ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

COPLEY SQUARE PLAZA
COPLEY TOWNSHIP, SUMMIT COUNTY, OHIO
EPA FACILITY ID: OH0000563122
SEPTEMBER 28, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT

COPLEY SQUARE PLAZA

COPLEY TOWNSHIP, SUMMIT COUNTY, OHIO

EPA FACILITY ID: OH0000563122

Prepared by:

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

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SUMMARY

The Copley Square Plaza site is a strip mall located just northwest of Akron in Copley, Summit County, Ohio. The site was listed on the National Priorities List (NPL) of Superfund hazardous waste sites in April, 2005. The main concerns at the site are the possibility that groundwater contamination could impact drinking water supplies in the area and the potential for site related volatile contaminants to enter the breathing air of residents and workers at nearby residences and businesses.

Built in the late 1950's, the shopping plaza consists of two buildings. The tenants initially were a grocery store, a dental office, a hair care center, and a dry cleaner. The plaza had two water supply wells installed in 1963 and 1975 to provide water to the tenants. The dry cleaner was operated by a number of owners from 1962 to 1994. They performed dry cleaning operations using various solvents common to the dry cleaning industry at that time, including tetrachloroethylene (PCE) and trichloroethylene (TCE). Wastewater containing high concentrations of solvents were stored in a series of home-built basins buried along the east side of the dry cleaner.

In April 1990, Ohio EPA responded to an odor complaint in drinking water at Copley Square Plaza. This led to the discovery of the contamination of the two plaza wells with PCE, TCE, dichloroethene (DCE), and vinyl chloride (VC). Nearby residential wells were sampled over the next several years and no contaminants were found prior to 1994. In 1994, site-related contaminants were detected in down-gradient residential wells southeast of the drycleaners at concentrations exceeding the U.S. EPA's Maximum Contaminant Levels (MCLs) for drinking water. Chemical concentrations in some wells exceeded U.S. EPA's Superfund Removal Action Levels (RALs). The U.S. EPA initiated a limited time-critical removal action to remove the source of the contaminants and installed eight whole house residential water treatment systems at the homes with contaminated wells.

Chlorinated solvents in the groundwater and soil beneath the dry cleaner continue to impact the groundwater in the area 10 years after initiation of these response activities. The groundwater monitoring program in subsequent years has indicated that the contamination has continued to spread with additional monitoring wells detecting contaminants at greater concentrations over time. In August 2003, four residential wells, previously found to be contaminated in 1994, continued to have site-related contaminants in well water at concentrations exceeding U.S. EPA's MCLs.

A nearby property, east of the site, has recently been developed into condominiums with basements. The shallow groundwater contaminant plume appears to flow to the east-northeast and to the east-southeast (Earth Tech, 1995) towards the condominiums several hundred feet east of the site. The plume has high concentrations of volatile chemical contaminants and, with a shallow depth to groundwater, it has become a concern that the condominium residents and possibly other nearby residents could be exposed to site-related contaminants through the intrusion of vapor phase solvents into their basements.

Copley Square Plaza site, in the *past*, posed a ***Public Health Hazard*** due to the exposure of the residents of nine down-gradient homes to chlorinated solvents in their drinking

water at concentrations that in some wells exceeded the U.S. EPA public drinking water standards for these chemicals.

Copley Square Plaza site *currently* poses ***No Apparent Public Health Hazard*** for residents who are drinking well water. Whole-house water treatment systems were installed in the homes with contaminated well water. Water at the tap has been routinely monitored and results indicate that contaminant levels in the water have not been exceeded.

The site *currently* poses an ***Indeterminate Public Health Hazard*** to nearby condominium residents due to the potential for vapor intrusion of volatile chemical contaminants into their basements. There is no soil gas or indoor air data to determine if residents are currently being exposed to site related chemicals through this pathway.

If effective groundwater remediation is not carried out at the site, the site may pose a ***Public Health Hazard*** to area residents in the *future* via the drinking water and vapor intrusion pathways. Very high concentrations of contaminants are still present in the groundwater at the site and the direction of groundwater flow may have shifted towards the east in recent years, toward the nearby condominium complex and nearby residential wells.

It is recommended that U.S. EPA-directed remedial investigation activities at the Copley Square Plaza site be focused on addressing:

1. The Potential short-term public health threat posed by vapor intrusion of the solvent PCE present at elevated concentrations in the shallow aquifer on the former golf course property to residents in newly built condominium units; and

2. Pursuing a long-term solution to the public health threat posed by the site by fully delineating and removing or containing the source(s) of the groundwater contamination at the site.

PURPOSE AND HEALTH ISSUES

The Copley Square Plaza site is a former dry cleaners located in Copley, Summit County, Ohio. The Copley Square Plaza site was added to the Superfund National Priorities List (NPL) of the most contaminated hazardous waste sites in the country, on April 27, 2005. The site was added to the NPL because of confirmed groundwater contamination from dry cleaning solvents tetrachloroethylene (PCE) and trichloroethylene (TCE), still impacting nearby residential wells. Additional concerns about possible vapor intrusion of these groundwater contaminants into a nearby condominium complex have also been stated in OEPA's Expanded Site Inspection (ESI) in 2003. Upon the site being listed on the NPL, the Agency for Toxic Substances and Disease Registry (ATSDR) is required by a congressional mandate to complete a public health assessment evaluating the threat to public health posed by this NPL site. The Health Assessment Section (HAS) at the Ohio Department of Health has had a cooperative agreement with ATSDR since 1990. As part of that agreement, HAS agreed to take the lead in completing this public health assessment. This health assessment will evaluate the historical environmental data collected at the site and will make conclusions and recommendations for additional actions that may be necessary to protect the public health.

BACKGROUND

Site Location and History

Copley Square Plaza is a three-acre site in Summit County, Ohio. It is in Copley Township approximately 2 miles east of Copley Square and about 5 miles west of Akron, Ohio (Figure 1). The site is on Copley Road, just northeast of the intersection of Copley Road and Jacoby Road. To the south of the site is Copley Road; to the north the site is bordered by a vacant lot; to the east by a condominium development property; and to the west by commercial businesses. The site is not fenced and the two buildings that make up the plaza are accessible on all sides and currently house several small businesses.

Copley Square Plaza site sits on Copley Road, one of the main streets in Copley, Ohio. There are numerous commercial and retail businesses along Copley Road, but the surrounding area, especially to the east of the site, is predominantly residential. There are some residences on Copley Road but the major residential areas are on adjacent side streets (Figure 2).

The site was developed into a shopping plaza in the late 1950's. The plaza consists of two buildings and original tenants included a grocery store, a dental office, a hair care center, and the dry cleaners. The plaza had two water supply wells installed to service the tenants; one at the northeast corner of the former Danton Dry Cleaners installed in 1975, and the other located on the east side of the dry cleaners between the back door and the cistern (that once served as a water source for the building) which was installed in 1963.

The former Danton Dry Cleaners operated under a number of owners from 1962 to 1994. They performed dry cleaning operations using various solvents common to the industry at that time, including tetrachloroethylene (PCE) and trichloroethylene (TCE). Eight

concrete waste solvent tanks were discovered beneath the floor of the dry cleaner in 1994. These tanks are believed to have been the sources of the subsequent groundwater contamination (EarthTech, 1995). The front portion of the dry cleaners is now occupied by a dance studio while the back portion, where the dry cleaner's waste pits were located, is now a storage area for the other tenants using the building.

Hydrogeology and Groundwater Resources

Copley Square Plaza site sits on top of a bedrock hill that gently slopes to the east towards the Pigeon Creek valley. Pigeon Creek is a south flowing tributary of the Tuscarawas River.

The underlying geology has been separated into three zones of interest with regard to the contamination beneath Copley Square Plaza site. The upper portion consists of clay, silt, sand, and gravel deposits. The next two zones are in the underlying shale and sandstone bedrock. There appears to be interconnectivity between these three zones based on groundwater elevations, flow direction, and hydraulic gradient, as well as consistent detection of site-related contaminants in all three of these geologic layers (Ohio EPA, 2004).

The unconsolidated glacial till deposits in the immediate vicinity of the site range in thickness from 13.3 to 19 feet. These "tills" consist of brown clayey silt to brown silty clay with some sand and gravel. The till is interbedded with layers of sand that range in thickness from less than one foot to almost 5 feet. The coarser-grained sand layers are water bearing and typically encountered just above the bedrock (Ohio EPA, 2003). These more permeable sand layers appear to thicken to the east between MW-5S and the condominium development (Partners, 1999 Figure 6).

The two bedrock zones have been divided into the "Intermediate Zone" and the underlying "Deep Bedrock Zone", which is the bedrock below the intermediate zone. The "Intermediate Zone" is a layer of fractured rock, typically encountered between the weathered bedrock surface and the deeper, more competent bedrock. The weathered bedrock ranges from 5 to 7 feet thick and is encountered from 13 to 20 feet below ground surface. The bedrock becomes less fractured and harder at approximately 30 to 33 feet below ground surface. The intermediate bedrock zone is comprised of gray shale with interbedded layers of siltstone and sandstone, varying in thickness from less than one foot to six feet. Vertical and almost vertical fracturing with iron oxidation and some mineralization was noted throughout this zone. The fractures were wet and in some areas were filled with water saturated silty or clayey material (Ohio EPA, 2003).

The "Deep Bedrock Zone" is the rock encountered below the weathered and fractured intermediate bedrock layer. The exact boundary between these two zones is indistinct and cannot be readily defined solely on the amount of fracturing of the rock. However; bedrock borings from Copley Square Plaza site indicate that the fracturing ends when the deep bedrock zone is encountered. The fracturing predominates in rock layers composed primarily of shale and thin interbeds of sandstone; whereas, sandstone with minor interbedded shale prevails as the dominant rock layer in the deep bedrock. The deep bedrock zone consists of sandstone and shale layers that vary from a very hard mudstone

to dark gray or black organic-rich shale. The deep bedrock zones contain some vertical fracturing. However, the amount of fracturing observed in the deep bedrock zone is not as prevalent as that observed in the intermediate bedrock (Ohio EPA, 2003).

Comparison of the groundwater levels recorded from the shallow, intermediate, and deep zones indicates that a downward movement of water occurs at the site during the drier months, between May and September. However, in the shallow zones during the spring when precipitation is greater, there is an upward movement of the groundwater. In addition, during both the May 2002 Site Inspection Report (SI) and the August 2003 Expanded Site Inspection Report (ESI) sampling events, artesian conditions were observed in all monitoring wells. Artesian conditions in a well are when the groundwater is under enough pressure that the water level rises above the top of the well on its own accord. Groundwater flow direction in the vicinity of Copley Square Plaza site appears to be east to southeast toward the condominium developments and residential areas along Plainview Drive (Ohio EPA, 2003).

Demographics, Land Use, and Natural Resources

Approximately 84.4 % of the people in Copley Township are white and 8.6 % are black. The other 5.1 % are all the other categories of races (Census, 2000) (see Table 1). There are approximately 3.5 % more women than men in Copley Township and approximately 14.1 % of all the residents are 65 years old or older (Census, 2000).

The land surrounding the site is mostly commercial businesses and urban residences. Copley Township is considered urban with approximately 3,695 families and has a total of 5,140 households (Census, 2000).

The majority of nearby residents currently use private wells to obtain drinking water. Well log records (ODNR) indicate that there are about 150 wells within a ½ mile radius of the site. Approximately 2,000 people utilize the groundwater from non-community and community public water systems located within one mile of the site (Ohio EPA, 2003).

The shaley bedrock of the Cuyahoga Formation is the primary aquifer used by local residents as a source of drinking water. Residential water wells in the Copley Square Plaza area are typically cased to the bedrock, averaging 60 to 70 feet in depth, and yielding 5-10 gallons of water per minute (HAS, 1995). Wells in this aquifer naturally have high levels of undesirable minerals, including iron and manganese oxides and sulfates.

Residential areas along portions of North Plainview and Aberth Drives are northeast of Copley Square Plaza site. Wells in these areas are located in a buried bedrock valley filled with layers of glacial clay, sand, and gravel up to 200 feet thick. Well logs from this residential area (ODNR) indicate deep sand and gravel deposits that are overlain with up to 65 feet of clay. These wells have yields up to 20 gallons of water per minute.

The Copley Square Water Company has a public water supply well at the north end of Aberth Drive, northeast of the site. The well is 150 feet deep and is screened in the sand and gravel aquifer. Yields average between 130,000 and 150,000 gallons per day (Jim

Cleary, Engineer, Pers. Comm.). This water company provides water to 272 apartments and condominiums north of the Copley Square Plaza site and east of Jacoby Road (Larry Butler, manager, Pers. Comm.). Another community well is located 0.27 miles to the southeast and down-gradient of the site at the Lorantffy Care Center. This well supplies water to approximately 101 people at this nursing and rehabilitation center. About one half mile south of the site there is the Spring Garden Waldorf School with a well that supplies water to 216 people. The Copley Meadows' public water well about a half mile southeast of the site just off of Copley Road on Lawnshire Drive, operated at full capacity until it experienced water pressure difficulties. The City of Akron shut down this well in May of 2002. Copley Meadows had supplied water to approximately 392 people. The City of Akron has extended a waterline along Copley Road past State Route 21, west of the Copley Square Plaza site. The cost of the connecting to the waterline has evidently has deterred a lot of the residents from hooking up to the public water system. The source of all Akron public water is from surface waters east of the city and no site-related contaminants have been detected in these public water supplies.

DISCUSSION

Previous Site Investigations

Site Discovery April 1990

In April 1990, Ohio EPA responded to an odor complaint in water from two wells on the property of Copley Square Plaza. Ohio EPA sampled the wells and found them to be contaminated with the chemicals tetrachloroethylene (PCE), trichloroethylene (TCE), dichloroethylene (DCE), and vinyl chloride (VC). Plaza tenants were provided with drinking water trucked in from the City of Akron water system and tenants ceased using water from the wells in April, 1990. In September 1991, the Plaza was hooked up to the Copley Square Water Company system. The Copley Square Water Company's well is located less than one half mile northeast of the site at the north end of Aberth Drive. Fifteen nearby residential wells were sampled in 1990 and no volatile organic compounds (VOCs) were detected.

Six residential wells were sampled for VOCs in April 1991 and no contaminants were detected.

In April and November 1992, eight residential wells were sampled for VOCs in two rounds of sampling. Tetrachloroethylene (PCE) and 1,1,1-trichloroethane (TCA) were detected at low levels at one well on the north side of Copley Road, at the Indoor Soccer facility.

In March and August 1993, fifteen residential wells were sampled for VOCs in two rounds of sampling. Again, the Indoor Soccer facility had low levels of PCE and TCA. However, low levels of TCA were also detected in two residential wells on North Plainview Drive.

In May of 1994, twelve residential wells were sampled for VOCs. The Indoor Soccer facility again, had low-levels of PCE and TCA. Low-levels of 1,2-DCE were detected in two wells on the south side of Copley Road.

In June and July 1994, fifteen residential wells southeast of the site along Copley Road were sampled for VOCs. The levels of chemical contaminants exceeded the U.S. EPA's Removal Action Levels (RALs) in four residential wells, Maximum Contaminant Levels (MCLs) were exceeded in another well, and VOCs detected at four additional wells (See Table 2). July 22, 1994, the Ohio Department of Health issued a water use advisory to occupants of homes with wells exceeding U.S. EPA MCLs. The advisory warned residents not to use well water for drinking, cooking, and bathing purposes. Representatives of the Ohio EPA and Summit County Health Department went door-to-door in the neighborhood notifying residents of the contamination and providing them with consumption advice. On August 8, 1994, the Summit County Chapter of the American Red Cross, in conjunction with the Summit County Emergency Management Agency, began providing bottled water to nine homes with contaminants above the MCLs.

Removal Action

On August 22, 1994, Ohio EPA requested that the U.S. EPA perform a time-critical removal action in response to well water with the concentrations of contaminants exceeding MCLs in nine residential wells. In September of 1994, the sample results indicated continued contamination with levels now in excess of the U.S. EPA MCLs by several orders of magnitude. Residents with contaminated wells above the MCLs were advised not to use their well water for drinking, cooking, or bathing purposes.

The U.S. EPA time-critical removal action took place between August 1994 and April 1995. As part of the U.S. EPA removal action the following actions were taken;

1. dye testing to identify discharge points of the wastewaters leaving the eight tanks/pits was performed,
2. approximately 8,000 gallons of solvent contaminated waste water were sampled and removed from the waste water tanks/pits beneath the dry cleaner,
3. the two water supply wells at Copley Square Plaza site were abandoned,
4. soil samples were taken,
5. eleven monitoring wells were installed around the cleaners determining the depth to the water table and groundwater flow direction,
6. semi-annual sampling of residential wells down gradient of the site was initiated.
7. U.S. EPA installed a shallow groundwater recovery trench and sump system to remove solvents that contaminated the soil and groundwater around and beneath the building foundation, and
8. installed eight residential whole house water treatment systems as a temporary fix for the residences who had well water exceeding the MCLs. These treatment systems consisted of
    - *a "mini air stripper"* - a device which blows air across the surface of the well water and, at the same time, trickles water over an object which provides the greatest amount of contact between air and water, thus allowing the air to pick up contaminants from the water, which are then

vented outside the house (the air stripper is where most, if not all, the contaminants are removed).

- *carbon filters* – the well water is again pressurized into a holding tank before passing through two carbon filters. The activated charcoal in the filters adsorbs any organic contaminants that have not been removed by the air stripper. The well water may go through the household water softener before the air stripper or after the carbon filters. The water then goes to the tap.

One resident on Appletree Drive, who's well had very low levels of cis-1,2-DCE (1.4 ppb), below the federal drinking water standard for this chemical, declined the installation of a water treatment system.

In February 1995, the Health Assessment Section of the Ohio Department of Health issued a "Health Consultation for Copley Square Plaza Groundwater Contamination" recommending continued monitoring of residential wells until public water is available and further characterization of other sources of contamination (HAS, 1995).

In April 1995, U.S. EPA turned over the responsibility of the operation and maintenance of the trench system, the eight residential water treatment systems and the residential well monitoring to the Ohio EPA. The residential wells were sampled on a quarterly basis until 2002 when sampling was reduced to a semiannual schedule (sampled twice a year).

No Further Remedial Action Plan 1999

In 1999, Ohio EPA submitted the site to the U.S. EPA as a "No Further Remedial Action Plan" (NFRAP) site. However, in November 2000, results of the monitoring well sampling indicated that the groundwater contamination had spread.

Site Inspection May 2002

Initially the groundwater recovery trench installed at the site by the U.S.EPA was capturing the contaminants in the shallow groundwater (at the 4 foot depth) at the perimeter of the building. By 2001/2002, the recovery trench was collecting primarily surface water as indicated by;

- the contaminants becoming significantly diluted during precipitation events,
- the concentrations much lower than when the trench was first installed, and
- the concentrations of the contaminants in the monitoring well (10 feet away at a depth of 12 feet) were significantly higher than the levels in the trench (PCE at 33,000 ppm).

It was believed that the contaminants were being introduced to the recovery trench from the contaminated groundwater below (Ohio EPA staff, Pers. Comm. 2005). The recovery trench was determined to be ineffective and, in 2002, pumping was discontinued. On January 23, 2002, Ohio EPA recommended that the site be taken off the NFRAP status and that a Site Inspection (SI) be completed. Monitoring and residential wells were sampled again in May and August, 2002. Four residential wells had concentrations of

contaminants exceeding drinking water MCLs (Ohio EPA, 2002). All four residences had whole house water treatment systems installed in 1994 and concentrations of contaminants did not exceed drinking water standards at the tap. During the May 2002 sampling event, all of the monitoring wells exhibited artesian (water flowing up and out of the well) conditions. Ohio EPA completed the SI in September 2002.

Expanded Site Inspection July 2003

Ohio EPA conducted an Expanded Site Investigation (ESI) in August 2003. Sampling of 17 monitoring wells and 23 residential wells indicated that eight monitoring wells and six residential wells had become contaminated or continued to be contaminated with site related VOCs (See Table 3). Two of the residential wells had concentrations of contaminants in raw well water exceeding U.S. EPA's MCLs (all these residential wells have treatment systems and the samples were taken before treatment). Significant increases in the levels of PCE were observed in shallow aquifer monitoring wells MW-3S, MW-4S, and MW-5S in the vicinity of the former golf course east of the site. Due to the high concentrations of contaminants in the monitoring wells, it was suggested that an assessment be made of the engineering control system installed by the U.S. EPA (the groundwater recovery trench) and of the current groundwater conditions. As in the May 2002 sampling event, all the monitoring wells exhibited artesian conditions during the August 2003 sampling event. Groundwater flow in the deep bedrock aquifer appeared to be to the southeast.

The property immediately to the east and northeast of the contaminant plume was formerly a miniature golf course. It has recently been developed into a condominium complex with basements (Figure 2). Significant groundwater contamination with the VOCs PCE and TCE was detected in the shallow monitoring wells 3-S, 4-S, 5-S, and MW-12. These wells are in close proximity to the nearby residences with monitoring well 5-S located only 75 feet away from the closest condominium unit. Ohio EPA further evaluated the potential for a completed indoor air pathway using a vapor intrusion model (U.S. EPA version of the Johnson & Ettinger 1991 model version 3.0). The model indicated that a potential exists for the indoor pathway to be complete and that vapors coming off the contaminated groundwater could pose an unacceptable risk to residents using basement areas in the adjacent dwellings (ESI, p.16, 2003).

HRS Scoring Package June 2004

Hazard Ranking System (HRS) scoring was completed by U.S. EPA's contractor in June 2004. The HRS was submitted to the U.S. EPA as part of the process to assess the relative threat associated with actual or potential releases of hazardous substances from the site. The HRS is the primary way of determining whether a site is to be included on the National Priority List of Superfund hazardous waste sites, the U.S. EPA's list of sites that are priorities for long-term evaluation and remediation. The HRS evaluation for Copley Square Plaza site only required evaluation of the threat associated with groundwater contamination in order to attain a score sufficient to include it on the NPL. Other pathways, such as air, surface water, or soil, were not evaluated by USEPA at that time (Ohio EPA, 2004).

Listing on NPL April 2005

Copley Square Plaza site was proposed to be listed on the NPL in September 23, 2004 and the final listing on the NPL occurred on April 27, 2005.

Potential Exposure Pathways

For the public *to be exposed* to elevated levels of chemical contaminants in and around the Copley Square Plaza site they must first come into contact with the contaminated groundwater, surface water, soils, sediment, or air. To come into contact with the contaminated media there must be a *completed exposure pathway*. A completed exposure pathway consists of *five main parts,* which must be present for a chemical exposure to occur. These include:

1) A Source of the Toxic Chemicals of concern;
2) A method of Environmental Transport, which allows the chemical contaminant to move from its source (soil, air, groundwater, surface water, sediment);
3) A Point of Exposure where the residents come into direct physical contact with the chemical (on-site, off-site);
4) A Route of Exposure, which is how the residents come into physical contact with the chemical (drinking, eating, touching); and
5) A Population at Risk which are the people who could possibly come into physical contact with site-related chemicals.

Exposure pathways can also be characterized as to when the exposure occurred or might occur in the *Past, Present, or Future*.

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

- How much of the chemical a person is exposed to (the *Dose*).
- How long a person is exposed to the chemical (duration of exposure).
- How often a person is exposed to the chemical (frequency).
- The toxicity of chemicals the person is exposed to (how chemicals can make people sick).

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

- Personal habits
- Diet
- Age and sex
- Current health status
- Past exposures to toxic chemicals (occupational, hobbies, etc.)

Site related chemicals of concern found in the groundwater plume under the Copley Square Plaza include tetrachloroethylene (PCE), trichloroethylene (TCE) 1,2-dichloroethene (DCE), and vinyl chloride (VC).

Soil Pathway

These chemicals tend to be mobile in soils. The analytical results of the soil samples collected during the ESI determined that there were no other sources of contaminants that were contributing to the groundwater plume. Due to the cement floor and the surrounding cement and asphalt parking lots, no soil samples were collected at the Copley Square Plaza site or adjacent properties. Contaminants leaked from tank/pits below floor level inside the dry cleaners. The soils surrounding the tank/pits are now and have been covered by the concrete floor of the building and the concrete and asphalt parking areas outside the building. The concrete and asphalt created a physical barrier to the contaminated soils. It is believed that the soil was not in the past and is not currently a pathway for exposure to these chemicals. However, digging into soils beneath or near the building in the future may cause workers to be exposed to contaminants in the soil.

Vapor Pathway

Tetrachloroethylene (PCE), trichloroethylene (TCE) 1,2-dichloroethene (DCE), and vinyl chloride (VC) are volatile organic compounds (VOCs) and are typically found in the liquid phase in groundwater but will rapidly vaporize to a gas on exposure to the air. These vapor phase contaminants can migrate into the basements of nearby residences as soil gas. Once in the basements, contaminants may be distributed throughout the homes and into the breathing air of the residents. Factors that favor this transport of these chemicals at the Copley Square Plaza site are 1) the shallow depth to the groundwater, 2) the shallow depth to the bedrock, 3) the sand lenses in the glacial till that thicken to the east towards the condominiums, 4) the high concentration of the contaminants in the groundwater plume, and 5) the relatively short horizontal distance to the nearest residential basements. Since the depth to groundwater is shallow, 4 to 12 feet below ground surface at the Copley Square Plaza site, the vertical distance the contaminants will have to travel as a vapor to get into a basement will be minimal. The bedrock provides a physical barrier which slows the contaminants from traveling deeper into the bedrock and farther away from basements. The bedrock at the Copley Square Plaza site is at a shallow depth, 13.3 to 19 feet below ground surface. The sand lenses at the Copley Square Plaza site range in thickness from less than one foot to 4.8 feet and occur at a depth of less than 19 feet below ground surface. The sand lenses provide a preferred pathway that the contaminants can more easily travel through compared to the surrounding silt and clay soils. The contaminants can move more easily through the sand and gravel, either dissolved in the groundwater or as vapors moving through the shallow soils. A plume with higher concentrations of volatile contaminants will generate higher concentrations of contaminant vapors in the air spaces above the plume. The concentrations of the contaminants in the groundwater at the Copley Square Plaza site continue to be high as indicated by the levels found in monitoring well MW-14S: 36,000 ppb PCE, 2,100 ppb 1,2-DCE, and 810 ppb TCE (Ohio EPA, 2003). Contaminant levels remain comparatively high in MW-5S, seventy-five feet west of the nearest condominium units. In 2003, this well had PCE levels at 2,800 ppb, 1,2-DCE at 160 ppb, and TCE at

150 ppb. Potential exists for the indoor pathway to be complete and pose an unacceptable risk to residents spending extensive time in the basement areas of the adjacent dwellings (Ohio EPA ESI, 2003, p.16).

Groundwater Pathway

Eight whole-house water treatment systems were installed at residences that had contaminated wells in 1994. The treatment systems have been maintained and monitored by the Ohio EPA, with the raw water and treated water periodically sampled and tested. Results indicate that drinking water standards have not been exceeded at the tap for these wells since the installation of treatment system in 1994. In 2002, the City of Akron brought city water lines along Copley Road to the impacted area. The condominium complex is supplied with drinking water from a public water supply that is not impacted by contaminated groundwater at the Copley Square Plaza site.

Chemicals of Concern

PCE and TCE are partially soluble in water and are heavier than water. Significant rainfall events usually flushes some of these chemicals deeper into the soils and then into the groundwater. PCE and TCE tend to sink down through the groundwater and accumulate at the bottom of the aquifer. As they travel deeper in the aquifer they enter low oxygen areas and come in contact with bacteria that break them down into other chemicals. Under certain conditions TCE and PCE break down to DCE and VC (Vogel and McCarty, 1985). DCE, and VC are typically found at the leading edge of a plume where contaminants have been in the ground for the longest period and where bacteria have had more time to break down PCE and TCE. Typically the highest concentrations of PCE and TCE will be found in that portion of the plume nearest to the source.

<u>Tetrachloroethylene (PCE)</u>

This chemical was widely used for dry cleaning of fabrics and for metal degreasing. Other major uses of PCE were as a solvent in some consumer products and as a building block to make other chemicals. Much of the PCE that gets into surface water and soil evaporates into the air. In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain. Under the right conditions, bacteria will break down some of the PCE that is in soil and groundwater (ATSDR, 1997A). The primary means of degradation of PCE in groundwater is by bacteria, leading to the formation vinyl chloride, a known carcinogen and likely more of a health concern than PCE. There are three ways that people are typically exposed to PCE; 1) from occupational sources, 2) from consumer products, and 3) from environmental sources. PCE from environmental sources is found most frequently in the air and less often in drinking water. It does not appear to bioaccumulate in fish or other animals that live in water.

PCE has been used safely as a general anesthetic agent at concentrations high enough to produce loss of consciousness. Single exposures in air at high concentrations can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Skin irritation may result from repeated or prolonged exposure to this chemical. High exposures have occurred in work or hobby environments

where there have been accidental exposures to concentrated PCE, but high exposures have also occurred from intentional chemical abuse to get "high". There are no known human health effects of breathing air or drinking water with low levels of PCE. Animal studies, with exposures to much higher concentrations of PCE, have concluded that such exposures may cause liver and kidney damage and liver and kidney cancers. The relevance of these animal studies to humans however, is unclear.

PCE is under review for classification by the U.S. EPA as a human carcinogen. Although exposure to PCE has not been directly shown to cause cancer in humans, the U.S. Department of Health and Human Services has determined that PCE may reasonably be anticipated to be a carcinogen. The International Agency for Research on Cancer (IARC) has classified PCE as a Group 2A carcinogen; probably carcinogenic to humans (limited human evidence, sufficient evidence in animals). The U.S. EPA drinking water standard for PCE in public water supplies is 5 ppb.

PCE tends to be retained in the body for a longer period of time than TCE, having the ability to accumulate to a limited extent in fatty tissues (NIOSH, 1976; 1978). Several studies of workers at dry-cleaning businesses have suggested associations between the development of elevated occurrence of urinary tract, kidney, and cervical cancers and chronic exposures to high levels (parts per million range) of PCE and other dry-cleaning chemicals in the air at their places of work (Katz and Jowett, 1981; Brown and Kaplan, 1987). These studies were confounded by the presence of carbon tetrachloride, TCE, and several petroleum-based solvents, in addition to PCE, in these indoor air environments. These occupational exposures are via the inhalation pathway rather than the drinking water route, and the levels of PCE that workers were exposed to were several orders of magnitude above the levels of PCE detected in local residential wells. As indicated above, the Woburn, Massachusetts study (Lagako et al., 1984), the Tom's River study (Fagliano et al., 1990), and ATSDR studies of PCE and TCE contaminated water supplies at the Camp Lejuene Marine base (ATSDR, 2003) have associated exposure to these chemicals with increased levels of leukemia in specific populations within these communities. The concentrations of the PCE found in the residential wells near Copley Square Plaza site are higher than the concentrations found in Woburn, Massachusetts and are comparable to the levels found at the Camp Lejuene Marine base.

Trichloroethylene (TCE)

The primary use of trichloroethylene has been the degreasing of metal parts and its use has been closely associated with the automotive and metal-fabricating industries from the 1950's through the 1970's. It is an excellent solvent for removing greases, oils, fats, waxes, and tars. As a solvent it was used alone or blended with other solvents. These solvents were also added to adhesives, lubricants, paints, varnishes, paint strippers, pesticides, and cold metal cleaners. When in surface soils, TCE will form a gas faster than many other volatile organic compounds. It has been shown that the majority of the TCE put on soils close to the surface will vaporize into the air. When TCE is released into the air, it reacts relatively quickly with other chemicals with about half of it breaking down in about a week. TCE sorption to soil is largely dependent on the organic carbon content of the soil, as soils with a higher organic carbon content tend to more effectively adsorb the TCE. TCE is known to be only slightly soluble in water, but there is ample

evidence that dissolved TCE remains in groundwater for a long time. Studies show that TCE in water will rapidly form a gas when it comes into contact with air. In a sand and gravel aquifer, TCE in the groundwater would rapidly vaporize into the air spaces between soil grains. Studies indicate that it would then disperse by two primary routes; first, diffusion through the soil air spaces and then be re-adsorbed by groundwater or infiltrating rainwater, or second, it would migrate to the surface and be released to the atmosphere. The primary means of degradation of trichloroethylene in groundwater is by bacteria, but a breakdown product by this means is vinyl chloride, a known human carcinogen and likely more of a health concern than TCE (Vogel and McCarty, 1985).

TCE was most recently classified by the U.S. EPA as a B2 carcinogen – a probable human cancer-causing agent. However, the cancer classification of TCE has been withdrawn and is currently under review by U.S. EPA. The U.S. EPA drinking water standard for TCE in public water supplies is 5 ppb.

The health effects from drinking and inhaling low levels of TCE over long periods of time remain poorly-documented and controversial (ATSDR, 1997B). A study of residents in Woburn, Massachusetts associated excessive cases of acute lymphocytic leukemia in children with their mothers' exposure to elevated levels of TCE (183 – 267 ppb) in a public drinking water well over a course of 5 to 10 years (Lagako et al., 1984). The impacted well also contained low levels (<50 ppb) of PCE, 1,2-DCE, and chloroform. Statistically significant excess leukemia cases in females were associated with residents exposed to TCE and other chemicals, both in their drinking water supply and from factory air emissions in Toms River, New Jersey (Fagliano et al., 1990). A health study conducted by ATSDR (2003) of birth defects and childhood leukemia in children born to parents stationed at Camp Lejeune Marine base between 1975 and 1988 linked an increased incidence of these adverse health effects to the parents' exposure to high levels of TCE (up to 1,400 ppb), PCE (up to 407 ppb), and 1,2-DCE (up to 215 ppb) in the base public drinking water supply(ATSDR, 2003). Further investigations of the Camp Lejuene exposures are being carried out by ATSDR. The concentrations of the TCE found in the residential wells near Copley Square Plaza site are similar to the concentrations found in Woburn, Massachusetts but are significantly lower than the levels found at the Camp Lejuene Marine base.

In contrast, consecutive surveys of self-reported health effects from over 4,000 residents at 15 sites in five states exposed to TCE through their drinking water supplies (of levels of 3 to 24,000 ppb) for varying periods of time (7-20 years) failed to link these exposures with the development of excess cancer cases. Non-cancer health effects tentatively linked to these exposures included an increased incidence of strokes, increased incidence of diabetes, some increased incidence in liver and kidney disease, and urinary tract disorders (ATSDR, 1999).

1,2-Dichloroethene (DCE)

This chemical has been manufactured as a chlorinated solvent, but at Copley Square Plaza site it is believed to be a primary by-product of the breakdown of the solvents PCE and TCE by bacteria. It easily vaporizes upon exposure to air and significant rainfalls will

readily wash it through sandy, gravelly soils to the underlying groundwater. There are three different forms of DCE; 1,1-DCE, cis-1,2-DCE, and trans-1,2-DCE. The 1,1-DCE form was found at very low concentration in only one monitoring well (2 ppb) at Copley Square Plaza site. PCE and TCE do not typically break down to the 1,1-DCE form and it is not found at a concentration at Copley Square Plaza site that poses a health concern.

Both cis-1,2-DCE and trans-1,2-DCE have been detected in the groundwater at the Copley Square Plaza site. Cis-1,2-DCE is classified as a Class D Carcinogen because there is no data to indicate that this chemical promotes tumor formation in the body (ATSDR, 1996). Trans-1,2-DCE is classified as having evidence that it does not cause cancer in humans.

There is no significant research documenting adverse effects of 1,2-DCE in humans from drinking contaminated water. Occupational studies indicate central nervous system dysfunction in workers breathing very high levels of DCE in the air (1,000 – 2,000 ppm). The concentrations of the 1,2-DCE found in the residential wells near Copley Square Plaza site are significantly lower in these drinking water supplies compared to the levels detected in the indoor air in these occupational exposures.

Vinyl Chloride (VC)

Vinyl chloride is a man-made chemical, typically a sweet-smelling colorless gas, that is used in the manufacture of polyvinyl chloride (PVC) products. As indicated above, it also forms as the result of the biological degradation of chlorinated solvents like PCE and TCE in groundwater under anaerobic (oxygen-poor) conditions that increase with depth below the ground surface (Smith and Dragun, 1984; Vogel and McCarty, 1985)

The primary means by which vinyl chloride is believed to be generated at the Copley Square Plaza site is by anaerobic bacteria breaking down chlorinated solvents such as TCE and PCE in groundwater. These chlorinated solvents are heavier than water and tend to sink to the bottom of the aquifer where they encounter bacteria that require little or no oxygen. PCE and TCE are broken down by these bacteria with one of the primary by-products of this breakdown being vinyl chloride, which becomes dissolved in the groundwater (Vogel and McCarty, 1985). When groundwater encounters air, vinyl chloride will quickly become a gas. While in groundwater and under the right conditions, a little of the vinyl chloride can be broken down by bacteria, but most escapes as a gas. When found in soil and surface water, vinyl chloride rapidly escapes as a gas to the surrounding air. Vinyl chloride does not tend to adsorb to the soil. In areas that have high concentrations of solvent present, such as, landfills and hazardous waste sites, the vinyl chloride may more readily dissolve in the solvents than in water. It would then become as mobile as the solvent that it is dissolved in, which may make it more or less mobile than when it is dissolved in water. When vinyl chloride is released into the air, it is quickly degraded in the presence of certain chemicals and sunlight.

Vinyl chloride is currently classified as a Group A carcinogen; a “known human cancer causing agent” by U.S. EPA and the U.S. Department of Health & Human Services based on evidence from both human occupational health studies and animal laboratory studies (ATSDR, 2004). Occupational studies of workers in the vinyl chloride industry in the

1970's (Creech and Johnson, 1974; Heath et al., 1975; Fox and Collier, 1977) demonstrated a link between chronic occupational exposure to very high levels of vinyl chloride in the air in an enclosed environment (estimated vinyl chloride concentrations of several thousand parts per million) and the development of hepatic angiosarcoma, a rare and fatal form of liver cancer. Besides liver cancer, workers exposed to very high levels of vinyl chloride in the air on a regular basis also developed "vinyl chloride disease". Symptoms included liver abnormalities; the development of "acroosteolysis", a degenerative loss of bone from the tips of the fingers; plus the formation of skin lesions and nodules on the hands and forearms. Additional studies of workers in the vinyl chloride industry indicated less conclusively an association between exposures to high levels of vinyl chloride vapor and /or PVC dust and the development of cancers of the brain, lungs, and digestive tract (Wagoner, et al., 1980; Wong et al., 1991).

In contrast to occupational studies of human exposures to vinyl chloride via the inhalation route, no similar human epidemiological studies have indicated associations between drinking vinyl chloride-contaminated water and the development of cancers. Similarly, no studies could be found linking oral exposure to vinyl chloride in humans with the development of neurological, developmental, reproductive, genotoxic, or dermal health effects (ATSDR, 2004). However, studies of laboratory rats fed large doses of vinyl chloride as PVC powder or via gavage led to statistically-significant increases in the incidence of hepatic angiosarcomas in these animals (Feron et al., 1981; Maltoni et al., 1981; Til et al., 1983).

Based on the evidence of carcinogenicity in animals after oral exposure, both the Department of Health and Human Services (2002) and the U.S. EPA (1994), have considered it to be prudent public health practice to consider the potential for carcinogenic effects in humans by this route as well as via inhalation. U.S. EPA's current weight-of-evidence characterization for vinyl chloride concludes that vinyl chloride is a known human carcinogen by the inhalation route of exposure based on human epidemiological studies and, by analogy, considered to be carcinogenic by the oral route based on positive animal laboratory studies.

On this basis, U.S. EPA established a pubic drinking water Maximum Contaminant Level goal of zero for vinyl chloride in drinking water supplies. The actual Maximum Contaminant Level (MCL) for vinyl chloride has been established to be 2.0 parts vinyl chloride per billion parts of water (MCL = 2 ppb). This concentration has also been adopted as the Removal Action Level (RAL) by U.S. EPA (1997) for vinyl chloride at federal Superfund sites with contaminated drinking water. The U.S. EPA Drinking Water Equivalent Level (DWEL) for non-cancer health effects resulting from a lifetime of drinking water contaminated with vinyl chloride is 100 ppb. The U.S.EPA One-Day and Ten-Day Health Advisories for children drinking water contaminated with vinyl chloride (= acute exposure scenario) are both at 3,000 ppb. The ATSDR has also developed Cancer Risk Evaluation Guide (CREG) numbers for specific carcinogens that calculate at what levels exposure to the chemical could result in additional cancer cases per million people (1×10^{-6} risk). The CREG value for vinyl chloride is 0.03 ppb in drinking water.

Levels of vinyl chloride historically detected in nearby residential wells ranged up to 24 ppb. These detections exceed the USEPA MCL and ATSDR Cancer Risk Evaluation Guide numbers. It is uncertain what health impacts, if any, would result from drinking water with these levels of VC.

Past Exposures

It is very difficult, if not impossible, to determine the extent of the public's exposure to groundwater contamination prior to being made aware of the contamination in 1994. In April, 1990, the two wells supplying water to Copley Square Plaza site were found to be contaminated with PCE, TCE, DCE, and VC. The Plaza stopped using these wells and safe drinking water was supplied to the Plaza tenants from the City of Akron water system. It is unknown how long the groundwater was contaminated prior to the sample collection. In September 1991, the Plaza was connected to Copley Square Water Company system, a public water supply with a wellfield located less than one half mile to the northeast of the Plaza. About eighteen residential wells were sampled in May of 1994. About half of these wells were at locations that had not been sampled during earlier investigations. Nine of these residential wells were found to have detections of site-related contaminants of concern. Of these nine wells, only one had been sampled prior to May 1994. It is unknown how long these wells had been contaminated. Bottled water was initially provided to the nine residences with contaminated wells in August, 1994. Whole house water treatment systems were installed in eight of the nine impacted homes in October, 1994.

It is unknown how long or at what concentration employees or customers of the dry cleaners may have been exposed to any of the contaminants from inhalation of contaminated air inside the former Danton Dry Cleaners or the Plaza.

Current Exposures

Nine of the 23 residential wells sampled during the ESI in August 2003 had detections of contaminants and two had concentrations of contaminants above the MCL's. Four of these samples were collected at residences that had groundwater treatment systems installed by U.S. EPA in 1994. Samples for these residential wells were taken before the treatment system. Samples were also taken at the tap and indicate that the residents there are not currently being exposed to these contaminants. Five additional residential wells have low level detections of contaminants in the water; VC at one well at 0.39 ppb and DCE at three wells ranging from 0.21 to 2 ppb. The vinyl chloride is below the U.S. EPA's MCL for public drinking water. The most likely points of exposure to contaminants from the groundwater are through drinking, cooking, and bathing with well water. Both private and public wells are located in close proximity to the site and in the same aquifer contaminated by The former Danton Dry Cleaners. Summit County sold their public water supply system to the City of Akron in February 2002 (Debra Houdeshell, Summit County Public Works Manager, Pers. Comm.). Akron shut down the wells bought from the county within six months of the purchase (Ken Coy, Akron Public Water, Pers. Comm.). One of those wells, the Copley Meadows Water System, was just southeast of the site on Copley Road and the discontinued use of this well may have caused a shift in the direction of the groundwater flow. There is no data that

indicates that public water supplies are currently being impacted by site-related chemicals and all of the Akron public water supplies originate from surface water reservoirs. However, the source of continuing groundwater contamination has not been eliminated, the aquifer continues to be a source of drinking water, and there may be changes in the direction of the groundwater flow due to discontinued use of wells. There is not enough data to indicate if this site will pose a public health hazard via drinking water route in the future.

The contaminants PCE, TCE, DCE and VC are now being detected in shallow monitoring wells that were previously clean and shallow monitoring wells that previously had low levels of contaminants detected, now have significantly higher concentrations (MW-3S, MW-4S, MW-5S). Groundwater elevation data indicates that the direction of groundwater flow in the shallow aquifer is to the east-northeast and east-southeast. There is no soil gas data for adjacent condominium property, nor indoor air sampling results for those units closest to monitoring wells with heavily contaminated groundwater.

Health Outcome Data

No health outcome data was compiled or reviewed as part of this assessment.

Community Health Concerns

The draft Public Health Assessment for Copley Square Plaza site was made available for public comment September 30th through December 30th, 2006. ODH released a media advisory that notified the public of a comment period and instructions on how to submit their concerns or comments. The document was made available to the public at the Fairlawn Bath Branch Public Library and on-line on the ODH web site. The following is a summary of the community concerns submitted to ODH. The community concerns are in italic text and the ODH response follows in normal text.

1. *We were told that there was not a health threat due to vapor intrusion and now we are being told that there is a health concern. We are concerned that there is a potential for vapor intrusion.*

HAS is also concerned by the potential health threat by vapor intrusion into the residential and commercial buildings near the Copley Square Plaza site. We have recommended that the vapor intrusion of contaminants be investigated further.

2. *We are concerned that vapor intrusion may be a current or future health threat*.

HAS is also concerned that vapor intrusion may be a current or future health threat, however it is unlikely levels will pose an acute (immediate) health threat. Our concerns are that chronic (long-term) exposures may potentially cause health problems.

3. *We are concerned that the groundwater flow is now toward the east in the shallow and deep aquifers*.

HAS expects that the U.S. EPA's Remedial Investigation will provide data on the current groundwater flow direction in the shallow and deep aquifers.

4. *We are concerned that the groundwater problem has not been cleaned up*.

HAS is also concerned about the groundwater contamination. There are contaminants beneath the former dry cleaners that continue to be a source of contamination for drinking water wells and for vapor intrusion.

5. *We are concerned about well contamination on Aberth Drive and at least two residents on North Plainview. Would it be possible to test these wells for this contamination?*

Wells on North Plainview have been sampled by U.S. EPA and contaminants were not detected. It is expected that contaminants would be detected in these wells before there would be any contaminants that would reach the wells on Aberth Drive.

6. *We are concerned that the chemicals may be leaching into the basements through the sump pumps. Is it feasible that these chemicals could be leaching into the basements in this area and posing a health hazard*?

Generally, it is unlikely that the groundwater table would be elevated to the level that contaminants would leach into the basement. Typically, the contaminants of concern would vaporize from the groundwater and then travel through cracks in the basement floor and/or foundation to the indoor air of residents. Contaminant in vapor form, rather than liquid form, would more likely pose a health threat and are the concern for this site.

7. *My child plays in the finished basement of our condominium. What should I be doing to protect our health? Are these levels posing a health concern*?

Preliminary data collected by U.S. EPA as part of the ongoing Remedial Investigation indicates that the levels of contaminants found may pose a potential chronic (longterm) health threat after years of exposure. If you feel that your child is being exposed to contaminants in the basement, you may want to minimize the time your child spends in the basement or do not let him play in the basement. Keep in mind that at the levels of these contaminants found so far, you would have a potential for health effects and only after years of exposure.

8. *Can the contaminants be transferred through breastmilk*?

Tetrachloroethylene can be found in breast milk of mothers who have been exposed to the chemical. The effects of exposing babies to tetrachloroethylene through breast milk are unknown.

9. *Did I have a past exposure from drinking contaminated well water. My family lived on South Plainview and moved in 1992 before the residential wells were sampled.*

The well at this location was sampled as part of the investigations in the mid-1990's and contaminants were not found in the analyses from your former residence.

10. *We have health concerns from eating vegetables from backyard gardens for Copley area residents. Can contaminant exposure occur through eating garden vegetables*?

The exposure route of concern is not through contaminated soils or ingestion of vegetables grown in contaminated soils. The soils that are known to be contaminated are the soils beneath the former dry cleaners and possibly some nearby soils adjacent to the

site. Soils in the backyard of Copley area residents are not in the area of contaminated soil from the former dry cleaners.

11. *Our 3-year old child has severe asthma. Will the presence of PCE in the indoor air environment exacerbate this condition?*

We have very little information about human health effects in people exposed to very low levels of these solvents in the indoor air. Human health studies have not taken into account sensitive populations, such as infants, children, and elderly, or as in this case, a toddler with a pre-existing severe respiratory condition. It is unlikely that very low levels of PCE in the air would exacerbate your child's asthma, however this cannot be said with any level of certainty. Your child can be tested to determine if he was exposed to PCE, however this testing not will provide much information besides confirming that he had been exposed to PCE.

CHILDRENS HEALTH CONSIDERATIONS

ATSDR and HAS recognize the unique vulnerabilities of children exposed to environmental contamination and hazards. As part of this health assessment, HAS considered the greater sensitivity of the children who live in the area of the Copley Square Plaza site when drawing conclusions and making recommendations regarding health effects from exposure to chemicals related to the Copley Square Plaza site.

CONCLUSIONS

1. The Copley Square Plaza site was a ***"Public Health Hazard"*** in the *past* to nearby residents and workers due to elevated levels of trichloroethylene (TCE), tetrachloroethylene (PCE), 1,2-dichloroethene (DCE), and/or vinyl chloride (VC) in their drinking water. It is unknown how long and at what concentrations the contaminants were in the drinking water of nearby residents prior to them being provided with whole house water treatment systems in 1994.

2. *Currently* contaminants pose ***"No Apparent Public Health Hazard"*** via the drinking water route to nearby residents of Copley Square Plaza site who previously had detects of solvent in their well water. There are low levels of contaminants in the drinking water of some of the residential wells, but they are not at concentrations that pose a public health hazard. The whole house treatment systems in operation effectively reduce the levels of contaminants to safe levels or eliminate them from drinking water prior to the tap.

3. *Currently* the potential for vapor intrusion of contaminants into basements poses an ***"Indeterminate Public Health Hazard"*** for nearby condominium residents. There is no soil gas or indoor air data to determine whether the nearby residents are being exposed.

4. If effective groundwater remediation is not put into place, site related contamination may pose a ***"Public Health Hazard"*** in the *future* to area residents via both drinking water and vapor intrusion pathways. The contaminant plume

from Copley Square Plaza site appears to be now moving towards residential areas east of the site.

RECOMMENDATIONS

As part of the U.S. EPA Remedial Investigation at the Copley Square Plaza site, U.S. EPA and its contractor should:

- Determine if any additional drinking water wells in the area are contaminated and from what groundwater zone the residential wells that have been sampled have been drawing water. The geologic logs and well construction summaries for these residential wells are needed to fill important data gaps for the evaluation of this site.
- Ensure that the whole house groundwater treatment systems in impacted residences continue to be effective in the removal of contaminants to acceptable levels.
- The vertical and horizontal flow in the shallow and intermediate groundwater zones need further evaluation. More data is needed on the affects of water levels, recharge from precipitation, geochemical conditions, flow direction and other hydrological data have on the variability of the VOC concentrations and distributions.
- Characterize the potential for vapor intrusion of contaminants into the indoor air of nearby residences. Indoor air at Copley Square Plaza site should be evaluated to determine if contaminants are present and pose a hazard to the tenants or customers. Seasonal variation warrants sampling several times throughout the year.
- Better characterize the source of the continuing groundwater contamination at the site. Further evaluation is needed to determine if there is significant residual contamination beneath the former Danton Dry Cleaner's building. Potential that the intermediate bedrock, with its significant fracturing, needs further investigation to determine if these fractures are acting as a preferential pathway for contaminant migration.
- The extent of contamination needs to be fully delineated. Further evaluation to the northeast, south, southeast, and southwest is necessary to fully define the boundaries of the contaminant plume within each of the affected aquifers. Existing data may be skewed due to the potential differences in well screen depths (i.e., not within the same aquifer zones) as well as potential sharp concentration gradients in the horizontal and/or vertical directions.

PUBLIC HEALTH ACTION PLAN

The Health Assessment Section at the Ohio Department of Health, along with Ohio EPA, US EPA, and the Summit County Health Department, have a long history of public health actions taken in response to the contamination associated with the Copley Square Plaza site, going back over a decade. The following timeline lists some of these activities:

1990: Ohio EPA samples two on-site production wells and discovers they are contaminated with a variety of Volatile Organic Compounds (VOCs) at levels of public health concern. Use of the wells is discontinued and the businesses on-site are connected to a local public water supply.

1991-1994: Ohio EPA samples a number of adjacent residential wells in the area.

June, 1994: Ohio EPA sampling discovers nine downgradient residential wells contaminated with site-related VOCs and their break-down products. Contacts Ohio Department of Health, Summit County H.D., and US EPA.

July, 1994: The Ohio Department of Health issues a Water Use Advisory advising impacted residents not to use their well water from drinking, cooking, or bathing. Ohio EPA and Summit County H.D. staff notify individually all of the impacted residents of the advisory.

August, 1994: The American Red Cross and the Summit County H.D. provide bottled water to impacted area residents.

August, 1994 - April, 1995: US EPA Superfund Time-critical Removal Action at the site. This included assessing the extent and sources of the contamination, a limited removal action at the Copley Square Plaza site, and the installation and operation of whole-house water treatments systems in 8 of the 9 homes determined to have wells impacted by site-related contamination.

February, 1995: Release of the Public Health Consultation for the Copley Square Plaza site.

1995-2002: Quarterly sampling of downgradient residential wells by Ohio EPA. Ohio EPA quarterly sampling and O&M of whole-house treatment systems in 8 impacted residences.

2002: Sampling of residential wells reduced to a semi-annual schedule.

2003: Ohio EPA carries out an Expanded Site Investigation of the site, sampling 17 monitoring wells and 23 residential wells for site-related VOCs. Several monitoring wells east of the site indicated very high levels of site-related contaminates. Ohio EPA vapor-intrusion modeling suggests a likelihood of site-related VOCs impacting indoor air quality in adjacent condominium units, possibly posing a health risk to residents using their basements on a regular basis.

June, 2004: Ohio EPA completed scoring the site using the Superfund Hazard Ranking System. Evaluating just the drinking water pathway, the site scored high enough for inclusion on the National Priorities List of Superfund hazardous waste sites (NPL).

Sept, 2004: Copley Square Plaza site proposed for listing on the NPL.

Oct., 2004: Multi-agency site visit to the Copley Square Plaza site. Walk-through the area and discussions of the issues.

April, 2005: Copley Square Plaza site officially added to the NPL as a Superfund site.

Sept., 2005: Initial draft Public Health Assessment document sent to agencies.

Feb., 2005: U.S. EPA Remedial Investigation began at the site.

As the Remedial Investigation/Feasibility Study is carried out at the site, HAS will continue review and evaluate additional environmental data as it becomes available to insure that the site does not pose a public health hazard to area residents.

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TABLE and FIGURES

Table 1. Demographics of the Copley Square Plaza Area (Census 2000 & Ohio EPA, 2003)						
	Copley Township		**1 mile radius of site**		**4 mile radius of site**	
White	11,786	86.4 %	2,266	78.8 %	49,808	62.8 %
Black	1,169	8.6 %	433	15.1 %	26,665	33.6 %
American Indian	12	0.1 %	4	0.1 %	125	0.1 %
Asian	448	3.3 %	101	3.5 %	1,256	1.6 %
Other	53	0.4 %	69	2.5 %	1,500	1.9 %
Two or more races	173	1.3 %				
Total	13,641		2,874		79,357	
Hispanic or Latino	146	1.1 %				
Males	6,575	48.2 %				
Females	7,066	51.8 %				
65 years old & older	1,917	14.1 %				

Table 2. Residential Well Contamination Investigation 1994*				
Well Location	**Contaminant**	**Concentration ppb**	**MCL ppb**	**RAL ppb**
Residence A	Vinyl chloride	ND–1.6	2	2
	cis-1,2-dichloroethylene	23-24	70	400
Residence B	**Vinyl chloride**	**ND-17**	2	**2**
	trans-1,2-dichloroethene	ND-7.8	100	
	cis-1,2-dichloroethylene	230-290	**70**	400
Residence C	Vinyl chloride	ND-2	**2**	2
	trans-1,2-dichloroethene	ND-2	100	
	cis-1,2-dichloroethylene	41-61	70	400
Residence D	**Vinyl chloride**	**ND-24**	2	**2**
	trans-1,2-dichloroethene	ND-23	100	
	cis-1,2-dichloroethylene	**586-760**	70	**400**
Residence E	**Vinyl chloride**	**ND-14**	2	**2**
	trans-1,2-dichloroethene	ND-10	100	
	cis-1,2-dichloroethylene	**318-530**	70	**400**
	Trichloroethylene	161-220	**5**	300
	Tetrachloroethylene	**399-570**	5	**70**
Residence F	Vinyl chloride	ND-1.5	2	2
	cis-1,2-dichloroethylene	21-34.6	70	400
Residence G	**Vinyl chloride**	**ND-11**	2	**2**
	trans-1,2-dichloroethene	ND-5.7	100	
	cis-1,2-dichloroethylene	197-231	**70**	400
Residence H	cis-1,2-dichloroethylene	2.5	70	400
Residence I +	cis-1,2-dichloroethylene	1.4	70	400

*** Concentrations above the RALs are shaded.**

+ This residence declined installation of the whole-house treatment system. The treatment systems were installed in the other eight residences.

Table 3. Expanded Site Inspection Well Sampling Results 2003				
Monitoring Wells+				
Well ID	**Contaminant**	**Concentration**	**Units**	**Aquifer**
MW-1S	1,1,1-trichloroethane	9	Ppb	shallow
	tetrachloroethylene	3	Ppb	
MW-3S	trans-1,2-dichloroethylene	2	Ppb	shallow
	cis-1,2-dicholoethylene	250	Ppb	
	trichloroethylene	130	Ppb	
	tetrachloroethylene	460	Ppb	
MW-3I	cis-1,2-dicholoethylene	1	Ppb	intermediate
	tetrachloroethylene	7	Ppb	
MW-3D	vinyl chloride	17	Ppb	deep
	1,1-dichloroethylene	2	Ppb	
	trans-1,2-dichloroethylene	7	Ppb	
	cis-1,2-dicholoethylene	530	Ppb	
	trichloroethylene	750	Ppb	
	tetrachloroethylene	6200	Ppb	
MW-4S	cis-1,2-dicholoethylene	100	Ppb	shallow
	trichloroethylene	85	Ppb	
	tetrachloroethylene	1500	Ppb	
MW-4I	vinyl chloride	15	Ppb	intermediate
	cis-1,2-dicholoethylene	42	Ppb	
	trichloroethylene	9	Ppb	
	tetrachloroethylene	92	Ppb	
MW-4D	vinyl chloride	5	Ppb	deep
	trans-1,2-dichloroethylene	2	Ppb	
	cis-1,2-dicholoethylene	72	Ppb	
	trichloroethylene	3	Ppb	
	tetrachloroethylene	7	Ppb	
MW-5S	vinyl chloride	9	Ppb	shallow
	cis-1,2-dicholoethylene	160	Ppb	
	trichloroethylene	150	Ppb	
	tetrachloroethylene	2800	Ppb	
MW-5D	cis-1,2-dicholoethylene	2	Ppb	deep
MW-7D	cis-1,2-dicholoethylene	30	Ppb	deep
MW-8S	cis-1,2-dicholoethylene	4	Ppb	shallow
MW-14	cis-1,2-dicholoethylene	2100	Ppb	shallow
	trichloroethylene	810	Ppb	
	tetrachloroethylene	36000	Ppb	
MW-4S	vinyl chloride	27	Ppb	Not reported
	trans-1,2-dichloroethylene	2	Ppb	
	cis-1,2-dicholoethylene	170	Ppb	
	trichloroethylene	120	Ppb	
	tetrachloroethylene	5100	Ppb	

+ Highest concentration of each contaminant shaded.

Table 3. Well Sampling Results					
Monitoring Wells+					
		Concentration (ppb)			
Well ID	**Contaminant**	**1995**	**1999**	**2003**	**Aquifer (sceen depth)**
MW-1S	1,1,1-trichloroethane	ND		9	shallow (9.3-16.3)
	tetrachloroethylene	ND		3	
MW-3S	trans-1,2-dichloroethylene	ND		2	Shallow (13.4–18.1)
	cis-1,2-dicholoethylene	260		250	
	trichloroethylene	66		130	
	tetrachloroethylene	86		460	
MW-4S[1]	vinyl chloride	ND		27	Shallow (6.3-14.3)
	trans-1,2-dichloroethylene	ND		2	
	cis-1,2-dicholoethylene	67		170	
	trichloroethylene	16		120	
	tetrachloroethylene	280		5100	
MW-5S	vinyl chloride		4.6	9	Shallow (6-13)
	cis-1,2-dicholoethylene			160	
	trichloroethylene			150	
	tetrachloroethylene	7.3		2800	
MW-8S	cis-1,2-dicholoethylene			4	Shallow
MW-4.1	cis-1,2-dicholoethylene	NA	66.9	NS	
	trichloroethylene	NA	57.1	NS	
	tetrachloroethylene	NA	872	NS	
MW-14 (ESI MW-12)	cis-1,2-dicholoethylene	NA	2,590	2,100	Shallow (14.42)
	trichloroethylene	NA	ND	810	
	tetrachloroethylene	NA	47,400	36,000	
MW-4I	vinyl chloride	32	9.4	15	Intermediate (17.4-27.4)
	cis-1,2-dicholoethylene	64	39.7	42	
	trichloroethylene		5.3	9	
	tetrachloroethylene	240	103	92	
MW-3I	cis-1,2-dicholoethylene			1	Intermediate (24.4-34.4)
	tetrachloroethylene	25		7	
MW-3D	vinyl chloride	24		17	Deep (41-61)
	1,1-dichloroethylene			2	
	trans-1,2-dichloroethylene			7	
	cis-1,2-dicholoethylene	430	388	530	
	trichloroethylene	540	232	750	
	tetrachloroethylene	5,800	1,210	6,200	
MW-4D	vinyl chloride			5	Deep(34.3-54.3)
	trans-1,2-dichloroethylene			2	
	cis-1,2-dicholoethylene			72	
	trichloroethylene	16		3	
	tetrachloroethylene	200		7	
MW-5D	cis-1,2-dicholoethylene	8.0		2	Deep
	tetrachloroethylene	0.9		ND	
MW-7D	cis-1,2-dicholoethylene			30	Deep

[1]duplicate sample results from MW-4S
ND – Chemical Not Detected

FIGURE 1. COPLEY SQUARE PLAZA LOCATION

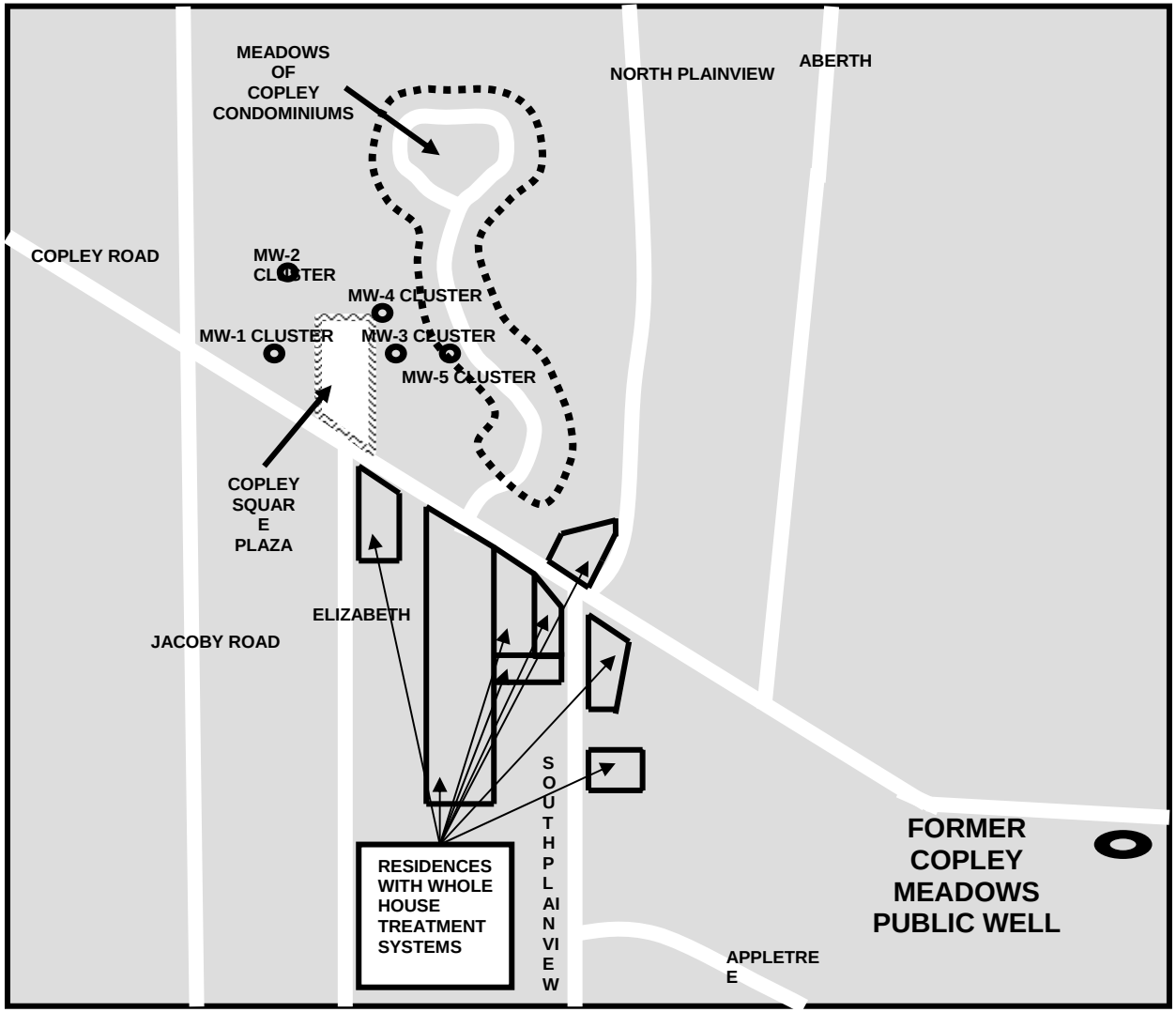

FIGURE 2 COPLEY SQUARE PLAZA MONITORING WELL LOCATIONS & RESIDENCES WITH WHOLE HOUSE TREATMENT SYSTEMS

CERTIFICATION

This **Copley Square Plaza** Health Assessment was prepared by the Ohio Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures. Editorial review was completed by the cooperative agreement partner.

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

Team Leader, CAPEB, DHAC, ATSDR