



GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF HEALTH AND HUMAN SERVICES
LANSING

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M E M O R A N D U M

DATE: August 12, 2022

TO: Sarah Lyon-Callo, State Epidemiologist and Director Bureau of Epidemiology and Population Health
Kory Groetsch, Environmental Public Health Director, Division of Environmental Health

THROUGH: Marcus Wasilevich, Toxicology and Assessment Section Manager;
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FROM: Joost van 't Erve, Toxicologist, Env. Assessment & ATSDR Unit

SUBJECT: Determination to remove no contact recommendation for parts of the Huron River.

PURPOSE: To assess environmental data and information to determine if the no contact recommendation issued by MDHHS on 8/2/2022 due to potential hexavalent chromium contamination of sections of the Huron River within Oakland and Livingston Counties may be removed.

This memo documents the basis of the Michigan Department of Health and Human Service -Toxicology and Assessment Section (MDHHS-TAS) public health determination regarding the Huron River no contact recommendation caused by the National Response Center (NRC) report on Tribar hexavalent chromium release (#1343317). MDHHS-TAS concludes that the initial worst-case estimate of hexavalent chromium industrial release entering the Huron River was orders of magnitude too high compared to the current analytically derived estimate based on the Wixom wastewater treatment plant effluent composite samples. Further, MDHHS-TAS concludes that use of the Huron River for recreation activities such as swimming and wading or as source water for public water supplies is not expected to harm people's health as a result of the NRC reported industrial hexavalent chromium release. Therefore, MDHHS-TAS recommends the Huron River no contact recommendation be lifted for the initially identified area and a return to normal usage resume.

The MDHHS-TAS August 12, 2022, public health determination and recommendation are based on the Environment, Great Lakes, and Energy (EGLE) Huron River water chromium test results. The Huron River water test results are considered a reasonably representative dataset for hexavalent chromium and total chromium river water levels.

The finding in the EGLE *Fate of Release Report* (EGLE 2022a) and the *Barr Engineering Technical Memorandum, Conceptual Fate of Chromium in Wastewater* (Barr 2022) provide a weight-of-evidence that supports that the river water chromium test results are reasonably representative and sufficient to make a public health determination.

As an additional measure of public assurance to downstream public drinking water intakes on the Huron River, a three-day per week, five repeated locations per day sampling effort for total chromium, hexavalent chromium, with a one day per week, five sampling location for per- and polyfluorinated substances (PFAS) is recommended.

Initial estimates of release and basis for the No-Contact Recommendation Area:

The initial recommendation for people and pets to avoid contact with the Huron River water between North Wixom Road in Oakland County and Kensington Road in Livingston County was based on the report of an estimated 10,000-gallon release of a 5% hexavalent chromium solution (approximately 4,170 lbs. hexavalent chromium) into the sanitary sewer on 7/29/2022. If there was no further treatment or capture of the released chemical (meaning a direct release from the sanitary sewer into the river), this could have resulted in concentrations several orders of magnitude greater than human health protective standards in the Huron River. Data now shows that the release into the sanitary sewer system first passed through the industrial wastewater facility at Tribar Technologies plant 5 in Wixom, MI and then through the Wixom wastewater treatment plant (WWTP) before it was released into Norton Creek.

Environmental Data:

Total and Hexavalent Chromium

The initial estimates of the release from Tribar Technologies plant 5 impacting the Huron River have been revised as recently as 8/11/2022. Revisions of initial estimates are described in the *Fate of Release Report* (EGLE 2022a) and *Barr Engineering Technical Memorandum, Conceptual Fate of Chromium in Wastewater* (Barr 2022). The Huron River surface water data are described in *Summary of EGLE Monitoring Activities* (EGLE 2022b). The EGLE reports estimate amounts of total chromium leaving the Wixom WWTP, which could enter the Huron River, as being less than 20 pounds, with minimal amounts of the total chromium being hexavalent chromium.

Weight-of-Evidence for Release Timing

From the *Fate of Release Report* (EGLE 2022a), the release started around 8:30PM on Friday 7/29/22 and occurred for a period of 3.5 hours. The material then traveled through the sanitary sewer into the Wixom WWTP arriving around 1:30AM on Saturday 7/30/22. Travel time through the Wixom WWTP is expected at 45 hours; therefore, the first release from the WWTP and into the Norton Creek would be at 10:30PM on Sunday 7/31/22.

Weight-of-Evidence for Release Amount of Hexavalent Chromium

The weight-of-evidence based on analytical data found in the EGLE and Barr technical reports that support that a minimal amount of hexavalent chromium was released from the Wixom WWTP are:

- The Wixom WWTP measured 24-hour effluent composite samples spanning the whole time of release (expected start is 7/31/22 at 10:30PM) with a 11.5-minute sampling interval [every 10-12 K gallons]. The sample results from 7/31 to 8/2 indicate 14 pounds [13.8 lbs. + 0.2 lbs.] of total chromium were discharged into Norton Creek.
 - 1st 24 hours [7/31/22 7AM to 8/1/22 7AM] = 1.44 million gallons per day x 3.78 L/gal x 2.2 lbs./kg x 1.15 mg/L = 13.8 lbs. total chromium
 - 2nd 24 hours [8/1/22 7AM to 8/2/22 7AM] = 1.64 million gallons per day x 3.78 L/gal x 2.2 lbs./kg x 0.016 mg/L = 0.2 lbs. total chromium
- Measurements in Wixom WWTP show mostly total chromium and not hexavalent chromium (> 99.9% reduced).
- 275 lbs. of total chromium are at the Wixom WWTP and have not been discharged. This material is non-detect for hexavalent chromium but had total chromium that ranged from 15 to 41 mg/L, supporting >99.9% of the material not being hexavalent chromium.
- Ratio of total chromium to hexavalent chromium in the last of four granular activated carbon (GAC) filter tanks, through which the release flowed in series from tank 1 to tank 4, show that the total chromium was at most 0.125% hexavalent chromium before it left the Tribar Technologies plant 5.

Huron River Water Chromium Results

The weight-of-evidence for minimal hexavalent chromium release to the Huron River aligns with the finding of infrequent, low-level detections of total and hexavalent chromium in surface water sample (EGLE 2022b).

Surface water data from the Huron River collected from 8/2/2022 to 8/6/2022 support a much lower release amount (Figure 1 and 2). Of 146 water samples collected throughout 42 river miles since the release:

- Hexavalent chromium was detected in 3 of 146 samples (2%).
 - Two detections in Milford's Hubbell Pond (11 and 9 ppb) and one in the middle of Kent Lake (5 ppb).
- Hexavalent chromium was detected at 2 of 61 locations (3%).
- Total chromium was found in 6 of 146 samples (4%).
 - Two detections in Norton Creek (1.1 and 1.4 ppb) and four in Kent Lake (1.1 to 2.5 ppb).
- Total chromium was found at 5 of 61 locations (5%).

Per- and Polyfluoroalkyl (PFAS) Substances

Tribar Technologies reported up to 7 lbs. of Macuplex STR NPFX mist suppressant was also part of the release. (Tribar Technologies Spill or release report 8/11/2022). This likely contained the PFAS 6:2 FTS and potentially others in lower amounts as this PFAS is typically found in mist suppressants used for chrome plating (EGLE 2020).

Health Assessment:

Swimming in, wading in, and playing in the Huron River (dermal contact and incidental ingestion):

For swimming, wading, and playing, the chemical of concern is hexavalent chromium. With the release being near exclusively trivalent chromium and not hexavalent chromium, the concern for toxicity from dermal contact and incidental ingestion has been greatly reduced. There is a minimal risk level (MRL) for hexavalent chromium and since it is the more toxic form is also appropriate to use for total chromium health assessment.

All concentrations of total chromium and hexavalent chromium for any section of the Huron River were measured and are expected to remain well below the concentration of 80 ppb which is protective of human health from dermal contact and incidental ingestion of hexavalent chromium. The value of 80 ppb would be at the MRL of 0.005 mg/kg/day [ATSDR 2012] for a child up to 1 years old, swimming for a full 8 hours. This scenario would also be protective of everyone for wading and playing since the exposure will be less. See appendix for support of calculations.

Therefore, MDHHS-TAS determines that **swimming in, wadding in, and playing in the Huron River is no longer expected to harm people's health from the hexavalent or total chromium released in this industrial chromium release.**

In addition, an amount of a PFAS (6:2 FTS) was likely in the tank that was release but it is unknown how much was ultimately released into the Huron River. These PFAS are not a dermal contact concern (MDHHS 2021). Incidental ingestion exposure during swimming is possible but unlikely to be at a concentration and duration to be a concern to health.

Public Water Supply Source Drinking Water from the Huron River at the City of Ann Arbor:

For drinking water, the contaminants of concerns are total chromium and hexavalent chromium. Given the revised release amount, surface water data from Norton Creek and the Huron River, and the near certain additional dilution and binding to sediments before it reaches Ann Arbor, concentrations of total chromium and/or hexavalent chromium will become less and not increase.

Initial assessment of a 3-day release into Norton Creek and the Huron River would put the hazard quotient of 1 for non-cancer health effects for a birth to 1-year old infant consuming water at the reasonable maximum drinking water intake rate of 1.11 L/day at 35 ppb hexavalent chromium. Cancer risk estimates over a 78-year lifetime for a 3-day exposure at 35 ppb would not exceed the 1 in 1 million extra cancer cases per million exposed. See appendix for support of calculations.

For total chromium, which includes trivalent and hexavalent chromium the EPA's maximum contaminant level (MCL) is 100 ppb with a MCL goal of 100 ppb. The California Office of Environmental Health Hazard Assessment (OEHHA) has a MCL for total chromium of 50 ppb.

Therefore, MDHHS-TAS determines that **drinking water from public drinking water supplies using the Huron River as the source is not expected to harm people's health from the** hexavalent or total chromium released in this industrial chromium release.

In addition, a small amount of a PFAS was likely in the tank that was release but it is indeterminate how much was ultimately released into the Huron River. There is a potential for exposure through drinking water. Monitoring of the Huron River near the City of Ann Arbor drinking water with a one day per week, five sampling location for per- and polyfluorinated substances (PFAS) is recommended to monitor this exposure route.

As an additional measure of public assurance to downstream public drinking water intakes on the Huron River, a three-day per week, five repeated locations per day sampling effort for total chromium and hexavalent chromium is recommended for the expected duration of travel from any released chemical to the drinking water source waters.

Conclusions:

MDHHS-TAS concludes that the initial worst-case estimate of hexavalent chromium industrial release entering the Huron River was orders of magnitude too high compared to the current analytically derived estimate based on the Wixom wastewater treatment plant effluent composite samples. Further, MDHHS-TAS concludes that use of the Huron River for recreation activities such as swimming and wading or as source water for public water supplies is not expected to harm people's health as a result of the NRC reported industrial hexavalent chromium release.

Recommendations:

1. MDHHS-TAS recommends the Huron River no contact recommendation be lifted for the initially identified area and a return to normal usage resume.

2. MDHHS TAS recommends continued Huron River water testing for total chromium, hexavalent chromium and PFAS, during the expected travel time, as a public assurance measure for protecting public water supply drinking water confidence.

Public Health Action Plan:

1. MDHHS will issue a press release to notify the public that the no contact recommendation has been lifted.
2. MDHHS is working with EGLE, Local Public Health, and Ann Arbor Drinking Water Treatment Plant to design, implement public health assurance Huron River water assurance sampling upstream of the Ann Arbor Drinking Water.
3. MDHHS will continue to work with EGLE, Local Public Health, and Ann Arbor Drinking Water Treatment Plant to evaluate Huron River water analytical results from the assurance sampling effort.

References

(EGLE 2022a) Michigan Department of Environment, Great Lakes, and Energy Fate of Chromium (Total and Hexavalent) Release from Tribar Plant 5. August 10, 2022

(EGLE 2022b) Summary of Michigan Department of Environment, Great Lakes, and Energy Water Resources Division Monitoring Activities Wixom Hexavalent Chromium Spill Response. August 10, 2022

(EGLE 2020) Michigan Department of Environment, Great Lakes, and Energy (EGLE), Water Resources Division June 2020; Targeted and Nontargeted Analysis of PFAS in Fume Suppressant Products at Chrome Plating Facilities (Michigan EGLE, 2020)

(ATSDR 2012) Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, /Public Health Service. Accessed 8/9/2022

<https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=62&tid=17>

(MDHHS 2021) Toxicological Profiles of Per- and Polyfluoroalkyl Substances (PFAS) Quantified Using MDHHS Isotope Dilution Method (7/2/2021)

(Barr 2022) Barr Engineering Technical Memorandum, Conceptual Fate of Chromium in Wastewater, 8/11/2022

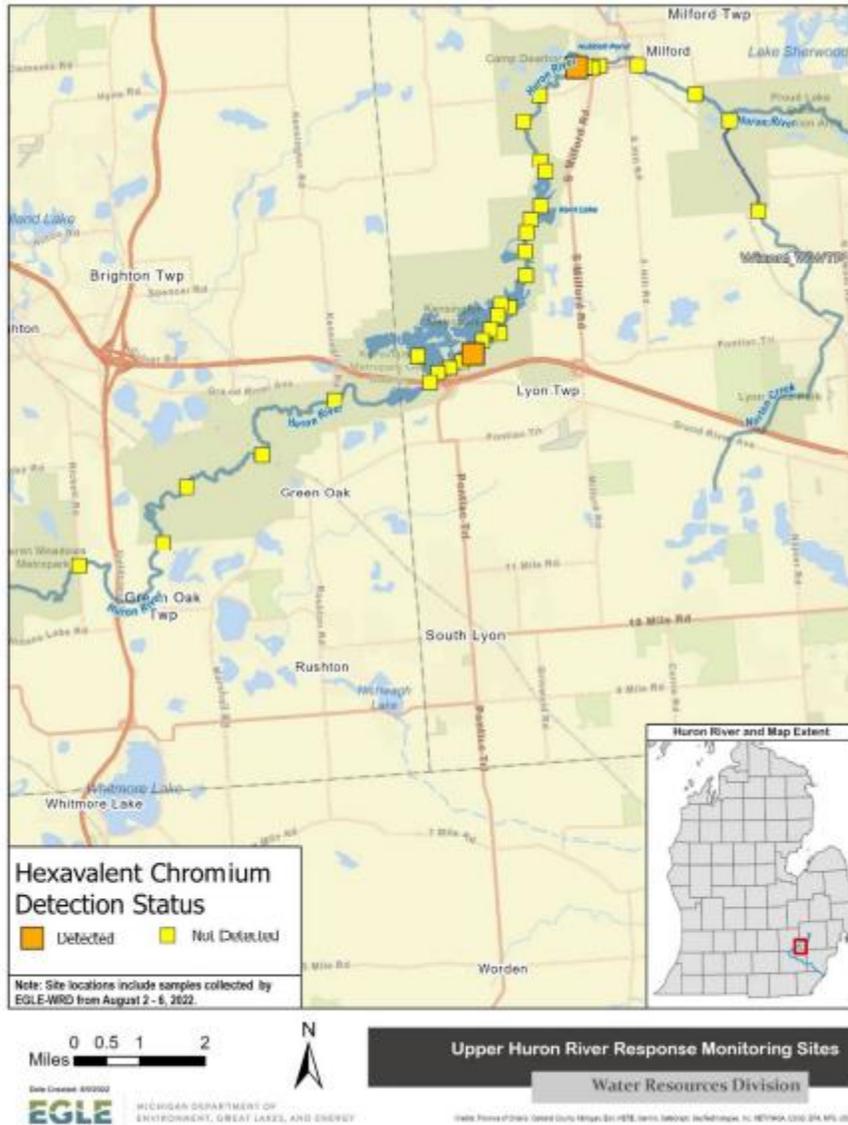
Tribar Technologies, Spill or Release. Report 8/11/2022

OEHHA, <https://oehha.ca.gov/chemicals/chromium-hexavalent>

Figure 1: Total Chromium results in upstream reach of response monitoring efforts, Norton Creek to Rickett Road, August 2 – August 6, 2022



Figure 2: Hexavalent Chromium results in upstream reach of response monitoring efforts, Norton Creek to Rickett Road, August 2 – August 6, 2022



Appendix

Swimming

Table 1. Swimming: Site-specific combined ingestion and dermal exposure doses for intermediate exposure to hexavalent chromium in surface water at 0.08 mg/L along with non-cancer hazard quotients*

 Exposure Group	CTE Dose (mg/kg/day)	CTE Non-cancer Hazard Quotient	RME Dose (mg/kg/day)	RME Non-cancer Hazard Quotient
Birth to < 1 year	0.0043	0.86	0.0052	1.0 [†]

Source: [list reference of environmental data]

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.1.1.0. The non-cancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.005 mg/kg/day.

† A shaded cell indicates the hazard quotient is greater than 1, which ATSDR evaluates further.



Site-specific Parameters Table PHAST Report, v2.1.1.0, August 11, 2022

Equations

Surface Water Ingestion Exposure Dose Equation

$$D_{\text{noncancer}} = (C \times IR \times t_{\text{event}} \times EV \times EF_{\text{noncancer}}) \div BW \quad \text{Equation 1}$$

$D_{\text{noncancer}}$ = dose (mg/kg/day), C = contaminant concentration (mg/L), IR = intake rate (L/hr), t_{event} = event duration (hr/event), EV = event frequency (events/day), $EF_{\text{noncancer}}$ = exposure factor (unitless), BW = body weight (kg)

Administered Dermal Dose Equation

$$ADD_{\text{noncancer}} = (DA_{\text{event}} \times SA \times EV \times EF_{\text{noncancer}}) \div (BW \times ABS_{GI}) \quad \text{Equation 2}$$

$ADD_{\text{noncancer}}$ = administered dermal dose (mg/kg/day), DA_{event} = absorbed dose per event (mg/cm²/event), SA = skin surface area available for contact (cm²), EV = event frequency (events/day), $EF_{\text{noncancer}}$ = exposure factor (unitless), BW = body weight (kg), ABS_{GI} = gastrointestinal absorption factor (unitless)

Hazard Quotient

$$HQ = D_{\text{noncancer}} \div HG \quad \text{Equation 3}$$

HQ = hazard quotient, $D_{\text{noncancer}}$ = dose (mg/kg/day), HG = health guideline (e.g., oral MRL, RfD)

Site-specific Exposure Factors

Duration Category	Event Duration (hours/event)	Event Frequency (events/day)	Days per Week	Weeks per Year	Years	Exposure Group Specific $EF_{\text{noncancer}}$
Intermediate	8	1	1	2	-	0.14

Abbreviations: EF = exposure factor;

Site-specific Exposure Parameters

Exposure Group	Body Weight (kg)	Exposure Duration (years)	CTE Intake Rate (L/hr)	RME Intake Rate (L/hr)	Custom Intake Rate (L/hr)	Combined Skin Surface Area (cm ²)	Notes
Birth to < 1 year	7.8	-	0.0490	0.120	-	3,992	-

Abbreviations: cm² = centimeters square skin; CTE = central tendency exposure (typical); kg = kilograms; L/hr = liters per hour; RME = reasonable maximum exposure (higher)

Contaminant Information

Contaminant Name	Entered Concentration	EPC Type	Converted Concentration*	ABS _{GI}	DA _{event}
Chromium, hexavalent	80 ppb	Maximum	0.08 mg/L	0.025	1.28E-06 mg/cm ² /event

Abbreviations: ABS_{GI} = gastrointestinal absorption factor; DA_{event} = absorbed dose per event; EPC = exposure point concentration; mg/cm²/event = milligrams per centimeter squared per event; mg/L = milligram chemical per liter water; ppb = parts per billion

* Contaminant concentration converted to standard unit for calculating exposure.

Drinking Water Ingestion Intermediate

Chromium, hexavalent

Table 1. Residential Site-specific exposure doses for intermediate exposure to hexavalent chromium in drinking water at 0.035 mg/L along with non-cancer hazard quotients*

 PUBLIC HEALTH ASSESSMENT SITE TOOL Exposure Group	CTE Dose (mg/kg/day)	CTE Non-cancer Hazard Quotient	RME Dose (mg/kg/day)	RME Non-cancer Hazard Quotient
Birth to < 1 year	0.0023	0.45	0.0050	1.0

Source: [\[list reference of environmental data\]](#)

Abbreviations: CTE = central tendency exposure (typical); mg/kg/day = milligram chemical per kilogram body weight per day; mg/L = milligram chemical per liter water; RME = reasonable maximum exposure (higher)

* The calculations in this table were generated using ATSDR's PHAST v2.1.1.0. The non-cancer hazard quotients were calculated using the intermediate (two weeks to less than 1 year) minimal risk level of 0.005 mg/kg/day.



Site-specific Parameters Table PHAST Report, v2.1.1.0, August 11, 2022

Equations

Water Ingestion Exposure Dose Equation

$$D_{\text{noncancer}} = \text{dose (mg/kg/day)}, C = \text{contaminant concentration (mg/L)}, IR = \text{intake rate (L/day)}, EF_{\text{noncancer}} = \text{exposure factor (unitless)}, BW = \text{body weight (kg)}$$

$$D_{\text{noncancer}} = (C \times IR \times EF_{\text{noncancer}}) \div BW \quad \text{Equation 1}$$

Hazard Quotient

$$HQ = D_{\text{noncancer}} \div HG \quad \text{Equation 2}$$

HQ = hazard quotient, $D_{\text{noncancer}}$ = dose (mg/kg/day), HG = health guideline (e.g., oral MRL, RfD)

Cancer Risk Equations

$$CR = D_{\text{noncancer}} \times CSF \times (ED \div LY) \quad \text{Equation 3}$$

CR = cancer risk (unitless), $D_{\text{noncancer}}$ = dose, CSF = oral cancer slope factor $[(\text{mg}/\text{kg}/\text{day})^{-1}]$, EF (cancer) = exposure factor (cancer) calculated as follows: $\text{EF}(\text{non-cancer; unitless}) \times \text{exposure group specific exposure duration (years)} \div \text{lifetime of 78 years}$, ED = exposure duration (years), LY = lifetime years (78 years)

Site-specific Exposure Factors

Duration Category	Days per Week	Weeks per Year	Years	Exposure Group Specific EF _{noncancer}
Intermediate	7	2	-	1

Abbreviations: EF = exposure factor;

* Cancer risk is averaged over a lifetime of exposure (78 years).

Site-specific Exposure Parameters

Exposure Group	Body Weight (kg)	Exposure Duration (years)	CTE Intake Rate (liters/day)	RME Intake Rate (liters/day)	Custom Intake Rate (liters/day)	Notes
Birth to < 1 year	7.8	-	0.504	1.11	-	-

Abbreviations: CTE = central tendency exposure (typical); kg = kilograms; RME = reasonable maximum exposure (higher)

Contaminant Information

Contaminant Name	Entered Concentration	EPC Type	Converted Concentration*
Chromium, hexavalent	35 ppb	Maximum	0.035 mg/L

Abbreviations: EPC = exposure point concentration; mg/L = milligram chemical per liter water; ppb = parts per billion

* Contaminant concentration converted to standard unit for calculating exposure.

Drinking water Cancer Risk

Cancer risk = (Dose * CSF) * (ED/78 years)

Dose = 0.005 mg/kg/day (intermediate MRL)

CSF = 0.5 (mg/kg/day)⁻¹

ED = 0.009 year (3 days)

Cancer risk = (0.005 * 0.5) * (0.009/78) = **2.8 x 10⁻⁷**