

MEMORANDUM
DEPARTMENT OF COMMUNITY HEALTH
LANSING, MICHIGAN 48913

DATE: May 15, 2008

TO: David R. Wade, Manager
Division of Environmental Health

FROM: Linda D. Dykema, Manager
Toxicology and Response Section

SUBJECT: Wild Game Advisories for the Tittabawassee and Saginaw River Flood Plains

Attached is the Technical Support Document (TSD) for the “Wild Game Advisories for the Tittabawassee and Saginaw River Flood Plains Downstream of Midland” (Updated May 12, 2008). The purpose of the TSD is to document the development of the Wild Game Advisory (Advisory) for the Tittabawassee and Saginaw River Flood Plains. The Advisory was prompted by studies conducted in 2004 and 2007 by the Dow Chemical Company to evaluate the level of dioxin-like compounds (DLCs) in wild game in these areas. Studies conducted in 2004 measured only levels of dioxins and furans, while those conducted in 2007 also include the co-planar polychlorinated biphenyls (PCBs).

Several risk assessment approaches may be considered in evaluating the safety of consuming wild game harvested from the flood plain of the Tittabawassee and Saginaw Rivers. The attached TSD provides comparisons to health benchmarks developed by the World Health Organization (WHO), the Agency for Toxic Substances and Disease Registry (ATSDR), and the Michigan Department of Environmental Quality (MDEQ) including:

- The WHO Tolerable Monthly Intake (TMI) of 70 pg/Kg-month protective of both cancer and noncancer health effects.
- The ATSDR Minimal Risk Level (MRL) of 1 pg/Kg-day protective of noncancer health effects.
- The MDEQ Great Lakes Initiative (GLI) Acceptable Daily Exposure (ADE) of 1.3 pg/kg/d protective of noncancer health effects (adjusted to 30 days for comparison to the WHO TMI).

These health benchmarks do not represent a boundary between safe and unsafe intake of DLCs. However, intake of DLCs above these values will erode the margin of safety used in their derivation. Therefore, consumption of foods that contribute a high percentage of the recommended intake should be limited to avoid a significant exceedance of the health benchmark dose. The WHO TMI, the ATSDR MRL, and the GLI ADE are all intended to be protective of potential developmental effects of DLC exposure either before birth or in the first

few years of life. Therefore, exposures for women of childbearing age and children under the age of 15 are of particular concern.

The incremental lifetime cancer risk associated with consumption of wild game taken from the flood plain of the Tittabawassee River has also been calculated in the attached spreadsheets. These may be compared to an acceptable increase in cancer risk of 1 additional cancer in a population of 100,000 people.

Table 1 in the attached TSD provides a comparison of DLC intake rates for some common foods available in the U.S. food supply (fast-food cheeseburger, tuna, and beef chuck roast. **These comparisons are for information purposes only and were not used to determine the Advisory recommendations provided below:**

Deer Muscle – DLC intake for adults from deer muscle meat from all sampling locations appears to be generally low in comparison to both the WHO TMI and the GLI ADE. However, consumption of 30 kilograms (Kg) of deer muscle meat (one average deer per year or 1.3 pounds per week) would result in an exceedance of the ATSDR MRL and an increased cancer risk of approximately two to three additional cancers in 100,000 people. The MRL is protective of developmental effects in offspring of exposed mothers; therefore an exceedance of this value is of more concern for women of child-bearing age than for the general population of adults.

Consumption by a child of 10 Kg of muscle meat (2 ounces every other day) from deer muscle meat would result in a three- to five-fold exceedance of the ATSDR MRL. An increased cancer risk of 1.2 additional cancers in 100,000 children would result from consumption of deer meat taken from near Imerman Park.

The State Of Michigan should recommend that people limit consumption of muscle meat from deer harvested in or near the floodplain of the Tittabawassee River downstream of Midland and in or near the floodplain of the Saginaw River. Women of childbearing age and children under the age of 15 should eat only one meal of deer muscle meat harvested in the floodplains per week. Trimming any visible fat will lower the level of dioxins in the cooked meat.

Deer Liver - Consumption of 2 Kg of liver per year (one liver) from a deer taken near Imerman Park by an adult would result in a 15-fold exceedance of the ATSDR MRL and an increased cancer risk of 3.7 cancers in 10,000 people. Consumption of 4 ounces of liver from a deer taken near Imerman Park would result in an 8-fold exceedance of the ATSDR MRL and an increased cancer risk of 1.9 additional cancers in 100,000 children.

DLC intakes from deer liver taken in the flood plain of the Saginaw River are far lower than those estimated for sampling locations near the Tittabawassee River. Therefore, no advisory is recommended for deer livers taken from this area.

The State Of Michigan should recommend that people not eat the liver from deer harvested in or near the Tittabawassee River floodplain downstream of Midland. Eating liver taken from deer harvested in the flood plain of the Saginaw River is not likely to result in adverse health effects.

Turkey - Consumption of 4 Kg (one half the edible meat of two turkeys) per year by an adult would result in a 2.5- (meat without skin) to 5.3-fold (meat with skin) exceedance of the ATSDR MRL and an increased cancer risk of up to 1.3 additional cancers in 10,000 adults. Consumption of 8 ounces of turkey per year by a child would result in a 1.5 to 3.2-fold exceedance of the ATSDR MRL and an increased cancer risk of 3.6 to 7.5 additional cancers in one million children.

DLC intakes from turkey meat without skin taken in the flood plain of the Saginaw River are far lower than those estimated for sampling locations near the Tittabawassee River. However, limiting consumption of turkey skin and internal organs would limit DLC intake.

The State of Michigan should advise that no one eat turkey (with or without the skin) taken in the Tittabawassee River flood plain south of Midland. If wild game consumers choose to eat turkey taken in the flood plain of the Tittabawassee and Saginaw Rivers, the State of Michigan should advise that the skin and the internal organs such as the liver should not be eaten.

Squirrel - DLC intake for adults from squirrel meat taken near Smith's Crossing and in the flood plain of the Saginaw River appears to be generally low in comparison to both the WHO TMI and GLI ADE. However, DLC intake from just 4 ounces of meat from a squirrel taken near Imerman Park provides 10 percent of the WHO TMI and 18 percent of the GLI ADE. A single 2-ounce serving at the 95th percentile of DLC content in squirrel near Imerman Park provides 23 percent of the WHO TMI and 42 percent of the GLI ADE for a 15 Kg child.

The State of Michigan should advise that women of childbearing age and children under the age of 15 should eat only one meal per week of squirrel meat taken from near Imerman Park. Eating squirrel meat harvested in the flood plain of the Saginaw River is not likely to result in adverse health effects.

Canada Goose and Wood Duck - Yearly consumption by an adult of 6.8 Kg of goose meat with skin or 0.7 Kg of wood duck meat with skin taken from the Shiawassee National Wildlife Refuge and from the Crow Island State Game Area would result in a 1.2 to 5.3 additional cancers in 100,000 adults. Consumption of 15 2-ounce servings of goose meat with skin per year or four 2-ounce servings of wood duck by a child would result in a 1.1 to 2.2 exceedance of the ATSDR MRL. DLC intake from Canada goose and wood duck meat with the skin removed from all sampling locations appears to be generally low.

The State of Michigan should advise that people not eat the skin of Canada goose or wood duck harvested in or near the floodplain of the Tittabawassee River downstream of Midland and in or near the floodplain of the Saginaw River. MDCH recommends that people remove the skin of waterfowl before cooking and discard the liver and other internal organs.

Cottontail Rabbit - DLC intake from cottontail rabbit meat appears to be generally low and no advisory is recommended for this game meat.

Conclusions

In conclusion, the results of the Dow studies indicate that wild game harvested from the flood plain of the Tittabawassee River south of Midland and from the flood plain of the Saginaw River contain levels of DLCs that are higher than levels found in wild game north of Midland and in similar meats available in the commercial U.S. food supply. This indicates that DLC contamination is bioavailable for uptake by animals living and feeding in the flood plain. Further, consumption of a single meal of some wild game taken from these areas may result in exceedance of the WHO TMI or the GLI ADE (adjusted to 30 days) for DLCs, either alone or when added to intakes from other sources such as the general diet, intake from other game and fish, or incidental ingestion of contaminated soil. The State of Michigan should provide this information to hunters and their families to inform their decisions concerning consumption of wild game from the area and the resulting risk of adverse health effects of DLC exposure.

Attachment

cc: Dr. Corinne Miller, MDCH
Dr. Deborah Mackenzie-Taylor, MDEQ
Dr. Daniel O'Brien, MDNR

**Michigan Department of Community Health
Technical Support Document**

Wild Game Advisories Downstream of Midland

Updated May 12, 2008

The Dow Wild Game Study “Evaluation of PCDDs and PCDFs in Wild Game Taken from the Floodplain Along the Tittabawassee River” (June 2004) provided information about elevated levels of dioxins and dioxin-like compounds (DLCs) in wild game harvested in the flood plain of the Tittabawassee River. The 2004 study report evaluated DLC levels found in deer, turkey, and squirrel taken from three locations: a reference area upstream of the city of Midland, and two downstream locations (Smith’s Crossing and Imerman Park). Wild game meat taken from these areas were analyzed for dioxins and furans only. In September of 2004, the Michigan Department of Community Health (MDCH) issued a wild game advisory for the Tittabawassee River flood plain (MDCH 2004).

In 2007, Dow funded an additional wild game collection to further evaluate DLC concentrations in wild game taken from the Tittabawassee River flood plain near Imerman Park. In addition, the 2007 study evaluated DLC concentrations in game taken from the Shiawassee National Wildlife Refuge and Crow Island State Game Area on the Saginaw River. Wild game meat harvested in the 2007 study were analyzed for dioxins and furans, as well as co-planar polychlorinated biphenyls (PCBs). These results were presented in the “Analytical Report for Wild Game Sampled from the Tittabawassee and Saginaw River Floodplains in Support of Human Health Risk Assessment” (December 17, 2007).

This document provides the methodology used to determine if consumption of wild game harvested in the flood plain of the Tittabawassee and Saginaw Rivers presents a human health hazard.

General Approach

The attached tables present the evaluations used by the MDCH in evaluating the safety of consuming wild game harvested from the flood plain of the Tittabawassee River downstream of Midland. For comparative purposes, each table provides intake rates and risk evaluations for intake of DLCs in the U.S. food supply.

- Table 1 provides a comparison of intake rates of DLCs from consumption of wild game harvested from the flood plain of the Tittabawassee River and health benchmarks developed by the World Health Organization (WHO) and the U.S. Environmental Protection Agency Great Lakes Water Quality Initiative (GLI). Comparisons are presented as percentiles of the recommended dose per month (30 days). Health benchmarks for DLCs are discussed below.
- Table 2 provides cancer and noncancer risk estimates for adults who consume wild game harvested from the flood plain of the Tittabawassee River.

- Table 3 provides cancer and noncancer risk estimates for children who consume wild game harvested from the flood plain of the Tittabawassee River.

The equation shown below was used to calculate the DLC intakes shown in Tables 2 and 3:

$$Intake = \frac{TEQ \times CR \times ED \times CF}{BW \times AT}$$

Where,

- TEQ = The DLC Toxic Equivalent (TEQ) concentration in parts per trillion
- CR = Consumption Rate in kilograms (kg) per year
- ED = Exposure Duration in years
- CF = Conversion Factor of 1.0 E-6 milligrams per nanogram (mg/ng)
- BW = Body Weight in kg
- AT = Averaging Time in days

Assumptions made for each of these equation parameters are described below.

TEQ Concentrations of DLCs in Wild Game

The 95th percent upper confidence level on the mean (95% UCL) concentration as well as the 95th percentile of the distribution are used to represent the DLC content of wild game. An average concentration is not used since wild game consumers will not randomly sample among several animals, but could instead harvest individual animals that could contain the higher levels of DLCs detected in Dow's study.

TEQ concentrations for wild game samples reported in the 2004 evaluation include dioxin and furan congeners only. The TEQ concentrations reported for the 2007 wild game samples include dioxins and furans with the addition of the co-planar PCBs for which toxic equivalency factors (TEFs) are available. This approach is consistent with the recommendations of the National Research Council of the Academies of Sciences (NAS 2006).

Consumption Rates

For comparisons in Table 1, adults were assumed to eat a one-quarter (1/4) pound or four ounce serving once per month (30 days). This meal size and frequency may underestimate the amount of each meat eaten per month by larger adults or high-end meat eaters, but may be compared to a quarter pound commercially purchased cheeseburger. Children were assumed to eat a two-ounce serving.

For calculation of adult cancer and noncancer risk shown in Tables 2 and 3, the following intakes were assumed:

- Deer Muscle – 30 Kilogram (Kg) per year = 66 pounds (lbs) per year or 1.3 lbs per week
- Deer Liver – 2.0 Kg per year = 4.4 lbs per year or the liver from one average deer
- Turkey – 4 Kg per year = 8.8 lbs per year or one half the edible meat of two turkeys
- Squirrel – 6.8 Kg per year = approximately 15 lbs or 15 fox squirrel per year
- Wood Duck – 0.7 Kg per year = 1.5 lbs per year or four wood duck

- Canada Goose – 6.8 Kg per year = 15 lbs per year or half the edible meat of 15 geese
- Cottontail Rabbit – 3.4 Kg per year = 7.5 lbs per year or half the edible meat of 15 rabbit

The Michigan Department of Natural Resources (DNR) deer harvest values for Bay, Midland and Saginaw Counties indicate that about 45.9% of the hunters harvesting deer in these counties take only one, and the other 54.1% take 2 or more (DNR 2007a). Therefore, it is reasonable to assume that some hunters or adult family members may consume most of one deer in households that harvest more than one deer. The consumption rate of 30 Kg per is based on the assumption that 2 deer are taken and an adult will consume one half the edible meat available to the household.

While some deer hunters may choose not to eat the liver, many do, therefore it is assumed that one deer liver will be eaten in a year. The weight of 2 Kg is based on the actual weight of a deer liver weighed by DNR staff (personal communication with Dr. Daniel O'Brien, Veterinary Specialist 13 with the Wildlife Disease Laboratory, DNR Wildlife Division, 2004).

The turkey consumption rate assumes that a hunter may take only 2 turkeys per year consistent with Michigan hunting regulations. While many hunters may skin the turkey rather than pluck the feathers, the DNR estimates that perhaps 10 percent of hunters will retain and may consume the skin (personal communication with Dr. Daniel O'Brien, Veterinary Specialist 13 with the Wildlife Disease Laboratory, DNR Wildlife Division, 2004).

DNR small game surveys for 2006 indicate that the mean number of squirrels harvested per hunter is about 7 per year (DNR 2007b). However, avid hunters may take 10 to 15 animals per year (personal communication with Dr. Daniel O'Brien, Veterinary Specialist 13 with the Wildlife Disease Laboratory, DNR Wildlife Division, 2004).

Michigan regulations for hunting migratory waterfowl are controlled by the United States Fish and Wildlife Service (USFWS). These regulations allow a hunter to theoretically harvest 120 wood duck (60-day season, 2 bird limit/day). Based on USFWS harvest estimates, Michigan hunters averaged 0.78 and 1.2 wood ducks/active hunter/season in 2005 and 2006, respectively. For this assessment, it was assumed that an avid hunter would take four wood duck per year. Assuming approximately 25 percent meat yield and about 25 ounces total body weight, each wood duck would yield approximately 6.25 ounces of meat.

The USFWS regulations theoretically allow a legal maximum annual harvest for all seasons (early, regular, and late) of 255 Canada geese per hunter in the counties of interest. Based on USFWS harvest estimates, Michigan hunters averaged 3.7 to 4.2 Canada geese/hunter in 2005 and 2006. For this assessment, it was assumed that an avid hunter would take 15 geese per year (personal communication with Dr. David Luukkonen, Wildlife Research Biologist, DNR, April 15, 2008). Assuming approximately 33 percent meat yield and about 6 lbs total body weight, each Canada goose would yield about 2 lbs of meat.

DNR small game surveys for 2006 indicate that the mean number of rabbits harvested per hunter is about 6 to 7 per year (DNR 2007b). However and avid hunter is likely to take 10 to 15 animals per year. Each rabbit yields approximately one pound of edible meat (Personal Communications

with Dr. Dwayne R. Etter, Acting Research Section Supervisor, DNR Wildlife Division, April 2008.)

For calculation of childhood cancer and noncancer risk, the following intakes were assumed:

- Deer Muscle – 10 Kg per year = 2 ounces every other day
- Deer Liver – 0.11 Kg per year = 4 ounces per year
- Turkey – 0.25 Kg per year or four 2 ounce servings
- Squirrel – 0.25 Kg per year or four 2 ounce servings
- Wood Duck – 0.25 Kg per year or four 2 ounce servings
- Canada Goose – 0.85 Kg per year or fifteen 2 ounce servings
- Cottontail Rabbit – 0.57 Kg per year or ten 2 ounce servings

It is difficult to estimate how much wild game a young child may consume. However, in households where wild game is used in place of store-bought meats, it is reasonable to assume that a child will get a substantial portion of their protein intake from these foods. The estimated consumption rates for children may therefore underestimate the amounts of these foods eaten in a year.

Exposure Duration (ED)

The exposure duration was assumed to be 6 years for a child and 30 years for an adult consistent with assumptions used by the Michigan Department of Environmental Quality (MDEQ) to develop environmental cleanup criteria.

Body Weight (BW)

The adult and child body weights were assumed to be 70 Kg and 15 Kg, respectively. A 15 Kg body weight corresponds approximately to a three-year old child weighing 33 pounds.

Averaging Time (AT)

The AT represents the number of days over which the exposure is averaged and will vary dependent upon the type of toxic effect being evaluated. When evaluating noncancer effects, exposure is calculated by averaging over the period of exposure. For this evaluation, noncancer childhood exposures were averaged over 2,190 days (6 years x 365 days per year). Adult noncancer exposures were averaged over 10,950 days (30 years x 365 days per year). For cancer risk, the exposure is averaged over an assumed lifetime of 25,550 days (70 years x 365 days per year).

Health Benchmarks

Noncancer Health Effects

The Agency for Toxic Substances and Disease Registry (ATSDR), the WHO and the GLI have each assessed the noncancer effects of exposure to DLCs. The following benchmarks were used in assessing intake of DLCs from wild game. All values are presented as DLC doses in picogram (pg) per kilogram (Kg) of body weight per unit of time.

- The WHO Tolerable Monthly Intake (TMI) of 70 pg/Kg-month protective of both cancer and noncancer health effects (WHO 2001).
- The ATSDR Minimal Risk Level (MRL) of 1 pg/Kg-day protective of noncancer health effects (ATSDR 1998).
- The GLI Acceptable Daily Exposure (ADE) of 1.3 pg/kg/day protective of noncancer health effects (adjusted to 30 days for comparison to the WHO TMI) (GLI 1995).

These health benchmarks do not represent a boundary between safe and unsafe intake of DLCs. However, intake of DLCs above these values will erode the margin of safety used in their derivation. Therefore, consumption of foods that contribute a high percentage of the recommended intake should be limited to avoid a significant exceedance of the health benchmark dose.

The derivations for the health benchmarks used in this evaluation are presented in detail in the cited documents and are not reproduced here. The WHO TMI, the ATSDR MRL, and the GLI ADE are all intended to be protective of potential developmental effects of DLC exposure either before birth or in the first few years of life. Therefore, exposures for women of childbearing age and children under the age of 15 are of particular concern.

Hazard quotients for wild game consumption are presented in Tables 2 and 3 for adults and children respectively. A hazard quotient is a ratio of an exposure level to a reference dose developed for a chemical under consideration. If the hazard quotient is greater than unity, there may be concern for noncancer effects. The ATSDR MRL of 1 pg/Kg-day is used to calculate hazard quotients for this evaluation. It is important to note that the hazard quotients shown are for one wild game species only and may not adequately account for DLC exposure if a consumer has additional exposures from sources such as other game or sport-caught fish.

Cancer

The incremental lifetime cancer risk associated with consumption of wild game taken from the flood plain of the Tittabawassee River has also been calculated and may be compared to the acceptable incremental risk of 1 additional cancer in a population of 100,000 people as specified in Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

The cancer slope factor of 75,000 mg/Kg-day⁻¹ is used by the MDEQ to develop clean up criteria under Part 201 of PA 451, referenced above. The slope factor is based on an observed increase in cancer in female rats in a two-year study conducted by the Dow Chemical Company (Kociba 1978). The cancer potency of DLCs is under review by the U.S. Environmental Protection Agency (EPA) and the National Toxicology Program and this assessment may be revised pending the outcome of those reviews.

Background Exposures

When evaluating the potential for noncancer health effects resulting from exposure to DLCs in wild game, it is important to consider the level of exposure already occurring due to levels of DLCs in the national food supply. The U.S. Food and Drug Administration (FDA) Center for Food Safety and Applied Nutrition has estimated the exposure levels that would result from

consumption of foods sampled in their Total Dietary Studies (TDS) conducted in 2001-2004. DLC concentration data were linked to consumption amounts for each food sampled in the TDS to provide an estimate of dietary exposure to DLCs by age group (FDA 2006). MDCH used these values to estimate the contribution of dietary exposure to adjust the ATSDR MRL of 1 pg/Kg-day used in the Hazard Quotient evaluations presented in Tables 2 and 3.

For adults, the FDA provides a TEQ intake from background dietary sources of 7.0 pg/Kg-month. One half the TEQ intake from meat and poultry of 3.5 pg/Kg-month was assumed to come from wild game consumption and the background rate adjusted to 5.25 pg/Kg-month or 0.18 pg/Kg-day, leaving 82 percent of the MRL for additional exposures. Hazard quotient calculations shown in Table 2 reflect this adjustment for wild game exposures.

For children ages 1-6 years, the FDA 2001-2004 TDS indicates an average TEQ intake from dietary sources of 21 pg/Kg-month, which includes an average TEQ intake from meat and poultry of 8.7 pg/Kg-month. It was assumed that wild game could account for one half the intake from meat and poultry, and the background dietary intake was adjusted to 16.65 pg/Kg-month or 0.56 pg/Kg-day. Therefore, only 44 percent of the ATSDR MRL of 1 pg/Kg-day is not already taken up by background dietary exposures (1 pg/Kg-day minus 0.56 pg/Kg-day times 100).

References

ATSDR (Agency for Toxic Substances and Disease Registry). 1998. Toxicological Profile for Chlorinated Dibenzo-*p*-Dioxins. December 1998.

DNR 2007a. (Michigan Department of Natural Resources) Michigan Deer Harvest Survey Report 2006 Seasons. Wildlife Division Report No. 3467. June 2007.

DNR 2007b. (Michigan Department of Natural Resources) 2006 Small Game Harvest Survey. Wildlife Division Report No. 3479. October 2007.

FDA (U.S. Food and Drug Administration) 2006. PCDD/PCDF Exposure Estimates from TDS Samples Collected in 2001-2004. June 2006. <http://www.cfsan.fda.gov/~lrd/dioxee.html>.

GLI (Great Lakes Water Quality Initiative, U.S. Environmental Protection Agency). 1995. Criteria Documents for the Protection of Human Health. EPA Number: 820B95006. March 1995.

Kociba, et al. 1978. "Results of a two-year chronic toxicity and oncogenicity study of 2,3,7,8-TCDD in rats." *Toxicol. Appl. Pharmacol.* 46:281-287.

MDCH (Michigan Department of Community Health). 2004. "State of Michigan Issues Health Advisories for Consuming Wild Game from Tittabawassee River Flood Plain." September 14, 2004.

NAS (National Academies of Sciences). 2006. National Research Council, Committee on EPA's Exposure and Human Health Reassessment of TCDD and Related Compounds. "Health Risks from Dioxin and Related Compounds: Evaluation of the EPA Reassessment." The National Academies Press, Washington, D.C.

WHO (World Health Organization). 2001. Joint FAO/WHO Expert Committee on Food Additives (JECFA). Fifty-Seventh Meeting, Rome, June 5-14, 2001.

Comparison of Intake Rates for Meat from FDA Total Diet Study (TDS) and Dow Wild Game Studies

The comparisons shown below are the percentage of the WHO Tolerable Monthly Intake (TMI) or the GLI Acceptable Daily Exposure (ADE) accounted for by a single 4 ounce serving for adults or a single 2 ounce serving for children. ⁽¹⁾

1/4 lb or 4 ounce serving	Concentration of DLCs TEQ in ng/Kg (ppt)	Adults				Children ⁽²⁾			
		grams per 4 oz.	Intake (pg TEQ) per 4 ounce serving	Percent of WHO TMI	Percent of GLI ADE	grams per 2oz	Intake (pg TEQ) per 2 ounce serving	Percent of WHO TMI	Percent of GLI ADE
INSTITUTE OF MEDICINE-NATIONAL AVERAGE⁽³⁾									
2004 TDS Cheeseburger ⁽³⁾	0.0337	113.5	3.8	0.1	0.1	56.75	1.9	0.2	0.3
2004 TDS Chicken Breast, Meat Only ⁽³⁾	0.0255	113.5	2.9	0.06	0.1	56.75	1.4	0.14	0.2
2004 TDS Beef Chuck Roast ⁽³⁾	0.2943	113.5	33.4	0.7	1.2	56.75	16.7	1.6	2.9
DEER MUSCLE									
Upstream 95% UCL ⁽³⁾	0.089	113.5	10.1	0.2	0.4	56.75	5.1	0.5	0.9
Upstream 95th Percentile ⁽³⁾	0.12	113.5	13.6	0.3	0.5	56.75	6.8	0.6	1.2
Smith's Crossing 95% UCL ⁽³⁾	0.2	113.5	22.7	0.5	0.8	56.75	11.4	1.1	1.9
Smith's Crossing 95 Percentile ⁽³⁾	0.25	113.5	28.4	0.6	1.0	56.75	14.2	1.4	2.4
Near Imerman Park 95% UCL ⁽³⁾	0.82	113.5	93.1	1.9	3.4	56.75	46.5	4.4	8.0
Near Imerman Park 95%th Percentile ⁽³⁾	1	113.5	113.5	2.3	4.2	56.75	56.8	5.4	9.7
SNWR 95% UCL	0.72	113.5	81.7	1.7	3.0	56.75	40.9	3.9	7.0
SNWR 95th Percentile	0.74	113.5	84.0	1.7	3.1	56.75	42.0	4.0	7.2
Crow Island State Game Area 95% UCL	0.69	113.5	78.3	1.6	2.9	56.75	39.2	3.7	6.7
Crow Island State Game Area 95th Percentile	0.71	113.5	80.6	1.6	3.0	56.75	40.3	3.8	6.9
DEER LIVER									
Upstream 95% UCL ⁽³⁾	0.73	113.5	82.9	1.7	3.0	56.75	41.4	3.9	7.1
Upstream 95th Percentile ⁽³⁾	1	113.5	113.5	2.3	4.2	56.75	56.8	5.4	9.7
Smith's Crossing 95% UCL ⁽³⁾	16	113.5	1816.0	37.1	66.5	56.75	908.0	86.5	155.2
Smith's Crossing 95th Percentile ⁽³⁾	19	113.5	2156.5	44.0	79.0	56.75	1078.3	102.7	184.3
Near Imerman Park 95% UCL ⁽³⁾	148	113.5	16798.0	342.8	615.3	56.75	8399.0	799.9	1435.7
Near Imerman Park 95th Percentile ⁽³⁾	149	113.5	16911.5	345.1	619.5	56.75	8455.8	805.3	1445.4
SNWR 95% UCL	8.02	113.5	910.3	18.6	33.3	56.75	455.1	43.3	77.8
SNWR 95th Percentile	12.9	113.5	1464.2	29.9	53.6	56.75	732.1	69.7	125.1
CISGA 95% UCL	1.23	113.5	139.6	2.8	5.1	56.75	69.8	6.6	11.9
CISGA 95th Percentile	1.47	113.5	166.8	3.4	6.1	56.75	83.4	7.9	14.3
TURKEY MEAT ONLY									
Upstream 95% UCL ⁽³⁾	0.15	113.5	17.0	0.3	0.6	56.75	8.5	0.8	1.5
Upstream 95th Percentile ⁽³⁾	0.15	113.5	17.0	0.3	0.6	56.75	8.5	0.8	1.5

Comparison of Intake Rates for Meat from FDA Total Diet Study (TDS) and Dow Wild Game Studies

1/4 lb or 4 ounce serving	Concentration of DLCs TEQ in ng/Kg (ppt)	Adults				Children ⁽²⁾			
		grams per 4 oz.	Intake (pg TEQ) per 4 ounce serving	Percent of WHO TMI	Percent of GLI ADE	grams per 2oz	Intake (pg TEQ) per 2 ounce serving	Percent of WHO TMI	Percent of GLI ADE
Smith's Crossing 95%UCL ⁽³⁾	13.3	113.5	1509.6	30.8	55.3	56.75	754.8	71.9	129.0
Smith's Crossing 95th Percentile ⁽³⁾	12.3	113.5	1396.1	28.5	51.1	56.75	698.0	66.5	119.3
Near Imerman Park 95% UCL	9.95	113.5	1129.3	23.0	41.4	56.75	564.7	53.8	96.5
Near Imerman Park 95th Percentile	12.65	113.5	1435.8	29.3	52.6	56.75	717.9	68.4	122.7
SNWR 95% UCL	2.06	113.5	233.8	4.8	8.6	56.75	116.9	11.1	20.0
SNWR 95th Percentile	2.98	113.5	338.2	6.9	12.4	56.75	169.1	16.1	28.9
CISGA 95% UCL	0.84	113.5	95.3	1.9	3.5	56.75	47.7	4.5	8.1
CISGA 95th Percentile	0.83	113.5	94.2	1.9	3.5	56.75	47.1	4.5	8.1
TURKEY MEAT WITH SKIN									
Upstream Meat & Skin 95% UCL ⁽³⁾	0.22927	113.5	26.0	0.5	1.0	56.75	13.0	1.2	2.2
Upstream Meat & Skin 95th Percentile ⁽³⁾	0.3176	113.5	36.0	0.7	1.3	56.75	18.0	1.7	3.1
Smith's Crossing 95%UCL ⁽³⁾	13.97	113.5	1585.6	32.4	58.1	56.75	792.8	75.5	135.5
Smith's Crossing 95th Percentile ⁽³⁾	23.25	113.5	2638.9	53.9	96.7	56.75	1319.4	125.7	225.5
Near Imerman Park 95% UCL	15.93	113.5	1808.1	36.9	66.2	56.75	904.0	86.1	154.5
Near Imerman Park 95th Percentile	19.45	113.5	2207.6	45.1	80.9	56.75	1103.8	105.1	188.7
SNWR 95% UCL	2.54	113.5	288.3	5.9	10.6	56.75	144.1	13.7	24.6
SNWR 95th Percentile	3.68	113.5	417.7	8.5	15.3	56.75	208.8	19.9	35.7
CISGA 95% UCL	1.09	113.5	123.7	2.5	4.5	56.75	61.9	5.9	10.6
CISGA 95th Percentile	1.11	113.5	126.0	2.6	4.6	56.75	63.0	6.0	10.8
SQUIRREL									
Upstream 95% UCL ⁽³⁾	0.087	113.5	9.9	0.2	0.4	56.75	4.9	0.5	0.8
Upstream 95th Percentile ⁽³⁾	0.11	113.5	12.5	0.3	0.5	56.75	6.2	0.6	1.1
Smith's Crossing 95%UCL ⁽³⁾	0.93	113.5	105.6	2.2	3.9	56.75	52.8	5.0	9.0
Smith's Crossing 95th Percentile ⁽³⁾	1.1	113.5	124.9	2.5	4.6	56.75	62.4	5.9	10.7
Near Imerman Park 95%UCL ⁽³⁾	4.3	113.5	488.1	10.0	17.9	56.75	244.0	23.2	41.7
Near Imerman Park 95th Percentile ⁽³⁾	4.3	113.5	488.1	10.0	17.9	56.75	244.0	23.2	41.7
SNWR 95% UCL	0.77	113.5	87.4	1.8	3.2	56.75	43.7	4.2	7.5
SNWR 95th Percentile	0.83	113.5	94.2	1.9	3.5	56.75	47.1	4.5	8.1
CISGA 95% UCL	0.71	113.5	80.6	1.6	3.0	56.75	40.3	3.8	6.9
CISGA 95th Percentile	0.73	113.5	82.9	1.7	3.0	56.75	41.4	3.9	7.1

Comparison of Intake Rates for Meat from FDA Total Diet Study (TDS) and Dow Wild Game Studies

1/4 lb or 4 ounce serving	Concentration of DLCs TEQ in ng/Kg (ppt)	Adults				Children ⁽²⁾			
		grams per 4 oz.	Intake (pg TEQ) per 4 ounce serving	Percent of WHO TMI	Percent of GLI ADE	grams per 2oz	Intake (pg TEQ) per 2 ounce serving	Percent of WHO TMI	Percent of GLI ADE
CANADA GOOSE MEAT ONLY									
SNWR 95% UCL	1.19	113.5	135.1	2.8	4.9	56.75	67.5	6.4	11.5
SNWR 95th Percentile	1.69	113.5	191.8	3.9	7.0	56.75	95.9	9.1	16.4
CISGA 95% UCL	0.79	113.5	89.7	1.8	3.3	56.75	44.8	4.3	7.7
CISGA 95th Percentile	0.87	113.5	98.7	2.0	3.6	56.75	49.4	4.7	8.4
CANADA GOOSE MEAT WITH SKIN									
SNWR 95% UCL	2.25	113.5	255.4	5.2	9.4	56.75	127.7	12.2	21.8
SNWR 95th Percentile	3.13	113.5	355.3	7.3	13.0	56.75	177.6	16.9	30.4
CISGA 95% UCL	1.39	113.5	157.8	3.2	5.8	56.75	78.9	7.5	13.5
CISGA 95th Percentile	1.85	113.5	210.0	4.3	7.7	56.75	105.0	10.0	17.9
WOOD DUCK MEAT ONLY									
SNWR 95% UCL	2.66	113.5	301.9	6.2	11.1	56.75	151.0	14.4	25.8
SNWR 95th Percentile	4.45	113.5	505.1	10.3	18.5	56.75	252.5	24.1	43.2
CISGA 95% UCL	1.27	113.5	144.1	2.9	5.3	56.75	72.1	6.9	12.3
CISGA 95th Percentile	1.93	113.5	219.1	4.5	8.0	56.75	109.5	10.4	18.7
WOOD DUCK MEAT WITH SKIN									
SNWR 95% UCL	12.95	113.5	1469.8	30.0	53.8	56.75	734.9	70.0	125.6
SNWR 95th Percentile	21.2	113.5	2406.2	49.1	88.1	56.75	1203.1	114.6	205.7
CISGA 95% UCL	6.33	113.5	718.5	14.7	26.3	56.75	359.2	34.2	61.4
CISGA 95th Percentile	11.66	113.5	1323.4	27.0	48.5	56.75	661.7	63.0	113.1
COTTONTAIL RABBIT									
Near Imerman Park 95%UCL	1.21	113.5	137.3	2.8	5.0	56.75	68.7	6.5	11.7
Near Imerman Park 95th Percentile	1.68	113.5	190.7	3.9	7.0	56.75	95.3	9.1	16.3
SNWR 95% UCL	0.94	113.5	106.7	2.2	3.9	56.75	53.3	5.1	9.1
SNWR 95th Percentile	1.22	113.5	138.5	2.8	5.1	56.75	69.2	6.6	11.8
CISGA 95% UCL	0.71	113.5	80.6	1.6	3.0	56.75	40.3	3.8	6.9
CISGA 95th Percentile	0.72	113.5	81.7	1.7	3.0	56.75	40.9	3.9	7.0

⁽¹⁾The WHO UN Food and Agricultural Organization Tolerable Monthly Intake (TMI) = 70 pg/Kg per month: 4,900/month for an adult, 1,050 for a 15 Kg child.

The Great Lakes Initiative Acceptable Daily Exposure (ADE) for 2,3,7,8-TCDD is 1.3 pg/kg/d: 2,730 for an adult, 585 for a 15 Kg child. Comparisons presented here are for a 30 day exposure for consistency with the WHO TMI.

⁽²⁾Children are assumed to eat 1/2 the 4 oz serving (i.e., 1/2 a cheeseburger, 2 oz of venison, turkey etc)

⁽³⁾Concentration of DLC TEQ does not include co-planar PCBs and is calculated using the WHO 1998 TEFs.

Table 2
Adult Cancer and Noncancer Risks for Dioxin-Like Compounds
FDA TDS and Dow Wild Game Studies

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate in kg/year	conversion factor from ng to mg	Exposure Duration in years	Adult Body Weight (kg)	Adult TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Adult Incremental Cancer Risk	ATSDR MRL for Chronic Noncancer Hazard (mg/kg/day)	Adult Chronic NonCancer Hazard Quotient
INSTITUTE OF MEDICINE-NATIONAL AVERAGE										
2004 TDS Cheeseburger	0.0337	41	1.0E-06	30	70.0	2.32E-11	7.50E+04	1.7E-06	1.0E-09	0.07
2004 TDS Chicken Breast, Meat Only	0.0255	41	1.0E-06	30	70.0	1.75E-11	7.50E+04	1.3E-06	1.0E-09	0.05
2004 TDS Beef Chuck Roast	0.2943	41	1.0E-06	30	70.0	2.02E-10	7.50E+04	1.5E-05	1.0E-09	0.58
DEER MUSCLE										
Upstream 95% UCL	0.089	30.0	1.0E-06	30	70.0	4.48E-11	7.50E+04	3.4E-06	1.0E-09	0.13
Upstream 95th Percentile	0.12	30.0	1.0E-06	30	70.0	6.04E-11	7.50E+04	4.5E-06	1.0E-09	0.17
Smith's Crossing 95% UCL	0.2	30.0	1.0E-06	30	70.0	1.01E-10	7.50E+04	7.5E-06	1.0E-09	0.29
Smith's Crossing 95 Percentile	0.25	30.0	1.0E-06	30	70.0	1.26E-10	7.50E+04	9.4E-06	1.0E-09	0.36
Near Imerman Park 95% UCL	0.82	30.0	1.0E-06	30	70.0	4.13E-10	7.50E+04	3.1E-05	1.0E-09	1.17
Near Imerman Park 95%th Percentile	1	30.0	1.0E-06	30	70.0	5.03E-10	7.50E+04	3.8E-05	1.0E-09	1.43
SNWR 95% UCL	0.72	30.0	1.0E-06	30	70.0	3.62E-10	7.50E+04	2.7E-05	1.0E-09	1.03
SNWR 95th Percentile	0.74	30.0	1.0E-06	30	70.0	3.72E-10	7.50E+04	2.8E-05	1.0E-09	1.06
Crow Island State Game Area 95% UCL	0.69	30.0	1.0E-06	30	70.0	3.47E-10	7.50E+04	2.6E-05	1.0E-09	0.99
Crow Island State Game Area 95th	0.71	30.0	1.0E-06	30	70.0	3.57E-10	7.50E+04	2.7E-05	1.0E-09	1.02
DEER LIVER										
Upstream 95% UCL	0.73	2	1.0E-06	30	70.0	2.45E-11	7.50E+04	1.8E-06	1.0E-09	0.07
Upstream 95th Percentile	1	2	1.0E-06	30	70.0	3.35E-11	7.50E+04	2.5E-06	1.0E-09	0.10
Smith's Crossing 95% UCL	16	2	1.0E-06	30	70.0	5.37E-10	7.50E+04	4.0E-05	1.0E-09	1.53
Smith's Crossing 95th Percentile	19	2	1.0E-06	30	70.0	6.37E-10	7.50E+04	4.8E-05	1.0E-09	1.81
Near Imerman Park 95% UCL	148	2	1.0E-06	30	70.0	4.97E-09	7.50E+04	3.7E-04	1.0E-09	14.13
Near Imerman Park 95th Percentile	149	2	1.0E-06	30	70.0	5.00E-09	7.50E+04	3.7E-04	1.0E-09	14.22
SNWR 95% UCL	8.02	2	1.0E-06	30	70.0	2.69E-10	7.50E+04	2.0E-05	1.0E-09	0.77
SNWR 95th Percentile	12.9	2	1.0E-06	30	70.0	4.33E-10	7.50E+04	3.2E-05	1.0E-09	1.23
CISGA 95% UCL	1.23	2	1.0E-06	30	70.0	4.13E-11	7.50E+04	3.1E-06	1.0E-09	0.12
CISGA 95th Percentile	1.47	2	1.0E-06	30	70.0	4.93E-11	7.50E+04	3.7E-06	1.0E-09	0.14

Table 2
Adult Cancer and Noncancer Risks for Dioxin-Like Compounds
FDA TDS and Dow Wild Game Studies

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate in kg/year	conversion factor from ng to mg	Exposure Duration in years	Adult Body Weight (kg)	Adult TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Adult Incremental Cancer Risk	ATSDR MRL for Chronic Noncancer Hazard (mg/kg/day)	Adult Chronic NonCancer Hazard Quotient
TURKEY MEAT ONLY										
Upstream Meat Only 95% UCL	0.15	4	1.0E-06	30	70.0	1.01E-11	7.50E+04	7.5E-07	1.0E-09	0.03
Upstream Meat Only 95th Percentile	0.15	4	1.0E-06	30	70.0	1.01E-11	7.50E+04	7.5E-07	1.0E-09	0.03
Smith's Crossing 95%UCL ⁽³⁾	13.3	4	1.0E-06	30	70.0	8.92E-10	7.50E+04	6.7E-05	1.0E-09	2.54
Smith's Crossing 95th Percentile ⁽³⁾	12.3	4	1.0E-06	30	70.0	8.25E-10	7.50E+04	6.2E-05	1.0E-09	2.35
Near Imerman Park 95% UCL	9.95	4	1.0E-06	30	70.0	6.68E-10	7.50E+04	5.0E-05	1.0E-09	1.90
Near Imerman Park 95th Percentile	12.65	4	1.0E-06	30	70.0	8.49E-10	7.50E+04	6.4E-05	1.0E-09	2.42
SNWR 95% UCL	2.06	4	1.0E-06	30	70.0	1.38E-10	7.50E+04	1.0E-05	1.0E-09	0.39
SNWR 95th Percentile	2.98	4	1.0E-06	30	70.0	2.00E-10	7.50E+04	1.5E-05	1.0E-09	0.57
CISGA 95% UCL	0.84	4	1.0E-06	30	70.0	5.64E-11	7.50E+04	4.2E-06	1.0E-09	0.16
CISGA 95th Percentile	0.83	4	1.0E-06	30	70.0	5.57E-11	7.50E+04	4.2E-06	1.0E-09	0.16
TURKEY MEAT WITH SKIN										
Upstream Meat & Skin 95% UCL	0.22927	4	1.0E-06	30	70.0	1.54E-11	7.50E+04	1.2E-06	1.0E-09	0.04
Upstream Meat & Skin 95th Percentile	0.3176	4	1.0E-06	30	70.0	2.13E-11	7.50E+04	1.6E-06	1.0E-09	0.06
Smith's Crossing 95%UCL ⁽³⁾	13.97	4	1.0E-06	30	70.0	9.37E-10	7.50E+04	7.0E-05	1.0E-09	2.67
Smith's Crossing 95th Percentile ⁽³⁾	23.25	4	1.0E-06	30	70.0	1.56E-09	7.50E+04	1.2E-04	1.0E-09	4.44
Near Imerman Park 95% UCL	15.93	4	1.0E-06	30	70.0	1.07E-09	7.50E+04	8.0E-05	1.0E-09	3.04
Near Imerman Park 95th Percentile	19.45	4	1.0E-06	30	70.0	1.31E-09	7.50E+04	9.8E-05	1.0E-09	3.71
SNWR 95% UCL	2.54	4	1.0E-06	30	70.0	1.70E-10	7.50E+04	1.3E-05	1.0E-09	0.48
SNWR 95th Percentile	3.68	4	1.0E-06	30	70.0	2.47E-10	7.50E+04	1.9E-05	1.0E-09	0.70
CISGA 95% UCL	1.09	4	1.0E-06	30	70.0	7.31E-11	7.50E+04	5.5E-06	1.0E-09	0.21
CISGA 95th Percentile	1.11	4	1.0E-06	30	70.0	7.45E-11	7.50E+04	5.6E-06	1.0E-09	0.21
SQUIRREL										
Upstream 95% UCL	0.087	6.8	1.0E-06	30	70.0	9.92E-12	7.50E+04	7.4E-07	1.0E-09	0.03
Upstream 95th Percentile	0.11	6.8	1.0E-06	30	70.0	1.25E-11	7.50E+04	9.4E-07	1.0E-09	0.04
Smith's Crossing 95%UCL	0.93	6.8	1.0E-06	30	70.0	1.06E-10	7.50E+04	8.0E-06	1.0E-09	0.30
Smith's Crossing 95th Percentile	1.1	6.8	1.0E-06	30	70.0	1.25E-10	7.50E+04	9.4E-06	1.0E-09	0.36
Near Imerman Park 95%UCL	4.3	6.8	1.0E-06	30	70.0	4.90E-10	7.50E+04	3.7E-05	1.0E-09	1.40
Near Imerman Park 95th Percentile	4.3	6.8	1.0E-06	30	70.0	4.90E-10	7.50E+04	3.7E-05	1.0E-09	1.40
SNWR 95% UCL	0.77	6.8	1.0E-06	30	70.0	8.78E-11	7.50E+04	6.6E-06	1.0E-09	0.25
SNWR 95th Percentile	0.83	6.8	1.0E-06	30	70.0	9.47E-11	7.50E+04	7.1E-06	1.0E-09	0.27
CISGA 95% UCL	0.71	6.8	1.0E-06	30	70.0	8.10E-11	7.50E+04	6.1E-06	1.0E-09	0.23
CISGA 95th Percentile	0.73	6.8	1.0E-06	30	70.0	8.33E-11	7.50E+04	6.2E-06	1.0E-09	0.24

Table 2
Adult Cancer and Noncancer Risks for Dioxin-Like Compounds
FDA TDS and Dow Wild Game Studies

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate in kg/year	conversion factor from ng to mg	Exposure Duration in years	Adult Body Weight (kg)	Adult TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Adult Incremental Cancer Risk	ATSDR MRL for Chronic Noncancer Hazard (mg/kg/day)	Adult Chronic NonCancer Hazard Quotient
CANADA GOOSE MEAT ONLY										
SNWR 95% UCL	1.19	6.8	1.0E-06	30	70.0	1.36E-10	7.50E+04	1.0E-05	1.0E-09	0.39
SNWR 95th Percentile	1.69	6.8	1.0E-06	30	70.0	1.93E-10	7.50E+04	1.4E-05	1.0E-09	0.55
CISGA 95% UCL	0.79	6.8	1.0E-06	30	70.0	9.01E-11	7.50E+04	6.8E-06	1.0E-09	0.26
CISGA 95th Percentile	0.87	6.8	1.0E-06	30	70.0	9.92E-11	7.50E+04	7.4E-06	1.0E-09	0.28
CANADA GOOSE MEAT WITH SKIN										
SNWR 95% UCL	2.25	6.8	1.0E-06	30	70.0	2.57E-10	7.50E+04	1.9E-05	1.0E-09	0.73
SNWR 95th Percentile	3.13	6.8	1.0E-06	30	70.0	3.57E-10	7.50E+04	2.7E-05	1.0E-09	1.02
CISGA 95% UCL	1.39	6.8	1.0E-06	30	70.0	1.59E-10	7.50E+04	1.2E-05	1.0E-09	0.45
CISGA 95th Percentile	1.85	6.8	1.0E-06	30	70.0	2.11E-10	7.50E+04	1.6E-05	1.0E-09	0.60
WOOD DUCK MEAT ONLY										
SNWR 95% UCL	2.66	0.7	1.0E-06	30	70.0	3.12E-11	7.50E+04	2.3E-06	1.0E-09	0.09
SNWR 95th Percentile	4.45	0.7	1.0E-06	30	70.0	5.23E-11	7.50E+04	3.9E-06	1.0E-09	0.15
CISGA 95% UCL	1.27	0.7	1.0E-06	30	70.0	1.49E-11	7.50E+04	1.1E-06	1.0E-09	0.04
CISGA 95th Percentile	1.93	0.7	1.0E-06	30	70.0	2.27E-11	7.50E+04	1.7E-06	1.0E-09	0.06
WOOD DUCK MEAT WITH SKIN										
SNWR 95% UCL	12.95	0.7	1.0E-06	30	70.0	1.52E-10	7.50E+04	1.1E-05	1.0E-09	0.43
SNWR 95th Percentile	21.2	0.7	1.0E-06	30	70.0	2.49E-10	7.50E+04	1.9E-05	1.0E-09	0.71
CISGA 95% UCL	6.33	0.7	1.0E-06	30	70.0	7.43E-11	7.50E+04	5.6E-06	1.0E-09	0.21
CISGA 95th Percentile	11.66	0.7	1.0E-06	30	70.0	1.37E-10	7.50E+04	1.0E-05	1.0E-09	0.39
COTTONTAIL RABBIT										
Near Imerman Park 95%UCL	1.21	3.4	1.0E-06	30	70.0	6.90E-11	7.50E+04	5.2E-06	1.0E-09	0.20
Near Imerman Park 95th Percentile	1.68	3.4	1.0E-06	30	70.0	9.58E-11	7.50E+04	7.2E-06	1.0E-09	0.27
SNWR 95% UCL	0.94	3.4	1.0E-06	30	70.0	5.36E-11	7.50E+04	4.0E-06	1.0E-09	0.15
SNWR 95th Percentile	1.22	3.4	1.0E-06	30	70.0	6.96E-11	7.50E+04	5.2E-06	1.0E-09	0.20
CISGA 95% UCL	0.71	3.4	1.0E-06	30	70.0	4.05E-11	7.50E+04	3.0E-06	1.0E-09	0.12
CISGA 95th Percentile	0.72	3.4	1.0E-06	30	70.0	4.11E-11	7.50E+04	3.1E-06	1.0E-09	0.12

Exposure Frequency is 25,550 days for cancer risk and 10,950 days for non cancer hazard quotient.

100 % Bioavailability is assumed for DLCs in food (Moser and McLachlan 2001).

Hazard Quotient calculations are based on the ATSDR Minimal Risk Level of 1 pg TEQ per Kg body weight per day adjusted for background dietary intake

**Child Cancer and Noncancer Risk for Dioxin-Like Compounds
FDA TDS, Dow Wild Game Study, and Incidental Ingestion of Soil**

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate kg/year	conversion factor from ng to mg	Exposure Duration years	Child body weight (kg)	Child TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Child Incremental Cancer Risk	ATSDR MRL for Chronic NonCancer Hazard (mg/kg/day)	Child Chronic Non Cancer Hazard Quotient
INSTITUTE OF MEDICINE-NATIONAL AVERAGE										
2004 TDS Cheeseburger	0.0337	20.5	1.0E-06	6	15.0	1.26E-10	7.50E+04	8.1E-07	1.0E-09	0.29
2004 TDS Chicken Breast, Meat Only	0.0255	20.5	1.0E-06	6	15.0	9.55E-11	7.50E+04	6.1E-07	1.0E-09	0.22
2004 TDS Beef Chuck Roast	0.2943	10.0	1.0E-06	6	15.0	5.38E-10	7.50E+04	3.5E-06	1.0E-09	1.22
DEER MUSCLE										
Upstream 95% UCL	0.089	10.0	1.0E-06	6	15.0	1.63E-10	7.50E+04	1.0E-06	1.0E-09	0.37
Upstream 95th Percentile	0.12	10.0	1.0E-06	6	15.0	2.19E-10	7.50E+04	1.4E-06	1.0E-09	0.50
Smith's Crossing 95% UCL	0.2	10.0	1.0E-06	6	15.0	3.65E-10	7.50E+04	2.3E-06	1.0E-09	0.83
Smith's Crossing 95 Percentile	0.25	10.0	1.0E-06	6	15.0	4.57E-10	7.50E+04	2.9E-06	1.0E-09	1.04
Near Imerman Park 95% UCL	0.82	10.0	1.0E-06	6	15.0	1.50E-09	7.50E+04	9.6E-06	1.0E-09	3.40
Near Imerman Park 95%th Percentile	1	10.0	1.0E-06	6	15.0	1.83E-09	7.50E+04	1.2E-05	1.0E-09	4.15
SNWR 95% UCL	0.72	10.0	1.0E-06	6	15.0	1.32E-09	7.50E+04	8.5E-06	1.0E-09	2.99
SNWR 95th Percentile	0.74	10.0	1.0E-06	6	15.0	1.35E-09	7.50E+04	8.7E-06	1.0E-09	3.07
Crow Island State Game Area 95% UCL	0.69	10.0	1.0E-06	6	15.0	1.26E-09	7.50E+04	8.1E-06	1.0E-09	2.86
Crow Island State Game Area 95th	0.71	10.0	1.0E-06	6	15.0	1.30E-09	7.50E+04	8.3E-06	1.0E-09	2.95
DEER LIVER										
Upstream 95% UCL	0.73	0.11	1.0E-06	6	15.0	1.47E-11	7.50E+04	9.4E-08	1.0E-09	0.03
Upstream 95th Percentile	1	0.11	1.0E-06	6	15.0	2.01E-11	7.50E+04	1.3E-07	1.0E-09	0.05
Smith's Crossing 95% UCL	16	0.11	1.0E-06	6	15.0	3.21E-10	7.50E+04	2.1E-06	1.0E-09	0.73
Smith's Crossing 95th Percentile	19	0.11	1.0E-06	6	15.0	3.82E-10	7.50E+04	2.5E-06	1.0E-09	0.87
Near Imerman Park 95% UCL	148	0.11	1.0E-06	6	15.0	2.97E-09	7.50E+04	1.9E-05	1.0E-09	6.76
Near Imerman Park 95th Percentile	149	0.11	1.0E-06	6	15.0	2.99E-09	7.50E+04	1.9E-05	1.0E-09	6.80
SNWR 95% UCL	8.02	0.11	1.0E-06	6	15.0	1.61E-10	7.50E+04	1.0E-06	1.0E-09	0.37
SNWR 95th Percentile	12.9	0.11	1.0E-06	6	15.0	2.59E-10	7.50E+04	1.7E-06	1.0E-09	0.59
CISGA 95% UCL	1.23	0.11	1.0E-06	6	15.0	2.47E-11	7.50E+04	1.6E-07	1.0E-09	0.06
CISGA 95th Percentile	1.47	0.11	1.0E-06	6	15.0	2.95E-11	7.50E+04	1.9E-07	1.0E-09	0.07
TURKEY MEAT ONLY										
Upstream Meat Only 95% UCL	0.15	0.25	1.0E-06	6	15.0	6.85E-12	7.50E+04	4.4E-08	1.0E-09	0.02
Upstream Meat Only 95th Percentile	0.15	0.25	1.0E-06	6	15.0	6.85E-12	7.50E+04	4.4E-08	1.0E-09	0.02
Smith's Crossing 95%UCL ⁽³⁾	13.3	0.25	1.0E-06	6	15.0	6.07E-10	7.50E+04	3.9E-06	1.0E-09	1.38
Smith's Crossing 95th Percentile ⁽³⁾	12.3	0.25	1.0E-06	6	15.0	5.62E-10	7.50E+04	3.6E-06	1.0E-09	1.28

**Child Cancer and Noncancer Risk for Dioxin-Like Compounds
FDA TDS, Dow Wild Game Study, and Incidental Ingestion of Soil**

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate kg/year	conversion factor from ng to mg	Exposure Duration years	Child body weight (kg)	Child TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Child Incremental Cancer Risk	ATSDR MRL for Chronic NonCancer Hazard (mg/kg/day)	Child Chronic Non Cancer Hazard Quotient
Near Imerman Park 95% UCL	9.95	0.25	1.0E-06	6	15.0	4.54E-10	7.50E+04	2.9E-06	1.0E-09	1.03
Near Imerman Park 95th Percentile	12.65	0.25	1.0E-06	6	15.0	5.78E-10	7.50E+04	3.7E-06	1.0E-09	1.31
SNWR 95% UCL	2.06	0.25	1.0E-06	6	15.0	9.41E-11	7.50E+04	6.0E-07	1.0E-09	0.21
SNWR 95th Percentile	2.98	0.25	1.0E-06	6	15.0	1.36E-10	7.50E+04	8.7E-07	1.0E-09	0.31
CISGA 95% UCL	0.84	0.25	1.0E-06	6	15.0	3.84E-11	7.50E+04	2.5E-07	1.0E-09	0.09
CISGA 95th Percentile	0.83	0.25	1.0E-06	6	15.0	3.79E-11	7.50E+04	2.4E-07	1.0E-09	0.09
TURKEY MEAT WITH SKIN										
Upstream Meat & Skin 95% UCL	0.22927	0.25	1.0E-06	6	15.0	1.05E-11	7.50E+04	6.7E-08	1.0E-09	0.02
Upstream Meat & Skin 95th Percentile	0.3176	0.25	1.0E-06	6	15.0	1.45E-11	7.50E+04	9.3E-08	1.0E-09	0.03
Smith's Crossing 95%UCL ⁽³⁾	13.97	0.25	1.0E-06	6	15.0	6.38E-10	7.50E+04	4.1E-06	1.0E-09	1.45
Smith's Crossing 95th Percentile ⁽³⁾	23.25	0.25	1.0E-06	6	15.0	1.06E-09	7.50E+04	6.8E-06	1.0E-09	2.41
Near Imerman Park 95% UCL	15.93	0.25	1.0E-06	6	15.0	7.27E-10	7.50E+04	4.7E-06	1.0E-09	1.65
Near Imerman Park 95th Percentile	19.45	0.25	1.0E-06	6	15.0	8.88E-10	7.50E+04	5.7E-06	1.0E-09	2.02
SNWR 95% UCL	2.54	0.25	1.0E-06	6	15.0	1.16E-10	7.50E+04	7.5E-07	1.0E-09	0.26
SNWR 95th Percentile	3.68	0.25	1.0E-06	6	15.0	1.68E-10	7.50E+04	1.1E-06	1.0E-09	0.38
CISGA 95% UCL	1.09	0.25	1.0E-06	6	15.0	4.98E-11	7.50E+04	3.2E-07	1.0E-09	0.11
CISGA 95th Percentile	1.11	0.25	1.0E-06	6	15.0	5.07E-11	7.50E+04	3.3E-07	1.0E-09	0.12
SQUIRREL										
Upstream 95% UCL	0.087	0.25	1.0E-06	6	15.0	3.97E-12	7.50E+04	2.6E-08	1.0E-09	0.01
Upstream 95th Percentile	0.11	0.25	1.0E-06	6	15.0	5.02E-12	7.50E+04	3.2E-08	1.0E-09	0.01
Smith's Crossing 95%UCL	0.93	0.25	1.0E-06	6	15.0	4.25E-11	7.50E+04	2.7E-07	1.0E-09	0.10
Smith's Crossing 95th Percentile	1.1	0.25	1.0E-06	6	15.0	5.02E-11	7.50E+04	3.2E-07	1.0E-09	0.11
Near Imerman Park 95%UCL	4.3	0.25	1.0E-06	6	15.0	1.96E-10	7.50E+04	1.3E-06	1.0E-09	0.45
Near Imerman Park 95th Percentile	4.3	0.25	1.0E-06	6	15.0	1.96E-10	7.50E+04	1.3E-06	1.0E-09	0.45
SNWR 95% UCL	0.77	0.25	1.0E-06	6	15.0	3.52E-11	7.50E+04	2.3E-07	1.0E-09	0.08
SNWR 95th Percentile	0.83	0.25	1.0E-06	6	15.0	3.79E-11	7.50E+04	2.4E-07	1.0E-09	0.09
CISGA 95% UCL	0.71	0.25	1.0E-06	6	15.0	3.24E-11	7.50E+04	2.1E-07	1.0E-09	0.07
CISGA 95th Percentile	0.73	0.25	1.0E-06	6	15.0	3.33E-11	7.50E+04	2.1E-07	1.0E-09	0.08
CANADA GOOSE MEAT ONLY										
SNWR 95% UCL	1.19	0.85	1.0E-06	6	15.0	1.85E-10	7.50E+04	1.2E-06	1.0E-09	0.42
SNWR 95th Percentile	1.69	0.85	1.0E-06	6	15.0	2.62E-10	7.50E+04	1.7E-06	1.0E-09	0.60

**Child Cancer and Noncancer Risk for Dioxin-Like Compounds
FDA TDS, Dow Wild Game Study, and Incidental Ingestion of Soil**

	Concentration of DLCs TEQ in ng/Kg (ppt)	Consumption Rate kg/year	conversion factor from ng to mg	Exposure Duration years	Child body weight (kg)	Child TEQ intake in mg/kg-day	Cancer Slope Factor [1/(mg/kg-day)]	Child Incremental Cancer Risk	ATSDR MRL for Chronic NonCancer Hazard (mg/kg/day)	Child Chronic Non Cancer Hazard Quotient
CISGA 95% UCL	0.79	0.85	1.0E-06	6	15.0	1.23E-10	7.50E+04	7.9E-07	1.0E-09	0.28
CISGA 95th Percentile	0.87	0.85	1.0E-06	6	15.0	1.35E-10	7.50E+04	8.7E-07	1.0E-09	0.31
CANADA GOOSE MEAT WITH SKIN										
SNWR 95% UCL	2.25	0.85	1.0E-06	6	15.0	3.49E-10	7.50E+04	2.2E-06	1.0E-09	0.79
SNWR 95th Percentile	3.13	0.85	1.0E-06	6	15.0	4.86E-10	7.50E+04	3.1E-06	1.0E-09	1.10
CISGA 95% UCL	1.39	0.85	1.0E-06	6	15.0	2.16E-10	7.50E+04	1.4E-06	1.0E-09	0.49
CISGA 95th Percentile	1.85	0.85	1.0E-06	6	15.0	2.87E-10	7.50E+04	1.8E-06	1.0E-09	0.65
WOOD DUCK MEAT ONLY										
SNWR 95% UCL	2.66	0.25	1.0E-06	6	15.0	1.21E-10	7.50E+04	7.8E-07	1.0E-09	0.28
SNWR 95th Percentile	4.45	0.25	1.0E-06	6	15.0	2.03E-10	7.50E+04	1.3E-06	1.0E-09	0.46
CISGA 95% UCL	1.27	0.25	1.0E-06	6	15.0	5.80E-11	7.50E+04	3.7E-07	1.0E-09	0.13
CISGA 95th Percentile	1.93	0.25	1.0E-06	6	15.0	8.81E-11	7.50E+04	5.7E-07	1.0E-09	0.20
WOOD DUCK MEAT WITH SKIN										
SNWR 95% UCL	12.95	0.25	1.0E-06	6	15.0	5.91E-10	7.50E+04	3.8E-06	1.0E-09	1.34
SNWR 95th Percentile	21.2	0.25	1.0E-06	6	15.0	9.68E-10	7.50E+04	6.2E-06	1.0E-09	2.20
CISGA 95% UCL	6.33	0.25	1.0E-06	6	15.0	2.89E-10	7.50E+04	1.9E-06	1.0E-09	0.66
CISGA 95th Percentile	11.66	0.25	1.0E-06	6	15.0	5.32E-10	7.50E+04	3.4E-06	1.0E-09	1.21
COTTONTAIL RABBIT										
Near Imerman Park 95%UCL	1.21	0.57	1.0E-06	6	15.0	1.26E-10	7.50E+04	8.1E-07	1.0E-09	0.29
Near Imerman Park 95th Percentile	1.68	0.57	1.0E-06	6	15.0	1.75E-10	7.50E+04	1.1E-06	1.0E-09	0.40
SNWR 95% UCL	0.94	0.57	1.0E-06	6	15.0	9.79E-11	7.50E+04	6.3E-07	1.0E-09	0.22
SNWR 95th Percentile	1.22	0.57	1.0E-06	6	15.0	1.27E-10	7.50E+04	8.2E-07	1.0E-09	0.29
CISGA 95% UCL	0.71	0.57	1.0E-06	6	15.0	7.39E-11	7.50E+04	4.8E-07	1.0E-09	0.17
CISGA 95th Percentile	0.72	0.57	1.0E-06	6	15.0	7.50E-11	7.50E+04	4.8E-07	1.0E-09	0.17

20.5 Kg = approx 2 oz cheese burger every day

10 Kg = 2 oz every other day

0.11 Kg = two 2oz servings per year

0.25 Kg = four 2oz servings per year

0.57 Kg = ten 2oz servings per year

0.85 Kg = fifteen 2oz servings per year

Exposure Frequency is 25,550 days for cancer risk and 2,190 days for non cancer hazard quotient.

100 % Bioavailability is assumed for DLCs in food (Moser and McLachlan 2001).