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HOUSTON COUNTY LAKE HYDROGRAPHIC SURVEY REPORT

INTRODUCTION

Staff of the Hydrographic Survey Unit of the Texas Water Development Board (TWDB) conducted a hydrographic survey of Houston County Lake during the period of January 18 and 19, 1999. The purpose of the survey was to determine the capacity of the lake at the conservation pool elevation. From this information, future surveys will be able to determine the location and rates of sediment deposition in the conservation pool over time. Survey results are presented in the following pages in both graphical and tabular form. All elevations presented in this report will be reported in feet above mean sea level based on the National Geodetic Vertical Datum of 1929 (NGVD '29) unless the elevation is noted otherwise. The conservation pool elevation for Houston County Lake is 260.0 feet. The original design information estimates the original surface area at this elevation to be 1,282 acres and the storage volume to be 19,500 acre-feet of water.

LAKE HISTORY AND GENERAL INFORMATION

Information in this section was obtained from Texas Water Development Board Report 126 (1974) and from results of the current, 1999, volumetric survey. Houston County Water Control and Improvement District No. 1 (Houston County WCID No. 1) owns the water rights to Houston County Lake and operates and maintains associated Houston County Dam. The lake is located on Little Elkhart Creek in Houston County, 10 miles northwest of Crockett, Texas (see Figure 1). Records indicate the drainage area is approximately 44 square miles. At the conservation pool elevation, the lake has approximately 17 miles of shoreline and is 3.6 miles long. The widest point of the reservoir is approximately 1.2 miles (located 2.0 miles upstream of the dam).

Water Rights Permit No. 2160 (Application No. 2380) was issued to Houston County Fresh WCID No. 1 on May 10, 1965 and authorized the construction of a dam to impound 19,500 acre-feet

of water. The owner was granted the right to divert and use not to exceed 3,500 acre-feet of water for municipal purposes and 3,500 acre-feet of water for industrial purposes. The Texas Water Commission issued Certificate of Adjudication No. 08-5097 on May 5, 1987. The certificate authorizes Houston County WCID No. 1 to maintain an existing dam and reservoir on Little Elkhart Creek (Houston County Lake) and to impound not to exceed 19,500 acre-feet of water. The owner was authorized to divert and use not to exceed 3,500 acre-feet of water per year for municipal purposes.

Records indicate the construction for Houston County Lake started April 14, 1966. Deliberate impoundment began November 4, 1966 and the project was officially completed in December 1966. The design engineer for the facility was Lloyd Engineers and Freese, Nichols and Endress. The general contractor was Spencer Construction Company. The estimated cost of the dam was \$500,000.00.

Houston County Lake Dam and appurtenant structures consist of a rolled-earth embankment 1,250 feet in length, with a maximum height of 63 feet and a crest elevation of 277.0 feet. The service spillway is a concrete morning glory type drop inlet with a seven feet by seven feet conduit. The crest elevation is 260.0 feet. There is a valve-controlled one and one-half feet diameter low-flow outlet with an invert elevation of 234.0 feet. The emergency spillway is an uncontrolled excavated channel located at the right (north) end of the embankment. The 500 feet wide crest is at elevation 265.0 feet.

HYDROGRAPHIC SURVEYING TECHNOLOGY

The equipment used in the performance of the hydrographic survey consists of a 23-foot aluminum tri-hull SeaArk craft with cabin, equipped with twin 90-Horsepower Johnson outboard motors. Installed within the enclosed cabin are an Innerspace Helmsman Display (for navigation), an Innerspace Technology Model 449 Depth Sounder and Model 443 Velocity Profiler, a Trimble Navigation, Inc. 4000SE GPS receiver, an OmniSTAR receiver, and an on-board 486 computer. A water-cooled generator provides electrical power through an in-line uninterruptible power supply.

Reference to brand names does not imply endorsement by the TWDB.

The GPS equipment, survey vessel, and depth sounder combine together to provide an efficient hydrographic survey system. As the boat travels across the lake surface, the depth sounder takes approximately ten readings of the lake bottom each second. The depth readings are stored on the survey vessel's on-board computer along with the corrected positional data generated by the boat's GPS receiver. The data files are downloaded daily from the computer and brought to the office for editing after the survey is completed. During editing, bad data is removed or corrected, multiple data points are averaged to get one data point per second, and average depths are converted to elevation readings based on the lake elevation recorded on the day the survey was performed. Accurate estimates of the lake volume and surface area can be quickly determined by creating a 3-D digital model of the reservoir from the collected data. The level of accuracy is equivalent to or better than previous methods used to determine lake volumes, some of which are discussed in Appendix F.

PRE-SURVEY PROCEDURES

The reservoir's surface area was determined prior to the survey by digitizing with AutoCad software the lake's pool boundary (elevation 260.0). The boundary file was created from the 7.5-minute USGS quadrangle map, Hays Spring, TX. (1964). The graphic boundary file created was then transformed into the proper datum, from NAD '27 datum to NAD '83, using Environmental Systems Research Institute's (ESRI) Arc/Info project command with the NADCOM (standard conversion method within the United States) parameters. The area of the lake boundary was checked to verify that the area was the same in both datums.

The survey layout was designed with Coastal Oceanographics, Inc. Hypack software by placing survey track lines at 500-foot intervals across the lake. The survey design for this lake required approximately 79 survey lines to be placed along the length of the lake. The survey layout files were copied onto diskettes for use during the field survey.