

dioxins and furans:

Reducing Exposure at Home

Reducing Your Exposure to Dioxins and Furans at Home

Experts agree that all of us, as residents of the United States, are exposed to dioxins and furans, and have at least some level of dioxins and furans in our bloodstreams. However, if you live in the Tittabawassee River floodplain downstream of Midland or in certain parts of the City of Midland – your risk of dioxin and furan exposure may be higher.

This brochure explains how you can reduce exposure to dioxins and furans in and around your home, yard and garden.

About this brochure

The Michigan Department of Environmental Quality (MDEQ) has found higher than normal levels of dioxins and furans in soil and sediments of the Tittabawassee River and floodplain from Midland, Michigan into the Saginaw River and in certain parts of the City of Midland.

The Dow Chemical Company (Dow), which has manufacturing operations in this area, is thought to be responsible for these increased levels of dioxins and furans. Dow is required by its hazardous waste facility operating license to provide information about dioxins and furans to the general public so that people living in these areas can make informed decisions about limiting their potential exposure to these contaminants. This brochure covers reducing exposure to dioxins and furans at home and is one of a series of publications that addresses the topic of dioxins and furans in mid-Michigan.

The information in this brochure has been reviewed and approved with modifications by the MDEQ. Dow does not necessarily agree with all of the information contained in this brochure. The sources for the information contained in this brochure are from the U.S. Environmental Protection Agency (EPA), the Agency for Toxic Substances and Disease Registry (ATSDR), the World Health Organization (WHO),

the International Agency for Research on Cancer (IARC) and published peer-reviewed scientific literature.

Where are the Priority Areas?

The maps at the end of this brochure show the areas where higher levels of dioxins and furans are expected based on concentrations that have been found in the City of Midland and along the Tittabawassee River downstream of Midland.

In the Tittabawassee floodplain, areas that have been repeatedly flooded have been shown to have higher levels of dioxins and furans. Higher levels have also been found outside of the floodplain in areas where contaminated soils have been moved and relocated. Residential properties where homes flooded or came close to flooding in March of 2004 and agricultural properties that flooded in 2004 have been identified as “Priority Areas” for initial response activities by Dow in 2005 and 2006.

In Midland, higher than normal levels of dioxins and furans have also been found in surface soils located north and east of the Dow plant site. Levels appear to decrease in soils that are located further away from the plant. Several Priority 1 neighborhoods have been identified in this area based on location and historic sampling information.

Background

What are dioxins and furans?

Dioxins and furans are a group of chemical compounds that have similar structures and chemical properties. These compounds usually are grouped together and referred to simply as “dioxins.” Because dioxins are usually found as mixtures, the total toxicity of the 17 most toxic dioxin and furan compounds is usually expressed as a single value, the toxic equivalent concentration, or TEQ.

Some polychlorinated biphenyls (PCBs) also have dioxin-like toxicity and may be included in reported TEQ values. In the Priority Areas covered by these brochures, dioxin-like PCBs have not been measured at elevated levels.

Most of the dioxins that are present in the environment today formed as unintentional by-products of certain industrial manufacturing processes, waste incineration, and combustion processes. Dioxins break down in the environment very slowly, usually over decades or centuries. Changes in manufacturing processes and increased environmental controls have resulted in a steady decline in releases of dioxin and typical levels in the environment.

In Michigan, the typical or “background” level of dioxins in soils is less than 10 parts per trillion (ppt) TEQ. In the Priority Areas, dioxin levels in soils and river sediments can range from this “background” concentration up into the hundreds of parts per trillion in certain parts of the City of Midland and into the thousands of parts per trillion in and along the Tittabawassee River.

Dioxin compounds do not readily dissolve in water, but tend to attach to soils and sediments. Dioxins build up in the bodies of fish, wildlife, domesticated animals and people, and tend to concentrate in the liver and fat.

What are the current sources of dioxins?

Current emissions of dioxins from Dow’s Midland facility are very low and are not thought to contribute significantly to the existing elevated levels of dioxins in Midland and in and along the Tittabawassee River. Today, the major sources of dioxin contamination in the Tittabawassee River and in the City of Midland are the contaminated soils and river sediments that remain from past releases. Elevated levels of dioxins are also found in some species of fish and animals living in the Tittabawassee River and floodplain

Elevated levels of dioxins have been found in:

- ☞ Sediments in the Tittabawassee River
- ☞ Soils in the Tittabawassee River floodplain
- ☞ Soils that have been relocated from the Priority Areas
- ☞ Eggs from chickens raised on the floodplain
- ☞ Wild game and other animals from the flood plain and river
- ☞ Fish from the Tittabawassee River
- ☞ Surface soils in certain parts of the City of Midland

Exposure

How can my family and I be exposed to dioxins?

Researchers believe that for the general public, most dioxin exposure comes from food, especially foods high in animal fat.

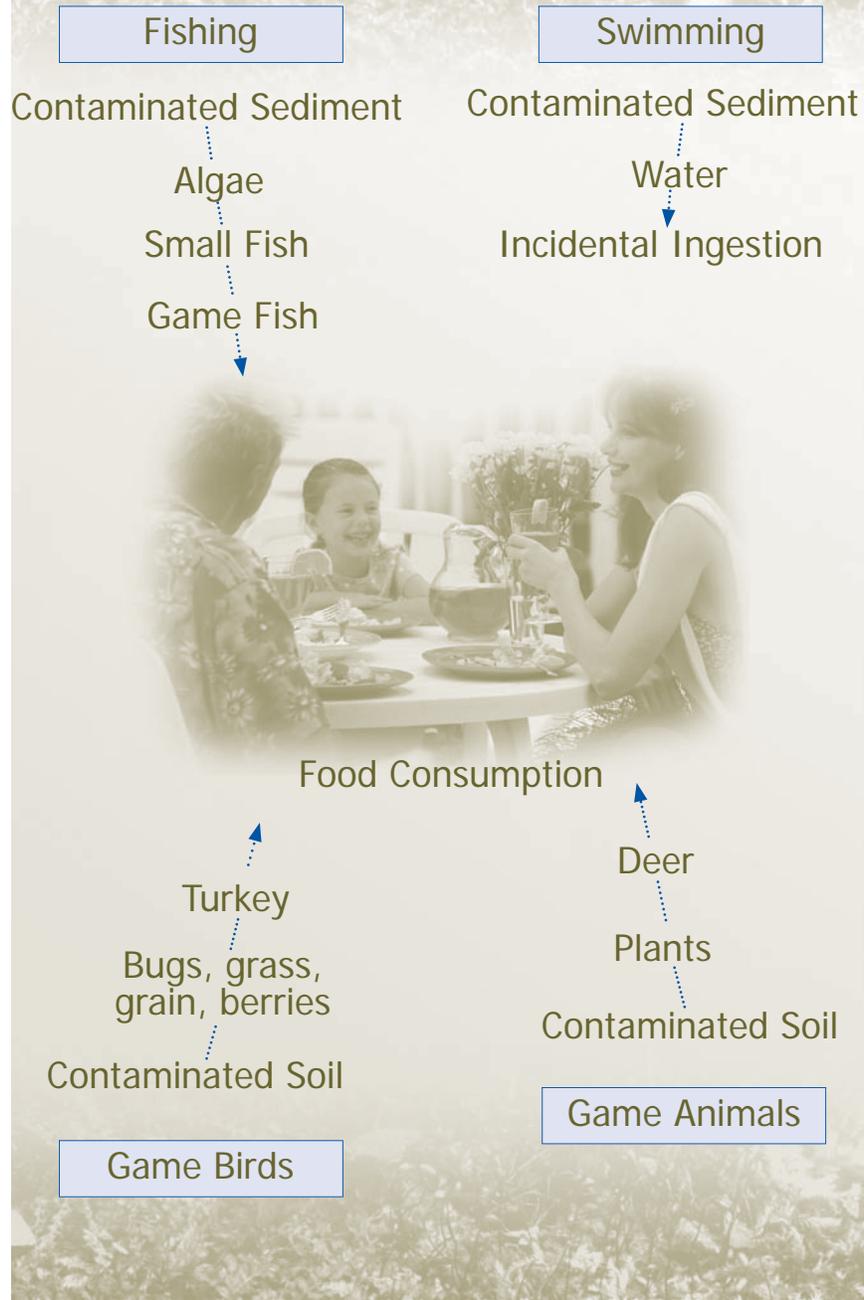
In addition, people living in the Priority Areas may be exposed to higher levels of dioxins than the general public by eating locally harvested fish and wild game and locally grown foods (e.g., produce, meat, dairy products, eggs) that contain dioxins at levels greater than the national food supply. Fruits and vegetables do not appreciably take up dioxins through their roots. However, dioxin contaminated soil particles may adhere to fruits and vegetables and therefore they should be carefully washed and/or peeled. Exposure can also occur by incidentally consuming small amounts of contaminated soil, sediments, and blowing dust. To a lesser extent, exposure can also occur by skin contact with contaminated soils and sediments.

Depending on an individual's diet, occupation, and personal habits/behaviors the amount of dioxin entering the body from each exposure pathway can vary greatly. Some of the major pathways are shown on the next pages

POTENTIAL HOME AND GARDEN EXPOSURES



POTENTIAL FISHING, HUNTING AND SWIMMING EXPOSURES



Since dioxins build up in the body over time, the levels in your blood or other tissues are mostly from past exposures. It takes time for those levels to build up and once exposures are decreased, it will also take time for levels in your body to decline.

Does amount of exposure make a difference?

The EPA, WHO, MDEQ, Michigan Department of Community Health (MDCH) and others all agree that lower levels of exposure result in a lower risk for adverse health effects. Higher exposure leads to a greater risk for health effects.

Is there a safe level of exposure?

There is disagreement in the scientific community on the question of whether there is a safe level or frequency of exposure to dioxins. Until scientists understand more about these compounds, public policy will focus on protecting the most sensitive groups of people, such as children and women of childbearing age.

Fact Summary

- ☞ Low levels of dioxins are found throughout the environment as a by-product of combustion and industrial processes.
- ☞ Much higher dioxin levels than normal have been found in the Priority Areas (Tittabawassee River sediments and floodplain soils and in soils in certain areas of the city of Midland).
- ☞ If you live in the Priority Areas, your risk of dioxin exposure may be higher.
- ☞ Most dioxin exposure in humans comes from foods such as various meats, dairy products and fish. Locally grown livestock, eggs, and dairy products; fish from the Saginaw Bay watershed; and wild game from the Tittabawassee River floodplain may contain higher levels of dioxin.
- ☞ In general, exposure to dioxins through food can be reduced with a low-fat diet, trimming fat from meats, choosing low-fat dairy

Fact Summary, continued

products and by following local fish, game and food consumption advisories.

- ☞ Exposure to dioxins through soil can be reduced with simple measures to avoid inhaling and ingesting dust or soil while gardening or farming.
- ☞ Simple guidelines may also be used to help children limit exposure to dioxins in soils while playing outdoors.
- ☞ Although breast milk is a source of dioxin exposure for nursing infants, studies consistently show that breastfed infants are healthier than formula fed infants, in spite of the dioxin in breast milk.

How to Reduce Your Exposure

Dioxins found in the Priority Areas are mainly attached to soils and sediment. The main dioxin exposure pathway is through the diet (especially through consumption of locally grown livestock, eggs, and dairy products, fish from the Saginaw Bay watershed and wild game from the Tittabawassee River floodplain), also through incidentally consuming small amounts of contaminated soil, sediments, and dust.

Minimizing potential dioxin exposure from diet

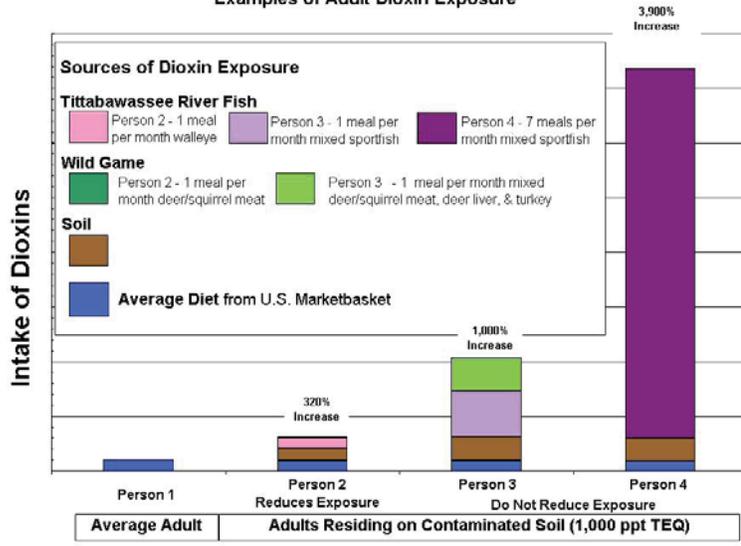
The following are recommendations for reducing potential exposure to dioxins from diet:

The MDCH recommends following the state's fish advisory and wild game consumption advisory for dioxins in effect for this area of mid-Michigan.

The Michigan Department of Agriculture (MDA) highly recommends not purchasing, eating, or selling home raised livestock from the Tittabawassee floodplain until the dioxin status of the property on which the animals were raised can be assessed. This recommendation includes livestock, eggs, and dairy products from animals that were raised, foraged, or fed forage grown on contaminated soils.



Examples of Adult Dioxin Exposure



Adult Exposure Level Description

How much dioxin gets into your body depends, in part, on what you eat and how much contact you have with contaminated soil and dust. Figure 1 compares the estimated dioxin exposure of an average adult living in the United States to three people who reside on and consume food from contaminated property in the Tittabawassee River floodplain or in Midland. The three people who reside in the contaminated area are assumed to have soil levels of 1,000 ppt TEQ. This level is typical of the level of contamination seen in repeatedly flooded areas of this floodplain. Two of these people eat about an 8 ounce (oz.) meal of fish from the Tittabawassee River and an 8-oz. meal of wild game from this floodplain per month. The graph also shows a person (Person 4) who may eat a higher than average amount of Tittabawassee River fish (two meals per week).



Person 1 is an average adult who does not reside in an area of elevated

Adult Exposure Levels Continued

dioxin levels and whose dioxin exposure comes from eating the very small amounts of dioxin that are present in the food supply, in other words, what you would buy at the grocery store. Most people in the United States have dioxin exposure mainly from their food.

Person 2 is an adult who resides on contaminated soil and reduces exposure to dioxins from soil, local fish, wild game, and domestic livestock by following the recommendations in this brochure. As you can see, the bar is higher which means person 2 is receiving a greater exposure than person 1, mostly from eating fish and from exposure to contaminated soil.

Person 3 is an adult who resides on contaminated soil and does not reduce exposure to dioxins from soil, local fish, and wild game by following the advisories and recommendations in this brochure. This person's two monthly fish and game meals include a mixture of Tittabawassee River fish and a mixture of wild game, including deer liver and wild turkey from the Tittabawassee River floodplain. Because the advisories are not followed, this person's exposure is significantly increased.

Person 4 is an adult who resides on contaminated soil and does not reduce exposure to dioxins from soil and local fish by following the advisories and recommendations in this brochure. Instead of one meal of fish per month, Person 4 eats eight meals of fish per month and no local wild game. Large increases in exposure could also occur from eating other animal products raised on the floodplain, such as chicken meat or eggs raised on contaminated soil, or by eating more highly contaminated fish (e.g., catfish) from the river.

Copies of these advisories, recommendations, and details on the graph are available at www.michigan.gov/deqdioxin



In addition, because dioxins build up in the food chain, the following general guidelines are recommended for reducing potential dioxin exposures via food:

- ☞ Consume a balanced diet low in fats of animal origin
- ☞ Trim fat from foods
- ☞ Cook foods in ways that reduce animal fat content
- ☞ Thoroughly wash, pare or peel any garden produce grown in contaminated soils.

Consuming a “Heart Healthy Diet” is recommended. Information on a “Heart Healthy Diet” can be found at:

<http://nhlbisupport.com/cgi-bin/chd1/step1intro.cgi>

Minimizing Potential Exposure to Dioxins from Contaminated Soil and Dust during Backyard Gardening and Other Outdoor Activities

When considering how to reduce exposure to dioxins from soils around your backyard, you must consider where you live, how dirty you get when working outdoors and whether you have young children living and playing around your home.

To minimize exposure through soils, you can follow these steps:

1. Try to avoid creating dusty conditions to minimize inhaling and swallowing airborne soil particles and dust.
2. Wash dirt and mud from items like clothes, gardening tools and supplies outside after each use and store them outside.
3. Avoid tracking mud or dirt into the house. Remove shoes before entering the house.
4. While gardening, do not eat unwashed produce or other foods. Do not drink, smoke or engage in other activities while gardening that may introduce soil into the mouth.
5. Keep soil moist while gardening to control dust.

6. Designate certain clothing, including footwear and tight-fitting disposable gloves, for gardening use only. Remove gardening footwear before entering the house and store all used gardening clothing outdoors to limit the amount of contaminated soil that is tracked into the house.
7. After gardening, wash all exposed areas of skin, preferably by showering, as soon as possible.
8. If dioxin contamination is known or suspected in soils around your home, clean fill soil can be placed over the contaminated soil. Garden beds can be raised and replaced with clean soil. Care should be taken not to disturb the layer of clean soil covering the contaminated soil.
9. Prevent pets from tracking contaminated soil into the house. Provide animals that come indoors with a clean area for outdoor activities.

Children

When children play outside, they should be discouraged from eating dirt or putting toys, their hands or other objects in their mouths.

Children should not play in soils that are known or suspected to contain higher levels of chemical contaminants. Be sure to have children wash their hands frequently, especially before eating or drinking, and be sure to have children wash up thoroughly after playing outdoors.

Pregnant and Nursing Mothers

Although breast milk is a source of dioxin exposure for nursing infants, studies consistently show that breastfed infants are healthier than formula fed infants, in spite of the dioxin in breast milk. This statement is even truer now that typical or “background” levels have declined.

There are overwhelming benefits of breastfeeding both for the mother and her infant. The American Academy of Pediatrics and many other professional organizations have concluded that the benefits of breastfeeding far outweigh the potential effects of dioxin in breast milk. Breast milk is known to be the most complete form of nutrition for infants, with benefits for infant health, growth, immunity, and development. If you are concerned about this issue, you should consult your doctor.

Other Ways to Reduce Exposure

Copy: Here are some additional steps to take around your home to further reduce your exposure to dioxins in the environment:

1. Do not burn household trash in backyard barrels or wood-burning stoves. Additional dioxins formed during the burning of trash could remain in your backyard soil for many years. More information about open burning is available at <http://www.michigan.gov/deq/0,1607,7-135-3310-65250--,00.html>.
2. If you're planning a construction or landscaping project in your yard, follow the guidelines for gardening listed above. Also try to control dust by pre-watering deeply before excavating and be sure to cover or stabilize piles of soil.
3. When dusting and cleaning inside the home, avoid creating airborne dust (to minimize breathing and swallowing dust) and wash your hands frequently, especially before eating or drinking. Frequent vacuuming (with a high efficiency filter) may help to reduce the amount of dust in your home.

Additional guidance on reducing potential exposure to dioxins will be provided in other brochures that are being developed as part of this series.

About the Brochures in this Series

The brochures in this series are intended to provide straight-forward information so the public can make informed personal decisions about limiting potential exposure to dioxins or about other issues related to dioxin contamination. The brochures are part of an “interim response activity” for the Priority Areas.

Interim response activities are actions that are taken to control risk of exposure to dioxins or other contaminants, while longer-term plans for permanent corrective action are developed and implemented. The brochures are being produced at the direction of MDEQ, with funding from Dow.

For questions about the Dow hazardous waste facility operating license or about the corrective action process, please contact Ms. Cheryl Howe of the MDEQ at 517-373-9881.

The MDEQ, MDCH, and MDA are largely responsible for the content of this brochure.

Other Brochures in This Series

- Overview of Dioxins and Furans
- Overview of the Corrective Action Process
- Dioxins and Furans Health Questions
- Reducing Exposure during Recreational Activities
- Reducing Exposure from Agricultural Activities
- Reducing Exposure for Workers Who Have Contact with Contaminated Media
- Management of Disturbed Soils and Dredged Sediments
- How Regulations Affect Impacted Property Owners
- Fish Advisory for the Saginaw Bay Watershed
- Wild Game Advisory for the Tittabawassee River Watershed

These brochures can be found at several public locations:

– Bay County:

- Sage Branch Library; 100 E. Midland Street; Bay City MI 48706
- Bay City Branch Library; 708 Center Avenue; Bay City, MI 48708

– Saginaw County:

- Hoyt Library; 505 Janes Avenue; Saginaw, MI 48607
- James Township Hall; 6060 Swan Creek Road; Saginaw, MI 48609
- Zael (Saginaw Township) Library; 3100 N. Center Road; Saginaw, MI 48603
- Thomas Township Library; 8207 Shields Drive; Saginaw, MI 48609
- Tittabawassee Township Hall; 145 S. Second Street; Freeland, MI 48623

– Midland County:

- Grace A. Dow Memorial Library; 1710 W. St. Andrews Street; Midland, MI 48640

Electronic versions of the brochures are housed on various web sites, including:

– Michigan Department of Environmental Quality (MDEQ):

<http://www.michigan.gov/deqdioxin>

– Michigan Department of Community Health (MDCH):

<http://www.michigan.gov/mdch>

– The Dow Chemical Company:

<http://www.dow.com>

More information about dioxins also can be found at:

– Agency for Toxic Substances and Disease Registry (ATSDR):

<http://www.atsdr.cdc.gov>

– Michigan Department of Agriculture: <http://www.michigan.gov/mda>

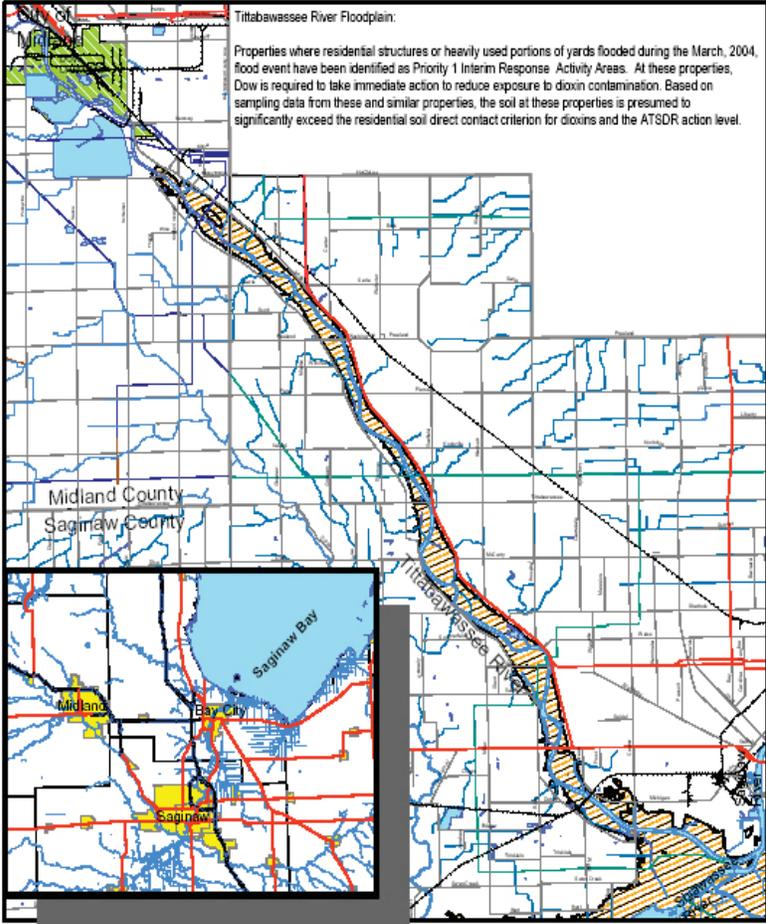
– National Toxicology Program: <http://ntp.niehs.nih.gov>

– United States Environmental Protection Agency: <http://cfpub.epa.gov/ncea>

– World Health Organization (WHO):

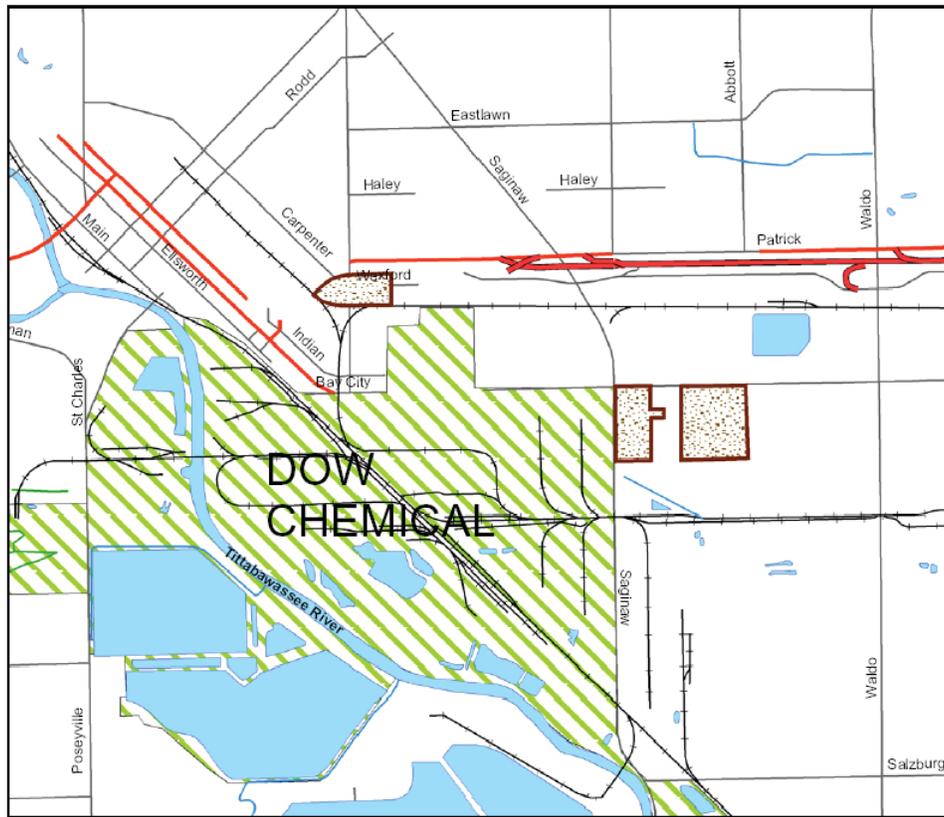
<http://www.who.int/mediacentre/factsheets/fs225/en>

Tittabawassee River Floodplain

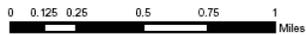


August 23, 2005

Midland Priority 1 Neighborhoods



August 23, 2005



City of Midland: The full extent of the Midland contamination has not yet been determined. Based on existing information, three neighborhoods that are close to and downwind of the Dow Midland Plant Site have been identified as Priority 1 Interim Response Activity Areas for immediate action by Dow to reduce exposure to dioxin contamination. These areas are presumed to significantly exceed the residential soil direct contact criterion for dioxins, based on soil sampling by the DEQ, Dow, and the U.S. Environmental Protection Agency. As part of the Corrective Action Process, Dow may develop site specific cleanup criteria and will further define the extent of contamination for remediation purposes.

For questions about the The Dow Chemical Company's operating license or about the Corrective Action Process, please contact the MDEQ at 517-373-9881.

The Michigan Departments of Environmental Quality, Community Health and Agriculture are largely responsible for the content of this brochure.

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