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Public Utility District No. 1 of Chelan County

P.O. BOX 1231 WENATCHEE, WASHINGTON 98807-1231 (509) 663-8121

September 27, 1999

Ms. Cindy Engstrom and Mr. Jack Raines
LAKE CHELAN BOAT COMPANY
Post Office Box 186
Chelan, WA 98816

Subject: Lake Chelan Bathymetry

Dear Cindy and Jack:

Here is the information that you requested. I am sorry about the delay. Due to extensive field work, we were not able to produce the GIS map until now.

We should discuss this at your convenience. Please contact me at 663-8121 ext. 4670 or by e-mail at gregg@chelanpud.org.

Thank you,

Gregg Carrington
Relicensing Project Manager

Enclosures



A Duke Energy Company

1111 North Forest Street
Bellingham, WA 98225-5119

360 671-1150
Fax 360 671-1152

Mr. Gregg Carrington
Public Utility District No. 1 of Chelan County
P.O. Box 1231
327 N. Wenatchee Avenue
Wenatchee, WA 98807

July 20, 1999

Dear Gregg,

Please find enclosed a draft report describing the bathymetry around the Chelan Boat Company docks and also the old hydraulic control for Lake Chelan prior to dam construction. As we discussed on the phone, we were given a 2-paged, fax of the shoreline near the docks, and the boat company circled those areas in which they were interested. There was no exact scale, so we needed to go with their approximation on the distance from the fill to the turn-around circle. They aren't exactly what I'd call base-map quality!

If you could give these maps to Scott and have him clean them up, using your GIS base maps, that would certainly improve the legibility of the report. Let me know if there are any changes that you'd like to the draft, and I'll be happy to put those together as well. If you have a good map showing the area of the lake from Caravel's Resort to the bridge, I could also draw you the hydraulic control for the lake. I've also included a disk which shows the raw data with notes for the transects near the boat dock.

Thanks, Gregg. I'll be out of the office the rest of this week, and in on Monday and Tuesday of next week. I'll be at Lake Chelan from Wednesday through Friday next week. Give me a call if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads 'John P. Blum'.

John P. Blum

DRAFT

LAKE CHELAN BATHYMETRY
Adjacent to the Chelan Boat Company Dock

Prepared for:

Public Utility District No. 1 of Chelan County

Prepared by:

Duke Engineering & Services, Inc.

July 20, 1999

1.0 INTRODUCTION

Duke Engineering & Service, Inc. (DE&S) was contracted by Chelan County Public Utility District (District) to 1) map the lake elevations in the vicinity of the Chelan Boat Company's dock on Lake Chelan; and 2) find and determine the elevation of the old hydraulic control for Lake Chelan prior to construction of the dam.

2.0 METHODS

On May 12, 1999, DE&S conducted surveys of the lower portion of Lake Chelan in the Wapota basin immediately upstream of the dam and in the vicinity of the Lake Chelan Boat Company's dock along the South Shore of Lake Chelan. Surveys were conducted using an Acoustic Doppler Current Profiler (ADCP) developed by RD Instruments, Inc. The ADCP currently owned by DE&S measures depths and velocities down to 100 ft and 55 feet, respectively; calculates real-time discharge; replicates discharge measurements within 2%; and measures velocity to +/- 0.033 ft/sec. The ADCP with bottom tracking accurately measures depth and velocity along a course while simultaneously indexing each measurement relative to the point of origin. The bottom tracking and depth stratification features make the instrument compatible with the "transect method" of measuring hydraulic variables and fish habitat availability. The water column can be stratified into as many as 128 depth bins, allowing for examination of velocities anywhere within the water column. Bottom Tracking corrects for variability in boat course and direction, reconciling the data to reflect an accurate transect across a given body of water. For the purposes of these surveys, the velocity data collected were not utilized; however, the depth and bottom tracking features of the ADCP were used to determine straight-line distances from reference points along the shore or in the water.

Methodologies are described below.

2.1 Elevations in the vicinity of the Lake Chelan Boat Company

DE&S used a map provided by Chelan Boat Company in order to survey the area of interest around the docks and in the travel path away from the dock. No direct scale was provided; however, an area of approximately 200 feet was marked on the map as a reference. DE&S used this distance as a benchmark for the surveys around the dock (Figure 1).

A total of eight transects were used to determine the elevations around the lake (Figure 2). These transects covered the following areas: 1) the old river channel upstream from the dam to approximately 13,000 up-lake from the docks (Transect 1); 2) Through the turn-around area parallel to the Boat Company Dock and the Goodfellow Dock and between the docks (Transects 2 - 5); and 3) perpendicular to the docks extending out to the end the Goodfellow Fill (Transects 6 - 8). For reference points for locating the transect data, DE&S recorded the data ensemble at known positions (i.e., at the end of a dock, etc.). This provided DE&S with "ground truthing" the data.

2.2 Determining the Old Hydraulic Control for Lake Chelan.

In order to determine the general vicinity of the hydraulic control, DE&S surveyed the thalweg (i.e., the deepest part of the channel) from the dam upstream into the lake. Data ensembles were referenced to known points (i.e., bridges, bulkheads, etc.) for reference. Areas where the thalweg became shallower were noted; these areas were then surveyed using additional transects which extended from one bank to the other, perpendicular to the current.

Four areas were selected for further analysis: 1) At the pipeline crossing downstream of the bridge (Transect 12); 2) immediately below the bridge at the lake outlet (Transect 13) upstream from the bulkhead just across and downlake from Caravel's (Transect 9); and 4) immediately downlake from Transect 9, extending from a white house immediately downlake of Caravel's across to the bulkhead near the boat launch (Transect 14).

The ADCP provides depths relative to the water surface. True elevations were calculated by subtracting the water depth from the lake elevation at the time of the surveys (El. 1084.83 feet on May 12, 1999). Depths were rounded to the nearest 0.1 foot.

3.0 RESULTS

Locations on maps were relative to reference points. When depths changed by 1 foot, it was noted on the maps. Electronic files for reference are also provided of the transects.

3.1 Lake Elevations in the Vicinity of the Chelan Boat Company Dock

Figure 2 shows the locations and the direction of transects used to survey elevations in the vicinity of the boat company dock. Transect 1 (Figure 3) shows elevations within the old river channel in the vicinity of the two docks. Transect 2 (Figure 4) was extended from the deeper area of the lake and ran parallel to the Chelan Boat Company Dock into the shallower, nearshore waters. Transects 3, 4 and 5 (Figure 5) determined elevations between the docks, along the inside of the Goodfellow Dock and outward from the Goodfellow Dock, respectively. Transects 6, 7 and 8 (Figure 6) ran perpendicular to the end of the docks and traversed the turn-around area. Figure 7 summarizes elevations recorded from the 8 transects.

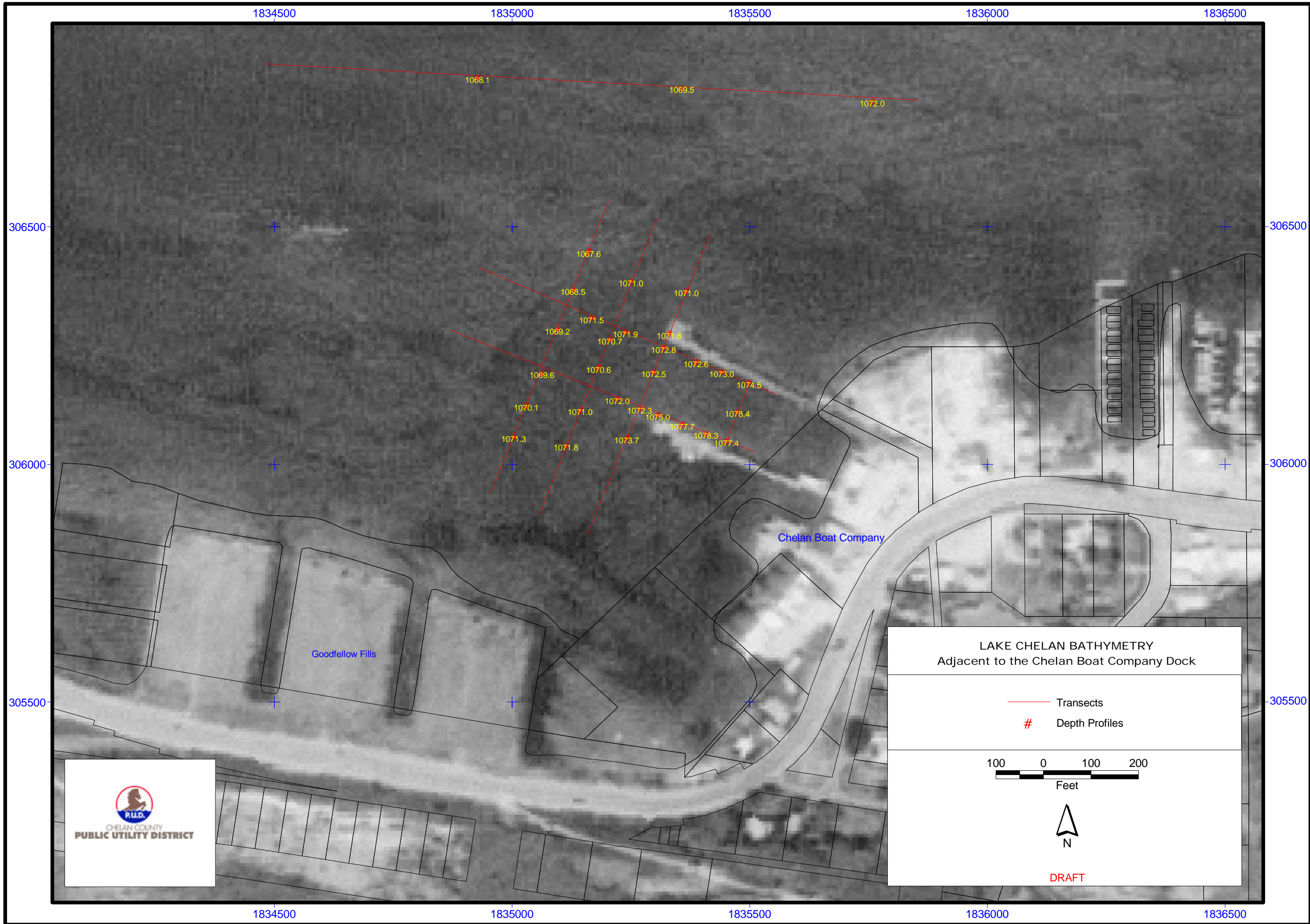
3.2 Hydraulic Control for Lake Chelan.

Thalweg depths for Transects 9, 12, 13 and 14 are listed below. Transect 14, located immediately to the east of Caravel's and extending to the northshore just uplake of the boat launch bulkhead, is the old hydraulic control for Lake Chelan prior to construction of the dam. The cross sectional profile of Transect 14 is shown in Figure 8.

<u>Transect No.</u>	<u>Thalweg Depth (ft)</u>
9	1073.44
12	1074.34
13	1073.74
14	1074.55

4.0 DISCUSSION

Bathymetry around the Lake Chelan Boat Company docks is approximate due to the lack of differential GPS at the time of the survey and the quality of the base map. Several of the transects selected to determine the old hydraulic control for Lake Chelan were within 0.3 foot; however, Transect 14, located adjacent to Caravel's, has been determined to be the hydraulic control for the lake prior to construction of the dam.



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LAKE CHELAN BATHYMETRY
Adjacent to the Chelan Boat Company Dock

- Transects
- # Depth Profiles



DRAFT



CHELAN COUNTY
PUBLIC UTILITY DISTRICT