# Volumetric and Sedimentation Survey of EAGLE MOUNTAIN LAKE

## October 2018 Survey

Texas Water Development Board

**October 2019**

# Texas Water Development Board

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Prepared for:

**Tarrant Regional Water District**

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## Executive summary

In March 2018, the Texas Water Development Board (TWDB) entered into an agreement with the Tarrant Regional Water District to perform a volumetric and sedimentation survey of Eagle Mountain Lake (Tarrant and Wise counties, Texas). Surveying was performed using a multi-frequency (208 kHz, 50 kHz, and 12 kHz), sub-bottom profiling depth sounder. Sediment core samples were collected in select locations and correlated with sub-bottom acoustic profiles to estimate sediment accumulation thicknesses and sedimentation rates.

Eagle Mountain Dam and Eagle Mountain Lake are located on the West Fork Trinity River, in Tarrant County, less than 15 miles northwest of Downtown Fort Worth, Texas. The conservation pool elevation of Eagle Mountain Lake is 649.1 feet (NAVD88). The TWDB collected bathymetric data for Eagle Mountain Lake between August 14 and October 2, 2018, while daily average water surface elevations measured between 646.27 and 648.00 feet (NAVD88).

**The 2018 TWDB volumetric survey indicates Eagle Mountain Lake has a total reservoir capacity of 185,087 acre-feet and encompasses 9,246 acres at conservation pool elevation (649.1 feet NAVD88).** Previous capacity estimates include three U.S. Department of Agriculture estimates of 211,000 acre-feet, 205,175 acre-feet and 182,000 acre-feet in 1934, 1939, and 1952, respectively, a 1968 U.S. Army Corps of Engineers estimate of 190,460 acre-feet, a 1988 Freese and Nichols estimate of 178,440 acre-feet, and two TWDB surveys in 2001 and 2008. The 2001 and 2008 TWDB surveys were re-evaluated using current processing procedures resulting in updated capacity estimates of 184,157 acre-feet and 187,387 acre-feet, respectively.

**The 2018 TWDB sedimentation survey indicates Eagle Mountain Lake has lost capacity at an average of 260 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (649.1 feet NAVD88)**. **Long-term trends indicate that Eagle Mountain Lake loses capacity at an average of 274 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (649.1 feet NAVD88).** The sedimentation survey indicates sediment accumulation is occurring throughout the reservoir. The TWDB recommends that a similar methodology be used to resurvey Eagle Mountain Lake in 10 years or after a major flood event.

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## Introduction

The Hydrographic Survey Program of the Texas Water Development Board (TWDB) was authorized by the 72nd Texas State Legislature in 1991. Texas Water Code Section 15.804 authorizes the TWDB to perform surveys to determine reservoir storage capacity, sedimentation levels, rates of sedimentation, and projected water supply availability.

In March 2018, the TWDB entered into an agreement with the Tarrant Regional Water District, to perform a volumetric and sedimentation survey of Eagle Mountain Lake (Texas Water Development Board, 2018). This report provides an overview of the survey methods, analysis techniques, and associated results. Also included are the following contract deliverables: (1) a shaded relief plot of the reservoir bottom (Figure 4), (2) a bottom contour map (Figure 6), (3) an estimate of sediment accumulation and location (Figure 10), and (4) an elevation-area-capacity table of the reservoir acceptable to the Texas Commission on Environmental Quality (Appendices I and J).

## Eagle Mountain Lake general information

Eagle Mountain Dam and Eagle Mountain Lake are located on the West Fork Trinity River, in Tarrant County, less than 15 miles northwest of Downtown Fort Worth, Texas (Figure 1). Eagle Mountain Lake is owned and operated by the Tarrant Regional Water District. Construction of the dam began on January 23, 1930, and the dam was completed on October 24, 1932. Deliberate impoundment of water began on February 28, 1934 (Texas Water Development Board, 1973). The reservoir was built primarily for water supply for Fort Worth and surrounding cities (Tarrant Regional Water District, 2019). Additional pertinent data about Eagle Mountain Dam and Eagle Mountain Lake can be found in Table 1.

Water rights for Eagle Mountain Lake have been appropriated to the Tarrant Regional Water District through Certificate of Adjudication No. 08-3809 and Amendments to Certificate of Adjudication Nos. 08-3809A, 08-3809B, and 08-3809C. The complete permits are on file in the Information Resources Division of the Texas Commission on Environmental Quality.

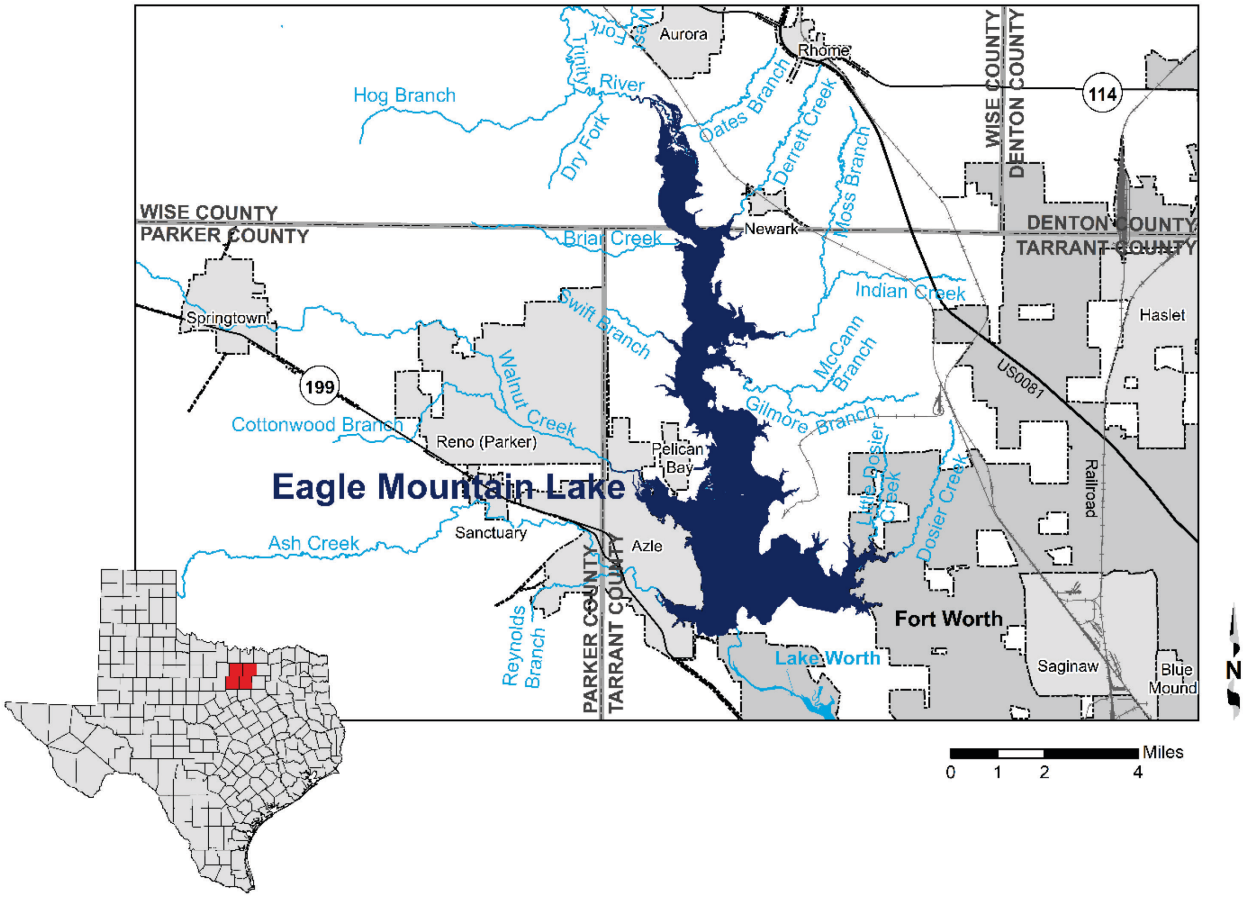


**Figure 1. Location map of Eagle Mountain Lake.**

**Table 1. Pertinent Data for Eagle Mountain Dam and Eagle Mountain Lake**

**Owner**

Tarrant Regional Water District

**Engineer (Design)**

Hawley, Freese and Nichols (original)
Freese, Nichols and Endress (1971 spillway)

**Location of Dam**

On the West Fork Trinity River in Tarrant County, less than 15 miles northwest of Downtown Fort Worth, Texas.

**Drainage Area**

1,970 square miles

**Dam**

| | |
|---|---|
| Type | Two sections of earthfill and a concrete spillway separated by high ground of Eagle Mountain and Burgess Gap |
| Length | 4,800 feet |
| Maximum height | 85 feet |
| Top width | 25 feet |

**Spillway (emergency)**

| | |
|---|---|
| Location | At Burgess Gap, between dam and concrete spillway |
| Type | Natural ground |
| Length | 1,300 feet |
| Crest elevation, top of fuse plug | 676.0 feet NAVD88 |
| Crest elevation, bottom of fuse plug | 670.0 feet NAVD88 |

**New Side Channel Spillway**

| | |
|---|---|
| Location | Spillway levee section |
| Type | Concrete side channel ogee to forebay discharging through a 25-foot square conduit |
| Length | 1,300 feet |
| Control | 6 roller gates, each 11.25 feet by 22.0 feet |
| Crest elevation | 637.0 feet NAVD88 |

**Old Spillway**

| | |
|---|---|
| Type | Concrete ogee with four bays, each 25 feet wide<br>Three bays have vertical lift roller type gates |
| Crest elevation | 649.1 feet NAVD88 |

**Reservoir data** (Based on 2018 TWDB survey)

| **Feature** | **Elevation (feet** NAVD88[a]**)** | **Capacity (acre-feet)** | **Area (acres)** |
|---|---|---|---|
| Top of dam | 682.0 | N/A | N/A |
| Crest of emergency spillway | 676.0 | N/A | N/A |
| Base of emergency spillway | 670.0 | N/A | N/A |
| Crest of service spillway/ Top of conservation pool elevation | 649.1 | 185,087 | 9,246 |
| Invert of low flow outlet | 599.9 | 0 | 0 |
| Conservation storage capacity[b] | — | 185,087 | — |

Source: (Texas Water Development Board, 1973)

[a] NAVD88 = North American Vertical Datum 1988

Note: On October 1, 2016, the U.S. Geological Survey changed the datum of water surface elevations from NGVD29 (National Geodetic Vertical Datum 1929) to NAVD88 (North American Vertical Datum 1988). (U.S. Geological Survey, 2019).

[b] Usable conservation storage equals total capacity at conservation pool elevation minus dead pool capacity. Dead pool refers to water that cannot be drained by gravity through a dam's outlet works.

## Volumetric and sedimentation survey of Eagle Mountain Lake

### Datum

The vertical datum used during this survey is the North American Vertical Datum 1988 (NAVD88). This datum also is utilized by the United States Geological Survey (USGS) for the reservoir elevation gage *USGS 08045000 Eagle Mtn Res abv Ft Worth, TX* (U.S. Geological Survey, 2019). Elevations herein are reported in feet relative to the NAVD88 datum. Volume and area calculations in this report are referenced to water levels provided by the USGS gage. The horizontal datum used for this report is North American Datum 1983 (NAD83), and the horizontal coordinate system is State Plane Texas North Central Zone (feet).

### TWDB bathymetric and sedimentation data collection

The TWDB collected bathymetric data for Eagle Mountain Lake between August 14 and October 2, 2018, while daily average water surface elevations measured between 646.27 and 648.00 feet (NAVD88). For data collection, the TWDB used a Specialty Devices, Inc. (SDI), single-beam, multi-frequency (208 kHz, 50 kHz, and 12 kHz) sub-bottom profiling depth sounder integrated with differential global positioning system (DGPS) equipment. Data was collected along pre-planned survey lines oriented perpendicular to the assumed location of the original river channels and spaced approximately 500 feet apart. Many of the same survey lines also were used by the TWDB for the *Volumetric and Sedimentation Survey of Eagle Mountain Lake, February 2008 Survey* (Texas Water Development Board, 2008) and *Volumetric Survey of Eagle Mountain Lake, February 2001 Survey* (Texas Water Development Board, 2001). The depth sounder was calibrated daily using a velocity profiler to measure the speed of sound in the water column and a weighted tape or stadia rod for depth reading verification. Each speed of sound profile, or velocity cast, is saved for further data processing. Figure 2 shows the data collection locations for the 2018 TWDB survey.

All sounding data was collected and reviewed before sediment core sampling sites were selected. Sediment core samples are collected throughout the reservoir to assist with interpretation of the sub-bottom acoustic profiles. After analyzing the sounding data, the TWDB selected 12 locations to collect sediment core samples (Figure 2). Sediment cores were collected on November 13-14, 2018, with a custom-coring boat and an SDI VibeCore system.

Sediment cores are collected in 3-inch diameter aluminum tubes. Analysis of the acoustic data collected during the bathymetric survey assists in determining the depth of penetration the tube must be driven during sediment sampling. A sediment core extends from the current reservoir-bottom surface, through the accumulated sediment, and into the pre-impoundment surface. After the sample is retrieved, the core tube is cut to the level of the sediment core. The tube is capped and transported to TWDB headquarters for further analysis.

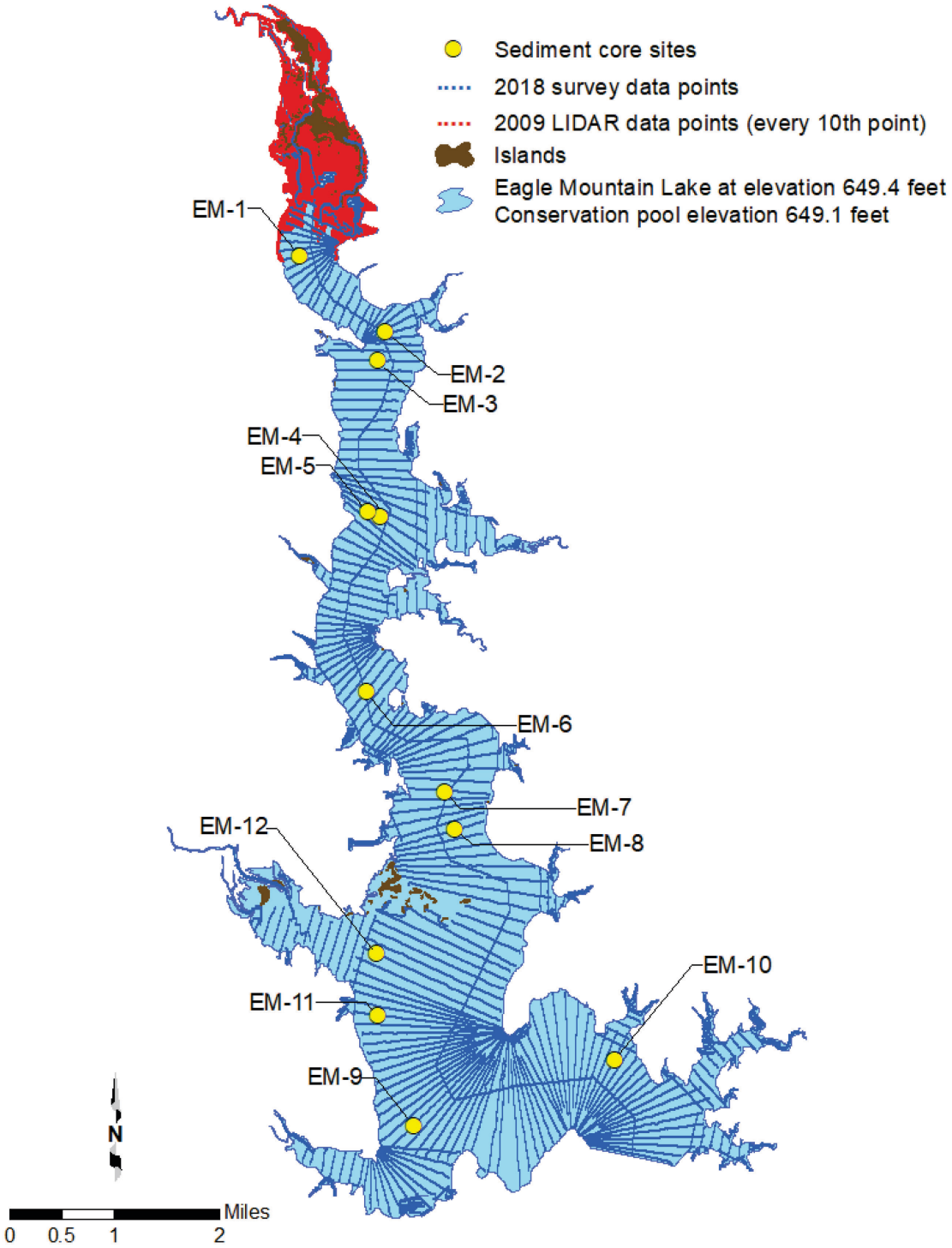


**Figure 2.** **2018 TWDB Eagle Mountain Lake survey data (*blue dots*), sediment coring locations (*yellow circles*), and 2009 LIDAR data (*red dots*).**

## Data processing

### Model boundary

The reservoir's model boundary was digitized from aerial photographs, also known as digital orthophoto quarter-quadrangle images (DOQQs), obtained through the Texas Imagery Service. The Texas Natural Resources Information System manages the Texas Imagery Service allowing public organizations in the State of Texas to access Google Imagery as a service using Environmental Systems Research Institute's ArcGIS software (Texas Natural Resources Information System, 2018a). The quarter-quadrangles containing Eagle Mountain Lake are Avondale (NW, SW), Azle (NE, SE), Boyd (SE), Lake Worth (NW), and Springtown (NE, SE). The DOQQs were photographed on January 26, 2017, while the daily average water surface elevation measured 649.44 feet (NAVD88). The DOQQs have a resolution of 6 inches (Texas Natural Resources Information System, 2018b). The model boundary was digitized at the land-water interface in the 2017 photographs and assigned an elevation of 649.4 feet.

The shoreline near the headwaters of the reservoir, within the Boyd (SE) quarter-quadrangle, is difficult to identify in the aerial photographs through dense vegetation. Therefore, the boundary near the headwaters was generated with Light Detection and Ranging (LIDAR) Data available from the Texas Natural Resource Information System. According to the associated metadata, the LIDAR data was collected on March 29, 2009, while the reservoir was at elevation 644.29 feet. The LIDAR data has a tested consolidated vertical accuracy of 0.084 meters at the $95^{th}$ percentile in all land cover categories and a horizontal accuracy of 1 meter (Texas Natural Resources Information System, 2018b). LIDAR data with a classification equal to 2, or ground, was imported into an Environmental Systems Research Institute's ArcGIS file geodatabase from .las files. A topographical model of the data was generated and converted to a raster using a cell size of 1.0 meters by 1.0 meters. The horizontal datum of the LIDAR data is Universal Transverse Mercator (UTM) North American Datum 1983 (NAD83; meters) Zone 14, and the vertical datum is North American Vertical Datum 1988 (NAVD88; meters). To integrate the LIDAR boundary with the DOQQ boundary, a contour of 197.9371 meters NAVD88, equivalent to 649.4 feet NAVD88, was extracted from the raster. Horizontal coordinate transformations to NAD83 State Plane Texas North Central Zone (feet) coordinates were done using the ArcGIS Project tool. Additional editing of the 649.4-foot contour was necessary to remove other artifacts.

**LIDAR data points**

To model the headwaters area of the reservoir where shallow depths limited sounding data collection, lidar data was used to augment the data set. To incorporate the LIDAR data into the reservoir model the.las files were converted to text files with x, y, and z values. The LIDAR data was thinned using a stepwise progression in which every $10^{th}$ point was retained to reduce computational burden. LIDAR points outside the reservoir boundary were removed before adding to the model. LIDAR data was only used to model the headwaters area due to significant changes to the shoreline throughout the main body of the reservoir since LIDAR collection in 2009 (Figure 2). According to the associated metadata, the LIDAR data points have a nominal point spacing of 1.0 meter; therefore, using a thinned point dataset did not significantly affect the modeled topography of the coverage area. No further interpolation of the data in the areas of LIDAR coverage was necessary. After the points were clipped to within the boundary, the shapefile was projected to NAD83 State Plane Texas North Central Zone (feet). A new attribute field was added to convert the elevations from meters NAVD88 to feet NAVD88 for compatibility with the bathymetric survey data.

**Triangulated Irregular Network model**

Following completion of data collection, the raw data files collected by the TWDB were edited to remove data anomalies. The reservoir's current bottom surface is automatically determined by the data acquisition software. DepthPic© software, developed by SDI, Inc., was used to display, interpret, and edit the multi-frequency data by manually removing data anomalies in the current bottom surface. The speed of sound profiles, also known as velocity casts, were used to further correct the measured depths. For each location velocity casts are collected, the harmonic mean sound speed of all the casts are calculated. From this, depths collected using one average speed of sound are corrected with an overall optimum speed of sound for each specific depth (Specialty Devices, Inc., 2018). The TWDB developed an algorithm to automatically determine the pre-impoundment surface based on the intensity of the acoustic returns. Hydropick software, developed by TWDB staff, was used to calibrate the algorithm and manually edit the pre-impoundment surfaces in areas where the algorithm did not perform as expected. For further analysis, all data was exported into a single file, including the current reservoir bottom surface, pre-impoundment surface, and sediment thickness at each sounding location. The water surface elevation at

the time of each sounding was used to convert each sounding depth to a corresponding reservoir-bottom elevation. This survey point dataset was then preconditioned by inserting a uniform grid of artificial survey points between the actual survey lines. Bathymetric elevations at these artificial points were determined using an anisotropic spatial interpolation algorithm described in the next section. This technique creates a high resolution, uniform grid of interpolated bathymetric elevation points throughout a majority of the reservoir (McEwen *et al.* 2011a). Finally, the point file resulting from spatial interpolation was used in conjunction with sounding and boundary data to create volumetric and sediment Triangulated Irregular Network (TIN) models utilizing the 3D Analyst Extension of ArcGIS. The 3D Analyst algorithm uses Delaunay's criteria for triangulation to create a grid composed of triangles from non-uniformly spaced points, including the boundary vertices (Environmental Systems Research Institute, 1995).

**Spatial interpolation of reservoir bathymetry**

Isotropic spatial interpolation techniques such as the Delaunay triangulation used by the 3D Analyst extension of ArcGIS are, in many instances, unable to suitably interpolate bathymetry between survey lines common to reservoir surveys. Reservoirs and stream channels are anisotropic morphological features where bathymetry at any particular location is more similar to upstream and downstream locations than to transverse locations. Interpolation schemes that do not consider this anisotropy lead to the creation of several types of artifacts in the final representation of the reservoir bottom surface and hence to errors in volume. These include artificially-curved contour lines extending into the reservoir where the reservoir walls are steep or the reservoir is relatively narrow, intermittent representation of submerged stream channel connectivity, and oscillations of contour lines in between survey lines. These artifacts reduce the accuracy of the resulting volumetric and sediment TIN models in areas between actual survey data.

To improve the accuracy of bathymetric representation between survey lines, the TWDB developed various anisotropic spatial interpolation techniques. Generally, the directionality of interpolation at different locations of a reservoir can be determined from external data sources. A basic assumption is that the reservoir profile in the vicinity of a particular location has upstream and downstream similarity. In addition, the sinuosity and directionality of submerged stream channels can be determined by directly examining the survey data, or more robustly by examining scanned USGS 7.5-minute quadrangle maps

(known as digital raster graphics), hypsography files (the vector format of USGS 7.5-minute quadrangle map contours), and historical aerial photographs, when available. Using the survey data, polygons are created to partition the reservoir into segments with centerlines defining directionality of interpolation within each segment. For surveys with similar spatial coverage, these interpolation definition files are, in principle, independent of the survey data and could be applied to past and future survey data of the same reservoir. In practice, minor revisions of the interpolation definition files may be needed to account for differences in spatial coverage and boundary conditions between surveys. Using the interpolation definition files and survey data, the current reservoir-bottom elevation, pre-impoundment elevation, and sediment thickness are calculated for each point in the high-resolution uniform grid of artificial survey points. The reservoir boundary, artificial survey points grid, and survey data points are used to create volumetric and sediment TIN models representing reservoir bathymetry and sediment accumulation throughout the reservoir. Specific details of this interpolation technique can be found in the HydroTools manual (McEwen and others, 2011a) and in McEwen and others (2011b).

LIDAR data can provide a detailed topography in areas inaccessible to survey data collection, such as small coves and shallow upstream areas of the reservoir, however, significant changes to the shoreline occurred throughout the main body of the reservoir between LIDAR collection in 2009 and bathymetric data collection in 2018. These shoreline changes are evident in the aerial photographs taken in 2017. Therefore, linear interpolation was used for volumetric and sediment accumulation estimations. Linear interpolation follows a line linking the survey points file to the lake boundary file (McEwen *et al.* 2011a). Without linearly interpolated data, the TIN model builds flat triangles. A flat triangle is defined as a triangle where all three vertices are equal in elevation, generally the elevation of the reservoir boundary. Reducing flat triangles by applying linear interpolation improves the elevation-capacity and elevation-area calculations, although it is not always possible to remove all flat triangles.

Figure 3 illustrates typical results from application of the anisotropic interpolation and linear interpolation techniques to Eagle Mountain Lake. In Figure 3A, deeper channels and steep slopes indicated by surveyed cross-sections are not continuously represented in areas between survey cross-sections. This is an artifact of the TIN generation routine rather than an accurate representation of the physical bathymetric surface. Inclusion of interpolation points in creation of the volumetric TIN model, represented in Figure 3B,

directs Delaunay triangulation to better represent the reservoir bathymetry between survey cross-sections. The bathymetry shown in Figure 3C was used in computing reservoir elevation-capacity (Appendix I) and elevation-area (Appendix J) tables.

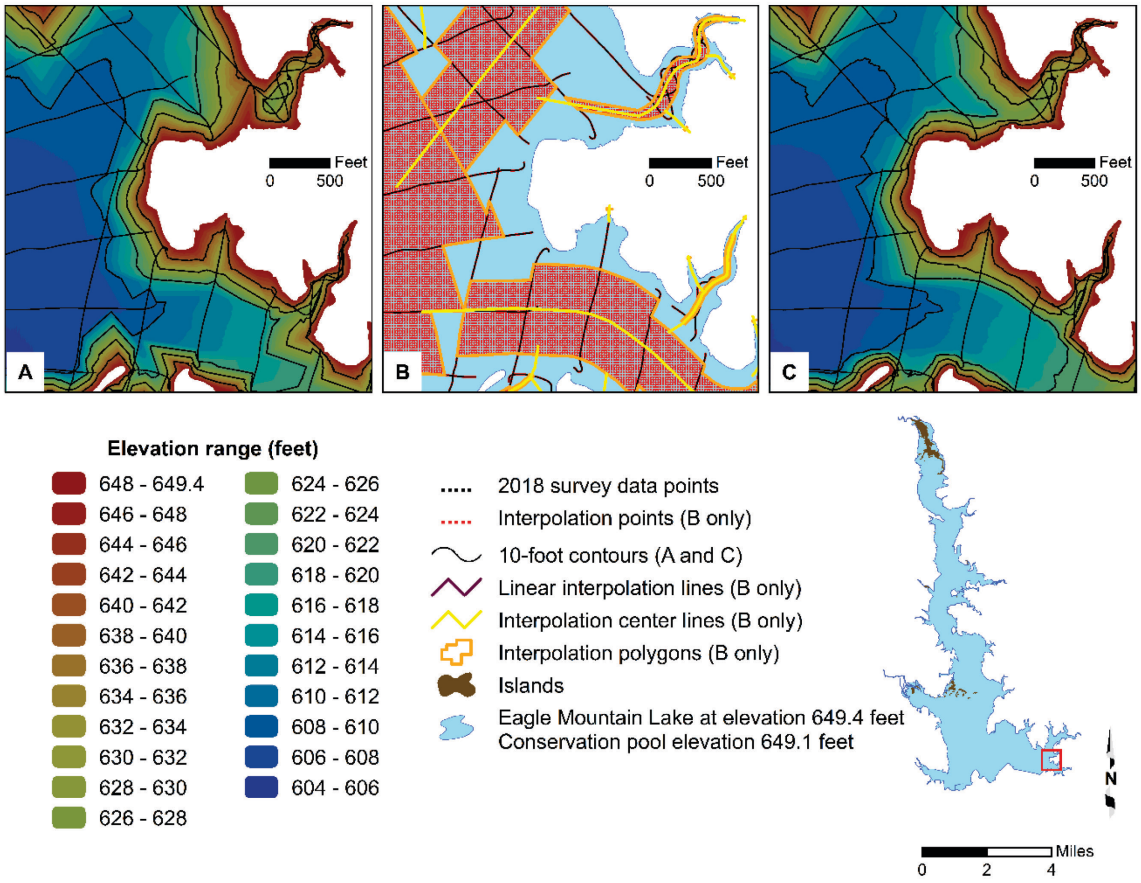


**Figure 3. Anisotropic spatial interpolation and linear interpolation of Eagle Mountain Lake sounding data; A) bathymetric contours without interpolated points, B) sounding points (*black*) and interpolated points (*red*), C) bathymetric contours with interpolated points.**

In 2016, TWDB conducted a re-assessment of surveys conducted prior to the development of current spatial interpolation techniques. As part of this re-assessment the TWDB applied anisotropic spatial interpolation to the 2001 Eagle Mountain survey. The original 2001 survey boundary (Texas Water Development Board, 2001) was revised at Eagle Mountain Marina near Castle, and a new TIN model was created using the revised boundary. Additionally, survey data points with anomalous elevations were removed from the new model. While linear interpolation was used to estimate the topography in areas without data, flat triangles led to anomalous area and volume calculations at the boundary elevation of 649.1 feet. The TWDB evaluated the availability and distribution of survey data and the shape of the elevation-area curve and determined the highest contour

accurately modeled by survey data was 647.0 feet. Therefore, areas between 647.0 feet and 649.1 feet were linearly interpolated between the computed values, and volumes above 647.0 feet were calculated based on the corrected areas (Texas Water Development Board, 2016). The re-calculated 2001 elevation-capacity table and elevation-area table are presented in Appendices A and B, respectively. The re-calculated capacity curve is presented in Appendix C, and the area curve is presented in Appendix D.

Cross-sectional comparison of the 2018, 2008, and 2001 TWDB current bottom surfaces revealed several discrepancies within the 2008 bottom surface. Upon further investigation, discrepancies between overlapping data in the 2008 survey suggested an error occurred during the original processing of the data. Available field notes suggested a possible draft error. Using the cross-sectional comparisons of the three surveys, draft corrections were estimated and applied to the final 2008 survey data set. The original 2008 model boundary, digitized from aerial photographs taken between August 3, 2004, and August 4, 2004, while the daily average water surface elevations measured between 648.74 feet and 648.68 feet, was modified to include the 2009 LIDAR shoreline in the upper reaches within the Boyd (SE) quarter-quadrangle. Using the same interpolation definition file used for the 2018 survey, with minor edits to account for differences in data coverage and boundary conditions, anisotropic spatial interpolation was applied to the 2008 data to provide a new best estimate of the total reservoir capacity. Many contour segments digitized from aerial photographs taken on July 30, 2006, and August 19, 2006, while the water surface elevation measured 643.81 feet, and 2009 LIDAR points were also used in the new model.

While linear interpolation was used to estimate the topography in areas without data, flat triangles at contour elevation 643.81 feet led to anomalous area and volume calculations at elevations immediately above and below the contour. The TWDB evaluated the availability and distribution of survey data and the shape of the elevation-area curve to determine cubic spline interpolation of the areas between 641.0 and 643.85 feet, and 643.85 and 645.0 feet would best estimate the areas between these elevations. Volumes above 641.0 feet were calculated based on the corrected areas. The re-calculated 2008 elevation-capacity table and elevation-area table are presented in Appendices E and F, respectively. The re-calculated capacity curve is presented in Appendix G, and the area curve is presented in Appendix H.

**Area, volume, and contour calculation**

Using ArcInfo software and the volumetric TIN model, volumes and areas were computed for the entire reservoir at 0.1-foot intervals, from 599.0 to 649.4 feet. The elevation-capacity table and elevation-area table, based on the 2018 survey and analysis, are presented in Appendices I and J, respectively. The capacity curve is presented in Appendix K, and the area curve is presented in Appendix L.

The volumetric TIN model was converted to a raster representation using a cell size of 2 feet by 2 feet. The raster data then was used to produce three figures: (1) an elevation relief map representing the topography of the reservoir bottom (Figure 4); (2) a depth range map showing shaded depth ranges for Eagle Mountain Lake (Figure 5); and, (3) a 2-foot contour map (Figure 6).

# Figure 4

# Eagle Mountain Lake

## Elevation relief map

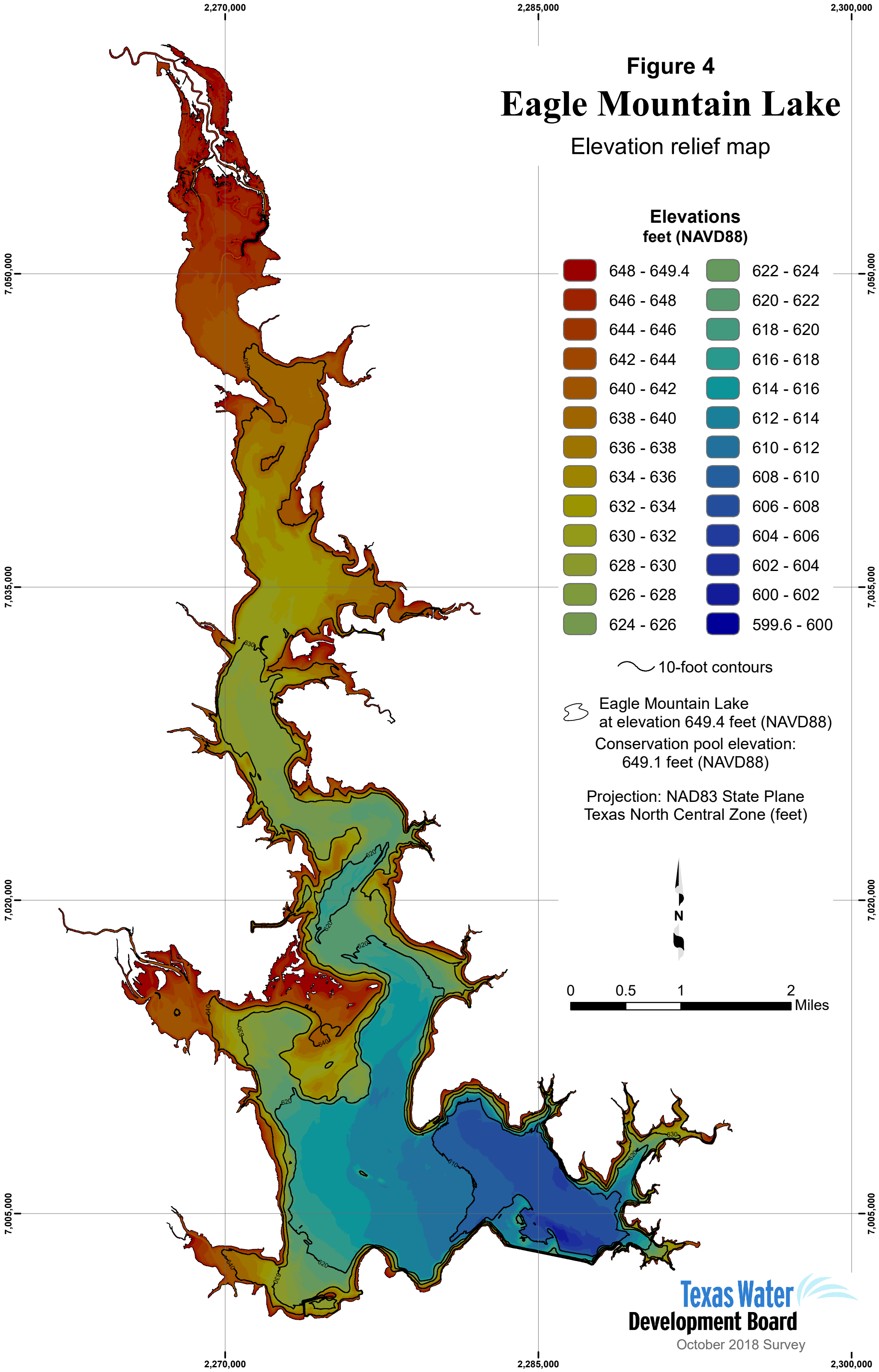


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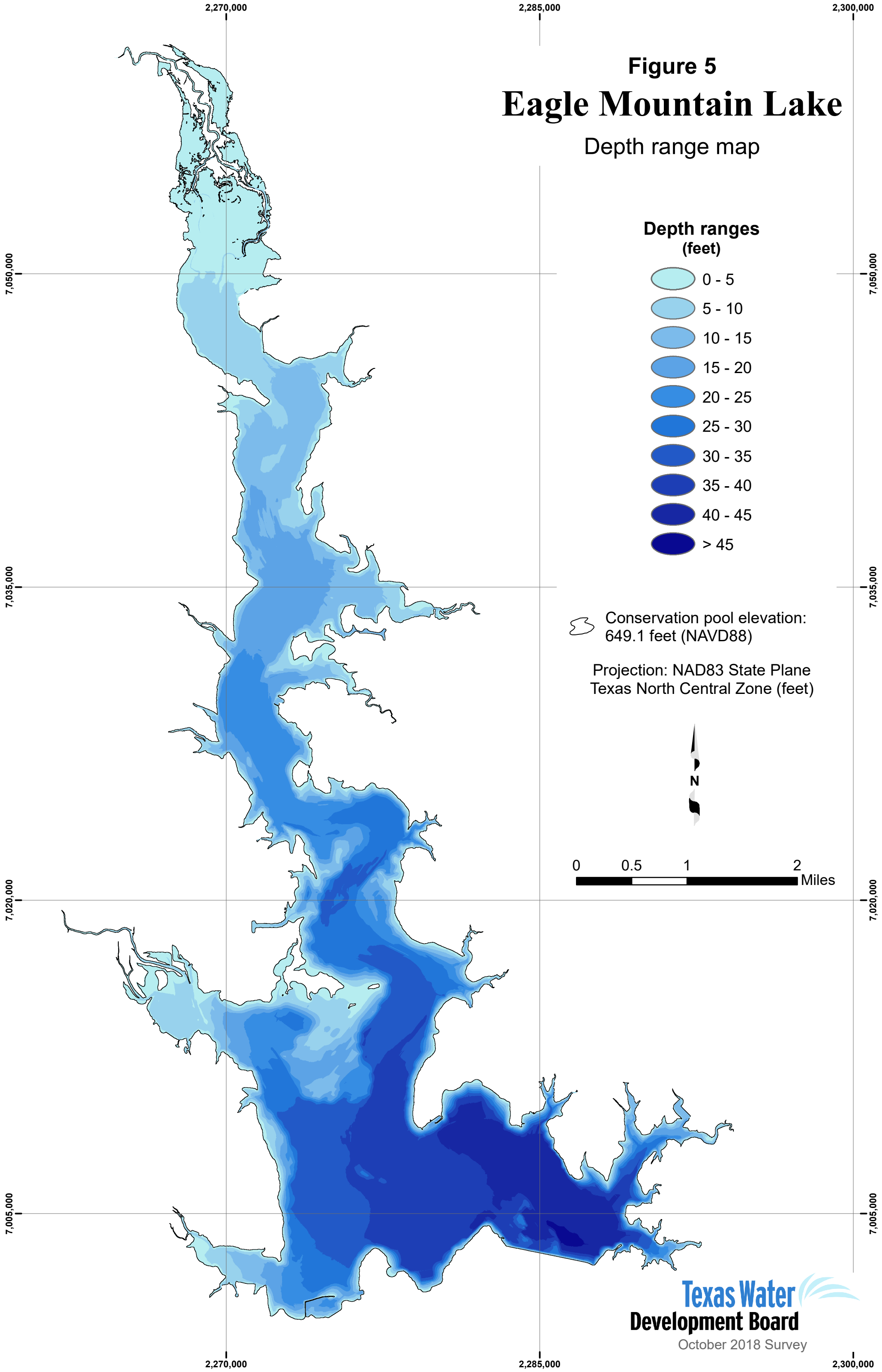
Figure 5

# Eagle Mountain Lake

Depth range map

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**Analysis of sediment data from Eagle Mountain Lake**

Sedimentation in Eagle Mountain Lake was determined by analyzing the acoustic signal returns of all three depth sounder frequencies using customized software called Hydropick. While the 208 kHz signal is used to determine the current bathymetric surface, the 208 kHz, 50 kHz, and 12 kHz, are analyzed to determine the reservoir bathymetric surface at the time of initial impoundment, *i.e.*, pre-impoundment surface. Sediment core samples collected in the reservoir are correlated with the acoustic signals in each frequency to assist in identifying the pre-impoundment surface. The difference between the current surface bathymetry and the pre-impoundment surface bathymetry yields a sediment thickness value at each sounding location.

Sediment cores were analyzed at TWDB headquarters in Austin. Each core was split longitudinally and analyzed to identify the location of the pre-impoundment surface. The pre-impoundment surface was identified within the sediment core using the following methods: (1) a visual examination of the sediment core for terrestrial materials, such as leaf litter, tree bark, twigs, intact roots, *etc.*, concentrations of which tend to occur on or just below the pre-impoundment surface; (2) recording changes in texture from well sorted, relatively fine-grained sediment to poorly sorted mixtures of coarse and fine-grained materials; and, (3) identifying variations in the physical properties of the sediment, particularly sediment water content and penetration resistance with depth (Van Metre and others, 2004). Total sediment core length, post impoundment sediment thickness, and pre-impoundment thickness were recorded. Physical characteristics of the sediment core, such as Munsell soil color, texture, relative water content, and presence of organic materials were recorded (Table 2).

**Table 2. Sediment core sample analysis data for Eagle Mountain Lake.**

| Sediment core sample | Easting[a] (feet) | Northing[a] (feet) | Total core sample/ post-impoundment sediment | Sediment core description | | Munsell soil color |
|---|---|---|---|---|---|---|
| EM-1 | 2268757.86 | 7048372.28 | 32.0”/ 2.5” | post-impoundment | 0.0–2.5” high water content, chunky/globby texture, uniform color/consistency throughout | 10YR 3/2 very dark grayish brown |
| | | | | pre-impoundment | 2.5–32.0” mostly clay, malleable (holds shape), water content decreases with depth, uniform color/texture throughout | 10YR 4/1 dark gray |
| EM-2 | 2273041.34 | 7044543.89 | 78.5”/ 57.0” | post-impoundment | 0.0–57.0” pudding like, color/texture consistent throughout, minimal organic material at 22.0 inches, decreasing water content with depth | 10YR 2/1 black |
| | | | | pre-impoundment | 57.0–64.0” gritty texture, high water content, sticky (similar to peanut butter), uniform consistency | 10YR 3/1 very dark gray |
| | | | | | 64.0–78.5” all clay, dense and compact, holds shape, uniform color/consistency | 10YR 4/1 dark gray |
| EM-3 | 2272682.53 | 7043091.67 | 18.5”/ 2.0” | post-impoundment | 0.0–2.0” very sandy (gritty) silt, small pieces of shell/rock, uniform color throughout, loosely packed | 2.5YR 4/2 dark grayish brown |
| | | | | pre-impoundment | 2.0–18.5” dense, very low water content, malleable, gritty, uniform color/texture throughout | 2.5YR 4/6 red |
| EM-4 | 2272775.19 | 7035221.07 | 72.0”/ 53.0” | post-impoundment | 0.0–2.0” pudding like, silty, smooth, very high water content, uniform color/texture | 10YR 3/1 very dark gray |
| | | | | | 2.0–35.0” smooth pudding like, uniform color/texture throughout, loosely packed material, high water content (less than previous layer) | 10YR 3/1 very dark gray |
| | | | | | 35.0–43.0” loosely packed, moderate water content, pudding like with thick grains of clay | 10YR 2/1 black |
| | | | | | 43.0–53.0” very smooth, sticky, moderate water content, will not hold shape, uniform color/texture throughout | 10YR 3/1 very dark gray |
| | | | | pre-impoundment | 53.0–72.0” predominately clay, small bits of organic matter (roots), water content decreasing with depth | 10YR 3/1 very dark gray |

[a] Coordinates are based on NAD83 State Plane Texas North Central System (feet)

**Table 2. Sediment core sample analysis data for Eagle Mountain Lake (continued).**

| Sediment core sample | Easting[a] (feet) | Northing[a] (feet) | Total core sample/ post-impoundment sediment | | Sediment core description | Munsell soil color |
|---|---|---|---|---|---|---|
| EM-5 | 2272192.57 | 7035514.80 | 34.5”/ 10” | post-impoundment | 0–1.0” very high water content, smooth with grittiness, color consistent throughout | 10YR 3/1 very dark gray |
| | | | | | 0–10.0” high water content, clay present | 10YR 3/1 black |
| | | | | pre-impoundment | 10.0–34.5” high water content decreasing to moderate at bottom, organic material present (woody debris), clay material present, sticky (similar to peanut butter) | 10YR 2/1 black |
| EM-6 | 2272100.74 | 7026394.82 | 45.5”/N/A | post-impoundment | 0.0–2.0” very high water content, smooth, uniform color/texture throughout, soupy consistency | 10YR 3/1 very dark gray |
| | | | | | 2.0–39.0” high water content, pudding like, smooth, uniform color/texture throughout | 10YR 2/1 black |
| | | | | | 39.0–45.5” high water content, uniform color/texture throughout, more dense than previous layers, pudding like, will somewhat hold shape | 10YR 3/1 very dark gray |
| EM-7 | 2276040.19 | 7021372.62 | 27.25”/19.0” | post-impoundment | 0.0–19.0” high water content, organic matter at 16 inches, smooth, uniform color/texture throughout, pudding like | 2.5Y 3/3 dark olive brown |
| | | | | pre-impoundment | 19.0–27.25” very low water content, dense clay material, organic material present (roots, woody debris), water decreases throughout layer, uniform color/texture throughout | 2.5Y 3/2 |
| EM-8 | 2276534.47 | 7019459.50 | 35.5”/12.0” | post-impoundment | 0.0–3.0” very high water content, soupy, uniform color/texture throughout, organic material present | 10YR 3/2 very dark grayish brown |
| | | | | | 3.0–12.0” high water content, soupy, uniform color/texture throughout, organic material present | 10YR 3/2 very dark grayish brown |
| | | | | pre-impoundment | 12.0–35.5” moderate water content (decreasing throughout layer), organic material present (woody debris, roots), compacted sand | 10YR 3/2 very dark grayish brown (top), 10YR 4/3 brown (bottom) |

[a] Coordinates are based on NAD83 State Plane Texas North Central System (feet)

**Table 2. Sediment core sample analysis data for Eagle Mountain Lake (continued).**

| Sediment core sample | Easting[a] (feet) | Northing[a] (feet) | Total core sample/ post-impoundment sediment | Sediment core description | | Munsell soil color |
|---|---|---|---|---|---|---|
| EM-9 | 2274482.95 | 7004556.66 | 87.75”/45.0” | post-impoundment | 0.0–9.0” very high water content, soupy, smooth, uniform color/texture throughout | 10YR 2/1 black |
| | | | | | 9.0–45.0” high water content, pudding like, smooth texture, uniform color/texture throughout | 10YR 2/1 black |
| | | | | pre-impoundment | 45.0–55.0” high water content (48.0”–55.0”) decreasing to very low, uniform color/texture throughout, clay present, malleable, sticking | no color recorded |
| | | | | | 55.0–87.75” high water content decreasing to very low, uniform color/texture throughout, clay present, malleable, sticking | no color recorded |
| EM-10 | 2284598.41 | 7007837.50 | 116.0”/94.0” | post-impoundment | 0.0–29.0” high water content, pudding like, uniform color/texture throughout | 10YR 3/1 very dark gray |
| | | | | | 29.0–94.0” high water content, pudding like, more dense than previous layer, smooth, uniform color/texture throughout | 10YR 3/1 very dark gray |
| | | | | pre-impoundment | 94.0–116.0” moderate water content decreasing to low, organic material present at top and bottom of layer, predominately clay, malleable, sediment at top of layer is sticky | 10YR 2/1 black |
| EM-11 | 2272651.69 | 7010111.55 | 109.0”/52.0” | post-impoundment | 0.0–39.0” high water content, pudding like, smooth, uniform color/texture throughout | 10YR 3/1 very dark gray |
| | | | | | 39.0–52.0 high water content, silt/sand mix, milkshake consistency, organic material (roots) present at bottom of layer, uniform color/texture throughout | 10YR 3/2 very dark grayish brown |
| | | | | pre-impoundment | 52.0–94.0” low water content decreasing with depth, very dense, organic material present at top and middle (66.0”) of layer, predominately compacted sand | 10YR 5/3 brown |
| | | | | | 94.0–109.0” very low water content, predominately clay, malleable, dense, organic material found throughout, uniform color/texture throughout | 10YR 2/1 black |

[a] Coordinates are based on NAD83 State Plane Texas North Central System (feet)

**Table 2. Sediment core sample analysis data for Eagle Mountain Lake (continued).**

| Sediment core sample | Easting[a] (feet) | Northing[a] (feet) | Total core sample/ post-impoundment sediment | Sediment core description | | Munsell soil color |
|---|---|---|---|---|---|---|
| EM-12 | 2272640.39 | 7013199.46 | 116.0”/63.0” | post-impoundment | 0.0–18.0” high water content, pudding like, smooth, organic material present (woody debris, roots) | 10YR 3/1 very dark gray |
| | | | | | 18.0–63.0” high water content (less than previous layer), smooth clumps of clay present throughout, pudding like, uniform color/texture throughout, more dense, sticky, organic material (rocks) present | 10YR 3/1 very dark gray |
| | | | | pre-impoundment | 63.0–76.0” moderate water content, organic material present at top of layer, high concentration of clay, sticky, more dense than previous layer, sand mixed throughout (gritty), uniform color/texture throughout | 10YR 2/1 black |
| | | | | | 76.0–101.0” low water content, sand/clay mix, predominately sand, organic material present (roots), dense | 10YR 3/1 very dark gray |
| | | | | | 101.0–116.0” low to no water content, predominately clay, malleable, holds shape, organic material present (woody debris, roots), uniform color/texture throughout | 10YR 2/1 black |

[a] Coordinates are based on NAD83 State Plane Texas North Central System (feet)

A photograph of sediment core EM-9 (for location, refer to Figure 2) is shown in Figure 7 and is representative of sediment cores sampled from Eagle Mountain Lake. The base of the sample is denoted by the blue line. The pre-impoundment boundary (right most yellow line) was evident within this sediment core sample at 45.0 inches and identified by the change in color, texture, moisture, porosity, and structure. Identification of the pre-impoundment surface for each sediment core followed a similar procedure.

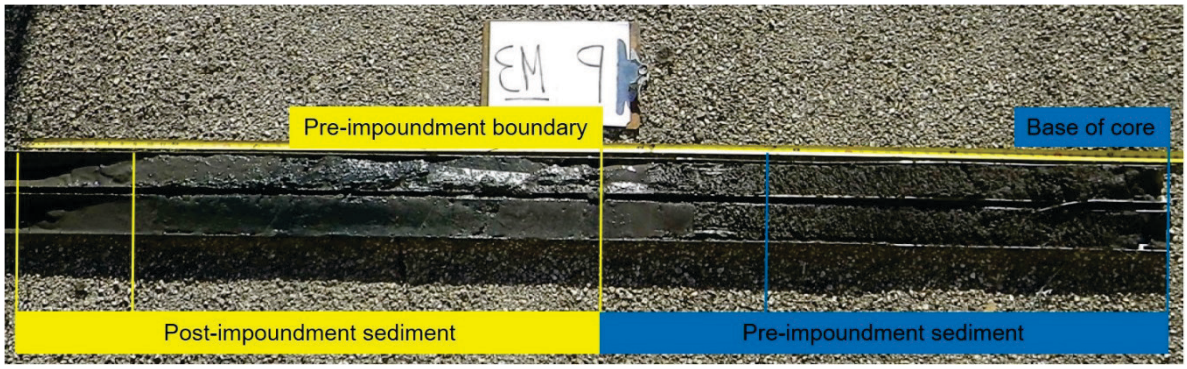



**Figure 7. Sediment core EM-9 from Eagle Mountain Lake. Post-impoundment sediment layers occur in the top 45.0 inches of this sediment core (identified by the yellow box). Pre-impoundment sediment layers were identified and are defined by the blue box.**

Figure 8 compares sediment core sample EM-9 with the acoustic signals as seen in Hydropick for each frequency: 208 kHz, 50 kHz, and 12 kHz. The current bathymetric surface is automatically determined based on signal returns from the 208 kHz transducer as represented by the top red line in Figure 8. The pre-impoundment surface is identified by comparing boundaries observed in the 208 kHz, 50 kHz, and 12 kHz signals to the location of the pre-impoundment surface of the sediment core sample. Many layers of sediment were identified during analysis based on changes in observed characteristics such as water content, organic matter content, and sediment particle size, and each layer is classified as either post-impoundment or pre-impoundment. The boundary of each layer of sediment identified in the sediment core sample during analysis (Table 2) is represented in Figures 8 and 9 by a yellow or blue box. A yellow box represents post-impoundment sediments. A blue box indicates pre-impoundment sediments that were identified.

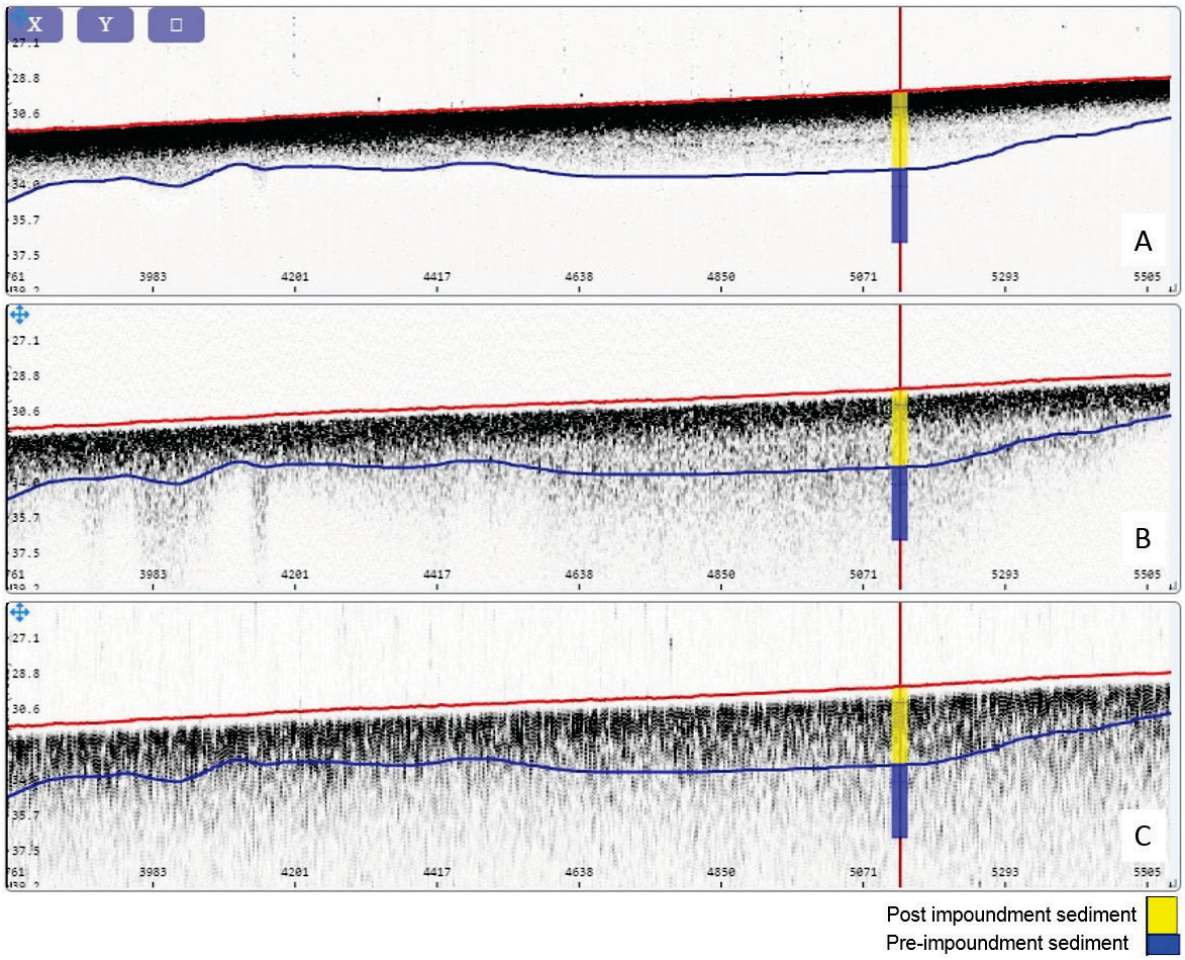



**Figure 8. Comparison of sediment core EM-9 with acoustic signal returns. A) 208 kHz frequency, B) 50 kHz frequency, and C) 12 kHz frequency. The current surface in red and pre-impoundment surface in blue.**

In this case, the boundary in the 208 kHz signal most closely matched the pre-impoundment interface of the sediment core sample; therefore, the 208 kHz signal was used to locate the pre-impoundment surface (blue line in the top panel in Figure 8). Figure 9 shows sediment core sample EM-9 correlated with the 208 kHz frequency of the nearest surveyed cross-section. The pre-impoundment surface is first identified along cross-sections for which sediment core samples have been collected. This information then is used as a guide for identifying the pre-impoundment surface along cross-sections where sediment core samples were not collected.

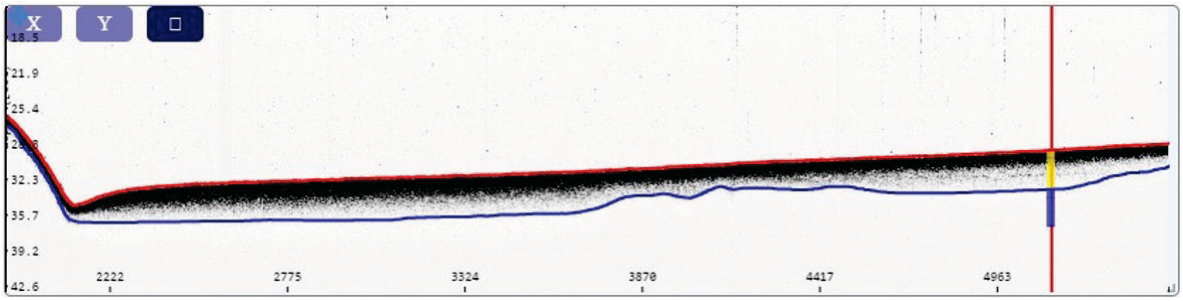



**Figure 9. Cross-section of data collected during survey, displayed in Hydropick (208 kHz frequency), correlated with sediment core sample EM-9 and showing the current surface in red and pre-impoundment surface in blue.**

The pre-impoundment surface was automatically generated in Hydropick using Otsu's thresholding algorithm of classifying greyscale intensity images into binary (black and white) images based on maximum inter-class variance. The acoustic return images of a selected frequency from each survey line were processed using this technique and the pre-impoundment surface was identified as the bottom black/white interface (where black is the sediment layer) of the resulting binary image (D. Pothina, written commun., 2014). The pre-impoundment surface then is verified and edited manually as needed.

Identification of the pre-impoundment surface can be challenging. Eagle Mountain Lake has periodically experienced low water levels leading to the desiccation of any exposed sediment. Upon inundation and re-saturation, exposed sediment will not return to its original high level of water content (Dunbar and Allen, 2003). Drying of sediment in exposed areas create hard surfaces that cannot be penetrated with gravity coring techniques, and compressive stresses on the sediments may also increase sediment density, inhibiting the measurement of the original, pre-impoundment surface. Density stratification in the sediment layers can also scatter and attenuate acoustic return signals of the multi-frequency depth sounder (U.S. Army Corps of Engineers, 2013).

After the pre-impoundment surface for all cross-sections is identified, a pre-impoundment TIN model and a sediment thickness TIN model are created following standard GIS techniques (Furnans and Austin, 2007). Pre-impoundment elevations and sediment thicknesses are interpolated between surveyed cross-sections using HydroTools with the same interpolation definition file used for bathymetric interpolation. For the purposes of TIN model creation, the TWDB assumed the sediment thickness at each LIDAR data point and the reservoir boundary was 0 feet (defined as the 649.4-foot elevation contour). LIDAR data points overlapping survey data were deleted from the pre-

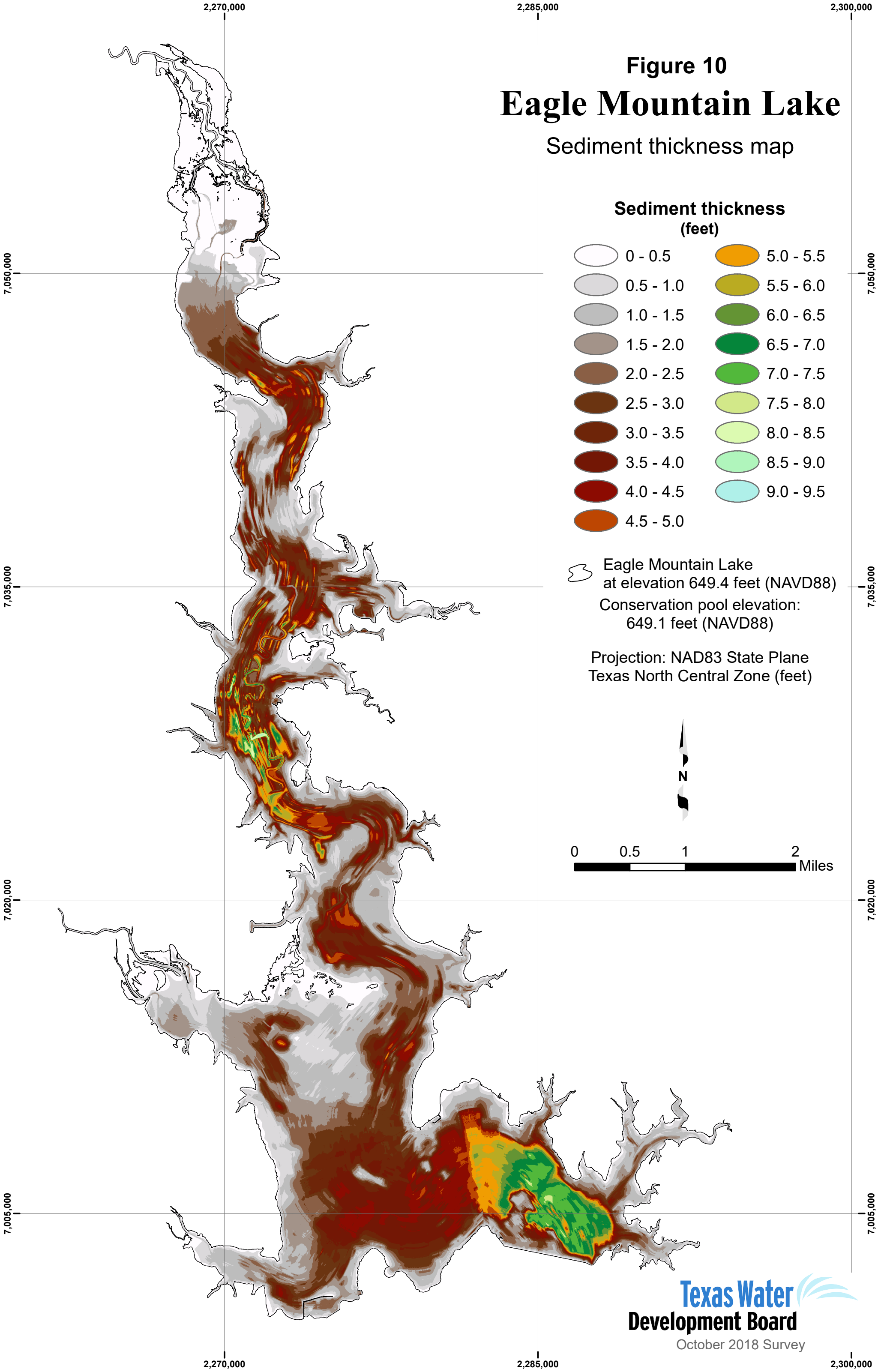
impoundment and sediment thickness TIN models. The sediment thickness TIN model was converted to a raster representation using a cell size of 5 feet by 5 feet and was used to produce a sediment thickness map of Eagle Mountain Lake (Figure 10). Using ArcInfo software, the pre-impoundment TIN model was used to compute elevation-capacity and elevation-area tables for the purpose of calculating the total volume of accumulated sediment.

Although LIDAR and linear interpolation were used to estimate topography in areas inaccessible by boat or too shallow for the instruments to work properly, development of some flat triangles (triangles whose vertices all have the same elevation) in the pre-impoundment TIN model are unavoidable. The flat triangles and lack of pre-impoundment elevations for the LIDAR data led to anomalous calculations of the pre-impoundment surface area and volume for the higher elevations. The TWDB evaluated the availability and distribution of bathymetric survey data and the shape of the elevation-area curve to determine the highest pre-impoundment contour accurately modeled by survey data was 644.0 feet. To mitigate the effects of insufficient data in the upper elevations on area and volume calculations, areas between elevations 644.0 and 649.4 feet were linearly interpolated between the computed values, and volumes above elevation 644.0 feet were calculated based on the corrected areas.

Figure 10

# Eagle Mountain Lake

Sediment thickness map




Texas Water Development Board

October 2018 Survey

## Survey results

### Volumetric survey

**The 2018 TWDB volumetric survey indicates that Eagle Mountain Lake has a total reservoir capacity of 185,087 acre-feet and encompasses 9,246 acres at conservation pool elevation (649.1 feet NAVD88).** Previous capacity estimates include three U.S. Department of Agriculture estimates of 211,000 acre-feet, 205,175 acre-feet and 182,000 acre-feet in 1934, 1939, and 1952, respectively, a 1968 U.S. Army Corps of Engineers estimate of 190,460 acre-feet, and a 1988 Freese and Nichols estimate of 178,440 acre-feet. Re-evaluation of the 2001 and 2008 TWDB surveys resulted in updated capacity estimates of 184,157 acre-feet and 187,387 acre-feet (Table 3). Differences in surface area are most likely attributable to differences in reservoir boundary delineation methods. Because of differences in past and present survey methodologies, direct comparison of volumetric surveys to others to estimate loss of area and capacity can be unreliable.

**Table 3. Current and previous survey capacity and surface area estimates for Eagle Mountain Lake.**

| Top of conservation pool elevation (649.1 feet NAVD88) | | | |
|---|---|---|---|
| **Survey** | **Surface area (acres)** | **Total capacity (acre-feet)** | **Source** |
| **1934** | - | 211,000 | Dendy and Champion, 1969 |
| **1939** | - | 205,175 | Dendy and Champion, 1969 |
| **1952** | - | 182,000 | Dendy and Champion, 1969 |
| **1968** | 9,200 | 190,460 | U.S. Army Corps of Engineers, 1968 |
| **1988** | 9,030 | 178,440 | Freese and Nichols, 1988 |
| **TWDB 2001** | 8,702 | 182,505 | Texas Water Development Board, 2001 |
| **TWDB 2001 (re-calculated)** | 8,737 | 184,157 | Texas Water Development Board, 2016 |
| **TWDB 2008** | 8,694 | 179,880 | Texas Water Development Board, 2008 |
| **TWDB 2008 (re-calculated)** | 9,132 | 187,387 | |
| **TWDB 2018** | 9,246 | 185,087 | |

**Sedimentation survey**

**The 2018 TWDB sedimentation survey indicates Eagle Mountain Lake has lost capacity at an average of 260 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (649.1 feet NAVD88). Long-term trends indicate Eagle Mountain Lake loses capacity at an average of 274 acre-feet per year since impoundment due to sedimentation below conservation pool elevation (649.1 feet NAVD88).** The sedimentation survey indicates sediment accumulation is occurring throughout the reservoir. Comparison of capacity estimates of Eagle Mountain Lake derived using differing methodologies are provided in Table 4 for sedimentation rate calculation.

**Table 4. Average annual capacity loss comparisons for Eagle Mountain Lake.**

| Survey | Volume comparisons at top of conservation pool elevation 649.1 feet NAVD88 (acre-feet) | | | | | |
|---|---|---|---|---|---|---|
| 1934[a] | 211,000 | <> | <> | <> | <> | <> |
| 1939[a] | <> | 205,175 | <> | <> | <> | <> |
| 1968[b] | <> | <> | 190,460 | <> | <> | <> |
| TWDB 2001 (re-calculated) | <> | <> | <> | 184,157 | <> | <> |
| TWDB 2008 (re-calculated) | <> | <> | <> | <> | 187,387 | <> |
| TWDB pre-impoundment estimate based on 2018 survey | <> | <> | <> | <> | <> | 206,914 |
| 2018 volumetric survey | 185,087 | 185,087 | 185,087 | 185,087 | 185,087 | 185,087 |
| Volume difference (acre-feet) | 25,913 (12.3%) | 20,088 (9.8%) | 5,373 (2.8%) | -930 (-0.5%) | 2,300 (1.2%) | 21,827 (10.5%) |
| Number of years | 84 | 79 | 50 | 17 | 10 | 84 |
| Capacity loss rate (acre-feet/year) | 308 | 254 | 107 | -55 | 230 | 260 |
| Capacity loss rate (acre-feet/square mile of drainage area of 1,970[a] square miles /year) | 0.16 | 0.13 | 0.05 | -0.03 | 0.12 | 0.13 |

[a] Source: (Dendy and Champion, 1969), note: Eagle Mountain Dam was completed in October 24, 1932, and the deliberate impoundment began on February 28, 1934.
[b] Source: U.S. Army Corps of Engineers, 1968.

To account for short-term variances in sedimentation rate, the TWDB generated a trend line utilizing the pre-impoundment value identified in the 2018 survey and all TWDB volumetric estimates generated in 2001, 2008, and 2018 to show the sedimentation rate trend since impoundment. The 1934, 1939, 1952, 1968 and 1988 estimates were not considered in the long-term rate calculation. Results show a 274 acre-feet per year sedimentation rate and are shown in Figure 11.

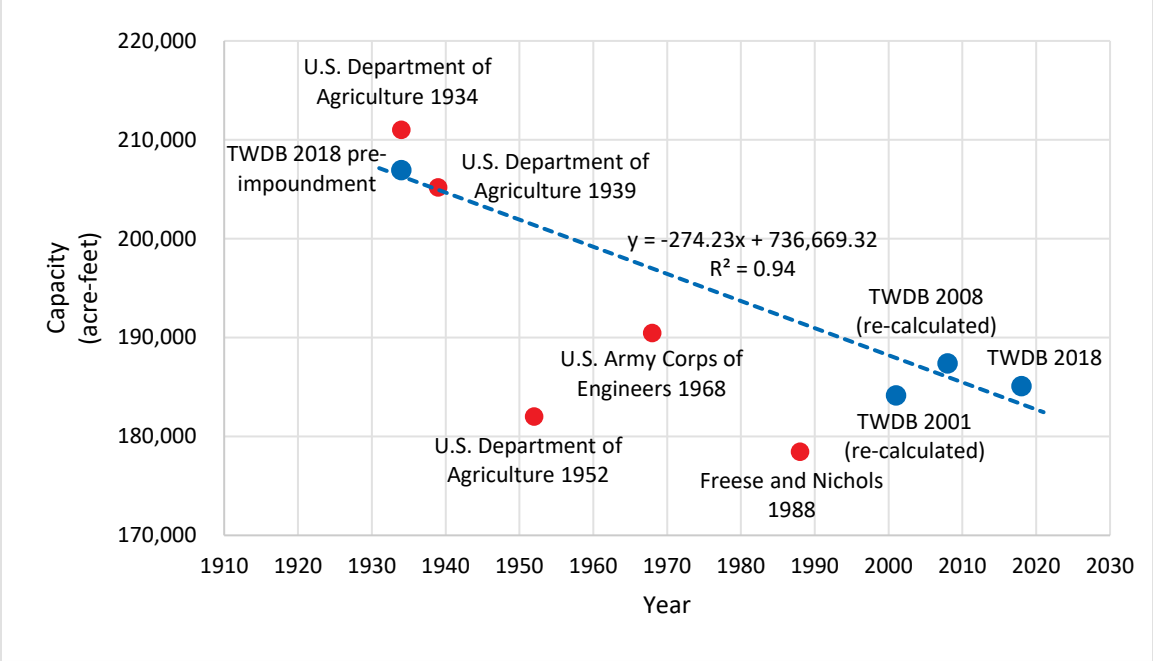



**Figure 11. Plot of current and previous capacity estimates (acre-feet) for Eagle Mountain Lake. Capacity estimates for each TWDB survey plotted as blue dots and other surveys as red dots. The blue trend line illustrates the total average loss of capacity through 2018.**

## Sediment range lines

In 2001, the TWDB established seventeen sediment range lines throughout Eagle Mountain Lake to measure sediment accumulation over time. A cross-sectional comparison of the seventeen sediment range lines comparing the current bottom surface from the 2018 TWDB survey, the 2008 TWDB re-calculated survey, and the 2001 TWDB re-calculated survey is presented in Appendix M. Also presented in Appendix M are a map, depicting the locations of the sediment range lines and Table M1, a list of the endpoint coordinates for each line. Some differences in the cross-sections may be a result of spatial interpolation and the interpolation routine of the TIN Model.

## Axial profile

At the request of the Tarrant Regional Water District, the TWDB surveyed the axial profile of the reservoir. This profile showing both the 2018 current and pre-impoundment surfaces is plotted in Appendix N. Also presented in Appendix N are a map, depicting the TWDB location of the axial profile, and a table listing the coordinates of each vertex defining the axial line.

Identification of the pre-impoundment surface on the axial profile was based on the acoustic returns identified in the cross-sections where sediment cores were collected. Sediment core sites were selected to recollect cores where previously collected in 2008 and to correlate with unique acoustic returns throughout the reservoir. Axial profile data points within 1.5 feet of survey data points were compared to refine identification of the pre-impoundment surface along survey transects. Pre-impoundment acoustic signature interpretation was refined based on the agreement between intersecting data and applied during pre-impoundment identifications throughout the reservoir.

## Recommendations

The TWDB recommends a detailed analysis of sediment deposits in the areas where exposure of the lake bottom may have led to identification of a false pre-impoundment using augured-coring techniques, as well as a volumetric and sedimentation survey in 10 years or after a major flood event to further improve estimates of sediment accumulation rates.

## TWDB contact information

More information about the Hydrographic Survey Program can be found at:

http://www.twdb.texas.gov/surfacewater/surveys/index.asp

Any questions regarding the TWDB Hydrographic Survey Program may be addressed to:

Hydrosurvey@twdb.texas.gov

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Appendix A

# Eagle Mountain Lake

## RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD
CAPACITY IN ACRE-FEET
ELEVATION INCREMENT IS ONE TENTH FOOT

May 2001 Survey re-calculated October 2016
Conservation pool elevation 649.1 feet NGVD29

| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 599 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| 600 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 |
| 601 | 11 | 12 | 13 | 14 | 15 | 17 | 18 | 20 | 21 | 23 |
| 602 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 43 |
| 603 | 45 | 47 | 50 | 53 | 56 | 59 | 62 | 65 | 68 | 72 |
| 604 | 76 | 80 | 84 | 89 | 94 | 100 | 106 | 112 | 119 | 127 |
| 605 | 136 | 146 | 158 | 173 | 190 | 210 | 233 | 258 | 286 | 315 |
| 606 | 347 | 380 | 414 | 450 | 488 | 526 | 567 | 608 | 652 | 696 |
| 607 | 742 | 790 | 838 | 888 | 939 | 991 | 1,045 | 1,100 | 1,156 | 1,214 |
| 608 | 1,272 | 1,332 | 1,393 | 1,456 | 1,519 | 1,584 | 1,650 | 1,718 | 1,786 | 1,855 |
| 609 | 1,925 | 1,997 | 2,069 | 2,143 | 2,219 | 2,297 | 2,376 | 2,457 | 2,540 | 2,624 |
| 610 | 2,710 | 2,797 | 2,887 | 2,979 | 3,073 | 3,169 | 3,268 | 3,369 | 3,472 | 3,578 |
| 611 | 3,686 | 3,795 | 3,906 | 4,019 | 4,136 | 4,256 | 4,379 | 4,505 | 4,635 | 4,767 |
| 612 | 4,902 | 5,040 | 5,180 | 5,323 | 5,469 | 5,617 | 5,768 | 5,921 | 6,076 | 6,233 |
| 613 | 6,392 | 6,553 | 6,716 | 6,881 | 7,048 | 7,217 | 7,388 | 7,561 | 7,737 | 7,916 |
| 614 | 8,097 | 8,280 | 8,465 | 8,653 | 8,843 | 9,036 | 9,231 | 9,429 | 9,629 | 9,831 |
| 615 | 10,035 | 10,242 | 10,450 | 10,659 | 10,871 | 11,084 | 11,299 | 11,516 | 11,735 | 11,956 |
| 616 | 12,180 | 12,405 | 12,632 | 12,861 | 13,092 | 13,324 | 13,558 | 13,793 | 14,029 | 14,267 |
| 617 | 14,507 | 14,747 | 14,989 | 15,232 | 15,477 | 15,723 | 15,970 | 16,218 | 16,468 | 16,720 |
| 618 | 16,973 | 17,227 | 17,483 | 17,740 | 17,998 | 18,258 | 18,519 | 18,782 | 19,046 | 19,312 |
| 619 | 19,579 | 19,847 | 20,117 | 20,389 | 20,663 | 20,937 | 21,213 | 21,491 | 21,770 | 22,050 |
| 620 | 22,332 | 22,615 | 22,902 | 23,190 | 23,482 | 23,775 | 24,070 | 24,366 | 24,664 | 24,964 |
| 621 | 25,265 | 25,568 | 25,872 | 26,178 | 26,485 | 26,794 | 27,105 | 27,417 | 27,731 | 28,047 |
| 622 | 28,364 | 28,683 | 29,003 | 29,324 | 29,647 | 29,971 | 30,297 | 30,623 | 30,951 | 31,280 |
| 623 | 31,609 | 31,940 | 32,272 | 32,605 | 32,939 | 33,273 | 33,609 | 33,947 | 34,285 | 34,625 |
| 624 | 34,967 | 35,310 | 35,655 | 36,001 | 36,348 | 36,697 | 37,047 | 37,399 | 37,751 | 38,106 |
| 625 | 38,462 | 38,819 | 39,178 | 39,539 | 39,901 | 40,265 | 40,631 | 40,998 | 41,368 | 41,740 |
| 626 | 42,114 | 42,489 | 42,867 | 43,247 | 43,628 | 44,011 | 44,396 | 44,782 | 45,169 | 45,558 |
| 627 | 45,949 | 46,342 | 46,736 | 47,132 | 47,531 | 47,931 | 48,333 | 48,738 | 49,144 | 49,554 |
| 628 | 49,966 | 50,379 | 50,796 | 51,214 | 51,635 | 52,058 | 52,483 | 52,912 | 53,342 | 53,775 |
| 629 | 54,209 | 54,646 | 55,084 | 55,524 | 55,966 | 56,409 | 56,854 | 57,300 | 57,748 | 58,197 |
| 630 | 58,648 | 59,101 | 59,555 | 60,011 | 60,469 | 60,928 | 61,388 | 61,850 | 62,314 | 62,779 |
| 631 | 63,245 | 63,714 | 64,184 | 64,656 | 65,130 | 65,607 | 66,086 | 66,567 | 67,051 | 67,537 |
| 632 | 68,025 | 68,515 | 69,007 | 69,501 | 69,997 | 70,494 | 70,994 | 71,497 | 72,001 | 72,507 |
| 633 | 73,016 | 73,527 | 74,040 | 74,555 | 75,073 | 75,593 | 76,116 | 76,643 | 77,172 | 77,703 |
| 634 | 78,238 | 78,775 | 79,314 | 79,857 | 80,401 | 80,948 | 81,498 | 82,049 | 82,603 | 83,158 |
| 635 | 83,715 | 84,274 | 84,835 | 85,397 | 85,961 | 86,527 | 87,094 | 87,663 | 88,233 | 88,805 |
| 636 | 89,379 | 89,954 | 90,531 | 91,110 | 91,690 | 92,271 | 92,854 | 93,439 | 94,026 | 94,615 |
| 637 | 95,205 | 95,798 | 96,392 | 96,988 | 97,586 | 98,186 | 98,788 | 99,394 | 100,001 | 100,612 |
| 638 | 101,225 | 101,840 | 102,457 | 103,075 | 103,695 | 104,317 | 104,941 | 105,567 | 106,195 | 106,826 |
| 639 | 107,459 | 108,094 | 108,731 | 109,371 | 110,013 | 110,657 | 111,302 | 111,951 | 112,602 | 113,257 |
| 640 | 113,917 | 114,580 | 115,248 | 115,919 | 116,594 | 117,271 | 117,950 | 118,632 | 119,316 | 120,003 |
| 641 | 120,692 | 121,386 | 122,085 | 122,789 | 123,496 | 124,204 | 124,915 | 125,627 | 126,341 | 127,056 |
| 642 | 127,773 | 128,491 | 129,211 | 129,932 | 130,656 | 131,382 | 132,109 | 132,838 | 133,570 | 134,303 |
| 643 | 135,038 | 135,775 | 136,514 | 137,255 | 137,998 | 138,743 | 139,489 | 140,238 | 140,989 | 141,742 |
| 644 | 142,497 | 143,254 | 144,013 | 144,774 | 145,538 | 146,304 | 147,072 | 147,844 | 148,617 | 149,394 |
| 645 | 150,173 | 150,954 | 151,738 | 152,524 | 153,312 | 154,103 | 154,897 | 155,694 | 156,493 | 157,296 |
| 646 | 158,101 | 158,908 | 159,719 | 160,531 | 161,346 | 162,163 | 162,982 | 163,804 | 164,627 | 165,453 |
| 647 | 166,281 | 167,111 | 167,943 | 168,777 | 169,613 | 170,452 | 171,292 | 172,135 | 172,980 | 173,827 |
| 648 | 174,676 | 175,527 | 176,380 | 177,236 | 178,094 | 178,954 | 179,815 | 180,680 | 181,546 | 182,414 |
| 649 | 183,285 | 184,157 | | | | | | | | |

Note: Capacities above elevation 647.0 feet calculated from interpolated areas

Appendix B

# Eagle Mountain Lake

## RESERVOIR AREA TABLE

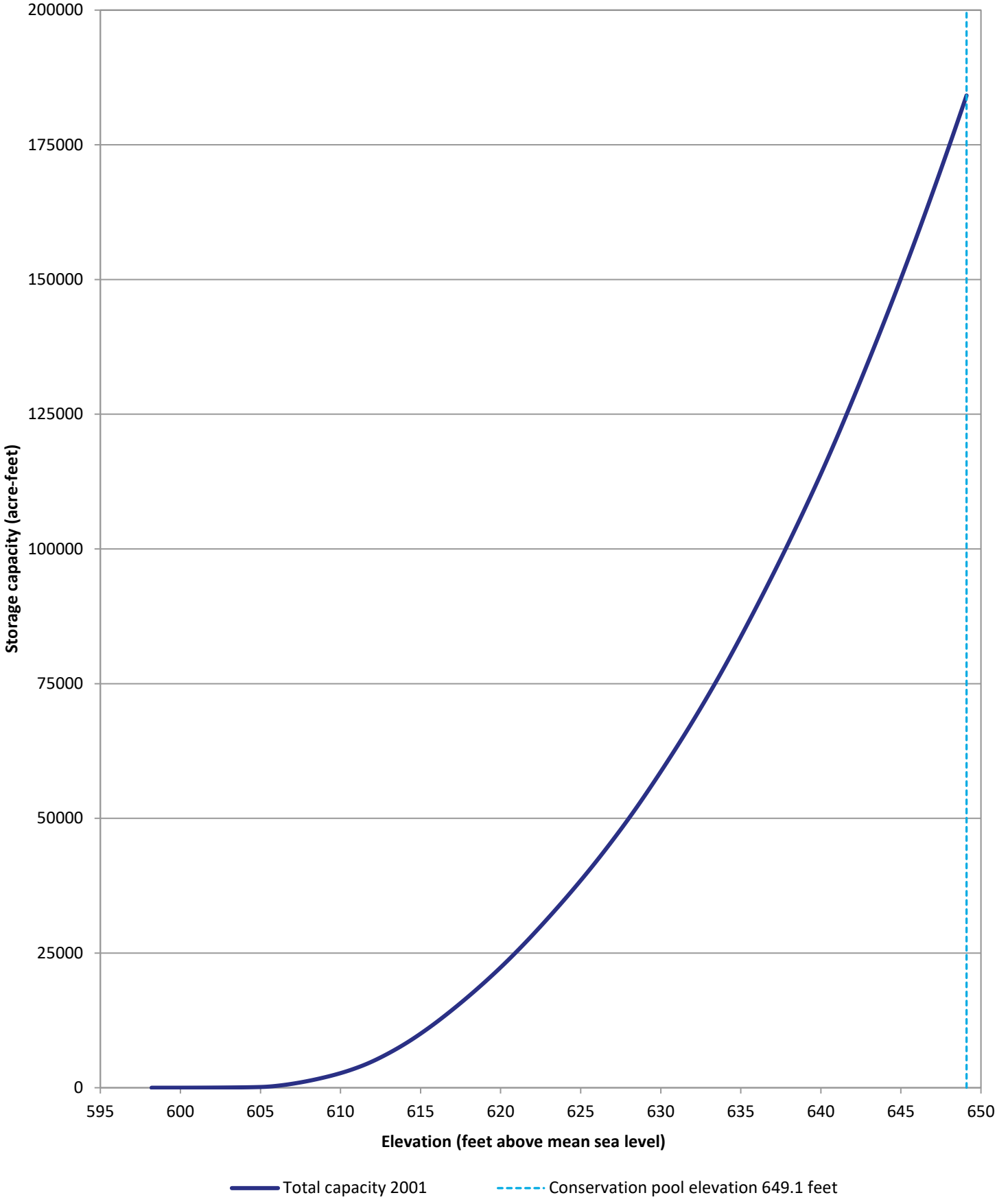
TEXAS WATER DEVELOPMENT BOARD — May 2001 Survey re-calculated October 2016

AREA IN ACRES — Conservation pool elevation 649.1 feet NGVD29

ELEVATION INCREMENT IS ONE TENTH FOOT

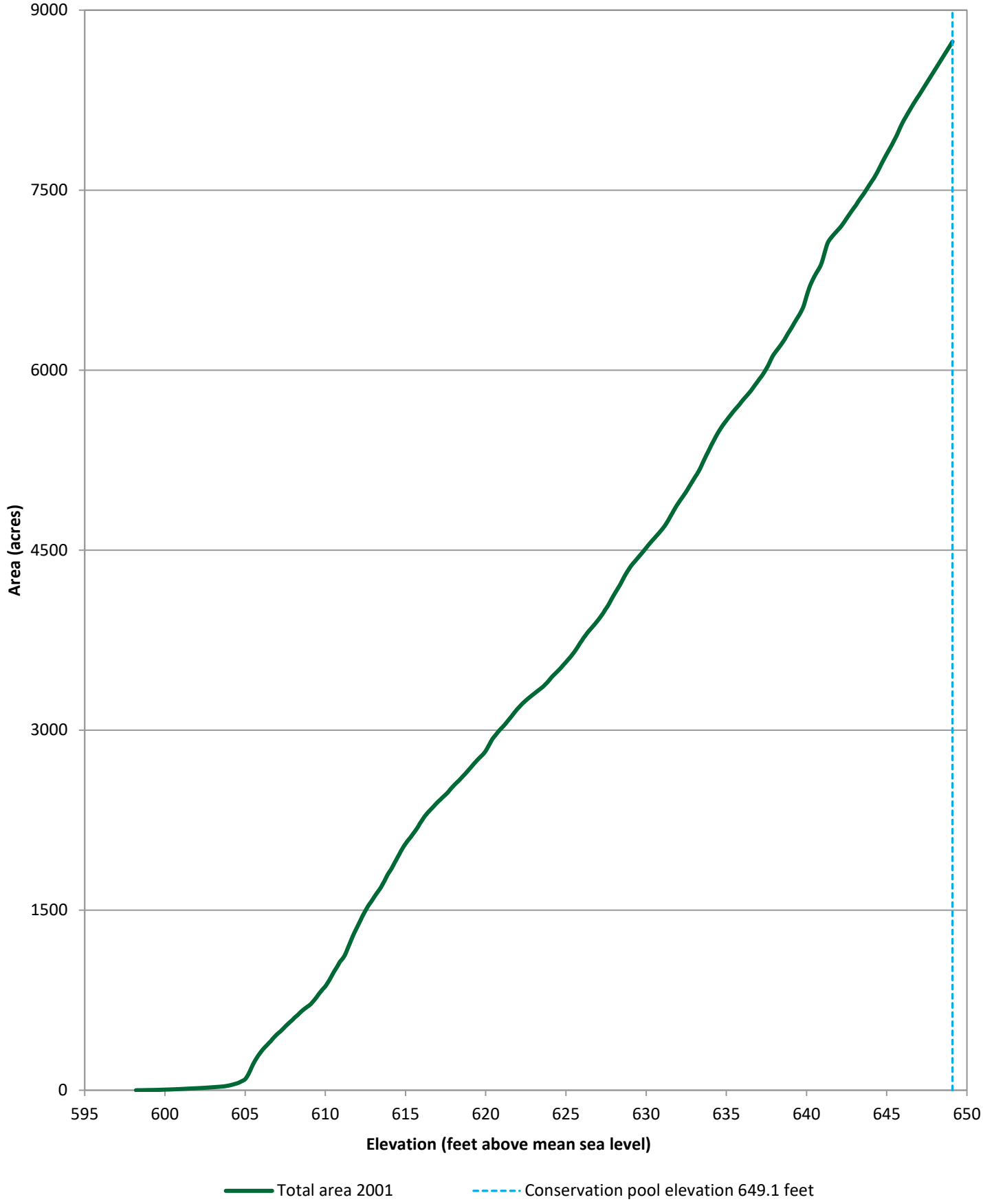
| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 599 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 |
| 600 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 |
| 601 | 10 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 16 | 16 |
| 602 | 17 | 17 | 18 | 19 | 20 | 21 | 21 | 22 | 23 | 24 |
| 603 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 33 | 35 | 37 |
| 604 | 40 | 43 | 46 | 50 | 54 | 57 | 63 | 69 | 76 | 82 |
| 605 | 92 | 109 | 132 | 159 | 189 | 217 | 242 | 264 | 285 | 304 |
| 606 | 321 | 338 | 354 | 367 | 381 | 396 | 409 | 426 | 440 | 454 |
| 607 | 467 | 479 | 490 | 503 | 516 | 530 | 544 | 556 | 568 | 580 |
| 608 | 593 | 607 | 618 | 629 | 643 | 656 | 667 | 678 | 688 | 698 |
| 609 | 707 | 719 | 734 | 749 | 766 | 783 | 803 | 819 | 836 | 851 |
| 610 | 865 | 885 | 906 | 929 | 953 | 978 | 1,000 | 1,021 | 1,043 | 1,068 |
| 611 | 1,084 | 1,101 | 1,121 | 1,150 | 1,183 | 1,215 | 1,248 | 1,279 | 1,309 | 1,336 |
| 612 | 1,364 | 1,391 | 1,417 | 1,446 | 1,471 | 1,496 | 1,519 | 1,541 | 1,560 | 1,579 |
| 613 | 1,600 | 1,620 | 1,640 | 1,658 | 1,677 | 1,698 | 1,723 | 1,747 | 1,774 | 1,800 |
| 614 | 1,821 | 1,841 | 1,865 | 1,890 | 1,914 | 1,940 | 1,963 | 1,989 | 2,012 | 2,034 |
| 615 | 2,053 | 2,072 | 2,089 | 2,105 | 2,124 | 2,142 | 2,160 | 2,179 | 2,200 | 2,223 |
| 616 | 2,243 | 2,263 | 2,283 | 2,299 | 2,315 | 2,329 | 2,344 | 2,357 | 2,372 | 2,387 |
| 617 | 2,400 | 2,413 | 2,425 | 2,439 | 2,451 | 2,463 | 2,476 | 2,491 | 2,508 | 2,523 |
| 618 | 2,537 | 2,551 | 2,564 | 2,577 | 2,591 | 2,605 | 2,619 | 2,633 | 2,648 | 2,664 |
| 619 | 2,679 | 2,694 | 2,710 | 2,726 | 2,740 | 2,755 | 2,768 | 2,781 | 2,794 | 2,809 |
| 620 | 2,827 | 2,850 | 2,874 | 2,899 | 2,923 | 2,941 | 2,957 | 2,974 | 2,990 | 3,005 |
| 621 | 3,020 | 3,033 | 3,049 | 3,065 | 3,081 | 3,098 | 3,114 | 3,131 | 3,149 | 3,165 |
| 622 | 3,181 | 3,194 | 3,209 | 3,223 | 3,235 | 3,247 | 3,259 | 3,270 | 3,281 | 3,292 |
| 623 | 3,302 | 3,313 | 3,324 | 3,334 | 3,344 | 3,354 | 3,366 | 3,380 | 3,393 | 3,407 |
| 624 | 3,424 | 3,440 | 3,454 | 3,467 | 3,480 | 3,494 | 3,507 | 3,522 | 3,537 | 3,552 |
| 625 | 3,567 | 3,583 | 3,598 | 3,613 | 3,631 | 3,648 | 3,666 | 3,686 | 3,708 | 3,729 |
| 626 | 3,748 | 3,769 | 3,786 | 3,805 | 3,822 | 3,837 | 3,853 | 3,868 | 3,884 | 3,900 |
| 627 | 3,917 | 3,934 | 3,953 | 3,971 | 3,993 | 4,013 | 4,033 | 4,056 | 4,081 | 4,105 |
| 628 | 4,129 | 4,151 | 4,173 | 4,195 | 4,218 | 4,243 | 4,269 | 4,293 | 4,316 | 4,337 |
| 629 | 4,357 | 4,376 | 4,392 | 4,407 | 4,423 | 4,439 | 4,454 | 4,470 | 4,486 | 4,503 |
| 630 | 4,519 | 4,536 | 4,552 | 4,568 | 4,583 | 4,598 | 4,613 | 4,628 | 4,643 | 4,659 |
| 631 | 4,675 | 4,692 | 4,710 | 4,731 | 4,754 | 4,778 | 4,801 | 4,825 | 4,848 | 4,871 |
| 632 | 4,890 | 4,911 | 4,930 | 4,949 | 4,968 | 4,988 | 5,010 | 5,033 | 5,054 | 5,076 |
| 633 | 5,098 | 5,119 | 5,140 | 5,164 | 5,190 | 5,220 | 5,247 | 5,276 | 5,303 | 5,330 |
| 634 | 5,357 | 5,384 | 5,409 | 5,435 | 5,460 | 5,483 | 5,504 | 5,525 | 5,544 | 5,562 |
| 635 | 5,580 | 5,598 | 5,615 | 5,632 | 5,649 | 5,665 | 5,681 | 5,696 | 5,711 | 5,729 |
| 636 | 5,746 | 5,761 | 5,777 | 5,791 | 5,807 | 5,823 | 5,841 | 5,859 | 5,878 | 5,896 |
| 637 | 5,914 | 5,933 | 5,950 | 5,969 | 5,991 | 6,013 | 6,037 | 6,065 | 6,093 | 6,119 |
| 638 | 6,139 | 6,157 | 6,175 | 6,192 | 6,211 | 6,230 | 6,249 | 6,272 | 6,296 | 6,318 |
| 639 | 6,339 | 6,360 | 6,384 | 6,407 | 6,429 | 6,450 | 6,473 | 6,499 | 6,528 | 6,570 |
| 640 | 6,616 | 6,658 | 6,697 | 6,728 | 6,757 | 6,783 | 6,807 | 6,829 | 6,851 | 6,879 |
| 641 | 6,918 | 6,965 | 7,012 | 7,054 | 7,079 | 7,098 | 7,114 | 7,130 | 7,145 | 7,160 |
| 642 | 7,175 | 7,189 | 7,207 | 7,225 | 7,245 | 7,265 | 7,284 | 7,304 | 7,324 | 7,342 |
| 643 | 7,360 | 7,379 | 7,400 | 7,420 | 7,439 | 7,458 | 7,477 | 7,498 | 7,519 | 7,539 |
| 644 | 7,560 | 7,580 | 7,600 | 7,623 | 7,647 | 7,673 | 7,699 | 7,726 | 7,752 | 7,777 |
| 645 | 7,801 | 7,825 | 7,849 | 7,872 | 7,898 | 7,924 | 7,950 | 7,979 | 8,010 | 8,038 |
| 646 | 8,066 | 8,090 | 8,113 | 8,136 | 8,159 | 8,182 | 8,204 | 8,226 | 8,247 | 8,269 |
| 647 | 8,288 | 8,309 | 8,331 | 8,352 | 8,373 | 8,395 | 8,416 | 8,438 | 8,459 | 8,480 |
| 648 | 8,502 | 8,523 | 8,545 | 8,566 | 8,587 | 8,609 | 8,630 | 8,652 | 8,673 | 8,694 |
| 649 | 8,716 | 8,737 | | | | | | | | |

Note: Areas between elevations 647.0 and 649.1 feet linearly interpolated




**Eagle Mountain Lake**
May 2001 Survey
re-calculated October 2016
Prepared by: TWDB

Appendix C: Capacity curve




**Eagle Mountain Lake**
May 2001 Survey
re-calculated October 2016
Prepared by: TWDB

Appendix D: Area curve

Appendix E

# Eagle Mountain Lake

## RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD
CAPACITY IN ACRE-FEET
ELEVATION INCREMENT IS ONE TENTH FOOT

February 2008 Survey re-calculated October 2018
Conservation pool elevation 649.1 feet NGVD29

| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 599 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 |
| 601 | 5 | 6 | 7 | 8 | 9 | 11 | 12 | 13 | 14 | 15 |
| 602 | 17 | 18 | 20 | 22 | 23 | 25 | 27 | 29 | 31 | 33 |
| 603 | 35 | 37 | 39 | 42 | 44 | 47 | 49 | 52 | 55 | 58 |
| 604 | 61 | 64 | 67 | 71 | 74 | 78 | 82 | 86 | 90 | 94 |
| 605 | 100 | 106 | 112 | 119 | 127 | 136 | 146 | 157 | 170 | 184 |
| 606 | 202 | 222 | 245 | 270 | 297 | 326 | 357 | 390 | 424 | 461 |
| 607 | 499 | 539 | 580 | 623 | 667 | 713 | 760 | 808 | 857 | 908 |
| 608 | 959 | 1,012 | 1,066 | 1,121 | 1,178 | 1,236 | 1,295 | 1,356 | 1,418 | 1,481 |
| 609 | 1,546 | 1,612 | 1,679 | 1,747 | 1,817 | 1,889 | 1,962 | 2,037 | 2,112 | 2,189 |
| 610 | 2,268 | 2,348 | 2,430 | 2,514 | 2,601 | 2,690 | 2,781 | 2,875 | 2,971 | 3,070 |
| 611 | 3,170 | 3,273 | 3,378 | 3,485 | 3,594 | 3,704 | 3,817 | 3,934 | 4,054 | 4,178 |
| 612 | 4,306 | 4,437 | 4,572 | 4,710 | 4,852 | 4,997 | 5,144 | 5,294 | 5,446 | 5,601 |
| 613 | 5,758 | 5,918 | 6,080 | 6,244 | 6,410 | 6,579 | 6,749 | 6,922 | 7,098 | 7,276 |
| 614 | 7,458 | 7,642 | 7,829 | 8,019 | 8,212 | 8,407 | 8,605 | 8,806 | 9,009 | 9,215 |
| 615 | 9,423 | 9,634 | 9,847 | 10,062 | 10,279 | 10,498 | 10,718 | 10,941 | 11,164 | 11,390 |
| 616 | 11,617 | 11,847 | 12,078 | 12,311 | 12,546 | 12,782 | 13,021 | 13,260 | 13,501 | 13,743 |
| 617 | 13,986 | 14,231 | 14,477 | 14,725 | 14,975 | 15,226 | 15,478 | 15,732 | 15,986 | 16,242 |
| 618 | 16,499 | 16,758 | 17,017 | 17,278 | 17,541 | 17,804 | 18,070 | 18,337 | 18,605 | 18,875 |
| 619 | 19,146 | 19,418 | 19,692 | 19,967 | 20,244 | 20,522 | 20,802 | 21,083 | 21,366 | 21,651 |
| 620 | 21,937 | 22,226 | 22,517 | 22,810 | 23,105 | 23,401 | 23,699 | 23,999 | 24,300 | 24,602 |
| 621 | 24,906 | 25,211 | 25,517 | 25,825 | 26,135 | 26,447 | 26,760 | 27,075 | 27,392 | 27,709 |
| 622 | 28,029 | 28,349 | 28,671 | 28,994 | 29,319 | 29,644 | 29,971 | 30,299 | 30,627 | 30,957 |
| 623 | 31,288 | 31,621 | 31,954 | 32,289 | 32,626 | 32,963 | 33,302 | 33,642 | 33,984 | 34,327 |
| 624 | 34,671 | 35,017 | 35,364 | 35,713 | 36,064 | 36,416 | 36,771 | 37,127 | 37,484 | 37,844 |
| 625 | 38,205 | 38,568 | 38,933 | 39,300 | 39,669 | 40,039 | 40,412 | 40,786 | 41,161 | 41,539 |
| 626 | 41,918 | 42,298 | 42,681 | 43,065 | 43,451 | 43,838 | 44,227 | 44,618 | 45,011 | 45,407 |
| 627 | 45,805 | 46,204 | 46,607 | 47,011 | 47,417 | 47,825 | 48,236 | 48,649 | 49,064 | 49,482 |
| 628 | 49,901 | 50,323 | 50,749 | 51,177 | 51,607 | 52,039 | 52,472 | 52,908 | 53,345 | 53,784 |
| 629 | 54,225 | 54,667 | 55,111 | 55,556 | 56,003 | 56,451 | 56,901 | 57,353 | 57,805 | 58,260 |
| 630 | 58,715 | 59,173 | 59,632 | 60,093 | 60,556 | 61,020 | 61,485 | 61,952 | 62,421 | 62,893 |
| 631 | 63,366 | 63,840 | 64,318 | 64,796 | 65,277 | 65,760 | 66,245 | 66,732 | 67,222 | 67,714 |
| 632 | 68,207 | 68,702 | 69,199 | 69,697 | 70,198 | 70,700 | 71,204 | 71,711 | 72,220 | 72,732 |
| 633 | 73,247 | 73,765 | 74,287 | 74,812 | 75,341 | 75,873 | 76,408 | 76,947 | 77,489 | 78,035 |
| 634 | 78,584 | 79,136 | 79,691 | 80,247 | 80,805 | 81,365 | 81,926 | 82,489 | 83,053 | 83,619 |
| 635 | 84,186 | 84,755 | 85,326 | 85,898 | 86,472 | 87,047 | 87,624 | 88,203 | 88,784 | 89,367 |
| 636 | 89,951 | 90,538 | 91,126 | 91,716 | 92,308 | 92,902 | 93,498 | 94,097 | 94,697 | 95,300 |
| 637 | 95,905 | 96,512 | 97,122 | 97,733 | 98,348 | 98,964 | 99,582 | 100,203 | 100,826 | 101,452 |
| 638 | 102,080 | 102,710 | 103,343 | 103,978 | 104,617 | 105,258 | 105,901 | 106,546 | 107,194 | 107,845 |
| 639 | 108,498 | 109,153 | 109,811 | 110,471 | 111,134 | 111,798 | 112,464 | 113,132 | 113,803 | 114,479 |
| 640 | 115,158 | 115,840 | 116,526 | 117,213 | 117,904 | 118,597 | 119,293 | 119,992 | 120,694 | 121,399 |
| 641 | 122,107 | 122,818 | 123,531 | 124,246 | 124,964 | 125,684 | 126,406 | 127,131 | 127,858 | 128,587 |
| 642 | 129,319 | 130,052 | 130,789 | 131,527 | 132,268 | 133,011 | 133,757 | 134,505 | 135,255 | 136,008 |
| 643 | 136,762 | 137,520 | 138,279 | 139,041 | 139,805 | 140,572 | 141,340 | 142,112 | 142,885 | 143,661 |
| 644 | 144,439 | 145,220 | 146,003 | 146,788 | 147,576 | 148,366 | 149,158 | 149,953 | 150,750 | 151,550 |
| 645 | 152,352 | 153,157 | 153,963 | 154,772 | 155,583 | 156,397 | 157,213 | 158,031 | 158,852 | 159,675 |
| 646 | 160,501 | 161,328 | 162,158 | 162,991 | 163,825 | 164,662 | 165,501 | 166,342 | 167,186 | 168,032 |
| 647 | 168,881 | 169,732 | 170,585 | 171,441 | 172,300 | 173,161 | 174,026 | 174,893 | 175,763 | 176,637 |
| 648 | 177,513 | 178,392 | 179,275 | 180,160 | 181,049 | 181,941 | 182,836 | 183,734 | 184,635 | 185,539 |
| 649 | 186,447 | 187,359 | | | | | | | | |

Note: Capacities above elevation 641.0 feet calculated from interpolated areas

Appendix F

# Eagle Mountain Lake

## RESERVOIR AREA TABLE

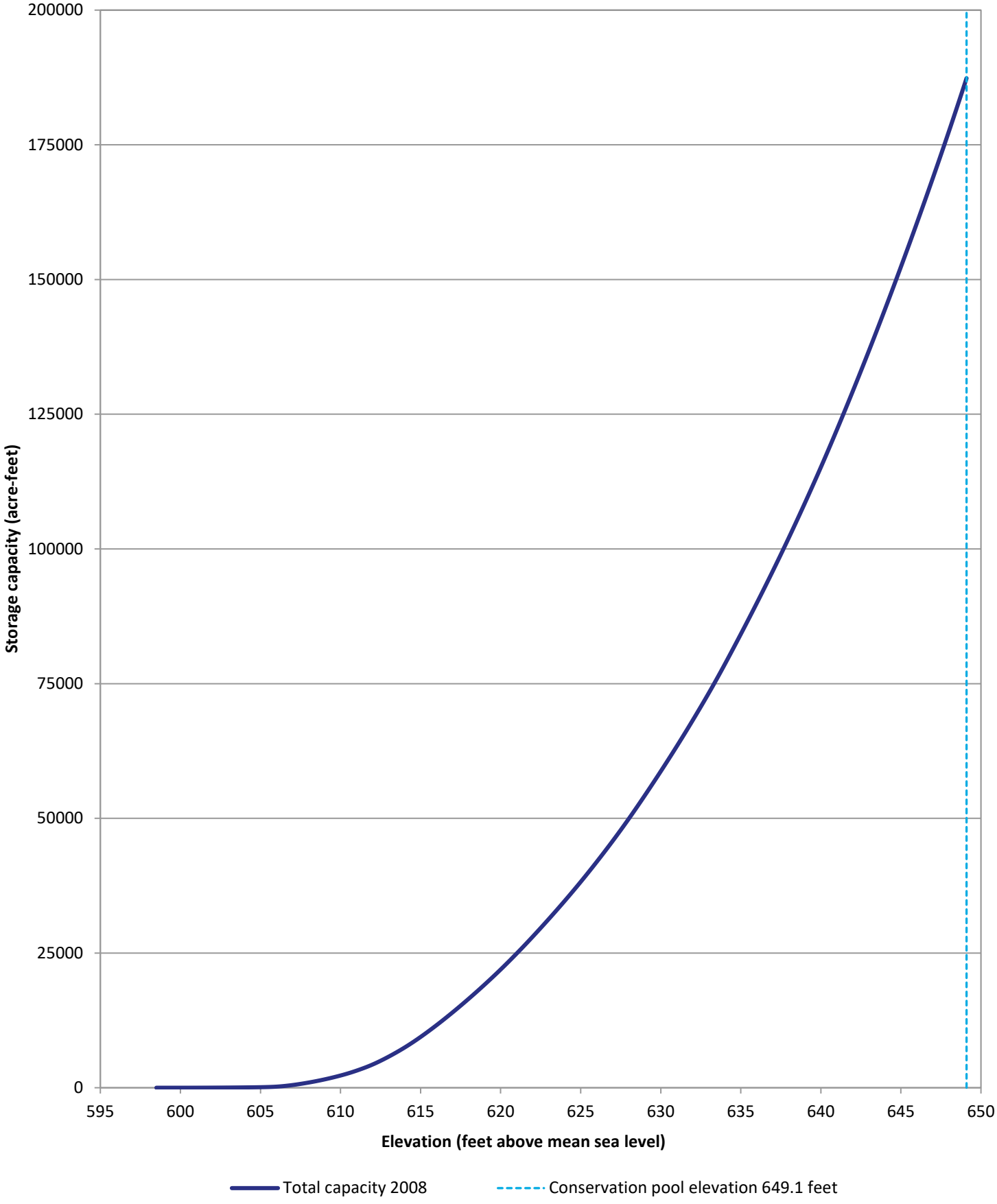
TEXAS WATER DEVELOPMENT BOARD — February 2008 Survey re-calculated October 2018

AREA IN ACRES — Conservation pool elevation 649.1 feet NGVD29

ELEVATION INCREMENT IS ONE TENTH FOOT

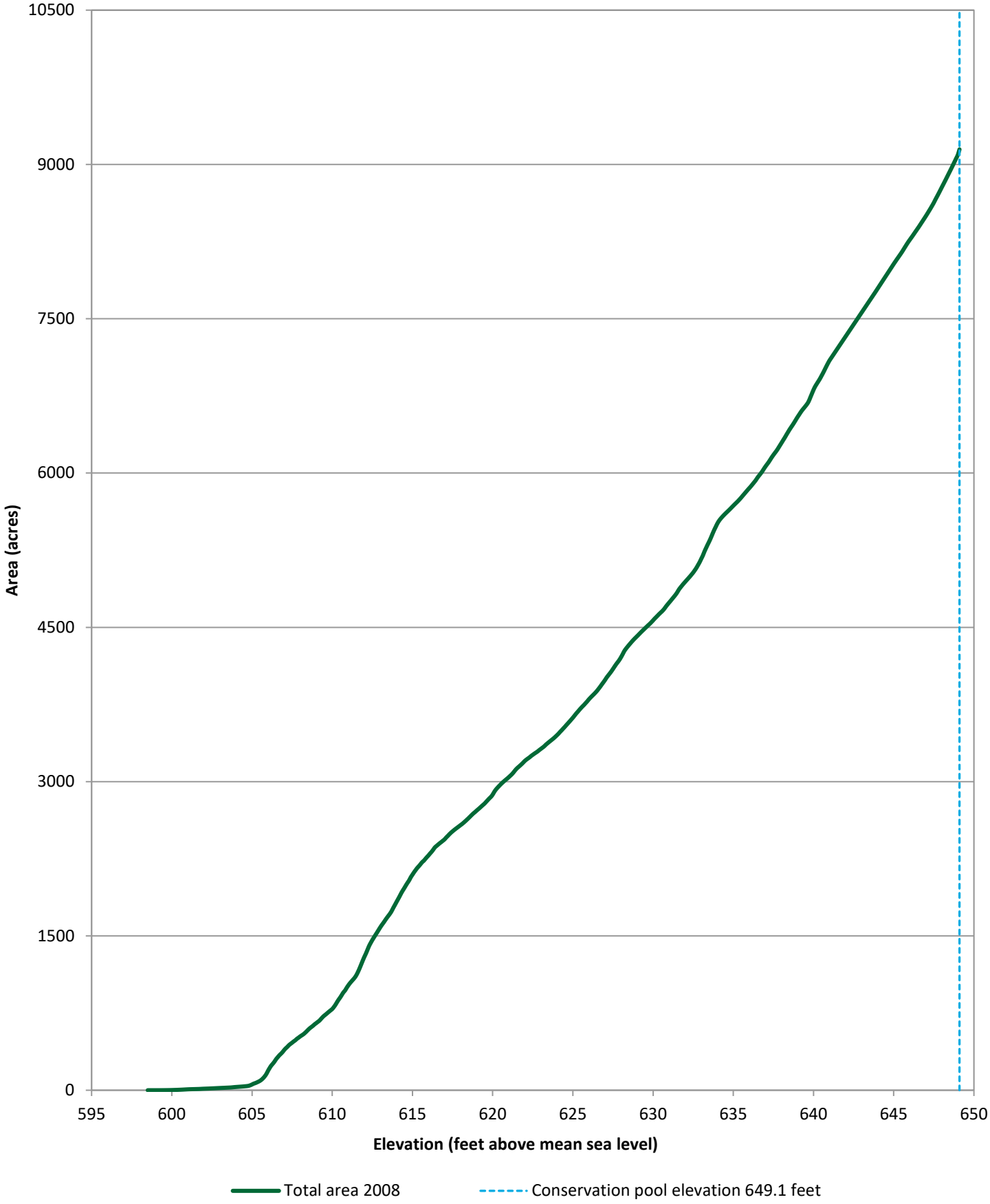
| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 598 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 599 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 600 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 8 |
| 601 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 14 |
| 602 | 15 | 15 | 16 | 16 | 17 | 18 | 19 | 19 | 20 | 21 |
| 603 | 22 | 22 | 23 | 24 | 25 | 25 | 26 | 27 | 29 | 30 |
| 604 | 31 | 32 | 34 | 35 | 36 | 37 | 39 | 41 | 43 | 49 |
| 605 | 56 | 64 | 69 | 76 | 83 | 92 | 103 | 118 | 137 | 160 |
| 606 | 190 | 216 | 240 | 258 | 278 | 302 | 321 | 339 | 354 | 370 |
| 607 | 390 | 407 | 421 | 438 | 450 | 462 | 475 | 486 | 500 | 511 |
| 608 | 523 | 533 | 544 | 557 | 572 | 588 | 602 | 614 | 627 | 641 |
| 609 | 652 | 664 | 676 | 693 | 710 | 725 | 737 | 751 | 764 | 777 |
| 610 | 789 | 808 | 830 | 857 | 881 | 903 | 927 | 952 | 970 | 996 |
| 611 | 1,019 | 1,040 | 1,058 | 1,076 | 1,094 | 1,118 | 1,148 | 1,183 | 1,221 | 1,259 |
| 612 | 1,296 | 1,329 | 1,366 | 1,403 | 1,433 | 1,460 | 1,486 | 1,511 | 1,535 | 1,560 |
| 613 | 1,585 | 1,608 | 1,629 | 1,652 | 1,675 | 1,695 | 1,716 | 1,741 | 1,771 | 1,799 |
| 614 | 1,828 | 1,857 | 1,885 | 1,915 | 1,942 | 1,967 | 1,994 | 2,018 | 2,042 | 2,072 |
| 615 | 2,095 | 2,119 | 2,140 | 2,161 | 2,178 | 2,197 | 2,216 | 2,230 | 2,248 | 2,266 |
| 616 | 2,283 | 2,302 | 2,319 | 2,339 | 2,361 | 2,375 | 2,388 | 2,401 | 2,413 | 2,426 |
| 617 | 2,438 | 2,456 | 2,472 | 2,488 | 2,503 | 2,517 | 2,530 | 2,542 | 2,554 | 2,565 |
| 618 | 2,577 | 2,589 | 2,602 | 2,616 | 2,631 | 2,645 | 2,661 | 2,677 | 2,691 | 2,704 |
| 619 | 2,718 | 2,732 | 2,745 | 2,760 | 2,774 | 2,787 | 2,805 | 2,821 | 2,838 | 2,853 |
| 620 | 2,874 | 2,900 | 2,923 | 2,941 | 2,957 | 2,974 | 2,988 | 3,003 | 3,016 | 3,029 |
| 621 | 3,043 | 3,057 | 3,072 | 3,090 | 3,110 | 3,127 | 3,141 | 3,155 | 3,169 | 3,185 |
| 622 | 3,201 | 3,214 | 3,225 | 3,236 | 3,250 | 3,261 | 3,272 | 3,283 | 3,293 | 3,306 |
| 623 | 3,318 | 3,330 | 3,341 | 3,357 | 3,370 | 3,383 | 3,396 | 3,408 | 3,421 | 3,435 |
| 624 | 3,450 | 3,465 | 3,483 | 3,499 | 3,516 | 3,533 | 3,551 | 3,568 | 3,585 | 3,603 |
| 625 | 3,621 | 3,641 | 3,661 | 3,678 | 3,697 | 3,714 | 3,731 | 3,747 | 3,764 | 3,781 |
| 626 | 3,800 | 3,817 | 3,833 | 3,848 | 3,864 | 3,882 | 3,902 | 3,922 | 3,944 | 3,965 |
| 627 | 3,987 | 4,011 | 4,032 | 4,052 | 4,072 | 4,095 | 4,119 | 4,142 | 4,162 | 4,183 |
| 628 | 4,209 | 4,237 | 4,267 | 4,290 | 4,310 | 4,329 | 4,347 | 4,365 | 4,382 | 4,398 |
| 629 | 4,413 | 4,429 | 4,445 | 4,461 | 4,476 | 4,491 | 4,506 | 4,521 | 4,535 | 4,551 |
| 630 | 4,568 | 4,585 | 4,601 | 4,617 | 4,632 | 4,647 | 4,662 | 4,680 | 4,702 | 4,722 |
| 631 | 4,740 | 4,759 | 4,778 | 4,797 | 4,817 | 4,839 | 4,865 | 4,886 | 4,906 | 4,924 |
| 632 | 4,942 | 4,960 | 4,977 | 4,995 | 5,014 | 5,033 | 5,055 | 5,078 | 5,105 | 5,133 |
| 633 | 5,165 | 5,197 | 5,236 | 5,270 | 5,304 | 5,335 | 5,370 | 5,407 | 5,443 | 5,475 |
| 634 | 5,507 | 5,533 | 5,554 | 5,572 | 5,589 | 5,605 | 5,620 | 5,635 | 5,650 | 5,666 |
| 635 | 5,682 | 5,698 | 5,713 | 5,728 | 5,745 | 5,763 | 5,782 | 5,800 | 5,818 | 5,836 |
| 636 | 5,854 | 5,872 | 5,891 | 5,910 | 5,930 | 5,954 | 5,974 | 5,994 | 6,015 | 6,039 |
| 637 | 6,062 | 6,084 | 6,105 | 6,129 | 6,153 | 6,176 | 6,197 | 6,218 | 6,241 | 6,267 |
| 638 | 6,292 | 6,317 | 6,342 | 6,369 | 6,395 | 6,421 | 6,444 | 6,468 | 6,492 | 6,518 |
| 639 | 6,543 | 6,567 | 6,591 | 6,612 | 6,631 | 6,651 | 6,671 | 6,697 | 6,734 | 6,771 |
| 640 | 6,809 | 6,841 | 6,866 | 6,891 | 6,916 | 6,945 | 6,974 | 7,005 | 7,037 | 7,067 |
| 641 | 7,095 | 7,118 | 7,141 | 7,165 | 7,188 | 7,211 | 7,234 | 7,258 | 7,281 | 7,304 |
| 642 | 7,328 | 7,351 | 7,374 | 7,397 | 7,421 | 7,444 | 7,467 | 7,490 | 7,514 | 7,537 |
| 643 | 7,560 | 7,583 | 7,607 | 7,630 | 7,653 | 7,677 | 7,700 | 7,723 | 7,746 | 7,770 |
| 644 | 7,794 | 7,818 | 7,842 | 7,865 | 7,889 | 7,913 | 7,937 | 7,961 | 7,985 | 8,009 |
| 645 | 8,033 | 8,056 | 8,078 | 8,101 | 8,123 | 8,146 | 8,171 | 8,196 | 8,221 | 8,245 |
| 646 | 8,267 | 8,289 | 8,311 | 8,334 | 8,356 | 8,379 | 8,402 | 8,426 | 8,449 | 8,473 |
| 647 | 8,497 | 8,522 | 8,548 | 8,574 | 8,600 | 8,628 | 8,659 | 8,688 | 8,718 | 8,748 |
| 648 | 8,779 | 8,809 | 8,840 | 8,871 | 8,902 | 8,933 | 8,964 | 8,996 | 9,028 | 9,061 |
| 649 | 9,094 | 9,147 | | | | | | | | |

Note: Areas between elevations 641.0 and 643.85 feet, and 643.85 and 645.0 feet adjusted using cubic spline interpolation. Values used for cubic spline interpolation equal to average of computed values at 0.1-foot increments.




**Eagle Mountain Lake**
February 2008 Survey
re-calculated October 2018
Prepared by: TWDB

Appendix G: Capacity curve




**Eagle Mountain Lake**
February 2008 Survey
re-calculated October 2018
Prepared by: TWDB

Appendix H: Area curve

Appendix I

# Eagle Mountain Lake

## RESERVOIR CAPACITY TABLE

TEXAS WATER DEVELOPMENT BOARD
CAPACITY IN ACRE-FEET
ELEVATION INCREMENT IS ONE TENTH FOOT

October 2018 Survey
Conservation pool elevation 649.1 feet NAVD88

| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 599 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 601 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 |
| 602 | 4 | 5 | 5 | 6 | 7 | 8 | 9 | 11 | 12 | 13 |
| 603 | 15 | 16 | 18 | 19 | 21 | 22 | 24 | 26 | 28 | 30 |
| 604 | 32 | 34 | 36 | 39 | 41 | 44 | 46 | 49 | 52 | 55 |
| 605 | 58 | 61 | 65 | 68 | 72 | 76 | 80 | 85 | 90 | 96 |
| 606 | 103 | 111 | 119 | 129 | 141 | 157 | 174 | 194 | 217 | 243 |
| 607 | 271 | 302 | 336 | 372 | 409 | 449 | 490 | 533 | 579 | 625 |
| 608 | 673 | 721 | 771 | 822 | 874 | 927 | 982 | 1,038 | 1,096 | 1,155 |
| 609 | 1,216 | 1,278 | 1,341 | 1,406 | 1,472 | 1,539 | 1,607 | 1,676 | 1,747 | 1,818 |
| 610 | 1,891 | 1,966 | 2,042 | 2,120 | 2,199 | 2,280 | 2,363 | 2,448 | 2,535 | 2,623 |
| 611 | 2,714 | 2,806 | 2,901 | 2,997 | 3,096 | 3,196 | 3,298 | 3,402 | 3,508 | 3,615 |
| 612 | 3,724 | 3,835 | 3,948 | 4,065 | 4,184 | 4,308 | 4,436 | 4,569 | 4,706 | 4,846 |
| 613 | 4,989 | 5,134 | 5,281 | 5,431 | 5,583 | 5,737 | 5,894 | 6,053 | 6,215 | 6,378 |
| 614 | 6,544 | 6,711 | 6,882 | 7,054 | 7,230 | 7,408 | 7,589 | 7,773 | 7,960 | 8,151 |
| 615 | 8,345 | 8,541 | 8,741 | 8,944 | 9,149 | 9,356 | 9,565 | 9,777 | 9,992 | 10,209 |
| 616 | 10,427 | 10,647 | 10,869 | 11,093 | 11,318 | 11,545 | 11,773 | 12,004 | 12,236 | 12,469 |
| 617 | 12,704 | 12,940 | 13,178 | 13,418 | 13,659 | 13,902 | 14,146 | 14,392 | 14,639 | 14,887 |
| 618 | 15,137 | 15,388 | 15,641 | 15,895 | 16,150 | 16,407 | 16,665 | 16,925 | 17,187 | 17,449 |
| 619 | 17,713 | 17,978 | 18,245 | 18,513 | 18,782 | 19,052 | 19,324 | 19,597 | 19,872 | 20,148 |
| 620 | 20,426 | 20,704 | 20,985 | 21,266 | 21,550 | 21,835 | 22,121 | 22,410 | 22,700 | 22,992 |
| 621 | 23,287 | 23,584 | 23,884 | 24,184 | 24,487 | 24,790 | 25,095 | 25,403 | 25,711 | 26,022 |
| 622 | 26,335 | 26,650 | 26,966 | 27,283 | 27,602 | 27,923 | 28,244 | 28,567 | 28,892 | 29,217 |
| 623 | 29,544 | 29,872 | 30,201 | 30,530 | 30,862 | 31,194 | 31,528 | 31,863 | 32,200 | 32,537 |
| 624 | 32,876 | 33,216 | 33,558 | 33,900 | 34,245 | 34,590 | 34,936 | 35,284 | 35,634 | 35,985 |
| 625 | 36,337 | 36,692 | 37,048 | 37,406 | 37,765 | 38,125 | 38,488 | 38,852 | 39,218 | 39,586 |
| 626 | 39,955 | 40,326 | 40,700 | 41,075 | 41,452 | 41,830 | 42,210 | 42,593 | 42,977 | 43,363 |
| 627 | 43,751 | 44,141 | 44,533 | 44,927 | 45,324 | 45,723 | 46,125 | 46,529 | 46,936 | 47,346 |
| 628 | 47,758 | 48,173 | 48,591 | 49,012 | 49,434 | 49,859 | 50,286 | 50,715 | 51,145 | 51,578 |
| 629 | 52,012 | 52,448 | 52,886 | 53,325 | 53,767 | 54,209 | 54,653 | 55,099 | 55,547 | 55,995 |
| 630 | 56,445 | 56,897 | 57,350 | 57,804 | 58,261 | 58,718 | 59,177 | 59,638 | 60,100 | 60,565 |
| 631 | 61,031 | 61,498 | 61,968 | 62,440 | 62,914 | 63,390 | 63,867 | 64,347 | 64,829 | 65,314 |
| 632 | 65,800 | 66,288 | 66,779 | 67,271 | 67,765 | 68,261 | 68,758 | 69,257 | 69,757 | 70,260 |
| 633 | 70,764 | 71,271 | 71,780 | 72,292 | 72,807 | 73,326 | 73,848 | 74,374 | 74,905 | 75,439 |
| 634 | 75,977 | 76,518 | 77,064 | 77,613 | 78,164 | 78,718 | 79,274 | 79,833 | 80,393 | 80,954 |
| 635 | 81,517 | 82,082 | 82,649 | 83,217 | 83,787 | 84,359 | 84,932 | 85,506 | 86,083 | 86,661 |
| 636 | 87,240 | 87,821 | 88,405 | 88,990 | 89,577 | 90,166 | 90,757 | 91,351 | 91,946 | 92,543 |
| 637 | 93,143 | 93,745 | 94,349 | 94,956 | 95,565 | 96,177 | 96,791 | 97,408 | 98,027 | 98,648 |
| 638 | 99,272 | 99,898 | 100,527 | 101,158 | 101,794 | 102,433 | 103,075 | 103,720 | 104,368 | 105,019 |
| 639 | 105,674 | 106,330 | 106,990 | 107,652 | 108,317 | 108,984 | 109,654 | 110,327 | 111,002 | 111,679 |
| 640 | 112,359 | 113,041 | 113,726 | 114,414 | 115,105 | 115,800 | 116,498 | 117,200 | 117,905 | 118,614 |
| 641 | 119,325 | 120,039 | 120,756 | 121,475 | 122,197 | 122,921 | 123,648 | 124,378 | 125,110 | 125,845 |
| 642 | 126,582 | 127,322 | 128,065 | 128,809 | 129,557 | 130,307 | 131,059 | 131,813 | 132,570 | 133,329 |
| 643 | 134,090 | 134,854 | 135,620 | 136,389 | 137,159 | 137,932 | 138,707 | 139,485 | 140,264 | 141,046 |
| 644 | 141,829 | 142,614 | 143,401 | 144,189 | 144,980 | 145,772 | 146,566 | 147,364 | 148,163 | 148,966 |
| 645 | 149,770 | 150,577 | 151,386 | 152,198 | 153,013 | 153,829 | 154,648 | 155,471 | 156,296 | 157,124 |
| 646 | 157,954 | 158,786 | 159,622 | 160,459 | 161,300 | 162,142 | 162,987 | 163,836 | 164,686 | 165,540 |
| 647 | 166,395 | 167,254 | 168,115 | 168,979 | 169,846 | 170,716 | 171,589 | 172,466 | 173,345 | 174,228 |
| 648 | 175,114 | 176,004 | 176,897 | 177,793 | 178,693 | 179,595 | 180,501 | 181,411 | 182,324 | 183,241 |
| 649 | 184,160 | 185,083 | 186,009 | 186,939 | 187,872 | | | | | |

Appendix J

# Eagle Mountain Lake

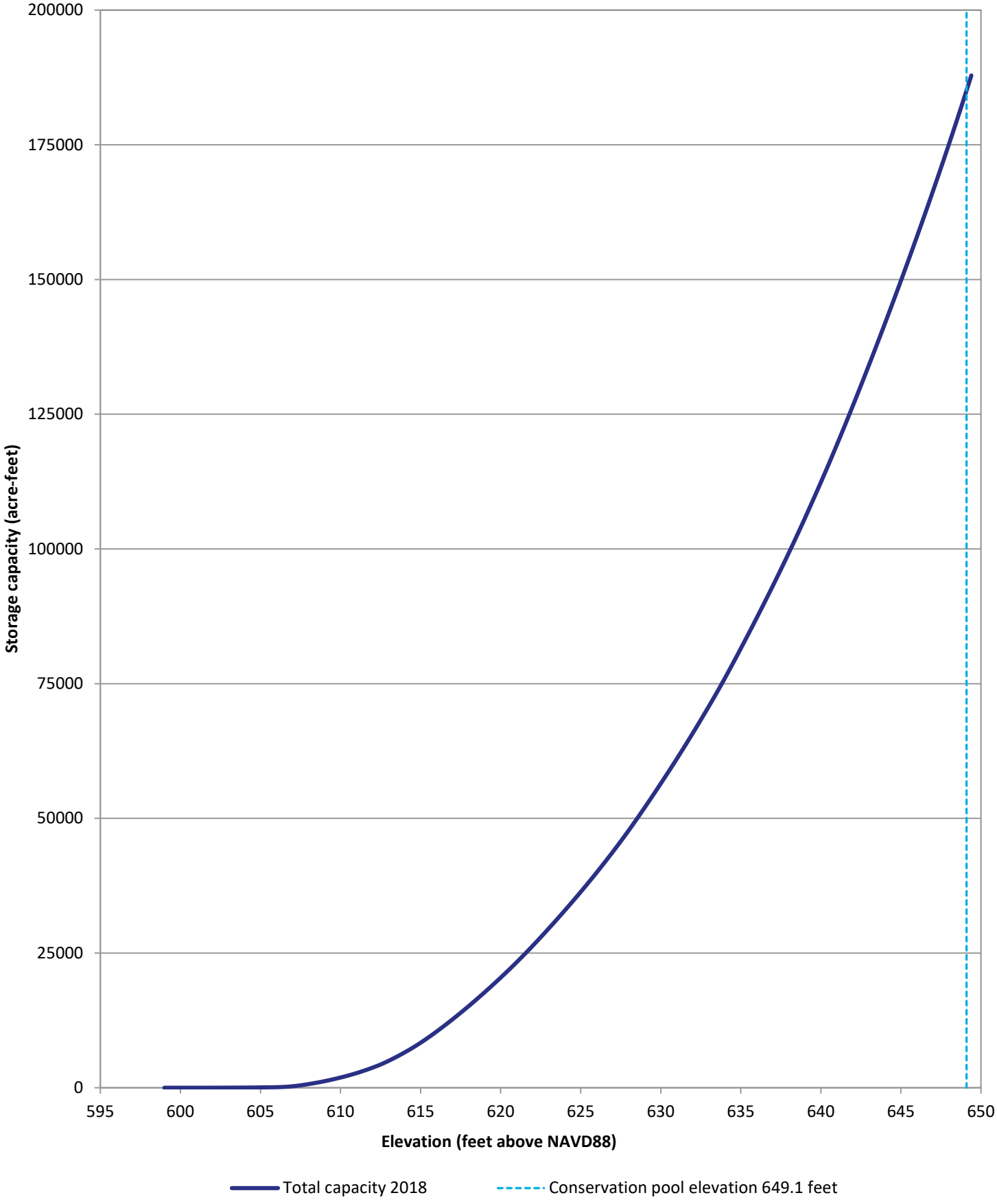
## RESERVOIR AREA TABLE

TEXAS WATER DEVELOPMENT BOARD — October 2018 Survey

AREA IN ACRES — Conservation pool elevation 649.1 feet NAVD88

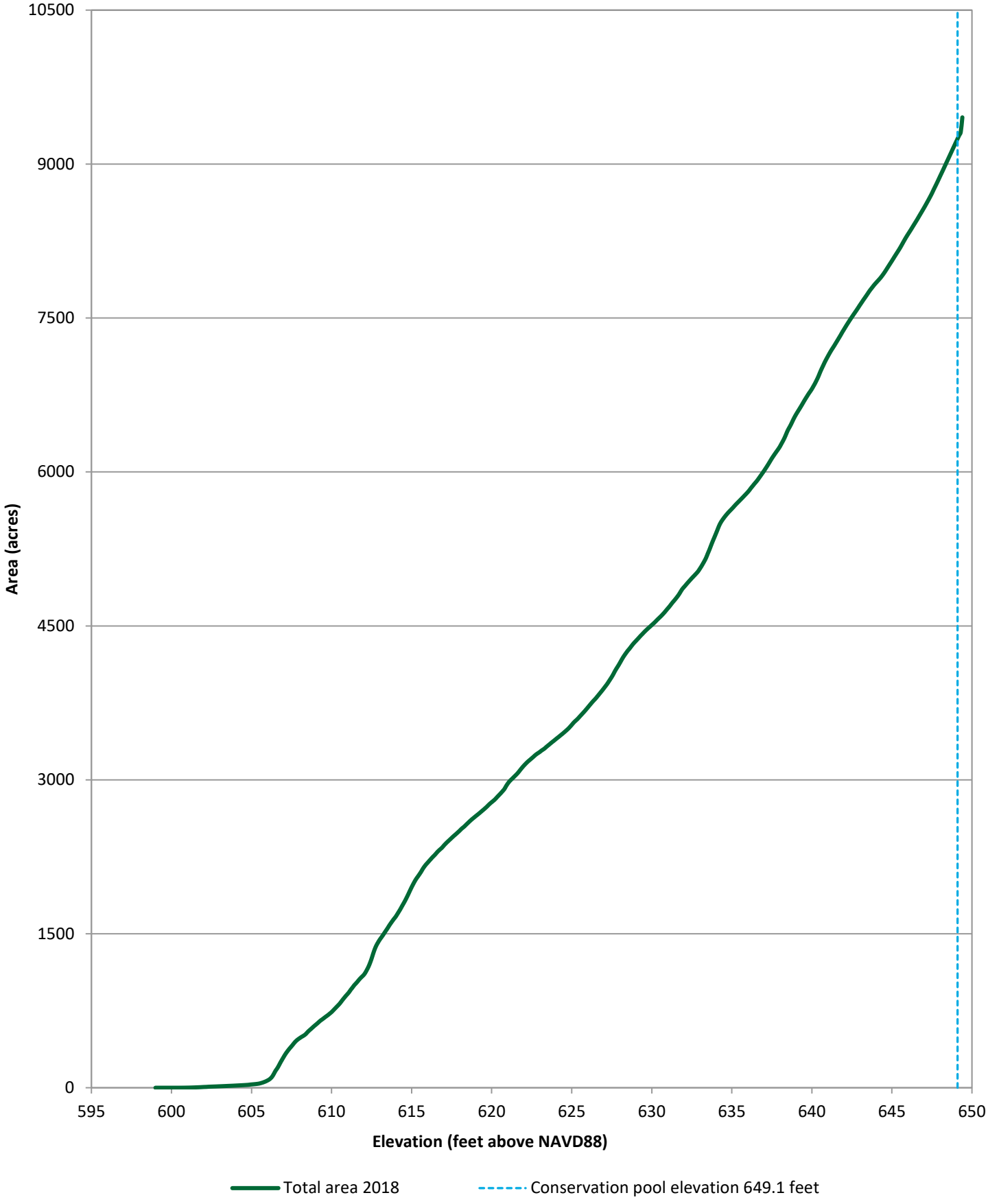
ELEVATION INCREMENT IS ONE TENTH FOOT

| ELEVATION in Feet | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 599 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 601 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 |
| 602 | 7 | 8 | 8 | 10 | 10 | 11 | 11 | 12 | 13 | 13 |
| 603 | 14 | 15 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 20 |
| 604 | 21 | 22 | 23 | 24 | 24 | 25 | 26 | 27 | 28 | 30 |
| 605 | 32 | 34 | 35 | 37 | 39 | 42 | 46 | 51 | 56 | 63 |
| 606 | 71 | 80 | 93 | 110 | 137 | 165 | 187 | 214 | 244 | 271 |
| 607 | 298 | 323 | 346 | 367 | 386 | 404 | 423 | 443 | 458 | 471 |
| 608 | 482 | 493 | 502 | 512 | 525 | 542 | 557 | 571 | 585 | 599 |
| 609 | 612 | 625 | 639 | 653 | 664 | 676 | 688 | 699 | 711 | 724 |
| 610 | 737 | 753 | 769 | 786 | 802 | 818 | 838 | 859 | 878 | 897 |
| 611 | 914 | 933 | 955 | 975 | 996 | 1,013 | 1,030 | 1,049 | 1,067 | 1,082 |
| 612 | 1,098 | 1,119 | 1,147 | 1,177 | 1,214 | 1,258 | 1,307 | 1,351 | 1,387 | 1,415 |
| 613 | 1,441 | 1,463 | 1,484 | 1,508 | 1,531 | 1,555 | 1,580 | 1,603 | 1,625 | 1,646 |
| 614 | 1,665 | 1,690 | 1,715 | 1,741 | 1,769 | 1,796 | 1,825 | 1,856 | 1,888 | 1,921 |
| 615 | 1,954 | 1,984 | 2,013 | 2,038 | 2,060 | 2,083 | 2,106 | 2,133 | 2,156 | 2,176 |
| 616 | 2,193 | 2,211 | 2,228 | 2,245 | 2,261 | 2,277 | 2,296 | 2,311 | 2,325 | 2,339 |
| 617 | 2,357 | 2,374 | 2,390 | 2,405 | 2,419 | 2,434 | 2,448 | 2,462 | 2,476 | 2,490 |
| 618 | 2,504 | 2,520 | 2,534 | 2,547 | 2,562 | 2,577 | 2,592 | 2,607 | 2,620 | 2,633 |
| 619 | 2,646 | 2,658 | 2,671 | 2,684 | 2,697 | 2,710 | 2,724 | 2,739 | 2,754 | 2,769 |
| 620 | 2,782 | 2,795 | 2,809 | 2,825 | 2,842 | 2,858 | 2,875 | 2,893 | 2,912 | 2,939 |
| 621 | 2,962 | 2,983 | 2,999 | 3,014 | 3,030 | 3,045 | 3,061 | 3,079 | 3,100 | 3,119 |
| 622 | 3,137 | 3,153 | 3,169 | 3,183 | 3,196 | 3,210 | 3,223 | 3,238 | 3,250 | 3,261 |
| 623 | 3,271 | 3,284 | 3,294 | 3,305 | 3,319 | 3,332 | 3,345 | 3,358 | 3,370 | 3,383 |
| 624 | 3,396 | 3,408 | 3,420 | 3,434 | 3,446 | 3,459 | 3,473 | 3,487 | 3,501 | 3,518 |
| 625 | 3,535 | 3,554 | 3,570 | 3,584 | 3,599 | 3,617 | 3,633 | 3,650 | 3,668 | 3,686 |
| 626 | 3,704 | 3,723 | 3,742 | 3,760 | 3,777 | 3,794 | 3,813 | 3,832 | 3,851 | 3,870 |
| 627 | 3,890 | 3,911 | 3,931 | 3,954 | 3,979 | 4,003 | 4,030 | 4,059 | 4,086 | 4,110 |
| 628 | 4,137 | 4,165 | 4,191 | 4,215 | 4,237 | 4,258 | 4,277 | 4,297 | 4,317 | 4,335 |
| 629 | 4,352 | 4,369 | 4,385 | 4,403 | 4,419 | 4,435 | 4,451 | 4,466 | 4,480 | 4,494 |
| 630 | 4,508 | 4,522 | 4,537 | 4,553 | 4,569 | 4,584 | 4,599 | 4,615 | 4,633 | 4,652 |
| 631 | 4,670 | 4,688 | 4,708 | 4,728 | 4,747 | 4,766 | 4,786 | 4,807 | 4,833 | 4,857 |
| 632 | 4,876 | 4,894 | 4,912 | 4,930 | 4,947 | 4,965 | 4,981 | 4,997 | 5,014 | 5,033 |
| 633 | 5,056 | 5,080 | 5,107 | 5,135 | 5,167 | 5,205 | 5,242 | 5,283 | 5,322 | 5,359 |
| 634 | 5,396 | 5,435 | 5,474 | 5,505 | 5,529 | 5,551 | 5,572 | 5,590 | 5,608 | 5,624 |
| 635 | 5,640 | 5,657 | 5,675 | 5,691 | 5,707 | 5,723 | 5,738 | 5,755 | 5,771 | 5,787 |
| 636 | 5,804 | 5,823 | 5,844 | 5,863 | 5,882 | 5,900 | 5,920 | 5,941 | 5,963 | 5,985 |
| 637 | 6,008 | 6,031 | 6,055 | 6,080 | 6,106 | 6,132 | 6,156 | 6,178 | 6,201 | 6,223 |
| 638 | 6,246 | 6,275 | 6,303 | 6,335 | 6,371 | 6,407 | 6,435 | 6,465 | 6,497 | 6,529 |
| 639 | 6,557 | 6,583 | 6,608 | 6,634 | 6,660 | 6,687 | 6,713 | 6,738 | 6,762 | 6,785 |
| 640 | 6,809 | 6,836 | 6,864 | 6,895 | 6,928 | 6,966 | 7,002 | 7,035 | 7,068 | 7,098 |
| 641 | 7,127 | 7,155 | 7,182 | 7,206 | 7,231 | 7,256 | 7,282 | 7,308 | 7,334 | 7,362 |
| 642 | 7,387 | 7,413 | 7,438 | 7,462 | 7,487 | 7,510 | 7,533 | 7,556 | 7,578 | 7,602 |
| 643 | 7,626 | 7,649 | 7,672 | 7,695 | 7,717 | 7,740 | 7,763 | 7,784 | 7,804 | 7,824 |
| 644 | 7,841 | 7,859 | 7,876 | 7,894 | 7,914 | 7,936 | 7,959 | 7,984 | 8,008 | 8,033 |
| 645 | 8,057 | 8,082 | 8,107 | 8,131 | 8,156 | 8,181 | 8,208 | 8,236 | 8,264 | 8,290 |
| 646 | 8,315 | 8,339 | 8,364 | 8,390 | 8,415 | 8,440 | 8,466 | 8,492 | 8,519 | 8,545 |
| 647 | 8,572 | 8,599 | 8,627 | 8,656 | 8,685 | 8,715 | 8,748 | 8,780 | 8,812 | 8,845 |
| 648 | 8,879 | 8,912 | 8,945 | 8,978 | 9,012 | 9,045 | 9,079 | 9,113 | 9,146 | 9,180 |
| 649 | 9,213 | 9,246 | 9,279 | 9,312 | 9,455 | | | | | |




**Eagle Mountain Lake**
October 2018 Survey
Prepared by: TWDB

Appendix K: Capacity curve




**Eagle Mountain Lake**
October 2018 Survey
Prepared by: TWDB

Appendix L: Area curve

# Appendix M

# Eagle Mountain Lake

## Sediment range lines

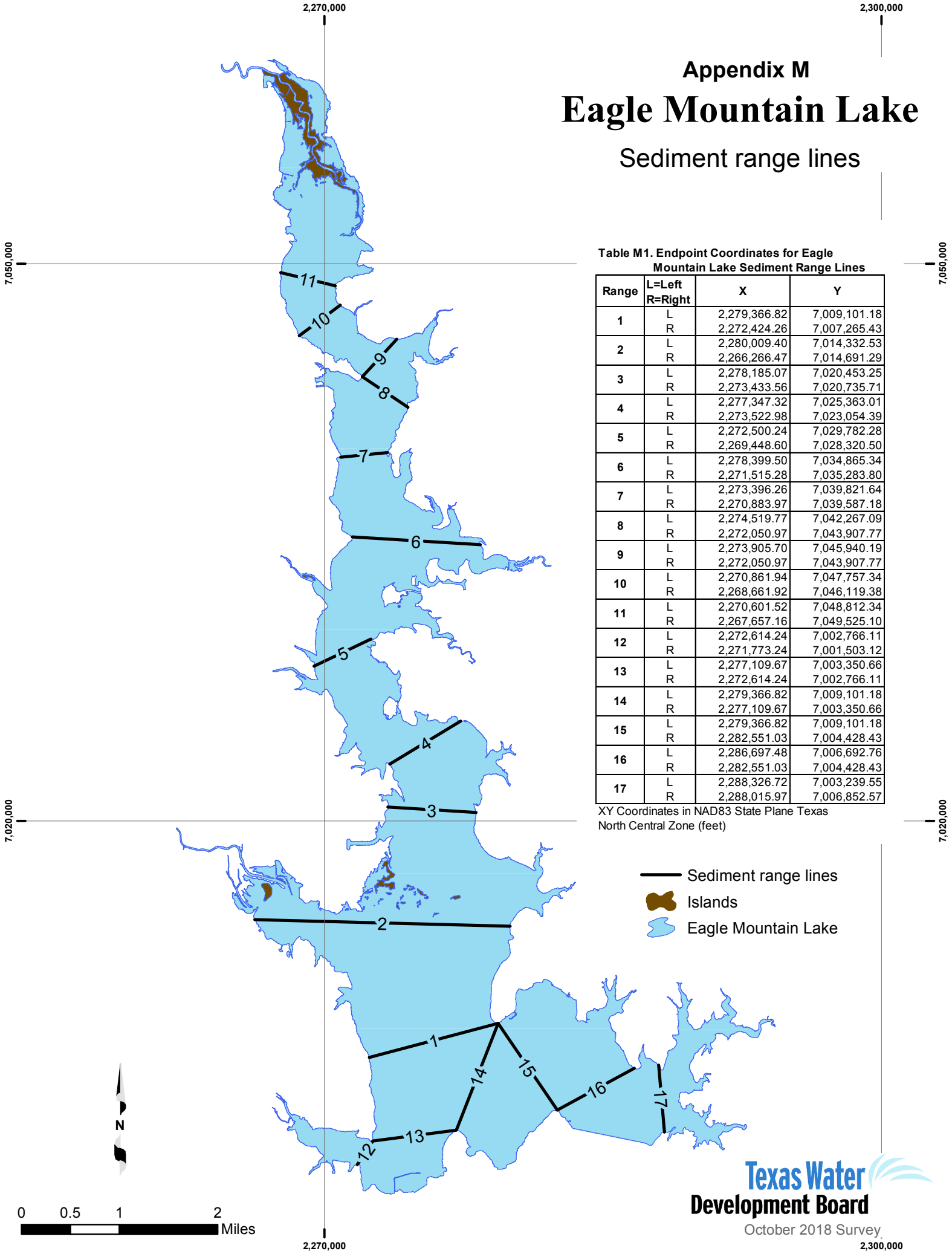


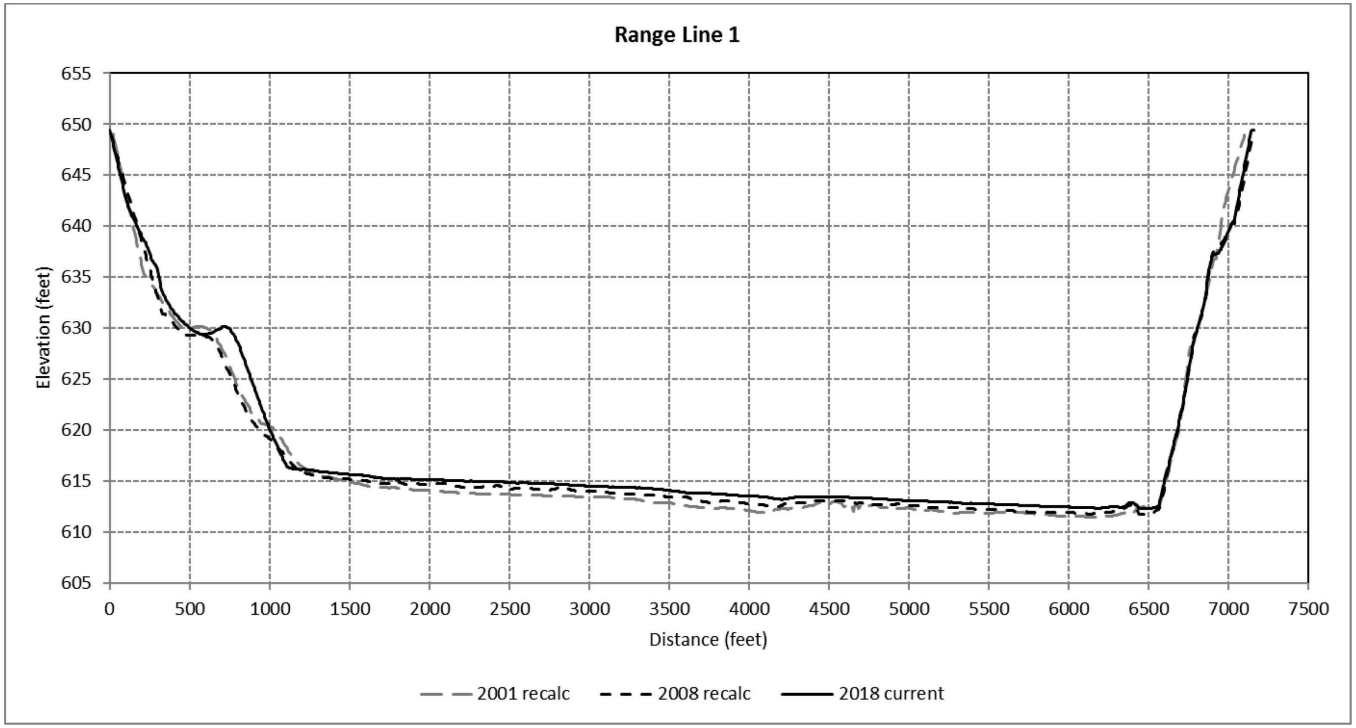

**Table M1. Endpoint Coordinates for Eagle Mountain Lake Sediment Range Lines**

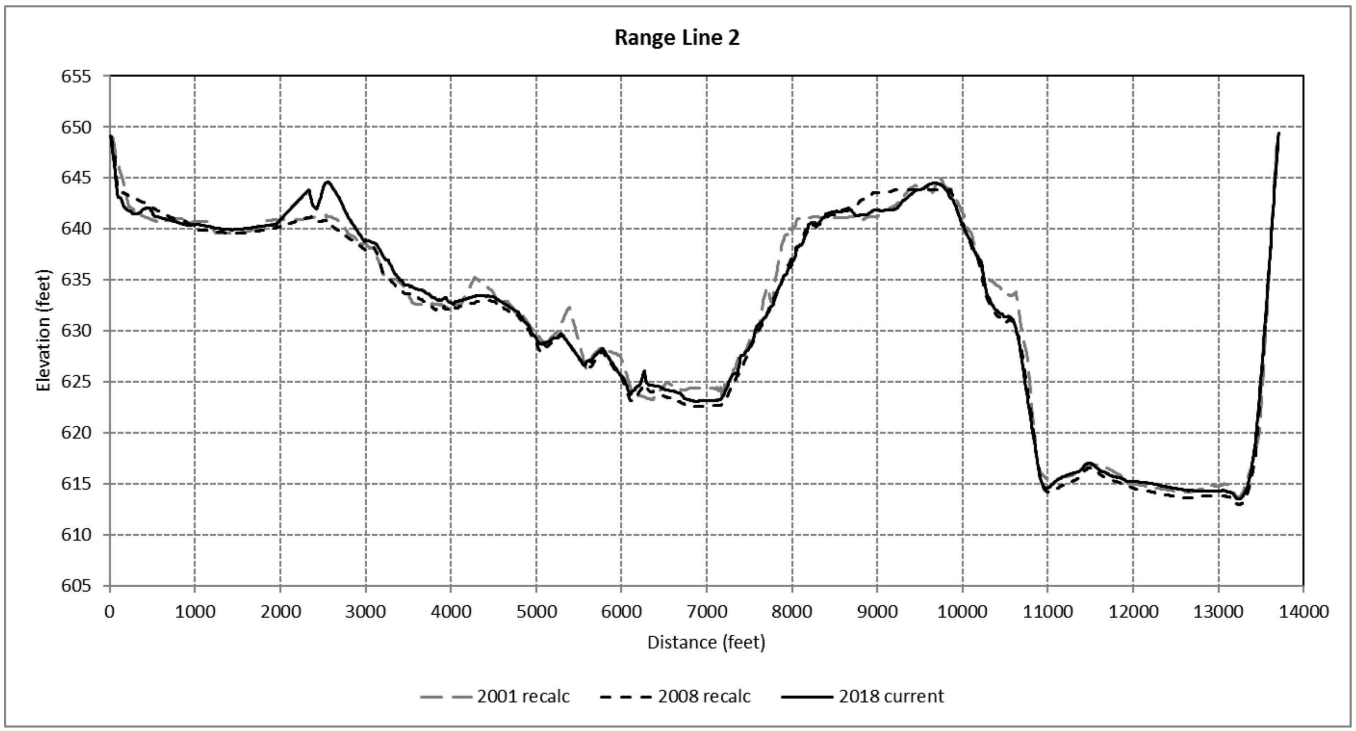
| Range | L=Left R=Right | X | Y |
|---|---|---|---|
| 1 | L | 2,279,366.82 | 7,009,101.18 |
| | R | 2,272,424.26 | 7,007,265.43 |
| 2 | L | 2,280,009.40 | 7,014,332.53 |
| | R | 2,266,266.47 | 7,014,691.29 |
| 3 | L | 2,278,185.07 | 7,020,453.25 |
| | R | 2,273,433.56 | 7,020,735.71 |
| 4 | L | 2,277,347.32 | 7,025,363.01 |
| | R | 2,273,522.98 | 7,023,054.39 |
| 5 | L | 2,272,500.24 | 7,029,782.28 |
| | R | 2,269,448.60 | 7,028,320.50 |
| 6 | L | 2,278,399.50 | 7,034,865.34 |
| | R | 2,271,515.28 | 7,035,283.80 |
| 7 | L | 2,273,396.26 | 7,039,821.64 |
| | R | 2,270,883.97 | 7,039,587.18 |
| 8 | L | 2,274,519.77 | 7,042,267.09 |
| | R | 2,272,050.97 | 7,043,907.77 |
| 9 | L | 2,273,905.70 | 7,045,940.19 |
| | R | 2,272,050.97 | 7,043,907.77 |
| 10 | L | 2,270,861.94 | 7,047,757.34 |
| | R | 2,268,661.92 | 7,046,119.38 |
| 11 | L | 2,270,601.52 | 7,048,812.34 |
| | R | 2,267,657.16 | 7,049,525.10 |
| 12 | L | 2,272,614.24 | 7,002,766.11 |
| | R | 2,271,773.24 | 7,001,503.12 |
| 13 | L | 2,277,109.67 | 7,003,350.66 |
| | R | 2,272,614.24 | 7,002,766.11 |
| 14 | L | 2,279,366.82 | 7,009,101.18 |
| | R | 2,277,109.67 | 7,003,350.66 |
| 15 | L | 2,279,366.82 | 7,009,101.18 |
| | R | 2,282,551.03 | 7,004,428.43 |
| 16 | L | 2,286,697.48 | 7,006,692.76 |
| | R | 2,282,551.03 | 7,004,428.43 |
| 17 | L | 2,288,326.72 | 7,003,239.55 |
| | R | 2,288,015.97 | 7,006,852.57 |

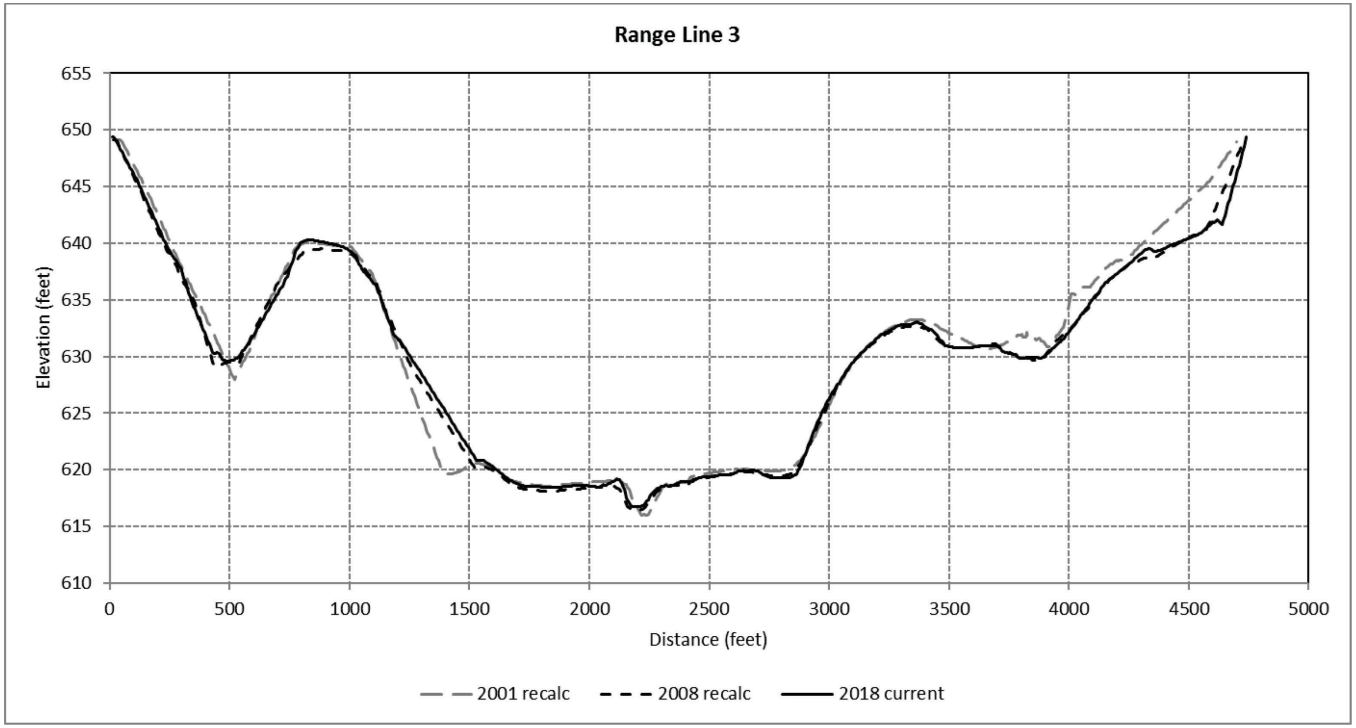
XY Coordinates in NAD83 State Plane Texas North Central Zone (feet)

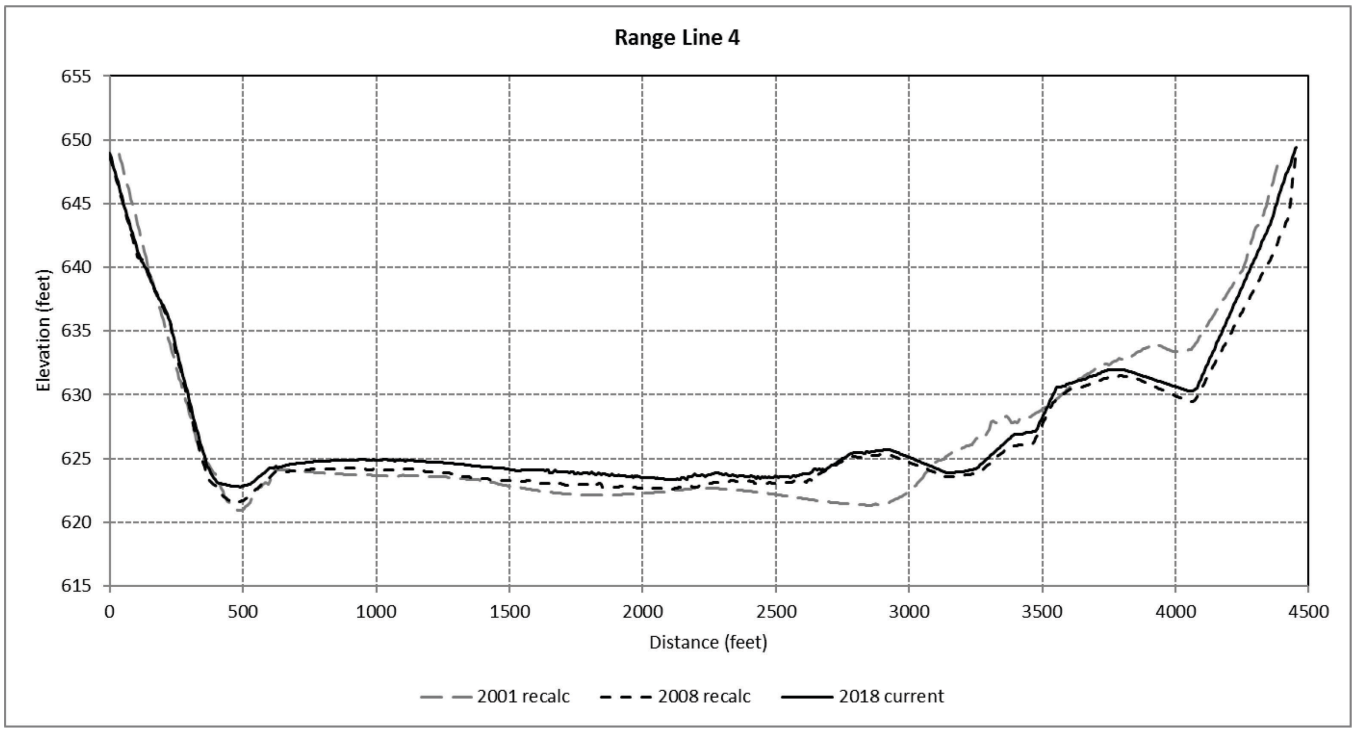
Texas Water Development Board

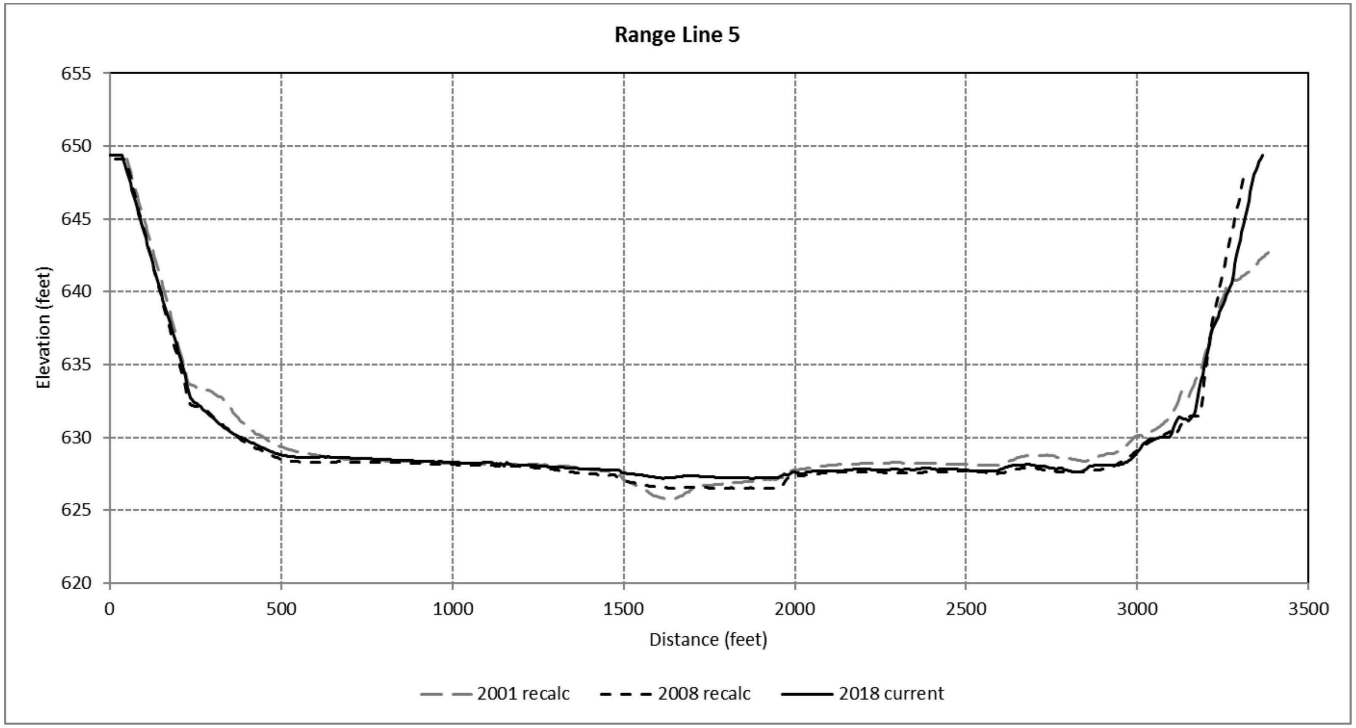
October 2018 Survey

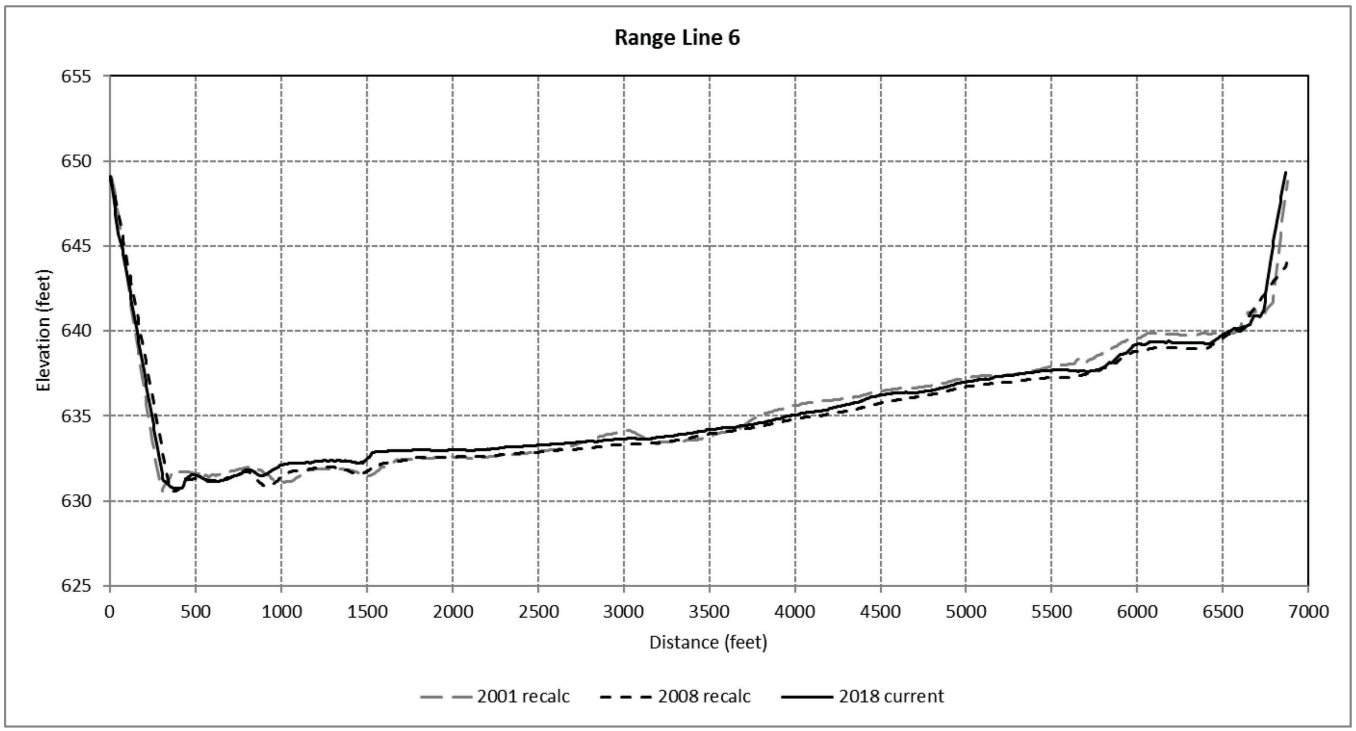

Range Line 1
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
7500
Distance (feet)
2001 recalc
2008 recalc
2018 current

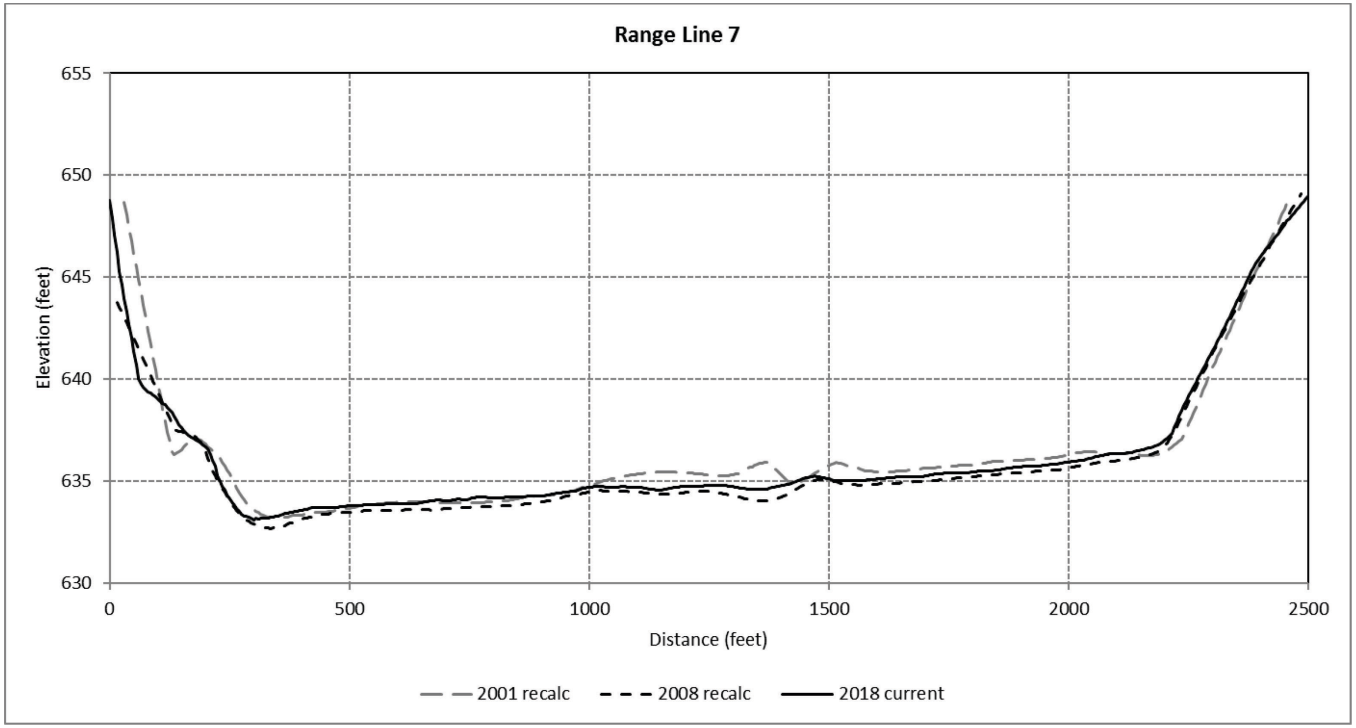

Range Line 2
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
Distance (feet)
2001 recalc
2008 recalc
2018 current

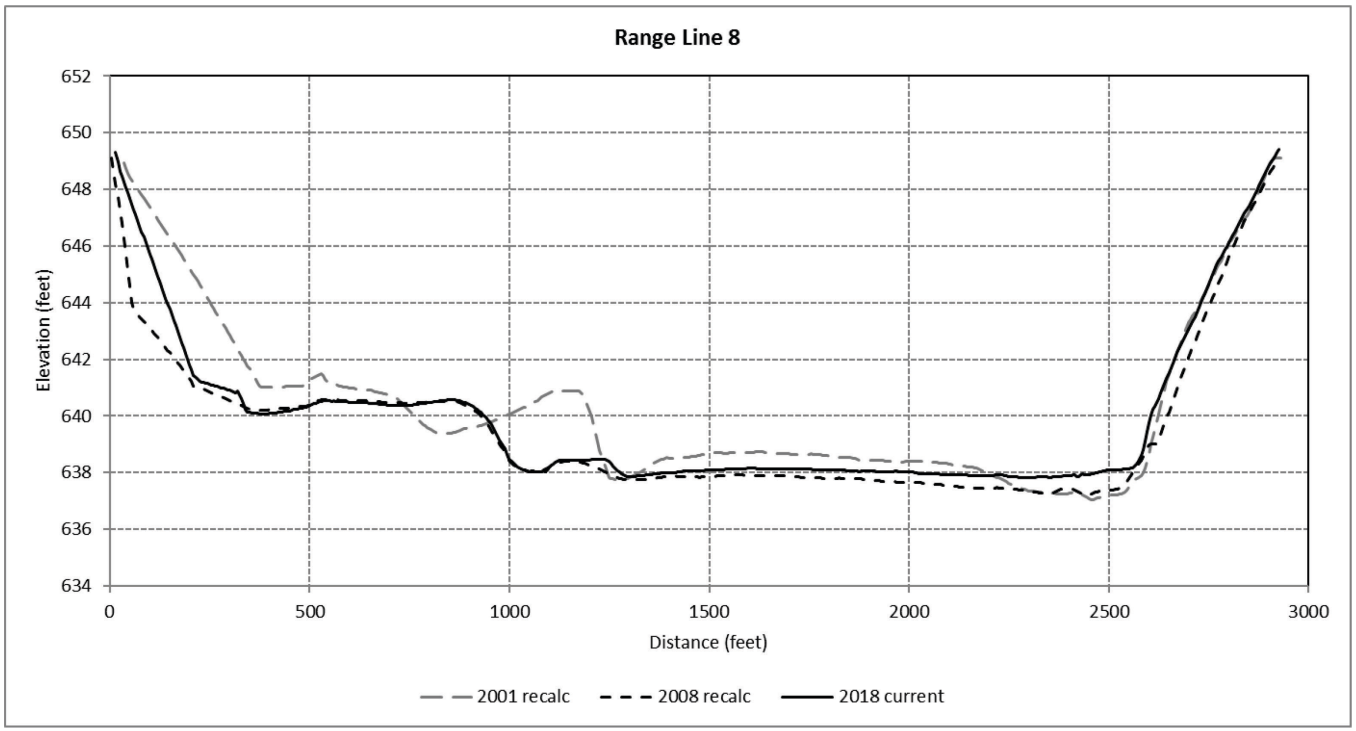

Range Line 3
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Distance (feet)
2001 recalc
2008 recalc
2018 current

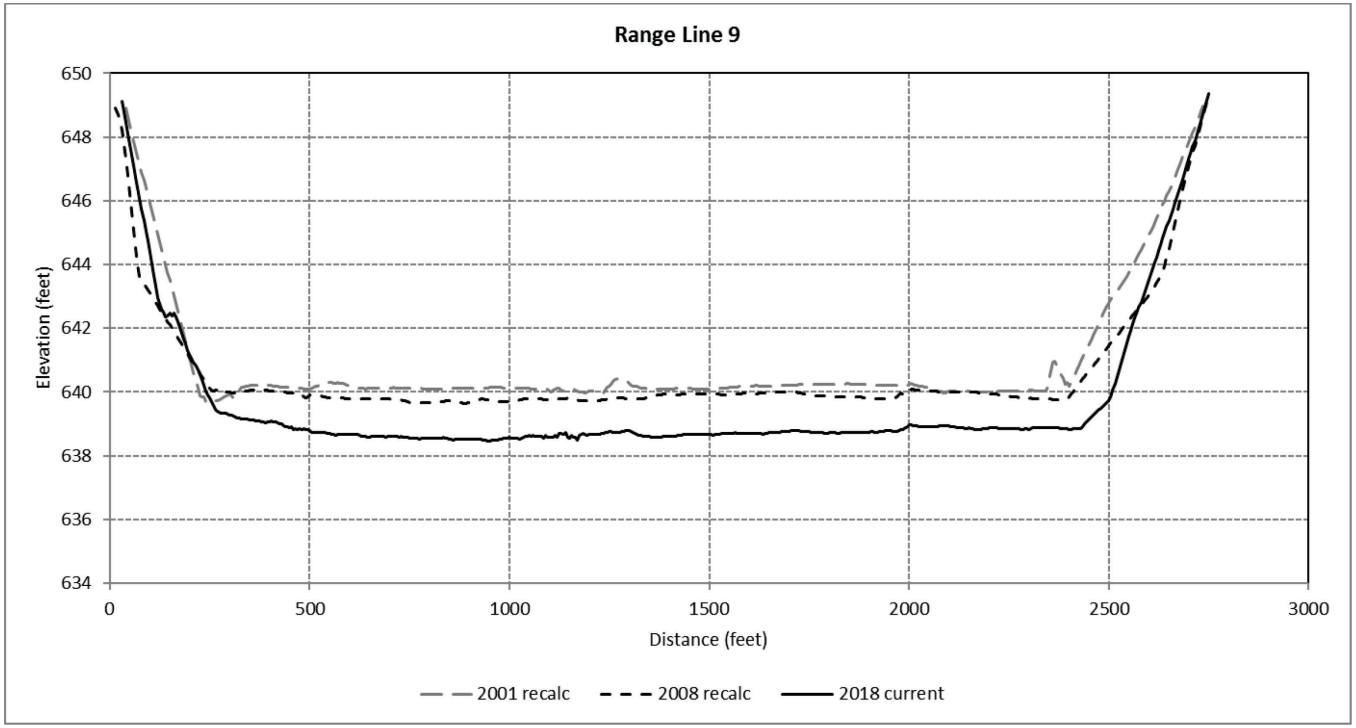

Range Line 4
Elevation (feet)
655
650
645
640
635
630
625
620
615
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Distance (feet)
2001 recalc
2008 recalc
2018 current

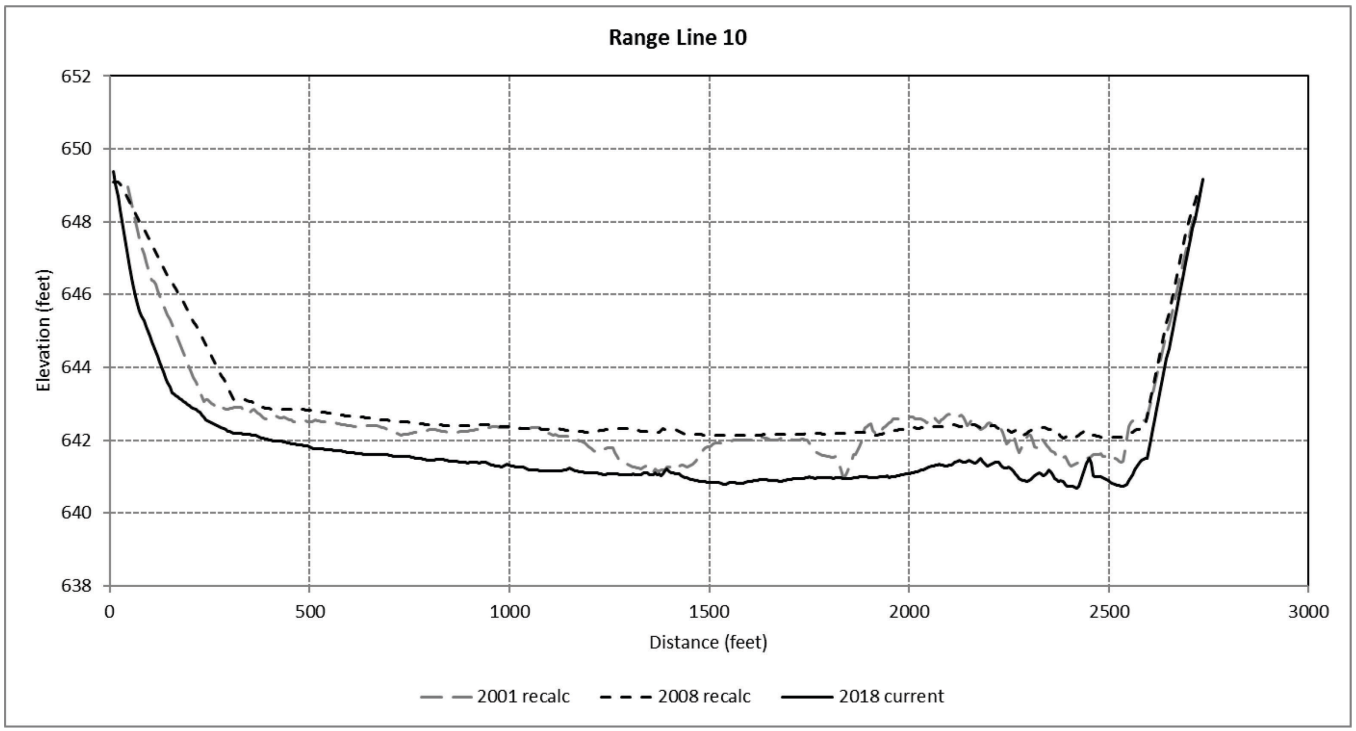

Range Line 5
655
650
645
640
635
630
625
620
Elevation (feet)
0
500
1000
1500
2000
2500
3000
3500
Distance (feet)
2001 recalc
2008 recalc
2018 current

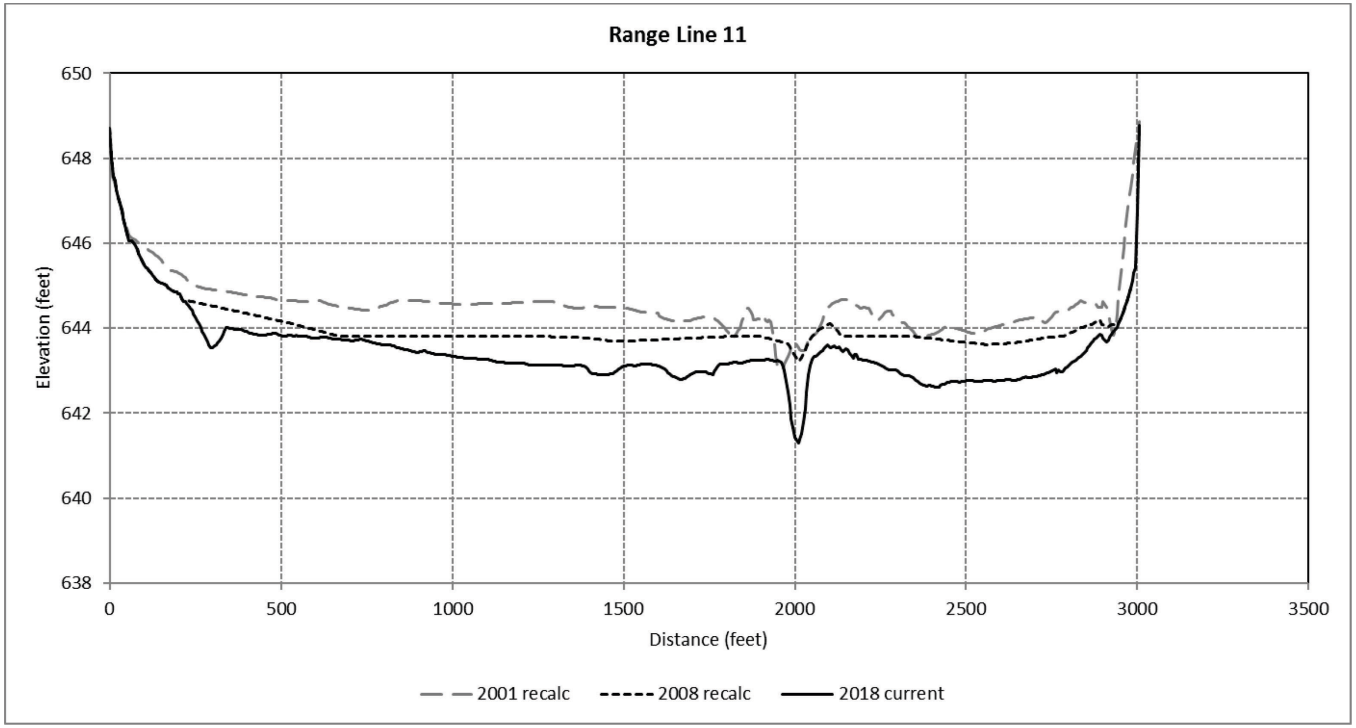

Range Line 6
655
650
645
640
635
630
625
Elevation (feet)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
7000
Distance (feet)
2001 recalc
2008 recalc
2018 current

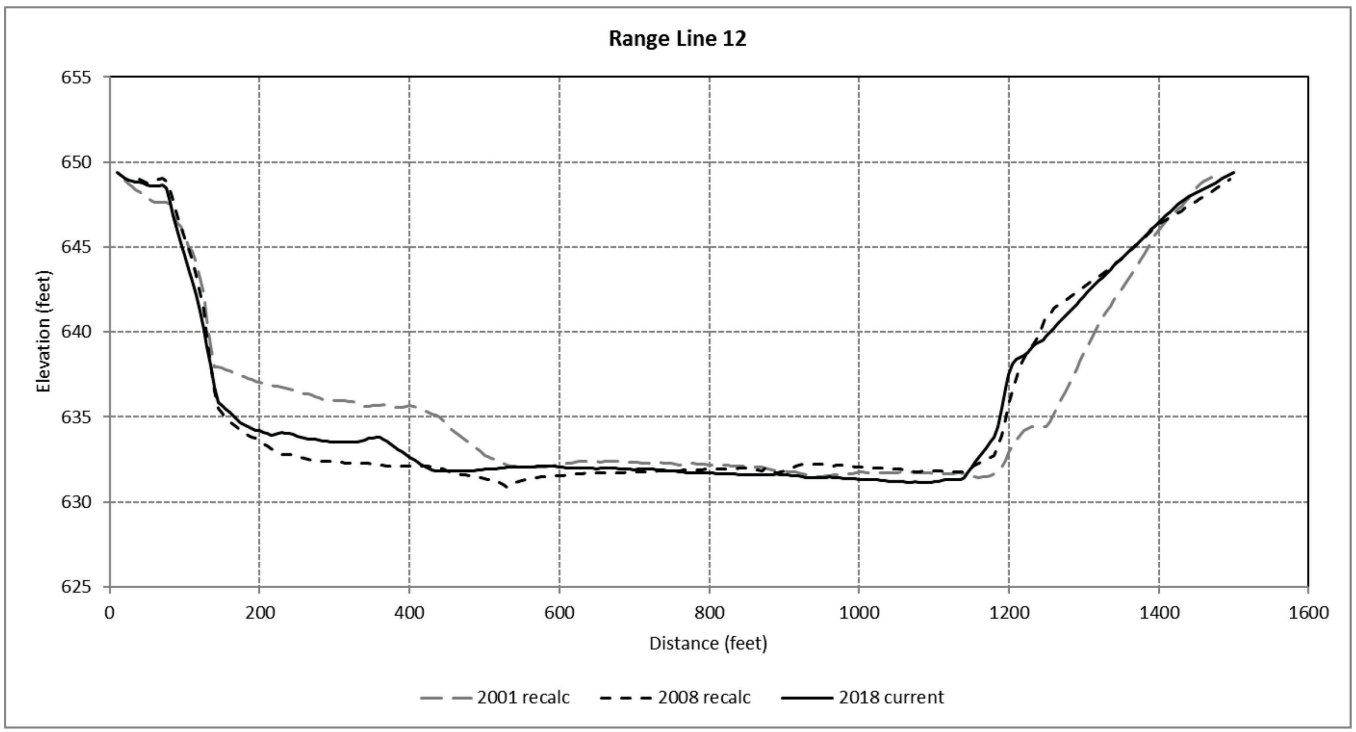

Range Line 7
655
650
645
640
635
630
Elevation (feet)
0
500
1000
1500
2000
2500
Distance (feet)
2001 recalc
2008 recalc
2018 current

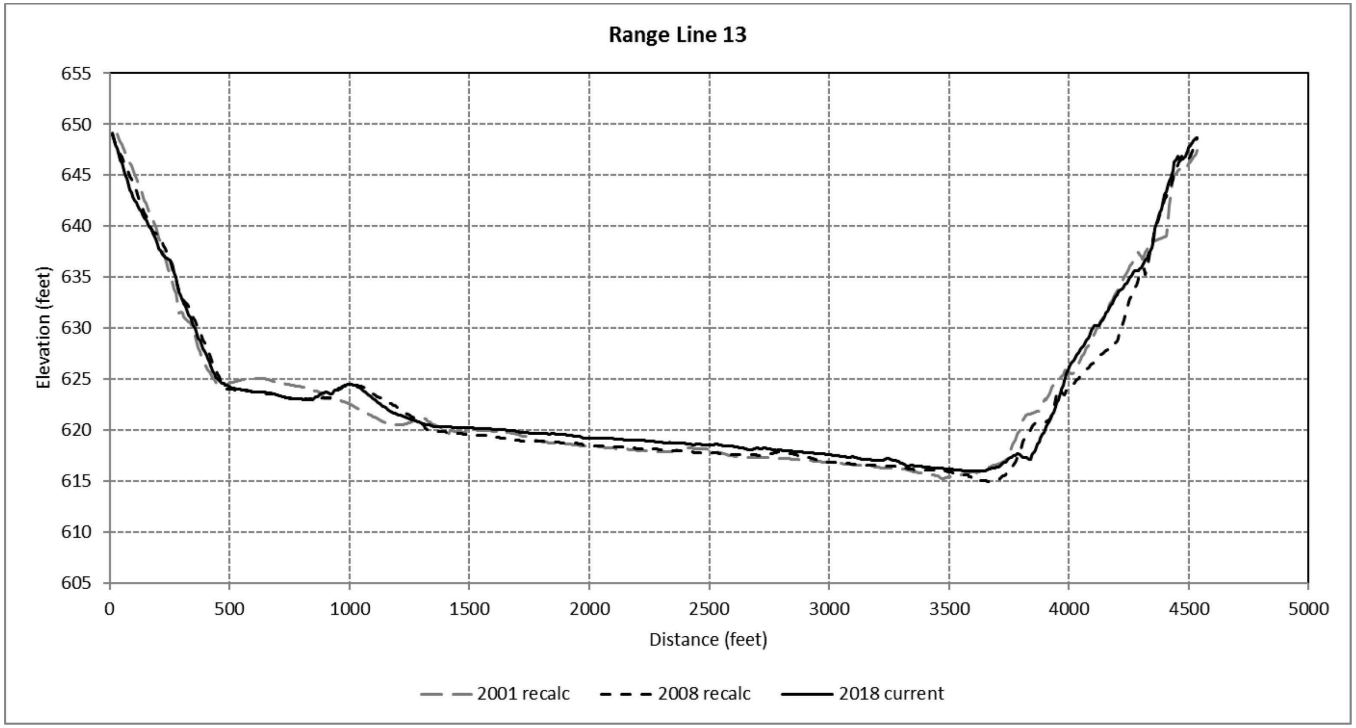

Range Line 8
652
650
648
646
644
642
640
638
636
634
Elevation (feet)
0
500
1000
1500
2000
2500
3000
Distance (feet)
2001 recalc
2008 recalc
2018 current

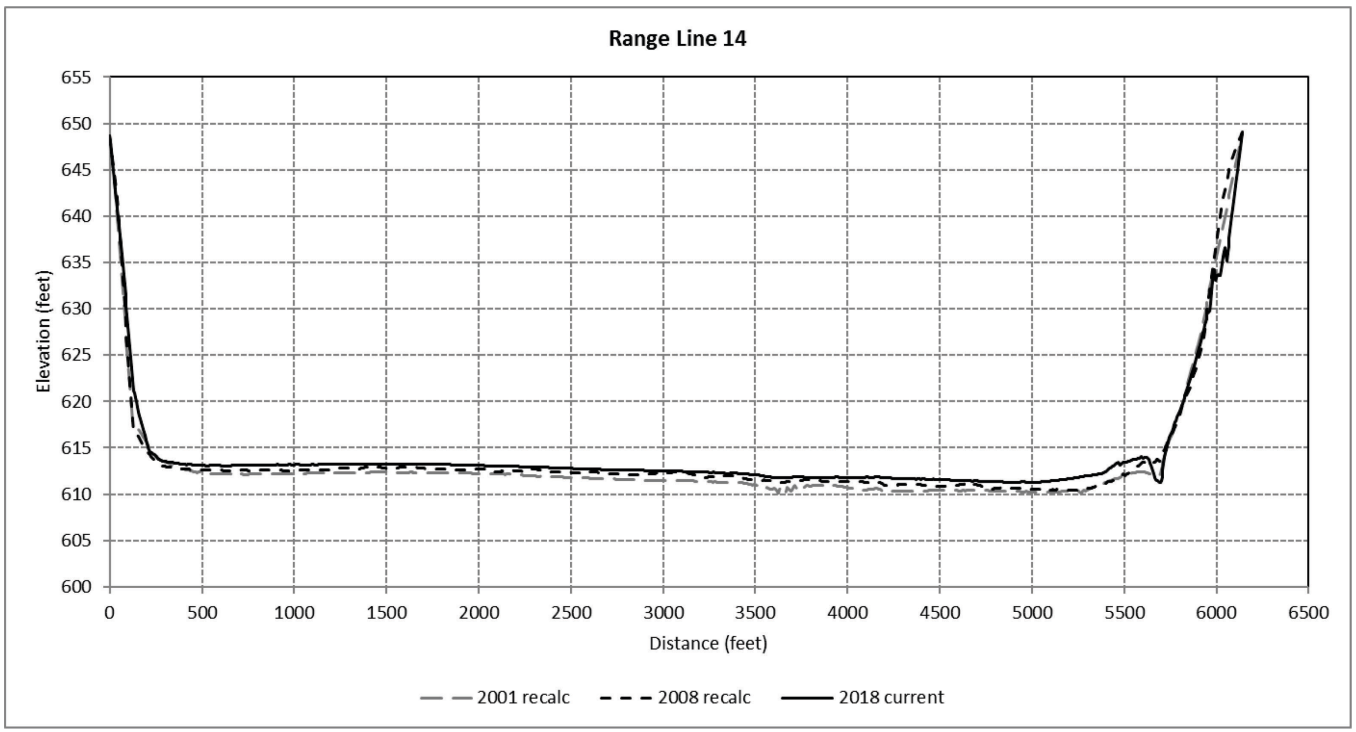

Range Line 9
650
648
646
644
642
640
638
636
634
Elevation (feet)
0
500
1000
1500
2000
2500
3000
Distance (feet)
2001 recalc
2008 recalc
2018 current

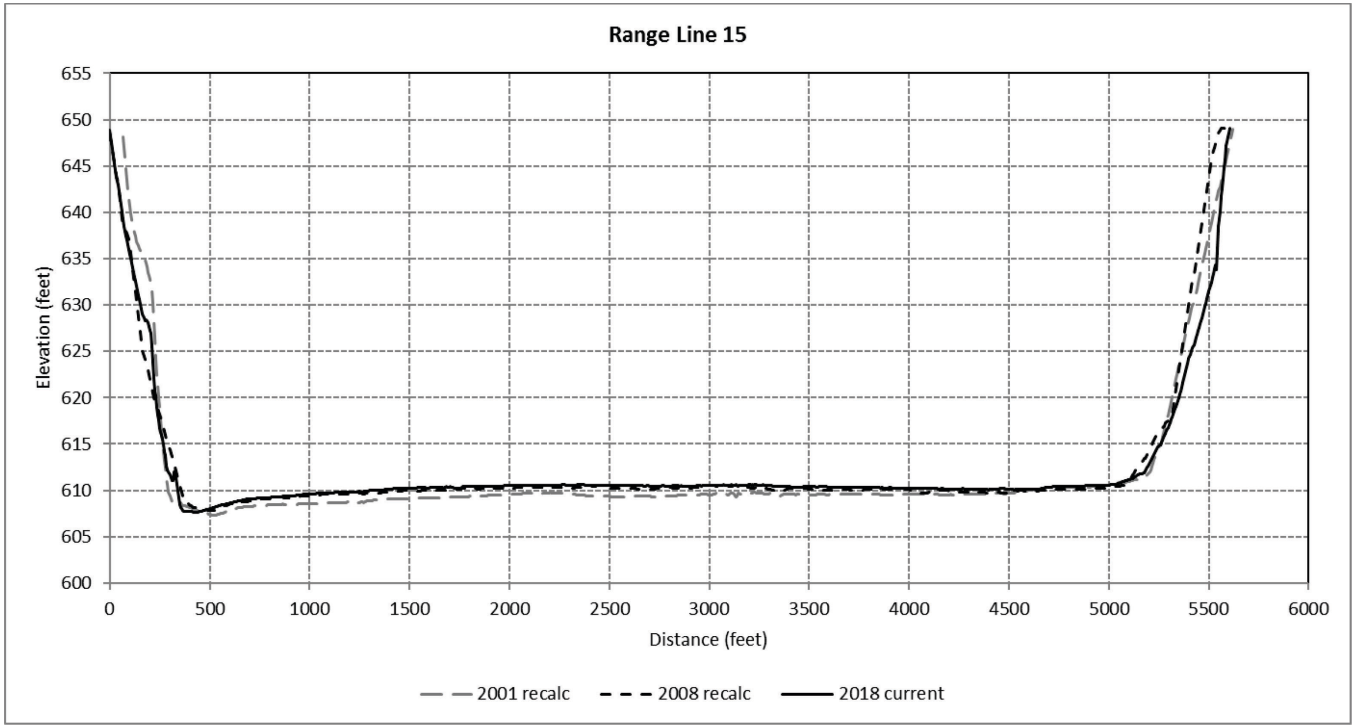

Range Line 10
652
650
648
646
644
642
640
638
Elevation (feet)
0
500
1000
1500
2000
2500
3000
Distance (feet)
2001 recalc
2008 recalc
2018 current

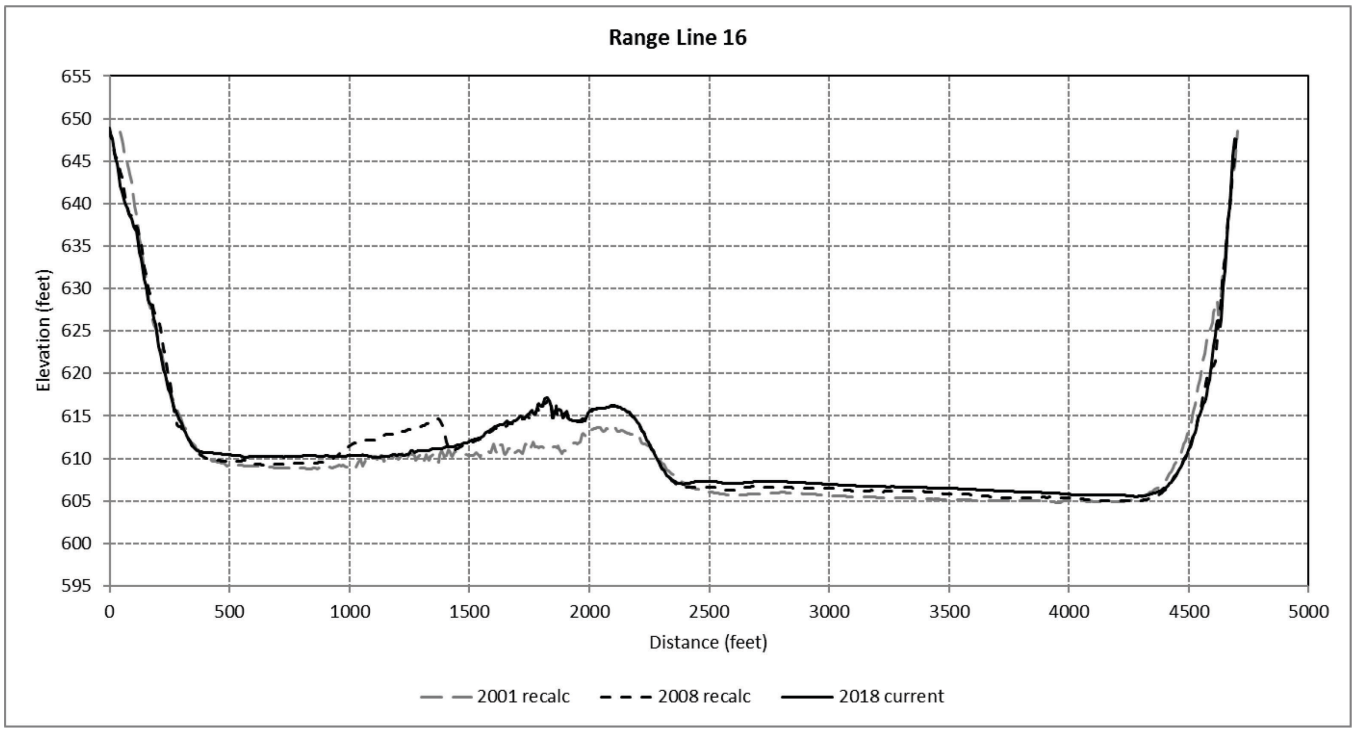

Range Line 11
650
648
646
644
642
640
638
Elevation (feet)
0
500
1000
1500
2000
2500
3000
3500
Distance (feet)
2001 recalc
2008 recalc
2018 current

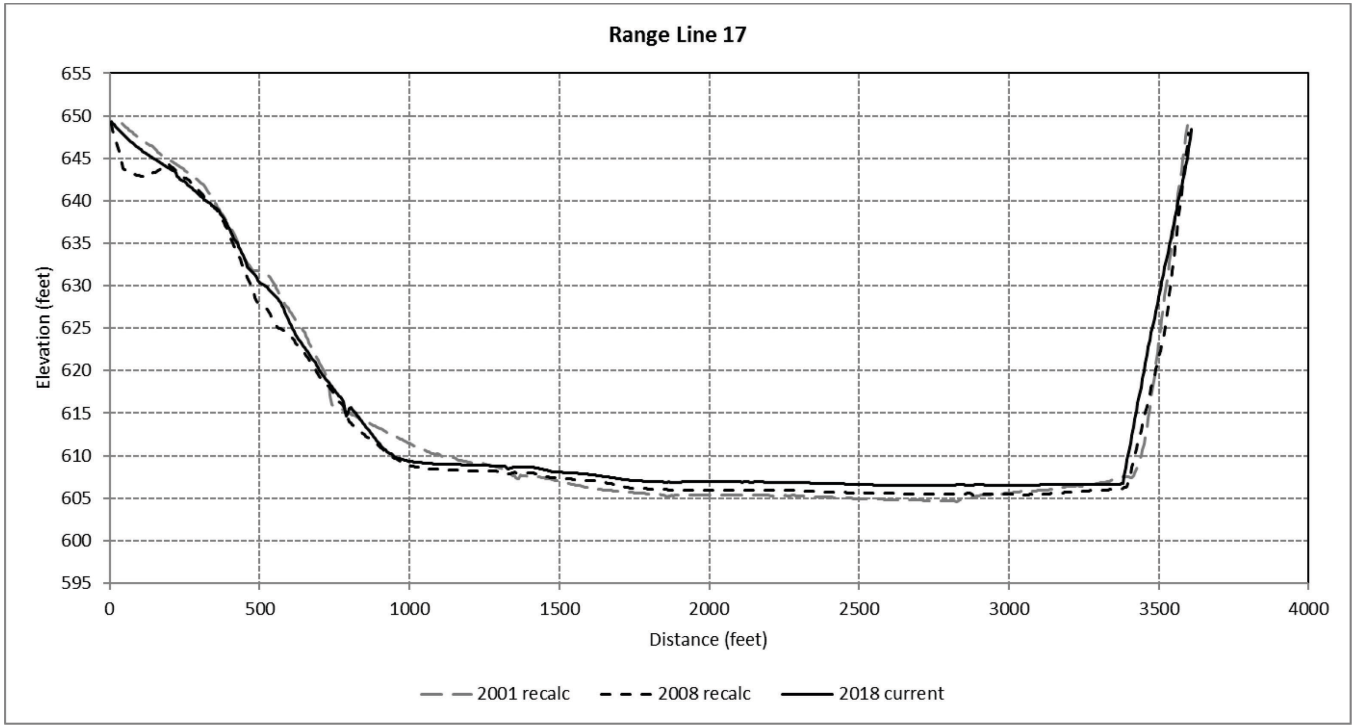

Range Line 12
655
650
645
640
635
630
625
Elevation (feet)
0
200
400
600
800
1000
1200
1400
1600
Distance (feet)
2001 recalc
2008 recalc
2018 current


Range Line 13
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Distance (feet)
2001 recalc
2008 recalc
2018 current


Range Line 14
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
600
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
Distance (feet)
2001 recalc
2008 recalc
2018 current


Range Line 15
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
600
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
Distance (feet)
2001 recalc
2008 recalc
2018 current


Range Line 16
Elevation (feet)
655
650
645
640
635
630
625
620
615
610
605
600
595
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Distance (feet)
2001 recalc
2008 recalc
2018 current


Range Line 17
655
650
645
640
635
630
625
620
615
610
605
600
595
Elevation (feet)
0
500
1000
1500
2000
2500
3000
3500
4000
Distance (feet)
2001 recalc
2008 recalc
2018 current

# Appendix N Axial profile

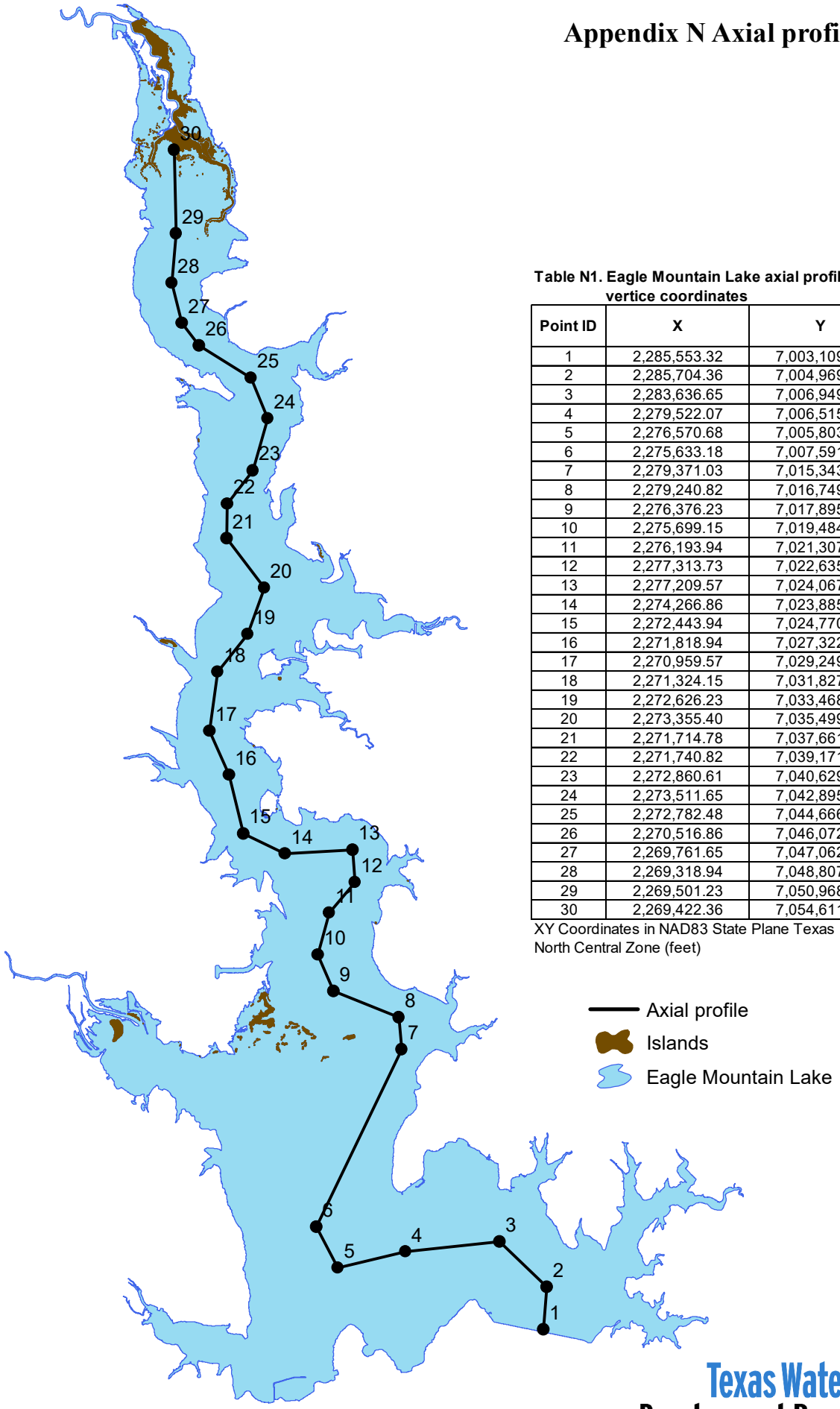



**Table N1. Eagle Mountain Lake axial profile vertice coordinates**

| Point ID | X | Y |
|---|---|---|
| 1 | 2,285,553.32 | 7,003,109.99 |
| 2 | 2,285,704.36 | 7,004,969.37 |
| 3 | 2,283,636.65 | 7,006,949.40 |
| 4 | 2,279,522.07 | 7,006,515.38 |
| 5 | 2,276,570.68 | 7,005,803.57 |
| 6 | 2,275,633.18 | 7,007,591.77 |
| 7 | 2,279,371.03 | 7,015,343.50 |
| 8 | 2,279,240.82 | 7,016,749.75 |
| 9 | 2,276,376.23 | 7,017,895.58 |
| 10 | 2,275,699.15 | 7,019,484.13 |
| 11 | 2,276,193.94 | 7,021,307.04 |
| 12 | 2,277,313.73 | 7,022,635.17 |
| 13 | 2,277,209.57 | 7,024,067.46 |
| 14 | 2,274,266.86 | 7,023,885.17 |
| 15 | 2,272,443.94 | 7,024,770.58 |
| 16 | 2,271,818.94 | 7,027,322.67 |
| 17 | 2,270,959.57 | 7,029,249.75 |
| 18 | 2,271,324.15 | 7,031,827.88 |
| 19 | 2,272,626.23 | 7,033,468.50 |
| 20 | 2,273,355.40 | 7,035,499.75 |
| 21 | 2,271,714.78 | 7,037,661.21 |
| 22 | 2,271,740.82 | 7,039,171.63 |
| 23 | 2,272,860.61 | 7,040,629.96 |
| 24 | 2,273,511.65 | 7,042,895.58 |
| 25 | 2,272,782.48 | 7,044,666.42 |
| 26 | 2,270,516.86 | 7,046,072.67 |
| 27 | 2,269,761.65 | 7,047,062.25 |
| 28 | 2,269,318.94 | 7,048,807.04 |
| 29 | 2,269,501.23 | 7,050,968.50 |
| 30 | 2,269,422.36 | 7,054,611.56 |

XY Coordinates in NAD83 State Plane Texas North Central Zone (feet)

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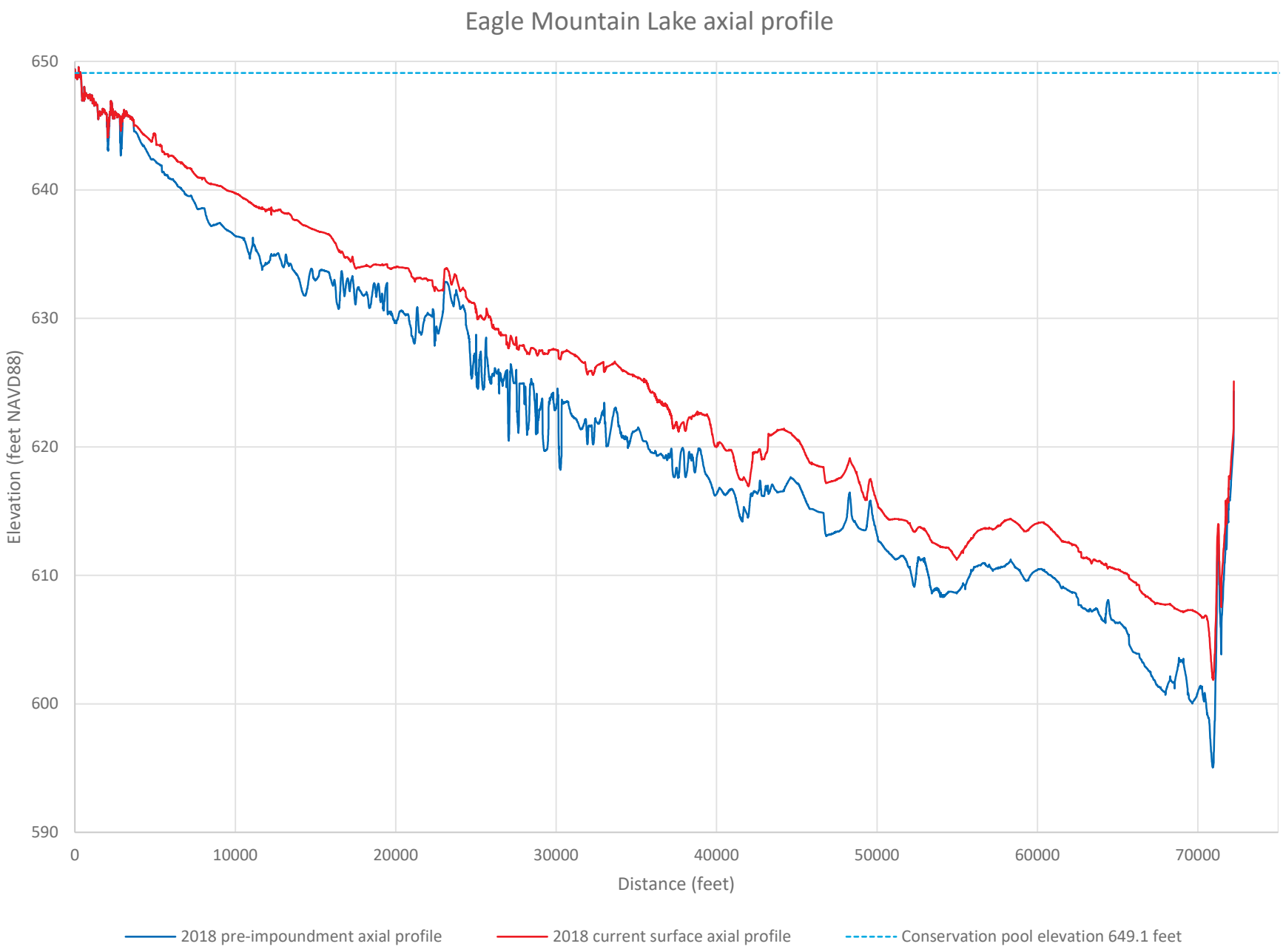

Eagle Mountain Lake axial profile
650
640
630
620
610
600
590
Elevation (feet NAVD88)
0
10000
20000
30000
40000
50000
60000
70000
Distance (feet)
2018 pre-impoundment axial profile
2018 current surface axial profile
Conservation pool elevation 649.1 feet

# Figure 6

## Contours
**feet (NAVD88)**

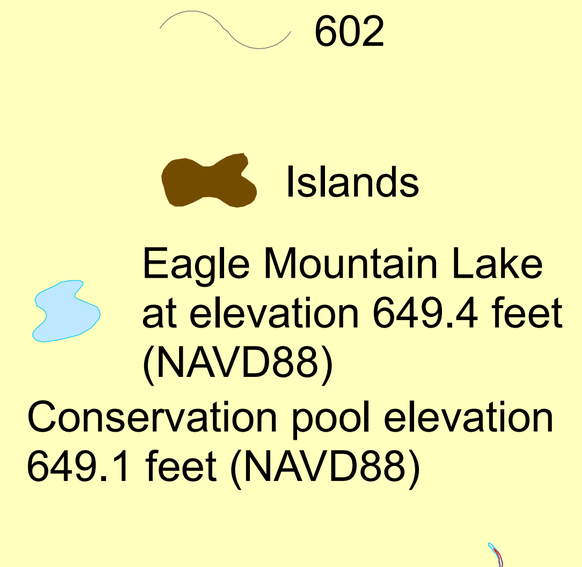
649.1
648
646
644
642
640
638
636
634
632
630
628
626
624
622
620
618
616
614
612
610
608
606
604
602

Islands

Eagle Mountain Lake at elevation 649.4 feet (NAVD88)

Conservation pool elevation 649.1 feet (NAVD88)

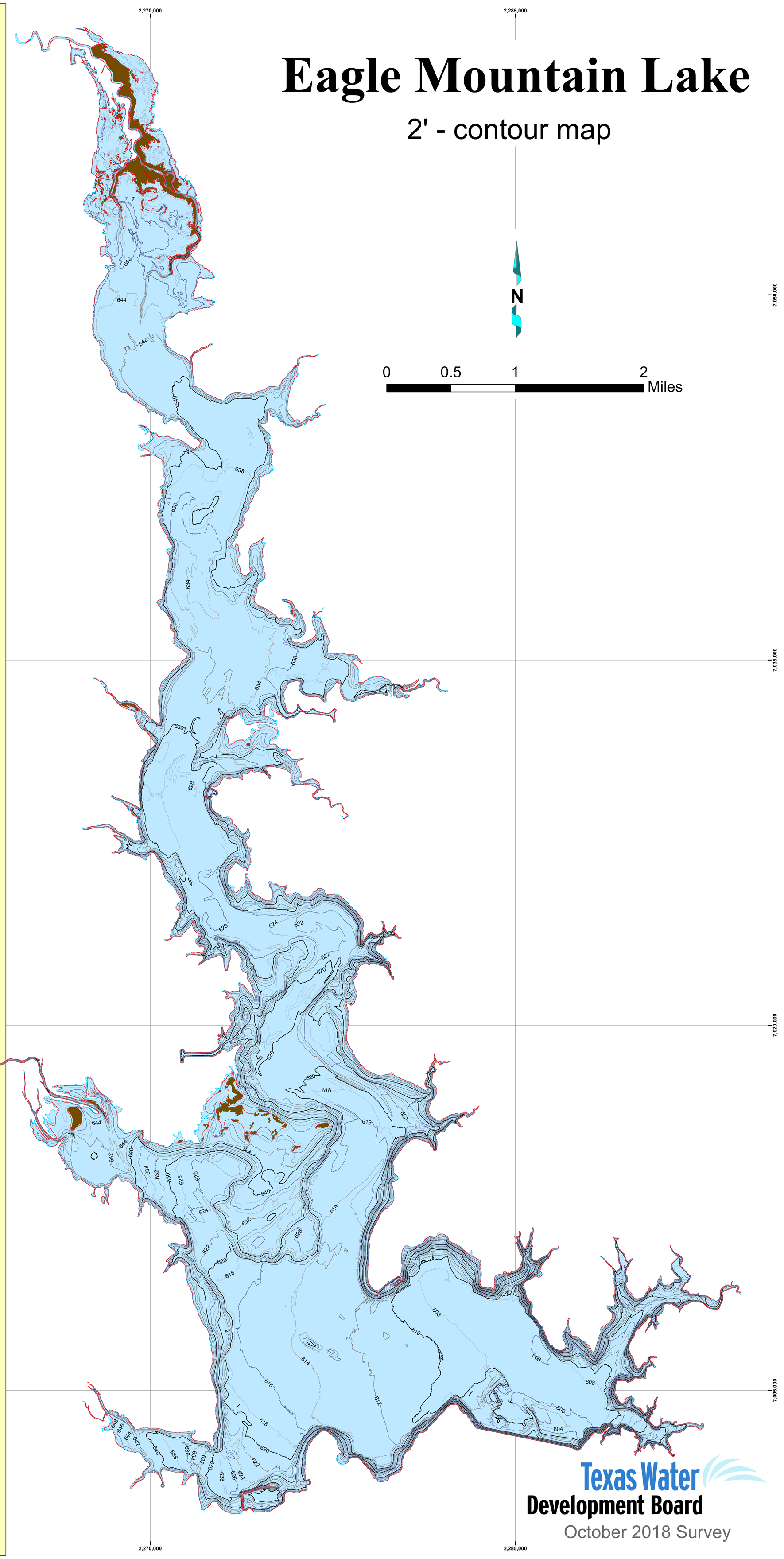
Projection: NAD83
State Plane Texas
North Central Zone (feet)




This map is the product of a survey conducted by the Texas Water Development Board's Hydrographic Survey Program to determine the capacity of Eagle Mountain Lake. The Texas Water Development Board makes no representations nor assumes any liability.

# Eagle Mountain Lake

2' - contour map

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