

Operations Management Services



2016 - 2017 Annual Operations Report

Traverse City Regional Wastewater Treatment Plant



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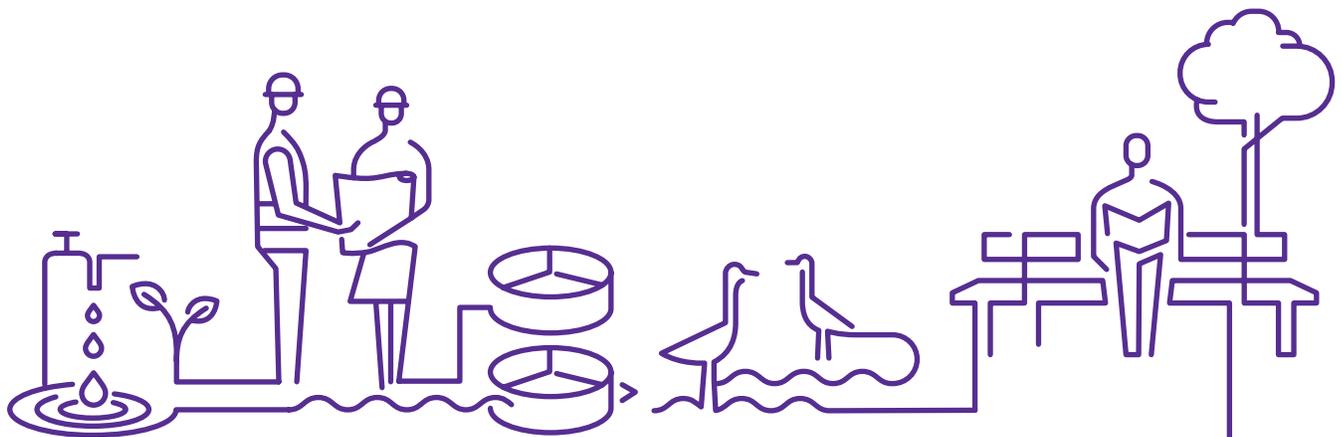
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Introduction

CH2M is pleased to present the City of Traverse City with this annual report as an overview of activities related to the Traverse City Regional Wastewater Treatment Plant (TCRWWTP) during the 2016-2017 contract year. CH2M has been operating and maintaining the WWTP and seven lift stations (increased to eight year-round lift stations) since 1990. During this time, we have stewarded the facility through various upgrades, the last of which took place in 2004, when the facility was converted to a Membrane Bioreactor (MBR) facility (CH2M's family of engineers was selected to design and build this upgrade). This project allowed the City to increase plant capacities while staying within the current foot print of the WWTP, and offered a high-quality effluent that was desired by the public. In 2016, the City extended our partnership through June 30, 2022. In the coming years, we will continue working together on membrane replacement, asset management, and investigating the presence of comma shaped Gram positive bacteria.



We look forward to the opportunity to serve this community where we live and work.

Plant Performance

The TCRWWTP operates under a National Pollutant Discharge Elimination System (NPDES) permit that is issued by the Michigan Department of Environmental Quality (MDEQ). The NPDES permit contains limits (requirements) for certain parameters within the plant effluent to protect the receiving waters.

Carbonaceous Biochemical Oxygen Demand (CBOD) and Total Suspended Solids (TSS) Plant Percent Removals and Effluent Concentrations

The plant is required to remove, at a minimum, 85 percent of the influent CBOD and TSS. Exhibits 1 and 2, illustrate the plant percent removals for 2016-2017. Exhibit 3, contains NPDES permit effluent concentration [milligrams per liter (mg/L)] limits compared to the actual average effluent concentrations for 2016-2017.

Exhibit 1

TCRWWTP Percent Removals versus NPDES Permit Requirements 2016-2017

NPDES Minimum Percent Removal Requirement	TCRWWTP Minimum Percent CBOD Removal	TCRWWTP Average Percent CBOD Removal	TCRWWTP Minimum Percent TSS Removal	TCRWWTP Average Percent TSS Removal
85	97	99	99	99

Exhibit 2

TCRWWTP Percent Removals versus NPDES Permit Requirement 2016-2017

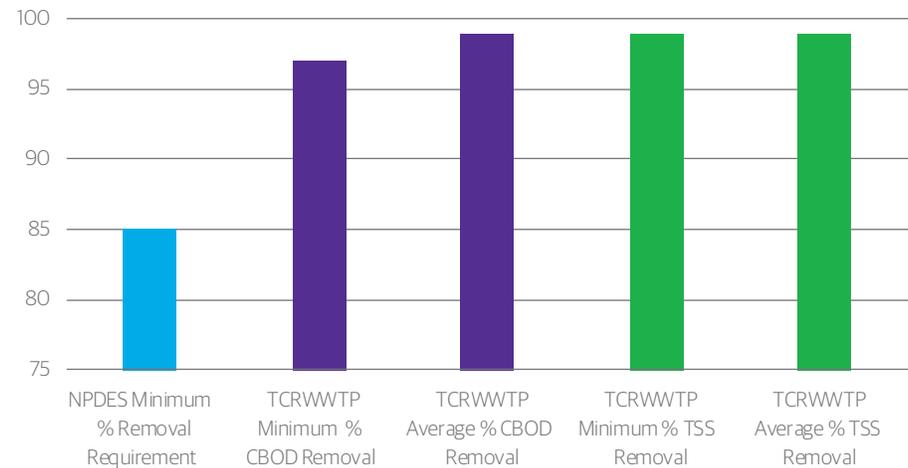


Exhibit 3

Plant Effluent Average CBOD and TSS Concentrations versus NPDES Permit Average Concentration Requirements 2016-2017

	CBOD Concentration (mg/L)	TSS Concentration (mg/L)
NPDES Permit Average Concentration Requirement	25	30
Plant Effluent Average Concentration	<2.17	<1.02

Total Phosphorus and Ammonia Nitrogen Concentrations

Total phosphorus and ammonia nitrogen are nutrients that aid in the growth of organisms and plant life, however, if these nutrients are present in the facility's effluent in too great of concentrations, it could lead to algae blooms, plant over growth, and decreased dissolved oxygen concentrations in the receiving waters. Exhibits 4-6, illustrate 2016-2017 effluent average concentrations of ammonia nitrogen and total phosphorus as they compare to the wastewater treatment plant's NPDES limits.

The addition of ferric chloride is used to remove total phosphorus from the wastewater. To reduce the expense of purchasing ferric chloride, we monitor the concentration of total phosphorus in the plant effluent closely and only add ferric chloride as needed to meet the permit requirement.



Exhibit 4

Plant Effluent Average Nutrient Concentrations versus NPDES Permit Average Concentration Requirements 2016-2017

	Ammonia Nitrogen Concentration (mg/L)	Total Phosphorus Concentration (mg/L)
NPDES Permit Average Concentration Requirement	11	0.5
Plant Effluent Average Concentration	<.16	0.34

Exhibit 5

Plant Effluent Average Ammonia Concentrations versus NPDES Permit Average Concentration Requirements 2016-2017

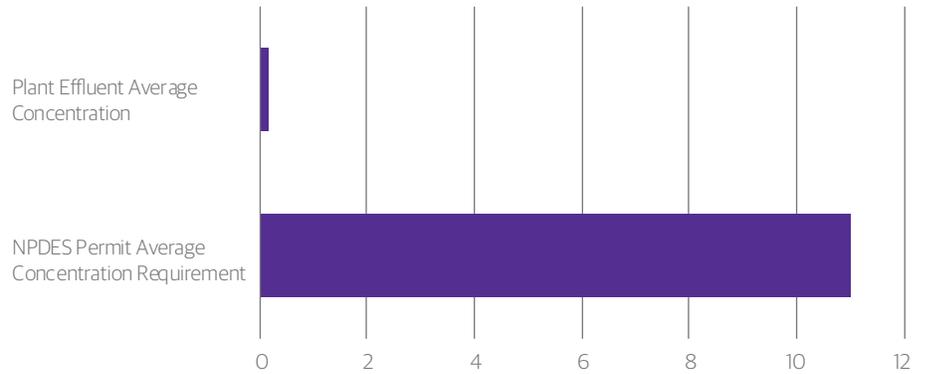
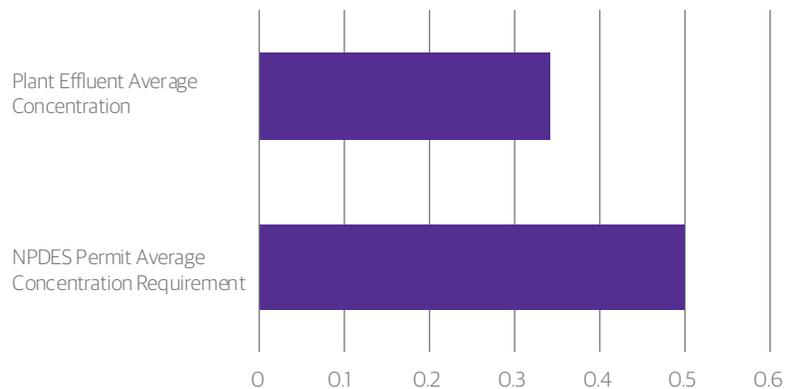


Exhibit 6

Plant Effluent Average Total Phosphorus Concentrations versus NPDES Permit Average Concentration Requirements 2016-2017



Plant Performance

Dissolved Oxygen (mg/L), and pH [standard units (S.U)]

An adequate dissolved oxygen concentration and pH level is essential to maintaining the quality of a body of water. For this reason, the MDEQ included a minimum dissolved oxygen concentration (mg/L), and pH limits in the plant's NPDES permit. Exhibit 7 compares the NPDES permit plant effluent minimum dissolved oxygen requirement with the plant effluent minimum dissolved oxygen concentration in 2016-2017. Exhibit 8 compares the NPDES permit plant effluent pH limits with the maximum and minimum pH values for the plant's effluent in 2016-2017.

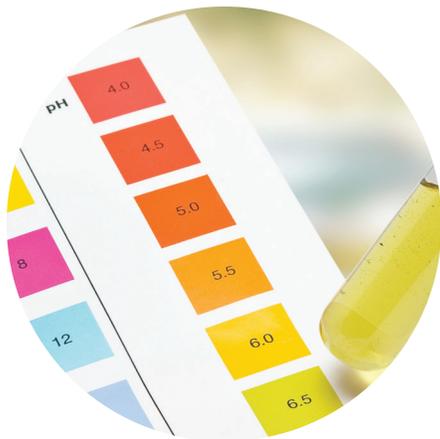


Exhibit 7
Plant Effluent Dissolved Oxygen Concentration Limits versus NPDES Permit Average Concentration Requirements 2016-2017

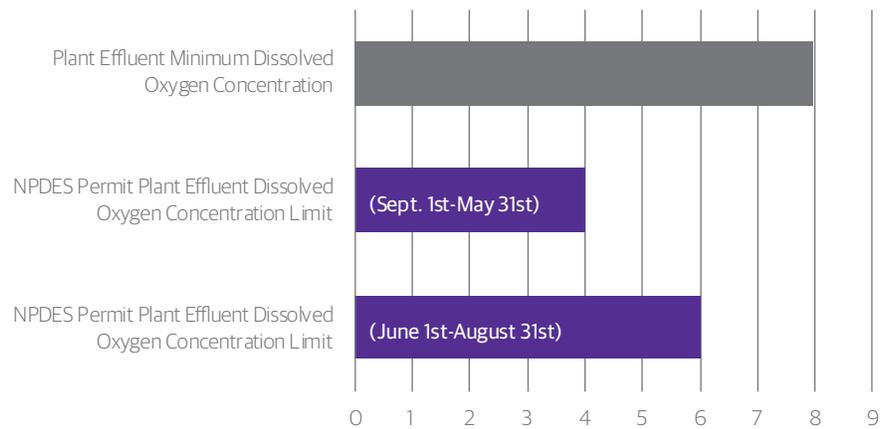
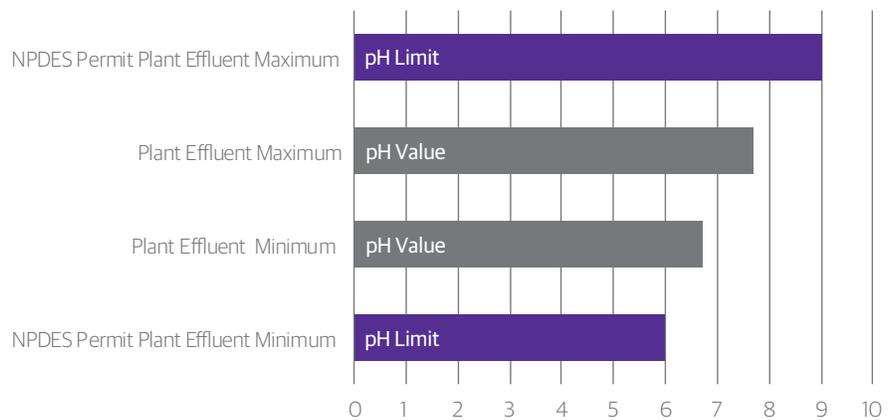


Exhibit 8
Plant Effluent pH Maximum and Minimum Limits versus NPDES Permit Average Concentration Requirements 2016-2017



Fecal Coliform

To protect the City's water ways and ultimately the public from harmful pathogens that are present in wastewater, the MDEQ requires disinfection of WWTP effluent. Disinfection destroys or deactivates pathogenic microorganisms resulting in the termination of their growth and reproduction. The plant's NPDES permit limits the monthly geomean of fecal coliform to 200 counts (cts)/100 milliliters (mls). Exhibits 9 and 10 compare the NPDES permit plant effluent requirement with the plant effluent maximum 7-day geomean for 2016-2017.

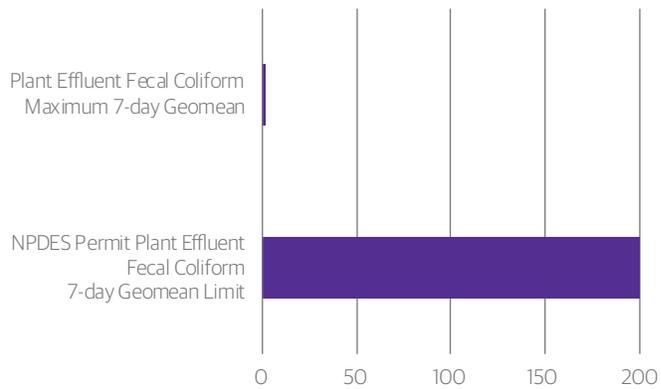
Exhibit 9

NPDES Permit Plant Effluent Fecal Coliform Requirement versus Plant Effluent Maximum Fecal Coliform 7-Day Geomean (counts/100mls) 2016-2017

	Fecal Coliform 7-day Geomean (cts/100mls)
NPDES Permit Plant Effluent Fecal Coliform 7-day Geomean Limit	200
Plant Effluent Fecal Coliform Maximum 7-day Geomean	1.26

Exhibit 10

NPDES Permit Plant Effluent Fecal Coliform Requirement versus Plant Effluent Maximum Fecal Coliform 7-Day Geomean (counts/100mls) 2016-2017



Plant Performance

Total Silver, Ag (micrograms/Liter, ug/L)

Silver, among other uses, is a byproduct of traditional photography found in photo fixer. While the effects of silver in the environment vary greatly based on the form of silver, it can be toxic to both plants and animals. In order to protect the aquatic life in the receiving stream, the Boardman River, the NPDES permit limits the amount of silver allowed in the plant effluent to an average concentration of 5.3 ug/L. Exhibit 11 and 12 compare the NPDES plant effluent limit and the average plant effluent concentration for 2016-2017. As of June 2017, the MDEQ approved our petition to reduce Silver monitoring from weekly to quarterly. This will reduce the expense related to monitoring Silver.

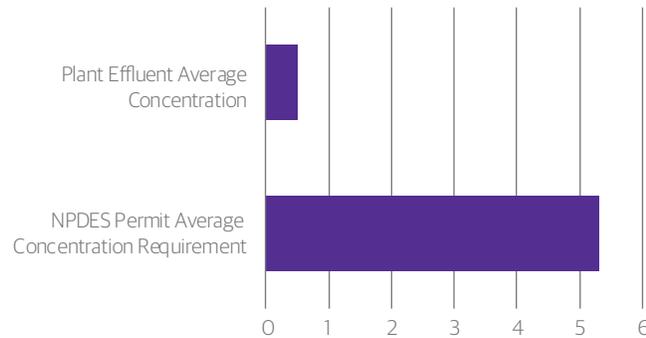
Exhibit 11

Plant Effluent Average Silver Concentration versus NPDES Permit Plant Effluent Silver Concentration Requirement 2016-2017

	Silver (ug/L)
NPDES Permit Average Concentration Requirement	5.3
Plant Effluent Average Concentration	0.50

Exhibit 12

Plant Effluent Average Silver Concentration versus NPDES Permit Plant Effluent Silver Concentration Requirement 2016-2017



Michigan Department of Environmental Quality Facility Inspection

The MDEQ inspected the facility in 2016-2017, below is an excerpt from the follow-up report.

During our review, we found two issues in the laboratory, which should be addressed as soon as possible. The pH buffers used for calibration were expired and the fecal coliform incubator was above the required temperature of 44.5 ± 0.2 °C (recorded at 46 °C at the time of inspection). Other than these two issues, the facility seemed well maintained and operated and was in compliance with the permit. We also found that the stormwater non-exposure certification for the facility is appropriate.

National Pollution Discharge Elimination System Permit Reporting

In accordance with the NPDES permit for the TCRWWTP, CH2M completed and submitted the following reports/plans to the MDEQ:

- Monthly Discharge Monitoring Reports
- Asset Management Plan and Revisions
- Asset Management Annual Report
- Mercury Monitoring Data Report
- Annual Residual Management Report
- Annual Federal Industrial Pretreatment Program (IPP) Report
- Additional Monitoring Data Report

IPP Overview

CH2M is responsible for administering the City's and through jurisdictional agreements, the Townships', IPP program as spelled out in their approved Sewer Use Ordinances (SUO). CH2M monitors **Significant Industrial Users (SIUs)**, responds to and investigates reported collection system interferences, reports non-compliance to the control authority (the City Manager) promptly, and prepares documents for the control authority as needed to fulfill the duties as spelled out in the SUO. (For compliance purposes the IPP "year" is based on the calendar year from January 1- December 31). Below is the definition, the MDEQ offers on their website, for SIUs:

An **industrial user (IU)** will be classified as an SIU if it meets any of the following:

- (A) Is subject to categorical pretreatment standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N;
- (B) Discharges an average of 25,000 gallons per day (gpd) or more of process wastewater to the Publicly Owned Treatment Works (POTW) (excluding sanitary, noncontact cooling, and boiler blowdown wastewater);
- (C) Contributes a process waste stream that makes up 5 percent or more of the average dry-weather hydraulic or organic capacity of the POTW treatment plant;
- (D) Is designated as such by the POTW on the basis that the IU has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

A **categorical industrial user (CIU)** is an SIU [see (A) above], but an SIU is not always a CIU. CIUs have specific limits and requirements that are determined by the Federal government. States and local governments can develop requirements that are more restrictive, but not less restrictive.

SIUs are required to have discharge permits to operate on the system. Within those permits, they are required to perform self-monitoring tests on their discharges and report those results to CH2M at least twice per year. We also perform our own testing once per year. We inspect the SIUs twice per year; once on short notice (less than 24 hours) and once for a longer visit (1 to 2-week notice).

Light Industrial User (LIU) is a classification we use in Traverse City to monitor industries on the sewer system that discharge process water, but do not qualify as an SIU. They are not required to have a discharge permit and are not subject to mandatory testing. They are inspected at least once every two years, have a Slug Control Plan and an IPP Inspection Manhole.

IPP Overview

Traverse City has one CIU, three SIUs and 23 LIUs discharging to the sanitary sewer. CRM is considered a Categorical User because of the metal finishing process that occurs at their site. The three SIUs are: Munson Medical Center, Munson Support Services, and Hillshire Food. Exhibit 13 is a summary of LIU locations inspected in the last year. Exhibit 14 is a summary of CIU and SIU locations inspected in the last year.



Exhibit 13
Light Industrial Users Inspections 2016-2017

Date	Discharger
11/4/2016	North Peak Brewing Company
11/28/2016	Right Brain Brewery
11/28/2016	The Filling Station

Exhibit 14
SIUs and CIU Inspections 2016-2017 (Grouped by User)

Date	Discharger
8/5/2016	Munson Support Services
11/30/2016	Short-notice inspection of Munson Support Services
9/15/2016	CRM, Inc. (CIU)
5/17/2017	Short Notice inspection of CRM, Inc.
11/21/2016	Hillshire Foods
8/10/2016	Short-notice inspection of Hillshire Brands
12/1/2016	Munson Medical Center
9/1/2016	Short-notice inspection on Munson Medical Center

IPP Overview

In addition to inspecting the CIU, SIUs, and LIUs, CH2M conducted in-field inspections, distributed and evaluated IU Surveys, and responded to discharge issues. These activities are summarized in Exhibit 15.

Exhibit 15
IPP Items Responded to in 2016-2017

Date	Item
7/21/2016	Located and inspected the manhole (IMH) for GT Distillery.
7/28/2016	Inspected Coast Guard Lift Station for oil buildup.
8/1/2016	Inspected the IMH at Copper Falls. It needs to be modified.
8/8/2016	Met with Jack of SOS Analytical and performed a field sampling inspection.
8/11/2016	Performed a follow-up field inspection with Jack of SOS Analytical.
8/12/2016	Performed a follow-up field inspection with Jack of SOS Analytical.
8/12/2016	Inspected modified Copper Falls IMH.
9/1/2016	Inspected manholes in the Grand Traverse Commons, looking for the source of a grease plug on Elmwood Street.
10/3/2016	Performed field follow-ups on the IU's Survey.
10/5/2016	Performed field follow-ups on the IU's Survey.
10/10/2016	Performed field follow-ups on the IU's Survey.
10/13/2016	Performed field inspection at Press On Juice.
10/18/2016	Performed field follow-ups on the IU's Survey.
10/20/2016	Performed field follow-ups on the IU's Survey.
10/21/2016	Performed field follow-ups on the IU's Survey.
10/21/2016	Met with CRM, Inc.
10/24/2016	Performed field follow-ups on the IU's Survey.
10/26/2016	Performed field follow-ups on the IU's Survey.
10/27/2016	Inspected 120 South Union to evaluate if an IMH can fit there.
10/28/2016	Visited Copper Falls and discussed pumping history and frequency.
10/31/2016	Performed field follow-ups on the IU's Survey.
11/2/2016	Performed field follow-ups on the IU's Survey.
11/3/2016	Performed field follow-ups on the IU's Survey.
11/14/2016	Site inspection at Press On Juice, looking for the IMH.
11/14/2016	Visited Copper Falls because they did not pump their grease interceptor.
12/2/2016	Sewer inspection at Lowes Home Improvement.
1/11/2017	Met with Alcotech and inspected their Oil/Water Separator (OWS).
1/25/2017	Performed a site inspection at 328 East Front Street to look for an IMH.
2/8/2017	Inspected Coast Guard Lift Station for oil buildup.
2/8/2017	Performed a site inspection at 813 Garfield Road to look for an IMH.
2/8/2017	Performed a site inspection at 537 14th Street to look for an IMH.
2/8/2017	Searched for manholes to track a high oil discharge on Rice Street.
3/8/2017	Performed a site inspection at 1230 Woodmere Avenue to look for an IMH.
3/8/2017	Performed a site inspection at 813 Garfield Road to look for an IMH.
3/27/2017	Performed a site inspection at 329 State Street to look for an IMH.
6/14/2017	Performed site inspection of Press On Juice to confirm the installation of the IMH.
6/15/2017	Performed field follow-ups on the IU's Survey.
6/15/2017	Visited CRM, Inc and observed sample collection of the rinse tank.

IPP Overview

When an industry fails to comply with Traverse City's Sewer Use Ordinance (SUO), that business is sent a Notice of Violation. Exhibit 16 is a summary of the Notices of Violation sent in 2016-2017.

Exhibit 16

Notice of Violations Issued to Dischargers in 2016-2017

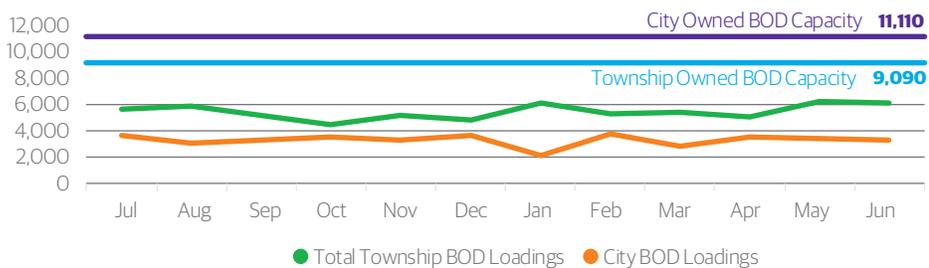
Date	User	Classification	Violation	Notes
7/18/2016	Munson Medical Center	SIU	pH too low at Outfall-003 for reporting period December 2015 to May 2016.	Tests confirmed a return to compliance.
7/18/2016	Munson Medical Center	SIU	TSS too high at Outfall-003 for reporting period December 2015 to May 2016.	Tests confirmed a return to compliance.
7/18/2016	Munson Medical Center	SIU	Failing to report a permit violation within 24 hours.	Reporting Violation.
8/27/2016	Munson Medical Center	SIU	pH too low at Outfall-003 in Control Authority Sampling.	Resample showed non-compliance.
8/27/2016	Munson Medical Center	SIU	TSS too high at Outfall-003 in Control Authority Sampling.	Resample showed non-compliance.
9/30/2016	Munson Medical Center	SIU	pH too low at Outfall-003 in Control Authority Sampling.	Follow up testing confirmed a return to compliance.
9/30/2016	Munson Medical Center	SIU	TSS too high at Outfall-003 in Control Authority Sampling.	Follow up testing confirmed a return to compliance.
12/13/2016	Lowes Home Improvement	User	Discharging excessive discoloration (dumped paint dye).	Sewer was cleaned and now in compliance.
1/9/2017	Munson Medical Center	SIU	Total kjeldahl nitrogen (TKN) too high at Outfall-003 in Self-Monitoring Report June 2016 to November 2016.	Follow up testing confirmed a return to compliance
1/9/2017	Munson Medical Center	SIU	Failure to report a violation verbally within 24 hours.	Reporting violation.
1/9/2017	Munson Medical Center	SIU	Failure to report a violation in writing within 5 days.	Reporting violation.
1/11/2017	Beitner Square	Restaurant	High grease discharge.	Fine.

IPP Overview

Township BOD Loadings

As part of CH2M's contractual obligation to the City, we operate and maintain eight automatic flow proportioned samplers strategically placed throughout the collection system, in order to obtain representative samples from each of the following townships: Garfield, East Bay, Acme, Elmwood, and Peninsula. We collect three samples per week, and each sample is analyzed to determine its BOD concentration. These concentrations are used to calculate a monthly average BOD concentration. The monthly average BOD concentration for each township and monthly township flow values (provided by the City and the County) are used to calculate the BOD loadings from each of the fore mentioned townships, and the City. Together the five Townships own 45 percent of the facility's organic loading capacity amounting to 9,090 pounds per day of BOD. The City owns the remaining 55 percent of the facility's organic loading capacity or 11,110 pounds per day of BOD. (Exhibit 17 summarizes the 2016-2017 BOD loadings versus owned capacities.)

Exhibit 17
Total Daily Average BOD Loadings



Operations and Maintenance Highlights

As part of the CH2M culture we are always looking for opportunities to improve our performance by reducing compliance vulnerabilities, operational costs, and the facility's carbon footprint; achieving operational excellence; acquiring and maintaining a highly-qualified staff; and demonstrating a high standard of safety. Itemized below are this year's accomplishments:

Membrane System and Ultraviolet Disinfection System Programming Enhancements

Ultraviolet (UV) light is used for disinfection at the facility. Since the upgrade to membranes, the facility meets MDEQ requirements for disinfection without UV disinfection. However, the state of Michigan requires that all facilities disinfect. During the month of September 2016, we experienced two separate membrane control component failures that led to the flooding of our UV module controls, rendering them inoperable. CH2M developed and implemented an action plan to reduce the likelihood of the UV modules flooding in the future. This action plan is itemized below:

- Addressed return activated sludge (RAS) channel high float switch issue. Implemented a preventive maintenance (PM) work order to check floats and float placement semiannually.
- Adjusted the peak flow set point for each membrane train to better compliment the capacity of the UV system. We also created a procedure to manually override these set points to meet the influent flow demand during a high flow event, when or if it becomes necessary, in a manner that would reduce the possibility of flooding the UV modules. In addition, alarming was added to the supervisory control and data acquisition (SCADA) to call out when a train is triggered to go into peak flow mode.
- Added alarming and programming to the SCADA that would allow the RAS channel level transducers to trigger an alarm if they are out of range, and the control loop to default to the other level transducer in the channel.
- Maintain two spare UV modules in storage for immediate use in the event the UV modules in service become flooded.
- Identified and confirmed current wiring configuration from the UV channel to programmable logic controller (PLC), and added alarms that will callout in the event either channel of modules loses power.
- Verified UV channel flow capacity and identified options for modifying the manhole between the permeate header and UV channel to prevent overwhelming the manhole in high flow scenarios.
- Identified options for moving the UV module controls out of the UV channel to eliminate the possibility of flooding.
- Added a cement ramp leading to the UV channel so that we could more readily move UV modules with the use of the fork truck.



UV module in channel. Controls are inside of the hatched lid and the UV lamps are under the water. The MDEQ wants the controls out of channel.



UV modules.



UV system north channel and south channel.

Operations and Maintenance Highlights

Aeration Basin Dissolved Oxygen Programming

Certain levels of dissolved oxygen are needed to treat the waste stream entering the aeration basin. CH2M's SCADA programmer updated the facility's programming to trigger an alarm when dissolved oxygen levels in the aeration basin are low and in the event there is not at least one aeration blower running.

Anaerobic Digester Operation

Digesters perform optimally when continually fed. To date, we would send concentrated waste activated sludge (CWAS) to the digesters through the course of the day while the plant was staffed. We have worked to improve SCADA programming and add necessary control components to make it possible for us to continuously send CWAS to the digesters. With this programming now in place, we can waste solids out of the system on a 24-hour basis. We are still limited by the equipment in use (i.e. pump sizing, current digesters in service), but we will continue working on perfecting the digester feeding capabilities.



Boiler Operation

We adjusted the boiler controls to operate boiler #1 using local controls on the boiler rather than the controls on the main control panel. The boiler now cycles off and on based on the temperature of the water in that boiler, rather than the temperature in the boiler water header. This modification allows the boiler to operate with a steadier demand on gas usage. We also installed thermal alarming on the boiler header so that an alarm will be triggered if the temperature falls below a predetermined set point. This allows the digesters to be supplied with the heat they need to maintain temperatures required for proper digestion.

Comma Shaped Gram Positive Bacteria

We identified comma shaped Gram positive bacteria in the biomass of the treatment plant and linked it to a decline in membrane train permeability in 2011. Despite our best efforts, we have been unsuccessful in preventing their periodic growth in the system. In 2016, CH2M funded a study to be performed by the University of Michigan, that would result in the identification of this microorganism which would lead to a better understanding of their life cycle, and offer strategies to prevent their growth.

Operations and Maintenance Highlights

This bacterium periodically blooms in the facility's biomass declining membrane permeability which reduces the rate at which the water can be filtered and limits plant capacity.

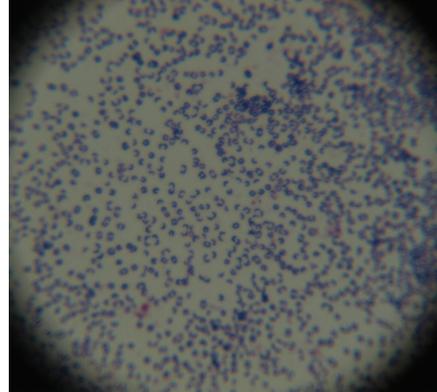
In the 2015-2016 annual report, we reported, that with GE's assistance, we enhanced the membrane back pulse programming. It's important to note that these enhancements and the replacement of five trains of membranes made it possible for the facility to meet flow demands in the presence of this bacterium throughout 2016-2017 without taking the operational measures that were necessary in past years.

Odor Control

We continually monitor the facility to optimize our capability to capture odors. On a weekly basis, we test the areas on the odor control system to verify that air is being pulled into these spaces and not allowed to escape. There are covers over the tanks, and equipment that tend to be odoriferous. These covers have been in place for many years and will be included in the facility plan for replacement. In the interim, we have taped all the seams in the covers to attempt to seal in the odors.

We also verify on a regular basis that the activated carbon system is operating optimal. One adjustment made this year was to program the wash times so that the canisters would be washed from 12:00 a.m. to 2:00 a.m. during low demand.

At the Front Street Lift Station, we placed an activated carbon canister on the vent stack connected to the influent manhole, in an attempt to reduce odors. We replace the carbon on a regular basis.



Comma shaped Gram positive bacteria.



Screw pump covers with seams taped.

Operations and Maintenance Highlights

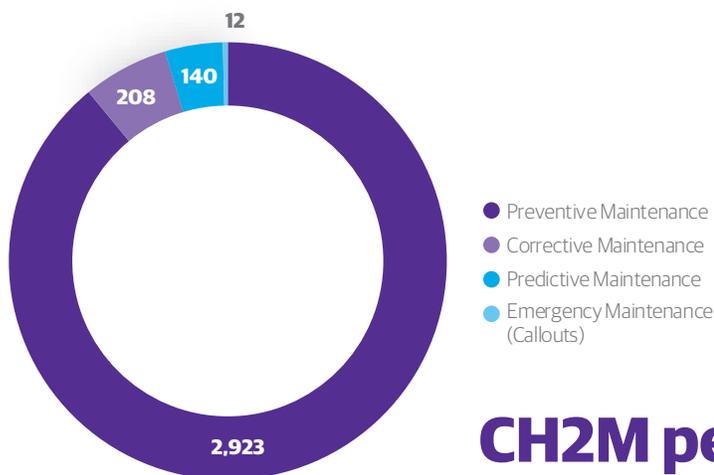
Coast Guard Lift Station

With the equipment maintenance tracking provided by our computerized maintenance management system (CMMS), we identified a systemic failure of the pump motors in the Coast Guard lift station. These failures left us vulnerable with one pump in service, and led to repeated motor repair expenses. With the assistance of TC Light and Power, we pinpointed the source of the failures to be an issue with the line power supplied to this lift station. TC light and Power corrected the issue by installing a new pole-mounted transformer, and a local contractor installed a new electrical meter and neutral connection from the meter to the transformer. We have not experienced a motor failure since.

Maintenance Work Orders

CH2M performed 3,283 work orders in 2016-2017. Eighty-nine percent of the work orders were for preventive maintenance (PM) activities, work that helps prolong the life of the City's assets. Our proactive and robust PM program is geared toward increasing the life expectancy of the City's assets, and decreasing the need for corrective maintenance (CM) activities or emergency repairs. Exhibit 18 highlights our maintenance work orders for 2016-2017.

Exhibit 18
Completed Maintenance Work Orders



CH2M performed 3,283 work orders in 2016-2017.

Operations and Maintenance Highlights



Facility Corrective Maintenance Overview

Six percent of our completed work orders consisted of corrective maintenance, unscheduled maintenance activities. A partial list of work includes:

- Repaired the roof on the administration building.
- Repaired the primary pipe gallery sump pump.
- Replaced and relocated the support struts and conduit for primary tanks 1 and 2 S's flight drive disconnect to an area less susceptible to moisture accumulation and rusting.
- Repaired the flight chains in primary tank 4 north.
- Replaced one of the valves for primary tank 4 south.
- Replaced one of the valves on primary tank 2 north.
- Repaired the actuator valve for primary tank 1 north.
- Repaired the check valves on all the scour air blowers.
- Replaced the pressure release valve on scour air blower B.
- Installed new soft starts for scour air blowers A and C.
- Replaced all the batteries in the Uninterruptable Power Supplies (UPS) in the membrane building control room.
- Replaced the scour air isolation valve for train #6.
- Replaced membrane train #6's level transmitter.
- Repaired membrane train #2's outlet gate.
- Moved the supports for the scour airline that were located by the outlet gate for train #2 to allow for replacement of the outlet gate in 2017-2018.
- Replaced membrane train #3's air inlet actuator, solenoid and beacon, and scour air valve.
- Tightened the packing on the drain valves for all eight membrane trains.
- Replaced the level transducer for RAS channel B.
- Replaced the doctor blade, plows, and seals on the gravity belt concentrator (GBC).
- Installed a high-level float for the GBC containment structure.
- Replaced one of the input cards for the GBC's PLC.
- Repaired the sump pump for the GBC.
- Repaired the overflow float switch for the GBC.
- Replaced the floats in the west US filter polymer tank.
- Adjusted the cutter teeth on the recirculation pump for digester #4.
- Repaired the motor for digester #4's recirculation pump.
- Repaired digester #5's transfer pumps A and B.
- Repaired the north and south Sieve Drum Concentrator (SDC) feed pump.
- Repaired the piston pump.
- Installed new outdoor lighting at the east biosolids loadout.
- Painted the GBC, SDC, semplex polymer, US filter polymer rooms, and phoenix odor control building
- Repaired RAS pump #1.

Operations and Maintenance Highlights



North and south SDC feed pumps.



Gravity belt concentrator room.



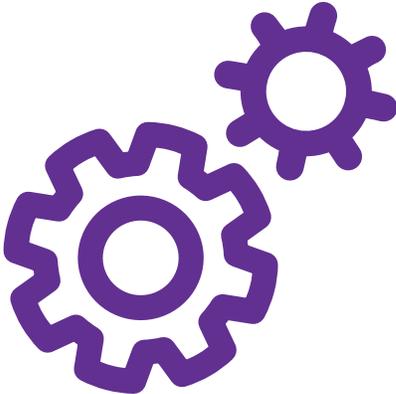
US Filter polymer room.



Sieve drum concentrator room.



SDC polymer room.



Operations and Maintenance Highlights

Lift Stations Corrective Maintenance Overview

- Repaired the lock at the Riverine lift station.
- Installed a new flow meter at the Coast Guard lift station.
- Replaced the motor contactor on the Front Street lift station pump #2.



TBA control panel,



TBA can liner.

Facility Upgrades (Major Maintenance Projects in 2016-2017)

TBA Lift Station Upgrade (CIP #892)

This project included upgrading the lift station's control panel, replacing both pumps at the lift station, lining the inside of the lift station can to prevent degradation, and installation of cathodic protection.

Screw Pump #1's Reconditioning (CIP #893)

This project included replacing the screw body and connected upper bearing and lower bearing, reconditioning the gear box and motor, and refurbishing the trough that houses the screw body.

Digester #3 (CIP #966)

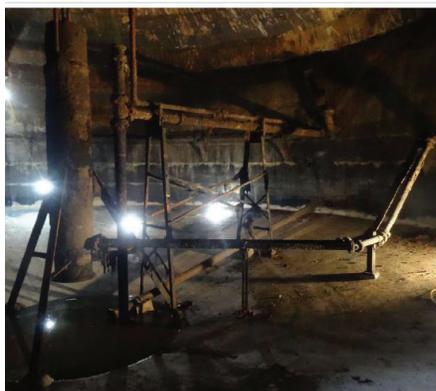
Digester #3 was cleaned and the condition assessment performed.



Screw pump before project.



Screw pump after project completion.



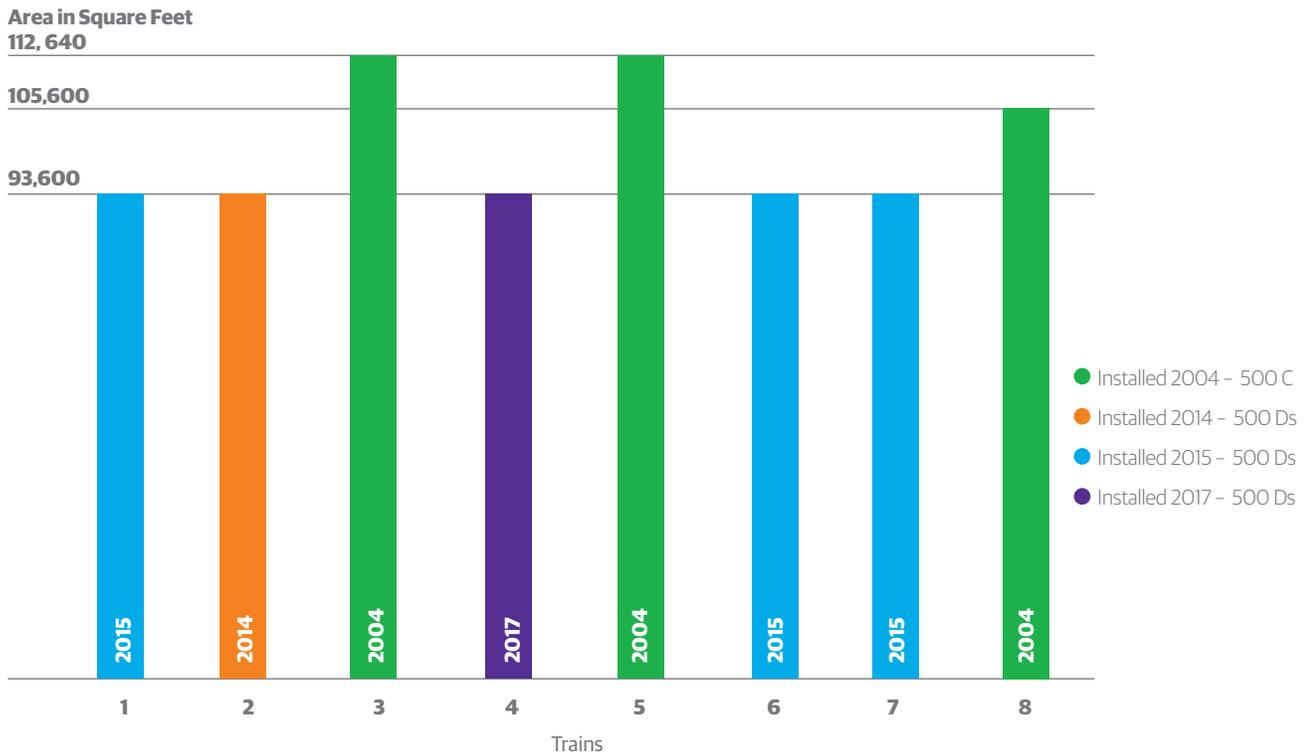
Digester 3 cleaning.

Operations and Maintenance Highlights

Membrane Replacement (CIP #890)

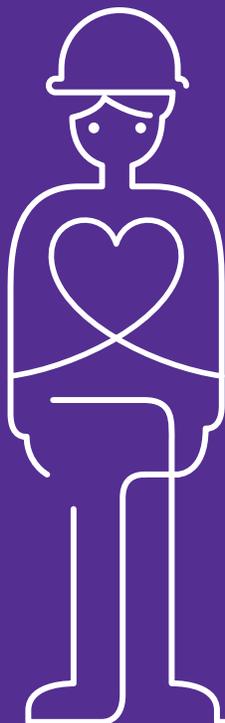
CH2M installed new 500Ds cassettes in membrane train #4. Currently, three trains are operating with the original 500C cassettes, and five trains are operating with the 500Ds cassettes. One train of membranes will be replaced per year until all the trains contain 500Ds cassettes. (Refer to Exhibit 19.)

Exhibit 19
Membrane Train Map



Safety

We had zero loss-time injuries or injuries requiring treatment in 2016-2017, and have accumulated 635 days and counting without a loss time injury, or an injury requiring treatment beyond first aid.



**Safety is a priority
for CH2M.**

Target Zero. *It's personal*

Community Involvement Summary

It's important for us to give back to the communities in which we live and work. We strive to make an impact that extends even further than exemplary delivery of our contractual obligations. In addition to the many tours we gave throughout the year, we participated as shore ambassadors for Paddle Antrim, and made donations to groups and organizations that, like CH2M, strive to preserve our environment for future generations. Exhibit 20 summarizes the donations we contributed in 2016-2017.

Exhibit 20 CH2M Local Donations

Group/Organization	Amount
Watershed Center	\$1,000
Inland Seas	\$1,000
Down Syndrome of Northwest Michigan	\$500
Paddle Antrim	\$1,000



Water Watch Tour.



Water Watch Tour.



Water Watch Tour.



Water Watch Tour.



Paddle Antrim.



Paddle Antrim.

Fiscal Summary

We strive to provide the best quality of service we can day in and day out. We understand that the City has fiscal demands. CH2M is focused on minimizing the financial impact operating the wastewater treatment plant and the related lift stations has on the City's fiscal budget.

Base Fee/Direct Cost Overview

The City pays, to CH2M, a fraction of our base fee every month. Our base fee is the direct cost incurred in operating and maintaining the facility and its related lift stations, plus our margin. Exhibit 21 is a summary of our 2016-2017 reconciliation.

Exhibit 21
Contract Year 27 Reconciliation Summary

O&M Base Fee	\$2,503,245	Direct Cost plus margin
Non-Repairs Direct Cost Overage-Covered by CH2M	\$116,481.66	Contractor (CH2M) is responsible for actual non-repairs direct costs over the budgeted non-repairs direct costs - (per contract article 4.2 of 2012 Agreement).
Repairs Invoice	\$40,399.51	Repairs limit of \$125,000 per contract the City is responsible for any expenses over this amount. (Article 2.21 of 2012 Agreement, refer to exhibit 22 for repair expenses over \$2,000).
Electric Invoice	\$11,106.73	Electrical reimburse to CH2M because fuel power cost adjustment increased in 2016-2017 (Article 4.4 of 2012 Agreement).
Total Reconciliation:	\$51,506.24	Invoiced to the City.
Total Fee Paid to CH2M	\$2,554,751.20	

**We strive to
provide the
best quality
of service**
we can day in
and day out.

Fiscal Summary

Repair Expenses Over \$2,000

CH2M obtains multiple bids for repair expenses greater than \$2,000, and unless there are extenuating circumstances, we choose the lowest bid. Any repair expense in excess of \$9,000 requires prior Commission approval. Repair expenses for 2016-2017 equal to or greater than \$2,000 are itemized in Exhibit 22.

Exhibit 22

Repair Expenses Over \$2,000

Repair	Contractor	Cost
New level transmitter for membrane train 3.	Top Line Electric	\$2,046.57
Seals for membrane RAS channel stop logs.	Whipps Inc	\$2,116.00
Replacement variable frequency drive (VFD) for digester 5 transfer pump.	Top Line Electric	\$2,231.77
Ballasts and fans for the UV system.	Radiant UV	\$2233.56
Spare level transmitter for the membrane system.	Endress and Hauser	\$2,267.15
Boiler repair.	Dean Bioler	\$2,421.20
Installed GFI on two of the aeration basin mixers.	Windemuller Electric Inc	\$2,544.00
Replaced VFD on backpulse pump B.	Windemuller Electric Inc	\$2,686.00
Spare air cyclic valve for the membrane trains.	Kennedy Industries, Inc	\$2,934.10
Replacement air cyclic valve for train.	Kennedy Industries, Inc	\$2,947.71
SLC replacement for Screw Pump PLC.	Top Line Electric	\$3,097.74
Pressure relief valve for scour air blowers.	Aerzen	\$3,115.80
Replacement lamps for the UV system.	UV Doctors	\$3,220.00
Spare soft start for the scour air blowers.	Topline Electrical	\$3,222.68
GBC replacement belt and seals.	Andritz	\$3,228.42
Surveying the UV channel and related structures.	Goslings Czubek	\$3,300.00
Ballasts for UV modules.	Radiant UV	\$4,008.01
Replace the flow meter at Coast Guard lift station.	Windemuller Electric Inc	\$4,473.00
Data cabling upgrade.	Top Line Electric	\$5,885.00
Supply and install 2 Toshiba soft starts for scour air blowers.	Top Line Electric	\$6,360.00
Purchase and replace motor contactor for pump at Front Street lift station.	Top Line Electric	\$7,256.00
Digester #3 condition assessment.	RBF Construction	\$7,820.00

CH2M TCRWWTP Staff Overview

Twelve CH2M employees operate the TCRWWTP 24 hours a day, 7 days a week. CH2M has five additional staff members supporting the Traverse City-based staff. Exhibit 27 highlights our team.

Exhibit 23
TCRWWTP Organizational Chart



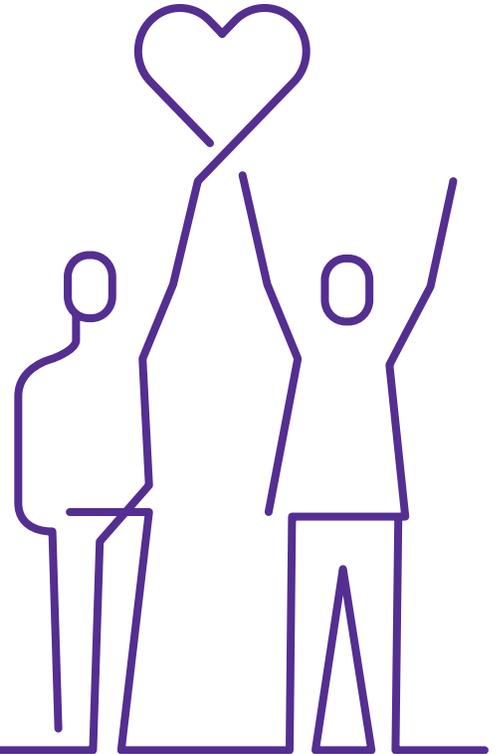
24 hours day,
7 days a week

Summary

It is our goal to exceed your expectations. CH2M and the City of Traverse City have worked to create a partnership where we reduce risk, exceed performance expectations, and apply our institutional knowledge gained while working with the City for more than 26 years.

We appreciate the opportunity to serve Traverse City and its citizens.

We look forward to our continued partnership for many years to come.



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