Health Consultation

Public Health Implications of Site-Related Indoor Air Exposures

CORNELL-DUBILIER ELECTRONICS SITE

SOUTH PLAINFIELD (MIDDLESEX COUNTY), NEW JERSEY

EPA FACILITY ID: NJD981557879

Prepared by the
New Jersey Department of Health and Senior Services

FEBRUARY 15, 2012

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

Health Consultation: A Note of Explanation

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

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

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Summary

Introduction

The New Jersey Department of Health and Senior Services (NJDHSS) and the Agency for Toxic Substances and Disease Registry (ATSDR) have reviewed environmental data to evaluate the public health implications of tetrachloroethylene (PCE) contamination in indoor air for residences investigated as part of the Cornell Dubilier Electronics, Inc. (CDE) Superfund site located in South Plainfield in Middlesex County. Vapor intrusion investigations were conducted from May 2007 through May 2010 by the United States Environmental Protection Agency (US EPA).

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

Conclusions

NJDHSS and ATSDR conclude that, based on the US EPA vapor intrusion data from May 2007 through May 2010, past, current and future exposures to PCE in indoor air are not expected to harm people's health.

Basis for Conclusion

Regarding residential Unit 10, completed exposures to children and adults to PCE in indoor air are not expected to cause adverse non-cancer health effects as contaminant concentrations remain below health-based comparison values. The lifetime excess cancer risk is considered a no apparent increase in risk when compared to the background risk of cancer. It is noted, however, that investigation data for residential Unit 10 is very limited where additional investigation should be conducted to confirm PCE levels in indoor air do not pose a risk to occupants.

Next Steps

Based on soil gas results below residential Unit 10, it is apparent a vapor intrusion source exists; however, it is not clear whether this source is related to the CDE site or a suspected secondary source. Therefore, further investigation is recommended, by either the US EPA or request to the New Jersey Department of Environmental Protection, to determine whether another PCE source is present in the immediate area. Additionally, based on PCE concentrations in soil gas, a short-term solution, such as a venting system, should be considered to reduce the threat of vapor intrusion at this residence.

The US EPA should continue remedial actions for the OU1 through OU4 study areas to eliminate remaining exposure pathways and provide a permanent solution to prevent exposures to site related contaminants. This includes continuing remedial investigations for vapor intrusion sources and to evaluate feasibility studies within the Operational Unit 3 study area to implement necessary actions to

address contaminated groundwater and to eliminate any potential vapor intrusion exposure pathways to residents.

For More Information

Copies of this health consultation will be provided to concerned residents in the vicinity of the site via the township libraries and the Internet. NJDHSS will notify area residents that this report is available for their review and provide a copy upon request. Questions about this health consultation should be directed to the NJDHSS at (609) 826- 4984.

Statement of Issues

In June 2011, the federal Agency for Toxic Substances and Disease Registry (ATSDR) requested assistance from the New Jersey Department of Health and Senior Services (NJDHSS) in the interpretation and public health evaluation of site-related contamination detected during vapor intrusion investigations being conducted by the United States Environmental Protection Agency (US EPA) for the residential area near the Cornell Dubilier Electronics, Incorporated (CDE) site. The site is located in South Plainfield, Middlesex County. This request was made as part of several health risk assessments conducted for the CDE site by the ATSDR and the NJDHSS initiated in 1996. Through a cooperative agreement with the ATSDR, the NJDHSS reviewed environmental data and prepared this health consultation to determine the public health implications concerning exposures to contaminants associated with this site. This includes obtaining the most recent data related to the ongoing vapor intrusion investigation being conducted for the site from May 2007 through May 2010.

Background and Site History

The CDE site is located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey (see inset). It consists of approximately 25 acres in an industrial/residential area. The site is bordered by residences and commercial businesses from the south to the north. An unnamed tributary of the Bound Brook borders the property on the southeast. The Bound Brook and the unnamed tributary converge approximately 800 meters downstream of the site. Bound Brook then flows west for approximately 3,000 meters and enters New Market Pond. Conrail railroad tracks crisscross the unnamed tributary just north of the site. Other industries are scattered to the northeast and east of the site, on the side opposite the Conrail tracks.

Figure 1: Location of Cornell Dubilier Electronics Site

From 1936 to 1962, CDE manufactured electronic parts and components, including capacitors. CDE tested transformer oils, and it is alleged that the company dumped materials contaminated with polychlorinated biphenyls (PCBs) and other hazardous substances directly onto the soil at the site. The site is currently known as Hamilton Industrial Park. Numerous companies have rented locations at the site and operated businesses there over the years. The CDE site is currently undergoing extensive soil remediation under the direction of the United States Environmental Protection Agency (US EPA).

Investigations conducted by the New Jersey Department of Environmental Protection (NJDEP) prior to 1991 indicated extensive groundwater contamination consisting mainly of two

volatile organic compounds, tetrachloroethylene (PCE) and trichloroethylene (TCE). The findings of these investigations led to the closure of private wells and the provision of municipal water to residences in the impacted area.

During the early 1990s, the US EPA led several investigations of soil, surface water, and sediments at the site and surrounding area. The results of the sample analyses indicated that concentrations of PCBs and TCE in on-site soils were significantly above background levels (background levels are levels typical of naturally occurring concentrations or of concentrations found in uncontaminated areas).

The US EPA conducted additional soil and sediment sampling in February 1996. PCBs, alpha-chlordane, and TCE were detected in the soil samples, and PCBs were detected in sediment samples, at levels significantly above background levels. PCBs were also detected in the sediment of the unnamed tributary of the Bound Brook. PCB contamination of more than one-tenth of a mile of wetland frontage of the tributary was documented. As part of this investigation, samples of sediment and fish were collected from the Bound Brook and New Market Pond. Fish collected from the Bound Brook were found to contain PCBs at levels higher than the U.S. Food and Drug Administration (FDA) tolerance level of 2.0 parts per million (ppm). In response to the level of PCBs detected in the fish, on August 8, 1997, the NJDEP, the NJDHSS and the New Jersey Department of Agriculture (NJDOA), in coordination with the USEPA, issued an interim fish consumption advisory for the entire length of the Bound Brook, Middlesex County. In August 1997, ATSDR provided a short fact sheet for use by the local health department describing the reasons for the advisory. In August 1998, the NJDEP, the NJDHSS and NJDA, in coordination with the USEPA, issued the final fish consumption advisory for the entire length of the Bound Brook including Spring Lake.

Remedial and Cleanup Actions

Due to the extensive on-site contamination and migration of contaminants, the US EPA issued a Superfund order to the property owners (CDE) in March 1997, to conduct the following clean-up actions: 1) restrict access to areas known to be contaminated with PCBs; 2) take necessary actions to limit the movement of contaminants to Bound Brook through surface water runoff; and 3) pave driveways and parking areas within the industrial park. These actions were completed in the fall of 1997.

In October 1997, the US EPA investigated several properties along Spicer Avenue and Delmore Avenue near the CDE site. Soil and indoor dust samples indicated low level PCB contamination at some of the properties. As a result, in March through April 1998, the US EPA performed remedial and removal actions to clean properties where PCBs were found indoors at levels of concern. Contaminated soil at 14 properties was addressed through removal actions completed through a series of Administrative Orders beginning in 1998. The final cleanup was completed by the US EPA in 2004 as the property owners failed to address all residential properties.

In April 2000, the US EPA initiated the Remedial Investigation/Feasibility Study (RI/FS) for the site. To expedite cleanup measures, the US EPA divided the study into Operable Units OU1 through OU4. OU1 addresses offsite soil contamination at residential, municipal, and commercial properties in the vicinity of the CDE site. Remedial actions for OU1 have been partially completed. OU2 addresses on-site contaminated soils and facility buildings within the industrial park. Dismantling of 18 on-site buildings was initiated in September 2007 and completed by May 2008. Excavation of the "capacitor disposal area," an area identified as the most highly contaminated portion of the CDE site, was completed by June 2008. Contaminated soils are being treated on site by low temperature thermal desorption which began in November 2009. Removal of on-site contaminated soils is currently in progress with a tentative completion by the end of 2011.

The RI/FS for OU3 and OU4 are currently ongoing and address contaminated groundwater and contaminated sediments within the Bound Brook, respectively. A vapor intrusion investigation for the surrounding residential area was initiated in 2007 as part of OU3 activities and is the focus of this health consultation report.

Community Health Concerns

Based on information obtained from the South Plainfield Health Department and the US EPA, health concerns expressed by the community are related to the health implications from inhalation of contaminants occurring from vapor intrusion associated with the CDE site. These concerns have been addressed within this document through the review and health risk evaluation based on vapor intrusion data collected by the US EPA during their investigations of the residential area for the period of May 2007 through May 2010.

Demographics

Using 2000 U.S. Census data, it is estimated that 11,619 individuals reside within a one-mile radius of the CDE site (see Figure 2).

Past ATSDR/NJDHSS Involvement

From 1996 to 2000, ATSDR consulted frequently with US EPA regarding on- and off-site PCB contamination in soil, indoor dust and stream sediments, with several public health recommendations made for further investigation including sampling of residential homes near the site. As follow-up to these recommendations, ATSDR and NJDHSS completed a health consultation report in May 1998 in addressing resident exposures to PCBs in indoor dust and surface soils for 16 residential locations of interest. A second health consultation report was issued in December 1998 addressing US EPA remedial actions and exposures to PCBs in indoor dust and surface soils for 44 residential locations of interest. Both health consultations cited health concerns regarding exposures to PCBs in residential soil and indoor surface dust with recommendations focused on additional sampling and continued remediation for properties still posing a potential risk for exposures.

In addition, the ATSDR and NJDHSS completed a public health assessment report in September 2000 indicating the CDE site posed a public health hazard to area residents because site-related contaminants were migrating to off-site properties and local waterways, specifically the Bound Brook and New Market Pond. Supportive findings include PCBs in fish collected in surface water near the site that exceed FDA tolerance levels for PCBs; elevated levels of PCBs were detected in indoor dust and the surface soils at residential properties that may pose a health concern or potential health concern to the residents; and, workers and trespassers (adults and children) are likely exposed to PCBs at the site at levels of public health concern.

Site Visit

For this health consultation, representatives from the US EPA, ATSDR and NJDHSS conducted a site visit on July 13, 2011. The following observations were made during the visit.

The CDE site has been undergoing active remediation of on-site contaminated soils (primarily PCBs) since the beginning of 2011. Approximately 120,000 tons of contaminated soils have been remediated on-site through the use of a thermal desorption unit then used as backfill on the site. Soils remaining at the site and exceeding 500 ppm for PCBs are being removed from the site and disposed at US EPA approved treatment facilities. It is estimated that approximately 30,000 to 50,000 tons of contaminated soil remains to be addressed through US EPA remedial activities as of July 2011. Remedial activities to address remaining on-site contaminated soil are planned to be completed by the end of 2011. The CDE site is surrounded by security fencing to prevent unauthorized access onto the property.

Soil remediation on the majority of the western and southern portions of the site has been completed and is covered with asphalt. The remaining soil remediation was occurring on the northern and eastern portions of the site during the July 2011 site visit. A storm water detention basin is being constructed on the southeastern portion of the site to collect surface water runoff and will be operational once soil remediation is completed and the entire site is covered with an asphalt cap. Currently all surface water runoff is being managed by the US EPA to prevent site contamination from migrating off-site.

The area surrounding the site includes residential and commercial properties generally to the west, southwest and south of the site. An unnamed tributary to the Bound Brook runs roughly east to west near the northern property boundary of the CDE site. The confluence of the unnamed creek and the Bound Brook is approximately 800 meters downstream of the site. The Bound Brook then flows west for approximately 3,000 meters and enters New Market Pond. There is a heavily vegetated area immediately to the east of the site. Access to this area would be difficult due to the security fence and the degree to which the area is overgrown.

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 media-specific health-based guideline comparison values (CVs). If

concentrations exceed the CV, these substances, referred to as Contaminants of Concern (COC), are selected for further evaluation. Contaminant levels above 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.

Health-Based Guideline Comparison

There are a number of CVs available for the 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 during their lifetime (70 years). In the absence of an ATSDR CV, other comparison values may be used to evaluate contaminant levels in environmental media. These include the US EPA Region 6 Human Health Media-Specific Screening Levels (SLs) and the NJDEP Soil Gas Screening Values (SGSV) for vapor intrusion sources. 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 CVs are identified as COCs and evaluated further to determine whether these contaminants pose a health threat to exposed or potentially exposed receptor populations. If CVs are unavailable, these contaminants are selected for further evaluation.

Vapor Intrusion Investigation

Based on the extent of PCE and TCE contamination in groundwater, a vapor intrusion investigation was initiated for several residential homes in the immediate vicinity of the CDE site. In May 2007, the US EPA installed sub-slab soil gas extraction points at 24 residences to the southwest, west and northwest of the site. An additional residence added to the investigation with a sub-slab soil gas well installed in March 2008. In addition, ambient air samples were also collected in each of the 25 residence locations.

Soil gas data was used to identify locations for further evaluation of vapor intrusion. Site-related contaminants detected in soil gas and indoor air for the investigated properties has been evaluated for the sampling periods of May 2007 and March 2008 through April 2008.

Sub-slab/Soil Gas

Based on the extent and concentration of contaminants within the groundwater plume, the US EPA identified 25 residences (Units 1 through 25), including one daycare center, for soil gas evaluation. Soil gas samples were analyzed for targeted VOCs including 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene, trans-1,2-dichloroethene, PCE, TCE and vinyl chloride. Analysis was performed using US EPA Method TO-15 for samples collected during the May 2007 and March through April 2008 investigation period.

Only PCE was detected at one residence (Unit 10: range 89 to 200 $\mu g/m^3$) exceeding the New Jersey Department of Environmental Protection's Soil Gas Screening Level (SGSL) of 34 $\mu g/m^3$. TCE and 1,1,-DCE were not detected above their respective SGSLs of 27 $\mu g/m^3$ and 11,000 $\mu g/m^3$. The range of contaminants detected in soil gas at sampled residences included PCE from non-detect to 200 $\mu g/m^3$, TCE from non-detect to 3.9 $\mu g/m^3$ and 1,1-DCE from non-detect to 2.91 $\mu g/m^3$. Cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride were not detected in any of the samples analyzed. A summary of sampled locations and COCs detected in sub-slab/soil gas samples are presented in Table 1.

Indoor Air

Based on investigation results and residential locations relative to the CDE site, the US EPA selected two residences (Units 10 and 17) for further investigation of indoor air. Air samples were collected over a 24-hour period using SUMMA® canisters and analyzed for the same targeted VOCs as the sub-slab/soil gas samples. Analysis was performed using US EPA Method TO-15 for samples collected during the March 2008 through May 2010 investigation period.

PCE (range non-detect to 32 $\mu g/m^3$) was the only COC detected in indoor air exceeding its respective environmental CVs (see Table 2a). Ambient (outdoor air) PCE concentrations were within typical background concentrations observed for suburban areas (see Table 2b and Appendix A). PCE was detected in Unit 10 in the basement and first floor at 3.1 and 2.7 $\mu g/m^3$, respectively. PCE was detected in Unit 17 in the basement (range non-detect to 32 $\mu g/m^3$) and first floor (range non-detect to 6.7 $\mu g/m^3$). A summary of PCE concentrations detected in Units 10 and 17 are presented in Table 3.

For Unit 17, it is noted that the initial sampling event conducted in April 2008 indicated PCE was not detected in both the basement and first floor living space. The second sampling event conducted in May 2010 indicated PCE concentrations in indoor air ranging from 32 $\mu g/m^3$ (basement) to 6.7 $\mu g/m^3$ (first floor). However, soil gas samples collected from below this residence did not indicate a significant source of PCE (range non-detect to 2.2 $\mu g/m^3$) was present. US EPA personnel have noted this property owner is storing various products and debris on the premises and have been unsuccessful in re-sampling indoor air and soil gas at this residence due to the reluctance of the property owner. Therefore, as the current US EPA data does not indicate a significant source of PCE is present in soil gas below this residence, it is concluded that PCE concentrations in indoor air are likely present due to property owner sources.

As such, US EPA observations and data support that there is not an indoor inhalation exposure pathway related to the CDE site present at this residence.

Based on the review of data described above, PCE related to the CDE site is considered a COC in indoor air for the residential Unit 10 location.

Summary of Contaminants of Concern for Evaluated Locations

Indoor Air	
Residence	**VOCs**
Unit 10	PCE

Toxicological summaries for identified COCs are provided in Appendix B.

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.

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 1992). However,

due to the limited sample size, a 95% UCL cannot be accurately determined. Therefore, the maximum concentration detected was used for assessment purposes.

The exposed populations for identified areas of concern include children and adults associated with the two residences where PCE was detected in indoor air. The evaluated exposure pathways for site-related contaminants are presented in Table 4.

Completed Exposure Pathways

Inhalation of COCs in Indoor Air (past, present, future). There is a past, present and future exposure pathway via vapor intrusion regarding the inhalation of air contaminated with PCE for residence Unit 10 evaluated by the US EPA. The completed exposure pathway involves these contaminant vapors migrating upwards through contaminated subsurface media, groundwater and soil, and entering the interior of this residence.

Distinct observations have been noted for the detections present at Unit 10. It is noted that PCE concentrations in soil gas were significantly elevated compared to the remainder of the 24 sample locations. Upon further review of site information obtained from the US EPA, this residence is located immediately adjacent to and hydraulically downgradient from an adjacent dry cleaning operation which the US EPA has identified as a potential contributor to the source of PCE groundwater contamination associated with the CDE site. Therefore, PCE detections in both indoor air and soil gas at this residence may originate from operations and/or environmental impacts occurring from this dry cleaning business; however, this assumption requires additional investigation by the US EPA to determine if this business is a possible source.

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 toxicologic literature and often include uncertainty or safety factors to ensure that they are amply protective of human 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 (or safety) factors or through the use of statistical models. In toxicological literature, observed effect levels 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. In order to provide additional perspective on these health effects, the calculated exposure doses were then compared to observed effect levels (e.g., NOAEL, 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.

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

$$EPC = \frac{C \, x \, ET \, x \, EF \, x \, ED}{AT}$$

where EPC = exposure point concentration of contaminant in air ($\mu g/m^3$);
C = 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 (years).

Inhalation of COCs in Indoor Air via Vapor Intrusion

The calculated EPC of 1.33 $\mu g/m^3$ did not exceed the chronic MRL for PCE of 300 $\mu g/m^3$, for residential unit 10 (see Table 5). Based on the currently available data, as no chronic health-based comparison values were exceeded for PCE, adverse non-cancer health effects are not expected to occur for past and present exposures to PCE detected in indoor air to adults and children occupying this residence. Adverse non-cancer health effects are not expected to occur for future exposures to these contaminants in indoor air to these populations as the area is under active investigation and actions are being taken by the US EPA to remediate site contamination to reduce and/or prevent the threat of exposure. It is noted that this assessment is based on very limited sampling data; therefore, as further detailed, additional investigation should be conducted to verify PCE contaminant levels in indoor air do not pose a health risk to the occupants of this residence.

It is further noted, however, that residential Unit 10 is located adjacent to a potential secondary source (dry cleaning operation) of PCE groundwater contamination not related to the CDE site. Therefore, additional recommendations have been made within this document to ensure the threat of vapor intrusion from this potential secondary source is further investigated for this residence.

Cancer Health Effects

The theoretical site-specific lifetime excess cancer risk (LECR) indicates the cancer potential of contaminants. LECR estimates are usually expressed in terms of excess cancer cases in an exposed population in addition to the background rate of cancer. For perspective, the lifetime risk of being diagnosed with cancer in the United States is 46 per 100 individuals for males, and 38 per 100 for females; the lifetime risk of being diagnosed with any of several common types of cancer ranges between 1 in 10 and 1 in 100 (SEER 2005). Typically, health guideline CVs developed for carcinogens are based on one excess cancer case per 1,000,000 individuals. The NJDHSS 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

The NJDHSS uses the following cancer risk descriptions for health assessments:

Public Health Assessment/Health Consultation
Risk Description for New Jersey

LECR	Risk Description
$\geq 10^{-1}$	Increase
10^{-2} to $<10^{-1}$	
10^{-3} to $<10^{-2}$	
10^{-4} to $<10^{-3}$	Low increase
10^{-5} to $<10^{-4}$	No apparent increase
10^{-6} to $<10^{-5}$	
$< 10^{-6}$	No expected increase

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

$$LECR = EPC \times IUR$$

where EPC = 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 theoretical 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 $\mu g/m^3$ in air (US EPA 2008b).

The inhalation CSF for PCE was used to estimate the LECR to exposed individuals. Please refer to the *Completed Pathways* section of this report for specific discussions regarding the evaluated exposure at areas of concern.

Inhalation of COCs in Indoor Air via Vapor Intrusion

The risk of cancer for past exposures regarding the inhalation of indoor air contaminated with PCE was evaluated for adults and children occupying residential Unit 10 identified from the March 2008 through May 2010 indoor air investigations.

The LECR was estimated using EPCs in indoor air using data from the above indoor air investigation period. Site-specific assumptions and recommended exposure factors (US EPA 2002, 2009) were used to calculate the exposure point concentration based on the exposure period as described in Table 6.

Unit 10 (past, present, future). Based on the EPC of PCE exposure concentrations in the indoor air, LECRs were estimated to be less than 8 in 1,000,000 for adults and children which is considered a no apparent increased risk when compared to the excess background risk of all or specific cancers (see Table 6).

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.

For the residential area, non-cancer health effects associated with the inhalation of contaminants of concern, including PCE, from vapor intrusion sources in indoor air detected at residential Unit 10 are not expected to occur in children. For cancer health effects, the LECR at this location indicates there is a no apparent increase in risk posed to children based on PCE concentrations detected in indoor air. It is further noted that LECRs were calculated for PCE inhalation exposures outlined in the US EPA's Risk Assessment Guidance for Superfund, Part F, Supplemental Guidance for Inhalation Risk Assessment. Under this guidance, the US EPA does not require additional adjustments to their defined default values for children in calculating the LECR. In the future, if the US EPA's guidance is revised regarding inhalation exposures to PCE where exposure adjustments to default values for children are necessary, an update to the risk assessment for inhalation exposures to children may be required for this site.

Conclusions

From 1936 to 1962, CDE manufactured electronic parts and components, including capacitors. CDE tested transformer oils, and it is alleged that the company dumped materials contaminated with PCBs and other hazardous substances directly onto the soil at the site. Several investigations and remedial actions beginning in the 1990s confirmed widespread on- and off-site contamination related to the CDE site. Under the April 2000 RI/FS, the US EPA divided the site into Operable Units OU1 through OU4 to address contamination. As part of the investigations associated with the OU 3 groundwater contamination study, a vapor intrusion investigation for the surrounding residential area was initiated in 2007. Following review and assessment of environmental data associated with the vapor intrusion investigation, the NJDHSS and ATSDR have reached the following conclusions regarding exposures to residents for the CDE site:

NJDHSS and ATSDR conclude that, based on available data from the US EPA vapor intrusion investigations from May 2007 through May 2010, past, current and future exposures to PCE in indoor air are not expected to harm people's health. Regarding residential Unit 10, completed exposures to children and adults to PCE in indoor air are not expected to cause adverse non-cancer health effects as the PCE exposure point concentration is below the health-based comparison value. The lifetime excess cancer risk is considered a no apparent increase in risk when compared to the background risk of cancer.

It is noted, however, that investigation data for residential Unit 10 is very limited where additional investigation should be conducted to confirm PCE levels in indoor air do not pose a risk to occupants. Furthermore, residential Unit 10 is located adjacent to a potential secondary source (dry cleaning operation) of PCE groundwater contamination not related to the CDE site. Therefore, additional investigation is required to determine whether the dry cleaning operations, or other potential sources, are acting as contributor to PCE groundwater contamination and as a vapor intrusion source for nearby residences, including residential Unit 10.

Recommendations

1. Based on soil gas results below residential Unit 10, it is apparent a vapor intrusion source exists; however, it is not clear whether this source is related to the CDE site or a suspected secondary source. Therefore, further evaluation is recommended to determine whether another PCE source is present in the immediate area, including the adjacent dry cleaning operation, which may be impacting nearby residences. If a secondary source is determined to be present, the US EPA should attempt to, or request the New Jersey Department of Environmental Protection, perform additional investigation to characterize contamination in this area. Additionally, as PCE concentrations in soil gas are significantly above the NJDEP soil gas screening level, a short-term solution, such as a venting system, should be considered to reduce the threat of vapor intrusion.

2. As current data is limited to two sampling events, the US EPA should attempt additional investigation of residential Unit 17 to confirm non-site related sources are the cause for elevated concentrations of PCE detected in indoor air at this residence.

3. The US EPA should also continue remedial investigations, including vapor intrusion, and evaluate feasibility studies within the OU3 study area to implement necessary actions to address contaminated groundwater and to eliminate any potential vapor intrusion exposure pathways to residents. Short-term solutions, such as venting systems, should continue to be considered for buildings where elevated concentrations of site-related contaminants are present in soil gas increasing the threat of vapor intrusion or directly causing elevated contaminant concentrations in indoor air.

4. The US EPA should continue to implement remedial actions specified in their Records of Decision (RODs) for the OU1 through OU4 study areas to eliminate remaining exposure pathways and provide a permanent solution to prevent exposures to site related contaminants.

5. The NJDHSS will review the final RI/FS for the OU3 study area, which addresses site-related groundwater contamination, once it is released.
6. Residents are encouraged to contact their primary health care physician to discuss health concerns regarding exposure to site-related contaminants. Additionally, as the US EPA is actively addressing site contamination through remedial measures, residents are encouraged to follow US EPA's recommendations and allow them to take the measures necessary to reduce or prevent exposures. The NJDHSS will make available to residents materials on site-related contaminants and provide assistance concerning the findings of this report.

Public Health Action Plan

The purpose of a Public Health Action Plan is to ensure that this Public Health Assessment 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 ATSDR and the NJDHSS to follow-up on this plan to ensure that it is implemented. The public health actions to be implemented by the ATSDR and NJDHSS are as follows:

Public Health Actions Taken

1. The ATSDR and NJDHSS reviewed information and relevant data to evaluate the potential health implications for exposures to PCE in indoor air for residences investigated by the US EPA within the OU3 study area.

2. Nine health consultations and a public health assessment were completed for the site beginning in September 1996 through September 2000. These documents evaluated the potential health implications for exposures to site-related contaminants based for both on- and off-site sources. The NJDHSS and ATSDR concluded that exposures to site-related contaminants were a public health concern and that additional investigation into source areas and areas of potential concern for exposures were needed to more fully assess the extent of risk associated with this site.

Public Health Actions Planned

1. The US EPA is currently reviewing the draft RI/FS for the OU3 study area which addresses groundwater contamination. Data from this RI/FS will not be available until this document is finalized which is scheduled for the fall of 2011. Once this document becomes available the NJDHSS will review to determine whether an update to this health consultation is required.

2. Copies of this public health assessment will be provided to concerned residents in the vicinity of the site via the township libraries and the Internet.

3. The NJDHSS and the ATSDR will continue to review data as it is made available. This includes new information related to investigations and remedial actions taken for areas of concern within the OU1 through OU4 study areas as they are completed in the future.

References

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[ATSDR] Agency for Toxic Substances and Disease Registry. 1997b. Toxicological profile for Trichloroethylene. US Department of Health and Human Services, Atlanta, Georgia.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2001. Toxicological profile for 1,2-Dichloroethane. US Department of Health and Human Services, Atlanta, Georgia.

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[Cal EPA] California Environmental Protection Agency. 2011. OEHHA Toxicity Criteria Database. Office of Environmental Health Hazard Assessment. http://oehha.ca.gov/risk/ChemicalDB/index.asp

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[USEPA] US Environmental Protection Agency. 2008. National Center for Environmental Assessment. Office of Research and Development. Child-Specific Exposure Factors Handbook. Washington, DC. September 2008.

[USEPA] US Environmental Protection Agency. 2008b. National Center for Environmental Assessment. Office of Research and Development. Integrated Risk Information System, Glossary of Terms. Available from: http://www.epa.gov/iris/help_gloss.htm#content

[USEPA] US Environmental Protection Agency. 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). Office of Superfund Remediation and Technology Innovation. Washington, DC. January 2009.

[USEPA] US Environmental Protection Agency. 2010. US Environmental Protection Agency. Cornell Dubilier Electronics, Inc. Site: Indoor Air Results. Edison, NJ. June 16, 2010.

Report Preparation

This Health Consultation for the Cornell-Dublier Electronics site was prepared by the New Jersey Department of Health and Senior Services (NJDHSS) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved agency methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this health consultation and concurs with its findings based on the information presented in this report. ATSDR's approval of this document has been captured in an electronic database, and the approving reviewers are listed below.

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P.O. Box 369
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Table 1: Summary of Detected Soil Gas/Sub-Slab Gas Contaminants of Concern Concentrations
Cornell Dubilier Site, Middlesex County
Sample Period: May 2007, March - April 2008

Sample Location	Number of Samples	1,1-DCE Concentration Range (µg/m3) [a]	PCE Concentration Range (µg/m3)	TCE Concentration Range (µg/m3)	NJDEP Soil Gas Screening Values (µg/m3) [b]	Selected for Further Evaluation by US EPA
Unit 1	1	ND	2.4	ND	1,1-DCE = 11,000 PCE = 34 TCE = 27	No
Unit 2	1	0.91	3.6	0.33		No
Unit 3	1	ND	2.5	0.24		No
Unit 4	1	1.91	26	ND		No
Unit 5	1	ND	3.3	0.44		No
Unit 6	1	2.91	3.7	ND		No
Unit 7	1	ND	3.7	0.31		No
Unit 8	2	ND	1.3 - 8.6	0.17 - 0.29		No
Unit 9	1	ND	2.1	ND		No
Unit 10	2	ND	**89 - 200**	0.23 - 0.28		**Yes**
Unit 11	2	ND	0.83 - 1.3	ND - 0.17		No
Unit 12	1	ND	4.1	ND		No
Unit 13	2	ND	1.1 - 1.9	ND		No
Unit 14	1	ND	1.7	1.00		No
Unit 15	1	ND	5.8	ND		No
Unit 16	1	ND	13	0.37		No
Unit 17	2	ND - 0.2	ND - 2.2	2.1 - 3.9		**Yes** [c]
Unit 18	1	ND	4.4	ND		No
Unit 19	1	ND	5.0	ND		No
Unit 20	1	ND	0.74	ND		No
Unit 21	1	0.21	1.1	0.61		No
Unit 22	1	ND	0.74	0.19		No
Unit 23	1	ND	1.1	ND		No
Unit 24	1	ND	2.8	ND		No
Unit 25	1	ND	1.0	ND		No

(a) - micrograms per cubic meter.

(b) - New Jersey Department of Environmental Protection Soil Gas Screening Values (NJDEP 2007)

(c) US EPA soil gas data does not support that a vapor intrusion source exists below this residence. However, due to the proximity of this residence to the CDE site, the US EPA conducted an indoor air evaluation at this residence. It is noted the US EPA has acknowledged various debris and storage of chemical products are present at this residence.

ND - Not Detected

Further investigation was conducted by the US EPA at chosen locations based on site-specific information.

Table 2a: Overview of Site-Related Contaminants in Indoor Air from US EPA Selected Residential Locations
Comparison of Contaminant Concentrations in Indoor Air With Environmental Guideline Comparison Values
Cornell Dubilier Site, Middlesex County
Sample Period: March 2008, April 2008, May 2010

Contaminant	Number of Sample Locations	Number of Samples	Number of Detections	Concentration: micrograms/cubic meter					Contaminant of Concern
				Minimum	Maximum	Average	Environmental Guideline Comparison Value	US EPA Residential Air Screening Levels (d)	
1,1-Dichloroethene	2	4	0	ND	ND	ND	80 (EMEG) (b)	210	No
1,2-Dichloroethene (cis)	2	4	0	ND	ND	ND	NV	NV	No
1,2-Dichloroethene (trans)	2	4	0	ND	ND	ND	800 (EMEG)	63 N	No
Tetrachloroethylene	2	6	4	ND	**32**	**7.4**	0.2 (CREG) (c)	0.2 C	**Yes**
Trichloroethylene	2	6	2	ND	0.082	0.03	0.2 (CREG) (c)	0.5 C	No
Vinyl Chloride	2	4	0	ND	ND (e)	NA	0.1 (CREG)	0.16	No

(a) Cancer Risk Evaluation Guideline
(b) Environmental Media Evaluation Guideline
(c) Interim ATSDR Cancer Risk Exposure Guideline
(d) USEPA Region 6 Human Health Media-Specific Screening Levels (N = Non cancer, C = Cancer)
(e) Detection Limit = 0.16 or less micrograms per cubic meter
NV - No Value Established; ND - Not Detected

Table 2b: Ambient Air Concentrations for US EPA Investigation Period
Cornell Dubilier Site, Middlesex County
Sample Period: March 2008, April 2008, May 2010

Contaminant	Number of Sample Locations	Number of Samples	Number of Detections	Concentration: micrograms/cubic meter		
				Minimum	Maximum	Average
1,1-Dichloroethene	2	2	0	ND	ND	ND
1,2-Dichloroethene (cis)	2	2	1	ND	0.041	0.05
1,2-Dichloroethene (trans)	2	3	0	ND	ND	ND
Tetrachloroethylene	2	3	2	ND	4.1	1.5
Trichloroethylene	2	3	1	ND	0.098	0.03
Vinyl Chloride	2	2	0	ND	ND	ND

Table 3: Comparison of Indoor Air PCE Concentrations With Environmental Guideline Comparison Values
Cornell Dubilier Site, Middlesex County
Sample Period: March 2008, April 2008, May 2010

Sample Location		Number of Samples	Number of Detections	Minimum PCE Concentration ($\mu g/m^3$) [a]	Maximum PCE Concentration ($\mu g/m^3$)	Average PCE Concentrations ($\mu g/m^3$)	ATSDR Chronic EMEG [b] ($\mu g/m^3$)	US EPA RASL [c] ($\mu g/m^3$)	Contaminant of Concern
Unit 10	Basement	1	1	**3.1**	**3.1**	**3.1**	0.2	0.2 (C) 280 (N)	**Yes**
	1st Floor	1	1	**2.7**	**2.7**	**2.7**			
Unit 17	Basement	2	1	ND	**32**	**16**			No [d]
	1st Floor	2	1	ND	**6.7**	**3**			

(a) - micrograms per cubic meter.
(b) - Agency for Toxic Substances and Disease Registry Environmental Media Evaluation Guideline: Chronic = > 364 day exposure.
(c) - United States Environmental Protection Agency Residential Air Screening Level; (C) - based on cancer health effects, (N) - based on non-cancer health effects
(d) - US EPA soil gas data does not support that a vapor intrusion source exists below this residence. The US EPA has acknowledged various debris and storage of chemical products are present at this residence which supports assessment conclusions that PCE concentrations in indoor are likely due to property owner sources.
ND - Not Detected

Table 4 – Evaluated Exposure Pathways

Pathway	Exposure Pathway Elements				Pathway Classification
	Environmental Medium	Route of Exposure	Location	Exposed Population	
Vapor Intrusion via Groundwater	Indoor Air	Inhalation	Residential Homes	Adults/Children	Past – Completed Current and Future – Interrupted [(a)]

(a) Considered interrupted as the US EPA is actively monitoring and are planning remedial actions to address site-related groundwater contamination. Additionally, US EPA soil gas data does not support that a vapor intrusion source exists below one of the investigated residences. The US EPA has acknowledged various debris and storage of chemical products are present at this residence supporting assessment conclusions that PCE concentrations in indoor are likely present due to property owner sources.

Table 5: Comparison of Indoor Air Exposure Point Concentrations with Health Guideline Comparison Values for Non-Cancer Health Effects: Vapor Intrusion Investigations

Cornell Dubilier Site, Middlesex County

Exposure Point Indoor Air	Contaminant of Concern	Exposure Point Concentration (µg/m3) [(a)]	Tetrachloroethylene MRL (Health-Based Comparison Value) (µg/m^3)	Potential for Non-Cancer Health Effects
Unit 10	PCE	1.33	300 (C)[(b)]	No

(a) - micrograms per cubic meter.
(b) - Agency for Toxic Substances and Disease Registry, Tetrachloroethylene Minimal Risk Level (C = Chronic >364 days/year).

Sample Calculation: Exposure concentrations to indoor air contaminants and LECRs were calculated using the following formulas:

EPC = C x ET x EF x ED/AT

where

EPC = exposure point concentration of contaminant in air (µg/m^3);
C = concentration of contaminant detected in air (µg/m^3);
ET = exposure time (hours/day);
EF = exposure frequency (days/year);
ED = exposure duration (years); and
AT = averaging time (years).

EPC = (3.1 µg/m^3) x (24 hrs/24 hrs - day) x (365 days/365 days - year) x (30 years)/70 years = 1.33 µg/m^3

Table 6: Calculated Lifetime Excess Cancer Risk from Inhalation Exposures to Indoor Air Contaminants: Vapor Intrusion Investigations

Cornell Dubilier Site, Middlesex County

Exposure Point Indoor Air	Contaminant of Concern	Exposure Point Concentration (µg/m3) [a,b]	Exposure Duration (years) [c]	Exposed Population	USEPA IUR [d] $(\mu g/m^3)^{-1}$	LECR
OU1 - Study Area						
Unit 10	PCE	1.33	30	Adult/Child	5.9E-06 [e]	7.84E-06

(a) micrograms per cubic meter.

(b) Based on maximum concentration detected.

(c) Based on EPA recommended length of residency for current residents. Exposure Assumptions: 365 days a year exposure frequency, 70 years averaging time (USEPA 2002d, 2009).

(d) Inhalation Unit Risk (cancer slope factor) for human inhalation exposure.

(e) IUR for tetrachloroethylene

Sample Calculation: Exposure concentrations to indoor air contaminants and LECRs were calculated using the following formulas:

EPC = C x ET x EF x ED/AT

where

EPC = exposure point concentration of contaminant in air ($\mu g/m^3$);

C = concentration of contaminant detected in air ($\mu g/m^3$);

ET = exposure time (hours/day);

EF = exposure frequency (days/year);

ED = exposure duration (years); and

AT = averaging time (years).

EC = (3.1 $\mu g/m^3$) x (24 hrs/24 hrs - day) x (365 days/365 days - year) x (30 years)/70 years = 1.33 $\mu g/m^3$

LECR = EPC x IUR

where

EPC = exposure point concentration of contaminant in air ($\mu g/m^3$); and

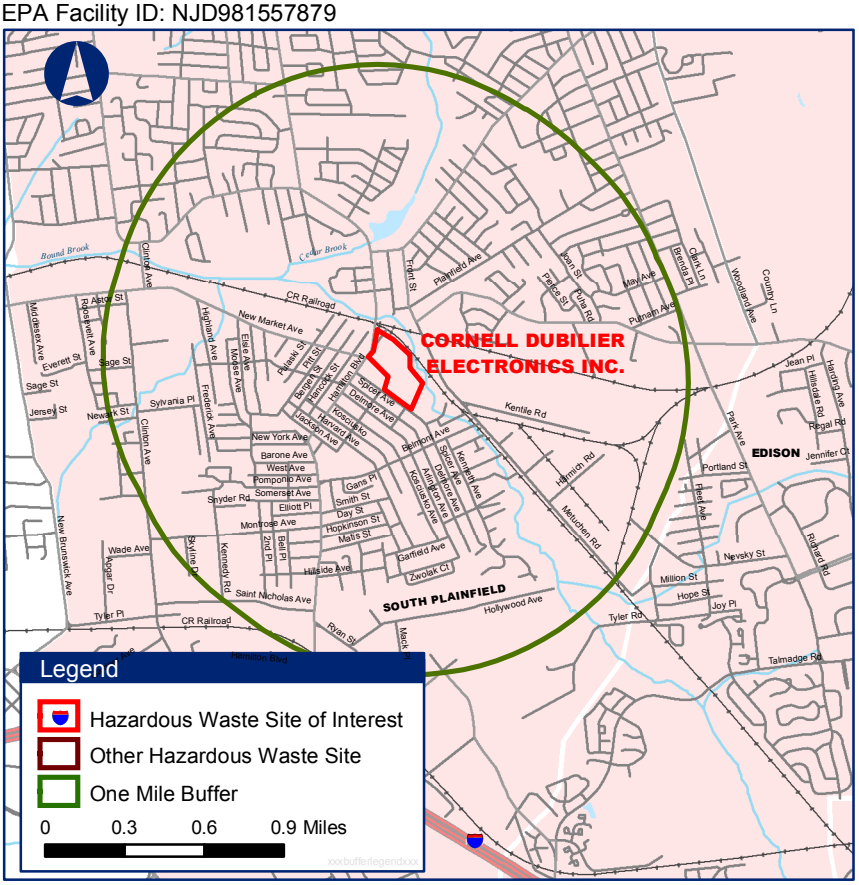
IUR = inhalation unit risk of contaminant in air $(\mu g/m^3)^{-1}$

LECR = 1.33 $\mu g/m^3$ x 0.0000059 $\mu g/m^{3\,(-1)}$ = 7.84E-06

Cornell Dubilier Electronics Inc.

South Plainfield, NJ

EPA Facility ID: NJD981557879



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

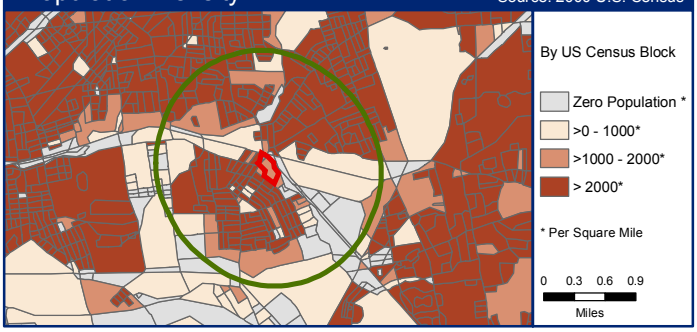
Site Location: Middlesex County, NJ

Demographic Statistics
Within One Mile of Site*

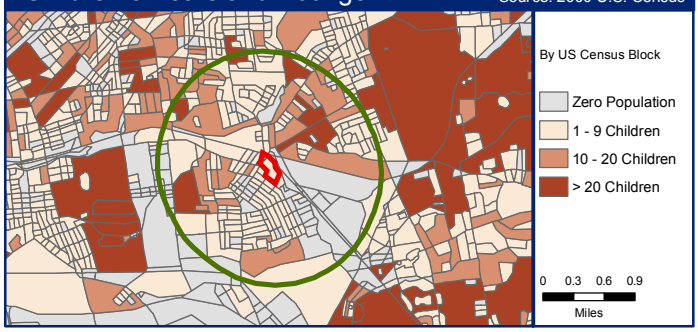
Total Population	11,619
White Alone	8,836
Black Alone	843
Am. Indian & Alaska Native Alone	35
Asian Alone	1,092
Native Hawaiian & Other Pacific Islander Alone	1
Some Other Race Alone	473
Two or More Races	339
Hispanic or Latino**	1,023
Children Aged 6 and Younger	1,046
Adults Aged 65 and Older	1,391
Females Aged 15 to 44	2,453
Total Housing Units	3,878

Demographics Statistics Source: 2000 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.

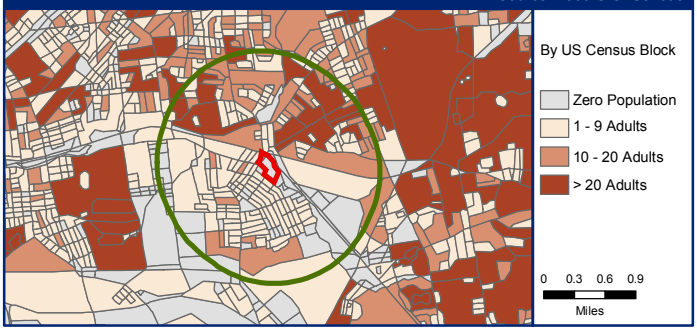
Population Density
Source: 2000 U.S. Census



Children 6 Years and Younger
Source: 2000 U.S. Census



Adults 65 Years and Older
Source: 2000 U.S. Census



Females Aged 15 to 44
Source: 2000 U.S. Census

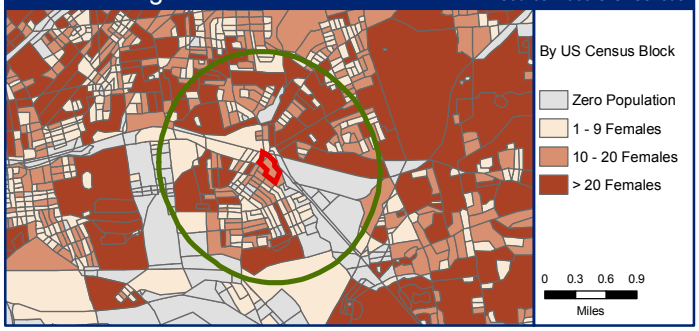


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Figure 2: Demographics information for the Cornell Dubilier Electronics, Inc. site based on the 2000 census data.

Photograph 1: Main entrance to Cornell Dubilier Electronics Site.

Photograph 2: Soil remediation activities along the northeast portion of the CDE property.

Photograph 3: Construction of storm water detention basin at southeast area of site.

Photograph 4: View to south of site with commercial properties in background.

Photograph 5: View of residential area along Spicer Avenue to south of site. CDE site on left side of photograph.

Photograph 6: View of residential area along Hancock Street to west of CDE site.

Appendix A

Background and Ambient Air Sources of Indoor Air Contaminants

Appendix A: Uses and Typical Background Concentrations of Contaminants of Concern Detected in Residential Indoor Air Samples
Cornell Dubilier Electronics, Inc. Site, South Plainfield, Middlesex County, New Jersey

Chemical	Usage[a]	Sources of Common Exposure[b]	Background Concentrations ($\mu g/m^3$)[a]
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	1-4 (average)[b]; 7 (average)[c]

[a]The background concentrations presented are not specific to South Plainfield, New Jersey in particular, but are presented to provide the homeowner some perspective as to levels typically found in U.S. homes.
[b]HSDB, 2002, at www.toxnet.nlm.nih.gov
[c]Tox Profile at www.atsdr.cdc.gov

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 associated with the Cornell Dubilier Electronics, Inc. site for nearby residences under investigation. The health effects described in the 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.

Tetrachloroethylene (PCE). PCE is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell PCE when it is present in the air at a level of approximately 7,000 micrograms per cubic meter or more, although some can smell it at even lower levels. People are commonly exposed to PCE when they bring clothes from the dry cleaners.

High concentrations of PCE can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been exposed to high concentrations. In industry, most workers are exposed to levels lower than those causing obvious nervous system effects, although more subtle neurological effects are possible at the lower levels. The health effects of breathing in air or drinking water with low levels of PCE are not known. Results from some studies suggest that women who work in dry cleaning industries where exposures to PCE can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that PCE can cause liver and kidney damage. Exposure to very high levels of PCE can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

The U.S. Department of Health and Human Services (USDHHS) has determined that PCE may reasonably be anticipated to be a carcinogen. PCE has been shown to cause liver tumors in mice and kidney tumors in male rats.

Appendix C

Indoor Air Quality Information Sources

The following sources of information are provided as a reference to homeowners and business owners regarding actions and preventative measures on how to help improve the quality of indoor air within their homes or workplace.

"Healthy Indoor Air for America's Homes – Indoor Air Hazards Every Homeowner Should Know About." USEPA. EPA 402-K-98-002. June 2002 available at: http://www.montana.edu/wwwcxair/

"The Inside Story – A Guide to Indoor Air Quality." USEPA. EPA 402-K-93-007. April 1995 available at: http://www.epa.gov/iaq/pubs/index.html

"Health Buildings, Health People: A Vision for the 21st Century." USEPA. EPA 402-K-01-003. October 2001 available at: http://www.epa.gov/iaq/pubs/index.html

"Indoor Air Pollution: An Introduction for Health Professionals." USEPA. EPA 402-R-94-007. 1994 available at: http://www.epa.gov/iaq/pubs/index.html

"What You Should Know About Using Paint Strippers." Consumer Product Safety Commission. CPSC Publication # F-747-F-95-002. February, 1995 available at: www.cpsc.gov/cpscpub/pubs/423.html

"Healthy Indoor Painting Practices." USEPA. EPA 744-F-00-001. May 2000 available at: www.cpsc.gov/cpscpub/pubs/456.pdf

Many of these sources are available in print through the website contact or through:

New Jersey Department of Health and Senior Services
Indoor Environments Program
PO Box 369
Trenton, NJ 08625-0369
609-826-4984
Access on line at:http://www.state.nj.us/health/eoh/tsrp/index.html

Appendix D

ATSDR Glossary of Terms

ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health. This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-422-ATSDR (1-888-422-8737).
The glossary can be accessed online at http://www.atsdr.cdc.gov/glossary.html

Other glossaries and dictionaries:
Environmental Protection Agency (http://www.epa.gov/OCEPAterms/)

National Center for Environmental Health (CDC)
(http://www.cdc.gov/nceh/dls/report/glossary.htm)

National Library of Medicine (NIH)
(http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)

For more information on the work of ATSDR, please contact:
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