Health Consultation

Surface Water Data Review

CLIFTON PRECISION/LITTON SYSTEMS

MURPHY, CHEROKEE COUNTY, NORTH CAROLINA

EPA FACILITY ID: NCD044438406

NOVEMBER 30, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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

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

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Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

Statement of Issues

On November 15, 2007, the U.S. Environmental Protection Agency (EPA) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate current surface water data associated with the Clifton Precision/Litton Systems site (the site) in Murphy, Cherokee County, North Carolina. From August 1996 to August 2007, EPA collected and analyzed water samples from Slow Creek for volatile organic compounds (VOCs). Local community members may be exposed to VOCs in Slow Creek during recreational activities, such as wading or swimming. Indirect exposure could occur by consuming beef or milk from cows that drink water from the creek or by consuming fish from the creek. EPA asked ATSDR *to provide a public health evaluation of the VOC levels detected in Slow Creek.*

Background

The site began operations in 1967 as Clifton Precision, under the ownership of Litton Industries. Clifton Precision manufactured small electric rotary components and motors. The operations resulted in releases of VOCs, such as trichloroethylene (TCE), to shallow groundwater from an underground storage tank and from a percolation pit. The shallow groundwater table recharges water to Slow Creek on the north side of the facility. The creek has been sampled biannually for VOCs since 1996. The sampling was performed both upstream and downstream of the site (see Attachment B, Figure 1).

Litton Industries has four recovery wells extracting and treating the groundwater by a process known as air stripping. Two of the recovery wells are along the SE bank of Slow Creek (on the facility's property). The other two recovery wells are located in the area with the greatest concentration of VOCs on the facility property. Unfortunately, the system is not functioning at the desired effectiveness, and improvements are under consideration.

Data Quality and Limitations

ATSDR's analyses, conclusions, and recommendations are valid only if the data are complete and reliable. EPA provided surface water data to ATDSR in electronic form [EPA 2007]. Although ATSDR staff did not receive or review quality assurance/quality control (QA/QC) information, EPA indicated that the sampling data did receive a QA/QC review. As such, ATSDR considers these data adequate for public health evaluation purposes.

Discussion

The mission of ATSDR 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 disease related to toxic substances. In general, ATSDR considers reducing or minimizing exposures to hazardous chemical contaminants a prudent public health measure. For further information regarding the agency, please visit ATSDR's web site at http://www.atsdr.cdc.gov/.

ATSDR provides site-specific public health recommendations based on available toxicological literature, levels of environmental contaminants detected at a site compared to accepted comparison values, an evaluation of potential exposure pathways, and the characteristics of the exposed population. Whether a person will be harmed by exposure to hazardous substances

depends upon several factors, including the type and amount of the contaminant, the manner in which the person was exposed, the duration of the exposure, the amount of the contaminant absorbed by the body, genetic factors, and individual lifestyle factors.

ATSDR's approach to evaluating a potential health concern has two components. The first component involves a screening process that could indicate the need for further analysis of selected contaminants. The second component involves a weight-of-evidence approach that integrates estimates of likely exposure with information about the toxicology and epidemiology of the substances of interest.

Screening is a process of comparing appropriate environmental concentrations and doses to ATSDR or EPA comparison values. These comparison values (CVs) include but are not limited to

- ATSDR's Environmental Media Evaluation Guides (EMEGs),
- ATSDR's Reference Dose Media Evaluation Guides (RMEGs),
- ATSDR's Minimum Risk Levels (MRLs),
- ATSDR's Cancer Risk Evaluation Guidelines (CREGs), and
- EPA's Maximum Contaminant Levels (MCLs).

These CVs and health guidelines, as well as all other health-based screening criteria, represent conservative levels of safety; they are not thresholds of toxicity. Although concentrations at or below a CV may reasonably be considered safe, concentrations above a CV will not necessarily be harmful. To ensure that they will protect even the most sensitive populations (such as children or the elderly), CVs are lower by as much as two to three orders of magnitude than the corresponding no-observed-adverse-effect-levels (NOAELs) or lowest-observed-adverse-effect-levels (LOAELs) on which the CVs were based. When a level is above a comparison value, it does not mean that health effects will occur—it does, however, represent a point at which further evaluation is warranted. After identifying potential chemicals of concern through the screening process, ATSDR evaluates the potential for health effects to occur depending on the contaminant and site-specific exposure conditions.

For this site, the creek monitoring points (CMPs) shown in Figure 1 (Attachment B) are labeled CMP-1, CMP-2, CMP-3 and CMP-4. CMP-1 is upstream of the site and CMP-2 is adjacent to the site. Both CMP-3, which is located at the northwest corner of the site, and CMP-4, which is located approximately 150 feet west of the site, are downstream. Historical VOC sampling results from CMP-3 and CMP-4 are provided in Table 1 (Attachment A). Because the data from CMP-1 and CMP-2 were typically below detection limits, ATSDR did not include those results in the table. Table 2 (Attachment A) provides each chemical's respective CVs. Drinking water CVs were used as conservative screening values in the absence of surface water screening values.

Slow Creek may be used for wading and swimming by children and adults in the warmer months. Direct exposures during wading and swimming, such as dermal contact, inhalation of vapors, and incidental ingestion, are expected to be short–term and sporadic.

Slow Creek is used as a source of water for farm animals such as cows and horses, which could result in an indirect exposure if people drink the milk or eat the meat. Limited fishing also cannot

be ruled out as a potential indirect exposure pathway for this small creek if the fish are consumed.

The chemicals 1,1-dichloroethene, 1,2-dichlorethene, tetrachloroethene, and 1,1,1-trichloroethane were all detected below health-based drinking water CVs. Therefore, direct exposures to these chemicals are not expected to result in harmful health effects. Indirect exposures from eating fish, beef and dairy products are expected to be minor and below levels of health concern. The following text outlines ATSDR's public health evaluation of TCE, which is the only chemical to exceed its CV.

Trichloroethene

Trichloroethene (TCE) is a nonflammable, colorless liquid at room temperature with a somewhat sweet odor and a sweet, burning taste. TCE enters your body when you breathe air or drink water containing it. It can also enter your body if you get it on your skin. If you breathe the chemical, about half the amount you breathe in will get into your bloodstream and organs. You will exhale the rest. If you drink TCE, most of it will be absorbed into your blood. If TCE comes in contact with your skin, some of it can enter your body, although not as easily as when you breathe or swallow it [ATSDR 1997].

Once in your blood, your liver changes much of the TCE into other chemicals. The majority of these breakdown products leave your body in the urine within a day. You will also quickly breathe out much of the TCE that is in your bloodstream. Some of the TCE or its breakdown products can be stored in body fat for a brief period, and thus may build up in your body if exposure continues [ATSDR 1997].

TCE was detected above its MCL of 5 µg/L at sampling locations CMP-3 and CMP-4 in Slow Creek, and the concentrations are plotted in Figure 2 (Attachment B). Since February 2005, TCE sampling in the creek at location CMP-3 shows levels below the MCL. However, the levels exceeded the MCL in all samples at this location prior to 2005. The maximum value of 54 micrograms/liter (ug/L) occurred in February 2002. Almost all of the TCE levels detected at location CMP-4 were below the levels detected at location CMP-3 for each sampling event prior to February 2005, confirming that the TCE likely evaporates rapidly in the flowing creek. Though the levels at location CMP-3 have decreased over the past few years, further downstream levels at location CMP-4 increased, which could be due to a change in the recharge pattern from the contaminated shallow plume.

Exposures to people swimming and wading in Slow Creek are not expected to result in noncancer or cancer health effects from past, current or future exposures, if future conditions do not worsen. The amounts of TCE expected to be accidentally swallowed during recreational activities are very low. The concentrations of TCE in air near the creek are expected to be quickly dispersed in outdoor air. Because TCE concentrations in air are expected to be low and the absorption of TCE into the body from inhalation is about 50%, the amount of TCE entering the body by breathing vapors is expected to be negligible. Absorption through the skin is very limited and not expected to result in significant exposure.

Studies have shown that TCE has a low tendency to bioaccumulate in fish [ATSDR 1997]. Additionally, the EPA Water Quality Criteria for consumption of aquatic organisms based on human health is 30 µg/L [EPA 2006]. Samples only exceeded this level twice— during August 2001 (43 µg/L) and February 2002 (54µg/L). Since it is unlikely that subsistence levels of fish

consumption occur from this small creek, even these maximum past exposures are not expected to have caused harmful health effects.

ATSDR literature searches did not reveal any studies of TCE concentrations in cows' tissues or milk after the cows consumed water containing TCE. In people, TCE is rapidly and completely absorbed and distributed following ingestion, and storage is limited by rapid metabolism and excretion. Although there are no data, one would not expect concentrations in the parts per billion range (another way of expressing units in µg/L) in the cows' drinking water to be transferred to their milk, especially not at elevated levels. A cow's stomach consists of four chambers saturated with microflora such as protozoa and bacteria. Such microflora provide ample opportunity for metabolism prior to absorption of these chemicals into the cow's bloodstream, tissues and milk used for drinking and other dairy products [ATSDR 2001].

Child Health Considerations

Children could be at greater risk than adults are after certain kinds of exposure to hazardous substances. A child's lower body weight results in a greater dose of hazardous substance per unit of body weight. Children also are more active and have higher heart and respiratory rates, causing them to have higher peak and mean exposures. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Based on the Slow Creek sampling data, ATSDR considers that exposures to VOC-contaminated surface water would not be likely to result in harmful health effects in children.

Conclusions

EPA asked ATSDR *to provide a public health evaluation of the VOC levels detected in Slow Creek surface water in Murphy, North Carolina*. The chemicals 1,1-dichloroethene, 1,2-dichlorethene, tetrachloroethene, and 1,1,1-trichloroethane were all detected below health-based screening values. Therefore, exposures to these chemicals are not expected to result in harmful health effects.

TCE was the only VOC detected above screening levels downstream of the site. Based on the sampling data and the expected exposures, ATSDR concludes that exposures to the TCE levels in Slow Creek are unlikely to result in any adverse health effects in area residents. Though the TCE levels in the creek were above acceptable drinking water concentrations, this creek is not considered a primary drinking water source for area residents, workers or recreators. Exposures from breathing and swallowing TCE and absorbing TCE through the skin from the creek water during swimming or wading are expected to be negligible. Thus, no health effects are expected from these exposures. Additionally, consumption of fish from the stream and beef and milk from cows that drank from the stream are not expected to cause health effects, because TCE bioaccumulation is expected to be insignificant in these animals.

Overall, ATSDR categorizes exposures to the VOC levels detected in Slow Creek as presenting no apparent public health hazard. However, ATSDR considers reducing or minimizing exposures to hazardous chemical contaminants a prudent public health measure.

Recommendations

1. Monitoring of the surface water in Slow Creek should continue to ensure that VOC concentrations in the creek do not increase markedly over time.
2. Consider improvements to the groundwater treatment system to minimize TCE recharge to Slow Creek.

Public Health Action Plan

The purpose of the public health action plan is to ensure that this evaluation not only identifies potential and ongoing 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. ATSDR will mail this health consultation to the appropriate personnel at EPA to ensure that they are aware of ATSDR's public health conclusions and recommendations.

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References

[ATSDR] Agency for Toxic Substances and Disease Registry. 1997. Toxicological profile for trichloroethylene (update). Atlanta: US Department of Health and Human Services.

[ATSDR] Agency for Toxic Substances and Disease Registry. 2001. Health Consultation: Union Springs Groundwater Contamination, Springport, Cayuga County, New York. January 18, 2001. Atlanta: US Department of Health and Human Services.

[EPA] Environmental Protection Agency. 2006. National Recommended Water Quality Criteria. Office of Water. Office of Science and Technology. Available at: http://www.epa.gov/waterscience/criteria/wqcriteria.html#C. Accessed November 2007.

[EPA] Environmental Protection Agency. 2007. November 15 email containing attachments from John E. Johnston, Corrective Action Section, Restoration and Underground Storage Tank Branch RCRA Division USEPA Region 4, to ATSDR Strike Team.

Attachment A. Table 1 - Summary of Surface Water Data, August 1996 - August 2007. Clifton Precision/Litton System, Murphy, NC

Date	CMP-3					CMP-4				
	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE	1,1-DCE	1,2-DCE	PCE	1,1,1-TCA	TCE
Aug-1996	1.4	4.8	<5	2.1	**29**	NS	NS	NS	NS	NS
Feb-1997	0.81	2.1	<1	2.4	**19**	<5	1.4	<5	2.2	**12**
May-1997	1.3	4.1	<5	2.1	**20**	1	1.9	<5	1.7	**11**
Nov-1997	<5	<5	<5	<5	**25**	<5	<5	<5	<5	**24**
Mar-1998	<5	<5	<5	<5	**10**	<5	<5	<5	<5	**9.8**
Aug19-98	<5	<5	<5	<5	**5.7**	<5	<5	<5	<5	**7.1**
Mar-1999	1.3	2.5	<1	2.6	**17**	<1	<2	<1	1.3	**7.6**
Aug-1999	1.6	4.2	<1	<1	**22**	1.4	3.1	<1	2.8	**17**
Feb-2000	1.6	3.1	1.2	3.6	**22**	1.1	1.6	1.1	1.8	**11**
Aug-2000	1.4	4.2	1	3.1	**19**	<1	2.2	<1	1.7	**10**
Feb-2001	1.1	2.3	<1	2.7	**20**	<1	<1	<1	1.2	**8.8**
Aug-2001	3.4	7.7	1.7	6.1	**43**	1.4	1.4	<1	2.2	**13**
Feb-2002	3.1	9	2.4	5.6	**54**	<1	1.9	<1	1.3	**12**
Aug-2002	1.1	3.3	<1	1.8	**21**	<1	2.5	<1	1.2	**14**
Feb-2003	1.5	4.3	1	2	**26**	<1	<1	<1	<1	**6.4**
Aug-2003	<1.0	9.4	<1.0	1.1	**18**	<1.0	1.6	<1.0	<1.0	**9.0**
Feb-2004	1.0	1.8	<1.0	1.6	**23**	<1.0	<1.0	<1.0	<1.0	**9.9**
Aug-2004	<1.0	1.0	<1.0	<1.0	**8.4**	<1.0	1.4	<1.0	1.0	**14**
Feb-2005	<1	<1	<1	<1	<1	<1	<1	<1	<1	4.3
Aug-2005	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Feb-2006	<1	<1	<1	<1	1.7	0.46J	0.85J	0.28J	0.52J	**8.6**
Aug-2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.8
Mar-2007	<1	<1	<1	<1	0.34J	0.55J	1.2	0.42J	0.53J	**12**
Aug-2007	<1	<1	<1	<1	<1	0.86J	1.7	0.57J	0.78J	**16**

Notes:
Bolded values indicate detections above the drinking water standard.
All concentrations are in units of μg/L.

DCE Dichloroethene
PCE Tetrachloroethene
TCA Trichloroethane
TCE Trichlorothene
J estimated value, result is below the reporting limit
< less than the reporting limit shown
μg/L micrograms per liter

Attachment A. Table 2 – Drinking Water Comparison Values

Chemical	CV	Type of CV	CV	Type of CV	CV	Type of CV
1,1-Dichloroethene	90	i-EMEG (child)	300	i-EMEG (adult)	7	MCL
cis-1,2-dichloroethene	3,000	c-EMEG (child)	10,000	c-EMEG (adult)	70	MCL
1,1,1-Trichloroethane	200,000	i-EMEG (child)	700,000	i-EMEG (adult)	200	MCL
Tetrachloroethene	100	RMEG (child)	400	RMEG (adult)	5	MCL
Trichloroethylene	NA	NA	NA	NA	5	MCL

Notes:

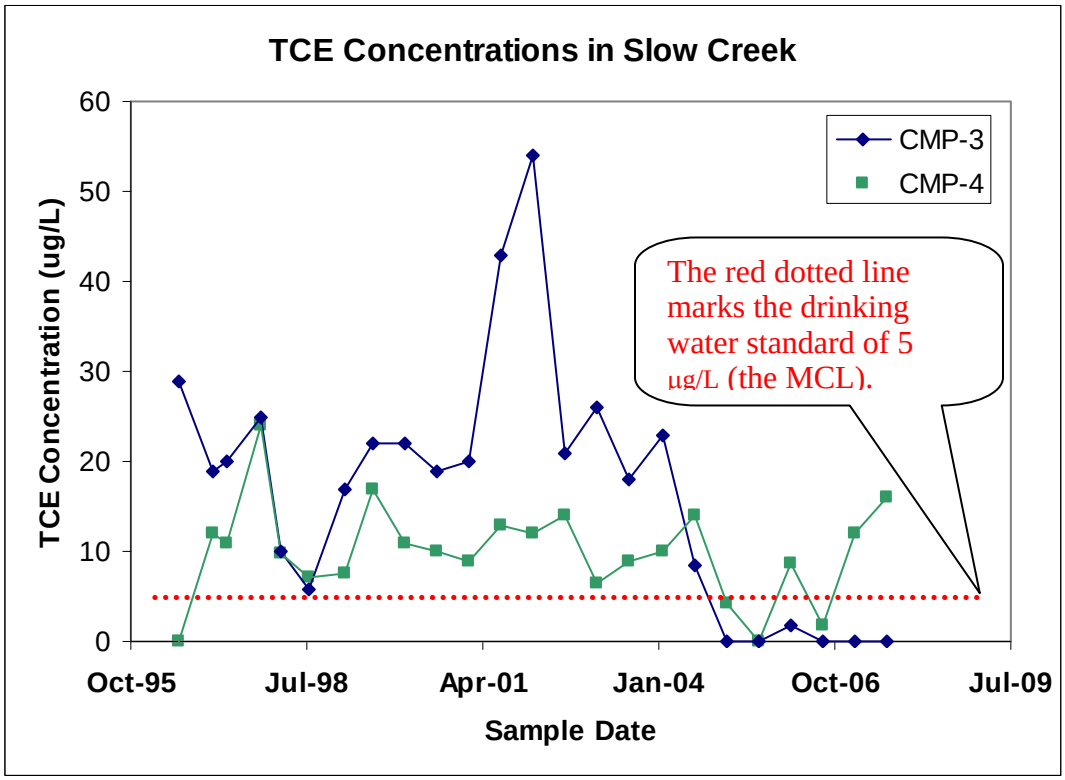
All concentrations are in units of μg/L.

CV	comparison value
NA	not available
i-EMEG	ATSDR's Intermediate Environmental Media Evaluation Guide
c-EMEG	ATSDR's Chronic Environmental Media Evaluation Guide
MCL	EPA's Maximum Contamination Level
RMEG	ATSDR's Reference Dose Media Evaluation Guide
μg/L	micrograms per liter

Attachment B. Figure 1 - Location Map

* Image from reference EPA 2007.

Attachment B. Figure 2 - TCE Concentrations in Slow Creek



MCL EPA's Maximum Contamination Level
TCE Trichlorothene
µg/L micrograms per liter