



February 18, 2008

Ms. Geri Radermacher  
Wisconsin Department of Natural Resources  
141 NW Barstow St, Rm 180  
Waukesha WI 53188

Dear Ms. Radermacher:

RE: Information for the Revised Chapter 30 Permit  
Nagawicka Lake Restoration Project

This letter has been prepared by Foth Infrastructure & Environment (Foth), on behalf of the Lake Welfare Committee (LWC) for Nagawicka Lake, Delafield, Wisconsin. The purpose of this correspondence is to provide information to the WDNR regarding the proposed dredge alignments that will be incorporated into a revised Chapter 30 Permit Application for restoration of Nagawicka Lake. We request that you review this correspondence and the attached figures and provide input so that a consensus on the dredge alignments can be reached prior to submittal of the Revised Chapter 30 Permit Application.

The following information regarding the Nagawicka Lake Restoration Project is presented herein:

- ◆ Updated sediment dredge quantities based on revised dredge prisms.
- ◆ Revised dredge prism figures. Figures are excerpts from the Revised Chapter 30 Permit Application. Additional figures and details will be included in the revised application.
- ◆ Rationale/criteria for revision of dredge prisms.

The areas to be dredged were substantially reduced since submittal of the Preliminary Application to account for input received from the WDNR related to water depth, the presence of submergent native vegetation and fish habitat. The revised dredge channel areas and volumes presented herein are generally determined using the following criteria:

- ◆ A minimum 5 foot horizontal setback from the shoreline, although two channels in the Northwest Channels area will have a 0 foot setback from shoreline due to channel width limitations.
- ◆ Maximum side slope of the dredge cut of 4H:1V (Horizontal to Vertical) to maintain stability.

- ♦ Post-dredge water depth of 5 feet, resulting in a channel bottom target elevation of 884.5 MSL. Within the sedimentation trap at the Bark River Inlet, the post-dredge water depth will be 6.5 feet deep, having a bottom elevation established at 883.0 MSL.
- ♦ A minimum 25 foot channel bottom width, where feasible.

These criteria define the channel alignment within each dredge area as shown on Figure 3 and Figures 5A through 13A.

Typically, the channel width for navigation was established at 25 feet. However, based upon either physical or environmental constraints, channel width will be less in certain locations, such as portions of the Northwest Channels.

Table 1 summarizes the dredge areas and associated dredge prism volumes for the proposed dredge locations within Nagawicka Lake.

**Table 1**  
**Dredge Prism Volumes**

Dredge Location	Approx. Dredge Prism Volume December 2006 Chapter 30 Permit Application (cy)	Revised Dredge Volume <sup>(2)</sup> (cy)
West Channels	21,283	16,930 *
Northwest Channels	52,181	49,085 *
Northeast Channels	8,361	4,277
Bark River Inlet	35,469	33,590
Zastrow's Bay	7,412	8,146
Bleeker Street Bay	10,072	0
Kettle Area	5,261	0
<b>Total</b>	<b>140,039<sup>(1)</sup></b>	<b>112,028<sup>(1)</sup></b>

(1) In-situ lake sediment volume of dredge prism. Upland disposal volume, after dewatering, will be substantially less than the dredge prism volume.

(2) Assume a 0.5 ft. overcut allowance to establish target elevation and 5% additional volume for dredging by piers not shown on the 2005 orthophoto base map.

\* Estimated volumes. Final volumes will be included in Revised Chapter 30 Permit Application.

Prepared by: MJPI  
 Checked by: JOSI

**West Channels** – The dredge alignments in the West Channels are shown on Figures 5A and 6A. The dredge alignment for the West Channel (south) shown on Figure 5A was revised based upon WDNR's sensitive area definition. Pre-dredge water depths in the West Channel range from less than 0.5 feet to 2.5 feet.

The specific need for dredging of the West Channels is to provide better access for safe navigation for boaters. In the southern channel area, as shown on Figure 5A, in order to comply with WDNR requirements, the limit of the channel will not extend further than 150 feet into the lake. The channel bottom will be 25 feet wide. In the northern portion of the dredge alignment, the dredge prism shows a bottom width of 34 feet. This is to accommodate riparian piers that extend through that area. As such, the dredge prism needed to be extended to allow for unimpeded navigation through the channel (i.e. the channel width extends 25 feet beyond the end of the existing piers in that area.). A significant proportion of the sediment in the West Channels is composed of a very organic muck resulting from the decomposition of organic matter such as leaves and other vegetation. Furthermore, it has been noted by the WDNR that a significant growth of Eurasian water milfoil will be eradicated by dredging this area.

The dredge alignment in the West Channels is located in accordance with information presented in an October 30, 2007 e-mail from Ms. Heidi Bunk, of the WDNR, to Mr. Tom Hafner, of the City of Delafield, including extending the dredge area approximately 50 feet further north, as shown on Figure 5A.

Based upon the proposed dredge alignment for the West Channel areas, it is estimated that approximately 16,930 cubic yards (cy) (including 0.5 foot overcut and pier contingency) of sediment will be removed, 4,353 cy less than the initial Chapter 30 Permit Application volume.

**Northwest Channels** – The dredge alignments in the Northwest Channels are shown on Figures 7A through 9A. In their letter dated March 8, 2007, the WDNR requested that the following areas be removed from the dredge alignment: the area west of parcel 0750029 and south of parcel 0750024 and the areas between the wetland islands identified as bordered by parcel 07500999001. As shown on Figure 9A, the area west of parcel 0750029 and south of parcel 0750024 has been removed from the proposed dredge area.

The LWC believes that the channels between the wetland islands identified as bordered by parcel 07500999001 (see Figures 8A and 9A) should be dredged for watercraft access. Without these channels being dredged, Northwest Channels access for riparians will be limited to locations north and south. During summer months, this will result in boat congestion and could potentially be a safety hazard. In addition, allowing access to the lake at only two locations will require boaters to travel longer distances consuming more gas, increasing noise, air, and water pollution and causing added wear to boats and motors.

Riparian owners have historically used these channels to gain access to the lake and the Northwest Channel area, and will continue to use these very shallow channels, thus stirring up sediments that could drift into the lake or dredged areas. These east-west channels have also become very narrow, creating unsafe boating conditions. If these channels are not dredged, they will continue to fill with sediments, dead aquatic vegetation, and decomposing terrestrial vegetation and will become wetlands, no longer serving as fish habitat. By dredging these channels, not only will this allow for safer watercraft access, but littoral zone habitat and

wetland edge habitat will be maintained, thus providing fish spawning and juvenile fish habitat, fish nursery areas, and feeding areas for great blue herons and other shoreline birds.

The LWC and City of Delafield also believe dredging is necessary between parcels 0750032 to 0750029 as shown on Figure 9A. This is necessary to provide lake access to these property owners. Presently, this area is silted in having less than 6 inch water depth. Without dredging in this area, these owners will not have lake access.

The LWC also believes that dredging of the channel between parcels 0750059/0750058 and parcel 0750085 and between parcel 0750059 is absolutely necessary for water craft navigation (see Figure 8A) and to provide a complete dredge plan for the community. Even with dredging the channel between parcels 0750059/0750058 and the developed west shore, the channel width will be too narrow for adequate watercraft passage, thereby causing a choke point and safety hazard. In order to mitigate this potential problem, the LWC believes that, in addition to dredging of the channel between parcels 0750059/0750058 and parcel 0750085, the very narrow channel west of parcels 0750058/0750059 should be dredged with a 0 foot setback on both sides of the channel.

The LWC also strongly recommends that due to public safety issues, the channel from parcel 0751998 north to parcel 0751008 be dredged with a 0 foot setback as shown on Figures 7A and 8A. This channel has not been dredged since its construction in 1929 and is very shallow near the shoreline. When water levels are lower in the fall, a shoreline mudflat is exposed, and, in the winter, these mudflats freeze down to 6 to 12 inches. In the spring, when water levels rise back to normal, the blocks of sediment-laden ice float out into the channels, melt, and deposit their sediment load into the channels. Additionally, as temperatures drop in the fall, the channel freezes sufficiently to support people, but the exposed mudflat does not freeze as rapidly, leaving a potentially unstable 5 foot wide area (assuming a setback) along the shoreline that will pose a threat to the public. This past fall, an incident occurred where a property owner and their dog broke through the thin crust of frozen sediments and were buried to their waist in muck. Dredging a complete channel will eliminate this very real hazard in the future. Silt thicknesses have been measured at 4 feet along this area.

Conditions in the Northwest Channels are similar to the West Channels, with water depths ranging from less than 1.5 to 3.0 feet, with substantially lesser depths in many locations. At several locations, the water depth is very shallow (less than 6 inches) because of excessive sediment accumulation.

Using the above dimensions results in an estimated total dredge volume in the Northwest Channels of 49,085 cy (including a 0.5 foot overcut and 5% pier contingency), 3,096 cy less than initial Chapter 30 Permit Application volume.

**Northeast Channels** – The Northeast channels are labeled as NE1 through NE5, as shown on Figure 10A. Due to shallow water depth, dredging is proposed in all five channels following the criteria listed previously. As identified in the WDNR's March 8, 2007 comment letter, the area previously identified as channel NE4 was removed from the dredging plan, and the

remaining areas renumbered. In the remainder of the Northeast Channels, due to the narrow existing channel widths and in order to maintain a 5 foot buffer from shore, channel bottom widths will range from 4 to 12 feet.

The Northeast Channels require dredging due to shallow water depth caused by accumulated sediment. The existing channels are very narrow at some locations, therefore magnifying the impact of the shallow water depths on safe navigation for boaters. Existing water depth in those channels ranges from less than 1.0 feet to 3.0 feet. The estimated dredge volume for the Northeast Channels is 4,277 cy (including 0.5 foot overcut and 5% pier contingency), 4,084 cy less than the initial Chapter 30 Permit Application volume.

**Bark River Inlet Area** – The Bark River Inlet area is divided into four sub-areas, as shown on Figure 11A, and described below:

- ◆ Bark River (mouth of river)
- ◆ Bark River sediment trap (in the lake at the river mouth)
- ◆ Lake Drive (shoreline located north of the river mouth)
- ◆ Sylvester Drive (shoreline located south of the river mouth)

The Lake Drive dredge channel, as identified in the WDNR March 8, 2007 letter, suggested that water depth was greater than 3.5 feet. The WDNR therefore concluded this area should not be dredged. Refinement of the dredge prism in this area, based on additional survey information collected during the fall of 2007, shows pre-dredge water depth generally ranging from 0.5 to 3.0 feet; as such, dredging will be performed along Lake Drive (see Figure 11A). Because the dredge area along Lake Drive is not within a sensitive area, dredging will be performed to provide better water craft access and navigation.

Dredging criteria within the Bark River Inlet and the north and south shorelines are the same as for the West and Northwest Channels (5 foot shoreline setback, 4V:1H sideslopes, typical 25-foot wide dredge channel bottom, and 5-foot post-dredge water depth).

A sedimentation trap has been designed at the Bark River Inlet to the lake to reduce future sediment loading to the lake. Collecting sediment at this location not only reduces overall particulate loading to the lake, but also allows for effective future maintenance dredging of the sediment trap. The bottom target elevation for the sediment trap will be established at elevation 883.0, resulting in a post-dredge water depth of 6.5 feet. The sediment trap will have capacity to store sediments for 7 to 14 years based upon a 100% to 50% deposition efficiency, respectively.

The estimated dredge volume for the Bark River Inlet is 33,395 cy (including 0.5 foot overcut and 5% pier contingency), 1,879 cy less than the initial Chapter 30 Permit Application volume.

**Zastrow's Bay** – Zastrow's Bay is divided into three sub-areas, as shown on Figures 12A and 13A, and described below:

- ◆ ZB1 (northwest inlet),
- ◆ ZB2 (northeast inlet), and
- ◆ ZB3 (south inlet).

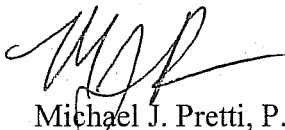
The proposed dredging within Zastrow's Bay has also been modified to account for vegetation and water depth information. In general, for ZB1 and ZB2, shoreline dredge channels are proposed in areas where the water depth is less than 3 feet. Areas in the middle of these inlets where native vegetation and deeper water are present will remain undredged. In the March 8, 2007 letter, the WDNR noted that water depths in ZB3 (southern inlet) were greater than 3 feet, and therefore, dredging should not be conducted. The City of Delafield and LWC believe dredging in this area is needed to provide safe lake access to riparian owners. Considering this area is outside of a sensitive area, dredging in water depths greater than 3.0 feet meets the aforementioned criteria. The combined Zastrow's Bay dredge prisms are estimated at 8,146 cy (including 0.5 foot overcut and 5% pier contingency), 734 cy more than the initial Chapter 30 Permit Application volume.

Dredging of the Zastrow's Bay area will provide improved boater safety due to increased water depth, an improved environment for reestablishment of native Wisconsin submergent vegetation, and improved fishery habitat.

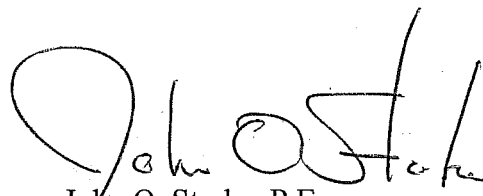
We look forward to discussing this information with the department to work towards obtaining the Chapter 30 Permit for the Nagawicka Lake Restoration project. If you need additional information, please contact John Starke, of Foth, at (920) 497-2500.

Sincerely,

Foth Infrastructure & Environment, LLC



Michael J. Pretti, P.E.  
Project Engineer



John O. Starke, P.E.  
Senior Geotechnical Engineer

Attachments

cc: Tom Hafner, City of Delafield  
Kent Attwell, LWC