Noise Impacts Related to Lake Restoration Activities at Lake Kittamaqundi and Lake Elkhorn

Short-term temporary increases to noise will occur in the vicinity of the dredging operations and staging/dewatering activities. Sources of noise include the dredging equipment, dewatering equipment, generators, loaders, and the trucks used to transport the dewatered material for placement. Noise levels generated by the dredging operation will vary according to the size and type of the equipment used, and more importantly, the size and type of the engines. All equipment used will be required to meet regulatory requirements for mufflers and other sound suppression techniques. However, the lake restoration – like any construction activity – will generate some noise.

Generally, hydraulic dredges generate noise at around 60 to 80 decibels[1] (dB) at about 50 feet. Sediment dewatering equipment will be less noisy, operating at around 50 to 60 dB. A backhoe or loader generates about 85 dB, while a generator operates at about 78 dB. The large dump trucks used to transport the sediment will be the primary source of noise, generating around 90 dB each.

Comparative Noise Levels - The attached U.S. Environmental Protection Agency Fact Sheet on Noise, generated for the dredging of the Hudson River PCBs Superfund Site, provides a useful comparison of noise from dredging and sediment dewatering activities to other routine noise levels. The USEPA has identified the following levels of loudness (compared to 70 dB):

dB	Levels of Loudness
< 60	quiet
60 – 90	moderate
90 – 110	very loud
> 110	uncomfortable

Dredging activities are at the lower end of the moderate noise levels, although the trucks used to haul the sediment away are much louder.

The adverse impact of the noise generated by the project will be largely dependent upon the distance from the source, the time of year, and the time of day (people are more sensitive to noise at night). Change in noise levels compared to ambient noise will also be a key in how people perceive the impacts.

Distance from Source - Noise levels from a point source decrease in inverse proportion to the square of the distance from the sound source – e.g., at distances greater than 50 feet from the source, every doubling of the distance decreases the noise by approximately 6 dB.

[1] Noise levels are measured by decibels (dB), a logarithmic scale measuring sound pressure levels. An increase of 10 dB is equivalent to doubling the noise level, e.g. a 70 dB noise sounds twice as loud as a 60 dB noise. The total sound pressure created by multiple sound sources (such as several trucks) is not mathematically additive; combining several noise sources generally only increases the pressure level a few dB above the loudest sound. For example, two trucks generating 90 dB each have a combined noise level of 93dB.

Outdoor noise levels from the dredging and staging areas are estimated as shown assuming only decreases due to distance:

	Distance from noise source					
	50 ft	100 ft	200 ft	400 ft	800 ft	1,600 ft
Hydraulic Dredge[2]	70 dB moderate	64 dB moderate	58 dB quiet	52 dB quiet	46 dB quiet	40 db quiet
Staging Area Activity[3]	95 dB very loud	89 dB moderate	83 dB moderate	77 dB moderate	71 dB moderate	65 dB moderate

Reference the associated maps for concentric rings that corresponde to the "Distance from Noise Source".

There are also numerous environmental factors that determine the level of sound actually "heard", including surrounding terrain, ambient or background sound level, wind direction, temperature gradient, relative humidity, etc.

Time of Year – Noise has a greater impact in the summer time because of open windows, outside activity, etc. In the winter and when windows are closed for air conditioning in the summer, there is a 15 dB reduction within a building. If the windows are open, there is generally only a 5 dB reduction.

Time of Day – People are more sensitive to noise during the night than during the day.

Ambient Noise - Background, or ambient noise, will also play a role in determining the perceived level of impact. Where ambient noise is relatively high, an increase in noise is often perceived as having less impact. Thus a residential area next to a main roadway would likely be less sensitive to additional truck noise than a residential area in a less noisy environment.

Human Reaction to Changes in Sound Pressure – Generally, increases in sound pressure < 3 dB have no appreciable effect on people. Increases from 3 -5 dB would have an adverse noise impact only where the most sensitive of receptors are present; most people would notice little real change in an increase of 5 dB or less. Increases from 5 – 10 dB could be considered intrusive; increases from 10 – 15 dB are very noticeable, and increases of 15 - 20 dB are objectionable to most people.

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[2] Hydraulic dredges generate noise between 60 to 80 dB, depending on size of dredge, engine, and other characteristics. 70 dB is used as a reasonable mid-range, representative of the smaller to mid-size dredges likely to be employed on the lakes.

[3] Staging area sound level is estimated as a compilation of multiple sound sources, including dewatering equipment, a loader, generator, and three trucks operating on site.

Noise Mitigation - Controlling the hours of operation – e.g. limiting peak noise generating operations (e.g. loading sediment onto trucks) to daytime - is the best available method to avoid or reduce adverse noise effects from the dredging operation.