TORCH LAKE WEST BOATING ACCESS SITE

Feasibility Study

Michigan Department of Natural Resources

Torch Lake from Study Site

June 20, 2019

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Acknowledgements

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Executive Summary

Introduction

Located in Antrim County, Torch Lake is Michigan's longest, deepest, and second largest inland lake. Long considered a premier water recreation destination and located near other 'up north' tourist locales, increased Torch Lake public boating access has been a goal of the Michigan Department of Natural Resources (MDNR) for years.

After acknowledging increased demand and inadequate public boating access facilities on Torch Lake, MDNR in 1994 and 1995 purchased a 2.47-acre site located along the western shore of Torch Lake located in the northern one-third of the lake's length. The purchase was made utilizing funding from the Michigan Natural Resources Trust Fund.

MDNR sought to prepare a site assessment and feasibility study to better determine both the need for increased public boating access on Torch Lake and the potential opportunities and constraints of the subject site's development.

Project Process and Approach

A consultant firm was retained to execute a study which consisted of data collection and assessment of Torch Lake boating access and trends, analysis of the site's physical characteristics, the preparation of a conceptual design plan, an assessment of local planning and zoning, engagement of stakeholders and the public, an evaluation of potential permitting requirements, and resulting feasibility statement and recommendations.

MDNR provided broad input and support from various divisions including Parks and Recreation, Fisheries, and Law Enforcement. Parks and Recreation program representatives including the district manager, regional field planner, waterways development program manager, and unit supervisor were vital and informative participants for the duration of the process.

Local community stakeholders including representatives of Torch Lake Township, Torch Lake Protection Alliance, Three Lakes Association, and local legislators were consulted. Further, community input was solicited via a Public Input Open House held at Torch Lake Township Hall, in which attendees were invited to view the study findings to date in a workshop setting and offer written comment. The same information was shared on MDNR's website, which invited written comments by e-mail. Over 100 responses were left by participants either during or following the meeting.

Boating Access Site Assessment

A boating access site (BAS) is defined as a facility containing at minimum a launch, maneuvering area, and parking. Additional site components for user comfort and convenience may also include restrooms and a courtesy pier. MDNR professional staff who monitor and enforce MDNR-operated boating access site use have witnessed a steady increase, and often over-capacity conditions, at the Torch Lake launch sites resulting in improper parking, illegal roadside parking, and denied user access to Torch Lake, especially on weekends and most especially on holiday weekends.

State of Michigan boater registrations offer another glimpse of the boating trends in the area, which are increasing locally per data studied between 2012 and 2016.

Many launch points exist around Torch Lake and range from primitive "carry-down" sites to vehicular access points and from simple "road ends" to commercial launch establishments. In order to present a comprehensive view of available access sites on Torch Lake, the study prepared an inventory of all such locations.

MDNR's design target is one BAS parking space, accommodating tow vehicle and trailer, per every 15 lake acres. At over 18,000 acres, 1,200 vehicle and trailer parking spaces would be required to meet this target. Currently, public BAS's are limited to the northern and southern extremities of Torch Lake and collectively, parking in those existing public boating access sites is approximately 150 spaces, or one parking space per every 127 lake acres. Thus, this level of parking quantity (one per 127 lake acres) is vastly below MDNR's design target.

Site Characteristics / Assessment

As a part of the study, the site's physical characteristics were studied to determine its viability for use as a public boating access site meeting the *MDNR Boating Access Site Design Guide*. The site's geography, location, access, soils, topography, bathymetry, and localized coastal processes suggest adequate properties for development as a boating access site.

Conceptual Design

A Conceptual Design Plan was developed depicting the site's ability to approximately 44 vehicle/trailer spaces plus 8 single car parking spaces to facilitate non-motorized boating access, as well as boater guest parking. The design also accommodated reasonable buffers on the north and south sides of the parking lot to provide landscape screening for the adjacent residential properties. Amenities such as a vault toilet, launch pier, and barrier-free accommodations are anticipated.

Though few obstacles to development of a boating access site on the subject property are identified from a physical site analysis perspective, a greater challenge exists in MDNR's working with local agency planning and zoning to collectively mitigate mutual concerns due to differing directives and constituents. A significant test lies in addressing mutual endeavors and mandates of MDNR and Torch Lake Township, while making mutually responsible and palatable development decisions.

Conclusions and Recommendations

The project's feasibility from a physical and site constraints stand point, as well as a localized coastal processes stand point, has been verified as favorable through the course of this study. Using best management practices, it is well within the realm of viability and feasibility when considering comparable public boating access sites developed by MDNR and other public agencies in Michigan. The site's physical challenges can be reasonably mitigated by modern construction techniques and best management practices. The permitting required by regulatory agencies tasked with protection of the state's natural resources and the health, safety, and welfare of the public is anticipated to be favorable.

Though physical development of the site is reasonably unencumbered by challenges, local support for the project by the local agency, as well as by local non-governmental agencies (Torch Lake Protection Alliance and Three Lakes Association) is expected to be less than favorable. Torch Lake Township has codified several zoning ordinance provisions that, if applicable, will challenge this project's ability to move forward. The applicability of the zoning ordinance and the necessity of MDNR to seek formal site plan approval from the local agency are legal questions that fall outside of the scope of this study. For this reason, it is recommended that guidance be sought from the State of Michigan Attorney General before proceeding further.

Through the course of the study, topics that warrant further diligence in contemplating development of this site for the intended purpose have been identified and include collection of data on use at existing public boating access sites, study of phosphorous concerns related to dredging / environmental impacts of dredging and maintenance dredging, collection of fishing statistics, a fisheries opinion, and a traffic / roadway impact study.

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Introduction and Statement of Purpose

Torch Lake from Study Site

Introduction and Statement of Purpose

Torch Lake, located in Antrim County, is Michigan's longest inland lake at 19 miles from northern tip to southern tip, and its second largest inland lake based on a surface area of nearly 19,000 acres. Also Michigan's deepest inland lake, Torch Lake boasts an impressive average depth of 111 feet and a maximum depth of 315 feet. These deep waters afford an unusually clear and turquoise-hued body of water, reminiscent of the Caribbean, ocean, and most unexpected in northern Michigan. Long considered a premier water recreation destination and located in close proximity to other 'up north' tourist-oriented locales such as Traverse City and Charlevoix, increased Torch Lake public boating access, has long been a goal of the Michigan Department of Natural Resources (MDNR).

A boating access site, or BAS, is defined as a facility containing at a minimum a launch, maneuver area, and parking. Additional site components may also include restrooms and a courtesy pier. These public boating access sites, with the purpose of providing efficient means of vessel transfer between land and water, are limited to the northern and southern extremities of Torch Lake. Parking in those public boating access sites is collectively quantified in the range of 144-152 spaces, resulting in approximately one parking space per every 127 lake acres. This level of parking quantity is vastly below the MDNR's design target of one parking space per every 15 lake acres. Though this design target varies greatly around the inland lakes of Michigan based on a number of factors (population, land availability, environmental restrictions, lake characteristics, demand, use trends, etc.) and may never be fully realized on Torch Lake, the need for additional vehicle/trailer parking on one of the most popular inland lakes of Michigan is undeniable. This is especially true along the east and west shores where large gaps exist with few or no safe, public boating access sites. Toward that end, MDNR acquired property in 1994 and 1995 along the west shore of the lake, in Torch Lake Township and referred to herein as the Torch Lake West Study Site, with plans to develop it as a public boating access site in a more centralized position along the north-south expanse of the water body to better serve the boating public.

Exercising its due diligence as an agency tasked with being a steward of the state's natural resources, the purpose of this study is to determine the need for and consider the feasibility of the development of the subject property as a public boating access site. The need will be assessed through the consideration of existing lake access, use, and trends, while the feasibility will be assessed through a thorough site analysis consisting of a study of the site's topography, bathymetry, land ownership, soils, and coastal processes; consideration of physical design options; an assessment of the local planning and zoning provisions; and an assessment of the permitting requirements related to such a development. After a careful review of these considerations, the feasibility of the development and associated recommendations for the development will be made.

Background Data

Lake Access Locations

Though well-developed public boating access sites are currently limited to the north and south extremities of Torch Lake, many access points exist around the lake and include motorized and carry-down launch sites, "road ends," and commercial launch establishments. In order to present a comprehensive view of available access points on Torch Lake, this study includes an inventory of all such locations and an associated map. Information utilized (included as Appendix A) was derived from Land Use and Recreation Plans from Antrim County and the townships surrounding Torch Lake, from the Michigan Recreational Boating Information System (MRBIS), and from site visits and local knowledge. For the purposes of this study, the access points included herein are those that currently exist on Torch Lake proper, with the addition of the MDNR's Torch River Boating Access Site, which is just off of Torch Lake, but known to be used primarily by boaters whose primary destination is Torch Lake.

The Torch Lake Boating Access Site Map illustrates (see page 11) three different types of existing access:

1. Public Boating Access Site - an improved vessel launching facility administered through a governmental agency and providing a moderate to high level of development including at a minimum a launch, maneuver area, and parking. Additional components may include a restroom and courtesy pier for use by the general public (For the purpose of this section, parking is defined as space for a tow vehicle and boat trailer, unless noted otherwise). Meeting the criteria set forth in the *MDNR Boating Access Site Design Guide,* these sites are generally used for daily launch and "take-out" of boats by Torch Lake day users, but also as seasonal access by local residents and property owners whose water craft remain on the lake over the summer.
2. Public Launch Site - a "road end" or other minimally improved launch facility that is available to the general public but provides limited or no parking, maneuverability, restrooms, or barrier-free provisions.

A Public Launch Site does not meet the criteria set forth in the *MDNR Boating Access Site Design Guide*. These locations are also used for seasonal access by local residents and property owners due to local knowledge of their existence and locations. While daily launching also occurs at a Public Launch Site, the lack of parking and other provisions limits their ability to contribute substantively to safe public boating access to Torch Lake.

3. Commercial Boating Access or Launch Site – privately operated launch of varying level of improvements related to parking, maneuverability, and barrier-free provisions. These sites may or may not meet the criteria set forth in the *MDNR Boating Access Site Design Guide*. These location are also used for both seasonal access by local residents and property owners and daily access. However, given the private nature of the enterprise, the provisions for launching, even if at a high level of development and accessibility, cannot be considered public due to the uncertainty of their operation into the future.

LEGEND
PUBLIC BOATING ACCESS SITE
PUBLIC LAUNCH SITE / ROAD ENDS
COMMERCIAL BOATING ACCESS OR LAUNCH SITE
STUDY SITE
MDNR Eastport BAS
Torch Lake Twp. BAS / William K. Good Day Park
Sand Point Torch Lake Twp.
STUDY SITE
LAKE MICHIGAN (Grand Traverse Bay)
INTERMEDIATE LAKE
TORCH LAKE
LAKE BELLAIRE
Waring Rd.
Butch's
DeWitt Marine
ELK LAKE
U.S. Highway 31
Alden Safe Harbor BAS
MDNR Torch River Bridge BAS
Torch River Marine
MDNR Torch River BAS

The proposed Torch Lake West Study Site is also indicated on the map. This study identified five (5) Public Boating Access Sites, two (2) Public Launch Sites, and three (3) Commercial Boating Access or Launch Sites. Public Launch Sites identified on the map, aside from the primitive launch sites based on local planning documents described in detail, include numerous "road ends." "Road ends" were not individually verified and site conditions range from "rustic" to "developed" with the primary use being for shore side recreation, swimming, and in some cases non-motorized water craft launching.

Public Boating Access Sites

Again, for the purpose of this study, a Public Boating Access Site is defined as an improved vessel launching facility administered through a governmental agency and providing a moderate to high level of development including at a minimum a launch, maneuver area, and parking. Additional components may include a restroom and courtesy pier for use by the general public (For the purpose of this section, parking is defined as space for a tow vehicle and boat trailer, unless noted otherwise).

Meeting the criteria set forth in the *MDNR Boating Access Site Design Guide*, these sites are generally used for daily launch and "take-out" of boats by Torch Lake day users, but also as seasonal access by local residents and property owners whose watercraft remain on the lake over the summer.

Alden Safe Harbor Boating Access Site

Operated by Helena Township, Alden Safe Harbor is a public facility and the only safe harbor on Torch Lake. Parking for vehicles with boat trailers is available on the street and portable toilets and benches are available to users from May to October. Additionally, nine (9) floating docks are available for daytime docking, which are the only public boat docks on Torch Lake. Visitors often fish from the recently-replaced docks (2011) or from the break wall. In the Township's public survey, Alden Safe Harbor was identified as the second most important resource in the township with over 79% of respondents listing Alden Safe Harbor as important or very important. Of that group, 50 percent of respondents reported using Alden Safe Harbor one to six times per year and more than 30 percent reported using it more than seven times each year. (Source: Helena Township Recreation Plan) The boat ramp is a 12 foot wide concrete sectional ramp, though turning and maneuvering space is limited. Additionally, limited on-site parking is available. Thus, boaters must park on the street or at the nearby "Depot Park", which provides approximately 15 to 20 spaces.

MDNR Torch River Bridge Boating Access Site

Located at the mouth of the Torch River, the MDNR operates the Torch River Bridge Boating Access Site, which provides access to both Torch River and Torch Lake via a small site with limited maneuverability. A paved parking area for about 3 vehicles is available in the immediate vicinity of the launch, and a separate parking area for approximately 20 vehicles and boat trailers is available across the road. Toilet facilities are also available. The launch is heavily utilized: public input obtained during Milton Township's recreation planning process noted that the launch becomes very crowded in summer months, particularly on holidays. (Source: Milton Township Recreation Plan)

Torch Lake Township Boating Access Site / William K. Good Day Park

The Torch Lake Township Public Boating Access Site is located in Torch Lake Village adjacent to the William K. Good Day Park. It is owned and maintained by the Township. (Source: TLT Land Use Plan) The boat ramp is a 12 foot wide concrete sectional ramp, and while concrete planks are being displaced at the deep end of the ramp, recent concrete repairs have been made at the ramp entrance. The ramp is protected on the south side by a seawall and water depth at this site is adequate for larger boats. The approach road is paved, though turning and maneuvering space is limited. On-site parking is available for approximately 7 to 10 spaces with potential overflow available into adjacent William K. Good Day Park.

The William K. Good Day Park is also used for swimming and kayaking. The property was improved with Torch Lake Township funds, a Michigan Natural Resources Trust Fund grant, and private donations. It is a 4 acre parcel located within Torch Lake Village with 200 feet of frontage on Torch Lake. The shallows just offshore are ideal for swimming and water games, the grassy, tree-shaded park land is ideal for picnicking and lawn games. A central building offers restrooms, clean water, storage space and telephone. Two pavilions offer shelter, a place for cooking, and provisions for group activities. The well-tended grounds provide for picnic tables and grills, a children's fun center with slides and swings, basketball and volleyball setups, a flagpole, signs, etc. (Source: TLT Land Use Plan). Collectively, these two sites meet the provisions for a public boating access site, although maneuvering is limited.

MDNR Eastport Boating Access Site

Offering 400 lineal feet of frontage on the northern tip of Torch Lake, the MDNR Eastport Boating Access Site offers restrooms, a boat ramp, and a parking area. This site is used by swimmers, though unauthorized due to the inherent conflict of swimming and boating access. As intended, this site is used extensively for boating access. Though not intended, designed for, or maintained for such, this site is also used informally as a launch area in winter for ice fishing access. (Source: TLT Land Use Plan) The boat ramp is a 36-foot wide, concrete sectional ramp with a single skid pier. Water depth is shallow as observed from shore, but MRBIS lists the site as 2.5 to 3 feet deep 20 feet from shore, and suitable for larger craft, though requires regular dredging maintenance to remain so. The approach road is gravel and maneuvering space is good. On-site parking is available, providing approximately 55 spaces.

MDNR Torch River Boating Access Site

Located immediately south of Torch Lake, MDNR operates a site for boating access to the Torch River just off Aarwood Trail. Parking was recently expanded on this 12 acre site, owing to the fact that it is heavily utilized seasonally. (Source: Clearwater Twp. Recreation Plan) The ramp is a hard-surfaced ramp with a skid pier, located in an area of limited water depth, where launching and retrieval of large boats may be difficult and not recommended. The site offers 44 parking spaces and a public toilet. (source: MDNR - MRBIS) Though not located directly on Torch Lake, the Torch River Boating Access Site has been included in this study due to its close proximity to Torch Lake and its use being primarily that of boaters whose primary destination is Torch Lake.

Public Launch Sites

Again, for the purpose of this study, a Public Launch Site is defined as a "road end" or other minimally improved launch facility that is available to the general public but provides limited or no parking, maneuverability, restrooms, or barrier-free provisions. A Public Launch Site does not meet the criteria set forth in the *MDNR Boating Access Site Design Guide*. These sites are used for seasonal access by local residents and property owners due to local knowledge of their existence and locations. While daily launching also occurs at a Public Launch Site, the lack of parking and other provisions limits their ability to contribute substantively to safe public boating access to Torch Lake.

Waring Road Boat Launch

Operated by Milton Township, a boat ramp is located at the extension of Waring Road (between Indian Rd. and Campbell Rd.). Sixty-six feet of the property is owned by Milton Township and an additional fifty feet adjoining the boat ramp is owned by the DNR and is available for parking. A steep grade exists down to the water, which is only accessible at the boat launch. Severe erosion is occurring at the site and is affecting concrete boat ramp pads. (Source: Milton Twp. Recreation Plan) The ramp is a single lane concrete section in moderate to poor condition. Depth of water beyond the ramp appears shallow upon visual inspection. There is a small gravel loop for limited maneuvering room and a small adjacent parking area for approximately five to eight spaces. No restroom or barrier-free amenities are provided at this site.

Sand Point Boat Launch

Operated by Torch Lake Township, the Sand Point Boat Launch is located 1/3 mile south of Barnes Road. Furnished with a narrow concrete launch ramp leading to the water's edge, a concrete ramp beyond the water's edge was not observed, though it may exist, just covered with sand and gravel. The site has a limited width of only 66 feet, thus parking is limited. (Source: TLT Land Use Plan) Further, there is extremely limited maneuvering and parking space (approximately 0 to 2 spaces). This ramp has limited capacity and is suitable for small to medium craft only. Depth of water beyond the ramp appears shallow. No restroom or barrier-free amenities are provided.

Various Road Ends

Various road end access points are identified on the map, gathered from local planning documents. Road ends were not individually verified and site conditions range from "rustic" to "developed." The primary use is for shore side recreation, swimming, and in some cases non-motorized watercraft launching. Provisions for launching motorized watercraft, maneuvering, trailer parking, and restrooms are generally not provided.

Commercial Boating Access and Launch Sites

Again, for the purpose of this study, Commercial Boating Access or Launch Sites are defined as privately operated launch sites of varying level of improvements related to parking, maneuverability, and barrier-free provisions. These sites may or may not meet the criteria set forth in the *MDNR Boating Access Site Design Guide*. These sites are used for both seasonal access by local residents and property owners and for daily access by day users of Torch Lake. However, given the private nature of the enterprise, the provisions for launching, even if at a high level of development and accessibility, cannot be considered public due to the uncertainty of their operation into the future.

Torch River Marine

This commercial boat ramp is located on Torch River just south of the Bridge. It provides covered boat docks, boat rentals, winter storage, and a boat launch ramp that has not been open to the public for ten to twelve years.

Butch's Marine

This commercial boat ramp is located on Clam River just west of the Bridge and near the river's mouth to Torch Lake. It provides dockage, boat rentals, winter storage, and a boat launch ramp that is currently open to the public.

Dewitt Marine

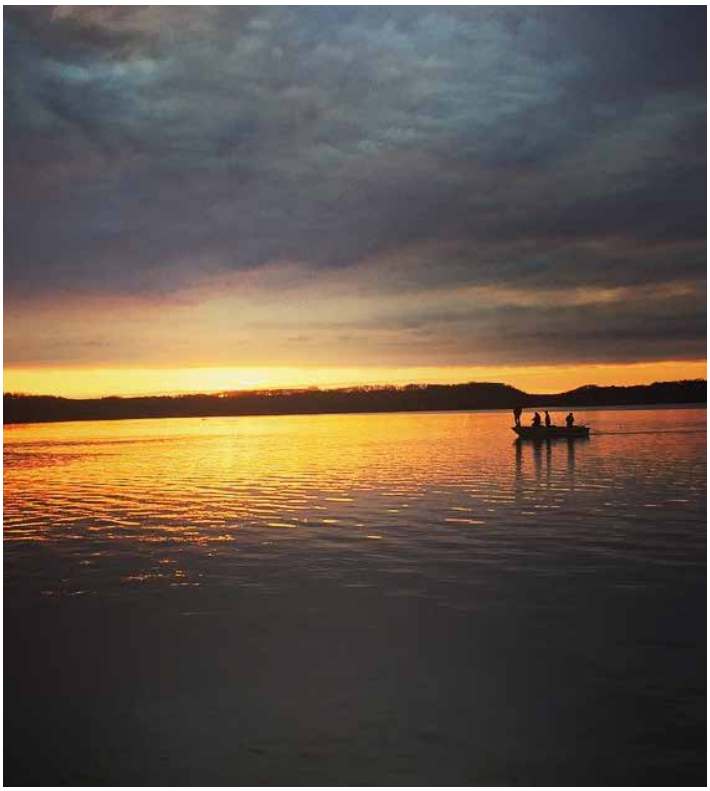
This commercial boat ramp is located on Clam River just east of the Bridge and the river's mouth to Torch Lake. It provides covered boat dockage, boat rentals, winter storage, and a boat launch ramp that is currently open to the public on weekdays only.

Lake Access Use and Trends

Though data collection for Boating Access Site use was outside of the scope of this study and has not been recently undertaken by MDNR, lake access and use is known anecdotally to be substantial and perceived to be increasing. The use of the sand bar on the southern shore, especially on holiday weekends, is evidence of the intense use that this destination inland lake receives.

State of Michigan boater registrations offer a glimpse of some of the boating use trends in the area, which are increasing locally based upon an evaluation of the information available between 2012 and 2016. Antrim and surrounding counties' boater registrations primarily trended upward every year since 2012 whereas the statewide trend was on a downward trajectory until 2015 when it began trending upwards. Due to the downward trend statewide, which has only recently begun to rebound, boater registrations statewide have decreased by 1% between 2012 and 2016. Conversely, in that same time period, boater registrations have increased in Antrim County by 10% and in surrounding counties by 3-6%. While this information is not definitive proof of increased boating use on Torch Lake, it is suggestive that increased use is likely, as has been identified anecdotally by those familiar with the existing access sites.

The consultant team discussed usage and trend perceptions with MDNR personnel, commercial enterprise personnel, Township personnel, and attendees at the



Public Input Open House held on August 17, 2017. Most individuals consistently described heavy use of existing boating access sites, to the point of exceeding capacity of those sites, especially on weekends, and greatly exceeding capacity on holiday weekends. Though numerous attendees of the Public Input Open House questioned the need for additional public boating access and suggested that existing sites are not regularly at or beyond capacity, individuals tasked with any level of monitoring the various sites stated otherwise.

Property owners surrounding Torch Lake reported that their weekend visitors do not encounter difficulties launching, which is plausible for those who are able to park their vehicle/trailer elsewhere including most often on private property. Boaters who wish to launch and park at a public Boating Access Site, however, have very limited options on Torch Lake. For this reason, existing boating access sites are described as regularly having lines of waiting vehicles/trailers for launching, and illegally parked vehicles/trailers (post launching) are reported as commonplace, requiring extra enforcement measures in recent years.

Some commercial enterprises have stopped allowing public launching on weekends, or altogether, due to the operational difficulties that launching/parking causes the enterprise to the detriment of its other business. The one commercial enterprise that maintains public weekend launching retains security services on holiday weekends, supporting the idea that holiday weekend use can be overwhelming. These accounts of high use at existing facilities speak to the need for improved and expanded boating access on Torch Lake, especially when coupled with limited public boating access sites and the unique lake size and depth characteristics.

As identified in the introduction, MDNR's design target for boating access sites is one parking space per every 15 lake acres (1:15). With public boating access sites on Torch Lake currently offering approximately one parking space per every 127 lake acres (1:127), parking for launching purposes is significantly below target. Even accounting for the spaces provided by the public boat launches fails to make an appreciable difference to the ratio, nor does accounting for the small number of potential parking spaces (40-50) that the subject property may afford the public. Further, MDNR's experience in increasing the capacity of existing or constructing new boating access sites on busy inland lakes is that relief is provided to less developed existing access points, more so than expanded lake usage, as has been MDNR's historical observation. Essentially, a relocation of use has been observed.

Site Analysis

Boundary Survey

The Torch Lake West Study Site is located on the east side of North West Torch Lake Drive, just north of McLachlan Road. It is a 2.47 acre site, Tax I.D. No. 05-14-006-011-00, generally rectangular in shape (except for the lakeshore side), with the long axis oriented in an east-west direction, between North West Torch Lake Road and Torch Lake. According to the boundary survey (attached as Appendix B), the lot contains 222.50 feet of lake frontage. The western-most 33.0' of property is Torch Lake Drive right-of-way and, therefore, unavailable for development.

Record documents from the purchase of the land by its current property owner, the State of Michigan, indicate that the site was contemplated by the previous property owners for subdivision and associated access easements. However, no such formal recordings were made and, as such, the property is unencumbered by easements for that or any other purpose. The boundary survey identified encroachments of landscaping and irrigation along the south property line. The MDNR is working through this matter with the appropriate party(ies).

Topographic Survey

The topography of the site identified limited areas of steep slopes that will create localized challenges for development. The Topographic & Bathymetric Survey (attached as Appendix C) depicts the overall site sloping generally from its high point at the road edge on the west to the east towards Torch Lake. The highest area of the site sits as an upper plateau covering approximately the western 1/6th of the property. The next 1/6th of the site presents an upper embankment that slopes down fairly quickly with approximately 13' in elevation dropping over a horizontal distance of approximately 80', yielding a slope of about 16%. Almost the entire remainder of the site is modestly sloped as a lower plateau dropping approximately 9' in elevation over a horizontal distance of over 300', yielding a slope of approximately 3%. On the eastern edge of the property, near the shoreline, a steep lake edge embankment drops approximately 8' in elevation over 15' of horizontal distance, yielding a slope of approximately 53%. The lack of development coupled with this steeper slope has created erosion exacerbated by currently unsupported use of the property.

For the development of a boating access site, the topography of the site presents modest but manageable challenges. The upper embankment is too steep to be developed as a parking lot, meeting current accessibility and other development guidelines, in its current slope. As such, the parking area could be confined to the lower

plateau, or the existing somewhat steep grade change of the upper embankment could be spread over the upper and lower plateaus in order to create a more manageable and accessible slope. The Conceptual Design Alternatives will consider both of these options, with the former option resulting in less expensive development costs, but also fewer parking spaces. The lower embankment presents additional challenges given the necessity to overcome the slope for access to the water at the point of the launch. Further, such a steep slope is at risk of erosion even in its current form, which may be exacerbated by unmitigated, increased impervious surfaces on site and disturbance of the slope through construction. Thus, care should be taken in both the design and construction to minimize disturbance of the lower embankment and to ensure its stabilization long-term.

Bathymetric Survey

The Bathymetric Survey (included on the Topographic & Bathymetric Survey (attached as Appendix C) reveals that the topography of the Torch Lake lake bottom in the vicinity of the Torch Lake West Study Site is shallow and shallowly sloping for several hundred feet into the lake. Given that the MDNR Boating Access Sites Design Guide suggests having 4'-4" of water depth at the end of the ramp and a channel of similar depth out to deeper water, initial development of this site will result in a dredge channel ranging between 230' and 260', depending on where along the lake frontage the ramp is positioned. Based on past project precedent on other MDNR Boating Access Sites, this dredge channel length and its long term maintenance are well within the acceptable range of the regulating agencies, Michigan Department of Environmental Quality (MDEQ) and the United States Army Corps of Engineers (USACE), for dredge channels for projects of this nature.

Soils Investigation: Upland

A Report of Geotechnical Exploration (attached as Appendix D) was prepared for the subject project in order to evaluate subsurface conditions at the site, assess suitability for the site's development as a boating access site, and develop recommendations regarding pavement design for said project type on the subject property. Toward that end, five (5) soil borings with standard penetration testing were performed. The borings indicate that surface soils consist of 18-24" of surficial fill on the western portion of the site and 14-16" of surficial topsoil on the eastern portion of the site. The surface soils are underlain by very stiff to hard silty clays and sandy clays. Interbedded layers of sand with varying amounts of silt and clay were also encountered within these cohesive soils.

The subsurface soils are noted to have good strength properties considered suitable for the support of proposed pavements associated with a boating access site. However, these soils are also noted to exhibit poor drainage properties and, therefore, require the installation of a granular subbase to the pavement to facilitate subsurface drainage and improve the longevity of the surface pavements. Because the soils are susceptible to softening by heavy construction traffic during periods of wet weather, the report recommends that care be taken to provide positive drainage during the construction process. Owing to the suitability of the subsurface soils for development of a boating access site, pavement recommendations included in the report depict pavement and aggregate / granular base cross-sections that are well within typical cross sections for MDNR boating access sites and paving projects of this nature.

Soils Investigation: Lake Bottom

A Report of Laboratory Analysis (attached as Appendix E) for lake bottom soil samples was prepared for this project. This analysis was precipitated by the anticipated need to dredge lake bottom soils in order to construct the boating access site launch ramp and excavate a channel out to sufficiently deep water to launch a boat into Torch Lake at the subject project site. Following the criteria set forth by MDEQ for dredge sample testing, six (6) samples were collected, analyzed for soil type, and tested for contamination by metals, chemicals, and compounds. Sample locations are shown on the bathymetric survey and were taken to a depth of the approximate dredging limits.

Soil types encountered in the lake bottom samples were courser medium sand surface soils over silty clays. The courser medium sand surface soils are subject to movement from wind and wave action, whereas the underlying silty clay soils tend to be more static. These soils were tested for contaminants in anticipation of a requirement for such by MDEQ in the event that a permit for dredging is sought.

The following provides a brief explanation of the contaminant testing procedure for dredge material required by MDEQ: Contaminants tested for in the lake bottom samples include mercury, arsenic, cadmium, copper, lead, selenium, zinc, and a number of semi-volatile organic compounds. All metals, chemicals, and compounds, if detected, are compared against state background levels. If the maximum detected concentration of a potential metal, chemical, or compound is detected at a concentration below state background levels, then the concentration deemed to not pose potential ecological concern, as it is at or below a naturally-occurring level. If the maximum detected concentration of a metal, chemical, or compound is detected at a concentration above state background levels, then the MDEQ may apply additional testing requirements or disposal limitations on the dredge spoils, to be determined at the time of permit application, review, and approval.

The dredge soils testing revealed that nearly all tested metals, chemicals, or semi-volatile organic compounds were either not detected or detected at a concentration below state background levels. The only metal, chemical, or compound tested and shown to reach a level that exceeds state background levels is selenium. In five (5) out of the six (6) samples, selenium was tested at a higher concentration than state background level, though this reading was noted to approximate regional background levels as identified by MDEQ. As a result, MDEQ will likely require leachate testing for the removal of the dredge spoils associated with the construction of a boating access site at this project. Further, depending on the results of the leachate testing, MDEQ may require that the dredge spoils be disposed of on site or, if disposed of offsite, that such disposal occur at a landfill licensed by the State of Michigan to accept such material. Though this requirement, if deemed necessary, will add modest costs to the project, it does not present an insurmountable challenge to site development.

Water Quality of Torch Lake

The Three Lakes Association is a non-profit organization serving the Chain of Lakes Watershed in Antrim County. Having monitored water quality since 1966, the Three Lakes Association has also developed a predictive water quality model for the protection of the lakes and watershed of the county. In 2006, the Three Lakes Association worked with Great Lakes Environmental Center to prepare a report entitled Development of a Predictive Nutrient-Based Water Quality Model for Torch Lake. According to the report, the analytic data of sampled lake water, tributaries, precipitation, ground water, and lake sediment "confirm the pristine nature of water quality in Torch Lake." The report also states that phosphorous concentrations, at the time, had been consistent over the course of the four years considered in the report, phytoplankton chlorophyll and dissolved oxygen levels were reported in acceptable ranges, and water transparency was considered excellent.

The study included a number of forecast models to simulate the expected water quality response to changes in phosphorous loading. The results of those forecast models suggest that "efforts to prevent or minimize future increases in phosphorous loadings will maintain the current pristine water quality of Torch Lake."

The Three Lakes Association has expressed concern about this project as it relates to dredging the lake bottom in order to construct and maintain a channel for water craft launching meeting MDNR Boating Access Site Guidelines. The concerns center on suggestion that such disturbance of the lake bottom soils will release phosphorous from the soil into the water, thereby negatively impacting water quality. However, comparative analysis of other potential land use impacts requires further study. While comments

have been shared by the Three Lakes Association regarding water quality, consideration of alternatives to the existence of a boating access site also raises concern as it relates to water quality. The development of the land into residential-type uses with the potential addition of multiple septic systems as well as chemical and fertilizer treatments to support manicured lawns, creates problems upon both the water and land resources. These developments, which were on this property previously, have the potential to increase phosphorous, nitrogen, and other chemical element/compound loads. The operation of a boating access site does not typically come with the development large septic systems and the need for tightly manicured landscapes. In fact DNR facilities often have a more naturalized maintenance response to the landscape. The DNR has incorporated practices such as reduction of mowing, control of water's edge erosion, and other best management principles on other similar facilities that may not be found with alternative lakefront land uses.

Further evaluation of the impact of dredging and the impact of residential development is outside the scope of this study and requires the specialized qualifications of a professional limnologist.

Localized Coastal Processes Assessment

An assessment of the existing shoreline and localized coastal processes such as wave and wind action was made for the subject project (attached as Appendix F). The intent of this assessment was to review the existing site conditions and data in order to examine the viability of the proposed project, its potential impact on Torch Lake and neighboring properties, and the impact or challenges that localized coastal processes may present to such a development. Information considered for the Localized Coastal Processes Assessment includes other data included herein, such as the Topographic & Bathymetric Survey and Soils Investigations, as well as review of aerial topography over a number of years, the Torch Lake Inventory Map, and recent site photos.

The aerial photography review revealed that the shoreline is heavily developed, with residential use dominating in the vicinity of the project. Most of the properties have boating access to the lake by way of a dock, boat house, or boat hoist. These structures, particularly those that remain in place year round such as a boat house, are subject to the same coastal forces (waves and ice) that the proposed boat launch would experience, and appear to have a persistence over the 18 years of aerial photography examined, suggesting that such structures are capable of withstanding the conditions present. Consequently, building similar structures at the proposed site appears compatible with the wave climate and ice forces. Lastly, the limited fetch in the vicinity of the subject project on this inland lake limits the growth of wind-generated waves. In effect, because Torch Lake is very long and narrow and oriented approximately north-south, a structure at either the north or south end of Torch Lake would be subject to a longer fetch and potentially larger waves. On the contrary, the proposed boat launch is

approximately in the center and is inheretly less likely to experience large waves from either the north or the south. Moreover, with prevailing winds from the west, the most quiescent water be found along the western shoreline of Torch Lake.

The aerial photography review also revealed that a small, sandy shelf rings the majority of this lake, as verified in the bathymetry at the study site. Further, lake bottom sample profiles, taken during the dredge test sample retrieval at the study site, depict that the sand is a 4-6 inch veneer over a silty clay material. The longshore transport of this material appears to be from north to south, based on accretion and other geomorphic indicators seen on all of the above referenced aerial photography. While the transport direction may change from storm to storm, the dominant direction appears to be to the south. Indicators of this southerly transport were observed in numerous places for several miles both north and south of the study site. Based only on an aerial photo examination, the sand in the nearshore does not appear to be organized into shore-parallel bars, suggesting a lack of wave energy to create such features. To minimize any impacts to the downdrift shoreline (south of the study site), any structure (such as a dock) extending into the lake should be permeable to the longshore transport of sand, as a typical skid pier associated with MDNR boating access sites would be.

Many parcels to both the north and the south have constructed shore protection to prevent the erosion of their shoreline, again as evidenced by review of the aerial photography. This shore protection is often implemented to prevent the erosion of the shoreline from either wave inundation (erosion that occurs from the lake) or from real estate / slope loss (erosion that occurs from the land) or from both. Review of the aerial photograph revealed that there are many properties that have no such shore protection. These unprotected properties do not appear to be recessed back any further than the armored sections. This suggests that the shoreline recession rate is likely low and that shore protection may be present to maintain real estate and prevent erosion from landward to the water rather than vice versa. During the design phase, care should be taken to site any infrastructure sufficiently landward such that it will not be impacted by future erosion.

Based on an interpretation of the bathymetry, navigation hazards in the nearshore are not anticipated. Moreover, the bathymetry does not suggest the creation of unusual or dangerous currents or wave focusing, issues that would impact safe navigation and long-term maintenance of a boating access channel. In fact, the mid-length lake location of the subject site portends less maintenance dredging than a far northerly or southerly tip where lake bottom sand deposits would more likely concentrate due to geology, wave climate, and fetch dynamics.

Given the fine characteristic of the silty clay soils below the courser medium sand surface soils of the lake bottom, the turbidity of the initial dredge has the potential to be greater than maintenance dredging, since the lower level silty clay soils will be disturbed in order to construct the launch and channel. This impact can be readily and easily mitigated with the placement of a turbidity curtain during construction activities, commonly proposed and accepted as a soil erosion and sedimentation control technique and best management practice for lake bottom disturbance activities, required to be addressed by PA 91 and 451 regulated by MDEQ. A turbidity curtain will allow the silty clay soils to resettle in the project vicinity and minimize drift outside of the project area. Future dredge operations to maintain the channel depth will only be that necessary to remove the courser material on the surface subject to transport. However, that operation may also require installation of a turbidity curtain to minimize the transport of suspended sediments to neighboring properties during the maintenance operation.

Only a localized examination of coastal processes and influences was made. While a more detailed assessment of coastal processes could be undertaken during the detailed design phase to estimate the long-term frequency and volume of maintenance dredging, the assessment performed does not suggest that such frequency and volume will be out of the ordinary. Though some may be of the opinion that any development along a lakeshore

will have a potential impact on the water quality of the lake, such impact for a project of the size and magnitude contemplated on a waterbody of the size and depth of Torch Lake, with the implementation of proper construction, soil erosion and sedimentation control, storm water management, and long-term maintenance practices is anticipated to be negligible. Therefore, the Localized Coastal Processes Assessment designates this site as compatible for use as a boating access site.

Aquatic Invasive Species Assessment

Whenever studying the feasibility of installing a public boating access site (BAS), it is important to consider the aquatic invasive species (AIS) aspect. The spread of AIS can be through many vectors, both natural and by other means. Furthermore, the presences of some AIS, such as forms of vegetation, can impact navigation channels to/from boating access sites.

Information on the presence of invasive species was gathered using online resources. According to the Midwest Invasive Species Information Network, several AIS exist within Torch Lake, including zebra mussels, eurasion watermilfoil, narrowleaf cattail, phragmites, and purple loosestrife. There are a number of pathways by which AIS could have entered the lake as the lake shoreline is highly developed creating multiple opportunities. Introduction and spread by natural means such as wildlife and waterfowl is another possibility.

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Potential Design Solution

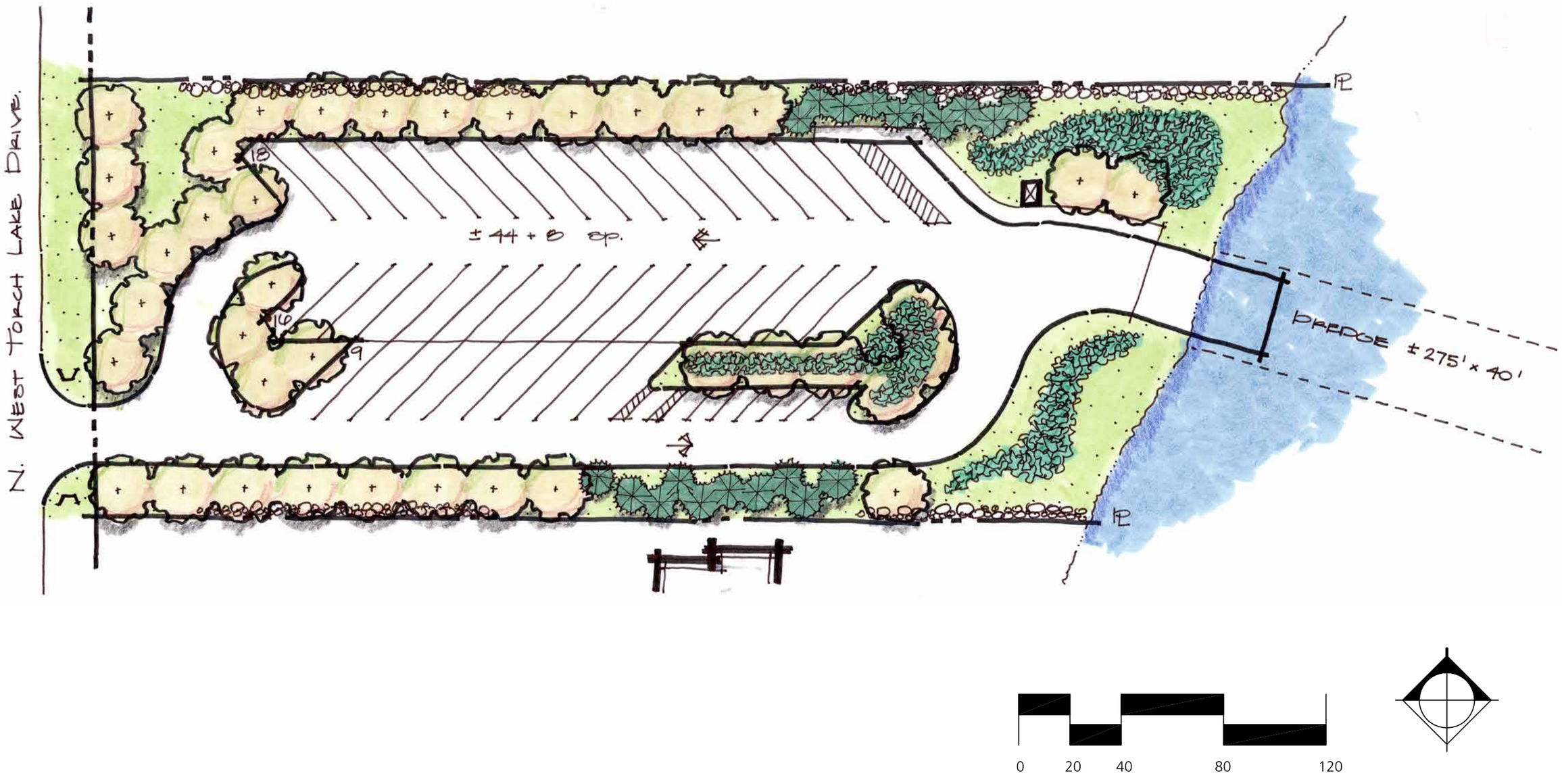
Potential Site Design

A possible design solution was developed to understand the site's potential, working within *MDNR Boating Access Site Design Guide.* The rectangular project site is oriented in an east-west direction dictating a boating access site parking arrangement that is likewise linear in an east-west orientation. A full angle parking bay (parking on both sides of a drive aisle) plus a half parking bay (parking on one side of a drive aisle) are dimensionally accommodated on the project site, while still allowing a 25-30' buffer on each side of the parking lot, as measured to the north and south property lines. This buffer along the property line affords ample space for an effective landscape buffer with evergreen trees placed in the vicinity of adjacent residential home sites.

The full bay of parking is oriented to the north, aligned with egress from the launch, and the half bay of parking is oriented to the south, aligned with ingress to the launch. This arrangement ensures that stacking of vehicles/trailers on site awaiting use of the launch, when such stacking occurs, impedes access to or from fewer parking spaces. The launch itself is oriented toward the north of the site, which slightly minimizes the dredge channel length given the localized bathymetry with deeper water being nearer shore in this location than further south.

Entry to the parking lot from the adjacent county road aligns with the half bay drive aisle oriented toward the south property line. A significant buffer of approximately 60' is afforded along the roadway frontage, allowing for street tree placement. Boulder retaining walls along the property lines facilitate surface grade manipulations on the property that produce a more even slope from the west to east, rather than the existing mostly flat slope of the site punctuated by two steeper embankments. Approximately 44 vehicle/trailer parking spaces are provided, along with approximately 8 vehicle-only parking spaces affording users with smaller vessels, not requiring a trailer, to park. This also allows spaces for guests of boaters. Parking lot islands will serve as bioretention basins, as will the buffer zones north and south of the parking lot and the space between the parking lot and the lake. Naturalized plantings in the space between the parking lot and the lake will serve to preclude erosion and avoid fertilized lawn along the lakeshore. Areas prone to more substantial erosion may be armored if necessary.

Amenities will include a vault toilet between the barrier-free parking spaces and launch ramp, along with an informational kiosk allowing MDNR to post site rules, invasive species information, and other communications for users. The launch ramp width will accommodate two lanes, though skid piers will be placed on each side of the launch to facilitate faster loading and unloading of boats by users.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Planning and Zoning Assessment

Planning and Zoning Assessment

Perhaps the most challenging aspect of development of this site for public boating access purposes to Torch Lake is in the realm of working with local agency planning and zoning to collaboratively mitigate mutual concerns due to differing directives and constituents. At the outset of the study, representatives of the study team met with officials from Torch Lake Township to inform them of the goals of the study and to seek their input on the local planning and zoning requirements, review, and approval process. Historically, MDNR has worked to collaborate with local and interested stakeholders and officials, implemented best management practices, worked with others similarly tasked as environmental stewards, and developed respectfully and sensitively toward neighboring properties and context as it carries out its mission.

The subject property is the former location of a single family residential structure. Though the house has been demolished, remnants of the development remain including portions of the previous foundation. Single family residential homes exist on the properties to the north and south of the site. The property is zoned R-1, as are all parcels along Torch Lake (see Zoning Map, attached as Appendix G) within Torch Lake Township. The Township Zoning Ordinance describes permitted uses in the R-1 Zone, including single family dwellings and accessory buildings. Special Uses, including parks and similar public facilities and uses, are also described, but require a Special Use Permit. The provision for parks and similar public facilities establishes that public recreational use is allowable.

A significant restriction for Special Uses, however, establishes setback criteria of 100', applicable to driveways and parking areas. Given the width of the study site at 200', establishment of a driveway or parking lot conforming to the Torch Lake Township Zoning Ordinance is precluded. Further, the ordinance puts forth additional requirements for increased setbacks or berms on facilities with the potential for use between the hours of 10:00 p.m. and 7:00 a.m. Most recently, Torch Lake Township has passed a new zoning ordinance that restricts any obstruction or structure within 50' of the lake frontage to a sidewalk or stair no wider than 48". For these reasons, the project risks being denied at the Planning Commission level. The rules set forth by Torch Lake Township for those who seek approvals include three avenues by which a denial might be overcome.

First, the Planning Commission could approve the Special Use with a waiver of the setback requirement. Language in the ordinance suggests that the Planning Commission can exercise authority over setbacks, buffers, yards, open space, and parking arrangements in a Special Use application. However, the language implies that the Planning Commission would be increasing setbacks, buffers, yards, and such, not decreasing them. Thus, the likelihood of this occurring seems remote.

Second, re-zoning the property is an option, however, the land use is not particularly well suited to any of the other zoning alternatives: Agricultural, Timber Reserve, or Commercial. Moreover, all three present the concern of being labeled 'spot zoning,' which is not generally recommended by planning professionals or looked upon favorably by Planning Commissions.

Lastly, upon denial at the Planning Commission level, the project could seek a variance from the Zoning Board of Appeals. However, the ordinance also identifies the four minimum criteria for a dimensional variance (20.06), all of which must be met. Most, if not all, of the criteria would be difficult to reach for this particular project, were it seeking approval.

a. That special conditions or circumstances exist which are peculiar to the land, structure or building involved and which are not applicable to most other lands, structures or buildings in the same zoning district; and
b. That literal interpretation of the provisions of this Zoning Ordinance would deprive the applicant of property rights commonly enjoyed by other properties in the same zoning district; and
c. That the special conditions or circumstances do not result from the actions of the applicant; and

d. That the authorizing of the variance will not be of substantial detriment to the neighboring property and will not be contrary to the spirit and purpose of this Zoning Ordinance.

As MDNR continues to consider development of this property, its endeavor to provide pubic recreational benefit and meet the spirit of local development guidelines will be tested. A significant challenge lies in the attempt to address mutual concerns related to diverse and differing directives and constituent needs and make mutually responsible and palatable development decisions.

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Stakeholder and Public Engagement

Stakeholder and Public Engagement

MDNR held a Stakeholder Meeting with invited representatives of Torch Lake Township, Torch Lake Protection Alliance, Three Lakes Association, and legislative representatives on August 10, 2017, at Torch Lake Township Hall. The parties discussed information intended to be shared at an upcoming Public Open House, including many of the study's technical findings to date.

One week later on August 17, 2017, MDNR conducted a Public Input Open House, also at Torch Lake Township Hall, to share the findings of the study to date and to seek input from the public regarding the project. The open house-style format allowed MDNR staff and its consultant team to be stationed at three identical areas in the Township's large meeting room. Each area consisted of one to two project team members and two presentation boards that provided written highlights of the project, site photographs, topographic information, etc. The public was invited to sign in, visit one or more stations, view the presentation boards, ask questions, and were given comment cards that they could complete and return. MDNR also made the presentation board information available on its website and invited e-mail comments through August 31, 2017.

Below are highlights of input received from the Public Input Open House and website/e-mail responses (complete responses are included in Appendix G):

104 attendees signed the sign-in sheet

a. 59 comments were left by those in attendance
b. 54 of 59 comments left by those in attendance expressed opposition to a new BAS in this location
c. 5 of 59 comments left by those in attendance were either neutral or in favor of a new BAS in this location
d. 63 comments were sent in by either mail or e-mail after the open house
e. 53 of 63 comments sent by mail/e-mail expressed opposition to a new BAS in this location
f. 10 of 63 comments sent by mail/e-mail were either neutral or in favor of a new BAS in this location.

A review of the comments identified several common themes of opposition to the project by those present or who chose to communicate their concerns. Those common themes of concern are as follows:

a. Zoning Ordinance / Injunction – A number of meeting attendees and written comments stated that the zoning ordinance and/or legal injunction preclude this project from moving forward and, therefore, question the rationale of going through the exercise of a study, and its associated costs.
b. Disputing Need of an Additional BAS – A number of meeting attendees and written comments dispute that even weekend and holiday boating access is difficult due to crowding at existing launches. They argue that the crowds of boats at the sandbar provide evidence that people who want to access the lake are doing so. They argue that a ratio of spaces per lake acre is not an adequate method of identifying insufficient boating access, especially on a lake as large as Torch Lake
c. Phosphorous Release Related to Dredging – A number of meeting attendees and written comments, including a letter from the Three Lakes Association, suggest that lake bottom dredging will have negative

ecological impacts on water quality and water clarity, and create an environment more conducive to invasive herbaceous species establishment, tied to phosphorous released from the disturbed lake bottom as a result of the dredge operation.

d. Lack of Enforcement of Current Boaters – A number of meeting attendees and written comments took issue with the current level of enforcement related to boating use, alcohol use, and boater noise, suggesting that if the current boating population cannot be effectively managed, additional boating access should not be sought.
e. Lack of Maintenance of Current BAS Sites – A number of meeting attendees and written comments expressed frustration that existing boating access sites, which may or may not be limited to DNR sites, are not being adequately maintained and should be addressed, improved, or even expanded long before an additional boating access site is considered, much less implemented.
f. Lake Frontage Owners vs. Day Users – A number of meeting attendees and written comments suggested that Torch Lake property owners' opinions, as tax payers, should be more heavily weighted as it relates to matters that impact Torch Lake, its use, its quality, etc. than day users who do not have the same type of vested interest in the lake.

Though fewer individuals expressed support for the project than expressed opposition, common themes of support were also found in the review of comments and are summarized as follows:

a. Additional BAS Needed in this Vicinity – A number of meeting attendees and written comments, including that of an Antrim County Commissioner, expressed that there is a need for additional boating access in this vicinity.
b. Better Launching Conditions Needed on the Lake – A number of meeting attendees and written comments noted that the depth, condition, and lack of amenities available (such as an adequately long pier at the north end launches) suggest the need for a new, modern boating access site in this location.
c. Close/Abandon Torch River BAS – A number of supporters suggested that their support for a boating access site in this location was with the condition of closing the Torch River Bridge boating access site due to perceived safety concerns of parking across the street from the launch site and the resulting pedestrian and vehicular conflicts.

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Prior Legal Action

Prior Legal Action

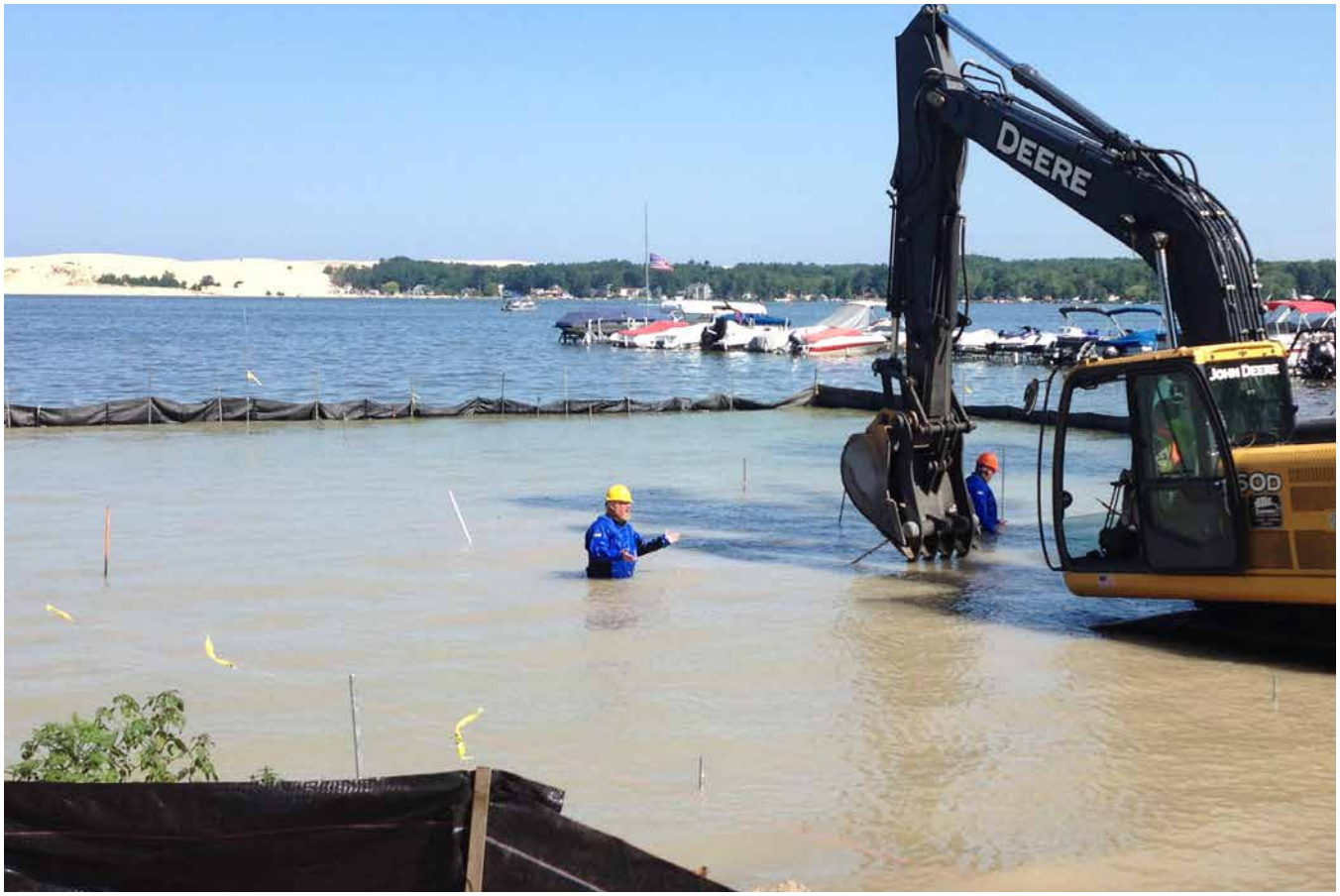
In the 1990's, the property in question was the subject of multiple legal actions. The first litigation was filed in Antrim County Circuit Court prior to MDNR's acquisition of the property. At that time, in August 1994, neighbors to the south of the property sued then property owners in Antrim County Circuit Court. MDNR then acquired the property in two transactions with the previous property owners, executed on Novemeber 18, 1994, and February 17, 1995. At about the time MDNR made its initial acquisition of the property, on November 16, 1994, a second lawsuit was filed against both the previous property owners and MDNR in Thirteenth Judicial Circuit Court.

Though not identical, in both lawsuits, plaintiffs alleged that Torch Lake is a fragile ecosystem susceptible to pollution and degradation, that the Torch Lake Township zoning ordinance does not allow the land use of a public boating access site, that such a use interferes with plaintiff's enjoyment of their own riparian property, that such a use will be detrimental to Torch Lake, and that such a use will invite other such adverse uses of Torch Lake property. Plaintiffs also sought injunctive relief in an effort to halt MDNR's proposed development of a boating access site on the property.

Over the course of nearly two years, and after the filing of several motions and briefs, the lawsuit concluded with an injunction that declared plaintiff's lawsuit to be premature, given that MDNR had neither detailed plans nor a permit to construct anything.

At such time that a boating access site project moves forward, a design is established, and permits are sought and issued, it is possible a similar action may be brought against MDNR. Therefore, it is recommended that guidance be sought from the State of Michigan Attorney General.

Permitting Requirements



Permitting Requirements

As with any construction project in the State of Michigan, a number of permits will be required to ensure that the project complies with regulations set forth to protect the environment and the health, safety, and welfare of the public. Many environmental regulations are exercised through the Joint Permit Application (JPA) of the Michigan Department of Environmental Quality / United States Army Corps of Engineers (MDEQ/USACE). Numerous Parts of the Natural Resources and Environmental Protections Act, 1994 PA 451, as amended, are permitted through the JPA. The portion of the JPA applicable to State of Michigan regulations is administered through the Water Resources Division (WRD) of the MDEQ, which regulates activities where land and water interface.

For the State of Michigan, the JPA ensures compliance through a review and approval process that covers Part 301 Inland Lakes and Streams and Part 91 Soil Erosion and Sedimentation Control, among numerous other environmental regulatory protections that do not apply to this project. Part 301 Inland Lakes and Streams covers all activity, including construction activity, that occurs beneath the Ordinary High Water Mark (OHWM). This includes placement of any boat launch surface materials, such as concrete planks; performance of any dredging activities and disposal of dredge spoils; and placement of any permanent erosion control measures, such as armored revetment. Part 91 Soil Erosion and Sedimentation Control covers placement of necessary measures to protect the inland lakes and streams of Michigan from erosion and sedimentation that may occur during construction or post-construction. This Part will cover placement of turbidity curtain during construction in the lake, placement of temporary measures such as filter fabric fence during construction when the soils are disturbed, and placement of permanent measures to stabilize the site post-construction.

For the United States federal government, the USACE has the authority to regulate activities within the waters of the United States under the Navigable Waters statute. The USACE seeks to ensure that the navigable waters of the United States remain so and may choose to review this project given its position on the Inland Waterway. As with the MDEQ, the jurisdictional review extends from the OHWM waterward, though the USACE OHWM is 1' above the MDEQ OHWM. Though a permit can never be guaranteed, the scope and magnitude of this project is well within that of projects that have been permitted previously for MDNR public boating access sites on the inland lakes and streams of Michigan and navigable waterways of the United States.

For soil erosion and sedimentation control on the landward portion of the site, the Department of Technology, Management and Budget (MDTMB) has established Soil Erosion and Sedimentation Control (SESC) procedures to provide effective soil erosion and sedimentation control, inspection, and enforcement on State of Michigan Construction projects. This work is also regulated pursuant to Part 91 of 1994 PA 451 and applies when projects have earth change in excess of 1 acre or within 500' of a waterbody. Again, though a permit can never be guaranteed, the scope and magnitude of this project is well within that of projects that have been

permitted previously for MDNR public boating access site development with the application of proper soil erosion and sedimentation controls during construction and upon construction completion.

Because the project includes a vault toilet, a permit for such will be necessary through the Health Department of Northwest Michigan.

Due to the addition of a drive approach on North West Torch Lake Drive (replacing two gravel residential-grade drive approaches that currently exist), a permit for work in the Antrim County Road Commission Right-of-Way will be necessary. Within its jurisdictional authority, the Road Commission may offer comment on items such as sight distances and the physical design of the drive approach, as well as any ditch or culvert work that may be necessary. They may also question if peak use occurs where stacking of vehicles/trailers and parking on the roadway happens and how to combat that. Design topics like this should be discussed with the Road Commission as a next step in order to ascertain if further measures such as additional paved stacking space on the roadway or additional regulatory signage will be beneficial.

The Local Agency site plan review process is covered in detail in Section V Planning & Zoning Assessment.

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Feasibility and Recommendations

Feasibility

The project's feasibility from a physical and site constraints stand point, as well as a localized coastal processes stand point, has been verified as favorable through the course of this study. It is well within the realm of viability and feasibility when considering comparable public boating access sites developed by MDNR and other public agencies in Michigan.

The physical geography of the site is adequate for development of parking, maneuvering area, and a launch space into the lake. The site's topography does not present challenges that significantly minimize its buildable area and though the site's bathymetry depicts a need for dredging, it is not at a volume that would be deemed unreasonable.

The site's soils were determined to be adequate to support the development of a boating access site using customary construction techniques and typical pavement cross sections. The lake bottom soil testing depicted no heavy metal or chemical contamination with only elemental selenium detected at higher concentrations than state background levels, though approximating regional levels. This circumstance warrants the need for further testing and possibly special handling of dredge materials but does not constitute an insurmountable challenge or added expense to the potential project.

Though water quality concerns for Torch Lake have been raised as it relates to the release of phosphorous allegedly resulting from dredging operations, this is not a known regulatory concern that would preclude permitting the project. Further, the nutrient loading concern from dredging and its relative impact in comparison to other point and non-point sources of nutrient loading from alternative land use development is not known.

The localized coastal processes assessment designates this site as compatible for use as a public boating access site when considering prevailing wave and wind action. The aquatic invasive species (AIS) assessment notes that boating access sites are only a single of many potential means of the introduction of AIS, suggesting that the preclusion of the subject boating access site alone will not solve this known aquatic ecosystem problem and in fact may not appreciably worsen it.

The site's physical challenges can be reasonably mitigated by modern construction techniques and best management practices. For the reasons cited above, the permitting required by regulatory agencies tasked with protection of the state's natural resources and the health, safety, and welfare of the public is anticipated to be favorable.

Though physical development of the site is reasonably unencumbered by challenges, local support for the project by the local agency, as well as by local non-governmental agencies (Torch Lake Protection Alliance and Three Lakes Association) is expected to be less than favorable. Torch Lake Township has codified several zoning ordinance provisions that, if applicable, may challenge this project's ability to move forward. It is recommended that guidance be sought from the State of Michigan Attorney General regarding the applicability of the zoning ordinances.

Recommendations for Next Steps

Through the course of the study, topics that warrant further diligence in contemplating development of this site for the intended purpose have been identified and include:

a. Data on Use at Existing Public Boating Access Sites - Data collection was outside of the scope of the study, but should MDNR choose to pursue construction of a public boating access site at this location, data supporting its need should be gathered to supplement anecdotal knowledge and target parking space ratios through the use of counters and other means of measuring use and overflow statistics.
b. Phosphorous Concerns Related to Dredging / Environmental Impacts of Dredging and Maintenance Dredging – The specialized services of a professional limnologist should be sought to address and respond to the phosphorous concerns raised by the Three Lakes Association and others.
c. Fishing Statistics / Fisheries Opinions –Fishing statistics and an MDNR Fisheries opinion as to the quality of fishing on Torch Lake should be sought, as suggestions

made by those opposing the project discounted the need for a boating access site on Torch for that common user group.

d. Traffic / Road Study – An evaluation of the traffic and condition impact of a boating access site on the county roadways that serve this project should be pursued.

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Appendix A: Gosling Czubak Progress Report

Torch Lake West
BAS Study - Existing Access Sites

PROGRESS REPORT

Torch Lake West BAS Study – Existing Access Sites

To:	Christy Summers, Beckett & Raeder Inc	Date:	March 17, 2017
From:	Doug Coates, PE	Re:	Torch Lake West BAS Study – Existing Access Sites
cc:	MDNR Team		

1.0 PURPOSE

Part of the Phase I Study is to provide an assessment of all boating access points around the lake, including motorized and carry-down access sites, road ends, the Alden Harbor launch ramp, etc. for usage trends and geographic analysis of distribution. To begin this assessment, Gosling Czubak has prepared an inventory map of access sites and prepared a brief description for the primary sites. Information was derived from Land Use and Recreation plans from Antrim County and the Townships surrounding Torch Lake, in addition to site visits and local knowledge. For the purposes of this study, the boating access points included herein are those that currently exist on Torch Lake proper, with the addition of the DNR's Torch River Boating Access Site, which is just off of Torch Lake, but known to be used primarily by Torch Lake boaters.

2.0 TORCH LAKE BOATING ACCESS – SITE MAP

A "Torch Lake Boating Access Site Map" is attached and illustrates three different types of existing access. These are indicated on the map as:

1. Public Boating Access Site – an improved launching facility operated by a governmental agency and providing a moderate to high level of development, parking, and maneuverability that affords barrier-free boating access to the general public.

2. Public Launch Sites – a "road end" or other minimally improved launch facility that is available to the general public but provides limited or no parking, maneuverability, or barrier-free provisions.

3. Commercial Boating Access and Launch Sites – privately operated launch sites of varying level of improvements related to parking, maneuverability, and barrier-free provisions

The proposed Torch Lake West BAS study site is also indicated on the map. Public Launch Sites identified on the map include numerous road ends and two primitive launch sites based on local planning documents. Road ends were not all individually verified. Site conditions range from "rustic" to "developed". The primary use is for shore side recreation, swimming, and in some cases kayak launching.

Five Public Boating Access Sites, and three Commercial Boating Access and Launch Sites where identified. The condition of these sites is provided in the following summary.

3.0 PLANNING DOCUMENTS

Additional information regarding lake access points is attached to this report. It includes pertinent excerpts from Land Use and Recreation plans from Antrim County and the Townships surrounding Torch Lake. Information was also obtained from the State's Michigan Recreational Boater Information System (MRBIS).

4.0 PUBLIC BOATING ACCESS SITES (BAS)

4.1 Alden Safe Harbor Boating Access Site

Alden Safe Harbor is a public boat launch and the only safe harbor on Torch Lake. Parking for vehicles with boat trailers is available on the street. There are 9 floating docks available for daytime docking. Portable toilets and 3 benches are located at the facility from May to October. Visitors often fish from the docks or the break wall. The docks were replaced in 2011. The Harbor provides the only public boat docks on Torch Lake. In Alden Township's public survey, Alden Safe Harbor was identified as the second most important resource in the township. Over 79% of those who completed the survey listed Alden Safe Harbor as important to very important. And of that group, more than 30% said they used the harbor more than seven times each year with 50% using it one to six times. *(source: Helena Twp. Recreation Plan)*

The boat ramp is a single, 12 feet wide concrete sectional ramp. Turning and maneuvering space is very limited. No on-site parking is available. Boaters must park on the street or at the nearby "Depot Park", which provides approximately 15 to 20 spaces.

4.2 Torch River DNR Boating Access Site

A DNR boat launch site for launching boats into Torch River is maintained just off Aarwood Trail. The DNR recently expanded parking within the 12 acre site. The site is heavily used seasonally. *(source: Clearwater Twp. Recreation Plan)*

The ramp is a hard-surfaced ramp with a skid pier. It is located in an area of limited water depth or limited size of water body, where launching and retrieving of largest boats may be difficult and not recommended. The site has 30 to 45 parking spaces and a public toilet. *(source: DNR - MRBIS)*

Though not located directly on Torch Lake, the Torch River DNR Boating Access Site has been included in this study due to its close proximity to Torch Lake and its acknowledged use being primarily that of Torch Lake boaters.

4.3 Torch River Bridge DNR Boating Access Site

The MDNR-owned Torch River Bridge Boat Access Site provides access to the Torch River and Torch Lake. A paved parking area for about 3 vehicles is available near the launch, and a separate parking area for approximately 20 vehicles and boat trailers is available across the road. Barrier-free toilet facilities are available. The launch is heavily used; public input obtained during Milton Township's recreation planning process noted that the launch becomes very crowded in summer months, particularly on holidays. Severe erosion is observed to occur at the Torch River Bridge Launch. Storm water runs off Cherry Avenue into the lake, and is very visible at the launch site. *(source: Milton Twp. Recreation Plan)*

4.4 Torch Lake Township Boating Access Site / William K. Good Day Park

The Torch Lake Township Public Dock and Boat Ramp is located in Torch Lake Village adjacent to the William K. Good Day Park. It is owned and maintained by the Township. *(source: TLT Land Use Plan)*

The boat ramp is a single, 12 feet wide concrete sectional ramp. The concrete planks are being displaced at the deep end of the ramp, but recent concrete repairs have been made at the ramp entrance. The approach road is paved. The ramp is protected on the south side by a seawall. Water depth is deep enough for larger boats. Turning and maneuvering space is limited. On-site parking is available for approximately 7 to 10 spaces with potential overflow into the adjacent William Good Day Park.

Torch Lake West BAS Study – Existing Access Sites March 17, 2017

The William Good Day Park is adjacent to the Torch Lake Township BAS and is used as an access site for swimming and kayaking. The property was purchased in 1993 and improved with Torch Lake Township funds, a Michigan Natural Resources Trust Fund grant and private donations. It is a 4 acre parcel located within Torch Lake Village with 200 feet of frontage on Torch Lake. The shallows just offshore are ideal for swimming and water games, the grassy, tree-shaded park land is ideal for picnicking and lawn games. A central building offers restrooms, clean water, storage space and telephone. Two pavilions offer shelter, a place for cooking and for group activities; the well-tended grounds have sprouted picnic tables and grills, a children's fun center with slides and swings, basketball and volley ball setups, a flagpole, signs, etc. *(source: TLT Land Use Plan)*

4.5 Eastport DNR Boating Access Site

This parcel with 400 feet of frontage is located at the north end of Torch Lake in Eastport. It has rest rooms, a boat ramp, parking area and beach. It is extensively used by swimmers as well as boaters. It is also a launch area in winter for ice fishing shanties. *(source: TLT Land Use Plan)*

The boat ramp is a 36 foot wide, concrete sectional ramp with one skid pier. The approach road is gravel. Water depth is shallow as observed from shore, but the MRBIS list the site as 2.5 to 3 feet deep 20 feet from shore, and suitable for larger craft. Turning and maneuvering space is good. On-site parking is available for approximately 55 spaces (per MRBIS).

5.0 PUBLIC LAUNCH SITES

5.1 Waring Road (Milton Twp.) Boat Launch

A boat ramp is located at the extension of Waring Road (between Indian Rd. and Campbell Rd.). 66' of the property is owned by Milton Township; an additional 50' adjoining the boat ramp is owned by the DNR and is available for parking. There is a steep grade down to the water; water is only accessible at the boat launch. Severe erosion is occurring at the site and is affecting cement boat ramp pads. *(source: Milton Twp. Recreation Plan)*

The ramp is a single concrete section in medium to poor condition. Depth of water beyond the ramp appears shallow. There is a small gravel loop for limited maneuvering room and a small adjacent parking area for approximately 5 to 8 spaces. No restroom or barrier-free amenities are provided.

5.2 Sand Point (Torch Lake Twp.) Boat Launch

The Sand Point Boat Launch is located 1/3 mile south of Barnes Road. It is furnished with a concrete launch ramp. Since the total width of the access is only 66 feet, parking is limited. *(source: TLT Land Use Plan)*

This ramp is a very narrow concrete ramp leading to the water's edge. A concrete ramp beyond the shore was not observed, but may be covered with sand and rock. There is extremely limited maneuvering and parking space (approximately 0 to 2 spaces). This ramp has limited capacity and is suitable for small-medium craft only. Depth of water beyond the ramp appears shallow. No restroom or barrier-free amenities are provided.

5.3 Road Ends

Other road end access points are identified and described in the attachment to this report, gathered from local planning documents. Road ends were not all individually verified. Site conditions range from "rustic" to "developed". The primary use is for shoreside recreation, swimming, and in some cases kayak or canoe launching. Provisions for launching motorized watercraft, maneuvering, and trailer parking are generally not provided.

6.0 COMMERCIAL BOATING ACCESS AND LAUNCH SITES

6.1 Torch River Marine

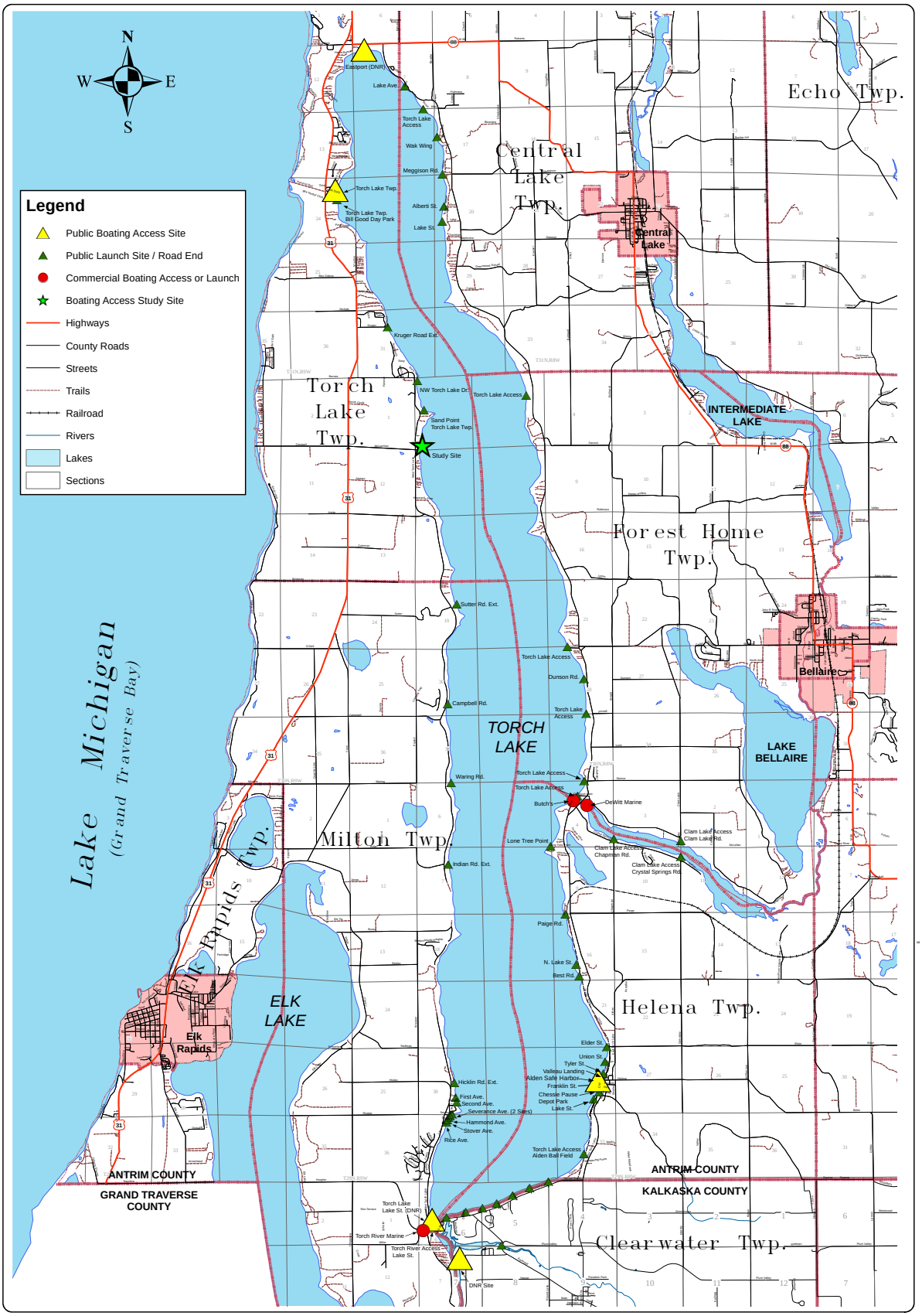
This commercial boat ramp is located on Torch River just south of the Bridge. It provides covered boat docks, boat rentals, winter storage, and a boat ramp.

6.2 Butch's Marine

This commercial boat ramp is located on Clam River just west of the Bridge. It provides dockage, boat rentals, winter storage, and a boat ramp.

6.3 DeWitt Marine

This commercial boat ramp is located on Clam River just east of the Bridge. It provides covered boat docks, boat rentals, winter storage, and a boat ramp.



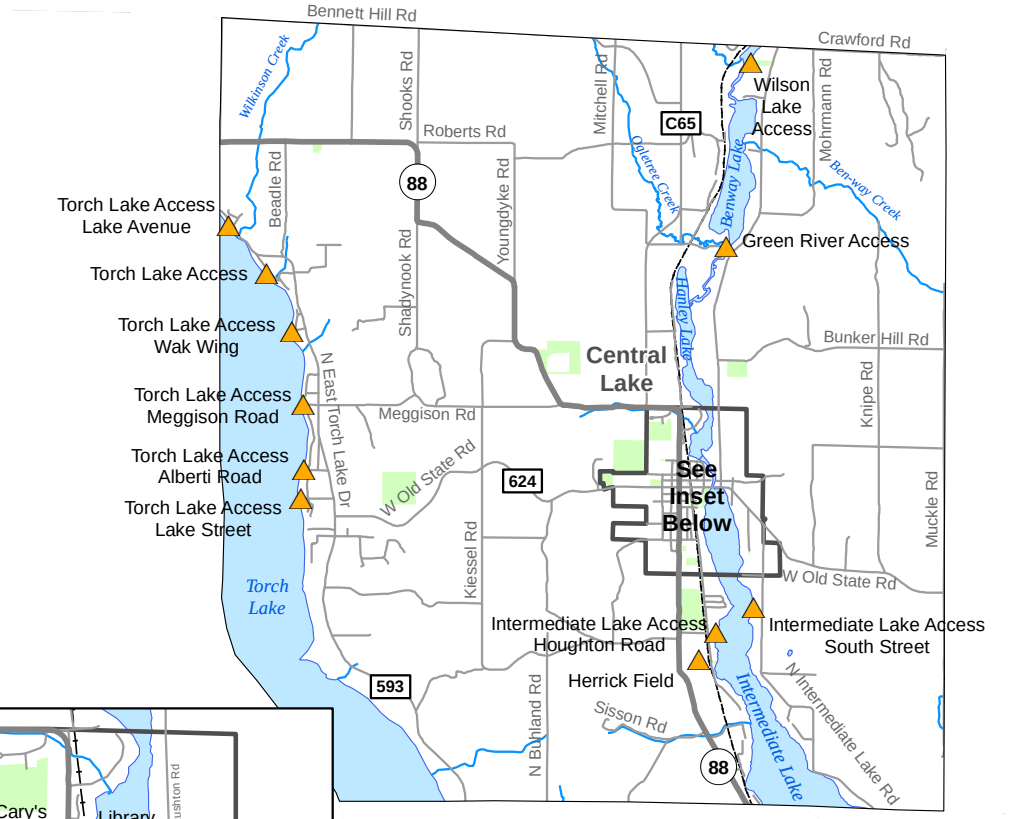
0 1 2 3
Miles

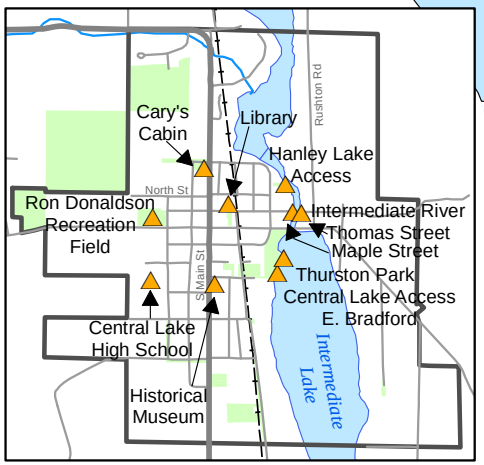
TORCH LAKE BOATING ACCESS - SITE MAP
MICHIGAN DEPARTMENT OF NATURAL RESOURCES
01/03/2017
AS NOTED
ADB
DAC
03/17/2017
Gosling Czubak
1280 Business Park Dr.
Traverse City, MI 49686-8607
231-946-9191 800-968-1062
Fax: 231-941-4603

NOTE: SOURCE - ANTRIM COUNTY 2013-2018 RECREATION PLAN AND STATE OF MICHIGAN CENTER FOR GEOGRAPHIC INFORMATION.

Central Lake Township

Parks and Recreation Facilities





Legend

- Rec/Access Sites
- Highway
- Local Road
- RR Grade
- River
- Lake
- Village
- Township Boundary
- Public Lands/Forest

0 0.5 1 2 3 4 Miles

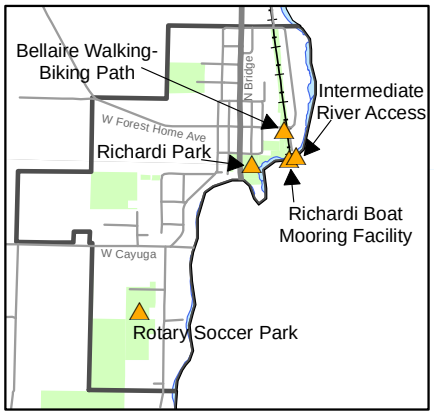
Map Produced by: Antrim County Equalization
Date: September 2010

Central Lake Township

Asset	Handicap Accessible	Acres	Electrified Campsites (qty)	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Play Ground	Picnic Area	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Equestrian Trails	Groomed X-Country Ski Trails	X-Country Ski Rentals	Ice Skating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Boat Launch (see notes for type)	Connected Water body	Notes
Recreation Field	x					x					x										1				
Library	x					x																			
Access Site	x																							Green River	
Recreation Field		13				x			x		x			2							1				
Access Site																								Intermediate Lake	
Access Site																								Intermediate Lake	
Access Site																								Intermediate River	
Access Site																								Intermediate River	
Access Site																								Torch Lake	
Access Site																								Torch Lake	
Access Site																								Torch Lake	
Access Site																								Torch Lake	
Access Site																								Torch Lake	
Access Site	x																						x	Central Lake	
Access Site	x					x																	x	Wilson Lake	
Recreation Field	x	1				x		x			x			2	1					1					
Campground	x	4	36		x	x	x	x	x			x											x	Intermediate Lake	
Access Site																								Hanley Lake	

Forest Home Township

Parks and Recreation Facilities



Legend

- Rec/Access Sites
- Highway
- Local Road
- RR Grade
- River
- Lake
- Village
- Township Boundary
- Public Lands/Forest

N
W E
S

0 0.5 1 2 3 4 Miles

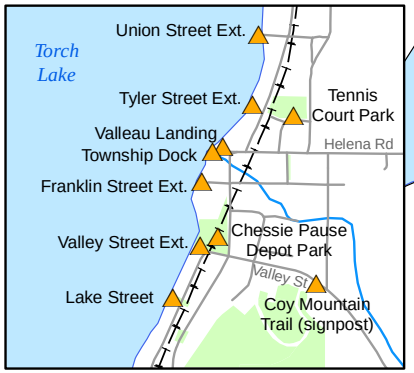
Map Produced by: Antrim County Equalization
Date: September 2010

Forest Home Township

Facility	Controlling Authority	Asset	Handicap Accessible	Acres	Electrified Campsites (qty)	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Picnic Area	Playground	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Equestrian Trails	Groom Cross-Country Ski T	Cross Country Ski Rentals	Ice Skating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Boat Launch (see notes for	Connected Waterbody	Notes
Glacial Hills Pathway and Natural Area/Kirkpatrick forest	Antrim County	Forest Area		536								x															
Glacial Hills Pathway and Natural Area	Forest Home Twp.	Forest Area		183								x															
North Arm Loon Preserve	Forest Home Twp.	Natural Area										x														Lake Bellaire	
Lake Bellaire Access (Miley's)	DNR	Access Site																								Lake Bellaire	
Bellaire Public Schools	Board of Education	Rec. Field	x					x			x		x									1					
Intermediate River Access	Village of Bellaire	Access Site																								Intermediate River	
Clam Lake Access - Clam Lake Road	DNR	Access Site																							x	Clam Lake	
Intermediate Lk Access - Gorham Bch	DNR	Access Site																								Intermediate Lake	
Lk Bellaire Pub. Access - Cottage Dr.	DNR	Access Site					x																			Lake Bellaire	
Lake Bellaire Access	Forest Home Twp.	Access Site																								Lake Bellaire	
Torch Lake Access (4 sites)	Forest Home Twp.	Access Site																								Torch Lake	
Richardi Boat Mooring Fac. - River St.	Village of Bellaire	Access Site																							x	Intermediate River	
Richardi Park	Village of Bellaire	Park		8			x	x		x	x	x				2	3				1					Intermediate River	
Rotary Soccer Park	Village of Bellaire	Park		10									x														
Grass River Natural Area	Antrim County	Natural Area										x														Grass River	
Bellaire Walking/Bike Path	Village of Bellaire	Walking Trail	x					x				x															
Intermediate Lake Access	Forest Home Twp.	Access Site																								Intermediate Lake	
Lake Bellaire Access (Lessard's)	Forest Home Twp.	Access Site																								Lake Bellaire	
Lake Bellaire Access (Pleasant Rd)	Forest Home Twp.	Access Site																								Lake Bellaire	
Grass River Natural Area (Hunt Club)	Antrim County	Natural Area																								Intermediate Lake	
Torch Lake Access (Dunson Rd)	Forest Home Twp.	Access Site																								Torch Lake	
Torch Lake Access (Dockside Beach)																										Torch Lake	

Helena Township

Parks and Recreation Facilities



Legend

- Rec/Access Sites
- Highway
- Local Road
- RR Grade
- River
- Lake
- Village
- Township Boundary
- Public Lands/Forest

0 0.5 1 2 3 4 Miles

N W E S

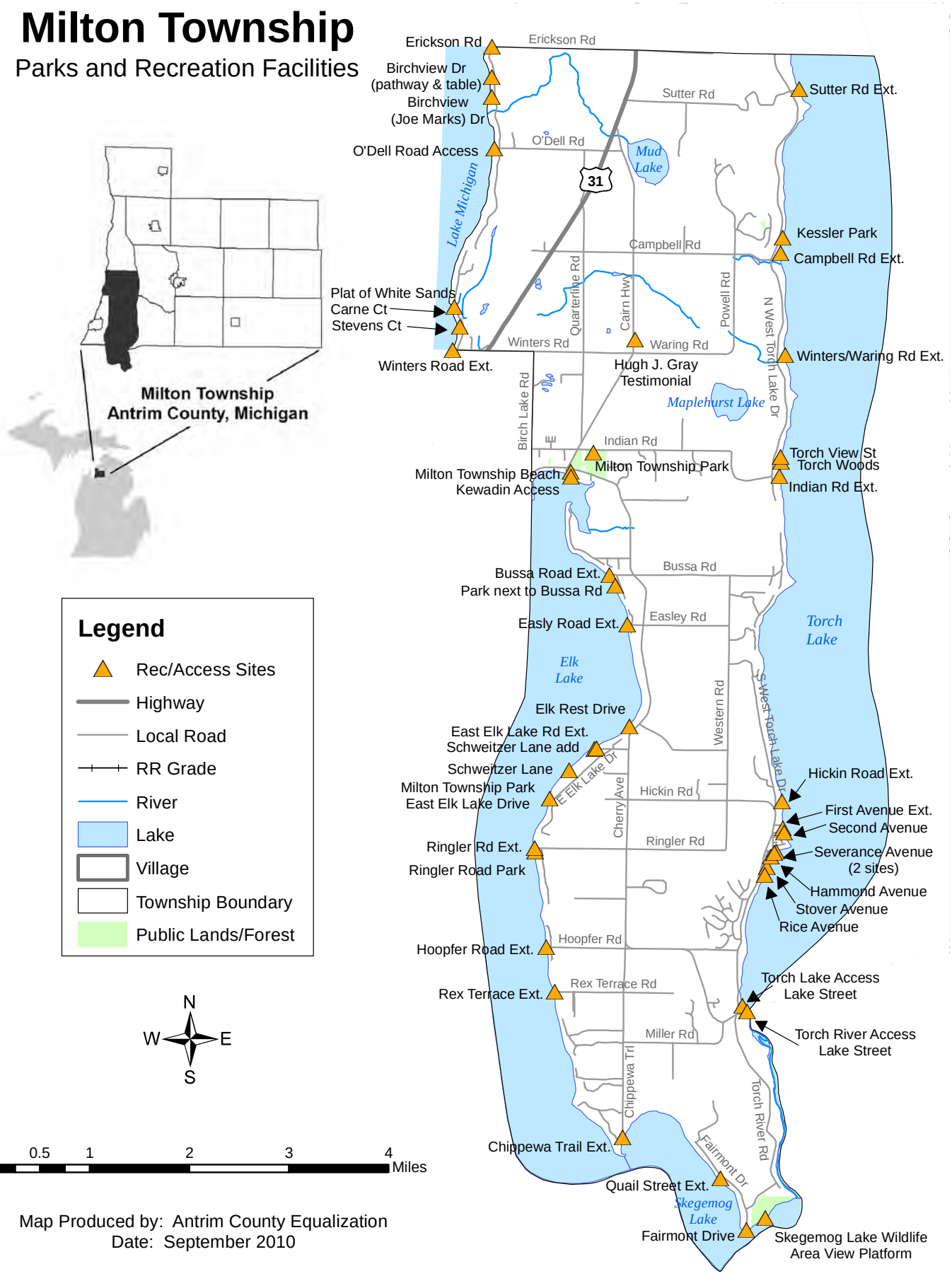
Map Produced by: Antrim County Equalization
Date: September 2010

Helena Township

Facility	Controlling Authority	Asset	Handicap Accessibe	Acres	Electrified Campsites (qty)	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Picnic Area	Playground	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Equestrian Trails	Groom Cross-Country Ski Tr	Cross Country Ski Rentals	Ice Skating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Connected Waterbody	Boat Launch (see notes for ty	Notes
Chessie Pause Depot Park	Helena Twp.	Museum	x				x	x		x	x				x										Torch Lake		
Clam Lake Access - Chapman Rd	Helena Twp.	Access Site	x																						Clam Lake		
Clam Lake Access - Crystal Spring R	Helena Twp.	Access Site	x																						Clam Lake		
Helena Twp. Ball Dimond	Helena Twp.	Recreation Field	x				x			x													x		Torch Lake		
Helena Twp. Library/Comm. Ctr.	Helena Twp.	Library	x																								
Helena Twp. Tennis Court Park	Helena Twp.	Park	x							x	x					2	x										
Valleau Landing	Helena Twp.	Access Site	x				x																		Torch Lake		
Lake Street between Lots 116 & 117	Helena Twp.	Access Site																							Torch Lake		
Valley Street Extension	Helena Twp.	Access Site																							Torch Lake		
Franklin Street Extension	Helena Twp.	Access Site					x																		Torch Lake		
Township Dock	Helena Twp.	Access Site	x																						Torch Lake		
Tyler Street Extension	Helena Twp.	Access Site																							Torch Lake		
Union Street Extension	Helena Twp.	Access Site																							Torch Lake		
Elder Street Extension	Helena Twp.	Access Site					x																		Torch Lake		
Best Road Extension	Helena Twp.	Access Site																							Torch Lake		
Pete Marquette Road	Helena Twp.	Access Site																							Torch Lake		
Paige Road Extension	Helena Twp.	Access Site																							Torch Lake		
Thayer Lake Access	Helena Twp.	Access Site																							Thayer Lake		
Lone Tree Point	Helena Twp.	Access Site																							Torch Lake		
Coy Mountain Reserve	Helena Twp.	Park		17								x															
Public Boat Launch - (Butch's)																											
Grass River Natural Area (Partial)																											

Milton Township

Parks and Recreation Facilities



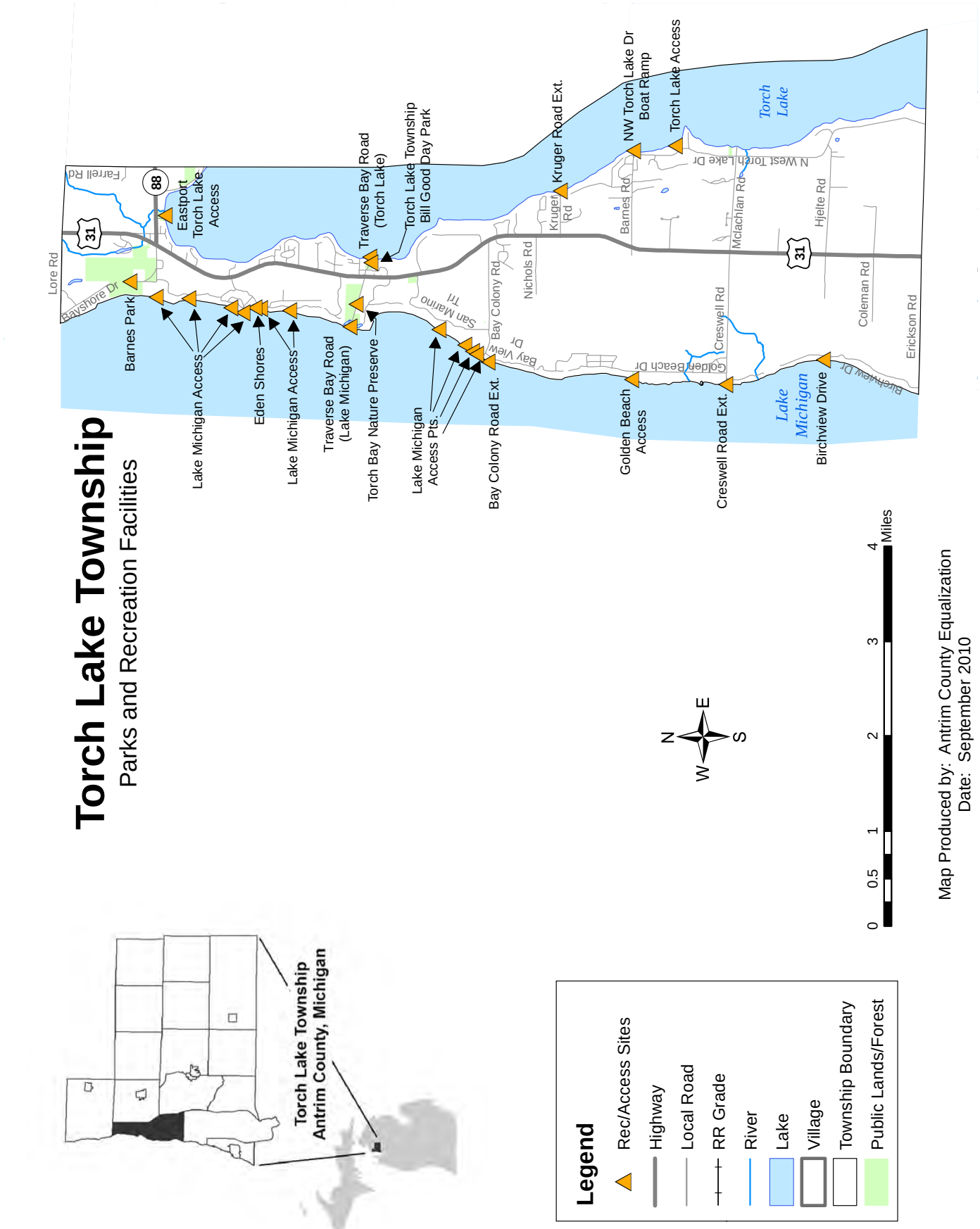
Map Produced by: Antrim County Equalization
Date: September 2010

Milton Township #1

Facility	Controlling Authority	Asset	Handicap Accessible	Acres	Electric Campsites	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Picnic Area	Playground	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Equestrian Trails	Groom X-Country Ski Trai	Cross Country Ski Rentals	Ice Skating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Connected Waterbody	Boat Launch (see notes for	Notes
Bussa Road Extension	ACRC	Access Site					x																		Elk Lake		
Chippewa Trail Extension	ACRC	Access Site																							Elk Lake		
Easly Road Extension	ACRC	Access Site																							Elk Lake		
Hoopfer Road Extension	ACRC	Access Site																							Elk Lake		
Quail Street Extension	ACRC	Access Site																							Elk Lake		
Rex Terrace Extension	ACRC	Access Site																							Elk Lake		
Elk Lake Access - Schweitzer Lane	DNR	Access Site					x																		Elk Lake		
East Elk Lake Rd. Extension	Milton Twp.	Access Site																							Elk Lake		
Elk Lake - Kewadin Extension	Milton Twp.	Access Site																							Elk Lake		
Elk Lake Access - Schweitzer Lane Addition	Milton Twp.	Access Site					x																		Elk Lake		
Elk Rest Drive	Milton Twp.	Access Site																							Elk Lake		
Milton Twp. Beach	Milton Twp.	Beach	x				x								x										Elk Lake		
Milton Twp. Park - East Elk Lake Drive	Milton Twp.	Park								x															Elk Lake		
Plat of Woodlawn - Park A next to Bussa Road	Milton Twp.	Access Site																							Elk Lake		
Ringler Road Park/Elk Lake, Site #38	Milton Twp.	Park	x	4			x			x															Elk Lake		
Erickson Road	ACRC	Access Site																							Grand Traverse Bay		
O'Dell Road Access	ACRC	Access Site					x																		Grand Traverse Bay		
Winters Road Extension	ACRC	Access Site					x																		Grand Traverse Bay		
Birchview (Joe Marks) Dr.	Milton Twp.	Access Site																							Grand Traverse Bay		
Birchview Dr. 94 ft on Lake - Pathway and Table	Milton Twp.	Access Site																							Grand Traverse Bay		
Carne Court, Plat of White Sands	Milton Twp.	Access Site																							Grand Traverse Bay		
Stevens Ct., Plat of White Sands	Milton Twp.	Access Site																							Grand Traverse Bay		
Skegemog Lake Wildlife Viewing Platform	DNR	Viewing Platform				x	x																		Lake Skegemog		
Skegemog Access - Fairmont Dr. - Site # 48	Milton Twp.	Access Site																							Lake Skegemog		

Milton Township #2

Facility	Controlling Authority	Asset	Handicap Accessible	Acres	Electric Campsites	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Picnic Area	Playground	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Equestrian Trails	Groom X-Country Ski Trails	Cross Country Ski Rentals	Ice Skating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Connected Waterbody	Boat Launch (see notes for type)	Notes
Torch River Access - Lake Street	DNR	Access Site					x																		Torch Lake		
Cairn Monument	ACRC	Monument																									
Milton Twp. Park - Cairn/Indian	Milton Twp.	Park	x	33						x	x		x		x	4	2					1	1				
Campbell Rd. Extension	ACRC	Access Site																							Torch Lake		
First Avenue Extension (Cedar Street)	ACRC	Access Site																							Torch Lake		
Hammond Avenue - Plat of Harbor Beach	ACRC	Access Site																							Torch Lake		
Hickin Road Extension	ACRC	Access Site																							Torch Lake		
Indian Road Extension	ACRC	Access Site																							Torch Lake		
Rice Avenue - Plat of Harbor Beach	ACRC	Access Site																							Torch Lake		
Ringler Rd. Extension of Torch Lake	ACRC	Access Site																							Torch Lake		
Stover Avenue - Plat of Harbor Beach	ACRC	Access Site																							Torch Lake		
Sutter Road Extension	ACRC	Access Site																							Torch Lake		
Winters/Waring Road Extension	ACRC	Access Site																							Torch Lake		
Torch Lake Access - Severance Avenue	Milton Twp.	Access Site					x																		Torch Lake		
Torch Lake Access - Kessler Park - Site #93	Milton Twp.	Access Site																							Torch Lake		
Lake St. Plat of New Highlands	Milton Twp.	Access Site																							Torch Lake		
Second Avenue - Harbor Beach (Pine Tr. Ln.)	Milton Twp.	Access Site																							Torch Lake		
Torch Lake Access - Severance Avenue Addition	Milton Twp.	Access Site					x																		Torch Lake		
Torch View Street (Torch Lake Acres)	Milton Twp.	Access Site																							Torch Lake		
Torch Woods #26 Lot #33 (100.38 Feet - Co. Land	Milton Twp.	Access Site																							Torch Lake		


Torch Lake Township
Parks and Recreation Facilities
Barnes Park
Lake Michigan Access
Eden Shores
Lake Michigan Access
Traverse Bay Road (Lake Michigan)
Torch Bay Nature Preserve
Lake Michigan Access Pts.
Bay Colony Road Ext.
Golden Beach Access
Creswell Road Ext.
Lake Michigan
Birchview Drive
Eastport Torch Lake Access
Traverse Bay Road (Torch Lake)
Torch Lake Township Bill Good Day Park
Kruger Road Ext.
NW Torch Lake Dr Boat Ramp
Torch Lake Access
Torch Lake
Lore Rd
Farrell Rd
Bayshore Dr
31
88
San Marino Trl
Bay View Dr
Bay Colony Rd
Nichols Rd
Kruger Rd
Barnes Rd
Golden Beach Dr
Creswell Rd
Mclachlan Rd
N West Torch Lake Dr
Hjelte Rd
Coleman Rd
Erickson Rd
Birchview Dr
N
W
E
S
0
0.5
1
2
3
4
Miles
Torch Lake Township
Antrim County, Michigan
Legend
Rec/Access Sites
Highway
Local Road
RR Grade
River
Lake
Village
Township Boundary
Public Lands/Forest
Map Produced by: Antrim County Equalization
Date: September 2010

Torch Lake Township

Facility	Controlling Authority	Asset	Handicap Assesible	Acres	Electrified Campsites (qty)	Rustic Campsites (qty)	Beach	Restrooms	Bath House	Picnic Area	Playground	Nature Trails	Track & Other Field	Fishing	Volleyball	Tennis Courts	Basketball Courts (qty)	Eqestrian Trails	Groom Cross-Country Ski Trails	Cross Country Ski Rentals	Ice Scating	Softball Fields (qty)	Baseball Fields (qty)	Golf Holes	Boat Launch (see notes for type)	Connected Waterbody	Notes
Barnes Park	Antrim County	Campground	x	163	64	11	x	x	x	x	x	x					x									Lake Michigan	
Torch Lake Access	DNR	Access Site					x	x																	x	Torch Lake	
Torch Lake Township Bill Good Day Park	Torch Lake Twp	Park		4			x	x		x	x				x		x								x	Torch Lake	
Golden Beach Access	Torch Lake Twp	Access Site					x																			Lake Michigan	
NW Torch Lake Drive Boat Ramp	Torch Lake Twp	Access Site		8																					x	Torch Lake	
Torch Bay Nature Preserve	Torch Lake Twp	Access Site		38			x					x													x	Lake Michigan	
Eastport Torch Lake Access	DNR	Access Site																								Torch Lake	
Traverse Bay Road	Antrim County	Access Site																								Torch Lake	
Birchview Drive	Torch Lake Twp	Access Site																								Torch Lake	
Lake Michigan Access (multiple)	Torch Lake Twp	Access Site																								Lake Michigan	
Eden Shores	Torch Lake Twp	Access Site																								Lake Michigan	
Creswell Road Extension	Antrim County	Access Site																								Lake Michigan	
Kruger Road Extension	Antrim County	Access Site																								Lake Michigan	
Bay Colony Road Extension																											

HELENA TOWNSHIP RECREATIONAL INVENTORY (rev. 04/24/2013)						
Map #	**Facility Name/Park Type**	**Location/Description**	**Size**	**Asset/Key Usage/Service Area**	**Recreation and Support Facilities**	**Notes**
2	**Archie Valleau Landing** **Park Type: Community Park (see note under "size")**	**This park is located adjacent to Alden Safe Harbor at the end of Helena Rd.**	**This park does not fit the size criteria for a Community Park as described in appendix C of the guidelines. It is less than ½ acre in size.**	**There is a small beach area near the mouth of Spencer Creek. This area is used by people from the area, State, and country.**	**There is a township bench overlooking this beach.**	**This park was donated to Helena Township by the estate of Archie Valleau** **The beach area needs more clean sand to enhance it.**
	Accessibility Assessment	**This park is located next to the Alden Safe Harbor and shares a parking lot with it. As with the Alden Safe Harbor there is no designated handicap parking space. However, the parking lot is paved and would allow a person using a wheelchair, cane, walker, or crutches to travel to the edge of Archie Valleau Park. However, there is a grassy area and then a concrete step down to the sandy beach area which would not be accessible.**				
	DNR Recreation Grant Inventory	**There is no DNR recreational grant associated with this property.**				
3	**Alden Safe Harbor** **Park Type: Community Park (see note under "size")**	**This park is located at the end of Helena Rd.**	**This park does not fit the size criteria for a Community Park as described in appendix C of the guidelines. It is less than ½ acre in size.**	**Alden Safe Harbor is a public boat launch and the only safe harbor on Torch Lake. Parking for vehicles with boat trailers is available on the street.**	**There are 9 floating docks available for daytime docking. Portable toilets and 3 benches are located at the facility from May to October. Visitors often fish from the docks or the break wall.**	**The docks were replaced in 2011.**
	Accessibility Assessment	**There are no designated handicap parking spaces at this park. However, the driveway and parking spaces adjoining the dock area are paved. These paved areas lead up to the docks and there is one dock that has a metal ramp leading down to the wood dock surface that would be accessible to a handicapped person using a wheelchair, cane, walker, or crutches.**				
	DNR Recreation Grant Inventory	**There is no DNR recreational grant associated with this property.**				

HELENA TOWNSHIP RECREATIONAL INVENTORY (rev. 04/24/2013)						
Map #	**Facility Name/Park Type**	**Location/Description**	**Size**	**Asset/Key Usage/Service Area**	**Recreation and Support Facilities**	**Notes**
4	**Helena Twp. Depot Park (Chessies's Pause)** **Park Type: Community Park (see note under size)**	**South East Torch Lake Drive, Alden, MI**	**This park does not fit the size criteria for a Community Park as described in appendix C of the guidelines. There is approximately 300 feet of frontage on Torch Lake. It is approximately 2.74 acres in size.**	**Key assets are Torch Lake access and the Historical Museum in the old Depot Building** **This is the main community outdoor activity site.** **This park is used by residents from all of Antrim Co. as well as visitors from out of state.**	**There are two sand volley ball courts.** **Decking and steps for access to Torch Lake.** **The Park has been landscaped and is maintained by volunteers.** **There are viewing benches, picnic tables and grills.** **The parking lot at Depot Park provides parking for the park and boat trailer parking for those using the Alden Safe Harbor.**	**The Depot building is a State Historical Site.** **The Township provides maintenance and electricity, takes care of cleanup and trash collection and provides portable toilets for the summer season.**
	Accessibility Assessment	**The parking lot at Depot Park is not paved. There is no designated handicap parking space. The parking lot surface is rough and uneven and would be a challenge for someone in a wheelchair or using a walker, a cane, or crutches. There is a paved sidewalk at the front of the parking lot that provides access to the depot and would allow someone in a wheelchair to travel all around the building except for one small step on the East side. The restroom may not be accessible to someone with a disability. Access to the rest of the park would be difficult for a disabled person. Once you leave the sidewalk area, you can travel partway to the Torch Lake water front by using the paved road surface on Lake Street. However, you then must travel across a rough grassy area to get to the closest wooden lookout/lake access area, which has stairs leading to the water with a handrail. The ground is uneven and would not be accessible for a disabled person. Likewise for accessing any other area of the park.**				
	DNR Recreation Grant Inventory	**DNR grant project #: TF1023. Project Title: Chessie's Pause Acquisition of 2.74 acres with 300 feet of frontage on Torch Lake.**				

Milton Township Road End Access Sites

About 31 road end properties are owned and/or maintained by Milton Township; an additional 2 water access sites/boat ramps are owned by the DNR. These sites provide public access to Milton Township's four lakes and the Torch River, and are used by residents and visitors for fishing, swimming, boating, canoeing, kayaking, picnicking, and potential fire lanes. While many of the sites are fairly small, they provide an important amenity to Township residents and visitors. Road end access and usage issues are regulated by Township policy.

Road ends and other public access sites were assessed by the Township Parks and Recreation Committee in 2013. Goals of the assessment process were to identify needs at each of the Township's public access properties and to determine the potential for public access improvements. Assessments reviewed specifics of the road ends including location; waterbody/water frontage details; owner; description/purpose of the site; adjacent landowner information; access to water; disabled access; parking; signage; infrastructure; greenbelt space; and details relative to any erosion issues identified at the site.

Properties were also assigned a ranking or category of 1-4, indicating the potential for public access enhancements. Categories were assigned as follows:

- Category 1 – Currently functional, no improvements needed
- Category 2 – Minimal public investment could enhance public access
- Category 3 – Substantial public investment could enhance public access

- Category 4 – Minimal potential for public access improvements

In addition to public access enhancement potential, Parks and Recreation Committee members, Township staff, and the Antrim County Erosion Control Officer assessed erosion issues occurring at each site. Assessments identified the presence and extent of greenbelts and of any erosion occurring on the site. Assessments also prioritized erosion control projects and identified the scale of any erosion control efforts needed to address erosion on the site.

The Recreation Inventory provides details on each of the following characteristics for each site:

- Waterbody
- Improvement category (potential for public access enhancements; categories are outlined above)
- Water frontage width
- Uses (uses that could or do occur at the site)
- Accessibility barriers (any obstacles to the water's edge, such as steep slopes or vegetation)
- Disabled access
- Parking
- Fire truck pump accessibility
- Erosion (presence and severity of erosion at the site)
- Greenbelt (extent of vegetative buffer impacting runoff into the water)
- Survey recommended

- Recommendations

A summary table on page 26 identifies major site characteristics, improvement rankings, and erosion control priority and project scale.

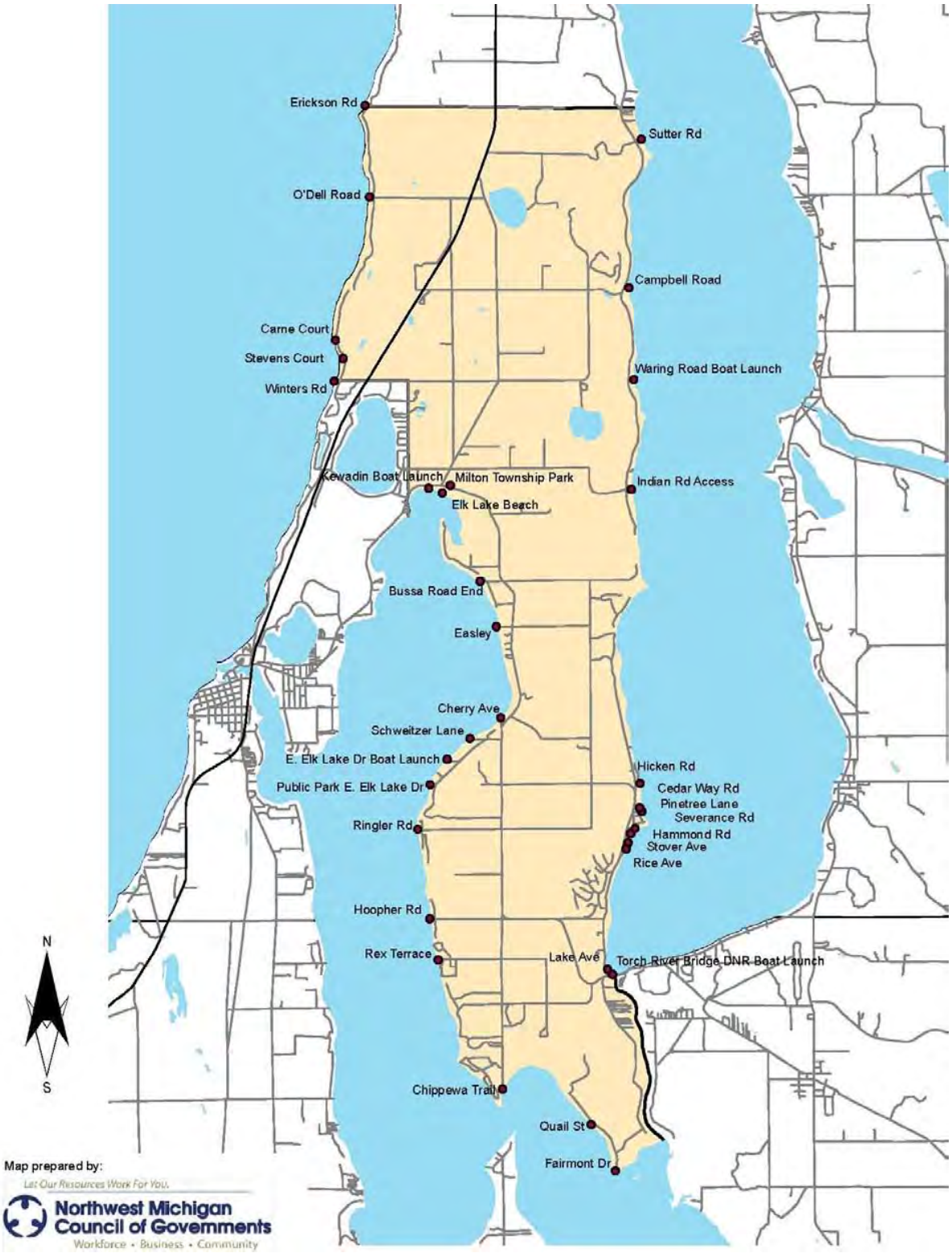
A report summarizing the results of the assessment around each one of the assessment categories is included in Appendix A.

Site ID	Waterbody	Water front-age width	Accessible for fire truck pump	Access to water	Accessible to disabled people	Swimming	Beach	Fishing	Kayak	Boat launch	Improvement ranking*	Erosion Control Priority & Project Type**
BUSSA	ELK LAKE	66'	Y	Y	N	Y	N	N	Y	N	1	L/3
CAMPBELL RD	TORCH	66'	Y	Y	N	Y	N	N	N	N	1	M/2
CEDAR WAY	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	L/3
CHERRY AVE	ELK LAKE	16'	N	Y	N	Y	Y	Y	N	N	2	
CHIPPEWA TRAIL	SKEGAMOG	66-100'	Y	Y	Y	Y	Y	Y	Y	N	1	L/3
EASLEY	ELK LAKE	66'	Y	Y	Y	Y	N	Y	Y	N	2	L/3
ELK LAKE DR	ELK LAKE	66'	N	Y	N	Y	Y	Y	Y	Y	1	NA
ELK LAKE DR BOAT RAMP	ELK LAKE	30'	Y	Y	Y	N	N	Y	N	Y	1	NA
ERICKSON RD	GT EAST		Y	Y	N	Y	Y	Y	Y	N	0	H/3
FAIRMONT	SKEGAMOG	66'	Y	Y	N ?	Y	Y	N	N	Y	1	L/3
HAMMOND	TORCH	48'	Y	N	Y	Y	N	N	N	N	2	L/2
HICKEN RD	TORCH	66'	N	Y	N	Y	N	Y	N	N	3	M/2
HOOPHER	ELK LAKE	66'	N	Y	N	Y	N	N	N	N	2	M/2
INDIAN RD ACCESS	TORCH	66'	Y	Y	N	Y	N	N	Y	N	2	H/1
KEWADIN BOAT LAUNCH	ELK LAKE		Y	Y	N	Y	Y	Y	N	Y	0	H/1
LAKE AVE	TORCH	40'	Y	Y	Y	Y	N	N	N	Y	1	M/2
O'DELL RD	GT EAST		Y	Y	N	Y	Y	Y	N	N	0	L/3
PINETREE LANE	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	L/3
QUAIL ST	SKEGAMOG, TORCH RIV	66'	Y	Y	Y	Y	N	N	N	N	4	L/2
REX TERRACE	LAKE		Y	Y	N	Y	N	N	N	N	4	L/3
RICE AVE	TORCH	30'	Y	Y	N	Y	N	N	N	N	2	M/2
RINGLER RD	ELK LAKE	50'	Y	Y	Y	Y	N	Y	Y	N	1	L/3
SCHWEITZER LANE	ELK LAKE	66'	N	Y	N	Y	N	N	Y	N	3	L/3
SEVERANCE RD	TORCH	66'	N	Y	Y	Y	Y	N	N	N	3	M/2
STOVER AVE	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	M/2
SUTTER RD	LAKE	66'	Y	Y	N	Y	N	Y	N	N	2	H/1
TORCH RIVER BRIDGE	TORCH	220'	Y	Y	N	Y	N	Y	N	Y	1	H/1
WARING/CAMPBELL RD	TORCH		Y	Y	N	Y	N	N	N	Y	1	HIGHEST/1
WHITE SANDS #5	GT EAST	50'	N	Y	N	N	N	N	N	N	4	NA
WHITE SANDS #6	GT EAST	50'	N	Y	N	N	N	N	N	N	4	NA
WINTERS ROAD	GT EAST	66'	N	Y	N	Y	N	Y	N	N	0	M/3

*1 = Currently functional, no improvements needed; 2 = Minimal public investment could enhance public access; 3 = Substantial public investment could enhance public access; 4= Minimal potential for public access improvements

**H = High prirority; M=Medium priority; L= Low priority. 1 = major project; 2=minor project; 3 = repair and maintain

Map 6. Road End Access Sites



Bussa Rd

The Bussa Road End Access is a paved road end with a grassy shoreline. A slight grade is present at the water's edge. The access site could be used as-is for swimming or a kayak/canoe launch. Homes are present on either side of the road end.

Waterbody	Elk Lake
Improvement Category	1
Water frontage width	66'
Uses	Swim, kayak/canoe launch
Accessibility Barriers	None
Disabled Access	N
Parking	Roadside parking
Accessible for fire truck pump	Y
Erosion	Minimal
Greenbelt	Enhance when conducting erosion control project
Survey recommended?	N
Recommendations	

Campbell Rd

The Campbell Road end access is used as an overlook or water view, and as a kayak launch. Some overnight parking is reported to occur. A survey was completed for this site, and boundaries were identified; however, stakes have been removed, and boundaries are difficult to identify.

Waterbody	Torch Lake
Improvement Category	1
Water frontage width	66' owned by Milton, 50' DNR
Uses	Boat launch, swimming
Accessibility Barriers	None
Disabled Access	N
Parking	Off-road—4 spaces, grass & gravel
Accessible for fire truck pump	Y
Erosion	Moderate
Greenbelt	Enhance when conducting erosion control project
Survey recommended?	Y
Recommendations	Re-stake boundaries

Fairmont Dr

The Fairmont Drive Road End features a fairly dense hardwood/cedar forest to the left. The property may have potential, with a sandy lake bottom and good parking. However, it is located near the outlet of Torch River; with lots of stumps and shallow water; the waterfront is not very inviting.

Waterbody	Lake Skegemog, Torch River
Improvement Category	4
Water frontage width	66’
Uses	Swimming
Accessibility Barriers	Large floating steel dock
Disabled Access	Y
Parking	Off road: 10 spaces
Accessible for fire truck pump	Y
Erosion	Minimal
Greenbelt	Minimal
Survey recommended?	N
Recommendations	

Hammond Rd

Hammond Road End Access includes a large grassy area and a 20’ sand beach on Torch Lake. A paved drive for neighboring property cuts across the access parcel; a 67’ drive divides as drives to 2 adjacent cottages. A steep 35 degree slope exists on the other side of Lake Street, which is contributing to erosion on the Hammond Road access site.

Waterbody	Torch Lake
Improvement Category	1
Water frontage width	30’
Uses	Swimming
Accessibility Barriers	None
Disabled Access	N
Parking	Roadside parking
Accessible for fire truck pump	Y
Erosion	Minimal
Greenbelt	Minimal
Survey recommended?	N
Recommendations	

Hicken Rd

The Hicken Road End provides access to Torch Lake. However, the lake bottom in this location is rocky and silty, and existing steps down to water's edge, about 15' from road elevation, are uneven and steep. There is little evidence of public use.

Waterbody	Torch Lake
Improvement Category	3
Water frontage width	66'
Uses	Swimming, fishing
Accessibility Barriers	Steep decline, uneven steps to water's edge
Disabled Access	N
Parking	Off-road: 2 spaces Roadside parking
Accessible for fire truck pump	N—too far to water's edge w/steep drop to water; water is shallow
Erosion	Moderate
Greenbelt	Minimal
Survey recommended?	N
Recommendations	Update stairs, add railing

Hoopher Rd

Hoopher Road ends in a paved cul-de-sac, 50' from the water's edge. 30% grade to water, 20' narrow path to 20' flat, then 4' drop to water. Evidence suggests that people have been going down to the water.

Waterbody	Elk Lake
Improvement Category	2
Water frontage width	66'
Uses	Swimming
Accessibility Barriers	Vegetation
Disabled Access	N
Parking	Roadside: 6 spaces
Accessible for fire truck pump	N
Erosion	Moderate
Greenbelt	Adequate
Survey recommended?	Y
Recommended improvements	Improve steps & provide stairs to water

Indian Rd

Indian Road End Access provides access for swimming, and potentially for a kayak or canoe launch. A steep grade exists at the water's edge, with stairs.

Waterbody	Torch Lake
Improvement Category	2
Water frontage width	66'
Uses	Swimming
Accessibility Barriers	Steep slope
Disabled Access	No
Parking	Off-road : 10 spaces
Accessible for fire truck pump	Y
Erosion	Severe
Greenbelt	Enhance when conducting erosion project
Survey recommended?	N
Recommendations	Improve grass area by lake, improve entry road and control severe erosion

Kewadin Boat Launch

The Kewadin Boat Launch provides boating access to Elk Lake. Severe erosion exists on the site.

Waterbody	Elk Lake
Improvement Category	2
Water frontage width	66'
Uses	Swimming, boat launch, fishing, beach
Accessibility Barriers	None
Disabled Access	N
Parking	Roadside
Accessible for fire truck pump	Y
Erosion	Severe
Greenbelt	Minimal
Survey recommended?	N
Recommendations	

Lake Ave

The Lake Ave Road End provides beach access to Torch Lake. Adjacent cottages on the south side of the site use the property for parking.

Waterbody	Torch Lake
Improvement Category	1
Water frontage width	40’
Uses	Swimming, canoe/kayak launch, beach
Accessibility Barriers	N
Disabled Access	Wheelchair accessible with assistance
Parking	Off road: 2 spaces
Accessible for fire truck pump	Y
Erosion	Moderate—storm water runoff
Greenbelt	Minimal
Survey recommended?	N
Recommendations	Address erosion

Pinetree Ln

The Pinetree Lane Road End provides access to Torch Lake; however, the lake bottom is rocky and silty, and there is no evidence of public use. Property boundaries are not easily identified.

Waterbody	Torch Lake
Improvement Category	2
Water frontage width	30’
Uses	Swimming, fishing
Accessibility Barriers	3’ drop to water’s edge
Disabled Access	N
Parking	Roadside/off-road: 3 spaces
Accessible for fire truck pump	
Erosion	Minimal
Greenbelt	Minimal
Survey recommended?	Y
Recommendations	Survey property and identify water access point

Rice Ave

The Rice Avenue Road End property appears to be used in the winter months for ice fishing. Erosion is observed on the site; runoff from across the road washes down the length of parcel.

Waterbody	Torch Lake
Improvement Category	2
Water frontage width	30’
Uses	Swimming, fishing
Accessibility Barriers	Large rocks at shoreline
Disabled Access	N
Parking	Off-road: 8 spaces
Accessible for fire truck pump	Y
Erosion	Moderate
Greenbelt	Adequate
Survey recommended?	N
Recommendations	A split rail fence 20’ in from the lake could designate parking and improve area between Lake and SW Torch to allow for more parking—add signage for awareness.

Ringler Rd

The Ringler Road end has excellent access for swimming and canoes/kayaks. There is minimal land cover and large rocks prohibit access by larger boats or fishing shelters. Ample roadside parking is available.

Waterbody	Elk Lake
Improvement Category	1
Water frontage width	33’ open, 15-16’ of vegetation on both sides
Uses	Swimming, fishing
Accessibility Barriers	Large rocks at shoreline
Disabled Access	N
Parking	Roadside
Accessible for fire truck pump	Y
Erosion	Minimal
Greenbelt	Minimal
Survey recommended?	N
Recommendations	

Schweitzer Ln

The Schweitzer Lane Road End site provides access to Elk Lake. The site provides excellent swimming access to Elk Lake via well-maintained steps down to the water's edge. Usage for canoe/kayak launch would be difficult, and the E. Elk Lake Dr DNR launch site is 1/4 mile south.

Severance Rd

Severance Road End is a regularly used access site with a designated swimming area outlined with buoys, a sandy lake bottom, and a level, grassy picnic and seating area. The swim area is currently limited by abutting property owner's dock/boat hoist. Issues related to activity/noise/parking at the site have largely been addressed by the addition of a fence.

Waterbody	Elk Lake
Improvement Category	1
Water frontage width	66'
Uses	Swimming
Accessibility Barriers	Steep slope and Vegetation
Disabled Access	N
Parking	Roadside
Accessible for fire truck pump	N
Erosion	Minimal
Greenbelt	Adequate
Survey recommended?	N
Recommendations	

Waterbody	Torch Lake
Improvement Category	3
Water frontage width	30'
Uses	Swimming, beach
Accessibility Barriers	None
Disabled Access	Y
Parking	Roadside
Accessible for fire truck pump	Y
Erosion	M
Greenbelt	Enhance, when conducting erosion project
Survey recommended?	Y
Recommendations	Storm water management

Stover Rd

The Stover Road End property provides access to Torch Lake for swimming or fishing; however, as is, it is difficult to enter the water from this site.

Waterbody	Torch Lake
Improvement Category	2
Water frontage width	30’
Uses	Swimming, fishing
Accessibility Barriers	None
Disabled Access	N
Parking	Off-road: 3 spaces
Accessible for fire truck pump	Y
Erosion	Moderate
Greenbelt	Minimal
Survey recommended?	M
Recommendations	

Sutter Rd

The Sutter Road End site provides access on foot to Torch Lake; however, a steep grade is present for the last 20’ to the water, and the lake bottom is rocky. Despite difficulties with accessing the water, this site is frequently used, including by disabled individuals. The site is too steep for uses such as boat launches.

Waterbody	Torch Lake
Improvement Category	3
Water frontage width	66’
Uses	Swimming, fishing
Accessibility Barriers	Steep drop last 20-50’
Disabled Access	N
Parking	Off-road: 5 spaces
Accessible for fire truck pump	Y
Erosion	Severe erosion last 30’ to water
Greenbelt	Minimal
Survey recommended?	N
Recommendations	Could use riprap to address erosion. Add steps—need steps with a handrail to water.

O'Dell Rd

The O'Dell Road End provides access to East Grand Traverse Bay and includes an old boat ramp.

Waterbody	East Grand Traverse Bay
Improvement Category	
Water frontage width	
Uses	Swimming, fishing, beach
Accessibility Barriers	None
Disabled Access	N
Parking	Roadside
Accessible for fire truck pump	Y
Erosion	Moderate
Greenbelt	Adequate
Survey recommended?	N
Recommendations	

Waring/Campbell Rd

A boat ramp is located at the Campbell Road End. 66' of the property is owned by Milton Township; an additional 50' adjoining the boat ramp is owned by the DNR and is available for parking. There is a steep grade down to the water; water is only accessible at the boat launch. Severe erosion is occurring at the site and is affecting cement boat ramp pads.

Waterbody	Torch Lake
Improvement Category	1
Water frontage width	66' owned by Milton, 50' DNR
Uses	Boat launch, swimming
Accessibility Barriers	None
Disabled Access	N
Parking	Off-road—4 spaces, grass & gravel
Accessible for fire truck pump	Y
Erosion	Severe
Greenbelt	Minimal
Survey recommended?	N
Recommendations	Address erosion

2013 Milton Township Public Access/Road End Assessment DRAFT Summary Report

31 public access/road end sites, located on East Grand Traverse Bay, Elk Lake, Lake Skegemog, and Torch Lake, were assessed in the summer of 2013 by members of the Milton Township Parks and Recreation Committee. Goals of the assessment process were to identify needs at each of the Township's public access properties and to determine the potential for public access improvements. Assessments reviewed specifics of the road ends including:

- Location
- Waterbody
- Owner
- Description/purpose of the site
- Adjacent landowner information
- Access to water
- Parking
- Signage
- Infrastructure
- Infrastructure
- Greenbelt space
- Erosion

Properties were also assigned a ranking or category of 1-4, indicating the potential for public access enhancements. Categories were assigned as follows:

- Category 1 – Currently functional, no improvements needed
- Category 2 – Minimal public investment could enhance public access
- Category 3 – Substantial public investment could enhance public access
- Category 4 – Minimal potential for public access improvements

A summary table showing selected characteristics is below; specifics on each of the assessment issues, along with details on each of the 4 categories, follow.

Site ID	Waterbody	Water frontage width	Accessible for fire truck pump	Access to water	Accessible to disabled people	Swimming	Beach	Fishing	Kayak	Boat launch	Improvement ranking*	Erosion Control Priority & Project Type**
BUSSA	ELK LAKE	66'	Y	Y	N	Y	N	N	Y	N	1	L/3
CAMPBELL RD	TORCH	66'	Y	Y	N	Y	N	N	N	N	1	M/2
CEDAR WAY	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	L/3
CHERRY AVE	ELK LAKE	16'	N	Y	N	Y	Y	Y	N	N	2	
CHIPPEWA TRAIL	SKEGAMOG	66-100'	Y	Y	Y	Y	Y	Y	Y	N	1	L/3
EASLEY	ELK LAKE	66'	Y	Y	Y	Y	N	Y	Y	N	2	L/3
ELK LAKE DR	ELK LAKE	66'	N	Y	N	Y	Y	Y	Y	Y	1	NA
ELK LAKE DR BOAT RAMP	ELK LAKE	30'	Y	Y	Y	N	N	Y	N	Y	1	NA
ERICKSON RD	GT EAST		Y	Y	N	Y	Y	Y	Y	N	0	H/3
FAIRMONT	SKEGAMOG	66'	Y	Y	N ?	Y	Y	N	N	Y	1	L/3
HAMMOND	TORCH	48'	Y	N	Y	Y	N	N	N	N	2	L/2
HICKEN RD	TORCH	66'	N	Y	N	Y	N	Y	N	N	3	M/2
HOOPHER	ELK LAKE	66'	N	Y	N	Y	N	N	N	N	2	M/2
INDIAN RD ACCESS	TORCH	66'	Y	Y	N	Y	N	N	Y	N	2	H/1
KEWADIN BOAT LAUNCH	ELK LAKE		Y	Y	N	Y	Y	Y	N	Y	0	H/1
LAKE AVE	TORCH	40'	Y	Y	Y	Y	N	N	N	Y	1	M/2
O'DELL RD	GT EAST		Y	Y	N	Y	Y	Y	N	N	0	L/3
PINETREE LANE	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	L/3
QUAIL ST	SKEGAMOG, TORCH RIV	66'	Y	Y	Y	Y	N	N	N	N	4	L/2
REX TERRACE	LAKE		Y	Y	N	Y	N	N	N	N	4	L/3
RICE AVE	TORCH	30'	Y	Y	N	Y	N	N	N	N	2	M/2
RINGLER RD	ELK LAKE	50'	Y	Y	Y	Y	N	Y	Y	N	1	L/3
SCHWEITZER LANE	ELK LAKE	66'	N	Y	N	Y	N	N	Y	N	3	L/3
SEVERANCE RD	TORCH	66'	N	Y	Y	Y	Y	N	N	N	3	M/2
STOVER AVE	TORCH	30'	Y	Y	N	Y	N	Y	N	N	2	M/2
SUTTER RD	LAKE	66'	Y	Y	N	Y	N	Y	N	N	2	H/1
TORCH RIV BRIDGE	TORCH	220'	Y	Y	N	Y	N	Y	N	Y	1	H/1
WARING/CAMPBELL RD	TORCH		Y	Y	N	Y	N	N	N	Y	1	HIGHEST/1
WHITE SANDS #5	GT EAST	50'	N	Y	N	N	N	N	N	N	4	NA
WHITE SANDS #6	GT EAST	50'	N	Y	N	N	N	N	N	N	4	NA
WINTERS ROAD	GT EAST	66'	N	Y	N	Y	N	Y	N	N	0	M/3

**1 = Currently functional, no improvements needed; 2 = Minimal public investment could enhance public access; 3 = Substantial public investment could enhance public access; 4= Minimal potential for public access improvements*

***H = High prirority; M=Medium priority; L= Low priority. 1 = major project; 2=minor project; 3 = repair and maintain*

Assessment Details

Waterbody	# of Public Access/Road End Sites	Boat Launch
East Grand Traverse Bay	5	1
Elk Lake	9	3
Lake Skegemog	3	1
Torch Lake	14	2
Milton Township Park	1	
Total	**32**	**7**

Waterbody & Ownership

Over a third of the assessed public access/road end properties were located on Torch Lake (13 sites); 11 sites were located on Elk Lake. Milton Township owns all but 2 of the sites; the DNR owns and manages boat launches on the Torch River and E. Elk Lake Dr.

General description/purpose of the site

Most sites were described as road ends; additional details were provided for some sites relative to swimming access, boat launch potential, or park characteristics. Some descriptions provided specifics around lake bottoms (i.e. sandy bottoms, silt, etc). Additional features noted in this section of the assessment included information on water frontage dimensions, ground cover, and fire truck pump accessibility.

- The majority of road ends (12) had a water frontage width of 66'. Water frontage at three sites ranged between 40-50', and four sites featured 30' of water frontage. The Torch Lake DNR Boat Launch includes 220' of water frontage, and the Milton Township park (public beach, volleyball, boardwalk trail) includes 300' of water frontage. Water frontage dimensions were not recorded for three sites.
- Most sites (29) can be used for swimming. Fishing (15 sites) and boat ramps (9) and kayak launch (7 sites) potential exists at about half of the assessed properties. "Beach" was identified as a use for 11 of the properties.
- Grass (or paved with grass) is noted as the primary ground cover for 23 properties. Ground cover is recorded as gravel/sand and gravel for 6 properties; sand is noted as ground cover for two properties; and trees are the primary ground cover for 2 properties.
- 21 sites are accessible for fire truck pumps.

Adjacent landowner information

Assessments identified issues or features of surrounding properties, with details including a description of surrounding properties and any barriers to that property.

- Homes or cottages were noted as being present adjacent to 23 sites. No information was recorded for 10 sites.
- In some cases, boundaries were not clear or adjacent property owners use the road end for parking. Surveys were recommended for 8 sites.
- 19 sites include barriers, including either/or vegetation or fencing, that may delineate boundaries or prevent access to neighboring properties.

Access to water

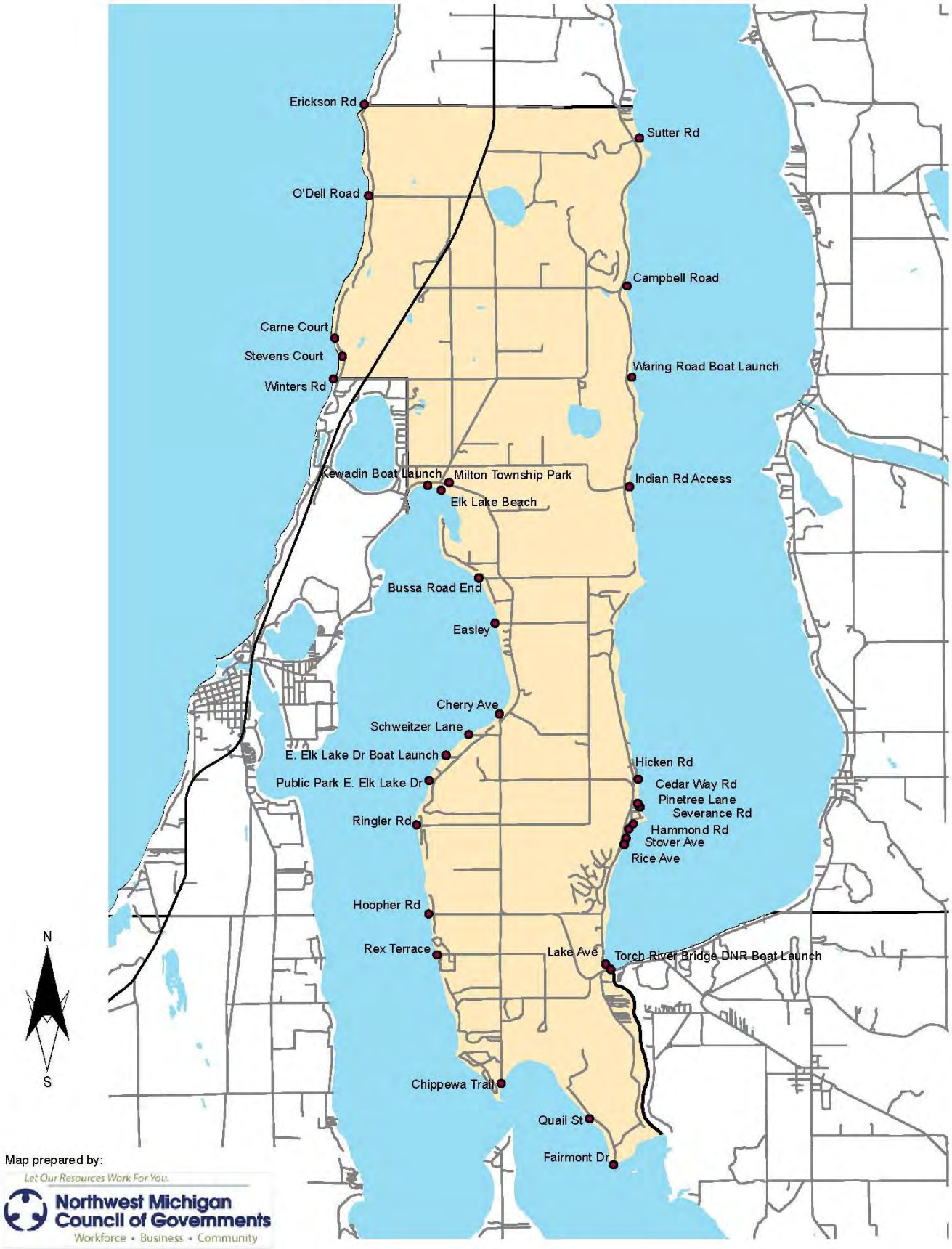
Details were recorded relative to the property's access to water; access to disabled people; stair access; barriers to access; docks; and boat ramps.

- All but two sites provide access to the water. One of these properties is a Milton Township park; the other is a road end with a road that does not extend to the water.
- 9 sites are considered accessible to disabled people. Notes indicated that several of these properties might be accessible to wheelchairs "with assistance."
- Barriers to access were observed at 16 sites. Barriers include large rocks (3); vegetation (3); steep declines, grades, or drops to the water (6); fencing (1); signage (1); and a large floating steel dock (1). (Please note some sites include more than one barrier.)
- Two properties – both DNR boat launches – include a dock.

Disabled Access				
Road End/Public Access	**Waterbody**	**Usage Characteristics**	**Additional Notes**	**Improvement Ranking**
37 Ringler Rd	Elk Lake	Swimming, beach, fishing, small boat launch		1
75 Lake Ave Access	Torch	Swimming, beach, boat launch		1
77 Hammond	Torch	Swimming		2
Chippewa Trail	Skegamog	Swimming, beach, fishing, small boat launch	A lot of signage, both private and township signage restrict parking. Very flat sand access to water. used for very small boats, wave runners, ice shanties. Signs say you'd have to go back up the road and park along the side or just drop something off and leave. Encroachment to the left, pretty significant barrier/fencing to the left. Nice sandy bottom for swimming	1
Easley	Elk Lake	Swimming, kayak launch, fishing		2
Elk Lake Dr Boat Ramp	Elk Lake	Boat ramp, fishing	Portable bathroom	1
Milton Township Park	Elk Lake	Park activities	Pavilion with covered picnic area, kitchen, restrooms	Not ranked
Quail Street	Skegemog	Swimming	Fairly dense hardwood/cedar forest to left. Property may have potential but is near the outlet of torch river and lots of stumps and shallow water. Sandy bottom, good parking but not very inviting waterfront.	4
Severance Road	Torch	Swimming, beach	Property boundaries not easily identified, survey recommended if expansion and/or improvements considered. Swim area limited by abutting property owner's dock/boat hoist. Used by public regularly – not heavily.	3

- Boat ramps/launches are available at 7 properties. Of those properties:
  - 2 ramps are DNR-owned.
  - 5 boat ramps are paved.
  - 5 are in "good" condition, 1 is in "fair" condition, and 1 is in "poor" condition (O'Dell Rd)

Milton Township Road End Access Sites



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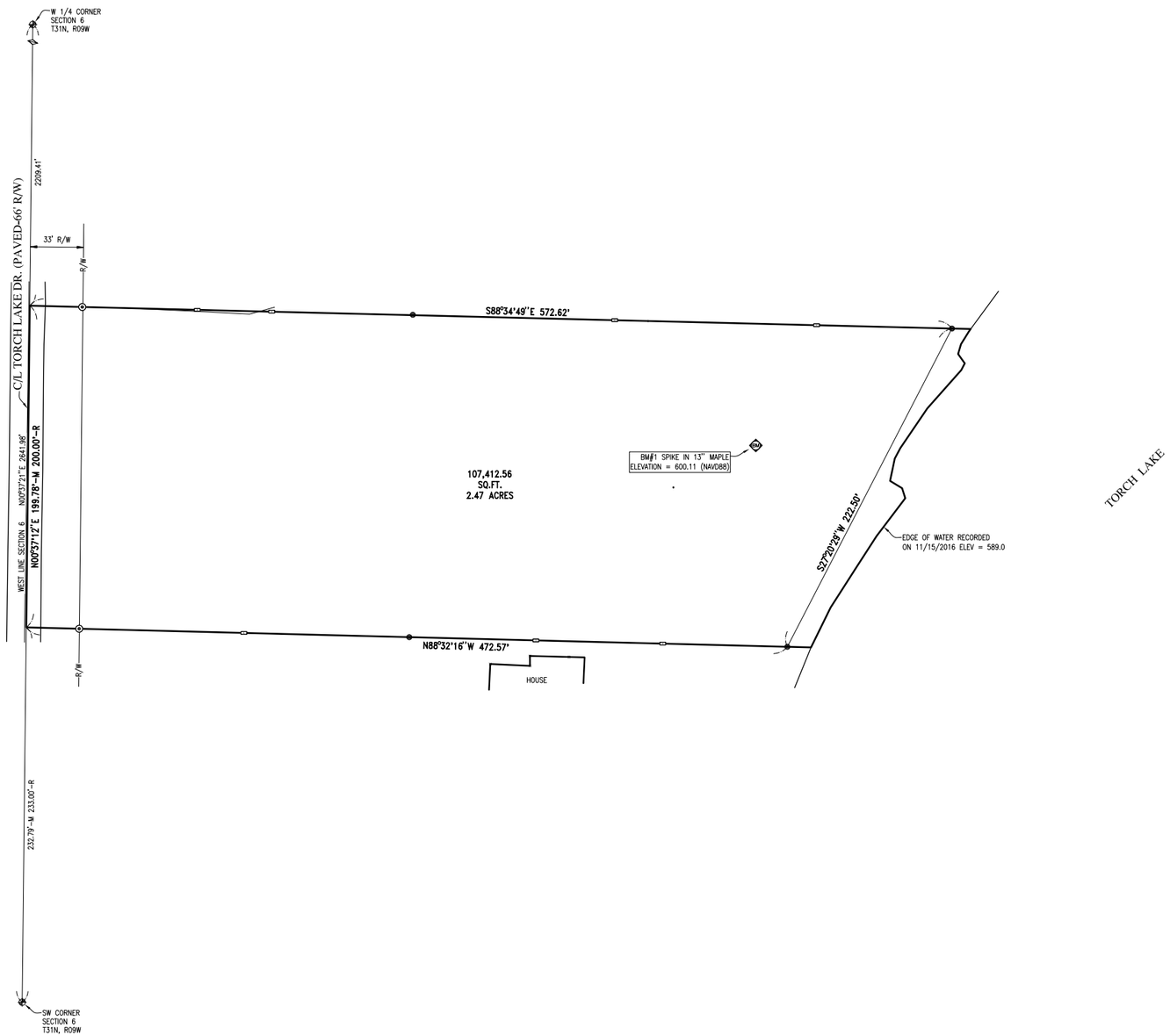
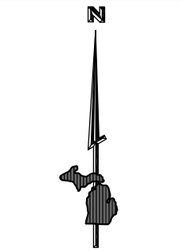
Appendix B: Boundary Survey and Riparian Rights Survey





SCALE 1" = 40'

0' 40' 80'

1	12/20/16	ADDED SOIL SAMPLES
		PCC

LEGEND

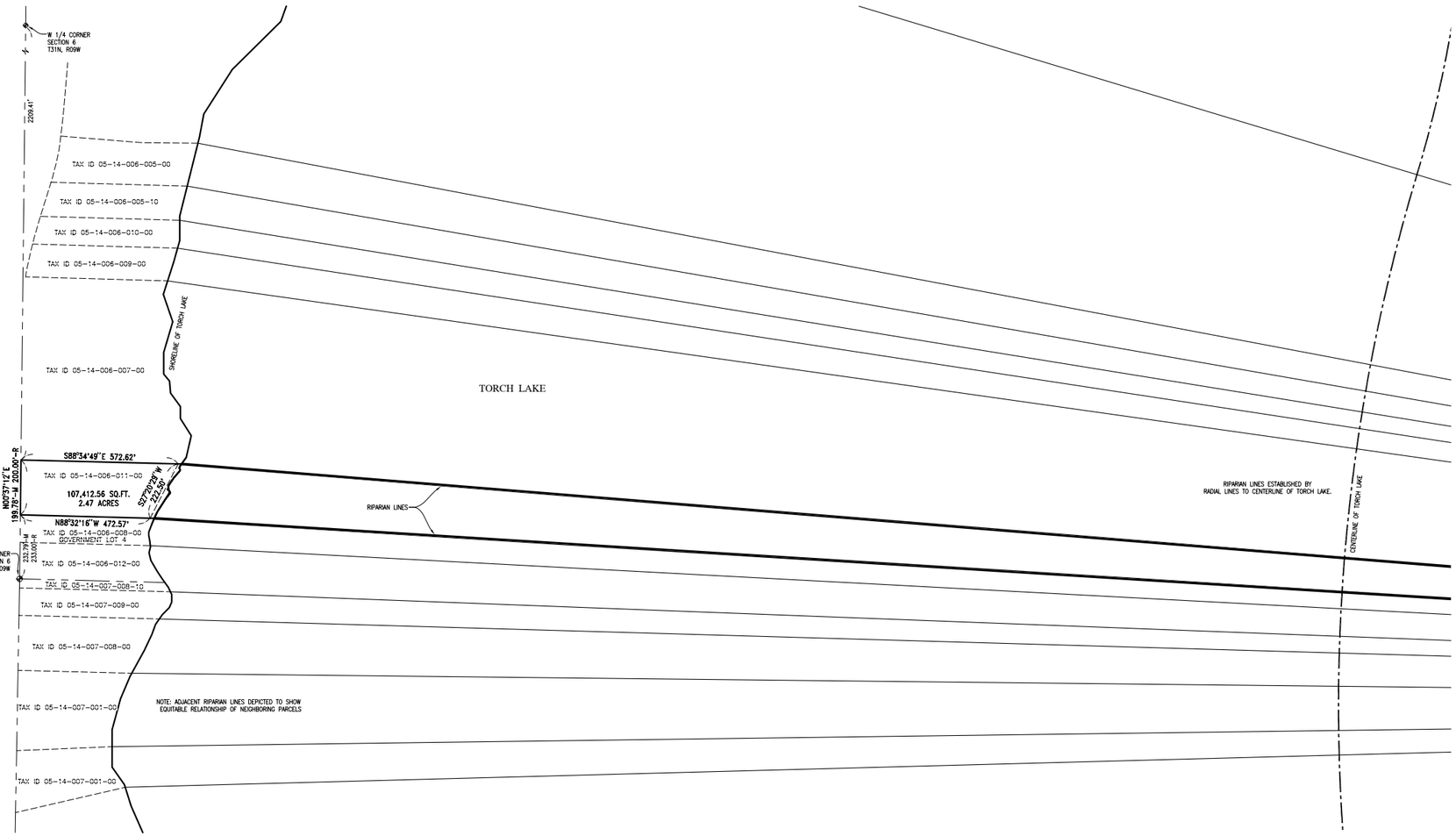
- BENCHMARK
- LATH FOUND
- LATH SET
- MONUMENT FOUND
- SECTION CORNER
- EXISTING UTILITY POLE
- EXISTING GUY ANCHOR
- EXISTING POST
- EXISTING ROCK
- EXISTING SIGN
- EXISTING SOIL BORING
- EXISTING SOIL SAMPLE
- EXISTING CONIFEROUS SHRUB
- EXISTING CONIFEROUS TREE
- EXISTING DECIDUOUS SHRUB
- EXISTING DECIDUOUS TREE
- EXISTING BUILDING
- EXISTING CONIFEROUS TREE LINE
- EXISTING DECIDUOUS TREE LINE
- EXISTING FENCE
- EXISTING GUARDRAIL
- EXISTING CABLE TV – OVERHEAD
- EXISTING TELEPHONE – UNDERGROUND

LEGAL DESCRIPTION (#05-14-006-011-00) PER WARRANTY DEED PROVIDED:
A PARCEL OF LAND SITUATED IN THE TOWNSHIP OF TORCH LAKE, COUNTY OF ANTRIM, STATE OF MICHIGAN, DESCRIBED AS FOLLOWS, TO WIT:

THE NORTH 200 FEET OF THE SOUTH 433 FEET OF GOVERNMENT LOT 4, SECTION 6 T30N-R8W, LYING EAST OF THE COUNTY HIGHWAY RUNNING NORTH AND SOUTH ACROSS SAID GOVERNMENT LOT 4.

811 Know what's **below.** **Call** before you dig.

THE LOCATION OF THE EXISTING UTILITIES, AS SHOWN ON THIS PLAN, ARE APPROXIMATE ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ACTUAL LOCATION AND DEPTH OF ALL EXISTING UTILITIES. THE OWNER AND THE SURVEYOR SHALL NOT BE RESPONSIBLE FOR ANY OMISSION OR VARIATION FROM THE LOCATION SHOWN. THE CONTRACTOR SHALL NOTIFY "MISS DIG" AT 1 (800) 482-7171 OR 811



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A PARCEL OF LAND SITUATED IN THE TOWNSHIP OF TORCH LAKE, COUNTY OF ANTRIM, STATE OF MICHIGAN, DESCRIBED AS FOLLOWS, TO WIT:

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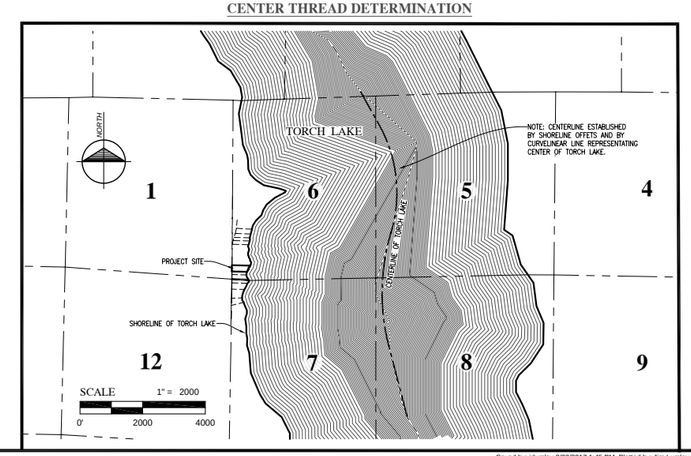
CENTER THREAD DETERMINATION



Gosling Czubak
ENGINEERING SERVICES, INC.
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231.946.9191 800.968.3582
FAX 231.946.9583

• Engineers
• Surveyors
• Environmental
Services
• Landscape
Architecture

No.: Date: Revision: By:

Date: 02/16/2017
Scale: 1" = 200'
Drawn By:
Checked By: CJP

Location: PART OF SECTION 6
T31N, R09W
TORCH LAKE TOWNSHIP
ANTRIM COUNTY, MICHIGAN

RIPARIAN DETERMINATION
BECKETT & RAEDER
MDNR TORCH LAKE WEST BOATING ACCESS SITE

Project No.
2016471001.03

Sheet
1
of 1

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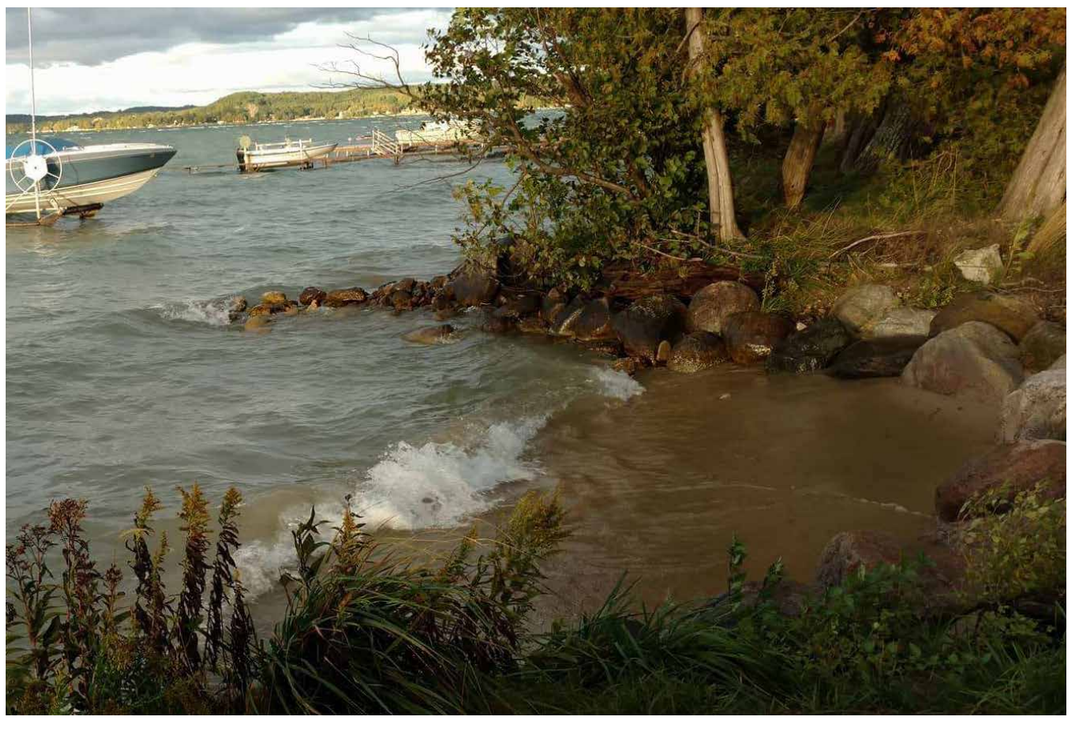
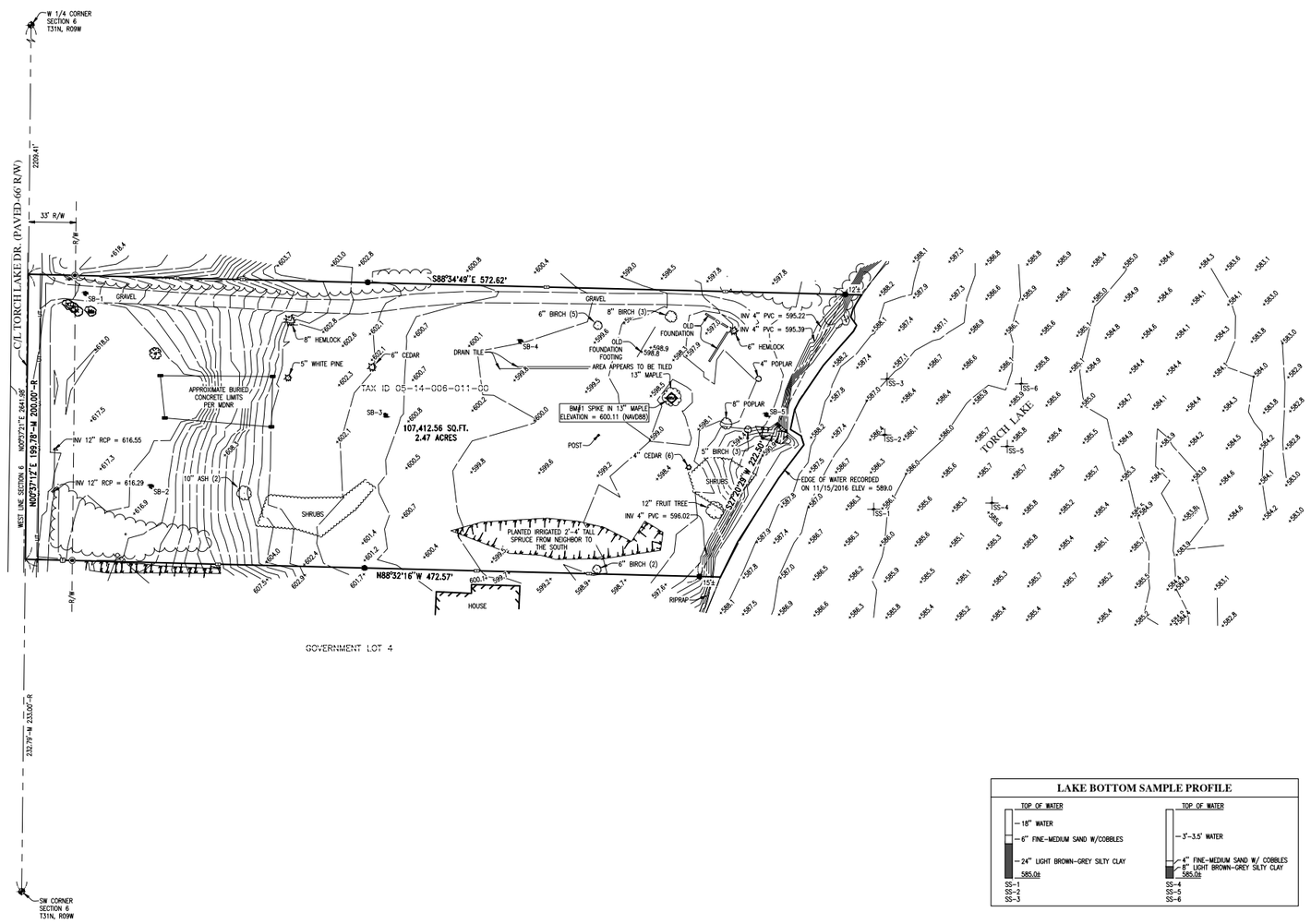
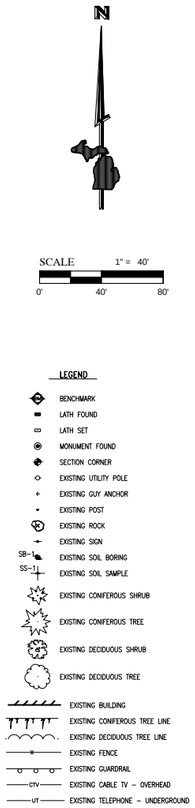
Appendix C: Bathymetric and Topographic Survey







LEGAL DESCRIPTION (#05-14-006-011-00) PER WARRANTY DEED PROVIDED:
A PARCEL OF LAND SITUATED IN THE TOWNSHIP OF TORCH LAKE, COUNTY OF ANTRIM, STATE OF MICHIGAN, DESCRIBED AS FOLLOWS, TO WIT:

THE NORTH 200 FEET OF THE SOUTH 433 FEET OF GOVERNMENT LOT 4, SECTION 6 T30N-R8W, LYING EAST OF THE COUNTY HIGHWAY RUNNING NORTH AND SOUTH ACROSS SAID GOVERNMENT LOT 4.

811 Know what's below. Call before you dig.

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Engineers • Surveyors • Environmental Services • Landscape Architecture

Bradley Czubak engineering sciences, inc.
1280 Business Park Drive
Traverse City, MI 49686-8607
231-946-9191 800-968-1062
Fax: 231-941-8003

No:	Date:	Revision:	By:
1	12/2016	ADDED SOIL SAMPLES	PCC

Date: 12/02/2016
Scale: 1" = 40'
Drawn By: PCC
Checked By: CJP/DAC

Location: PART OF SECTION 6, T31N, R09W, TORCH LAKE TOWNSHIP, ANTRIM COUNTY, MICHIGAN

TOPOGRAPHIC & BATHYMETRIC SURVEY
BECKETT & RAEDER

Project No.

Sheet 1 of 1

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Appendix D: Report of Geotechnical Exploration

REPORT OF GEOTECHNICAL EXPLORATION

Torch Lake West BAS – Pavement Recommendations

To:	Christy Summers – Beckett & Raeder	Date:	January 9, 2017
From:	Douglas Hula, PE	Re:	Pavement Recommendations
cc:	Doug Coates, PE – GCES		GCES Project # 2016471001.04

1.0 INTRODUCTION

The purpose of this study was to evaluate subsurface conditions at the site and develop recommendations regarding the proposed pavement at the Torch Lake West BAS project in Torch Lake Township, Antrim County, Michigan. Gosling Czubak's original scope of services included drilling eight soil borings with standard penetration testing and preparation of a geotechnical report. However, three of the soil boring locations were not drilled because the subsurface soil conditions encountered were consistent across the five locations drilled. The work was authorized by Ms. Christy Summers with Beckett & Raeder, who served as Gosling Czubak's Client contact.

2.0 SUBSURFACE CONDITIONS

As shown on the attached boring logs, the borings indicate 18 to 24 inches of surficial fill within the western portion of the site (SB-1 through SB-3), and 14 to 16 inches of surficial topsoil within the eastern portion of the site (SB-4 and SB-5). These surface layers are generally underlain by very stiff to hard silty clay and sandy clay. Some interbedded layers of sand with varying amounts of silt and clay were also encountered within these cohesive soils.

The subsurface soils encountered have good strength properties, but poor drainage properties, and are considered suitable for support of the proposed asphalt pavement, with the installation of a granular subbase pavement layer. It should be noted that the cohesive soils present at this site are highly susceptible to softening by construction traffic during periods of wet weather. Care must be taken to provide positive drainage during the entire construction process to prevent the softening of these soils.

3.0 SUBGRADE PREPARATION

Based on the subsurface soil conditions encountered in our soil borings, we recommend that the existing fill and topsoil materials be removed in their entirety from the pavement areas. The existing subgrade soil should be sloped and graded for proper drainage, as shown on the plans. All pavement areas should be proof-rolled with heavy rubber-tired equipment, such as a full dump truck, or a loader with a full bucket. Any areas that exhibit pumping or yielding should be undercut and replaced with MDOT Class II sand compacted in place.

4.0 PAVEMENT RECOMMENDATIONS

The following pavement sections were determined generally using guidelines from the AASHTO Guide for Design of Pavement Structures. No specific traffic loading was provided to us for design. However, we anticipate mixed use passenger vehicle, truck and trailered boats for the heavy duty driveway pavement areas, and only light passenger vehicle traffic for the standard duty parking lot pavement areas.

Table 1 Recommended Standard Duty HMA Pavement Section

Layer	Minimum Thickness
Asphalt Top Course, MDOT 36A	1.5 in.
Asphalt Base Course, MDOT 13A	1.5 in.
Aggregate Base, MDOT 22A	6.0 in.
Granular Subbase, MDOT Class II	12.0 in.

Table 2 Recommended Heavy Duty HMA Pavement Section

Layer	Minimum Thickness
Asphalt Top Course, MDOT 36A	2.0 in.
Asphalt Base Course, MDOT 13A	2.0 in.
Aggregate Base, MDOT 22A	8.0 in.
Granular Subbase, MDOT Class II	12.0 in.

It should be noted that these pavement sections are based on the completion of proper subgrade preparation and construction of the drainage system, the soil and groundwater conditions encountered in our soil borings, as well as our experience with pavement sections subjected to similar traffic loads. During the

design life of the pavement, standard preventive maintenance such as crack sealing and localized patching are expected to maintain a healthy pavement with acceptable performance.

5.0 CLOSURE

This report was prepared using generally accepted geotechnical engineering practices. Recommendations were developed based on the information gained from the soil borings performed, and the other information reviewed. No other warranty, expressed or implied, regarding the recommendations and conclusions provided in this report addendum is offered.

Any changes to the project with respect to the information understood and/or our stated assumptions should also be brought to the attention of this office prior to construction so that they can be reviewed to see that they are consistent with the recommendations presented in this report.

Gosling Czubak
engineering sciences, inc.

Key to Gosling Czubak Boring Logs and Well Construction Diagrams

SOIL CLASSIFICATION INFORMATION

SOIL DESCRIPTIONS

Example: **Silty fine SAND (SM) - trace clay - occasional clay seams - dense - brown/gray below 40 feet - wet (1 - 2 - 3 - 4 - 5 - 6 - 7- 8 - 9 - 10)**

1a FOR COARSE GRAINED PRIMARY MATERIAL: Secondary Material of 15 to 50%, if applicable. (eg. Silty, Clayey)
1b FOR FINE GRAINED PRIMARY MATERIAL: Secondary Material of 30 to 50%, if applicable (eg. Gravelly, Sandy)

2 PRIMARY MATERIAL (in CAPs)- SILT, SAND, GRAVEL, or CLAY
Note: fine, medium and/or coarse grained SAND
fine and/or coarse grained GRAVEL

3 (USCS) Unified Soil Classification System (USCS) symbol(s) is presented at the end of the soil description (in parentheses) based on ASTM gradation and plasticity testing. See attached USCS chart.

4 Additional Materials (with percentage descriptors as below)

Fine Grained Material	Coarse-Grained Material
15 to 30% - "some" or "with"	5 to 15% - "little"
5 to 15% - "little"	< 5% - "trace" or "few"
< 5% - "trace" or "few"	

5 Description of sorting or grading. For example, "well-sorted, or "poorly graded."

6 Occurrences (with frequency descriptors as below) - cobbles, boulders, bricks, layers, seams, etc.
Greater than one per 12-inches = "frequent"
One per 12-inches = "occasional"

Note: Seams = < 1-inch in thickness
Layers = > 1-inch in thickness

7 Angularity and mineral composition, if warranted

8 Odor or Sheen, if applicable

9 Soil Strength Description (Relative Density for sand and silt, or Consistency for clay)

10 Color

11 Moisture - "dry" or "wet" or "moist"
"dry" = absence of apparent moisture
"moist" = damp but not saturated
"wet" = saturated

Particle Sizes	
Boulders	- > 12-in
Cobbles	- 12 to 3 in
Course gravel	- 3 to 3/4 in
Fine gravel	- 3/4 to 0.187-in
Coarse sand	- 4.75 to 2.0-mm
Medium sand	- 2.0 to 0.425-mm
Fine sand	- 0.425 to 0.075-mm
Clay/Silt	- < 0.075-mm

Relative Density	SPT N-Value
"very loose"	W.O.H. to 4
"loose"	5 to 10
"medium dense"	11 to 30
"dense"	31 to 50
"very dense"	over 50

Consistency	SPT N-Value	Ppen, tsf
"very soft"	WOH to 2	0 - 0.125
"soft"	2 to 4	0.125 - 0.25
"medium stiff"	4 to 8	0.25 - 0.5
"stiff"	8 to 15	0.5 - 1.0
"very stiff"	15 to 30	1.0 - 2.0
"hard"	over 30	2.0 - 4.0

NOTES AND GENERAL INFORMATION

1. Drilling and sampling activities are indicative of subsurface conditions only at locations where data are taken, and when data are taken. Conditions at locations not evaluated may differ from professional interpretation.

2. Environmental boring logs present soil and groundwater data collected for resource development, depositional environment, groundwater flow and/or contaminant transport analyses and may not for be suited for geotechnical or structural engineering use unless otherwise arranged.

3. Stratigraphic Contacts: Solid line denotes a sudden, observed soil transition.
Dashed line denotes a gradual or gradational soil transition.
Dotted line denotes an inferred transition, therefore the type and specific location of the transition is unknown / approximated.

3. Common abbreviations: WOH = Weight of (SPT) Hammer DHH = Down Hole Hammer HA = Hand Auger
DR = Drove Rock (During SPT) NR = No Recovery
Ppen = Pocket Penetrometer (unconfined compressive strength in tons per square foot)

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UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

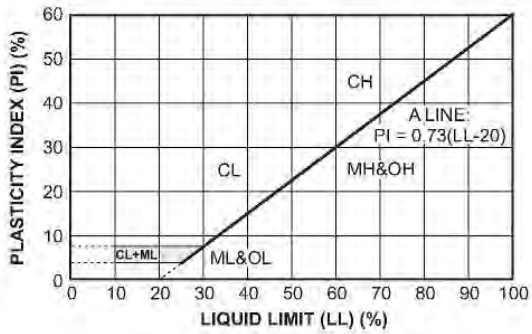
LABORATORY CLASSIFICATION CRITERIA

GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



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engineering sciences, inc.

Engineers Surveyors
Landscape Architecture
Environmental and Drilling Services
1280 Business Park Dr., Traverse City, Michigan 49686
(231) 946-9191

PROJECT: Torch Lake West BAS
PROJECT NO.: 2016471001.04
PROJECT LOCATION: NW Torch Lake Drive, Antrim Co., MI
CLIENT: Beckett & Raeder
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** A. Biteman

LOG OF BORING: SB-1

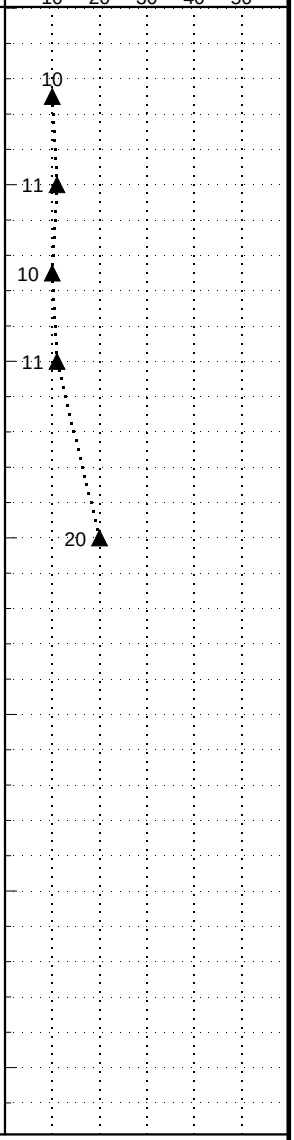
GROUND ELEVATION: 617.5 +/- **DATE:** 11-17-16
DRILLING LOCATION: As shown on plan
DRILLING METHOD: 4.25-in (ID) Hollow Stem Auger
BOREHOLE DIAMETER (IN): +/-10 **TOTAL DEPTH (FT):** 15
STATIC WATER LEVEL: ▽ None **CAVING DEPTH:** ⊂ 15

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
		Sandy GRAVEL - some silt - trace clay - brown (FILL-road gravel)	0							
		1.5								
615		Sandy CLAY (CL) - some silt - trace gravel - hard - light brown			SS1	18	3 4 6		3.50	
			5		SS2	18	3 5 6		2.50	
					SS3	18	3 4 6		3.50	
610		7 Silty clayey fine SAND (SC-SM) - light brown - moist								
		7.5 Silty CLAY (CL) - trace fine sand - hard - light grey								
			10		SS4	18	2 5 6		3.25	
605										
			15		SS5	18	4 8 12		4.25	
		Boring terminated at 15 ft.								
600										
595										
590										

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - × %
SPT RESULT - ▲ N Value



Borehole was abandoned/backfilled with augered soil cuttings.
Driller reported that the lead auger was wet upon withdrawal, no other indication of groundwater was encountered.

Gosling Czubak engineering sciences, inc.

Engineers Surveyors
Landscape Architecture
Environmental and Drilling Services
1280 Business Park Dr., Traverse City, Michigan 49686
(231) 946-9191

PROJECT: Torch Lake West BAS
PROJECT NO.: 2016471001.04
PROJECT LOCATION: NW Torch Lake Drive, Antrim Co., MI
CLIENT: Beckett & Raeder
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** A. Biteman

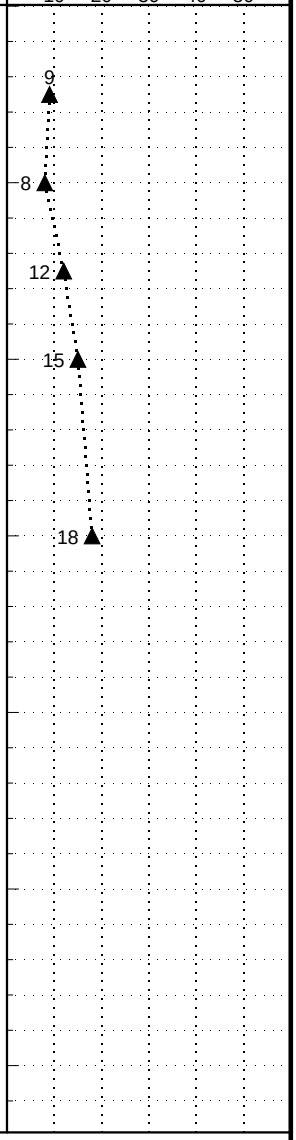
LOG OF BORING: SB-2

GROUND ELEVATION: 616.5 +/- **DATE:** 11-17-16
DRILLING LOCATION: As shown on plan
DRILLING METHOD: 4.25-in (ID) Hollow Stem Auger
BOREHOLE DIAMETER (IN): +/-10 **TOTAL DEPTH (FT):** 15
STATIC WATER LEVEL: None **CAVING DEPTH:** 15

Elevation (feet)	Soil Description (See Boring Log Key)	Depth (feet)	Sample No.	Recovery (in)	Blow Counts	Pocket Penetrometer (tsf)	% < #200
616.5	Fine to medium SAND - some gravel - frequent concrete pieces (FILL)	0					
615			SS1	14	2 3 6		
614.5	Sandy CLAY (CL) - some silt - trace gravel - hard - light brown	2					
			SS2	14	3 3 5		
612.5	Silty clayey fine SAND (SC-SM) - trace fine gravel - light brown - moist	4.5					
610	Silty CLAY (CL) - trace fine sand - hard - light grey	5.5	SS3	18	5 5 7	3.50	
			SS4	18	9 6 9	4.5+	
605		10					
		15	SS5	18	9 7 11	4.5+	
601	Boring terminated at 15 ft.						

TEST RESULTS

Plastic Limit ├─┤ Liquid Limit
Water Content - × %
SPT RESULT - ▲ N Value



This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Borehole was abandoned/backfilled with augered soil cuttings.
Driller reported that the lead auger was wet upon withdrawal, no other indication of groundwater was encountered.

Figure PAGE 1 of 1

Gosling Czubak
engineering sciences, inc.

Engineers Surveyors
Landscape Architecture
Environmental and Drilling Services
1280 Business Park Dr., Traverse City, Michigan 49686
(231) 946-9191

PROJECT: Torch Lake West BAS
PROJECT NO.: 2016471001.04
PROJECT LOCATION: NW Torch Lake Drive, Antrim Co., MI
CLIENT: Beckett & Raeder
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** A. Biteman

LOG OF BORING: SB-3

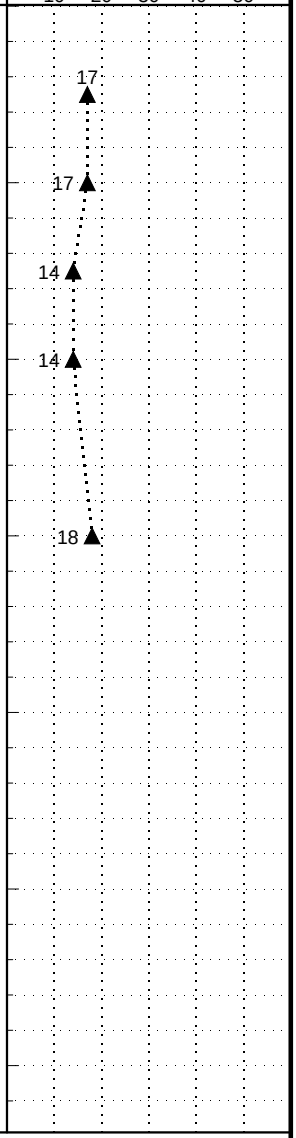
GROUND ELEVATION: 601 +/- **DATE:** 11-17-16
DRILLING LOCATION: As shown on plan
DRILLING METHOD: 4.25-in (ID) Hollow Stem Auger
BOREHOLE DIAMETER (IN): +/-10 **TOTAL DEPTH (FT):** 15
STATIC WATER LEVEL: ▽ None **CAVING DEPTH:** ⊂ 15

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
600		Gravelly SAND - occasional asphalt pieces (FILL)	0							
		1.17								
		Fine to medium SAND (SP-GP) - some fine gravel - brown (possible fill)			SS1	10	5 10 7			
		2								
		Sandy CLAY - some silt - light grey/brown (possible fill)								
		2.5			SS2	18	5 7 10		3.75	
		Fine SAND (SM) - some silt - trace gravel - moist	5							
		4								
595		Silty CLAY (CL) - trace fine sand - very stiff to hard - light grey			SS3	18	3 5 9		1.50	
					SS4	18	4 5 9		4.25	
			10							
590										
			⊂ 15		SS5	18	6 7 11		4.25	
585		Boring terminated at 15 ft.								
580										
575										
570										

TEST RESULTS

Plastic Limit ├─┤ Liquid Limit
Water Content - × %
SPT RESULT - ▲ N Value
10 20 30 40 50



Borehole was abandoned/backfilled with augered soil cuttings.
Driller reported that the lead auger was wet upon withdrawal, no other indication of groundwater was encountered.

Gosling Czubak
engineering sciences, inc.

Engineers Surveyors
Landscape Architecture
Environmental and Drilling Services
1280 Business Park Dr., Traverse City, Michigan 49686
(231) 946-9191

PROJECT: Torch Lake West BAS
PROJECT NO.: 2016471001.04
PROJECT LOCATION: NW Torch Lake Drive, Antrim Co., MI
CLIENT: Beckett & Raeder
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** A. Biteman

LOG OF BORING: SB-4

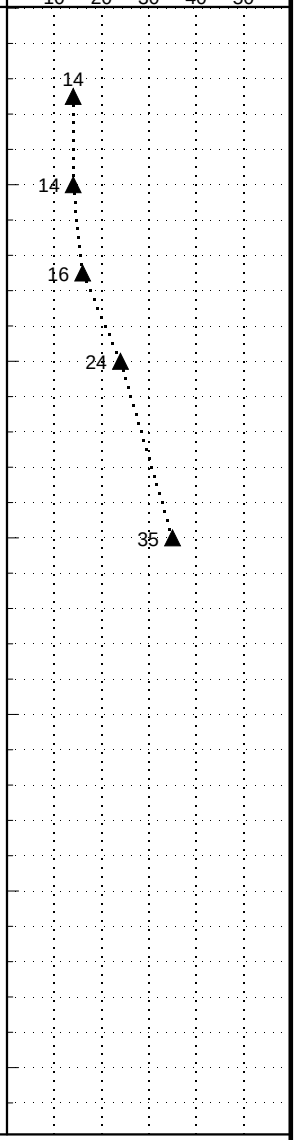
GROUND ELEVATION: 600 +/- **DATE:** 11-17-16
DRILLING LOCATION: As shown on plan
DRILLING METHOD: 4.25-in (ID) Hollow Stem Auger
BOREHOLE DIAMETER (IN): +/-10 **TOTAL DEPTH (FT):** 15
STATIC WATER LEVEL: ▽ None **CAVING DEPTH:** ⊂ 15

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
600		Clayey silty fine SAND (SC-SM) - dark brown to black - hard	0							
		1.25			SS1	18	7 6 8		4.25	
		Silty CLAY (CL) - trace fine sand and gravel - hard - light grey			SS2	18	4 5 9		4.5+	
595			5							
					SS3	18	4 6 10		4.5+	
					SS4	18	8 10 14		4.5+	
590			10							
			⊂ 15		SS5	18	8 14 21		4.5+	
585		Boring terminated at 15 ft.								
580										
575										
570										

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - × %
SPT RESULT - ▲ N Value



Borehole was abandoned/backfilled with augered soil cuttings.

Gosling Czubak
engineering sciences, inc.

Engineers Surveyors
Landscape Architecture
Environmental and Drilling Services
1280 Business Park Dr., Traverse City, Michigan 49686
(231) 946-9191

PROJECT: Torch Lake West BAS
PROJECT NO.: 2016471001.04
PROJECT LOCATION: NW Torch Lake Drive, Antrim Co., MI
CLIENT: Beckett & Raeder
DRILLING COMPANY: Gosling Czubak **RIG:** CME-75
DRILLER: M. Allen **LOGGED BY:** A. Biteman

LOG OF BORING: SB-5

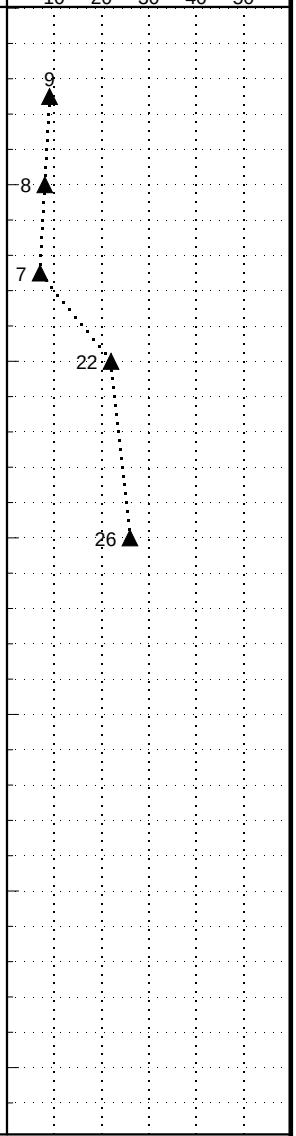
GROUND ELEVATION: 597 +/- **DATE:** 11-17-16
DRILLING LOCATION: As shown on plan
DRILLING METHOD: 4.25-in (ID) Hollow Stem Auger
BOREHOLE DIAMETER (IN): +/-10 **TOTAL DEPTH (FT):** 15
STATIC WATER LEVEL: ▽ None **CAVING DEPTH:** ⊂ 15

This information pertains only to this boring and should not be interpreted as being indicitive of the site.

Elevation (feet)	Graphic	Soil Description (See Boring Log Key)	Depth (feet)	Sample Type	Sample No.	Recovery (in)	Blow Counts	Notes	Pocket Penetrometer (tsf)	% < #200
		14 inches of sandy TOPSOIL - dark brown	0							
		1.17								
595		Silty fine SAND (SM) - trace clay - loose - light brown - moist			SS1	18	2 4 5			
		3								
		Sandy CLAY (CL) - some silt - trace gravel - very stiff - light brown			SS2	18	4 5 3		1.25	
		5	5							
		Silty CLAY (CL) - little fine sand - trace gravel - hard - light grey			SS3	18	2 2 5		2.00	
590										
					SS4	18	4 7 15		4.5+	
			10							
585										
			⊂ 15		SS5	18	4 8 18		4.5+	
		Boring terminated at 15 ft.								
580										
575										
570										

TEST RESULTS

Plastic Limit ⊢⊣ Liquid Limit
Water Content - × %
SPT RESULT - ▲ N Value



Borehole was abandoned/backfilled with augered soil cuttings.
(orginally labeled as SB-6 on field log)

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation*.

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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Appendix E: Report of Laboratory Analysis

21-Dec-2016

Doug Coates
Gosling Czubak Engineering Sciences, Inc.
1280 Business Park Drive
Traverse City, MI 49686

Re: **Gosling (Torch Lake W BAS - 2016471001.05)** Work Order: **1612436**

Dear Doug,

ALS Environmental received 6 samples on 07-Dec-2016 10:00 AM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Sample results are compliant with industry accepted practices and Quality Control results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.
This revised report supersedes any previous report.

The total number of pages in this report is 27.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,
Gary Byar

Electronically approved by: Gary Byar

Gary Byar
Project Manager

Certificate No: MI: 0022

ADDRESS 3352 128th Ave Holland, Michigan 49424 | PHONE (616) 399-6070 | FAX (616) 399-6185
ALS GROUP USA, CORP Part of the ALS Laboratory Group A Campbell Brothers Limited Company

Environmental www.alsglobal.com
RIGHT SOLUTIONS RIGHT PARTNER

ALS Group, USA

Date: 21-Dec-16

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05)
Work Order: **1612436**

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1612436-01	SS #1	Soil		12/5/2016	12/7/2016 10:00	☐
1612436-02	SS #2	Soil		12/5/2016	12/7/2016 10:00	☐
1612436-03	SS #3	Soil		12/5/2016	12/7/2016 10:00	☐
1612436-04	SS #4	Soil		12/5/2016	12/7/2016 10:00	☐
1612436-05	SS #5	Soil		12/5/2016	12/7/2016 10:00	☐
1612436-06	SS #6	Soil		12/5/2016	12/7/2016 10:00	☐

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #1 **Lab ID:** 1612436-01
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.015	mg/Kg-dry	1	12/12/2016 04:55 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**2.3**		**0.40**	**mg/Kg-dry**	4	12/9/2016 06:48 AM
Cadmium	**0.37**		**0.20**	**mg/Kg-dry**	4	12/9/2016 06:48 AM
Copper	**14**		**2.0**	**mg/Kg-dry**	4	12/9/2016 06:48 AM
Lead	**7.4**		**2.0**	**mg/Kg-dry**	4	12/10/2016 07:36 PM
Selenium	**1.1**		**0.20**	**mg/Kg-dry**	4	12/9/2016 06:48 AM
Zinc	**32**		**4.0**	**mg/Kg-dry**	4	12/9/2016 06:48 AM
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Acenaphthene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Acenaphthylene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Anthracene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Benzo(a)anthracene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Benzo(a)pyrene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Benzo(b)fluoranthene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Benzo(g,h,i)perylene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Benzo(k)fluoranthene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Chrysene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Dibenzo(a,h)anthracene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Fluoranthene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Fluorene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Indeno(1,2,3-cd)pyrene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Naphthalene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Phenanthrene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Pyrene	ND		8.2	µg/Kg-dry	1	12/13/2016 08:34 PM
Surr: 2,4,6-Tribromophenol	*64.6*		*34-140*	*%REC*	1	12/13/2016 08:34 PM
Surr: 2-Fluorobiphenyl	*75.0*		*12-100*	*%REC*	1	12/13/2016 08:34 PM
Surr: 2-Fluorophenol	*72.9*		*33-117*	*%REC*	1	12/13/2016 08:34 PM
Surr: 4-Terphenyl-d14	*83.0*		*25-137*	*%REC*	1	12/13/2016 08:34 PM
Surr: Nitrobenzene-d5	*75.4*		*37-107*	*%REC*	1	12/13/2016 08:34 PM
Surr: Phenol-d6	*72.4*		*40-106*	*%REC*	1	12/13/2016 08:34 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**20**		**0.050**	**% of sample**	1	12/8/2016 02:43 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #2 **Lab ID:** 1612436-02
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.018	mg/Kg-dry	1	12/12/2016 06:37 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**1.2**		**0.38**	**mg/Kg-dry**	4	12/9/2016 06:55 AM
Cadmium	**0.40**		**0.19**	**mg/Kg-dry**	4	12/9/2016 06:55 AM
Copper	**13**		**1.9**	**mg/Kg-dry**	4	12/9/2016 06:55 AM
Lead	**9.7**		**1.9**	**mg/Kg-dry**	4	12/10/2016 07:42 PM
Selenium	**1.0**		**0.19**	**mg/Kg-dry**	4	12/9/2016 06:55 AM
Zinc	**29**		**3.8**	**mg/Kg-dry**	4	12/9/2016 06:55 AM
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Acenaphthene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Acenaphthylene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Anthracene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Benzo(a)anthracene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Benzo(a)pyrene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Benzo(b)fluoranthene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Benzo(g,h,i)perylene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Benzo(k)fluoranthene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Chrysene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Dibenzo(a,h)anthracene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Fluoranthene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Fluorene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Indeno(1,2,3-cd)pyrene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Naphthalene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Phenanthrene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Pyrene	ND		8.1	µg/Kg-dry	1	12/13/2016 08:53 PM
Surr: 2,4,6-Tribromophenol	*61.5*		*34-140*	*%REC*	1	12/13/2016 08:53 PM
Surr: 2-Fluorobiphenyl	*77.2*		*12-100*	*%REC*	1	12/13/2016 08:53 PM
Surr: 2-Fluorophenol	*70.4*		*33-117*	*%REC*	1	12/13/2016 08:53 PM
Surr: 4-Terphenyl-d14	*83.5*		*25-137*	*%REC*	1	12/13/2016 08:53 PM
Surr: Nitrobenzene-d5	*72.9*		*37-107*	*%REC*	1	12/13/2016 08:53 PM
Surr: Phenol-d6	*67.1*		*40-106*	*%REC*	1	12/13/2016 08:53 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**22**		**0.050**	**% of sample**	1	12/8/2016 02:43 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #3 **Lab ID:** 1612436-03
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.015	mg/Kg-dry	1	12/12/2016 06:47 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**2.7**		**0.39**	**mg/Kg-dry**	4	12/9/2016 07:01 AM
Cadmium	**0.45**		**0.19**	**mg/Kg-dry**	4	12/9/2016 07:01 AM
Copper	**14**		**1.9**	**mg/Kg-dry**	4	12/9/2016 07:01 AM
Lead	**7.9**		**1.9**	**mg/Kg-dry**	4	12/10/2016 07:48 PM
Selenium	**0.96**		**0.19**	**mg/Kg-dry**	4	12/9/2016 07:01 AM
Zinc	**31**		**3.9**	**mg/Kg-dry**	4	12/9/2016 07:01 AM
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Acenaphthene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Acenaphthylene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Anthracene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Benzo(a)anthracene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Benzo(a)pyrene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Benzo(b)fluoranthene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Benzo(g,h,i)perylene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Benzo(k)fluoranthene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Chrysene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Dibenzo(a,h)anthracene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Fluoranthene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Fluorene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Indeno(1,2,3-cd)pyrene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Naphthalene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Phenanthrene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Pyrene	ND		7.7	µg/Kg-dry	1	12/13/2016 09:13 PM
Surr: 2,4,6-Tribromophenol	*57.5*		*34-140*	*%REC*	1	12/13/2016 09:13 PM
Surr: 2-Fluorobiphenyl	*83.7*		*12-100*	*%REC*	1	12/13/2016 09:13 PM
Surr: 2-Fluorophenol	*70.9*		*33-117*	*%REC*	1	12/13/2016 09:13 PM
Surr: 4-Terphenyl-d14	*89.6*		*25-137*	*%REC*	1	12/13/2016 09:13 PM
Surr: Nitrobenzene-d5	*81.1*		*37-107*	*%REC*	1	12/13/2016 09:13 PM
Surr: Phenol-d6	*71.5*		*40-106*	*%REC*	1	12/13/2016 09:13 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**19**		**0.050**	**% of sample**	1	12/8/2016 02:43 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #4 **Lab ID:** 1612436-04
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.015	mg/Kg-dry	1	12/12/2016 06:49 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**1.4**		**0.31**	**mg/Kg-dry**	4	12/9/2016 07:07 AM
Cadmium	ND		0.16	mg/Kg-dry	4	12/9/2016 07:07 AM
Copper	**4.2**		**1.6**	**mg/Kg-dry**	4	12/9/2016 07:07 AM
Selenium	**0.51**		**0.16**	**mg/Kg-dry**	4	12/9/2016 07:07 AM
Zinc	**8.5**		**3.1**	**mg/Kg-dry**	4	12/9/2016 07:07 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (coarse fraction)	ND		10	mg/Kg-dry	10	12/13/2016 01:55 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (fine fraction)	ND		10	mg/Kg-dry	10	12/13/2016 06:12 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**			Analyst: **ML**
Lead (total - calculated)	**1.7**		**0.75**	**mg/Kg-dry**	1	12/12/2016
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Acenaphthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Acenaphthylene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Benzo(a)anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Benzo(a)pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Benzo(b)fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Benzo(g,h,i)perylene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Benzo(k)fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Chrysene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Dibenzo(a,h)anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Fluorene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Indeno(1,2,3-cd)pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Naphthalene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Phenanthrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:32 PM
Surr: 2,4,6-Tribromophenol	*67.3*		*34-140*	*%REC*	1	12/13/2016 09:32 PM
Surr: 2-Fluorobiphenyl	*87.1*		*12-100*	*%REC*	1	12/13/2016 09:32 PM
Surr: 2-Fluorophenol	*72.5*		*33-117*	*%REC*	1	12/13/2016 09:32 PM
Surr: 4-Terphenyl-d14	*91.7*		*25-137*	*%REC*	1	12/13/2016 09:32 PM
Surr: Nitrobenzene-d5	*79.1*		*37-107*	*%REC*	1	12/13/2016 09:32 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #4 **Lab ID:** 1612436-04
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: Phenol-d6	*70.9*		*40-106*	*%REC*	1	12/13/2016 09:32 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**13**		**0.050**	**% of sample**	1	12/8/2016 02:43 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #5 **Lab ID:** 1612436-05
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.015	mg/Kg-dry	1	12/12/2016 06:52 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**0.55**		**0.32**	**mg/Kg-dry**	4	12/10/2016 12:32 AM
Cadmium	ND		0.16	mg/Kg-dry	4	12/10/2016 12:32 AM
Copper	ND		1.6	mg/Kg-dry	4	12/10/2016 12:32 AM
Selenium	ND		0.16	mg/Kg-dry	4	12/10/2016 12:32 AM
Zinc	**3.6**		**3.2**	**mg/Kg-dry**	4	12/10/2016 12:32 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (coarse fraction)	ND		11	mg/Kg-dry	10	12/13/2016 02:01 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (fine fraction)	ND		11	mg/Kg-dry	10	12/13/2016 06:18 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**			Analyst: **ML**
Lead (total - calculated)	**1.2**		**0.75**	**mg/Kg-dry**	1	12/12/2016
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Acenaphthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Acenaphthylene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Benzo(a)anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Benzo(a)pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Benzo(b)fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Benzo(g,h,i)perylene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Benzo(k)fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Chrysene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Dibenzo(a,h)anthracene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Fluoranthene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Fluorene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Indeno(1,2,3-cd)pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Naphthalene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Phenanthrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Pyrene	ND		7.5	µg/Kg-dry	1	12/13/2016 09:52 PM
Surr: 2,4,6-Tribromophenol	*72.5*		*34-140*	*%REC*	1	12/13/2016 09:52 PM
Surr: 2-Fluorobiphenyl	*87.6*		*12-100*	*%REC*	1	12/13/2016 09:52 PM
Surr: 2-Fluorophenol	*74.9*		*33-117*	*%REC*	1	12/13/2016 09:52 PM
Surr: 4-Terphenyl-d14	*94.1*		*25-137*	*%REC*	1	12/13/2016 09:52 PM
Surr: Nitrobenzene-d5	*81.7*		*37-107*	*%REC*	1	12/13/2016 09:52 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #5 **Lab ID:** 1612436-05
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: Phenol-d6	*73.3*		*40-106*	*%REC*	1	12/13/2016 09:52 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**13**		**0.050**	**% of sample**	1	12/8/2016 02:43 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #6 **Lab ID:** 1612436-06
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
MERCURY BY CVAA			**SW7471B**		Prep: SW7471 / 12/12/16	Analyst: **LR**
Mercury	ND		0.015	mg/Kg-dry	1	12/12/2016 06:55 PM
METALS BY ICP-MS			**SW6020A**		Prep: SW3050B / 12/8/16	Analyst: **ML**
Arsenic	**0.89**		**0.32**	**mg/Kg-dry**	4	12/10/2016 12:38 AM
Cadmium	ND		0.16	mg/Kg-dry	4	12/10/2016 12:38 AM
Copper	**6.0**		**1.6**	**mg/Kg-dry**	4	12/10/2016 12:38 AM
Selenium	**0.58**		**0.16**	**mg/Kg-dry**	4	12/10/2016 12:38 AM
Zinc	**13**		**3.2**	**mg/Kg-dry**	4	12/10/2016 12:38 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (coarse fraction)	ND		12	mg/Kg-dry	10	12/13/2016 02:20 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**		Prep: SW3050 / 12/12/16	Analyst: **ML**
Lead (fine fraction)	ND		11	mg/Kg-dry	10	12/13/2016 06:25 AM
LEAD ANALYSIS BY ICP-MS			**SW6020A**			Analyst: **ML**
Lead (total - calculated)	**3.7**		**0.75**	**mg/Kg-dry**	1	12/12/2016
SEMI-VOLATILE ORGANIC COMPOUNDS			**SW846 8270D**		Prep: SW3546 / 12/12/16	Analyst: **RM**
2-Methylnaphthalene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Acenaphthene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Acenaphthylene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Anthracene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Benzo(a)anthracene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Benzo(a)pyrene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Benzo(b)fluoranthene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Benzo(g,h,i)perylene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Benzo(k)fluoranthene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Chrysene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Dibenzo(a,h)anthracene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Fluoranthene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Fluorene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Indeno(1,2,3-cd)pyrene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Naphthalene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Phenanthrene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Pyrene	ND		7.6	µg/Kg-dry	1	12/13/2016 10:11 PM
Surr: 2,4,6-Tribromophenol	*65.8*		*34-140*	*%REC*	1	12/13/2016 10:11 PM
Surr: 2-Fluorobiphenyl	*88.0*		*12-100*	*%REC*	1	12/13/2016 10:11 PM
Surr: 2-Fluorophenol	*73.5*		*33-117*	*%REC*	1	12/13/2016 10:11 PM
Surr: 4-Terphenyl-d14	*93.0*		*25-137*	*%REC*	1	12/13/2016 10:11 PM
Surr: Nitrobenzene-d5	*80.0*		*37-107*	*%REC*	1	12/13/2016 10:11 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: *21-Dec-16*

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05) **Work Order:** 1612436
Sample ID: SS #6 **Lab ID:** 1612436-06
Collection Date: 12/5/2016 **Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Surr: Phenol-d6	*69.6*		*40-106*	*%REC*	1	12/13/2016 10:11 PM
MOISTURE			**SW3550C**			Analyst: **EDL**
Moisture	**15**		**0.050**	**% of sample**	1	12/8/2016 04:59 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group, USA

Date: 21-Dec-16

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05)
Work Order: 1612436

Case Narrative

Client sample IDs SS#1, SS#2 & SS#3 were all clay matrix and therefore could not be analyzed for Fine and Coarse Fractions Lead. They were analyzed for Total Lead.

Batch 95596 The MS/MSD data for Copper and Zinc are not related to this projects sample. No data requires qualification.

ALS Group, USA

Date: 21-Dec-16

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95717** Instrument ID: **HG1** Method: **SW7471B**

MBLK Sample ID: **MBLK-95717-95717** Units: **mg/Kg** Analysis Date: **12/12/2016 04:49 P**
Client ID: Run ID: **HG1_161212A** SeqNo: **4198831** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	ND	0.020								

LCS Sample ID: **LCS-95717-95717** Units: **mg/Kg** Analysis Date: **12/12/2016 04:52 P**
Client ID: Run ID: **HG1_161212A** SeqNo: **4198832** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.175	0.020	0.1665	0	105	80-120		0		

MS Sample ID: **1612436-01AMS** Units: **mg/Kg** Analysis Date: **12/12/2016 04:57 P**
Client ID: **SS #1** Run ID: **HG1_161212A** SeqNo: **4198834** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.1222	0.013	0.1048	0.01073	106	75-125		0		

MSD Sample ID: **1612436-01AMSD** Units: **mg/Kg** Analysis Date: **12/12/2016 05:00 P**
Client ID: **SS #1** Run ID: **HG1_161212A** SeqNo: **4198835** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Mercury	0.1183	0.012	0.1028	0.01073	105	75-125	0.1222	3.27	35	

The following samples were analyzed in this batch:

1612436-01A	1612436-02A	1612436-03A
1612436-04A	1612436-05A	1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95596** Instrument ID: **ICPMS1** Method: **SW6020A**

MBLK Sample ID: **MBLK-95596-95596** Units: **mg/Kg** Analysis Date: **12/9/2016 10:21 PM**
Client ID: Run ID: **ICPMS1_161209A** SeqNo: **4195485** Prep Date: **12/8/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	ND	0.25								
Cadmium	ND	0.10								
Copper	ND	0.25								
Lead	0.0053	0.25								J
Selenium	ND	0.25								
Zinc	ND	0.50								

LCS Sample ID: **LCS-95596-95596** Units: **mg/Kg** Analysis Date: **12/9/2016 11:11 PM**
Client ID: Run ID: **ICPMS1_161209A** SeqNo: **4195491** Prep Date: **12/8/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	4.681	0.25	5	0	93.6	80-120	0			
Cadmium	4.697	0.10	5	0	93.9	80-120	0			
Copper	4.61	0.25	5	0	92.2	80-120	0			
Lead	4.898	0.25	5	0	98	80-120	0			
Selenium	4.406	0.25	5	0	88.1	80-120	0			
Zinc	4.561	0.50	5	0	91.2	80-120	0			

MS Sample ID: **1612362-01BMS** Units: **mg/Kg** Analysis Date: **12/9/2016 11:23 PM**
Client ID: Run ID: **ICPMS1_161209A** SeqNo: **4195493** Prep Date: **12/8/2016** DF: **4**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	10.27	1.3	6.468	3.622	103	75-125	0			
Cadmium	6.215	0.52	6.468	0.1243	94.2	75-125	0			
Copper	12.47	1.3	6.468	5.643	105	75-125	0			
Lead	9.878	1.3	6.468	4.246	87.1	75-125	0			
Selenium	6.23	1.3	6.468	0.4292	89.7	75-125	0			
Zinc	30.01	2.6	6.468	15.17	229	75-125	0			S

MSD Sample ID: **1612362-01BMSD** Units: **mg/Kg** Analysis Date: **12/9/2016 11:29 PM**
Client ID: Run ID: **ICPMS1_161209A** SeqNo: **4195494** Prep Date: **12/8/2016** DF: **4**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Arsenic	9.481	1.3	6.452	3.622	90.8	75-125	10.27	8.03	20	
Cadmium	6.09	0.52	6.452	0.1243	92.5	75-125	6.215	2.02	20	
Copper	15.33	1.3	6.452	5.643	150	75-125	12.47	20.6	20	SR
Lead	9.45	1.3	6.452	4.246	80.7	75-125	9.878	4.43	20	
Selenium	6.302	1.3	6.452	0.4292	91	75-125	6.23	1.14	20	
Zinc	19.47	2.6	6.452	15.17	66.7	75-125	30.01	42.6	20	SR

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95596** Instrument ID: **ICPMS1** Method: **SW6020A**

The following samples were analyzed in this batch:

1612436-01A	1612436-02A	1612436-03A
1612436-04A	1612436-05A	1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95705** Instrument ID: **ICPMS1** Method: **SW6020A**

MBLK Sample ID: **MBLK-95705-95705** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 12:15 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198551** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (coarse fraction)	ND	0.75								

LCS Sample ID: **LCS1-95705-95705** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 12:22 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198552** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (coarse fraction)	131.9	7.5	149.6	0	88.2	80-120		0		

MS Sample ID: **1612436-05AMS** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 02:08 A**
Client ID: **SS #5** Run ID: **ICPMS1_161212B** SeqNo: **4198567** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (coarse fraction)	73.84	11	75.53	0.5009	97.1	75-125		0		

MSD Sample ID: **1612436-05AMSD** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 02:14 A**
Client ID: **SS #5** Run ID: **ICPMS1_161212B** SeqNo: **4198568** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (coarse fraction)	82.73	11	75.41	0.5009	109	75-125	73.84	11.4	25	

LCS2 Sample ID: **LCS2-95705-95705** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 12:28 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198553** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (coarse fraction)	465.6	7.5	429.4	0	108	80-120		0		

The following samples were analyzed in this batch: 1612436-04A 1612436-05A 1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95706** Instrument ID: **ICPMS1** Method: **SW6020A**

MBLK Sample ID: **MBLK-95706-95706** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 04:44 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198634** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (fine fraction)	0.007725	0.75								J

LCS Sample ID: **LCS1-95706-95706** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 04:50 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198635** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (fine fraction)	144.6	7.5	149.7	0	96.6	80-120	0			

MS Sample ID: **1612435-01AMS** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 05:09 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198638** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (fine fraction)	87.47	9.9	66.31	25.07	94.1	75-125	0			

MSD Sample ID: **1612435-01AMSD** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 05:15 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198639** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (fine fraction)	87.14	9.9	66.31	25.07	93.6	75-125	87.47	0.38	25	

LCS2 Sample ID: **LCS2-95706-95706** Units: **mg/Kg-dry** Analysis Date: **12/13/2016 04:57 A**
Client ID: Run ID: **ICPMS1_161212B** SeqNo: **4198636** Prep Date: **12/12/2016** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Lead (fine fraction)	430.9	7.4	429	0	100	80-120	0			

The following samples were analyzed in this batch: 1612436-04A 1612436-05A 1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95699** Instrument ID: **SVMS5** Method: **SW846 8270D**

MBLK Sample ID: **SBLKS1-95699-95699** Units: **µg/Kg** Analysis Date: **12/12/2016 06:41 P**
Client ID: Run ID: **SVMS5_161212A** SeqNo: **4199325** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
2-Methylnaphthalene	ND	6.7								
Acenaphthene	ND	6.7								
Acenaphthylene	ND	6.7								
Anthracene	ND	6.7								
Benzo(a)anthracene	ND	6.7								
Benzo(a)pyrene	ND	6.7								
Benzo(b)fluoranthene	ND	6.7								
Benzo(g,h,i)perylene	ND	6.7								
Benzo(k)fluoranthene	ND	6.7								
Chrysene	ND	6.7								
Dibenzo(a,h)anthracene	ND	6.7								
Fluoranthene	ND	6.7								
Fluorene	ND	6.7								
Indeno(1,2,3-cd)pyrene	ND	6.7								
Naphthalene	ND	6.7								
Phenanthrene	ND	6.7								
Pyrene	ND	6.7								
Surr: 2,4,6-Tribromophenol	*2127*	0	*3333*	0	*63.8*	*34-140*		0		
Surr: 2-Fluorobiphenyl	*2399*	0	*3333*	0	*72*	*12-100*		0		
Surr: 2-Fluorophenol	*2443*	0	*3333*	0	*73.3*	*33-117*		0		
Surr: 4-Terphenyl-d14	*2611*	0	*3333*	0	*78.3*	*25-137*		0		
Surr: Nitrobenzene-d5	*2336*	0	*3333*	0	*70.1*	*37-107*		0		
Surr: Phenol-d6	*2477*	0	*3333*	0	*74.3*	*40-106*		0		

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95699** Instrument ID: **SVMS5** Method: **SW846 8270D**

LCS Sample ID: **SLCSS1-95699-95699** Units: **µg/Kg** Analysis Date: **12/12/2016 07:04 P**
Client ID: Run ID: **SVMS5_161212A** SeqNo: **4199326** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
2-Methylnaphthalene	1055	6.7	1333	0	79.2	45-105	0			
Acenaphthene	1009	6.7	1333	0	75.7	45-110	0			
Acenaphthylene	1087	6.7	1333	0	81.6	45-105	0			
Anthracene	1150	6.7	1333	0	86.3	55-105	0			
Benzo(a)anthracene	1177	6.7	1333	0	88.3	50-110	0			
Benzo(a)pyrene	1191	6.7	1333	0	89.3	50-110	0			
Benzo(b)fluoranthene	1197	6.7	1333	0	89.8	45-115	0			
Benzo(g,h,i)perylene	1193	6.7	1333	0	89.5	40-125	0			
Benzo(k)fluoranthene	1187	6.7	1333	0	89.1	45-115	0			
Chrysene	1176	6.7	1333	0	88.2	55-110	0			
Dibenzo(a,h)anthracene	1206	6.7	1333	0	90.5	40-125	0			
Fluoranthene	1244	6.7	1333	0	93.3	55-115	0			
Fluorene	1087	6.7	1333	0	81.6	50-110	0			
Indeno(1,2,3-cd)pyrene	1235	6.7	1333	0	92.6	40-120	0			
Naphthalene	1058	6.7	1333	0	79.4	40-105	0			
Phenanthrene	1174	6.7	1333	0	88.1	50-110	0			
Pyrene	1168	6.7	1333	0	87.6	45-125	0			
Surr: 2,4,6-Tribromophenol	*2461*	0	*3333*	0	*73.8*	*34-140*	0			
Surr: 2-Fluorobiphenyl	*2507*	0	*3333*	0	*75.2*	*12-100*	0			
Surr: 2-Fluorophenol	*2425*	0	*3333*	0	*72.7*	*33-117*	0			
Surr: 4-Terphenyl-d14	*2770*	0	*3333*	0	*83.1*	*25-137*	0			
Surr: Nitrobenzene-d5	*2580*	0	*3333*	0	*77.4*	*37-107*	0			
Surr: Phenol-d6	*2540*	0	*3333*	0	*76.2*	*40-106*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95699** Instrument ID: **SVMS5** Method: **SW846 8270D**

MS Sample ID: **1612304-05B MS** Units: **µg/Kg** Analysis Date: **12/12/2016 09:10 P**
Client ID: Run ID: **SVMS5_161212A** SeqNo: **4199327** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
2-Methylnaphthalene	980.5	6.6	1311	0	74.8	45-105	0			
Acenaphthene	884.1	6.6	1311	0	67.4	45-110	0			
Acenaphthylene	981.1	6.6	1311	0	74.8	45-105	0			
Anthracene	1026	6.6	1311	0	78.2	55-105	0			
Benzo(a)anthracene	1032	6.6	1311	0	78.7	50-110	0			
Benzo(a)pyrene	1049	6.6	1311	0	80	50-110	0			
Benzo(b)fluoranthene	1070	6.6	1311	0	81.6	45-115	0			
Benzo(g,h,i)perylene	1017	6.6	1311	0	77.6	40-125	0			
Benzo(k)fluoranthene	1056	6.6	1311	0	80.5	45-115	0			
Chrysene	1033	6.6	1311	0	78.8	55-110	0			
Dibenzo(a,h)anthracene	1040	6.6	1311	0	79.3	40-125	0			
Fluoranthene	1102	6.6	1311	0	84.1	55-115	0			
Fluorene	981.1	6.6	1311	0	74.8	50-110	0			
Indeno(1,2,3-cd)pyrene	1036	6.6	1311	0	79	40-120	0			
Naphthalene	977.2	6.6	1311	0	74.5	40-105	0			
Phenanthrene	1044	6.6	1311	0	79.6	50-110	0			
Pyrene	1049	6.6	1311	0	80	45-125	0			
Surr: 2,4,6-Tribromophenol	*2176*	0	*3279*	0	*66.4*	*34-140*	0			
Surr: 2-Fluorobiphenyl	*2197*	0	*3279*	0	*67*	*12-100*	0			
Surr: 2-Fluorophenol	*2213*	0	*3279*	0	*67.5*	*33-117*	0			
Surr: 4-Terphenyl-d14	*2449*	0	*3279*	0	*74.7*	*25-137*	0			
Surr: Nitrobenzene-d5	*2276*	0	*3279*	0	*69.4*	*37-107*	0			
Surr: Phenol-d6	*2411*	0	*3279*	0	*73.5*	*40-106*	0			

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **95699** Instrument ID: **SVMS5** Method: **SW846 8270D**

MSD Sample ID: **1612304-05B MSD** Units: **µg/Kg** Analysis Date: **12/12/2016 09:33 P**
Client ID: Run ID: **SVMS5_161212A** SeqNo: **4199328** Prep Date: **12/12/2016** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
2-Methylnaphthalene	1011	6.7	1332	0	75.9	45-105	980.5	3.06	30	
Acenaphthene	909.7	6.7	1332	0	68.3	45-110	884.1	2.86	30	
Acenaphthylene	1024	6.7	1332	0	76.9	45-105	981.1	4.24	30	
Anthracene	1077	6.7	1332	0	80.9	55-105	1026	4.86	30	
Benzo(a)anthracene	1072	6.7	1332	0	80.5	50-110	1032	3.86	30	
Benzo(a)pyrene	1078	6.7	1332	0	80.9	50-110	1049	2.71	30	
Benzo(b)fluoranthene	1081	6.7	1332	0	81.2	45-115	1070	0.98	30	
Benzo(g,h,i)perylene	1050	6.7	1332	0	78.8	40-125	1017	3.13	30	
Benzo(k)fluoranthene	1098	6.7	1332	0	82.5	45-115	1056	3.93	30	
Chrysene	1064	6.7	1332	0	79.9	55-110	1033	2.98	30	
Dibenzo(a,h)anthracene	1055	6.7	1332	0	79.2	40-125	1040	1.41	30	
Fluoranthene	1110	6.7	1332	0	83.4	55-115	1102	0.697	30	
Fluorene	1048	6.7	1332	0	78.7	50-110	981.1	6.55	30	
Indeno(1,2,3-cd)pyrene	1078	6.7	1332	0	81	40-120	1036	3.97	30	
Naphthalene	1019	6.7	1332	0	76.5	40-105	977.2	4.18	30	
Phenanthrene	1068	6.7	1332	0	80.2	50-110	1044	2.28	30	
Pyrene	1092	6.7	1332	0	82	45-125	1049	4	30	
Surr: 2,4,6-Tribromophenol	*2270*	0	*3329*	0	*68.2*	*34-140*	2176	*4.24*	*40*	
Surr: 2-Fluorobiphenyl	*2377*	0	*3329*	0	*71.4*	*12-100*	2197	*7.89*	*40*	
Surr: 2-Fluorophenol	*2306*	0	*3329*	0	*69.2*	*33-117*	2213	*4.08*	*40*	
Surr: 4-Terphenyl-d14	*2529*	0	*3329*	0	*76*	*25-137*	2449	*3.23*	*40*	
Surr: Nitrobenzene-d5	*2426*	0	*3329*	0	*72.9*	*37-107*	2276	*6.4*	*40*	
Surr: Phenol-d6	*2508*	0	*3329*	0	*75.3*	*40-106*	2411	*3.95*	*40*	

The following samples were analyzed in this batch:

1612436-01A	1612436-02A	1612436-03A
1612436-04A	1612436-05A	1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **R202194** Instrument ID: **MOIST** Method: **SW3550C**

MBLK Sample ID: **WBLKS-R202194** Units: **% of sample** Analysis Date: **12/8/2016 02:43 PM**
Client ID: Run ID: **MOIST_161208B** SeqNo: **4194553** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	ND	0.050								

LCS Sample ID: **LCS-R202194** Units: **% of sample** Analysis Date: **12/8/2016 02:43 PM**
Client ID: Run ID: **MOIST_161208B** SeqNo: **4194552** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	100	0.050	100	0	100	99.5-100.5	0			

DUP Sample ID: **1612436-01A DUP** Units: **% of sample** Analysis Date: **12/8/2016 02:43 PM**
Client ID: **SS #1** Run ID: **MOIST_161208B** SeqNo: **4194545** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	19.77	0.050	0	0	0		19.65	0.609	20	

DUP Sample ID: **1612436-03A DUP** Units: **% of sample** Analysis Date: **12/8/2016 02:43 PM**
Client ID: **SS #3** Run ID: **MOIST_161208B** SeqNo: **4194548** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	19.57	0.050	0	0	0		18.92	3.38	20	

The following samples were analyzed in this batch:

1612436-01A	1612436-02A	1612436-03A
1612436-04A	1612436-05A	

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

Client: Gosling Czubak Engineering Sciences, Inc.
Work Order: 1612436
Project: Gosling (Torch Lake W BAS - 2016471001.05)

QC BATCH REPORT

Batch ID: **R202195** Instrument ID: **MOIST** Method: **SW3550C**

MBLK Sample ID: **WBLKS-R202195** Units: **% of sample** Analysis Date: **12/8/2016 04:59 PM**
Client ID: Run ID: **MOIST_161208C** SeqNo: **4194577** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	ND	0.050								

LCS Sample ID: **LCS-R202195** Units: **% of sample** Analysis Date: **12/8/2016 04:59 PM**
Client ID: Run ID: **MOIST_161208C** SeqNo: **4194576** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	100	0.050	100	0	100	99.5-100.5	0			

DUP Sample ID: **1612436-06A DUP** Units: **% of sample** Analysis Date: **12/8/2016 04:59 PM**
Client ID: **SS #6** Run ID: **MOIST_161208C** SeqNo: **4194572** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	16.42	0.050	0	0	0		14.73	10.9	20	

DUP Sample ID: **1612493-01B DUP** Units: **% of sample** Analysis Date: **12/8/2016 04:59 PM**
Client ID: Run ID: **MOIST_161208C** SeqNo: **4194575** Prep Date: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Moisture	47.14	0.050	0	0	0		45.06	4.51	20	

The following samples were analyzed in this batch: 1612436-06A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

ALS Group, USA

Date: 21-Dec-16

Client: Gosling Czubak Engineering Sciences, Inc.
Project: Gosling (Torch Lake W BAS - 2016471001.05)
WorkOrder: **1612436**

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte is present at an estimated concentration between the MDL and Report Limit
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL
X	Analyte was detected in the Method Blank between the MDL and Reporting Limit, sample results may exhibit backgr or reagent contamination at the observed level.

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
% of sample	Percent of Sample
µg/Kg-dry	Micrograms per Kilogram Dry Weight
mg/Kg-dry	Milligrams per Kilogram Dry Weight

ALS Group, USA

Sample Receipt Checklist

Client Name: **GOSLING** Date/Time Received: **07-Dec-16 10:00**

Work Order: **1612436** Received by: **MBB**

Checklist completed by Meghan Broadbent (eSignature) 07-Dec-16 (Date) Reviewed by: Gary Byar (eSignature) 08-Dec-16 (Date)

Matrices: soil
Carrier name: FedEx

	Yes	No	Not Present
Shipping container/cooler in good condition?	☑	☐	☐
Custody seals intact on shipping container/cooler?	☐	☐	☑
Custody seals intact on sample bottles?	☐	☐	☑
Chain of custody present?	☑	☐	
Chain of custody signed when relinquished and received?	☑	☐	
Chain of custody agrees with sample labels?	☑	☐	
Samples in proper container/bottle?	☑	☐	
Sample containers intact?	☑	☐	
Sufficient sample volume for indicated test?	☑	☐	
All samples received within holding time?	☑	☐	
Container/Temp Blank temperature in compliance?	☑	☐	
Sample(s) received on ice?	☑	☐	

Temperature(s)/Thermometer(s): 4.6/4.6 SR2

Cooler(s)/Kit(s):

Date/Time sample(s) sent to storage: 12/7/2016 4:24:56 PM

	Yes	No		
Water - VOA vials have zero headspace?	☐	☐	No VOA vials submitted	☑
Water - pH acceptable upon receipt?	☑	☐	N/A	☐
pH adjusted?	☐	☑	N/A	☐

pH adjusted by: -

Login Notes:

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

CorrectiveAction

ALS Environmental

Cincinnati, OH +1 513 733 5336 | Fort Collins, CO +1 970 490 1511 | Houston, TX +1 281 530 5656 | Spring City, PA +1 610 948 4903 | South Charleston, WV +1 304 356 3168
Everett, WA +1 425 356 2600 | Holland, MI +1 616 399 6070 | Middletown, PA +1 717 944 5541 | Salt Lake City, UT +1 801 266 7700 | York, PA +1 717 505 5280

Chain of Custody Form

Page 1 of 1

COC ID: 14459

ALS Project Manager: Cody Byers ALS Work Order #: [illegible]

Customer Information		Project Information		Parameter/Method Request for Analysis	
Purchase Order		Project Name	TORCH LAKE WEST BAS	A	PNA's
Work Order		Project Number	201647/001.05	B	AS, Cd, Cu, Se, Zn, Hg
Company Name	GOSLING CZUBAK	Bill To Company	GOSLING CZUBAK	C	LEAD FRACTIONIZATION
Send Report To	DOUG COATES	Invoice Attn	DOUG COATES	D	**** HOLD ONTO SAMPLES FOR POSSIBLE TCLP
Address	1280 BUSINESS PARK DRIVE	Address	1280 BUSINESS PARK DRIVE	E	
				F	
City/State/Zip	TRAVERSE CITY 49686	City/State/Zip	TRAVESE CITY, MI 49686	G	
Phone	231 946-9191	Phone	231-946-9191	H	
Fax	231-941-4603	Fax	231-941-4603	I	
e-Mail Address	DACOATES@GOSLINGCZUBAK.COM	e-Mail Address	DACOATES@GOSLINGCZUBAK.COM	J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SS #1	12/5/16	–	SOIL	–	2	X	X	X								
2	SS #2	12/5/16	–	SOIL	–	2	X	X	X								
3	SS #3	12/5/16	–	SOIL	–	2	X	X	X								
4	SS #4	12/5/16	–	SOIL	–	2	X	X	X								
5	SS #5	12/5/16	–	SOIL	–	2	X	X	X								
6	SS #6	12/5/16	–	SOIL	–	2	X	X	X								
7																	
8																	
9																	
10																	

Sampler(s) Please Print & Sign: [signature] JEFF KOWALSKI

Shipment Method:

Required Turnaround Time: (Check Box) ☐ Other ☐ STD 10 Wk Days ☒ 5 Wk Days ☐ 2 Wk Days ☐ 24 Hour

Results Due Date:

Relinquished By:	Date:	Time:	Received By:	Notes:
[signature] JEFF KOWALSKI	12/6/16	15:20	[signature]	ALS Proj: Gosling-MISC
[signature]	12/6/16	16:30	[signature] 12/7/16 1000	
Logged by (Laboratory): MB	Date: 12/7/16	Time: 1620	Checked by (Laboratory):	

Cooler ID	Cooler Temp
SR2	4.6

QC Package: (Check One Box Below)
☐ Level II Std QC ☐ TRRP Checklist
☐ Level III Std QC/Raw Data ☐ TRRP Level IV
☐ Level IV SW846/CLP
☐ Other

Preservative Key: 1-HCl 2-HNO_3 3-H_2SO_4 4-NaOH 5-$Na_2S_2O_3$ 6-$NaHSO_4$ 7-Other 8-4°C 9-5035

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.
2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.
3. The Chain of Custody is a legal document. All information must be completed accurately.

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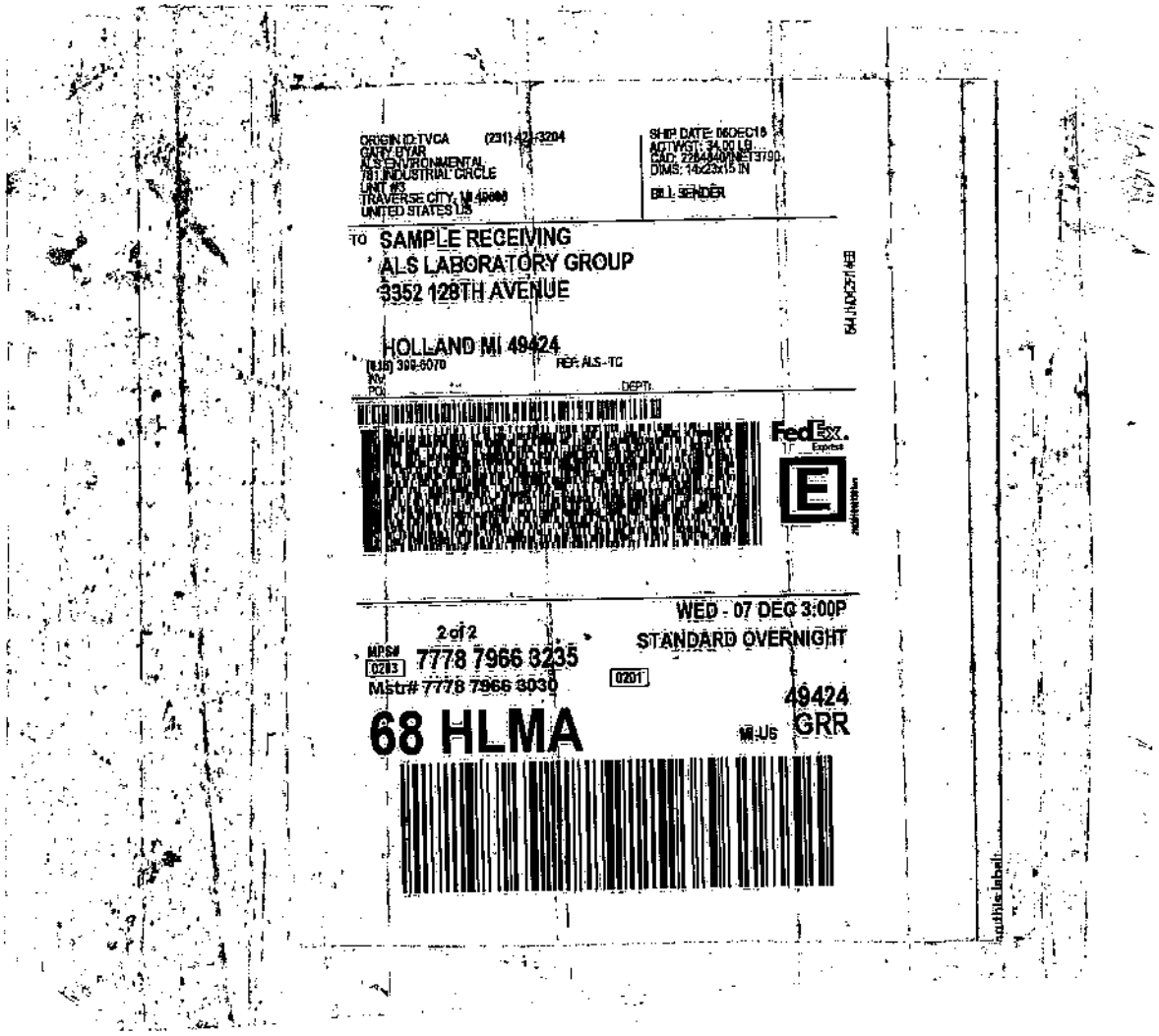
ORIGIN ID:TVCA (231) 422-3204
GARY UYAR
ALS ENVIRONMENTAL
781 INDUSTRIAL CIRCLE
UNIT #3
TRAVERSE CITY, MI 49686
UNITED STATES US
SHIP DATE: 06DEC18
ACTWGT: 34.00 LB
CAD: 2284409/NET3790
DIMS: 14x23x15 IN
BILL SENDER
TO SAMPLE RECEIVING
ALS LABORATORY GROUP
3352 128TH AVENUE
HOLLAND MI 49424
(616) 399-6070
REF: ALS-TC
DEPT:
FedEx Express
WED - 07 DEC 3:00P
STANDARD OVERNIGHT
2 of 2
MPS# 7778 7966 3235
Mstr# 7778 7966 3030
0201
49424
68 HLMA
MI-US
GRR

Torch Lake West BAS Dredging Sediment Sampling Analysis

Torch Lake Township, Antrim County, MI

12/22/2016 Soil Sample Date

Total Metals Screening

Parameter	State Default Background (ppm)	Sample ID 1 (ppm)	Sample ID 2 (ppm)	Sample ID 3 (ppm)	Sample ID 4 (ppm)	Sample ID 5 (ppm)	Sample ID 6 (ppm)
Arsenic	5.8	2.3	1.2	2.7	1.4	0.55	0.89
Cadmium	1.2	0.37	0.4	0.45	ND	ND	ND
Copper	32	14	13	14	4.2	ND	6
Lead	21	7.4	9.7	7.9	1.7	1.2	3.7
Mercury	0.13	ND	ND	ND	ND	ND	ND
Selenium	0.41	1.1	1.0	0.96	0.51	ND	0.58
Zinc	47	32	29	31	8.5	3.6	13
PNA's		ND	ND	ND	ND	ND	ND
Meets MDEQ Pre Screening Criteria? [2]		No	No	No	No	Yes [1]	No
Surveyed Bottom Elevation		587	587	587	586	586	586
Soil Sample Bottom Elevation		585	585	585	585	585	585

Concentration exceeds background level

[1] All metal concentrations are below State Default Background screening criteria.

[2] For samples with a total metal above Background criteria, leachate testing is required for removal of material. To be considered uncontaminated the UCL of the leachate testing must be below the groundwater criteria AND the totals testing must be below the soil criteria. If either of these criteria is exceeded restrictions may be placed on the disposal of the material.

File 303

Michigan Department of Transportation 1901 (03/14)

MECHANICAL ANALYSIS REPORT

JOB NO. 201647/001.05

MATERIAL	SAMPLED FROM	SPEC.	PRODUCER	CONTROL SECTION
Bottom Sediment	Torch Lake		Beckett & Raeder	TL #5

SIEVE	RETAINED FRACTIONAL WEIGHT	RETAINED FRACTIONAL PERCENT	PERCENTS CUMULATIVE RETAINED	PERCENTS CUMULATIVE PASSING
2 1/2"				
2"				
1 1/2"				
1"				
3/4" 100.0			0.0	100
1/2"	58.2	13.3		
3/8"	11.5	2.6		
1/4"	32.7	7.5		
NO. 4 95-100	6.7	1.5	1.5	98.5
NO. 8 65-95	3.7	0.8	2.3	96.2
NO. 16 35-75	10.9	2.5	4.8	91.4
NO. 30 20-55	156.8	~~35.9~~ 36.1	40.9	50.5
NO. 50 10-30	101.4	23.3	64.2	
NO. 100 0-10	22.4	5.1	69.3	
PAN	2.5	0.6		
LBW	29.4	6.7		
TOTAL	~~435.7~~ 436.1	~~99.8~~ 100.0		

TEST NO. 2		DATE 1-4-17	
Initial Weight of Sample	436.1		gm
Weight After Washing	406.3		gm
Loss By Washing (Clay & Silt)	29.4 gm	6.4	%
Fineness Modulus			
Crushed Material	gm		%
Organic Plate No.			
Clay-Ironstone	gm		%
(1) Soft Particles Including:			
Clay-Ironstone	gm		%
(2) Chert	gm		%
Sum of (1) + (2)	gm	%	
Material ☐ Meets ☐ Fails			
REMARKS:			
AGGREGATE INSPECTOR (Signature)		DATE 1/4/17	

File 303

Michigan Department of Transportation 1901 (03/14)

MECHANICAL ANALYSIS REPORT

JOB NO. 201647/001.05

MATERIAL	SAMPLED FROM	SPEC.	PRODUCER	CONTROL SECTION
			Beckett & Raeder	TL #4

SIEVE	RETAINED FRACTIONAL WEIGHT	RETAINED FRACTIONAL PERCENT	PERCENTS CUMULATIVE RETAINED	PERCENTS CUMULATIVE PASSING
2 1/2"				
2"				
1 1/2"				
1"				
3/4"				100.0
1/2"	21.6	4.1		
3/8"	5.9	1.1		
1/4"	3.3	0.6		
NO. 4 95-100	1.5	0.3	.3	99.7
NO. 8 65-95	1.4	0.3	0.6	99.1
NO. 16 35-75	.8	0.1	.7	98.4
NO. 30 20-55	2.0	0.4	1.1	97.3
NO. 50 10-30	56.9	10.8	11.9	85.4
NO. 100 0-10	220.1	42.0	53.9	31.5
PAN	3.0	0.6		
LBW	147.8	28.2		
TOTAL	524.5	100.0		

TEST NO. 1		DATE 1-4-17	
Initial Weight of Sample	524.5		gm
Weight After Washing	376.7		gm
Loss By Washing (Clay & Silt)	147.8 gm	28.2	%
Fineness Modulus			
Crushed Material	gm		%
Organic Plate No.			
Clay-Ironstone	gm		%
(1) Soft Particles Including:			
Clay-Ironstone	gm		%
(2) Chert	gm		%
Sum of (1) + (2)	gm	%	
Material ☐ Meets ☐ Fails			
REMARKS: 200#60.2 11.5			
AGGREGATE INSPECTOR (Signature)		DATE 1/4/17	

Appendix F: Localized Coastal Processes Assessment

Localized Coastal Processes Assessment
West Torch Lake BAS
28 September 2017

An assessment of the existing shoreline and coastal processes was made for the proposed West Torch Lake boat launch. The intent of this assessment was to examine the viability of the proposed project and the impact it may have on the lake and neighboring properties. Only coastal processes and influences were examined.

The following information was examined in the course of this assessment:

1. Topographic and Bathymetric survey performed by Gosling-Czubak, 2016
2. Google Earth aerial photography from 1998, 2005, 2012, 2013, 2015 and 2016
3. Michigan Conservation Department, Division of Fisheries, Torch Lake Inventory Map (undated)
4. Laboratory analysis of six sediment samples, ALS Environmental, 2016
5. Site visit photos, 2016

Aerial photography of the shoreline was examined for several miles to the north and south of the proposed boat launch. The shoreline is heavily developed, with residential use dominating. Most of the properties have boating access to the lake by way of a dock, boat house or boat hoist. These structures are subject to the same coastal forces (waves and ice) that the proposed boat launch would experience. Moreover, these structures appear to have a persistence over the 18 years of aerial photography examined. Consequently, building similar structures at the proposed site appears compatible with the wave climate and ice forces. Lastly, the limited fetch on this inland lake limits the growth of wind-generated waves. Waves grow larger as the wind blows across open water. Since Torch Lake is very long and narrow and oriented approximately north-south, a structure at either the north or south end of Torch Lake would be subject to a longer fetch and potentially larger waves. The proposed boat launch is approximately in the center and is inherently less likely to experience large waves from either the north or south. Moreover, with prevailing winds from the west, the most quiescent water would be found along the western shoreline of Torch Lake.

A small, sandy shelf appears in the air photos and bathymetric surveys and rings the majority of this lake. At the study site, the sand is a 4-6 inch veneer over a silty clay. The longshore transport of this material appears to be from north to south, based on accretion and other geomorphic indicators seen on all of the above referenced aerial photography. While the transport direction may change from storm to storm, the dominant direction appears to be to the south. Indicators of this southerly transport were observed in numerous places for several miles both north and south of the study site. Based only on an aerial photo examination, the sand in the nearshore does not appear to be organized into shore-parallel bars, suggesting a lack of wave energy to create such features. To minimize any impacts to the downdrift shoreline (south of the study site), any structure (such as a dock) extending into the lake should be permeable to the longshore transport of sand. If an impermeable structure is necessary, the amount of material expected to be impounded updrift should be determined and

prefilled with beach-suitable material. This would mitigate any effects from the interruption of the longshore transport of sand.

Many parcels to both the north and the south have constructed shore protection to prevent the erosion of their shoreline. There are, however, many properties that have no shore protection. These unprotected properties do not appear to be recessed back any further than the armored sections. This suggests that the shoreline recession rate is low. During the design phase, care should be taken to site any infrastructure sufficiently landward such that it will not be impacted by future erosion.

Lastly, based on an interpretation of the bathymetric survey, there does not appear to be any navigation hazards in the nearshore. Moreover, the bathymetry does not suggest the creation of unusual or dangerous currents or wave focusing, issues that would impact safe navigation.

In conclusion, based on the above comments and caveats, this site appears compatible for use as a boat launch.

Dr. Jim Selegean, P.E., P.H.

Jim Selegean

Principal/Owner
Great Lakes Hydrology, LLC

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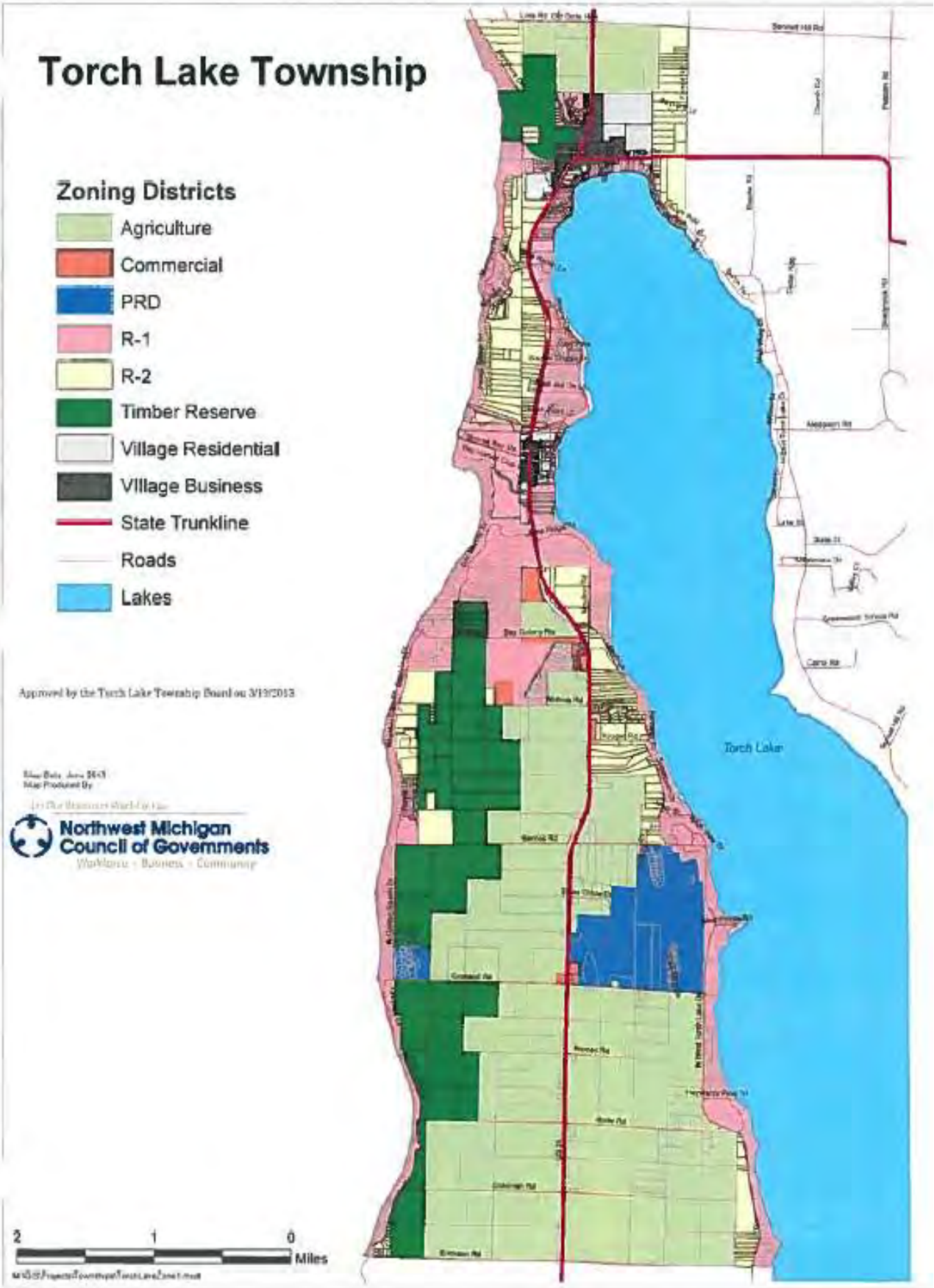
Appendix G: Torch Lake Township Zoning Map


Torch Lake Township
Zoning Districts
Agriculture
Commercial
PRD
R-1
R-2
Timber Reserve
Village Residential
Village Business
State Trunkline
Roads
Lakes
Approved by the Torch Lake Township Board on 3/19/2013
Northwest Michigan
Council of Governments
Workforce • Business • Community
Torch Lake
2
1
0
Miles

Appendix H: Torch Lake Township Applicable Zoning Ordinances

CHAPTER VII

"R-1" - RESIDENTIAL - ONE-UNIT DWELLING ZONE

(Amendment effective February 18, 2014)

SECTION 7.01 - PERMITTED USES. No building or part thereof in an "R-1" Residential Zone shall hereafter be used, erected, altered or converted, or land used, in whole or in part, except for:

A. 1-unit dwellings with accessory buildings and uses as defined in this Ordinance including structures which are considered necessary in, or compatible with, residential neighborhoods. An accessory use or structure is not allowed on lots within the R-1 Zone prior to the establishment of a primary use or structure, such as a 1-unit dwelling.

B. Parking requirements for all permitted uses shall be governed by Chapter XVI: OFF STREET PARKING AND UNLOADING.

SECTION 7.02 – SPECIAL USES. Special Uses requiring a Special Use permit in accordance with Section 17.01 within the R-1 Residential Zone.

A. Private and Quasi-public Facilities.

1. Churches with accessory uses and structures (including but not limited to a rectory, convent, and halls).
2. Private schools

B. Public Facilities.

1. Libraries
2. Schools
3. Museums
4. Parks
5. Play Grounds
6. Community Centers
7. Similar public facilities and uses

C. Conditions of Approval.

1. A greenbelt shall be provided as defined within Chapter XIII: Definitions of this ordinance.
2. Minimum lot line setbacks for structures, driveways, and parking areas shall be as required for uses permitted by right with the

exception of the side and rear lot line setbacks which shall contain a minimum distance of one hundred (100) feet, a portion of which may be occupied by the greenbelt. These setback standards shall replace those required in Chapter XVII: Special Uses Section 17.01 D.2.

3. Facilities which will be used or have the potential to be used between the hours of 10:00 PM and 7:00 AM or which will be used for purposes that will generate potential nuisances, including noise-shall contain greater setbacks and green belts including vegetated earthen berms at the discretion of the Planning Commission.

SECTION 7.03 - HEIGHT, AREA AND LOT LINE SETBACK RESTRICTIONS OF PLATTED AND UNPLATTED LOTS. Every platted or unplatted lot in the R-1 Zone shall meet the following requirements:

A. An unoccupied front lot line setback having a minimum distance of fifty (50) feet.

B. A side lot line setback from each side lot line having a minimum distance of ten (10) feet. Corner lots shall have a minimum of a fifteen (15) feet setback from side street right-of-way. *(Amendment effective May 19, 2015).*

C. A rear lot line setback having a minimum distance of thirty-five (35) feet.

D. The entire lot shall be well maintained and kept free of rubbish, solid waste, junk, scrap, and inoperable vehicles, such as but not limited to autos, recreational vehicles, travel trailers, campers, temporary or mobile structures, mobile homes, watercraft or debris.

E. Building height shall not exceed thirty-five (35) feet.

F. Every dwelling unit shall have a minimum usable floor area of nine hundred and sixty (960) square feet. At least one section of the dwelling unit shall contain a core living area having minimum horizontal dimensions of twenty (20) feet by twenty (20) feet.

G. Lot Area. All lots in this zone shall have a minimum width of one hundred (100) feet at the front lot line, and shall have a minimum lot area of twenty thousand (20,000) square feet. Should the road upon which the frontage is located be a cul-de-sac, or dead-end road with a minimum right-of-way of sixty-six (66) feet, the front lot line may be sixty (60) feet in width provided the lot width is one hundred (100) feet at the front lot line setback line.

CHAPTER VII

"R-1" - RESIDENTIAL - ONE-FAMILY ZONE

Section 7.01 - PERMITTED USES. No building or part thereof in an "R-1" Residential Zone shall hereafter be used, erected, altered or converted, or land used, in whole or in part, except for:

A. One-family dwellings with accessory uses as defined in this Ordinance including structures pertaining to energy savings or production which are considered necessary in, or compatible with, residential neighborhoods.

B. Parking requirements for all permitted uses shall be governed by Chapter XVI.

Section 7.02 - Special Uses Requiring the submission and approval of a special use permit in accordance with Section 17.01

A. Private and Quasipublic Facilities
   1. Churches and accessory structures (rectory, convent, and halls.
   2. Private and parochial schools.

B. Public Facilities
   1. Public Libraries
   2. Public Schools
   3. Public Museums
   4. Public Parks
   5. Public Play Grounds
   6. Public Community Centers

C. Conditions of Approval
   1. A green belt shall be provided as defined within this ordinance.
   2. Minimum setback for structures, driveways, and parking areas shall be as required for uses permitted by right with the exception of the side and rear yard setbacks which shall be a minimum of one hundred (100) feet, a portion of which may be occupied by the green belt.
   3. Facilities which will be used or have the potential to be used between the hours of 10:00 PM and 7:00 AM or which will be used for purposes that will generate unusually loud noises shall contain greater setbacks and greenbelts including vegetated earthen berms at the discretion of the Planning Commission.
   4. The above listed special uses must meet the standards contained in Chapter 17 of this ordinance.

Section 7.03 - HEIGHT, AREA AND YARD RESTRICTIONS OF PLATTED AND UNPLATTED LOTS. Every platted or unplatted lot in this Zone shall meet the following requirements:

A. An unoccupied front yard of at least fifty (50) feet.

B. Two (2) side yards shall be minimum of ten (10) feet each. Corner lots shall have thirty-five (35) feet setback from side street right-of-way.

C. A rear yard of thirty-five (35) feet.

D. The entire lot shall be well maintained and kept free of rubbish or debris.

E. No building or structure shall exceed a height of two and one-half (2 1/2) stories or thirty-five (35) feet whichever is the lesser, unless as otherwise provided by this Ordinance.

F. Every dwelling shall have a minimum useable floor area of nine hundred and sixty (960) square feet. The minimum width shall not be made up of additions of a dissimilar type or quality of construction or materials. At least one section of the dwelling shall contain a core living area having minimum horizontal dimensions of twenty (20) feet by twenty (20) feet.

G. Lot Area - All lots in this zone shall have a minimum width of one hundred (100) feet at the front lot line and the building line and shall have a minimum lot area of twenty thousand (20,000) square feet. Should the road upon which the frontage is located be a cul-de-sac, or dead end road with a minimum right-of-way of sixty six (66) feet, the front lot line may be sixty (60) feet in width provided the lot width is one hundred (100) feet at the front yard setback line.

H. Property being developed under the Condominium Act shall contain road frontage as well as the necessary square footage required for each condominium unit as is specified for a lot. In addition, properties bordering water bodies shall contain a minimum of one hundred (100) feet of water frontage per dwelling unit.

CHAPTER VII

"R-1" - RESIDENTIAL - ONE-FAMILY ZONE

Section 7.01 - PERMITTED USES. No building or part thereof in an "R-1" Residential Zone shall hereafter be used, erected, altered or converted, or land used, in whole or in part, except for:

A. One-family dwellings with accessory uses as defined in this Ordinance including structures pertaining to energy savings or production which are considered necessary in, or compatible with, residential neighborhoods.

B. Churches and accessory facilities; public libraries, public museums and art galleries; and public parks, playgrounds and community centers where located at least one hundred (100) feet from any other lot.

C. Public, parochial. and private schools where located at least three hundred (300) feet from any other lot.

D. Parking requirements for all permitted uses shall be governed by Chapter XVI.

Section 7.02 - HEIGHT. AREA AND YARD RESTRICTIONS OF PLATTED AND UNPLATTED LOTS. Every platted or unplatted lot in this Zone shall meet the following requirements:

A. An unoccupied front yard of at least fifty (50) feet.

B. Two (2) side yards shall be minimum of ten (10) feet each. Corner lots shall have thirty-five (35) feet setback from side street right-of-way.

C. A rear yard of thirty-five (35) feet.

D. The entire lot shall be well maintained and kept free of rubbish or debris.

E. No building or structure shall exceed a height of two and one-half (2 1/2) stories or thirty-five (35) feet whichever is the lesser, unless as otherwise provided by this Ordinance.

F. Every dwelling shall have a minimum useable floor area of nine hundred and sixty (960) square feet. The minimum width shall not be made up of additions of a dissimilar type or quality of construction or materials. No dimension shall be less than twenty (20) feet.

G. Lot Area - All lots in this zone shall have a minimum width of one hundred (100) feet at the front lot line and the building line and shall have a minimum lot area of twenty thousand

7 20-1993

(20,000) square feet. Should the road upon which the frontage is located be a cul-de-sac, or dead end road with a minimum right-of-way of sixty six (66) feet, the front lot line may be sixty (60) feet in width provided the lot width is one hundred (100) feet at the front yard setback line.

H. Property being developed under the Condominium Act shall contain road frontage as well as the necessary square footage required for each condominium unit as is specified for a lot. In addition, properties bordering water bodies shall contain a minimum of one hundred (100) feet of lake frontage per dwelling unit.

Section 7.03 - BOAT STORAGE. No structure for the storage or protection of a boat or boats shall be built within ten (10) feet of the water's edge of any lake or river within the Township unless the plans for such structure, and its location, have been approved by the Zoning Administrator who shall take into account in determining whether to approve same, the possible effects of such structure on the erosion of the shoreline, interference with the view of adjacent properties, contamination of the water, and compliance with the provisions of state law applicable thereto.

7-20-1993