer hub. While governments are used to understanding human needs as data, knowing this child and family going through treatments to survive a recurrent and aggressive brain cancer (and the mother also had melanoma skin cancer) is heartbreaking, and life-altering. Now an adult, this person with

¹ For example, Yu, et al. Differential White Matter Maturation from Birth to 8 Years of Age. *Cerebral Cortex* 2020, vol. 30.

cerebellar tumors that recurred and were serially treated with surgeries and moderately high irradiation to her brain, has coped very well with an intact and strong family. However, reduction in the capacity for life's achievements, self-concept and self-confidence, sadness, grief, and loss, and years of delay in being able to live independently though not at a self-sustaining level, are some of the costs of the long-term effects of environmental contaminants.

Environmental contaminants from human activities are at a crisis level for human health and survival and for our planet, as scientists today know², and Pennsylvania would benefit from a DEP that takes a more aggressive stance against environmental pollution.

Cancer Rate Increases in Chester County: A report by the US EPA (2018) reported TCE exposure is associated with several types of cancers in humans. Although the association of TCE with brain cancer is still unclear, studies have not been done on children whose mothers were exposed to TCE. The elevated rates of cancer at Village Way are not limited to brain cancers. In An Analysis of Cancer Incidence in Pennsylvania Counties 2008-2012, there was a statistically significant excess number of cancer cases in all cancer sites for males and for females. Of particular concern regarding the exposure to hazardous chemicals that has been going on at Bishop Tube for more than 20 years, is the significant increases in that five year period of 2008-2012 in female brain/nervous system cancers, thyroid cancer, ovarian cancer, and melanoma of the skin. Other rates were the same or higher though not significantly. In males, there were excess number of cancers of blood (leukemia), thyroid cancer, urinary bladder cancer, breast cancer, and melanoma of the skin.

Updated cancer statistics from the PA Dept of Health for 2014 – 2018 indicate that brain/nervous system cancer continues to be high for females in Chester County rankings (though data is presented differently and direct comparison cannot be made). Rates for males are higher. Melanoma of the skin has increased for males and females, as well as breast cancer for females.

While it is not possible to draw a causative connection to the cancers in Village Way residents and their progeny and the hazardous chemicals at Bishop Tube, this Chester County data serves to warn that the chemicals in our environment have consequences for human health, and that there is growing concern in the scientific community that the high rates of chemicals in our environment are related to increasing illnesses of many types, especially cancers and neurological illnesses.

Neurological Effects of Trichloroethylene (TCE) and other solvents: (from Roux report) “Primarily TCE, cDCE, 1,1-DCE, VC, TCA, 1,1-dichloroethane (“1,1-DCA”) and PCE (with 11 additional VOCs retained as COCs. In surface water: TCE. In soil: TCE, cDCE, 1,1-dichloroethene (“1,1-DCE), VC, TCA, 1,1,2-trichloroethane (“1,1,2-TCA”) and PCE”.

TCE has long been known to be neurologically damaging, causing toxic effects on cranial nerves³ including human in situ exposure through ingestion and dermal routes of exposure to contaminated water⁴. Chronic low-level exposure results in interference of cells' metabolism leading to gastrointestinal disturbances, cardiac abnormalities, cranial neuropathies, skin rashes,

² Rockstrom et al. *Breaking Boundaries: The Science Behind Our Planet*. New York: Penguin Random House, 2021.

³ Glaser. Treatment of Trigeminal Neuralgia with Trichloroethylene. *Journal of the American Medical Association*, v.96, 1931.

⁴ Feldman et al. Blink reflex latency after exposure to trichloroethylene in well water. *Archives of Environmental Health*, v. 43(2), 1988.

loss of sensation, slow nerve conduction, intolerance to alcohol, abnormal liver function, increased blood lipids, and macrocytic anemia. Similarly to Bishop Tube, it is a common environmental contaminant in Superfund sites as a result of leaching from disposal sites, is widely found in drinking water, surface water, and soils. Even though the interaction between chronic exposure and nervous system toxicity is not well understood, it is an ex post facto problem.

Neurocognitive abnormalities from TCE are well known from chronic exposures to TCE, which has a depressant action on the central nervous system affecting attention, concentration, visuospatial processing, and memory. In a study of neurobehavioral function damage from environmental exposures to TCE by those *living near* electronic manufacturing plants, and *near groundwater plumes*, also found at Bishop Tube, there was exposure to mixed solvents, primarily TCE⁵. Findings showed neurocognitive abnormalities.

Neurological diseases that are associated with exposure to TCE. The Roux report identified in the groundwater, surface water, and soil at Bishop Tube exceedances of Trichloroethene (TCE), cDCE, 1,1-dichloroethene, VC, TCA, 1,1-dichloroethane (“1,1-DCA”), Tetrachloroethene (PCE), and 11 additional Volatile Organic Compounds retained as Constituents of Concern (COCs).

Parkinson’s Disease has primarily environmental causes, which include TCE and other solvents (in twins, one of whom had been occupationally exposed to trichloroethylene, Parkinson’s disease risk was fivefold higher in the TCE-exposed twin)⁶. As more research accumulates, more becomes known about the neurotoxicity of TCE and risk for Parkinson’s disease. For residents who were exposed accidentally to low concentrations of TCE in municipal drinking water due to adjacent hazardous waste sites for five years, residents performed more poorly than the normal standard in various cognitive (attention, memory, reaction time) and emotional measures (more confusion, depression, tension)⁷. The Agency for Toxic Substances and Disease Registry reported evidence that chronic, low-dose TCE exposure can result in neurobehavioral impairment⁸.

Tetrachloroethylene (also known as PCE) when inhaled at rates higher than expected in a home, resulted in neurological changes⁹. The Roux report states that risk is elevated from solvents at Bishop Tube at all sites tested when analyzed as casual exposures by being in and around the water and soil there.

The most conservative of scientific analyses recognizes that health risks from TCE interact with other toxic exposures, such as those found at Bishop Tube. Analyses indicate that developing individuals are more sensitive, TCE leads to concentrations in the brain and cognitive dysfunction, and the solvents and COCs found at Bishop Tube have a role in the development of

⁵ Kilburn. Is Neurotoxicity Associated with Environmental Trichloroethylene (TCE)? *Archives of Environmental Health*, 2002 vol. 57(2).

⁶ Goldman. Trichloroethylene and Parkinson’s Disease: Dissolving the Puzzle. *Expert Review of Neurotherapeutics*, v. 21(12), 2010.

⁷ Reif, et al. Neurobehavioral Effects of Exposure to Trichloroethylene through a Municipal Water Supply. *Environmental Research*, vol. 93, 2003.

⁸ Agency for Toxic Substances and Disease Registry. Toxicological Profile for Trichloroethylene. *U. S. Public Health Service*, 1997.

⁹ Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. *Public Health Goal for Tetrachloroethylene in Drinking Water*. Pesticide and Environmental Toxicology Section, August 2001.

neurodegenerative diseases¹⁰. While quantitative and direct etiological certainties are hampered by lack of studies of long-term exposure in humans, the EPA has validly recognized the adverse effects for humans with chronic exposures. The potential environmental exposures quantified by Roux in their report exceed the EPA standards.

The Roux study makes many conclusion statements without findings to support them, or they fabricate the supporting evidence, for example, stating that the background levels of these chemicals probably account for the levels found at Bishop Tube. The Roux study examines the probability of carcinogenic and other disease risks from the exceedances at Bishop Tube from casual exposure to the contaminants at the site from children and adult recreational activities and from youth trespassing activity. They conclude that there is no human health risk from these casual exposures, while their data states otherwise. There appears to be a significant and unacceptable long-term risk for cancer and other diseases at Bishop Tube even after housing is built, that exposes especially the residents of the new housing, as well as others who live nearby.

Updated Science: Since the reports on the health hazards of TCE, a much greater human tissue sensitivity to TCE has been reported, and extensive research gives evidence that TCE is a causative factor in cancer, fetal cardiac development, and neurotoxicity¹¹. An updated literature search reaffirmed that TCE has the potential to cause cardiac defects in humans at sufficient doses during a sensitive window of fetal development¹². Furthermore, epidemiological studies show elevated relative risk estimates for major cardiac defects in humans contaminated with TCE via vapor intrusion from subsurface locations into the indoor air of overlying and nearby buildings¹³. The potential for exposure to disease risk for the residents of the new houses planned to be built at Bishop Tube appears significant, and even likely. Other complications from environmental TCE exposures for humans are fetal growth retardation, embryo lethality, ocular malformations, developmental neurotoxicity, and developmental immunotoxicity. There remains a degree of uncertainty about TCE toxicity and effects on the dopaminergic neurotransmitter system that is responsible for Parkinson's Disease but the issue remains.

Why Is Housing Being Built at Bishop Tube? The ATSDR, Chester County Planning Commission, and East Whiteland Environmental Advisory Council have all opined against taking the health risks of building homes at Bishop Tube. East Whiteland Supervisors have never given a sufficient explanation for their continued promotion of the housing development at Bishop Tube except that they are trying to avoid legal tort from O'Neill and Constitution Drive Partners. However, they have not done their due diligence to use local and Commonwealth laws to stop the development justified by the protection the people from harm. At least one supervisor admitted that he/she would not want to live in a home there due to the contamination. The financial loss to the developer should be weighed against the harm that has occurred to the people of Village Way, and the harm that will occur when vapor intrusions, air pollution from dissolved metals and solvents, and further contamination of Little Valley Creek and other surface water will occur when

¹⁰ National Research Council. *Assessing the Human Health Risks of Trichloroethylene: Key Scientific Issues*. The National Academies Press, Washington, D.C., 2006.

¹¹ Miranda and Greenamyre. Trichloroethylene, a Ubiquitous Environmental Contaminant in the risk for Parkinson's Disease. *Environmental Science: Processes and Impacts*, 2020, issue3.

¹² Makris et al. A Systematic Evaluation of the Potential Effects of Trichloroethylene Exposure on Cardiac Development. *Reproductive Toxicology*, 2016, vol. 65.

¹³ ATSDR (Agency for Toxic Substances and Disease Registry). **Public Health Statement on Trichloroethylene**. *CDC Agency for Toxic Substances and Disease Registry*, Atlanta, GA: 2014.

the construction of new housing occurs. The future harm to residents and nearby residents from long-term exposures to the many hazardous chemicals at Bishop Tube also carries significant economic loss to the community, individuals, exposed proximal businesses, future generations, multiplied by the number of individuals who will pass through that place, can be judged by common sense to be greater than that economic harm to a single developer.

Exposure Risks Described by PA DEP: Mr. Dustin Armstrong explained how humans can become exposed to the hazardous substances at Bishop Tube; he stated that the exposures could develop from multiple pathways over time, even after homes are built there. People could come into contact with contaminated soil. Construction and utility workers could be exposed when working on the property. Vapor intrusions can migrate from soil or groundwater and enter occupied buildings. If buildings are constructed over or near soil contamination, a vapor intrusion (VI) exposure pathway could be opened. Vapor can intrude through cracks in foundation of homes. Contaminants can migrate into rain water and into ground water (as has been already found here though the full extent is not known). The DEP's recommended remedial actions might not treat all of the soil at this site. Contaminants can be transferred from soil and migrate further into groundwater as rainwater moves downward. Contaminants can also be trapped in the soil only to be released into groundwater for the long term. TCE is the primary contaminant of concern in ground water and is found further away from the source than any other contaminant. Based on TCE concentration from some monitoring wells, residual free product could act as a long term source of ground water contamination, and also discharge to Little Valley Creek. There is the potential that if there are changes to homes, or construction of new buildings, such as installing a new sump pit, changes could open a new VI pathway.

Therefore, these risks potentially are a long term and possibly permanent risk to development there. Contaminated groundwater will continue to feed the flow of Little Valley Creek at least for many generations if not for hundreds of years. This exposure is at odds with permitting housing development there, yet the DEP proposes remedial methods that do not bring the hazardous chemical exposures to meet PA health standards, but rather use a site specific comparison for exposure that permits housing development.

The community is aware that the full contamination, based on records of the activities at Bishop Tube that were collected by prior employees of Bishop Tube, indicate that there are other areas of contamination that have not yet been tested by DEP. Judgements are being made about the safety of building homes there without the full data about the extent of contamination, the feasibility of remediation, and success of remediation efforts. I doubt that other hazardous waste sites with this level of contamination have been turned into a large housing development, as East Whiteland plans.

PA DEP Remediation of Wildlife Habitats: Another issue is the lack of any information on the risks to the biota at this site and Little Valley Creek flowing downstream eventually to Valley Creek and the Schuylkill River. BSTI stated at the public hearing by East Whiteland with BSTI on 11/5/21, that the chemicals, not specified to date, that would be used to decontaminate the soils through chemical oxidation and/or in situ chemical reduction, coupled with soil mixing, could affect the environmental biota at the bishop tube site and downstream. This concern has received no attention in any of the DEP analyses and response reports. We have a right to know what the impact will be on the natural environment there.

Roux Conclusions about Health Risks: Roux’s Remedial Investigation Report of 1/13/21 concludes that there is no current risk to human health at Bishop Tube, but that there are risks associated with development activities. This argues for no development and use of natural remediation and man-made remediation.

“Active remedial measures identified in these RAs may hasten current rates of CVOC [chlorinated volatile organic compounds] and inorganic concentration reduction in groundwater, i.e., short-term COC mass reduction (although pre-design testing would be required) but at the cost of reduced sustainability (‘medium’ ranking). The degree of their protectiveness would depend on the extent to which they did not adversely affect the natural attenuation processes that are already occurring and did not cause any new or increased discharges to the environment, including the LVC tributary.”

They go on to say:

“Based on groundwater conditions and property uses at the Site as documented in the 2021 RIR, current exposure pathways do not pose unacceptable human health or ecological risk to receptors or the LVC tributary. Future potential groundwater exposure pathways within the Site (except on the Property itself related to future redevelopment) are expected to remain reasonably similar to those that currently exist and potential exposures that could be associated with changed conditions (e.g., construction of a new structure on currently undeveloped property) can be managed through the use of ICs and ECs.”

In Roux,’s report, continuation of the seepage of Bishop Tube industrial water through manholes and pipes are documented. Their *analyses* of all exposures and human health risk are based on incidental exposures such as someone walking through the site. Risks from cracking of foundations, sump pump changes, new construction, and redevelopment at the planned housing site are not analyzed in this report. The report states that the health risk will occur when development occurs, affecting Little Valley Creek, groundwater, and soil. Inhalation exposure is considered only for the Chlorinated Volatile Organic Compounds (CVOCs), which Roux considered unproblematic because the CVOCs will disperse in air to acceptable levels. The chronicity of low levels of exposure is not addressed, and is potentially health aversive based on findings of health problems in communities who live near factories using CVOCs. In addition, some of the heavy metals found can be dissolved in water and become airborne, or otherwise become flaked and airborne.

For non-cancer contaminants: HQ-hazard quotients are summed to result in a Hazard Index - HI, which shall not exceed 1 according to EPA and DEP regulations. For Excess Lifetime Cancer Risk (ELCR), the same standards of probability of excess risk apply. The HI and ELCR are reported for 2011/2014 and 2018 in several site sectors. They defined the PA DEP standard for risk that should not be exceeded: A Hazards Quotient of 1, which they define as 1 in 10,000 (1E-04). However, in the two tables of their findings, all of the values exceed this standard of 1E-04. They also state that the levels of intoxicants went down over time, but the assessment tables do not seem to support that assertion. Roux’s conclusion that the potential risks to human health and the environment, associated with recreational or trespasser exposures for children and adults, is less than the risk-based goals, appears to be a false conclusion. See tables below from their

report of the assessments in 2011 and 2014, and in 2018 – the Human Health Risk Assessment Appendix pages 10-16.

Assessment 1 (2011 and 2014)				
Location	Child Recreational Scenario	Child/Adult Recreational Scenario	Youth Trespasser Scenario	
	HI	ELCR	HI	ELCR
SW-1	5.8E-04	0.0E+00	5.9E-05	0.0E+00
SW-2	1.3E-03	7.7E-10	1.4E-04	8.3E-11
SW-3	1.4E-02	1.2E-07	1.8E-03	1.3E-08
SW-4	1.5E-02	5.1E-08	1.9E-03	5.5E-09
SW-5	1.2E-02	4.4E-08	1.6E-03	4.7E-09
SW-6	9.9E-03	3.5E-08	1.2E-03	3.7E-09
SW-7	1.0E-02	3.5E-08	1.3E-03	3.7E-09
SW-8	9.1E-03	3.2E-08	1.1E-03	3.4E-09
SW-9	4.1E-03	1.4E-08	5.2E-04	1.5E-09
SW-10	2.9E-03	8.7E-09	3.6E-04	9.3E-10
SW-11	1.5E-03	4.9E-09	1.9E-04	5.3E-10
SW-12	1.2E-03	3.8E-09	1.5E-04	4.0E-10
SW-13	2.9E-04	1.0E-09	3.7E-05	1.1E-10
SW-14	9.2E-03	2.8E-08	1.1E-03	3.0E-09
SP-5	1.6E-02	4.6E-08	1.8E-03	5.1E-09

Assessment 2 (2018)				
Surface Water Samples				
Location	Child Recreational Scenario	Child/Adult Recreational Scenario	Youth Trespasser Scenario	
	HI	ELCR	HI	ELCR
SW-1	5.6E-04	3.0E-09	5.6E-05	4.1E-10
SW-2	1.4E-03	4.9E-08	1.4E-04	6.8E-09
SW-3	6.2E-03	1.3E-07	7.2E-04	1.8E-08
SW-4	6.9E-03	1.8E-07	7.8E-04	2.5E-08
SW-5	8.3E-03	1.8E-07	9.4E-04	2.4E-08

Effects of vinyl chloride: Vinyl Chloride and other chemicals, which damage the aquatic habitats and biota, are ‘daughter’ chemicals resulting from the degradation of TCE flowing through Little Valley Creek and a plume last measured as at least a mile. According to the East Whiteland assessment by the environmental engineering firm, BSTI, daughter chemicals can also result from

the chemical treatments of soil and groundwater that PA DEP proposes. The daughter chemicals, some of which might not be considered hazardous by EPA standards, in sufficient quantities can harm and imbalance the water and sediment, possibly damaging the aquatic habitat and causing permanent damage to this DEP-designed Exceptional Value stream at Bishop Tube. As DEP knows, the Valley Creek watershed is in the path of several Superfund and hazardous waste sites including high heat and salt impacts from the surrounding roads and highways. While aquatic life has been partially protected perhaps by the limestone geology of the stream, macroinvertebrate indices are already very poor or absent there, and biota might not survive more contamination.

Health impacts of vinyl chloride and its release of dioxins are a major concern at this location, and disturbance for the purposes of housing and related infrastructure is more likely to cause further contamination to enter the stream and groundwater (and air) than allowing the site to remediate naturally after engineered clean up by the responsible parties. Vinyl Chloride is known to cause cancer, and low level of exposure over long periods of time increases the risk of cancer in liver, blood vessels, kidney, stomach, skin, and the neurological system. In fact, there are people with melanoma of the skin who reside in the Village Way community next to Bishop Tube. Vinyl chloride is easily absorbed into skin. It is volatile, and can be released into the air from Little Valley Creek which is being fed by contaminated groundwater that will not be fully remediated. TCE and vinyl chloride can affect the metabolism, reproduction, and growth of daphnia magna¹⁴, which is a food web indicator.

Several aquatic experts have expressed major concerns about the effects of the ongoing levels of vinyl chloride in Little Valley Creek related to Bishop Tube.

Effects of heavy metals in soil, ground water, and surface water: Arsenic, Chromium, Hexavalent Chromium, Lead, Manganese, Nickel, Thallium, Aluminum, Vanadium, and others as cited by DEP. Roux reported exceedances in these heavy metals, but in each case, speculated that they were attributed to background conditions because of their “relatively” similar concentrations across the Bishop Tube site. This site was manufacturing with heavy metals from 1955 to 1999, and this nearly 45 years of badly managed use of toxic materials is long enough to cause similar distribution of the metals across the site. Some of these heavy metals will dissolve in water and be distributed through the soils and to conditions distant from the original site. It is biased interpretation of the data to attempt to attribute heavy metals to the background forest (naturally occurring background) than to the 45 years of manufacturing using VOCs, solvents, acids, heavy metals, and other hazardous substances.

Encephalopathy can result from chromium exposure. Chromium can go into solution in contact with water and move through soil and in water some distance from the original site of contamination¹⁵.

Because the background condition for this site prior to Bishop Tube is Pennsylvania forest, and while atmospheric deposition could result in heavy metals on the site, it is reasonable that the excessive levels of these heavy metals are the results of the manufacturing and practices used at the Bishop Tube site, affecting water use, chemical dumping, soil absorption, and atmospheric deposition from factory activities.

¹⁴ Houde, et al. Exposure of Daphnia Magna to Trichloroethylene (TCE) and Vinyl Chloride (VC): Evaluation of Gene Transcription, Cellular Activity, and Life-History Parameters. *Ecotoxicology and Environmental Safety*, 2015, June, vol. 116.

¹⁵ Pellerin and Booker. Reflections on Hexavalent Chromium: Health Hazards of an Industrial Heavyweight. *Environmental Health Perspectives*, vol. 108, 2000.

The National Toxicology Program of the National Institute of Environmental Sciences, and the U. S. Environmental Protection Agency provides extensive information on the well-known health hazards of heavy metals. Excessive levels of heavy metals, *present at Bishop Tube over four decades without any remediation even over the two decades since manufacturing activities ended*, are toxic, persistent in the environment, and bioaccumulate. They are a health threat to humans, animals, and plants and contribute to declines in species¹⁶. They bioaccumulate and leach into ground waters and other water resources. Fish downstream of the Little Valley Creek headwater, in Valley Creek and the Schuylkill river are at risk of bioaccumulation of heavy metals and their toxicities over 45 years of their presence at Bishop Tube. The longer the exposure period from soil or water from some of these, the lower the threshold at which organ impairments might occur¹⁷. Hazards to wildlife include sublethal effects of diminished growth and survival of biota including birds¹⁸. All of the heavy metals that were found to exceed health standards are found to cross placental barriers and cause damage and fetal mortality, as well as central nervous system encephalopathy and peripheral nerve damage¹⁹.

The Roux report emphasizes the areas where levels were not in exceedance of state standards, as if the health risks were a zero net estimation. Exceedances of this many heavy metals at so many sites, in groundwater and in soil, over decades, are problems for health, and will not be completely resolved by remediation. The placement of housing over a site with this severity of contamination is not ethical or humane.

Costs of Remediation: PA DEP estimated that the costs of the in-situ remediation alternatives were less expensive than actual clean up of the soil and water. However, these unknown and unspecified chemical processes, unknown areas of contamination still at the incompletely assessed site, could result in complications that balloon costs to become much greater than originally estimated. Little is currently known about the final testing results, what chemicals will be used, their effectiveness, new exposure pathways that could be found, and the final results. There needs to be assurances that the decisions regarding remediation include the requirement for all Responsible Parties to fund the completed remediation. It is illegal and immoral to have a partially remediated site that cannot be rehabilitated to natural forest and/or meadow.

Benefits of HSCA required remediation followed by forest restoration and natural remediation: There are benefits of remediating BT to the highest standards required by law, and then allowing natural geological, biological, and physical remediation of land, of expanding the forest cover, and of putting the area under permanent conservancy.

1) A Commonwealth natural resource would be made out of the toxic site that would benefit the nearby residents of Chester County including the DEP Environmental Justice income-defined areas, by providing open space and trails through a beautiful mature PA forest with the potential for environmental education in the remediated acres. Such remediation areas show the

¹⁶ Ali et al. Environmental Chemistry and Ecotoxicology of Hazardous Heavy Metals: Environmental Persistence, Toxicity, and Bioaccumulation. *Journal of Chemistry*, vol. 2019, 2019.

¹⁷ Mochizuki. Arsenic Neurotoxicity in Humans. *International Journal of Molecular Science*, vol. 20, 2019.

¹⁸ Eisler. A Review of Arsenic Hazards to Plants and Animals with Emphasis on Fishery and Wildlife Resources. *Arsenic in the Environment, Part II: Human Health and Ecosystem Effects*, John Wiley, 1994.

¹⁹ Eisler. Arsenic Hazards to Fish, Wildlife, and Invertebrate: A Synoptic Review. *Biological Report* (85), 1988.

will and determination of the Commonwealth and other stakeholders to return and reclaim a contaminated site for all to enjoy.

2) There would be benefit from remediation of improved air quality that has been degrading over time including since 2000.

3) Remediation would protect Little Valley Creek from continued contamination through construction and stormwater runoff from a dense housing project.

4) Remediation would help DEP achieve its goal to reduce contaminants to an Exceptional Value Stream by reducing impervious surface from the current level once the old factory is removed and allowed to naturalize and be restored as PA forest. It would likewise help East Whiteland reach its MS4 requirements. It would also prevent the intensive impervious surface that would result from the housing development. The stormwater runoff from the development will have major impact on Little Valley Creek and the Valley Creek watershed.

If the PA DEP wishes to achieve improvement in our PA streams, as it states in its MS4 requirements, then it needs to enforce its own regulations and prevent this housing development which has no redeemable qualities, and which will continue to expose the residents of that housing development, and existing proximal communities, to an elevated risk of contamination. There are entities that will purchase the property, still requiring legally mandated HSCA standards by the Responsible Parties, which would prevent hardship to O'Neill and Constitution Drive Partners. This is not a situation in which the residents, concerned citizens of the watershed, and our protected Commonwealth natural resources, should suffer from – Their hardship in the long term in illness burden, loss/reduction of employment, injury to children, and economic losses will be much greater than that of the current owners.

My Own Personal Response: In general, the process of formal discussion of this site has always defended the use of the property for residential housing to produce monetary benefits to the developer and the township of East Whiteland, and has never directly addressed the many problems the nearby residents and other agencies (County Planning Comm., township EAC, federal ATSDR) have expressed about the risks to human and environmental health. The Supervisors of East Whiteland are the only civic group that is recommending housing development on this toxic site. This silence from DEP and East Whiteland Supervisors about the existing and future health risks has been truly deafening, and its consistency, intransigency, and duplicity by the government that fails to protect the welfare of the people is shattering. At no time has the actual reason for the refusal to protect this site from damaging the humans who have been, and will should houses be built, and the wildlife, been explained as East Whiteland had choices to make in approving the development, and in their use of local and Commonwealth laws that would protect the residents and the environment rather than comply with the developer. *The discussions and hearings that have taken place describe a result that has been written in stone from the beginning* – this is disturbing and both legally and morally wrong. All advice to not build homes at Bishop Tube were ignored. Local government officials and attorneys did not educate themselves about Bishop Tube and its environmental consequences from the process of development. East Whiteland's own lawyer was biased towards the developer in the sense that the only protection he cared for was the protection of the three supervisors from being sued by the developer. The Supervisors did not instruct their lawyer to utilize existing laws to reject the development. In the Chester County Court of Common Pleas, the East Whiteland solicitor stood supported by the developer, when fending a suit brought by a community resident that harm was being caused to the community by the township's approval of housing development at Bishop Tube. This strongly appears like illegal bias on the part of East Whiteland, and possibly on the

part of the DEP. It is heartless that the DEP and local government officials remain obdurate and uncaring, not even willing to explain or apologize to the community for their decisions and willingness to put at risk the health of the people and the environment from both near-term and long-term harm.

Payments for housing purchases, or penalty payments imposed by PA DEP for poor decisions, can be deposited in less than a second. The specific amounts of money to be lost if the site is not developed for housing or other highly developed construction, can be precisely calculated. However, there are costs to the people of Pennsylvania who will live in those houses, who have been living nearby, to aquifers, ecologies, and to communities downstream, and to all Pennsylvanians who continue to sacrifice their constitutional rights to clean air and clean water, and the benefits of a natural environment because government laws are interpreted with a bias towards corporate or industry economic gain. The costs of environmental contamination and increasing pervious surfaces that continue to produce pollution, and the loss of the environmental services that would have continued to protect the quality of life and health of humans and wildlife, are extensive and long-term. We need the environmental services lost through development, including the health, quality of life, and wage/salary costs that are estimated to result, to be quantitated and included in determining who sustains greater harm.

Sincerely,

A handwritten signature in black ink that reads "Carol L. Armstrong, PhD, ABN". The signature is written in a cursive style with a small crossbar on the 't' in 'Carol'.

Carol L. Armstrong, PhD, ABN