Surface Water Intake Protection Plan

Prepared for

City of Traverse City

May 2024

2230584

CITY OF
TRAVERSE CITY

Contents

Tables

Figures

Appendices

Acronyms

AFFF	Aqueous Film Forming Foam
BEA	Baseline Environmental Assessment
CAZ	Critical Assessment Zone
CSI	Contaminant Source Inventory
EGLE	Michigan Dept of Environment, Great Lakes, and Energy
ERCOL	Elk River Chain of Lakes
LUST	Leaking Underground Storage Tank
MPART	Michigan PFAS Action Response Team
NPDES	National Pollutant Discharge Elimination System
PFAS	Per- and Polyfluoroalkyl Substances
RCRA	Resource Conservation and Recovery Act
SWAR	Source Water Assessment Report
SWIPP	Source Water Intake Protection Program
SWPA	Source Water Protection Area
SWPT	Source Water Protection Team
USCG	United States Coast Guard
UST	Underground Storage Tank
WTP	Water Treatment Plant

Chapter 1 - Introduction

Surface Water Intake Protection Program

Prepared for

City of Traverse City

May 2024

2230584

1. Purpose

The Surface Water Intake Protection Program (SWIPP) for the City of Traverse was undertaken as a proactive approach toward protecting the drinking water supply. Currently, this is a voluntary program being encouraged by the State of Michigan pursuant to the 1986 amendments to the Federal Safe Drinking Water Act. The SWIPP is implemented at the local level with coordination through the Source Water Protection Team (SWPT).

The main purpose of the program is to protect the area's public water supply system from contamination. Determining the area that could impact the existing drinking water intake is the first step towards providing this protection. The City's water is obtained from a surface water intake located in East Grand Traverse Bay. Water is then treated and distributed to customers in the City, as well as customers in Garfield Township, Peninsula Township, and Elmwood Township.

The Source Water Protection Area (SWPA) is defined by determining the area within and surrounding East Grand Traverse Bay that has the potential to contaminate the water supply. Once the SWPA is defined, existing and potential sources of contamination within that area are identified. Finally, methods to manage the SWPA and minimize any threats to the existing municipal water supply are considered and implemented if appropriate. The SWIPP also can serve as an aid in selecting new water sources. In order for the program to be successful, residents and water users in the area must be made aware of what the program is and what its benefits are through public education efforts.

This plan was developed with technical support from Prein&Newhof.

The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Source Water Protection Program guidelines include seven major elements. This written plan details the seven elements of the Traverse City Surface Water Intake Protection Program.

1. Overview of program and roles and responsibilities (Chapter 1)
2. Wellhead Protection Area delineation (Chapter 2)
3. Potential sources of groundwater contamination (Chapter 3)
4. Wellhead Protection Area management (Chapter 4)
5. Contingency Plan (Chapter 5)
6. New well siting (Chapter 6)
7. Public participation and education (Chapter 7)

The various action items are summarized in Chapter 8 for future implementation. The lead agency for the SWIPP is the City of Traverse City.

1.1. Benefits

The development of a SWIPP offers many benefits. These include:

- Protection of public health and the environment.
- Protection of the City's economic investment in its public water supply system.
- Protection of private wells in the SWPA.
- Proactive method of reducing potential contamination before it occurs.
- Identification of potential sources of contamination that could threaten the water supply.
- Identification of areas that should be protected and monitored.
- Priority cleanup of contamination sites within the SWPA.

The Traverse City region is known for community engagement in environmental issues and takes pride in its natural resources. It is anticipated this effort to protect the City's source water will have many advocates and opportunities for collaboration.

1.2. Water System Description

Service Area

The City of Traverse City water system is a regional system, providing water to approximately:

- 15,678 customers in the City of Traverse City,
- 25,870 customers in Garfield Township,
- 1,608 customers in Peninsula Township, and
- 480 customers in Elmwood Township/Greilickville.

The water system is estimated to serve a total population of approximately 43,636. There continues to be growth in the service areas surrounding the City, particularly in Garfield Township.

System Description

Early construction of the area water system dates back to the late 19th century and included a surface water intake in West Grand Traverse Bay as well as hollowed-out pine logs used as pipes. Iron pipes gradually replaced wooden ones, and a new water intake was constructed in 1965 to replace the original intake, located in East Grand Traverse Bay.

The intake is located approximately 4,000-feet offshore in East Grand Traverse Bay, submerged at a depth of approximately 40-feet. Water is treated at the Water Treatment Plant and distributed to customers in the City. In addition, the City provides water for wholesale customer communities of Garfield, Peninsula, and Elmwood Townships.

A map of the City's water system including approximate intake location is presented in **Figure 1**.

1.3. Source Water Protection Team

The City of Traverse City is responsible for the SWIPP and is committed to its development and ongoing implementation. The City will oversee and participate with the SWPT. The SWPT is a diverse group of members representing various interests in the region. An active and engaged

SWPT is essential to the long-term sustainability and effectiveness of the SWIPP. Members serving on the SWPT include:

Jackie Johnson ***Superintendent, Traverse City Water Treatment Plant***

Ms. Johnson oversees the daily WTP operations including water quality testing and managing capital improvement projects. Ms. Johnson holds an F-1 operations certificate and has 30 years of experience in the water industry. She will serve as the lead contact for the City on the team and is responsible for administering the SWIPP.

Art Krueger, P.E. ***Director of Municipal Utilities, City of Traverse City***

Mr. Krueger is responsible for planning, directing, and supervising all aspects of the City's Public Utilities, including wastewater collections and transmission systems, stormwater collection and treatment systems, and water treatment and distribution systems. He came to the City with 20 years of experience with various consulting engineering firms and served as the WTP Superintendent for Traverse City before taking on his current Director role. He will be assisting with all areas of the SWIPP.

Claire Karner, AICP ***Director of Planning & Zoning, East Bay Charter Township***

Since 2019, Ms. Karner has held the director position at the East Bay Charter Township Planning and Zoning Department. The Department is responsible for directing activities at the Township, including managing land use through implementation of the Township zoning ordinances. She has prior experience working as a Community Planner with *Land Information Access Association* and *Becket & Raeder*. She will be assisting with formulation of land management strategies in the Source Water Protection Area as well as public education efforts.

Gregory O. Carpenter, P.G. ***Chief of Environmental Compliance, United States Coast Guard***

As Chief of Environmental Compliance for District 9 and District 5, Mr. Carpenter has been involved with managing response to environmental contamination at the Coast Guard Air station located in Traverse City. He first started working in the community in 2003. He has a background in environmental engineering and will be an excellent technical advisor to the SWPT on the contaminant source inventory, management strategies, and public education.

Andy Smits, P.E. ***Drain Commissioner, Grand Traverse County***

Mr. Smits has an extensive background in environmental engineering including experience with working on sites of contamination in the Traverse City region. As Drain Commissioner, he is responsible for many aspects of surface water management throughout the County. His background and current role will provide assistance with the contaminant source inventory and developing management strategies.

John Divozzo ***Director, Grand Traverse County DPW***

Mr. Divozzo has many years of experience in public works. The Grand Traverse County Department of Public Works manages and operates various water distribution systems in the County. He will be assisting with management strategies and public education efforts.

Liz Kirkwood, J.D. ***Executive Director, FLOW (For Love Of Water)***

Ms. Kirkwood has over 20 years of experience as an environmental lawyer working on water, sanitation, energy, and environmental governance issues both nationally and internationally. As executive director of FLOW, she currently oversees the organization's policy, legal, technical and communications work. Ms. Kirkwood will assist the SWPT in developing management strategies and public education efforts.

Jim Tuller ***Chief, Traverse City Fire Department - Station 01***

As Fire Chief for the City of Traverse City for 15 years, Chief Tuller oversees a variety of programs that will contribute to the SWPT efforts. His connections with emergency management will assist the team in developing cross-agency communications and contingency planning. The department's non-emergency services such as management of hazardous material inventories and reporting will assist the SWPT with contaminant source inventory development, management strategies, and public education efforts.

Sarah U'Ren ***Program Director, Watershed Center Grand Traverse Bay***

With over 20 years as Program Director, Ms. U'Ren brings experience with past and ongoing efforts to protect and preserve water quality in Grand Traverse Bay and surrounding watersheds. She will be assisting with coordination of efforts that include identifying sources of water quality degradation as well as developing and implementing management strategies and public education efforts.

Barbara Marczak, P.E.
Peter Brink, P.E. ***Prein&Newhof***
Ernie Sarkipato, P.E.

The Prein&Newhof team provided technical guidance and grant management oversight during development of the SWIPP. The team brings an environmental and engineering background and previous experience with development and implementation of source water protection programs for municipal drinking water supplies.

1.4. SWPT Meetings

The SWPT meets at least quarterly as required by a grant that the City has received to help prepare the delineation of the SWPA and develop the SWIPP. It is anticipated the team and

program will continue to be active beyond the initial development period. Below is a summary of meetings to date, and meeting minutes are included in **Appendix A**.

Table 1: Meeting Summary

Date	Location	Purpose
October 17, 2023	Remote	Introductions, Program Overview, Review Draft SWPA Map
December 5, 2023	Traverse City	Discuss Contaminant Sources & Management Strategies
January 30, 2024	Remote	Contingency Plan & Assessing New Sources
April 9, 2024	Remote	Public Outreach and Final Report Review

1.5. Future Implementation

The initial development of the SWIPP, including the formation of the SWPT, should identify areas for future improvement and implementation. During subsequent years, continued quarterly meetings are recommended to sustain the program momentum and implementation. In addition, the existing SWPT should periodically discuss the makeup of the team and consider the benefits of adding new members to develop a variety of expertise.

Chapter 2 – Source Water Protection Area Delineation

Surface Water Intake Protection Program

Prepared for
City of Traverse City

May 2024

2230584

2 Source Water Protection Area Delineation

EGLE defines a surface water intake protection area as the area most likely to contribute contaminants to the drinking water source. The Source Water Protection Area (SWPA) delineation for a surface water intake requires background research to understand the dynamics of the water body, as well as the land uses and drainage patterns adjacent.

2.1 2004 Source Water Assessment Report

An initial assessment of the source water sensitivity and susceptibility was completed by the Michigan Department of Environmental Quality (MDEQ), now EGLE, and summarized in the Source Water Assessment Report, April 2004 (SWAR), included in **Appendix B**. The SWAR follows procedures established by the MDEQ/EGLE and provides context for determination of the SWPA.

2.1.1 Critical Assessment Zone

The Critical Assessment Zone (CAZ) is an area within the Source Water Protection Area (SWPA) that should be considered highly sensitive to contamination. It is determined as a function of the depth and distance from shore of the raw water intake. The MDEQ's Assessment Protocol for Great Lakes Sources (1999) outlines a calculation approach for determining the CAZ. Using the geometry of the Traverse City raw water intake, a CAZ radius of 1,000-feet is appropriate.

2.1.2 Buffer Zone

The Buffer Zone is defined by the SWAR as the area of land adjacent to the shoreline that falls within the CAZ, using the MDEQ's calculation methodology. The CAZ radius of 1,000-feet does not intersect the shoreline, as the intake is 4,000-feet offshore. Thus, the critical assessment zone is limited to the open water around the intake located in East Grand Traverse Bay.

2.2 Additional Research

Beyond the CAZ, the SWPA must define the area most likely to contribute contaminants to the drinking water source. Additional research included a review of available data for current patterns in Grand Traverse Bay, watershed delineations and studies, and stormwater drainage systems.

2.2.1 Current Patterns

Surface water intake source water is heavily influenced by prevailing currents in the source water body. A study of Grand Traverse Bay area included review of available literature including the Water Quality Monitoring of Saginaw and Grand Traverse Bays, September 2006, and the SWAR. A review of the literature indicates a lack of influence of Lake Michigan on Grand Traverse Bay due to the presence of a sill along the northeast portion of the bay, creating shallow water and restricting currents. This is supported by the bathymetry of the bay identified in **Figure 2**. In addition, a counterclockwise prevailing current in East Grand Traverse Bay was identified. This will guide the delineation of areas most likely to contribute contaminants to the drinking water source.

2.2.2 Coastal Watershed

The land area immediately adjacent to Grand Traverse East Bay is defined by The Watershed Center the as the coastal watershed. Potential sources of contamination in this area have closer proximity to the bay, increasing the risk to the source water. The Watershed Center has completed an extensive Coastal Grand Traverse Bay Watershed Plan which identifies potential sources of water pollution as well as management strategies to protect water quality, and is summarized in **Appendix C**.

2.2.3 Elk River Chain of Lakes Watershed

The largest sub-watershed of the Grand Traverse Bay watershed covering over 500 square miles is the Elk River Chain of Lakes Watershed (ERCOL). The outlet of the watershed at Elk Rapids is located in the northeast portion of East Grand Traverse Bay. The likelihood of source water contamination from the ERCOL has been determined to be low. However, a

review for major sources of contamination with persistent pollutants such as per- and polyfluoroalkyl substances (PFAS) was conducted.

2.2.4 Drainage Area Maps

Surface drainage patterns in urban areas are heavily dependent on stormwater capture systems and discharge locations. The SWPA delineation in the urban area of the City should account for the effects of stormwater capture. A review of GIS files provided by the City was completed and represented in the surface drainage area map in **Figure 3**.

2.2.5 Groundwater

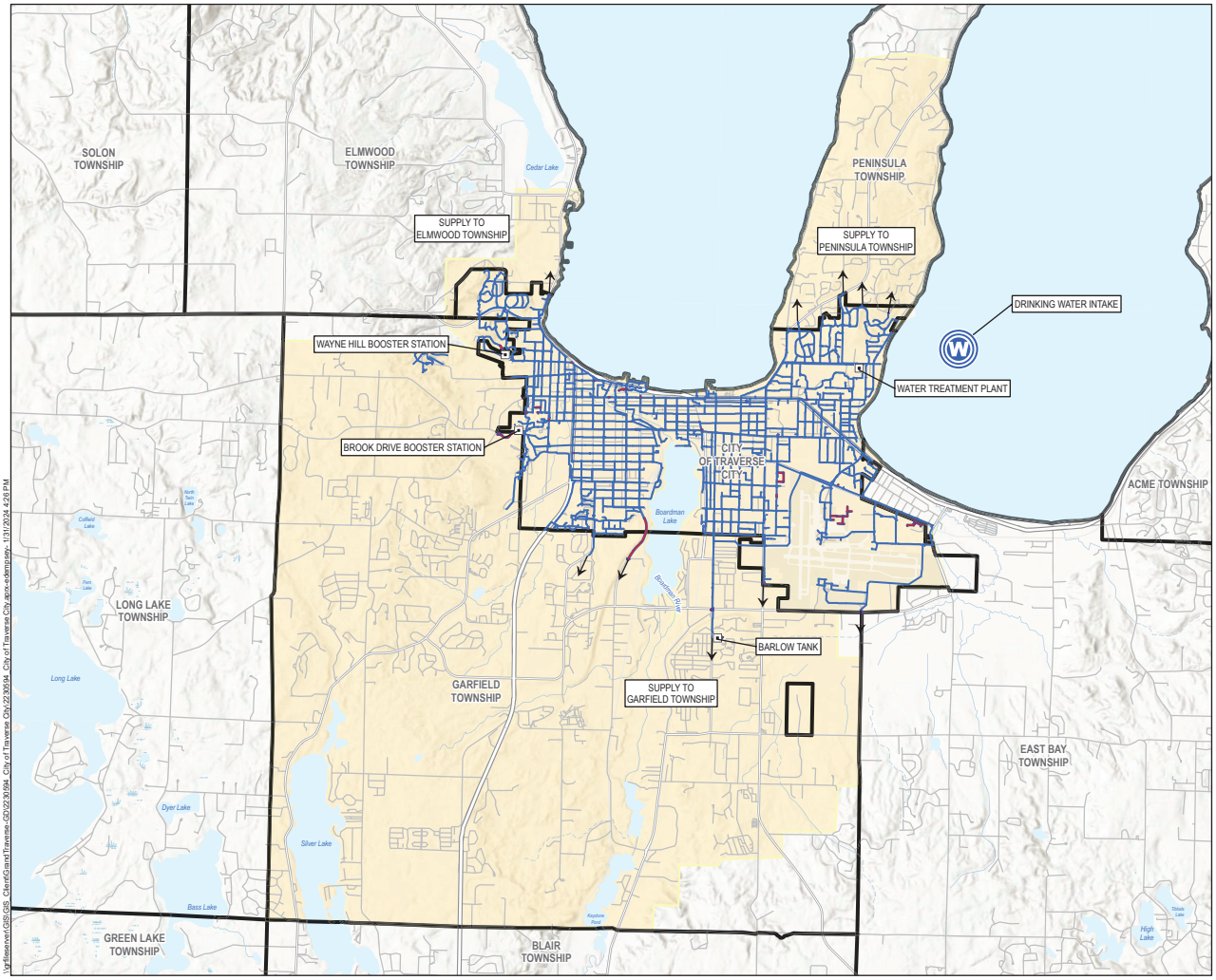
Contamination that reaches groundwater may not follow the surface drainage area delineations and has potential to impact the source water. A review of available groundwater data was conducted for the most significant potential sources of contamination. In general, the upper aquifers in the region drain towards Grand Traverse Bay.

2.3 SWPA Delineation

The resulting SWPA presented in **Figure 4** represents the area most likely to contribute contaminants to the source water. The delineation incorporates research on currents in Grand Traverse Bay and focuses on the southern shores of East Grand Traverse Bay. In addition, an expanded SWPA was included to capture the potential risk from significant sources from a broader area.

2.4 Future Implementation

As the SWIPP is implemented, the SWPT should consider revisiting the source water protection area delineation. The delineation completed during program development is likely conservatively large, intended to capture all potential sites of contamination of the source water. A refined SWPA delineation would likely capture actual risk to the City's water intake and would help simplify source identification and focused efforts on management strategies and public education.



CITY OF TRAVERSE CITY
GRAND TRAVERSE COUNTY, MICHIGAN
SURFACE WATER INTAKE PROTECTION PROGRAM

WATER SYSTEM

FIGURE 1

Prein&Newhof
2230594

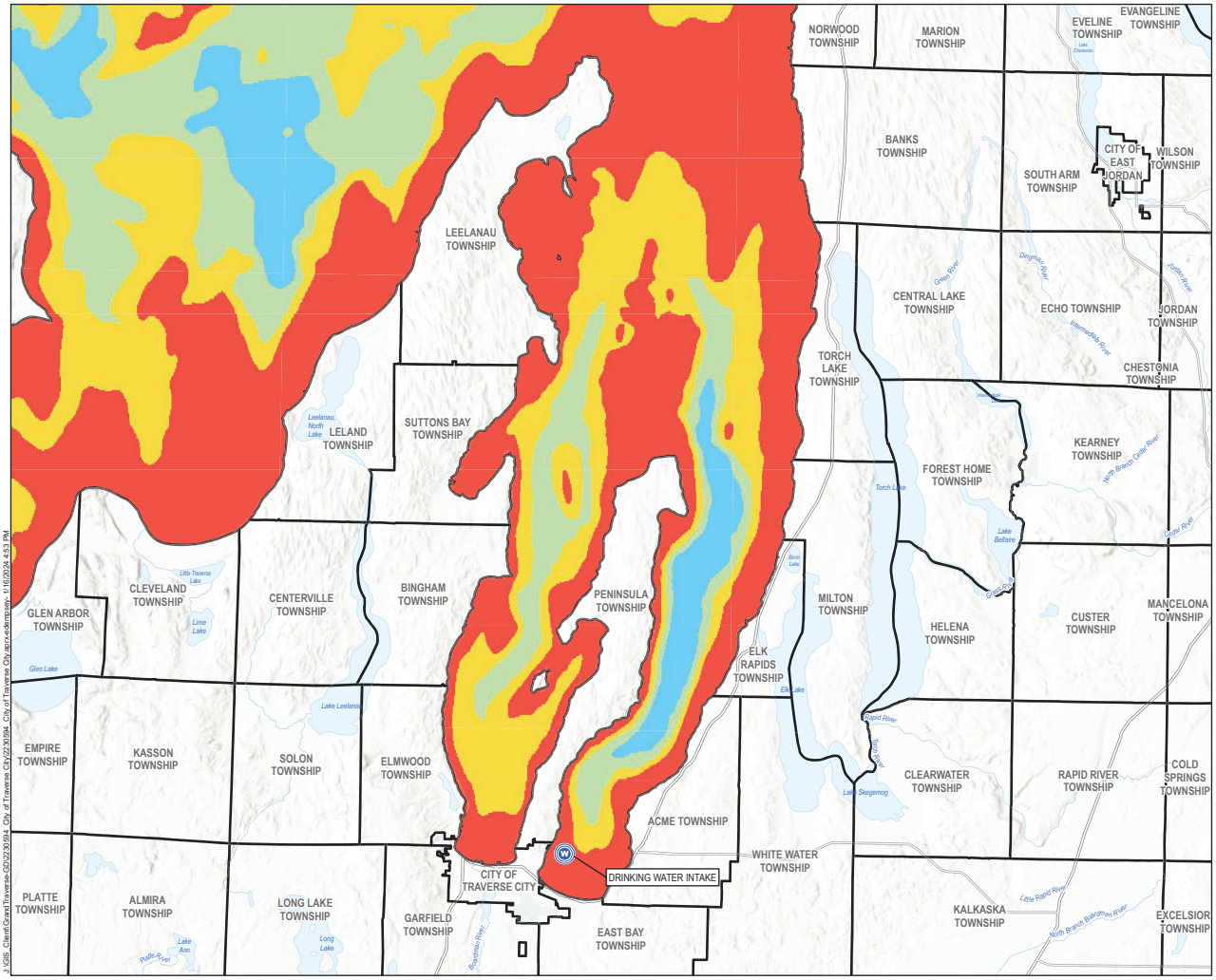
LEGEND

- City Owned Water Main
- Water Main (Owned by Others)
- Drinking Water Intake
- Water System Service Area

0.0 0.5 1.0 1.5 2.0 Miles

JANUARY 2024

\\gr1fileserver\GIS\GIS_Client\GrandTraverse-CO\22\230594_City of Traverse City\22x30\94_City of Traverse City.aprx-edemsey- 1/31/2024 4:26 PM



CITY OF TRAVERSE CITY
GRAND TRAVERSE COUNTY, MICHIGAN
SURFACE WATER INTAKE PROTECTION PROGRAM

BATHYMETRY OF GRAND TRAVERSE BAY

FIGURE 2

Prein&Newhof
2230594

LEGEND

- Drinking Water Intake

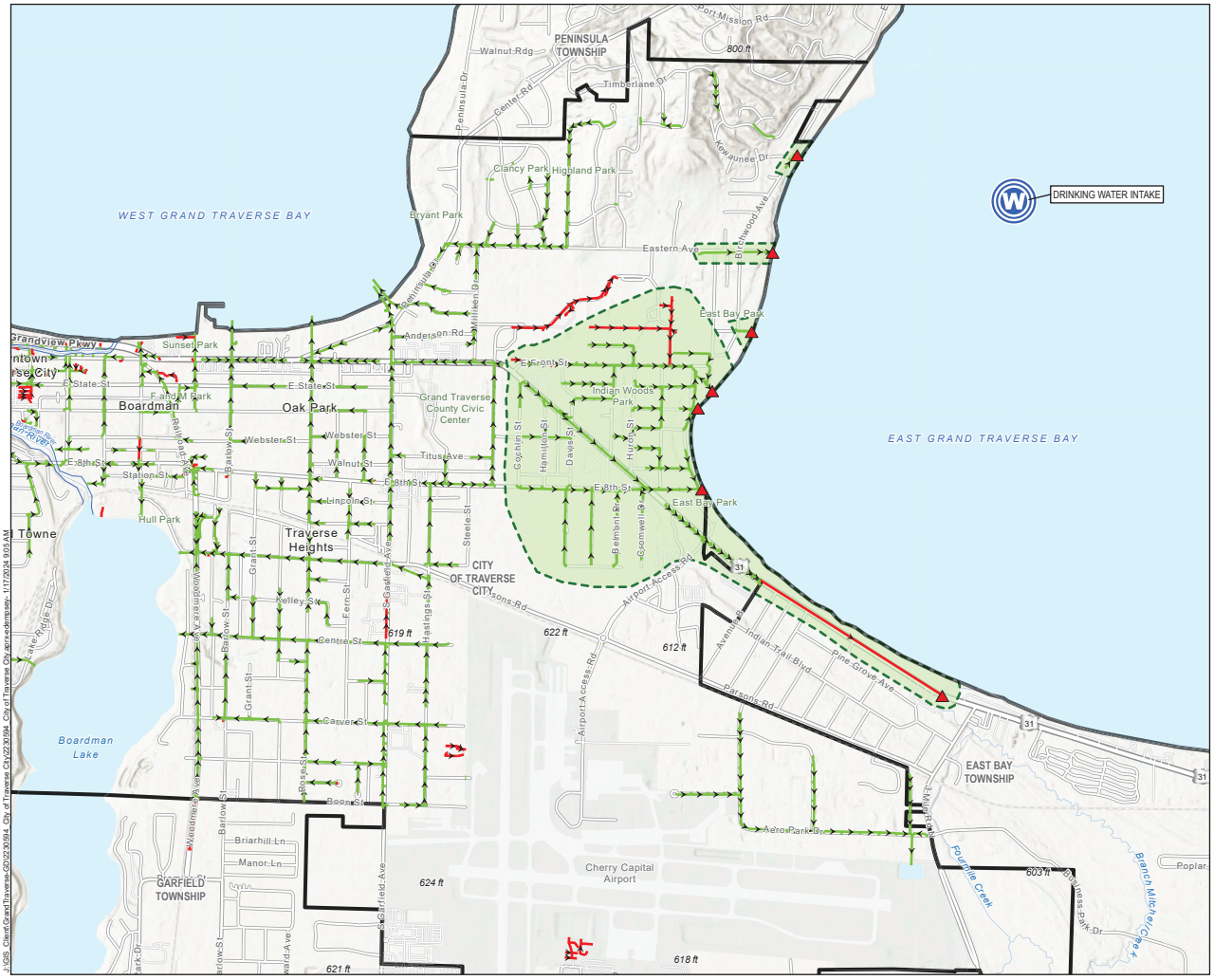
Grand Traverse Bay Bathymetry

- 0 m - 50 m
- 51 m - 100 m
- 101 m - 150 m
- 151 m - 200 m
- > 200 m

0 1 2 3 4 5 Miles

JANUARY 2024

J:\GIS_Client\Grand Traverse-GV\2230594_City of Traverse City\arcx-ddmmsgn- 1/16/2024 4:53 PM



CITY OF TRAVERSE CITY

GRAND TRAVERSE COUNTY, MICHIGAN

SURFACE WATER INTAKE PROTECTION PROGRAM

TRAVERSE CITY STORMWATER DRAINAGE TO EAST BAY

FIGURE 3

Prein&Newhof

2230594

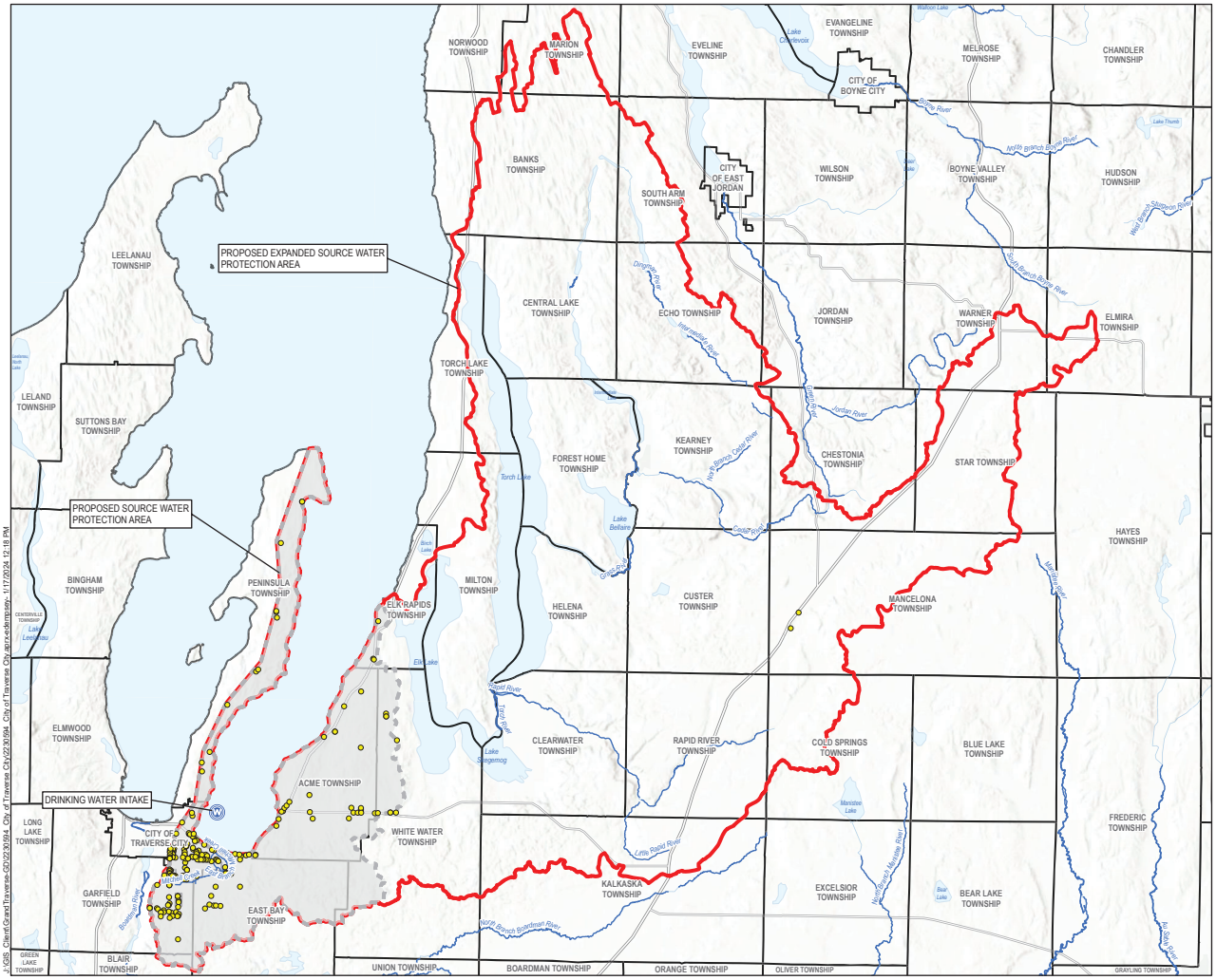
LEGEND

- Drinking Water Intake
- Stormwater Discharge
- Traverse City Storm Sewer
- Storm Sewer Owned by Others
- Areas of Surface Runoff

0.00 0.25 0.50 Miles

JANUARY 2024

K:\GIS_Client\Grand Traverse\2023\094_City of Traverse City\arcx-dmmsey- 11/7/2024 9:05 AM



J:\GIS_Client\GrandTraverse-GV\2230594_City of Traverse City\arcx-ddemsey- 1/17/2024 12:18 PM

CITY OF TRAVERSE CITY
GRAND TRAVERSE COUNTY, MICHIGAN
SURFACE WATER INTAKE PROTECTION PROGRAM

SOURCE WATER PROTECTION AREA

FIGURE 4

Prein&Newhof
2230594

LEGEND

- Proposed Source Water Protection Area
- Proposed Expanded Source Water Protection Area
- Drinking Water Intake
- Contaminant Source Inventory Site

Chapter 3 – Contaminant Source Inventory

Surface Water Intake Protection Program

Prepared for
City of Traverse City

May 2024

2230584

3 Contaminant Source Inventory

The contaminant source inventory (CSI) is a list of known or potential sources of contamination within the Source Water Protection Area (SWPA). The development of a comprehensive CSI is essential to inform the development of effective management and public education strategies. The process for developing the CSI is described below.

3.1 Local Knowledge

The Source Water Protection Team (SWPT) discussed local knowledge of known and potential sources of contamination of East Grand Traverse Bay. These included sources such as hazardous materials handling facilities, marinas with fuel storage, and historical agricultural practices in areas adjacent to East Bay. The SWPT also identified water quality preservation as a priority through identification of point sources and non-point source pollution.

3.2 Identification of Sources

Known or suspected sources of contamination within the SWPA were also researched using available data sources. A total of seventeen state and federal datasets were cross-referenced to the SWPA to generate a master list of 476 data points. These data sources are summarized in **Table 2**.

A broad search was also conducted for significant sources of contamination within the expanded SWPA as identified in **Figure 4**. This included the MPART and Superfund data sources. The full dataset was then analyzed for site duplication and non-viable sources were removed.

Table 2: Data Source Summary

Dataset	Description
NPDES (Federal)	Discharge to surface water under National Permit Discharge Elimination System.
RCRA (Federal)	Registered sites under Resource Conservation and Recovery Act.
Superfund (Federal)	Sites identified by the EPA on the National Priority List with known releases or threatened releases of contaminants.
Toxic Releases (Federal)	Sites with confirmed releases of toxic substances.
BEA (State)	Record of investigation of contamination at a site.
Groundwater Discharges (State)	Permitted discharge to groundwater.
LUST – Closed (State)	Sites with an underground storage tank that have been confirmed to have a leak, which have been closed by the State.
LUST – Open (State)	Sites with an underground storage tank that have been confirmed to have a leak, which have not yet been closed by the State.
UST – Open (State)	Sites with an underground storage tank that have not been confirmed to have a leak, which are still in operation.
UST – Closed (State)	Sites with an underground storage tank that have not been confirmed to have a leak, no longer in operation.
MPART (State)	Sites identified by the State to have known PFAS contamination.
Part 201 (State)	Sites identified by the State to have known contamination.
Land Use Restrictions (State)	Various actions with respect to property contamination including restrictive covenants.
Oil & Gas Contamination Sites (State)	Sites of known contamination from Oil & Gas sources.
Solid Waste/Landfill sites (State)	Sites for solid waste disposal, or landfills.

3.3 Risk Analysis

A numeric system was developed to assess relative risk of known and potential sources and identify the highest potential risks to the source water. Sites with a higher severity of contamination should be balanced with their distance from the raw water intake. A contamination severity rating between 1 - 10 was assigned to each source based on the nature and potential volume of the contamination, or potential contamination. A distance factor was also determined by dividing the maximum site distance to the intake by each site's distance to the intake, then dividing by two to approximate a 1 – 10 scale. A risk factor was then determined for each site using the following equation:

$$Risk\ Rating = \frac{\big((Severity\ Rating)\ x\ (Distance\ Factor)\big)}{10}$$

The risk ratings were reviewed by members of the SWPT with historical knowledge of known contamination in the region and adjusted as appropriate. Select high risk sites are summarized in **Table 3**.

The highest risk sites were found to be located within the smaller delineated SWPA shown on Figure 4. No major sites of contamination were found in the expanded SWPA that pose an elevated risk to the source water.

Table 3 - High Risk Sources of Contamination

Site No.	Site Name	Description
37	Stevens Property	LUST – Open, very close proximity to Mitchell Creek.
6	Traverse Bay Area Career Technical Center	Previously Parsons Helicopter, legacy contamination possibly affecting Site No.'s 59 & 60, and Mitchell Creek with chlorinated solvents.
51	United States Coast Guard Air Station	Originally the site of a Navy Air Station, it is a likely source of a PFAS plume moving north-northeast towards East Bay. Potential for other legacy contamination, and possible future contamination due to ongoing operations and fuel storage. Part 201, UST, MPART.
52	Cherry Capital Airport	Source of PFAS plume moving north-northeast towards East Bay. Potential for other contamination sources, needs more study. Part 201, UST, MPART.
58	Burwood Products (former)	Former manufacturer of furniture and fixtures with a number of legacy contaminants. Part 201, RCRA, many BEAs.
59 / 60	Avenue E Ground Water / Pine Grove Subdivision	This area is not a source but is has been impacted by a variety of sources to the south-southwest. Contaminants found in the 1980's included chlorinated solvents. More recently, this area has been found to be impacted by PFAS contamination.
1	True North #251 Gas Station	A closed LUST. Closed sites may still pose a risk, particularly if they are in close proximity to East Bay.
48	Grand Traverse Parasail	One of several operations along the bay that operate as a small marina and have gone through the site plan review process.
49	TC Watersports	One of several operations along the bay that operate as a small marina and have gone through the site plan review process.
227	Various Pesticide Application Sites	Historical application of lead-arsenate pesticide, particularly at orchards. Various sites surrounding East Bay.
228	Stormwater Runoff and Outfalls	Various known outfalls to municipal stormwater. Note, many non-point sources due to stormwater runoff also exist.

3.4 Known Sources of Contamination

The development of a CSI is intended to identify potential risks to the source water and includes sources of known and potential contamination. The full CSI is included in **Appendix D**. Sites of known contamination are not presumed to have impacted the East Bay watershed directly, but rather contamination is known to exist at the site. Sites of potential contamination have been identified as generating, storing, or handling materials that could degrade water quality if released to the environment. **Figures 5, 6, and 7** display CSI sites within the SWPA and include site numbers for reference to the CSI. The below details are provided for select sites of known contamination as they appear to pose the highest risk to impacting East Grand Traverse Bay and the City's drinking water source.

3.4.1 United States Coast Guard Air Station

This site is home to the former Navy Air Station site which began around 1941, after which the United States Coast Guard (USCG) assumed control. Located approximately 3,700 feet southwest of East Grand Traverse Bay, the U.S. Coast Guard (USCG) Air Station is a known source of PFAS according to information from the USCG website. Historical storage and use of Class B Aqueous Film Forming Foam (AFFF) has resulted in soil and groundwater contamination at various locations and depths. Investigation of the extent of contamination is ongoing and has confirmed PFAS in the groundwater at various depths and in proximity to East Bay. The site has additional contamination risks due to historical/legacy contamination and the continued storage of fuels and management of aircraft.

3.4.2 Cherry Capital Airport

Located adjacent to the USCG Air Station, the Cherry Capital Airport is also a known source of PFAS according to information from the Michigan PFAS Action Response Team (MPART) website. Historical use of Class B Aqueous Film Forming Foam (AFFF) has resulted in soil and groundwater contamination at various locations and depths. Investigation of the extent of contamination is ongoing with the project expected to conclude in October of 2024. The site also has additional contamination risks due to historical/legacy contamination and the continued storage of fuels and management of aircraft.

3.4.3 Underground Storage Tanks

Many of the CSI sites have underground storage tanks (USTs) that pose a risk for contamination or have been verified to have leaked. A LUST site with known contamination may be designated as open if investigation/cleanup is not completed, or as closed if requirements of the Natural Resources and Environmental Protection Act (NREPA) are met. However, LUST sites that are closed have the potential for presence of other contaminants that often accompany fuel storage tanks such as solvents or metals from auto shop activities. In short, closure of a LUST site does not eliminate all risk or concern of contamination.

3.4.4 Pesticide Use in Agriculture

The historical application of lead arsenate as a pesticide, particularly in orchards, is of concern in the Traverse City Area. This can lead to contamination of the soil at these sites, and in close proximity to East Grand Traverse Bay pose a risk to the source water.

An extensive study was not conducted for purposes of this program. However, anecdotal reports suggests areas surrounding East Grand Traverse Bay have a history of agriculture, including orchards. As such, further investigation is needed into the extent, nature, and risks to the East Bay watershed from former and present agricultural practices.

3.5 Potential Sources of Contamination

Most of the sites identified in the CSI do not have confirmed contamination but represent potential sources of contamination. These include the RCRA sites, UST sites, NPDES discharges, marinas, and accessory use watercraft rentals. While the risk rating may not be elevated, these sites remain a priority for the SWPT to prevent contamination by developing management strategies, raising awareness, and improving incident response protocols.

3.5.1 Accessory Uses

Several hotels along East Grand Traverse Bay offer watercraft rentals that are classified as “accessory uses.” These locations have not undergone a separate review process that would

be required for a marina. Due to proximity to East Grand Traverse Bay, any fuel storage on the waterfront is considered a high risk to the source water.

3.5.2 Hazardous Materials – Sara Title III, Tier 2 Reporting

Many of the sites identified in the CSI are required to register and report hazardous and non-hazardous materials under Sara Title III, Tier 2 reporting. Some onsite inspection work is conducted periodically to ensure safe handling and storage practices. This existing program is managed by the Traverse City Fire Department within the city limit.

3.6 Water Quality Degradation and Nonpoint Source Pollution

The overall water quality of the East Grand Traverse Bay watershed has the potential to directly impact the City's drinking water source. The potential for water quality degradation from nonpoint source pollution is a key component of the CSI. Runoff events can introduce nutrients such as phosphorus and nitrogen that, in excessive amounts, can lead to increased biological activity and potentially harmful algal blooms. Runoff can also introduce contaminants such as oils, grease and fertilizers, or pathogens such as *E. Coli*.

To date, the Traverse City Water Treatment Plant has not experienced problems with raw water quality such as elevated *E. Coli* counts or detection of pesticide-related chemicals. It is believed the City's drinking water intake and depth location in East Grand Traverse Bay has historically protected the source water from being influenced by near-shore water quality. The SWPT has identified the preservation of water quality in East Grand Traverse Bay as a priority to protect and maintain this excellent source water quality. The following are areas of particular focus.

3.6.1 Coastal Watershed

The Watershed Center Grand Traverse Bay (TWC) published the Coastal Grand Traverse Bay Watershed Plan in May 2021 (Coastal Plan), summarized in **Appendix C**. A portion of that plan covers the SWPA in this report. The full plan is available at https://gtbay.org/wp-content/uploads/2022/11/GT-Coastal-Bay-Plan_FINAL_May-2021__with-figures_for-distribution.pdf. The plan identifies risks of water quality degradation, priority and critical

areas for protection, and action items to accomplish goals including protecting the integrity of aquatic and terrestrial ecosystems as well as protecting and improving water quality.

Specific pollutants of concern and critical areas noted in the Coastal plan that relate to the SWPA include elevated *E. Coli* counts at area beaches and pollution coming from Mitchell Creek (which also includes elevated *E. Coli*). Data from EGLE's *E. Coli* Pollution and Solution Mapper confirms areas in the near shore of East Bay with periodic exceedances of body contact thresholds, and significant exceedances in Mitchell Creek. This is also identified in the Coastal Plan.

3.6.2 Mitchell Creek

Currently, Mitchell Creek is on the State's Impaired Waters List due to widespread *E. Coli* contamination. TWC has identified Mitchell Creek as a critical area for a variety of other reasons, including the abundance of agricultural areas in the headwaters. These agricultural areas have the potential, through stormwater runoff, to discharge elevated levels of nutrients and fertilizers/pesticides into East Grand Traverse Bay at the mouth of Mitchell Creek.

3.6.3 Urban Runoff and Stormwater Management

A number of locations were identified by the SWPT as point sources of urban stormwater discharge to East Grand Traverse Bay. These discharges can introduce significant levels of nutrients and contaminants if not properly managed.

A particular focus of the SWPT is on identifying and managing stormwater outfalls that discharge to East Grand Traverse Bay. Known outfalls from the City of Traverse City to East Grand Traverse Bay are shown on Figure 3 in Chapter 2.

3.7 Emerging Contaminants

Of special note in the drinking water industry and also noted in the Coastal Plan are Emerging Contaminants of Concern. The Coastal Plan specifically states that:

> *"Emerging contaminants are potentially harmful substances that have not yet been rigorously studied or have standards developed for water quality protection. They are often unregulated and are concerning because we do not yet know their fate in the watershed and the full extent*

of the risks they may pose to both humans and aquatic life and other wildlife. This nonpoint source watershed plan is not designed to address these contaminants."

These specific emerging contaminants of concern include Per- and Polyfluoroalkyl Substances (PFAS); Microplastics, Microfibers, and Microbeads; and Pharmaceuticals and other Personal Care Products. All three categories have the potential to find their way to surface waters in East Grand Traverse Bay and the city's drinking water intake. Special consideration should be given to these contaminants moving forward.

3.8 Future Implementation

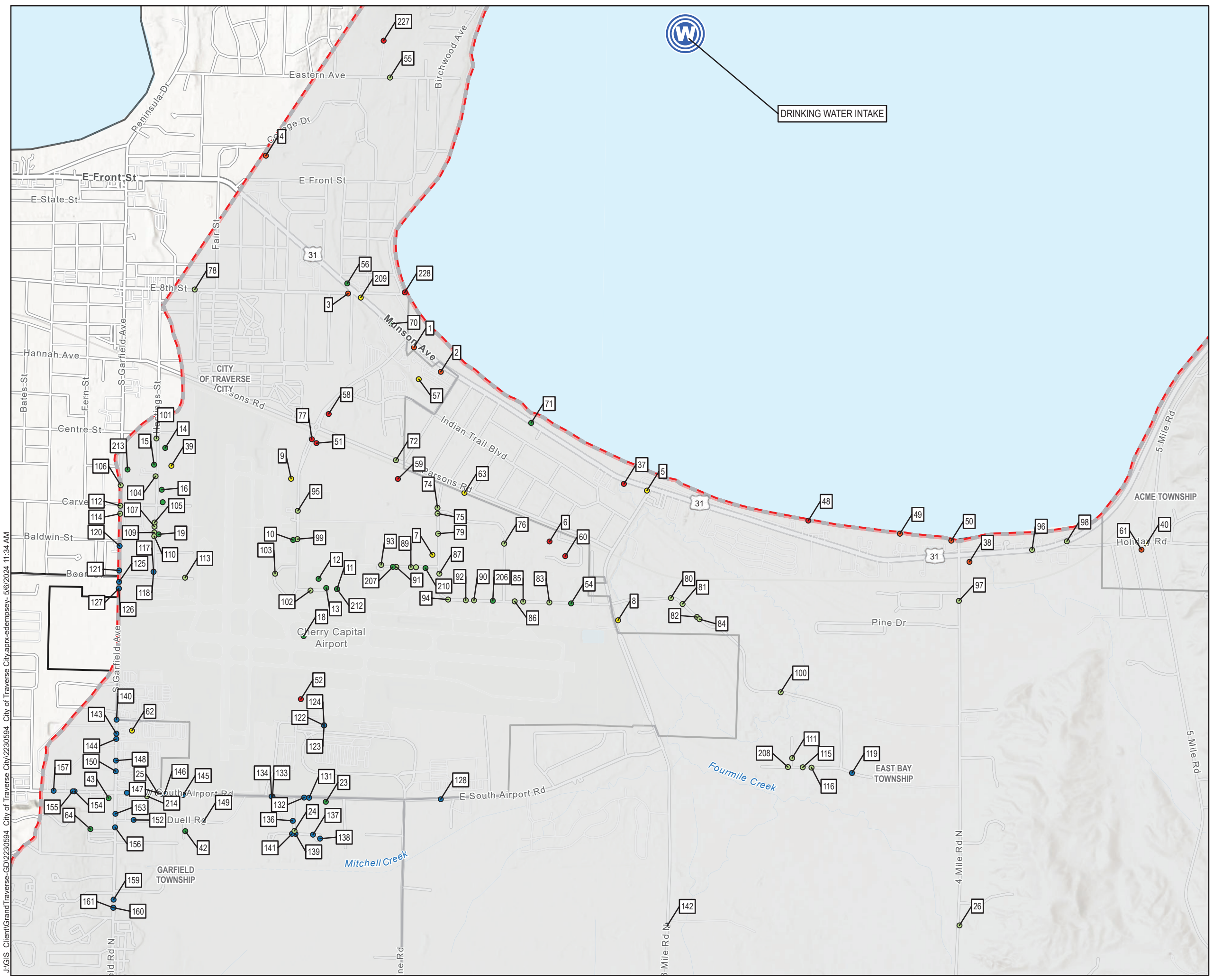
The CSI identified during SWIPP development is a dynamic list. The following action items for the CSI are for consideration of the SWPT as the SWIPP is implemented:

- Future meetings of the SWPT should include continued discussion of risks to the source water based on local knowledge and experiences.
- Data sources should be refreshed every few years to capture any new sites of known or potential contamination.
- Subject matter experts may be invited to present to the SWPT on sites of known or potential contamination.
- Review of available records for top priority sites may increase the SWPT's understanding of risk for individual sites.

In addition, partnership with watershed protection groups such as The Watershed Center Grand Traverse Bay will be key in improving and preserving water quality in the East Bay watershed. The risk of water quality degradation should be continually assessed as part of the SWIPP implementation, including the following:

- Identification of critical areas within the coastal watershed within the SWPA.
- Prioritization of pollutants/contaminants of concern, such as such as nutrients, pathogens, toxins, and emerging contaminant of concern.
- Continued water quality monitoring at key locations.
- Data sharing and coordination of surface water quality monitoring in the watershed with water quality monitoring at the Water Treatment Plant to assess risks to the source water.

- Partner with Northwestern Michigan College (NMC) Great Lakes Water Studies Institute to share water quality data and observations achieved through this educational program. Coordinate routine water quality sampling sites with NMC to increase the area that is able to be studied.



CITY OF TRAVERSE CITY

GRAND TRAVERSE COUNTY, MICHIGAN

SURFACE WATER INTAKE PROTECTION PROGRAM

CONTAMINANT SOURCES - AREA A

FIGURE 5

Prein&Newhof

2230594

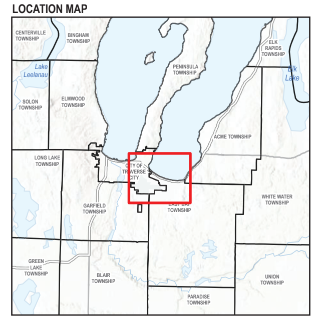
LEGEND

- Proposed Source Water Protection Area
- Proposed Expanded Source Water Protection Area
- Drinking Water Intake

Contaminant Source Inventory Site Risk Rating

- 0
- 1
- 2
- 3
- 4
- 5
- 6

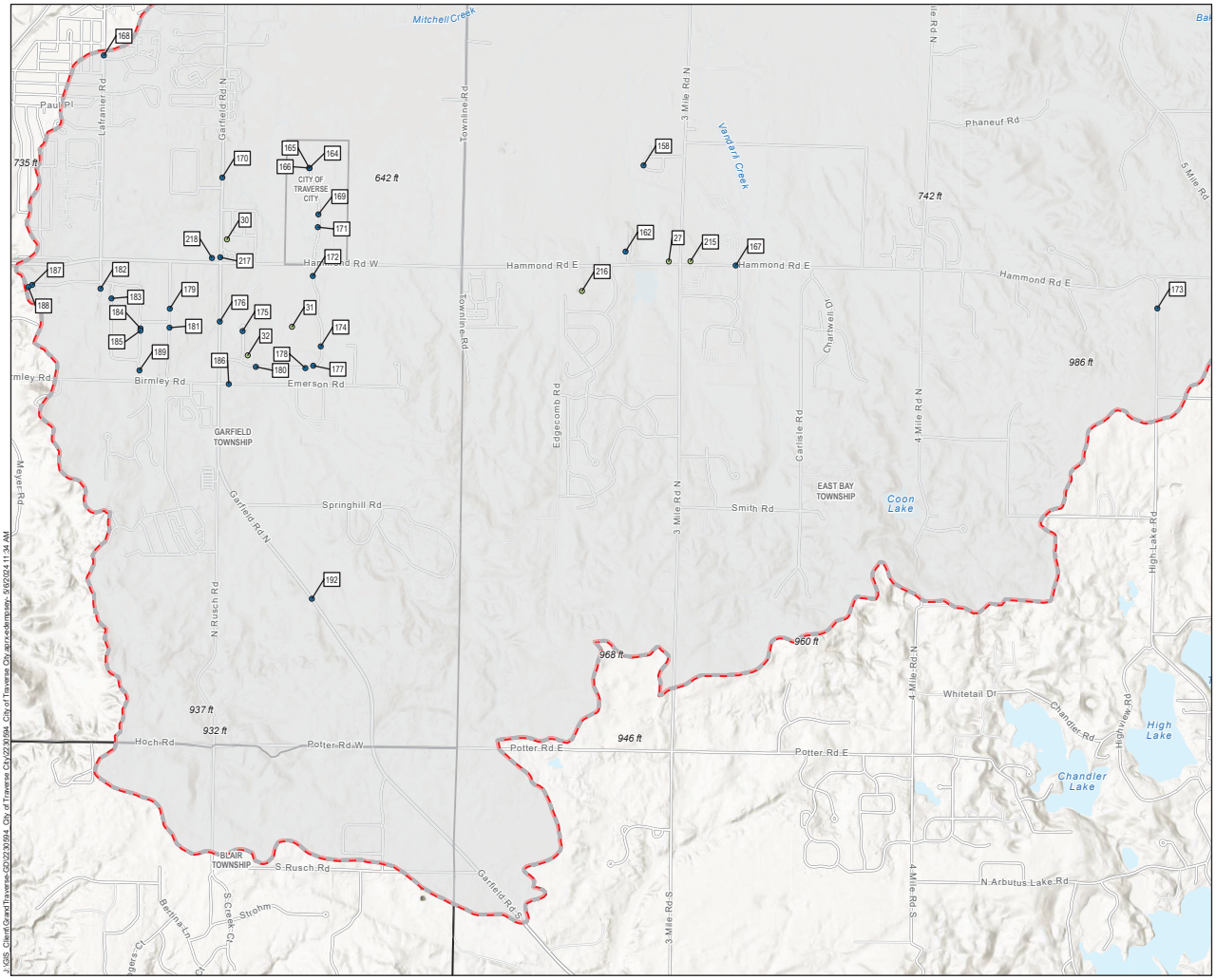
LOCATION MAP



0 0.25 0.5 0.75 Miles

JANUARY 2024

J:\GIS_Client\GrandTraverse-GD\2230594_City of Traverse City\aprx-edempsey - 5/6/2024 11:34 AM



CITY OF TRAVERSE CITY

GRAND TRAVERSE COUNTY, MICHIGAN

SURFACE WATER INTAKE PROTECTION PROGRAM

CONTAMINANT SOURCES - AREA B

FIGURE 6

Prein&Newhof

2230594

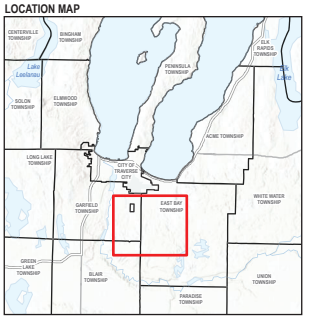
LEGEND

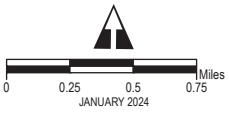
- Proposed Source Water Protection Area
- Proposed Expanded Source Water Protection Area
- Drinking Water Intake

Contaminant Source Inventory Site Risk Rating

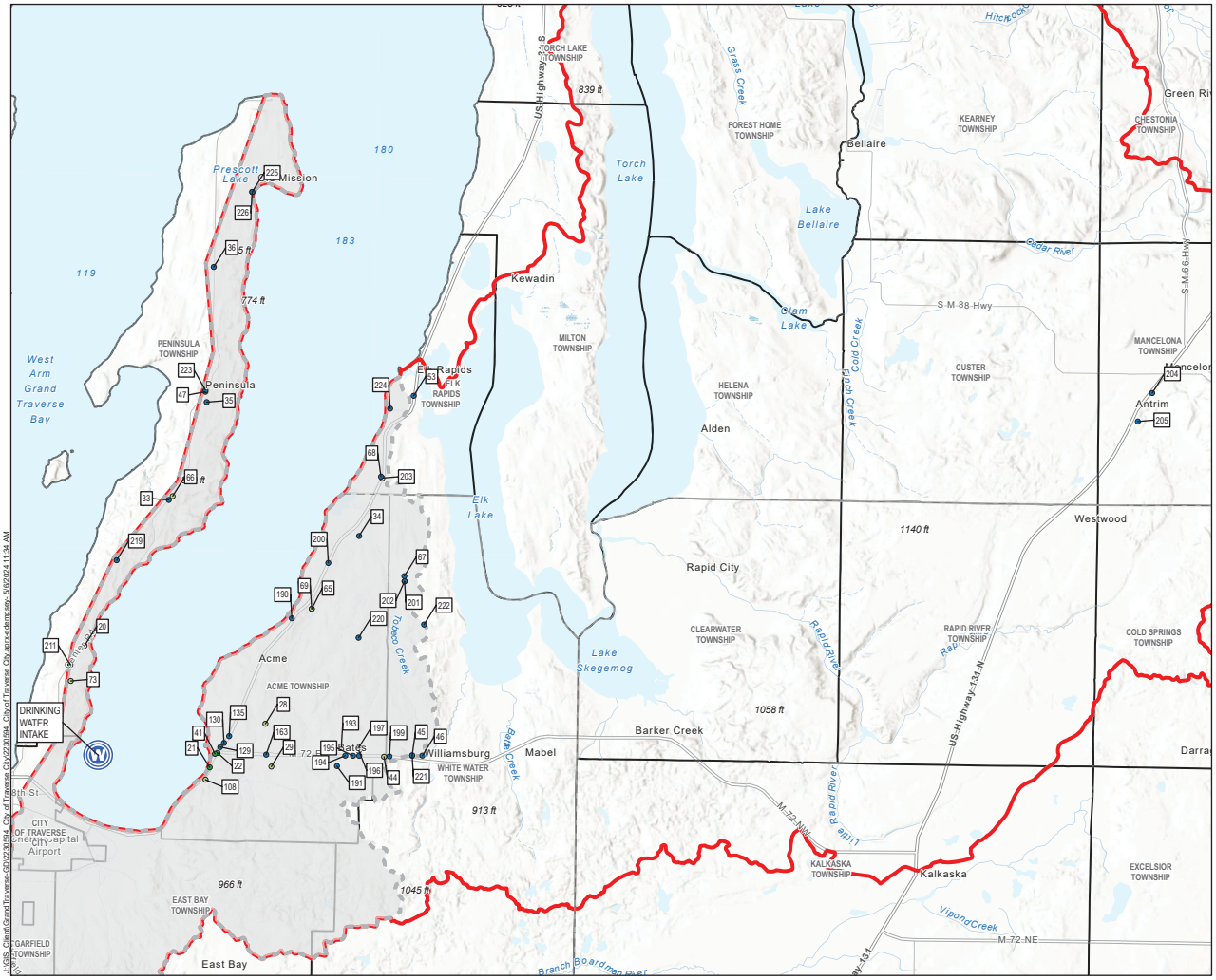
- 0
- 1
- 2
- 3
- 4
- 5
- 6

LOCATION MAP





JANUARY 2024



CITY OF TRAVERSE CITY
GRAND TRAVERSE COUNTY, MICHIGAN
SURFACE WATER INTAKE PROTECTION PROGRAM

CONTAMINANT SOURCES - AREA C

FIGURE 7

Prein&Newhof
2230594

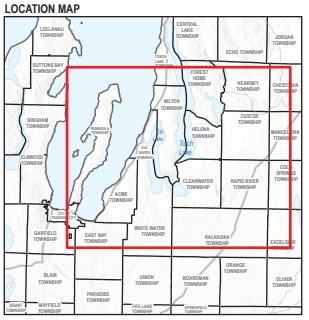
LEGEND

- Proposed Source Water Protection Area
- Proposed Expanded Source Water Protection Area
- Drinking Water Intake

Contaminant Source Inventory Site Risk Rating

- 0
- 1
- 2
- 3
- 4
- 5
- 6

LOCATION MAP



0 1 2 3 4 5 Miles

JANUARY 2024

X:\GIS Client\Grand Traverse-GV\2230694 City of Traverse City\arcx-ebmeyer- 5/9/2024 11:34 AM

Chapter 4 – Management Strategies

Surface Water Intake Protection Program

Prepared for

City of Traverse City

May 2024

2230584

4 Management Strategies

During development of the contaminant source inventory (CSI), the Source Water Protection Team (SWPT) began identifying strategies to manage the Source Water Protection Area (SWPA). Many of the strategies identified by the team align with ongoing efforts by partner organizations, several of which have well-developed organizations and plans that can benefit Traverse City's source water protection efforts. Categories of management strategies may include land use restrictions, developing partnerships, and inter-agency coordination. Implementation of management strategies can be difficult due to the extensive area of delineation for the SWPA, which includes several municipalities. During initial implementation, the SWPT should focus on management strategies for the highest risk areas. These are primarily located in the City of Traverse City, East Bay Township, and Peninsula Township. The following management strategies are being considered at this time and will be reviewed periodically.

4.1 Site Plan Review Standards

This strategy entails utilizing the existing site plan review process to develop a focused set of questions pertaining to risk of contamination. East Bay Township and the City of Traverse City have existing site plan review processes that may be amended. Other municipalities within the SWPA also have various existing review processes for site development. The addition of questions focused on chemical storage, hazardous waste, and stormwater management can help identify changes in the SWPA that could increase risk to the source water. Additionally, this process increases the property owner's awareness of the potential impact of his or her activities on the source water. An example environmental checklist is included in **Appendix E**.

Action Item: Finalize checklist questions with SWPT input.

Action Item: Implement checklist questions in high priority municipalities.

Action Item: Engage other municipalities within the SWPA.

4.2 Overlay Zoning

Developing zoning standards and establishing a zoning regulation in the SWPA is a robust tool for managing development activities. However, the local approval process can be complicated and

there are several municipalities within the SWPA. Municipalities within the SWPA that have high priority sites should consider amendments to current zoning to acknowledge the SWPA and increase protections. One such example identified by the SWPT are watercraft rentals offered by hotels and classified as "accessory uses". The potential for fuel spills to East Grand Traverse Bay could be mitigated by implementation of additional zoning standards to better ensure water quality protection. Considerations for planning and zoning to preserve water quality are also included in the Coastal Grand Traverse Bay Watershed Plan, summarized in **Appendix C.**

Action Item: Engage with local leaders to consider zoning standards for the SWPA.

4.3 Transportation Corridor

The US-31/M-72 corridor is a heavily used route for regional traffic, including trucks. It is also parallel to East Grand Traverse Bay for more than 5 miles. This corridor has been identified as an increased risk of accidents and spills that could contaminate East Grand Traverse Bay. The SWPT should explore opportunities to support efforts by emergency responders. In addition, a study of specific users of this corridor would help assess risks to the source water.

Action Item: Engage emergency managers to support efforts and highlight risk to the drinking water source.

4.4 Watershed Management

Management of the coastal watershed and local streams discharging to East Grand Traverse Bay was identified as a priority to maintain and improve water quality of the source water. Efforts outlined in the Coastal Grand Traverse Bay Watershed Plan, summarized in **Appendix C**, are supported by the SWPT as they contribute to source water protection by addressing water quality degradation. Select action items from the watershed plan that present collaborative opportunities with the SWPT are included below.

Action Item: Implement measures to reduce bacteriological impairment.

Action Item: Identify and address severe road stream crossings.

Action Item: Identify and preserve natural areas in proximity to ongoing development.

Action Item: Work with agricultural landowners in the watershed to implement BMPs.

Action Item: Establish riparian buffers in priority areas.

Action Item: Install green infrastructure and other stormwater best management practices in urban areas to reduce the quantity and improve the quality of stormwater runoff.

In addition to the local watershed management plan, there is also a Statewide "Forest to MI Faucet" initiative to encourage local water utilities to recognize the importance of forests in their source water areas. Forest to MI Faucet is encouraging the plans include efforts to 1) protect existing forests; 2) promote good forest management, and 3) strategically expand forests.

Action Item: Meet with the Conservation Resource Alliance to discuss Forest to MI Faucet Initiative, and key practices recommended for the SWPP.

Action Item: Consider implementing practices.

4.5 Stormwater Runoff

The City of Traverse City has an existing stormwater collection system that includes several direct discharges or outfalls to East Grand Traverse Bay. The existing system represents a potential risk to the source water due to urban stormwater runoff, as well as potentially transporting spills of contaminants. The following are potential management strategies regarding urban stormwater runoff.

Action Item: Identify all stormwater system outfalls to East Grand Traverse Bay.

Action Item: Prioritize maintenance of existing stormwater treatment systems.

Action Item: Seek funding for improvements to existing systems to reduce quantity and improve the quality of stormwater runoff.

Action Item: Coordinate with Emergency Response officials to highlight the outfalls.

4.6 Hazardous Materials

Various sites identified in the CSI are required to register and report hazardous and non-hazardous materials under Sara Title III, Tier 2 reporting. This program is managed by the Traverse City Fire Department within the city limits and includes regular reporting and periodic site inspections.

Action Item: Coordinate Traverse City FD efforts with other FD's.

Action Item: Prioritize onsite inspections for high risk sites within the SWPA.

4.7 Inter-Agency Coordination

Sites of known or suspected sources of contamination were identified within the SWPA; however a thorough review of each source has not been conducted. Scheduling meetings with regulatory agencies and subject matter experts would increase the SWPT understanding of risk to the source water, while simultaneously increasing the agencies' awareness of the SWIPP and highlight the importance of source water protection. Meetings with emergency management agencies helps increase awareness of threats to the drinking water source. Meetings with land use protection and watershed management experts helps identify additional management strategies that may be available. These and other opportunities for inter-agency coordination are presented in **Table 4**.

Action Item: Invite agency representatives to present and facilitate discussion at future SWPT meetings.

Table 4: Inter-Agency Coordination Opportunities

Agency	Description
EGLE Project Managers	Presentation to summarize investigation and response for the highest risk sites of known or potential contamination.
Airport and Coast Guard Air Station	Presentation to summarize investigations of these high profile sites.
Emergency Response Agencies: EGLE, USCG, County EM, Fire Dept.	Presentation on emergency response in the region and identify overlap with the SWIPP. Focus on open water spills, communication, and response.
Conservation Resource Alliance	Opportunities for protection of source water areas through the expansion of forested lands through the Forest to Mi Faucet program and/or similar programs.
The Watershed Center Grand Traverse Bay	Opportunities for protection and preservation of water quality through watershed management. Presentation on the highest risk sources of water quality degradation and efforts to protect and preserve water quality.
For Love of Water (FLOW)	Presentation on efforts to develop legislation and other management strategies to protect and preserve water quality.

4.8 Future Implementation

The management strategies identified in this chapter provide a framework for continued implementation of the SWIPP and identify specific action items. Future SWPT meetings may identify additional strategies and action items for effective source water protection.

Chapter 5 – Emergency Response Plan

Surface Water Intake Protection Program

Prepared for

City of Traverse City

May 2024

2230584

5 Emergency Response Plan

The City of Traverse City Water Department developed an Emergency Response Plan (ERP) in December 2021 to replace the previous Contingency Plan. These documents are intended to aid in planning for and response to emergencies that affect the water supply. An update to the ERP was initiated as part of the Source Water Intake Protection Program (SWIPP). The types of information in the ERP include:

- Information on the water supply and distribution system
- Alternative water supply options
- Identification of personnel responsible in an emergency
- Notification requirements and contacts for EGLE and public health agencies
- Emergency repair contractors and contacts
- Critical customers such as hospitals

A copy of the updated ERP is included in **Appendix F** and is incorporated by reference into the SWIPP.

Chapter 6 – Developing New Sources

Surface Water Intake Protection Program

Prepared for

City of Traverse City

May 2024

2230584

6 Developing New Sources

The City of Traverse City may consider the addition of new water sources to provide reliability to the water system. For example, a second intake in West Grand Traverse Bay would provide a redundant source and an alternative supply should East Bay source become compromised. The SWPT will become involved early in the planning process for developing a new source water. This chapter outlines the recommended procedure for developing new sources.

Step 1: Determine Proposed Source Water Protection Area

Delineation of the proposed source water protection area is a key step of assessing new water sources. The delineation enables a search for potential contaminant sources for the new water source. In the example of West Grand Traverse Bay, the delineated SWPT would be significantly different than the SWPT for East Bay.

Step 2: Develop Contaminant Source Inventory

A contaminant source inventory is developed for the new source relying on available data sources and local expertise of the SWPT. For example, the contaminant source inventory for West Grand Traverse Bay would be different than the CSI developed in this SWIPP.

Step 3: Study of Water Quality

A robust water quality sampling of the proposed source water should be conducted using information from Steps 1 and 2. Sampling should be conducted at the proposed intake location and depth, to capture seasonal changes including wet weather and runoff conditions.

Step 4: SWPT Approval

The SWPT should make a recommendation to pursue the new source in consideration of the information gathered in steps 1 through 3.

Step 5: EGLE Approval

In the event the SWPT supports the pursuit of the new source, the City must pursue approval for water withdrawal from the Great Lakes.

Step 6: Incorporation into the SWIPP

If EGLE approves the new source and construction is underway, the SWPT should begin steps to formally amend the SWIPP to incorporate the new source. New management strategies and public education goals may be needed. Communicate with partner agencies to raise awareness of the new source water.

Chapter 7 – Public Participation, Outreach, and Education

Surface Water Intake Protection Program

Prepared for
City of Traverse City

May 2024

2230584

7 Public Participation, Outreach, and Education

A key element of a successful Source Water Intake Protection Program (SWIPP) is public outreach and education. As a newly developed SWIPP, the program will benefit from generating interest and participation of the general public. Increasing awareness of businesses and landowners in the Source Water Protection Area (SWPA) has the dual purpose of public education as well as enhancing management strategies in the SWPA. This chapter outlines the future priorities for the SWIPP implementation regarding public participation, outreach, and education.

7.1 Messaging Priorities

Understanding the public messaging priorities of the Source Water Protection Team (SWPT) is key to begin developing an outreach strategy. A survey of the SWPT members collected votes on a variety of conceptual public messages related to the risks identified by the SWIPP. The top four priorities are as follows:

1. Where does your drinking water come from?
2. Boating practices and fuel management.
3. Value of our freshwater resources.
4. Household practices to reduce impacts to source water.

Other top scoring public messaging priorities of the SWPT include watershed education, impacts of stormwater runoff on water quality, land use around the waterfront, proper chemical storage and disposal, protection of key habitats and natural features, and "how does my water system work."

A variety of target audiences can be identified to tailor priority messaging to specific groups. **Table 5** presents possible target audience groups and pairs priority messages with those groups.

> ***Action Item***: Periodically revisit the Team's messaging priorities, target groups, and partner organizations.

7.2 Coordination with Partner Organizations

Partner organizations can help provide a jump start to the SWPT's efforts to conduct public outreach and education. The organizations identified below have shared goals with the SWIPP or work within target audience groups for public messaging.

- The Watershed Center of Grand Traverse Bay (TWC): A well established and trusted steward organization, TWC has developed extensive resources for educational purposes. Many of the TWC's fact sheets, brochures, and website pages are great resources for educating the public on issues regarding watershed's environmental health.

  TWC also organizes annual events such as the annual Swim for Grand Traverse Bay, as well as the annual Freshwater Summit to discuss the latest research, projects, and initiatives that impact the Great Lakes and Grand Traverse Bay regions.

- For Love Of Water (FLOW): A Great Lakes policy and advocacy group dedicated to protecting the public's rights to the region's waterways. FLOW organizes events throughout the year that may present opportunities for presenting or sharing educational materials on the SWIPP.

- Neighborhood Associations: Whether formal or informal, associations for neighborhoods can present excellent opportunities for public education. The SWPT should consider reaching out to active neighborhood groups within SWPA to explore opportunities.

- Boating Club of Grand Traverse Bay: the local chapter of America's Boating Club organization hosts educational courses throughout the year, including a free spring seminar focused on safe boating practices.

- Traverse Connect: The lead economic development organization for the Grand Traverse region, it may be a good opportunity to advocate for the importance of preserving freshwater resources for sustaining the local economy.

- Northwestern Michigan College (NMC): Home to the Great Lakes Water Studies Institute (GLWSI), the college offers bachelor's and associate degrees in environmental fields.

Opportunities to partner with the GLWSI include presentations to college classrooms, tours of the water system for students, and integrating source water protection into the existing curriculum.

- Traverse City Tourism (TCT): Tourism is a significant characteristic of the Traverse City region. Since 1981, TCT has served as the region's official destination marketing organization. Opportunities may exist for outreach with TCT to increase awareness of the region's freshwater resources and drinking water source.

- Traverse City State Park (TCSP): Visitors to the TCSP have a unique opportunity to learn about freshwater resources, due to the park's proximity to East Grand Traverse Bay and Mitchell Creek.

7.3 Outreach Strategies

Given the messaging priorities and target audiences, the following outreach strategies are identified for the consideration of the SWPT during implementation of the program.

7.3.1 Presentation of SWIPP to Local Leaders

Designated representatives from the Source Water Protection Team (SWPT) can present to local unit of government (LUG) bodies following approval of the SWIPP by EGLE. The presentation will help to educate the government representatives and members of the public in attendance on the water system in general, water resources, and the extent of the SWPA.

> ***Action Item***: Contact LUGs within the SWPA to schedule an informative presentation.

7.3.2 Local News

An article published in local newsletters, newspapers, and social media sites is an effective way to inform the public on the development of the SWIPP, funded in part through an EGLE grant. Periodic updates regarding the SWIPP implementation can be published similarly if readership is engaged.

Action Item: Draft an article presenting the new SWIPP for Traverse City to raise awareness.

Action Item: Contact local communities within the SWPA to discuss newsletter articles.

7.3.3 Website

Development of website content dedicated to the City's SWIPP is an effective way to communicate with interested members of the public. This is a particularly effective strategy because the SWPA incorporates multiple communities and municipalities, who can simply link to the website.

Action Item: Discuss with City web developers.

Action Item: If approved, develop content for SWIPP website.

7.3.4 Branding

Creating a brand for the communities' source water protection can be an effective way to help the public visualize and recall the importance of their local resources. It is also an effective way to build local support and capture the attention of the public.

Action Item: Hold discussions with the SWPT about branding.

7.3.5 Presentations

Presenting in person to target audiences is an effective way to communicate the importance of source water protection. This requires willing volunteers for presentations but is easier if presentations are developed for use in specific target audiences.

Action Item: Identify target audiences such as boating clubs and businesses and develop content specific to those audiences.

7.3.6 Consumer Confidence Reports

The City of Traverse City sends a Consumer Confidence Report (CCR) each year to customers. The CCR summarizes water testing conducted throughout the year. This report is distributed to all water system customers each year.

Action Item: Include information about the SWIPP in the next CCR.

7.3.7 Source Water Protection Brochure

The SWPT may develop a brochure to provide information about the City's source water and its protection to citizens of the area. Brochures can be made available at the City Governmental Center and Township Halls and given to civic groups when presentations are made.

Action Item: Develop a brochure with priority messages.

Action Item: Distribute brochures to target audiences.

7.3.8 School Participation

The SWPT may pursue involvement with area schools in educating the public about source water protection and preserving water quality. If pursued, the SWPT will collaborate with the public schools so that source water protection can be incorporated into the science curriculum. If opportunities arise, information about the City's water system and SWPA can be incorporated the school's program.

7.3.9 Road Signage

Other communities have installed road signage to identify the SWPA to raise public awareness. Road sign installation can focus on major roads as they enter the SWPA, or at intervals along roads with high sensitivity to the East Bay.

Action Item: Discuss road signage benefits and seek cost estimates.

7.3.10 Event Participation

Representatives of the SWPT can participate in events. Brochures, posters, and other educational material can help raise public awareness of source water protection.

Action Item: Identify and participate in events that will attract target audiences.

Table 5: Public Outreach Strategy Summary

Target Audience Group	Messaging	Partner Organizations	Outreach Strategy
General Public (Mass Messaging)	• Where does your tap water come from? • What can impact the source water? • What can I do to help protect my drinking water source? -Impacts from car washing, enviro. friendly soaps -Proper disposal of pharmaceuticals, other household waste -Information on drop-off sites and availability • How can stormwater runoff impact the source water, and what can I do to help?	• TWC • FLOW • TCT • Neighborhoods • Libraries	• Signage (Roads, along East Bay, select areas) • Source Water Protection Brochure • Consumer Confidence Report • Event Participation • Create Website • Present to Local Leaders • Brochure • Newsletters, newspapers, social media • Storm drain stenciling • Magnets, stickers, i.e. take-home materials
Boating Community (Targeted Messaging)	• Where does your tap water come from? • What are responsible boating practices? • How can waterfront properties impact the source water?	• Boating Club • TCT • TWC • FLOW	• Brochure (watercraft rentals, marinas, etc.) • Present at Boating Club seminars • Signage along East Bay at select locations
Schools (Youth Education Focus)	• Where does your tap water come from? • What can impact the source water? • What can I do to help protect my drinking water source?	• NMC-GLWSI • FLOW • Traverse City Area Public Schools • Elk Rapids Schools • Private & Charter Schools	• Branding • Brochure for events • Present at schools • Participate in local events with a youth focus • Signage (Roads, along East Bay, select areas)
Outdoor Recreation Community (Targeted Messaging)	• Where does your tap water come from? • What can impact the source water? • How can outdoor recreation impact key habitats and natural features? • What can I do to help protect the source water?	• TWC • TCT • TCSP	• Branding • Participate in outdoor recreation events that center around local water resources. • Brochure (outdoor retail shops, etc.) • Signage (Roads, along East Bay, select areas)
Local Business Community (Targeted Messaging)	• Where does your tap water come from? • What can impact the source water? • What is safe chemical handling, storage, and disposal?	• TCT • Traverse Connect	• Brochure (outdoor retail shops, etc.) • Event Participation • Presentations for businesses
Visitors (Tourism)	• Where does your tap water come from? • What can impact the source water? • How can outdoor recreation impact key habitats and natural features? • What can I do to help protect the source water?	• TWC • TCT • TCSP	• Branding • Participate in outdoor recreation events that center around local water resources. • Brochure (outdoor retail shops, etc.) • Signage (Roads, along East Bay, select areas)

Chapter 8 – Future Program Implementation

Surface Water Intake Protection Program

Prepared for

City of Traverse City

May 2024

2230584

8 Future Program Implementation

Previous chapters of the Surface Water Intake Protection Program (SWIPP) identify action items for continued implementation. This closing chapter will summarize action items and also identify potential funding sources to help ensure continued success.

8.1 Source Water Protection Team

A diverse, active, and engaged Source Water Protection Team (SWPT) is essential to continued success of the SWIPP. Membership on the SWPT is voluntary and by invitation. Periodic addition of new team members increases team diversity and sustains the energy of the team. Continued quarterly meetings are also essential to keep momentum of the SWIPP.

8.2 Source Water Protection Area Delineation

The initial SWPA delineation is designed to be conservatively large to capture all potential sources of contamination. Revisit the delineation periodically to ensure it is relevant and manageable.

8.3 Contaminant Source Inventory

Periodic updates to the Contaminant Source Inventory (CSI) are needed as new sites of contamination are identified and local knowledge of potential contamination evolves. Specifically, consider the following action items for implementation:

- Refresh data sources for CSI development.
- Invite subject matter experts to present to the SWPT on priority sites.
- Review available records for top priority sites to further understanding of risk.
- Continue water quality monitoring at key locations in the watershed and East Bay.
- Develop data sharing for water quality monitoring with WTP.
- Assess data and prioritize risks to water quality degradation.
- Partner with Northwestern Michigan College (NMC) Great Lakes Water Studies Institute.

8.4 Management Strategies

Many strategies have been identified and will require follow-through to be effective. In addition, the SWPT priorities may shift over time as some efforts can be more effective than others.

- Develop site plan review checklist questions for use in the SWPA.
- Implement site plan review checklist questions in high priority municipalities.
- Engage with local leaders to consider zoning standards for the SWPA.
- Engage emergency managers to support efforts to study transportation corridors.
- Implement measures to reduce bacteriological impairment.
- Identify and address severe road stream crossings.
- Identify and preserve natural areas in proximity to ongoing development.
- Work with agricultural landowners in the watershed to implement BMPs.
- Establish riparian buffers in priority areas.
- Install green infrastructure and other stormwater best management practices in urban areas to reduce stormwater runoff.
- Coordinate Traverse City FD efforts on Sara Title III Tier 2 reporting with other FDs.
- Prioritize Sara Title III onsite inspections within the SWPA.
- Invite agency representatives to present and facilitate discussion at future SWPT meetings.

8.5 Emergency Response Plan

As updates to the contingency plan/emergency response plan are completed they will be incorporated into the SWIPP.

8.6 Developing New Sources

Action items from this element are typically needed when assessing a new source.

8.7 Public Education and Outreach

Many strategies for public education and outreach have been identified and will require follow-through to be effective. In addition, the SWPT priorities may shift over time as some efforts can be more effective than others.

- Periodically revisit the Team's messaging priorities, target groups, and partner organizations.
- Contact Local Units of Government within the SWPA to schedule an informative presentation.

- Draft an article presenting the new SWIPP for local newsletters in the region.
- Develop a website for the SWIPP.
- Develop branding for the SWIPP.
- Present for target audiences such as boating clubs, select businesses, and schools.
- Include information about the SWIPP in the next CCR.
- Develop a brochure with priority messages and distribute to target audiences.
- Discuss road signage benefits and seek cost estimates.
- Identify and participate in events that will attract target audiences.

8.8 Funding

8.8.1 EGLE Source Water Protection Grant

This SWIPP was developed in part with funding through the Source Water Protection Grant administered by EGLE. This grant has historically been offered annually and is anticipated to continue. The City should consider pursuit of future grant funding through EGLE.

8.8.2 EPA Funding Integration Tool for Source Water (FITS)

FITS is a one-stop-shop tool that explains how users can integrate various federal funding sources to support activities that protect sources of drinking water. Using this online tool, users may navigate between fourteen source water protection funding sources, as well as planning and funding coordination information and examples of funding sources in action.

https://www.epa.gov/sourcewaterprotection/fits

Appendix A

Team Meeting Minutes

CITY OF TRAVERSE CITY

Source Water Protection Team Meeting No. 1

October 17, 2023, 11:00AM – 12:00PM

Location: Virtual

MEETING MINUTES

1. Project Background

a. Welcome Statement and City Perspective

Art Krueger, Traverse City DPW Director, introduced the City's water system, source water, and desire to develop a source water protection program. Art touched on known PFAS contamination south of the Grand Traverse East Bay, and the City's desire to sustain the source water protection effort into the coming years.

b. Grant Overview

Barbara Marczak provided some history of the EGLE source water protection grant program and her involvement over the years. It is a grant with 50% local match, with a maximum of $30,000 per year. However, each year is a new grant cycle to help sustain the program. There are quarterly submittals to summarize work progress and request reimbursement.

c. Overview of Schedule

Ernie Sarkipato provided an overview of the proposed timeline and meeting cadence. The intent is to complete the program development and report by May 2024.

2. Team Introductions

Art Krueger – Traverse City Director of Municipal Utilities, and previously the Traverse City WTP Superintendent.

Jackie Johnson – Traverse City WTP superintendent with 30 years in the water industry.

Barbara Marczak – Prein&Newhof Team Leader – Muskegon, is a civil/environmental engineer specializing in water/wastewater, water supply and hydrogeology. She has over 35 years of experience at Prein&Newhof and over 20 years with the Source Water Protection program. Her role will be to advise the team on past source water protection program successes and grant management.

Peter Brink – Prein&Newhof water process engineer, focusing on groundwater and surface water supplies, contaminant sources, sites of contamination.

Ernie Sarkipato – Prein&Newhof water process engineer. He will be involved with the day to day grant management and development of the source water protection plan with the team.

Andy Smits – County Drain Commissioner. He was previously the owner of Inland Seas Engineering for 25 years. Background in environmental engineering.

Chief Jim Tuller – City of Traverse City Fire Chief for 15 years, has coordinated the local hazardous materials response since 1991.

Claire Karner – Planning Director for East Bay Township, which has a public water supply with a groundwater source. High density land use around East Bay, beginning a planning process for the US-31 corridor.

John Divozzo – Director of Public Works for Grand Traverse County. Many years of experience with public works. Did some previous work on a Wellhead Protection Program.

Sarah U'Ren – Program Director for the Watershed Center Grand Traverse Bay, with 21 years in this role. They are a non-profit environmental group formed to protect and preserve the water in the bay including its watersheds. They have developed watershed plans for sub-watersheds, as well as the coastal bay watershed.

Greg Carpenter – Chief of Environmental Compliance for U.S. Coast Guard District 9, and District 5. Involved with public meetings and PFAS impacts at air stations. Actively working on that with State and City. Also collaborating with the Airport.

3. Project Elements

I. SWP Team, Roles, & Responsibilities

The team should be a diverse group, willing to share from their areas of experience/expertise. Individual roles will fit naturally to project elements.

II. Delineation

EGLE defines a surface water intake protection area as the area most likely to contribute contaminants to the drinking water source." Delineation of the SWPA is accomplished early on in the process.

III. Contaminant Source Inventory

An inventory of potential sources of contamination is developed within the SWPA. State and federal databases, as well as local knowledge, will be used.

IV. Management Strategies

How do you manage a source water protection area? The first round of the project will generate ideas based on group input and past experiences. May include:

- Zoning.
- Watershed planning.
- Hazardous material storage sites.
- Site plan review.
- Raising Awareness.

V. Contingency Plan

This is the water system plan for reacting to source water events such as contamination. The existing contingency plan will be updated.

VI. Plan to Assess New Sources

If new sources are pursued, they should be assessed from a source water protection standpoint. The program will include steps for the assessment.

VII. Public Education –

For the first year of the program, our scope is to generate ideas/strategies. Implementation would likely be for a future year. This item benefits from collaboration on a plan for future implementation.

4. Map Review: Source Water Protection Area - ES

Two draft source water protection area maps were presented, and are attached. One has an expanded area to look for major sources of contamination and be aware of the broader watershed.

Team input:

Art – Consider marinas. Elk Rapids has a marina on the water. East Bay has a private marina. Fuel storage.

Claire – Acme Twp marina at edge w/ East Bay. Lots of hotels in East Bay Twp that serve as boat rentals. She can provide a list.

Ernie – noted the abrupt delineation within the Traverse City limits.

Sarah – City has maps for drainage areas for storm drains.

- She thinks the City, and Mitchel Creek, Acme Creek are highest priority.
- Elk River chain of lakes is good to keep in mind, but very unlikely to impact.
- She can look for info on water cycling around the bay.
- They have GIS layers for sub-watersheds (various creeks).
- Coastal GTB watershed plan – critical areas, priority areas for protection. Mitchell Creek has been identified as a priority area for potential contamination.
- Protection: both from contamination events, and for general water quality.

Art – Old Mission. Agricultural Pesticide/Herbicide applications historically and currently. Not many streams into East Bay.

Andy – AG opinion around Easter, removed ag lands from the Part 201 remediation program exemption. They are now subject to 201.

Also, lots of road culverts with drainage to East Bay.

5. Scheduling of Future Meetings - ES

Next meeting date, time, and location.

Next Meeting: 1:00PM on December 5, 2023, In-person with hybrid option

Attachments: Draft Source Water Protection Area Maps
Attendance Report

Attendance Report

Meeting title	Traverse City Source Water Protection Team Meeting No. 1
Attended participants	11
Start time	10/17/23, 10:54:59 AM
End time	10/17/23, 12:05:25 PM
Meeting duration	1h 10m 26s
Average attendance time	1h 3m 8s

2. Participants

Name	First Join	Last Leave	Duration
Ernie Sarkipato	10/17/23, 10:55:55 AM	10/17/23, 12:02:34 PM	1h 6m 39s
Jackie (Guest)	10/17/23, 10:57:09 AM	10/17/23, 12:05:25 PM	1h 8m 15s
USCG Greg Carpenter	10/17/23, 10:57:10 AM	10/17/23, 12:02:23 PM	1h 5m 13s
Chief Tuller (Guest)	10/17/23, 10:57:10 AM	10/17/23, 12:01:16 PM	1h 4m 5s
Barbara Marczak	10/17/23, 10:57:40 AM	10/17/23, 12:02:25 PM	1h 4m 45s
Peter Brink	10/17/23, 10:58:17 AM	10/17/23, 12:02:24 PM	1h 4m 7s
Claire Karner	10/17/23, 10:59:29 AM	10/17/23, 12:02:21 PM	1h 2m 51s
Sarah U'Ren	10/17/23, 10:59:37 AM	10/17/23, 12:02:22 PM	1h 2m 45s
Art Krueger	10/17/23, 11:00:33 AM	10/17/23, 12:02:22 PM	1h 1m 49s
JOHN DIVOZZO	10/17/23, 11:04:39 AM	10/17/23, 12:02:24 PM	57m 45s
Andy Smits	10/17/23, 11:06:11 AM	10/17/23, 12:02:23 PM	56m 11s

3. In-Meeting Activities

Name	Join Time	Leave Time	Duration
Ernie Sarkipato	10/17/23, 10:55:55 AM	10/17/23, 12:02:34 PM	1h 6m 39s
Jackie (Guest)	10/17/23, 10:57:09 AM	10/17/23, 12:05:25 PM	1h 8m 15s
USCG Greg Carpenter	10/17/23, 10:57:10 AM	10/17/23, 12:02:23 PM	1h 5m 13s
Chief Tuller (Guest)	10/17/23, 10:57:10 AM	10/17/23, 12:01:16 PM	1h 4m 5s
Barbara Marczak	10/17/23, 10:57:40 AM	10/17/23, 12:02:25 PM	1h 4m 45s
Peter Brink	10/17/23, 10:58:17 AM	10/17/23, 12:02:24 PM	1h 4m 7s
Claire Karner	10/17/23, 10:59:29 AM	10/17/23, 12:02:21 PM	1h 2m 51s
Sarah U'Ren	10/17/23, 10:59:37 AM	10/17/23, 12:02:22 PM	1h 2m 45s
Art Krueger	10/17/23, 11:00:33 AM	10/17/23, 12:02:22 PM	1h 1m 49s
JOHN DIVOZZO	10/17/23, 11:04:39 AM	10/17/23, 12:02:24 PM	57m 45s
Andy Smits	10/17/23, 11:06:11 AM	10/17/23, 12:02:23 PM	56m 11s

CITY OF TRAVERSE CITY

Source Water Protection Team Meeting No. 2

December 5, 2023, 1:00PM – 2:00PM

Location: Traverse City Governmental Center

400 Boardman Ave, 2nd Floor, Committee Room

MEETING MINUTES

1. **Welcome**

2. **Project Status**
   - Discussed contract from EGLE, may have gone to previous City Manager.
   - Timeline overview – Contaminant sources and management strategies are current focus.

3. **Source Water Protection Area Delineation**
   - Discussed stormwater system research, no issues with delineation.

4. **Contaminant Source Inventory Discussion**
   - P&N provided overview of data search for potential sources.
   - Conceptual risk rating of sources discussed.
   - Smits noted a 'closed' LUST can have a variety of meanings, i.e. default closure.
   - Smits offered insights on various sources from his history of work in area.
   - Karner noted the municipality should be listed.
   - U'Ren noted distance from a surface water should be considered, not just intake.
   - P&N emphasized the data search is not a complete list, or even the highest priority. Welcome continued input from team on known or potential sources.

5. **Management Strategies Discussion**
   - Coordinate with other agencies for transfer of knowledge (e.g. EGLE for Part 201)
   - Karner noted that property transactions offer an opportunity.
   - Chief Tuller summarized the Sara Title III program with FD.
   - Chief Tuller noted possible transportation corridor study with EM.
   - Site Plan Review:
     - East Bay Township (EBT) has a GW protection ordinance for sites with chemical storage above a certain threshold. Also currently reviewing ordinances, requested examples from other source water programs.
     - City of TC has this as well, and recently formed the 'design team' which is a multi-disciplinary site plan review process.
     - TC has a tree ordinance, EBT is considering same.

- Highlighted importance and ongoing efforts for watershed management.
    - Forest to MI Faucet program, opportunity to protect/preserve water quality.
        - Collaborate with DJ Shook for future management strategy.
    - Actionable items in the coastal watershed plan, reference in SWIPP.
    - Ongoing study of E. Coli and possibly viruses in Mitchell Creek.
    - Importance of locating and prioritizing storm drain and surface water outlets to the East Bay.
    - Discussion of water quality in East Bay, relative to intake location and depth.

6. Scheduling of Future Meetings: February 2024 (TBD, likely virtual)

Attachments: Powerpoint Presentation
Draft Contaminant Source Inventory

CITY OF TRAVERSE CITY

Source Water Protection Team Meeting No. 3

January 30, 2024, 2:00PM – 3:00PM

Location: Remote

AGENDA

1. **Welcome**

2. **Project Status**

I. Team Roles & Responsibilities (Chapter 1)

-*Art*: Consider adding service areas to Figure 1. Not sure about showing intake.

-*Sarah*: Would also like to see population broken down by municipality

-*John* likely has population data. City – can use census data.

II. Source Water Protection Area Delineation (Chapter 2)

-*Ernie*: for future updates, consider honing the delineation (no need for expanded?)

III. Contaminant Source Inventory (Chapter 3)

-*Ernie*: updates since last meeting, input from Andy Smits from working history.

IV. Management Strategies (Chapter 4)

-*Ernie*: Overview of strategies already identified by the Team.

V. Contingency Plan (Chapter 5)

-*Ernie*: waiting for City to conduct updates.

VI. Plan to Assess New Sources (Chapter 6)

-*Ernie*: in draft form.

VII. Public Education (Chapter 7)

-Discussion below

3. **Managing the Risks**

Overview of graphic showing interrelationship between risks and management strategies.

4. **Public Outreach and Education Strategies**

Sarah: wonders if the team should develop a communications strategy for public education? This would be the primary messaging to the public. The audience and materials can easily flow out of this exercise. Note, the Coastal Plan has info on P267ff, Table 61 which would be tailored to watershed management related messaging.

Ernie: may poll the group on their top messaging priorities.

The Team mentioned the following as potential education strategies:

- Presentation of SWIPP to Local Leaders
- Consumer Confidence Reports
- Source Water Protection Brochure
- Schools
- Road Signage: either entering the watershed/SWPA, or along the East Bay.

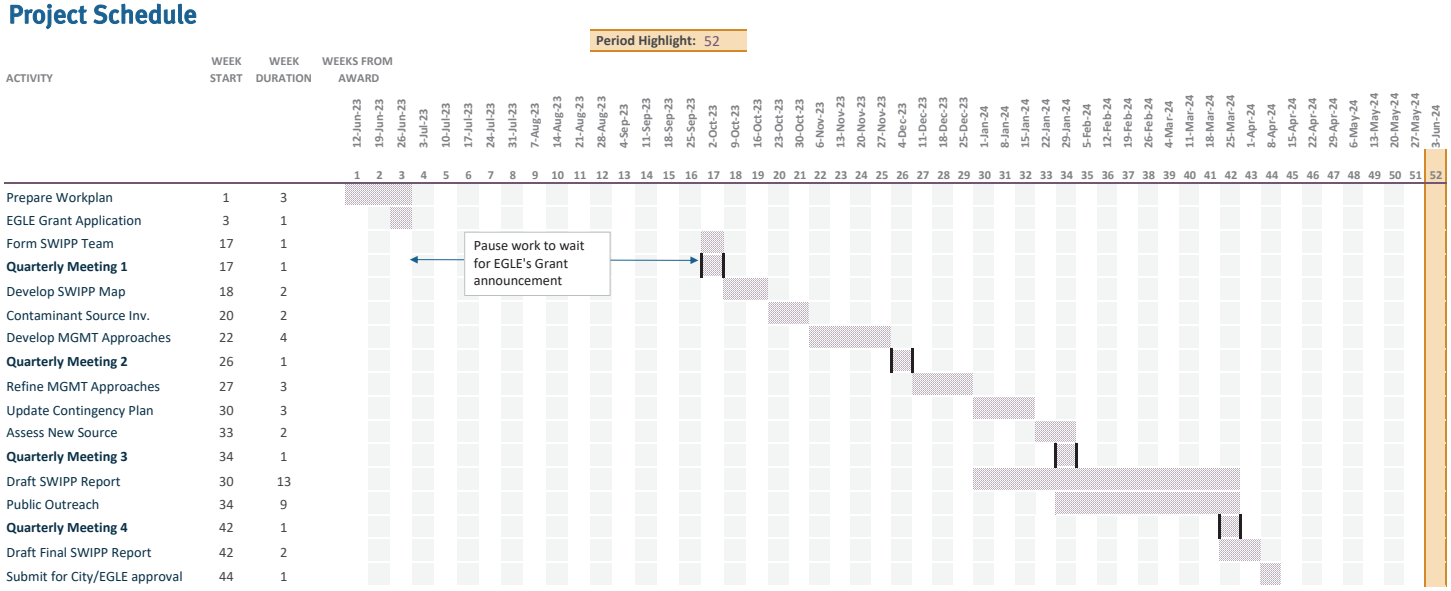
Claire indicated EB Township is starting a marketing project for the US-31 corridor.

Art indicated the State Park would be a great location to educate out-of-town visitors.

5. Schedule next Meeting (send Doodle Poll)

Attachments: Updated Schedule
Risks, Strategies, and Outreach graphic
Attendance Report

Project Schedule

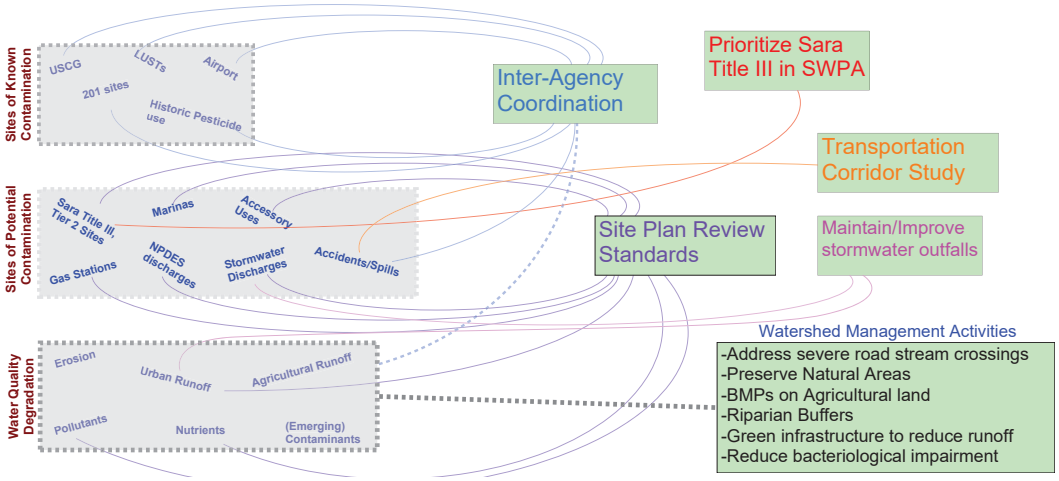


ACTIVITY	WEEK START	WEEK DURATION
Prepare Workplan	1	3
EGLE Grant Application	3	1
Form SWIPP Team	17	1
Quarterly Meeting 1	17	1
Develop SWIPP Map	18	2
Contaminant Source Inv.	20	2
Develop MGMT Approaches	22	4
Quarterly Meeting 2	26	1
Refine MGMT Approaches	27	3
Update Contingency Plan	30	3
Assess New Source	33	2
Quarterly Meeting 3	34	1
Draft SWIPP Report	30	13
Public Outreach	34	9
Quarterly Meeting 4	42	1
Draft Final SWIPP Report	42	2
Submit for City/EGLE approval	44	1

SURFACE WATER INTAKE PROTECTION PROGRAM
JANUARY 2024

CITY OF TRAVERSE CITY

RISKS



STRATEGIES

Inter-Agency Coordination

Prioritize Sara Title III in SWPA

Transportation Corridor Study

Site Plan Review Standards

Maintain/Improve stormwater outfalls

Watershed Management Activities

-Address severe road stream crossings
-Preserve Natural Areas
-BMPs on Agricultural land
-Riparian Buffers
-Green infrastructure to reduce runoff
-Reduce bacteriological impairment

OUTREACH

CCR

Present to Local Government Bodies

Brochure

Coordinate with ongoing efforts for public education

Schools

Local Newsletters
Publish article

Signage

Website

S:\2023\23250594 City of Traverse City\CCR\Quarterly meetings\Third Meeting\RISK & STRATEGIES.pdf

CITY OF TRAVERSE CITY 1/30/2024

SURFACE WATER INTAKE PROTECTION PROGRAM

1. Summary

Meeting title	Traverse City Source Water Protection Team Meeting #3
Attended participants	7
Start time	1/30/24, 1:58:06 PM
End time	1/30/24, 3:05:55 PM
Meeting duration	1h 7m 49s
Average attendance time	1h 1m 39s

2. Participants

Name	First Join	Last Leave	In-Meeting Duration	Email
Ernie Sarkipato	1/30/24, 1:58:31 PM	1/30/24, 3:02:54 PM	1h 4m 23s	esarkipato@preinnewhof.com
Jackie (Guest)	1/30/24, 1:59:43 PM	1/30/24, 3:05:55 PM	1h 6m 11s	
Sarah U'Ren	1/30/24, 2:00:15 PM	1/30/24, 3:02:52 PM	1h 2m 36s	suren@gtbay.org
Peter Brink	1/30/24, 2:00:17 PM	1/30/24, 3:02:51 PM	1h 2m 33s	PBrink@preinnewhof.com
JOHN DIVOZZO	1/30/24, 2:01:15 PM	1/30/24, 3:02:55 PM	1h 1m 39s	jdivozzo@gtcountymi.gov
Claire Karner	1/30/24, 2:01:27 PM	1/30/24, 2:58:48 PM	57m 21s	ckarner@eastbaytwp.org
Andy Smits	1/30/24, 2:06:00 PM	1/30/24, 3:02:52 PM	56m 52s	asmits@gtcountymi.gov

CITY OF TRAVERSE CITY

Source Water Protection Team Meeting No. 4

April 9, 2024, 2:00PM – 3:00PM

Location: Remote

MINUTES

1. Welcome

New Attendees: Liz Kirkwood, FLOW. Great Lakes advocacy and policy organization.

Matt Hirsch, NMC Great Lakes Water Studies Institute.

2. Project Status

Deadline to submit to EGLE is approaching, and the project budget has some remaining for final edits to report.

3. Public Outreach and Education Strategies

The following comments were provided on Chapter 7, mainly on the summary table:

- Expand on "household waste" – old paint, various possibly toxic substances.
- Awareness of drug drop site availability.
- Add FLOW to school outreach.
- Don't list all possible schools on the table (area schools).
- Add jetski & boat rental sites, marinas.
- Add the library as a potential partner.
- Signage: general signage for public education could be added (splash pad, state park, front street pump station, etc).
- Storm drain stenciling – good outreach.
- Magnets and stickers have been used in other communities as well.

Also, note the Tribe owns 900-ft of frontage west of the State Park. May be a potential partner in public education and outreach.

4. Report Review Comments

One member asked about WTP testing for arsenic. The group discussed arsenic testing at the WTP, to rule out potential impacts from historical pesticide application. Annual monitoring at treated tap has been non-detect.

Other comments on the report should be submitted to P&N by next week for incorporation before submitting to EGLE. Also, the City will provide the updated ERP for inclusion with the SWIPP.

5. Future Meetings & Discussions

This is the last planned meeting under the current EGLE grant. A renewed grant application may be submitted to EGLE for subsequent years. Some EPA grant funding opportunities also exist. Sara U'Ren offered assistance in seeking additional grants with the City.

Attachments: Attendees List

CITY OF TRAVERSE CITY 4/15/2024
SURFACE WATER INTAKE PROTECTION PROGRAM

1. Summary

Meeting title	Traverse City Source Water Protection Team Meeting #4
Attended participants	11
Start time	4/09/24, 1:46:47 PM
End time	4/09/24, 2:58:22 PM
Meeting duration	1h 11m 35s
Average attendance time	59m 3s

2. Participants

Name	First Join	Last Leave	In-Meeting Duration	Email	Participant ID (UPN)
Ernie Sarkipato	4/09/24, 1:56:25 PM	4/09/24, 2:58:22 PM	1h 1m 57s	esarkipato@preinnewhof.com	esarkipato@preinnewhof.com
Andy Smits	4/09/24, 1:56:46 PM	4/09/24, 2:58:15 PM	1h 1m 28s	asmits@gtcountymi.gov	asmits@gtcountymi.gov
Jackie (Guest)	4/09/24, 1:57:44 PM	4/09/24, 2:58:11 PM	1h 27s		
USCG Greg Carpenter	4/09/24, 1:57:45 PM	4/09/24, 2:58:15 PM	1h 29s		
Liz Kirkwood	4/09/24, 1:59:08 PM	4/09/24, 2:58:02 PM	58m 53s		
Claire Karner	4/09/24, 1:59:37 PM	4/09/24, 2:58:03 PM	58m 26s	ckarner@eastbaytwp.org	planner@eastbaytwp.org
Matt Hirsch	4/09/24, 1:59:49 PM	4/09/24, 2:58:07 PM	58m 18s		
Peter Brink	4/09/24, 2:00:10 PM	4/09/24, 2:58:14 PM	58m 3s	PBrink@preinnewhof.com	pbrink@preinnewhof.com
Sarah U'Ren	4/09/24, 2:00:36 PM	4/09/24, 2:58:09 PM	57m 32s	suren@gtbay.org	suren@gtbay.org
Art Krueger	4/09/24, 2:00:48 PM	4/09/24, 2:58:10 PM	57m 21s		
JOHN DIVOZZO	4/09/24, 2:01:33 PM	4/09/24, 2:58:12 PM	56m 39s	jdivozzo@gtcountymi.gov	jdivozzo@gtcountymi.gov

Appendix B

2004 Source Water Assessment

Source Water Assessment Report for the City of Traverse City Water Supply April 2004

City of Traverse City Water Treatment Plant
Traverse City, Michigan

Prepared for:
City of Traverse City Water Supply; WSSN 6640

Prepared by:
U.S. Geological Survey, Water Resources Division, Michigan District
Michigan Department of Environmental Quality, Water Division

Michigan Source Water Assessment Report 14

Executive Summary

The purpose of the Source Water Assessment is to provide information about the affects of environment on a community's drinking water source. The assessment seeks to analyze the natural sensitivity of the source water and determine the susceptibility of the source water to potential contamination. This information will help communities make important decisions about how to protect their drinking water.

Sensitivity is determined from the natural setting of the source water (raw water entering the water treatment plant), and indicates natural protection afforded the source water. Using procedures established in the Great Lakes Protocol, Michigan Source Water Assessment Program, the Michigan Department of Environmental Quality (MDEQ) has examined the effects of wind and lake currents, the possible influence of Mitchell Creek, and urban runoff. From this examination, the MDEQ has determined that the offshore intake for the Traverse City Water Treatment Plant has a moderate degree of sensitivity to potential contaminants.

Susceptibility identifies factors within the community's source water area that may pose a risk to the water supply, even though the level of such risk may be low. The susceptibility determination provides information about facilities and land areas in the vicinity of the source water that have the potential to contaminate the water supply. These potential contamination sites have been previously identified by the MDEQ, the U.S. Environmental Protection Agency, or other organizations as possible sources of concern and they should be given greater priority and oversight in the implementation of a source water protection program. These sites have the potential to cause contamination, but are not likely to do so if managed properly. The source water area for the Traverse City intake includes 48 potential contaminant sources, at least 2 of which discharge directly to the East Arm of Grand Traverse Bay, plus urban and agricultural runoff. The potential contaminant sources, in combination with the moderately sensitive intake, indicate that the Traverse City source water has moderate susceptibility to potential contamination.

The Traverse City source water is categorized with moderate susceptibility, given land uses and potential contaminant sources within the source water area. However, it is noted that historically, the city of Traverse City water treatment plant has effectively treated this source water to meet drinking water standards. The city of Traverse City has instituted pollution prevention programs, but should be cognizant of additional potential threats to its source of drinking water that are identified in this report. This report explains the background and basis for these determinations.

Using this Assessment

Clean, safe drinking water is fundamental to the viability of any community. Protecting the drinking water **source** is a wise and relatively inexpensive investment in your community's future. The overall intent of this assessment is to provide background information for your community to use in developing a local source water protection program. The assessment benefits your community by providing the following:

- ***A basis for focusing limited resources within the community to protect the drinking water source(s).*** The assessment provides your community with information regarding activities within the **source water area (SWA)** that directly affect your water supply. It is within this SWA that a spill or improper use of **potential contaminants** may cause these contaminants to migrate toward the water **intake**. By examining where the source waters are most susceptible to contaminants, and where

potential contaminants are located, the assessment clearly illustrates the potential risks that should be addressed.

- ***A basis for informed decision-making regarding land use within the community.***
  The assessment provides your community with a significant amount of information regarding where your drinking water comes from (the source) and what the risks are to the quality of that source. Knowing where the resource is allows your community planning authorities to make informed decisions regarding proposed land uses within the SWA that are compatible with both your drinking water resource and the vision of growth embraced by your community.
- ***A basis for dealing with future regulations.***
  The assessment has been designed to functionally meet proposed requirements for surface-water supplies. Information needed to address regulatory needs and requirements has been collected and made available to your community through this report.

This source water assessment also provides the basis for a locally developed, voluntary source water protection program. Communities interested in voluntarily developing source water protection programs should contact the Michigan Department of Environmental Quality (MDEQ) or visit the Department web page at

Introduction

In 1996, Congress amended the **Safe Drinking Water Act** and provided resources for state agencies to conduct source water assessments by identifying SWAs, analyzing the **sensitivity** of the source to natural conditions, conducting contaminant source inventories, and determining the **susceptibility** of the source to potential contamination. Delineations, sensitivity analyses, contaminant inventories, and susceptibility determinations comprise a "source water assessment." Assessments will be completed for every public water supply source in Michigan. To support this effort, the MDEQ Water Division established a partnership with the U.S. Geological Survey (USGS) to develop a method for conducting source water assessments for surface water supplies (Sweat and others, 2000; Sweat and others, *in press*).

The requirements for public water supplies in Michigan to meet United States Environmental Protection Agency (USEPA) **maximum contaminant levels (MCLs)** provide some degree of assurance of safe drinking water; however, all systems are vulnerable to potential contamination. One of the best ways to ensure safe drinking water is to develop a local program designed to protect the source of drinking water against potential contamination. Not only does this add a margin of safety, but it also raises the awareness of consumers and/or the community of the risks of drinking water contamination. It is expected that source water assessment results will provide a basis for developing a source water protection program.

Background

The city of Traverse City is located in Grand Traverse County, about 250 miles (mi) northwest of Detroit, Michigan, on the shore of Grand Traverse Bay (fig. 1). Besides serving a city residential population of 14,532, the water supply also serves an estimated 8,000 residents in Garfield Township and 750 in Peninsula Township. The Traverse City water supply's original intake was construct in West Bay in the 1890s. In 1965, a new intake was installed in East Bay with a low service pump station and filtration plant rated at 5 million gallons per day (MGD). An upflow clarifier was installed in the WTP along with an additional filter in 1971. In 1993, the WTP was converted to direct filtration and expanded to 20 MGD with a firm capacity of 19 MGD through the addition of two flocculators, two filters and new, low and high service pumps.

East Bay – Traverse City WTP Source Water

[THIS PAGE INTENTIONALLY LEFT BLANK]

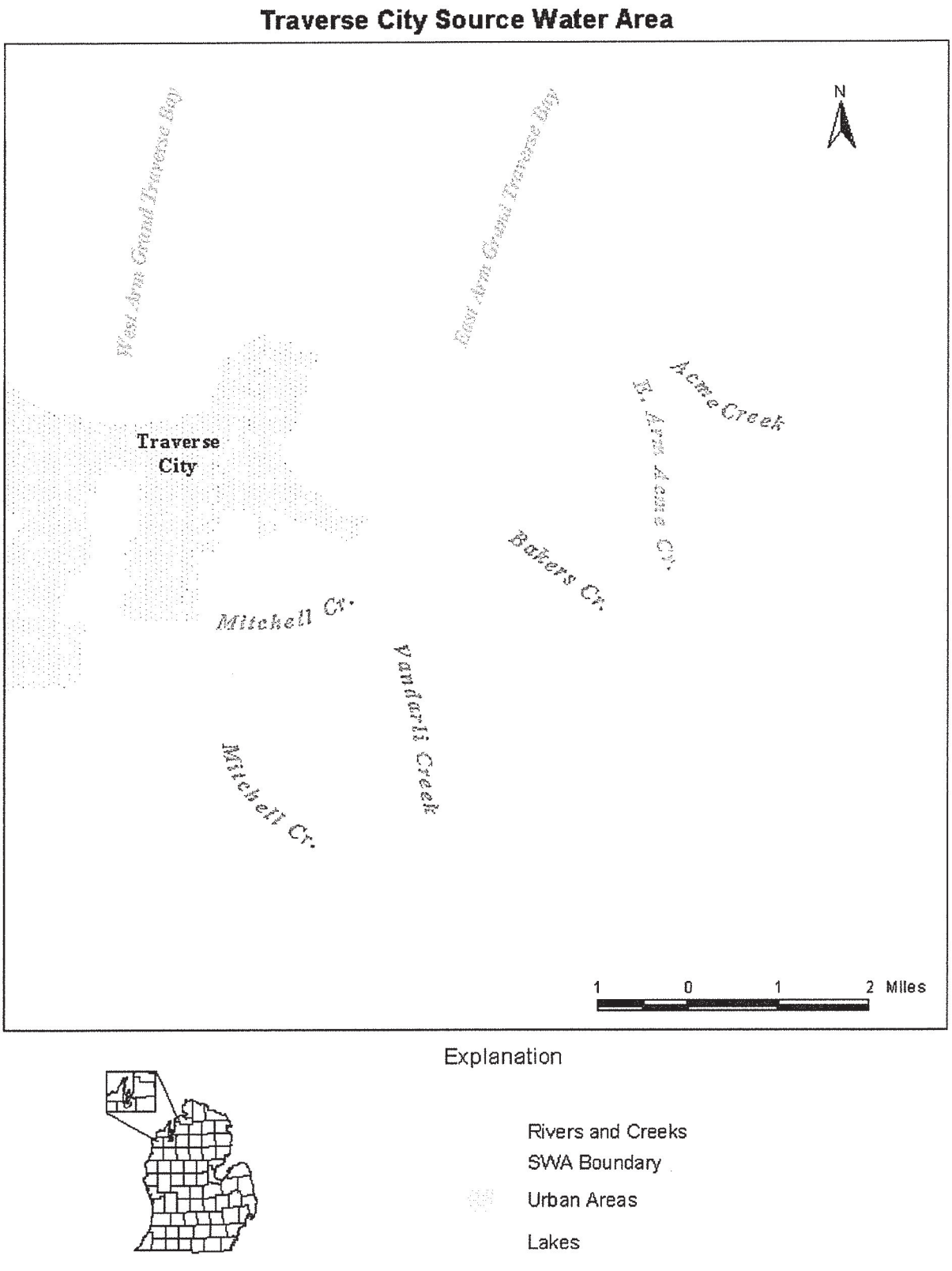


Figure 1. Source Water Area (SWA) for the evaluation of the Traverse City water Supply, Traverse City,

The WTP intake is located feet from shore in East Grand Traverse Bay. The intake crib is constructed of wood and has feet of submergence at its inlet. A 36-inch welded, steel pipe buried in the lake bottom connects the crib to the low service pump station. Chlorination was initiated at the intake in 1995 to control zebra mussels.

Water treatment plants are periodically inspected to identify construction, maintenance, and operational or source defects that could make them vulnerable to contamination, particularly from contaminants that are microbial in nature, such as fecal coliforms. Water suppliers are provided a sanitary survey report that notes any deficiencies in the system, and the State may direct the system to make necessary corrections. The sanitary survey is an important part of a safe drinking water program. The most recent sanitary survey of the Traverse City WTP was initiated in March 2002.

Climate

The Traverse City water supply is located in the North-Central Lower Peninsula hydrologic province (Rheaume, 1991). The region experiences temperate summers with moderate winters. The Traverse City weather station reports long-term average annual precipitation for the period 1903-2001 was about 30 in, with about 45 percent of that as snowfall between November and March. Annual average runoff for the Traverse City SWA, extrapolated from Miller and Twenter (1986, fig. 1) is 14 inches to 16 inches, with runoff values increasing from east to west.

Source Water Area Geology and Hydrology

The study area for evaluating the extent of the Traverse City WTP SWA includes Mitchell and Acme creek watersheds, in addition to East Arm Grand Traverse Bay (fig. 1). The SWA consists of eolian or wind made deposits in the northeastern portion of the SWA, lakebed deposits in the western portions of the SWA, and end moraines and glacial outwash in the eastern portion of the SWA. These landforms are underlain by shales from the Antrim, Bedford, Coldwater, Ellsworth, and Sunbury Groups (Martin, 1955; Milstein, 1987). Soils in the Traverse City SWA are primarily from the Emmet-Leelanau and Coventry-Karlin associations. They include loamy sands, sandy loams, mucks, peats and sands (U.S. Department of Agriculture, 1966; BASINS, 1998).

Soil permeability is based on the calculated time of travel, in inches per hour (in/hr), for water to move vertically through a saturated soil zone. Soil thickness and permeability values are available in soil survey reports published by the National Cooperative Soil Survey and U.S. Department of Agriculture (1987). Permeability ranges from less than 0.06 in/hr, rated as very slow, to more than 20 in/hr, rated as very rapid.

Very slowly permeable soils significantly reduce the movement of water through the soil zone and, as a result, allow greater time for natural degradation of contaminants. However, such soils also provide for rapid overland transport of contaminants directly to receiving waters, which in turn may affect the water supply intake. In contrast, very rapidly permeable soils allow for rapid infiltration and passage through the soil zone from the surface. Such soils potentially allow rapid transport of contaminants with minimal contact-time available for contaminant breakdown. Erosion and transport of soils by surface waters can cause an increase in turbidity. Mean, area-weighted, depth-integrated permeabilities for the Traverse City SWA range from 4.63 to as much as 13.0 in/hr. The mean permeability is 7.78 in/hr (Schneider and Erickson, undated, series of 5 maps; BASINS, 1998;). Soils are generally moderately rapid to rapidly permeable throughout the SWA (fig. 2; U.S. Department of Agriculture, 1966; BASINS, 1998). Soils with rapid permeability are close to Grand Traverse Bay and in the southeastern portion of the SWA (Lusch and others, 1992; BASINS, 1998).

The Traverse City SWA contains an area of about 45.5 square miles (mi^2) and is directly connected to Grand Traverse Bay. The most significant tributaries to Grand Traverse Bay from the SWA are Mitchell and Acme creeks, with drainage areas of about 16 mi^2 and 13 mi^2, respectively. No gauging stations are operated in the SWA by the USGS (Blumer and others, 2001, p. xii).

Mitchell Creek Discharge to East Bay

Under ambient conditions, currents in the lower, east Arm of Grand Traverse Bay are, typically, counterclockwise from west to east and north. Sustained strong winds from the west affect bay currents, causing increases in near shore turbidity. Sustained winds from the northwest through northeast can cause flow from the northern portion of the bay to pass over the intake, causing slight changes in water quality and chemistry at the intake.

History of Raw Water Quality at the Source

Public water supplies are required to routinely monitor raw water quality for selected parameters to optimize treatment, and to monitor treated water quality for a list of contaminants that is determined by MDEQ and the Safe Drinking Water Act. A detection of any contaminant may indicate that a pathway exists for contaminants to reach the intake. It is important to realize that the results from a given sample only provide information regarding the water quality at the time the sample was collected. Water quality can change with time for a number of reasons. The fact that a water sample does not contain contaminants is no guarantee that contamination will not occur in the future. Conversely, the detection of a contaminant in the past does not indicate that it will occur in the future.

The Traverse City WTP records show that water use between 1998 and 2001 fluctuated between 4.6 and 4.96 MGD, with a maximum day flow of 13.01 MGD during this period. Following is a summary of raw water quality from the WTP for the period October 1995 through September 2000.

Parameter	Average	Minimum	Maximum
Turbidity	0.33 NTU	0.09 NTU	1.10 NTU
Chloride	8.6 mg/l	7.0 mg/l	10.0 mg/l
pH	8.14	7.0	8.6
Alkalinity	109	105	114
Coliform Bacteria	4.8 cnts/100 ml	0.0	100 cnts/100 ml

These minor variations in raw water quality are most likely associated with changes to circulation patterns in Grand Traverse Bay, which can cause sediments near the intake to be suspended in the water column due to wind patterns and wave action. Coliform counts are typically zero during the winter months and increase during warmer weather. Periodic scans of raw water for volatile organic contaminants have been negative. No color problems were reported for raw water. While not regulated, esthetic parameters such as taste and odors associated with algae blooms are also a source water concern for the Traverse City WTP.

Natural occurring, thermal inversions in Grand Traverse Bay can also cause treatment problems for the plant. Thermal inversions are typically associated with heating of the surface of the Bay in spring, and cooling of the surface of the bay in the fall or early winter. Both events cause density differences in the Bay that cause the water to turnover and mix, often stirring up bottom sediments and detritus. In addition, rapidly fluctuating bay temperatures and very cold water can be issues for treatment at the WTP.

Source Water Assessment Methodology

Technical guidelines for completing source water assessments are contained in the Michigan **Source Water Assessment Program**, Assessment Protocol for Great Lakes Sources (Protocol) (MDEQ, 1999, Appendix L) available at http://www.deq.state.mi.us/dwr. In general, an assessment is a process for evaluating a drinking water supply and the potential for its treated water to exceed an MCL due to raw water contamination. A source water assessment considers the SWA, potential sources of contamination within the SWA, conditions of the water supply intake, and susceptibility to contaminants in order to identify potential risks to drinking water quality. Although the Protocol provides the minimum requirements and instructions on how to conduct an assessment, each water supply is unique with respect to how the process is carried out, due to local conditions and information. Sweat and others (2000, *in press*) have developed and documented the methodology used in the preparation of this assessment.

Delineating Source Water Areas

Delineation of the SWA is accomplished by using **geographic information system** (GIS) software to map the watershed(s) that have the potential to affect source water at the intake. Using information from the water supply, a **critical assessment zone** (CAZ) is defined for the intake (MDEQ, 1999, Appendix L). A buffer is then created along

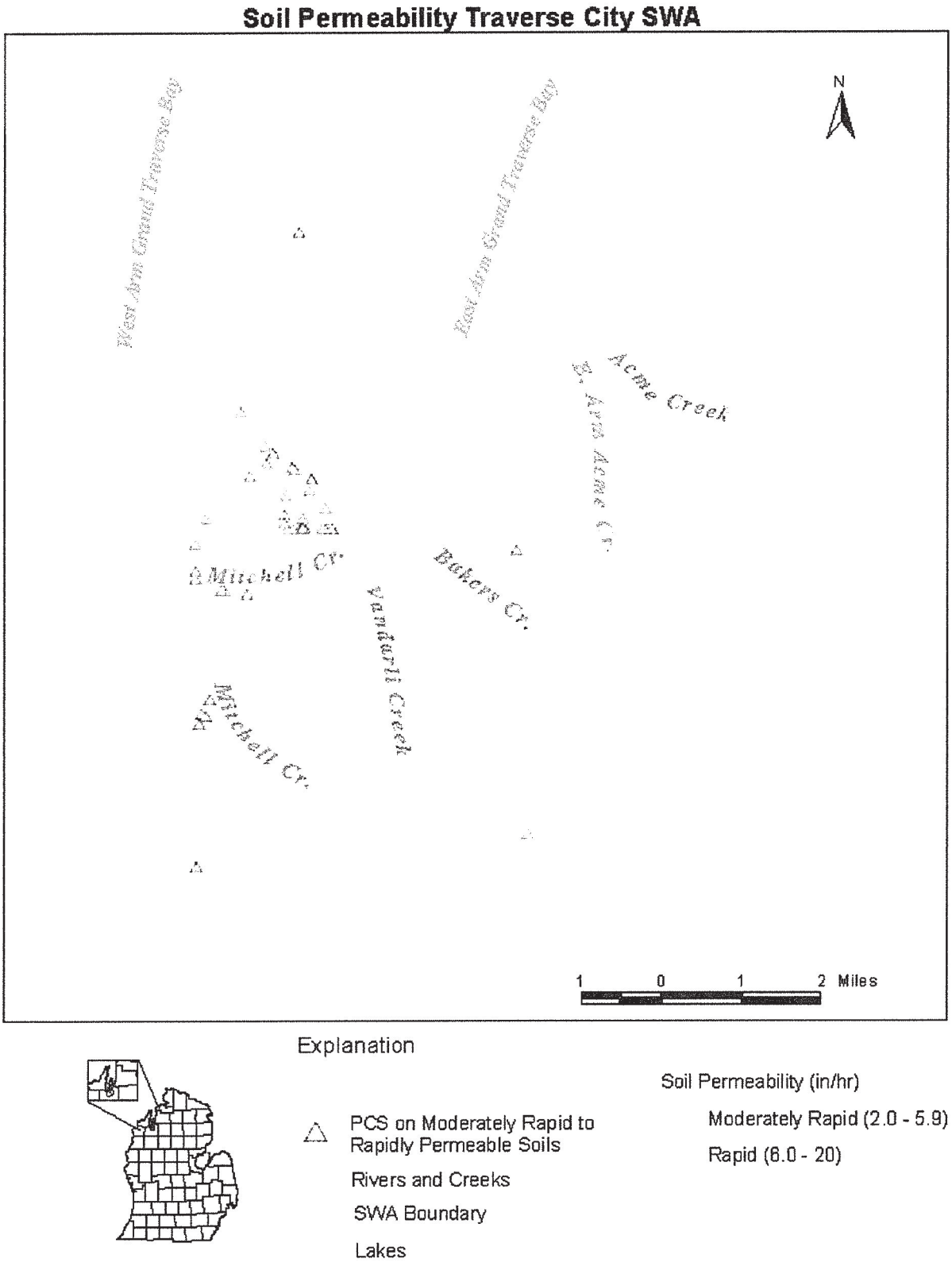


Figure 2. Source water (SWA) permeability map with Potential Contaminant Sources (PSC) for the Traverse City water supply, Traverse City, Michigan.

any shoreline intersected by the CAZ, and from the edge of the CAZ to the mouth of any river(s) that might influence the intake. Finally, the buffer is extended along the shoreline of any river(s) that might influence the intake, from the mouth of the river to its headwaters. The area defined by the CAZ, river and shoreline buffers is termed the **susceptible area.** The susceptible area within the SWA defines locations where a water supply should focus its management strategies and resources to benefit the drinking water resources.Using the Great Lakes Protocol and the Traverse City water supply information:

- The CAZ for the Traverse City intake is calculated as:

  (the length of the intake in ft.) x (the depth of the intake in ft.) = (unitless)
  This results in rating the intake as moderately sensitive, with a CAZ of 1,000 ft (MDEQ, 1999, Appendix L; fig. 3). The CAZ does not intersect the shoreline and there is no shoreline buffer.

Contaminant Source Inventory

Past, current, and potential future sources of contaminants were inventoried to identify several categories of potential sources of contaminants including microorganisms (bacteria, oocysts, and viruses), inorganic compounds (nitrates and metals), organic compounds (solvents, petroleum compounds, pesticides), and disinfection by-product precursors (trihalomethanes, haloacetic acids).

It is important to remember that sites and areas identified by this process are only **potential contaminant sources** (PCS) to the drinking water. Environmental contamination is not likely to occur when potential contaminants are used and managed properly. In addition, assumptions were made about particular types of land uses and risks associated with those land uses. Assumptions are discussed further in the results portion of this report.

The process for completing the inventory included several steps, which are summarized as follows:

1. Reviewed readily available land use maps and historical/current aerial photographs.
2. Plotted relevant information from applicable state and federal databases including the following lists:
   - MDEQ leaking underground storage tank (LUST) sites;
   - MDEQ registered underground storage tank (UST) sites;
   - MDEQ Environmental Cleanup Site Information System (ECSI) sites;
   - MDEQ Source Information System (for water discharge permit sites including National Pollutant Discharge Elimination System (NPDES) permits, Water Pollution Control Facility (WPCF) permits, storm water discharge permits, and on-site sewage (septic) system permits);
   - MDEQ Underground Injection Control (UIC) database;
   - MDEQ Active Solid Waste Disposal Permits list;
   - Michigan Department of Transportation (MDOT) - Hazardous Materials database;
   - State Fire Marshall registry of above-ground fuel storage tank sites;
   - State Fire Marshall Hazardous Material Handlers and Hazardous Material Incidents (HAZMAT) sites; U.S. EPA BASINS software, version 2.01.
   - U.S. EPA Envirofacts database;
   - U.S. EPA Resource Conservation Recovery Act (RCRA) generators or notifiers list;
   - U.S. EPA RCRA Treatment, Storage, and Disposal Facility (TSDF) Permits list;
   - U.S. EPA National Priorities List (NPL);
   - U.S. EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLA) List;
   - U.S. EPA RCRA Corrective Action Activity List (CORRACTS);
   - U.S. Department of Transportation (DOT) Hazardous Materials Information Reporting System (HMIRS);
   - U.S. EPA Toxic Chemical Release Inventory System (TRIS); and
   - U.S. EPA Oil Pollution Act of 1990 Spill Response Atlas.
3. Met with public water supply and community officials on October 12, 2000 to identify potential sources not listed elsewhere in databases or on maps and completed a preliminary inventory form to be used in

completing the SWA base map. Subsequent contacts by email and telephone on numerous occasions to request additional data, clarify data, and discuss results.

Critical Assessment Zone (CAZ) for Traverse City SWA Intake

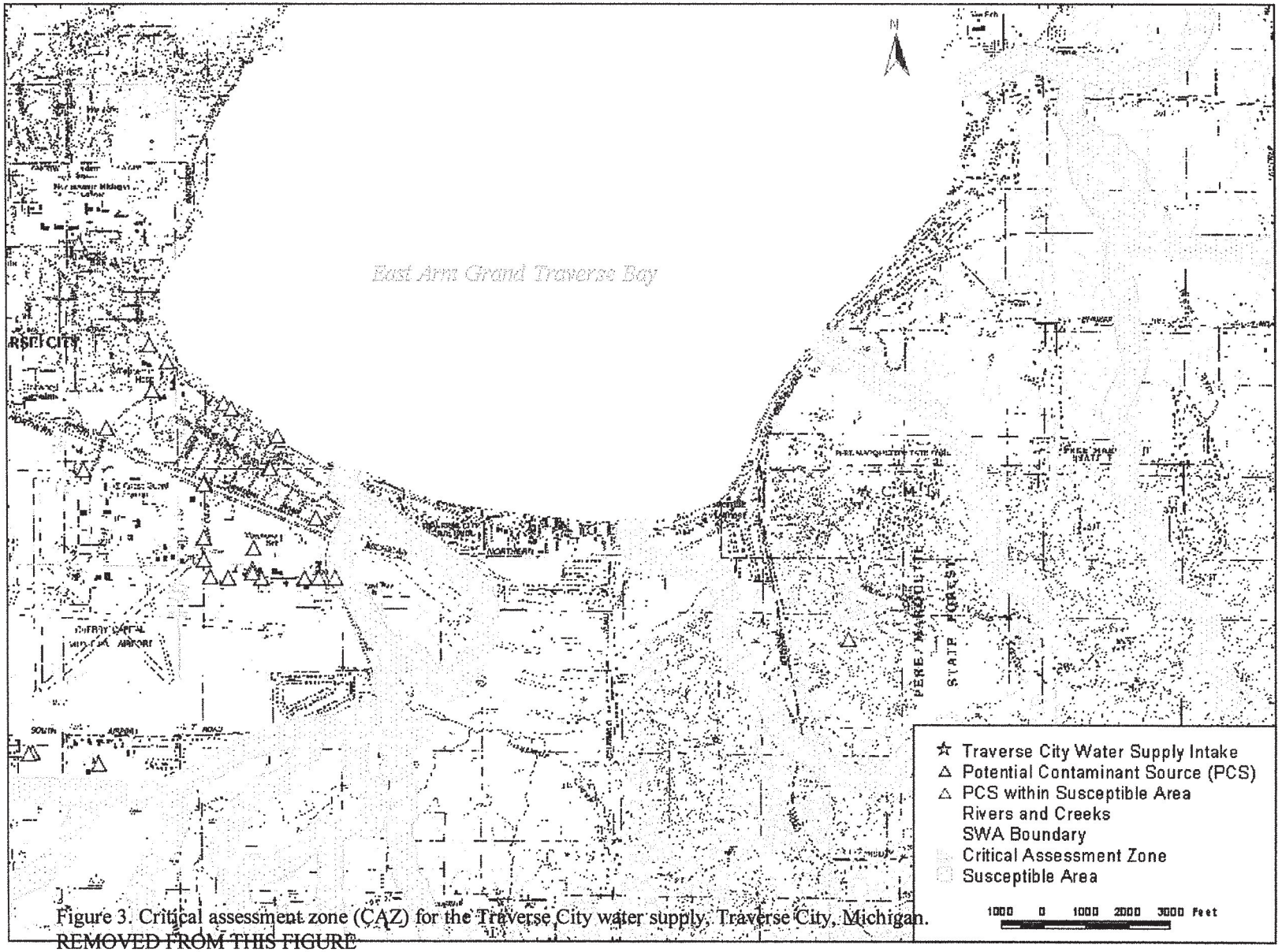


Figure 3. Critical assessment zone (CAZ) for the Traverse City water supply, Traverse City, Michigan. ~~REMOVED FROM THIS FIGURE~~

4. Land use and/or ownership (for example, residential/municipal; commercial/industrial; agricultural/forest; and other land uses) was mapped and evaluated in relation to PCS, soil characteristics, and proximity to the intakes.
5. Conducted an informal field inventory to locate additional PCS.
6. Completed final inventory form of PCS and plotted locations of PCS on the base map.

The purpose of the inventory is three fold: first, to provide information on the location of PCS, especially those within the susceptible area; second, to provide an effective means of educating the public about PCS; and third, to provide a reliable basis for developing a management plan to reduce potential contaminant risks to the Traverse City water supply.

The inventory process attempts to identify potential point-source contaminants within the SWA. It does not include an attempt to identify specific potential contamination problems at specific sites, such as facilities that do not safely store potentially hazardous materials. However, assumptions were made about particular types of land use. For example, it is assumed that rural residences associated with farming operations have specific potential contamination sources such as fuel storage, chemical storage and mixing areas, and machinery repair shops. It should also be noted that although the inventory depicts existing agricultural uses (crops grown), these are likely to undergo continual change due to normal crop rotation practices. What is irrigated farmland now may be non-irrigated farmland next year, or vice versa.

The results of the inventory were analyzed in terms of current, past, and future land uses and their relationship to the susceptible area and the supply intake. In general, land uses and PCS that are closest to the supply intake pose the greatest threat to a safe drinking water supply. Inventory results are summarized in tables 1 and 2 and are shown on figure 4.

Table 1. Potential contaminant sources (July 2002) in the Traverse City source-water area, Michigan.

Type of Potential Contaminant Source	Number of PCS	Number of PCS within the CAZ and susceptible area	Number of PCS with Direct Discharge to Grand Traverse Bay
Hazardous or Solid Waste Site Permits	39	1	--
Industrial Facilities Discharge Site Permits	2	0	1
National Priority List Sites	1	0	--
Permit Compliance System Permits	3	0	1
Toxic Release Inventory Permits	3	1	--

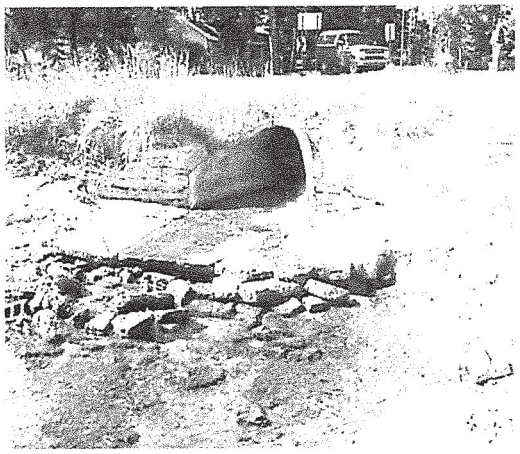
Table 2. Potential-contaminant source-inventory results (July 2002), Traverse City source-water area, Michigan

Site Name	City	ID Number	Reason for Permit	Reason for listing as Potential Contaminant Source
BORIDE PRODUCTS INC	TRAVERSE CITY	MID005518360	On-Site Storage	Hazardous or Solid Waste Site
BURWOOD PRODUCTS CO INC	TRAVERSE CITY	MID006025100		
SWANSON CHET SALES	TRAVERSE CITY	MID017420704		
TRAVERSE MOTORS BODY AND PAINT SHOP	TRAVERSE CITY	MID017420944		
MARSH BILL BUICK GMC	TRAVERSE CITY	MID017421132	On-Site Storage	Hazardous or Solid Waste Site
C-LAND EXCAVATING INC	TRAVERSE CITY	MID047146287		
VILLAGE PRESS INC	TRAVERSE CITY	MID049242076		
OLMSTED PRODUCTS CO	TRAVERSE CITY	MID049266091		
JANTEC INC	TRAVERSE CITY	MID054313358		
NISH NAH BEE INDUSTRIES INC	TRAVERSE CITY	MID060179165		
BORIDE PRODUCTS INC	TRAVERSE CITY	MID092952662		
ONE HOUR MARTINIZING	TRAVERSE CITY	MID097808125		
CENTURY SUN METAL TREATING INC	TRAVERSE CITY	MID270010408		

Site Name	City	ID Number		
Site Name	City	ID Number		
BORIDE ENGINEERED ABRASIVES	TRAVERSE CITY	MID982063307		
GRAND TRAVERSE STAMPING	TRAVERSE CITY	MID982639890		
GRAND TRAVERSE CTY DPW GARAGE	TRAVERSE CITY	MID985567148		
NISH NAH BEE PLASTICS	TRAVERSE CITY	MID985570365		
MUNSON COMMUNITY HEALTH CENTER	TRAVERSE CITY	MID985572809		
MARSH BILL CHRY PLYM DODGE	TRAVERSE CITY	MID985574474		
EMRO MARKETING 6257	TRAVERSE CITY	MID985576933		
JACKLIN STEEL SUPPLY CO	TRAVERSE CITY	MID985584523		
HARBOUR AIR INC	TRAVERSE CITY	MID985610971		
BRIAR HILL SHELL STATION	TRAVERSE CITY	MID985621895		
ALCOTEC	TRAVERSE CITY	MID985627926		
KRAUS JW	TRAVERSE CITY	MID985633007		
TWIN CITY OPTICAL CO	TRAVERSE CITY	MID985642628		
NORTHWESTERN MICHIGAN COLLEGE	TRAVERSE CITY	MID985644152		
COURTADES TRADING POST	TRAVERSE CITY	MID985653773		
TRAVERSE CITY RECORD EAGLE	TRAVERSE CITY	MID985655745		
CAMTEC INC	TRAVERSE CITY	MID985664309		
L O M CORP	TRAVERSE CITY	MIT270010333		
WATEROUS-TRAVERSE CITY IRON WORKS	TRAVERSE CITY	MIT270013030		
ORCHARD MANAGEMENT CORP	TRAVERSE CITY	MI0000361451		
DE BRUYN CONCRETE PRODUCTS	TRAVERSE CITY	MI0000384305		
GAS COMPRESSION SERVICES INC	TRAVERSE CITY	MI0000936724		
TELLUREX CORP	TRAVERSE CITY	MIR000000885		
OLMSTED PRODUCTS CO	TRAVERSE CITY	MIR000014514		
TRAVERSE CITY WFP	TRAVERSE CITY	MI0004979	Process, Treatment, and Waste Waters	Industrial Facilities Discharge Site
GRAND TRAVERSE OVERALL SUPPLY	TRAVERSE CITY	MI0038385		
WATEROUS TRAVERSE CITY GRAY IRON INC.	TRAVERSE CITY	MIT270013030	Superfund Site	National Priority List Site
EMRO-TRAVERSE CITY-MUNSON AVE	TRAVERSE CITY	MI0051608	Waste Water, Dust and Process Water	Permit Compliance System
ALCOTEC WIRE CO	TRAVERSE CITY	MI0053368		
TRAVERSE CITY WFP	TRAVERSE CITY	MI0004979		
CENTURY SUN METAL TREATING INC.	TRAVERSE CITY	MID270010408	Release or Manufacture of Toxic Compounds	Toxic Release Inventory
ALCOTEC WIRE CO.	TRAVERSE CITY	MID985627926		
NORCOM INC.	TRAVERSE CITY	MI0001489426		

Many PCS are readily identifiable because they have a single discharge point, and often a permit is required. Other PCS have diffused, poorly defined discharge locations. These are known as non-point discharges because they occur over large areas and may not be quantifiable by readily accepted methods. These non-point source discharges are difficult to identify and control, and consequently to quantify, yet they are a major source of water pollution (Carpenter and others, 1998). Non-point sources also include atmospheric deposition over water and land, and include urban, rural, and agricultural runoff from areas include atmospheric deposition over water and land, and include urban, rural, and agricultural runoff from areas such as lawns, golf courses, farm fields, pastures, parking lots, and roadways. Runoff from these areas can contain many types of pollutants including sediments, metals, organic and inorganic chemicals, viral and bacterial pathogens, pharmaceuticals, and animal

wastes. Specific nonpoint source discharges of concern in the Traverse City SWA are storm sewer outfalls from Eighth Street, Front Street and at the South Park. The discharge from Mitchell Creek also presents concerns related to agricultural, golf course, and residential runoff.



WTP Lagoon Discharge to East Bay

Eighth Street Storm Sewer Outfall to East Bay

Transportation also represents a non-point source of contamination. Trucking, railroads, and boating all transport potential contaminants through the SWA. An accident causing a spill could lead to potential contaminants entering a storm sewer, or in the case of boating, directly discharge to Grand Traverse Bay, possibly near the water intake. Non-point sources of concern to the Traverse City water supply are primarily from agriculture and livestock in the Traverse City SWA, and from industrial, commercial, and residential sources in Traverse City and surrounding communities. Volatile organic contaminants in groundwater originating from the airports also poses a potential threat as it enters the East Bay.

The U.S. Environmental Protection Agency (USEPA) has not identified any **impaired water bodies** in the Traverse City SWA on its Clean Water Act 303(d) list (MDEQ, 2001).

In general, PCS within the susceptible area pose greater risks than those outside the susceptible area. The presence of PCS within the SWA indicates potential sources of chemicals that could, if improperly managed or released, affect the water quality at the intake. A small quantity of these chemicals, in some cases a gallon or less, can significantly affect the supply. Also of concern is the location and distribution of these sources with respect to highly permeable soils. Overlaying the PCS locations and the soil permeability map for the Traverse City SWA indicates that all 48 of the located PCS are located on or very near to areas with moderate to rapidly permeable soils (fig. 2).

The SWA consists of primarily agricultural, forested, and urban land (fig. 4). The results of the PCS inventory performed for the Traverse City water supply are shown on figure 4 and are summarized as a function of PCS locations within the SWA relative to land use. Inventory results indicate that there are 48 PCS within the SWA, at least 2 of which discharge directly to Grand Traverse Bay (tables 1, 2).

Front Street Storm Sewer Discharge to East Bay

Sensitivity Analysis

Sensitivity is the natural ability of a SWA to provide protection against the contamination of the water supply intake, and includes physical attributes of lakes, rivers, and soils. The sensitivity analysis requires consideration of several different variables related to the natural environment, for example:

- Water quality history of the source.
- Distribution of moderately to highly-permeable soils.
- Amount of available water from precipitation or runoff.
- Potential for runoff to affect the intake.
- Nature of the intake, including: depth, distance from shore, age, and materials used.
- Surface water flow patterns in vicinity of intake.

To perform this analysis, USGS, MDEQ, and the operator of the Traverse City WTP collected, researched, and analyzed information from the WTP, monthly operator reports, sanitary surveys, soil maps, published reports, and historical plant operation and raw water quality data. The Michigan SWAP has three categories of sensitivity for surface water sources ranging from moderately sensitive to very highly sensitive. Analysis of this information, using guidelines provided in Brogren (1999) and Sweat and others (2000, 2002), indicates that the Traverse City intake is moderately sensitive (fig. 5). This means that the natural environment offers some limited protection against contamination of the water supply intake.

Susceptibility Determination

Susceptibility is the relative potential for contamination to reach the public water supply intake used for drinking water purposes. Whereas the sensitivity of a water supply is the natural ability of the area to protect the intake against contamination, the susceptibility determination also takes into account other factors that will affect whether a contaminant reaches the intake. Whether or not a particular drinking water source becomes contaminated depends on three factors:

(1) The distribution of PCS;
(2) The source water area; and
(3) The natural protection, or sensitivity, of the source.

In conducting a susceptibility determination, the part of the SWA that yields water to the water supply-system intake is identified by establishment of the susceptible area within the source water area. PCS within the susceptible area are then located. Based on the distribution of PCS within the susceptible area, the type of PCS, and the nature of the chemicals they use or store, PCS are analyzed for the risk they may represent to the water supply intake. Along with the presence and distribution of PCS, the sensitivity analysis is then used to determine the susceptibility of the water supply (fig. 5). This leads to a determination of whether the drinking water source is moderately susceptible, highly susceptible, or very highly susceptible to contamination (Sweat and others, *in press*). It is important to understand that a system can have low sensitivity relative to some conditions (for example, intake construction and location), and high susceptibility because of other conditions (for example, the type of PCS). In Michigan, surface water sources of drinking water range from moderately low to very-high susceptibility.

When a public water supply is determined to have a moderate, high, or very high susceptibility because of a particular condition or set of conditions, there is a significant risk of contamination of the drinking water source because of that condition or set of conditions. Although the susceptibility determination does not predict when or if contamination will actually occur, it does recognize conditions that are highly favorable for contamination of the supply. In the event of a contaminant release to soils or surface water within the susceptible area, it is very likely that contamination at the intake would occur without completion of remedial actions.

If a public water supply's drinking water source is determined to be highly susceptible, it is recommended that the system identify the condition(s) that lead to the high susceptibility. Immediate steps should be taken to protect the source, and action should be considered to remedy the condition (for example, repairing or replacing faulty intake construction, working directly with facility operators to implement sound management practices, etc.).

All water supplies, regardless of their susceptibility, should consider identified factors that could lead to higher susceptibility in the future, and should prepare a strategy to protect the water supply source. Raising public awareness through signs and other education programs, encouraging proper intake construction and the use of best management practices in existing facilities are good ways of ensuring that a surface water source maintains its moderate susceptibility rating. The Traverse City WTP intake is located far enough from shore and in deep enough water that the CAZ is 1,000 (fig. 3). The Traverse City WTP intake is considered to have moderate susceptibility to potential contamination (fig. 5).

Summary and Recommendations

The actual susceptibility of the drinking water source of a water supply depends on a number of contributing factors, some of which are only slightly related. Sensitivity is determined from the natural setting of the source and identifies the natural protection afforded to the source water. Susceptibility is determined by identifying those factors within the community's SWA that may pose a risk to the source water. The susceptibility determination provides information with respect to facilities within the SWA or land areas within the SWA that should be given greater priority and oversight in the implementation of a source water protection program.

Sensitivity Analysis: Based on criteria adopted in the Great Lakes Protocol of the Michigan Source Water Assessment Program, the offshore intake for the Traverse City water treatment plant has a moderate degree of sensitivity to potential contaminants. When considering off shore winds and shoreline influences, the Traverse City intake is categorized as moderately sensitive.

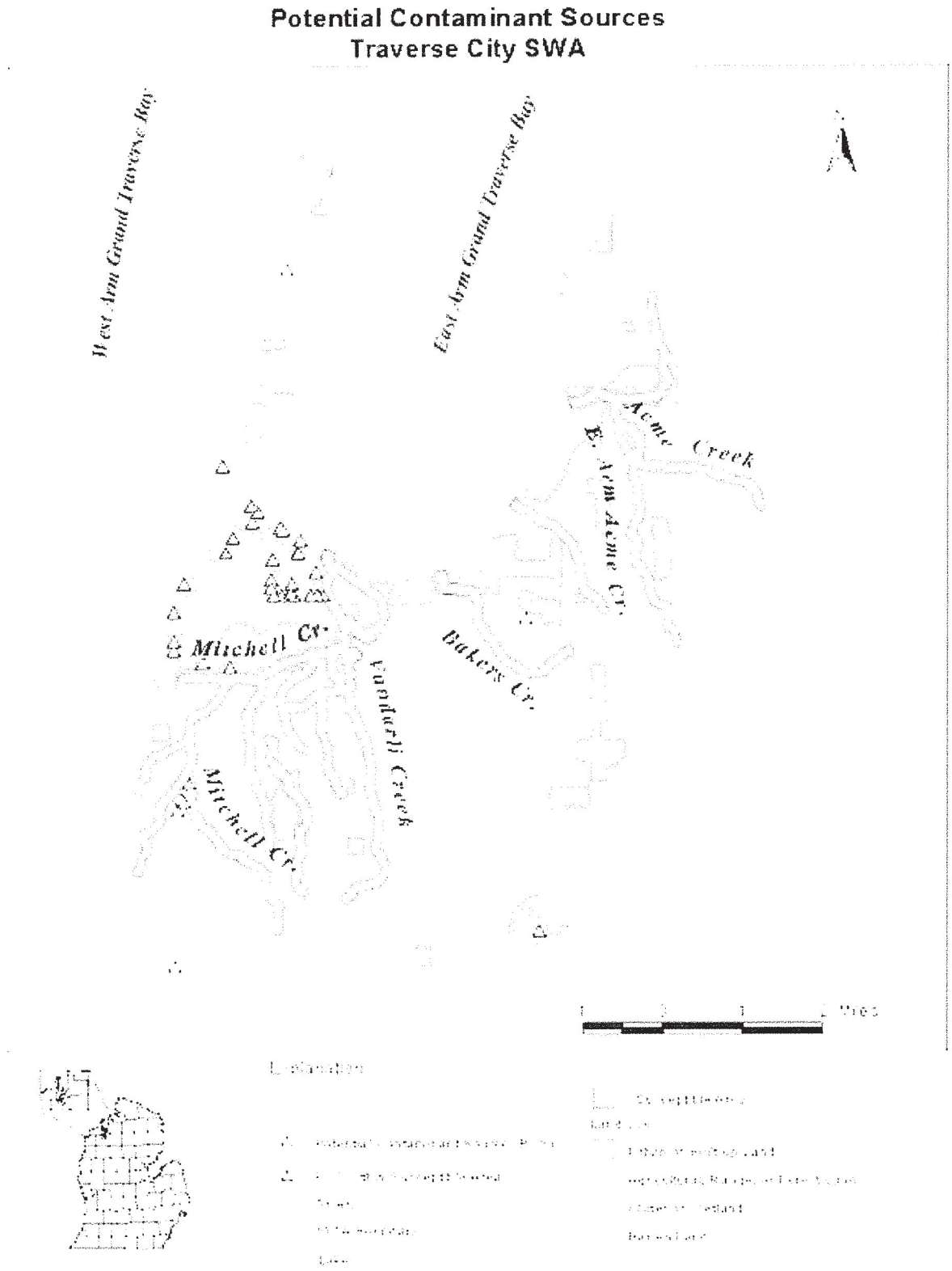


Figure 4. Contaminant Source Inventory for the Traverse City water supply, Traverse City,

Susceptibility Determination: The SWA for the Traverse City intake includes 48 listed potential contaminant sources, plus agricultural, urban, and industrial runoff from the Traverse City SWA. However, the intake is far enough from shore that the susceptible area likely doesn't influence them. The moderately sensitive intake for the Traverse City WTP has a moderate susceptibility determination (fig. 5).

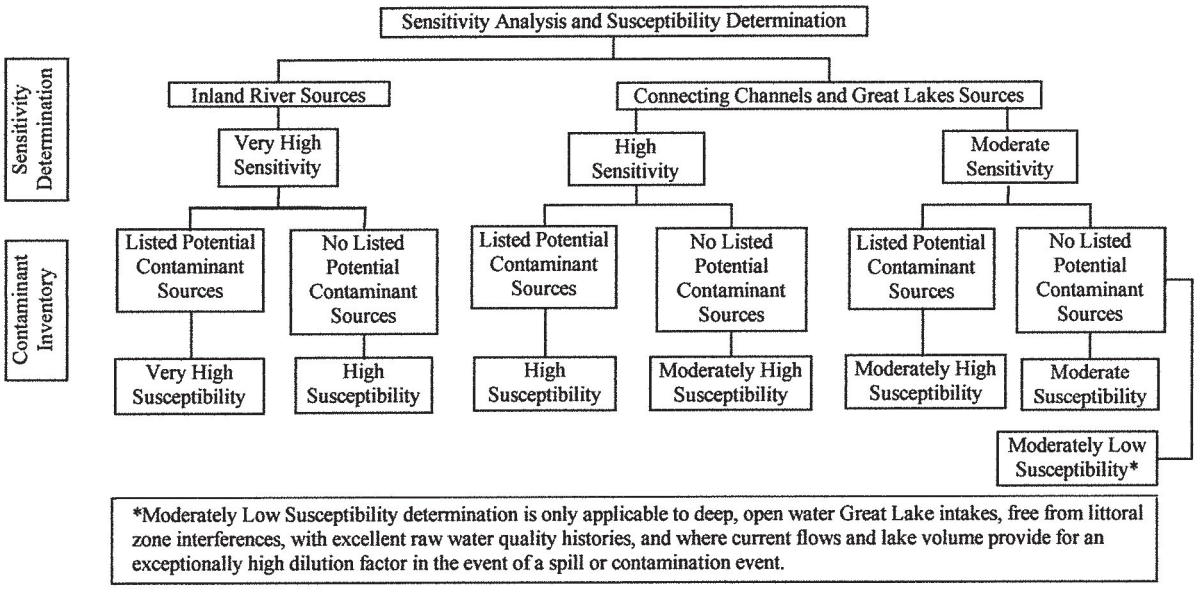


Figure 5. Surface-water source sensitivity analyses and susceptibility determination, Traverse City WTP, Michigan.

Effective Treatment: While it has been determined the Traverse City source water has moderate susceptibility to potential contamination, it is also noted the city of Traverse City water treatment plant has, historically, effectively treated this source water to meet drinking water standards. This assessment provides the WTP with a basis to institute a source water protection program as another tool to assure the continued safety of its water supply.

The results of this assessment and the recommendations based on these results are summarized as follows:

- ***Intake*** - The Traverse City Water Supply was originally constructed in the 1890s with an intake in West Bay. The current surface-water intake in East Bay was installed in 1965, and draws water ft from shore in ft of water (1935 datum), making it a moderately sensitive intake.
- ***Soils*** – Using a mean, area-weighted, depth-integrated permeability estimation, the soil and subsoil material in the SWA range from 4.63 in/hr to as much as 13.00 in/hr. The mean permeability is 7.78 in/hr (Schneider and Erickson, undated, series of 5 maps; BASINS, 1998). About half of the soils in the Traverse City SWA are rapidly permeable. At least 23 PCS are located on these soils. These factors combine to make the SWA, and thus the intake, moderately sensitive. The community should take steps to evaluate current and future land use in areas of highly permeable soils, particularly those occurring within the susceptible area. Those PCS that have been identified either on or in close proximity to these soils should be informed of the sensitive nature of the area and encouraged to adopt best management practices designed to minimize the risk of a ground release. Residential areas that have been developed on these soils should be targeted for educational programs identifying steps that residents can take to protect the water supply.
- ***Historical Contaminant Detections*** - There have been no detections of synthetic or volatile organic contaminants in the systems raw water. Inorganic contaminants are typically at lake background levels. Nitrate concentrations are routinely below the detection limit. Positive coliform bacteria detections have occurred and are probably associated with snowmelt, spring runoff, and discharge from Mitchell Creek. The periodic presence of coliform bacteria before chlorination at the intake is indicative of a relationship

between runoff and soil conditions, causing the occasional presence of bacteria at detectable levels in the source water. These factors indicate that the SWA, and thus the intake, is moderately susceptible.

- ***Sanitary Survey*** - The most recent sanitary survey is currently being drafted(Thurston, 2002). It is important that the water supply continue to follow good management practices as noted in sanitary surveys..
- ***Potential Contaminant Sources*** - A review of the PCS inventory and the moderately and highly permeable soil distribution indicates that the Traverse City SWA has at least 23 PCS located on highly permeable soils. is recommended that the community focus initially on PCS that are located on rapidly permeable soils and nearest any water bodies, as they pose the greatest potential threat to the water supply. These facilities should be made aware of free technical assistance that is available through MDEQ's pollution prevention programs. Through chemical inventory, waste reduction, and by increasing awareness of best management practices, the risk these facilities pose to source waters can be reduced. The PCS inventory indicates that the source has moderate susceptibility.
- ***Source Water Assessment*** - The Traverse City source water assessment of moderate susceptibility is based on these site-specific parameters:
  1. Definition of a Critical Assessment Zone around the intake for a source with moderate sensitivity;
  2. Definition of a SWA for the Mitchell Creek watershed and the shoreline near the intake;
  3. Wind and current patterns in Grand Traverse Bay near the Traverse City WTP intake and their effects on source water quality; and
  4. Listed and nonlisted potential contaminant sources.
- ***Source Water Protection*** – The City has initiated source water protection activities with an Industrial Pretreatment Program incorporating management plans, chemical containment, and spill response, spill response training, plus catch basin and street cleaning programs.

The Traverse City WTP and/or the community should assemble a team to assist in the development and implementation of a source water protection program that uses this assessment to further protect the Traverse City source water area.

Selected References

Blumer, S.P., Behrendt, T.E., Ellis, J.M., Minnerick, R.J., LeuVoy, R.L., and Whited, C.R., 2000, Water Resources Data Michigan Water Year 1999: Water-Data Report MI-99-1, 365 p.

Timm, D.A. and Pardini, J.J., 2002, Sanitary survey for the City of Traverse City Water Treatment Plant: Michigan Department of Public Health, unpublished sanitary survey, 162 p.

Carpenter, S.R., Caraco, N.F., Correll, D.L., Howarth, R.W., Sharpley, A.N., and Smith, V.H., 1998, Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen, Ecological Applications, 8:3, 559-568.

Lusch, D.P., Rader, C.P., Barrett, L.R., and Rader, N.K., 1992, Aquifer vulnerability to surface contamination in Michigan: Center for Remote Sensing and Department of Geography, Michigan State University, East Lansing, MI, scale 1:1,500,000.

Martin, H.M., 1955, Map of the surface formations of the southern peninsula of Michigan: Michigan Geological Survey, Department of Conservation, Publication 49, scale 1:500,000, 2 sheets.

Michigan Department of Environmental Quality, 1999, State of Michigan Source Water Assessment Program, 153 p.

Michigan Department of Environmental Quality, 2001. Great Lakes and Environmental Assessment Section. Online at . Last updated, July 05, 2001.

Miller, J.B. and Twenter, F.R., 1986, Michigan surface-water resources, *in* U.S. Geological Survey, National Water Summary 1985—hydrologic events and surface-water resources: U.S. Geological Survey Water-Supply Paper 2300, p. 277-284.

Milstein, R.L., compiler, 1987, Michigan sesquicentennial, 1837-1987, bedrock geology of southern Michigan: Michigan Department of Natural Resources, Geological Survey Division, scale 1:500,000.

National Oceanic and Atmospheric Administration, 1999, Climatological Data, Michigan: U.S. Department of Commerce, 113:13.

Rheaume, S.J., 1991, Hydrologic provinces of Michigan: U.S. Geological Survey Water-Resources Investigation Report 91-4120, 73 p., 1 plate, scale 1:500,000.

Sweat, M.J., Erickson, P.M., and Brogren, B.B., 2000, The Michigan Source Water Assessment Program for Evaluation of Public Surface Water Supplies, in Bryant, Jeff, ed., NWQMC National Monitoring Conference 2000: Monitoring for the Millennium, Austin, TX, April 25-27, 2000.

Sweat, M.J., Brogren, B.B., Loerop, M.W., Jodoin, R.S., and Rossi, T.A., 2002, Michigan's Source Water Assessment Program—Surface-Assessments Leading to Protection Initiatives, *in*, Watershed 2002, Proceedings of Watershed 2002, February 24-27, 2002, Fort Lauderdale, Florida, USA, 1 compact disc.

Sweat, M.J., Brogren, B.B., Jodoin, R.S., and Rossi, T.A., *in press*, The Michigan Source Water Assessment Program – methods for the evaluation of public surface water supplies: U.S. Geological Survey Water-Resources Investigations Report 2001-xxxx.

U.S. Department of Agriculture, 1966, Soil survey of Grand Traverse County, Michigan: 141 p., 92 sheets.

U.S. Environmental Protection Agency, 1998, Better assessment science integrating point and nonpoint sources: BASINS Version 2.01. EPA 823-B-98-006, variably numbered.

-----, 2001, Lake Michigan Mass Balance Study web site, URL http://www.epa.gov/glnpo/lmmb/pubs.html accessed April 13, 2001.

U.S. Geological Survey, 1974, Hydrologic unit map—1974, State of Michigan: scale 1:500,000, 2 sheets.

-----, 1982, Codes for the identification of hydrologic units in the United States and the Caribbean outlying areas: U.S. Geological Survey Circular 878-A, 115 p.

GLOSSARY

Critical Assessment Zone (CAZ) – the area from the intake structure to the shoreline and inland, including a triangular water surface and a land area encompassed by an arc from the endpoint of the shoreline distance on either side of the on shore intake pipe location

Geographic Information System (GIS) – a system to capture, store, update, manipulate, analyze, and display all forms of geographically referenced information

Impaired water bodies – As defined by USEPA and Clean Water Act 303(d) list

Intake – the point at which source (raw) water is drawn into a pipe to be delivered to a water treatment plant

Lignins – an amorphous, cellulose-like, organic substance that acts as a binder for the cellulose fibers in wood and adds strength and stiffness to cell walls

Maximum Contaminant Level (MCL) – the maximum permissible level of a contaminant in water that is delivered to any user of a public water system

Potential Contaminant Sources (PCS) – listed and non-listed agricultural sites, businesses, and industries that have the potential to cause contaminants to be introduced into source water

Sensitivity – a measure of the physical attributes of the source area and how readily they protect the intake from contaminants

Source – the water body from which a water supplier gets its water

Source Water Area (SWA) – the land and water area upstream of an intake that has the potential to directly influence the quality of the water at the intake

Source Water Assessment Program (SWAP)– in Michigan, the process defined by the state Department of Environmental Quality to complete assessments of all the state's public water supplies

Susceptibility – the Susceptibility identifies factors that may pose a risk within the community's source water area

Susceptible Area – the area defined by the critical assessment zone and a buffer on either side of any drainages that contribute water to an intake

Synthetic Organic Contaminants (SOC) – Manmade organic chemical compounds such as pesticides, etc.

Tannins – naturally occurring phenolic compounds that precipitate proteins, alkaloids, and glucosides from solution that has a yellowish appearance

Volatile Organic Contaminants (VOC) – Unnatural, volatile organic chemical compounds such as gasoline components, solvents, degreasers, etc.

Appendix C

Coastal Watershed Plan

THE PURPOSE. THE PLAN.

P

PROTECTING THE QUALITY OF LIFE

The prevailing opinion among experts is that the water quality in Grand Traverse Bay is excellent. The bay is typical of other oligotrophic embayments in the Great Lakes; deep, clear, and cold with an overall low productivity. However, there are several potential threats to water quality, with localized areas of pollution, both in the bay and its watershed.

THE PLAN AND IMPLEMENTATION STRATEGIES

The intent of the Coastal Grand Traverse Bay Watershed Plan is to assist area watershed groups, lake associations, local governments, volunteer groups, and many others in making sound decisions to help improve and protect water quality in their area. The plan summarizes existing water quality conditions in and around the bay while also outlining the major watershed pollutants and giving recommendations on how to reduce the impact and amount of pollution entering the system. Specific and tangible actions and recommendations were developed based on the prioritization of watershed pollutants, sources, and causes while also looking at the priority and critical areas in the watershed.

EVALUATION AND OVERSIGHT

An evaluation strategy will be utilized to measure progress during the implementation of the Coastal Grand Traverse Bay Watershed Plan to determine whether water quality is improving. The first aspect of the evaluation strategy measures how well the watershed plan is being implemented and whether project milestones are being met. The second aspect will evaluate water quality protection efforts.

TIMELINE

Implementation of the coastal watershed plan is spread out over ten years and will be evaluated for its success in 2030. Throughout that time, The Watershed Center and other partners will continue to strengthen existing relationships with various groups throughout the watershed. Funding sources will be pursued to implement recommendations made in the watershed plan.

WATERSHED CHARACTERISTICS

The coastal Grand Traverse Bay watershed includes subwatershed areas of Mitchell, Tobeco, Acme, and Yuba creeks, as well as areas along east and west Grand Traverse Bay and Old Mission Peninsula totaling 190 square miles. The coastal watershed area encompasses 7 lakes, 6 major rivers/creeks, and more than 100 additional small streams entering the bay. Most of the streams and rivers in this watershed are designated trout streams, with Tobeco Creek being the largest creek not classified as a cold water trout stream.

There are several areas of state-owned and other public land in the coastal watershed area. This large amount of publicly owned land provides significant recreational opportunities, attracts thousands of visitors each year, and adds to the highly cherished quality of life that makes this area such a desirable place to live and visit.

There are 11 townships and 4 municipalities located along the shoreline of Grand Traverse Bay that deal with Great Lakes shoreline issues and other watershed concerns. Since the watershed crosses so many political boundaries, it is important for local governments to know and understand watershed boundaries and to plan on a watershed scale with neighboring townships and municipalities.

UNIQUE ATTRIBUTES OF GRAND TRAVERSE BAY

WETLANDS — Wetlands are a vital part of the coastal ecosystem and perform important ecological functions like flood storage, pollutant filtration, and habitat for fish and wildlife. In the coastal Grand Traverse Bay watershed, the most wetlands (by percentage) are found in the East Bay Shoreline subwatershed (~20% of its area). Other subwatersheds with significant amounts of wetlands are Yuba, Tobeco, and Mitchell. A wetland loss analysis for the coastal watershed areas along Grand Traverse Bay shows a 38% wetland loss since pre-settlement times (from 19,005 acres to just over 7,000 acres). However, some subwatersheds have experienced more substantial wetland losses compared to their watershed size – both Acme Creek and Old Mission Peninsula subwatersheds have lost over half of their pre-settlement wetlands, with East Bay Shoreline, Mitchell Creek, and Yuba Creek at just under a 50% loss.

GRAND TRAVERSE BAY COASTAL WATERSHED WETLAND LOSS ANALYSIS

SUBWATERSHED	LOSS
West Bay Shoreline	29%
East Bay Shoreline	42%
Mitchell Creek	45%
Yuba Creek	48%
Tobeco Creek	25%
Acme Creek	52%
Old Mission Peninsula	53%
TOTAL	38%

FLUCTUATING WATER LEVELS IN THE GREAT LAKES — Grand Traverse Bay is part of Lake Michigan and the Great Lakes ecosystem. Water levels in the Great Lakes naturally fluctuate daily, seasonally, and annually and are primarily affected by evaporation, surface runoff, and precipitation. Short-term water level fluctuations in the Great Lakes are due to changes in barometric pressure and winds. Long-term annual variation of Great Lakes water levels occurs over consecutive years and depends on climatic conditions. Due to fluctuating water levels, the shoreline of the Great Lakes is considered a dynamic and quickly changing environment. Wave action, storms, wind, ground water seepage, surface water runoff, and frost are contributing factors to changing and reshaping the shoreline.

WATERSHED POLLUTANTS, SOURCES, AND CAUSES

Numerous watershed pollutants and their sources of water quality decline in the coastal Grand Traverse Bay watershed have been identified.

MAJOR POLLUTANTS

- Changes to hydrologic flow
- Loss of habitat
- Nutrients
- Sediment
- Invasive species
- Pathogens
- Thermal pollution
- Toxic substances (oils, gas, pesticides, pharmaceuticals)

PRIORITY SOURCES AND CAUSES

- Road stream crossings
- Streambank and shoreline erosion
- Stormwater
- Reduction of wetlands
- Lack of riparian buffers/streamside canopy
- Septic systems
- Lack of ordinances to protect water quality and natural resources
- Increased development in sensitive areas

**Note: the top two stressors affecting the waters of Grand Traverse Bay are invasive species and toxic substances (specifically emerging contaminants like microplastics, PFAS, and pharmaceuticals). Additionally, elevated nutrients in the nearshore area may cause localized problems in the bay.

THE WATERSHED. THE VISION.

W

WATERSHED

EVERYDAY WAYS YOU CAN PROTECT THE COASTAL WATERSHED

- Properly operate and maintain your septic system, including regular pumping and inspections.
- Establish a buffer of native plants between your lawn and the water to absorb pollutants from runoff, prevent shoreline erosion, and provide fish and wildlife habitat.
- Only fertilize your lawn if tests show you need it.
- To help reduce *E. coli* bacteria, don't feed waterfowl and put pet waste in the trash immediately.
- Put all litter, including cigarette butts, in the trash.
- Clean and drain your boat after leaving every water body to prevent spreading invasive species.
- Do not dump motor oil, litter, or cigarettes in storm drains.
- Direct runoff from your property onto vegetated areas instead of onto your driveway or the street.
- Avoid using coal tar-based sealants to coat your driveway and parking areas and instead look for less toxic asphalt-based products for sealing surfaces.
- Check local government meeting agendas to stay up to date on decisions and policies that may affect your area.

Get involved by visiting gtbay.org for updates on the Coastal Grand Traverse Bay Watershed Plan.

This project has been funded by Michigan Department of Environment, Great Lakes, and Energy's Nonpoint Source Program using Watershed Council Support funds.

EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

WE PROTECT WHAT YOU LOVE

C

COASTAL WATERSHED PLAN

WATERSHED GOALS

The goal for the Coastal Grand Traverse Bay Watershed Plan is to provide guidance for the implementation of actions that will reduce the negative impact that pollutants and environmental stressors have on the designated watershed uses in the coastal watershed area. Seven specific goals were developed to work in conjunction with those identified in the companion watershed plans for the Boardman River and Elk River Chain of Lakes subwatersheds.

1. **Protect the integrity of aquatic and terrestrial ecosystems.**
2. **Protect and improve water quality.**
3. **Establish and promote land and water management practices that conserve or protect natural resources.**
4. **Encourage and support a sustainable local economy with diverse recreational and commercial opportunities that are compatible with a healthy watershed.**
5. **Develop and maintain effective education and outreach efforts to support watershed protection.**
6. **Protect the distinctive character, cultural heritage, and aesthetic qualities of the watershed.**
7. **Integrate climate-resilient practices and efforts throughout the watershed.**

COASTAL WATERSHED

132 miles of Lake Michigan shoreline

10 miles at its widest point

32 miles to its base in Traverse City

The Watershed Center Grand Traverse Bay
13170 S. West Bay Shore Drive, Suite 102
Traverse City, MI 49684
231.935.1514 | info@gtbay.org

Protecting and enhancing the quality of our watershed is critical to our region's future. The Coastal Grand Traverse Bay Watershed Plan is a 10-year strategy for the management of this valuable resource.

R
RESTORATION

THE COASTAL WATERSHED

CRITICAL AREAS FOR RESTORATION

1 **Critical Concerns:** Areas of bacterial impairment
Location: Mitchell Creek, Grand Traverse County; Mitchell Creek, Antrim County; Northport Creek

2 **Critical Concerns:** Urban sprawl
Location: Zones directly east and west of Traverse City, downstream portion of the Mitchell Creek subwatershed, Acme Township area

3 **Critical Concerns:** Severe road stream crossings
Location: Various throughout watershed

4 **Critical Concerns:** High risk erosion areas
Location: Various locations along bay shoreline (identified by EGLE)

5 **Critical Concerns:** Areas of wetland development pressure
Location: Various throughout watershed (close to urban areas where commercial development is happening and prime real estate along the bay where there is an increased demand for residential homes)

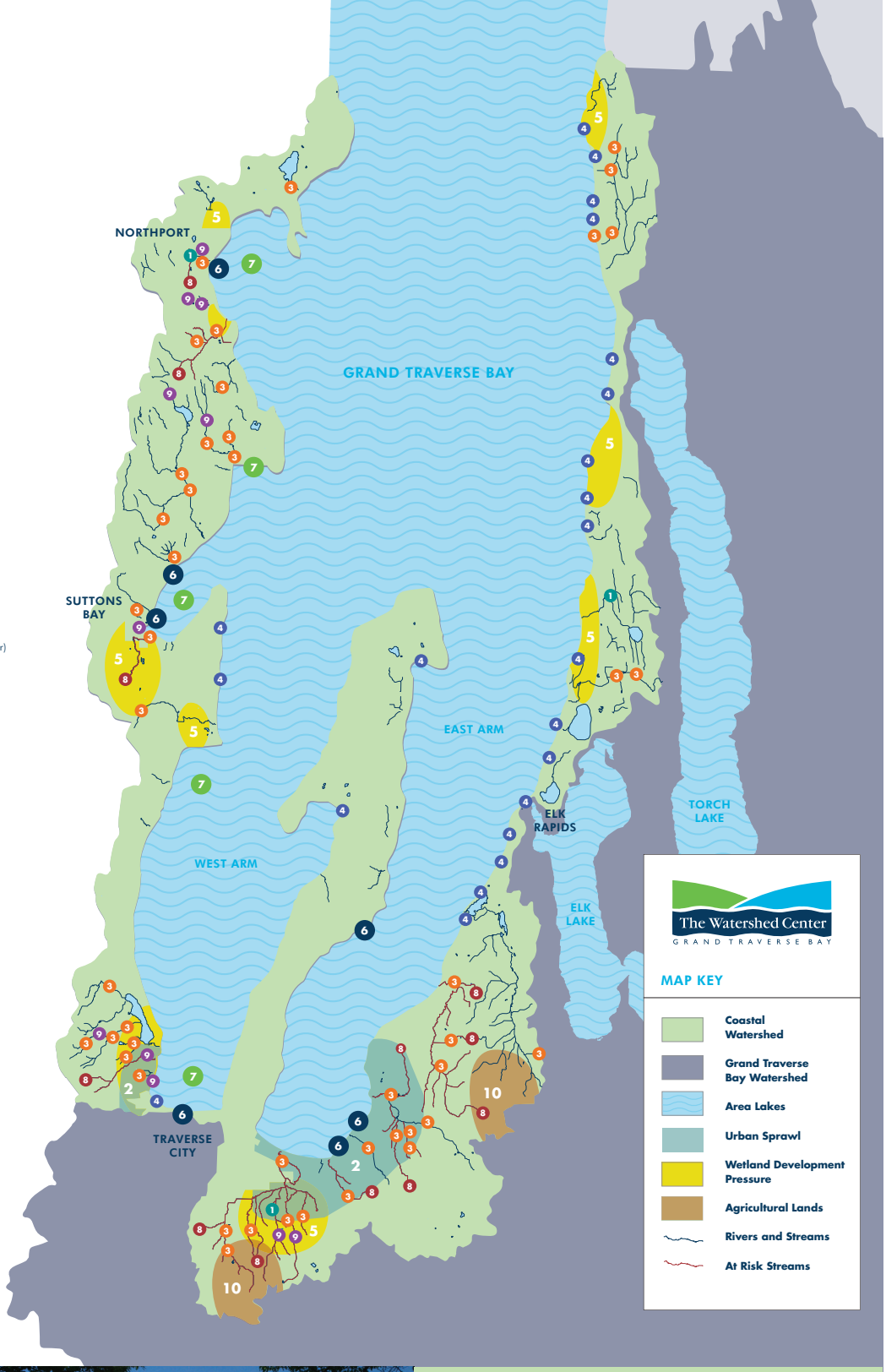
6 **Critical Concerns:** Areas of coastal infrastructure challenges (due to high water)
Location: Various locations along bay shoreline, near Traverse City

7 **Critical Concerns:** Macrophyte bed clusters (Grand Traverse Bay)
Location: Northport, Omena, and Suttons bays; Lee Point; southern end of west Grand Traverse Bay

8 **Critical Concerns:** Compromised at-risk streams
Location: Northport, Ennis, Leo, Waterwheel, Brewery, Mitchell, Acme, Baker, and Yuba creeks

9 **Critical Concerns:** Small dam locations
Location: Various throughout watershed

10 **Critical Concerns:** Agricultural lands
Location: Tobeco Creek and Mitchell Creek headwater areas



CRITICAL AND PRIORITY AREAS

Several areas in the coastal Grand Traverse Bay watershed were identified for protection or restoration activities. Recommendations were aimed at protecting land from future development or protecting water quality from future potential impairment. Locations for these actions were placed into either **Priority Areas** (for protective actions) or **Critical Areas** (for restoration actions).

PRIORITY AREAS FOR PROTECTION

Priority areas are those that are particularly vulnerable to degradation or development pressure and should be protected from future harm. One of the best strategies for protecting priority areas is through the purchase/donation of land or the establishment of conservation easements.

General: critical dunes, undeveloped parcels along Grand Traverse Bay shoreline, headwaters of Acme Creek and Cedar Lake, wetlands, and Grand Traverse Bay spawning reefs
Specific: local land conservancies identified parcels of land as priorities for their land protection efforts

CRITICAL AREAS FOR RESTORATION

Critical areas are those in need of restoration that are contributing a significant amount of pollutants to the watershed (currently or in the future).

General:
- Grand Traverse Bay shoreline
- Riparian corridors (areas within 100 feet of bodies of water)
- City and village centers

There are several areas in the coastal watershed where various specific critical areas are clustered and overlap. These include areas surrounding Mitchell Creek (Grand Traverse County), Cedar Lake/Creek area just north of Traverse City, Suttons Bay area and south, and the Village of Northport. Special care should be taken for these areas and they should be prioritized for restoration activities.

IMPAIRMENTS

There are three waterbodies in the coastal Grand Traverse Bay watershed that are on the State's Impaired Waters List due to elevated bacteria *(E. coli)* levels. Coincidentally, two are named Mitchell Creek – one in Grand Traverse County and the other in Antrim County. The third is Northport Creek in Leelanau County. Sources and causes of these impairments are unknown at this time. In 2021, The Watershed Center began microbial source tracking studies in Mitchell Creek in Grand Traverse County. Surface water and groundwater testing for *E. coli* and other genetic markers is being conducted at various locations along Mitchell Creek to determine the source of bacterial contamination.

TO DO LIST

Priority work that should be conducted over the next several years is as follows, in no particular order:

- Streambank and shoreline erosion stabilization projects
- Establish riparian buffers in priority areas
- Install green infrastructure and other stormwater best management practices in urban areas to reduce stormwater runoff
- Road crossing improvements using best management practices
- Assist with developing or revising Master Plans and Zoning Ordinances to include more water quality protection, including stormwater ordinances
- Continue successful initiatives by local conservancies to preserve open space and wildlife corridors
- Implement measures to reduce bacteria contamination of local waters
- Wetland assessment, restoration, and protection
- Continue tracking the introduction and spread of invasive species and implement programs to reduce and eliminate their spread
- Continue developing Conservation Plans for farms
- Continue priority monitoring programs
- Continue outreach and education efforts

Costs for implementing all the tasks noted in the plan total more than $34 million, with the most expensive tasks in the categories containing stormwater management, road stream crossings, and septic systems. Outreach costs are much less at just over $2 million.

Appendix D

Contaminant Source Inventory

Contaminant Source Inventory

Map ID	Name	Address	City/Township	Why it is a Potential Source	Source of Information	Risk Rating	Comments
1	True North #251	708 MUNSON AVE	EAST BAY TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	5	Also RCRA, still active. Many BEAs.
2	United 6257	752 MUNSON AVE	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	5	restrictive covenant. Also RCRA.
3	Briar Hill Shell	488 MUNSON AVE	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	5	restrictive covenant, RCRA, BEAs
4	NW Michigan College Main Campus	1701 E FRONT ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	5	restrictive covenant, also RCRA site
5	Total Petroleum, Traverse City	896 MUNSON AVE	EAST BAY TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	4	Restrictive covenant. Not Active, RCRA.
6	Traverse Bay Area Career Tech. Center	880 PARSONS RD	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	6	Not active, also RCRA
7	Former Fed Ex Bldg	2510 AERO PARK DR	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	4	
8	East Bay Elementary School	3962 3 MILE RD	EAST BAY TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	4	
9	Cherry Capital Storage (Harbour Air)	960 AIRPORT ACCESS RD	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	4	Not active, BEA 00016081-BEA-1
10	Winchester Aviation	CHERRY CAPITAL AIRPORT	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
11	Northwest Airlines	CHERRY CAPITAL AIRPORT	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
12	Traverse City Leasing, Inc.	2050 STULTZ DR	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	Also RCRA site
13	National Car Rental	1330 CHERRY CAPITOL AIRPORT	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
14	Farmers Petroleum	911 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	Not active, RCRA, BEA
15	W Basch & Sons Inc	934 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	Not active
16	Coca Cola Distributing	1031 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
17	Michcon, Traverse City Facility	1011 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	Also RCRA
18	Trans Air	AIRPORT ACCESS B	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
19	Donald F. Lynch	1145 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - CLOSED	DATABASE SEARCH	3	
20	Peninsula Fire Department	8150 CENTER RD	PENINSULA TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	3	Not active.
21	East Bay Harbor Co	5517 US 31	ACME TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	3	
22	Total Petroleum, Acme	5980 N US-31	ACME TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	3	restrictive covenant. Still Active, had BEA
23	Mcdonald Dairy	325 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	3	
24	Ups, Traverse City	300 CONTINENTAL DR	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	
25	Newman Display Service	926 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Not active
26	Belanger, Cletus	2710 4 MILE RD	EAST BAY TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	
27	Roy's General Store	963 HAMMOND RD	EAST BAY TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Still active, RCRA, Restrictive covenant
28	Gt Resort Golf & Grounds Bldg	6751 LAUTNER 6300 US 31	ACME TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Also RCRA
29	Acme Airport	5486 LAUTNER RD	ACME TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	
30	Ups, Hammond Rd.	1189 HAMMOND RD	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Also a RCRA site
31	Mascotech Hughes Drive	280 HUGHES DR	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Notice of Corrective Action. Also RCRA
32	Te Technology, Inc	1590 KEANE DR	GARFIELD TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	2	Also RCRA and had a BEA
33	Kroupa's Inc.	11586 CENTER ROAD	PENINSULA TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	1	
34	Morrisons Inc	10800 BATES RD	ACME TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	1	
35	Watson Estate	14102 CENTER RD	PENINSULA TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	1	
36	Bower's Boat Works	16961 CENTER RD	PENINSULA TOWNSHIP	LUST - CLOSED	DATABASE SEARCH	1	
37	Stevens Property	886 MUNSON AVE	EAST BAY TOWNSHIP	LUST - OPEN	DATABASE SEARCH	6	Active site. BEAs.
38	Marathon Oil, 4-mile	2014 N US HIGHWAY 31	EAST BAY TOWNSHIP	LUST - OPEN	DATABASE SEARCH	5	Also RCRA site
39	Michigan Bell Traverse City Garage	941 HASTINGS ST	CITY OF TRAVERSE CITY	LUST - OPEN	DATABASE SEARCH	4	Active, also RCRA
40	G.j.'s Party Store	2700 HOLIDAY HILLS RD	ACME TOWNSHIP	LUST - OPEN	DATABASE SEARCH	4	
41	True North #258	5927 US 31	ACME TOWNSHIP	LUST - OPEN	DATABASE SEARCH	3	restrictive covenant. Still Active, had BEA
42	C-land Excavation	767 DUELL RD	GARFIELD TOWNSHIP	LUST - OPEN	DATABASE SEARCH	3	Not Active. Also RCRA.
43	Gilbert Oil, Airport Rd.	1025 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	LUST - OPEN	DATABASE SEARCH	3	Multiple BEAs
44	True North #259	7600 M72 E WILLIAMSBURG	ACME TOWNSHIP	LUST - OPEN	DATABASE SEARCH	2	Still active.
45	Seeleys Garage	8227 OLD M 72	WHITE WATER TOWNSHIP	LUST - OPEN	DATABASE SEARCH	1	Still Active
46	Podleski Mobil	8451 OLD M-72	WHITE WATER TOWNSHIP	LUST - OPEN	DATABASE SEARCH	1	Not active.

Contaminant Source Inventory

Map ID	Name	Address	City/Township	Why it is a Potential Source	Source of Information	Risk Rating	Comments
47	Mollys By-golly	14091 CENTER RD	PENINSULA TOWNSHIP	LUST - OPEN	DATABASE SEARCH	1	OPEN LUST
48	Grand Traverse Parasail	1469 US-31	EAST BAY TOWNSHIP	MARINA	WHPT	6	
49	TC Watersports	1773 US-31 NORTH	EAST BAY TOWNSHIP	MARINA	WHPT	5	
50	Blue Sky Rentals	1995 US 31 NORTH	EAST BAY TOWNSHIP	MARINA	WHPT	5	
51	United States Coast Guard Air Station	1169 AIRPORT ACCESS ROAD	CITY OF TRAVERSE CITY	MPART	DATABASE SEARCH	6	Part 201 (Asbestos; PCE; TCE), LUST, RCRA Site
52	Cherry Capital Airport	727 FLY DON'T DRIVE	CITY OF TRAVERSE CITY	MPART	DATABASE SEARCH	6	Part 201 (Ethylene glycol; Xylenes; Jet-A fuel), LUST,
53	Key II Industrial Building	603 BRIDGE ST.	ELK RAPIDS TOWNSHIP	MPART	DATABASE SEARCH	1	
54	Kennametal	2879 AERO PARK DRIVE	CITY OF TRAVERSE CITY	NPDES	DATABASE SEARCH	3	ACTIVE, TO MITCHELL CREEK. Also RCRA
55	Traverse City Wfp	2010 EASTERN AVE.	CITY OF TRAVERSE CITY	NPDES	DATABASE SEARCH	2	BACKWASH PONDS TO EAST BAY, also RCRA
56	Briar Hill Motel	461 MUNSON AVE	CITY OF TRAVERSE CITY	PART 201	DATABASE SEARCH	3	Not a source per Smits. Change Severity
57	East Bay Plaza-One Hour Martinizing	726 MUNSON AVENUE	CITY OF TRAVERSE CITY	PART 201	DATABASE SEARCH	4	Dry Cleaning, also RCRA, PCE
58	Burwood Products (former)	807 AIRPORT ACCESS RD	CITY OF TRAVERSE CITY	PART 201	DATABASE SEARCH	6	Furniture & Fixtures. RCRA, many BEAs
59	Avenue E Ground Water	NORTH OF PARSONS RD & AVE E	CITY OF TRAVERSE CITY	PART 201	DATABASE SEARCH	6	Private Households, PCE; TCE
60	Pine Grove Subdivision	EAST BAY TOWNSHIP	CITY OF TRAVERSE CITY	PART 201	DATABASE SEARCH	6	Elementary/Secondary Schools, PCE; TCE
61	Holiday Road Res. Well	2690 HOLIDAY HILLS	ACME TOWNSHIP	PART 201	DATABASE SEARCH	5	Private Households
62	Mavety Oil (Former)	1719-1725 GARFIELD AVENUE	GARFIELD TOWNSHIP	PART 201	DATABASE SEARCH	4	Petroleum Bulk Stations & Term
63	Traverse City Gray Iron	2475 NORTH AERO PARK DRIVE	EAST BAY TOWNSHIP	PART 201	DATABASE SEARCH	4	Gray Iron Foundries
64	Cherryland Mobile Home Park	3011 N GARFIELD ROAD	GARFIELD TOWNSHIP	PART 201	DATABASE SEARCH	3	Private Households
65	Gray and Co	YUBA ROAD OFF U.S.31 NORTH	ACME TOWNSHIP	PART 201	DATABASE SEARCH	2	Food & Kindred Products
66	Kroupas Inc	11586 CENTER RD	PENINSULA TOWNSHIP	PART 201	DATABASE SEARCH	2	Food & Kindred Products
67	Williamsburg Receiving and Storage	8055 ANGELL ROAD	WHITE WATER TOWNSHIP	PART 201	DATABASE SEARCH	1	Agricultural Production-Crops
68	11590 US-31	11590 US-31	ELK RAPIDS TOWNSHIP	PART 201	DATABASE SEARCH	1	Agricultural Chemicals
69	Gray and Co	YUBA ROAD OFF U.S.31 NORTH	ACME TOWNSHIP	PART 201	DATABASE SEARCH	2	Food & Kindred Products
70	Munson Community Health Center	550 MUNSON AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	3	
71	Mi Dept/Transportation	US-31 OVER BOARDMAN RIVER	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	3	
72	Olson Auto Body Inc	713 PARSONS RD	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
73	Orchard Management Corp	360 E MC KINLEY RD	PENINSULA TOWNSHIP	RCRA	DATABASE SEARCH	2	
74	Waterous Traverse City Gray Iron, Inc.	2455 AERO PARK DRIVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	Two BEAs
75	I And W Industries Llc	2440 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
76	Trantek Inc	2470 N AERO PARK CT	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
77	Us Dept/Defense	901 AIRPORT ACCESS RD	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	6	
78	Northern Michigan Pediatric Dentistry	1241 E 8TH ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
79	Natural Gas Compression Systems Inc	2480 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	also listed as Nish Nah Bee Plastics
80	Quest Integrated Llc	1023 BUSINESS PARK DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
81	Harbor Optical Inc	1051 BUSINESS PARK DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
82	Pencon Inc	1125 BUSINESS PARK DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
83	R M Young Co	2801 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
84	Olmsted Products Co	1128 BUSINESS PARK DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
85	Village Press Inc	2779 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
86	Alcotec Wire Corp	2750 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
87	D.H. Baker Dental Laboratory	2531 AERO PARK DRIVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
88	Century Sun Metals	2411 W AERO PARK CT	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
89	Cpm Acquisition Corp	2412 W AERO PARK CT	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
90	National Vacuum Equipment Inc	2670 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
91	Twin City Optical Co	2323 W AERO PARK CT	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
92	Boride Engineered Abrasives	2615 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	

Contaminant Source Inventory

Map ID	Name	Address	City/Township	Why it is a Potential Source	Source of Information	Risk Rating	Comments
93	Century Inc	2301 W AERO PARK CT	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	Had a BEA
94	Michigan Blood	2575 AERO PARK DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
95	Air Services Inc	1100 AIRPORT ACCESS RD	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	Had BEA
96	Walgreen Co	2350 N. US HIGHWAY 31 N.	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
97	One Aqua Source Inc	3851 N 4 MILE RD	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
98	Harbor Freight Tools Usa Inc	2433 N US HWY 31 S	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
99	Harbour Air	1150 AIRPORT ACCESS ROAD	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
100	Corcoran Laboratories Inc	1301 BUSINESS PARK DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
101	Hdr Small Engine Repair	905 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
102	Northflight Inc	1840 STULTS DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
103	Northwest Airlines Inc	1330 AIRPORT ACCESS RD	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
104	Dte Gas Company	1011 HASTINGS	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
105	Davis Electric Inc	1131 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
106	Sittam Llc	1050 S GARFIELD AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
107	David Webster Construction Inc	1147 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
108	Acme Coin Laundry And Dry Cleaner	3593 BUNKER HILL RD	ACME TOWNSHIP	RCRA	DATABASE SEARCH	2	
109	Baum Enterprises Llc	1159 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
110	Grand Traverse Technologies Inc	1167 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
111	Coherent Inc	3340 PARKLAND CT	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
112	Olesons Land Co Llc	1105 S GARFIELD AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
113	Grand Traverse Machine Co	1247 BOON ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
114	Family Dollar Stores	1127 S GARFIELD AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	2	
115	Tellurex Corporation	1462 INTERNATIONAL DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
116	Opti Temp Inc	1500 INTERNATIONAL DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	2	
117	North Flight Inc	1237 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
118	Tellurex Corporation	1248 HASTINGS ST	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
119	Maxal International Inc	1631 INTERNATIONAL DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
120	The Sherwin Williams Co	1204 S GARFIELD AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
121	Paint Spot	1238 S GARFIELD AVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
122	Enterprise Leasing Co Of Detroit Llc	727 FLY DONT DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
123	Traverse City Cherry Capital Airport	727 FLY DONT DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
124	Unifi Aviation Llc	727 FLY DONT DRIVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
125	Serra Toyota Of Traverse City	1301 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
126	Marsh Bill Chry Plym Dodge	1302 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
127	Traverse City Auto Plaza	1302 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
128	Costco Wholesale Corporation	125 E SOUTH AIRPORT RD	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
129	Napleton Motor Cars Llc	6060 US HIGHWAY 31 N	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	also listed as Tc Imports Llc
130	Lls Properties Llc	6231 US HIGHWAY 31 N	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
131	Sears Appliance Rpr Ctr	345 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
132	Arms & Cole Inc	363 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	Had a BEA
133	Crm Inc	495 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
134	Northern Auto Service Inc	501 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
135	K-Mart # 3720	6455 US-31 NORTH	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
136	Kitchen Choreography Llc	3171 CONTINENTAL DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
137	Nevis Energy Services Inc	327 E WELCH CT	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
138	Lobo Signs Inc	322 E WELCH CT	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	

Contaminant Source Inventory

Map ID	Name	Address	City/Township	Why it is a Potential Source	Source of Information	Risk Rating	Comments
139	Mi Dept/Agriculture	361 EAST WELCH COURT	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
140	Bill Marsh Motors Inc	1621 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
141	Traverse Nail Co Inc	340 CONTINENTAL DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
142	Mitchell Creek Development Llc	2846 N 3 MILE RD	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
143	Bill Marsh Chrysler	1655 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
144	Penske Auto Center	1712 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
145	Gerber Collision & Glass	797 S AIPRORT ROAD W	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
146	Cummins Bridgeway Llc	863 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
147	Robinsons Auto Body & Restorations Inc	880 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
148	Northwood Paint & Supply	1721 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
149	Nes Equipment Services Corporation	765 DUELL RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
150	Serra Traverse City Llc	1747 S GARFIELD AVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
151	Walgreen Co.	975 W. SOUTH AIRPORT RD.	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
152	Jw Kraus Inc	950 DUELL RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
153	De Bruyn Concrete Products	3077 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
154	Big Lots Stores Inc	1144 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
155	Cherryland Center	1150 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
156	Northwoods Landscaping	3066 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
157	Sears Roebuck And Co	1212 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
158	Cruinn Machining Tech Corp	843 INDUSTRIAL CIR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
159	Garfield Cosmetic And Family Dentistry	2815 N GARFIELD RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
160	Tates Auto Body	2808 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
161	Grand Traverse Analytical Llc	2785 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
162	Lead Screw International	2101 PRECISION DR	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
163	Meijer Inc	4900 M 72 E	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
164	Plascon Films Inc	2375 TRAVERSEFIELD DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
165	Federal Express Corp	2386 TRAVERSEFIELD DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
166	Microline Technology Corporation	2397 TRAVERSEFIELD DRIVE	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
167	Grand Traverse Academy	1245 HAMMOND RD E	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
168	Wolverine Power Supply Cooperative Inc	2760 LAFRANIER RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
169	Packaging Corporation Of America	2207 TRAVERSEFIELD DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
170	Mi Dept/Community Health	2325 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
171	Forkardt Inc	2155 TRAVERSEFIELD DR	CITY OF TRAVERSE CITY	RCRA	DATABASE SEARCH	1	
172	Mccardel Culligan	40 HUGHES DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
173	Airlex Service & Sales	1888 HIGH LAKE RD	EAST BAY TOWNSHIP	RCRA	DATABASE SEARCH	1	
174	Quality Time Components	343 HUGHES DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
175	Traverse City Record Eagle	1621 KEANE DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
176	Us Postal Service	1801 GARFIELD RD N	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
177	Quality Dial Inc	404 HUGHES DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
178	Accutest Laboratories	459 HUGHES DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
179	Tricraft Corp	1777 NORTHERN STAR DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
180	Packaging Corporation Of America	839 HUGHES DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
181	Grand Traverse Construction Llc	1714 NORTHERN STAR DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
182	Grand Traverse Road Commission	1881 LAFRANIER RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
183	Sherwin-Williams #701999	1474 INDUSTRY DR.	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
184	Inception Woodworks Llc	1318 INDUSTRY DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	

Contaminant Source Inventory

Map ID	Name	Address	City/Township	Why it is a Potential Source	Source of Information	Risk Rating	Comments
185	Home Acres Building Supply Co Llc	1325 INDUSTRY DRIVE	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
186	Jantec Inc	970 EMERSON RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
187	Trane Commercial Systems	21420 TRADE CENTER DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
188	Grand Traverse Septage Treatment	1717 AHLBERG RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
189	Cequent Consumer Products Inc	1561 LAITNER DR	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
190	Merit Energy Co	500 YDS OFF BRIDGE, SEC 6-T26N	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
191	Schultz Snyder Steele Wholesale Lbr	5763 BATES RD	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
192	Grand Trverse County Road Commission	CR 611 GARFIELD RD	GARFIELD TOWNSHIP	RCRA	DATABASE SEARCH	1	
193	Great Lakes Trim	6183 S RAILWAY CMN	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
194	Kdk Downhole Tooling/Orchard Lk Mach	6671 M72 E	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
195	Trugreen Limited Partnership	6869 M 72 E	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
196	Egeler Industrial Services	6227 ARNOLD RD	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
197	Hammersmith Inc	6260 ARNOLD RD	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
198	Tractor Supply Company #1929	7007 EAST M72	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
199	GT Band Of Ottawa/Chippewa	7741 M 72 E	WHITE WATER TOWNSHIP	RCRA	DATABASE SEARCH	1	
200	Cherry Country Fruitworks Llc	10106 US HIGHWAY 31 N	ACME TOWNSHIP	RCRA	DATABASE SEARCH	1	
201	Hubbell Trucking Inc	8055 ANGELL RD	WHITE WATER TOWNSHIP	RCRA	DATABASE SEARCH	1	
202	Northpoint Farms Llc	8055 ANGELL RD	WHITE WATER TOWNSHIP	RCRA	DATABASE SEARCH	1	
203	Saint Gobain	11590 S US HIGHWAY 31	ELK RAPIDS TOWNSHIP	RCRA	DATABASE SEARCH	0	
204	Wickes (PROPOSED)	MANCELONA	MANCELONA TOWNSHIP	SUPERFUND	DATABASE SEARCH	1	TCE Plume is very extensive
205	Tar Lake	NE COR SEC30 T29N R6W	MANCELONA TOWNSHIP	SUPERFUND	DATABASE SEARCH	1	CONT. ESSENTIALLY CONTAINED TO SITE
206	Grand Traverse Stamping	2707 AERO PARK DR.	CITY OF TRAVERSE CITY	TOXIC REL.	DATABASE SEARCH	3	Transferred to other sites (copper). RCRA Site.
207	Century Specialties	2410 W. AERO PARK CT.	CITY OF TRAVERSE CITY	TOXIC REL.	DATABASE SEARCH	3	No info on toxic release. RCRA Site
208	The Oilgear Company	1424 INTERNATIONAL DR	EAST BAY TOWNSHIP	TOXIC REL.	DATABASE SEARCH	2	Toluene. Also a RCRA Site.
209	Miracle Mile EZ Mart	509 MUNSON AVE	CITY OF TRAVERSE CITY	UST - OPEN	DATABASE SEARCH	4	
210	NMC Aviation Facility	2550 AERO PARK DR	CITY OF TRAVERSE CITY	UST - OPEN	DATABASE SEARCH	3	Also RCRA with Restrictive Covenant
211	Bay Crest Orchards	7768 CENTER RD	PENINSULA TOWNSHIP	UST - OPEN	DATABASE SEARCH	3	
212	Northwest Airlines	CHERRY CAPITAL AIRPORT	CITY OF TRAVERSE CITY	UST - OPEN	DATABASE SEARCH	3	
213	943 S. Garfield Ave.	943 S GARFIELD AVE	CITY OF TRAVERSE CITY	UST - OPEN	DATABASE SEARCH	3	
214	Two Guys From Traverse Corp	921 W SOUTH AIRPORT RD	GARFIELD TOWNSHIP	UST - OPEN	DATABASE SEARCH	2	
215	True North #257	1031 HAMMOND RD	EAST BAY TOWNSHIP	UST - OPEN	DATABASE SEARCH	2	
216	Traverse City `	700 HAMMOND RD	EAST BAY TOWNSHIP	UST - OPEN	DATABASE SEARCH	2	
217	True North #256	2020 GARFIELD RD	GARFIELD TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
218	#5056 Next Door Store	2001 GARFIELD RD	GARFIELD TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
219	Tuller 1-28	SECTION 28-T28N-R10-W	PENINSULA TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
220	Engle Ridge Farms	8671 BATES RD	ACME TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
221	Seeleys Garage	8227 Old M 72	WHITE WATER TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
222	Henry B. Gee	9201 Elk Lake Rd	WHITE WATER TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
223	Heritage Station	14111 CENTER RD	PENINSULA TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
224	Paradise Pines	917 S BAYSHORE DR	ELK RAPIDS TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
225	Old Mission Inn - Campsites	18599 OLD MISSION RD	PENINSULA TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
226	Old Mission Inn Campground	18599 OLD MISSION RD	PENINSULA TOWNSHIP	UST - OPEN	DATABASE SEARCH	1	
227	Various Pesticide Application Sites	Various	Various	PART 201	SWPT	6	Potential Part 201 sites throughout SWPA
228	Stormwater Runoff and Outfalls	Various	Various	NPDES	SWPT	6	Potential water quality degradation

Appendix E

Site Plan Review Checklists

(LOCAL NAME)

Environmental Checklist

This checklist has been designed to assist businesses and developers in identifying and complying with state, county and local environmental permits and requirements. Please note that this checklist generally pertains only to state, county and local environmental permits. Additional permits and approvals may be required from the (LOCAL NAME) or other government agencies. **This form must be completed and returned to the (LOCAL NAME) when a site plan is submitted.**

This checklist is not a permit application form; businesses are responsible for obtaining information and permit application forms from the appropriate government offices. Compliance and proper registration with applicable state, county and local requirements is required for site plan approval in the (LOCAL NAME). The (LOCAL NAME) will forward a copy of this form to the Grand Traverse County Fire Department.

Name of Business: _____

Property Address: _____

Name of Business Owner: _____

Mailing Address: _____

City: _____ **State:** _____ **Zip Code:** _____

Telephone: _____ **Fax:** _____

Email address: _____

Business Manager / Operator: _____

Type of Business (type of activities to be carried out at the proposed business– include all processes and operations): _____

_____

_____

_____

I affirm that the information submitted in this form is accurate. Owner's

Signature: _____

Date: _____

	Circle Applicable	
1. Does the project involve renovating or demolishing all or portions of a building?	Y	N
2. Does the existing building (if applicable) contain asbestos?	Y	N
3. Are there wetlands present on the property?	Y	N
4. Has a wetlands determination been made?	Y	N
5. Is the property within the 100-year flood plain?	Y	N
6. Does the project involve any work (dredging, filling, draining, construction, etc.) in, across or under: o river, stream, creek, ditch, drain, lake, pond or swamp; or o wetlands; or o floodplain (i.e. an area that may have or has ever had standing or flowing water)?	Y	N
7. Does the project involve any earth change activity, including the disturbance of the natural cover, within 500 feet of a lake or stream?	Y	N
8. Will the project change the natural cover or change the natural land topography (including cut and fill), or otherwise disturb an area greater than one acre in size?	Y	N
9. Does the project involve construction which will disturb five or more acres?	Y	N
10. Does the project involve any clearing, grading or earth moving in a public road right-of-way?	Y	N
11. Does the project involve new curb cuts or improved access to a public road?	Y	N
12. Has the on-site retention of all storm water runoff been provided?	Y	N
13. Does the project discharge storm water runoff off site? If Yes, where? o Third party o County drain o Municipal storm sewer system o Lake, river or stream o Wetland o Other (please specify) _____	Y	N
14. Are stream, drain and lake edges to be protected with natural vegetative buffer strips; are protective buffer strips 20-feet in width or greater? *(Note: Site conditions such as slope angle, slope length and soil type may need greater widths for adequate environmental protection.)*	Y	N
15. Has pre-treatment been provided of storm water discharges?	Y	N
16. Have design provisions been made to accommodate periodic access of heavy equipment needed for regular maintenance of the storm water management system?	Y	N
17. Does the project involve the discharge of any type of wastewater or cooling water (including air conditioning) to a storm sewer, drain, lake, stream, or other surface water?	Y	N

Circle Applicable

18. Does or will the property contain a water well? If yes, please identify the type of well and the number (if known):_____ Y N
    - o single family well(s);_____active_____abandoned_____sealed/closed wells
    - o multi-family or multi-unit water well system, or a facility (such as a factory or restaurant) which serves a large number of employees/customers; _____active_____abandoned_____sealed/closed wells
    - o irrigation well(s)_____active_____abandoned_____sealed/closed wells
    - o monitoring well(s)_____active_____abandoned_____sealed/closed wells

19. Does the project involve the installation, connection or alteration of any sanitary waste collection or connection to a public sanitary sewer line? Y N

20. Does the project involve construction or alteration of the community water system or extension of a public water main or the addition, removal or relocation of a fire hydrant? Y N

21. Will the project or facility discharge anything other than sanitary waste to the municipal sewer? Y N

22. Does the project have floor drains? If yes, to which system will they be connected? (*Note: Floor drains are not allowed to be connected to a storm sewer/drain, drywell, leaching basin, or septic system.)* Y N
    - o sanitary sewer;
    - o on-site holding tanks;
    - o state approved discharge system; or
    - o other (please specify) _____

23. Does the project involve the generation of large quantities of dust? Y N

24. Does the project involve the discharge of liquids, sludge, wastewater and/or wastewater residuals into or onto the ground? Y N

25. Does the project involve the on-site reuse, treatment, storage or disposal of hazardous waste? Y N

26. Is the project site to be used for asphalt emulsion, cement manufacturing, feedlots, fertilizer manufacturing, petroleum refining, phosphate manufacturing, steam electric, or coal or mineral mining, processing or dressing? Y N

27. Does the project involve burning, landfilling, transferring or processing of any type of solid non-hazardous wastes on site? Y N

28. Does the project involve installation, construction, reconstruction, relocation, or alteration of any process or process equipment (including air pollution control equipment) which has the potential to emit air contaminants? Y N

29. Does the project involve transport of the contents of a holding tank, special waste or the transport of hazardous or non-hazardous liquid industrial waste? Y N

30. Does the site use storage tanks for holding petroleum products or other hazardous chemicals? If yes, are the tanks: Y N
    - o Underground Storage Tank(s) _____Quantity _____Capacity
    - o Above Ground Storage Tank(s) _____Quantity _____Capacity

Circle Applicable

31. Does the project involve a facility for the storage or mixing of agricultural chemicals, or the storage or handling of agricultural manure? Y N

32. Does the project involve the storage of other chemicals, petroleum products or salt on the property? Y N

33. Does evidence exist that the project site is, or may be affected by environmental contamination from previous activities? Y N
- If yes, has an Environmental Survey been completed for the project site? Y N
Contact your legal advisor.—An Environmental Survey can identify the need to conduct a Phase I Environmental Site Assessment for purposes of environmental liability protection.

34. Does any portion of the site fall under MI Part 201of PA 451 1994, "Michigan Sites of Environmental Contamination"? Y N

35. Is any portion of the site subject to corrective action under the MI "Leaking Underground Storage Tank Program"? Y N

36. Are you or the site owner currently involved in any compliance discussion with the Office of the Attorney General regarding this project or any other facilities under your ownership? Y N

Please list hazardous substances (see definition), hazardous waste, industrial waste, oil, or salt products expected to be used, stored, generated, or recycled on site, or transported to/from site.

Quantities should reflect maximum volumes on site at any one time. Attach Material Safety Data Sheets for each chemical or provide on computer disc. Attach additional pages if necessary.

	Chemical Common or Trade Name	**Chemical Components**	**Form***	**Maximum Quantity**	**Storage****
1					
2					
3					
4					

*Form: L = Liquid; PL = Pressurized Liquid; PG = Pressurized Gas; S = Solid

**Storage: AST = Above-ground Storage Tank; UST = Underground Storage Tank; PT = Portable Tank D = Drum; WC = Wooden Container; O = Other (specify)

Appendix F

Emergency Response Plan

Document not included for confidentiality purposes