Wetland Enhancement Berm Project

Cedar Lake Improvement Board

This document provides a refresher and summary of the background and rationale associated with this project resulting from recommended Watershed Management Plan (WMP) Implementation efforts. Cedar Lake is a 1,075-acre lake located in Alcona and Iosco Counties of Northeast Lower Michigan, one-half mile west of Lake Huron. Several studies of the lake conducted during the past decade have presented hydrologic concerns, as well as the need for aquatic plant management. Initial findings revealed that land development and installation of a drainage system on the southeast side of the lake was a major source of water loss from the lake during summer months (K&A, 2005). In addition, the wetlands complex in the northwest part of the watershed was identified as a major source of water recharge (both through groundwater and intermittent surface flows). Such a land use change as the development in the southeast and the resulting impacts demonstrated to the Cedar Lake Improvement Board (CLIB) that a watershed planning process to protect the Cedar Lake watershed and its recharge areas was extremely important in order to protect Cedar Lake for future use.

The CLIB, the local lake association, and other stakeholders collaborated to develop a plan that would provide a new approach to managing critical areas and conditions throughout the watershed. This collaboration resulted in an MDEQ-approved WMP that serves as a road map for achieving watershed goals and sustaining Cedar Lake into the future. The WMP process involved convening a steering committee (SC) to lead the planning process, consult technical resources, and provide local knowledge of the watershed and public's interest. For Cedar Lake, there was a broad-based representation of the local townships, county agencies, natural resource experts, and state representatives. The following individuals served on the SC in some capacity. A portion of the group was present at the meetings on a regular basis and participation was encouraged through conference call in the latter part of the WMP planning process:

Gary Adams, Iosco County Drain Commissioner
Caryl Anton, Alcona-Iosco Cedar Lake Association
Russ Anton, Alcona-Iosco Cedar Lake Association
Jim Baier, Oscoda Township Supervisor (replaced Rob Huebel, former Supervisor)
Carolyn Brummond, Alcona County Board of Commissioners
Gina Cinquino, Lakewood Shores Property Owners Association
Gary Crawford, SEAS, LLC
Doug Getty, District Health Department
Greg Goudy, Michigan Department of Environmental Quality

Richard Karsen, Sr., Alcona County Road/Drain Commission
Mark Kieser, Kieser & Associates, LLC
Ryan Kruse, Natural Resources Conservation Service
Jamie McCarthy, Kieser & Associates, LLC
Craig Peters, Lakewood Shores Resort & Golf Course
Doug Pullman, Aquest
Edward Roddy, Greenbush Township Supervisor
Roberta Roulo, Iosco County Commission
Steve Sendek, Michigan Department of Natural Resources
Art Winter, Greenbush Township Board of Commissioners
Rick Myrick, Alcona/Iosco County Conservation District

Background

Much of the land directly north of King's Corner Road and west of Cedar Lake Road is recognized as regulated wetlands. These wetlands (or cedar swamp) have been documented to be a critical source for watershed recharge to Cedar Lake in the MDEQ-approved WMP and subsequent Augmentation Study. A man-made surface water diversion out of the watershed is present on the west side of the lake. This diversion is a culvert under Kings Corner Road near West Cedar Lake Road routes runoff from the Cedar Lake watershed south into the Van Etten/Pine River watershed via Phelan Creek.

In 2006, the property on the north side of Kings Corner Road and west of West Cedar Lake Road was clear-cut (Figure 1). This clearing likely resulted in more evaporation of water in the wetland area and less storage of water overall. Because of the relatively small size of the Cedar Lake watershed, these sources of water loss can have a significant impact on the watershed and the lake in terms of lake level. The surface and groundwater resources found on the northwest side of the lake in the cedar swamp have implications for wildlife, fish habitat and spawning, recreational value, water quality protection, and water quantity issues. "Anthropogenic alterations to the hydrology of the wetland complex have resulted in impairment of catchment and water retention within the wetland resulting in increased discharge and sub-optimal time frame for completion of the [pike] spawning run and survival of fry." (Crawford, 2009).

During the past three years, the CLIB has purchased the 134 acres of property that surrounds Sherman Creek and encompasses the southern portion of the critical wetland areas west of Cedar Lake Road. By doing so, the CLIB intends to protect and enhance this critical property with respect to the importance of Sherman Creek flows to Cedar Lake.

Figure 1. Example of area in the northwest Cedar Swamp before (left) and after (right) clear cutting occurred in 2006 (looking north from Kings Corner Rd).

It is understood that this King's Corner culvert was installed by the Alcona County Road Commission in the 1970s to reduce seasonal roadway flooding in this area. It would appear that at least since 2003 when Kieser & Associates, LLC (K&A) began assisting the Alcona-Iosco Cedar Lake Association (AICLA) that the culvert has accomplished this purpose. Substantial volumes of water have been noted to flow from the cedar swamp southward out of the Cedar Lake drainage and into the Van Etten/Pine River watershed. Such volumes have ranged from approximately 2 million gallons a season in dry years to over 50 million gallons a season in wet years.

The 2011 Cedar Lake WMP (K&A, 2011) and a subsequent Cedar Lake Augmentation Feasibility Study (K&A, 2011b) identified the merits of reducing and slowing the Spring-time discharges through this culvert. Once water passes from this culvert, it is no longer available to sustain water levels in Cedar Lake. The objective of this project is to retain natural wet weather runoff within the watershed such that it can be directed into Cedar Lake.

Project Rationale and Supporting Information

This section of text provides a summary of the rationale for this first proposed WMP implementation project and also provides supplemental information in support of these improvement efforts.

Proposed Work

The purpose of the proposed project is to redirect wet-weather flows back to Cedar Lake rather than through the man-made Kings Corner Road culvert, enhance the existing wetland, improve pike spawning habitat, and implement the first phase of work associated with the MDEQ-approved Cedar Lake WMP. Therefore, this project serves to correct this man-made diversion of wet-weather flows by keeping them in the Cedar Lake watershed (in lieu of sending them to the Van Etten/Pine River watershed under Kings Corner Rd).

By constructing an earthen berm on CLIB property north of the existing Kings Corner Road culvert, less water will be lost from the swamp, more will be re-directed back into the lake and local property owners will see no changes in typical or high water conditions than they have historically experienced since the 1970s. The berm will create a condition whereby more surface runoff will reach the Cedar Lake through Sherman Creek, and existing wetlands will simply have saturated surface conditions further into the Spring than at present such that summer rains may again have the potential to generate wet-weather runoff from these areas. Refer to Figure 2 for a schematic illustration.

Of important note to surface water inflows to the lake, a total of six railroad culverts passing beneath the Lake State Railway within the northwest wetland complex area were given specific maintenance attention by railroad representatives in August/September of 2014. These efforts have since restored flow from the west to the east beneath the railroad tracks at six culvert locations. We expect that this will continue to allow more surface water to pass to the lake via Sherman and Jones Creeks. However, this will also likely result in increased surface water losses through the King's Corner culvert until a water level control berm can be implemented on the Lake Board parcel.

WMP Citations

The following represents a comprehensive list of direct WMP text citations (K&A, 2011) associated with the proposed project:

> *(Page 14)* "Another man-made surface water diversion out of the watershed is present on the west side of the lake. A culvert under Kings Corner Road near West Cedar Lake Road routes from the Cedar Lake watershed south to the Van Etten/Pine River watershed via Phelan

Creek. In 2006, the property on the north side of Kings Corner Road and west of West Cedar Lake Road was clear-cut. This clearing likely resulted in more evaporation of water in the wetland area and less storage of water overall. Because of the relatively small size of the Cedar Lake watershed, these sources of water loss can have a significant impact on the watershed and the lake in terms of lake level. The surface and groundwater resources found on the northwest side of the lake in the cedar swamp have implications for wildlife, fish habitat and spawning, recreational value, water quality protection, and water quantity issues."

(Page 41) "For this reason, modified hydrology is considered a high priority on the list of pollutants. Sources of this modification are shown in Table 4-2 and include diversion of water from the wetlands in the northwest corner of the watershed where recharge water for the lake is stored. Diversion out of the watershed through a culvert under Kings Corner Road (diverting water to the south) is well known to SC members as it relates to shunting water away from Cedar Lake during early spring months."

(Page 46) "The majority of the lost acreage, which is converted to residential land use (see Figure 5-2), is shown in the northwest wetlands, especially along Kings Corner Road and in the northwest section of the watershed. Loss of more than 100 acres of herbaceous openland is also predicted to occur by 2030, which is also shown in the northwest wetland section of the watershed."

(Page 48) "The average TP concentrations from water samples collected at Sherman Creek, Jones Creek, and near Kings Corner Road and West Cedar Lake Road were used to obtain an average TP concentration (0.131 mg/l). The surface and groundwater monitoring data collected at the same locations were used to calculate an average volume of runoff from the wetland to Cedar Lake (298 million gallons/year). The resulting UAL was applied to the entire area in the northwest wetlands to calculate “current” TP loading from Sherman and Jones Creeks."

(Page 54) "Other considerations of the impacts of the implementation phase of the WMP will be how changing runoff patterns in the watershed will affect: 1) pike spawning in Sherman Creek, 2) residents in the northwest wetlands, and 3) groundwater levels in the Lakewood Shores housing development."

(Page 55) "In general, the large tracts of wetlands in the northwest portion of the watershed have been identified as extremely significant for providing the majority of the surface water to Cedar Lake, especially through two small creeks, Sherman and Jones Creeks."

(Page 56) "Kings Corner Rd. Diversion: A culvert is located under Kings Corner Road near West Cedar Lake Road. This culvert diverts water from the wetland on the north side of the road to the south. This creates a diversion of water out of the Cedar Lake Watershed and into

the adjacent watershed (Pine River/Van Etten Lake). The culvert should be modified to prevent water from diverting out of the watershed. This diversion is critical in order to restore the wetland hydrology in this particular area and conserve surface water for Cedar Lake."

(Page 65) "Additionally, the group discussed a large-scale project to restore hydrology in the wetlands and create a wetlands preserve in a portion of the wetland near Kings Corner Road and West Cedar Lake Road."

(Page 65) "The wetlands in the northwest have already been compromised by a large diversion near Kings Corner Road and West Cedar Lake Road. A culvert currently drains water from the wetland to the south side of Kings Corner Road where it travels to Phelan Creek and eventually to the VanEtten Lake/Pine River watershed. This effectively removes water from the wetland that would otherwise drain to Cedar Lake (K&A, 2005). Historic filling of wetlands has occurred along West Cedar Lake Road and along the lakeshore to allow for building of homes and driveways. This slow development over time has changed the flow of water in the watershed, has likely contributed to lower lake levels and would further impact water quantities if left unchecked."

(Page 66) "Secondly, the SC is seeking opportunities to purchase land for sale near Kings Corner Road and West Cedar Lake Road to create a wetland preserve."

(Page 68) "Secure grants or other funds to purchase parcel(s) near Kings Corner Road and West Cedar Lake Road (where Sherman Creek drains to Cedar Lake) OR partner with a land conservancy to acquire land, solicit donation, or purchase conservation easements"

(Page 75) Table 7.2 Benefits - "Simple engineering - use stop board at culvert on seasonal basis, Store water in localized wetland area and “divert” to Sherman Creek, Water levels less than spring peak levels." Potential Issues - "Property ownership issues, Reduced flows to Phelan Creek."

(Page 102) "For the Kings Corner Road culvert, restoring the diversion of water to the Van Etten Lake watershed would result in approximately 58.2 million gallons per year routed back to Cedar Lake."

Pike Spawning

Anecdotal information from longtime residents and local agency officials suggests that both Sherman Creek and Jones Creek (west of Cedar Lake draining the cedar swamp/wetlands) once flowed year-round. Moreover, early spring spawning runs of pike were observed annually and with such abundance that fish were frequently observed in inundated roadside ditches adjacent to

these streams. Drainage modifications by county road commissions in the 1970s appear to have substantially lowered the groundwater table in the drainage areas of these creeks such that flows are now limited to the Spring months of April and May. Since these modifications, there have been reports of only limited pike spawning runs that were once commonplace.

In 2009, an evaluation was conducted by SEAS, LLC with respect to the spawning migration to and from Sherman Creek and the adjacent wetlands which determined that these wetlands contained ideal spawning habitat for the northern pike due to good water clarity, flow, vegetation, and stable bottom substrate (Crawford, 2009). This report further identified needs for wetland protection to preserve and extend the duration of creek flow during spring and early summer months for fish spawning and migration.

Water Level Data

A water level monitoring program was initially developed at select groundwater and surface water monitoring sites around Cedar Lake in 2004. Since then, these water level monitoring efforts have expanded to include additional critical areas using automated water level logger equipment (data loggers) in lieu of intermittent volunteer measurements. The current water level monitoring program includes 23 level loggers located around the lake and within critical wetland areas.

K&A staff conducted an evaluation of past wetland water elevation data recorded on an hourly schedule at the Kings Corner culvert. Table 1 below summarizes the observed maximum water elevations for each calendar year since this location began recording data in 2008.

Table 1. Summary of Kings Corner Road culvert water elevation monitoring data (8-year s) maximum observed water elevations.

Year	Max. Water Elev. (ft)
2008	610.24
2009	610.44
2010	610.56
2011	612.84
2012	610.84
2013	610.67
2014	610.57
2015	610.83
8-yr Avg.	**610.87**

The wetland water elevation data reveal that the maximum observed elevation recorded at the existing Kings Corner road culvert was 612.84 feet in 2011. However, it appears that the 8-year average elevation is 610.87 feet. The proposed design relies upon these valuable water elevation data to establish maximum high water elevation for the constructed berm spillway set at elevation 611.0 feet with 1-ft freeboard. Any additional water above this wetland elevation can be discharged off the property via overflow through the existing Kings Corner road culvert without impacting adjacent property or infrastructure.

Survey Confirmation

In November 2015, the CLIB authorized Northeast Land Surveys (NLS) to proceed with conducting a topographic and site boundary survey for their 134 acres of property. These survey elevation data confirmed that the proposed project can achieve the desired flow restrictions via construction of an earthen berm on the CLIB property to prevent wetland surface waters from discharging out of the Cedar Lake watershed. Furthermore, these survey data confirmed that desired wetland water levels can be maximized while preventing any unintended flooding or impact to other nearby property owners.

Wetland/Upland Delineation

On August 9, 2016, at the request of the CLIB, K&A staff conducted a limited wetland delineation of the area where the proposed berm is to be located on the subject property. The expressed purpose of this work was to determine if a wetland/upland boundary exists at either east-west end of the proposed 400-ft berm north of Kings Corner Road at the subject property. The methods used to conduct the delineation followed those outlined in the technical wetland delineation standards set forth in the U.S. Army Corps of Engineers (USACE) *January 1987 Wetland Delineation Manual, and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual, Northcentral and Northeast Regions (January 2012).*

Data collected at each observation/sampling location were recorded on the *Wetland Determination Data Form – Northcentral and Northeast Region.* The onsite wetland boundary at each end of the proposed berm location was determined based upon observed vegetation, hydrology and the presence/absence of hydric soil at each location. Each observation test pit and identified wetland boundaries on each end of the proposed berm location were physically marked with wooden stakes and survey ribbon and were referenced using a hand-held Garmin GPSMap 62 Series global positioning system (GPS).

These wetland delineation efforts revealed that there exists 66.5 feet of upland area located on the east end of the proposed berm. Likewise, approximately 64.5 feet of upland area exists on

the west end of the proposed berm location (K&A, 2016). Based upon the professional site topographic survey conducted for the property, these areas appear to be located just inside the 612.0 elevation contours (consistent with the observed historic water level data recorded in this area over the past 8 years). As a result, of the proposed 400-ft long berm, only 269 feet will actually involve placement of upland fill soils impacting the existing wetland (approximately 2,242 cubic yards of fill). Likewise, the two ends of the berm located in upland conditions amount to a total of 131 feet (approximately 1,092 cubic yards of fill).

Wetland Plant Composition

K&A staff also conducted a wetland area walk-through on August 9, 2016 to observe and identify existing vegetation within the project area wetland. The entire 1,600-ft length of wetland (approximately 6 acres) was observed between Kings Corner Road and Sherman Creek. It is this area that will receive increased wet-weather enhancement as a result of the proposed work (refer to Figure 2). Existing vegetation observed in this area included plant species very common in Michigan's wetlands. No rare or unique species of vegetation were observed within this portion of the CLIB property.

Summary

The proposed wetland enhancement berm project is a direct outcome of many years of watershed planning efforts involving multiple partners and local officials.

Additional project details include the following:

- Project involves less than 1/3 acre of impact (no mitigation requirement)
- Utilize onsite upland soils for berm material to further limit existing wetland impacts
- Proposed berm length is 400 feet in total, however it will only impact 6,456 square feet (0.15 acres) of wetland amounting to approximately 718 cubic yards fill
- Remaining 131 feet of the berm will be placed in 3,144 square feet (0.07 acres) upland conditions of the property amounting to approximately 349 cubic yards fill
- Past monitoring data logger water elevations at the Kings Corner Rd culvert span 8 years and average elevation 610.87
- Adjacent properties are above elevation 612.0 feet
- Proposed new top of berm at maximum elevation of 612.0 feet and maximum high water at 611.0 (allowing overflow to existing Kings Corner Rd culvert)
- Existing plant species do not include any rare or unique species on site
- Seasonal impact will involve approximately 6-acres, and only during wet-weather conditions to redirect runoff

- This project is a direct outcome of the MDEQ-approved WMP and will serve to implement the first phase of work that was recommended

The following list identifies anticipated project benefits associated implementation of the proposed wetland enhancement berm:

- Restored hydrology and improved wildlife habitat of approximately 6-acres of source water wetlands in the watershed surrounding Sherman Creek (lengthening "wet season" flows) and involving up to 50 MG increase of seasonal flow volumes to the lake
- Improved Sherman Creek/wetland fisheries spawning habitat with critical fish passage over existing conditions (March 2008 video recorded 121 pike utilized Sherman Creek over 25 hours; May 1, 2008 observed emigration rate of 37.8 fry/hour) (Crawford, 2009)
- Decreased Cedar Lake water level fluctuations during summer months (with prolonged inflows and restored hydrology)
- Enhancement/protection of wetland habitat to improve pike fry maturation

References

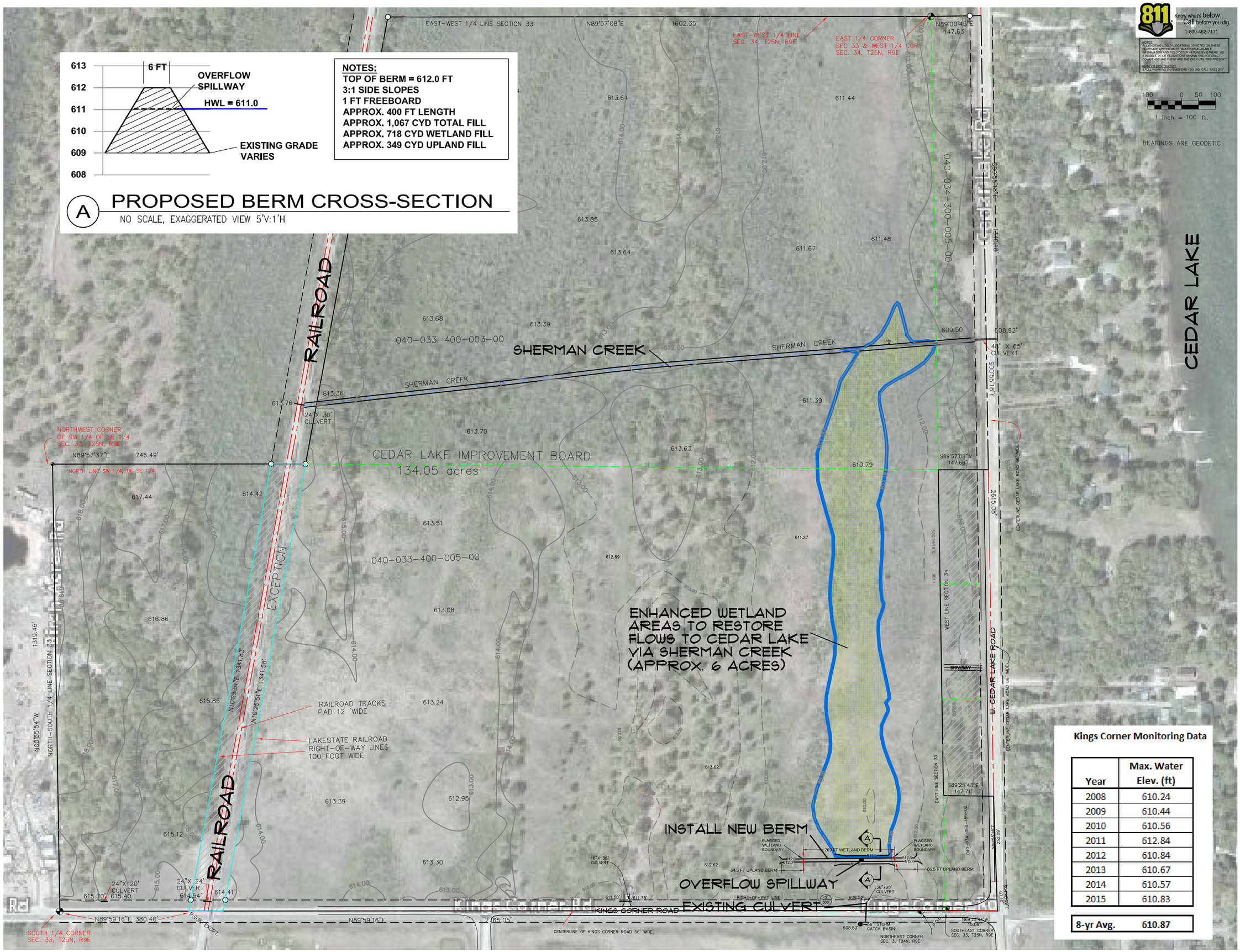
Crawford, G. SEAS, LLC. June, 2009. Cedar Lake Critical Fishery Habitat Assessment.

Kieser & Associates, LLC. 2005. Phase I – Final Report for the Preliminary Hydrologic Evaluation of Cedar Lake with Reference to Lake Levels. Prepared for Alcona-Iosco Cedar Lake Association, Inc. July 15, 2005.

Kieser & Associates, LLC. 2011. Cedar Lake Watershed Management Plan. Prepared for the Cedar Lake Improvement Board, PO Box 53, Greenbush, Michigan 48738, May 2011. 223 pp. Available at: http://www.cedarlakewmp.net/uploads/FINAL_Cedar_Lake_WMP_9-15-11.pdf

Kieser & Associates, LLC. 2011b. Cedar Lake Augmentation Feasibility Study. Prepared for the Cedar Lake Improvement Board, PO Box 53, Greenbush, Michigan 48738, August 25, 2011. 118 pp. Available at: http://www.cedarlakewmp.net/uploads/cedar_lake_augmentation_feasibility_study_8_25_11.pdf

Kieser & Associates, LLC. 2016. Cedar Lake Improvement Board Limited Wetland Delineation. Prepared for the Cedar Lake Improvement Board, PO Box 53, Greenbush, Michigan 48738, September 2, 2016.



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DATE
PRELIMINARY
JUL 27, 2016

PROJECT TITLE

CEDAR LAKE IMPROVEMENT BOARD WETLAND ENHANCEMENT BERM PROJECT

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ISSUED FOR DATE

SHEET TITLE

WETLAND ENHANCEMENT BERM

SHEET NUMBER

Figure 2