WATER WITHDRAWAL PERMIT APPLICATION

Required under Part 327 of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Failure to follow the provisions of the act may result in a civil fine up to $1,000.

Michigan
Department of Environmental Quality

Please PRINT the following information:

I. Facility Information	Contact Information	
Facility or Company Name Charter Township of Texas	Contact Person Julie VanderWiere	Phone [redacted]
Sub-Facility Name (if applicable)	Mailing address 7110 West Q Avenue	
Facility County Kalamazoo	City / State / Zip Kalamazoo, MI 49009	
Facility Township(s) Charter Township of Texas	Email address [redacted]	

II. Proposed Water Withdrawal Information (see instructions)

a. Water Source and Pump Information

1. Name of Water Source	2. Water Source Type (choose one)	3. Pump Capacity	4. Location
Crooked Lake	☐ Groundwater ☒ Inland Surface Water ☐ Great Lakes or Connecting Waterways	4.32 Million Gallons per Day	Latitude: 42.211065 Longitude: -85.692361

b. Proposed Maximum Withdrawal — Anticipated Withdrawal Volumes in MILLIONS OF GALLONS

January	February	March	April	May	June
133.92	120.96	133.92	129.60	133.92	129.60
July	**August**	**September**	**October**	**November**	**December**
133.92	133.92	129.60	133.92	129.60	133.92

c. Primary Purpose of Use (choose one)

Irrigation	Industrial / Manufacturing	Public Water Supply	Quarry / Mining / Dewatering	Electric Power Generation	Lake Augmentation	Other
☐	☐	☐	☐	☐	☐	☒

Description : Remove from lake for flood relief

III. Proposed Return Flow Discharge Information

a. Name of Discharge Location	b. Receiving Water Type (choose one)	c. Location		d. Total Discharge Volume or Rate
Wetlands south of Bentwood Trail entrance drive	☐ Groundwater ☒ Inland Surface Water ☐ Great Lakes or Connecting Waterways	Latitude:	42.210405	4.32
		Longitude:	-85.688895	☒ Million Gallons Per Day, or ☐ Percentage of Proposed Withdrawal

IV. Evaluation of Existing Hydrological and Hydrogeological Conditions

Please attach documentation of existing hydrological and hydrogeological conditions, and an evaluation of the predicted effects of the proposed withdrawal.

V. Environmentally Sound and Economically Feasible Water Conservation Measures

Please attach documentation self-certifying the water use conservation measures applicable to your water use sector that are currently in place or that you intend to incorporate into operation of the proposed withdrawal. Water Use Conservation Measures are available online at http://www.michigan.gov/wateruse .

VI. Decision-Making Standard of the Great Lakes – St. Lawrence River Basin Water Resources Compact

Please attach documentation describing how the withdrawal will be implemented such that the following criteria are met:

1. All water withdrawn shall be returned, either naturally or after use, to the source watershed less an allowance for consumptive use;
2. The withdrawal will be implemented so as to ensure it will not result in significant individual or cumulative adverse impacts to the quantity or quality of the waters and water dependent natural resources of the source watershed and the Great Lakes;
3. The withdrawal will be implemented so as to incorporate Environmentally Sound and Economically Feasible Water Conservation Measures;
4. The withdrawal or consumptive use will be implemented so as to ensure that it is in compliance with all applicable municipal, State and federal laws as well as regional interstate and international agreements, including the Boundary Waters Treaty of 1909;
5. The proposed use is reasonable under common law principles of water law in Michigan, and based upon a consideration of the following factors:
   a) Whether the proposed withdrawal is planned in a fashion that provides for efficient use of the water, and will avoid or minimize the waste of water;
   b) If the proposal is for an increased withdrawal, whether efficient use is made of existing water supplies;
   c) The balance between economic development, social development and environmental protection of the proposed withdrawal and use and other existing or planned withdrawals and water uses sharing the water source;
   d) The supply potential of the water source, considering quantity, quality, and reliability and safe yield of hydrologically interconnected water sources;
   e) The probable degree and duration of any adverse resource impacts caused or expected to be caused by the proposed withdrawal under foreseeable conditions, to other lawful consumptive or non-consumptive uses of water or to the quantity or quality of the waters and water dependent natural resources of the Basin, and the proposed plans and arrangements for avoidance or mitigation of such impacts; and,
   f) Consideration as to the need for the proposal to include restoration of hydrologic conditions and functions of the source watershed.

WATER WITHDRAWAL PERMIT APPLICATION, continued

VII. Does this facility hold a permit issued under Part 31 for a cooling water intake structure?	
☐ YES Please attach a copy of the signed Part 31 discharge authorization, certificate of coverage, or other substantiating documentation.	■ NO

VIII. Permit Application Return and Payment	
I understand that my signature constitutes a legal agreement as to the accuracy and truthfulness of the information provided in this application. Further, I certify as to compliance with the Water Conservation Measures identified in Section V of the permit application.	When completed, mail this form and a $2,000.00 permit application fee to the address below. Please make your check payable to STATE OF MICHIGAN (do not send cash).
x Julie VanderWeire 1/21/19 Owner or authorized representative's signature Date	**RETURN TO:** **MICHIGAN DEPT. OF ENVIRONMENTAL QUALITY** **CASHIER'S OFFICE – WURF** **PO BOX 30657** **LANSING, MI 48909-8157**

FOR DEQ CASHIER'S OFFICE USE ONLY: 60000-42248-9175

Water Permit Withdrawal Application
Charter Township of Texas – Flood Mitigation Project
01/23/2019

V. Environmentally Sound and Economically Feasible Water Conservation Measures
This withdrawal is strictly for "dewatering" to reduce flood levels, and is not consumption. Lake level gages are in place on sites so that once the target level is met, additional drawdown will stop and the level maintained until lakes are at the pre-determined level.

The Crooked Lake water will be immediately discharged to the adjacent wetland, and no additional water conservation measures will be taken.

VI. Decision-Making Standard of the Great Lakes – St. Lawrence River Basin Water Resources Compact
1. This is a "dewatering" project operation for flood control and water will be immediately discharged to the adjacent wetland after removal from Crooked Lake with no consumptive use.

2. The withdrawal and discharge of water are permitted in accordance with law and will not result in individual or cumulative adverse impacts to the quantity or quality of water resources.

3. Withdrawal is for flood control and will continue as needed. Withdrawal will not be performed beyond what is needed to reduce lake levels to normal.

4. The withdrawal will be in compliance with all applicable municipal, state, and federal laws, and interstate and international agreements and treaties.

5. The proposed use is reasonable under common law principles of water law in Michigan, and based upon a consideration of the following factors:

a) The withdrawal will be efficient and minimize waste due to zero consumption, discharge directly to adjacent wetland, watertight piping, and no additional withdrawals beyond the needs of the project.

b) Not applicable

c) This temporary "dewatering" operation is not expected to negatively impact the environment and will allow for significant reduction of flood risk until a permanent solution can be constructed. This project is critical in protecting the long-term public and environmental health of Township residents.

d) The existing groundwater is generally connected to the Kalamazoo River basin and is going to be pumped back into the watershed. The water supply is not anticipated to be negatively impacted by the proposed pumping.

e) The proposed pumping is temporary and relatively shallow with immediate discharge, and as such we do not anticipate adverse impacts to water resources or to other uses of water.

f) The project goal is to return the hydrologic conditions to normal. No additional restoration is anticipated or necessary other than the immediate discharge of all water back to the source watershed.

Eagle and Crooked Lake Drawdown
Supplemental Information to MDEQ Permit
Prepared: October, 2018
Revised: November 5, 2018
Revised: December 7, 2018
Revised: December 13, 2018
Revised: January 11, 2019

3. Project Description

Written Summary of All Proposed Activities

The project proposes the installation of a temporary pump along the east shoreline of Crooked Lake to draw down high water levels and alleviate flooding on the lake. The flow from the temporary pump will be discharged into a temporary 12" HDPE pipe placed along Bentwood Trail that outlets onto the ground surface (upland area) on the south side of Bentwood Trail before flowing into the wetland area between Crooked Lake and 8th Street. This wetland outlets into Bass Lake via a 29"x42" culvert under 8th Street that was recently replaced by the Kalamazoo County Road Commission prior to pumping.

The project also proposes the installation of a temporary pump on the south shoreline of Eagle Lake to draw down high water levels and alleviate flooding on the lake. The flow from the pump will be directed south along an existing sanitary sewer easement to PQ Avenue through temporary piping and thence east along the north side of PQ Avenue through temporary piping to Crooked Lake Drive. The flow will be directed south along Crooked Lake Drive through temporary piping that discharges into Crooked Lake.

Figures 1-3 illustrate the overall site location as well as more detailed depictions of the pump and piping locations for Crooked Lake and Eagle Lake.

Construction Sequence and Methods

The proposed sequence and methods of construction is as follows:

1. Install temporary soil erosion and sedimentation control features as needed.
2. Furnish and operate temporary pump at Crooked Lake with an estimated discharge rate of 3,000 gpm (6.7 cfs). Furnish and operation temporary pump at Eagle Lake with an estimated discharge rate of 1,500 gom (3.3 cfs).
3. Monitor pump performance and elevation of water downstream during pumping and storm events.
    a. If water level within wetland located between Crooked Lake and 8th Street exceeds the top of the 29"x42"culvert under 8th street, then the pumping activity will be monitored, throttled, or ceased (as necessary) until the water elevation subsides below that level. Monitoring to be performed by visual observation by Township representative.
    b. If water level within Bass Lake exceeds the top of the 24" outlet culvert, then the pumping activity will be monitored, throttled, or ceased (as necessary) until the water elevation subsides below that level. Monitoring to be performed by visual observation by the property owner (Boy Scouts of America troop).
    c. Per the City of Kalamazoo's request, pumping activity will also be suspended for the duration of time that the flow at the USGS Gage for Portage Creek at Kalamazoo exceeds 200 cfs or the flow at the Kalamazoo River at Comstock USGS Gage exceeds 3,600 cfs. Monitoring of these values will be performed by a Township representative.
    d. Water level monitoring at the 8th Street culvert and the Bass Lake outlet will be performed by a Township representative and the Boy Scouts of America Troup, respectively. Water levels at each culvert will be visually monitored twice a week and the water level depth below the crown will be recorded. Water levels will also be

observed and recorded after any significant runoff event defined as rainfall exceeding 0.5 inches as measured at the MAWN Oshtemo station.

   e. Based on conversations with Carrie Tansy, USFWS, we propose a 13-day ON with a 2-day OFF pump schedule to help minimize impacts to the Eastern Massasauga rattlesnake.

4. Continue to pump until water level in Crooked Lake reaches 1 foot below the normal lake elevation (892.9 feet, approximately 4.4 feet below current water surface elevation as of 9/27/2018). Continue to pump in Eagle Lake until water level reaches 899.8 feet (approximately 2.2 feet below current water surface elevation). This is expected to be reached before 1 year from the start of pumping. Water level monitoring on Eagle Lake and Crooked Lake will be performed by visual observation and recording by each respective Lake Association President.
5. Once the water levels in Crooked Lake and Eagle Lake reach the estimated drawdown elevations, pumping activity may be used to maintain the impoundment elevations. The drawdown period is estimated to last approximately 120-360 days, assuming continuous pumping and no significant rain events recharge the impounded volume.

4. Project Purpose, Use and Alternatives

Describe the purpose of the project and its intended use.

The purpose of the project is to provide flood relief to property owners on Crooked Lake and Eagle Lake.

Crooked Lake is located on the west side of 8th Street between West Q Avenue and West PQ Avenue. The surface area of the lake is approximately 170.8 acres with a contributing watershed area of approximately 768 acres (1.2 square miles). While the contributing area is relatively small, the total drainage area for Crooked Lake is 11.46 square miles. The total drainage area can be assumed to contribute infiltrated stormwater to the groundwater system around Crooked Lake.

No positive outlet currently exists for Crooked Lake, though historic aerial images and other records indicate a channel may have existed many years ago above the 1% frequency flood elevation. All discharge is assumed to be a function of groundwater discharge, generally contributing to the wetland located on the east side of the lake, bounded by 8th Street, Bentwood Trail, and Hidden Lane.

The normal pool elevation for Crooked Lake is approximately 893.9 feet and the current water surface elevation as of September 20, 2018 is 897.3 feet, a difference of approximately 3.4 feet (587 acre-feet of volume above normal pool level).

Eagle Lake is located north and west of Crooked Lake bounded on the east and west by 3rd Street and 6th Street, respectively, and bounded on the north and south by OP Avenue and PQ Avenue, respectively. Approximately 320 parcels abut the lake. The surface area of the lake is approximately 249 acres with a contributing watershed area of approximately 3.2 square miles. The total drainage area for Eagle Lake is approximately 10.1 square miles.

No positive outlet currently exists for Eagle Lake. All discharge is assumed to be a function of groundwater discharge.

The normal pool elevation is approximately 899.84 feet and the current water surface elevation as of September 20, 2018 is 902.0 feet, a difference of approximately 2.2 feet (approximately 554 acre-feet of volume above the normal pool level).

At these current water surface elevations, well over 50 homes have experienced flooding and property loss. The factors contributing to flooding include:

- Lack of positive outlet from Crooked Lake or Eagle Lake. All rainfall and runoff that enters the lakes remains in the lakes until it can be transmitted out via groundwater flow. No drain or water control structure exists to outlet surface waters from the lakes.
- Above average rainfall in 2017 and 2018
- High groundwater level within the area

Figure 1. Lake flooding. Yellow sandbags placed along shore to protect homes.

Downstream impacts will be controlled by the pump rate out of Crooked Lake, which is directed to a downstream wetland between Crooked Lake and 8th Street and Bass Lake. The addition of water flowing at 3,000 gpm will result in temporary, increased water levels within Bass Lake. A level pool routing model was constructed using HEC-HMS to evaluate the impact of pumping at various flow rates on the peak water surface elevation and discharge rate for Bass Lake. Three scenarios were evaluated to understand the impacts downstream:

1. Continuous pump discharge at 3,000 gpm through the existing 24" CMP outlet from Bass Lake
2. Concurrent 1, 10, or 100 year storms and continuous pump discharge at 3,000 gpm through the existing 24" CMP outlet from Bass Lake

The model assumes a starting water surface elevation on Bass Lake of 883.6 which is approximately 0.5 higher than the invert of the 24" CMP outlet pipe and matches the current water surface elevation on the lake.

The model results indicate under the first modeling scenario, the water surface elevation for Bass Lake will rise approximately 0.9 feet to a steady-state elevation of 884.5 feet. This corresponds to 18 inches of flow through the existing 24" CMP outlet pipe. The lake will achieve this elevation approximately 12 days after initiating pumping and maintain this elevation throughout the duration of pumping activity assuming no rain events occur.

The potential exists for even higher water surface elevations if a storm were to occur during continuous pumping. The worst case scenario is when the storm occurs after Bass Lake has reached steady-state conditions at approximately 12 days after initiating pumping. The impact of the 1 year, 10, and 100 year storms with concurrent pumping at 3,000 gpm was evaluated and the results tabulated below.

The 1 year storm elevation that occurs after the lake reaches a steady state with respect to pumping is approximately 0.1 feet higher than a 100- year storm under existing conditions which are no pumping, and a lower starting water surface elevation and more impoundment volume available to mitigate storm floods. For the 1 and 10 year storm and concurrent pumping scenarios, the flow will be fully contained within the existing 24" outlet and below the crown of that pipe.

Scenario 1 and 2 Results. Summary of Downstream Water Surface Elevation Impacts

Flow Condition	Existing Bass Lake Peak Elevation	Bass Lake Peak Steady State Pumping	Existing Al Sabo Two Track Peak Elevation	Al Sabo Two Track Steady State Pumping
No Storm	883.6	884.50	871.60	872.00
1 year	883.7	884.57	871.65	872.00
10 year	883.9	884.78	871.72	872.02
100 year	884.4	885.20	872.02	872.29

Scenario 1 and 2 Results. Summary of Downstream Peak Discharges

Flow Condition	Existing Bass Lake Peak Discharge	Bass Lake Peak Steady State Pumping	Existing Al Sabo Two Track Peak Discharge	Al Sabo Two Track Steady State Pumping
No Storm	0.1	6.7	23.0	23.0
1 year	1.4	7.3	23.1	31.4
10 year	2.7	9.1	25.5	31.8
100 year	6.5	21.4	30.2	38.0

At the downstream 48" culvert under the two track through the Al Sabo Land Preserve, the 1 and 10 year storm events with concurrent pumping are both below the existing 100 year flood elevation and all flow is below the crown of the pipe and fully contained within the culvert (i.e. no surcharging of the pipe). Based on this result, we anticipate no detrimental impacts downstream of the Al Sabo two track culvert due to the additional pumping from Crooked Lake.

This permit proposes monitoring the downstream water surface elevations and metering or ceasing the pump activity as described in the Construction Sequence and Methods.

The total additional volume passed downstream due to pumping is considered to be, at minimum, the volume of water stored in each lake above the normal pool elevation. The total volume is approximately 1,141 acre-feet and accounts for water currently stored within Crooked Lake. Stored groundwater will enter each lake as the hydraulic gradient in each impoundment decreases, therefore, the total volume passed downstream is expected to exceed this amount.

An environmental assessment of water quality impacts has been attached to this permit. The report recommends installation of a screen (1-2 mm mesh size) on the pump intake to minimize migration of invasive vegetation downstream to Bass Lake. The project proposes installation of a "Riverscreen" type intake screen with a commercially available #24 mesh (0.0277 inch sieve size). Literature provided.

Describe the alternatives considered to avoid or minimize resource impacts.
The following alternatives were considered to avoid or minimize impacts to natural resources:

1. Do nothing and wait for the groundwater and lake levels to subside naturally. Constant and excessive flooding to lakefront properties will continue resulting in distress to property owners, increased property damage. Further, public health and overall resident safety are hindered under a do-nothing approach.

   Given the high number of homes experiencing flooding and property loss, this alternative is unacceptable.

2. Construct a positive outlet
   The most reliable and cost-effective long-term approach is to provide a positive outlet for relief of high groundwater levels. This provides a direct route for transmission of flood waters out of the area and ultimately to Lake Michigan.

   Two critical requirements for providing a positive outlet are:
   - The water quality is acceptable for the receiving waters. The MDEQ will not permit release of flood water unless an environmental review is provided that shows that the flood waters will not have an adverse impact on downstream receiving waters.
   - The additional of waters from a new area does not have an adverse impact on flooding to areas downstream.

   As a short-term solution, the pumping of water from the flooded lakes to a stream is proposed. A short-term solution approach has a high operational cost with less capital costs and minimal maintenance costs.

   As a long-term solution, the positive outlet will have minimal operational/maintenance costs. However, the capital costs for constructing the outlet can be significant and the amount of time to yield satisfactory results is much longer. There are no operational costs so the only follow-up costs after the initial investment would be for maintenance purposes.

   Construction of a positive outlet is not proposed at this time due the immediate need for flood relief that can be provided by pumping.

3. Operate nearby wells more frequently.
   In some cases where wells are located near flooding due to a high water table, the wells could be operated more frequently to draw down the water table. This could be both a short-term and long-term alternative.

   There is a wellfield to the northeast of Crooked Lake that is operated by the City of Kalamazoo. Water supply is typically limited by the demand of the customers' base. In the case of the City of Kalamazoo, bleeder/booster station separated many of the pressure districts such that the wells near Crooked Lake could potentially be operated more frequently than necessary to lower the water table.

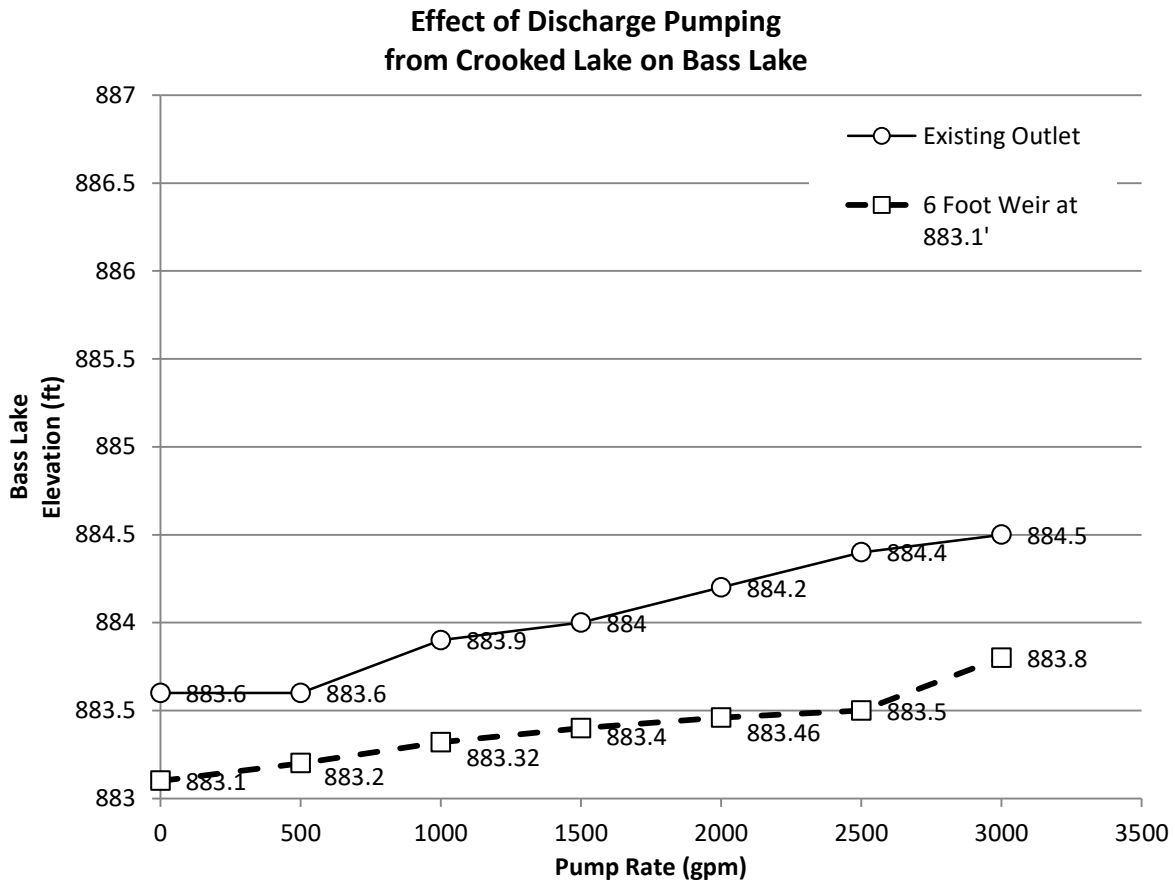
   The difficulty of relying on this alternative is that the additional pumping is limited and would have a negligible impact on the water table since the aquifer is leaky but confined. In addition, the drawdown time would be very slow.

4. Inject floodwaters into groundwater

In some areas where the water supply is limited, innovative approaches have been consider and applied. One of these is pumping treated wastewater into deep aquifers to replenish them.

The same approach could be considered to mitigate surface water flooding conditions. The critical requirement for injection, however, is the water cannot contaminate the aquifer. In most cases, flood waters are contaminated and would require treatment prior to injection. Providing a portable treatment unit prior to injection would be costly.

5. Replace outlet from Bass Lake
   Mitigation of water surface elevation peaks on Bass Lake could be accomplished by increasing the conveyance out of the Lake. The removal of the existing 24" CMP outlet pipe from Bass Lake and replacement with a 6 foot wide weir (Crest elevation set at the existing outlet invert of 883.1 feet) would result in 0.2 feet net increase in water surface elevation for continuous pumping at 3,000 gpm compared to the current surveyed water elevation.



   Replacement of the outlet is not considered with this permit due to the immediate need for drawing down Crooked Lake and Eagle Lake. It is our estimation that a 0.9 feet increase in Bass Lake will not have a detrimental impact on Bass Lake. If it is determined that there is a detrimental impact, the pump rate can be metered to allow for Bass Lake elevations to subside.

6. Pumping and/or transferring water to an upland infiltration basin or ditch system.
   The Crooked Lake pump and piping is proposed to discharge into the storm sewer system in Bentwood Trail. The plan and profile are illustrated in the attached "Additional Crooked Lake Outlet Figures, Plan and Profile". The construction record drawings indicate that the storm sewer discharges into a rain garden (designated on Page 2 as "Proposed Rain Garden."). We anticipate

some infiltration to occur here. No other infiltration basin or drainage ditch system is present along the proposed pump piping route.

6. Easements and Other Permits

All necessary easements will be secured prior to commencement of work.

A permit to occupy or cross county-maintained roads will be secured from the Road Commission of Kalamazoo County (RCKC) prior to beginning work.

A permit from the Michigan Department of Transportation (MDOT) has been applied for and approval is pending MDEQ permit approval.

An Application for Threatened and Endangered Species permit from the Michigan Department of Natural Resources (MDNR) has been submitted.

8. Adjoining Property Owners

Lukasz Niec
7212 Bentwood Trail
Kalamazoo, MI 49009

David and Sharon Groendyk
7234 S. 8th Street
Kalamazoo, MI 49009

Keith and Amanda Pung
7144 Bentwood Trails
Kalamazoo, MI 49009

Bentwood Shores LLC
1213 East Crooked Lake Drive
Kalamazoo, MI 49009

Mary Ewalt
7211 S. 8th Street
Kalamazoo, MI 49009

John & Linda Casper
7191 S. 8th Street
Kalamazoo, MI 49009

Southwest Michigan Council BSA
1035 West Maple Street
Kalamazoo, MI 49009

George & Clare Todd
PO Box 242
Oshtemo, MI 49077

The Connable Office Inc
136 E. Michigan Ave #1201
Kalamazoo, MI 49009

Stanton Barnes Company
136 E. Michigan Ave #1201
Kalamazoo, MI 49009

Eagle Point Association
8181 Contingo Terrace
Kalamazoo, MI 49009

Rajesh & Nita Dagli
500 E. Eagle Lake Drive
Kalamazoo, MI 49009

Frank & Michelle Loedeman
810 E. Eagle Lake Drive
Kalamazoo, MI 49009

NNH, LLC
P.O. Box 251
Plainwell, MI 49080

Allen & Diana Bellware Trust
8278 W. PQ Avenue
Kalamazoo, MI 49009

Christopher Wiedmayer & Chelsea Waite
8370 W. PQ Avenue
Kalamazoo, MI 49009

Salim & Amal Harik
PO Box 715
Portage, MI 49081

Timothy & Dianna Keesee
8292 W. PQ Avenue
Kalamazoo, MI 49009

Robert & June Strader
8238 W. PQ Avenue
Kalamazoo, MI 49009

Robert & Mary Sullivan
8284 W. PQ Avenue
Kalamazoo, MI 49009

Robert Zabavski
134 W. Crooked Lake Drive
Kalamazoo, MI 49009

10C. Projects Requiring Riprap
No riprap is proposed for locations waterward of an ordinary highwater mark. All riprap will be landward of any ordinary highwater mark.

Crooked Lake Discharge
Length: 10 feet
Width: 10 feet
Depth: 1.5 feet
Volume: 5.6 cubic yards

Total Volume: 5.6 cubic yards

10J. Intake Pipes

	Eagle Lake – Pump Intake Pipe	**Crooked Lake – Pump Intake Pipe**
Discharges to:	Piping system, Crooked Lake	Piping system, Upland
Discharge Rate (gpm)	1,500	3,000
No. of Pipes	1	1
Diameter	12 inch	12 inch
Material	HDPE	HDPE
Invert El.	902 +/-	897.3 +/-
Outlet El.	897 +/-	909
Discharge below OHWM	No	No
Water Treated before Discharge?	No	Screened inlet
Outlet Type	Riprap spillway	Riprap spillway

The intake pump from Crooked Lake will be screened with a #24 mesh (0.0277 inch sieve size) to prevent migration of invasive vegetation downstream.

The discharge from the Eagle Lake piping will outlet through an upturned 90° bend that is cantilevered over the water surface of Crooked Lake. 1,500 gpm of flow through a 12" pipe has an approximate velocity of 4.3 feet per second. Flow from the outlet will be directed over an existing seawall and into the lake.

The discharge from the Crooked Lake piping will outlet through an upturned 90° bend on the edge of the Bentwood Trail embankment. 3,000 gpm of flow through a 12" pipe has an approximate velocity of 8.5 feet per second. Plain riprap is proposed to be placed around the upturned 90° bend to spread out flow and minimize any potential erosion. See Section 10C for riprap quantity.

Profiles of the Crooked Lake and Eagle Lake piping schemes are attached.

12. Wetlands

Wetland areas have been identified based on the National Wetland Inventory (NWI) maps between Crooked Lake and 8th Street, 8th Street and the Bass Lake outlet (24" culvert), the Bass Lake Outlet and the 48" culvert in the Al Sabo Land Preserve, and between the Al Sabo culvert and the Atwater Millpond outlet under 12th Street. An additional map is included that illustrates the location and general type of the wetlands. Generally, the lakes (Bass Lake and the open water areas in the Al Sabo Land Preserve) are comprised of submerged and floating leaf vegetation and emergent vegetation near the land/water interface. Additional areas are noted as scrub-shrub and forested wetland areas in the NWI data.

A screen is proposed on the pump intake pipe to limit the transfer of non-desirable vegetative communities such as Eurasian watermilfoil, curly-leaf pondweed, and purple loosestrife.

A detailed discussion of wetland types, impacts, and depth and duration of inundation in each location follows:

Crooked Lake to 8th Street:

The NWI data indicates the two wetland types are Freshwater Emergent Wetland and Freshwater Scrub-Shrub/Forested wetlands.

Water flows through a defined channel towards the culvert under 8th Street. Due to pumping, the normal water level in this area is expected to increase approximately 0 inches (west side) up to 6 inches (8th Street) and is not expected to exceed the top of the culvert which is at the approximate bankfull height. Therefore, the additional surface runoff is expected to remain within the channel. The heightened water level may saturate the groundwater but the NWI limits appear to be extend to a point 2 feet higher in elevation than the channel and bounded by high banks at a moderate slope (1V:4H) which means that the increase in ground saturation will not likely have a lateral shift in wetland areas. The total duration of inundation is expected to last the duration of pumping as previously described. Temporary duration of heightened water levels after a 10 year storm are expected to last approximately 1 week before reaching pre-storm levels based on hydraulic modeling.

No changes to vegetative type are anticipated in the emergent wetland area though some changes may occur in forested/scrub-shrub area adjacent to the channel due to increased groundwater saturation near plant roots. The limits of the NWI forested/scrub-shrub wetlands all sit at least 2 feet higher than the channel bank. We expect this impact to be minimal as the proposed pumping will occur during the non-growing season.

No detrimental impacts are expected in this location. The total duration of inundation is expected to last the duration of pumping as previously described.

The culvert under 8th Street culvert was replaced in early November 2018, and model results reflect the system hydraulics with the newly constructed culvert.

8th Street to Bass Lake Outlet (24" Culvert)
The NWI data indicates the two wetland types are Freshwater Emergent Wetland and Freshwater Scrub-Shrub/Forested wetlands located immediately east of 8th Street. These wetland areas appear to be shallow water marsh type areas dominated with cattails.

Due to pumping, the normal water level in this area is expected to increase from 6 inches (at the 8th Street culvert) to 12 inches (in Bass Lake). The channel from 8th Street to Bass Lake falls approximately 2 feet over a distance of 400 feet so we anticipate the majority of increased water to remain within or near the primary flow path. We anticipate that increasing the water level in this area by 6 to 12 inches would not create a shift in the emergent wetland type or plant community because the proposed pumping is scheduled to occur during the non-growing season and may even reduce the advance of potentially invasive species such as invasive cattails, reed canary grass, and purple loosestrife.

Some changes may occur in forested/scrub-shrub area adjacent to the channel due to increased groundwater saturation near plant roots. The limits of the NWI forested/scrub-shrub wetlands all sit at least 2 feet higher than the channel bank. We expect this impact to be minimal as the proposed pumping will occur during the non-growing season and by visual observation these areas appear to be mixed with emergent type plants (cattails) already.

Any impacts to wetland areas along the land/water interface of Bass Lake are likely to be limited to small outward lateral shifts based on a change in water depth. No changes to community types are anticipated because the proposed pumping is scheduled for the non-growing season. Any vegetative community that shifts laterally will reestablish itself in the existing location once pumping ceases and the water level in Bass Lake recedes.

No detrimental impacts are expected in this location. The total duration of inundation is expected to last the duration of pumping as previously described. Temporary duration of heightened water levels after a 10 year storm are expected to last approximately 1 week before reaching pre-storm levels based on hydraulic modeling.

Bass Lake Outlet to 48" Culvert at Al Sabo Land Preserve
The NWI data indicate that three wetland types are present: freshwater emergent wetlands, freshwater forested/scrub-shrub wetlands, and freshwater pond wetlands.

Upon discharging from the 24" culvert from Bass Lake, stream flow is contained within a channel that is approximately 3-4 feet wide with a bankfull depth of 6-12 inches. This channel is bounded by the NWI Freshwater Pond type wetlands. We anticipate the baseflow depth to increase from approximately 4 inches to 8 inches deep (depth based on a normal depth calculation using Manning's Equation) which would put the water level in the channel at or near the bankfull depth. We anticipate no impacts to the area identified as freshwater pond as this area is bounded by channel banks that will fully contain all increased flow and the proposed pumping will occur during the non-growing season.

The stream flows through the 30" culvert (Roto Kiwan) and through an 8-12' wide channel to the West Fork of Portage Creek which flows northeasterly to the 48" culvert through forested/scrub-shrub,

emergent, and pond type wetlands. Based on topographic contours, we expect the bankfull depth in the channelized areas to be 6-12 inches deep. Due to pumping, the normal water level along this area is expected to increase up to 6 inches (0.48 feet at the Al Sabo culvert) which would put the water level at or near the bankfull depth in the channel portions. Further downstream, the change in water surface elevation is expected to stay within the open water areas. There may be some outward lateral shift in emergent vegetative communities due to an increase in surface water elevation but the outer limits of the emergent wetland area are bounded by high, steep banks and so any lateral shift will be limited geographically. Any vegetative community that shifted laterally will reestablish itself in the existing location once pumping ceases and the water level recedes back to a normal level. We would not expect the hydrologic change to create a shift in wetland type or plant community and it may even reduce the advance of potentially invasive species such as invasive cattails, reed canary grass, and purple loosestrife.

Some impacts to forested/scrub-shrub vegetation may occur due to increased saturation of the groundwater level near plant roots, however, these would only occur in the interface areas between emergent type and forested/scrub-shrub types and impacts are assumed to be minimal as the proposed pumping is expected to occur in the non-growing season. The limits of the NWI forested/scrub-shrub wetlands all sit at least 2 feet higher than the channel bank.

No detrimental impacts are expected in this location. The total duration of inundation is expected to last the duration of pumping as previously described. Temporary duration of heightened water levels after a 10 year storm are expected to last approximately 3 days before reaching pre-storm levels based on hydraulic modeling.

48" Culvert at Al Sabo Land Preserve to Atwater Millpond Outlet at 12th Street

The NWI data indicate that three wetland types are present: freshwater emergent wetlands and freshwater forested/scrub-shrub wetlands.

Upon discharging from the 48" culvert in the Al Sabo Land Preserve, stream flow is contained within a well-defined channel approximately 16 to 30 feet wide with approximately 12 to 18 inches of freeboard between the water surface elevation and the channel grades based on topography. The channel is bounded by shallow water marsh type wetland areas. Due to pumping, the water level is expected to increase approximately 6 inches (0.48 feet at the Al Sabo culvert). We would anticipate a slight outward lateral shift in emergent type vegetative communities at the water/marsh interface due to deeper water in the channel. We don't anticipate much lateral shift at the existing outside boundary of the emergent wetland areas due to high and steep existing banks.

Some impacts to forested/scrub-shrub vegetation may occur due to increased saturation of the groundwater level, however, these would only occur in the interface areas between emergent type and forested/scrub-shrub types and impacts are assumed to be minimal as the proposed pumping is expected to occur in the non-growing season. The limits of the NWI forested/scrub-shrub wetlands all sit at least 2 feet higher than the channel bank.

Any impacts to wetland areas along the land/water interface of the Atwater Millpond are likely to be limited to small outward lateral shifts based on a change in water depth. No changes to community types are anticipated because the proposed pumping is scheduled for the non-growing season. Any vegetative community that shifts laterally will reestablish itself in the existing location once pumping ceases and the water level in Bass Lake recedes.

No detrimental impacts are expected in this location. The total duration of inundation is expected to last the duration of pumping as previously described. Temporary duration of heightened water levels after a

10 year storm are expected to last approximately 3 days before reaching pre-storm levels based on hydraulic modeling.

13. Floodplain Activities

No excavation or filling is proposed within the project area. A flow discharge request from the MDEQ has been attached that details the contributing areas for Crooked Lake and Bass Lake. While the total watershed area is greater than 2 square miles, the contributing area to each lake is less than 2 square miles. Therefore, no floodplain permitting is proposed.

14. Potential Impact to Geomorphology

A geomorphologic assessment is important to determine whether the addition of constant pumped flow would change the channel dimensions such that the stream aquatic and riparian habitat, etc would be impacted.

USGS Regional Curves and Michigan Lake Plain Regional Reference Curves were used to evaluate the impact of the additional flow on the geomorphology. In each location, the addition of flow at 3000 gpm does not exceed the existing bankfull elevation. The downstream water surface elevations will be monitored and pump activity will be monitored, throttled, or ceased will be shut off during rain event of any significance and when water levels rise above specific settings. Bankfull would not be impacted by this temporary pumping. More detail on the expected changes to the water elevations can be found in the wetland discussion in this document.

A summary of approximate bankfull widths and depths for existing conditions and pumping conditions are provided below.

Location	**Ex. Width (feet)**	**Ex. Depth (inches)**	**Width with Pumping (feet)**	**Depth with Pumping (inches)**
Wetland, West of 8th STreet	2	6-12	2-2.5	6-12
8th Street to Bass Lake Outlet	Lake	-	-	-
Bass Lake 24” Outlet to Roto Kiwan Culvert (30”)	3-4	12 +/-	4	16-20
Roto Kiwan Culvert (30”) to Al Sabo Culvert	8-12	12 +/-	12	18
Al Sabo Culvert to Atwater Millpond	16-30	12-18 +/-	16-30	18-24

Condition Photos

Department of Environmental Quality, Water Resources Division

WATER WITHDRAWAL PERMIT

Issued under Part 327
Great Lakes Preservation, Natural Resources and Environmental Protection Act
1994 PA 451, as amended

In accordance with Part 327, Great Lakes Preservation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), authority is hereby given to withdraw water from the waters of the State of Michigan as described herein. This permit is issued and revised in reliance on information supplied in the corresponding application and other information as may have been supplied by the permit applicant in support of that application.

PERMIT NUMBER: **2019-001** DATE ISSUED:

Permittee Name and Address: Ms. Julie VanderWiere
Charter Township of Texas
7110 West Q Avenue
Kalamazoo, Michigan 49009

Location of Water Withdrawal
County: Kalamazoo County
Town, Range and Section: T03S R12W, Section 15

The activity authorized by this permit is subject to the following limitations and conditions:

Section A. Authorizations and Coverage Provisions

1. Water Withdrawal is restricted to the following sources, locations, rates, and purposes:

Source	Latitude and Longitude	Withdrawal Rate	Purpose of Use
Crooked Lake	42.2111°, -85.6924°	4.32 million gallons per day	Flood relief

2. Approval Conditions

This permit requires the permittee to maintain compliance with all applicable local, state, and federal laws including, but not limited to, obtaining all required permits.

The permittee must remain in compliance with the environmentally sound and economically feasible water conservation measures applicable to the construction dewatering.

DRAFT

Section B. Reporting and Record Keeping

1. Environmental Impacts

The permittee is required to immediately report to the MDEQ, Water Resources Division, at 517-284-5563 if an Adverse Resource Impact (ARI), as defined in Subsection 32701(1)(a)(vii) of Part 327 of the NREPA occurs as a result of the water withdrawal authorized by this permit.

2. Public and Private Rights Impacts

The permittee is required to immediately report to the MDEQ, Water Resources Division at 517-284-5563 if any interference with the normal operation of other wells occurs as a result of the water withdrawal authorized by this permit.

3. Water Use Report

The permittee is required to submit an annual water use report and payment for the water use reporting fee, if applicable, to the State of Michigan by April 1 of each year. A water use reporting form and water use reporting fee invoice will be sent to the permittee by mail each year in advance of the April 1 deadline.

Section C. Liability

1. Noncompliance

Commencing the water withdrawal authorized herein confirms the permittee's acceptance and agreement to comply with all terms and conditions of this permit. Noncompliance with these terms and conditions, and/or the initiation of other regulated activities not specifically authorized by this permit, shall be cause for the modification, suspension, or revocation of this permit, in whole or in part. Further, the MDEQ may initiate civil proceedings to correct deficiencies, protect natural resource values, and secure compliance with law.

2. Limitations

This permit does not authorize causing an ARI as defined in Subsection 32701(1)(a) of Part 327, Great Lakes Preservation, of the NREPA, as a result of the withdrawal.

This permit does not convey property rights in water, or other real or personal property, authorize any injury to private property or invasion of public or private rights, or waive the necessity of obtaining any other applicable federal, state or local permit or approval.

3. Indemnification

The permittee shall indemnify and hold harmless the State of Michigan and its departments, agencies, officials, employees, agents and representatives for any and all claims or causes of action arising from acts or omissions of the permittee, or employees, agents, or representatives of the permittee, undertaken in connection with this permit. This permit shall not be construed as an indemnity by the State of Michigan for the benefit of the permittee or any other person.

Section D. Permit Execution

Permittee accepts and agrees to comply with the terms and conditions of this permit.

This permit shall become effective on the date of the MDEQ representative's signature.

DRAFT

Liesl Eichler Clark, Director
Department of Environmental Quality

Signed By:

_____

Diana Klemans, Manager
Surface Water Assessment Section
Water Resources Division

DRAFT