Health Consultation

A & L SALVAGE C&DD LANDFILL
(PRIVATE WELLS)

LISBON, COLUMBIANA COUNTY, OHIO

EPA FACILITY ID: OHN000510257

JANUARY 22, 2009

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

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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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HEALTH CONSULTATION

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LISBON, COLUMBIANA COUNTY, OHIO

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Prepared By:

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

BACKGROUND AND STATEMENT OF ISSUES

Site Location and Description

The A & L Salvage Construction & Demolition Debris (C&DD) Landfill is located at 11225 State Route 45, Columbiana County, Ohio. The A & L Salvage C&DD Landfill is in a largely rural portion of Elk Run Township, just west of State Route 45, two miles south-southeast of Lisbon, Ohio in Columbiana County (Figure 1). The current landfill facility is located at the site of a former strip-mining operation on a bedrock hill on the west bank of Patterson Creek, a southeast-flowing tributary to the West Fork of Little Beaver Creek. The majority of residents in the area live along State Route 45, immediately east of the landfill site. Additional homes are scattered along Black and De Sellem Roads, in more rural areas west and south of the landfill (Figure 1).

The facility has had a number of violations, including: hydrogen sulfide odors and dust migrating off site, acceptance and disposal of pulverized debris and solid waste, improper handling and dispersal of asbestos outside the disposal area, and failure to properly cover disposed waste. Numerous complaints regarding nuisance odor issues from hydrogen sulfide gas released from the site coupled with numerous operating violations caused the Director of Ohio EPA to deny an operating permit for the landfill on October 16, 2007, effectively closing the facility (OEPA 2007).

HAS/ATSDR Involvement

At a public meeting held in Lisbon on September 17, 2007, residents expressed concerns about the safety of their drinking water to the Ohio EPA and the Ohio Department of Health (ODH) and requested that their drinking water wells be tested. The citizens felt that waste disposal operations at the landfill had adversely impacted the quality of their drinking water wells in recent years. The Health Assessment Section (HAS), along with the Residential Water and Sewage Program within ODH's Bureau of Environmental Health (BEH), collaborated with the Ohio EPA regarding the request from residents to sample private drinking water wells in the immediate vicinity of the A & L Salvage C&DD Landfill, south of Lisbon, Ohio. The Residential Water and Sewage Program agreed to sample roughly a dozen private wells in the immediate vicinity of the landfill to determine the quality of the water in these wells and insure that the water supply was safe for residents' consumption.

Area Hydrogeology and Sources of Drinking Water

Most area residents get their drinking water from private wells that average 100-150 feet in depth and obtain their water from groundwater-bearing sandstone, shale, and limestone bedrock. On-site wells at the landfill may penetrate up to 60 feet of unconsolidated fill – mostly made up of coal mine spoils – prior to coming into contact with underlying bedrock (Ohio EPA 2008). Elsewhere in the area, the bedrock surface is separated from the ground surface by 10 to 12 feet of unconsolidated clay till (ODNR well logs). These same well logs indicate that all of these wells obtain their water from the bedrock rather than the overlying fill or glacial till. Shallow groundwater onsite flows to the east-southeast toward Patterson Creek (Ohio EPA 2008).

Groundwater yields from these private wells are variable, depending on the well, its depth, the formation penetrated, and its geographic location. Most wells yield from 6 to 15 gallons of water per minute with the highest yielding wells being drilled into sandstone aquifers that may yield up to 40 gallons per minute. Sampled wells on the landfill property (Ohio EPA 2008), area residential wells, and public water supply wells at the Lisbon well field (Ohio EPA Ambient Groundwater Monitoring Network), all obtain their water from the same general bedrock aquifer. The water quality of this aquifer is impacted by naturally occurring, elevated levels of some metals, especially iron and manganese. Due to color, taste, and possibly odor issues, treatment of some type is typically needed to be able to use this water as a drinking water supply and a source of potable water.

In 2006, a public water line was extended up State Route 45 to the landfill site and north to the Columbiana County Career Center, just south of Lisbon. This public water is obtained from Buckeye Water in Wellsville, on the north side of the Ohio River, about 12 miles south-southeast of the landfill. However, only a handful of area residents evidently have hooked up to this public water supply with most retaining their private wells as their drinking water source.

DISCUSSION

Potential Exposure Pathways

For the public to be exposed to chemical contaminants in and around the A & L Salvage site they must first come into contact with the contaminated groundwater, soils 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.

A **completed exposure pathway** consists of five main parts:

1. **A source of contamination**;
2. **Environmental transport**, which is a way for the chemical to move away from its source (soil, air, groundwater, surface water);
3. **A point of exposure**, which is a place where people come into physical contact with the chemical (on-site, off-site);
4. **A route of exposure**, which is how people come into physical contact with the chemical (breathing, drinking, eating, touching); and
5. **People who could be exposed**, which are the people who come into physical contact with site-related chemicals.

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 (dose).
- How long a person is exposed to the chemical (duration).
- How often a person is exposed to the chemical (frequency).

- The toxicity of the chemical of concern (how a chemical affects the body).

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

1. Past exposure
2. Smoking, drinking alcohol, or taking certain medications
3. Current health status, sensitivity to certain substances
4. Age
5. Family medical history

A completed exposure pathway from the site to private drinking water wells does not appear to exist. As indicated below, the chemicals detected in well water are not believed to be associated with A & L Salvage Landfill and are more likely due to local geological conditions.

Exposure Evaluation

Water samples were collected by Ohio EPA and ODH during November 19-20, 2007 to measure the water quality in area private wells. The testing was conducted as a part of an on-going multi-agency environmental investigation of operations at the A&L Salvage Landfill near Lisbon, Ohio. Residents who live in close proximity to the landfill expressed concerns that their private water wells were being impacted by A&L operations. Based upon these concerns, residents that owned a private well and lived within one mile of the landfill were asked to take part in the sampling. Ohio EPA asked ODH for their assistance in sampling the wells of area residents beginning on November 19, 2007.

A total of 12 homes/wells were tested. These included six homes along State Route 45 east of the landfill, three wells on De Sellem Road, two wells at Black Road, and one well on Cusick Road, all west and south of the site. Laboratory tests measured the water for 64 volatile organic compounds (VOCs), 24 metals, and basic water quality criteria including alkalinity, hardness, ammonia, chloride, nitrate and sulfate. Table 1 lists the results including metals, VOCs, and other parameters affecting general water quality.

Five of the wells sampled indicated elevated concentrations of iron and/or manganese which exceeded the U.S. EPA Secondary Maximum Contaminant Level or "SMCLs" for these metals. The SMCLs are not based on health-related criteria. The U.S. EPA established National Secondary Drinking Water Regulations as non-mandatory water quality standards for 15 contaminants to assist public water systems in managing their drinking water based on aesthetic considerations, such as taste, color and odor.

Two VOCs, chloroform and dichlorodifluoromethane, were detected in two separate residential wells at very low concentrations. The level of chloroform, a common byproduct of chlorine disinfection, was 1.28 parts per billion (ppb), well below the U.S. EPA drinking water standard of 80 ppb for total trihalomethanes (THM). Another well indicated the presence of dichlorodifluoromethane at 1.74 ppb. This concentration is much lower than the U.S. EPA Lifetime Health Advisory (HA) concentration of 1,000 ppb established for this chemical.

Dichlorodifluoromethane is a common refrigerant (Freon) and a propellant used in aerosol containers.

On January 25, 2008, ODH sent explanatory letters along with the sample results to the affected residents who had their wells tested in the Lisbon area.

Ohio EPA Division of Drinking and Groundwater (DDAGW) and HAS staff compared the analytical results from the residential wells to the results from the leachate, public water supply wells, and the on-site well and made the following observations:

- Several key indicator parameters, such as chloride, potassium and ammonia, were elevated in the leachate, but were either not detected or at very low concentrations in the residential well samples.

- Nine VOC's were detected in the leachate, which did not show up in any of the off-site residential well results.

- The residential wells were very similar in water quality to area public water supply wells using the same aquifer system, with the public wells having higher concentrations of various parameters than most of the residential wells sampled.

- When comparing the background wells to the downgradient wells, there did not appear to be any significant difference in water quality other than the expected natural variation from well to well due to the nature of the aquifer.

Based on those comparisons, Ohio EPA determined that the landfill did not appear to be impacting the quality of the area groundwater (Ohio EPA 2008). The data suggest that the water quality of the wells sampled by ODH and Ohio EPA was due more to local geological conditions and/or former strip mining activity than current landfilling operations at the A & L Salvage site.

Health Evaluation

Manganese

Manganese is a naturally-occurring metal in soils and rocks. In nature, manganese occurs as solid forming mixtures with oxygen, carbon, and silica. These manganese compounds are mined and refined to yield manganese metal primarily for use in the steel industry, but also as dietary supplements and as ingredients in ceramics, fertilizers, and pesticides. Some manganese compounds dissolve in water, and manganese is a common trace element in surface and underground waters. Manganese levels in groundwater in Ohio typically are less than 100 ppb. However, certain sandstone aquifers in eastern Ohio can have levels of naturally-occurring manganese up to 2,000 ppb, and sand and gravel aquifers along the Ohio River can have manganese levels in excess of 5,000 ppb (Ohio EPA, 2000).

There are no federal health-based standards established for manganese in drinking water. U.S. EPA has established a Secondary Maximum Contaminant Level (SMCL) for manganese in public water supplies of 50 ppb. This is not a health-based drinking water standard, but is it

based on aesthetic qualities: odor, taste, color and clarity. Elevated manganese levels can result in a disagreeable odor and a black coloration to the water. The U.S. Food and Drug Administration uses the same 50 ppb standard for manganese in bottled drinking water. Various states have established their own water quality standards for manganese in drinking water, ranging from 50 to 840 ppb (ATSDR, 2000). The U.S. EPA established a Lifetime Health Advisory (HA) value of 300 ppb for manganese in drinking water. The Lifetime HA is the concentration of a chemical in drinking water that is not expected to cause any adverse non-cancer health effects for a lifetime of exposure (U.S. EPA, 2006 Edition of the Drinking Water Standards and Health Advisories).

Manganese at low levels is essential for good health. It plays a role in bone mineralization, protein formation, metabolic regulation, and provides cells with protection from free radical species. Diets deficient in manganese can result in serious illness, leading to problems with blood clotting, skin disorders, and metabolic disorders, plus interfering with normal growth, bone formation, and reproduction (ATSDR, 2000). Central nervous system effects (tremors, loss of muscle control) have been associated with ingestion of drinking water with highly elevated levels of manganese (at or in excess of 14,000 ppb) in a study of a human population in Japan and in a second study of elderly individuals in Greece who were drinking water with manganese levels of 1,800 to 2,300 ppb. Other studies in Canada and Israel, however, indicated no correlation between increased incidence of CNS disorders and ingestion of drinking water with similarly high levels of manganese (ATSDR, 2000).

Manganese levels in the raw water obtained from the sandstone aquifer that is the source of drinking water for rural residents in Elk Run Township near the A & L Salvage site ranged from below the detection limit to 1,600 ppb. One well had manganese levels exceeding the 300 ppb Lifetime HA value for manganese in drinking water. It was strongly recommended that this individual use a cation-exchange water softener system or some other type of treatment to reduce the amount of manganese in water at the tap.

One of the 12 private wells had a manganese level exceeding the U.S. EPA Lifetime Health Advisory (HA) value of 300 ppb. The Lifetime HA is the concentration of a chemical in drinking water that is not expected to cause adverse health effects over a lifetime of exposure. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 liters of water per day.

Child Health Issues

Children can be at a greater risk of developing illness due to exposure to hazardous chemicals because of their smaller stature and developing body systems. Children are likely to breathe more air and consume more food and water per body weight than are adults. Children are also likely to have more opportunity to come into contact with environmental pollutants due to being closer to the ground surface and taking part in activities on the ground such as, crawling, sitting, and lying down on the ground.

Children need small amounts of manganese daily for growth and good health. Manganese is available to a mother's baby during pregnancy and is also found in a nursing mother's breast milk at levels that are appropriate for proper development. Children, as well as adults, who come

in constant contact with high levels of manganese and cannot remove the excess from their bodies, may develop nervous system problems.

CONCLUSIONS

ODH HAS concluded that the levels of metals, VOCs and other chemicals detected in area private well samples are likely not related to landfilling operations at the A & L Salvage Landfill site and pose **no apparent public health hazard** to residents. The concentration of manganese found in one well exceeded the U.S. EPA Lifetime Health Advisory drinking water value for this chemical. This would not be expected to cause adverse health effects unless the water was untreated and consumed for over a period of several decades or longer.

A 2007 Ohio EPA review of the groundwater quality in both public and private wells in the area indicates that the water quality of the wells sampled by ODH and Ohio EPA is likely due to local geological conditions and does not appear to be the result of operations at the landfill.

RECOMMENDATIONS

For six out of the 12 wells (50%) tested, HAS recommended the installation and operation of a cation-exchange water softener unit to reduce the levels of manganese, iron, and other trace metals detected in the water at the tap to improve water quality.

PUBLIC ACTION PLAN

The Public Health Action Plan for this site includes actions and activities that have already been taken to protect public health as well as actions that should be taken in the future.

1. ODH sent letters and sample results to the affected residents who had their private wells tested in the Lisbon area.

2. ODH recommended water treatment for six wells overall, including a strong recommendation for treatment of one well which had a high manganese level. Whether or not this advice is followed is voluntary on the part of the private well owner and cannot be enforced by the agencies since the water supply is a private and not a public one.

3. Public water is available for those residents who are interested in tapping into the public water system.

PREPARERS OF THE REPORT

Health Assessment Section
John Kollman, Environmental Specialist
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REFERENCES

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) 2000. Toxicological Profile for Manganese. U.S. DHHS, Atlanta. September 2000.

OHIO EPA 2007. Letter from Chris Korleski, Director, Ohio EPA, regarding citizens' concerns and proposed denial of A & L Salvage C & DD Landfill's 2007 operating license. October 16, 2007.

OHIO EPA 2008. Russ Kocher. Interoffice Memorandum: Review of the November 19-20, 2007 Residential Well Sample Results Associated with the A & L Salvage C & DD Landfill, Columbiana County, Ohio. January 11, 2008.

U.S. EPA. 2006 Edition of the Drinking Water Standards and Health Advisories. EPA 822-R-06-013. Office of Water. Washington DC. Summer 2006.

TABLES

Table 1. Chemicals Detected in Private Wells
Lisbon, Ohio

Well ID	*#1*	*#2*	*#3*	*#5*	*#6*	*#7*	*#9*	*#10*	*#11*	*#12*	*#13*	*#14*	*MCL/SMCL/AL*
***Metals** (µg/L) unless noted*													
Aluminum	<200	799	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	50*
Arsenic	<5	<5	5.3	<5	<5	<5	<5	<5	<5	<5	<5	<5	10
Barium	102	152	32	30	36	94	54	55	30	47	44	45	2000
Beryllium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	4
Cadmium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5
Calcium mg/L	42	3	109	<2	171	5	2	5	50	<2	<2	69	
Chromium	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	100
Cobalt	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Copper	<10	83	19	46	39	<10	77	94	<10	16	45	<10	1300**
Iron	151	3390	3430	<50	546	<50	<50	366	226	<50	55	410	300*
Lead	<2	12.3	<2	<2	2.2	<2	4.6	6.2	<2	<2	<2	<2	15**
Magnesium mg/L	13	1	28	<1	50	2	1	3	18	<1	<1	18	
Manganese	51	102	235	<10	1600	<10	<10	<10	20	<10	<10	194	50*
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2
Nickel	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	
Potassium mg/L	2	<2	2	<2	3	<2	<2	<2	3	<2	<2	2	
Selenium	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	50
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100*
Sodium mg/L	46	149	22	154	23	93	165	87	79	163	158	16	
Strontium	1060	116	752	41	2140	120	42	59	1380	42	33	559	
Thallium	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2
Titanium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Vanadium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Zinc	36	14	<10	17	<10	72	30	334	21	<10	45	<10	5000*

Source: Ohio EPA 2008

Table 1 continued. Chemicals Detected in Private Wells
Lisbon, Ohio

Well ID	*#1*	*#2*	*#3*	*#5*	*#6*	*#7*	*#9*	*#10*	*#11*	*#12*	*#13*	*#14*	*MCL/SMCL/AL*
Parameter													
Alkalinity mg/L	198	305	286	332	533	227	361	178	219	342	325	190	
Ammonia mg/L	0.524	0.25	0.231	0.151	0.233	0.057	<0.05	<0.05	0.703	0.17	0.251	0.142	
COD mg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Chloride mg/L	31.8	<5	28	<5	10.9	<5	7.1	20.1	47.8	5	<5	32.1	250* mg/L
Hardness mg/L	158	12	387	<10	633	21	<10	25	199	<10	<10	246	
Nitrate+nitrite mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	
Sulfate mg/L	22	29.3	120	11.4	142	11.8	<5	17.9	110	24	27.9	55.1	250* mg/L
pH	7.61	8.8	7.28	9.24	6.71	7.92	8.83	8.14	7.58	8.93	9.1	7.26	6.5-8.5*
Conductivity	543	680	867	697	1243	404	733	459	783	737	727	585	
TDS	368	464	598	476	873	271	501	310	540	504	496	398	500* mg/L
Temperature	11.6	13.2	12.8	11.6	11.8	10.8	12.4	12.7	12.2	12.9	12.8	13.9	
ORP	-36	-40	45	-93	50	73	33	75	-42	-77	-180	-41	
Organic chemicals													
Chloroform	ND	ND	ND	ND	ND	ND	1.28	ND	ND	ND	ND	ND	
Dichlorodifluoromethane	ND	ND	ND	ND	1.74	ND	ND	ND	ND	ND	ND	ND	

Source: Ohio EPA 2008

ND - none detected
µg/L – micrograms per liter (parts per billion – ppb)
mg/L – milligrams per liter
MCL – maximum contaminant level for Ohio public water supplies
* SMCL – secondary maximum contaminant level
** AL – action level
TDS – total dissolved solids
#4 – field blank (not shown)
#8 – duplicate (not shown)

Table 2. Chemicals Detected in Public Water Supply Wells and Leachate

Sample ID	*UG-1*[1]	*Lisbon*[2]	*Columbiana4*[2]	*Columbiana8*[2]	*Leachate*[3]	*MCL/SMCL/AL*
***Metals** (µg/L) unless noted*						
Aluminum	NS	<200	<200	<200	60.2	50*
Arsenic	<1	<2	2	<2	14.1	10
Barium	270	106	128	448	1100	2000
Beryllium	<1	NS	NS	NS	<0.5	4
Cadmium	<2	<0.2	<0.2	<0.2	<2.5	5
Calcium mg/L	26.1	72	94	67	241	
Chromium	<10	<30	<30	<30	53	100
Cobalt	<5	NS	NS	NS	<2.5	
Copper	<10	12	<10	<10	5.5	1300
Iron	740	660	1120	450	5710	300*
Lead	<1	2.3	<2	<2	<2.5	15
Magnesium mg/L	8.3	17	22	16	191	
Manganese	40	240	254	157	415	50*
Mercury	NS	NS	NS	NS	<0.1	2
Nickel	<10	<40	<40	<40	10.9	
Potassium mg/L	1.5	2	2	2	106	
Selenium	<1	<2	<2	<2	6.52	50
Sodium mg/L	36.3	17	13	100	370	
Silver	<5	NS	NS	NS	<5	100*
Strontium	ns	449	422	426	4210	
Thallium	<0.2	NS	NS	NS	<0.5	2
Titanium	NS	NS	NS	NS	NS	
Vanadium	<5	NS	NS	NS	<5	
Zinc	<10	18	81	13	18.3	5000*

Source: Ohio EPA 2008

Table 2 continued. Chemicals Detected in Public Water Supply Wells and Leachate

Well ID	*UG-1*[1]	*Lisbon*[2]	*Columbiana4*[2]	*Columbiana8*[2]	*Leachate*[3]	*MCL/SMCL/AL*
Parameter						
Alkalinity mg/L	162	211	260	328	1830	
Ammonia mg/L	0.14	0.153	0.174	0.332	92.1	
Chloride mg/L	2	10.2	23.1	84	441	250* mg/L
Conductivity	355	533	672	888	NS	
COD mg/L	ns	<10	<10	<10	819	
Hardness mg/L	ns	250	325	233	NS	
ORP	ns	-99	-83	-220	NS	
pH	7.92	7.27	7.21	7.51	NS	6.5-8.5*
Nitrate+nitrite mg/L	<0.05	0.15	<0.1	<0.1	<0.125	
Sulfate mg/L	13	50.2	63.9	12.8	40.7	250* mg/L
TDS	ns	398	462	572	2650	500* mg/L
Temperature	17	12.5	13.2	12.7	NS	

Source: Ohio EPA 2008

ND – none detected
NS – not sampled
µg/L – micrograms per liter (parts per billion – ppb)
mg/L – milligrams per liter
MCL – maximum contaminant level for public water supplies
* SMCL – secondary maximum contaminant level
** AL – action level
TDS – total dissolved solids

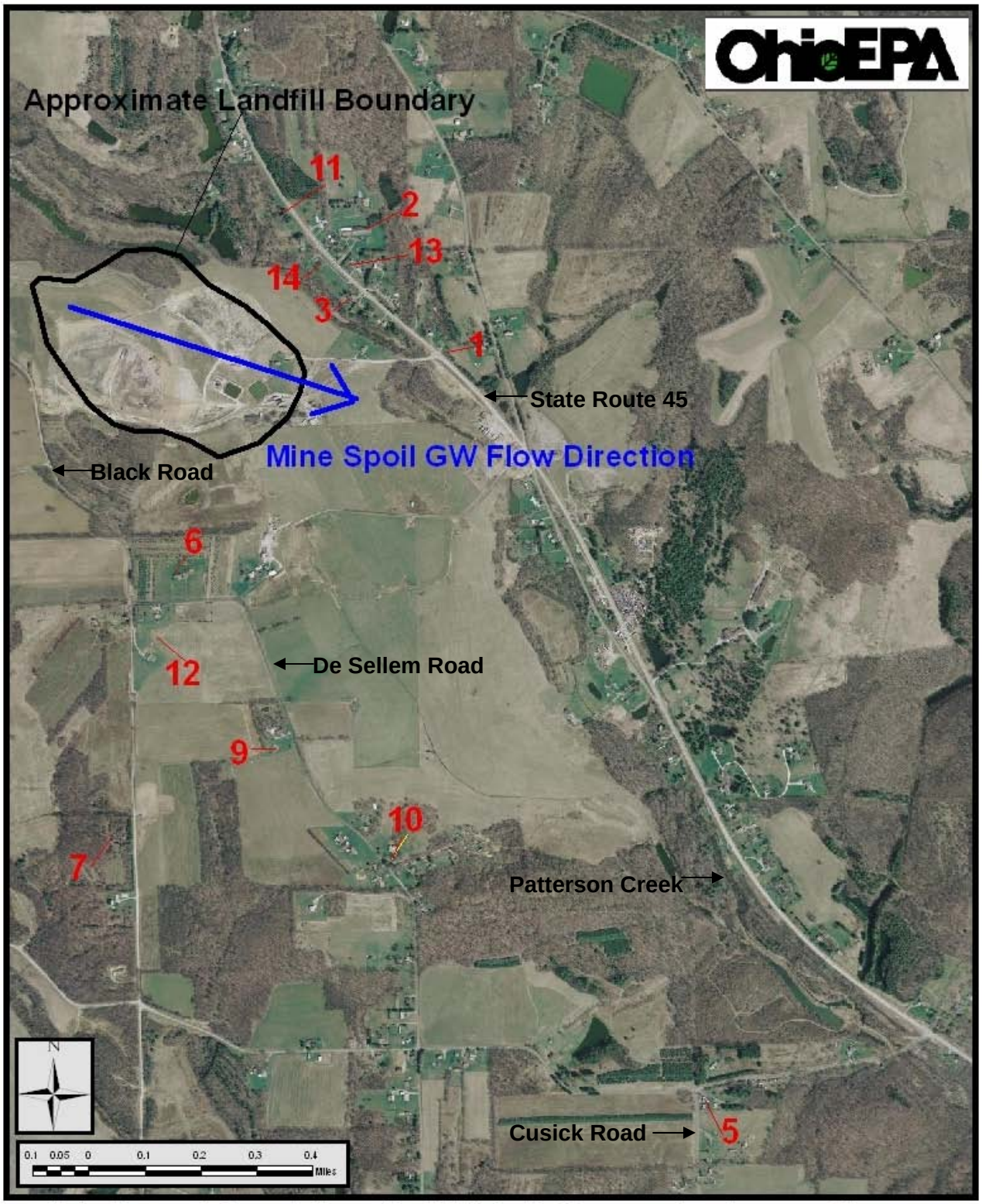
1 – On site, upgradient, bedrock monitoring well sampled on June 11, 2007

2 – Public water wells sampled October 16, 2007

3 – Lechate sample collected on October 18, 2007

FIGURES

Figure 1. Location of Residential Wells



Lisbon Residential Well Sample Locations

Re: A&L Salvage C&DD Landfill

Source: Ohio EPA 2008

CERTIFICATION

This A & L Salvage C&DD Landfill (Private Wells) Health Consultation 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 existing at the time the health consultation was begun. Editorial review was completed by the Cooperative Agreement Partner.

Technical Project Officer, CAT, CAPEB, DHAC, ATSDR

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

Team Lead, Cooperative Agreement Team, CAPEB, DHAC, ATSDR