

May 20, 2004

Mr. Darrell W. Harris
Witt Mares Eggleston Smith, PLC
701 Town Center Drive
Suite 900
Newport News, Virginia 23606

**RE: Bathymetric Survey and Plan
Tabb Lakes Homes Association
WEG Project #1256A**

Dear Mr. Harris:

Williamsburg Environmental Group, Inc. (WEG) has completed the bathymetric survey of Lake 2 and a portion of Lake 1. The survey was requested by the Tabb Lakes Homes Association in preparation for a lake dredging plan. The results of the survey are described below and provided in the attached plan set. The plans include longitudinal sections and cross-sections indicating water elevation, sediment thickness, and lake bottom data. Also depicted on the plans are locations of all outlets, pipes, and swales within the study area, as well as the locations of all outfall structures. Our subconsultant, Earthworks Consulting Engineers, Inc. also completed a sediment analysis for Lake 2. The results of this analysis are also described below.

Bathymetric Survey and Plan

Lake 2

WEG conducted a bathymetric survey of Lake 2. The current depth of sediment was measured along multiple transect locations, including, but not limited to those locations identified on the sediment load analysis plans prepared by WEG in December 2000. Four new cross-sections were included in the bathymetric survey ("O", "P", "Q", and "R") in addition to the six original sections. In addition, a longitudinal section ("N") was completed. The results of the survey were used to determine an estimate of sedimentation and the quantity of sediment to be removed in order to achieve the original lake design depth at elevation 21 ft msl.

Table 1 (attached), presents sediment volume calculations based on the results of the bathymetric survey for Lake 2. As seen in Table 1, the volume of soft sediment is approximately 3,805 cubic yards (CY). This value closely approximates the volume of sediment load of 3,850 CY computed during the December 2000 survey. The reason for this discrepancy is most likely due to the increased number of sections during this recent survey, which refines the value (more accurate) more than the 2000 survey.

For comparison purposes, Table 2 (attached) presents the new bathymetric survey results using only the six original cross-sections. The volume of sediment load of 4,552 cubic yards in Table 2 shows that, based on the original six cross-sections, the amount of sediment has increased since 2000.

The plan sheets reflect that the depth of Lake 2 has changed in some locations from the 2000 survey. The Lake 2 longitudinal section presented on Sheet 2 of the plans shows a "snapshot" of lake depth conditions in the present and from December 2000. Although discrepancies between the current and old data exist, the longitudinal section shows that the depth of Lake 2 is not at the design elevation of 21 ft msl, which is consistent with the 2000 survey.

Cross-sections for Lake 2 are also shown on Sheet 3 of the plan set. The depth to the soft sediment for most of the original sections ("H", "I", "J", "K", "L", "M") was less than the depth during the 2000 lake survey. As previously indicated during the 2000 survey, portions of Lake 2 were not constructed to its design depth of 21 ft msl. Lake 2 cross-sections on Sheet 3 of the plans show areas within the lake with a depth of water less than 3 feet. The south end of Lake 2 has an average depth of less than 4 feet. Sediment thicknesses ranged from 0.28 to 0.94 feet with an average thickness of 0.6 feet. This thickness closely approximates the average sediment thickness determined in the December 2000 survey.

Lake 1

The survey also included a portion of Lake 1 from cross-section "F", as identified on the previous plans from December 2000, to the culverts between the two lakes. In addition to cross-section "F", two new cross-sections were added ("S" and "T") between these two points. The longitudinal survey for Lake 1 shows a buildup in soft sediment near the culvert outfall of Lake 2. All three cross-sections for Lake 1 shown on Sheet 3 show a significant quantity of soft sediment in Lake 1 near the culverts. Table 3 (attached) presents the results of the bathymetric survey for this portion of Lake 1. As shown on the plans, Lake 1 was constructed much deeper than the design lake bottom elevation of 21 ft msl. Based on the area evaluated, the average thickness of sediment was approximately 1 foot.

Sediment Analysis

In addition to the bathymetric survey and plans, a sediment load analysis was conducted to help provide information about the sediment for future dredging decisions.

Lake 2

Earthworks Consulting Engineers, Inc. (ECE), a geotechnical firm with experience in collection and analysis of lake sediments performed the sediment analysis. The analysis included a collection of several handauger borings of sediment, which was collected and analyzed for moisture content, sieve analysis, organic content, and soil classification.

Sediment samples were collected at nine locations in Lake 2. A copy of the report is attached. The report from ECE also includes a map showing the general sample locations and a summary table showing the results of the analysis.

According to the sediment analysis, the bottom of the lake contained sediments consisting of black, organic, sandy silt (sludge). Soils under the sediment layer consisted primarily of gray, fine to medium sand, although some clayey soils were found at two of the nine sampling locations. The study shows that roughly one-third of the materials excavated during a dredging operation would consist of sludge. Due to the high moisture content of the sludge samples analyzed, it would be necessary to dewater the material after dredging. The clayey soils encountered at two the sampling locations could preclude the option of hydraulic dredging for at least of portion of the lake. Based on the results of the sediment analysis, it appears that hydraulic dredging is not recommended for at least a portion of Lake 2. However, other dredging methods could be employed at these locations.

Conclusion

The comparison of bathymetric surveys conducted in 2000 and 2004 show that Lake 2 was not constructed to its original design depth of 21 ft msl. The amount of sediment in the bottom of Lake 2, based on the 2004 bathymetric survey, remains close to the value determined in 2000. The survey also shows a buildup of sediment in the south end of Lake 1 near the culverts between the lakes. Due to the shallow depth of Lake 2, as a result of not being constructed to its design depth, the rate of sedimentation will adversely affect lake conditions faster than if the lake had been constructed in accordance with the design plans.

If you have any questions concerning this information, please feel free to contact me.

Sincerely,



Toni E. B. Small, P.E.
Senior Engineer

Attachments

Table 1
Lake 2 Bathymetric Survey Data
2004

Cross Section	Volume Soft Sediment (ft ³)	Volume Soft Sediment (yd ³)	Volume to Design Level (ft ³)	Volume to Design Level (yd ³)
Lake out	570	21	2,016	75
H1-H2	6,410	237	20,822	771
I1-I2	9,849	365	27,856	1,032
<i>O1-O2</i>	11,019	408	16,198	600
J1-J2	12,554	465	21,537	798
<i>P1-P2</i>	10,894	403	50,201	1,859
K1-K2	12,592	466	73,435	2,720
<i>Q1-Q2</i>	11,254	417	57,474	2,129
L1-L2	12,291	455	56,268	2,084
<i>R1-R2</i>	9,868	365	40,749	1,509
M1-M2	3,508	130	8,922	330
Lake in	1,919	71	4,590	170
Total	102,725	3,805	380,068	14,077

Note: New profile labels shown in italics.

Table 2
Lake 2 Bathymetric Survey Data
Original Profiles from 2000 Only
2004

Cross Section	Volume Soft Sediment (ft ³)	Volume Soft Sediment (yd ³)	Volume to Design Level (ft ³)	Volume to Design Level (yd ³)
Lake out	570	21	2,016	75
H1-H2	6,410	237	20,822	771
I1-I2	19,807	734	39,828	1,475
J1-J2	32,166	1,191	81,670	3,025
K1-K2	27,940	1,035	114,741	4,250
L1-L2	20,961	776	97,496	3,611
M1-M2	13,138	487	47,993	1,778
Lake in	1,919	71	4,590	170
Total	122,911	4,552	409,157	15,154

Table 3
Lake 1 Bathymetric Survey Data
2004

Cross Section	Volume Soft Sediment (ft ³)	Volume Soft Sediment (yd ³)	Volume to Design Level (ft ³)	Volume to Design Level (yd ³)
End Profile	0		0	0
F1-F2	1,423	53	4,988	185
T1-T2	2,928	108	8,541	316
U1-U2	2,175	81	5,093	189
Lake in	670	25	1,540	57
Total	7,196	267	20,162	747