Health Consultation

Former Ronson Metals Corporation
Newark, Essex County, New Jersey

Public Health Implications of Site-Related Indoor Air Exposures

July 17, 2015

Prepared by:

New Jersey Department of Health
Environmental and Occupational Health Surveillance Program

Summary

Introduction

At the request of the Ironbound Community Corporation (ICC), the New Jersey Department of Health (NJDOH) has reviewed environmental data to evaluate the public health implications of volatile organic compound (VOC) contamination in indoor air for residences and commercial properties being investigated as part of the former Ronson Metals site located in the city of Newark, Essex County, New Jersey. Vapor intrusion investigations were conducted beginning in January 2013 to the present by the New Jersey Department of Environmental Protection (NJDEP). This document evaluates data from January 2013 through March 2014 although additional data continues to be collected as part of the ongoing investigation.

The top priority of the NJDOH is to ensure that the community residing on and around the site has the best information possible to safeguard its health.

Conclusions

The NJDOH has reached four conclusions for the former Ronson Metals site.

Conclusion 1

The NJDOH concludes that, based on the available data collected by the NJDEP between January 2013 and March 2014, there is a past completed exposure pathway for site-related contaminants to impact the indoor air of 15 homes and four commercial properties.

Basis for Conclusion 1

Indoor air and sub-slab soil gas data for 15 homes and four commercial properties indicate elevated levels of site-related contaminants. All fifteen homes and the four commercial properties have sub-slab systems to interrupt the pathway.

Conclusion 2

The NJDOH concludes that, based on available data collected by the NJDEP between January 2013 and March 2014, past exposures to site-related contaminants at four homes may have harmed people's health.

Basis for Conclusion 2	Of the 15 homes impacted by vapor intrusion, there was an increased risk for fetal heart malformations to have occurred from past maternal exposures to indoor air contaminated with trichloroethylene (TCE) for individuals residing at four homes. There was also an additional risk for kidney damage in adults residing in one of these homes. Current and future inhalation exposures to site-related contaminants at these residences have been interrupted with the installation of sub-slab systems.
Recommended Next Steps	The NJDEP should continue to monitor all sub-slab systems installed at the properties on the site to ensure these mitigation systems are effectively preventing vapor intrusion of site-related contaminants. The NJDEP should provide guidance on proper operation and maintenance for residences that are not eligible for state funding due to changes in ownership.
Conclusion 3	*The NJDOH concludes that, based on available data collected by the NJDEP between January 2013 and March 2014, fifteen homes were not impacted by vapor intrusion at the time of sampling.*
Basis for Conclusion 3	Seven homes, including one residential/commercial property, did not have any site-related contaminants in indoor air or in the sub-slab soil gas. Eight homes have the potential to be impacted by vapor intrusion in the future due to the close proximity of these homes to those where soil gas data exceed screening levels. Three of these homes have sub-slab systems installed and therefore, the potential for site-related contaminants to impact these homes has been interrupted. The remaining five homes do not have systems installed and soil gas data indicate these homes may be impacted by vapor intrusion in the future.
Recommended Next Steps	Any property where there is a potential for site-related contaminants to impact indoor air in the future should be considered for periodic indoor air monitoring or installation of a sub-slab system.
Conclusion 4	*The NJDOH concludes that there is not enough data to evaluate whether residents are being exposed to soil contaminants on the residential properties constructed on the site.*

Basis for Conclusion 4	There is insufficient data available for the NJDOH to evaluate the potential for residents, particularly children, to come into contact with contaminated soil which was capped on the property before homes were built. It is also not known whether the caps were compromised during the construction of the homes which may expose contaminated soil.
Recommended Next Steps	Soil on the residential properties is likely impacted with site-related contaminants (heavy metals, PAHs, PCBs, VOCs and mercury) and should be evaluated by the NJDEP to determine the appropriate remedial action to prevent residents, especially children, from coming into contact with contaminated soil.
For more Information	Copies of this Health Consultation will be provided to the Ironbound Community Corporation and concerned residents in the vicinity of the site via the township libraries and the Internet. The NJDOH will notify the Ironbound Community Corporation that this report is available for their review and provide a copy. Questions about this Health Consultation should be directed to the NJDOH at (609) 826- 4920.

Statement of Issues

This health consultation was prepared by the New Jersey Department of Health (NJDOH), under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), at the request of the Ironbound Community Corporation (ICC). The ICC represents residents of the Ironbound section of Newark. This health consultation evaluates the public health implications from exposures to site-related contamination detected in indoor air during investigations of the residential area and commercial properties located on the former Ronson Metals Corporation site in Newark, Essex County. This evaluation includes the review of all vapor intrusion data collected by the New Jersey Department of Environmental Protection (NJDEP) between January 2013 and March 2014 related to the ongoing investigations being conducted at the site.

Background and Site History

The former Ronson Metals Corporation site (Ronson) is located at 45-65 Manufacturers Place in Newark, Essex County, New Jersey (**See Figure 1**). The site encompasses three separate parcels by Manufacturers Place and Horatio Street and is bordered by residential and industrial properties. There were seven buildings on the site which were used for storage and manufacturing purposes (**See Figure 2**).

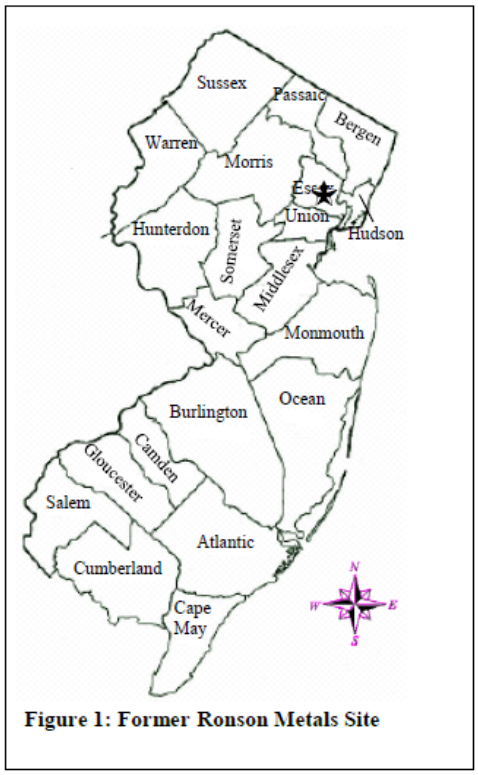

Figure 1: Former Ronson Metals Site

Ronson was founded in 1956 and produced mischmetal, a mixture of rare earth elements used to manufacture lighter flints and strikers. Ronson also manufactured thorium containing metal discs and coated strips which were used to aid in the maintenance of high efficiency vacuums. Ronson ceased operation in 1986 which triggered actions to evaluate and subsequently remediate the site under the NJDEP's Environmental Cleanup and Responsibility Act (ECRA), a predecessor to the Industrial Site Recovery Act (ISRA).

Groundwater contaminated with chlorinated volatile organic compounds (VOCs), primarily trichloroethylene (TCE), was identified during site investigations conducted from 1992 through 1997. Soils were also found to be contaminated with VOCs (including TCE), metals, radioactive materials, polyaromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

Ronson also had an incinerator on the property for the disposal of hazardous waste. Hazardous waste was stored in 55 gallon drums. At one time Ronson had between 2,000 and

3,000 drums stored at the site, mainly in Building 7. A site inspection conducted by the NJDEP on October 2, 1985 revealed some of the drums were leaking.

Remediation of radioactive contaminated soil found at the site in October 1994 was overseen by the Nuclear Regulatory Commission (NRC). Soil contamination was addressed by Ronson through capping and removal actions. An investigation to determine if groundwater was impacted by site operations was started in March 1992 with the installation of a monitoring well which detected the presence of TCE and cis-1,2-dichloroethylene. Groundwater was not remediated at the site.

Following remedial measures completed for soil contamination at the site, the NJDEP issued a No Further Action (NFA) letter for soil for one parcel on the site. The remaining two parcels received soil NFA letters contingent with deed notices to address remaining soil contamination within the site. The three parcels on the property were sold to a developer in three separate transactions in 1999, 2000 and 2002. The NJDEP determined that these transactions were in violation of ISRA regulations as soil and groundwater contamination remained at the site which required the NJDEP to be notified prior to the transfer of property (NJDEP 2012).

The NJDEP reviewed historic groundwater data in 2011 and determined that homes and commercial properties had been constructed on the site. This violated the conditions of the deed notices for two of the three parcels which restricted future development to parking or industrial use only. Based on the findings of a site visit conducted in September 2012 and the review of existing groundwater and other relevant data, the NJDEP conducted an initial vapor intrusion investigation in January 2013. Indoor air and sub-slab soil gas samples were collected as part of this investigation to determine whether homes were impacted from site-related contamination.

Remedial and Cleanup Actions

Since radioactive material, including thorium, was used at the site, the NJDEP required a radiation survey to determine whether facility operations had impacted the site. Based on the results of the survey, cerium and samarium were detected above the background levels at the site. On October 2, 1991, Ronson submitted a cleanup plan for radiological materials. Contaminated soil containing these radioactive materials were later excavated and removed from the site.

On October 31, 1994, Ronson signed a Memorandum of Agreement (MOA) and submitted a remedial action workplan (RAWP) on November 1, 1995. Based on the RAWP the main contaminants of concern at the site were TCE and heavy metals including arsenic, barium, lead, cerium, and samarium.

The site cleanup was divided into six areas of concern (AOCs) identified as Areas A through Area F (**See Figure 2**). A fuel oil underground storage tank (UST) was removed from Area A (located in front of Building 7) in February 1990. Post excavation soil sample results showed no detectable levels of total petroleum hydrocarbon (TPH) contaminants. In addition, a 550 gallon gasoline UST was removed from this area on March 17, 1995 and three soil samples

were collected from the excavation and analyzed for a variety of contaminants including petroleum hydrocarbons, volatile organic compounds (VOCs) and lead. Based on the analytical results, lead was detected in all three soil samples with one sample exceeding the NJDEP residential soil cleanup criteria.

Beginning in 1998, surface soils containing heavy metals from Area B were excavated and removed to a depth of six inches and disposed of off-site (NJDEP Correspondence January 2014). Areas C and D were sampled for metals, petroleum hydrocarbons, radioactive materials and base-neutral compounds. Results indicated elevated levels of some metals, TPHs and PAHs as well as the presence of radioactive materials. Therefore, a Declaration of Environmental Restriction (DER) was proposed and submitted to the Essex County Register of Deeds and Mortgages in April 1999. PCB and mercury "hot spots" were excavated and placed into Area B as surface fill prior to paving as it was deemed to be "non-hazardous" waste. Paving was recommended as a capping measure for these AOCs. Regarding Area E, two 3,000 gallon USTs were removed including contaminated subsurface soils within the excavation area. Post excavation soil samples were collected and analyzed for TPHs, base-neutral compounds, metals, and VOCs. Sample results showed that the cleanup was effective and contaminated soil had been removed. Paving was proposed for Area F as a capping measure due to the presence of cadmium impacted soil.

Ronson submitted plans for institutional (Deed Notice) and engineering (capping) controls for the TCE impacted area located near the former Building 6 and parking area in February 19, 2002. Capping included a six inch compacted clay layer, geotextile fabric and a six inch gravel layer. The clay layer was placed over the TCE impacted area and geotextile was placed over the clay layer. Six inches of gravel were placed on the top of the geotextile layer. The NJDEP issued NFA letters in October 1997, January 1998 and July 2000 for soil for all three parcels. NFA letters were also issued specifically for the removal of soils contaminated with radioactive materials in May 2000 and March 2002. The soil NFAs were contingent upon deed restrictions placed on two of these parcels limiting future use of the property for parking and industrial use only.

Despite the deed restrictions put on the property, the land was developed into residential and commercial properties following the three property acquisitions beginning in 1999. It is not known if the cap was compromised during construction of the homes.

The site encompasses several lots on three different blocks (parcels). **Table 1** details the soil contaminants and deed restrictions for these blocks:

Table 1: Summary of Site Blocks and Deed Restrictions

Block	Lots	Remediation Area (Figure 2)	Soil Contaminants	Deed Restriction
2395	45-65 Manufacturers Place, 56 Vincent Street, 68-70 Vincent Street	Area E	All contaminated soil was removed prior to the development of the homes on the site	None
2479	39-43 Manufacturers Place	Areas A and F	Cadmium, gasoline contaminants	Yes – Area is paved
2395.01	28-31 Manufacturers Place	Areas B, C, D (includes TCE impacted area)	PAHs, Priority Pollutant Metals, mercury, PCBs, VOCs including TCE	Yes – restricted to parking lot or industrial use – area is capped

Notes: PAHs = Polyaromatic Hydrocarbons
VOCs = Volatile Organic Compounds
PCBs = Polychlorinated Biphenyls

Community Health Concerns

The NJDEP held a community meeting on January 30, 2014 and the New Jersey Department of Health was present to gather information regarding community concerns and answer questions from residents. The meeting was sponsored by the Ironbound Community Corporation (ICC) and attended by approximately 50 residents. There were also legislative representatives, attorneys and realtors present. Residents expressed health concerns about a variety of issues, including exposures from vapor intrusion, eating garden grown vegetables, and whether the outside air was safe. One resident stated that she had a deed restriction for her property indicating that the property was "safe to live on" yet unsafe to eat vegetables grown in soil. This resident further stated that she has illnesses that her doctor cannot explain. Another resident asked if it was safe to live in his home and what is meant by "high levels" with regard to the vapor intrusion issue. The question of medical monitoring was raised by an environmental attorney. Additional concerns included whether headaches, nausea, and vomiting may be due to TCE exposure and if a nearby incinerator in addition to TCE exposure within impacted homes may affect the health of residents. In addition to concerns raised at this meeting, the NJDEP was made aware of a child living in one of the homes on the site who passed away from kidney cancer. Based on the concerns raised during the community meeting, the ICC asked if the NJDOH could prepare a health consultation to address these issues.

Demographics

The area surrounding the site is urban with residential, commercial and industrial properties. According to the 2010 U.S. Census, 20,593 people live within one mile of the site (**See Figure 3**).

Environmental Contamination

An evaluation of site-related environmental contamination consists of a two tiered approach: 1) a screening analysis; and 2) a more in-depth analysis to determine public health implications of site-specific exposures. First, maximum concentrations of detected substances are compared to environmental media-specific health-based guideline comparison values (CVs). If concentrations exceed the environmental CV, these substances, referred to as Contaminants of Concern (COC), are selected for further evaluation. Contaminant levels above environmental CVs do not mean that adverse health effects are likely, but that further evaluation is necessary. Once exposure doses are estimated, they are further evaluated to determine the likelihood of adverse health effects.

Environmental Comparison Value Guidelines

There are a number of environmental CVs available for screening environmental contaminants to identify COCs. These include ATSDR Environmental Media Evaluation Guides (EMEGs) and Reference Media Evaluation Guides (RMEGs). EMEGs are estimated contaminant concentrations that are not expected to result in adverse non-carcinogenic health effects. RMEGs represent the concentration in water or soil at which daily human exposure is unlikely to result in adverse non-carcinogenic effects. If the substance is a known or a probable carcinogen, ATSDR's Cancer Risk Evaluation Guides (CREGs) are also considered as comparison values. CREGs are estimated contaminant concentrations that would be expected to cause no more than one excess cancer in a million (10^{-6}) persons exposed over their lifetime (70 years). In the absence of an ATSDR environmental CV, other comparison values may be used to evaluate contaminant levels in environmental media. These include the US EPA Region 3 Human Health Media-Specific Screening Levels (SLs) and the NJDEP Soil Gas Screening Levels (SGSL) for vapor intrusion sources (NJDEP 2013). These health-based benchmarks are derived from the evaluation of cancer and non-cancer effects using current toxicity criteria. The NJDEP SGSVs serve as a predictor of potential concern from a vapor intrusion source acting as a threat of inhalation exposure posed to occupants of a building, which include residences.

Substances exceeding applicable environmental CVs are identified as COCs and evaluated further to determine whether these contaminants pose a health threat to exposed or potentially exposed receptor populations. Contaminant levels above environmental CVs do not mean that adverse health effects are likely, but that further evaluation is necessary. If environmental CVs are unavailable, these contaminants are selected for further evaluation.

Groundwater Contamination

Seven monitoring wells and three production wells were located on the site prior to the construction of the residential and commercial properties. Groundwater sampling data available for evaluation was limited for this site with the most recent data collected in June 1997. Results from the June 1997 sampling event indicate exceedances of the NJDEP's current groundwater quality criteria for benzene (1.7 micrograms of benzene per liter of water (µg/L)), 1,1-dichloroethane (67 µg/L), tetrachloroethylene (PCE) (7.7 and 17 µg/L), vinyl chloride (120

µg/L), and TCE. TCE was found in all seven monitoring wells at levels ranging from 4.2 µg/L to 35,000 µg/L. It is not known whether the monitoring wells on the property were properly sealed prior to the construction of the homes and commercial properties.

Three production wells (PW-1 through PW-3) on the site were sampled in February 1991. PW-1 and PW-2 were found to contain TCE (68.4 µg/L and 15.6 µg/L respectively), bromoform, trichloroethane and lead above the NJDEP's groundwater quality criteria. Cis-1,2-dichloroethylene exceeded the groundwater quality standards in PW-2. In July 2000, a groundwater investigation was conducted utilizing the existing production wells to determine if the groundwater in the bedrock beneath the site was contaminated. Production well PW-1 was abandoned due to its location near the area of radiological soil remediation which resulted in unstable ground conditions. Therefore, only two production wells (PW-2 and PW-3) were sampled as part of this investigation. Sampling results indicated TCE and cis-1,2-dichloroethylene were found in PW-2, while chloroform and bromodichloromethane were found in PW-3 exceeding the NJDEP's groundwater quality criteria.

Vapor Intrusion Investigation

Based on the discovery of homes and commercial properties on the site and the known presence of VOC contamination in groundwater, primarily with TCE, a vapor intrusion investigation was initiated by the NJDEP in January 2013. The first phase of vapor intrusion investigation began with four commercial properties in January and February 2013. The second phase of the vapor intrusion investigation began with a total of 30 residential properties from July 2013 through March 2014. This investigation included the collection of sub-slab soil gas samples and indoor air samples. An evaluation by the NJDEP of the results of the sampling events would determine whether a sub-slab vapor mitigation system would be installed at the property to prevent subsurface vapors from entering the homes and commercial properties. One commercial property received a sub-slab vapor mitigation system without prior sampling.

Sub-slab/Soil Gas – Residential Properties

Soil gas samples collected between July 2013 and March 2014 were analyzed for targeted VOCs using US EPA Method TO-15. There were 29 properties evaluated with two samples collected at one of the properties. Additionally, one property is considered a mixed use residential/commercial building.

The following compounds exceeded the NJDEP residential SGSLs in soil gas beneath the residential properties sampled.

Table 2: Compounds exceeding the NJDEP Residential SGSL

Contaminant	Number of Samples	Range ($\mu g/m^3$)	Number of Homes Above SGSL	NJDEP SGSL ($\mu g/m^3$)
Chloroform	30	10-710	16	24
Ethylbenzene	29	88	1	49
1,1,2,2-Tetrachloroethane	29	44	1	34
Trichloroethylene (TCE)	29	15-82,000	20	27

$\mu g/m^3$= micrograms per cubic meter

Sub-slab/Soil Gas – Commercial Properties

There were four commercial properties sampled during the initial phase of the vapor intrusion investigation. Three properties are used as warehouse/garages and one is a church building. Sub-slab soil gas samples were collected between January and February 2013 and analyzed for targeted VOCs using US EPA Method TO-15. A total of 13 sub-slab soil gas samples were collected within the four commercial properties.

The following compounds exceeded the non-residential SGSLs in soil gas beneath these four commercial buildings.

Table 3: Compounds exceeding the Non-Residential SGSL

Contaminant	Number of Samples	Range ($\mu g/m^3$)	Number of Properties Above SGSL	NJDEP SGSL ($\mu g/m^3$)
Bromodichloromethane	13	37	1	34
Chloroform	13	13-530	4	27
Trichloroethylene (TCE)	13	22-69,000	4	150
Vinyl Chloride	13	69-1,100	1	140

$\mu g/m^3$= micrograms per cubic meter

Indoor Air – Residential Properties

With the exception of one residence, indoor air samples were collected along with sub-slab samples during the same sampling event. There were a total of 30 homes sampled. For one home, a sub-slab sample could not be collected due to lack of an intact slab, therefore only an indoor sample was collected. One sample was collected from each home using the US EPA Method TO-15. The residential homes were sampled beginning in July 2013. **Table 4** shows the compounds exceeding environmental CVs in the indoor air.

Indoor Air – Commercial Properties

A total of 10 indoor air samples were collected within the four commercial properties. **Table 5** shows the compounds exceeding environmental CVs in the indoor air.

As of June 2014, five commercial properties including the church and 18 residences have sub-slab systems installed to prevent vapors from entering the building through vapor intrusion. This evaluation only includes four commercial properties, as the fifth property did not have samples collected, but a system was installed as a precaution. Sampling activities and the installation of vapor mitigation samples are continuing by the NJDEP. Contaminants potentially related to background sources are not likely due to vapor intrusion as these contaminants were either not detected or detected at very low levels in the sub-slab soil gas which were far below the applicable soil gas screening level criteria.

Discussion

The method for assessing whether a health hazard exists to a community is to determine whether there is a completed exposure pathway from a contaminant source to a receptor population and whether exposures to contamination are high enough to be of health concern. Site-specific exposure doses can be calculated and compared with health guideline CVs.

Assessment Methodology

An exposure pathway is a series of steps starting with the release of a contaminant in environmental media and ending at the interface with the human body. A completed exposure pathway consists of five elements:

1. source of contamination;
2. environmental media and transport mechanisms;
3. point of exposure;
4. route of exposure; and
5. receptor population.

Generally, the ATSDR considers three exposure categories: 1) completed exposure pathways, that is, all five elements of a pathway are present; 2) potential exposure pathways, that is, one or more of the elements may not be present, but information is insufficient to eliminate or exclude the element; and 3) eliminated exposure pathways, that is, a receptor population does not come into contact with contaminated media. Exposure pathways are used to evaluate specific ways in which people were, are, or will be exposed to environmental contamination in the past, present, and future.

The exposed populations for identified areas of concern include children and adults (residents and employees) associated with the 30 residences and four commercial properties. The evaluated exposure pathways for site-related contaminants are presented in **Table 6**.

Completed Exposure Pathways

Inhalation of COCs in Residential Indoor Air. Of the 30 homes sampled, there is a past completed exposure pathway at 15 homes through the inhalation of indoor air contaminated with TCE, which may be attributable to vapor intrusion based on the NJDEP soil gas and indoor air sampling data **(See Table 7).** The presence of chloroform in indoor air and sub-slab soil gas may be due to volatilization from drinking water use within the home, and from water or wastewater pipes in the area. The exposure pathway involves TCE vapors migrating upwards from beneath the surface from contaminated groundwater and soil and entering the interior of these residences. These 15 homes had TCE in sub-slab soil gas above residential soil gas screening levels and had TCE detected in indoor air. Current and future exposures to site-related contaminants from vapor intrusion at these 15 residences are considered interrupted with the operation of sub-slab vapor mitigation systems installed between January and June 2014. PCE was detected in indoor air above the environmental guideline CV at one home and one residential/commercial property. However, according to the NJDEP, the PCE measured in indoor air is attributed to sources within the buildings, and not due to vapor intrusion.

Contaminants not detected in soil gas or detected at concentrations below the NJDEP SGSLs were either considered to be present from an unknown source or attributable to background and/or consumer sources in indoor air. Contaminants detected in the residential and commercial properties attributable to background sources are listed in **Tables 4 and 5.** It is important for residents and workers to identify the sources of these contaminants in order to reduce indoor air levels of these substances as much as possible. Typical background contaminants and sources can be found in **Appendix A**.

Inhalation of COCs in Indoor Air at Commercial Properties. There is a past completed exposure pathway via vapor intrusion at four commercial properties through the inhalation of air contaminated with TCE which may be attributable to vapor intrusion based on the NJDEP soil gas sampling data. The exposure pathway involves TCE vapors migrating upwards through contaminated groundwater and soil and entering the interior of these buildings. Current and future exposures at these four commercial properties are considered to be interrupted by the operation of sub-slab vapor mitigation systems installed in February 2014.

Potential Exposure Pathways

Inhalation of COCs in Indoor Air at Residential Properties. There is a past potential exposure pathway for vapor intrusion in eight homes. Although the indoor air was not impacted at the time of sampling, soil gas data beneath these homes or nearby properties indicate there is a potential for COCs to impact the indoor air of these homes currently and in the future. Three of these homes have sub-slab systems installed and therefore, the pathway has been interrupted. The remaining five homes do not currently have sub-slab systems.

Incidental Ingestion of Surface Soil. There is a potentially completed exposure pathway for residents, particularly children, to come into contact with contaminated soil on the residential properties constructed over areas A, B, C, D and F. These areas have soil contaminated with metals, PAHs, PCBs, mercury and VOCs and were capped with the contamination in place. It is

not known whether the caps were compromised during the construction of the homes and the NJDOH is not aware of any data available to evaluate whether exposures to soil contaminants have occurred since the construction of the homes.

Public Health Implications of Completed Exposure Pathways

Once it has been determined that individuals have or are likely to come in contact with site-related contaminants (i.e., a completed exposure pathway), the next step in the public health assessment process is the calculation of site-specific exposure doses. This is called a health guideline comparison which involves looking more closely at site-specific exposure conditions, the estimation of exposure doses, and comparison to health guideline CVs. Health guideline CVs are based on data drawn from the epidemiologic and toxicological literature and often include uncertainty or safety factors to ensure that they are amply protective of human health.

If one is exposed to site-related contaminants, there are several factors that will determine whether they may be harmed. These factors include the amount of contaminant that enters the body, the duration and frequency that someone contacts the contaminant, and how one comes in contact with it. Additional considerations regarding potential adverse health effects from exposures to a contaminant include age, sex, diet, family traits, lifestyle, and state of health.

Non-Cancer Health Effects

To assess non-cancer health effects, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants that are commonly found at hazardous waste sites. An MRL is an estimate of the daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of adverse, non-cancer health effects. MRLs are developed for a route of exposure, i.e., ingestion or inhalation, over a specified time period, e.g., acute (less than 14 days); intermediate (15-364 days); and chronic (365 days or more). MRLs are based largely on toxicological studies in animals and on reports of human occupational (workplace) exposures. MRLs are usually extrapolated doses from observed effect levels in animal toxicological studies or occupational studies, and are adjusted by a series of uncertainty factors or through the use of statistical models. In toxicological literature, the following observations include:

- no-observed-adverse-effect level (NOAEL); and
- lowest-observed-adverse-effect level (LOAEL).

A NOAEL is the highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals. A LOAEL is the lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals. To provide additional perspective on these health effects, the calculated exposure doses were then compared to the applicable NOAEL or LOAEL. As the exposure dose increases beyond the MRL to the level of the NOAEL and/or LOAEL, the likelihood of adverse health effects increases.

When MRLs for specific contaminants are unavailable, other health based comparison values such as the US EPA's Reference Concentration (RfC) are used. The RfC is an estimate of a daily inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime of exposure.

When assessing an exposure risk to a COC, the US EPA recommends the 95 percent upper confidence limit (95% UCL) of the arithmetic mean should be used to determine the exposure point concentrations (EPC) for site-related contaminants (US EPA 2013). However, only one sample was collected from each home and therefore, a 95% UCL could not be accurately determined. Therefore, the EPC for the residential properties was determined based on the maximum concentration detected. For the commercial properties with four or more samples, the EPC was determined based on the 95% UCL and for those with less than four samples, the EPC was based on the maximum concentration detected.

Exposure point concentrations for non-cancer health effects to indoor air contaminants were calculated using the following formula:

$$EPC_{non\text{-}cancer} = C \times ET \times EF$$

where EPC = exposure point concentration of contaminant in air ($\mu g/m^3$);
C = 95% UCL or maximum concentration of contaminant in air ($\mu g/m^3$);
ET = exposure time (hours/24 hours); EF = exposure frequency (days/365 days).

The following site-specific exposure assumptions (US EPA 2009b, 2011b) were used to calculate exposures doses to residents and employees at commercial properties.

Exposed Population	Hourly Exposure Assumptions	Daily Exposure Assumptions
Adult/Child Residents	24 hours/day	350 days per 365 days
Adult Employees	12 hours/day	260 days per 365 days

Inhalation of COCs in Indoor Air

Of the 30 homes sampled, 19 had no exceedances of health based comparison values for non-cancer health effects. The remaining 11 homes sampled had exceedances of at least one contaminant above the applicable health CV **(See Table 7)**.

Site-Related Contaminants

TCE was determined to be related to contamination found at the site due to the presence of this compound in sub-slab soil gas and found in historical groundwater data. A toxicological summary for the identified COC is provided in **Appendix B**.

Trichloroethylene (TCE)

Eleven of the 15 homes where TCE was detected had exceedances of TCE above the ATSDR MRL of 2 µg/m^3. The EPCs in these homes ranged from 2.9 to 37.4 µg/m3. The ATSDR MRL for TCE is the same as the current TCE RfC (USEPA 2011c). This RfC reflects the midpoint between RfC estimates for two adverse health effects (Study 1: 1.9 µg/m^3 for adult immunological effects in mice and Study 2: 2.1 µg/m^3 for fetal heart malformations in rats). Regarding human health effects, specifically decreased thymus weights observed in mice from Study 1 and fetal heart malformations from Study 2, the predicted LOAELs for adult human inhalation exposures were derived using physiologically based pharmacokinetic (PBPK) modeling and route-to-route extrapolation to convert oral TCE doses in animals to a human equivalent concentration (HEC) in air.

The LOAELs for the two RfC studies are 190 µg/m^3 (immunological effects) and 21 µg/m^3 (fetal heart malformations). The US EPA attributes a small risk of developing the associated health effects when humans are chronically exposed to TCE at these concentrations (USEPA 2011c). There are many uncertainties when drawing conclusions as to whether critical health effects will occur based on data extrapolated from animal studies. However, the ATSDR considers the risk for harmful effects to occur in individuals exposed to TCE at concentrations near predicted LOAELs to be lower than for individuals exposed to TCE at levels exceeding the predicted LOAELs.

The US EPA also cites a third study (of lower confidence) in support of the RfC where female rats were exposed to TCE by administering the chemical in corn oil by gavage for a 104 week period (NTP 1988). The US EPA used PBPK modeling to convert the oral dose in animals to a HEC of TCE in air (US EPA 2013a). US EPA used the lower confidence limit of the benchmark dose response (BMDL05) to model (i.e., estimate) the air concentration that would yield a five percent response rate resulting in toxic nephropathy (kidney damage). The result of these transformations is an HEC99, BMDL05 of 30µg/m^3. The HEC99 is the human exposure concentration for which there is a 99% likelihood that a randomly selected individual will have an internal dose less than or equal to, in this case, the BMDL05. To summarize, the US EPA predicts that there is a 5% risk of kidney damage to individuals with long term exposure to TCE at 30 µg/m^3 (US EPA 2013a).

The TCE EPCs for four homes exceeded the LOAEL for fetal heart malformations and one home also had a TCE EPC level exceeding the LOAEL for adult kidney damage. The EPCs in these homes ranged from 21.1 µg/m^3 to 37.4 µg/m^3; therefore, there was a potential for fetal heart malformations to occur in the unborn children of pregnant women who may have resided in these four homes. For one of these homes, there was an additional risk for kidney damage in adults because the TCE EPC level was 37.4 µg/m^3 in this home. For seven residences, the EPCs were above the RfC but below the lowest LOAEL (for fetal heart malformations) and ranged from 2.9 µg/m^3 to 17.3 µg/m^3. Therefore, adverse non-cancer health effects were not likely to occur in people residing in these homes. Four homes had TCE EPCs below the RfC and therefore adverse non-cancer health effects are not expected. None of the homes sampled had TCE EPCs approaching the LOAEL of 190 µg/m^3 for immunological effects and therefore, this health effect was not likely to occur.

All four commercial properties sampled had TCE in the sub-slab soil gas and in the indoor air, indicating vapor intrusion was occurring in these buildings. For two commercial properties, the EPCs were below the RfC and therefore, adverse non-cancer health effects are unlikely. For the other two commercial properties, the EPCs slightly exceeded the RfC but were below the lowest LOAEL for fetal heart malformations and therefore, adverse non-cancer health effects are not likely to occur (**See Table 8**).

Cancer Health Effects

The site-specific lifetime excess cancer risk (LECR) estimates the cancer-causing potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population. For perspective, the lifetime risk of being diagnosed with cancer in the United States is 44 per 100 individuals for males, and 38 per 100 for females (ACS 2011). Typically, CVs developed for carcinogens are based on one excess cancer case per 1,000,000 individuals. The NJDOH considers estimated cancer risks of less than one additional cancer case among one million persons exposed as insignificant or no increased risk (expressed exponentially as 10^{-6}).

According to the United States Department of Health and Human Services (USDHHS), the cancer class of contaminants detected at a site is as follows:

1 = Known human carcinogen
2 = Reasonably anticipated to be a carcinogen
3 = Not classified

Exposure point concentrations for cancer health effects to indoor air contaminants were calculated using the following formula (US EPA 2009):

$$EPC_{cancer} = \frac{C \times ET \times EF \times ED}{AT}$$

where EPC = exposure point concentration of contaminant in air ($\mu g/m^3$);
C = 95% UCL or maximum concentration of contaminant in air ($\mu g/m^3$);
ET = exposure time (hours/day); EF = exposure frequency (days/year);
ED = exposure duration (years); and AT = averaging time (78 years).

LECRs were calculated using the following formula (US EPA 2009):

$$LECR = EPC_{cancer} \times IUR$$

where EPC_{cancer} = exposure point concentration of contaminant in air ($\mu g/m^3$); and
IUR = inhalation unit risk of contaminant in air $(\mu g/m^3)^{-1}$

The LECR for residents was calculated by multiplying the cancer exposure point concentration in indoor air by the inhalation unit risk (IUR). The IUR is defined by the US EPA as the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an

agent at a concentration of 1 µg/m^3 in air (US EPA 2008b). The inhalation CSF for carcinogens detected in indoor air was used to estimate the LECR to exposed individuals.

The following site-specific exposure assumptions (US EPA 2011) were used to calculate exposures doses to area residents and employees at commercial properties. For the exposure duration, 15 years was used because the homes and commercial properties were constructed on the site beginning in 1999.

Exposed Population	Hourly Exposure Assumptions	Daily Exposure Assumptions	Exposure Duration
Adult/Child Residents	24 hours/day	350 days per 365 days	15 years adults and children
Adult Employees	12 hours/day	260 days per 365 days	

Inhalation of COCs in Indoor Air

The risk of cancer for past exposures through the inhalation of indoor air contaminated with VOCs was evaluated for adults and children for properties identified from the January 2013 through March 2014 indoor air investigations.

Cancer Risk Attributed to Vapor Intrusion – Residences

Based on the EPC of VOC exposure concentrations in the indoor air which were likely attributable to a vapor intrusion source, two homes had LECR's of less than 1 in 1,000,000 individuals which is considered no expected increased risk above the background risk for cancer for adults and children. The range of LECRs for adults and children in 13 homes were estimated to be approximately 2 in 1,000,000 to 3 in 100,000 individuals. This is considered no apparent increased risk (**see Table 9**).

Cancer Risk Attributed to Vapor Intrusion - Commercial Properties

Based on the EPC of VOC exposure concentrations in indoor air which were likely due to vapor intrusion, the LECR for one commercial property was less than 1 in 1,000,000 individuals which is no expected increased risk. The LECR's for the remaining three commercial properties ranged from approximately 1 in 1,000,000 to 4 in 1,000,000 individuals which is no apparent increased risk (**See Table 10**).

Child Health Considerations

ATSDR recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination in their environment. Children are at greater risk than adults from certain kinds of exposures to hazardous substances because they eat and breathe more than adults. They also play outdoors and often bring food into contaminated areas.

Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Based on the sampling data, past inhalation exposures to TCE in indoor air posed an increased risk for fetal heart malformations to have occurred from maternal exposures to indoor air containing elevated levels of TCE in pregnant women living in 11 homes. This risk of this health effect to occur was higher for four of the homes where the LOAEL of 21 $\mu g/m^3$ was exceeded as opposed to the remaining seven homes which had a lesser risk as TCE levels were below the LOAEL but above the RfC. Exposures at these 11 residences have been interrupted with the installation of a sub slab systems beginning in January 2014.

It is important to note that the data collected for these residences represents one point in time and therefore, conditions within these homes may have changed over time and historical concentrations of TCE may have been higher or lower.

Conclusions

Following the review and assessment of environmental data associated with the vapor intrusion investigation, the NJDOH has reached the following conclusions regarding exposures to residents and workers occupying buildings on the Former Ronson Metals site:

1. *The NJDOH concludes that, based on the available data collected by the NJDEP between January 2013 and March 2014, there is a past completed exposure pathway for site-related contaminants to impact the indoor air of 15 homes and four commercial properties.* Indoor air and sub-slab soil gas data for 15 homes and four commercial properties indicate elevated levels of site-related contaminants. All fifteen homes and the four commercial properties have sub-slab systems to interrupt the pathway.

2. *The NJDOH concludes that, based on available data collected by the NJDEP between January 2013 and March 2014, past exposures to site-related contaminants at four homes may have harmed people's health.* Of the 15 homes impacted by vapor intrusion, there was an increased risk for fetal heart malformations to have occurred from past maternal exposures to indoor air contaminated with TCE for individuals residing at four homes. There was also an additional risk for kidney damage in adults residing in one of these homes. Current and future inhalation exposures to site-related contaminants at these residences have been interrupted with the installation of sub-slab systems.

3. *The NJDOH concludes that, based on available data collected by the NJDEP between January 2013 and March 2014, fifteen homes were not impacted by vapor intrusion at the time of sampling.* Seven homes, including one residential/commercial property did not have any site-related contaminants in indoor air or in the sub-slab soil gas. Eight homes have the potential to be impacted by vapor intrusion in the future due to the close proximity of these homes to those where soil gas data exceed screening levels. Three of these homes haves sub-slab systems installed and therefore, the potential for site-related

contaminants to impact these homes has been interrupted. The remaining five homes do not have systems installed and soil gas data indicate these homes may be impacted by vapor intrusion in the future.

4. *The NJDOH concludes that there is not enough data to evaluate whether residents are being exposed to soil contaminants on the residential properties constructed on the site.* There is insufficient data available for the NJDOH to evaluate the potential for residents, particularly children, to come into contact with contaminated soil which was capped on the property before homes were built. It is also not known whether the caps were compromised during the construction of the homes which may expose contaminated soil.

Recommendations

1. Properties where there is a potential for site-related contaminants to impact indoor air in the future should be considered for periodic indoor air monitoring or installation of a sub-slab system. The table in **Attachment 1** shows each home sampled and the potential for vapor intrusion.

2. The NJDEP should continue to monitor all sub-slab systems installed at the properties on the site to ensure these mitigation systems are effectively preventing vapor intrusion of site-related contaminants. The NJDEP should provide guidance on proper operation and maintenance for residences that are not eligible for state funding due to changes in ownership.

3. Soil on the residential properties is likely impacted with site-related contaminants (heavy metals, PAHs, PCBs, VOCs and mercury) and should be evaluated by the NJDEP to determine the appropriate remedial action to prevent residents, especially children, from coming into contact with contaminated soil.

4. Residents are encouraged to contact their primary health care physician to discuss health concerns regarding exposure to site-related contaminants. Additionally, residents are encouraged to follow the NJDEP's recommendations to get systems installed as necessary to reduce or prevent exposures.

Public Health Action Plan

The purpose of a Public Health Action Plan is to ensure that this Health Consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of the NJDOH to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by the NJDOH are as follows:

Public Health Actions Taken

1. The NJDOH reviewed information and relevant data provided by the NJDEP to evaluate the potential health implications for inhalation exposures in indoor air for residences and commercial properties located on the former Ronson Metals site.

2. The NJDOH attended a public meeting in January 2014 to address community concerns relating to possible health effects from exposures to site contaminants, particularly TCE, at the site.

Public Health Actions Planned

1. Copies of this health consultation will be provided to the ICC to distribute to concerned residents. This document will also be provided to the NJDEP and made available via the city libraries and the Internet. Additionally, residents who contact the NJDOH will be provided assistance in understanding the findings of this report.

2. The NJDOH will continue to review and evaluate data as it is made available.

3. For residents who have health concerns regarding past exposures to site-related contaminants, the NJDOH will provide, upon request, assistance with outreach between the resident's physician and trained experts who specialize in occupational and environmental related exposures to hazardous substances.

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REPORT PREPARATION

This Health Consultation for the Ronson Metals site, located in the city of Newark, within Essex County, New Jersey was prepared by the New Jersey Department of Health. This report was supported by funds from a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Department of Health and Human Services. This document has not been reviewed and cleared by ATSDR.

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Tables

Table 4: Compounds exceeding environmental CVs in Indoor Air – Residential Properties

Contaminant	Number of Samples	Range (µg/m^3)	Environmental CV (µg/m^3)	Number of Residences Above CV	VOCs Potentially Due to VI	VOCs likely due to Background Sources$^+$
Allyl Chloride	30	2	1 [(a)]	1	No	Yes
Benzene *	30	1-180	0.13 [(b)]	30	No	Yes
Bromodichloromethane	30	2-3	0.066 [(c)]	2	No	Yes
1,3-Butadiene	30	0.5-1	0.033 [(b)]	11	No	Yes
Carbon Tetrachloride	30	1-2	0.17 [(b)]	2	No	Yes
Chloroform**	30	1-92	0.043 [(b)]	18	No	Yes
1,2-Dichloroethane	30	0.9-4	0.038 [(b)]	5	No	Yes
1,3-Dichloropropene (trans)	30	0.9	0.25 [(b)]	2	No	Yes
Tetrachloroethylene (PCE)***	30	10-50	3.8 [(b)]	2	No	Yes
Trichloroethylene (TCE)	30	1-39	0.24 [(b)]	15	Yes	No
1,2,4-Trimethylbenzene ++	30	1-19	7 [(a)]	1	No	Yes

VI = Vapor Intrusion
CV = Comparison Value
µg/m^3= micrograms per cubic meter
+ = Unless otherwise noted, these contaminants were not detected in sub-slab samples collected beneath the properties and therefore can be attributed to consumer/background sources within the home and not due to vapor intrusion.
++ = 1,2,4-Trimethylbenzene was found in the sub-slab beneath one property and below the environmental CV in the indoor air of this same property. Therefore, for purposes of this health consultation, this contaminant is not considered to be site-related.
* = Maximum Benzene level of 180ug/m^3 was found in a vacant home; next highest level is 12ug/m^3 found in mixed use residential/commercial property
** =The presence of chloroform in indoor air may be due to volatilization from drinking water use within the home, and in sub-slab soil gas from water or wastewater pipes in the area.
*** = PCE was found in sub-slab below residential SGSL. Detections in indoor air at both properties are attributed to background sources.
a = US Environmental Protection Agency Reference Concentration
b = ATSDR Cancer Risk Evaluation Guide
c = US Environmental Protection Agency Regional Screening Level

Table 5: Compounds exceeding environmental CVs in Indoor Air – Commercial Properties

Contaminant	Number of Samples	Range (µg/m^3)	Environmental CV (µg/m3)	Number of Properties Above CV	VOCs Potentially Due to VI	VOCs likely due to Background Sources [(c)]
Benzene	10	0.8-6	0.13 [(a)]	4	No	Yes
Trichloroethylene (TCE)	10	3-13	0.24 [(a)]	4	Yes	No
1,2,4-Trimethylbenzene ++	10	2-19	7 [(b)]	1	No	Yes

VI = Vapor Intrusion
µg/m^3= micrograms per cubic meter
a = ATSDR Cancer Risk Evaluation Guide
b = US Environmental Protection Agency Reference Concentration
c = contaminants were not detected in sub-slab samples collected beneath the properties and therefore can be attributed to consumer/background sources within the building and not due to vapor intrusion.
++ = 1,2,4-Trimethylbenzene was found in the sub-slab in one sample beneath one commercial property and below the environmental CV in the indoor air of this same property. Therefore, for purposes of this health consultation, this contaminant is not considered to be site-related.

Table 6: Evaluated Exposure Pathways

Pathway	Pathway Elements				Pathway Classification
	Environmental Medium	Exposure Route	Location	Exposed Population	
Vapor Intrusion from soil and groundwater	Indoor Air	Inhalation	15 Homes	Adults/Children	Past - completed; Current and Future - interrupted [(a)]
			4 Commercial properties	Adults(Employees)	
Vapor Intrusion from soil and groundwater	Indoor Air	Inhalation	5 Homes	Adults/Children	Past, Current and Future - potentially completed [(b)]
Vapor Intrusion from soil and groundwater	Indoor Air	Inhalation	3 Homes	Adults/Children	Past - potentially completed; Current and Future - interrupted [(c)]
Incidental Ingestion of surface soil	Soil	Ingestion	All residences on the site	Adults/Children	Past, Current, and Future - potentially completed [(d)]

(a) Sub-slab vapor mitigation systems have been installed to prevent subsurface vapors from entering the building

(b) Contaminants of concern were detected in sub-slab but not in indoor air and therefore, future impact to indoor air may occur

(c) The potential for current and future vapor intrusion is interrupted by the installation of a sub-slab vapor mitigation system

(d) Site related contaminants including metals, PAHs and PCBs are present in soil on the site. It is not known whether the caps covering the contaminated soil were compromised during construction of the homes which may expose residents, particularly children, to contaminated soil.

Table 7: Exposure Point Concentrations – Non-Cancer Health Effects – Residential Properties Impacted by Vapor Intrusion

Residence	Contaminant of Concern	Exposure Point Concentration (µg/m^3) (a) (b)	Health Based Comparison Value (µg/m^3) (c) (d)	Exceedance of Health Based Comparison Value
1	TCE	8.63	TCE = 2 (d)	**Yes**
2	TCE	3.84		**Yes**
3	TCE	21.10		**Yes**
4	TCE	37.40		**Yes**
5	TCE	25.89		**Yes**
6	TCE	13.42		**Yes**
12	TCE	22.05		**Yes**
13	TCE	0.96		No
14	TCE	6.71		**Yes**
15	TCE	3.84		**Yes**
16	TCE	1.92		No
17	TCE	2.88		**Yes**
18	TCE	17.26		**Yes**
26	TCE	0.96		No
29	TCE	1.92		No

(a) micrograms/cubic meter

(b) exposure point concentration derived based on maximum concentrations for less than four results or derived using Pro UCL version 5.0.00 (EPA 2013) with four or more results

(c) RfC = USEPA Reference Concentration

(d) MRL = ATSDR Chronic Minimal Risk Level (exposure greater than 364 days/year)

Table 8: Exposure Point Concentrations – Non Cancer Health Effects – Commercial Properties

Commercial Properties	Contaminant of Concern	Exposure Point Concentration ($\mu g/m^3$) [(a) (b)]	Health Based Comparison Value ($\mu g/m^3$) [(c) (d)]	Exceedance of Health Based Comparison Value
1	TCE	2.12	TCE = 2 [(c,d)]	**Yes**
2	TCE	4.63		**Yes**
3	TCE	1.07		No
4	TCE	1.78		No

(a) = micrograms/cubic meter

(b) = exposure point concentration derived based on maximum concentrations for less than four results or derived using Pro UCL version 5.0.00 (EPA 2013) with four or more results

(c) RfC = USEPA Reference Concentration

(d) MRL = ATSDR Chronic Minimal Risk Level (exposure greater than 364 days/year)

Table 9: Lifetime Excess Cancer Risk – Residential Properties Impacted by Vapor Intrusion

Residence	Contaminant of Concern	Exposure Point Concentration ($\mu g/m^3$) [(a),(b)]	USEPA IUR [(c)] ($\mu g/m^3$)$^{-1}$	LECR [(d)]
1	TCE	1.6596	TCE = 4.10E-06	7.78E-06
2	TCE	0.7376		3.46E-06
3	TCE	4.0569		1.90E-05
4	TCE	7.1918		3.37E-05
5	TCE	4.9789		2.33E-05
6	TCE	2.5817		1.21E-05
12	TCE	4.2413		1.99E-05
13	TCE	0.1844		8.65E-07
14	TCE	1.2908		6.05E-06
15	TCE	0.7376		3.46E-06
16	TCE	0.3688		1.73E-06
17	TCE	0.5532		2.59E-06
18	TCE	3.3193		1.56E-05
26	TCE	0.1844		8.65E-07
29	TCE	0.3688		1.73E-06

(a) Micrograms/cubic meter

(b) Exposure point concentration derived based on maximum concentrations for less than four results or derived using Pro UCL version 5.0.00 (EPA 2013) with four or more results

(c) IUR = USEPA Inhalation Unit Risk

(d) Lifetime Excess Cancer Risk for adults and children based on exposure frequency of 350 days/year for 15 year length of residency over 78 year lifetime

Table 10: Lifetime Excess Cancer Risk– Commercial Properties

Commercial Properties	Contaminant of Concern	Exposure Point Concentration ($\mu g/m^3$) [(a),(b)]	USEPA IUR [(c)] $(\mu g/m^3)^{-1}$	LECR [(d)]	LECR Sum from Vapor Intrusion
1	TCE	0.408	TCE = 4.10E-06	1.67E-06	1.67E-06
2	TCE	0.890		3.65E-06	3.65E-06
3	TCE	0.205		8.42E-07	8.42E-07
4	TCE	0.342		1.40E-06	1.40E-06

(a) Micrograms/cubic meter

(b) Exposure point concentration derived based on maximum concentrations for less than four results or derived using Pro UCL version 5.0.00 (EPA 2013) with four or more results

(c) USEPA Inhalation Unit Risk

(d) LECR = Lifetime Excess Cancer Risk based on worker exposure scenario – 260 days/year for 15 year exposure duration over 78 year lifetime

Figures

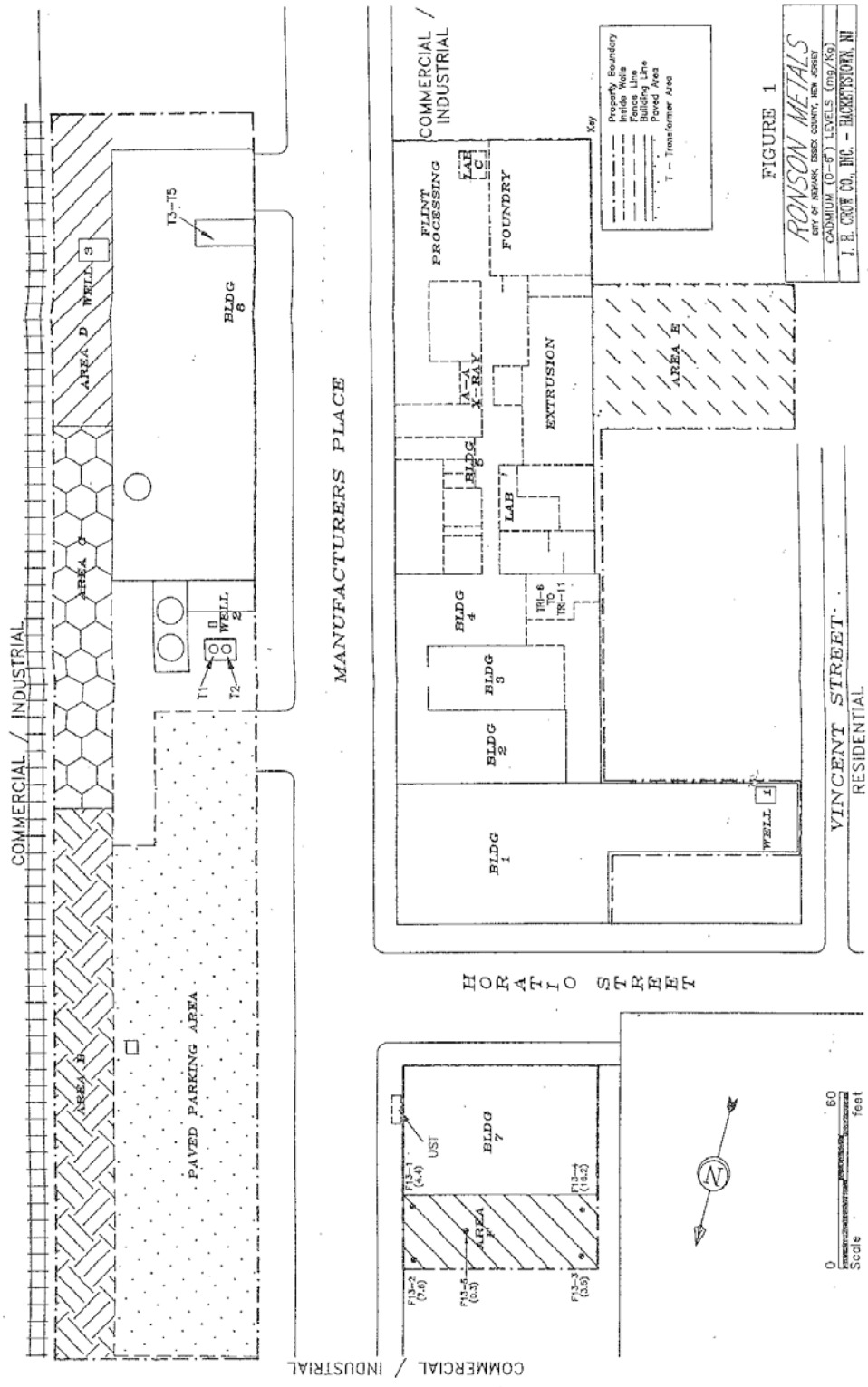
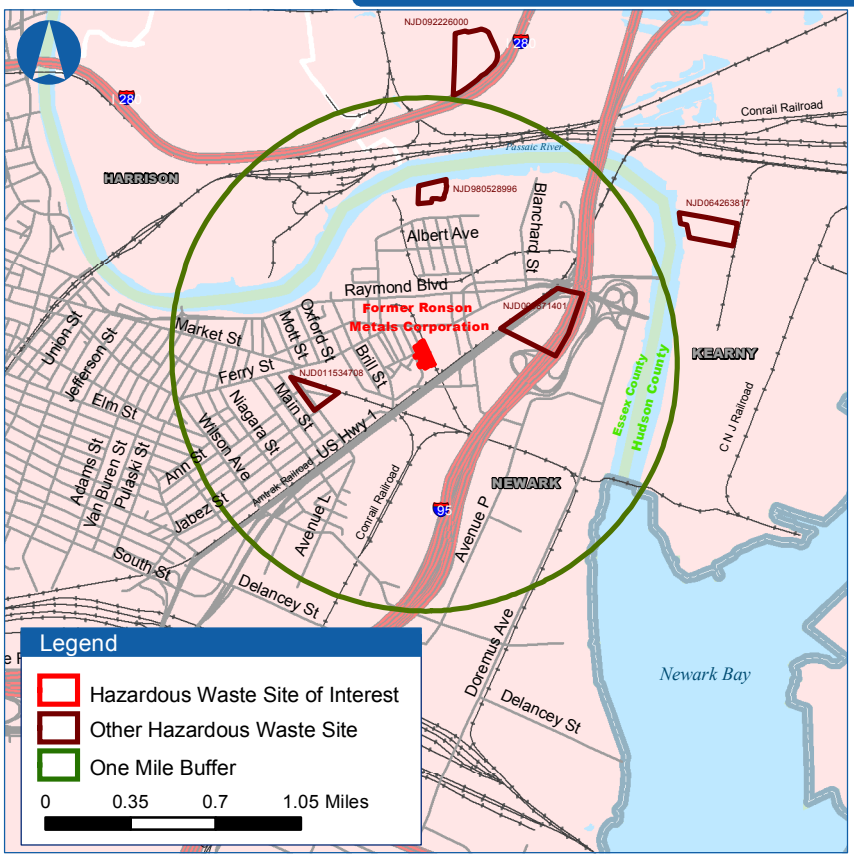


Figure 2 – Former Ronson Metals Site Map

EPA Facility ID :
UNAVAILABLE

FORMER RONSON METALS CORPORATION
NEWARK, ESSEX COUNTY , NJ



Base Map Source: Geographic Data Technology, May 2005.
Site Boundary Data Source: ATSDR Geospatial Research, Analysis, and Services Program, Current as of Generate Date (bottom left-hand corner).
Coordinate System (All Panels) : NAD_1983_StatePlane_New_Jersey_FIPS_2900_Feet

Site Location : Essex County , NJ

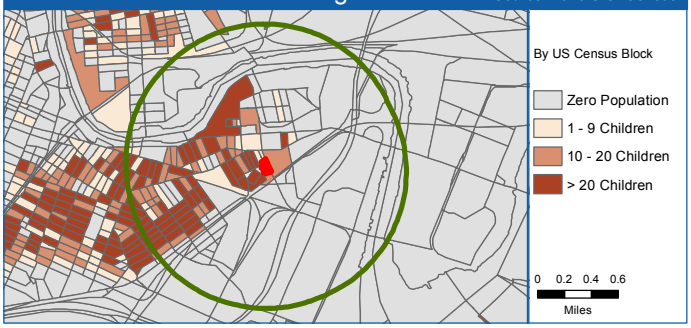
Demographic Statistics
Within One Mile of Site*

Total Population	20,593
White Alone	12,164
Black Alone	3,119
Am. Indian & Alaska Native Alone	72
Asian Alone	140
Native Hawaiian & Other Pacific Islander Alone	1
Some Other Race Alone	3,723
Two or More Races	1,374
Hispanic or Latino**	7,821
Children Aged 6 and Younger	1,917
Adults Aged 65 and Older	1,338
Females Aged 15 to 44	4,481
Total Housing Units	7,119

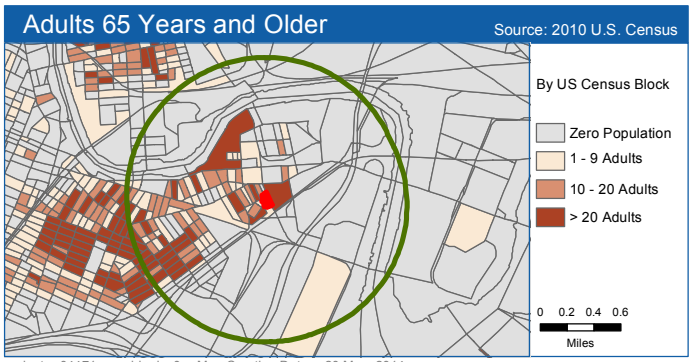
Demographics Statistics Source: 2010 U.S. Census
* Calculated using an area-proportion spatial analysis technique
** People who identify their origin as Hispanic or Latino may be of any race.

Population Density
Source: 2010 U.S. Census

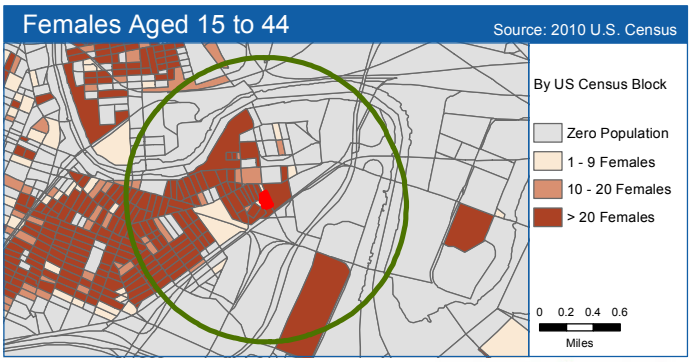
Children 6 Years and Younger
Source: 2010 U.S. Census



Adults 65 Years and Older
Source: 2010 U.S. Census



Females Aged 15 to 44
Source: 2010 U.S. Census



project = 04471 , userid = jxa0 , Map Creation Date = 20 May, 2014

GRASP

CDC ATSDR
Centers for Disease Control and Prevention
Agency for Toxic Substances and Disease Registry
Geospatial Research, Analysis & Services Program

Figure 3 - Demographic Map for the Former Ronson Metals Corporation Site

Appendices

Appendix A: Uses and Sources of Typical Contaminants Detected in Residential Vapor Intrusion Investigations

Chemical	Usage	Sources of Common Exposure
Allyl Chloride	Derivatives are found in varnish, plastics, adhesives, perfumes, pharmaceuticals, and insecticides	See Usage.
Benzene	Solvents, gasoline, resins and plastics; nylon; paints; adhesives (especially carpet); printing; pesticides; detergents/disinfectants; dyes; photographic processing	Gasoline emissions; cigarette smoke; paints and adhesives; particle board and wood composites; wood smoke
Bromodichloromethane	Used in laboratories to make other chemicals	Formed when chlorine is added to drinking water to kill bacteria
1,3-Butadiene	Intermediate (potential impurity) in many plastics and polymers; fungicides; latex paint; acrylics; fuel formulations	Vehicle emissions; tobacco smoke; wood fires; waste incinerators; electric wire coatings; thermal degradation of plastics
Carbon Tetrachloride	Formerly used in refrigerants, propellants for aerosol cans, solvent for oils, fats, lacquers, varnishes, rubber waxes, and resins, and as a grain fumigant and dry cleaning agent. Consumer and fumigant uses have been discontinued and only industrial uses remain	Cleaning agents
Chloroform	Refrigerant manufacturing; raw material for polytetrafluoroethylene plastics; insecticidal fumigant; solvent; cleansing agent in fire extinguishers; by-product in chlorination of potable water; former use in cough syrup, toothpastes, and toothache compounds..	Bathroom showers using chlorinated water; see Usage.
1,2 Dichloroethane	Manufacture of vinyl chloride; formerly used in varnish, paints, finish removers, adhesives, soaps, degreasing agent	Fugitive emissions from industries, treatment plants, hazardous waste sites; landfills; occupational settings; ambient air
1,2 Dichloroethene (cis)	Solvent for waxes and resins; in the extraction of rubber; as a refrigerant; in the manufacture of pharmaceuticals and artificial pearls; in the extraction of oils and fats from fish and meat; and in making other organics.	Commonly found in urban ambient (outside) air
1,3 Dichloropropene (trans)	Agricultural soil fumigant	Occupational exposures
4-Ethyltoluene	Solvent; kerosene and light vapor oil	See Usage.

Chemical	Usage	Sources of Common Exposure
n-Heptane	Industrial solvent; petroleum refining	Gasoline emissions
Tetrachloroethylene (PCE)	Solvent; degreaser; dry cleaning and textile production; water repellants; pharmaceuticals; pesticides; refrigerants; insulating fluids; correction fluid (e.g., white out) and inks; adhesives	Dry cleaned garments; paint removers; fabric cleaning products (e.g., stain removers, etc.); lubricants; wood products
Trichloroethylene (TCE)	Solvent; degreaser; dry cleaning and textile production; adhesives, paint removers; correction fluid (e.g., white out) and spot removers	Present main use as a metal degreaser; dry cleaned garments; paint removers; fabric cleaning products (e.g., stain removers, etc.)
1,2,4- Trimethylbenzene	Dyes, fragrances, and plastics; solvent and paint thinner; sterilizing agent; degreaser; gasoline additive; synthetic wood products.	Self-serve gasoline fill-ups; indoor painting or printing
1,3,5- Trimethylbenzene	Building materials; Dyes; UV inhibitor in plastics; solvent and paint thinner; gasoline additive.	Self-serve gasoline fill-ups; indoor painting or printing; new or remodel construction.
2,2,4 Trimethylpentane	Used to determine octane numbers of fuels; solvent; thinner	Automotive exhaust

References:

National Library of Medicine's (NLM) Hazardous Substances Data Bank (HSDB)
ATSDR Toxicological Profile at www.atsdr.cdc.gov
EPA Hazard Summary 2000, at http://www.epa.gov/ttn/atw/hlthef/acetalde.html ; http://www.epa.gov/ttn/atw/hlthef/allylchl.html ; http://www.epa.gov/ttn/atw/hlthef/carbonte.html ; http://www.epa.gov/ttn/atw/hlthef/dichl-pe.html ; http://www.epa.gov/ttn/atw/hlthef/tri-zene.html ; http://www.epa.gov/ttn/atw/hlthef/tri-pent.html

Appendix B

Toxicological Summaries

The toxicological summary provided in this appendix is based on ATSDR's ToxFAQs (http://www.atsdr.cdc.gov/toxfaq.html). Health effects are summarized in this section for the chemicals of concern found in indoor air of the residential and commercial buildings believed to be due to vapor intrusion. The health effects described in this section are typically known to occur at levels of exposure much higher than those that occur from environmental contamination. The chance that a health effect will occur is dependent on the amount, frequency and duration of exposure, and the individual susceptibility of exposed persons.

Trichloroethylene (TCE). TCE is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. TCE dissolves a little in water, and can remain in groundwater for a long time. It quickly evaporates from water, so it is commonly found as a vapor in the air. People can be exposed to TCE by breathing air in and around the home which has been contaminated with TCE vapors from shower water or household products, or by drinking, swimming, or showering in water that has been contaminated with TCE. Breathing small amounts of TCE may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating. Breathing large amounts of TCE may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage. Drinking large amounts of TCE may cause nausea, liver damage, unconsciousness, impaired heart function, or death. Drinking small amounts of TCE for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear. Skin contact with TCE for short periods may cause skin rashes.

Some studies with mice and rats have suggested that high levels of TCE may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of TCE in drinking water or in workplace air have found evidence of increased cancer. The National Toxicology Program has determined that TCE is "reasonably anticipated to be a human carcinogen," and the International Agency for Research on Cancer (IARC) has determined that trichloroethylene is "probably carcinogenic to humans."

Attachment 1 - Summary of Homes and Potential for Vapor Intrusion (VI)

House ID Number in Health Consultation Document	No VI	Past VI	Current VI	Potential VI	System Installed
1		X			Yes
2		X			Yes
3		X			Yes
4		X			Yes
5		X			Yes
6		X			Yes
7	X				No
8	X				No
9				X	Yes
10 *				X	No
11 *				X	No
12		X			Yes
13		X			Yes
14		X			Yes
15		X			Yes
16		X			Yes
17		X			Yes
18		X			Yes
19	X				No
20 *				X	No
21 *				X	No
22 *				X	No
23	X				No
24	X				No
25	X				No
26		X			Yes
27				X	Yes
28	X				No
29		X			Yes
30				X	Yes

* = DOH recommends sub-slab system or indoor air monitoring due to presence of TCE in sub-slab