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Ohio Sea Grant College Program

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Michael Russ
U.S. Environmental Protection Agency
Great Lakes National Program Office
77 W. Jackson Boulevard (G-17J)
Chicago, Illinois 60604-3511

Dear Mr. Russ,

I am writing to express my personal thoughts on dredging within the Maumee River and Bay. I believe it is essential to the restoration of Lake Erie to eliminate the open lake dumping of sediment from Toledo Harbor into the shallow waters of the western basin which are categorized by USEPA as nearshore waters. It is very difficult to understand that we would dredge the equivalent of the entire average annual sediment load from the Maumee River (955,000 metric tons), put it on barges and then dump it in a shallow area of the Western Basin where waves and currents can spread it and the associated nutrients and contaminants throughout Lake Erie.

I will try to be brief; but will begin with some information about the system that will help to justify my conclusions. Lake Erie is the southernmost, shallowest, and, therefore, the warmest of the Great Lakes. The watersheds around the other four Lakes have extensive forest ecosystems. The watershed around Lake Erie is dominated by an agricultural and urban system. Consequently, Lake Erie receives more sediment and more nutrients (agricultural and sewage) than the other four Lakes. It is also important to note that the Maumee River, draining an extensively farmed area of what used to be the Great Black Swamp, is the largest single tributary to the Great Lakes (the Detroit River is considered to be a connecting channel), but it brings in only 3% of the flow to Lake Erie, meaning that the Great Lakes system is fed by a number of small tributaries. However, while it brings in 3% of the flow, the Maumee River alone brings in more sediment to Lake Erie than all the tributaries put in Lake Superior, and Lake Superior (1,333 feet deep) contains 20 times more water than Lake Erie.

We divide Lake Erie into three basins, a very shallow Western Basin (average depth 24 feet) with a very irregular bottom west of Sandusky, a deep Eastern Basin with an irregular bottom east of Erie, and a moderately deep Central Basin (average depth 60 feet) with a very flat bottom between Sandusky and Erie. The Western Basin is the warmest during the summer and receives the most nutrients and sediment. When Lake Erie stratifies during the summer, the thermocline normally forms at a depth of about 50 feet. As a result, we seldom have a thermocline in the Western Basin, and the cold bottom layer (hypolimnion) beneath the thermocline in the Central Basin is very thin about 10 feet thick. Consequently, if the Lake is too productive from receiving too many nutrients (the problem that occurred in the 60s and 70s when Lake Erie was incorrectly

called a "Dead Lake"), it is likely that the dissolved oxygen in the Central Basin hypolimnion will be used up during the summer creating an area of anoxia referred to as the "Dead Zone." This changes the chemistry within the hypolimnion causing it to move from an oxidizing environment to a reducing environment, which allows phosphorus and metals in the sediment to dissolve into the water. This hypolimnetic water causes a number of serious problems if it is sucked into Central Basin water plants, e.g. City of Cleveland.
Because the Western Basin is so shallow, it is very easy for sediments to be resuspended during storm events. As Lake levels go down, resuspension of sediments becomes a more significant issue and sediments that previously had not been resuspended, will be. The projected impacts of climate change—lower water levels and more frequent severe storms—will exacerbate this problem. Models of the movement of dredged material from open lake disposal of Maumee River sediments show how the material moves throughout the lake and over Niagara Falls within one year. Dr. Keith Bedford and his collbeagues at The Ohio State University developed these models.*(1)*

Resuspending these sediments is relatively easy because a significant proportion is fine grained. On average, the Federal Navigation Channel sediment consists of 88 % silts and clays, with the remainder coarse-grain material. With few exceptions, sediment samples in the channel were comprised of between about 80 and 98 % silts and clays. The open-lake discharge site sediment samples consisted of an average of 96.8 % silts and clays, with the remainder coarse-grain material. *(2)Executive Committee Phase 3 Report, Toledo Harbor, Dec. '94.*

This fine grained sediment has significant impacts on Lake Erie and the volume of this material is quite large. In recent years, the quantity of dredged material has been equivalent to the average annual loading to Lake Erie from the Maumee River. Very fine silt is especially troublesome for habitat and drinking water treatment. Suspended sediment reduces sunlight from penetrating the water column causing a reduction in phytoplankton and aquatic plant growth. High concentrations of suspended sediment can abrade damaging fish gills and destroys the protective mucous covering the eyes and scales, increasing risk of infection and disease. As sediment settles out of the water column fish eggs, benthic organisms and high quality bottom substrate can be destroyed. We continue to exacerbate these problems by placing material that has been dredged, and is in our grasp, back into the Lake in shallow areas where it will rapidly disperse.

There are other significant Lake Erie problems that are aggravated by the practice of open lake disposal. In addition to Aquatic Invasive Species (AIS), I would argue that the most important problems facing the Lake Erie ecosystem right now are Harmful Algal Blooms (HABs), the Dead Zone, and increased loading of nutrients and contaminants. As stated above, the Dead Zone is a Central Basin issue, but HABs are a Western Basin problem that is spreading into the Central Basin and a significant human health issue *(Microcystis* sp. is a form of blue-green algae that produces the toxin microcystin and requires warm, nutrient-rich water, like that found in the Western Basin). Open lake disposal of sediments increases loading of nutrients and contaminants and makes both the Dead Zone and HABs worse. Tom Bridgeman of the University of Toledo has been conducting on-

going research sponsored through Ohio Sea Grant and the Lake Erie Protection Fund on Mycrosystis blooms and is tryng to identify the factors that are responsible for the recent dramatic increase in these algae blooms. Dr. Bridgeman has recently reported that turbidity gives Microcystis and competitive advantage and allows Microsystis which floats on the surface to thrive. Dr. Bridgeman has noted that we must address turbidity in the Western basin to reduce these algae blooms. (3)One source of turbidity is from the movement of sediment from the open lake dumpsite.

These algae blooms also contribute to the dead zone when they float and are carried into the Central basin where they die, sink to the bottom , decompose, and lower the oxygen content of these deeper waters of the hypolimnion. Open lake disposal is not the sole cause of either of these problems but given the volume of sediment that is relocated into shallow erosive areas of the lake, I believe it has a significant impact.

The volume of sediment that has been disposed on an annual basis and the proposed doubling or tripling of these volumes must command our attention as significant loadings to Lake Erie. The Corps of Engineers has recently requested permission to open lake dispose up to 1,900,000 cubic yards (or 1,250,000 as a lesser alternative) of material compared to the approximately 650,000 cubic yards of recent years. These volumes of sediment carry with them very large quantities of nutrients and other contaminants. One nutrient of great significance to Lake Erie is phosphorus. I am currently coordinating a team of researchers (funded by USEPA-GLNPO and Lake Erie Protection Fund) looking into the nutrient impacts on Lake Erie in hopes of identifying management practices that will allow us to reduce these nutrient inputs. Much of our attention has focused on soluble reactive phosphorus (SRP). However, there continues to be an impact from all sources and forms of phosphorous and we must step up our management practices on all fronts if we are to reduce the nutrient loadings to the lake. Phosphorus attached to sediment continues to be an issue. The cycling of phosphorus in Lake Erie is an important area of research. We are currently learning more about the role of the dreissenids in this process, but I think we can conclude that they play a significant role in phosphorus cycling. I previously noted that changes in the chemistry within the hypolimnion moves this affected area from an oxidizing environment to a reducing environment, which allows phosphorus and metals in the sediment to dissolve into the water. We know from Bedford's work that open lake sediment is being carried into the Central Basin where this can occur.

Ohio EPA has developed estimates of potential contaminant loadings from an increase of open lake dumping to 1,250,000 cubic yards (double the recent open lake quantities) that are very large and should cause us concern for their potential impacts. 1200 tons of phosphorus, 620 pounds of mercury, 2.5 tons of cadmium, 1.25 tons of selenium and 312 tons of ammonia are all very significant loading contributions to Lake Erie that should raise concerns. I believe that the weight of evidence clearly shows that open lake disposal of Toledo Harbor sediment must not continue and that eliminating this practice may be the single most significant action that we can take to restore Lake Erie

I have agreed to be a member of the Toledo Lucas County Port Authority's Toledo Harbor Dredging Task Force and I look forward to working with all of the involved parties to develop a plan for managing this sediment in an environmentally responsible manner that must not include open lake disposal.

I would be happy to respond to any question or comments.

Sincerely,

Jeffrey M. Reutter, Ph.D.
Director

(1) Integrated Analysis of the Impact of Unconfined Placement Activities on Near-Shore Sensitive Areas: Keith W. Bedford – Principal Investigator,
Vasilia Velissariou, Department of Civil and Environmental Engineering and Geodetic Science, The Ohio State University, Columbus, Ohio; 1999.

(2) Long Term Sediment Management Strategy, Executive Committee Phase 3 Report, Toledo Harbor, Dec. 1994.

(3)Dr. Bridgeman's work is reported in the Summer/Fall 2009 edition of Twineline.