

Health Consultation

Sub-Slab Gas and Air Sampling Data

Alcoa – Davenport Works

CERCLIS No. IAD005270160

Riverdale, Scott County, Iowa

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Prepared by:
Iowa Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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Purpose

The U.S. Environmental Protection Agency (EPA), the Alcoa – Davenport Works Facility (Alcoa), and concerned citizens and community leaders of Riverdale, Iowa requested the Iowa Department of Public Health (IDPH) Hazardous Waste Site Health Assessment Program to evaluate the health impacts of exposures to volatile organic vapors detected within residences located immediately to the west of the Alcoa property. This health consultation addresses inhalation exposure to individuals that may have occupied the currently vacant residences in which the air sampling was completed.

Background

The U.S. Environmental Protection Agency (EPA) has been working in cooperation with Alcoa to evaluate the subsurface migration of volatile organic chemicals (VOCs) that potentially originated from the Alcoa property. This evaluation of VOCs from below ground is a part of the on-going investigation surrounding the release of VOCs during previous activities at Alcoa. The evaluation of subsurface VOCs was initiated by the completion of soil-gas sampling beneath basement slabs in two homes on South Bellingham Road (226 and 240 S. Bellingham Road), located immediately to the west of the Alcoa property. Alcoa currently owns these two houses. These two houses were not occupied at the time of the sampling. Figure 1 shows the location of these homes and the Alcoa property.

Sub-slab Sampling and Air Quality Sampling

In July 2004, sampling of soil-gas from beneath basement slabs in the two homes on South Bellingham Road was completed. The sub-slab gas samples were collected in stainless steel Summa canisters over a 24-hour period and subsequently analyzed for VOCs, including: cis-1,2-dichloroethene (DCE), trans-1,2-dichloroethene (DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride. In addition to the sub-slab sampling, an ambient air sample was also obtained from the front porch of the residence located at 226 S. Bellingham Road and analyzed for VOCs. Table 1 is a summary of the analytical results from the July 2004 sampling event.

Table 1 – July 2004 Sub-slab and Ambient Air Sampling Event Results (1)

Location	226 S. Bellingham			240 S. Bellingham		
	Front Porch ($\mu\text{g}/\text{m}^3$)	Subslab ($\mu\text{g}/\text{m}^3$)	Subslab ¹ ($\mu\text{g}/\text{m}^3$)	Subslab ¹ ($\mu\text{g}/\text{m}^3$)	Subslab ($\mu\text{g}/\text{m}^3$)	Subslab ($\mu\text{g}/\text{m}^3$)
cis-1,2-DCE	0.011J	<0.056	<0.056	0.013J	<0.056	0.23
trans-1,2-DCE	<0.056	<0.056	<0.056	<0.056	<0.056	0.074
PCE	1.1	7.4	6.9	7.1	160	710
TCE	0.17	4.2	0.037	0.16	0.27	34
Vinyl chloride	0.043	<0.02	<0.02	<0.02	<0.02	<0.02

¹ Samples are a duplicate pair.

J means the reported result is an estimate.

Since VOCs were detected in the sub-slab soil gas samples it was felt that sampling air within the residences located at 226 and 240 S. Bellingham Road was warranted in an attempt to estimate exposure within the residences.

In September 2004, additional outdoor and indoor air monitoring was completed at the residences located at 226 and 240 S. Bellingham Road. Air monitoring was conducted on the front porch, in the living room, on the basement steps, and in the sump within the basement at each residence. Tables 2 and 3 summarize the analytical results from the September 2004 sampling event.

Table 2 – September 2004 Air Sampling Event Results for 226 S. Bellingham Road (1)

Location	Front Porch ($\mu\text{g}/\text{m}^3$)		Living Room ($\mu\text{g}/\text{m}^3$)		Basement Stairs ($\mu\text{g}/\text{m}^3$)		Sump ($\mu\text{g}/\text{m}^3$)	
	Alcoa	EPA	Alcoa	EPA	Alcoa	EPA	Alcoa	EPA ¹
cis-1,2-DCE	<0.056	1.1U	0.77	1.2U	0.11	1.1U	0.072	-
trans-1,2-DCE	<0.056	1.3UJ	<0.056	1.4UJ	<0.056	1.3UJ	<0.056	-
PCE	0.2	5.1	3.0	4.5	0.7	2.9	0.7	-
TCE	0.034	3.0	0.65	2.0	0.13	1.3U	0.094	-
Vinyl chloride	<0.02	0.69U	0.077	0.73U	0.014J	0.69U	0.0067J	-

Sample analysis was completed by Alcoa and EPA using different laboratories and different analytical techniques.

¹EPA did not collect a sample at this location.

U means the analyte was not detected at or above the reporting limit.

J means the reported result is an estimate.

UJ means the analyte was not detected at or above the reporting limit (the reporting limit is an estimate).

Table 3 – September 2004 Air Sampling Event Results for 240 S. Bellingham Road (1)

Location	Front Porch ($\mu\text{g}/\text{m}^3$)		Living Room ($\mu\text{g}/\text{m}^3$)		Basement Stairs ¹ ($\mu\text{g}/\text{m}^3$)		Basement Stairs ¹ ($\mu\text{g}/\text{m}^3$)		Sump ($\mu\text{g}/\text{m}^3$)	
	Alcoa	EPA ²	Alcoa	EPA	Alcoa	EPA	Alcoa	EPA ²	Alcoa	EPA
cis-1,2-DCE	<0.056	-	0.26	1.1U	0.13	1.1U	0.12	-	0.11	1.2U
trans-1,2-DCE	<0.056	-	<0.056	1.3UJ	<0.056	1.4UJ	<0.056	-	<0.056	1.4UJ
PCE	0.19	-	8.4	9.5	4.5	5.9	4.6	-	4.7	6.0
TCE	0.034	-	0.25	1.8	0.14	1.3U	0.14	-	0.15	1.7
Vinyl chloride	<0.02	-	0.04	0.69U	0.019J	0.71U	0.019J	-	0.017J	0.75U

Sample analysis was completed by Alcoa and EPA using different laboratories and different analytical techniques.

¹Samples are a duplicate pair.

²EPA did not collect a sample at this location.

U means the analyte was not detected at or above the reporting limit.

J means the reported result is an estimate.

UJ means the analyte was not detected at or above the reporting limit (the reporting limit is an estimate).

Contaminants of Concern

The contaminants of concern at the site further discussed in this health consultation are the volatile organic chemicals (VOCs) detected within the sampled outdoor and indoor air. These

VOCs are cis-1,2- DCE, trans-1,2- DCE, PCE, TCE, and vinyl chloride. This health consultation only considers inhalation exposure to these chemicals.

Discussion

Inhalation Exposure To VOCs

People that previously lived at the residences located a 226 and 240 S. Bellingham Road may have been exposed in the past to VOCs at the same concentrations that were detected in the outdoor air and indoor air during the September 2004 sampling event. The September 2004 sampling event is a one-time snapshot of VOC levels in outdoor and indoor air. Seasonal variations, including rainfall, depth to groundwater, wind, and temperature, are expected to produce different VOC levels in outdoor and indoor air. This health consultation evaluates the potential health effects from inhalation exposure based on the highest levels detected during September 2004 sampling event (Table 4).

Table 4 – Highest Level of Chemicals of Concern Detected in September 2004 Air Samples

Chemical of Concern	Highest Detected Level ($\mu\text{g}/\text{m}^3$)	Location of Sample
cis-1,2-DCE	0.77	Living Room
trans-1,2-DCE	not detected	All Sample Locations
PCE	9.5	Living Room
TCE	3.0	Front Porch
Vinyl chloride	0.077	Living Room

Toxicological Evaluation

The following information is a toxicological evaluation for inhalation exposure to the chemicals of concern at the highest levels detected during the September 2004 sampling event. This toxicological evaluation compares exposure levels to the following comparison values: Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs), the EPA Chronic Inhalation Reference Concentration (RfC), and the level of exposure that translates to a one-in-ten-thousand (10^{-4}) increased risk of cancer utilizing an EPA provisional unit risk estimate. A one-in ten-thousand increased risk of cancer is considered acceptable by EPA.

Minimum Risk Levels

Minimum risk levels (MRLs) are established by the Agency for Toxic Substances and Disease Registry (ATSDR). The MRL is defined as, “an estimate of daily exposure to a human being to a chemical that is likely to be without an appreciable risk of deleterious effects (non-carcinogenic) over a specified period of time (2).” MRLs are based upon human and animal

studies, include several safety factors, and are reported for acute exposure (≤ 14 days), intermediate exposure (15 – 364 days), and chronic exposure (≥ 365 days). Table 5 includes inhalation MRLs that have been developed for the chemicals of concern:

Table 5 – Inhalation MRLs for Chemicals of Concern (3, 4, 5, 6)

Chemical	Acute MRL ($\mu\text{g}/\text{m}^3$)	Intermediate MRL ($\mu\text{g}/\text{m}^3$)	Chronic MRL ($\mu\text{g}/\text{m}^3$)
cis-1,2-DCE	790	790	No MRL
PCE	1,400	No MRL	270
TCE	10,900	550	No MRL
Vinyl chloride	1,300	78	No MRL

Chronic Inhalation Reference Concentration

The EPA chronic inhalation RfC is defined as “an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime (7).” The chronic inhalation RfCs are based upon human and animal studies, include safety factors, and are reported for lifetime exposures. Table 6 includes RfCs that have been developed for the chemicals of concern:

Table 6 – RfCs for Chemicals of Concern (8, 9, 10)

Chemical	RfC ($\mu\text{g}/\text{m}^3$)
cis-1,2-DCE	Not Available
PCE	400
TCE	40
Vinyl chloride	100

Increased Risk of Cancer

EPA has developed unit risk factors for evaluating increased risk of cancer from a lifetime of exposure to certain chemicals. The unit risk is defined as “the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent at a concentration of 1 $\mu\text{g}/\text{L}$ in water, or 1 $\mu\text{g}/\text{m}^3$ in air (3).” The interpretation of unit risk would be as follows: if unit risk = $1.5 \times 10^{-6} \mu\text{g}/\text{m}^3$, 1.5 excess tumors are expected to develop per 1,000,000 people if exposed daily for a lifetime to 1 μg of the chemical in 1 cubic meter of air. Table 7 includes unit risks and provisional unit risks that have been developed for chemicals of concern and the

concentration in air that would equate to an excess cancer incidence risk of one-in-ten-thousand. A provisional unit risk is a unit risk that has not received EPA agency-wide review.

Table 7 – Unit Risks and Concentration Equating to 10⁻⁴ Cancer Risk

Chemical	Unit Risk (µg/m ³) ⁻¹ (11, 12, 13)	10 ⁻⁴ Cancer Risk (µg/m ³)
cis-1,2-DCE	Not Available	Not Determined
PCE	5.9 x 10 ⁻⁶ ⁽¹⁾	17
TCE	1.7 x 10 ⁻⁶ ⁽¹⁾	60
Vinyl chloride	8.8 x 10 ⁻⁶	10

¹ Provisional Unit Risk

Evaluation of Highest Inhalation Exposure Levels

For all chemicals, the highest levels detected in September 2004 (Table 4) are below the health effect levels included in Tables 5 through 7. The health effect levels shown in Tables 5 -7 consider both cancer and non-cancer end points. The conclusion of the toxicological evaluation is that individuals exposed to the levels of chemicals detected during September 2004 would not be expected to have adverse health effects, even if exposed at that level over a lifetime (70 years).

Children’s Health Concerns

Children have unique vulnerabilities to some environmental chemicals. IDPH’s Hazardous Waste Site Health Assessment Program evaluated the potential impact of the chemicals of concern detected in September 2004 on children’s health. The levels of the chemicals of concern were below published comparison values. These comparison values are considered protective, even to the most sensitive individuals including children. It is concluded that children’s health would not be negatively impacted by the presence of these chemicals at the levels detected within the air samples.

Community Health Concerns

Some current and former residents of the homes located along S. Bellingham Road have concerns after learning that volatile organic chemicals were detected in sub-slab gas and indoor air samples in two homes along S. Bellingham Road. One former resident has expressed concerns because she was living in one of the homes when she was pregnant. She and her young child lived there for several years after the baby was born.

Past and current inhalation exposure to volatile organic chemicals at these homes may be similar to the levels detected during the September 2004 sampling event. Seasonal variations, such as temperature, wind, and groundwater elevation, and varying VOC levels may have produced

outdoor and indoor VOC levels. Definitive conclusions cannot be made regarding previous exposures to VOCs in indoor and outdoor air at any of the homes located on S. Bellingham Road from the samples collected in September 2004.

Conclusions

From the air monitoring data collected during the September 2004 sampling event, it is concluded that:

- Exposure to the outdoor and indoor levels of VOCs detected during September 2004 is not likely to impact human health.
- VOCs that migrated underground from the Alcoa-Davenport Works plant and were detected during September 2004 do not pose a public health hazard at 226 and 240 S. Bellingham Road from inhalation exposures.

Public Health Action Plan

- IDPH will present the results of this consultation at a public meeting in Riverdale.
- IDPH will provide assistance with community health education as needed and requested.
- IDPH will continue to review monitoring data provided by EPA and/or Alcoa and update health recommendations as necessary.
- IDPH will continue to address and evaluate community concerns.

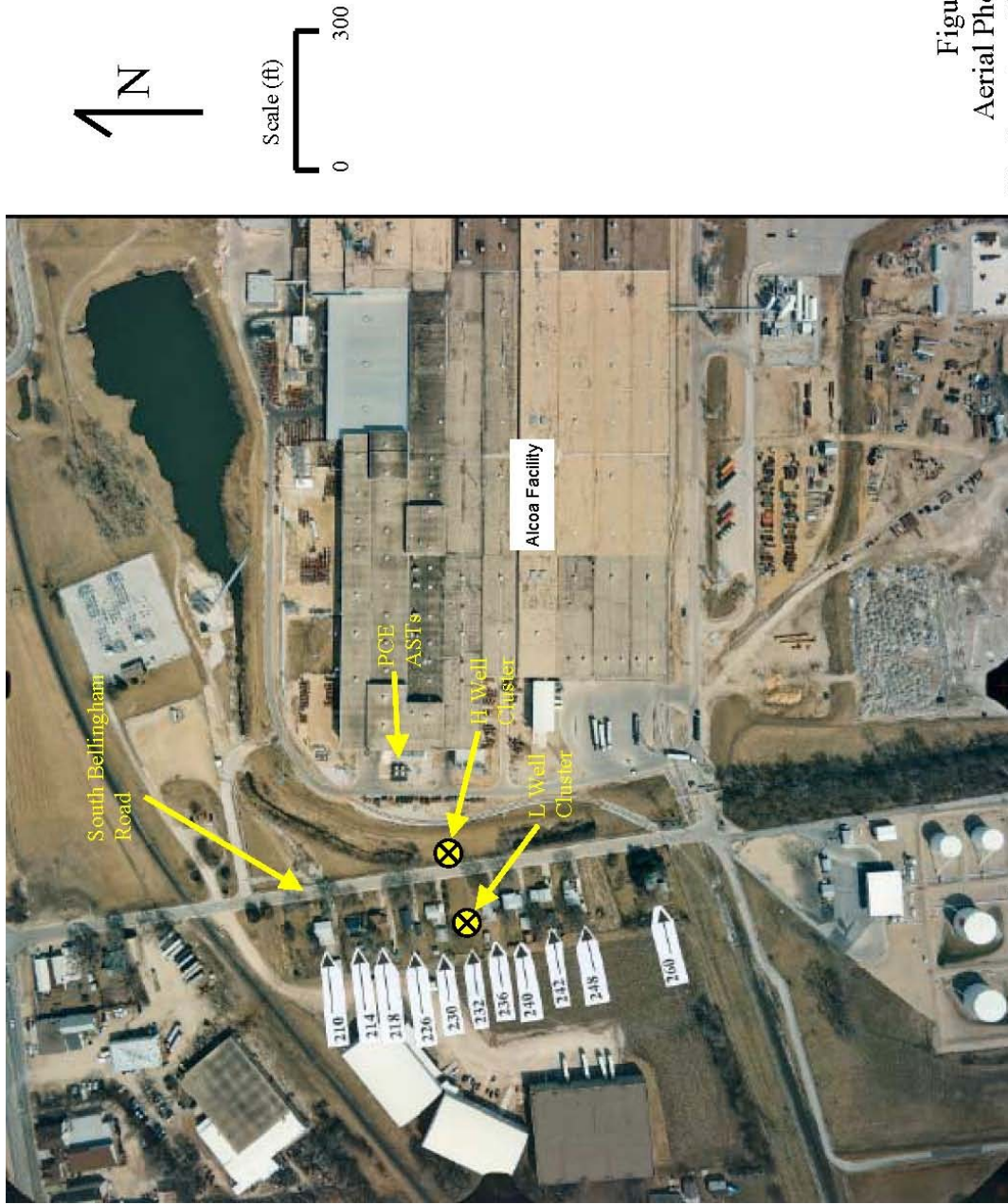


Figure 1
Aerial Photograph of
Northwestern Facility Boundary
Alcoa-Davenport Works

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CERTIFICATION

The Iowa Department of Public Health, Hazardous Waste Site Health Assessment Program, has prepared this health consultation evaluating the sub-slab gas and air sampling data near the Alcoa – Davenport Works site under a Cooperative Agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). This document was completed in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.

Technical Project Officer, SPS, SSAB, DHAC, ATSDR

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

Chief, SPS, SSAB, DHAC, ATSDR