



## **Lake Columbia Dredging and Storm Drain Evaluation**

Prepared for:

Lake Columbia Property Owners Association

Prepared by:

Progressive AE  
1811 4 Mile Road, NE  
Grand Rapids, MI 49525-2442  
616/361-2664

January 2008

Project No.: 55810102

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**PROJECT BACKGROUND**

Lake Columbia is an 815-acre lake located in Columbia Township (T. 4S, R. 1E), Jackson County, Michigan. Progressive AE was retained by the Lake Columbia Property Owners Association (LCPOA) in May of 2007 to conduct a dredging evaluation of the confluence area of Goose Creek and Lake Columbia. This area is located at the extreme south end of the lake, immediately north of Cement City Road near the Jackson County and Lenawee County border. This area of the lake has required periodic dredging since the lake was originally constructed in 1961. The area was last dredged in 1999 when approximately 20,000 cubic yards of sediment were removed.

In addition to the dredging evaluation, Progressive was retained by the LCPOA to inventory the storm drains that discharge directly to the lake and to prepare a preliminary maintenance and improvement plan for the storm water drainage system around Lake Columbia.

**DREDGING EVALUATION**

**Dredging Considerations**

Since Lake Columbia was last dredged in 1999, significant sediment accumulation has occurred in Lake Columbia at the mouth of Goose Creek (Figure 1.) Dredging will be required to effectively improve conditions in this portion of the lake.



 APPROXIMATE DREDGE AREA (4 ACRES)

**LAKE COLUMBIA**  
**DREDGING AREA**  
JACKSON COUNTY, MICHIGAN

  
N  
1 inch equals 200 feet

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**Figure 1. Dredge Area**

There are two major dredging methods: Drag-line and hydraulic (Figures 2 and 3). Drag-line dredging involves excavation using a crane, backhoe, or similar equipment. The crane is placed on shore or on a floating barge and excavates material with its "clamshell" or bucket. Excavated material is placed in an interim location to drain or "dewater" the dredged material. If a location is available nearby, dredge spoils can be placed directly in the final disposal location. Drag-line dredging is limited to areas that are within reach of the crane arm. With hydraulic dredging, excavated material is pumped in a slurry through a floating pipeline to the point of disposal. Most large-scale lake dredging projects are conducted with a hydraulic dredge. Hydraulic dredging can be limited by underwater obstructions such as stumps, logs, rocks, etc.

A primary consideration in a lake dredging project is identifying a suitable location (or locations) for the placement of dredged material. When a hydraulic dredge is used, disposal sites are usually constructed by excavating an area and creating an earthen dike to contain the dredged slurry (Figure 4). Given the flocculent nature of the organic sediments found in most lakes and the extended time frame for dredged material to dewater and consolidate, the disposal cell must be adequately sized to accommodate the amount of dredged material produced. The disposal cell should be designed to maximize the settling of solids while allowing excess water to drain. After dredged materials have been deposited and sufficiently drained and dried, the disposal area may be graded and seeded. Another disposal alternative for hydraulic dredging is pumping to sealed, permeable, geotextile tubes which are filled with dredged materials and allowed to dewater by percolation through the geotextile fabric walls (Figure 5). The drier sediments are retained inside the tube. This method allows for the use of a smaller site but is considerably more expensive due to the cost of the tubes and the extended time frame waiting for the tubes to dewater (Bernard, 2008).

Pursuant to provisions of Part 301, Inland Lakes and Streams, of the Natural Resource and Environmental Protection Act, PA 451 of 1994, a permit must be acquired from the Michigan Department of Environmental Quality (MDEQ) before a dredging project can be initiated. Permit conditions will generally require that the dredge disposal site be located in an upland location and that steps be taken during the dredging operation to prevent excessive sediment transport to adjacent areas. Dredge spoils are not typically allowed to be placed in wetland areas. MDEQ has recently developed testing procedures for sediments proposed for dredging that require non-sandy sediments to be tested for certain heavy metals, polychlorinated biphenyls (PCBs), and polynuclear aromatic hydrocarbons (PNAs). If sediment proposed for dredging is found to



**Figure 2. Dragline (backhoe) Dredging**



**Figure 3. Hydraulic Dredging**

be contaminated, the MDEQ may require special disposal requirements or, in extreme cases, that sediments be placed in a licensed landfill. These requirements can substantially increase the cost of a dredging project.

### Field Survey and Sediment Sampling Results

On May 16, 2007, staff from Progressive AE conducted a preliminary evaluation of the potential dredging area by taking 117 sediment depth measurements. Based upon these measurements, an estimate of approximately 11,000 cubic yards of sediment would need to be removed to re-establish the original bottom contours of the lake in this area. This equates to an average dredging depth of about 1.7 feet.

Two samples collected from representative sites within the proposed dredging area were analyzed according to Michigan Department of Environmental Quality (MDEQ) testing requirements (Appendix A). Sieve analyses indicated that more than five percent of the potential dredge sediments were finer than the #200 sieve, and thus, would require contaminant testing. A representative composite sample was analyzed for the MDEQ specified contaminants list using EPA standard methodologies to determine the likelihood that the dredge sediments would have special disposal restrictions. Preliminary sampling results indicate the sediments were slightly higher than MDEQ background standards for arsenic, barium, and zinc. Thus, disposal restrictions could be a condition of an MDEQ dredging permit. If a dredging project moves forward, a minimum of six sediment samples would need to be collected from the dredge area and tested according to MDEQ contaminant testing requirements. However, if a restrictive covenant can be obtained over the dredge disposal area, additional sediment sampling may not be required. Results of the preliminary sediment testing are included in Appendix B.

### Dredge Sediment Disposal

When evaluating the feasibility of a dredging project, locating a suitable disposal site is a major consideration. Assuming 11,000 cubic yards of sediment are dredged from Lake Columbia and the dredge material is placed in a five-foot-deep holding cell, about 2.5 acres of land would be required for disposal. Several potential disposal sites were identified within close proximity to the proposed dredging area (Figure 6). Characteristics of these sites are summarized in Table 1. It should be noted that the LCPOA does not own some of these sites and additional cost could be incurred to acquire use of these sites.



Figure 4: Dredged sediment disposal cell



Figure 5: Geotextile tubes.