Health Consultation

Evaluation of Fish Tissue Data Collected from Hobbs Pond

RHOADES SALVAGE SITE

MILTON, CHITTENDEN COUNTY, VERMONT

EPA FACILITY ID: VTR000006007

NOVEMBER 24, 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

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:

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Statement of Issues

The Vermont Department of Environmental Conservation (VTDEC) requested the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate fish tissue data for the Rhoades Salvage Yard (Rhoades) site located at 15 Shirley Avenue in Milton, Vermont.

The purpose of this health consultation is to determine whether fish from Hobbs Pond, adjacent to the site, are safe to eat. ATSDR prepared this health consultation at the request of VTDEC.

Background

Rhoades Salvage (previously ABC Metals) has been in operation since the 1950's. In the past, Rhoades Salvage (Rhoades) occupied a larger land parcel but currently occupies approximately five acres. Historically, Rhoades owners brought items, such as, cars, trucks, scrap metal, and tires, into the yard for recycling/scrap purposes [ATSDR 2009].

Many former underground storage tanks (USTs) are stored onsite in the yard. Some of these tanks are used to store petroleum products. Other former USTs line the perimeter to restrict entry to the site (i.e., in lieu of a fence in those areas) [ATSDR 2009]. In recent years, neighborhoods have built homes around the perimeter of Rhoades. In addition to residential homes, Rhoades borders Hobbs Pond to the southeast.

In January 2009, ATSDR released a Public Health Consultation that evaluated limited soil, sediment, and water sampling data [ATSDR 2009]. The community was also concerned about eating fish caught from Hobbs Pond. At the date of the January 2009 consultation release, biota sampling results from fish collected by the Vermont Agency of Natural Resources Fish and Wildlife in October 2008, were not available. Alpha Analytical completed the fish tissue analysis in late January of 2009 and the results were provided to ATSDR in early spring of 2009.

Eleven fish samples were collected from Hobbs Pond and included three Brown Bullhead (BBH), six yellow perch (YP), and two Pumkinseed (PMS).

Fish lengths can be found in Table 1. VTDEC prepared the fish samples for transport to Alpha Analytical to be analyzed as whole fish samples. Alpha Analytical used EPA Method 8270c-Modified for PCBs and EPA Method 8270-SIM for PAHs [Alpha]. Fish samples were digested according to EPA Method 3051 and analyzed for all metals except mercury, by ICP/MS according to EPA Method 6020A [Alpha]. Mercury was determined by cold vapor atomic fluorescence spectroscopy according to a modified EPA Method 7474 [Alpha].

Results

The three BBH and the two PMS samples were analyzed for Polychlorinated Biphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), and metals. Due to the size of the fish, some of the samples were too small to be used, and budget, the VTDEC limited analyzing the YP samples for PCBs and metals to four of the six YPs. All six YP samples were analyzed for PAHs.

All contaminant concentration means as discussed within this document are arithmetic means. The lower detection limit was used to calculate the concentration means. The arithmetic means were then used to calculate the exposure doses. Non-detects were reported by Alpha Analytical as the lower level of detection.

PCBs

Only nine of the eleven fish samples were analyzed for PCBs. Of the nine samples analyzed for PCBs, results ranged from non-detect (less than 0.358 parts per billion (ppb)) to 101.25 ppb with a mean of 51.81 ppb. In BBH samples, the maximum level was 53.91 ppb and the mean was 44.56 ppb. In YP samples, the maximum level was 101.25 ppb and the mean was 54.86 ppb. In PMS samples, the maximum level was 69.92 ppb and the mean was 56.62 ppb (Table 2).

PAHs

PAHs were detected in seven of eleven fish samples from Hobbs Pond ranging from non-detect (less than 7.59 ppb) to 12.90 ppb. Table 3 shows the maximum level, mean, and the ratio of detections per number of samples by analyte and fish species.

Found in only one of three samples of BBH, napthalene was at a level of 8.8 ppb (Table 3). Napthalene was detected in four samples of YP at a maximum level of 10.40 ppb; the mean in YP was 8.62 ppb. Napthalene was not detected in the PMS samples.

Benzo(a)pyrene was found only in the PMS samples. The maximum benzo(a)pyrene level was 9.20 ppb and the mean was 8.69 ppb (Table 3).

Chrysene was found only in PMS samples. The maximum chrysene level was 10.30 ppb and the mean was 10.25 ppb (Table 3).

Indeno[1,2,3-cd]pyrene was found only in PMS samples. The maximum indeno[1,2,3-cd]pyrene level was 12.90 ppb and the mean was 12.10 ppb (Table 3).

Benz[a]anthracene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, and dibenz[a,h]anthracene were also found in the PMS samples at low levels; the maximum and mean levels can be found in Table 3. These contaminants were not found in the BBH or YP samples.

Metals

The levels of metals measured in fish samples are summarized in Table 4. The following metals were detected in samples from all three fish species: chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), selenium (Se), strontium (Sr), and zinc (Zn). Vanadium (V) was detected in the BBH and YP samples, but not in the PMS samples. Arsenic was detected in only the PMS samples.

In addition to the metals discussed above, Alpha Analytical analyzed the fish samples for antimony (Sb), beryllium (Be), and cadmium (Cd) (Table 4). These elements were not detected in any of the fish samples.

Discussion

Exposure Scenario

A site-specific exposure scenario was developed for the assessment and discussion presented in this health consultation. The site-specific exposure scenario is based on available information describing the assumed fish consumption patterns of persons expected to be fishing at Hobbs Pond as detailed below. Initial screening of contaminant levels was accomplished using values derived from risk-based levels that are generated for biota by the U.S. Environmental Protection Agency (EPA) (Region III) [EPA 2009a]. The risk-based levels were converted to site-specific reference values for fish tissues; this was consistent with the following exposure scenario. The site-specific exposure parameters are designed to be conservative. That is, they are intentionally constructed to overestimate any health hazard associated with eating the fish rather than underestimate that hazard.

Site-Specific Exposure Scenario for Recreational Fishers at Hobbs Pond

Exposure Scenario Parameters

Population
Adult recreational fishers
Child recreational fishers
Consumption rate
One, eight ounce fish meal from Hobbs Pond consumed per week, 26 weeks per year

Exposure Assumptions

Adult body weight = 70 kilograms
Child body weight = 16 kilograms
One fish meal = 226 grams (approximately 8 ounces)
Average fish intake per day = 32.29 grams (226 grams per meal; one meal eaten per week)
Exposure duration = 30 years
Exposure factor = 0.07 (eating fish once per week, 26 weeks per year)

Assessment of PAHs and Metal Levels

Using the exposure scenario as described above and USEPA Region III Reference Based Concentrations (RBCs) [EPA 2009a], maximum levels of PAHs and Metals detected in Hobbs Pond fish samples were all below their respective Reference Concentrations. Therefore, no adverse

health effects are likely to result from ingestion of the PAHs or metals in those fish species.

Assessment of PCB Levels

Using the above exposure scenario and comparing the maximum contaminant level in each fish species to the EPA RBC, some of the estimated maximum contaminant levels exceeded the EPA RBCs. For each of the contaminants that exceeded the EPA RBC, an estimated dose was calculated then compared to the EPA 2009 Reference Dose (RfD) for PCBs in fish tissue of 0.00002 mg/kg/day [EPA 2009a]. An estimated exposure dose for adults consuming BBH is 0.000012 mg/kg/day which is below the EPA RfD; however, the estimated exposure dose for children is 0.000054 mg/kg/day which is approximately 2.7 times greater than the EPA RfD. An estimated exposure dose for adults consuming YP is 0.00002337 mg/kg/day which is slightly greater than the EPA RfD of 0.00002 mg/kg/day; however the estimated dose for children is 0.00010223 mg/kg/day approximately 10-fold greater than the EPA RfD. An estimated exposure dose for adults consuming PMS is 0.00001614 mg/kg/day which is below the EPA RfD; however the estimated exposure dose for children is 0.00007060 mg/kg/day which is approximately 3.5 times greater than the EPA RfD.

While some of the estimated PCB doses are above the EPA RfD is it very important to note the conservative estimation of the dose calculations. That is, the fish samples collected from Hobbs Pond were analyzed as a whole fish sample (homogenizing the entire fish including all organs, bone, etc) rather than a fillet which is the portion that is most likely consumed by a recreational fisher. The levels of contaminants in the fish fillet are likely to be much less than the estimate because PCBs tend to collect in fatty tissue, bone, and organs. Therefore, using the whole fish to derive a representative sample includes all of the contaminants in the fish rather than only the portion that would be consumed if only the fillet had been measured. However, some populations may eat organs or the entire fish including the bones; the doses derived in the calculations will be representative of exposure for those populations. ATSDR does not have data from the community to estimate consumption rates of fish caught from Hobbs Pond; however, assuming 26-8oz meals per year from this neighborhood pond should overestimate the actual number of fish meals consumed from this source because, most likely, fish are consumed from a variety of sources such as restaurants and grocery stores and not solely from Hobbs Pond. Another assumption made in the estimated dose calculation is the bioavailability of the PCBs within the fish. For the dose calculation, 100% bioavailability of the total PCB was used to determine the estimated dose which is greater than the actual percent of bioavailability according to a study by Adenugba et al which determined that up to 80% of PCBs can be bioaccessible from ingestion of food borne PCBs [Adenugba].

The EPA RfD is based on a lowest observed adverse effect level (LOAEL) in monkeys exposed to 0.005 to 0.08 mg/kg/day of PCBs for more than 5 years. The monkey showed toe/finger nail changes and immunological changes following the exposure [EPA 2009b]. The greatest estimated dose derived from the assumed exposure scenario in this PHA is the children's dose from consuming PMS which estimates a dose for children that is 50-fold less than the LOAEL. Based on the described exposure scenario, ATSDR concludes, it is unlikely that any adverse health effects will be seen as a result of ingesting fish from Hobbs Pond.

Fish as a Food Source, and Preparation Methods to Reduce Contaminant Levels

In some circumstances, individuals may eat more fish than was considered in the site-specific exposure scenario. For this reason, additional information is provided to help people gain perspective on their individual exposures.

Fish is a nutritious source of protein, antioxidants, and vitamins; and a diet containing fish can help reduce the risk for heart disease [ATSDR 2006]. Although the fish species taken from Hobbs Pond contain low levels of contaminants, similar levels, or higher levels, are found in fish taken from other Vermont waters and in grocery store foods [VTDOH 2009]. If individuals are concerned about the low level of contaminants described in this report, exposure can be reduced by selection of fish that are eaten and specific preparation methods. For example, it is better to eat a variety of different fish species that are collected from different locations. Eating small fish also can reduce exposures, because larger fish tend to accumulate higher levels of contaminants such as PCBs and PAHs. Advisable preparation methods include trimming fat and skin from the fish. When the fish is cooked, the juices and drippings from the fish should not be eaten. (Additional advice on how to reduce exposures to contaminants in fish is provided in Appendix A.)

Conclusions

The following conclusions are provided for the site-specific exposure scenario developed for the recreational fishing at Hobbs Pond in Milton, Vermont.

1. The available data indicate that the PAH and metal levels in the Brown Bullhead, Yellow Perch, and Pumpkinseed in Hobbs Pond in Milton, VT are below levels of health concern.

2. The available data indicate that the PCB concentrations in the Brown Bullhead, Yellow Perch, and Pumpkinseed in Hobbs Pond in Milton, VT are elevated above the EPA RBC; however, as explained in detail within the Assessment of PCB Levels section of this document, these low concentrations are not expected to results in adverse health effects.

3. ATSDR reviewed analytical results from limited sampling of three fish species found in Hobbs Pond. Based on the results reviewed consumption of PCBs, PAHs, and metals in the Brown Bullhead, Yellow Perch, and Pumpkinseed from Hobbs Pond in Milton, VT is not likely to result in adverse health effects.

Recommendations

The following recommendations are provided for the site-specific exposure scenario developed for the Hobbs Pond recreational fishers.

ATSDR suggests that recreational fishers follow Vermont fish consumption guidelines for

consumption of fish caught within the state of Vermont. The Vermont Department of Health maintains a list of various fish species found within the state and the recommended number of meals per month per category by consumer; the list is available at the following World Wide Web address: http://healthvermont.gov/enviro/fish_alert/documents/Fish_Alert_2007.pdf.

No consumption advisories are needed regarding the Brown Bullhead, Yellow Perch, and Pumpkinseed fish in Hobbs Pond in Milton, beyond that which the State of Vermont has already recommended in the 2009 Health Alert [VTDOH 2009].

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Tables

Table 1. Length of Fish from Hobbs Pond – Milton, VT (2009)

	Length	
Fish	**As reported in cm**	**Converted to in**
Brown Bullhead		
1	18.0	7.1
2	26.5	10.4
3	16.5	6.5
4	17.5	6.9
5	20.0	7.9
Yellow Perch		
1	21.5	8.5
2	14.5	5.7
3	12.7*	5.0
4	13.9*	5.5
5	18.0	7.1
6	14.3	5.6
Pumpkinseed		
1	15.2	6.0
2	18.0	7.1

Notes:
*Indicates samples were only analyzed for PAHs and not PCBs or metals. Vermont DEC limited analyzing the YP samples for PCBs and metals to four of the six YPs due to financial constraints.

cm - centimeters

in - inches

Source: Alpha Analytical. Analytical Report for Vermont Department of Environmental Conservation, Project: Hobbs Pond. January 29, 2009

Table 2. Total PCBs in Fish Samples at Hobbs Pond – Milton, VT (2009)

	Max	Mean	Detects/Samples
Brown Bullhead	53.91	44.56	3/3
Yellow Perch	101.25	54.86	4/6*
Pumpkinseed	69.92	56.62	2/2

Notes:
All results are in µg/kg (ppb)
* Only four of the six YP samples were analyzed for PCBs.

Source: Alpha Analytical. Analytical Report for Vermont Department of Envirc
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Table 3. Polycyclic Aromatic Hydrocarbons in Fish Samples at Hobbs Pond – Milton, VT (2009)

	Brown Bullhead			Yellow Perch			Pumpkinseed		
	Max	Mean	Detects/ Samples	Max	Mean	Detects/ Samples	Max	Mean	Detects/ Samples
Acenaphthene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Acenaphthylene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Anthracene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Benz[a]anthracene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**10.70**	**10.60**	2/2
Benzo[a]pyrene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**9.20**	**8.70**	2/2
Benzo[b]fluoranthene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**12.50**	**12.00**	2/2
Benzo[g,h,i]perylene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**11.60**	**10.85**	2/2
Benzo[k]fluoranthene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**10.40**	**10.17**	2/2
Chrysene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**10.30**	**10.25**	2/2
Dibenz[a,h]anthracene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**12.20**	**11.90**	2/2
Fluoranthene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Fluorene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Indeno[1,2,3-cd]pyrene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	**12.90**	**12.10**	2/2
Naphthalene	**8.80**	**7.99**	1/3	**10.40**	**8.62**	4/6	7.59*	7.59*	0/2
Phenanthrene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2
Pyrene	7.59*	7.59*	0/3	7.59*	7.59*	0/6	7.59*	7.59*	0/2

Notes:
All results are in µg/kg (ppb)
* Indicates a result was not detected during laboratory analysis. The result shown is the limit of detection reported by the lab.

Source: Alpha Analytical. Analytical Report for Vermont Department of Environmental Conservation, Project: Hobbs Pond. January 29, 2009

Table 4. Total Metals in Fish Samples at Hobbs Pond – Milton, VT (2009)

	Brown Bullhead			Yellow Perch			Pumpkinseed		
	Max	Mean	Detects/ Samples	Max	Mean	Detects/ Samples	Max	Mean	Detects/ Samples
Antimony	0.047*	0.047*	0/3	0.047*	0.047*	0/4	0.047*	0.047*	0/2
Arsenic	0.094*	0.094*	0/3	0.094*	0.094*	0/4	**0.101**	0.097*	1/2
Beryllium	0.047*	0.047*	0/3	0.047*	0.047*	0/4	0.047*	0.047*	0/2
Cadmium	0.019*	0.019*	0/3	0.019*	0.019*	0/4	0.019*	0.019*	0/2
Chromium	**6.770**	**4.033**	3/3	**3.500**	**2.678**	4/4	**1.580**	**1.555**	2/2
Copper	**1.350**	**1.068**	3/3	**0.681**	**0.540**	4/4	**0.501**	**0.435**	2/2
Lead	**0.145**	**0.089**	2/3	**0.041**	**0.030**	4/4	**0.037**	**0.033**	2/2
Mercury	**0.129**	**0.090**	3/3	**0.177**	**0.128**	4/4	**0.154**	**0.149**	2/2
Nickel	**5.150**	**3.064**	3/3	**2.990**	**2.253**	4/4	**1.620**	**1.600**	2/2
Selenium	**0.236**	**0.203**	3/3	**0.376**	**0.287**	4/4	**0.299**	**0.260**	2/2
Strontium	**18.200**	**13.693**	3/3	**18.200**	**15.675**	4/4	**30.400**	**28.200**	2/2
Vanadium	**0.117**	**0.104**	2/3	**0.096**	**0.094**	2/4	0.094*	0.094*	0/2
Zinc	**15.200**	**13.633**	3/3	**25.200**	**20.950**	4/4	**28.000**	**27.650**	2/2

Notes:
All results are in mg/kg (ppm)
* Indicates a result was not detected during laboratory analysis. The result shown is the limit of detection reported by the lab.

Source: Alpha Analytical. Analytical Report for Vermont Department of Environmental Conservation, Project: Hobbs Pond. January 29, 2009

Appendices

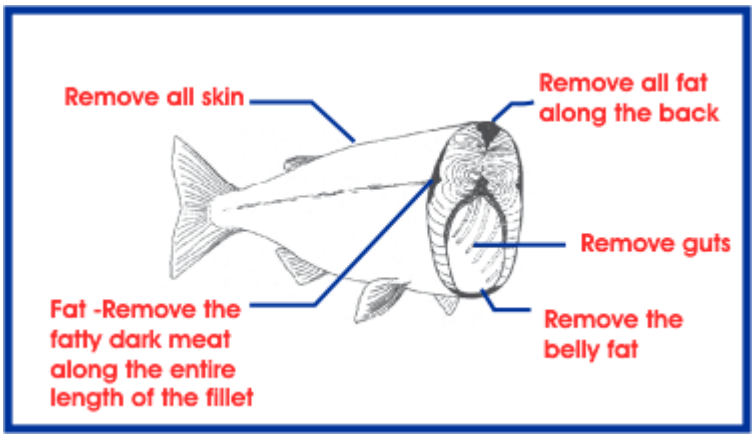
Appendix A. Cleaning and Cooking Your Fish [NJDEP].

The best way to reduce exposure to contaminants in fish is to learn what fish species are affected and either limit or avoid consumption. However, if you must eat those species under advisories, there are steps you can take to reduce your exposure. Contaminants tend to concentrate in the fatty tissue of the fish you catch. Proper cleaning and cooking techniques, which remove some of the fat from the fish, can significantly reduce levels of PCBs, dioxins and other organic chemicals. **Please note, however, that these techniques will not reduce or remove unsafe levels of mercury from these fish.** Mercury occurs in the flesh. There is no way to remove mercury through cooking. The best way to reduce mercury exposure is to select those species of fish which are known to have lower levels of mercury.

Fish Preparation Methods

Proper fish cleaning and cooking techniques may reduce PCB levels by approximately 50 percent when compared to raw fish fillets. A meal size is considered to be an uncooked 8 ounce fillet. **Eat only the fillet portions**. Do not eat whole fish or steak portions.

The following diagram illustrates those body portions. Many chemical contaminants, like PCBs and pesticides (but not mercury), are stored in the fatty portions of fish. To reduce the levels of these chemicals, skin the fish and trim any of the dark meat (lateral line), back strap and belly flap. Do not eat the heads, guts or liver, because PCBs usually concentrate in those body parts. Also, avoid consumption of any reproductive parts such as eggs or roe.



Fish Cooking Methods

Use a cooking method such as baking, broiling, frying, grilling, or steaming that allows the fats and juices to drain away from the fish. When possible, cook the fish on an elevated rack that allows fats and juices to drain to the pan below. Avoid batter, breading or coatings that can hold in the juices that may contain contaminants. The juices should be thrown away since they contain the PCBs and other chemicals that were in the fat. Do not pour these juices over the fish as a sauce or to moisten

the fish. Butter, margarine or other liquids can be added to the fish for this purpose once the juices have been poured off. After cooking, discard all liquids and frying oils. Do not reuse.

Do not use heads, skin, or trimmed fatty portions in soups, stews, chowders, boils, broth or for fish stock. If you make stews or chowders, only use skinless fillet parts.

Raw fish may be infested by parasites. Cook fish thoroughly to destroy the parasites. This also helps to reduce the level of many chemical contaminants