

**BROWNFIELD REDEVELOPMENT ASSESSMENT REPORT**

**FOR**

**PERE MARQUETTE LAKE BAYOU**

**EAST WATER ST. WEST OF SOUTH MADISON ST.**

**LUDINGTON, MICHIGAN 49431**

**MIB000000195**

**SEPTEMBER 17, 2015**

REPORT PREPARED BY: Joseph Walczak DATE: 9/17/15

Joseph Walczak, Investigation Team Leader  
Site Assessment and Site Management Unit

REVIEWED AND APPROVED BY: Daria W. Devantier DATE: 9-21-2015

Daria W. Devantier, Chief  
Site Assessment and Site Management Unit

Michigan Department of Environmental Quality  
Remediation and Redevelopment Division  
Superfund Section  
P.O. Box 30426  
Lansing, Michigan 48909

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## **EXECUTIVE SUMMARY**

The Michigan Department of Environmental Quality (MDEQ) conducts Brownfield Redevelopment Assessments (BFRAs) to assist local communities with redevelopment projects by providing environmental assessment information. BFRAs are conducted by the MDEQ to satisfy the Site Specific Assessment task of its 128(a) Brownfield Cooperative Agreement with the United States Environmental Protection Agency. The BFRAs provide information on brownfield properties where potential environmental contamination may be acting as an impediment to future redevelopment activities. They also provide information to determine if a property is a facility as defined in Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Part 201) and provide recommendations for addressing issues during redevelopment. A facility is defined as any area, place, or property that contains a hazardous substance at a concentration that exceeds Generic Residential Cleanup Criteria established in Section 20120a(1)(a) or (17) of Part 201. File and data searches and environmental sample collection and analyses are used to obtain the needed information to make the determination and recommendations. This report presents the findings of the Pere Marquette Lake Bayou property (Property) BFRA.

This BFRA report is written for the purpose of providing information on the Property that will encourage redevelopment in a way that ensures protection of the public health, safety, welfare, and the environment. This information is intended for use by the local unit of government, the MDEQ, potential developers, and any other stakeholder who may become involved in the future redevelopment of the Property. The report includes a summary of the Property background, assessment procedures, results, conclusions, and recommendations. The conclusion as to whether the Property is a facility as defined in Part 201 is made by comparison of sample concentrations of hazardous substances to the Generic Residential Cleanup Criteria established under Part 201. This report also compares the sample concentrations to other Generic Nonresidential Cleanup Criteria to provide additional information to promote appropriate redevelopment activities.

On January 6, 2015, a request and application were submitted to the MDEQ by the city of Ludington to request a BFRA of the Property and the associated bayou area of Pere Marquette Lake. The Property is owned by the city and is located on the bayou. The Property meets the definition of a brownfield based on its potential for being contaminated due to historical industrial operations that occurred in the area of the Property. There is no historical evidence to suggest that industrial activities occurred specifically on this Property; however, industrial activities did occur on adjacent properties and along the drain that discharges into the bayou just east of the Property.

The request by the city resulted in the MDEQ conducting a BFRA of the Property and the associated bayou. This BFRA included file and historic information searches, a reconnaissance inspection of the Property, the collection of subsurface soil and

sediment samples, Global Positioning System (GPS) data collection of sample locations and property features, and the collection of site feature photographs.

The reconnaissance inspection was conducted on April 16, 2015, and included a meeting with the city manager to discuss the BFRA procedures and requirements. The field sampling event was conducted on May 18 – 20, 2015, and included the collection of soil boring samples from 5 separate soil boring locations and sediment samples from 22 separate sediment coring locations.

Analysis of the soil samples did not detect the presence of any contaminants of concern at level exceeding Generic Residential Cleanup Criteria of Part 201. Due to the lack of elevated levels of contaminants above Generic Residential Cleanup Criteria on the Property, MDEQ staff has determined that the Property does not meet the definition of a facility as defined in Part 201. It does appear that sediments in the bayou have been impacted by some organic and inorganic contaminants. These contaminants likely migrated into the bayou from industrial/commercial operations surrounding the bayou or along the drain upstream of the bayou. Based on the findings of the BFRA, MDEQ staff recommends that the following issues should be addressed before or during the redevelopment of the Property:

The findings of the BFRA do not indicate that there are any Part 201 issues associated with the Property. The contamination that was detected in the bayou sediment samples may require consideration during any future dredging projects. The analytical data provided for those samples will be useful in planning for the proper disposal of dredged sediments from any potential dredging work.

Further information regarding dredging and Part 325, Great Lakes Submerged Lands, or Part 301, Inland Lakes and Streams, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, may be obtained from the MDEQ Water Resources Division at 231-775-3960. Further information concerning Part 201 cleanup criteria and screening levels, due care provisions, and remedial and/or removal activities may be obtained from the MDEQ Remediation and Redevelopment Division, Cadillac District Office at 231-876-4455.



**Otwell Mawby, P.C.**  
Consulting Engineers

## **SUMMARY OF RESULTS AND CONSIDERATIONS FOR MDEQ BROWNFIELD REDEVELOPMENT ASSESSMENT REPORT FOR PERE MARQUETTE LAKE BAYOU**

The following is a summary of the results and considerations for the MDEQ Brownfield Redevelopment Assessment Report for the Pere Marquette Lake Bayou, dated September 17, 2015.

### **BACKGROUND**

The City of Ludington has been requested to make improvements to the City Boat Launch and dredge portions of the Pere Marquette Bayou to improve boat access. In order to proceed, information on the environmental condition of the boat launch and sediments needed to be gathered to meet regulatory requirements.

In addition, a large storm in June 2008 flooded the Creamery Corners County Drain and caused a rupture of the sanitary sewer, washing sediment from the drain and sewage into the Bayou. There was interest in determining if there were environmental impacts on the Bayou.

At the request of the City of Ludington, the Michigan Department of Environmental Quality (MDEQ) conducted an environmental investigation at the Pere Marquette Bayou which included soil samples in five locations at the City Boat Launch and 31 sediment samples in 22 locations. Samples were taken on May 18 -20, 2015.

### **CRITERIA**

There are regulatory cleanup criteria established under the purview Part 201 of Act 451, PA 1994, and developed by the MDEQ for 285 different elements for soil and groundwater based on exposure pathways including drinking water, groundwater surfacewater interface, direct contact, and inhalation.

There are no Part 201 regulatory criteria established for sediment, partly because of widely different environments where sediments may be found, such as a flowing river, large body of water, or small bayou. There are however ecological screening levels for sediments established by the EPA.

The MDEQ Remediation and Redevelopment Division (RRD) has addressed sediments in RRD Operational Memorandum No 4 – Site Characterization and Remediation Verification in Attachment 3 – Sediments. The Attachment refers to and includes screening criteria from the EPA, which is used in the initial sediment evaluation phase for the potential impact of the presence of hazardous substances. In addition, the MDEQ utilizes two screening components: Threshold Effect Concentrations (TECs), below which harmful effects are unlikely to be observed and generally follow the EPA Screening Levels; and Probable Effect Concentrations (PECs), above which harmful effects are likely to be observed.

It is important to note that requirements for action under this regulation pertains to contaminated upland sites regulated under Part 201 or Part 213 at which adjacent surface waters or sediments have been or may be contaminated. As presented in the MDEQ September 2015 report, no contamination above MDEQ Criteria was identified in upland soils at the City Boat Launch, and there is no indication that the City Boat Launch contributed to impact to the Bayou sediments.

309 East Front Street Traverse City, Michigan 49684 231.946.5200 Fax: 231.946.5216

[www.otwellmawby.com](http://www.otwellmawby.com)

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In cases where a Part 201 or Part 213 site has contributed to sediment contamination, the MDEQ requires an extensive analysis to determine site-specific criteria to determine the cleanup or management of potential exposure with engineering controls. This analysis includes additional sediment testing, evaluation of the physical characteristics of the body water, determination of aquatic life, and exposure pathways for human contact, among other factors.

The level of effort and cost for such an analysis is extensive and expensive, and is typically reserved for those sites which have the most dangerous contaminants, the most extensive contamination, and the greatest threat to human health and the environment.

Any sediment that is removed from the Bayou must meet regulations which govern offsite transport and upland disposal or deposition. For example, if removed, contaminated sediment must be carefully managed not to create another contaminated site, and is typically taken to a landfill at a cost. There are not due care considerations for sediment which remains in place, since the bottomlands of the Great Lakes and connecting waterways are under the jurisdiction of the State and Federal government, and not the adjacent landowners.

## RESULTS

The MDEQ investigation did not identify contamination above MDEQ Criteria in the upland soils at the boat launch and there is no indication that the boat launch contributed to impact on the Bayou sediment. The MDEQ investigation did identify constituents, include metals and polynuclear aromatics (PNAs), which exceed the EPA ecological screening values in 24 of the 31 sediment samples. Metals and PNAs are typically found in higher levels in sediment in urban areas where there is more human and industrial activity, including the City of Ludington.

The following is a summary of the constituents found at the highest levels above EPA and MDEQ screening levels. Selected constituents are present that exceed the MDEQ Probable Effect Concentrations, highlighted below. The other constituents exceed the EPA and MDEQ Screening Levels, but do not exceed the PECs.

Constituent	Unit	EPA Sediment Screening Criteria	MDEQ TEC	MDEQ PEC	Highest Sample Results	Location	Depth	# of Locations Found	Average Value
Arsenic	mg/kg	9.79	9.79	33	14	SD-14A	24-34"	8	9.08
Benzo(a)anthracene	ug/kg	108	108	1050	5,300	SD-02DUP	8-20"	1	5,300
Cadmium	mg/kg	0.99	0.99	4.98	3.5	SD-14A	24-34"	7	1.94
Chromium	mg/kg	43.4	43.4	111	56	SD-17	0-12"	7	35.71
Chrysene		166			6,700	SD-6	0-18"	1	6,700
Copper	mg/kg	3.16	3.16	149	300	SD-20	20-30"	12	78.17
Flouranthene	ug/kg	423	423	2230	17,000	SD-6	0-18"	6	6,016.67
Lead	mg/kg	3.58	3.58	128	190	SD-13A	0-12"	19	107.53
Mercury	mg/kg	0.174	0.18	1.06	4.2	SD-14A	24-34"	8	0.85
Napthalene	ug/kg	176	176	561	2,700	SD-21	3-15"	1	2,700
Phenanthrene	ug/kg	204	204	1170	10,000	SD-6	0-18"	1	10,000
Pyrene	ug/kg	195	195	1520	12,000	SD-6	0-18"	3	5,803.33
Silver	mg/kg	0.5			3.6	SD-14A	24-34"	4	2.13
Zinc	mg/kg	121	121	459	440	SD-6A, 13A, 17	variable	17	314.12

## CONSIDERATIONS

The following is a summary of considerations in reviewing the MDEQ results, including human health effects, environmental impacts, dredging requirements, and storm effects.

**Human Health:** As noted above, there are no specific health based criteria for sediments, only ecological screening levels. While not directly applicable to sediments, the results can be compared to MDEQ Cleanup Criteria for upland sites, especially for Direct Contact, to inform human health considerations.

The following is comparison of the MDEQ Bayou sampling results to the MDEQ Direct Contact Cleanup Criteria for each of the identified constituents:

Constituent	Unit	MDEQ Direct Contact Criteria	Highest Sample Results
Arsenic	mg/kg	7.6	14
Benzo(a)anthracene	ug/kg	20,000	5,300
Cadmium	mg/kg	550	3.5
Chromium	mg/kg	2,500	56
Chrysene		2,000	6,700
Copper	mg/kg	20,000	300
Flouranthene	ug/kg	46,000	17,000
Lead	mg/kg	400	190
Mercury	mg/kg	160	4.2
Napthalene	ug/kg	16,000	2,700
Phenanthrene	ug/kg	1,600	10,000
Pyrene	ug/kg	29,000	12,000
Silver	mg/kg	2,500	3.6
Zinc	mg/kg	170,000	440

When the sample results were compared to MDEQ Cleanup Criteria, only three constituents -- arsenic, chrysene, and phenanthrene -- exceed the Direct Contact Criteria. Arsenic is a prevalent constituent especially in fruit growing regions where lead arsenate was widely used as a pesticide up until the 1960's and common at many industrial sites. Many former orchards have levels of arsenic that exceed Direct Contact Criteria.

Chrysene is a natural constituent of coal tar, is found in creosote, and is formed in small amounts during the burning or distillation of coal, crude oil, or plant material. Chrysene was found in a fairly high concentration, but only in one sample (SD-06) out of the 33 samples that were analyzed.

Phenanthrene is also a natural constituent of coal tar, and is formed in small amounts during combustion of wood and emissions from vehicle, coal and oil burning, and foundries. Phenanthrene was

found in a fairly high concentration in the same sample (SD-06) as the chrysene exceedance, but in none of the other 33 samples.

The Direct Contact Criteria is established through a complex calculation which assumes direct dermal exposure and ingestion of impacted soil for an extended period of time. Such an exposure scenario for arsenic levels in sediment across the Pere Marquette Bayou and for chrysene and phenanthrene in one area is unlikely.

While the Bayou does not appear to be a desirable place to swim, the City may wish to work with the MDNR and Army Corp of Engineers to determine whether there are any appropriate actions to limit direct contact to the sediment.

**Environmental Impacts:** The environmental impacts of contaminants in sediment are complicated to determine and are affected by a variety of factors including the physical features of the body of water, aquatic species, flow, and the nature and extent of the contaminants themselves. The MDEQ has stated that the constituents found in the Bayou sediment are comparable to those found in sediment in other urban areas of Michigan that experience human and industrial activity and from the MDEQ's perspective does not represent a significant risk. Contact with sediments is not a likely exposure scenario as the Bayou does not appear to be a swimming and beach area that would pose a significant potential for direct exposure and ingestions.

**Dredging Requirements:** As part of the permit approval process for dredging, there are requirement for sediment sampling to determine the appropriate fate for sediment disposal. In cases where there is adequate adjacent upland space and the contaminants are within levels that can be approved by the MDEQ, impacted sediment can be deposited on the adjacent upland site, with appropriate measures to ensure that there are no pathways of exposure, for example, at least 6 inches of cover over the impacted sediment to prevent direct contact. There may be additional testing necessary to meet regulatory requirements.

In the case of the City Boat Launch, there is not adequate adjacent upland space to deposit the dredge spoils. As a result, the spoils would need to be taken to a Type II licensed landfill, with the attendant disposal costs (which can be significant for large dredge projects) or other special arrangements would need to be made, with MDEQ approval.

**Storm Effects:** There was concern expressed of the environmental impact of the storm event, including the discharge of sediment from the Creamery Corners County Drain and the ruptured sanitary sewer along Madison Street.

While the specific impact of the storm event is difficult to determine without additional investigation and analysis, it would appear that the storm event did not have a significant impact on the sediment in the Bayou, based on the following:

- Constituents were found in varying, but generally consistent levels across the Bayou, which would indicate more generalized sources over time;
- Some of the constituents were found in deeper sediment, which would indicate more historic than recent deposition.
- Impacts would likely be most significant closest to the drain outlet; however the results from the four closest sample locations, SD-01, SD-02, SD-03 and SD-04 showed elevated levels of only two

of the constituents, flouranthene which was found in 5 other locations and pyrene, which was found in 2 other locations, with no elevated levels found in SB-01, nearest to the boat launch.

- SB-06 did have particularly higher levels of a number of PNA constituents, significantly higher than any other location, but is some distance from the drain outlet, with two other sample locations in between the Creamery Drain discharge point and SB-06 that exhibits PNA constituents at much lower levels. There is not an apparent explanation for these isolated high levels of PNAs in SB-06 without significant additional investigation and analysis.

## **SUMMARY**

The MDEQ conducted an environmental investigation of the Pere Marquette Bayou City boat launch and sediment to determine consideration for proposed improvements to the boat launch and potential dredging of a channel in the Bayou to improve boating access.

The MDEQ investigation did not identify contaminants above MDEQ Criteria at the boat launch, but did identify concentrations for various constituents that exceed MDEQ and EPA screening levels in sediment. There are no specific health based exposure criteria established for sediment.

The extent of the various constituents are widespread across the Bayou and include metals and polynuclear aromatic hydrocarbons (PNAs), commonly found in sediment in urban areas resulting from human and industrial activities. When compared to MDEQ Cleanup Criteria for Direct Contact, all the constituent are below Direct Contact Criteria, except arsenic in various locations and one sample for chrysene and phenanthrene. The Direct Contact Criteria is based on extensive long term dermal contact exposure and soil ingestion, which is unlikely for sediment in the Bayou.

The environmental impacts are difficult to determine, but does not appear to be close to the levels or extent of concern related other sites in Michigan. There were particularly high levels of a number of constituents found in one sample, SB-06; there does not appear to be explanations for these isolated high levels, without additional investigation and analysis.

Reportedly, the storm event of June 2008 did release additional sediment from the Creamery Corners County Drain and sewage from a ruptured sanitary sewer line, but based upon the MDEQ investigation, this event does not appear to have a significant or discernible impact on the Bayou sediment.

Prepared by:

Mac McClelland  
Manager – Brownfield Redevelopment  
Otwell Mawby, P.C.  
309 E. Front Street  
Traverse City, Michigan 49684  
231.946.5200  
[mac@otwellmawby.com](mailto:mac@otwellmawby.com)