FINAL REPORT

MARK TWAIN LAKE
UPPER MISSISSIPPI RIVER BASIN

SALT RIVER, MISSOURI

REPORT OF SEDIMENTATION
2010 RESURVEY

U.S. Army Engineer District, St. Louis
Corps of Engineers
St. Louis, Missouri

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REPORT ON RESURVEY OF SEDIMENTATION
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CONVERSION FACTORS, U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U.S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
inches	25.4	millimeters
feet	0.3048	meters
miles (U.S. statue)	1.609344	kilometers
square miles	3.589988	square kilometers
cubic yards	0.7645549	cubic meters
acre-feet	1,233.482	cubic meters
feet per second	0.3048	meters per second
cubic feet per second	0.02831685	cubic meters per second

PERTINENT DATA SUMMARY
MARK TWAIN LAKE

Pertinent Data revised a bit from original report due to changes in WCM. 7/11/11 J. Rapp EC-HD

Item	Unit	
DRAINAGE AREA	sq. mi.	2,318
INACTIVE STORAGE POOL		
Elevation	feet NGVD	520-567.2
Top Surface Area	acres	5,900
Storage	acre-feet	87,000
Storage (runoff)	inches	0.70
CONSERVATION POOL		
Elevation	feet NGVD	567.2-606.0
Top Surface Area	acres	18,600
Storage	acre-feet	457,000
Storage (runoff)	inches	3.70
Regulated Discharge		
Maximum	dsf	12,000
Minimum	cfs	0
HYDROELECTRIC POWER POOL		
Elevation	feet NGVD	590.0-606.0
FLOOD CONTROL POOL (LOWER ZONE)		
Elevation	feet NGVD	606.0-624.8
Top Surface Area	acres	28,500
Storage	acre-feet	426,200
Storage (runoff)	inches	3.45
Regulated discharge		
Maximum	dsf	12,000
Minimum	cfs	50

PERTINENT DATA SUMMARY
MARK TWAIN LAKE (continued)

Item	Unit	
FLOOD CONTROL POOL (UPPER ZONE)		
Elevation	feet NGVD	624.8-638.0
Top Surface Area	acres	38,600
Storage	acre-feet	442,000
Storage (runoff)	inches	3.58
Regulated discharge		
Mississippi River below flood stage from Louisiana to St. Louis, MO		
Maximum	dsf	12,000
Minimun	cfs	50
INDUCED SURCHARGE POOL		
Elevation	feet NGVD	638.0-642.0
Top Surface Area	acres	42,000
Storage	acre-feet	164,700
Storage (runoff)	inches	1.33
Maximum Discharge	cfs	217,000
SURCHARGE POOL (TOTAL)		
Elevation	feet NGVD	638.0-648.0
Top Surface Area	acres	47,800
Storage	acre-feet	433,800
Storage (runoff)	inches	3.51
Maximum Discharge	cfs	267,500
FREEBOARD		
Elevation	feet NGVD	648.0-653.0
Top Surface Area	acres	53,200
Storage	acre-feet	257,120
Storage (runoff)	inches	2.08
Height	feet	5.0

PERTINENT DATA SUMMARY
MARK TWAIN LAKE (continued)

Item	Unit	
STANDARD PROJECT FLOOD		
Peak Flowrate (dam site)	cfs	210,560
Peak Flowrate (reservoir	cfs	295,000
Maximum Discharge	cfs	12,000
Maximum Pool Elevation	feet NGVD	638.0
Design Storm	inches	12.19
Runoff	inches	7.93
Runoff	acre-feet	980,360
Runoff (above 12,000 cfs)	inches	7.00
Runoff (above 12,000 cfs)	acre-feet	865,400
CANNON DAM		
Elevation, Top of Dam	feet NGVD	653.0
Height above Streambed	feet	138.0
Length of Crest	feet	1,940
Spillway		
Gross Width	feet	230
Crest Elevation	feet NGVD	600.0
Tainter Gates		
Number	each	4
Size	feet	50(W) x 39(H)
Top Elevation, Closed	feet NGVD	639.0
Outlet Structure		
Number of Sluices	each	1
Size (diameter)	inches	24

REPORT ON RESURVEY OF SEDIMENTAITON
MARK TWAIN LAKE
SALT RIVER, MISSOURI

1. INTRODUCTION

This report is prepared according to instructions in EM 1110-2-4000, Sedimentation Investigations of Rivers and Reservoirs, dated December 15, 1989, and compares the original 1982 survey with the 1987, 1997, and 2010 resurveys. The purpose of the investigation is to analyze the 2010 resurvey data to determine the distribution of sediment, the depletion of storage in the reservoir, and the trap efficiency of the reservoir. Operation of the reservoir was initialized in September 1983.

2. LOCATION OF RESERVOIR

Mark Twain Lake is located on the Salt River in the Counties of Ralls, Monroe, Audrain, and Shelby in northeastern Missouri. Clarence Cannon Dam is approximately 63 miles[1/] above the confluence of the Salt River and the Mississippi River, and approximately 27 miles upstream of the Town of New London. The watershed for the reservoir is 2,318 square miles, or about 79 percent of the total Salt River Basin (Plate 1).

3. PURPOSE OF RESERVOIR

Mark Twain Lake is part of a general comprehensive plan for flood control on the Upper Mississippi Basin. As part of this plan, Mark Twain Lake and Clarence Cannon Dam provide flood control, hydroelectric power generation, water supply, recreation, fish and wildlife conservation, and water quality enhancement. Incidental navigation benefits on the Mississippi River will occur as the result of releases from the lake during low flow periods.

4. RESERVOIR PERTINENT DATA – DAM AND APPURTENANT STRUCTURES

The Pertinent Data Summary, shown on pages vi - viii, contains data concerning the dam, outlet, and spillway structures; and the elevations, areas, and capacities of the inactive, joint-use, flood control, and surcharge pools.

5. WATERSHED CHARACTERISTICS

The Mark Twain Lake watershed has a total area of 2,318 square miles. The reservoir occupies approximately 60.3 square miles of this area at flood-control pool (el. 638.0[2/]). North Fork is the major drainage channel, draining 626 square miles. North Fork is 88.0 miles in length, has an average gradient of 4.5 feet per mile, and has a maximum elevation of approximately 1,000 feet.

[1/] A table of factors for converting U.S. customary units of measurement to metric (SI) units is presented on page i.
[2/] All elevations cited herein are in feet referred to National Geodetic Vertical Datum (NGVD29).

Middle Fork, Elk Fork, and South Fork are the other major tributaries to Mark Twain Lake. Middle Fork drains 356 square miles, is 65.4 miles in length, has an average gradient of 5.1 feet per mile, and has a maximum elevation of approximately 940 feet. Elk Fork drains 262 square miles, is 34.8 miles in length, has an average gradient of 7.9 feet per mile, and has a maximum elevation of approximately 880 feet. South Fork drains 298 square miles, is 38.0 miles in length, has an average gradient of 7.2 feet per mile, and has a maximum elevation of 880 feet. North Fork, Middle Fork, Elk Fork, and South Fork drain a total of 1,542 square miles, which is 66 percent of the Mark Twain Lake watershed.

The Mark Twain Lake watershed is a gently undulating plain in the upstream portion becoming more rolling and hilly in the downstream reaches. High rock bluffs border the streams at various locations. The river valleys are characterized by fairly narrow, tortuous courses interspersed by areas of widened bottomlands. Hickory and oak groves are scattered among crop and grazing lands. Strip mining in the South Fork watershed may produce acid runoff. Several clay pits in the southwestern portion of the Mark Twain Lake watershed account for some colloidal suspension, which increases the turbidity of the lake.

6. CLIMATE

The climate of the area is relatively moderate. The summers are usually mild with occasional temperatures of 100°F or higher. The winters are generally short and moderate, although temperatures below 0°F are occasionally experienced. The minimum and maximum temperatures of record are -21°F during the winter and 108°F during the summer. The average annual temperature for the area is about 55°F. The average monthly temperature ranges from a maximum of 79°F during July to a minimum of 26°F during January. Summaries of the monthly and annual precipitation and runoff for the watershed are given in Tables 1 and 2.

7. RESERVOIR OPERATION

The objective of regulating the Clarence Cannon Dam is to provide flood control, hydroelectric power generation, water supply, minimum releases for downstream water quality control, water temperature control for fish and wildlife, and recreation. There are also incidental benefits to Mississippi River navigation. The pool at elevation 606.0 feet retains 100 percent of the joint-use storage for the project purposes, not including flood control.

The major physical constraint is that some of the agricultural land downstream of the project floods at a flow rate below 12,000 cfs. The lower 16 miles of the Salt River is greatly affected by Mississippi River backwater, and the project has limited capability to provide flood protection in that reach.

Normal drawdown of the conservation pool resulting from power production will be limited throughout the year, with a more significant limitation during the recreation

season. A minimum release will be maintained at all times from the re-regulation pool, regardless of the Mark Twain Lake pool elevation, in order to insure satisfactory water quality downstream, primarily for fish habitat. When the lake level is within the lower part of the flood control pool (elevation 606.0 to 624.8), the total release from Clarence Cannon Dam will be limited to the seasonal channel capacity downstream of the re-regulation dam, less local runoff. The monthly reservoir pool hydrograph for the period 1984 through 2010 (available period of record) is shown on Plate 2.

8. RESERVOIR INFLOW

Summaries of the monthly and annual precipitation and runoff data for the watershed are given in Tables 1 and 2. One inch of runoff equals 123,619 acre-feet. Average annual precipitation and inflow for the sediment survey period are tabulated in Items 34 and 35 of Plate 55, a data summary of reservoir sediment, ENG Form 1787. The average monthly inflow hydrograph for the period October 1983 through September 2010 is shown on Plate 3.

9. ORIGINAL RESERVOIR SURVEY

Reservoir area and volume were determined from 7.5 Minute U.S. Geological Survey (USGS) quadrangle sheets. A tabulation of the original capacity at 5-foot intervals is shown in Table 3. Area and capacity curves are shown on Plate 4.

10. TYPE AND SCOPE OF THE INITIAL SEDIMENT SURVEY

There were 49 sediment ranges established and surveyed by direct leveling during the period of April through July 1982 for the purpose of observing sediment distribution and the approximate rate of reservoir storage depletion. Plate 5 shows the locations of the sediment ranges. The cross sections of the ranges for the original, 1987, 1997, and 2010 resurveys are shown on Plates 6 through 54. Appendix A shows detailed locations for the 49 sediment ranges.

11. TYPE AND SCOPE OF SEDIMENT RESURVEY

The 1987 and 1997 sedimentation resurveys of Mark Twain Lake used direct leveling by a Raytheon Recording Depth Sounder. A detailed sediment resurvey of the 49 sediment ranges was conducted in September and October 1987, when the average pool elevation during the measurements was about 603.8 feet.

A detailed resurvey of all 49 sediment ranges was not possible in 1997 due to accessibility difficulties from low water surface elevations. The 1997 sedimentation resurvey included a partial hydrographic survey and overbank survey of 24 sediment ranges and 2 additional overbank surveys. The average pool elevation during the measurements was about 606.1 feet.

For the 2010 sedimentation survey, the dry land topographic portions of the sedimentation resurveys were completed utilizing a total station and prism rod.

Hydrographic surveying was completed using an Odum Hydrographic Hydrotrac Echo Sounder. Hydrographic data was collected, edited, and processed using Hypack 2009 software. Endpoints of each range line were marked on the shoreline and used to create planned run lines within Hypack and/or used visually by the boat operator to maintain proper alignment. No hydrographic data was obtained for sediment ranges 39B and 48B due to low water levels. These ranges were completely surveyed by land. The survey was conducted in NGVD29.

The horizontal project datum is the North American Datum of 1983 (NAD83), US State Plane Missouri Central Zone, FIPS 2402. Horizontal positioning of topographic features was determined by handheld GPS observations or Real Time Kinematic (RTK) observations on range line control points and should be considered approximate. Horizontal positioning of hydrographic data was established by Differential GPS (DGPS) observations made with a Trimble AG132 DGPS unit with antenna mounted to the survey boat.

Range line control points with known elevations were held when completing topographic surveys of sedimentation ranges. For sedimentation ranges where existing control was unreliable, RTK observations were used to establish control point elevations. To process sedimentation range hydrographic data, water surface elevations were based on the Mark Twain Lake Pool gage readings. For range lines surveyed when water was not in pooled condition, water surface elevations were established by leveling to the water surface from known control points prior to sounding.

12. METHODS OF SEDIMENT COMPUTATIONS

The procedure based on the prismoidal formula for computing reservoir capacities and developed by the U.S. Soil Conservation Service (SCS) was used in the 1982 and 1987 studies and also in this study. However, the 1997 study used the average end area method.

The prismoidal formula procedure, published by H.M. Eakin of the SCS as USDA Technical Bulletin No. 524, "Silting of Reservoirs," July 1936 (rev. C.B. Brown, August 1939), describes range-end formula given by

$$V = \frac{A'}{3}\left(\frac{E_1 + E_2}{W_1 + W_2}\right) + \frac{A}{3}\left(\frac{E_1}{W_1} + \frac{E_2}{W_2}\right) + \frac{h_3E_3 + h_4E_4}{3(43{,}560)}$$

where V = capacity, acre-feet

A′ = area of the quadrilateral formed by connecting the points of intersection of the ranges with a given contour, acres

E = Range cross-section area, square feet

W = Width of the main stream range at a given elevation, feet

A = Total surface area of the segment bounded by the ranges, acres

h = Perpendicular distance from a range on a tributary to the junction of the tributary with the main stream; or if this junction is outside the segment, to the intersection of the thalweg of the tributary with the downstream range, feet

This formula is illustrated in Figure 1 with a reservoir segment that includes two tributary arms, and is thus bounded by four ranges. The formula is applicable for all reservoir segments except for the one between the most downstream range and the dam. The reservoir volume in this section is given by:

$$V = A\left(\frac{E}{W}\right) - \frac{L\left(2B - \frac{E}{W}S\right)\frac{E}{W}}{3(43{,}560)}$$

where V, A, and W are the same as defined above, and

L = length of the dam, feet

B = base width of the dam, feet

S = slope of the upstream face of the dam

The length L and base width B refer to distances on the dam describing the volume of water displaced by the upstream face of the dam. Therefore, L and B almost always vary with reservoir stage.

Values for A′, A, E, and W were computed at seven reservoir elevations: 560.0, 570.0, 606.0, 620.0, 630.0, 640.0, and 650.0 feet. Elevation 606.0 corresponds to the joint use pool. Reservoir volumes corresponding to the tops of the inactive pool (567.2), lower zone of the flood control pool (624.8), upper zone of the flood-control pool (638.0), and surcharge pool (648.0) were interpolated. In this study, the quadrilateral area A′ and surface area A were computed from USGS 7.5 minute topographic maps in GIS. The values for E and W were computed in HEC-RAS based on the surveyed cross sectional data and 2009 LiDAR data. Surveyed cross section data only reached elevation 640; therefore LiDAR data was combined with the surveyed data in order to extend cross section elevations up to reservoir elevation 648.0. The 1987 and 1997 Reports of Sedimentation did not include reservoir capacity calculations for the top of the surcharge pool. Mark Twain Lake went into surcharge in 2008, with a crest elevation of approximately 642 feet, requiring the current study to determine reservoir capacity at 648.0 feet.

In reporting reservoir volumes, or sediment volumes, values were given to the nearest acre-foot. Due to inaccuracies in the survey data and in the application of the prismoidal formula, volumes can be accurate to three significant digits, at best. However, in order to be precise relative to previous work and in comparison of one value to another within this analysis, precision to the nearest acre-foot was maintained.

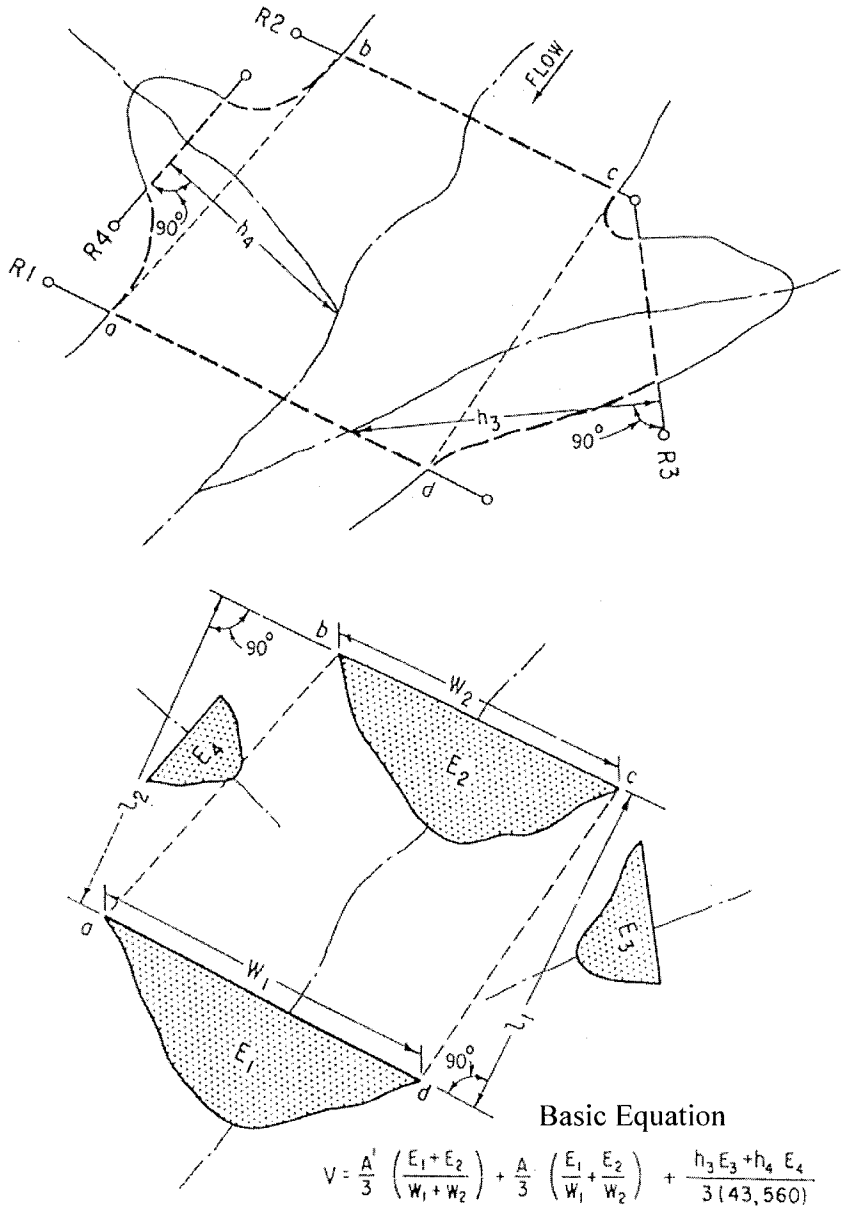


Figure 1. Terms of range-end formula for determining the capacity of a reservoir. (Taken from ASCE N&R No. 54 "Sedimentation Engineering", V.A. Vanoni, Editor, 1975, pp. 378-379).

Table 4 lists quadrilateral and surface areas between ranges at the top of the flood-control pool. The quadrilateral areas are generally smaller than the total surface areas because the quadrilateral areas do not reflect inlets and coves along the reservoir shoreline, which are included in the surface area. Range cross sectional areas measured in the 1983 and 2010 surveys and changes in cross sectional areas during the periods 1982-1987 and 1982-2010 are listed in Table 5a through 5e. Cross sectional areas are presented for elevations 567.2, 606.0, 624.8, 638.0, and 648.0 feet. Item 46 of Plate 56, ENG Form 1787, also lists elevation versus reservoir surface area for 2010.

13. SEDIMENT QUANTITIES

Table 3 lists the original, 1987, 1997, and 2010 reservoir capacities for Mark Twain Lake. Table 3a provides the computed changes in reservoir capacity for the periods 1983-1987, 1983-1997, and 1983-2010. The 2010 resurvey data show that 56,854 acre-feet of sediment was calculated to be deposited from 1983 to 2010 (period of operation) below elevation 638.0. About 26,318 acre-feet were deposited within the joint-use pool (below elevation 606.0). This decreased the amount of storage in the joint-use pool by 5.8 percent. In the flood-control pool (elevation 638.0 to 606.0), about 33,521 acre-feet of sediment accumulated. This reduced the flood-control pool capacity by 3.8 percent. Of the 33,521 acre-feet deposited in the flood control zone, approximately 19,984 acre-feet was calculated to be in the upper zone between elevations 624.8 and 638.0. The inactive storage pool (elevations 567.2 to 520) showed an increase in storage of 2,985 acre-feet. The surcharge pool (elevations 648.0 to 638.0) was not evaluated in previous sedimentation reports. Mark Twain Lake went into surcharge in 2008, with a crest elevation of approximately 640.4 feet (top of the induced surcharge pool is elevation 642.0), requiring the current study to determine reservoir capacity at 648.0 feet. Reservoir capacity at elevation 648.0 is 1,772,396 acre-feet. Capacity of the total surcharge pool is 401,195 acre-feet.

The 1997 resurvey calculated volume change for only the 24 resurveyed ranges. Remaining ranges were assumed to have no volume change. The following table summarizes the change in storage from 1983 to 2010 for the various pools. A period of 27.58 years (see Item 28, ENG Form 1787, Plate 55) was used in the calculations.

	Amount of Sediment Deposited (acre-feet)	Rate of Deposition (acre-feet/yr)	Percent of Storage Lost
Entire Reservoir	56,854	2,061	4.0%
Inactive Storage	-2,985	-108	-3.4%
Joint-Use Storage	26,318	954	5.8%
Flood-Control Storage	33,521	1,215	3.8%

14. TRAP EFFICIENCY OF THE RESERVOIR

For the period of operation, the entire reservoir has a trap efficiency of 94 percent. This computation was based on the method of Gunner Brune, where percentage of sediment

trapped is a function of the ratio of reservoir capacity to mean annual inflow, both in the same volume units (Item 33, Plate 39), presented in a transaction of the American Geophysical Union, Volume 34, Number 3, Figure 6, June 1953, pages 407-414. Table 7 presents descriptions of the sampling site locations. Appendix B provides the sediment size distributions based on sediment samples collected 29 April 1988. Sediment samples were not collected in 2010.

15. DOWNSTREAM CHANNEL AND RESERVOIR OPERATION

A separate study is ongoing concerning changes in the downstream regime. Nine ranges have been established in the re-regulation pool, and an additional twelve ranges have been established from the re-regulation dam to the Mississippi River. Inspection trips are made on an annual basis, and the ranges surveyed periodically. Information concerning this downstream data may be obtained by contacting the Engineering Division, Potamology Section, of the St. Louis District.

16. EFFECT ON WATER SUPPLY CONTRACT

The joint-use pool originally had 457,000 acre-feet of storage, of which 20,000 acre-feet was allocated for water supply. Of the total joint-use storage, 26,318 acre-feet had been depleted by 2010, a reduction of 5.8 percent. Due to the small amount of storage depleted, the existing water supply contract should not be changed. In the future, if sediment distribution decreases the amount of joint-use storage to the extent that any project purpose is affected, the District Engineer shall make an equitable redistribution of the storage allocation served by the project. Information concerning future sedimentation and any redistribution of storage allocations shall be made available to the Missouri State Water Resources Board.

17. SUMMARY (Revised from original report after error in previous reports discovered. Jo Rapp, EC-HD 7/11/11)

The computed rate of sediment deposition, 2,061 acre-feet per year, is very near the predicted rate of 1,740 acre-feet per year, which was the expected yearly sedimentation rate computed before the operation of the project. Note: the 1987 and 1997 Sedimentation reports incorrectly used 11,500 acre-feet per year as the predicted rate. At the computed sedimentation rate of 2,061 acre-feet per year, the entire reservoir (below elevation 638.0) will have lost 103,050 acre-feet of capacity after 50 years of operation. After 50 years of operation, the joint-use pool will have lost 47,700 acre-feet of storage at the computed rate of 954 acre-feet per year. At the computed deposition rate of -108 acre-feet per year, the inactive pool (elevations below 567.2 feet) will gain 5,400 acre-feet of storage after 50 years of operation. The validity of the inactive pool gaining storage capacity is questionable. The increasing trend of the inactive storage will have to be verified in future resurveys to determine if this trend is actually valid. These resurveys only examine data based on a set number of single beam range lines. The lake covers approximately 40,000 acres at the top of the flood control pool. Analysis of these range lines does not constitute a detailed storage analysis. The sedimentation program is established to make sure that gross miscalculations were not made in the initial design of

the reservoir. If the resurveys show a significant change in initial assumptions, then more detailed studies would be necessary to further evaluate present day storage.

18. RECOMMENDATION

Current budgeting guidance limits potential funding for future sediment surveys. A resurvey schedule of ten to fifteen years for the sedimentation ranges will be maintained until the sedimentation rate has been verified. The decision to do so should be based on an evaluation of future flood events and their estimated contribution to loss of available storage.

Table 1. Monthly Precipitation and Runoff for Mark Twain Lake (Sept. 1984 - 2010)

Month	Maximum Precipitation (inches)	Minimum Precipitation (inches)	Average Precipitation (inches)	Average Runoff (inches)	Runoff (percent)
January	5.40	0.20	2.01	0.72	35.87
February	6.90	0.12	2.34	1.17	49.97
March	5.26	0.77	2.42	1.24	51.12
April	9.31	1.60	3.68	1.47	39.94
May	11.76	0.78	4.29	1.74	40.67
June	8.24	0.68	3.92	1.04	26.44
July	15.11	0.57	3.51	1.15	32.78
August	9.31	0.59	3.87	0.47	12.19
September	11.77	1.10	3.16	0.74	23.38
October	8.62	1.29	2.81	0.58	20.52
November	7.22	0.35	2.39	0.81	33.90
December	5.76	0.26	2.08	0.65	31.26

Table 2. Annual Precipitation and Runoff for Mark Twain Lake (1984 - 2010)

Year	Rainfall (inches)	Runoff (inches)	Runoff (percent)	Average Daily Runoff (cfs)
1984	23.32	15.31	65.66	2615.00
1985	23.23	19.41	83.54	3314.56
1986	23.16	12.42	53.63	2102.48
1987	23.08	5.43	23.55	927.99
1988	23.00	2.47	10.75	427.46
1989	31.08	3.00	9.65	512.11
1990	44.75	12.11	27.06	2068.01
1991	43.26	10.14	23.43	1722.25
1992	34.59	7.36	21.29	1262.94
1993	50.17	25.33	50.48	4324.60
1994	31.53	8.79	27.88	1500.99
1995	41.88	12.76	30.46	2697.48
1996	38.73	8.71	22.49	1488.69
1997	34.75	8.92	25.67	1523.01
1998	47.50	19.41	40.86	3313.89
1999	26.61	11.66	43.82	1991.07
2000	33.75	2.64	7.83	451.52
2001	44.36	12.31	27.75	2101.95
2002	36.42	10.70	29.39	1827.68
2003	36.08	8.07	22.36	1177.63
2004	38.40	11.72	30.52	2004.04
2005	26.09	6.84	26.23	1168.38
2006	30.44	4.06	13.34	693.40
2007	36.41	7.82	21.48	1203.53
2008	57.44	30.00	52.23	5134.90
2009	59.22	20.57	34.73	3512.05
2010	44.73	21.57	48.22	3683.29
Maximum	59.22	30.00	83.54	5,135
Minimum	23.00	2.47	7.83	427
Average	36.02	11.83	32.38	2,005

Table 3. Tabulation of Capacity for Mark Twain Lake

Elevation (NGVD)	Original Capacity (ac-ft)	1987 Capacity (ac-ft)	1997 Capacity[1/] (ac-ft)	2010 Capacity (ac-ft)
560	50,150	47,330	60,729	45,742
565	74,448	71,275	85,795	75,754
567.2	87,027	83,699	97,609	90,012
570	104,716	100,856	112,644	108,529
575	141,508	136,699	144,150	146,258
580	185,196	179,438	184,280	188,297
585	236,332	229,625	230,458	236,226
590	295,388	287,732	284,775	291,072
595	362,886	354,280	345,323	353,859
600	439,401	429,846	410,305	425,613
605	525,560	515,056	480,048	507,359
606.0	543,994	533,300	494,527	520,661
610	622,607	611,783	552,443	600,123
615	732,139	721,152	627,205	704,930
620	854,997	843,849	705,148	822,804
624.8	986,079	974,775	782,509	949,209
625	991,779	980,388	785,732	954,772
630	1,145,045	1,131,470	868,598	1,087,572
635	1,316,103	1,300,345	953,657	1,265,088
638.0	1,428,055	1,410,987	1,005,684	1,371,201
640	--[2/]	--	--	1,448,914
645	--	--	--	1,644,080
648.0	--	--	--	1,772,396
650.0	--	--	--	1,862,428

[1/] Based on resurveyed cross sections only - additional capacity from ranges not surveyed = 333,156

[2/]Reservoir capacity calculations ended at 638.0 feet, top of flood control pool, in the original, 1987, and 1997 Reports of Sedimentation

Table 3a. Computed Change in Capacity For Mark Twain Lake

Elevation (NGVD)	Change in Capacity 1983-1987[3/] (ac-ft)	Change in Capacity 1983-1997[3/] (ac-ft)	Change in Capacity 1983-2010 (ac-ft)
567.2	-3,328[4/]	-2,059	2,985
606.0	-10,694	-5,136	-23,333
624.8	-11,304	-4,835	-36,870
638.0	-17,068	-4,054	-56,854
648.0	--[5/]	--	--

[3/] As reported in 1986 and 1997 Reports of Sedimentation, Mark Twain Lake

[4/] Negative value indicates decrease in storage

[5/]Reservoir capacity calculations ended at 638.0 feet, top of flood control pool, in the 1987 and 1997 Reports of Sedimentation

Table 4. Area Data by Reach for Mark Twain Lake, Elevation 606.0 feet

Reach	Quadrilateral Area - A' * (acres)	Measured Surface Area A (acres)
Dam-1A	85.9	174.2
1A-9A	631.8	1,496.2
9A-11A	849.2	975.3
11A-16A	896.0	1,261.0
16A-34A	1,334.0	1,955.8
34A-35A	782.0	1,036.8
35A-36A	391.2	713.5
36A-37A1	182.0	408.6
37A1-40AB	125.7	597.7
40AB-41AB	112.0	307.1
41AB-42AB	67.6	276.6
42AB-43B	43.7	112.1
43B-44B	--[6/]	--
44B-45B	--	--
45B-46B	--	--
46B-END	--	--
2A-3A	162.5	381.7
3A-4AB	240.0	579.3
4AB-5B	130.6	148.5
5B-END	6.4	45.3
6A-7A	465.9	1,223.5
7A-8B	180.0	202.4
8B-END	7.0	14.2
10AB-END	49.3	64.0
12A-13B	93.8	134.3
13B-END	29.9	50.4
14A-15B	263.5	298.8
15B-END	7.1	8.6
17A-18A	891.6	843.9
18A-26A	802.9	1,115.6
26A-28A	747.0	1,026.1
28A-31AB	207.0	469.1
31AB-32B	61.4	64.3
32B-END	1.5	17.4
19A-20A	477.2	713.7

[6/]Indicates cross section did not extend below elevation 606.0

Table 4. Area Data by Reach for Mark Twain Lake, Elevation 606.0 feet (continued)

Reach	Quadrilateral Area - A' * (acres)	Measured Surface Area A (acres)
20A-21B	338.4	678.4
21B-22B	166.6	185.4
22B-23B	0.3	1.0
23B-END	--	--
24B-END	--	--
25B-END	--	--
27B-END	19.2	20.3
29AB-30B	19.0	78.9
30B-END	--	--
33AB-END	51.7	82.6
37AB-38B	87.0	309.4
38B-39B	0.6	1.0
39B-END	--	--
47B-48B	--	--
48B-END	--	--
36A-37A2	212	330.1
28A-29AB	219	388.8

Table 5a. Range Cross Section Data for Mark Twain Lake, Elevation 567.2 feet

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
1A	56,897	-1,149	53,803	-3,094
2A	54,635	-873	51,738	-2,897
3A	22,012	-1,470	19,986	-2,026
4AB	--[7]	--	--	--
5				
B	--	--	--	--
6A	61,941	-1,536	59,339	-2,602
7A	--	--	--	--
8B	--	--	--	--
9A	64,256	-832	56,672	-7,584
10AB	4,520	-131	3,516	-1,004
11A	54,261	-2,966	49,382	-4,879
12A	9,075	-661	7,823	-1,252
13B	--	--	--	--
14A	9,816	-780	7,194	-2,622
15B	--	--	--	--
16A	85,947	-6,773	83,603	-2,344
17A	4,952	-1,141	3,538	-1,414
18A	2,913	-216	2,542	-371
19A	2,038	130	--	--
20A	171	-171	--	--
21B	--	--	--	--
22B	--	--	--	--
23B	--	--	--	--
24B	--	--	--	--
25B	--	--	--	--
26A	546	-131	--	--
27B	--	--	--	--
28A	--	--	--	--
29AB	--	--	--	--
30B	--	--	--	--
31AB	--	--	--	--
32B	--	--	--	--
33AB	1,832	-149	1,665	-167
34A	17,862	-832	17,253	-609
35A	3,386	-108	2,637	-749

[7] Indicates cross section did not extend below elevation 567.2.

Table 5a. Range Cross Section Data for Mark Twain Lake, Elevation 567.2 feet (continued)

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
36A	1,597	-217	--	--
37A1	521	-191	--	--
37A2	--	--	--	--
38B	--	--	--	--
39B	--	--	--	--
40AB	--	--	--	--
41AB	--	--	--	--
42AB	--	--	--	--
43B	--	--	--	--
44B	--	--	--	--
45B	--	--	--	--
46B	--	--	--	--
47B	--	--	--	--
48B	--	--	--	--

Table 5b. Range Cross Section Data for Mark Twain Lake, Elevation 606.0 feet

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
1A	142,390	-1,505	138,922	-3,468
2A	127,809	-323	124,671	-3,138
3A	61,506	-1,080	59,185	-2,321
4AB	23,914	-611	22,765	-1,149
5B	2,354	-541	1,099	-1,255
6A	153,207	-1,611	150,381	-2,826
7A	27,878	-1,510	25,989	-1,889
8B	1,883	-482	237	-1,646
9A	213,828	-740	202,388	-11,440
10AB	33,507	81	32,005	-1,502
11A	175,761	-3,187	170,816	-4,945
12A	41,491	-284	40,249	-1,242
13B	11,596	-70	10,384	-1,212
14A	97,482	-868	91,213	-6,269
15B	2,972	-459	1,211	-1,761
16A	321,486	-7,761	318,308	-3,178
17A	183,305	-3,730	182,328	-977
18A	72,377	-602	70,842	-1,535
19A	89,553	-314	87,852	-1,701
20A	45,171	-1,070	43,551	-1,620
21B	13,063	-967	5,430	-7,633
22B	596	105	736	140
23B	--[8/]	--	--	--
24B	--	--	--	--
25B	--	--	--	--
26A	56,642	-639	54,093	-2,549
27B	5,956	-435	4,006	-1,950
28A	27,931	248	24,244	-3,687
29AB	3,283	-809	1,183	-2,100
30B	--	--	2	2
31AB	2,841	-498	986	-1,855
32B	1,058	-146	650	-408
33AB	22,056	407	21,941	-115
34A	140,175	-1,564	138,338	-1,837
35A	102,433	-2,026	98,622	-3,811

[8/]Indicates cross section did not extend below elevation 606.0.

Table 5b. Range Cross Section Data for Mark Twain Lake, Elevation 606.0 feet (continued)

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	2010 Cross-Sectional Area (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
36A	68,537	-807	67,306	-1,231
37A1	24,651	-819	22,964	-1,687
37A2	13,522	-139	11,967	-1,555
38B	42	30	7	-35
39B	--	--	--	--
40AB	14,091	-657	9,643	-4,448
41AB	7,000	-1,264	2,373	-4,627
42AB	2,687	-486	1,877	-810
43B	554	67	691	137
44B	--	--	--	--
45B	--	--	--	--
46B	--	--	--	--
47B	16	16	67	51
48B	--	--	--	--

Table 5c. Range Cross Section Data for Mark Twain Lake, Elevation 624.8 feet

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	2010 Cross-Sectional Area (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
1A	185,987	-1,629	182,602	-3,385
2A	164,963	-283	161,866	-3,097
3A	82,245	-1,082	79,925	-2,320
4AB	57,145	-1,921	54,621	-2,524
5B	14,392	-435	12,761	-1,631
6A	200,018	-1,535	206,039	6,021
7A	56,479	-1,473	56,722	243
8B	8,124	-554	6,498	-1,626
9A	292,210	-769	281,261	-10,949
10AB	55,281	110	54,243	-1,038
11A	236,618	-3,172	231,754	-4,864
12A	61,243	-258	69,728	8,485
13B	26,945	-12	25,699	-1,246
14A	169,755	-602	163,693	-6,062
15B	14,921	-735	17,385	2,464
16A	443,206	-7,756	440,187	-3,019
17A	297,698	-3,449	297,081	-617
18A	119,252	-568	117,921	-1,331
19A	150,415	-144	149,076	-1,339
20A	91,572	-1,129	91,789	217
21B	37,669	-1,068	30,088	-7,581
22B	6,407	191	6,347	-60
23B	1,265	77	1,459	194
24B	1,904	17	1,718	-186
25B	4,305	-144	4,106	-199
26A	134,376	-602	131,948	-2,428
27B	21,839	-578	19,652	-2,187
28A	94,911	-62	91,409	-3,502
29AB	25,288	-1,038	26,383	1,095
30B	3,289	-167	3,440	151
31AB	24,634	-454	21,679	-2,955
32B	10,573	-464	9,216	-1,357
33AB	37,709	387	37,719	10
34A	231,753	-1,807	229,943	-1,810
35A	167,328	-2,206	171,754	4,426

Table 5c. Range Cross Section Data for Mark Twain Lake, Elevation 624.8 feet (continued)

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
36A	120,670	-665	119,722	-948
37A1	50,317	-597	48,978	-1,339
37A2	28,968	-160	29,993	1,025
38B	23,020	-75	21,612	-1,408
39B	408	-41	499	91
40AB	38,818	-715	34,317	-4,501
41AB	20,244	-1,530	15,111	-5,133
42AB	24,503	-1,427	21,180	-3,323
43B	20,566	39	19,171	-1,395
44B	5,217	-234	6,428	1,211
45B	1,192	-33	1,602	410
46B	1,277	-343	1,255	-22
47B	6,371	-53	5,996	-375
48B	1,420	28	865	-555

Table 5d. Range Cross Section Data for Mark Twain Lake, Elevation 638.0 feet

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
1A	217,433	-1,660	214,108	-3,325
2A	191,665	-250	188,632	-3,033
3A	97,401	-1,083	95,107	-2,294
4AB	81,375	-1,891	78,848	-2,527
5B	25,626	-348	24,119	-1,507
6A	234,613	-1,548	253,770	19,157
7A	80,239	-1,513	86,383	6,144
8B	16,102	-380	14,593	-1,509
9A	348,955	-761	338,111	-10,844
10AB	73,246	174	72,322	-924
11A	279,817	-3,149	275,028	-4,789
12A	76,636	-305	98,246	21,610
13B	43,957	49	42,779	-1,178
14A	228,335	-753	222,122	-6,213
15B	26,281	-868	40,633	14,352
16A	531,249	-8,014	528,220	-3,029
17A	385,795	-3,377	385,402	-393
18A	153,417	-507	152,174	-1,243
19A	194,234	-112	195,741	1,507
20A	132,043	-1,072	132,352	309
21B	58,451	-1,114	50,989	-7,462
22B	18,489	43	18,409	-80
23B	9,804	250	9,723	-81
24B	10,170	46	9,974	-196
25B	15,151	-292	14,783	-368
26A	194,033	-558	191,738	-2,295
27B	35,498	-593	33,312	-2,186
28A	149,428	-729	147,602	-1,826
29AB	50,771	-1,005	51,968	1,197
30B	18,103	-48	18,200	97
31AB	47,180	-328	44,136	-3,044
32B	26,322	-516	24,864	-1,458
33AB	52,266	410	52,332	66
34A	310,986	-1,955	309,185	-1,801
35A	218,066	-2,168	236,589	18,523

Table 5d. Range Cross Section Data for Mark Twain Lake, Elevation 638.0 feet (continued)

Range	Original Cross-Sectional Area, 1982 (ft^2)	Change in Cross-Sectional Area, 1982-1987 (ft^2)	Cross-Sectional Area, 2010 (ft^2)	Change in Cross-Sectional Area, 1982-2010 (ft^2)
36A	158,914	-624	158,672	-242
37A1	71,566	-435	74,151	2,585
37A2	43,245	-105	55,103	11,858
38B	49,578	-64	48,340	-1,238
39B	10,693	-155	10,619	-74
40AB	63,270	-585	61,570	-1,700
41AB	39,532	-1,572	34,786	-4,746
42AB	54,176	-1,420	50,885	-3,291
43B	44,928	108	44,270	-658
44B	27,513	-267	34,472	6,959
45B	23,979	-161	32,585	8,606
46B	8,769	-351	8,478	-291
47B	19,258	-575	18,990	-268
48B	11,560	11	9,245	-2,315

Table 5e. Range Cross Section Data for Mark Twain Lake, Elevation 648.0 feet

Range	2010 Cross-Sectional Area (ft^2)	Range	2010 Cross-Sectional Area (ft^2)
1A	238,475	36A	191,567
2A	209,319	37A1	98,050
3A	106,951	37A2	82,465
4AB	98,270	38B	70,876
5B	33,759	39B	27,991
6A	297,184	40AB	89,100
7A	112,348	41AB	62,286
8B	25,539	42AB	76,442
9A	382,913	43B	63,769
10AB	87,213	44B	64,334
11A	308,321	45B	77,174
12A	124,267	46B	39,881
13B	57,994	47B	33,789
14A	269,042	48B	19,810
15B	65,364		
16A	600,462		
17A	455,801		
18A	180,664		
19A	236,427		
20A	165,143		
21B	68,083		
22B	29,771		
23B	18,384		
24B	19,491		
25B	26,748		
26A	240,025		
27B	46,916		
28A	203,128		
29AB	74,102		
30B	33,346		
31AB	64,485		
32B	41,430		
33AB	67,722		
34A	372,747		
35A	297,751		

Table 6. Descriptive Locations of Sediment Sampling Sites (29 April 1988)

Site Identification	Description
MT EM	Near the confluence of the Elk and Middle Forks. Near Range 28A.
MT FF	North Fork at Highway FF near Range 43B.
MT IC	Upper end of Indian Creek near Range 8B.
MT LC	Upper end of Lick Creek on Range 5B.
MT LI	Extreme upper end of Little Indian Creek. No range nearby.
MT 22	Near center of main body of lake, opposite from Spalding Recreation Area (Old Joanna Bridge Site). Between Ranges 1A and 6A.
MT 33	Upsteam side of Route J bridge (Lick Creek) near Black Jack Marina. Near Range 3A.
MT 66	On South Fork, upstream of Highway 107 bridge near Range 18A.
MT 77	On North Fork, upstream of Highway 107 bridge near Range 34A.
MT 88	On South Fork, upstream of Highway 154 bridge near Range 20A.
MT 99	On North Fork, upstream of Highway 24 bridge near Range 40AB.

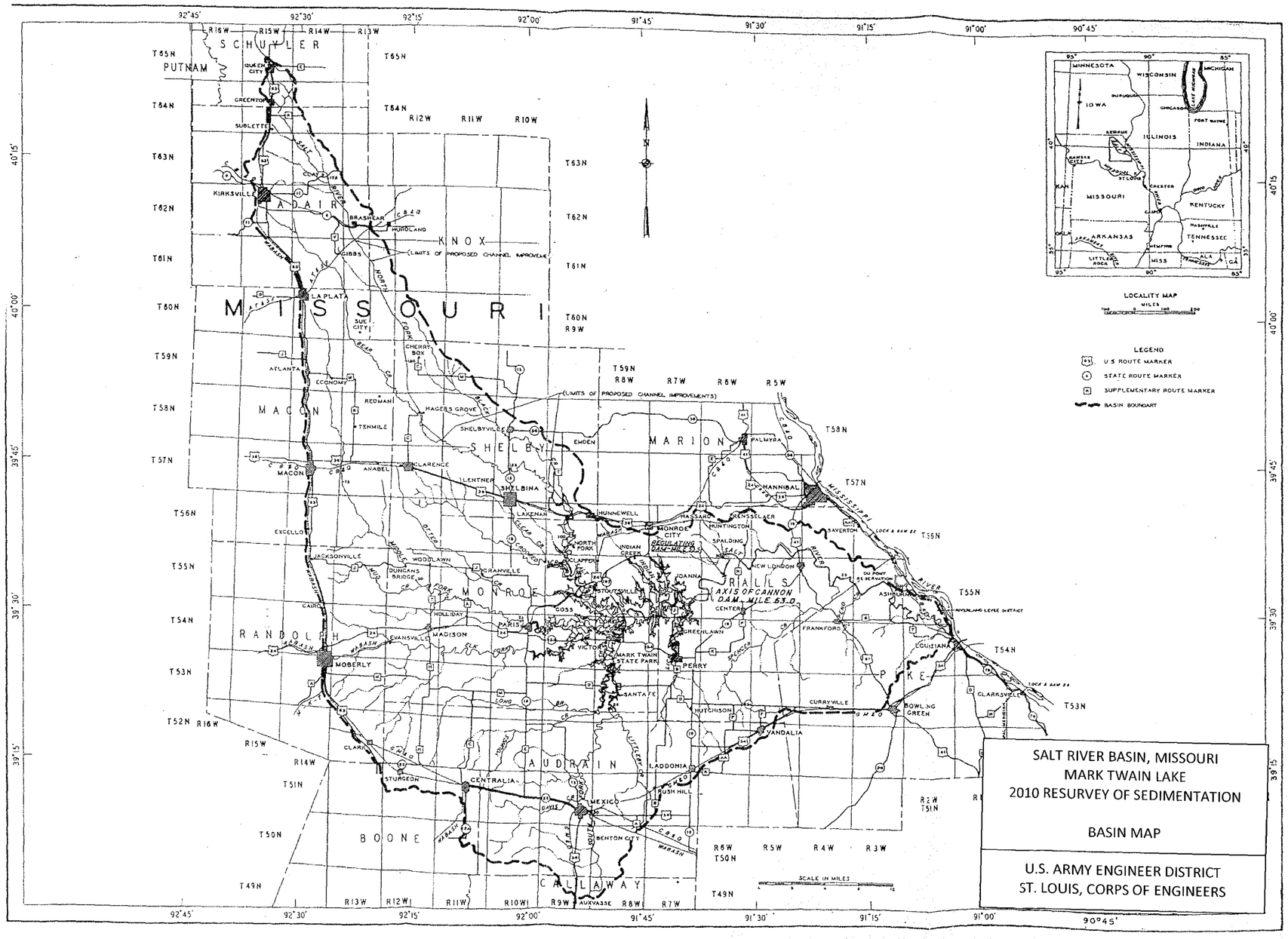
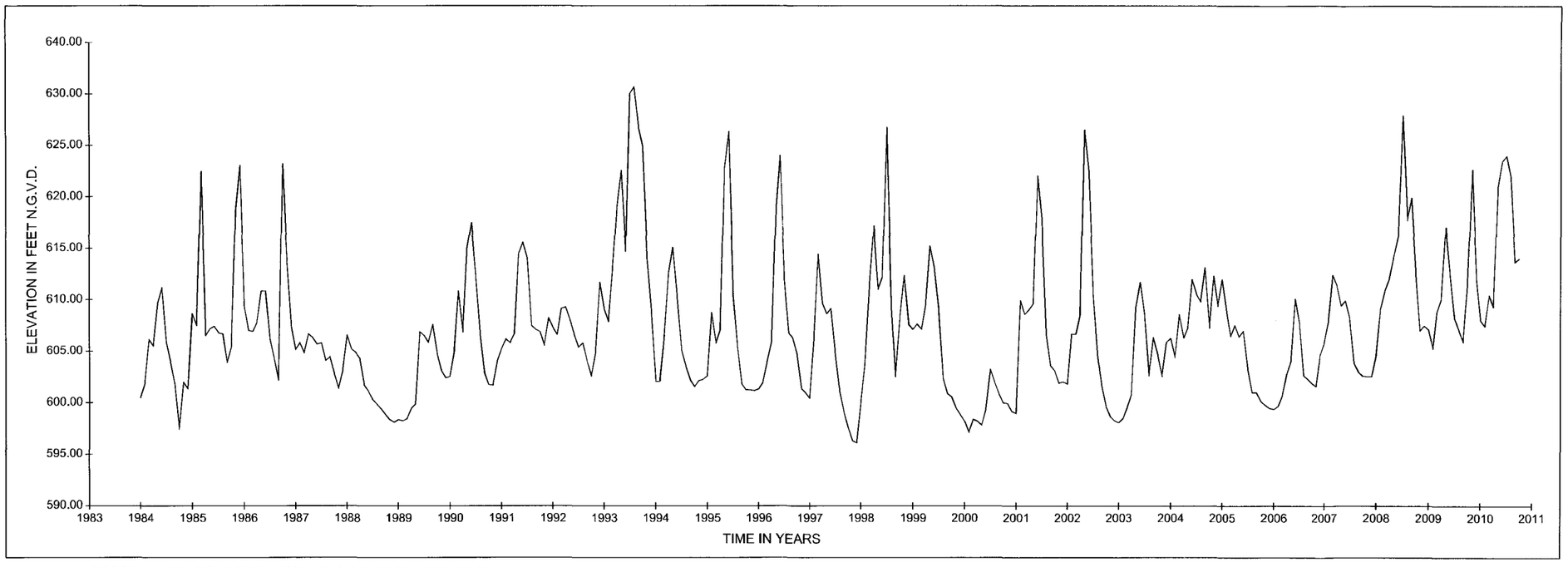

SALT RIVER BASIN, MISSOURI
MARK TWAIN LAKE
2010 RESURVEY OF SEDIMENTATION
BASIN MAP
U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, CORPS OF ENGINEERS
LOCALITY MAP
LEGEND
U.S. ROUTE MARKER
STATE ROUTE MARKER
SUPPLEMENTARY ROUTE MARKER
BASIN BOUNDARY
(LIMITS OF PROPOSED CHANNEL IMPROVEMENTS)
AXIS OF CANNON DAM MILE 63.0
REGULATING DAM MILE 5.0
SCALE IN MILES
SCHUYLER
PUTNAM
ADAIR
KNOX
MISSOURI
MACON
SHELBY
MARION
MONROE
RALLS
RANDOLPH
PIKE
AUDRAIN
BOONE
CALLAWAY
KIRKSVILLE
LA PLATA
MACON
SHELBINA
HANNIBAL
MONROE CITY
PALMYRA
MOBERLY
CENTRALIA
MEXICO
BOWLING GREEN
CLARKSVILLE
MARK TWAIN STATE PARK
MISSISSIPPI
MISSOURI
SALT RIVER
92°45'
92°30'
92°15'
92°00'
91°45'
91°30'
91°15'
91°00'
90°45'
40°15'
40°00'
39°45'
39°30'
39°15'
T65N
T64N
T63N
T62N
T61N
T60N
T59N
T58N
T57N
T56N
T55N
T54N
T53N
T52N
T51N
T50N
T49N
R16W
R15W
R14W
R13W
R12W
R11W
R10W
R9W
R8W
R7W
R6W
R5W
R4W
R3W

PLATE 1



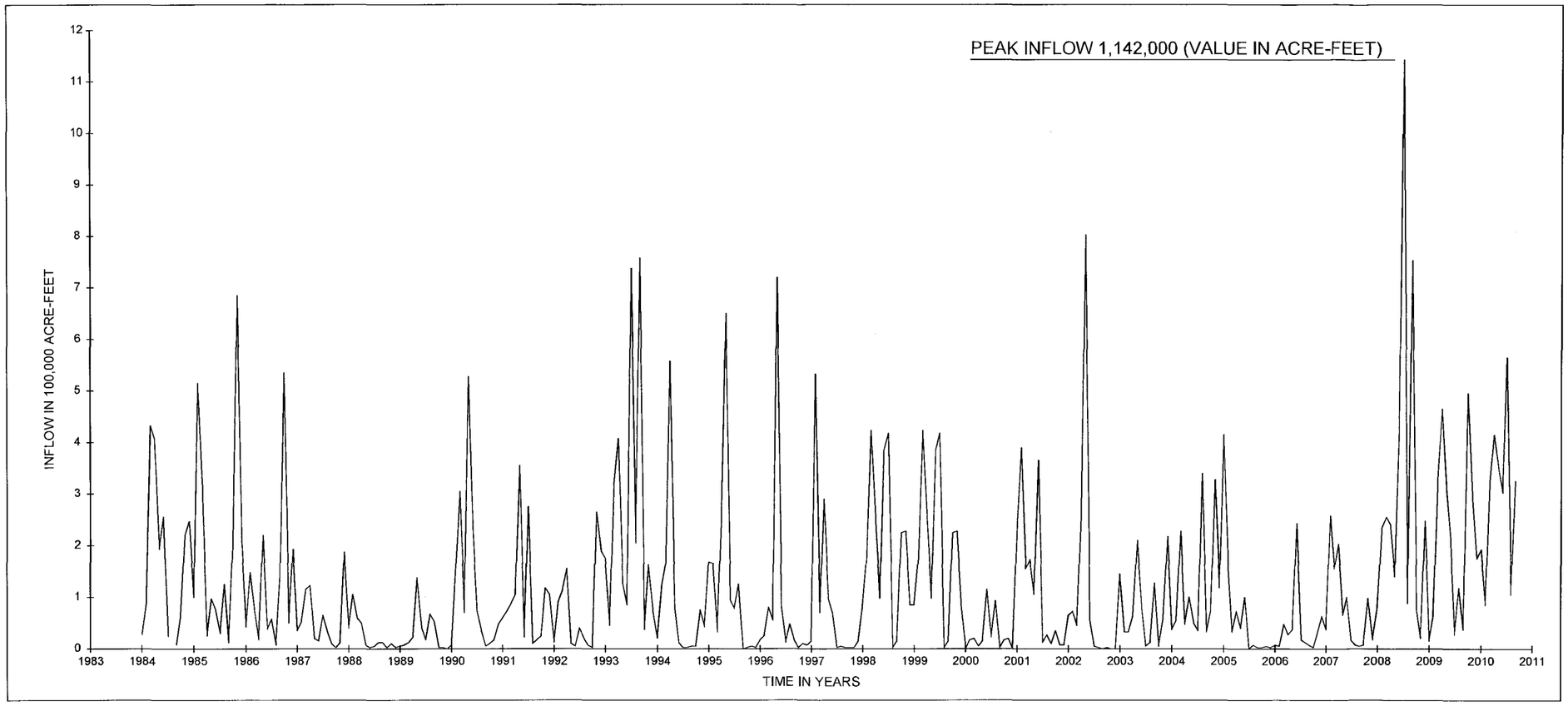
* RECORD DAILY PEAK ELEVATION WAS 640.36 ON JULY 30,2008

SALT RIVER BASIN, MISSOURI
MARK TWAIN LAKE

2010 RESURVEY OF SEDIMENTATION

AVERAGE MONTHLY
POOL ELEVATIONS

U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, CORPS OF ENGINEERS

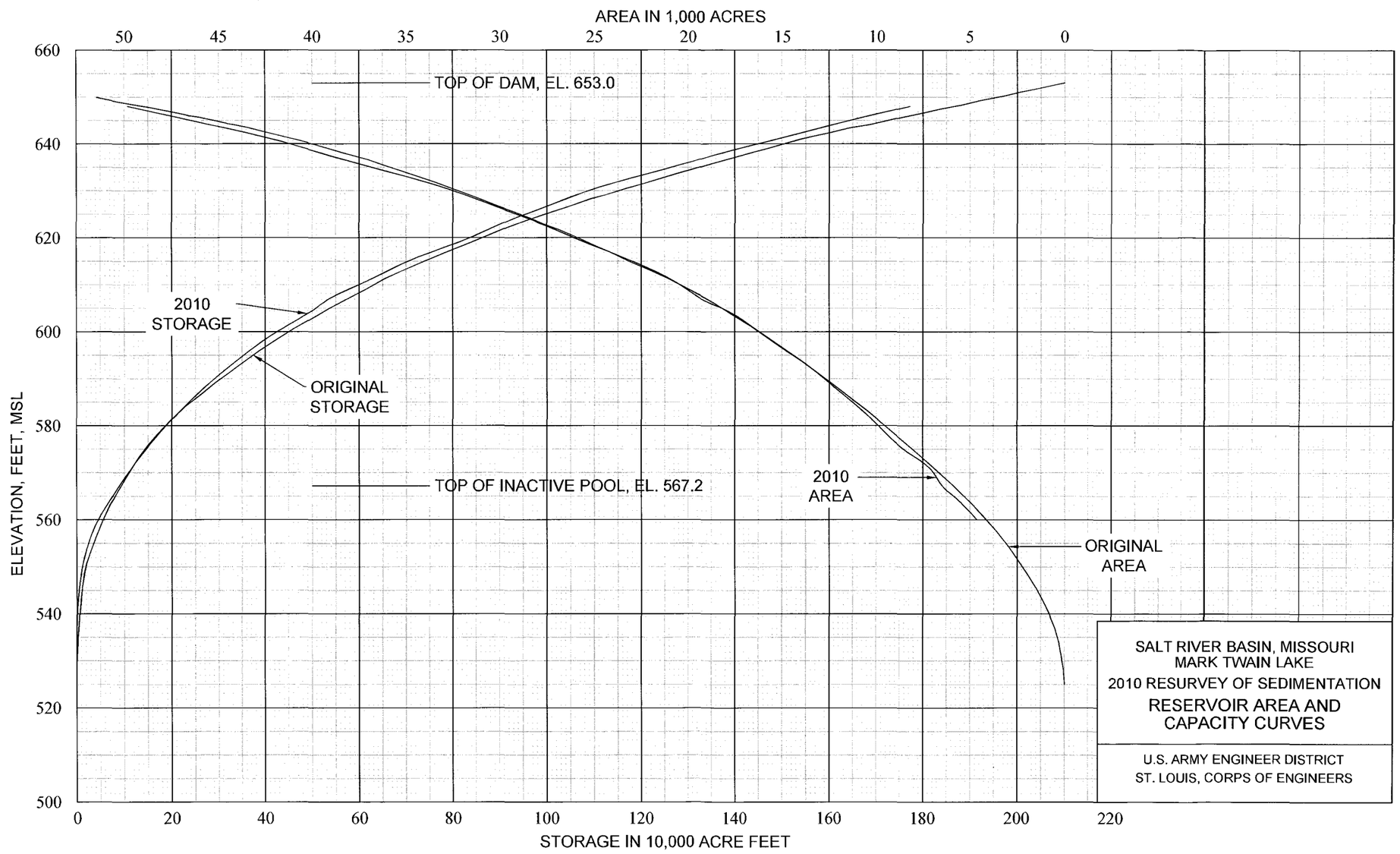


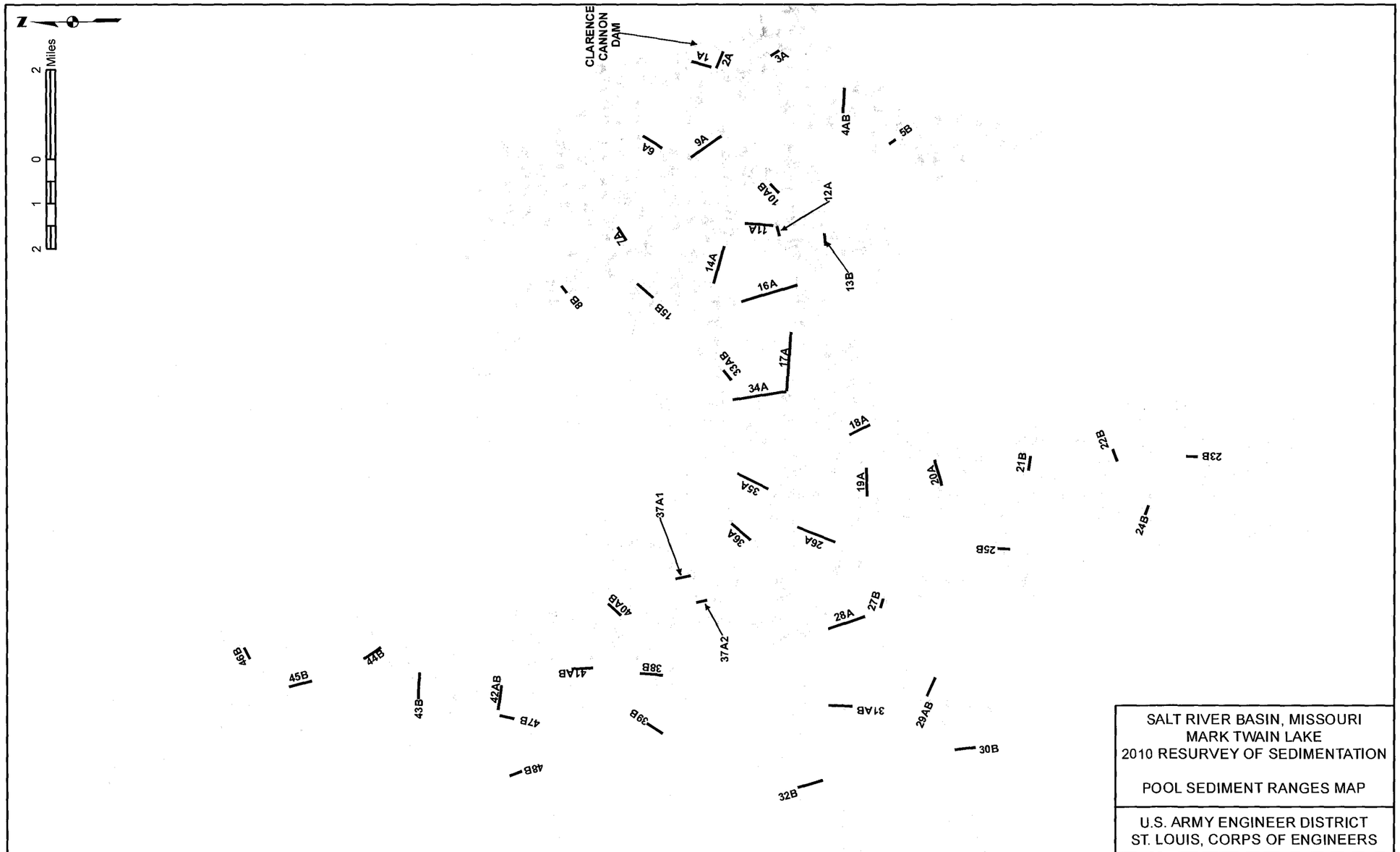
SALT RIVER BASIN, MISSOURI
MARK TWAIN LAKE

2010 RESURVEY OF SEDIMENTATION

AVERAGE MONTHLY
INFLOW HYDROGRAPH

U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, CORPS OF ENGINEERS

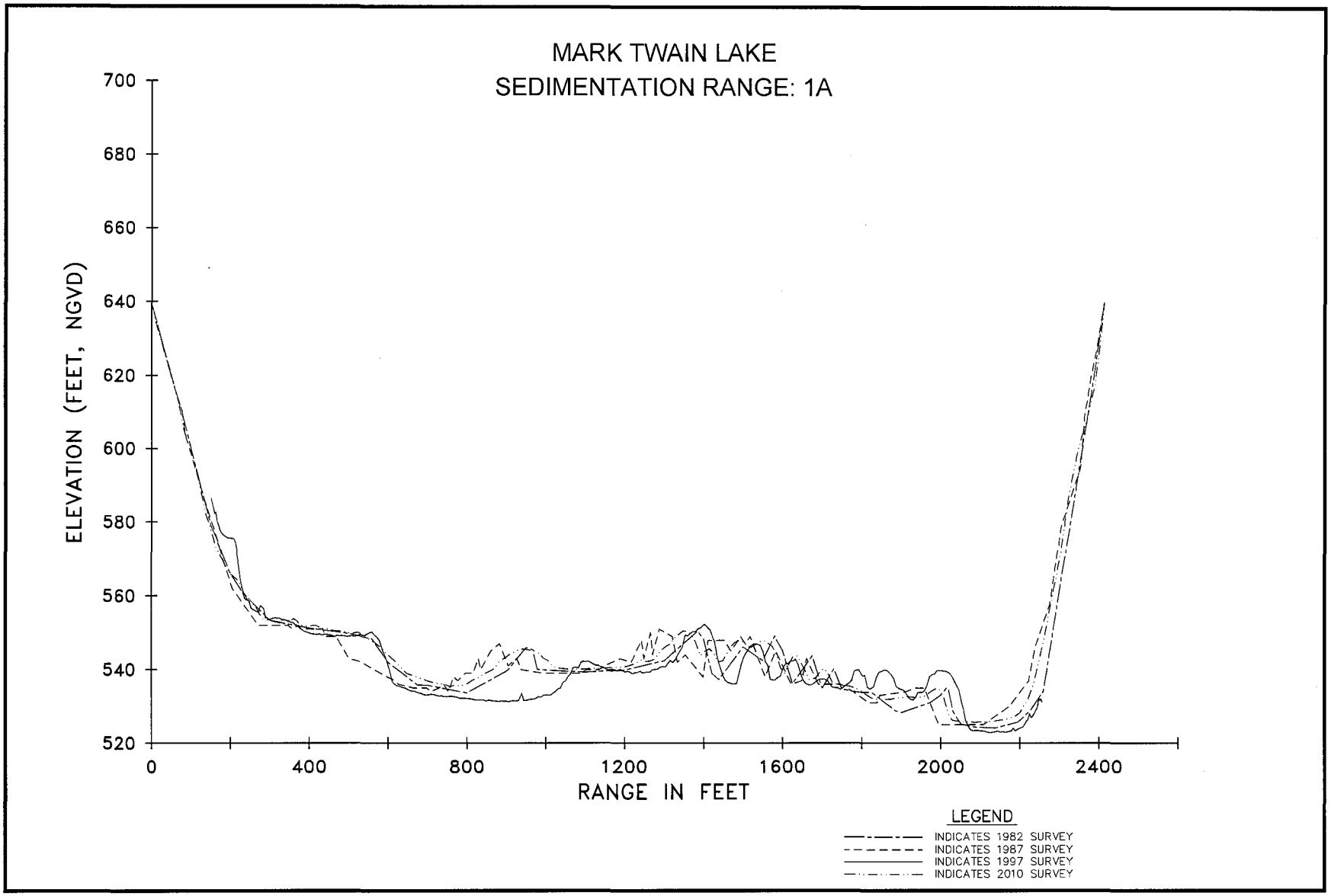

AREA IN 1,000 ACRES
50
45
40
35
30
25
20
15
10
5
0
660
640
620
600
580
560
540
520
500
ELEVATION, FEET, MSL
TOP OF DAM, EL. 653.0
2010
STORAGE
ORIGINAL
STORAGE
TOP OF INACTIVE POOL, EL. 567.2
2010
AREA
ORIGINAL
AREA
0
20
40
60
80
100
120
140
160
180
200
220
STORAGE IN 10,000 ACRE FEET
SALT RIVER BASIN, MISSOURI
MARK TWAIN LAKE
2010 RESURVEY OF SEDIMENTATION
RESERVOIR AREA AND
CAPACITY CURVES
U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, CORPS OF ENGINEERS

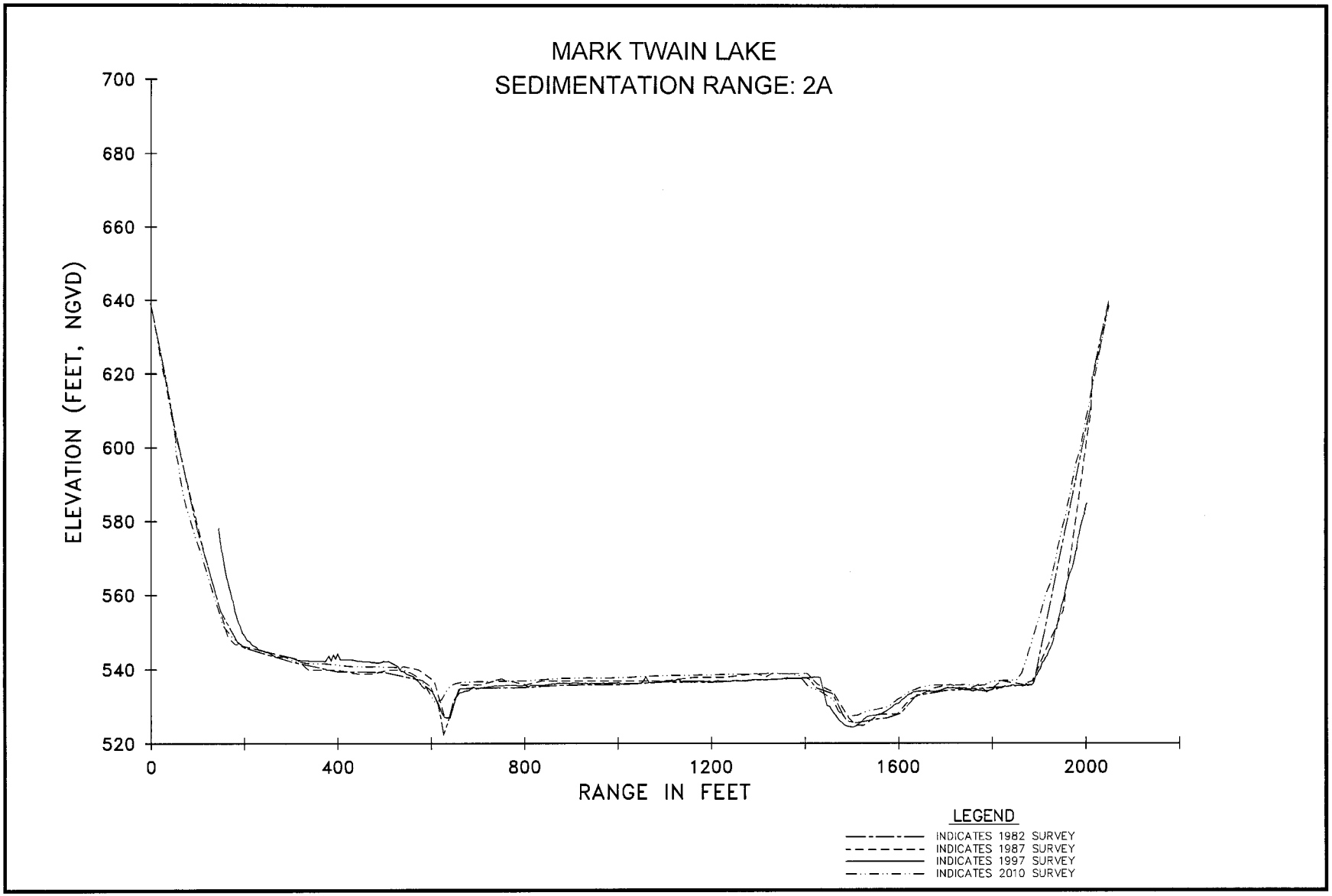


SALT RIVER BASIN, MISSOURI
MARK TWAIN LAKE
2010 RESURVEY OF SEDIMENTATION

POOL SEDIMENT RANGES MAP

U.S. ARMY ENGINEER DISTRICT
ST. LOUIS, CORPS OF ENGINEERS


MARK TWAIN LAKE
SEDIMENTATION RANGE: 1A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 2A
ELEVATION (FEET, NGVD)
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680
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540
520
0
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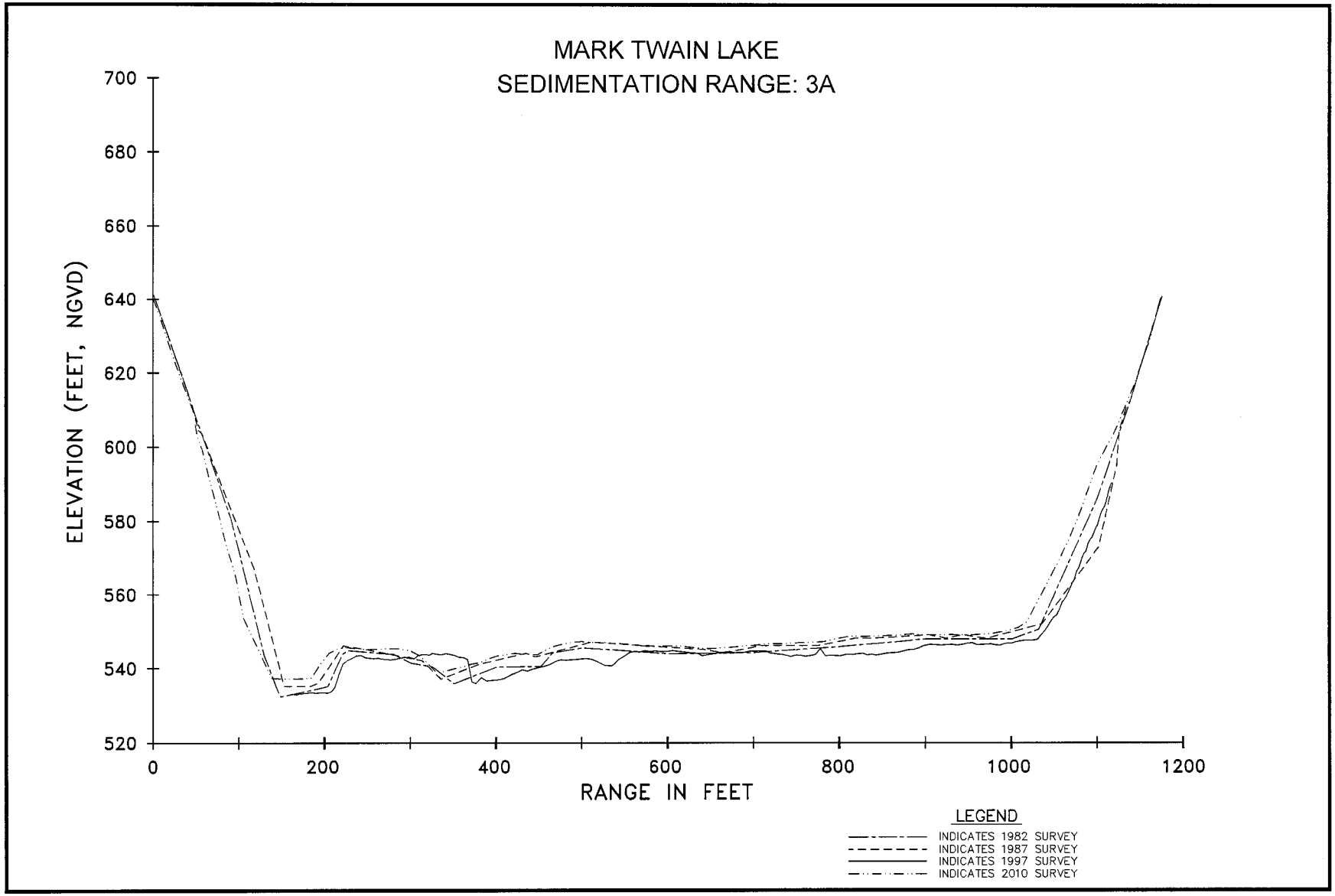
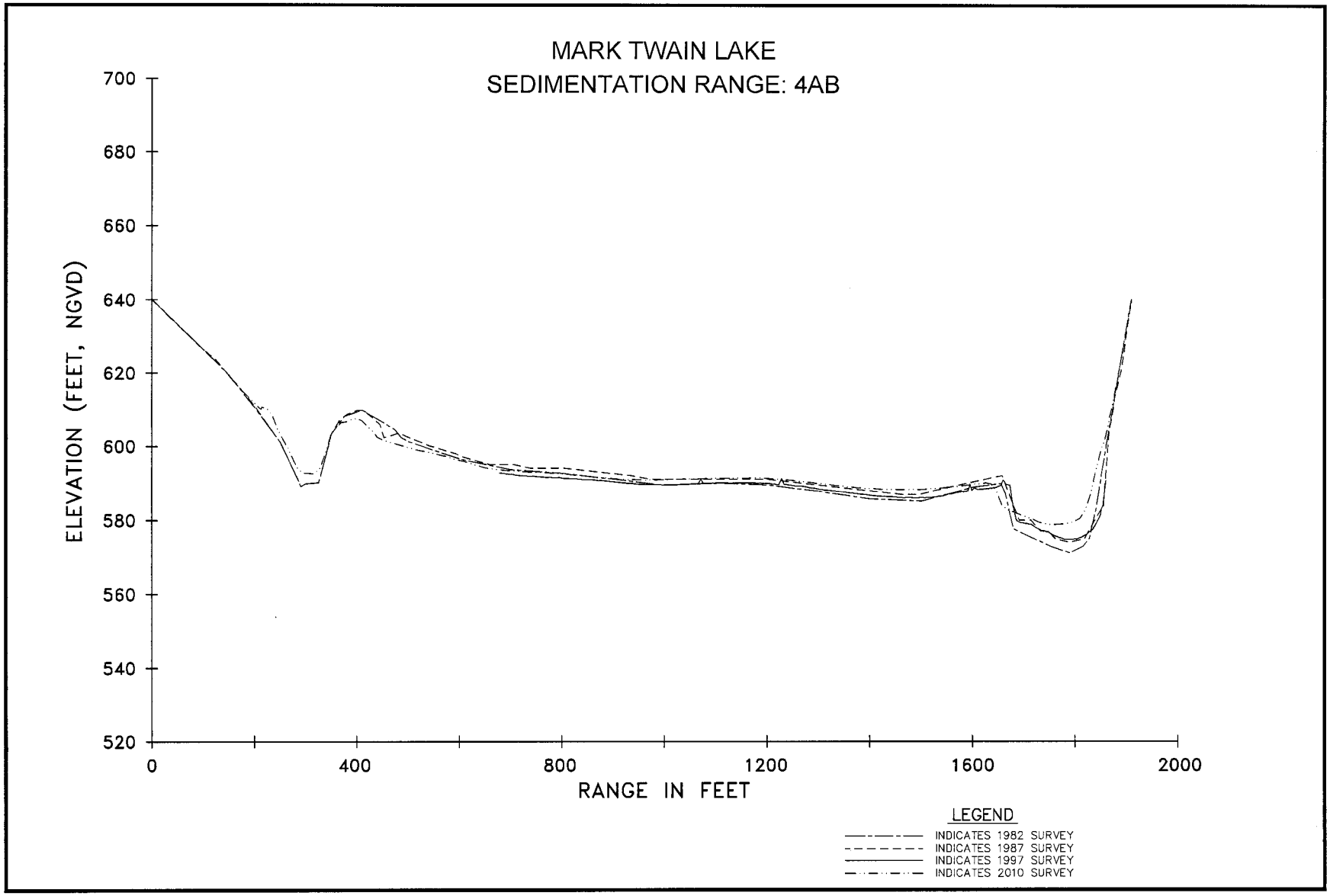
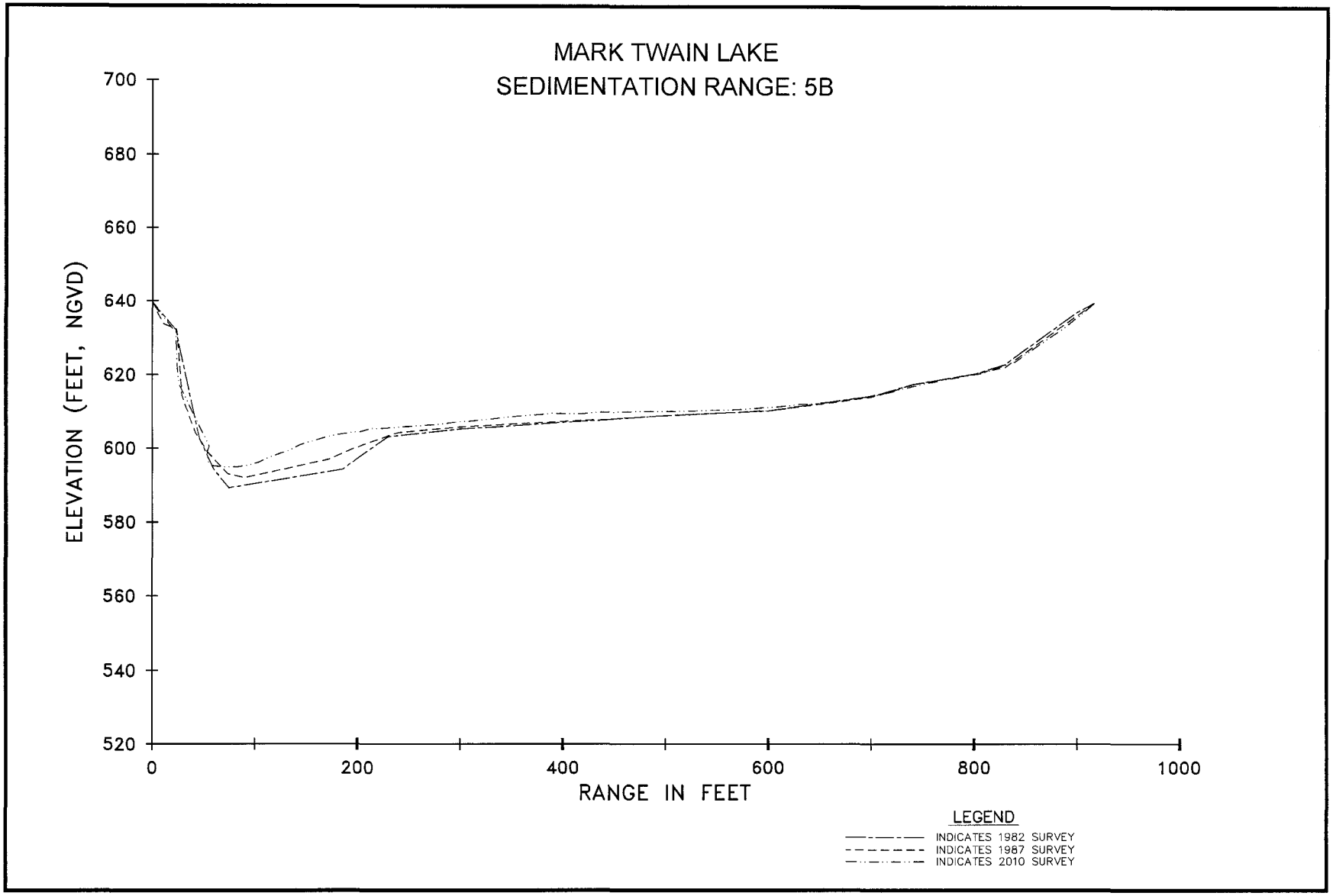
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 3A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 4AB
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 5B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
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520
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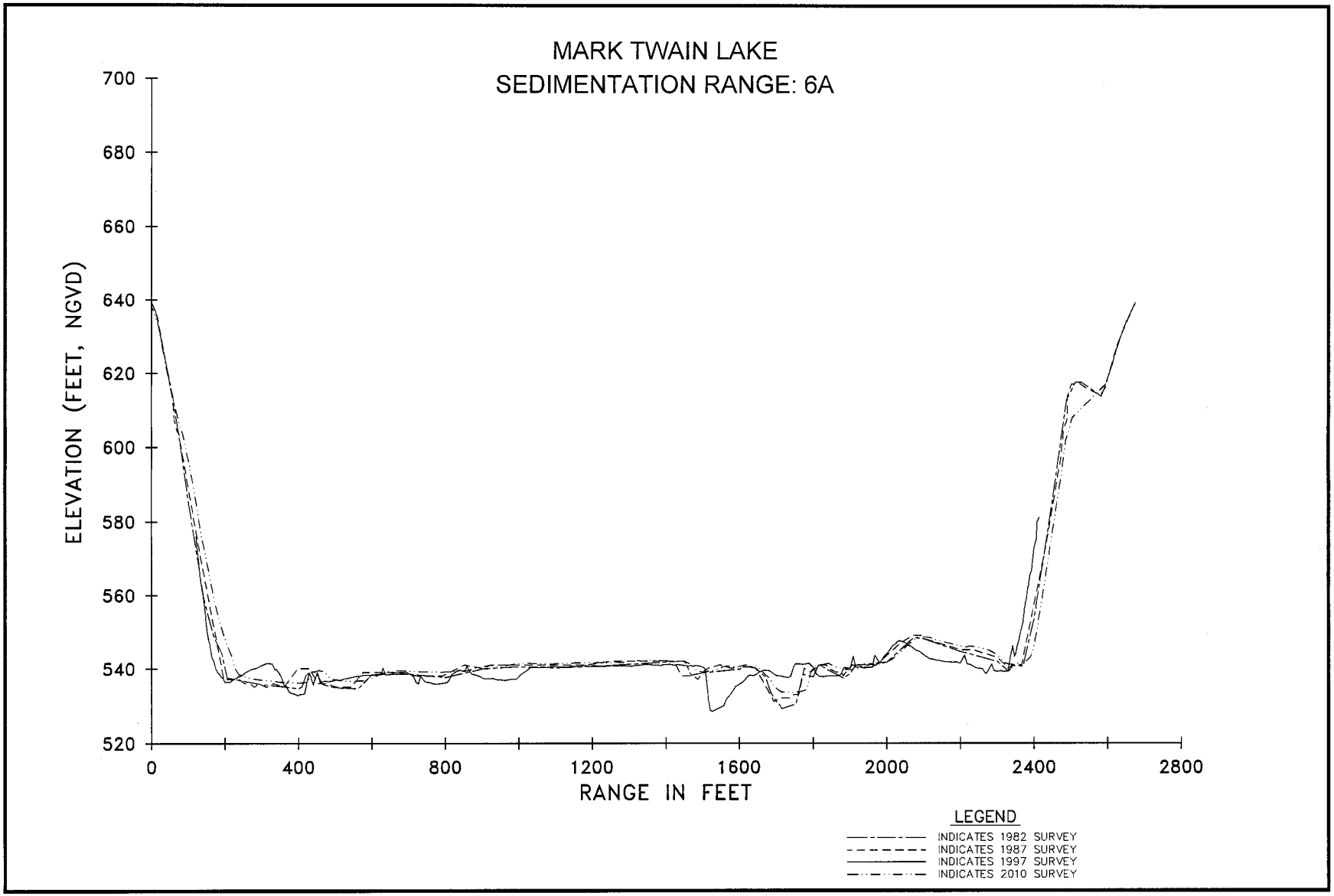
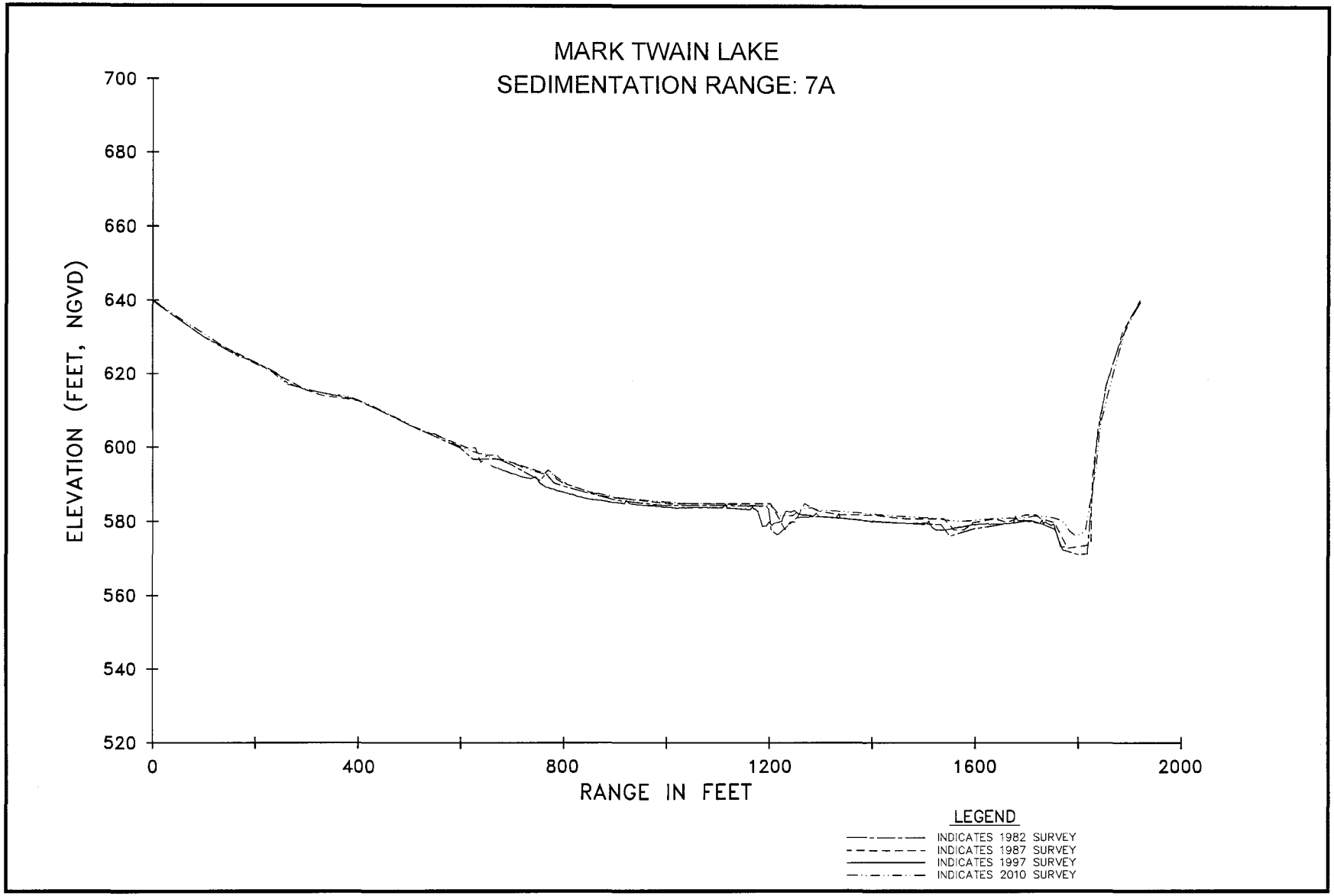
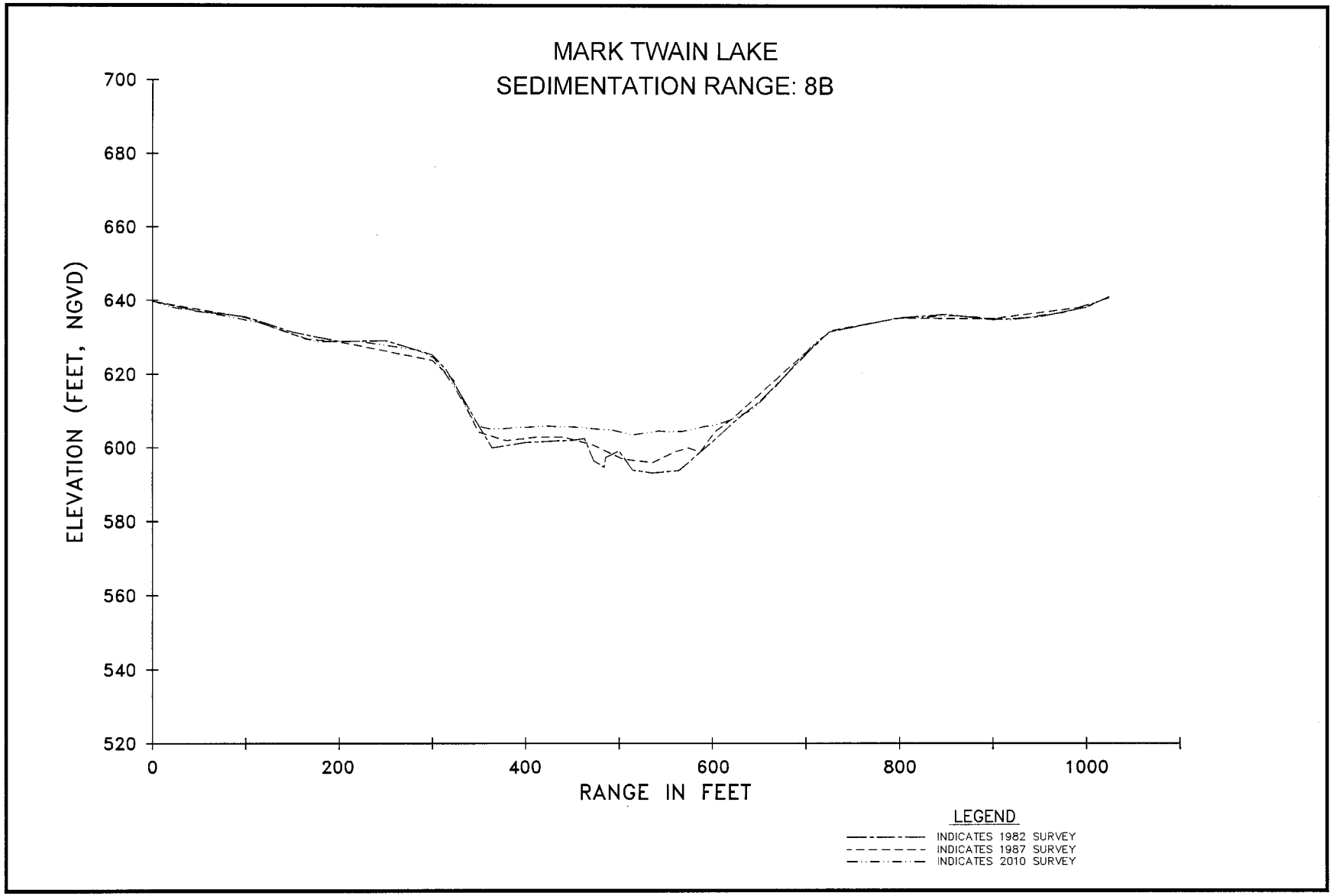
200
400
600
800
1000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 6A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 7A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 8B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
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0
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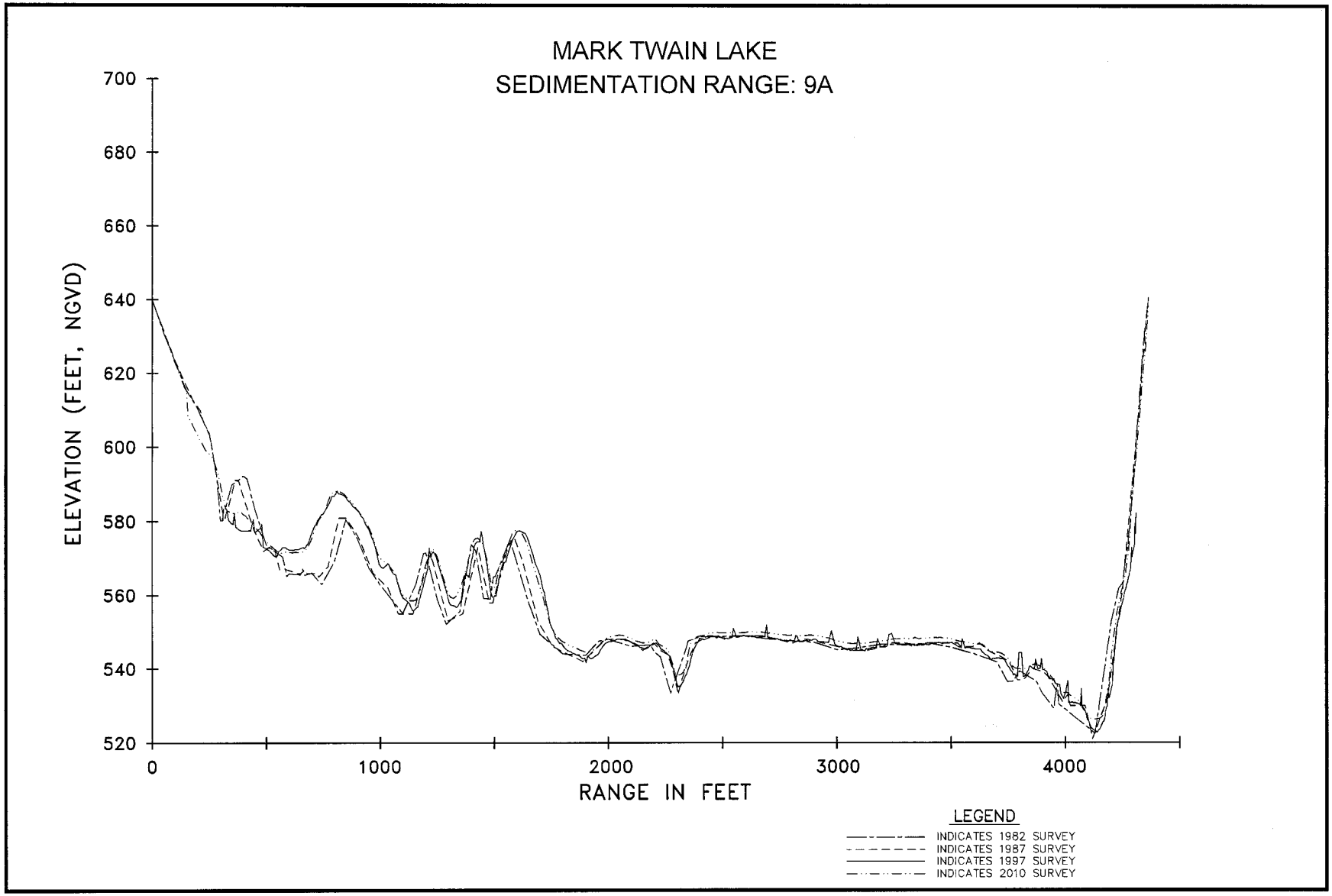
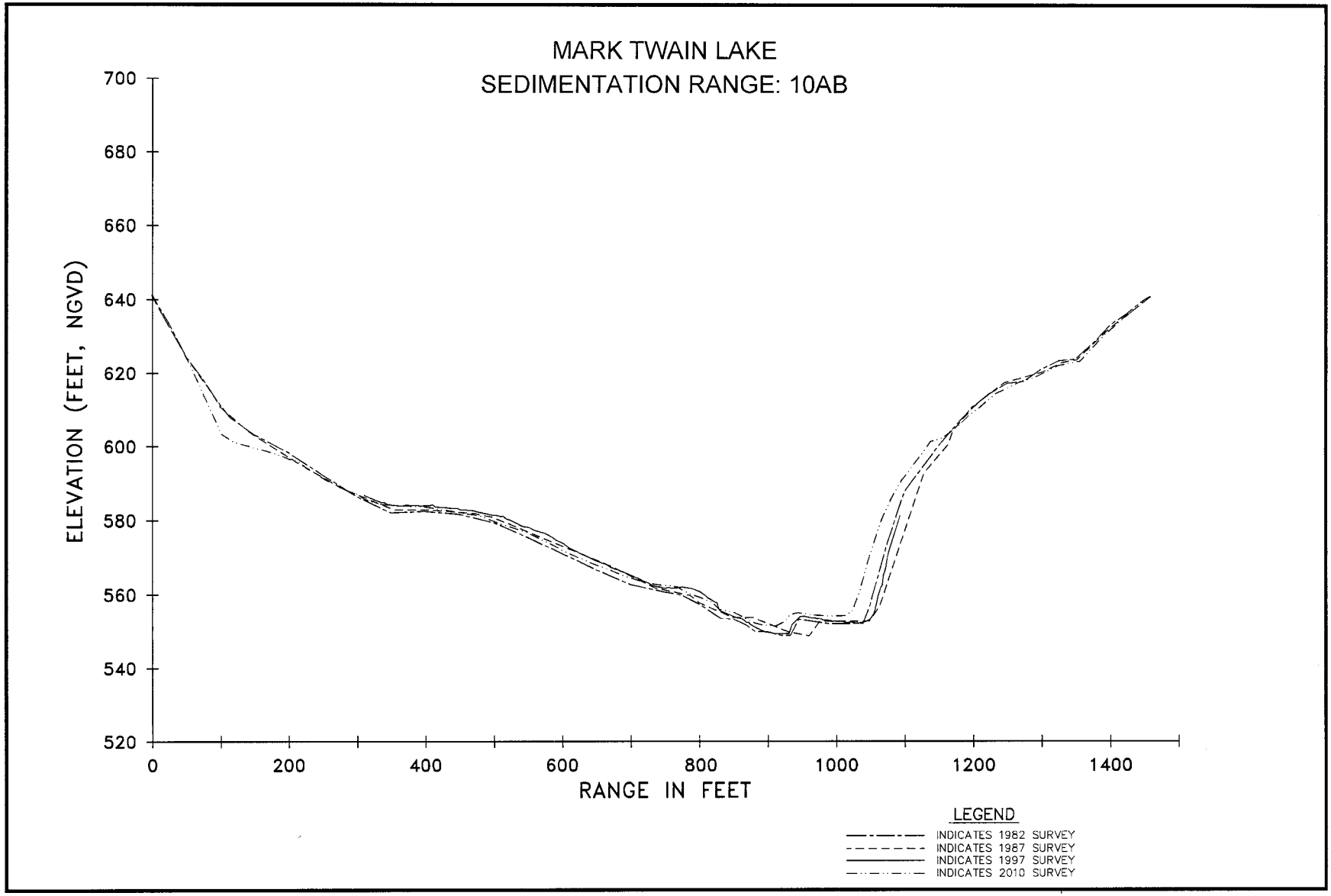
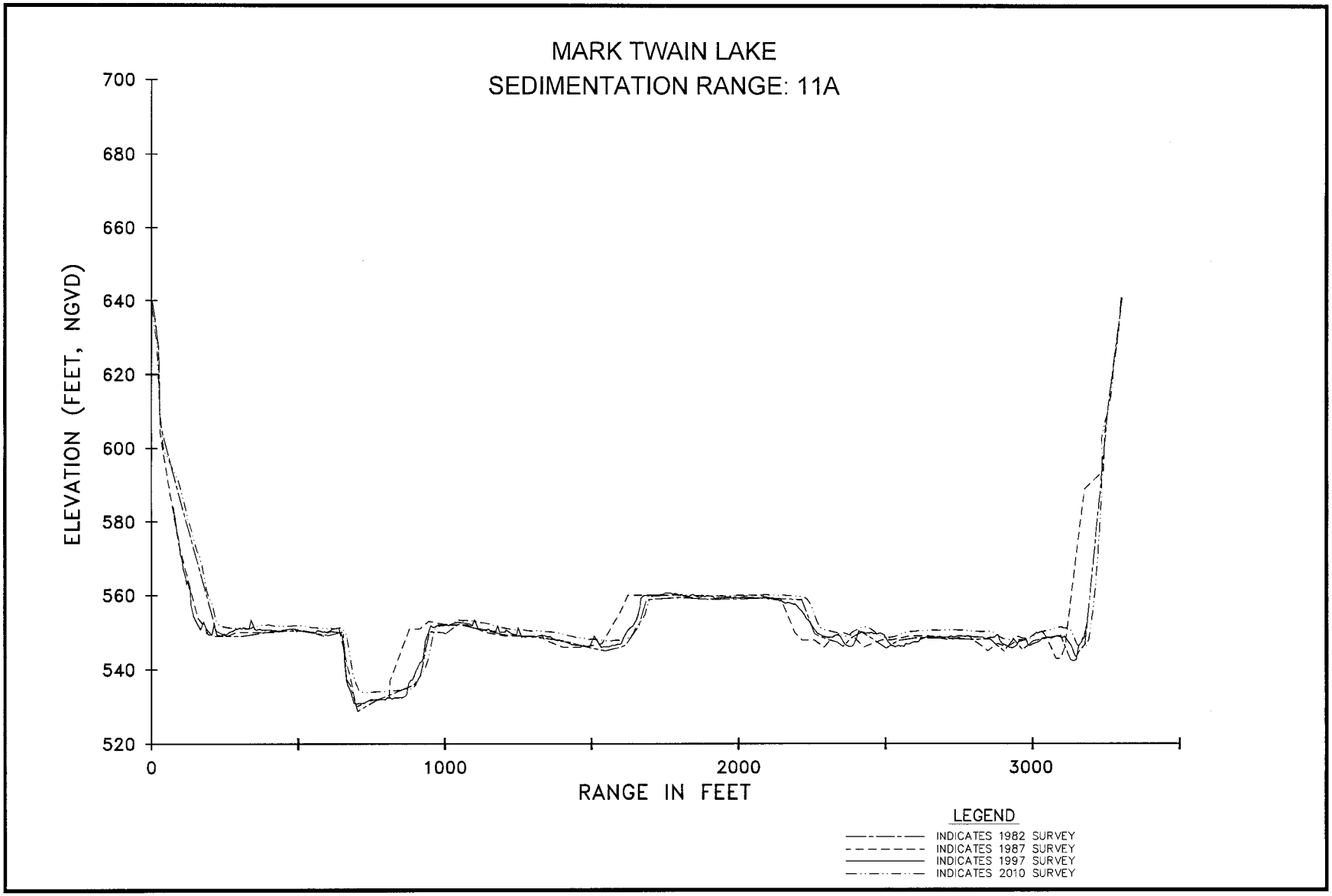
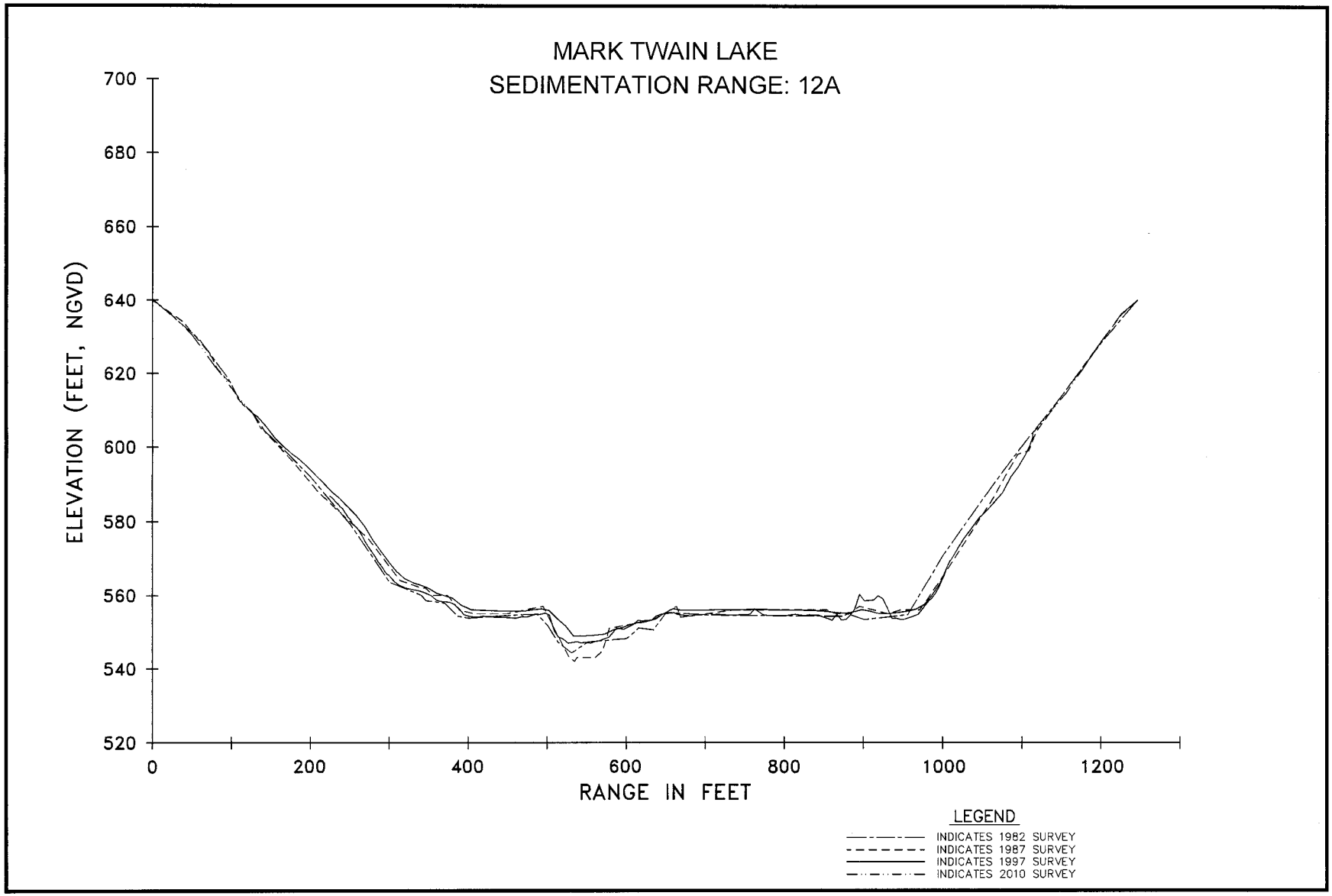
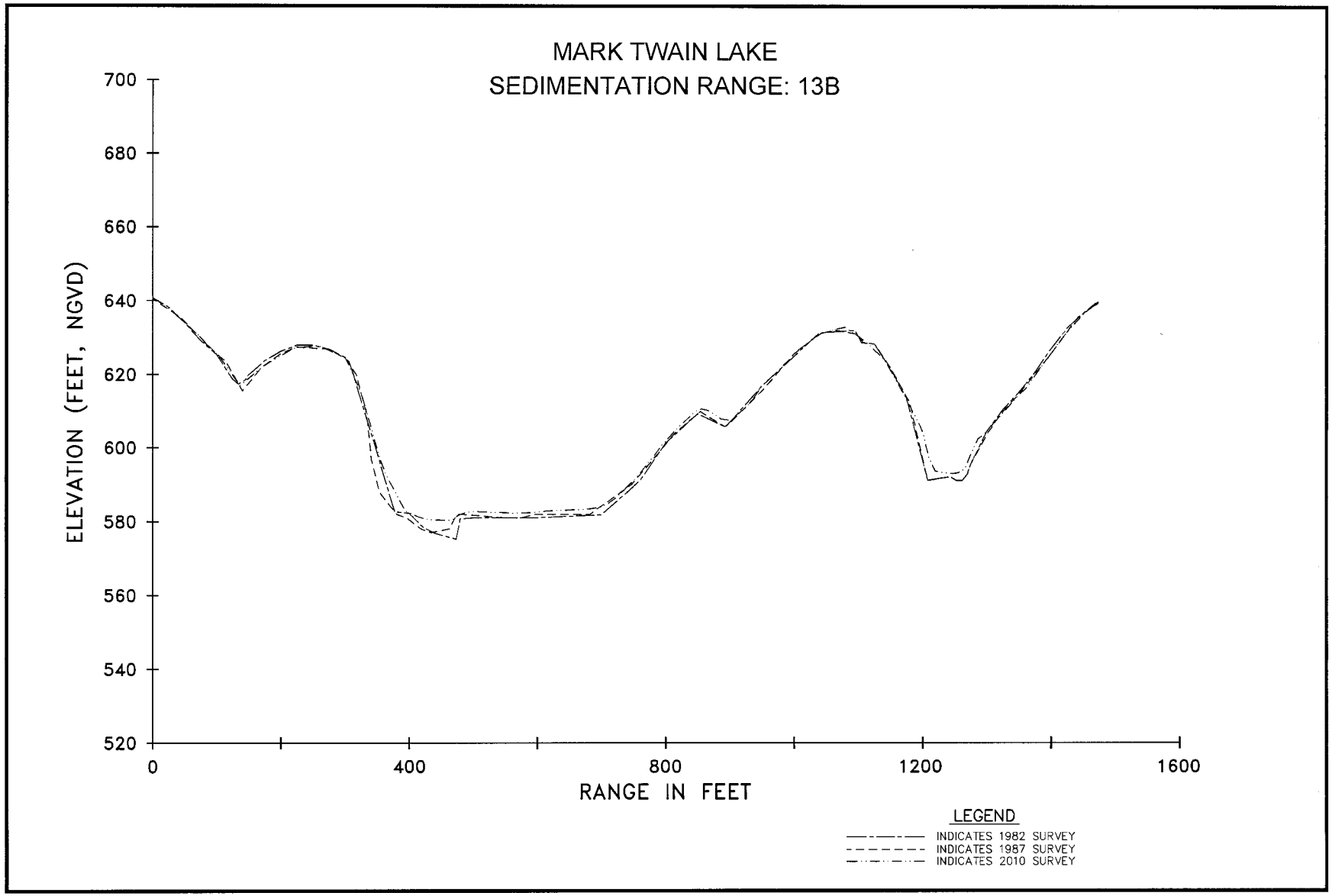
400
600
800
1000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY

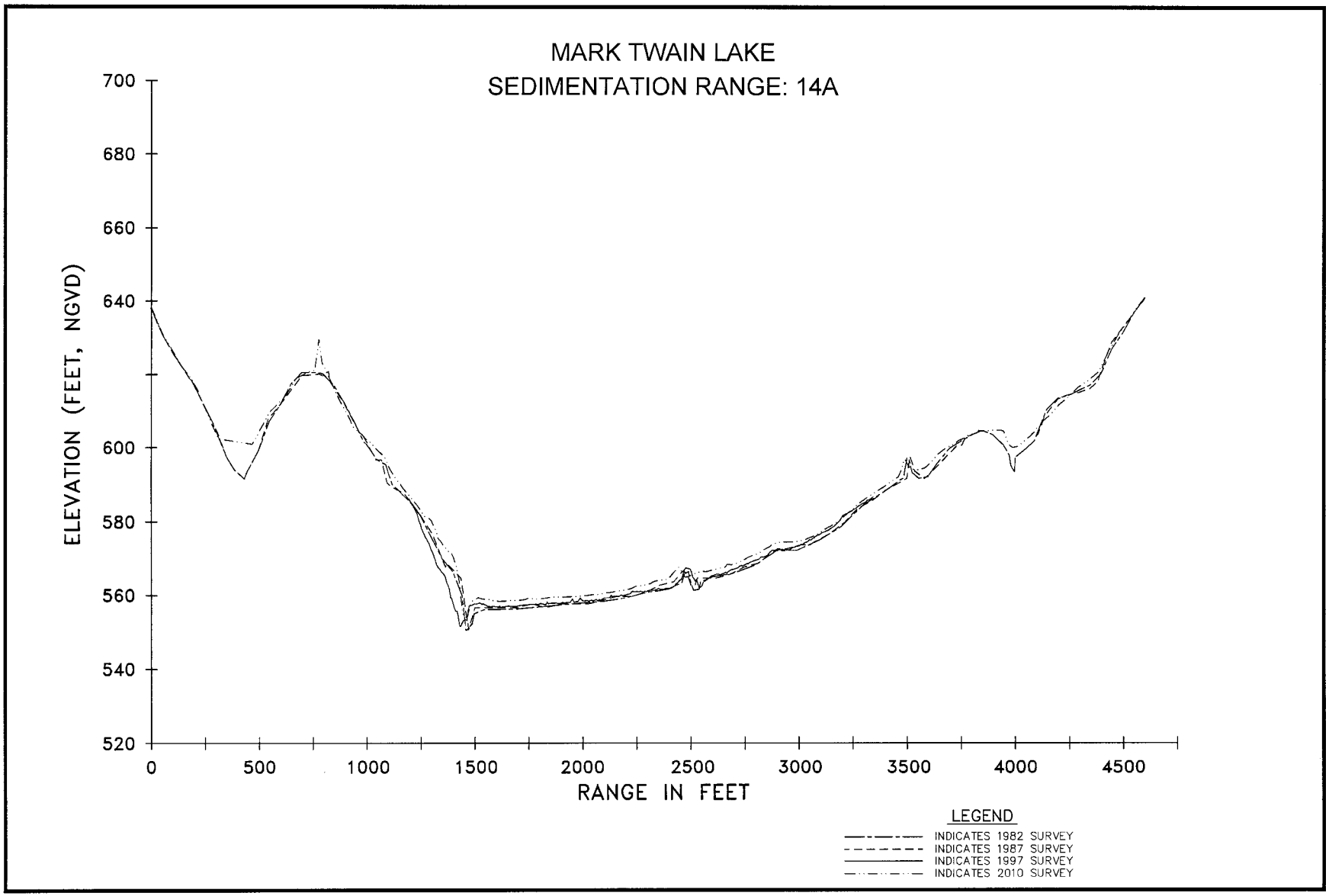

MARK TWAIN LAKE
SEDIMENTATION RANGE: 9A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY

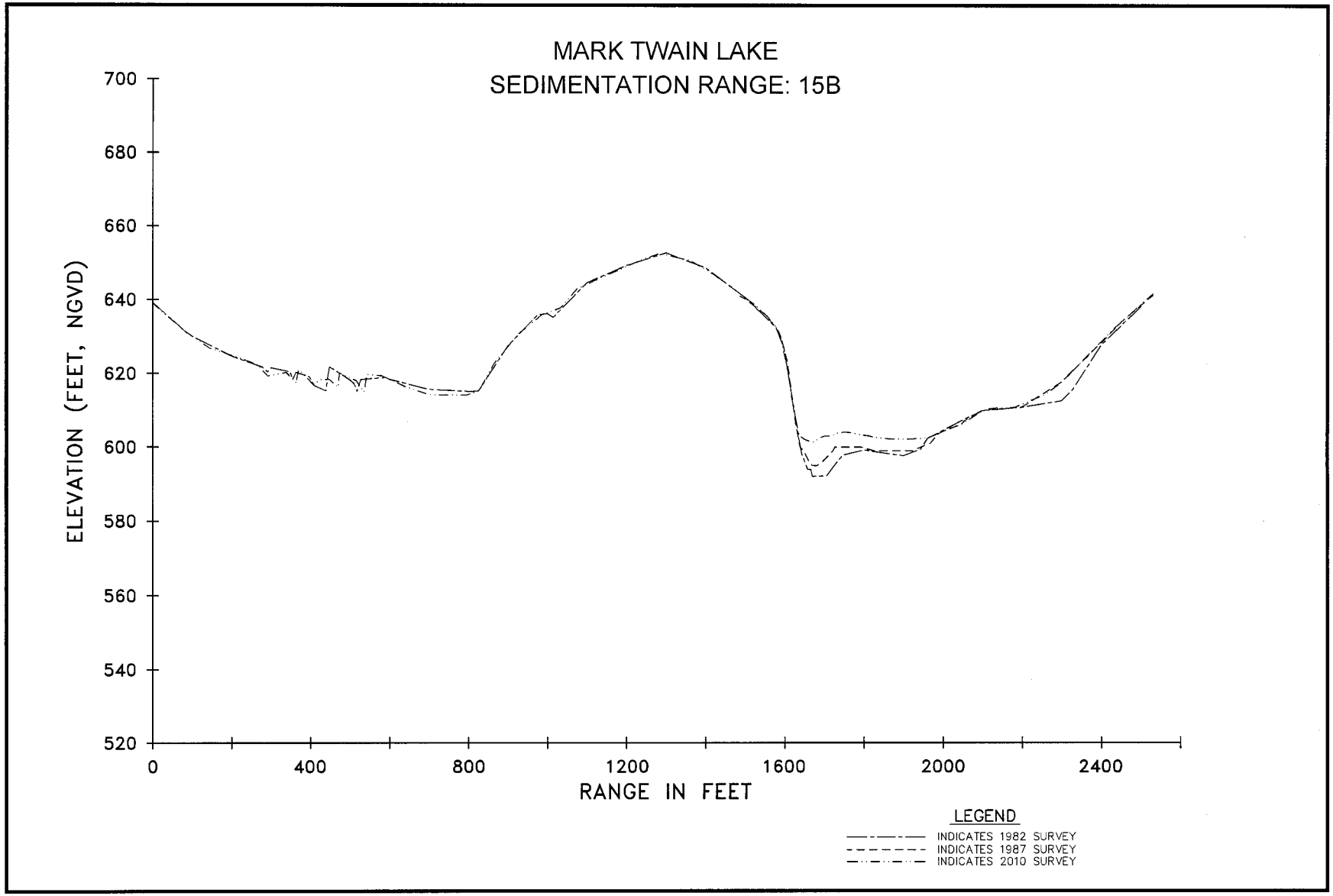

MARK TWAIN LAKE
SEDIMENTATION RANGE: 10AB
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
1400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY

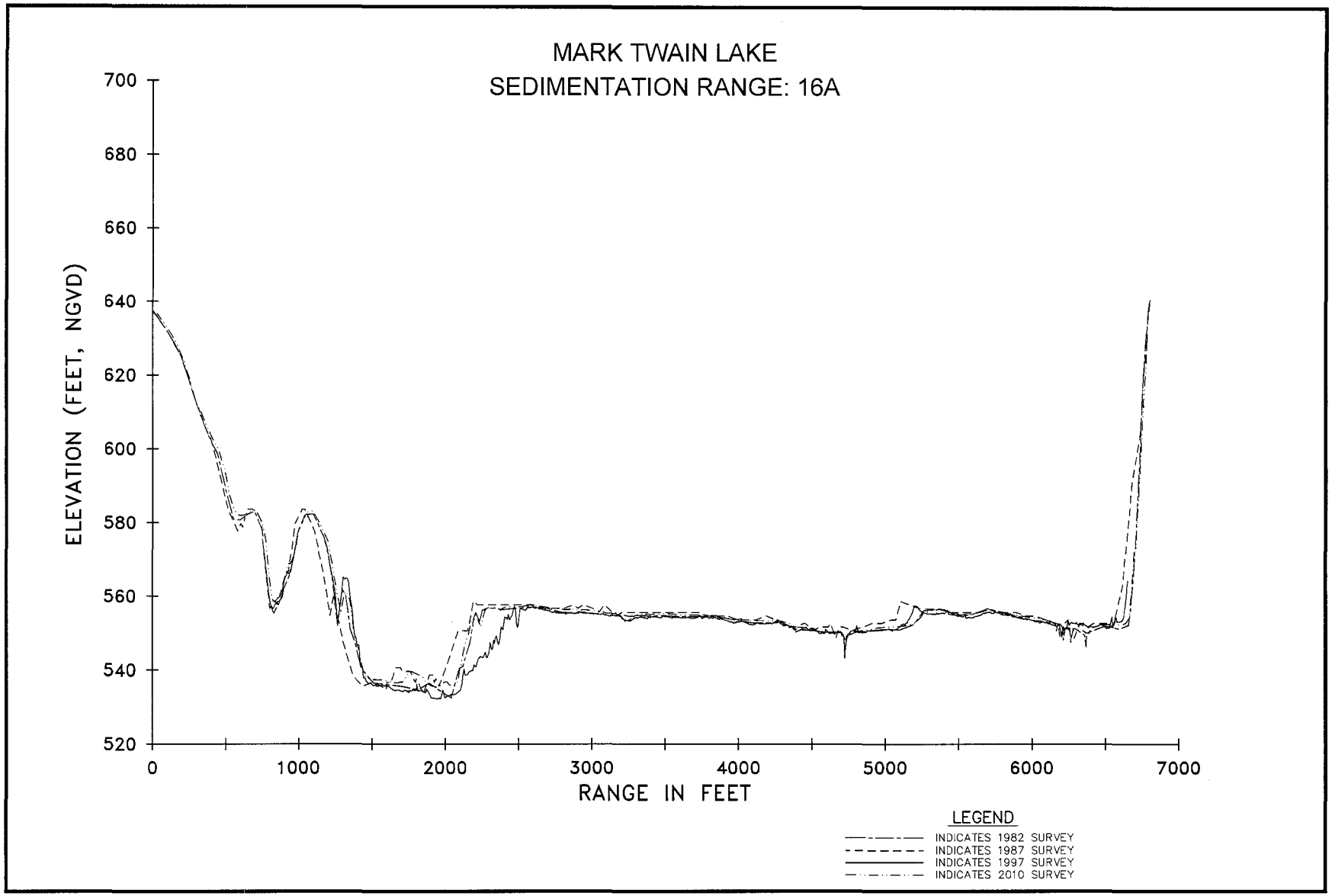

MARK TWAIN LAKE
SEDIMENTATION RANGE: 11A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY

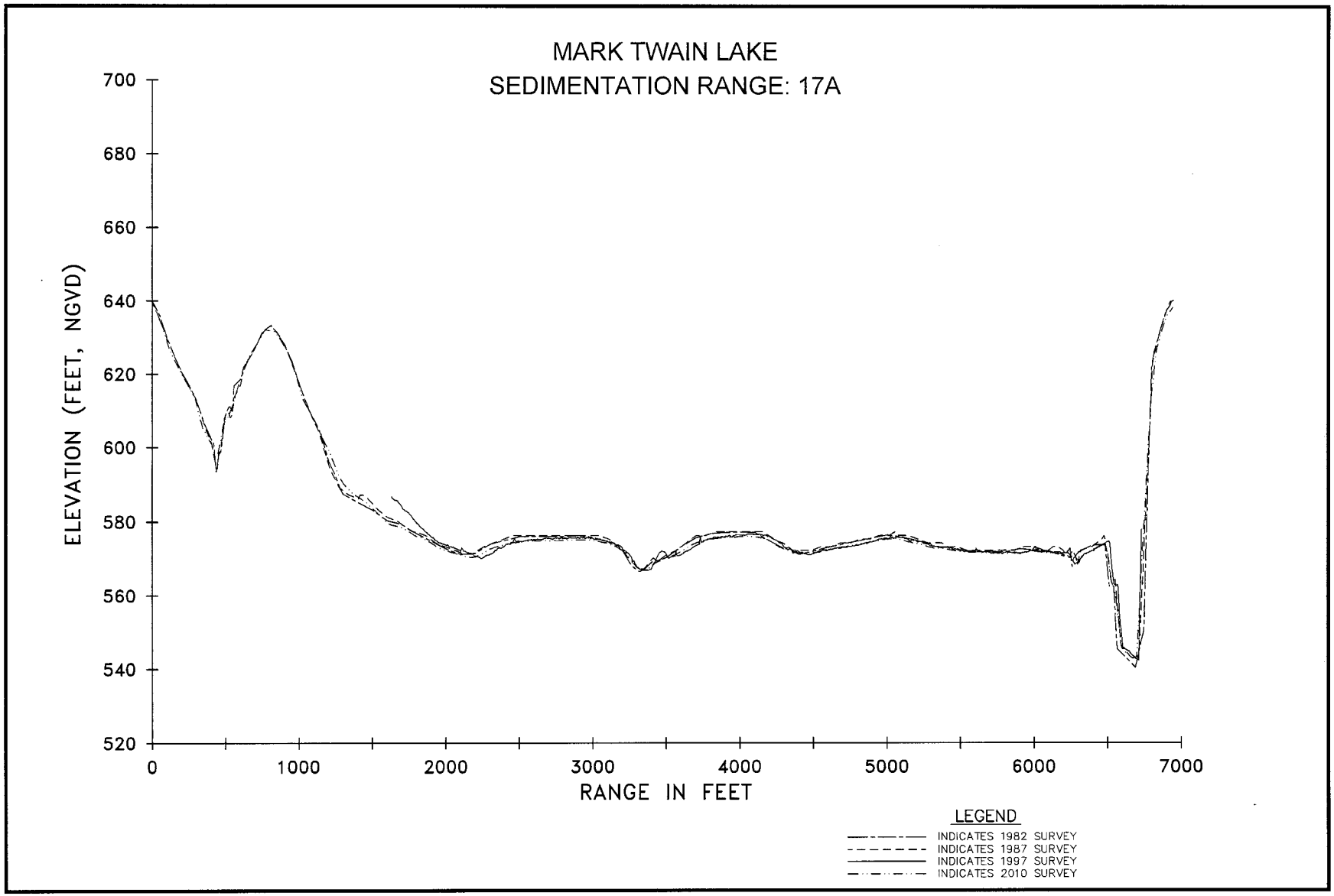

MARK TWAIN LAKE
SEDIMENTATION RANGE: 12A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY

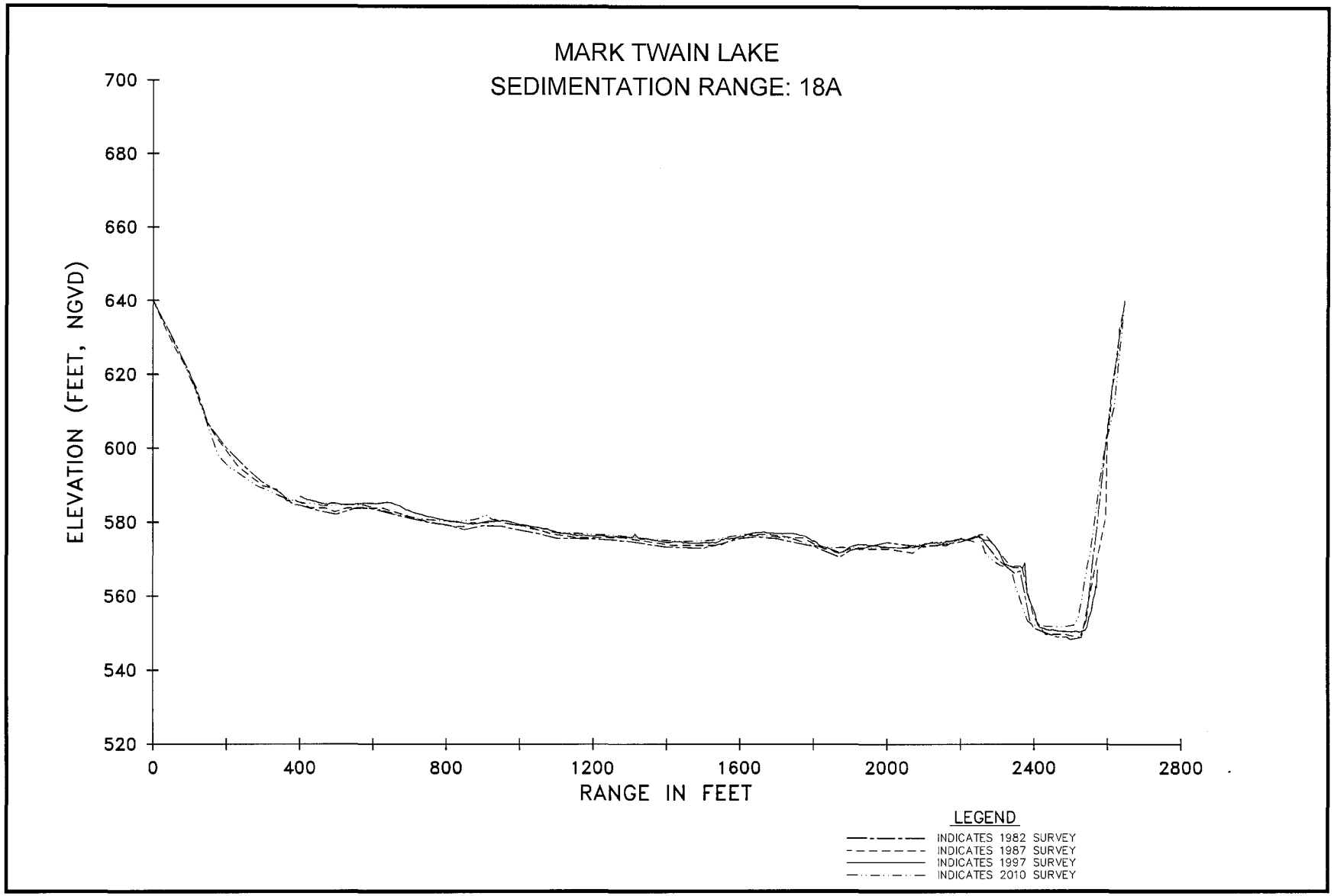

MARK TWAIN LAKE
SEDIMENTATION RANGE: 13B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 14A
ELEVATION (FEET, NGVD)
700
680
660
640
600
580
560
540
520
0
500
1000
1500
2000
2500
3000
3500
4000
4500
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 15B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 16A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
5000
6000
7000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 17A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
5000
6000
7000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 18A
ELEVATION (FEET, NGVD)
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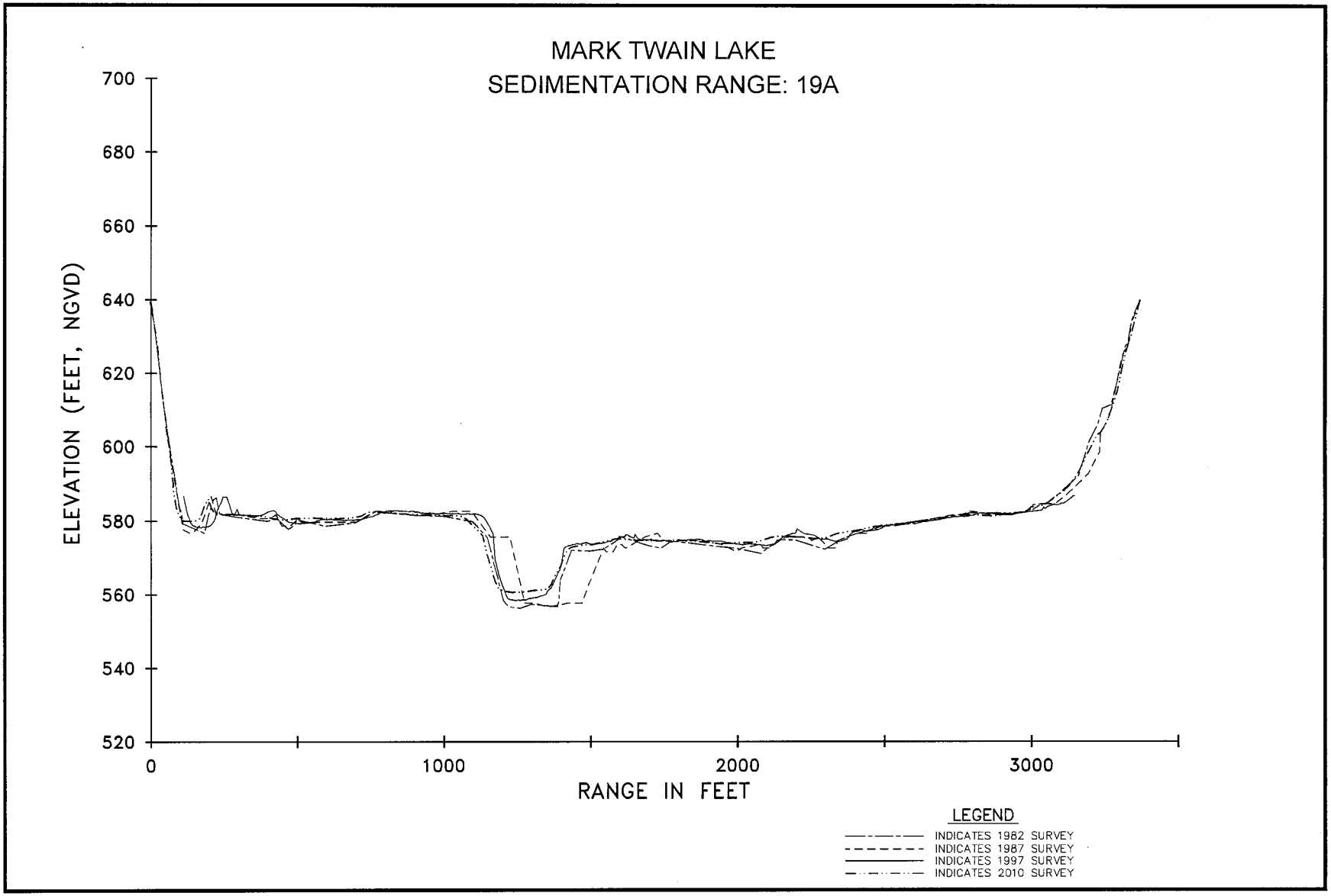
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 19A
ELEVATION (FEET, NGVD)
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680
660
640
620
600
580
560
540
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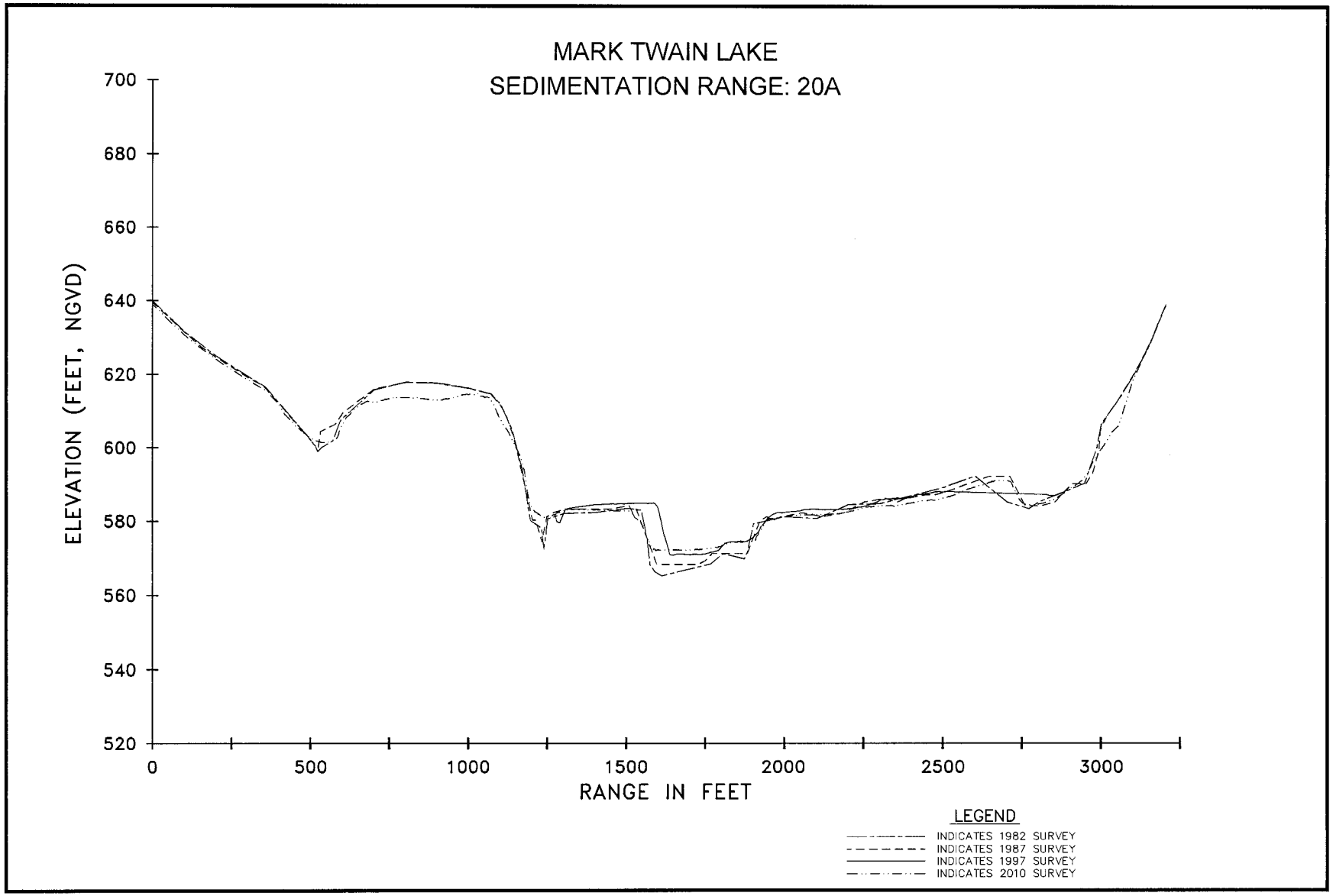
2000
3000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 20A
ELEVATION (FEET, NGVD)
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680
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640
620
600
580
560
540
520
0
500
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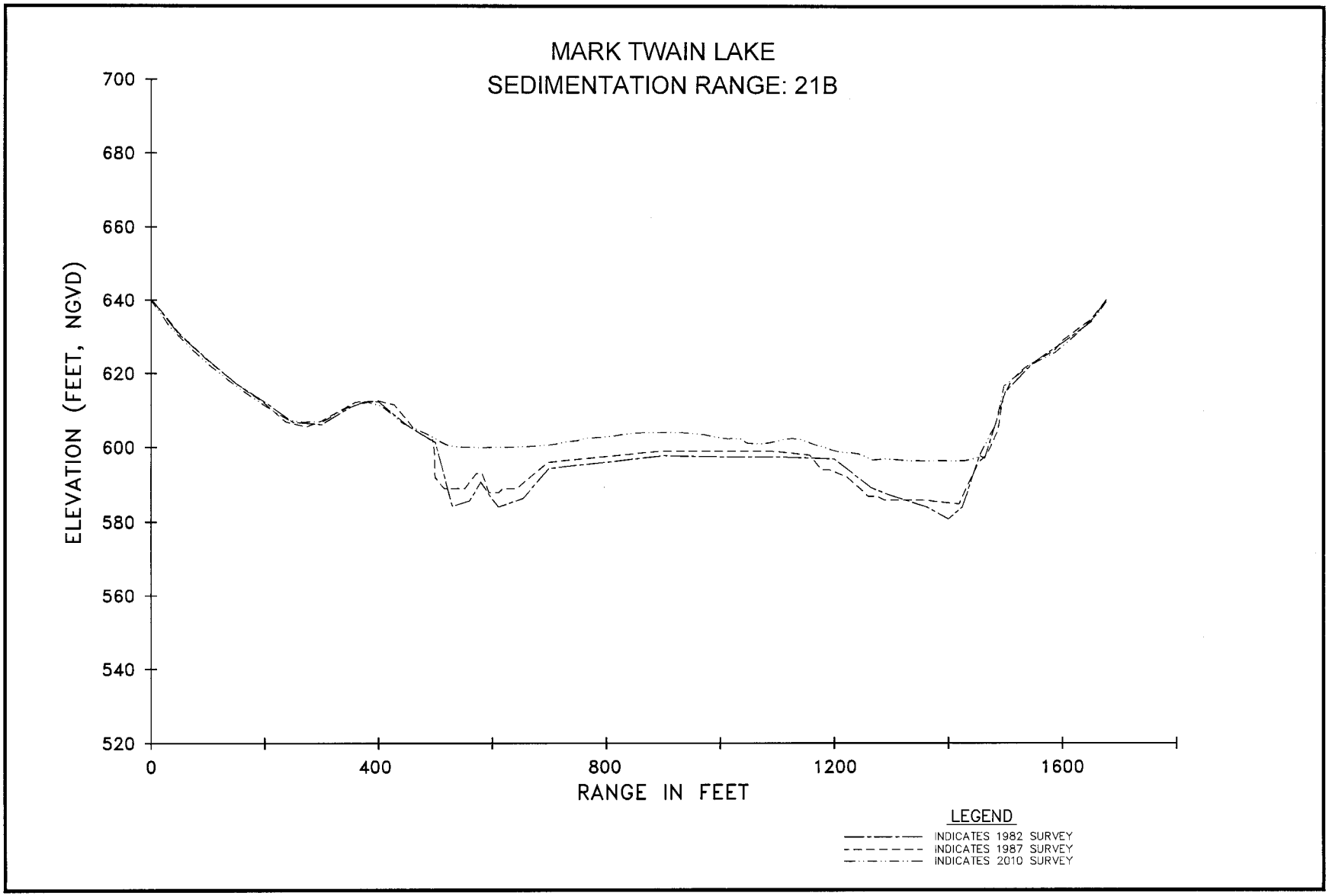
2000
2500
3000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 21B
ELEVATION (FEET, NGVD)
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680
660
640
620
600
580
560
540
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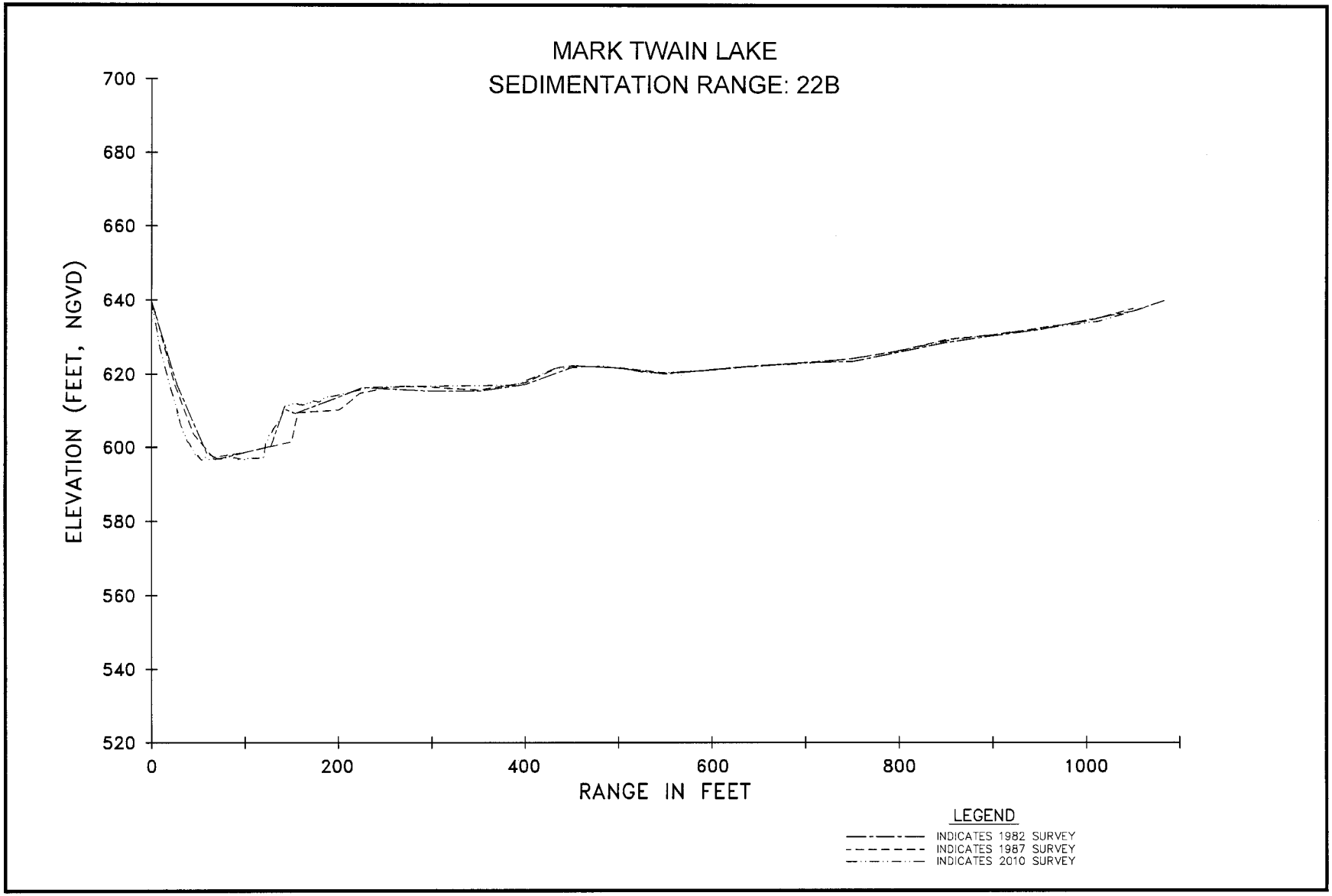
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 22B
ELEVATION (FEET, NGVD)
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680
660
640
620
600
580
560
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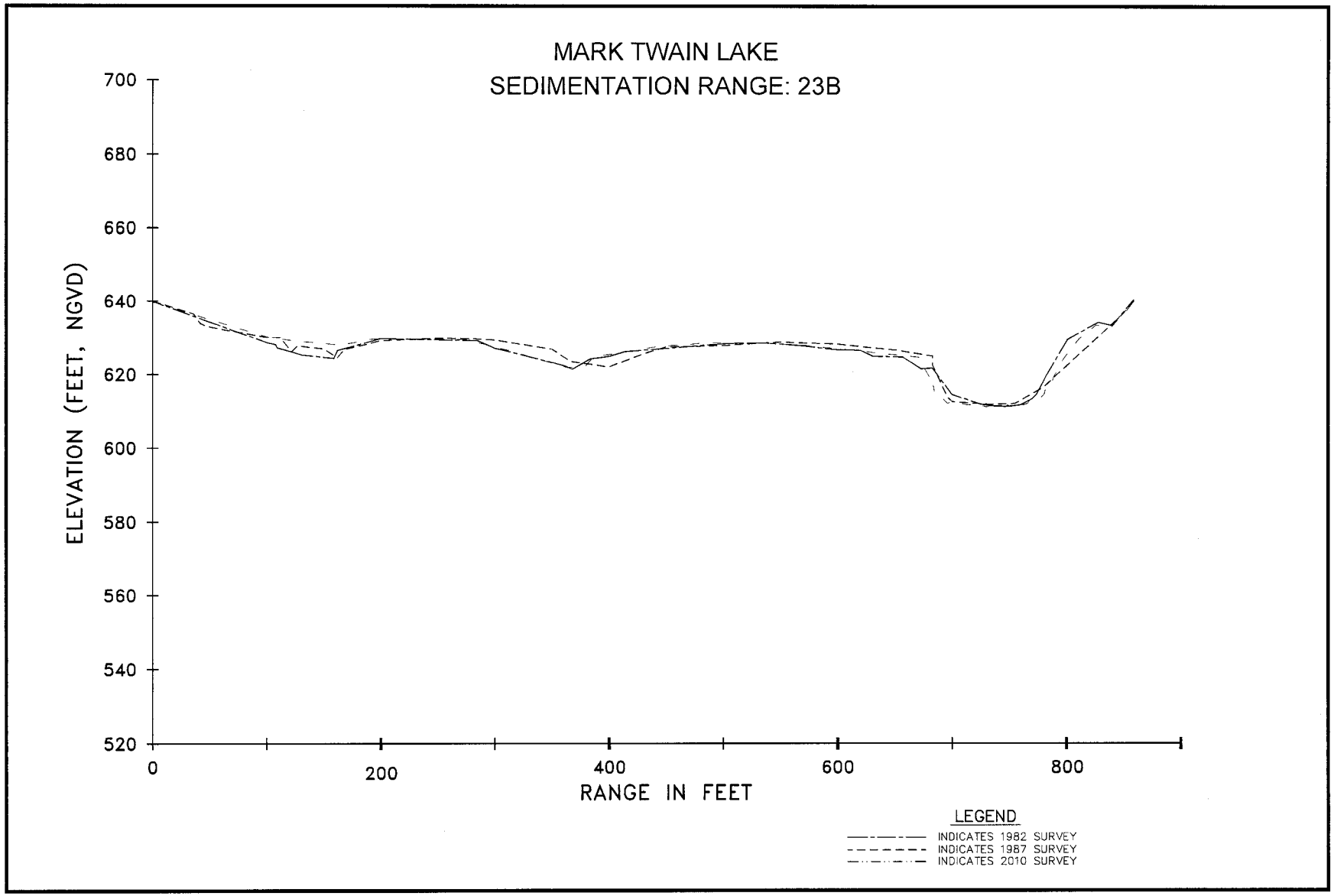
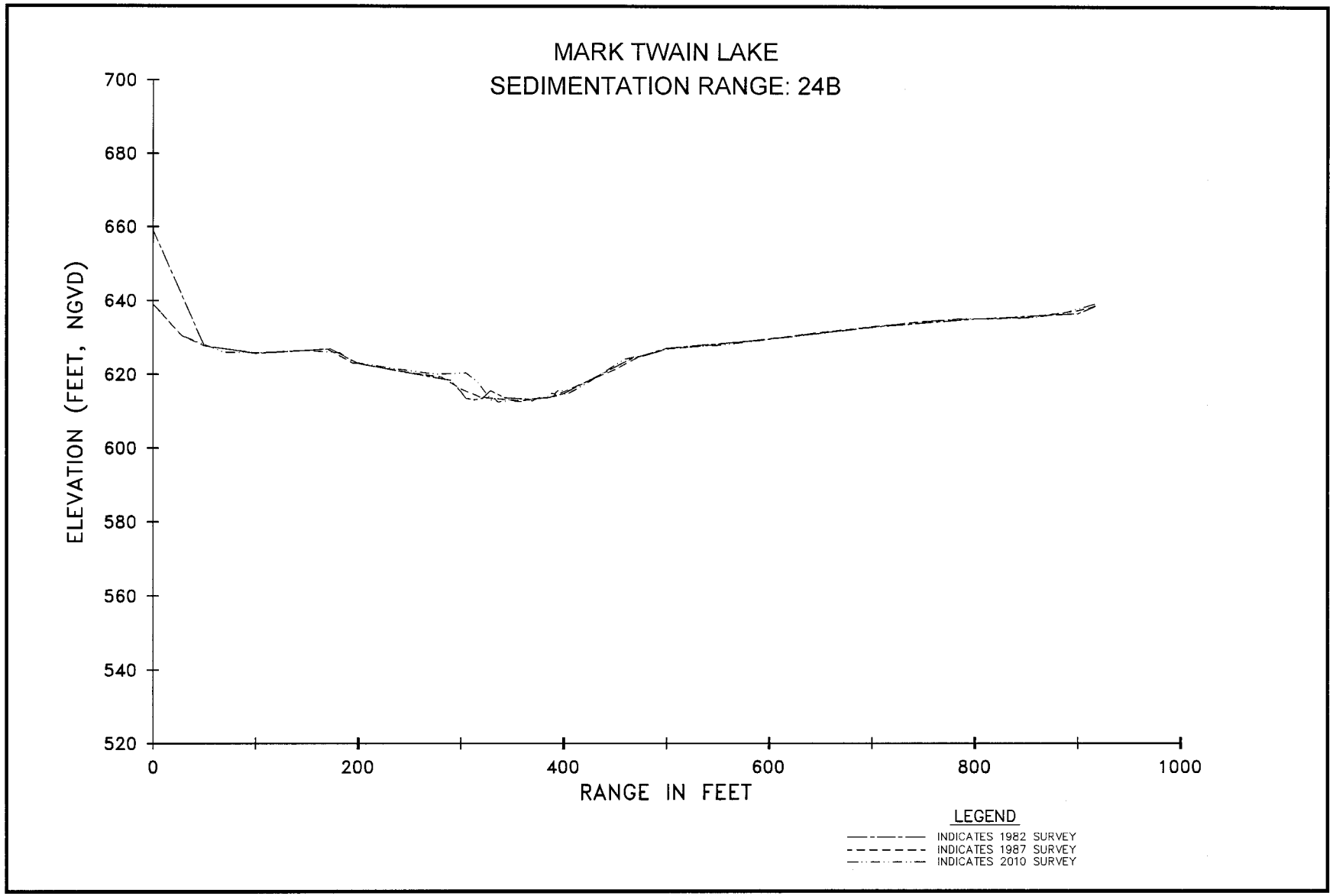
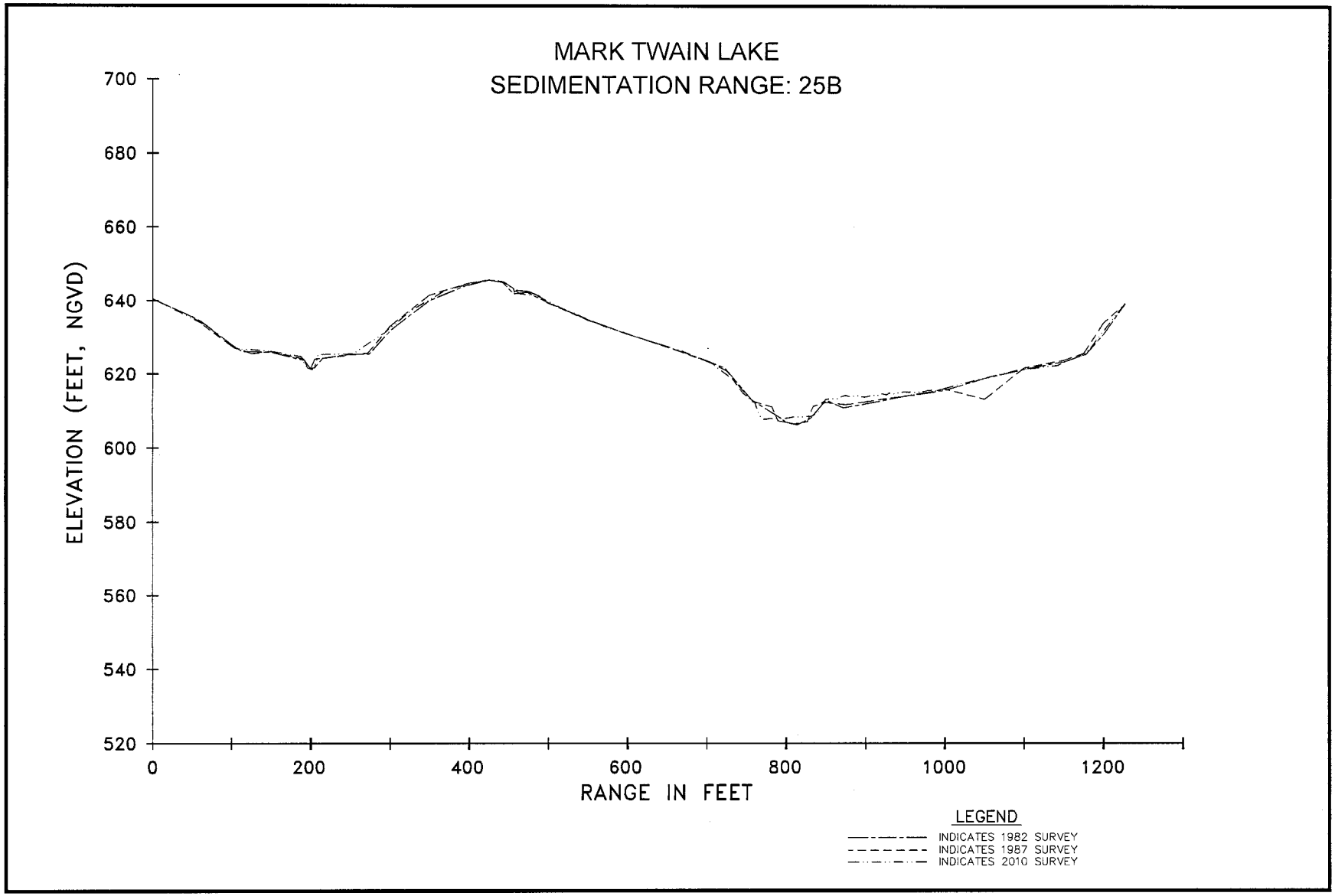
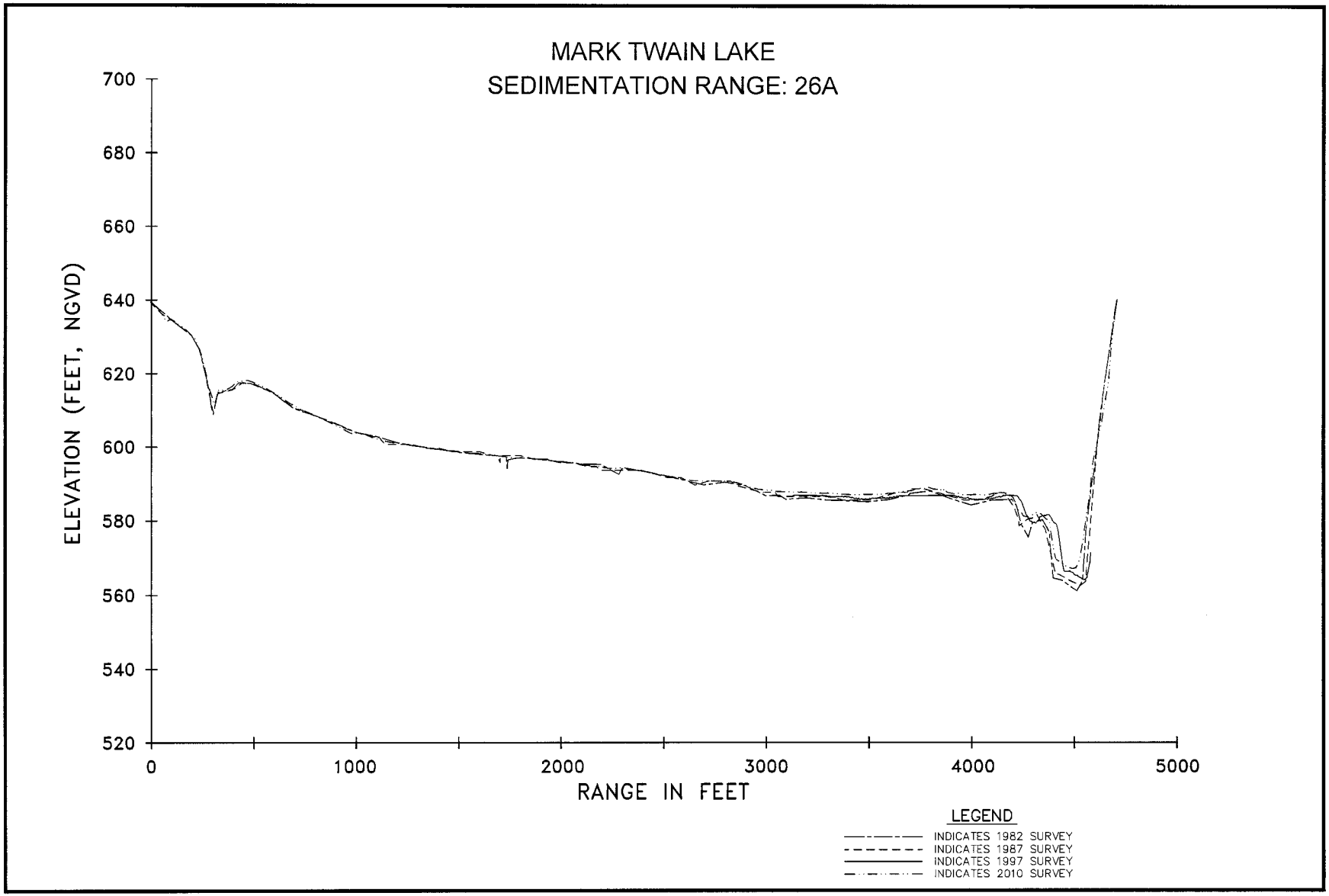
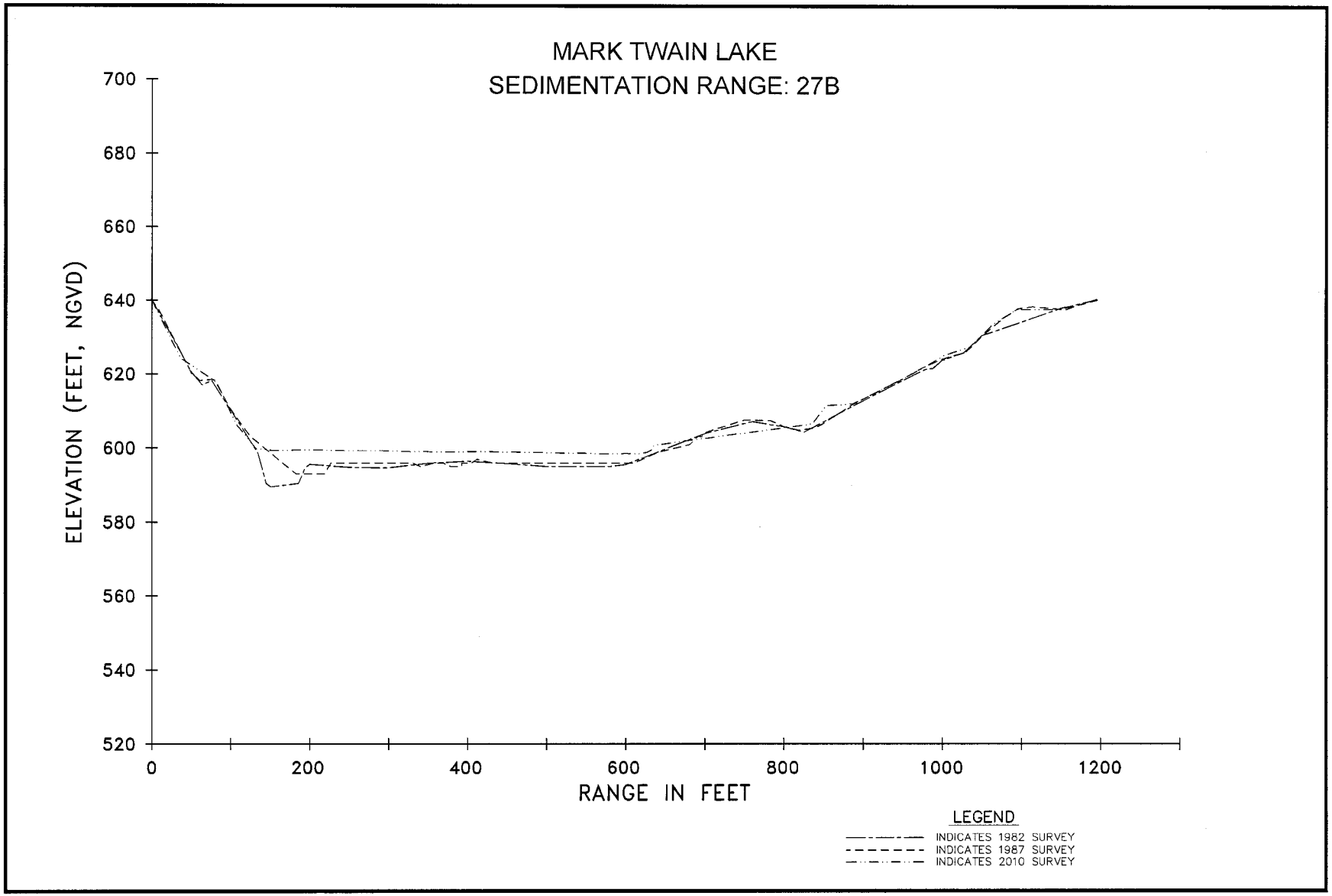
400
600
800
1000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 23B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 24B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 25B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 26A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
5000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 27B
ELEVATION (FEET, NGVD)
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680
660
640
620
600
580
560
540
520
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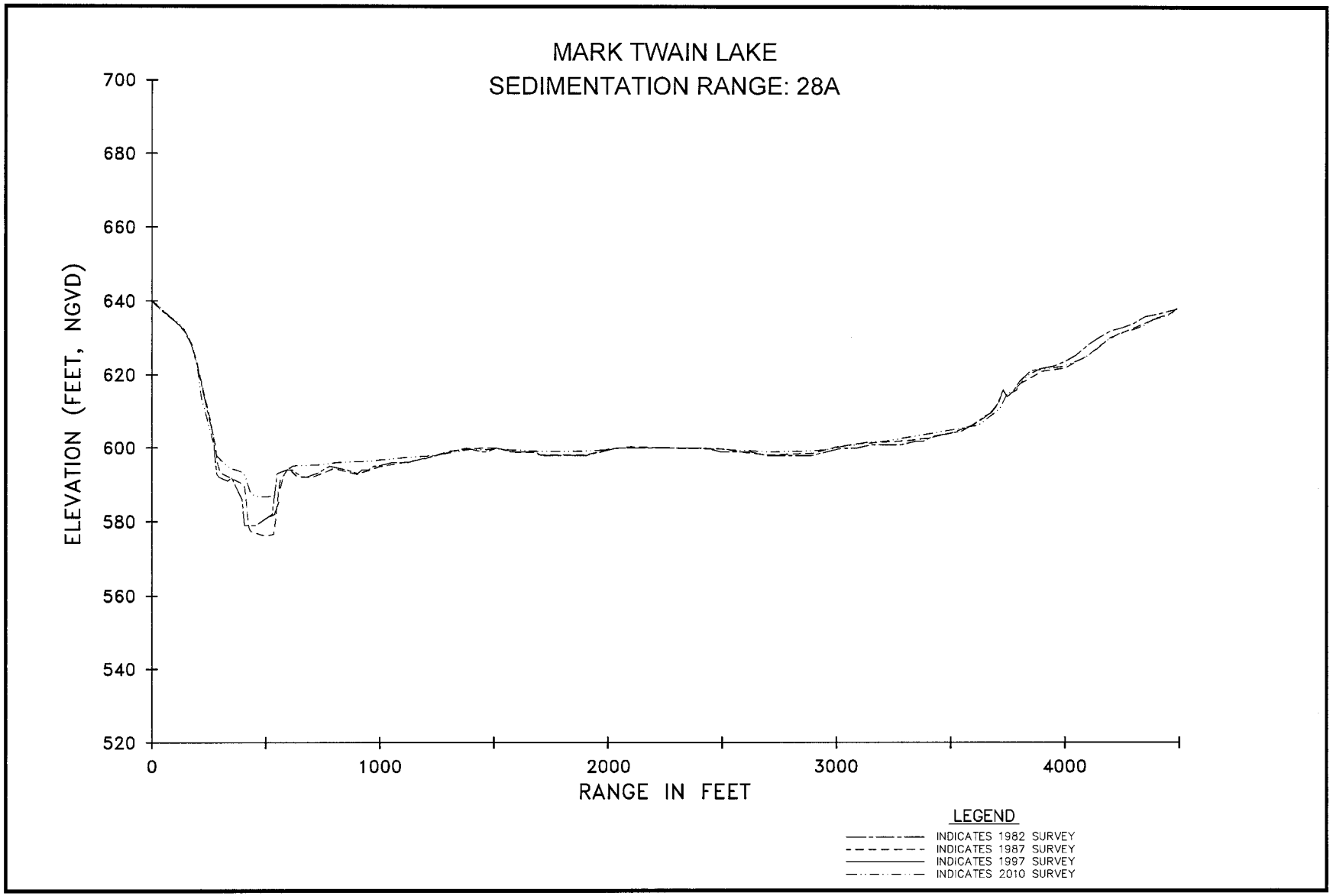
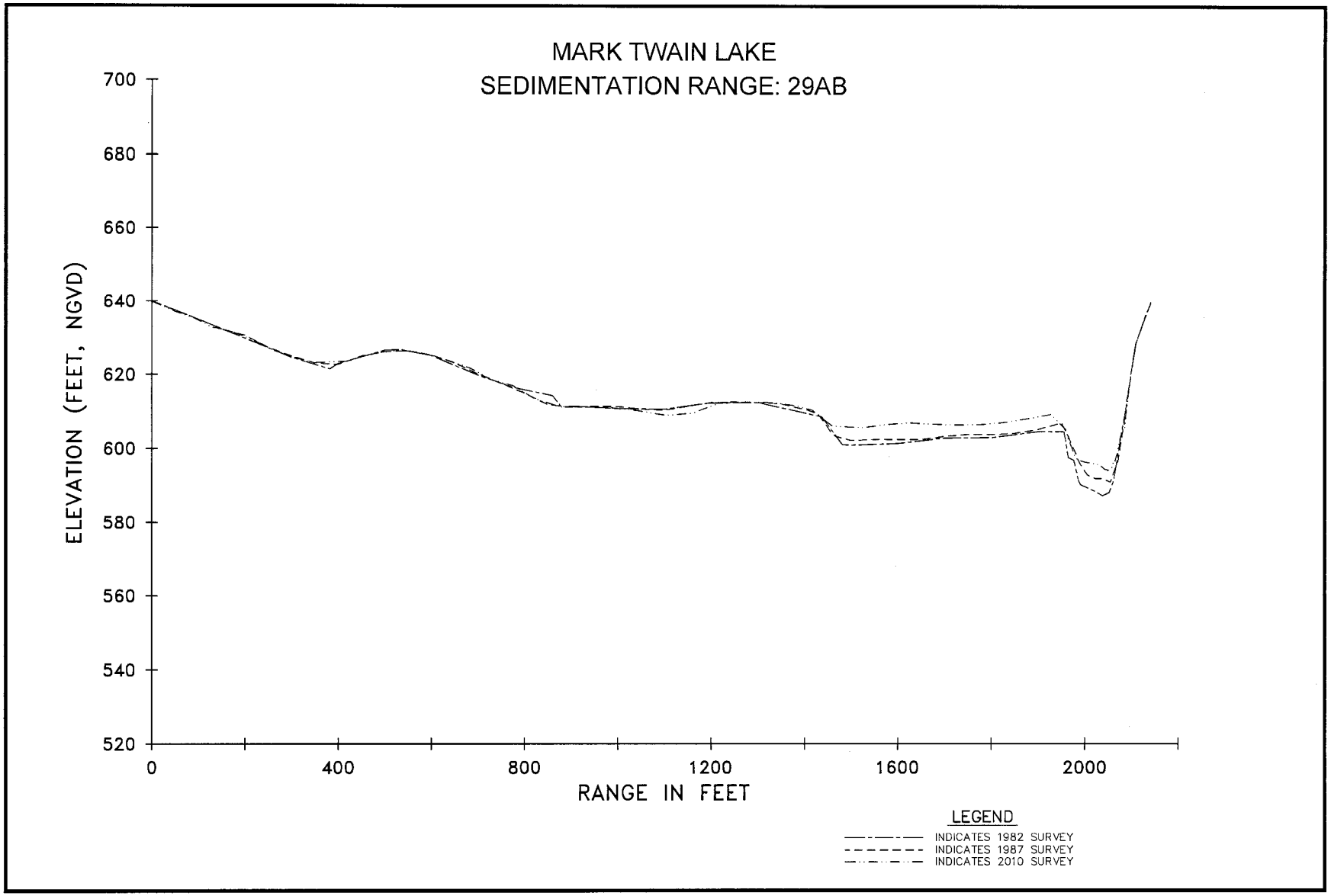
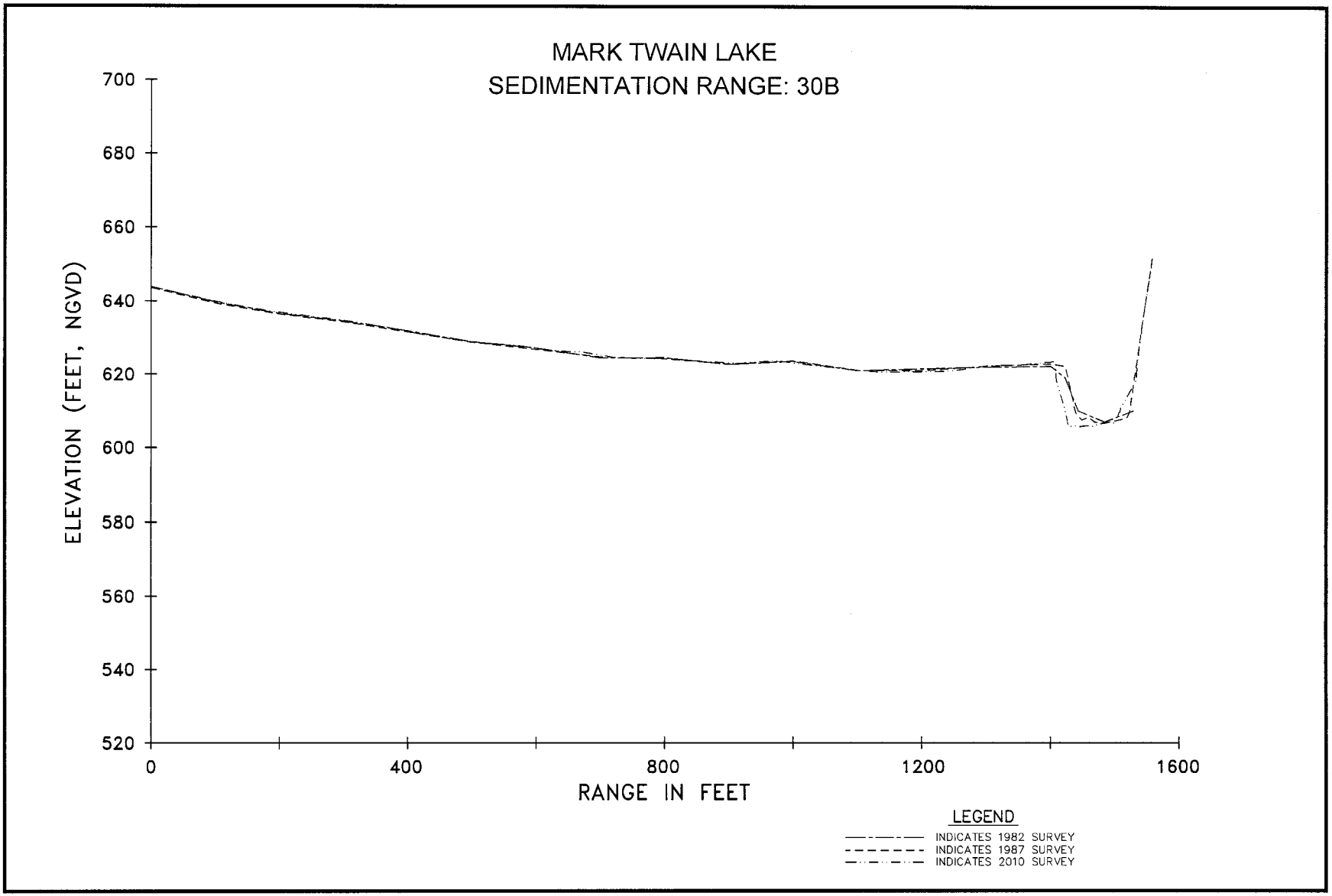
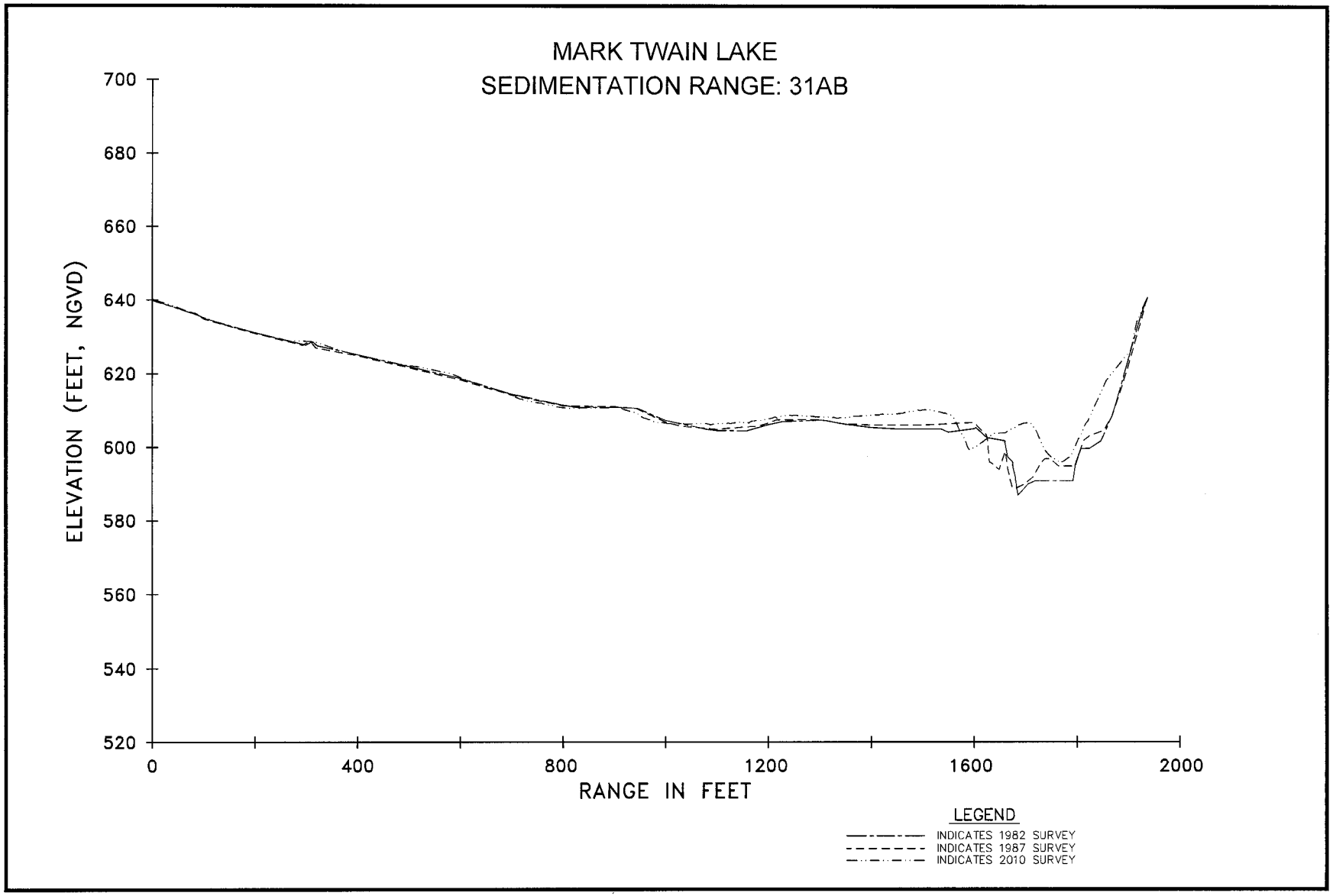
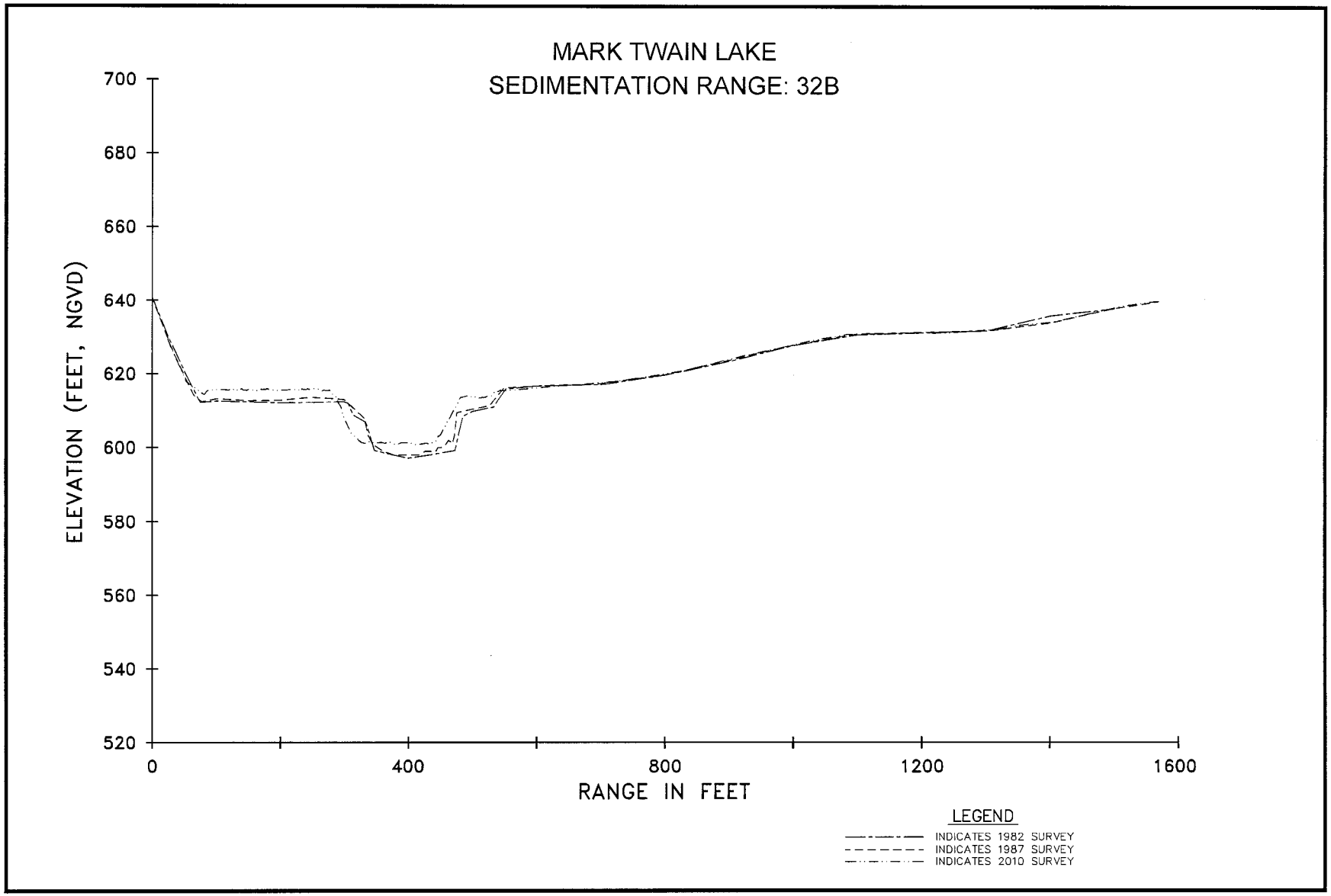
200
400
600
800
1000
1200
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 28A
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 29AB
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 30B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 31AB
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 32B
ELEVATION (FEET, NGVD)
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680
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640
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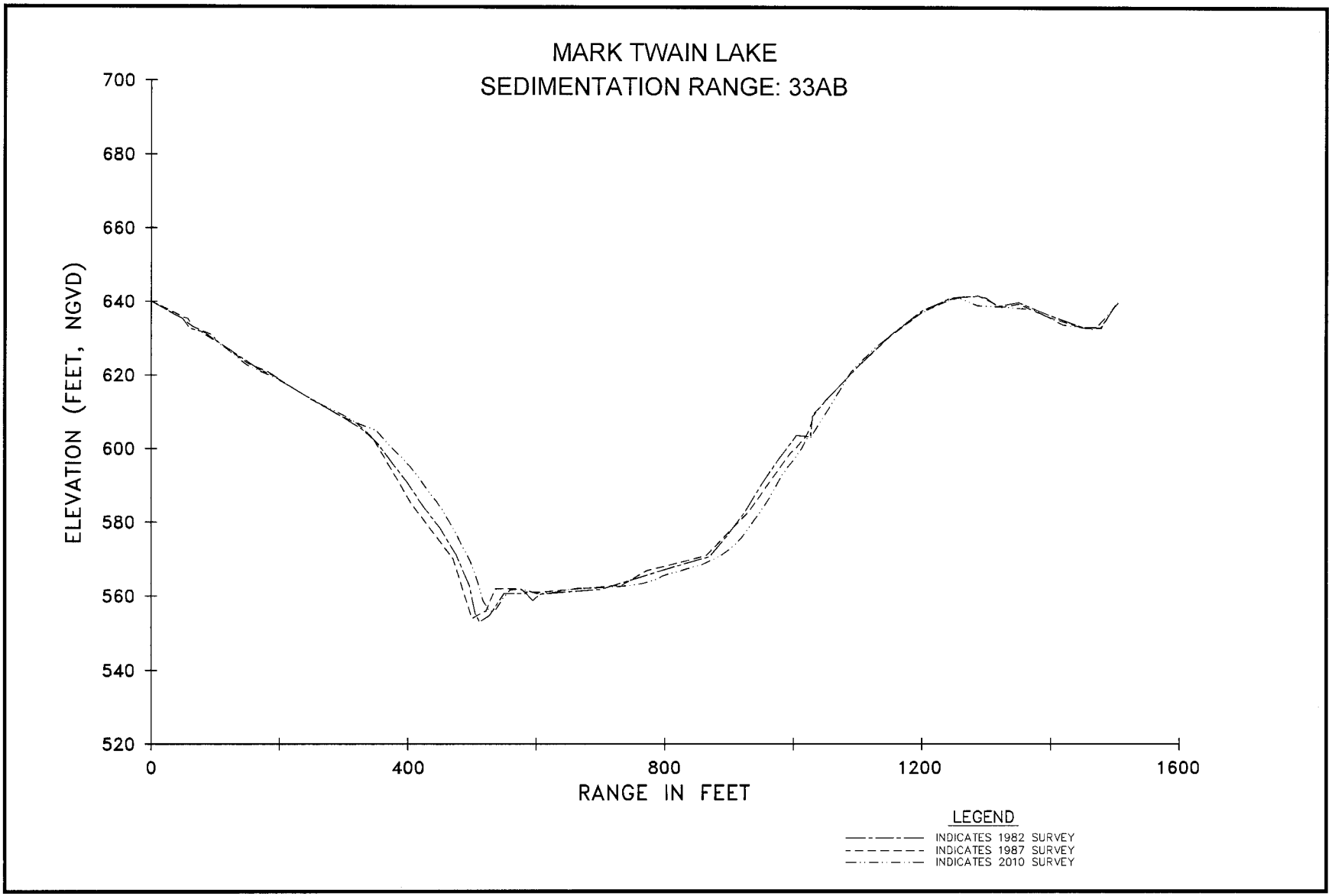
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 33AB
ELEVATION (FEET, NGVD)
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680
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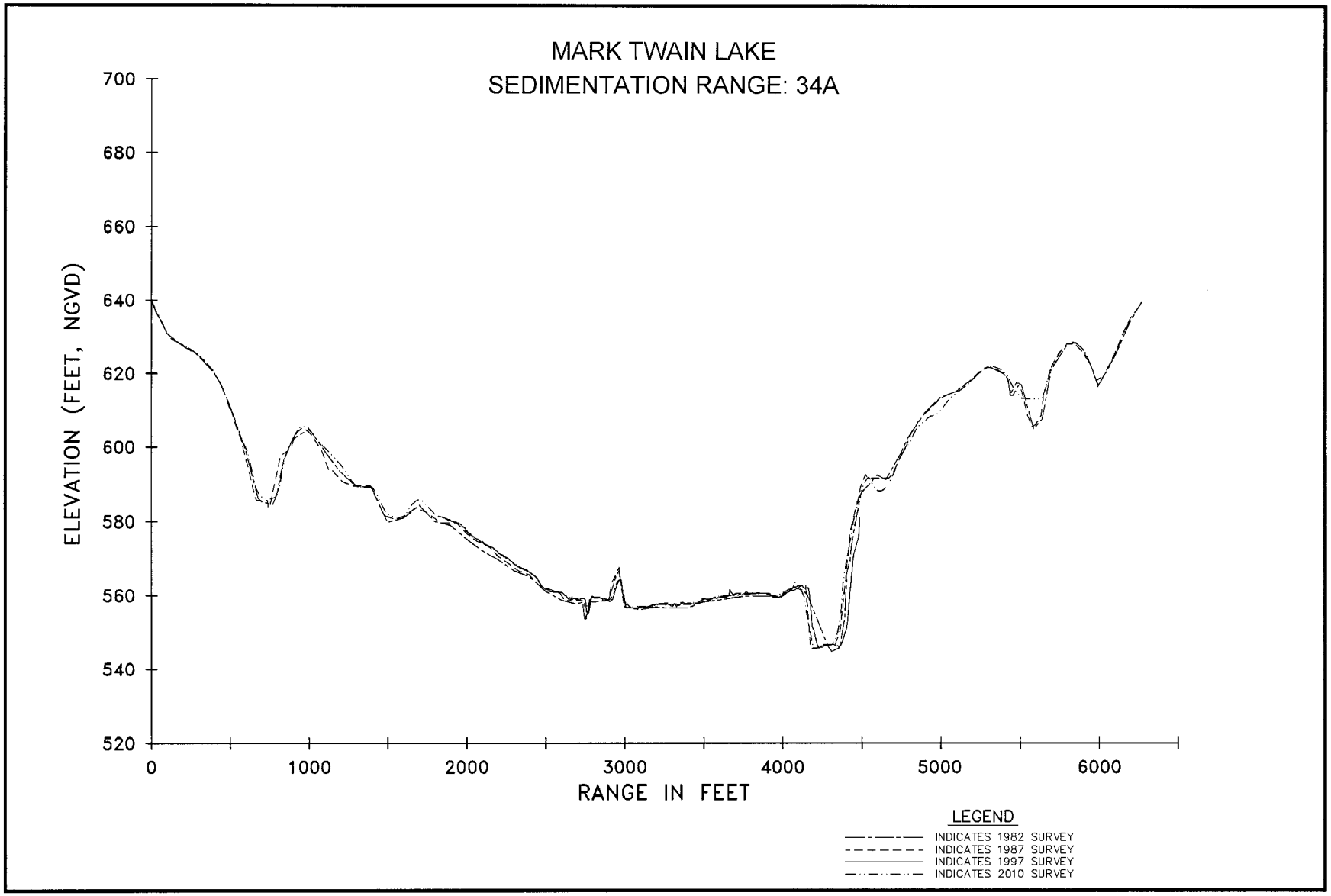
640
620
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY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1000
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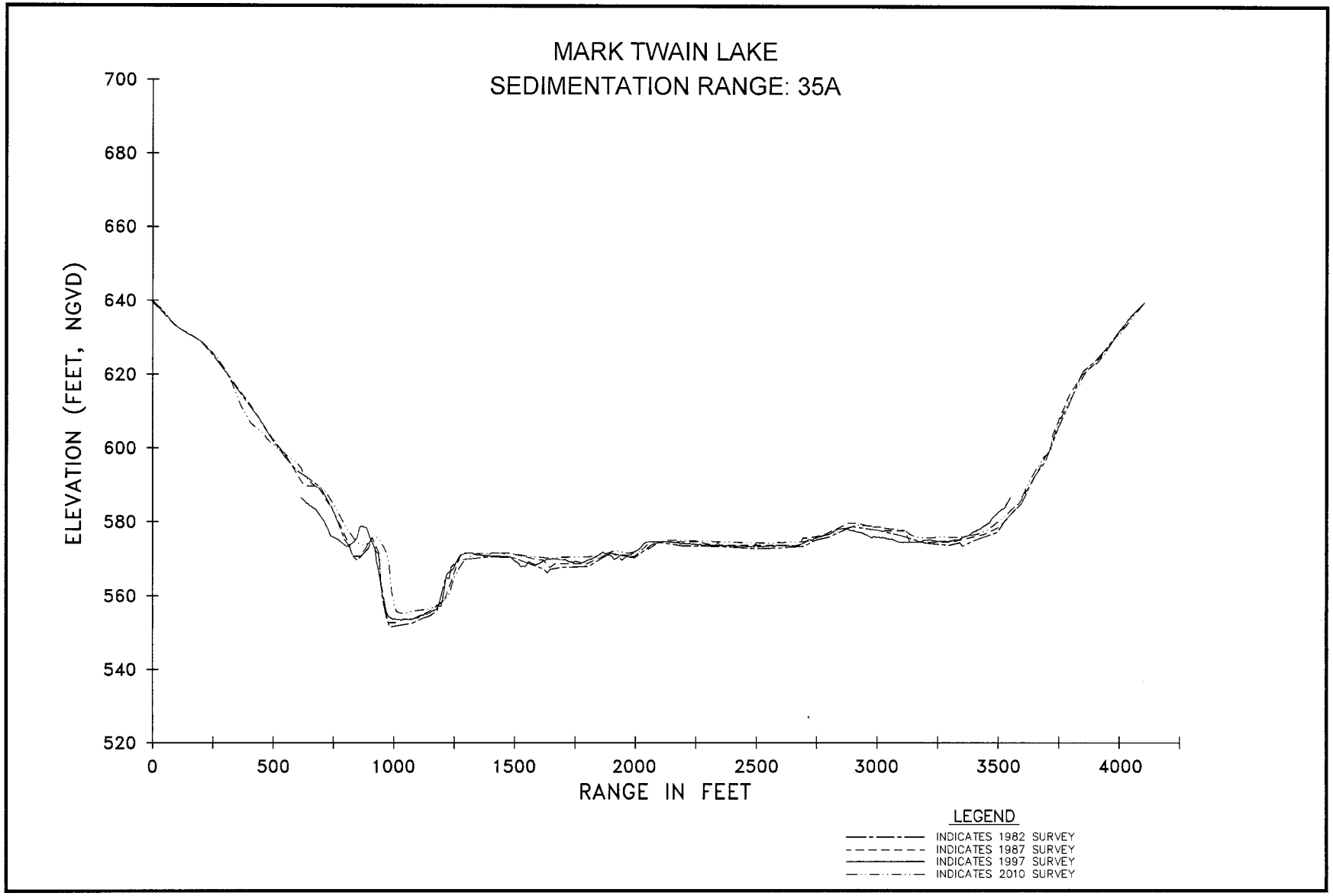
4000
5000
6000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY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ELEVATION (FEET, NGVD)
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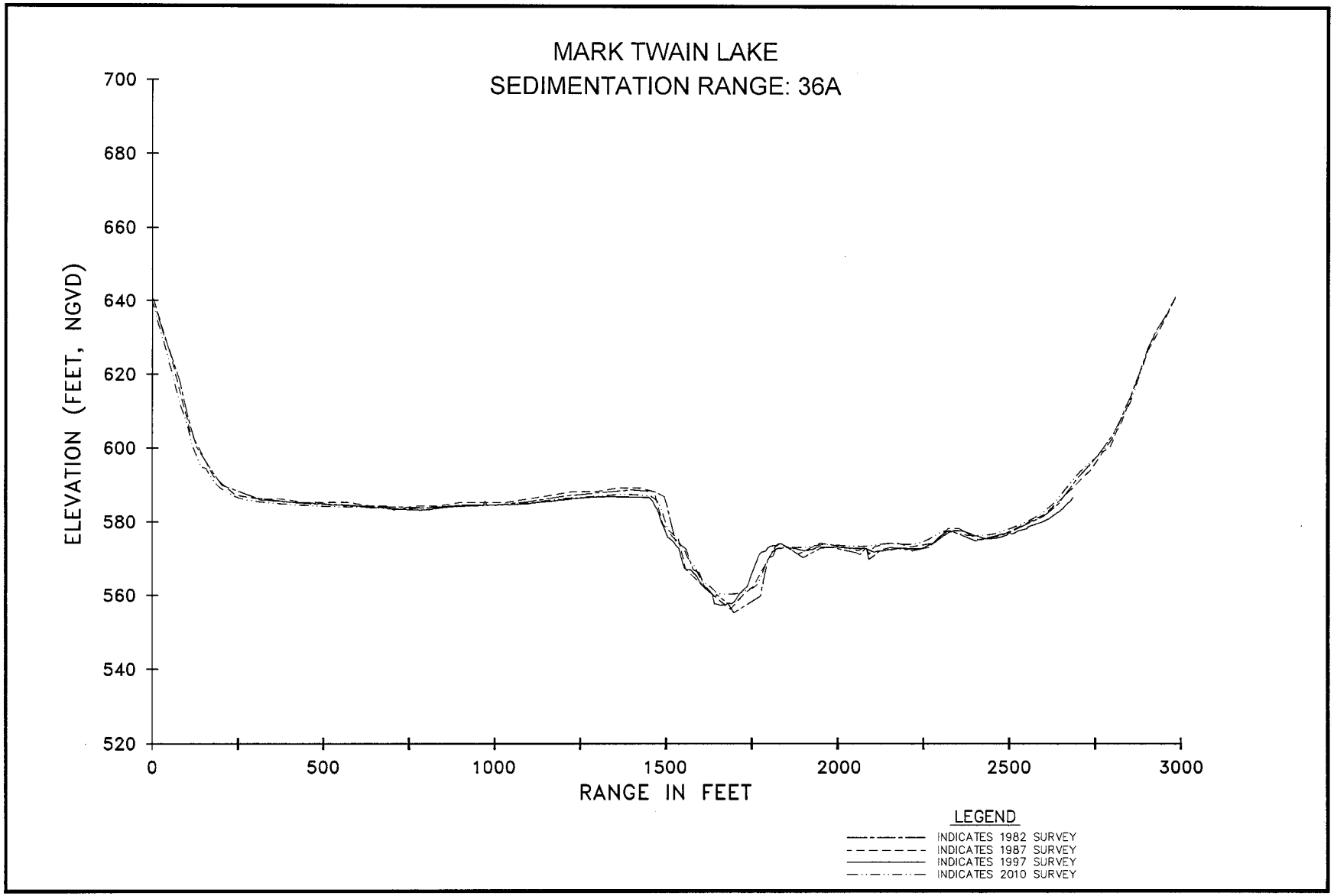
600
580
560
540
520
0
500
1000
1500
2000
2500
3000
3500
4000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY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SEDIMENTATION RANGE: 36A
ELEVATION (FEET, NGVD)
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680
660
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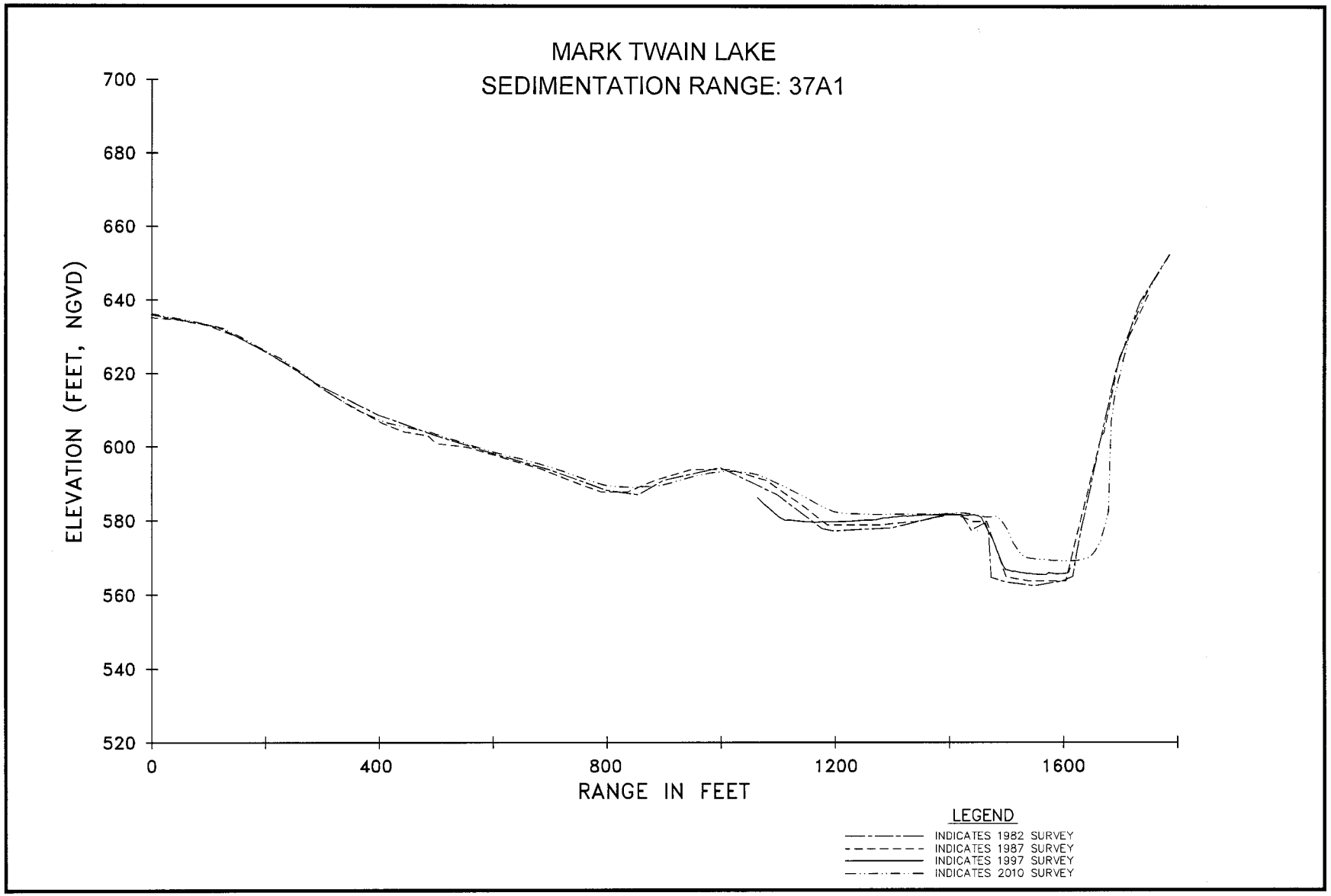
620
600
580
560
540
520
0
500
1000
1500
2000
2500
3000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY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SEDIMENTATION RANGE: 37A1
ELEVATION (FEET, NGVD)
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680
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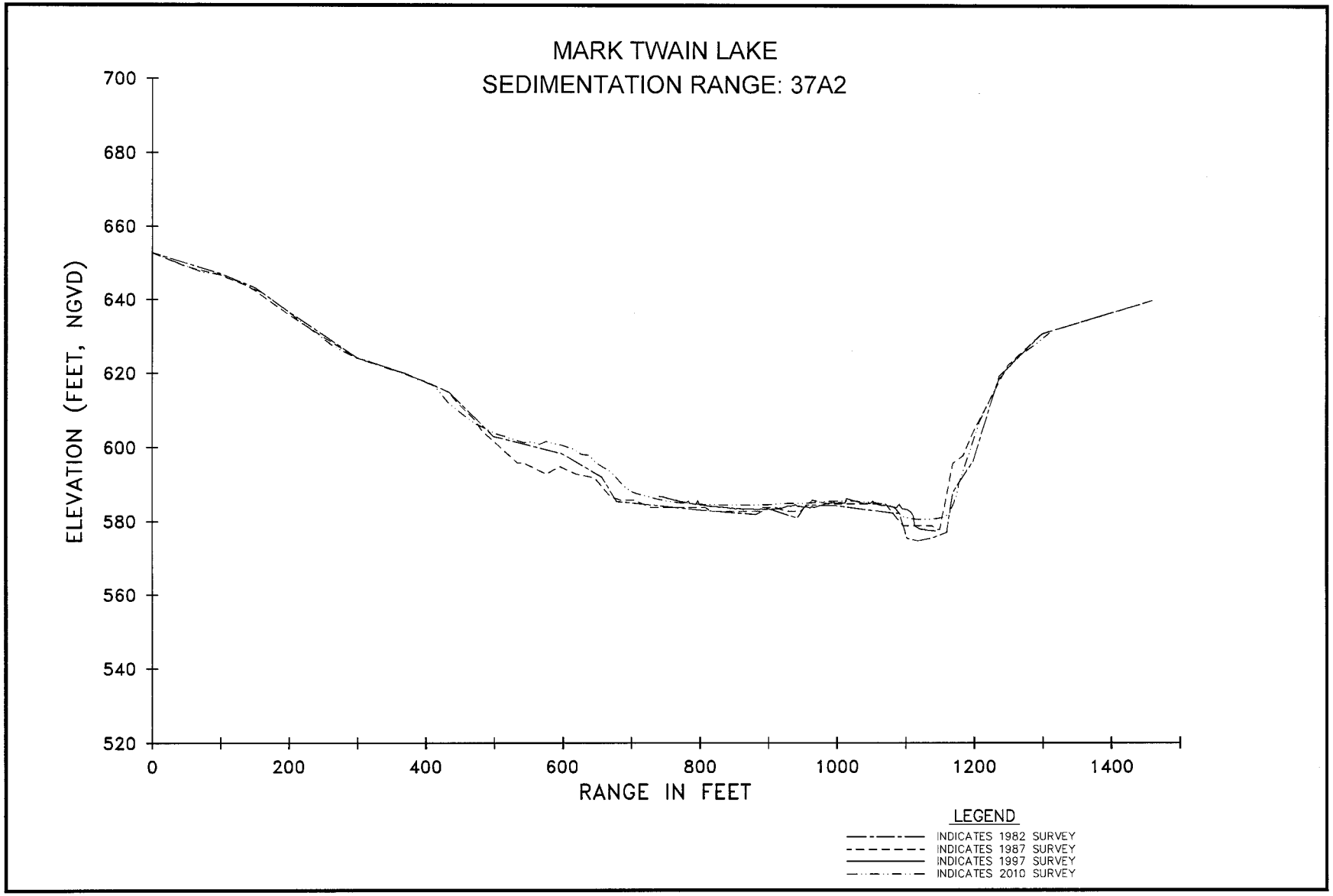
640
620
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY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SEDIMENTATION RANGE: 37A2
ELEVATION (FEET, NGVD)
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600
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560
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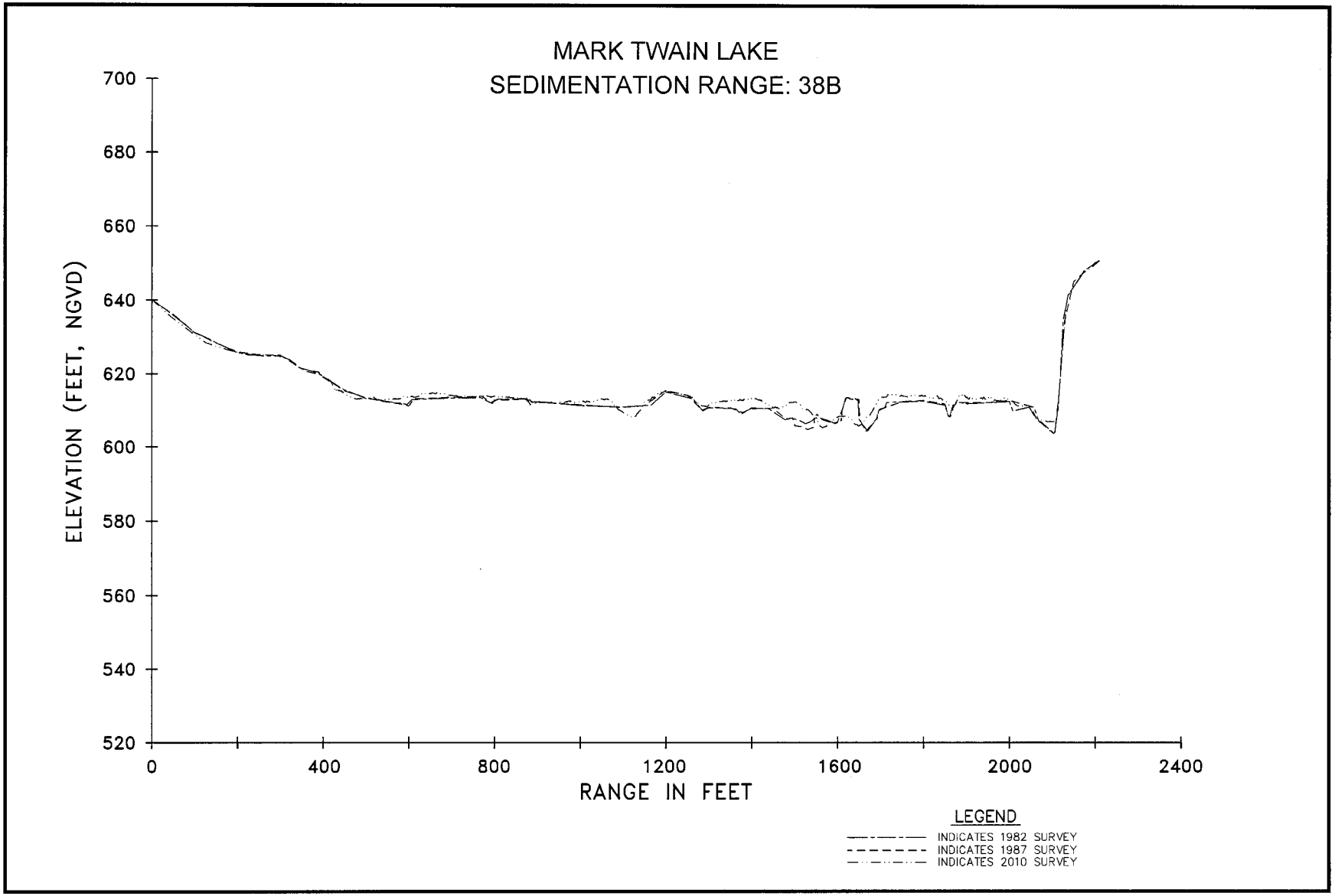
0
200
400
600
800
1000
1200
1400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 38B
ELEVATION (FEET, NGVD)
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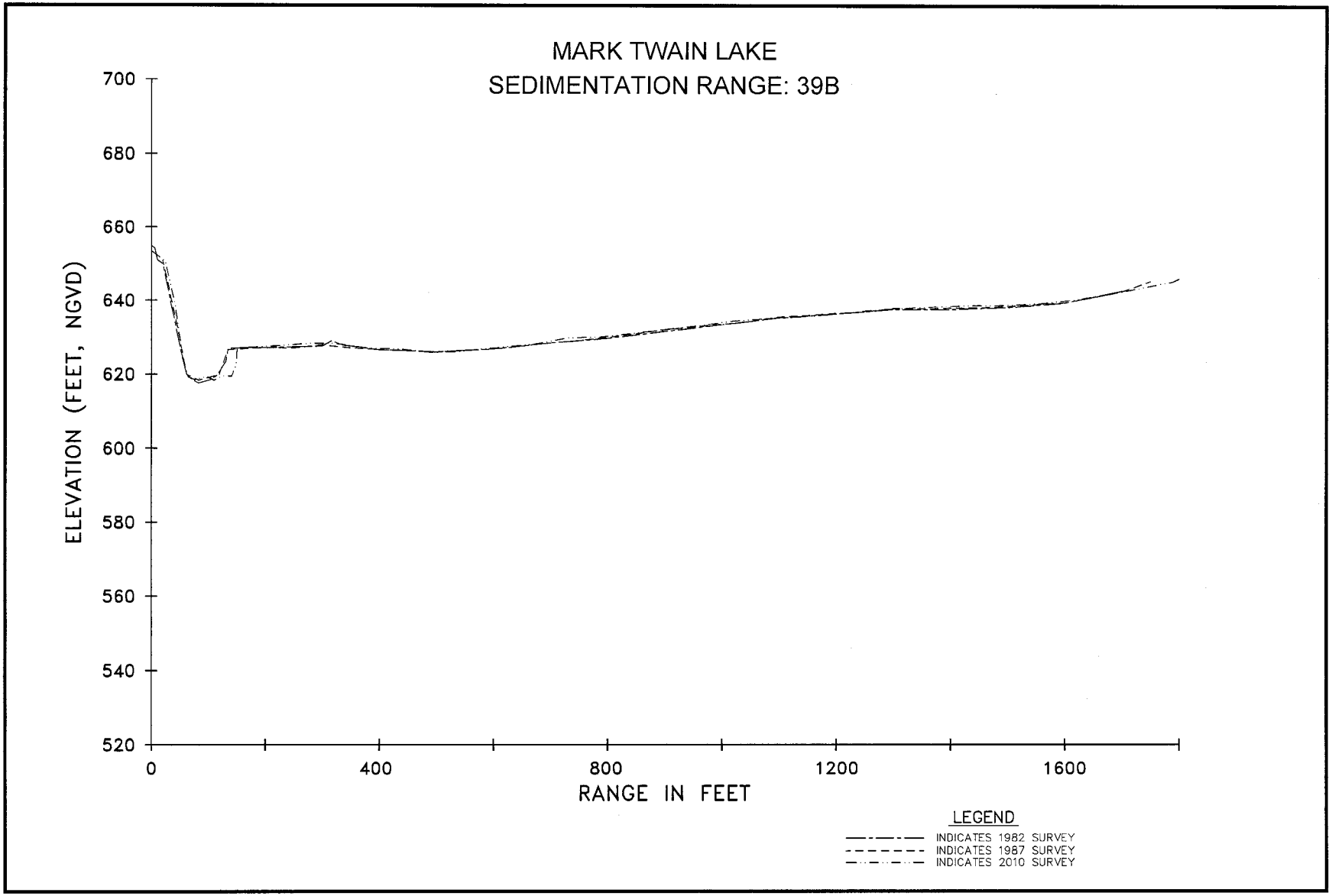
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 39B
ELEVATION (FEET, NGVD)
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680
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640
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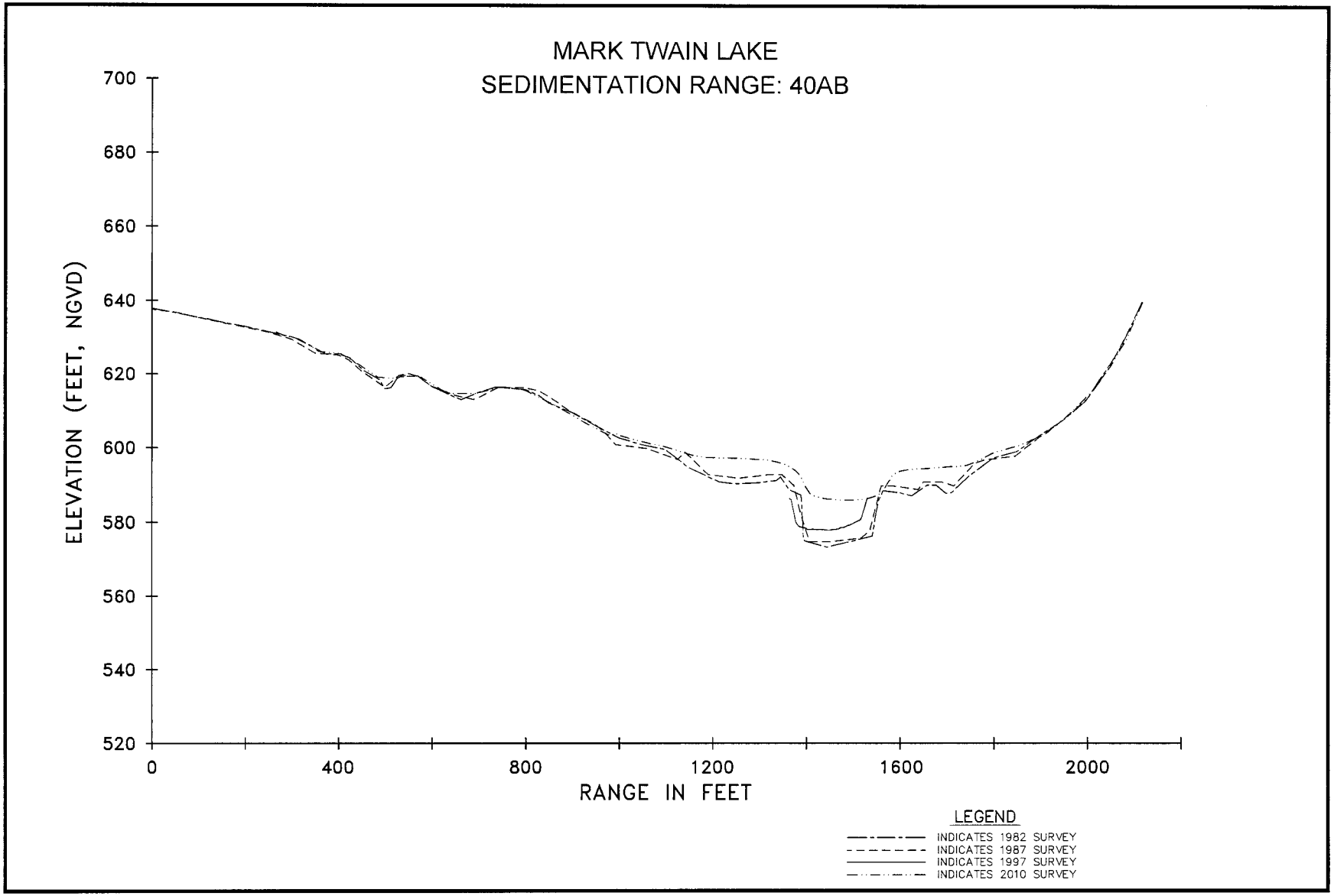
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY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SEDIMENTATION RANGE: 40AB
ELEVATION (FEET, NGVD)
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680
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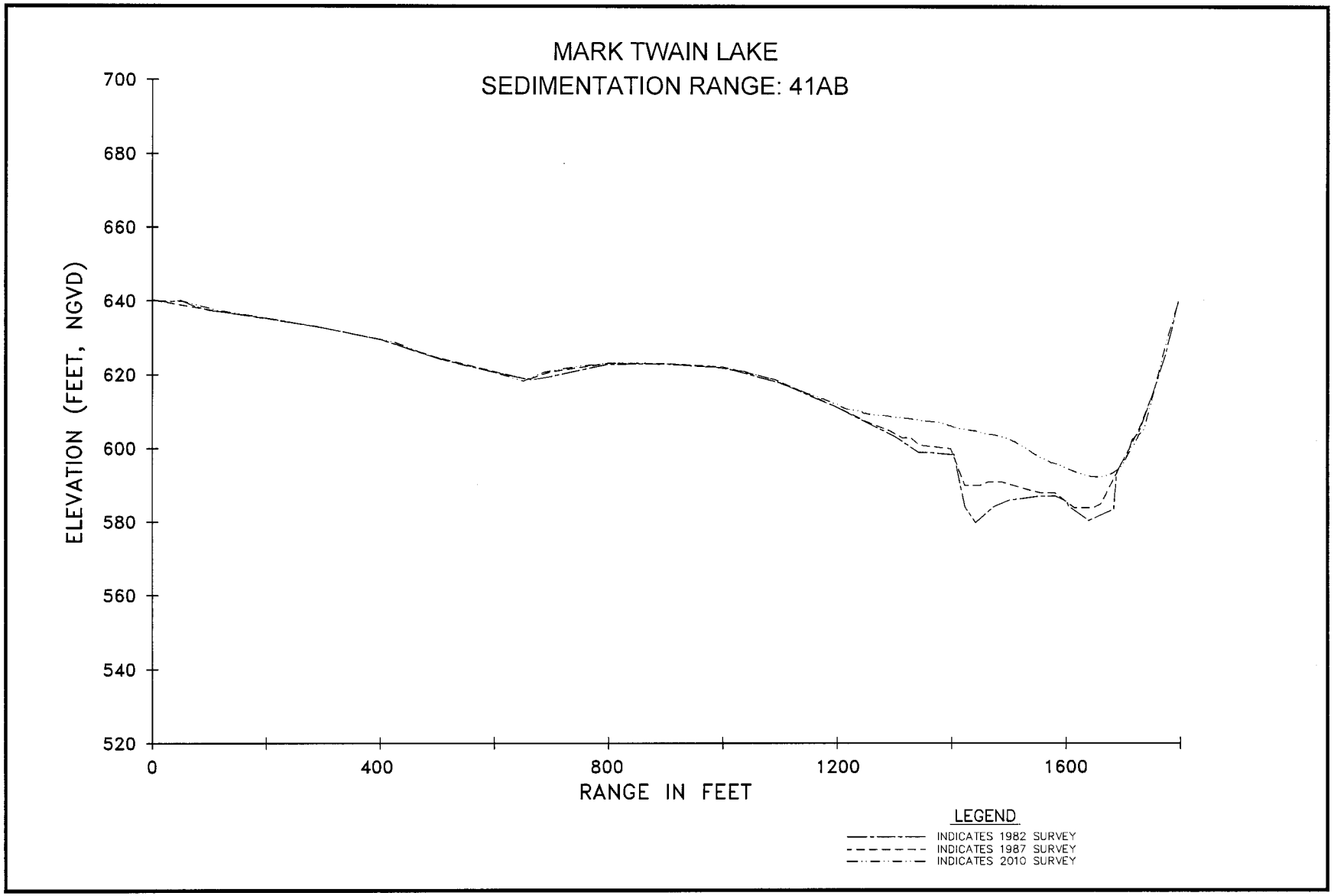
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 1997 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 41AB
ELEVATION (FEET, NGVD)
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680
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620
600
580
560
540
520
0
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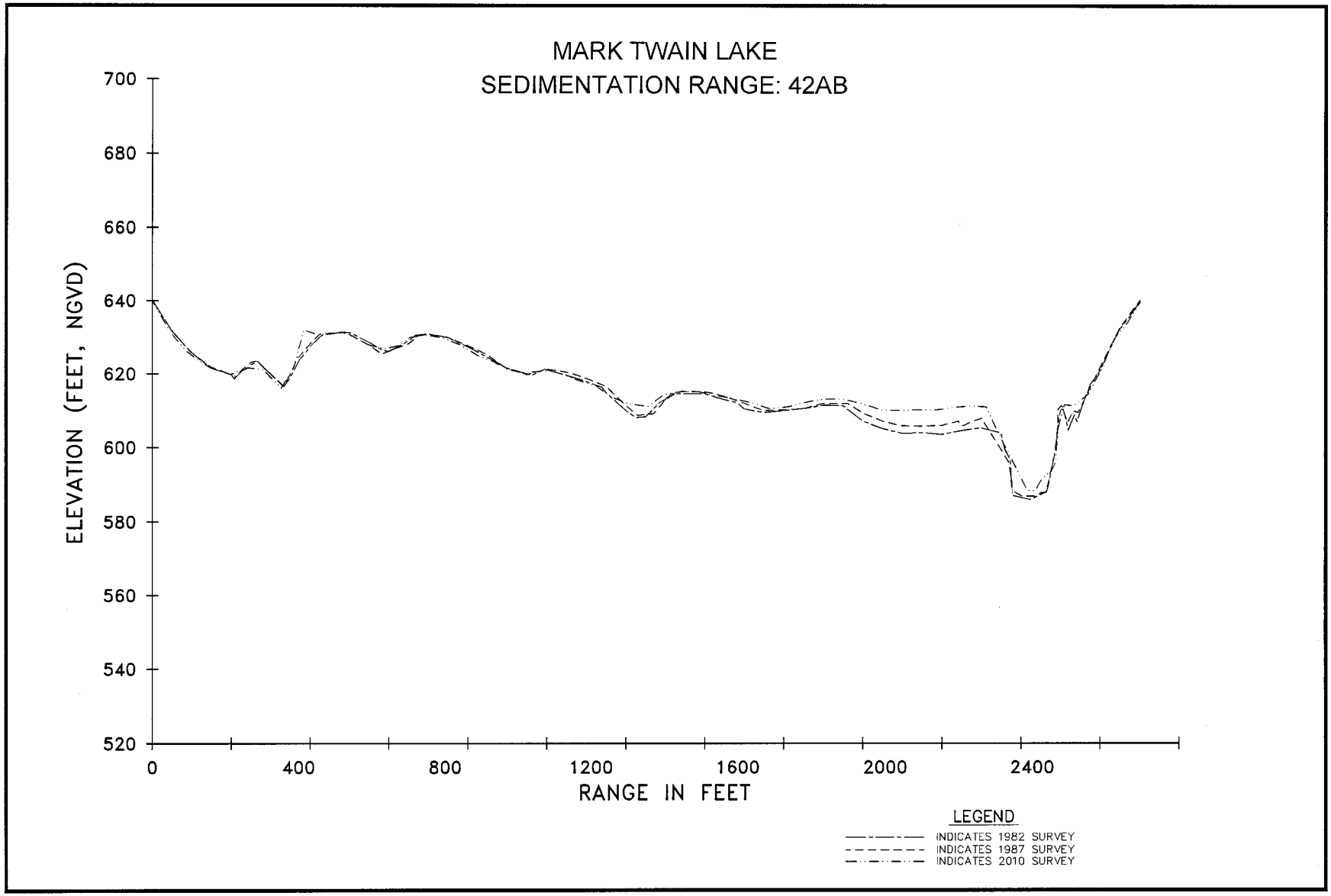
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 42AB
ELEVATION (FEET, NGVD)
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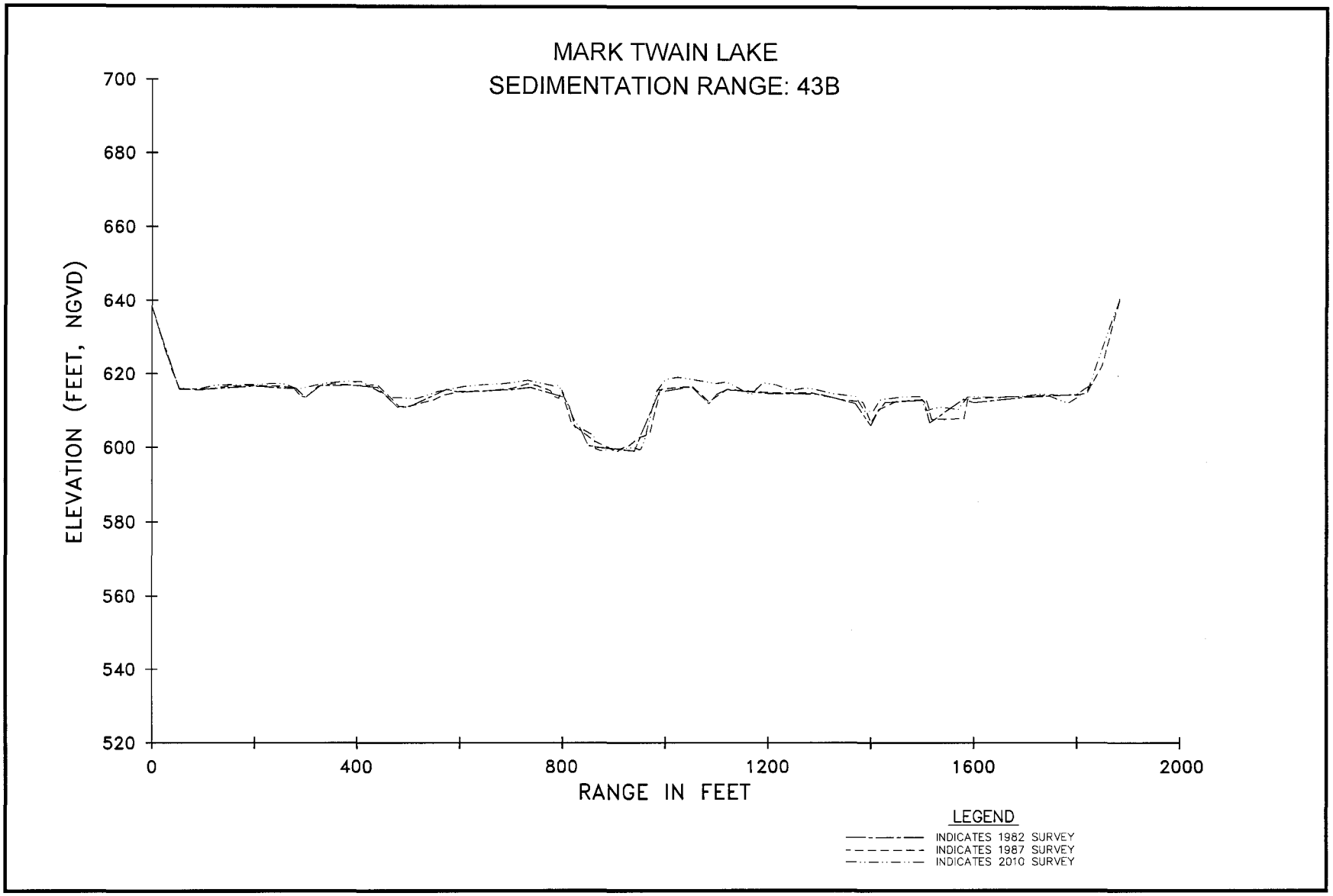
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 43B
ELEVATION (FEET, NGVD)
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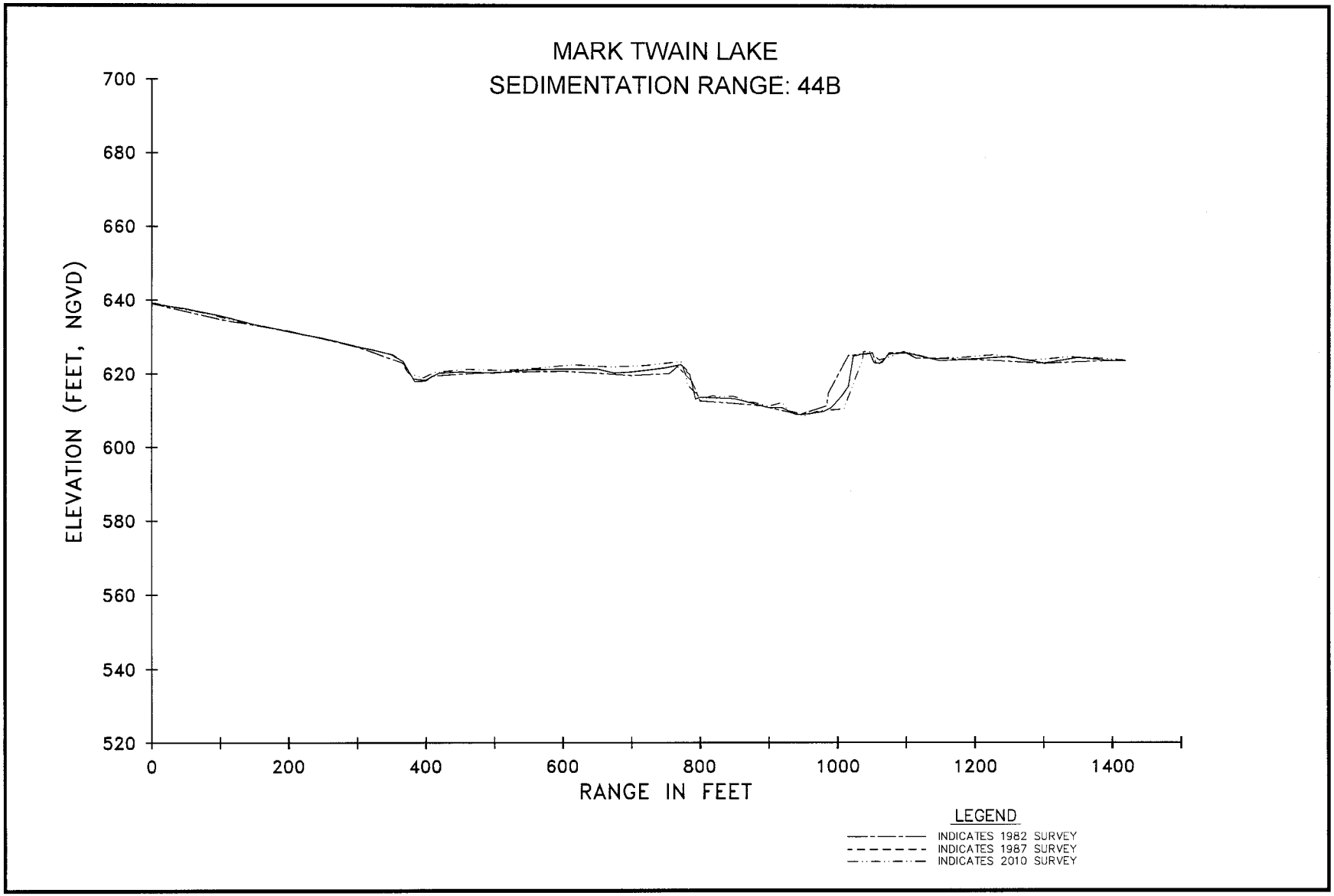
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 44B
ELEVATION (FEET, NGVD)
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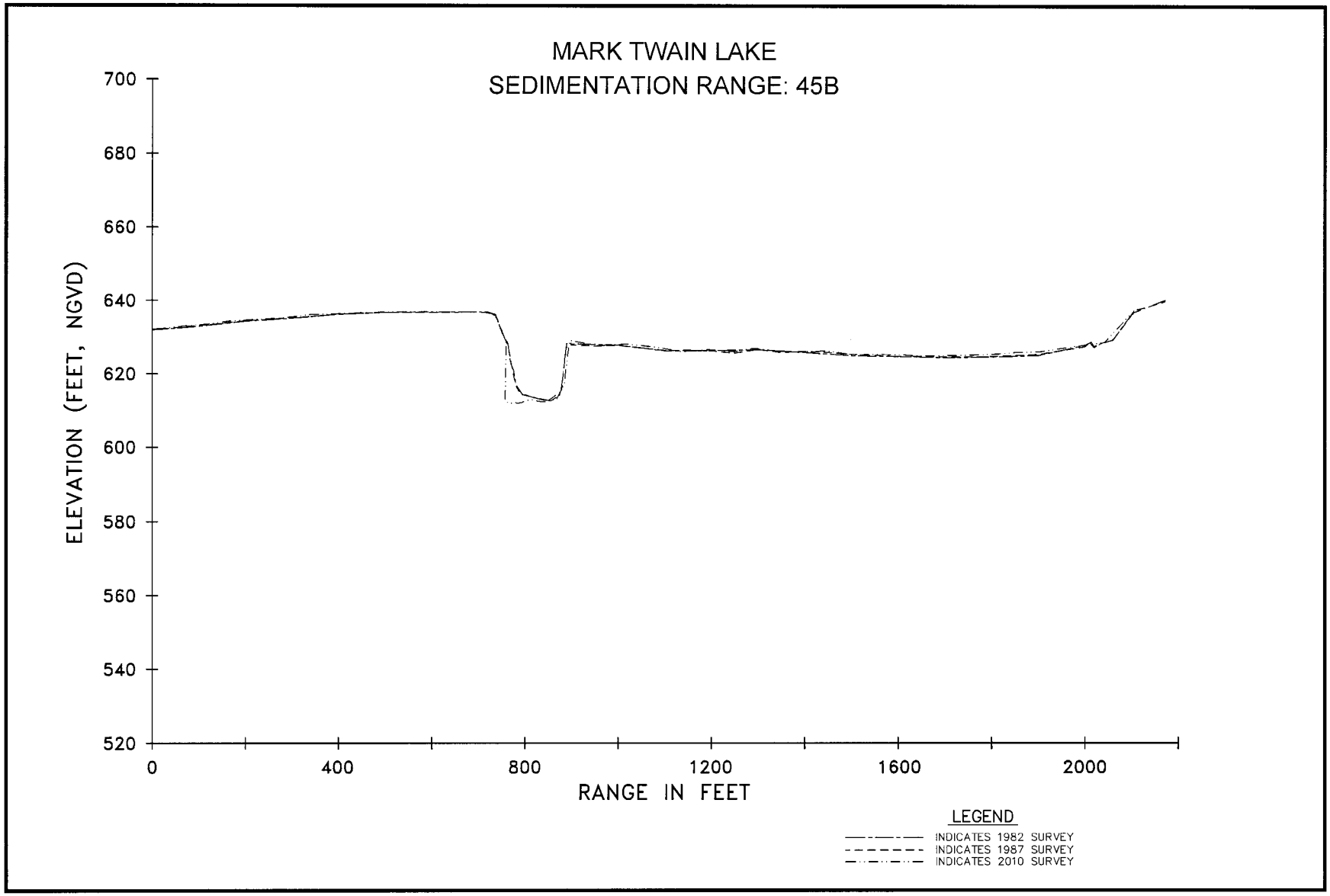
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
1400
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 45B
ELEVATION (FEET, NGVD)
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660
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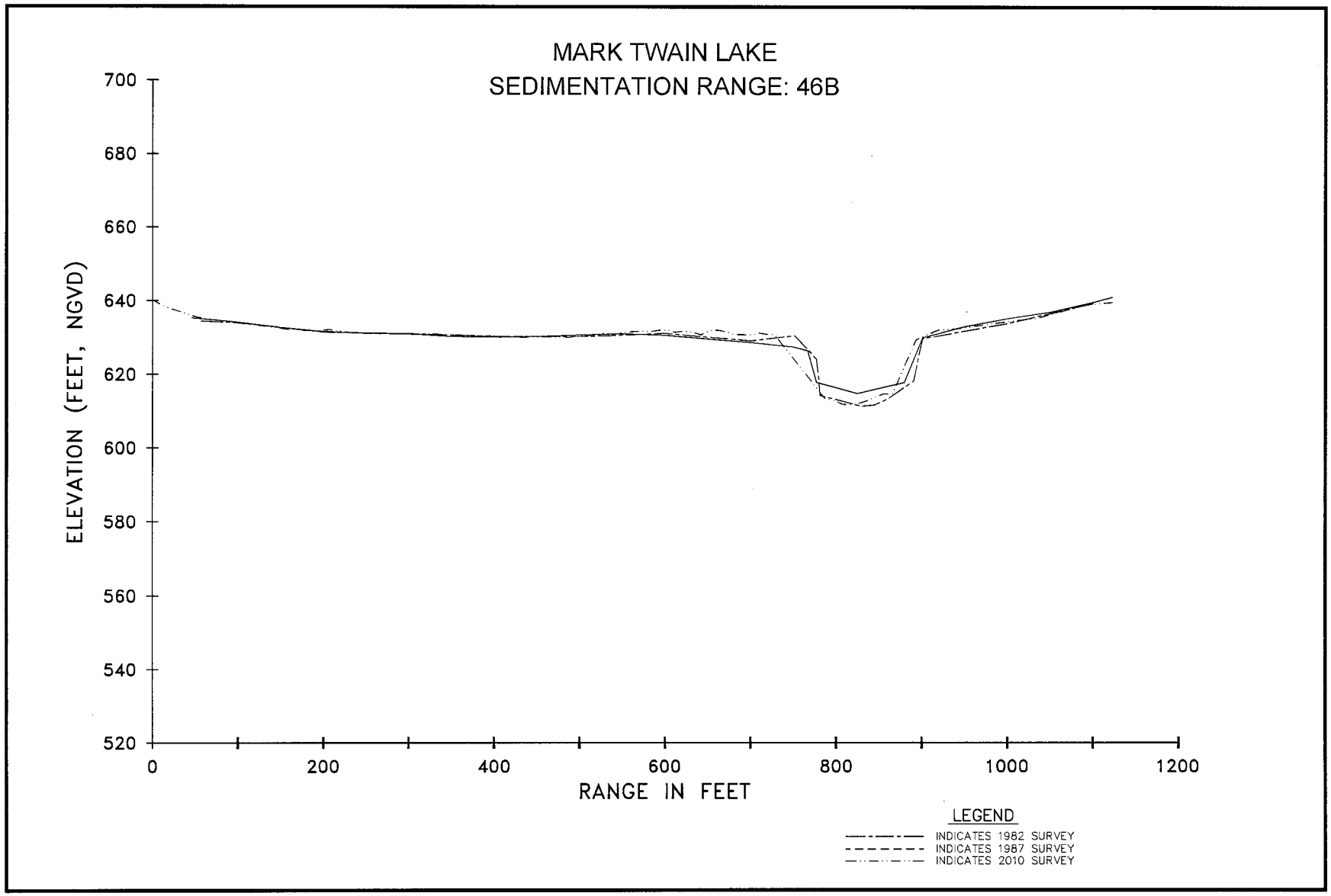
620
600
580
560
540
520
0
400
800
1200
1600
2000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 46B
ELEVATION (FEET, NGVD)
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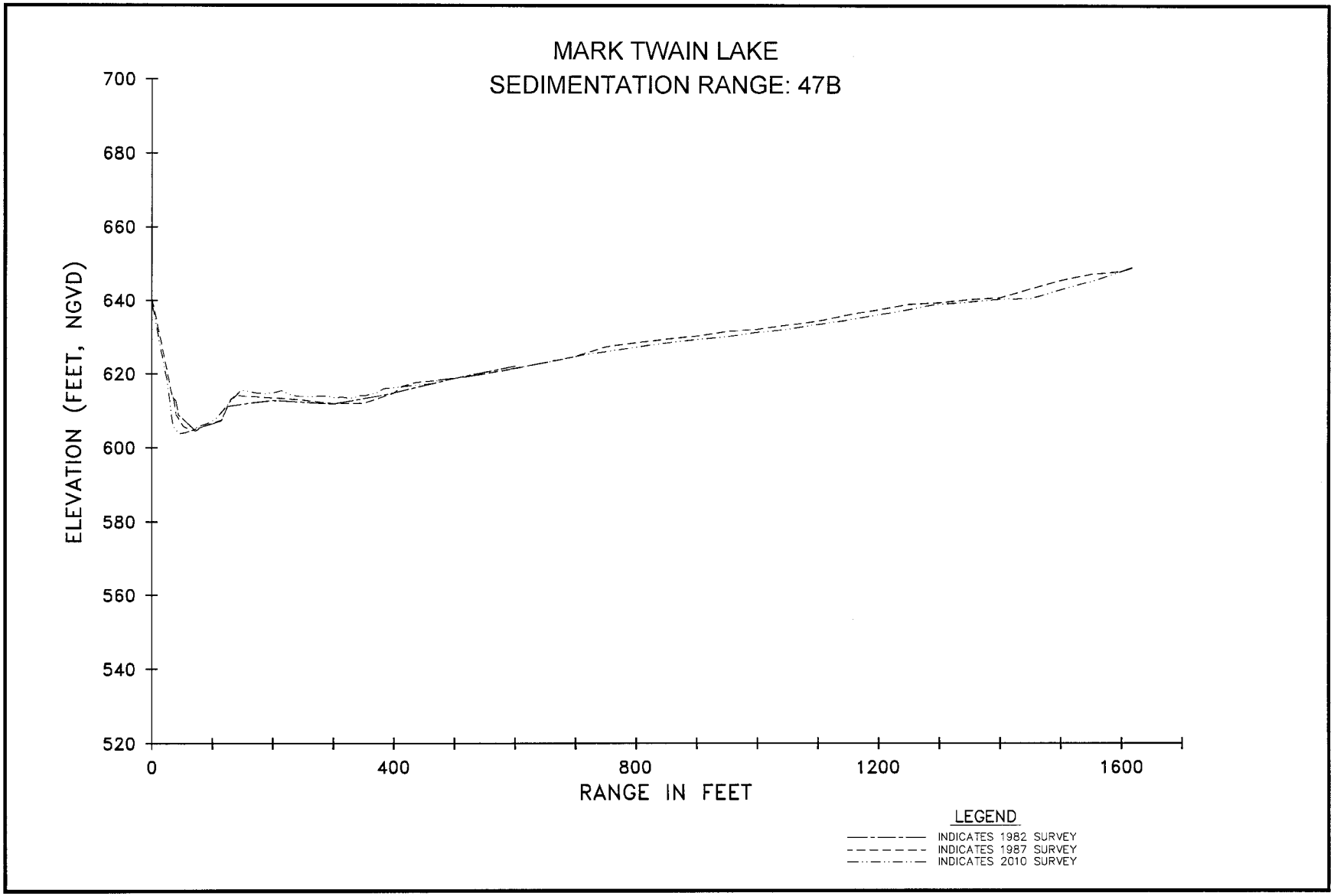
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
1200
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 47B
ELEVATION (FEET, NGVD)
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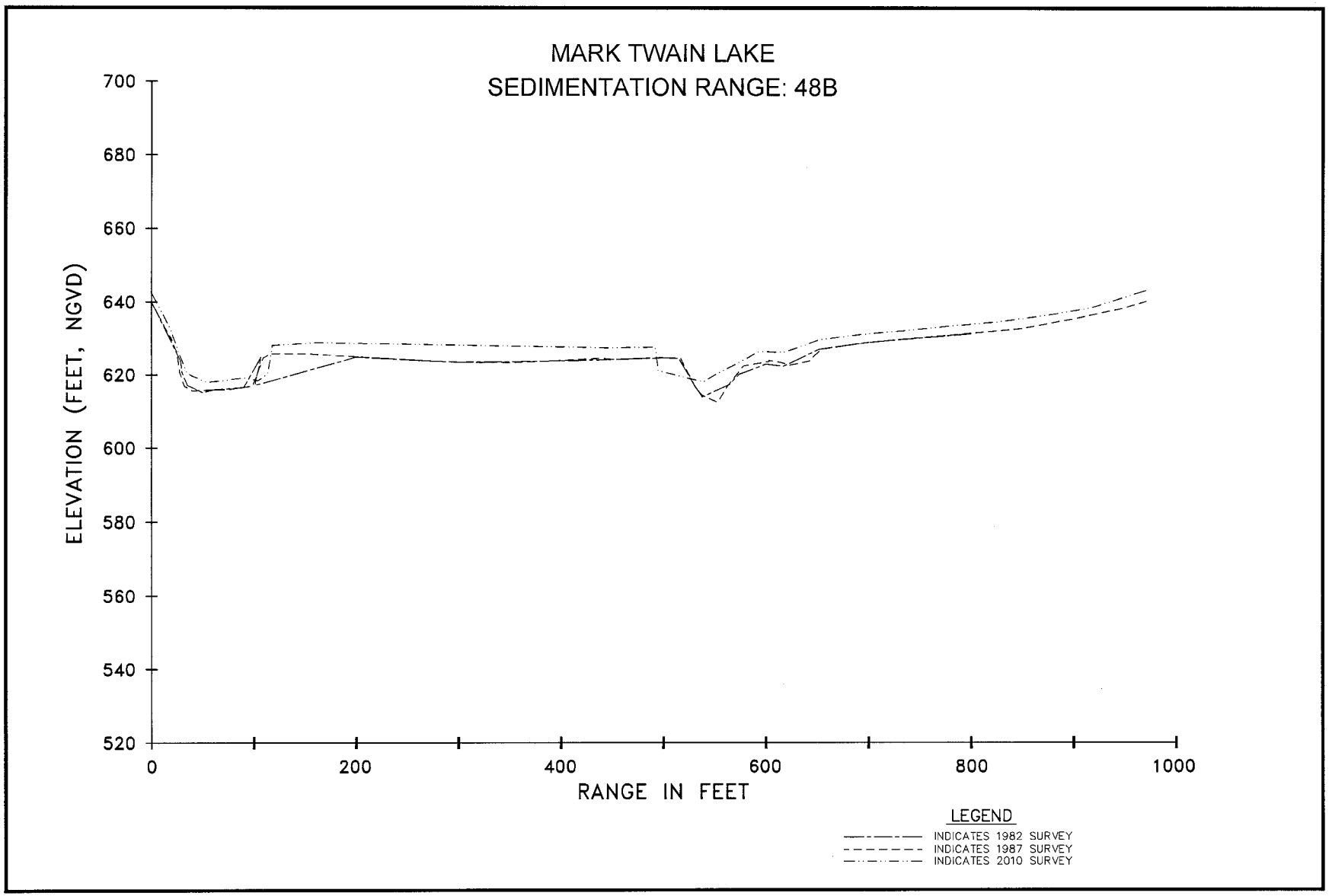
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY


MARK TWAIN LAKE
SEDIMENTATION RANGE: 48B
ELEVATION (FEET, NGVD)
700
680
660
640
620
600
580
560
540
520
0
200
400
600
800
1000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY
INDICATES 2010 SURVEY

RESERVOIR SEDIMENT
DATA SUMMARY

MARK TWAIN LAKE
NAME OF RESERVOIR

DATA SHEET NO.

DAM	1. OWNER Dept. of Army, Corps of Engineers	2. STREAM Salt River	3. STATE Missouri
	4. SEC. 23 & 26 TWP. 55N RANGE 7W	5. NEAREST P.O. Center	6. COUNTY Ralls
	7. LAT. 39° 31' 29" LONG. 91° 38' 36"	8. TOP OF DAM ELEVATION 653.0	9. SPILLWAY CREST ELEV. 639.0[1]

RESERVOIR	10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, ACRES	13. ORIGINAL CAPACITY, ACRE-FEET	14. GROSS STORAGE, ACRE-FEET	15. DATE STORAGE BEGAN
	a. FLOOD CONTROL	638.0	38,580	884,061	1,428,055	September 1983
	b. MULTIPLE USE	606.0	18,650	456,967[2]	543,994	
	c. POWER					
	d. WATER SUPPLY					16. DATE NORMAL OPER. BEGAN
	e. IRRIGATION					September 1983
	f. CONSERVATION					
	g. INACTIVE	567.2	5,970	87,027	87,027	
	17. LENGTH OF RESERVOIR 134.9[3] MILES			AV. WIDTH OF RESERVOIR 0.45 MILES		

WATERSHED			
	18. TOTAL DRAINAGE AREA 2,318 SQ. MI.		22. MEAN ANNUAL PRECIPITATION 36.02 INCHES
	19. NET SEDIMENT CONTRIBUTING AREA 2,258 SQ. MI.		23. MEAN ANNUAL RUNOFF 11.83 INCHES
	20. LENGTH 129 MILES	AV. WIDTH 18 MILES	24. MEAN ANNUAL RUNOFF 1,462,503 AC.F.T.
	21. MAX. ELEV. 1,000	MIN. ELEV. 515	25. ANNUAL TEMP: MEAN 54.6° F RANGE -21° to 108° F

SURVEY DATA

26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA, ACRES	32. CAPACITY, ACRE-FEET	33. C/I. RATIO, AC.-FT. PER AC.-FT.
September 1983 (Date of Operation)	4.08	4.08	Range (D)	49	38,580	1,428,055	1.23
Sept.-Oct. 1987			Range (D)	49	38,580	1,410,987	1.21
Sept. 1996	9.83	13.91	Range (D)	24	38,580	1,338,840	0.96
May 2010	13.67	27.58	Range (D)	49	39,262	1,371,201	0.94

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET			36. WATER INFL. TO DATE, AC.-FT.	
		a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE
September 1983 Sept.-Oct. 1987	46.1	1,714,942[4]	1,898,303[4]	6,859,768[4]	1,714,942[4]	6,859,768[4]
Sept. 1996	21.49	1,380,282	3,130,887	12,689,131	1,405,385	19,548,899
May 2010	39.44	1,540,375	3,717,555	21,565,255	1,468,301	41,114,154

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET			38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET		
	a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
September 1983 Sept.-Oct. 1987	17,068[4]	4,183[4]	1.85[4]	17,068[4]	4,183[4]	1.85[4]
Sept. 1987-1996	4,054[5]	290[5]	0.13[5]	21,122[5]	1,518[5]	0.67[5]
May 2010	39,786[6]	1,693[6]	0.75[6]	56,854	2,061	0.91

26. DATE OF SURVEY	39. AV. DRY WGT. LBS. PER CU. FT.	40. SED. DEP. TONS PER SQ. MI.-YR.		41. STORAGE LOSS PCT.		42. SED. INFLOW PPM	
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANN.	b. TOTAL TO DATE	a. PERIOD	b. TOTAL TO DATE
September 1983							
Sept.-Oct. 1987	29.1	1,174	1,174	0.29	1.20	1,160	1,160
May 2010	29.1	727	792	0.20	5.46	7,656	884

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26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	Bottom-100	100-85	85-70	70-55	55-40	40-25	25-10	10-Crest				
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											
September 1983	4	6.2	6.8	16.7	16.7	10.2	10.4	25.6				
Sept.-Oct. 1987												
September 1996	7											
May 2010	7											

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														
September 1983	26.3	22.0	12.5	8.0	15.3	8.7	5.0	0.9	0.3	1.0					
Sept.-Oct. 1987															
September 1996	7														
May 2010	7														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1984	613.18	596.88	1,898,303	2003	613.34	597.62	852,580
1985	630.56	602.01	1,832,823	2004	619.36	603.53	1,450,877
1986	627.10	600.22	1,886,852	2005	616.95	599.36	845,883
1987	608.97	600.71	1,241,790	2006	613.57	599.30	502,004
1988	608.58	597.93	309,297	2007	616.96	602.19	871,332
1989	609.14	598.02	370,665	2008	640.36	602.97	3,717,555
1990	622.73	601.53	1,497,144	2009	625.30	603.97	2,542,649
1991	620.34	603.30	1,246,869	Sept. 2010	630.21	605.72	2,666,617
1992	615.27	600.76	914,354				
1993	636.77	605.21	3,130,887				
1994	621.35	600.21	1,086,720				
1995	636.22	599.74	1,952,928				
1996	627.55	600.60	1,077,776				
1997	622.82	595.85	1,102,628				
1998	632.83	596.81	2,399,182				
1999	617.85	598.40	1,441,487				
2000	604.10	596.86	327,498				
2001	625.14	594.54	1,521,761				
2002	633.98	598.13	1,323,203				

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
560	4,607	45,742	600	16,184	425,613	635	36,812	1,265,088
565	5,848	75,754	605	18,188	507,359	638.0	39,492	1,371,201
567.2	6,449	90,012	606.0	18,792	520,661	640	41,175	1,448,914
570	6,914	108,529	610	20,442	600,123	645	46,469	1,644,080
575	8,531	146,258	615	22,984	704,930	648.0	49,789	1,772,396
580	9,875	188,297	620	26,058	837,516			
585	11,274	236,226	624.8	28,951	949,209			
590	12,765	291,072	625	29,088	954,772			
595	14,389	353,859	630	32,494	1,087,572			

47. REMARKS AND REFERENCES

1/ Elevation of top of gates in closed position.
2/ Includes 20,000 acre-feet of water supply.
3/ 50.8 miles, Salt River and North Fork; 20.0 miles, South Fork; 29.3 miles, Middle Fork; 12.2 miles, Elk Fork; 13.3 miles, Lick Creek; 9.3 miles, Indian Creek
4/ For period 10/1/83 through 9/30/87
5/ Current survey only. Based only on 24 resurveyed cross sections. Assumed no volume change in rest of reservoir. The 1996 Report of Sedimentation listed period totals (1987 to 1996) for Items 38a, b, and c based on 24 resurveyed cross sections. The values were updated in the 2010 Report of Sedimentation to reflect accumulative total sediment deposits below crest for the period 1983-1996.
6/ Period totals provided for 1987-2010.
7/ Insufficient data to determine.

48. AGENCY MAKING SURVEY U.S. Army Engineer District
49. AGENCY SUPPLYING DATA St. Louis, Missouri 50. DATE March 2011

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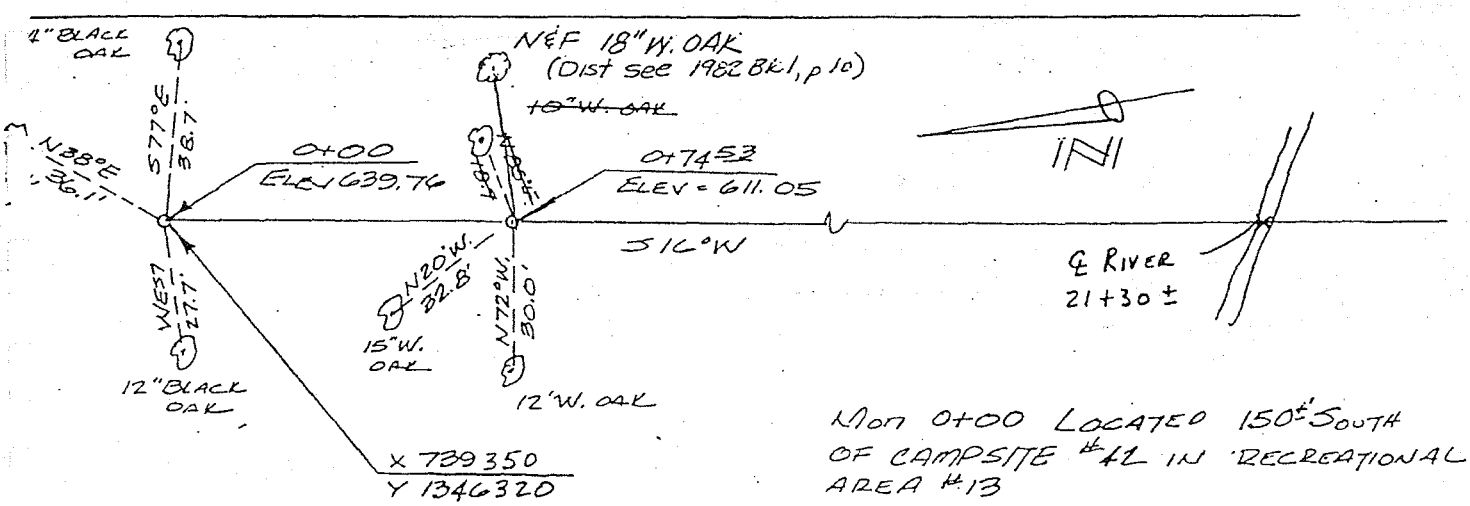
APPENDIX A

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR [illegible]
RANGES.

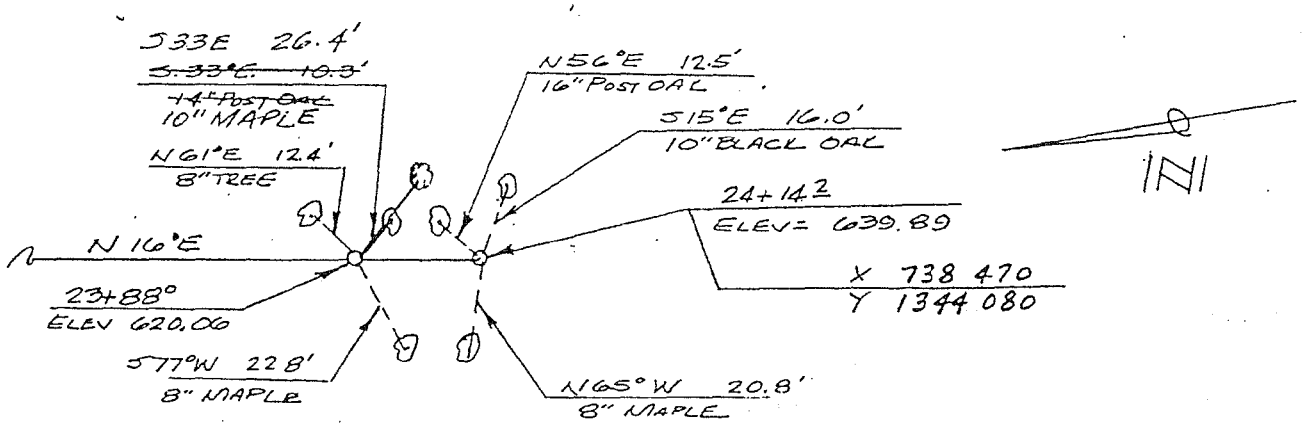
RANGE NO. SR. 1-A BY: G. BUDDE DATE: 6/10/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. Topo 9
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



MON 0+00 LOCATED 150± SOUTH OF CAMPSITE #42 IN RECREATIONAL AREA #13

BM SR 1 AY LOCATED N 70°E AND 70' FROM 0+00



B.M SR 1AX LOCATED SOUTH 180' FROM MON 24+14.2

MON 24+14.2 LOCATED 280' NE OF CAMPSITE #134 IN REC. AREA 2

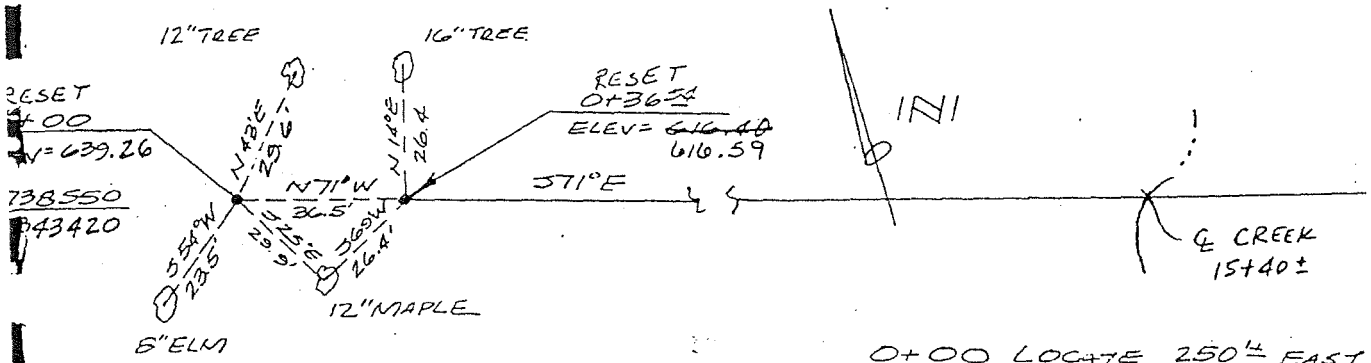
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-2A BY: G. BUDDE DATE: 6/11/82

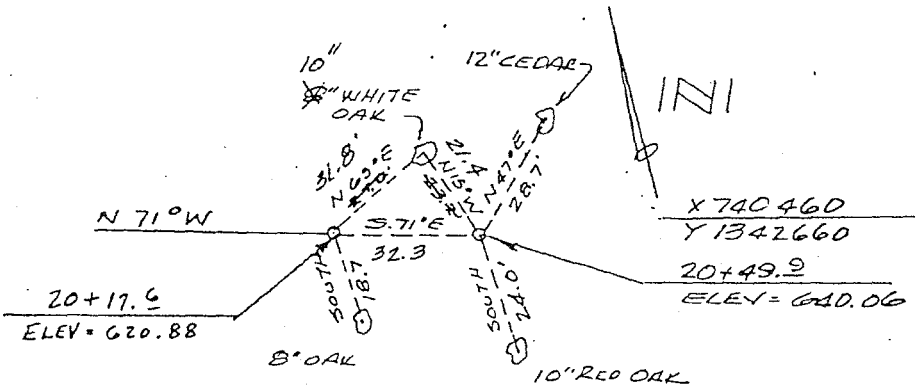
TOPO. 4 & 9

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



0+00 LOCATE 250'± EAST OF CUL-DE-SAC ROAD "D" OF REC AREA #2

BM SR 2AX ELEV= 662.58
LOCATED S 60°W 150'± FROM 0+00



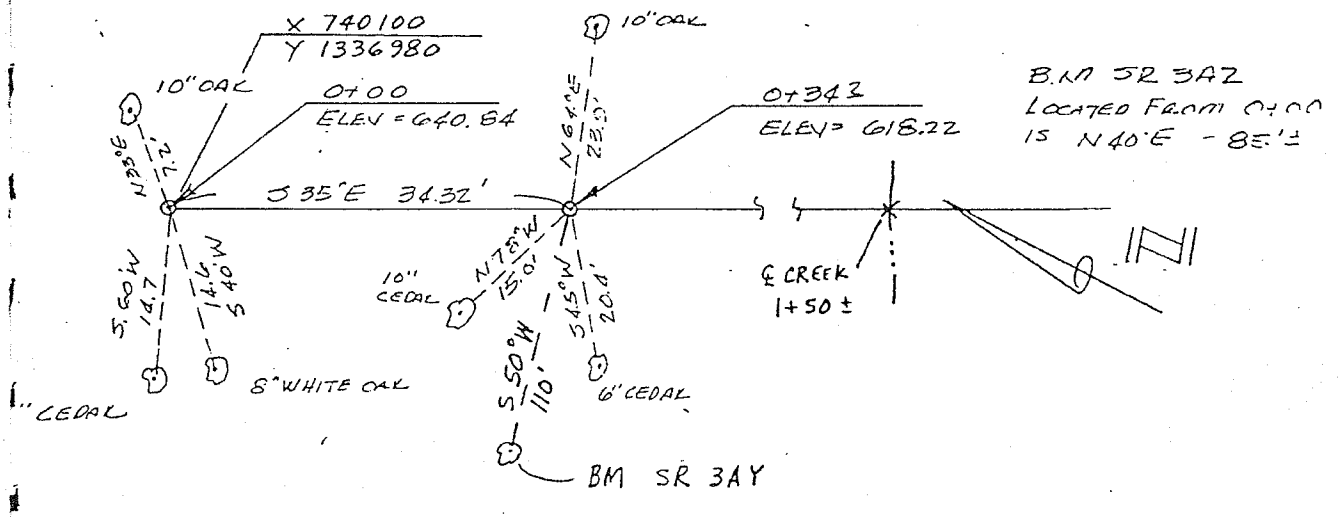
B.M SR 2A-2 LOCATED N 69°W 80'± FROM MON 20+49.9

MON 20+49.9 LOCATED 400'± WEST OF C.O.E PARKING AND STORAGE COMPOUND

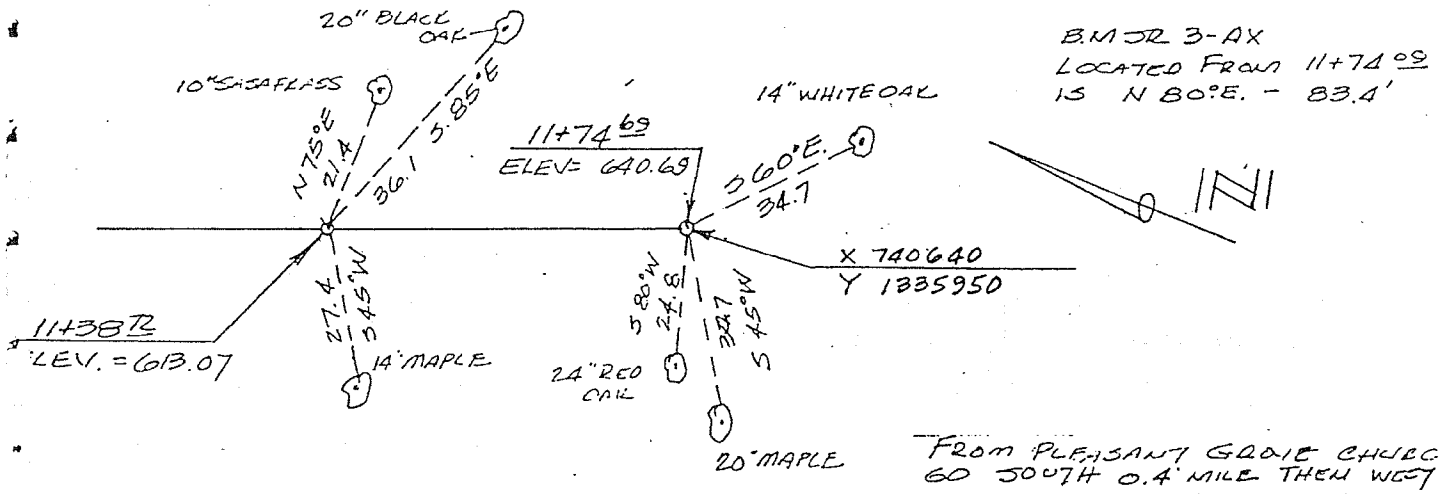
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR 3A BY: G. BUDDE DATE: 6/21/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 5
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM MT. HOPE CHURCH ON HWY "J" GO SOUTH 0.5 MILE, THEN EAST 1.0 MILE AND SOUTH 0.3 MILE ON COUNTY ROAD, THEN WALK 0.5' MILE TO 0+00



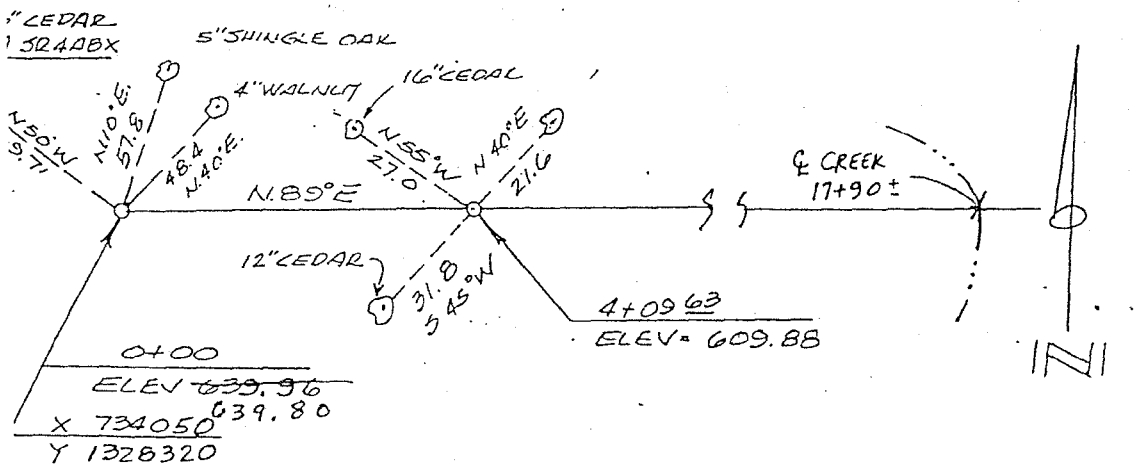
FROM PLEASANT GROVE CHURCH GO SOUTH 0.4' MILE THEN WEST 0.3 THEN SOUTH 0.1' MILE, THEN SOUTH AND WEST ON DIRT ROAD 0.6' MILE THEN WALK, THEN WALK 1700± TO SOUTH END OF RANGE

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

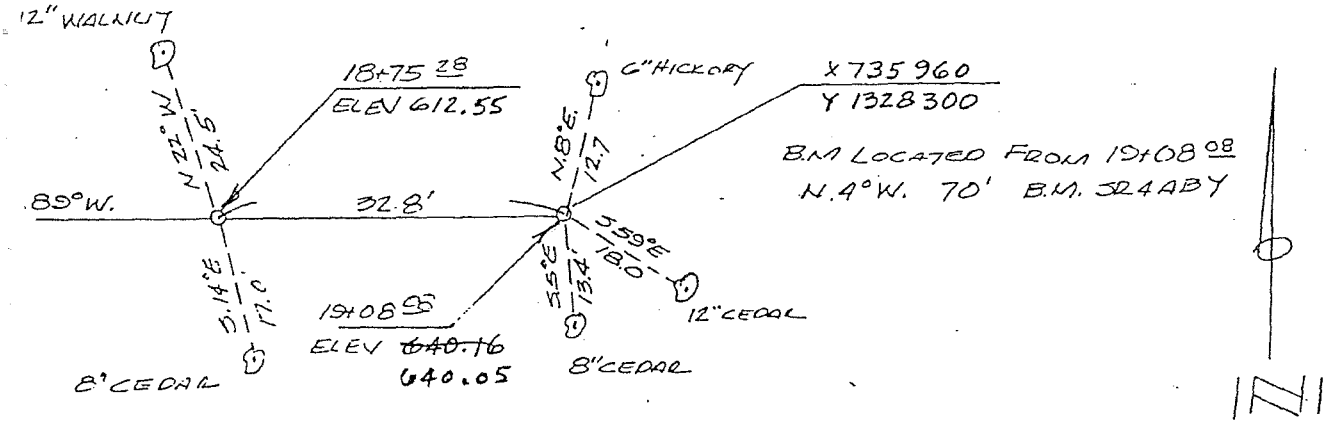
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 4-AB BY: G. BUDDE DATE: 6/21/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 11
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM GREENLAWN CEMETARY GO 1.0 MILE ON DIRT ROAD THEN 700'± NORTH TO RANGE

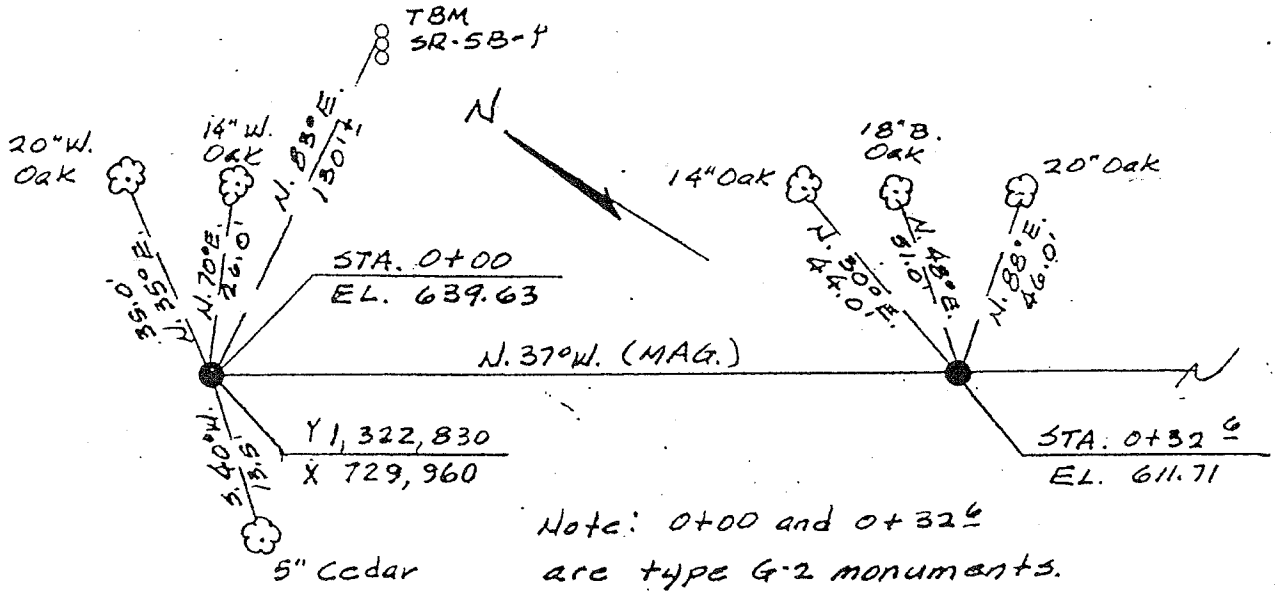


ACCESS SAME AS FROM WEST END OF RANGE

RANGES.

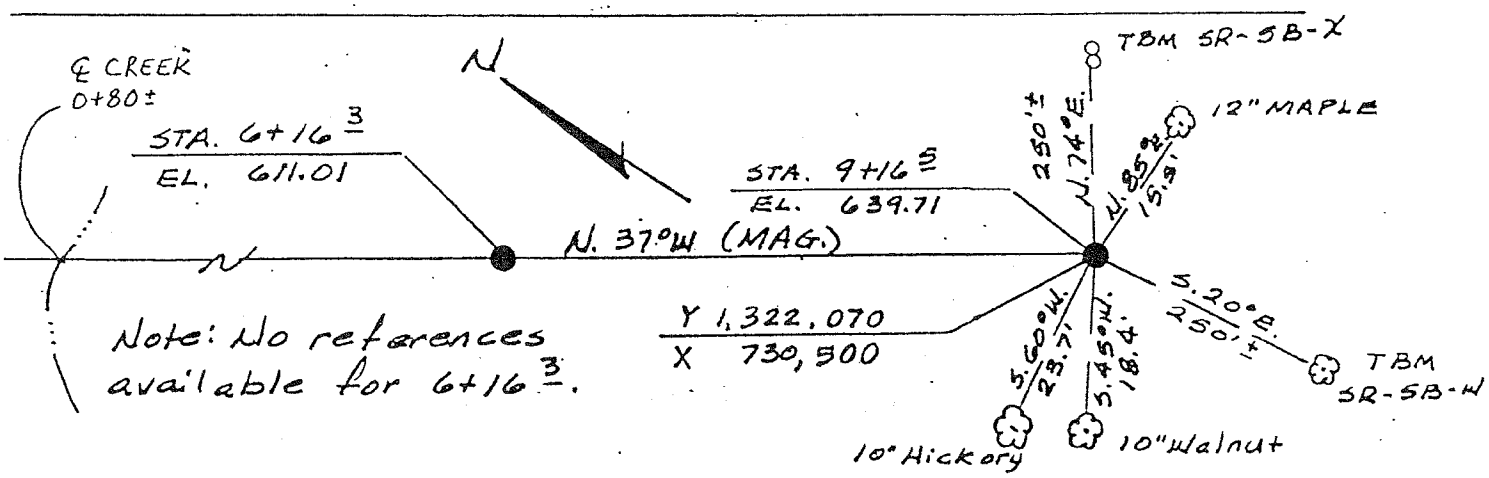
RANGE NO. SR-5B BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 11
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



Note: 0+00 and 0+32 G are type G-2 monuments.

From South end of guard rail of Hwy "J" bridge over Lick Creek, pack West 300'± along tree line to Range.



Note: No references available for 6+16 3.

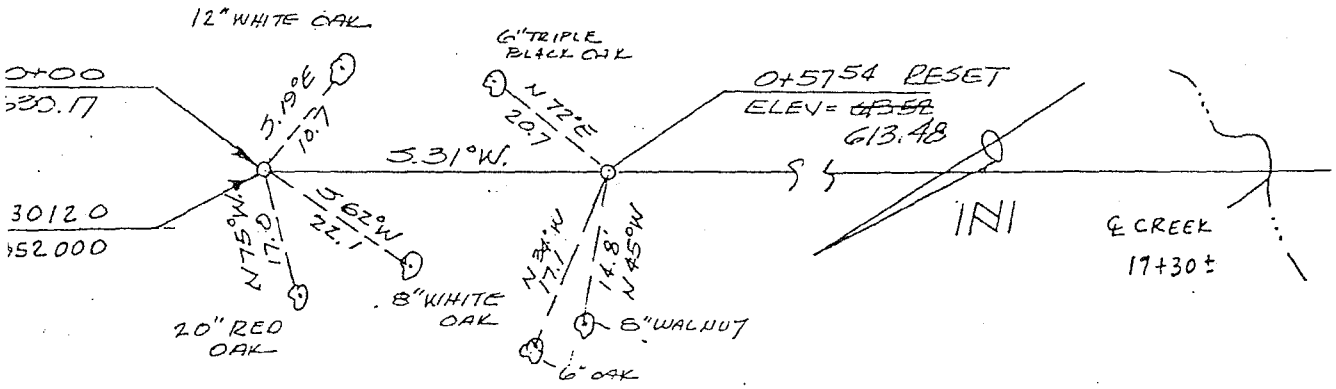
From North end of guard rail of Hwy "J" bridge over Lick Creek, pack West 300'± along top of bluff to Range 100'± West of power lines.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

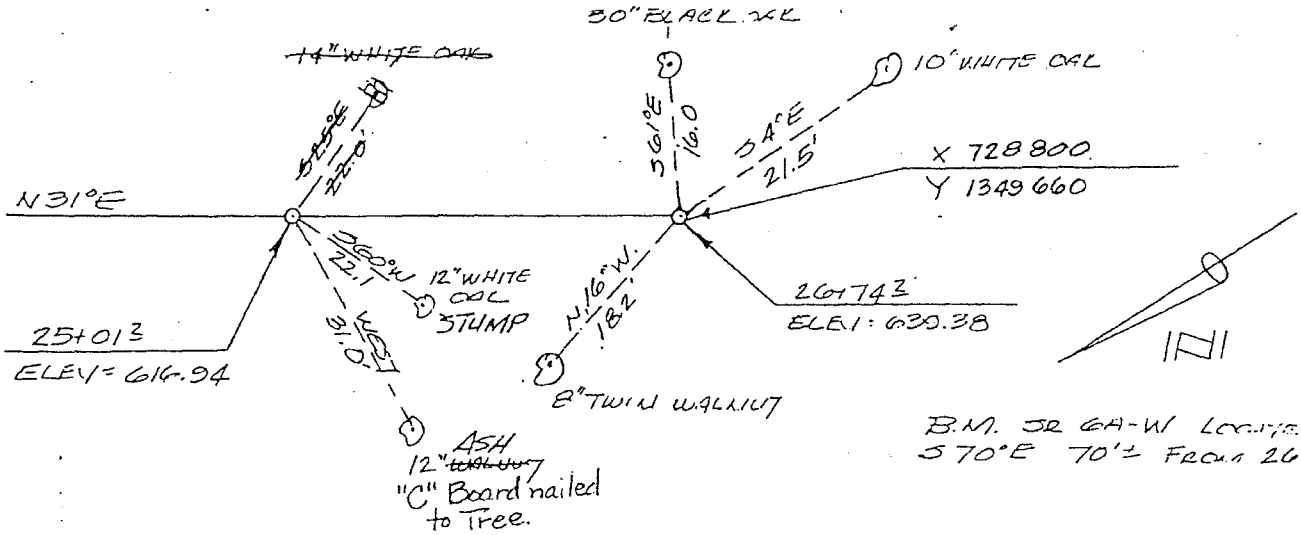
RANGE NO. SR 6A BY: G. BUDDE DATE: 6/21/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 9
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



B.M SR 6AY LOCATED
N 83°W 500'± FROM 0+00

FROM OLD HWY "J" BRIDGE GO 1.0 MILE
N.E. ON DIRT ROAD THEN WALK 1100'± S.W
THROUGH FIELD TO 0+00



B.M. SR 6A-W LOCATED
S 70°E 70'± FROM 26+74.3

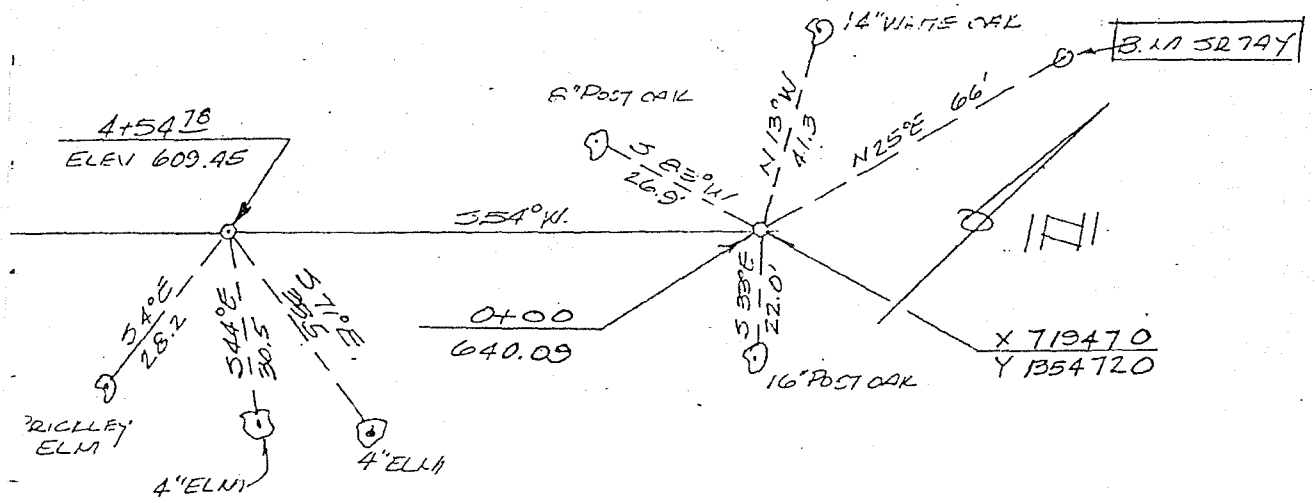
ACCESS WALK FROM NORTH END OF RANGE

DACW43-82-D-0011

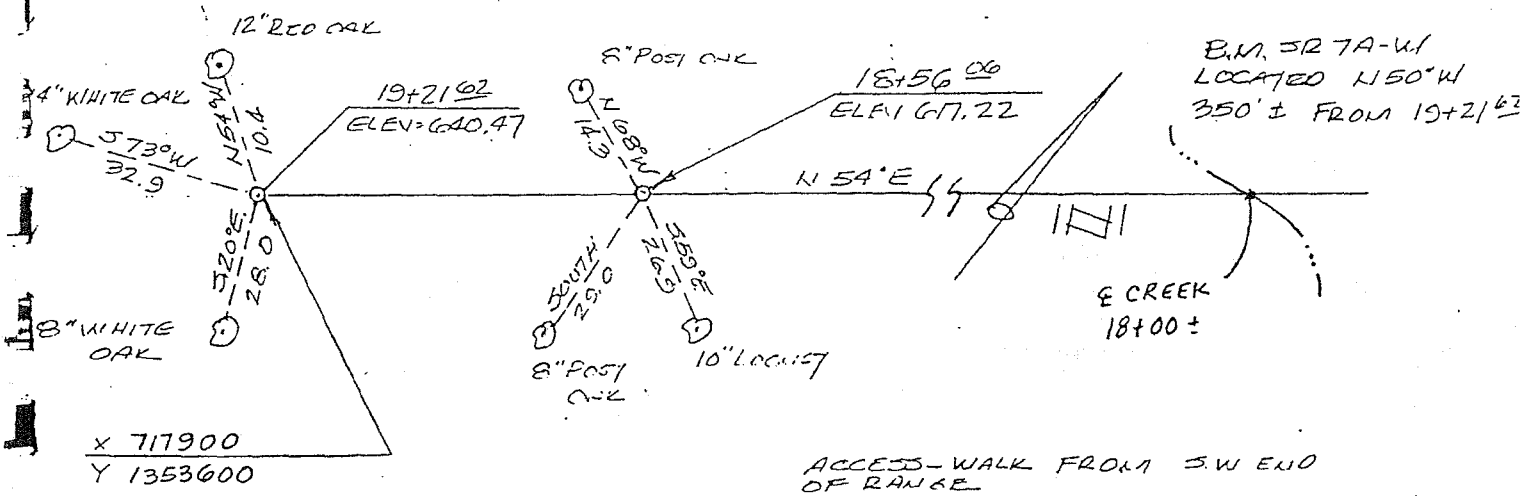
[illegible] IMPLEMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR 74 BY: G. BUDDE DATE: 6/21/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 16
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



0.5 MILE WEST OF N.E COR SEC 18 T 55 N R 7E
ON HWY "N" WALK SOUTH ON CENTER SECTION LINE
0.5 MILE TO RANGE



ACCESS-WALK FROM S.W END OF RANGE

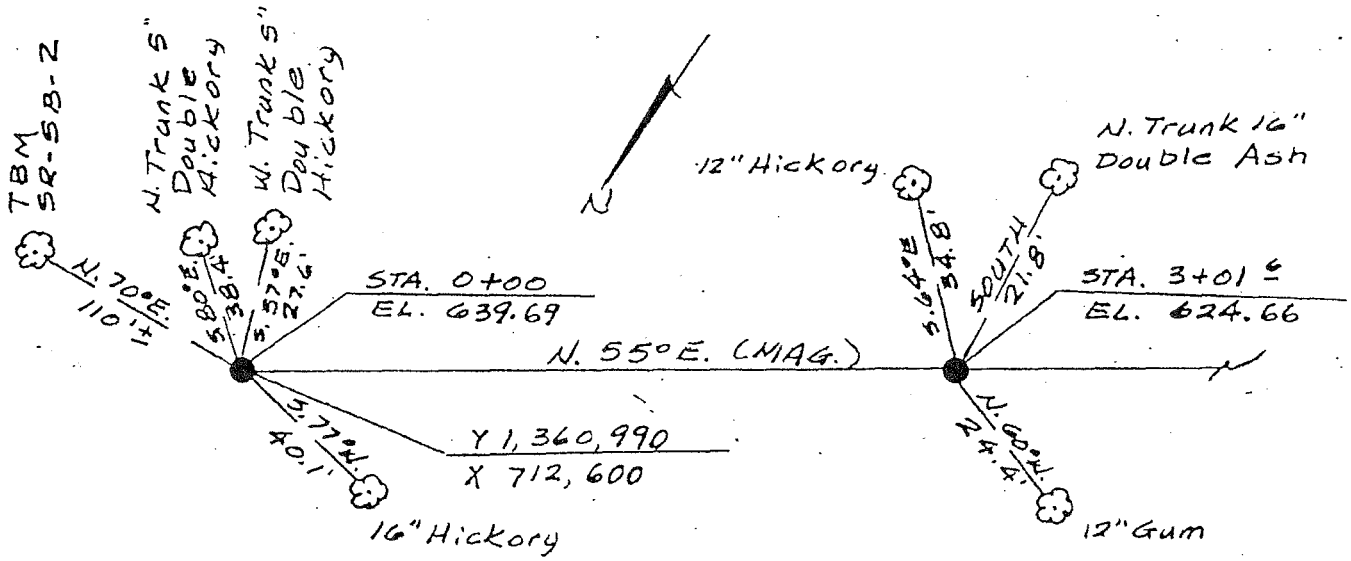
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SECTION LINE RANGES.

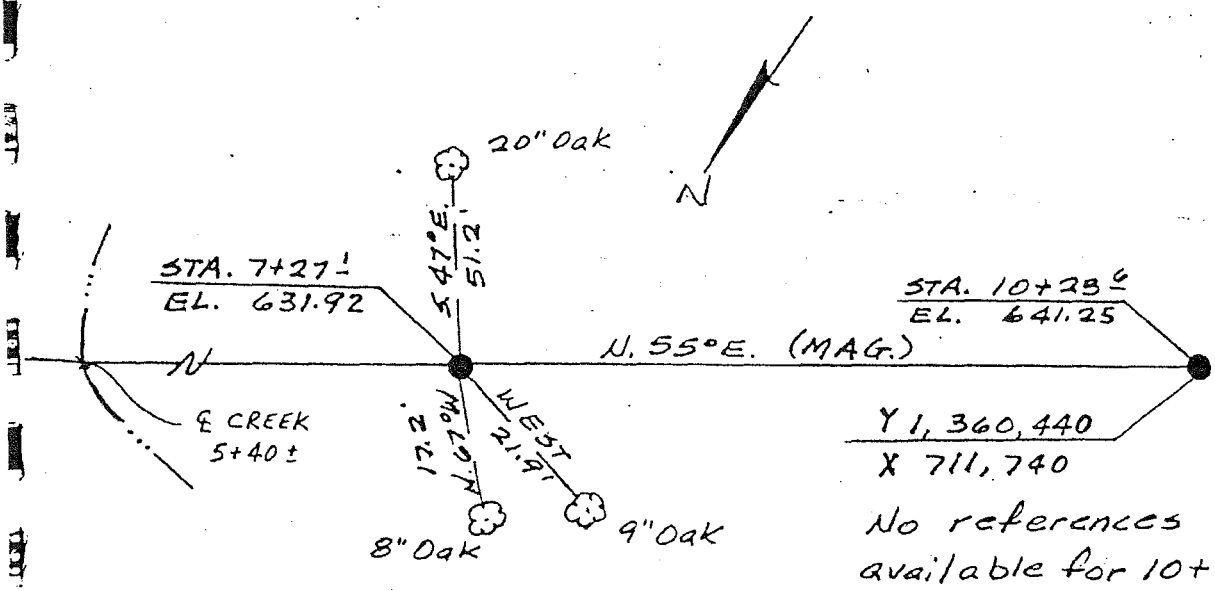
RANGE NO. SR-8B BY: Owen Zurowieste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TOPO 15, 20



From intersection of Hwy 24 and Hwy "HH", travel South on Hwy "HH" 1.75 mi ± to intersection of County Road. Then turn left on paved road and travel 1.25 mi ± passed 2nd curve to right. Then pack N-E .25 mi. ± to Range.



No references available for 10+23 ±.

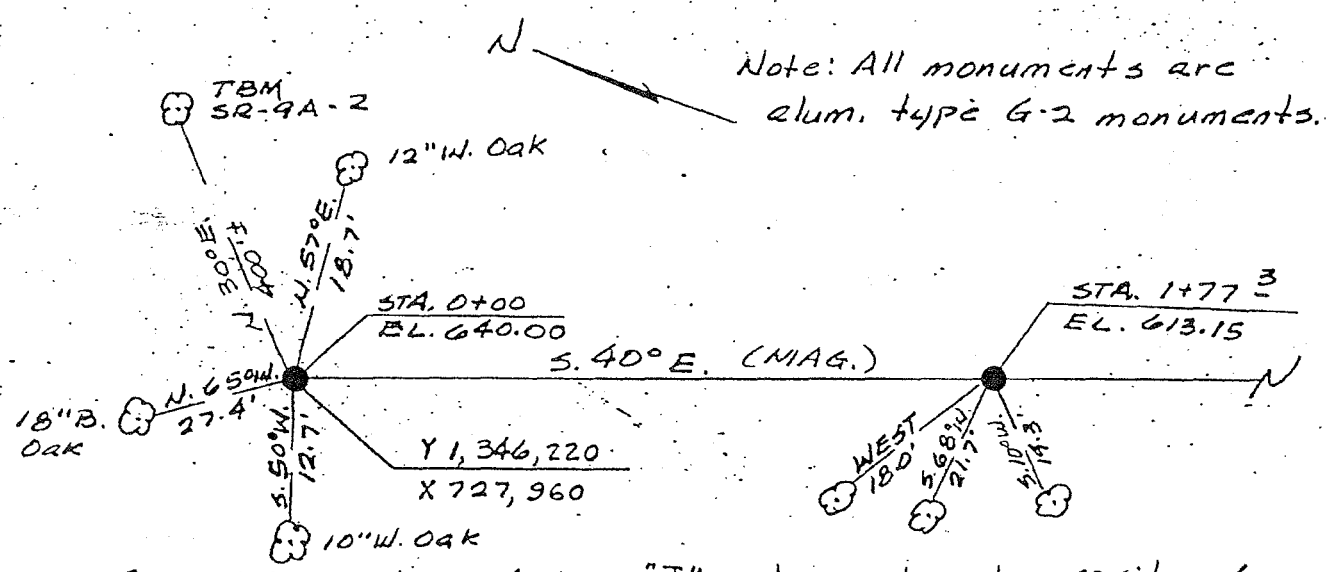
All monuments are alum. type G-2.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

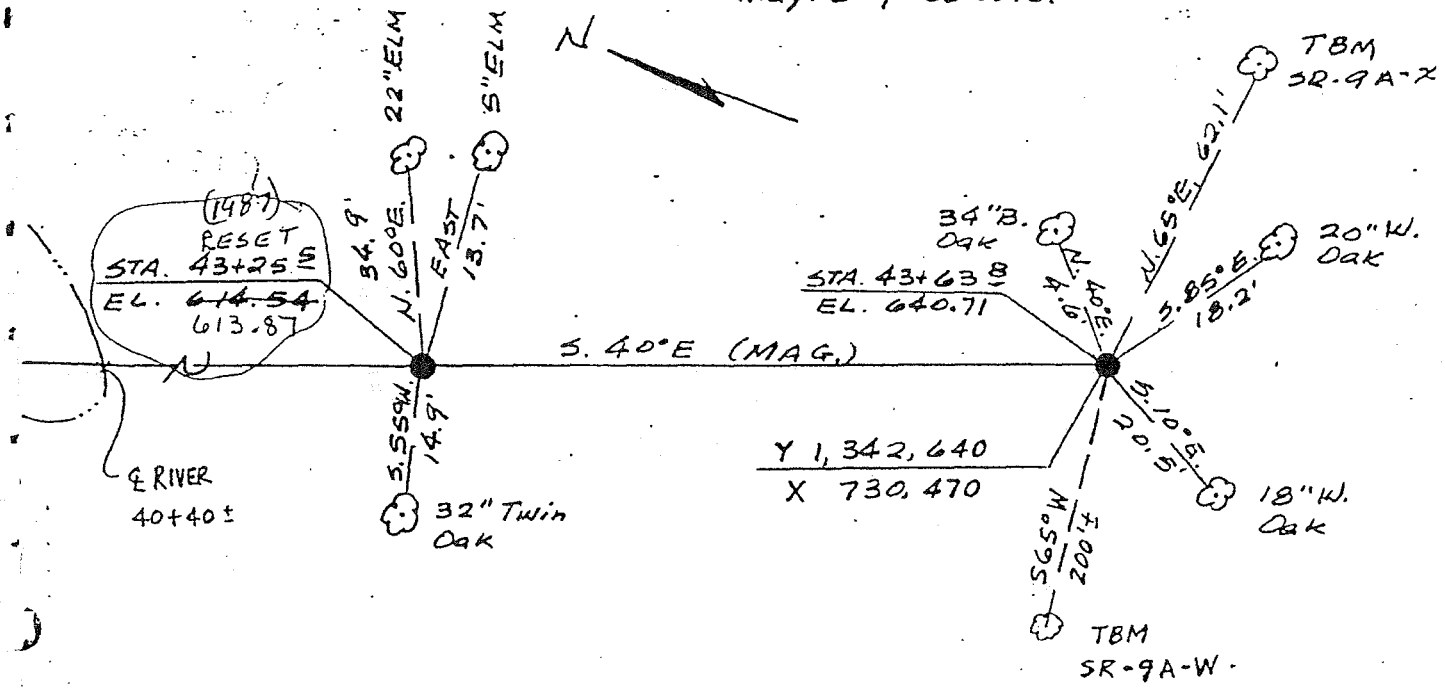
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-9A BY: Owen Zurowesta DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 9
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



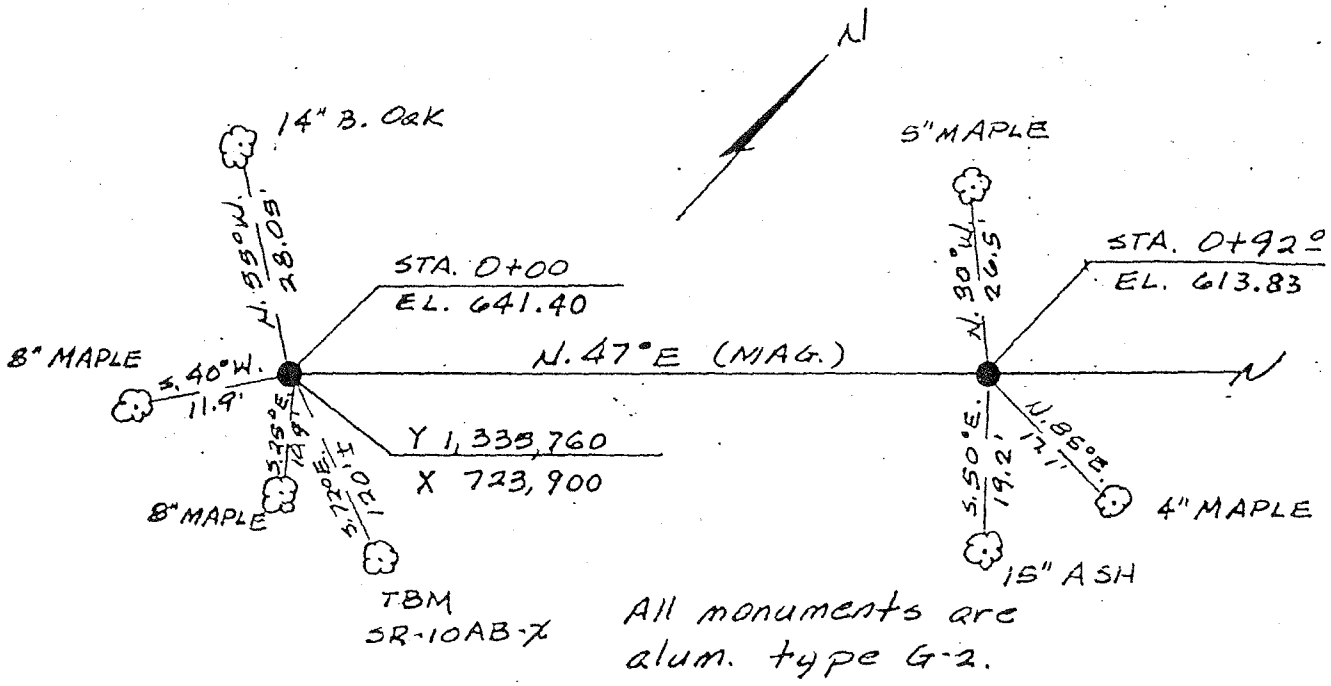
From intersection of Hwy. "J" and gravel road opposite of Mt. Hope Church, travel West on gravel road 500'± then travel North across private property with permission of land Owner .25 mi.±. Then pack North 200'± to 43+63 8. Crossed river in boat and packed North 4000'± to 0+00. Other access maybe possable.

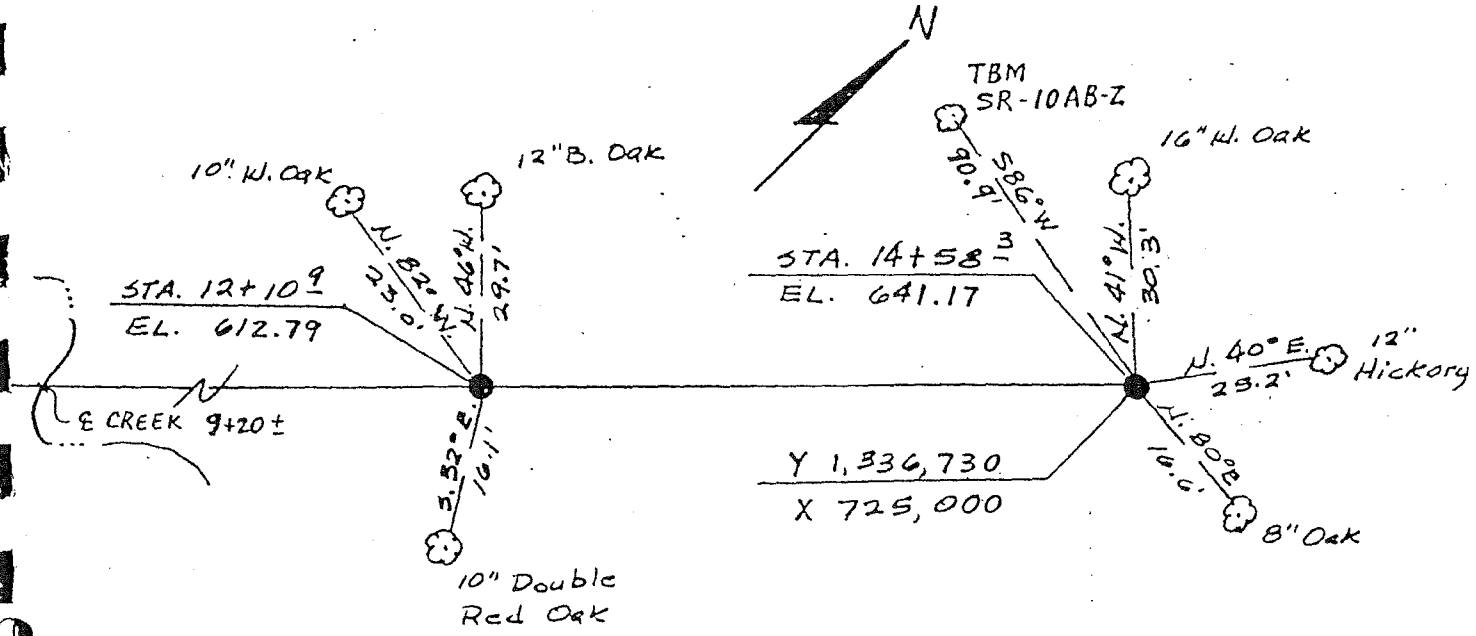


KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

RANGE NO. SR-10AB BY: Owen Zurowieste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 18
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-10AB BY: Owen Zurowieste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Hwy "J" and Hwy "BB", travel West on Hwy "BB" 1.25 ± mi. Then pack North 0.75 ± mi. to range.

Station 14+58 ±:
Same as above.

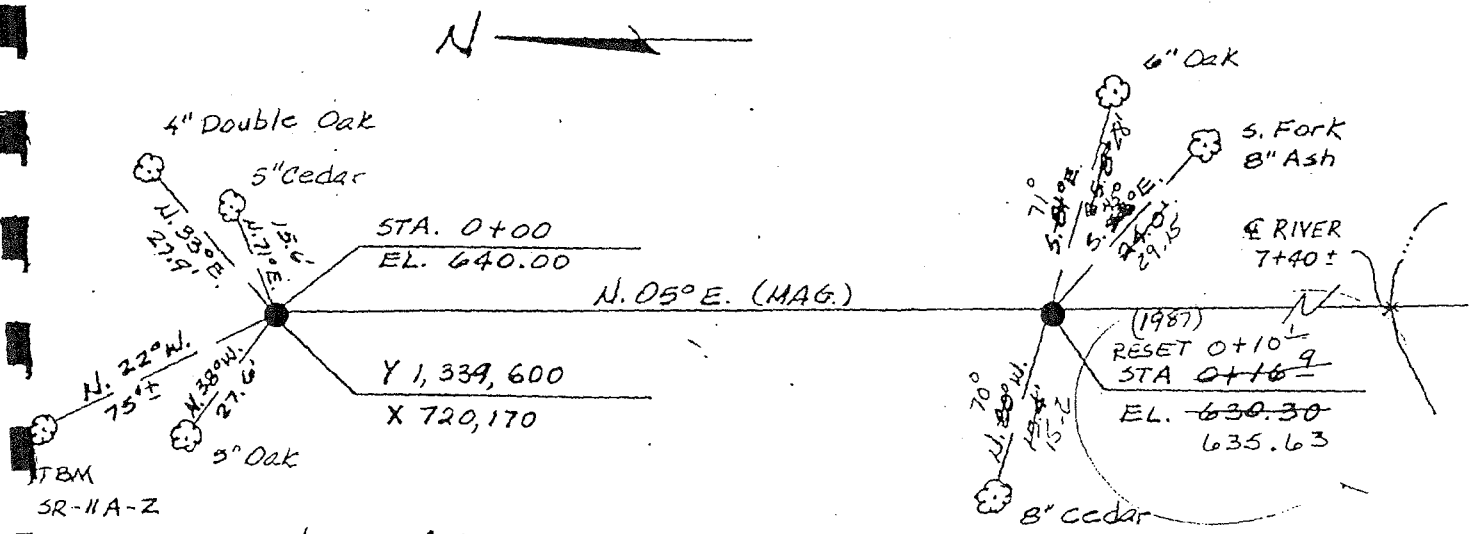
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

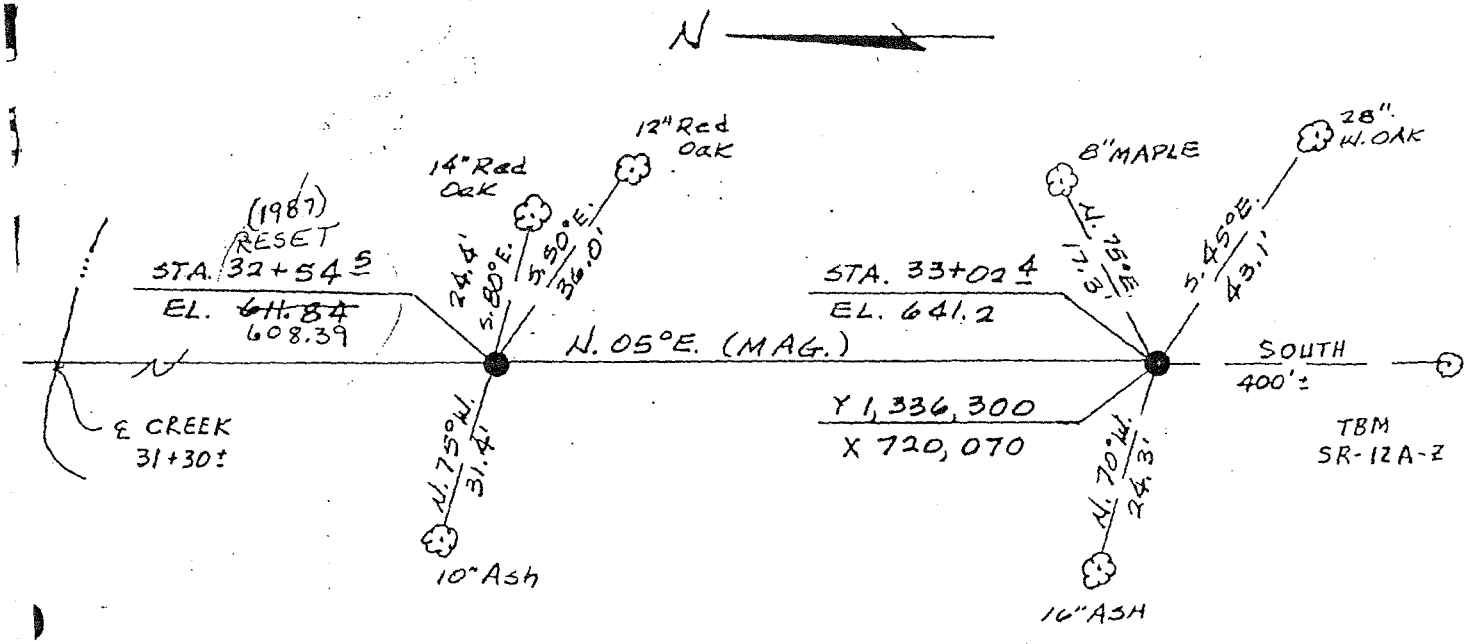
RANGE NO. SR-11A BY: Owen Zurowleste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TOPO 17, 18



Note: All monuments are type G-2.



KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.____

ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-11A BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Hwy "I" and Hwy "BB", travel West on Hwy "BB" 2.75± mi. to gravel road on right at end of pavement. Then travel North on gravel road 1.8± mi. Then turn East for 300'± to middle of range. Then pack North 1900'± across river.
4WD and boat need.
Possable access thru Indian Creek Access Area.

Station 33+02±:
Same access as for 0+00 except pack South 1500'±.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

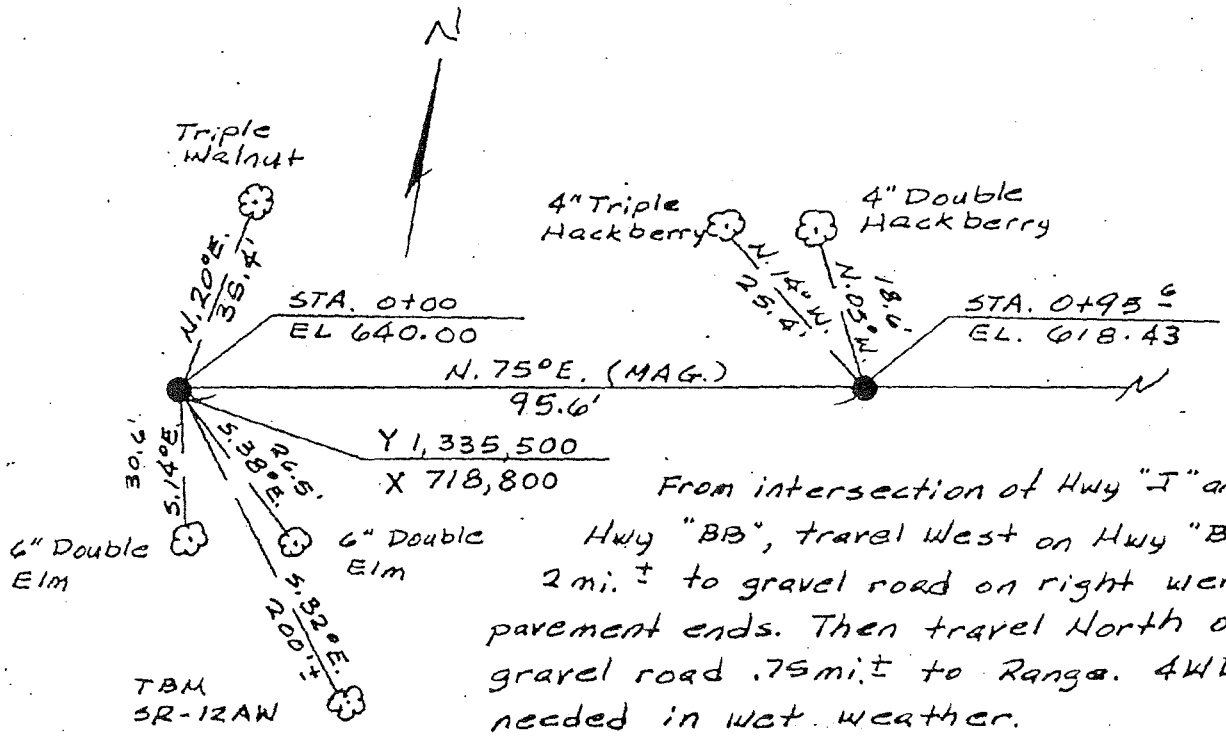
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

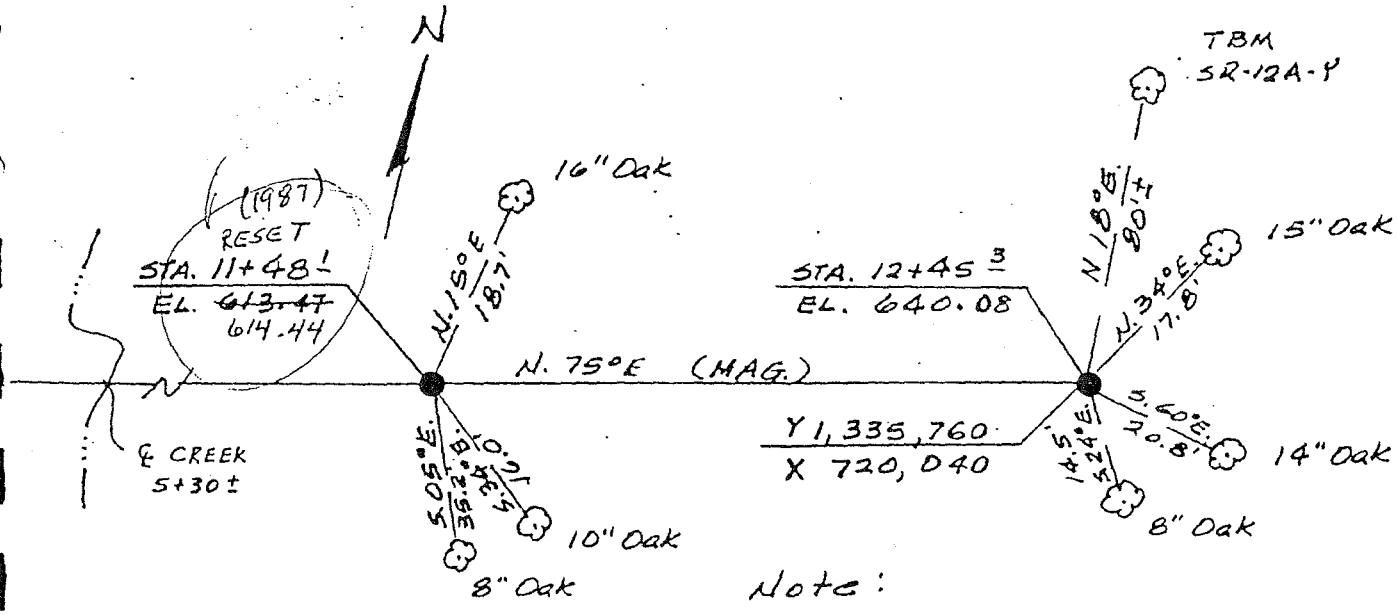
RANGE NO. SR-12A BY: Owen Zurowaste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TOPO 18



From intersection of Hwy "I" and Hwy "BB", travel West on Hwy "BB" 2 mi.± to gravel road on right were pavement ends. Then travel North on gravel road .75 mi.± to Range. 4WD needed in wet weather.



Note:
All monuments are alum. type G-2.

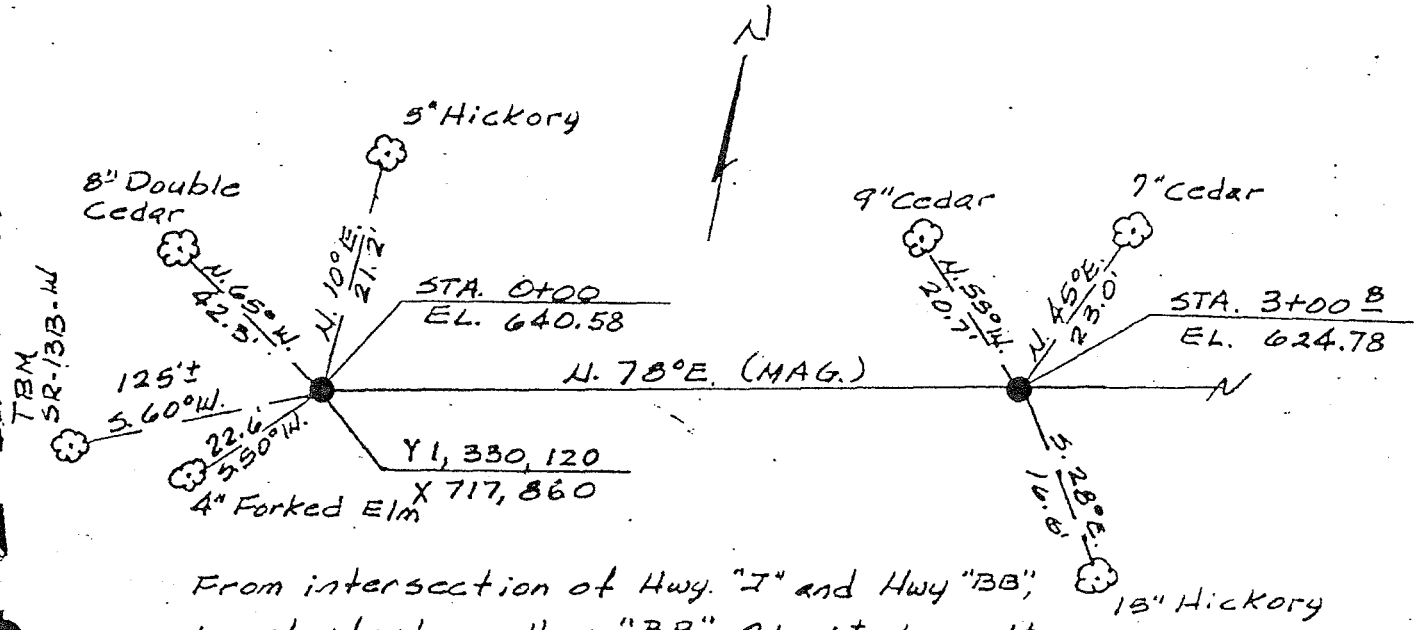
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

ORIGINAL

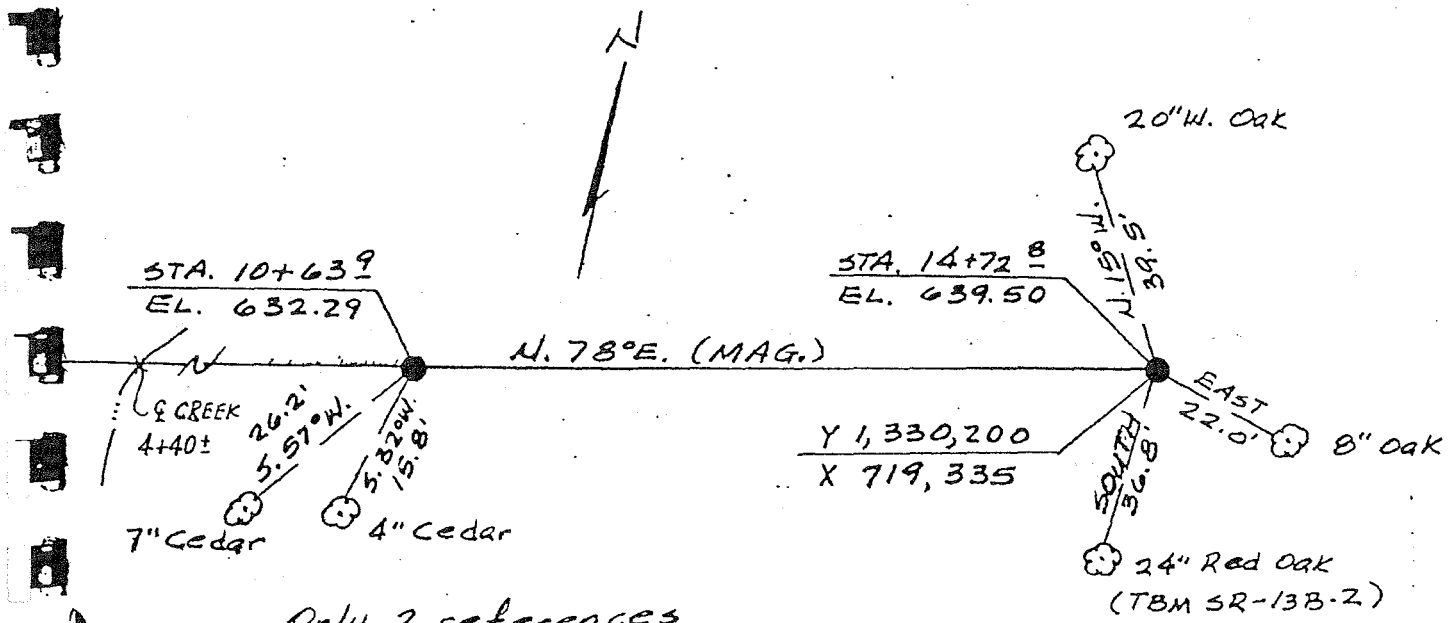
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-13B BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 18
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



From intersection of Hwy. "J" and Hwy "BB", travel west on Hwy. "BB" 2.1 mi.± to 100'± East of Pigeon Roost Creek. Then turn South on old road (4WD only) and travel South 400'± to range.

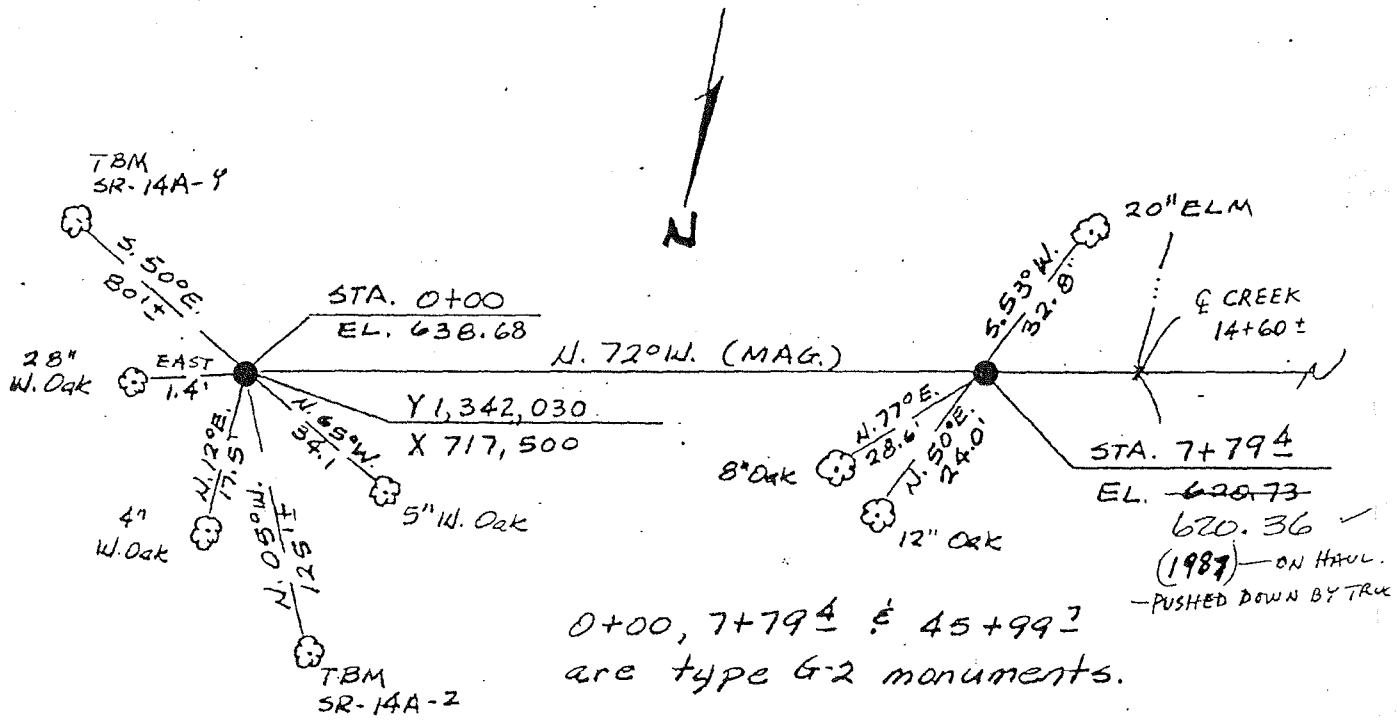


Only 2 references available for 10+63 9

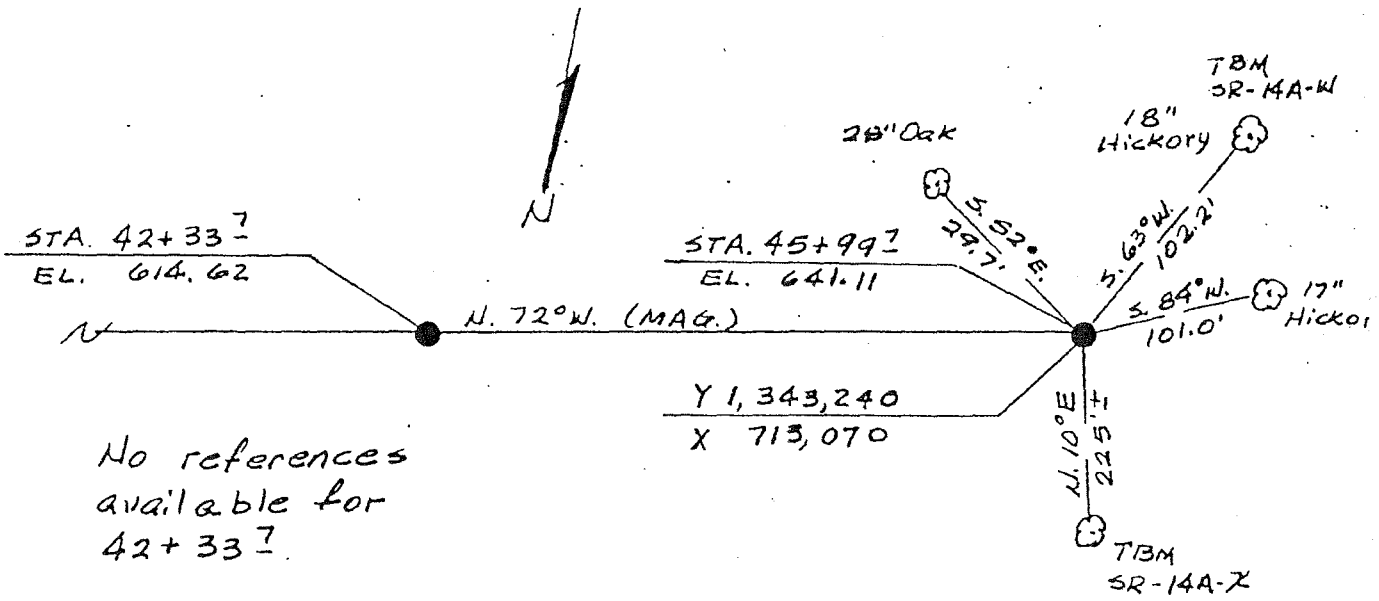
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

RANGE NO. SR-14A BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 17
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



0+00, 7+79± & 45+99? are type G-2 monuments.



No references available for 42+33?

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____

ORIGINA

CHANGES CANNOT BE MADE AND THE SMALL ALTERNATE NUMERATION OF THE DESIGNATION RANGES.

RANGE NO. SR-14A BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From Main Road of India Creek Access Area, turn West on Concessionaire Rd and travel West to West parking Area. Then pack South 50' ± to range.

Station 45+99 ?:
From intersection of Hwy 24 and Hwy "HH", travel South on "HH" 1.75 mi. ± to intersection of County Road. Then turn left on paved road and travel 3 mi ± to gravel road on right 300' ± North of "Indian Creek Access Area" sign. Take gravel road South-West 2.5 mi. ± to "T" intersection of gravel roads. Take gravel road to South-West 2 mi. ±. Then pack East 1/4 mi ± to Range, 500' ± North of Bannister-Mecker Cem.

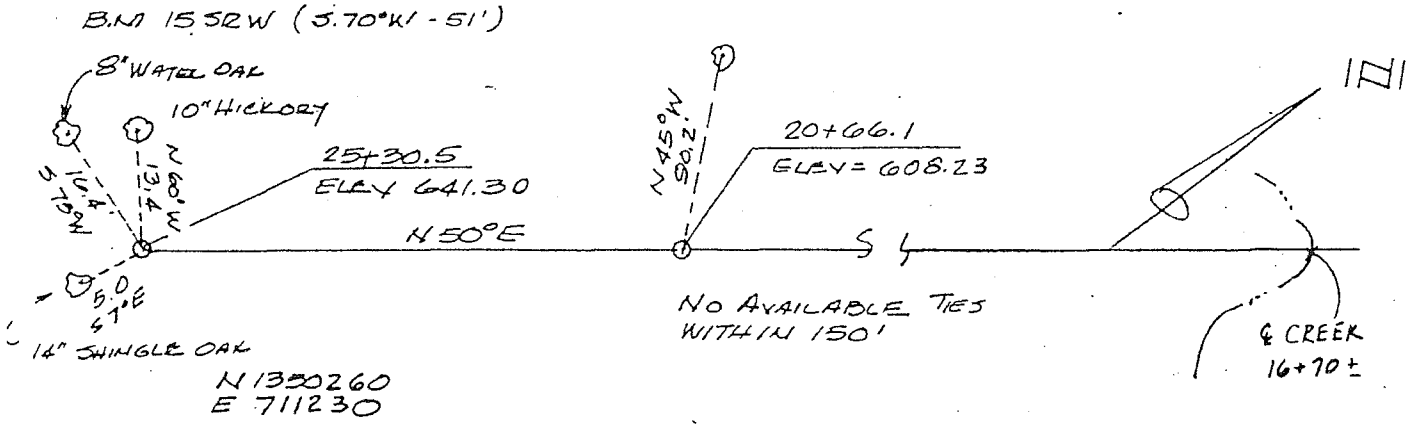
ORIGINAL

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

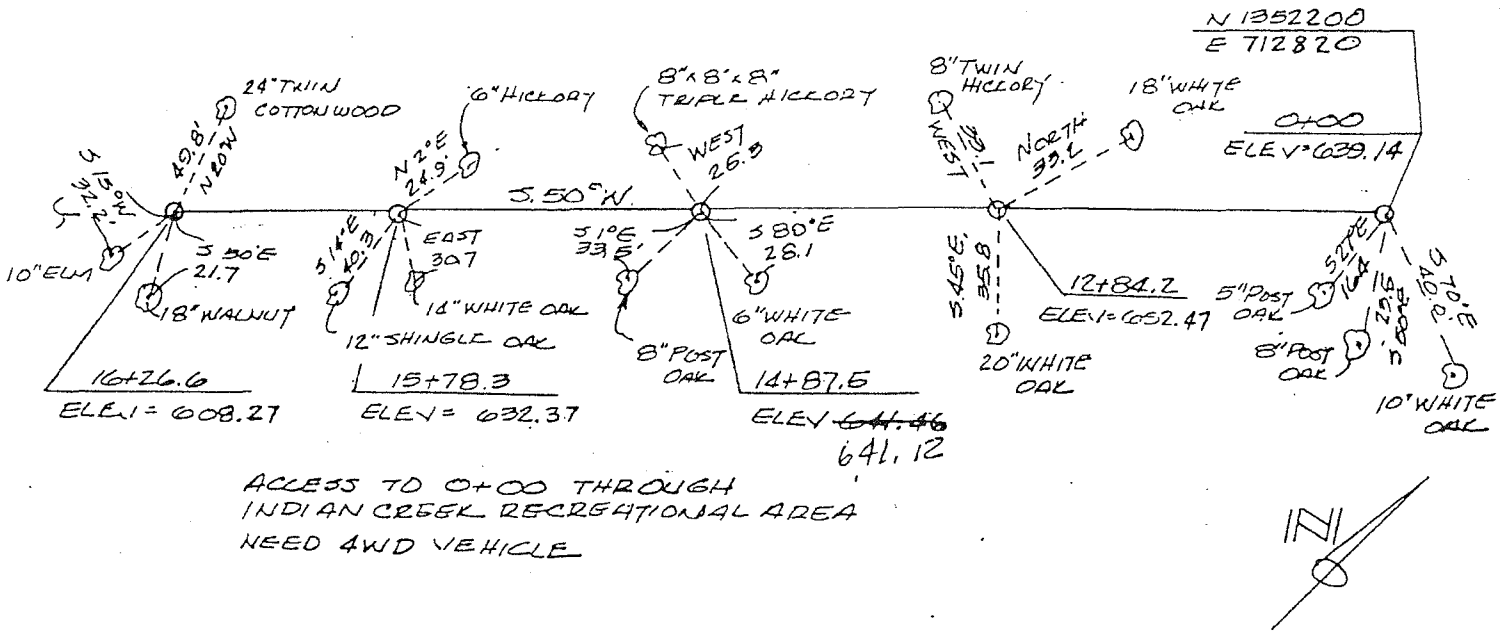
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 15-B BY: Gene Budde DATE: 10/5/82

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2 TOPO 16, 21
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM CORNER OF SECTIONS 14-13-23-24 T.55N., R8W DRIVE SOUTH ON COUNTY ROAD 800'±, THEN EAST ON FIELD ROAD ALONG TREE LINE 300'± TO RANGE AT STA 23+0±



ACCESS TO 0+00 THROUGH INDIAN CREEK RECREATIONAL AREA NEED 4WD VEHICLE

TBM SR-15B-Z (N 74°E, 230'± OF 0+00)

ORIGINAL

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

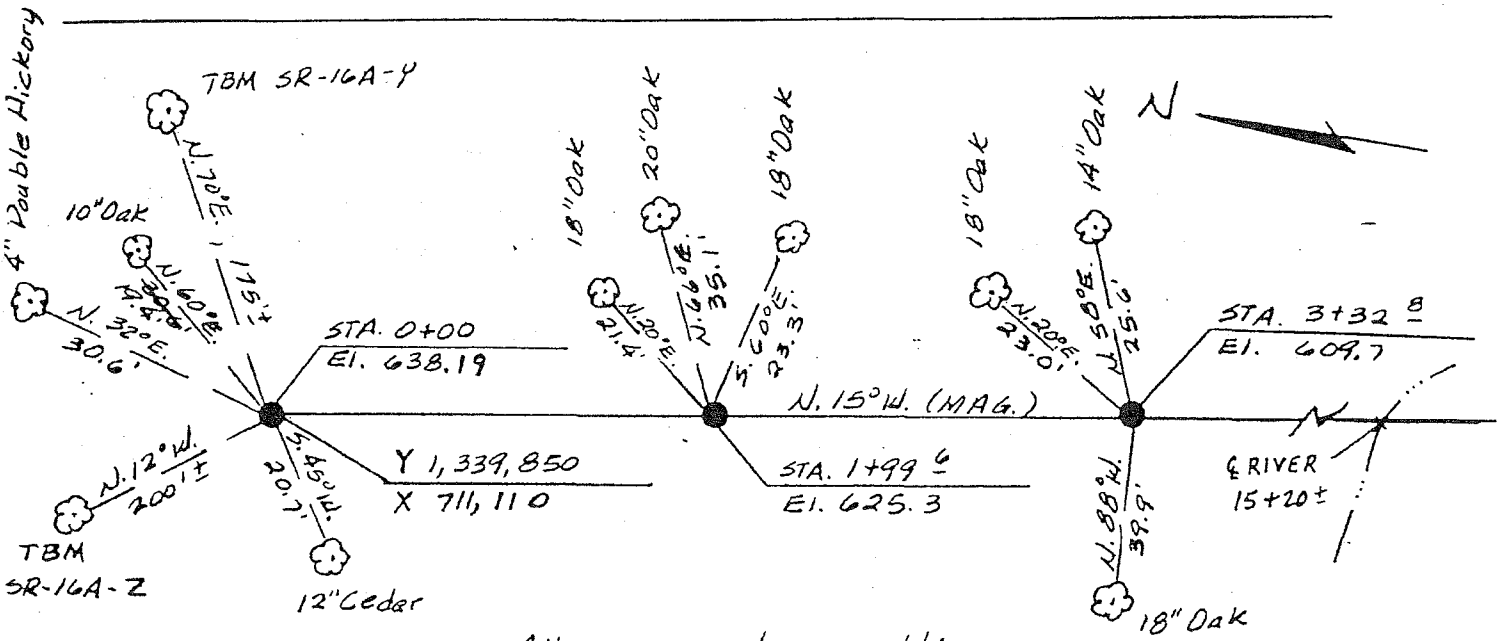
DACW43-82-D-0011

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

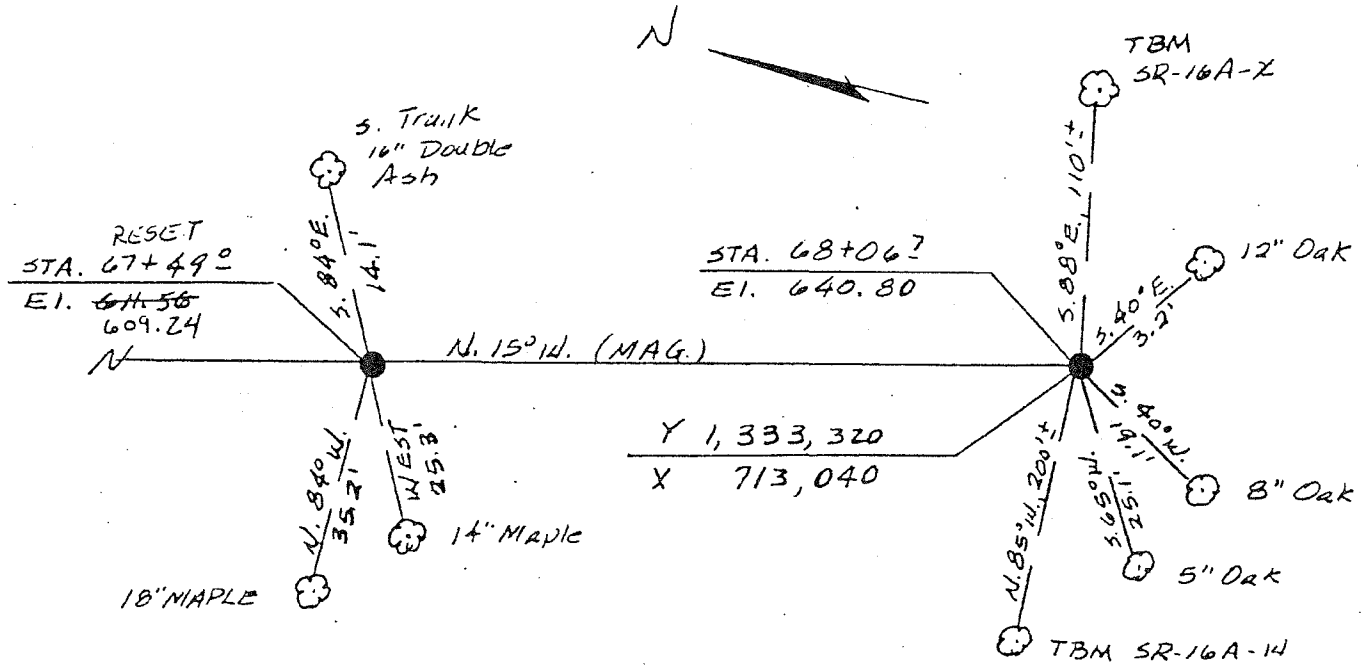
RANGE NO. SR-16A BY: Owen Zuroweste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TOPO 18, 23



All monuments on this Range are Alum. type G-2



KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____

ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-16A BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Hwy 24 and Hwy HH, travel South on HH 1 3/4 mi ± to intersection of County Road. Then turn left on paved road and travel 3 mi ± to gravel road on right 300' ± North of "Indian Creek Access Area" sign. Take gravel road South-West 2.5 mi ± to "T" intersection of gravel roads. Take gravel road to South-West 2 3/4 mi ± to old Indian Burial Grounds known as Crigler Mounds. Then pack South 400' ± to Range.

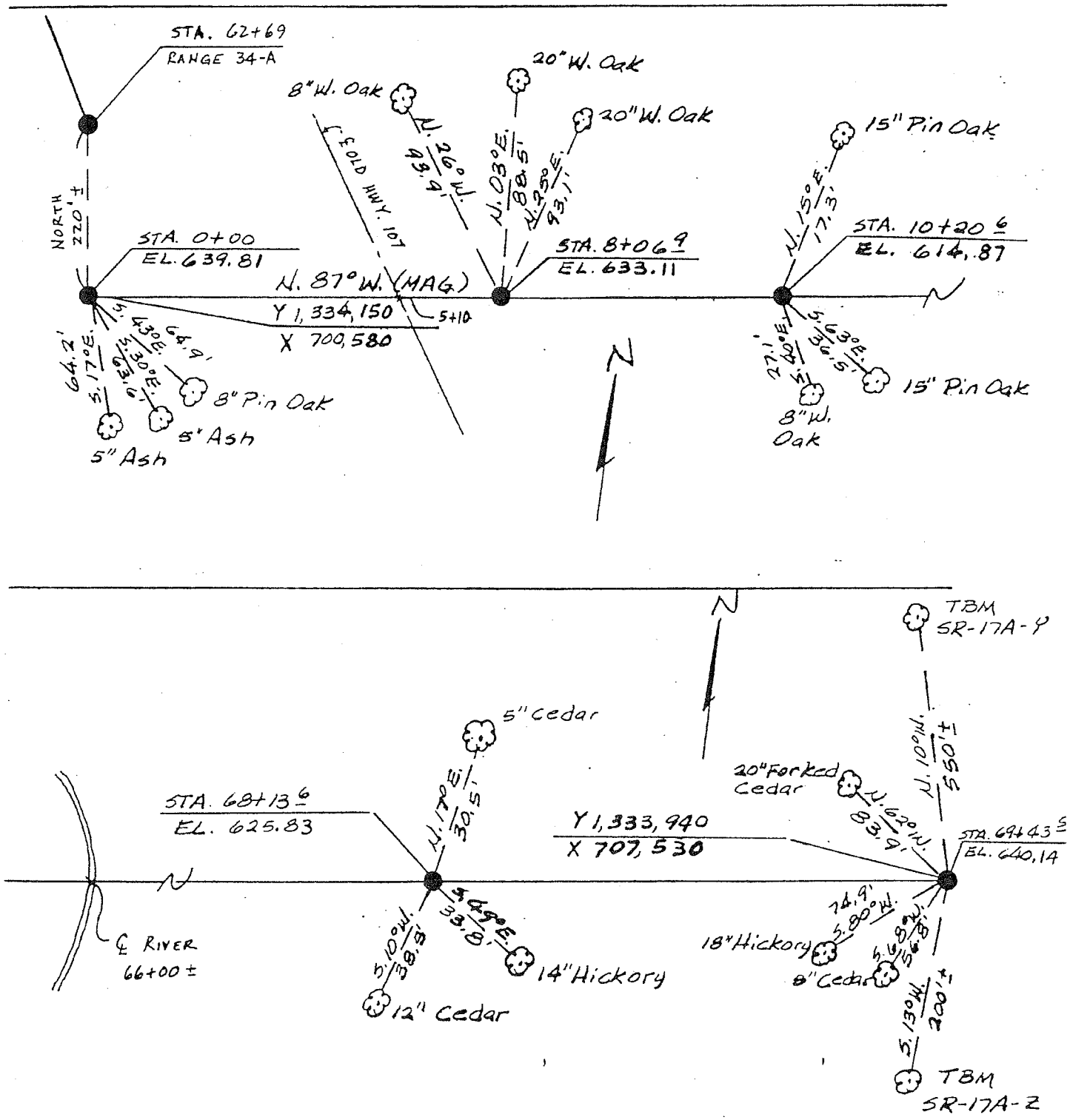
Station 68+06 ?:
From intersection of Hwy 107 and Hwy 154, travel East on Hwy 154 to intersection of gravel road (County Road C-29). Then North on gravel road 3 mi ± to intersection of East-West gravel road. Then West on gravel road 200' ± to old field road on right. Then North on old field 1/2 mi ± to North-West corner of field. Then pack North 150' ± to range.
4WD needed on field road.

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-17A BY: Owen Zurowieste DATE: 5/82

TOPO 23

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



ORIGINAL

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-17A BY: Owen Zurowaste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Old Hwy U & Old Hwy 107 in the town of Florida, travel North on Old Hwy 107 1/4 mi.± to where pavement of Old Hwy 107 ends. The pack West 500'± to station 0+00.

STATION 69+43±:
From "T" intection of gravel road and County Road 3-29 at S. 1/4 cor SEC. 1, T. 55N., R. 7W., travel West on gravel road 1 mi.± to old gravel road on right (500'± East of County Road C-29W.). Then North on old gravel road 3/4 mi± to Range.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

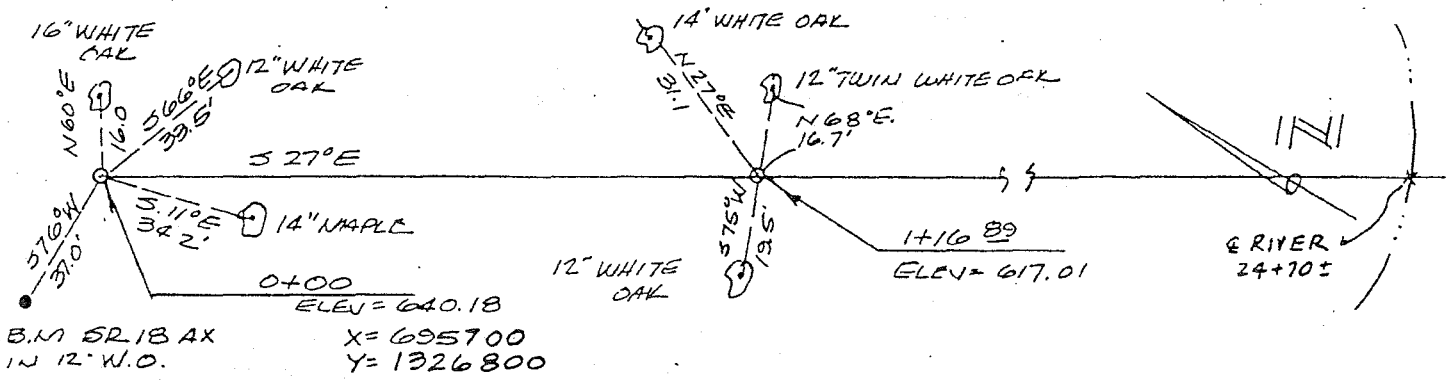
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

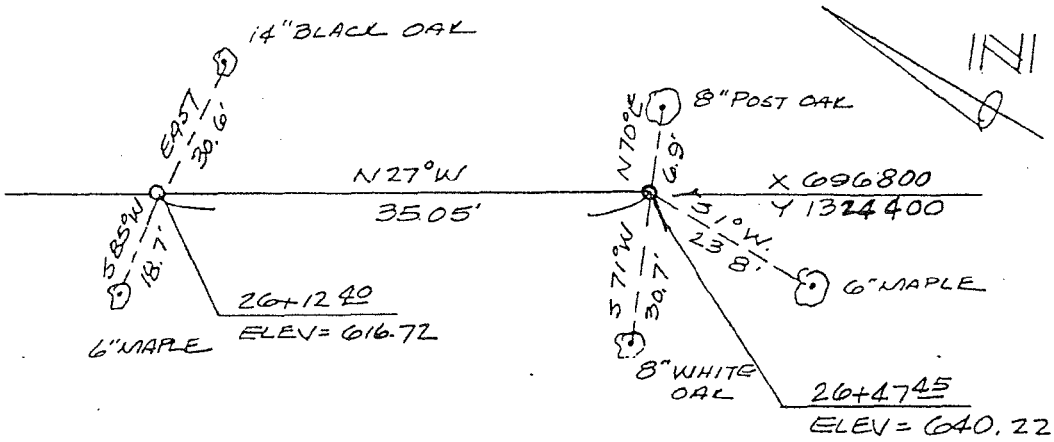
RANGE NO. SR 18-A BY: G. BUDDE DATE: 6/11/82

TOPO 30

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECTION OF CAMPGROUND ROAD SOUTH OF BUZZARD'S ROOST AND HWY #107 DRIVE WEST ON CAMPGROUND ROAD 0.5 MI. THEN WALK NORTH 1000'± TO 0+00



B.M SR 18 A Y
LOCATED S 62°E
110'± FROM 26+47

FROM INTERSECTION OF HWY #107 AND HWY "U" DRIVE 0.8 MIL EAST TO ASPHALT ROAD. THEN SOUTH TO GRAVEL ROAD, THEN SOUTH ON GRAVEL ROAD 0.3 MIL TO "T" INTERSECTION THEN WALK S.W ON DIRT ROAD 0.5 MIL THEN LEAVING ROAD WALK THRU WOODS IN S.W DIRECTION 800'± TO 26+47 45

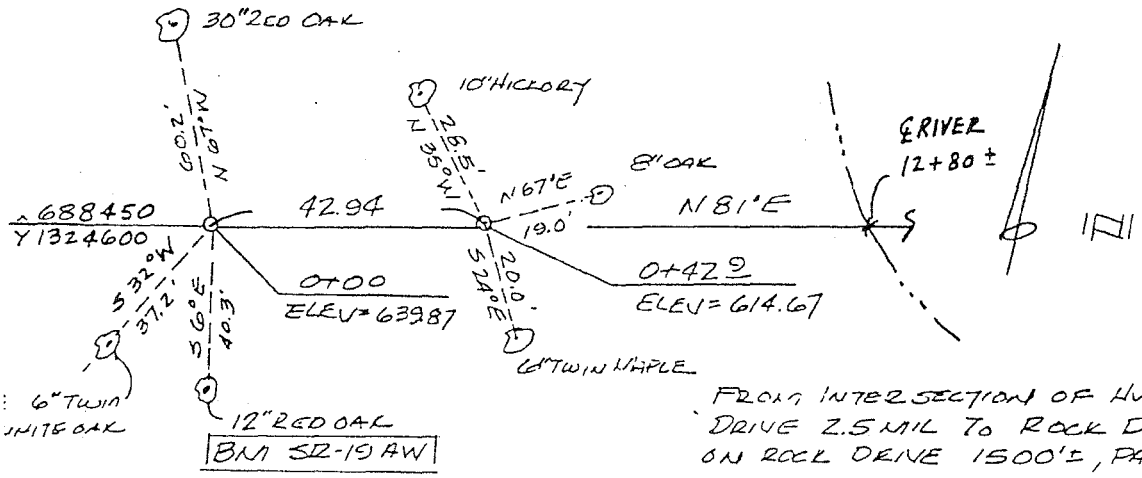
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

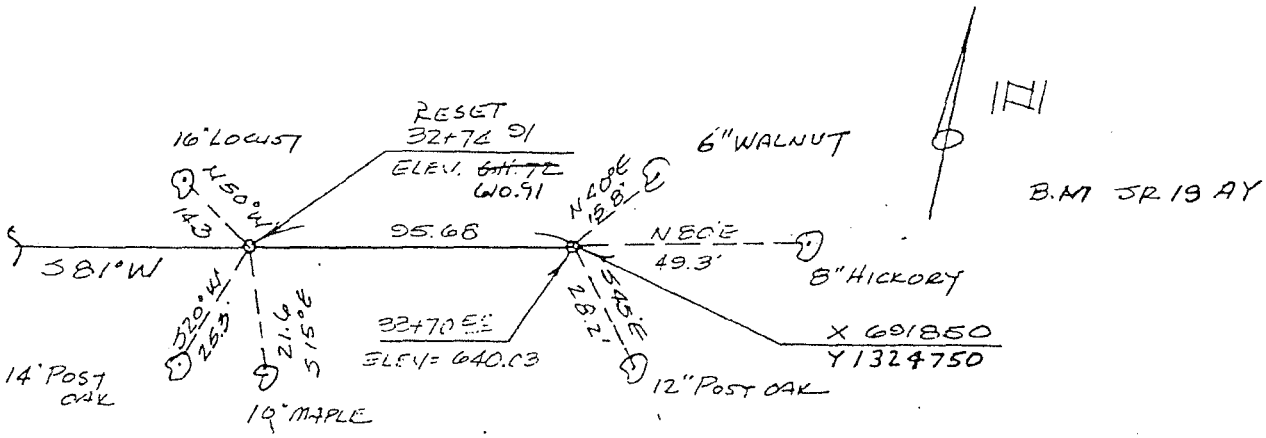
RANGE NO. SR-19 A BY: G. BUDDE DATE: 6/11/82

TOPO 30

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECTION OF HWY # 154 & HWY 107 DRIVE 2.5 MIL TO ROCK DRIVE THEN NORTH ON ROCK DRIVE 1500'±, PARK AT HOUSE THEN WALK N 12°E 2200' THEN EAST 900' TO 0+00



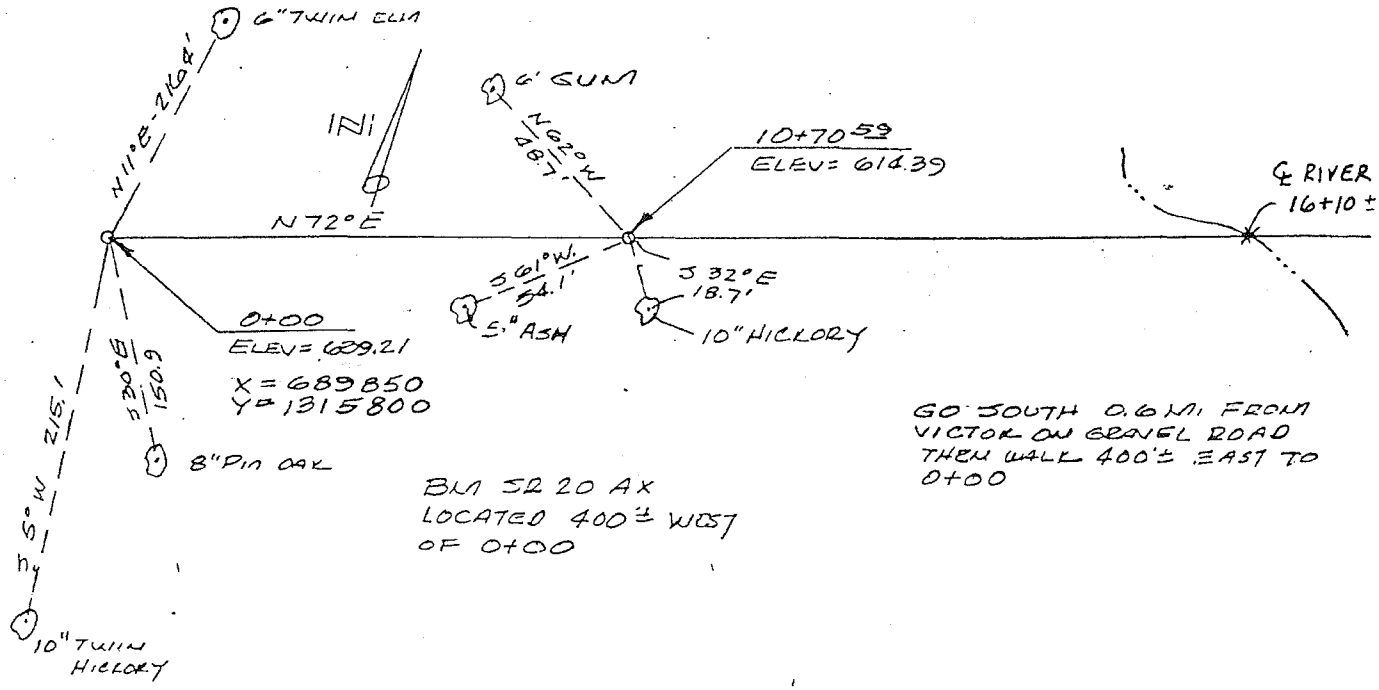
FROM BOAT RAMP ROAD IN MARK TWAIN STATE PARK WALK 1.0 MIL N.W ON DIRT TRAIL TO RANGE LINE

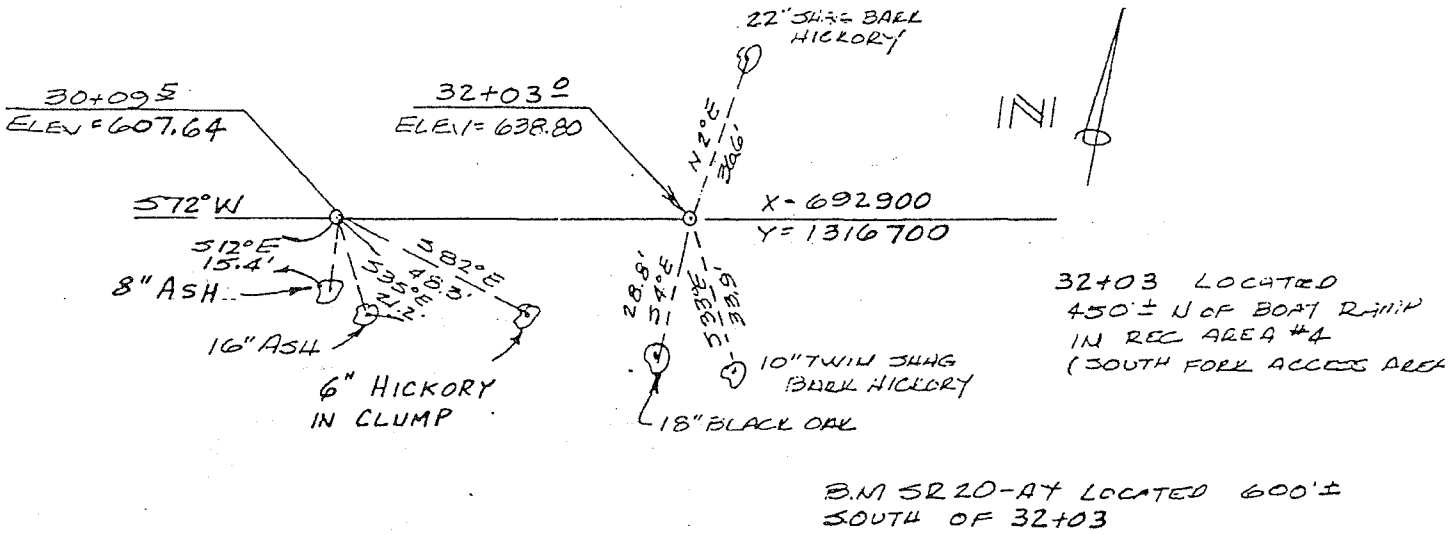
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR 20 A BY: G. Buood DATE: 6/11/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 31
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





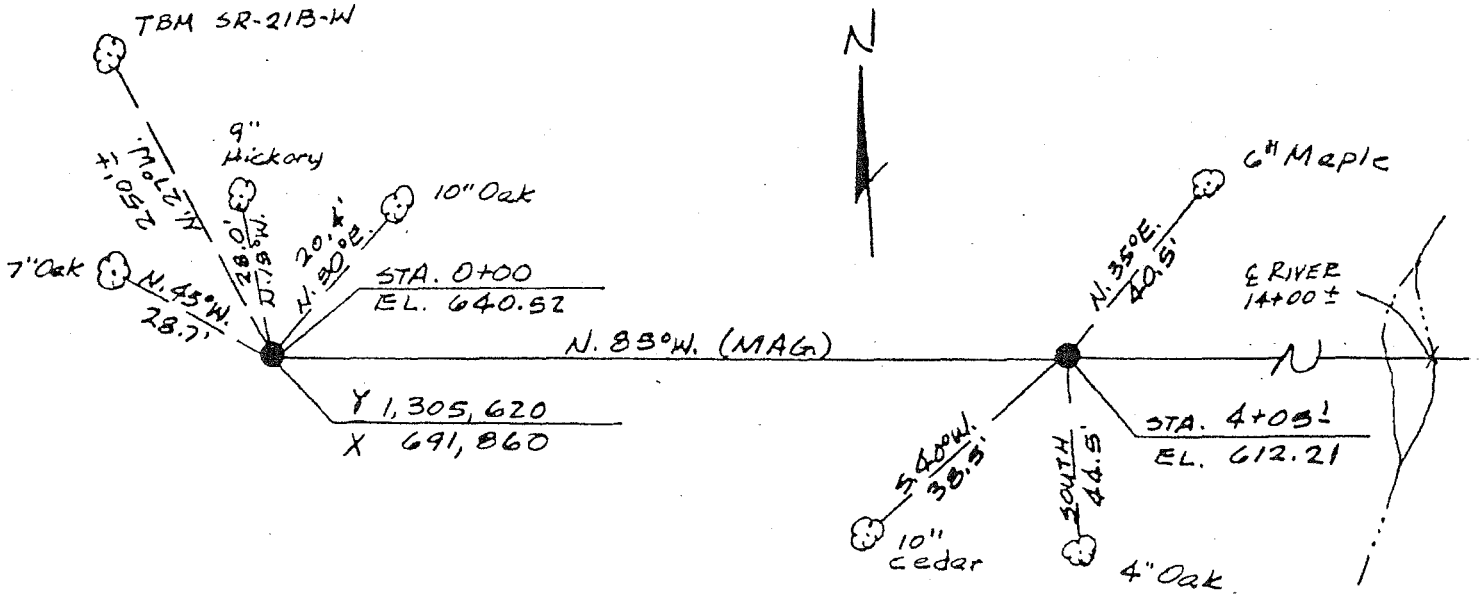
ORIGINAL

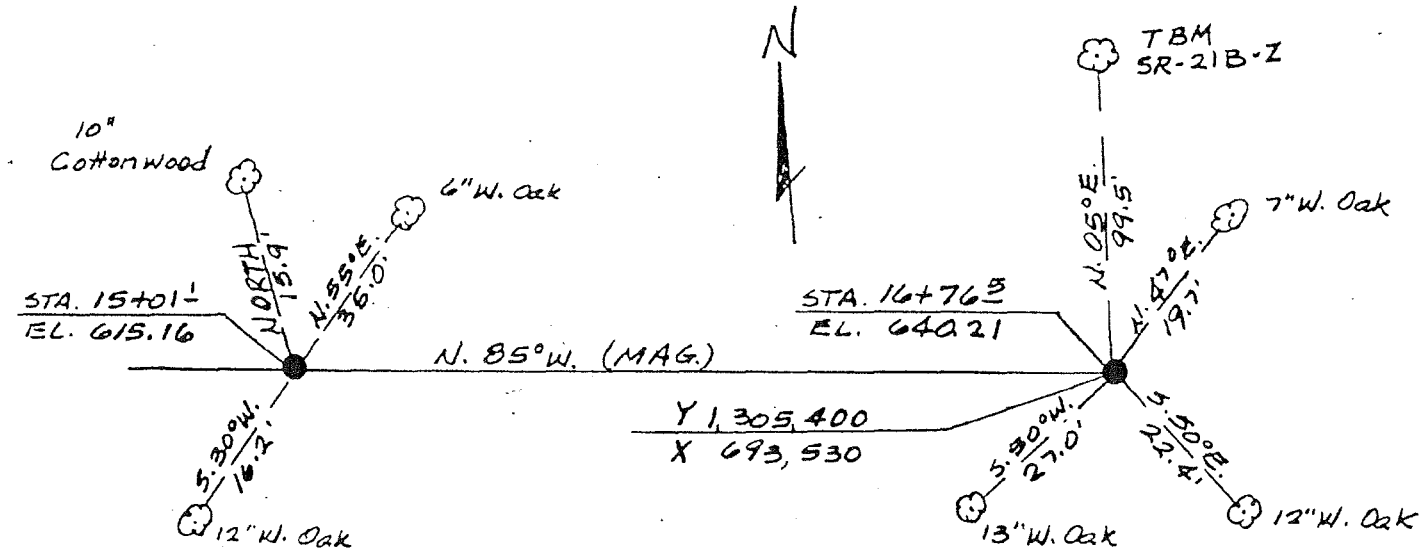
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-21B BY: Owen Zuroweste DATE: 7/82

TOPO 32

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-21B BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

STATION 0+00:
From intersection of Hwy 107 and Hwy 154, travel West on Hwy 154 3.25 mi.± to gravel road on left. Then travel South on gravel road 3.25 mi.± to gravel road on left. Then travel North-East on gravel road 2.1 mi.± to point were road turns due North. Then pack south 200'± to range.

Station 16+76 S:
From intersection of Hwy 154 and Hwy "E", travel South on Hwy "E" 2 mi.± to intersection of gravel road. Then travel West on gravel road 1 mi.± to "T" intersection of gravel roads. Then travel South on gravel road 0.5 mi.±. Then pack West 150'± to Range.

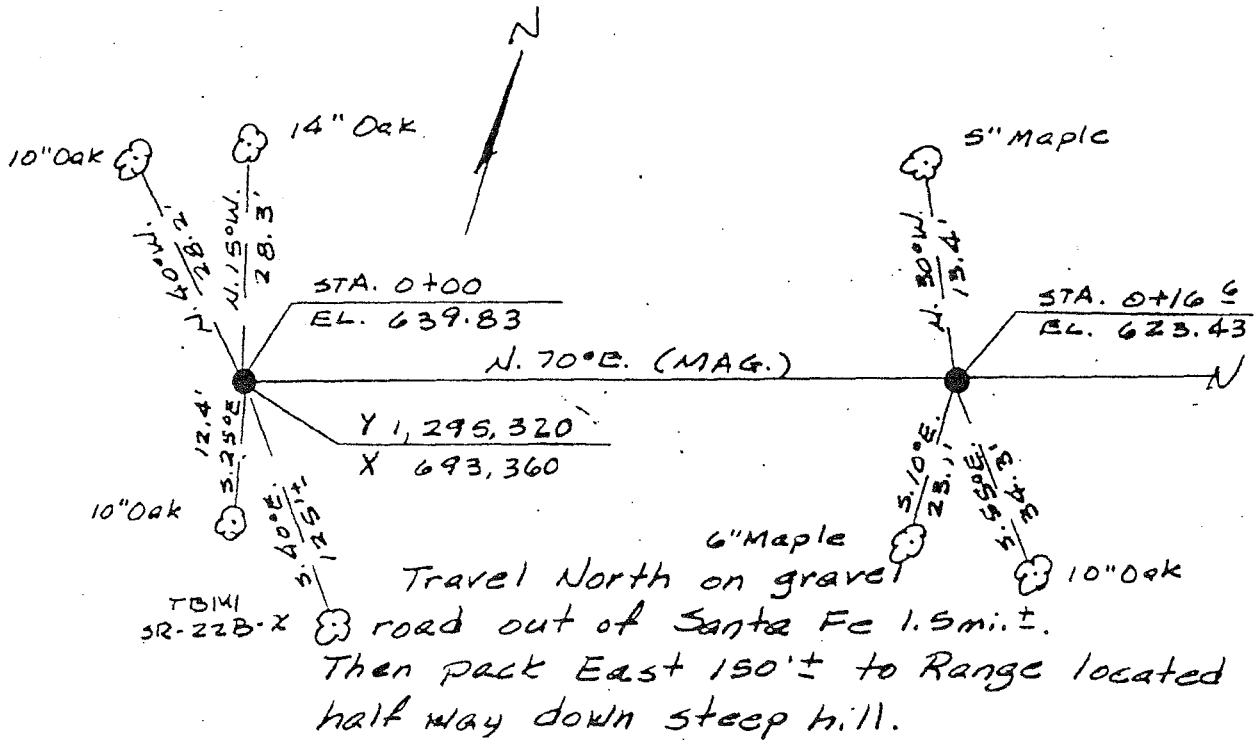
KENNETH BALK AND ASSOCIATES ST. LOUIS, MO. SHEET NO. ORIGINAL

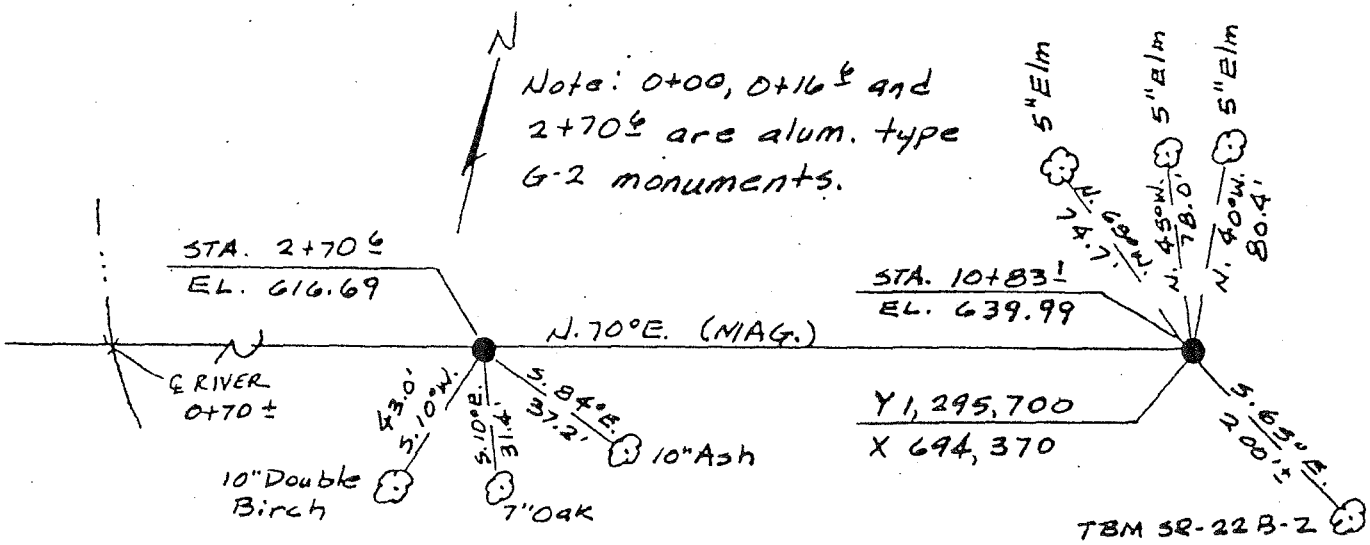
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-22B BY: Owen Zurowesta DATE: 7/82

TOPO 33

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





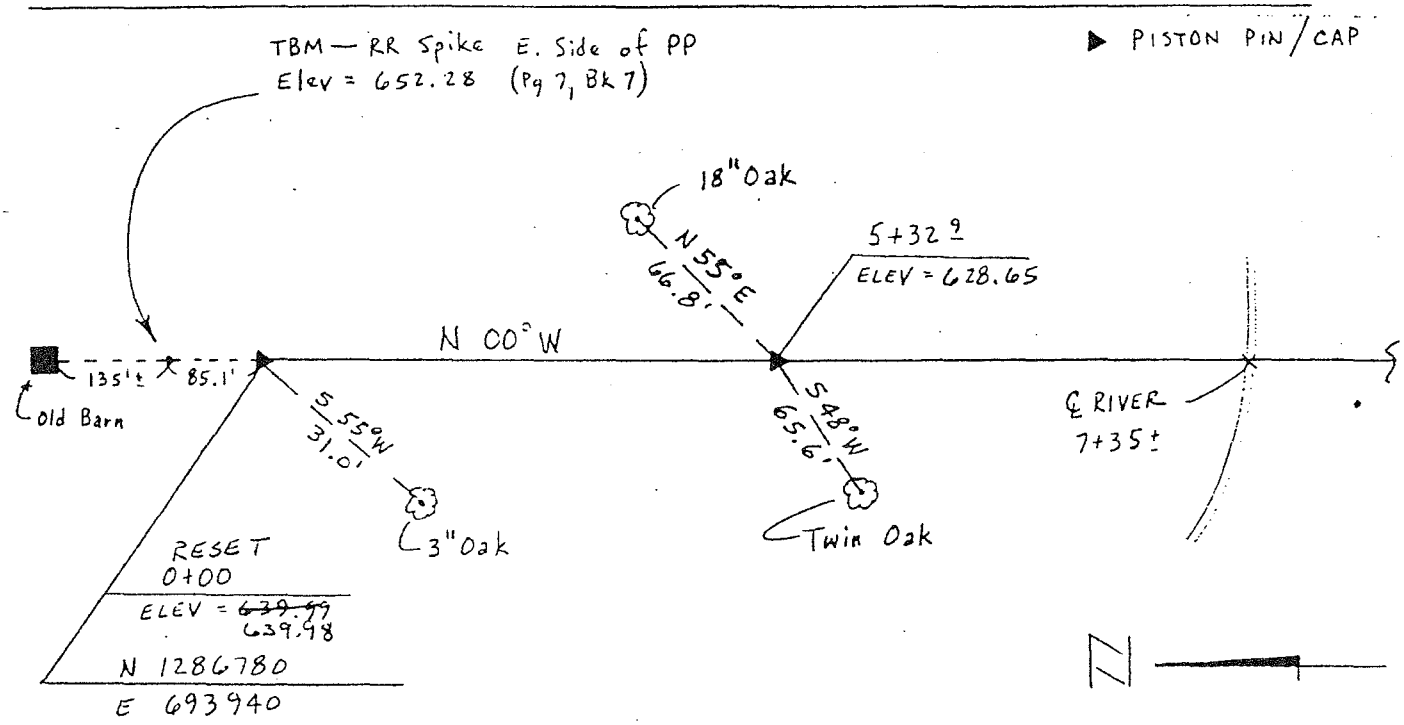
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

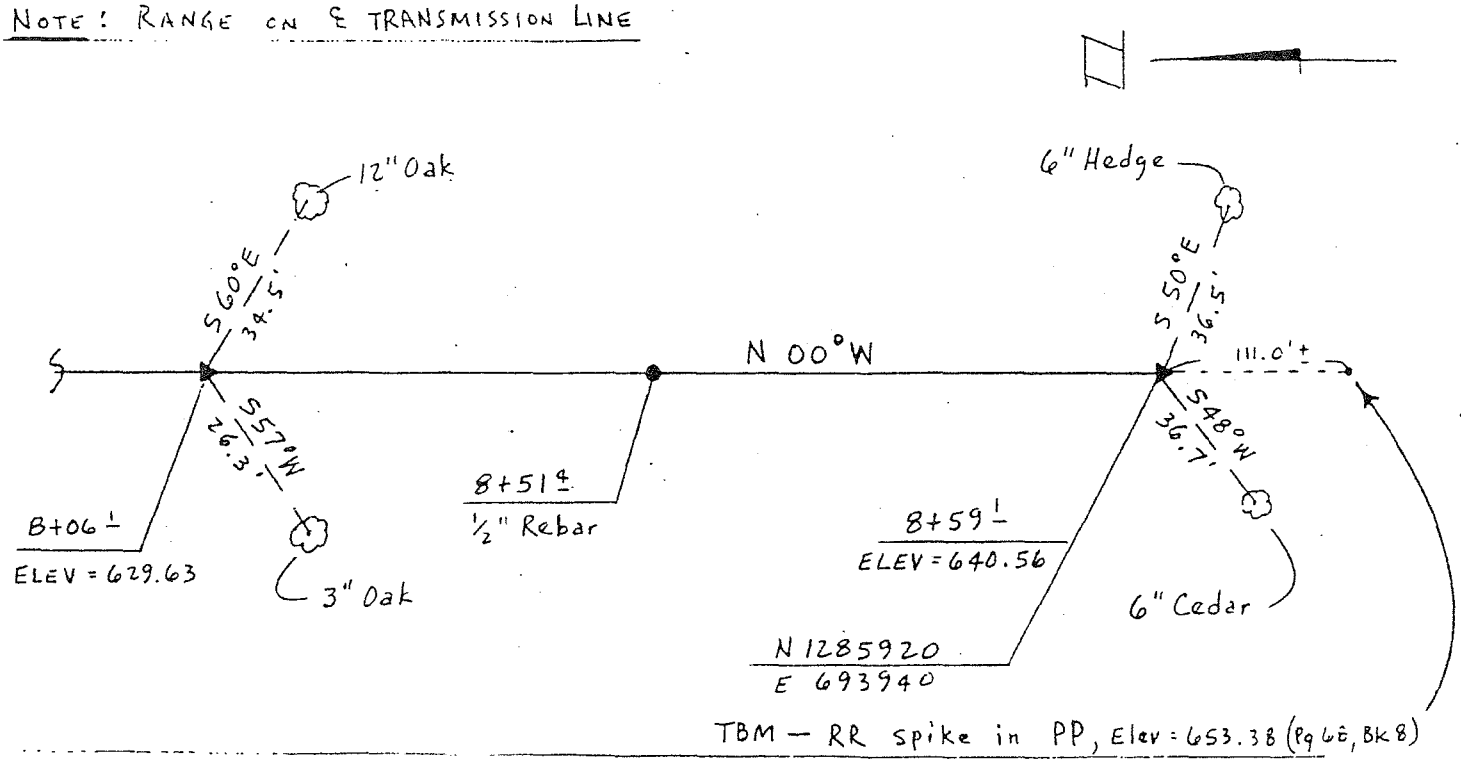
RANGE NO. SR 23-B BY: JIM CAIN / WFM DATE: 5/83

TOPO 26

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



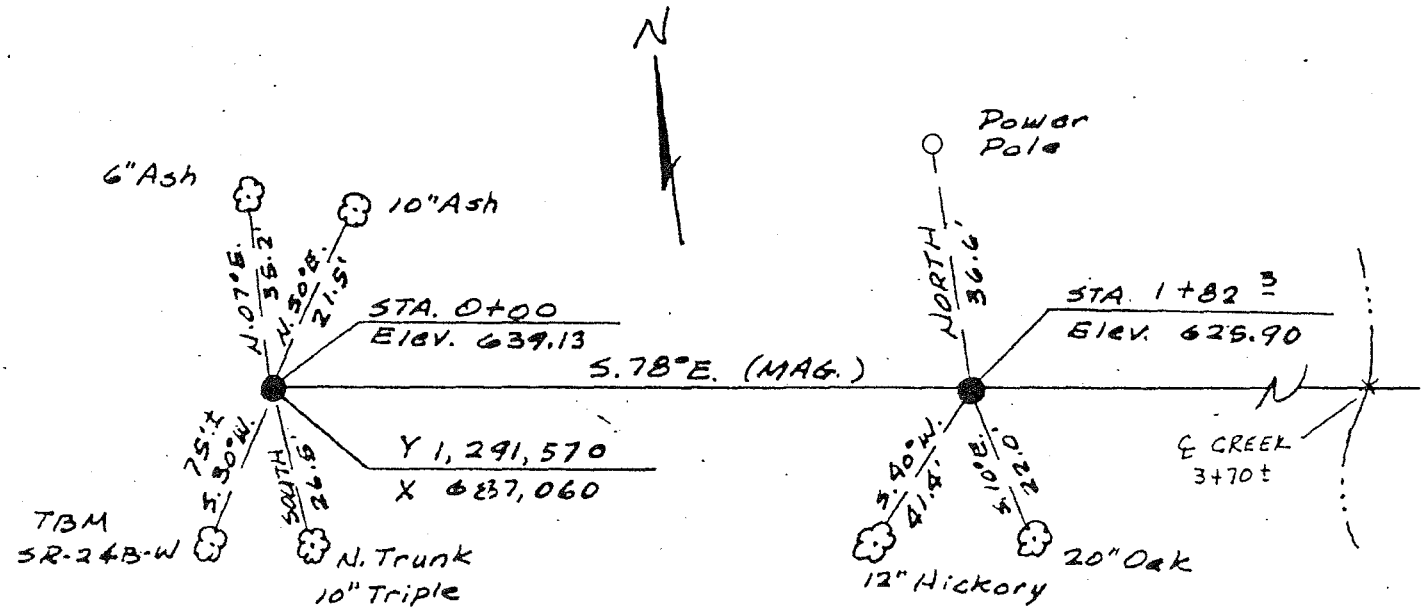
NOTE: RANGE ON ℄ TRANSMISSION LINE



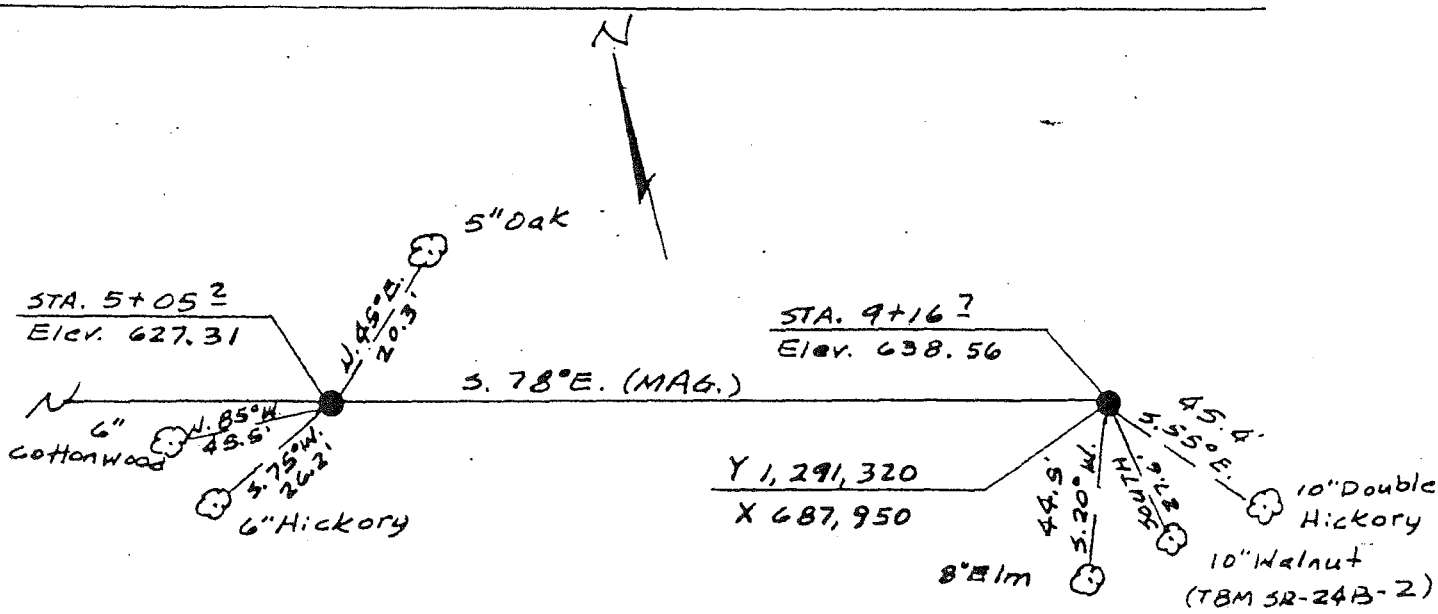
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-24B BY: Owen Zurowaste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 34
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



From the town of Santa Fe, travel North West on Hwy. "D" 1.25 mi. ± to Long Branch Creek. Then pack North 150'± to Range.

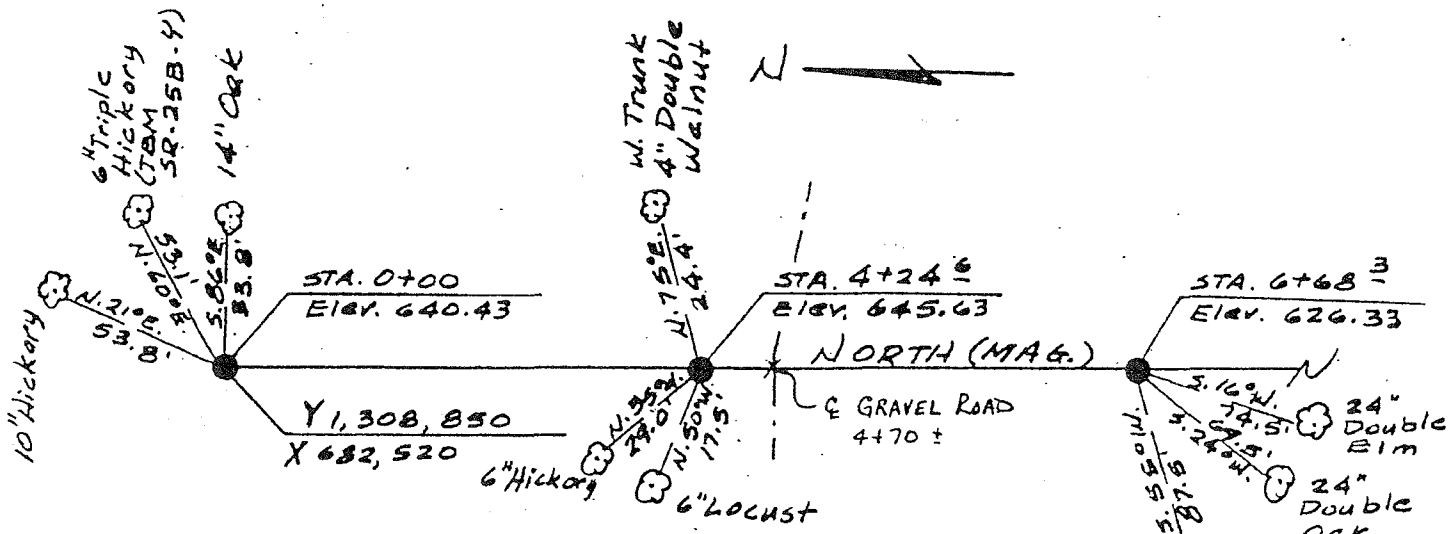


KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

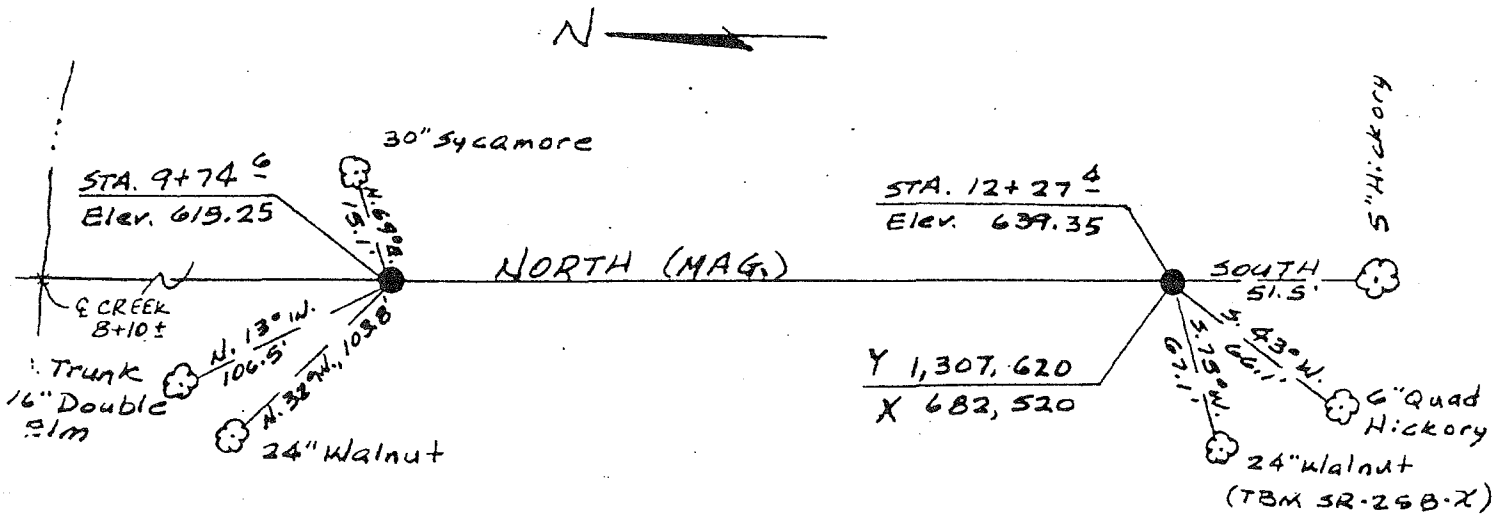
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-25B BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 42
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



From the intersection of Hwy 107 and Hwy 154, travel West on Hwy 154 3.23 mi.± to intersection of gravel road on Range Line 8 and 9 W. Then travel South on gravel road 2.5 mi.± to bridge over Brush Creek. 0+00 is 100'± W. of North end of guard rail. 12+27 4 is 100'± West of South end of guard rail.

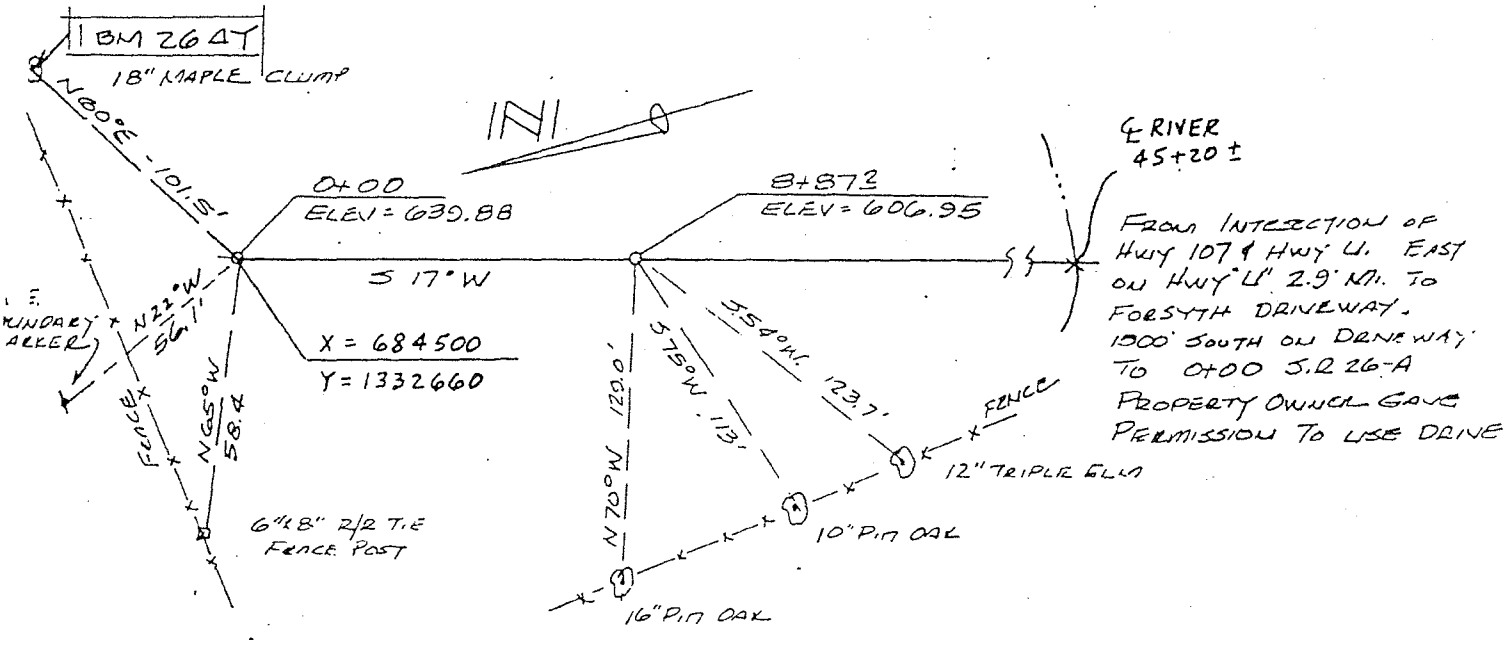


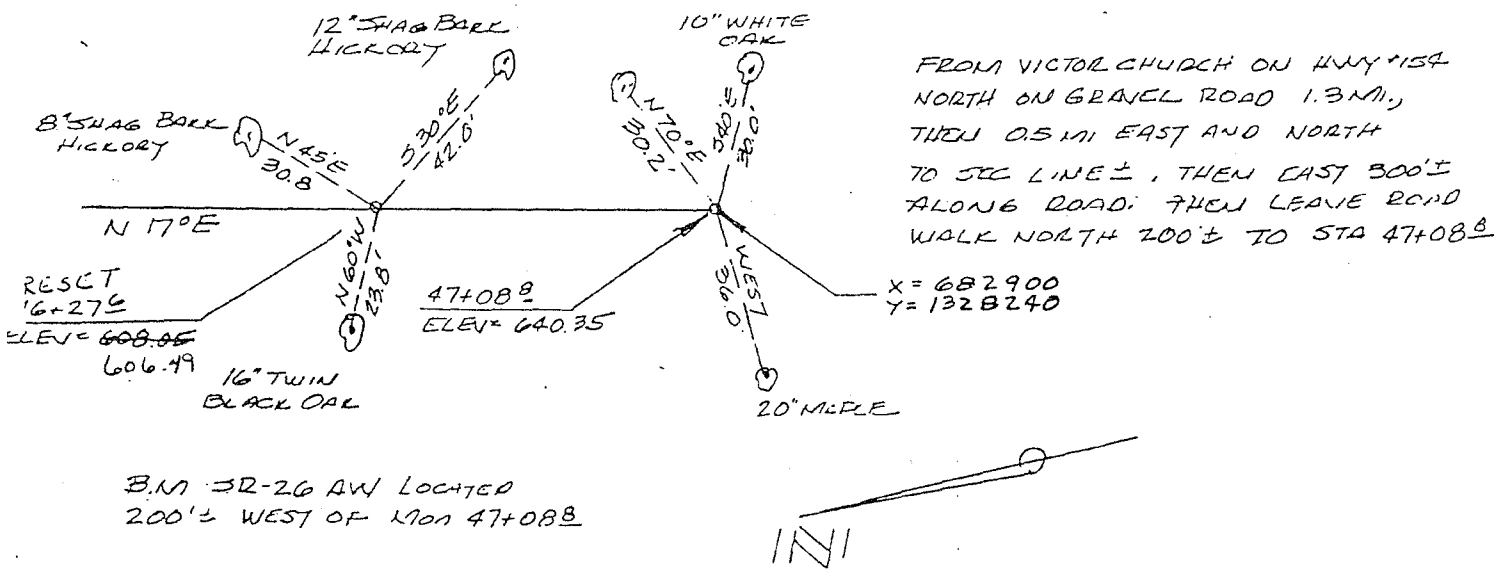
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR 26-A BY: G. BUDDE DATE: 6/11/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 29, 30, 40
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





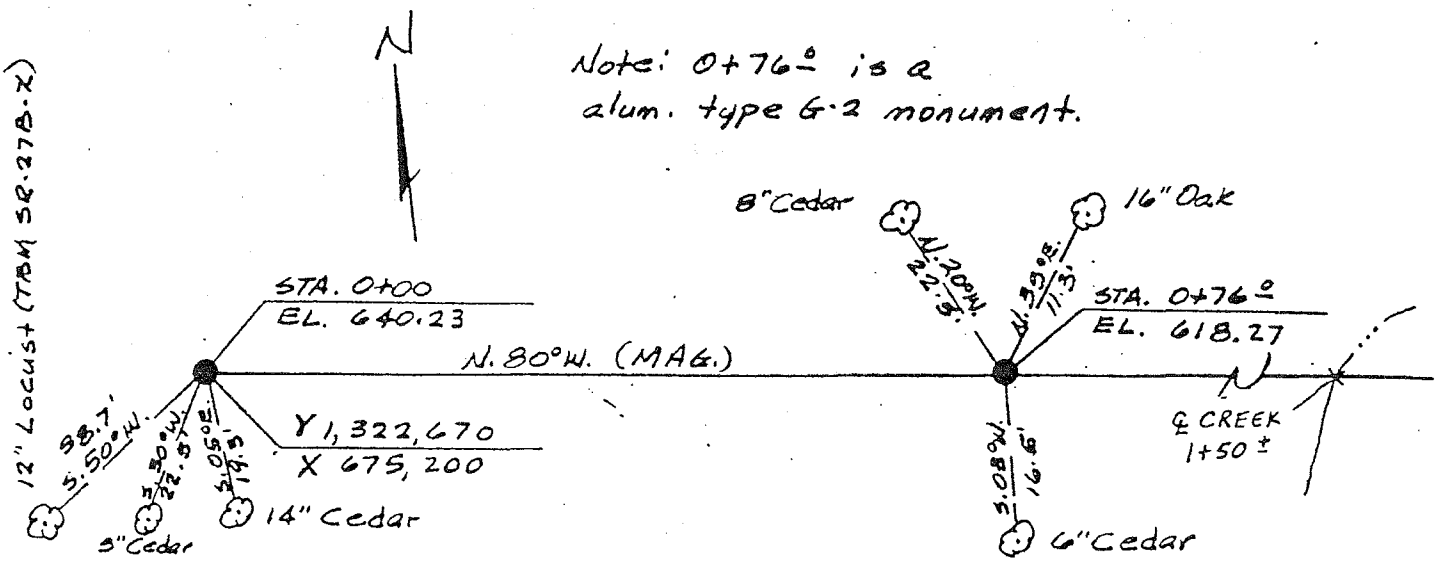
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

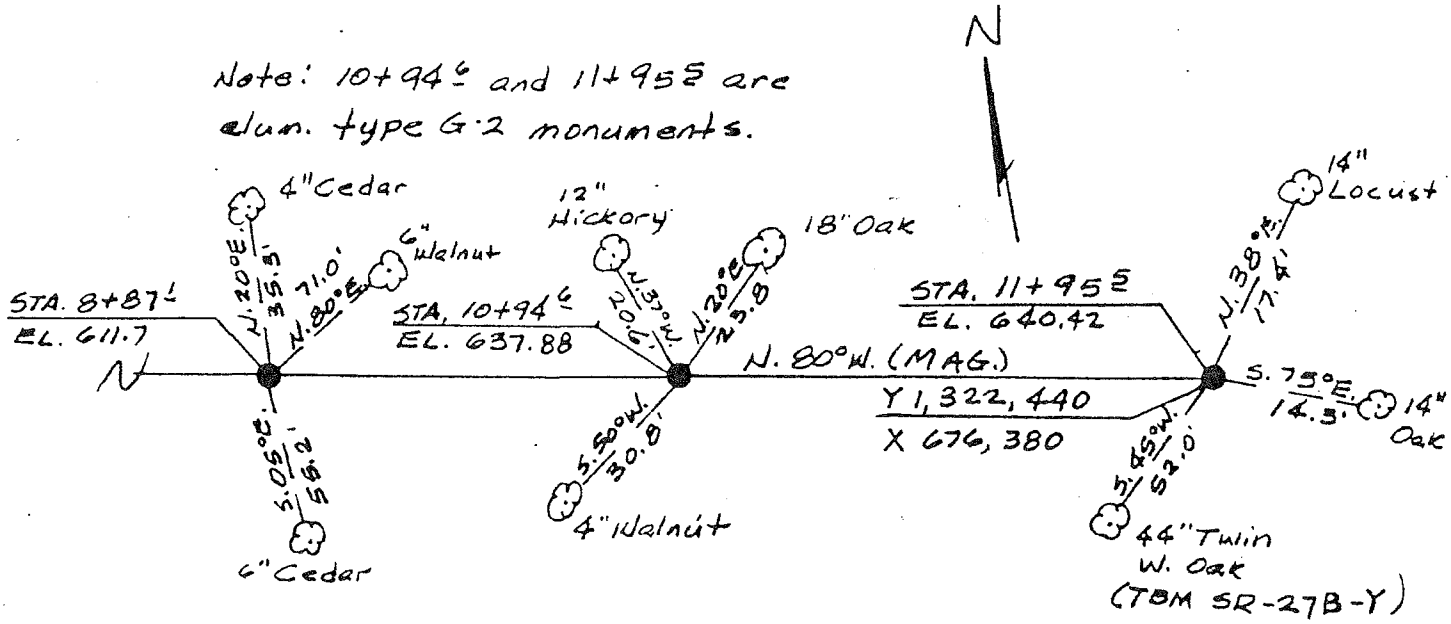
RANGES.

RANGE NO. SR-27B BY: Owen Zurowestc DATE: 7/82

TOPO 40

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

DACW43-82-[illegible]

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR [illegible]
RANGES.

RANGE NO. SR-27B BY: Owen Zurowesta DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Old Hwy 154 and Hwy "Z", travel West on Old Hwy 154 0.25 mi.± to gravel road on right. Then travel North on gravel road 0.33 mi.±, then West 0.17 mi.± then South 225'±. Then pack East 79'±.

Station 11+95 ≡
From intersection of Old Hwy 154 and Hwy "Z", travel West on Old Hwy 154 0.25 mi.± to gravel road on right. Then travel North on gravel road 0.29 mi.±. Then pack East 150'±.

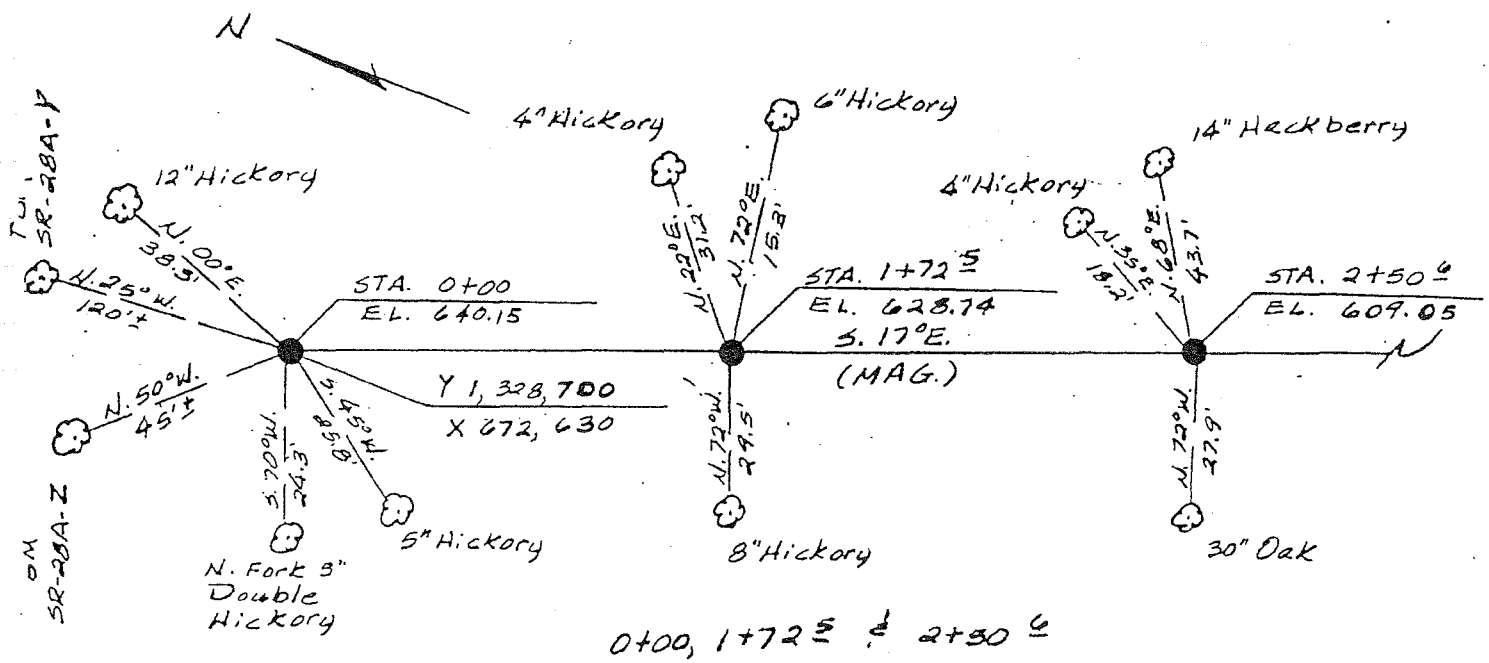
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

RANGES.

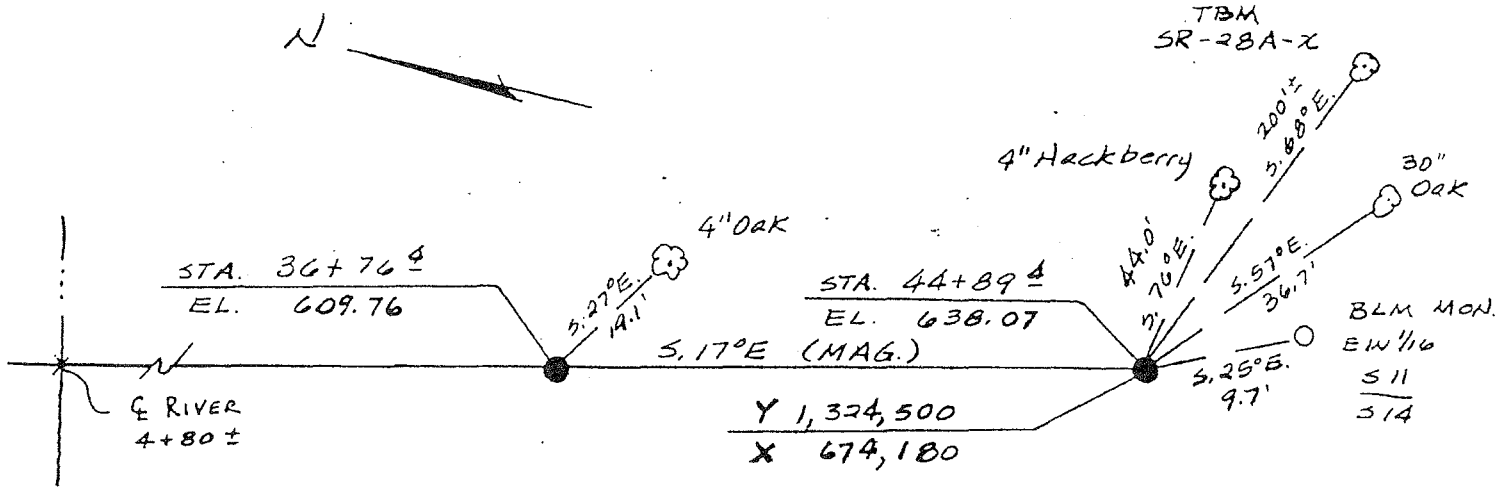
RANGE NO. SR-28A BY: Owen Zurowcste DATE: 6/82

TOPO 40

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



0+00, 1+72 5 & 2+50 6 are G-2 Monuments.



No other references available for 36+76 4.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-28A BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From the intersection of Hwy 107 and Hwy U, travel West on Hwy U 5mi ± to gravel road on left. Then travel South on gravel road 1mi ± to point where road turns to East. Then pack South-East 500' ± to Range.

Station 44+89 ±:
From the intersection of Hwy 107 and Hwy 154, travel West on Hwy 154 5 1/4 mi ± to road on right. Then travel back East 1/4 mi ± on Old Hwy 154 to gravel road on left. Then travel North 1/2 mi ± to point where road turn West. Then pack North 1/2 mi ± to range.

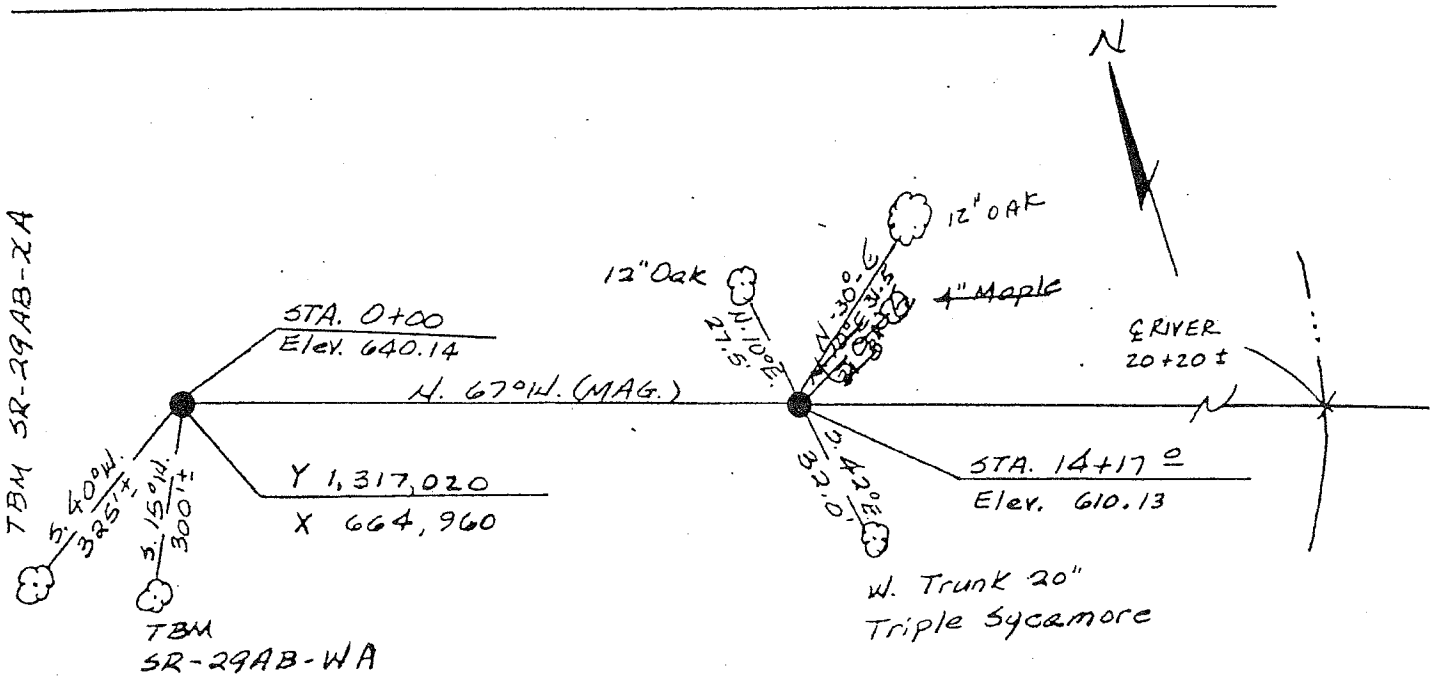
ORIGINAL

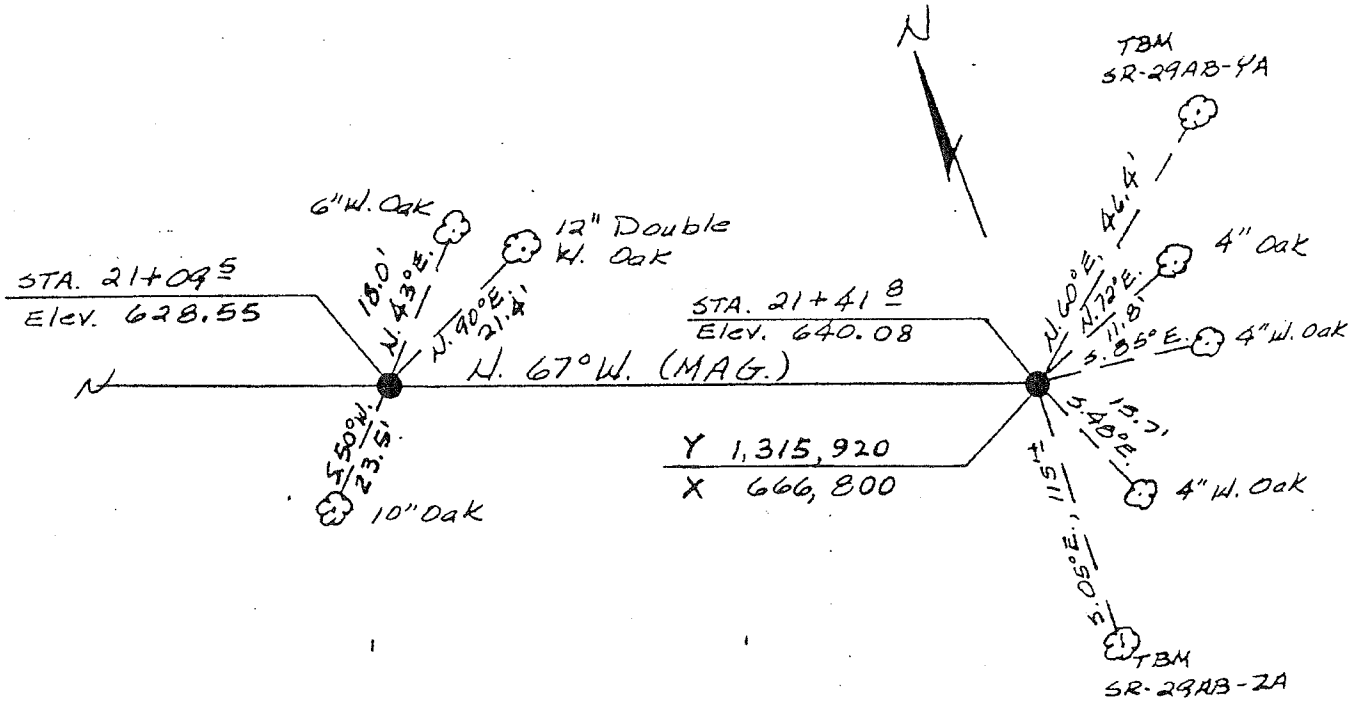
DACW43-82-D-0011 1-2757-22.9-S

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-29AB BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 52, 53
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-29AB BY: Owen Zuroweste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

STATION 0+00:
From intersection of Hwy 154 and Elk Fork Salt River, travel West on Hwy 154 1/2 mi ± to intersection of Hwy 154 and gravel road. Then South on gravel road .4 mi. ± across creek to top of hill. Then pack East 400' ± to Range.

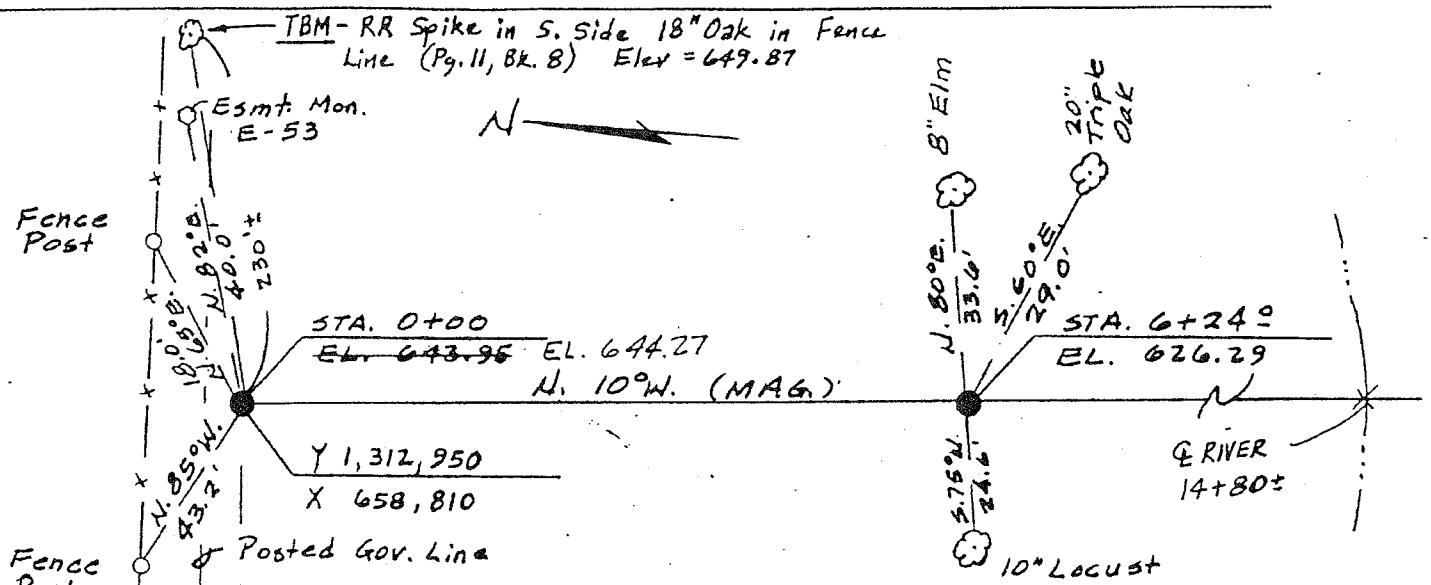
STATION 21+41 ±:
From intersection of Hwy 154 and Elk Fork Salt River, travel East on Hwy 154 2000' ± to gravel road on right. Then South on gravel road .6 mi. Then pack West 1/2 mi ± through gully and over hill to Range.

ORIGINAL

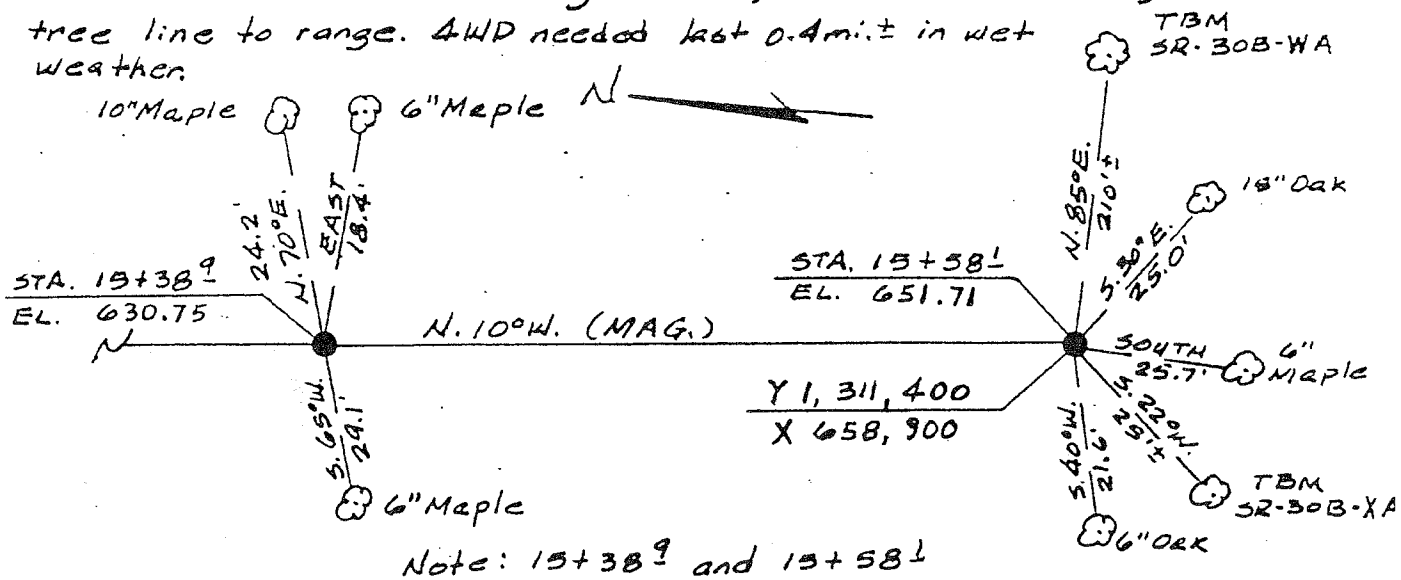
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-30B BY: Owen Zuroweste DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 53
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



From intersection of Elk Fork and Hwy 154, travel West on Hwy 154 1.6 mi.± to intersection with gravel road. Then travel South on gravel road 0.5 mi.±, then East 0.25 mi.±, then South 0.5 mi.±, then West 0.5 mi.± to "T" intersection with gravel road. Then South on gravel road 0.5 mi.± to gov. line. Then travel North-East along boundary line 0.4 mi.± through tree line to range. 4WD needed last 0.4 mi.± in wet weather.



Note: 15+38.9 and 15+58.1 are alum. type G-2 monuments.

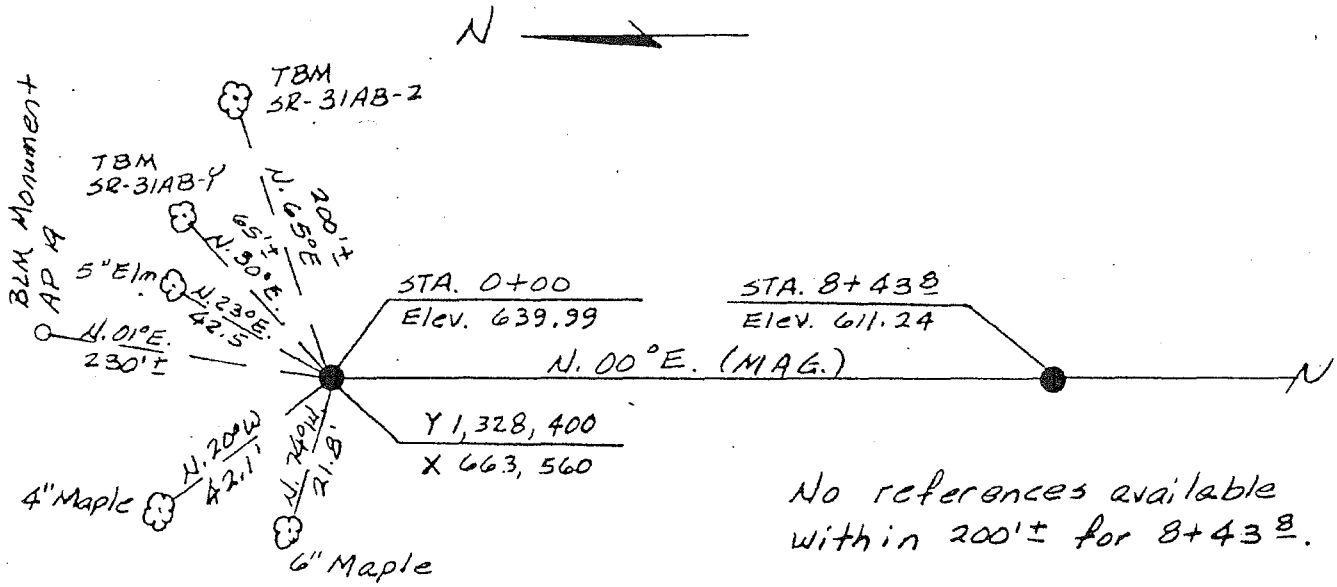
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

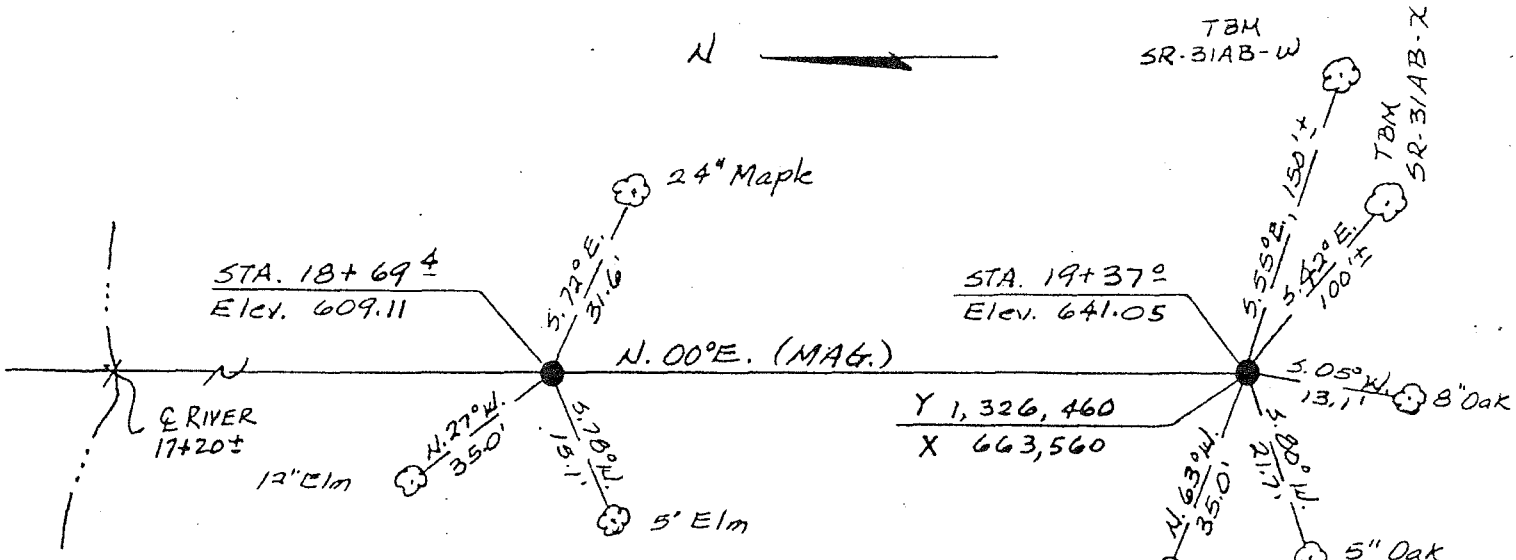
RANGE NO. SR-31AB BY: Owen Zurcweste DATE: 6/82

TOPO 51

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



No references available within 200'± for 8+43.8.



18+69.4 is G-2 monument.

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-31AB BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

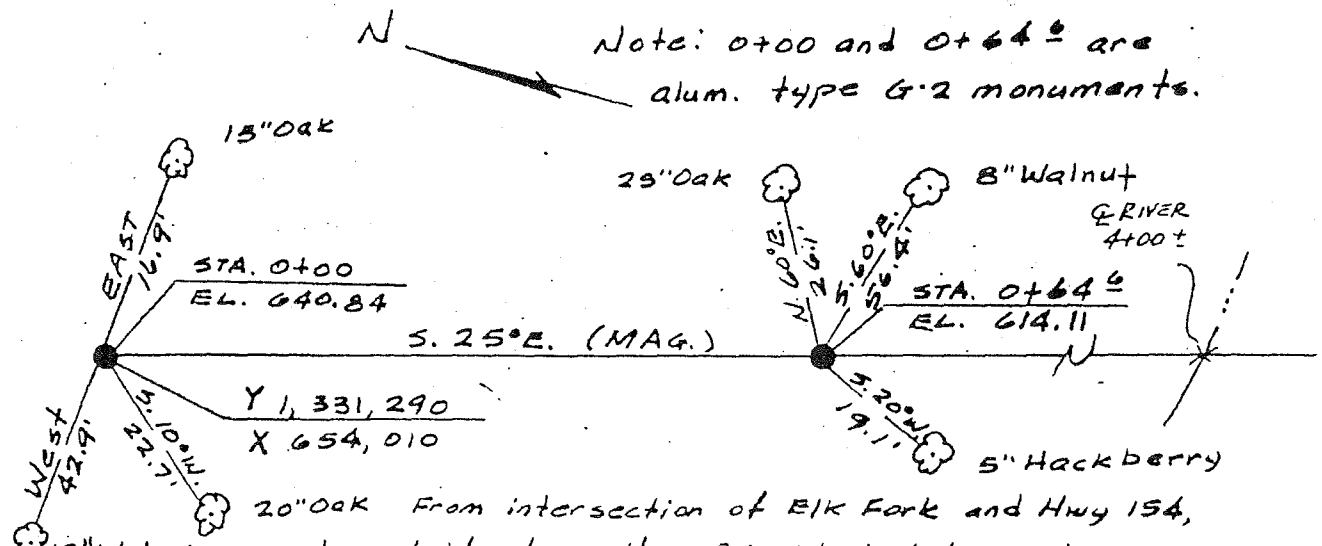
Station 0+00:
From intersection of Hwy U and gravel road on North line of SEC 4, T. 54 N., R. 9 W., travel gravel road West 1600'± to "T" intersection of gravel roads. Then South on gravel road 1 mi. to where it turns East. Then South-West on field road 1600'± to Range.

Station 29+80±:
From the South 1/4 cor. SEC. 9, T. 54N., R. 9 W. on gravel road on South line of SEC. 9, pack North 800'± along fence line to old logging road. Then pack North-West on logging road 800'± to Range.

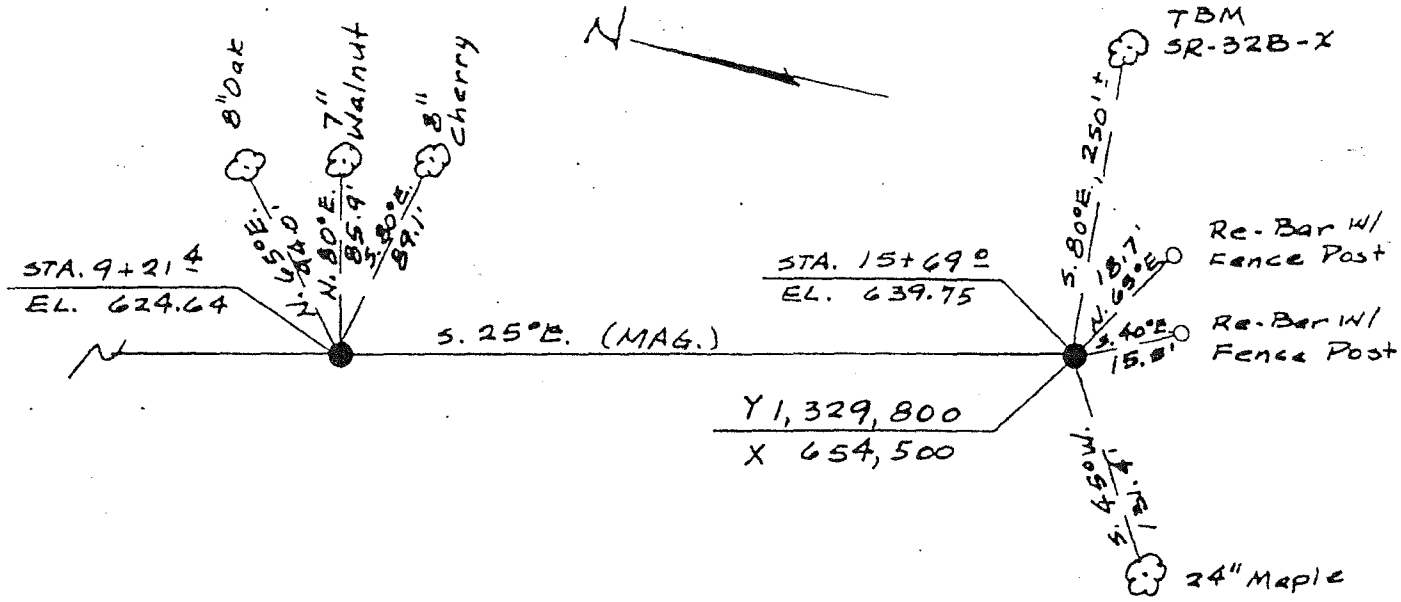
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR. 32 B BY: Owen Zurowesta DATE: 7/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 59
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



From intersection of Elk Fork and Hwy 154, travel West on Hwy 2.6 mi.± to intersection with gravel road. Then travel North on gravel road 1.5 mi.± to old gravel road on right. Then travel East through gate on old gravel road 0.45 mi.± then North 0.75 mi.± through gate then West 0.3 mi.± to Range.



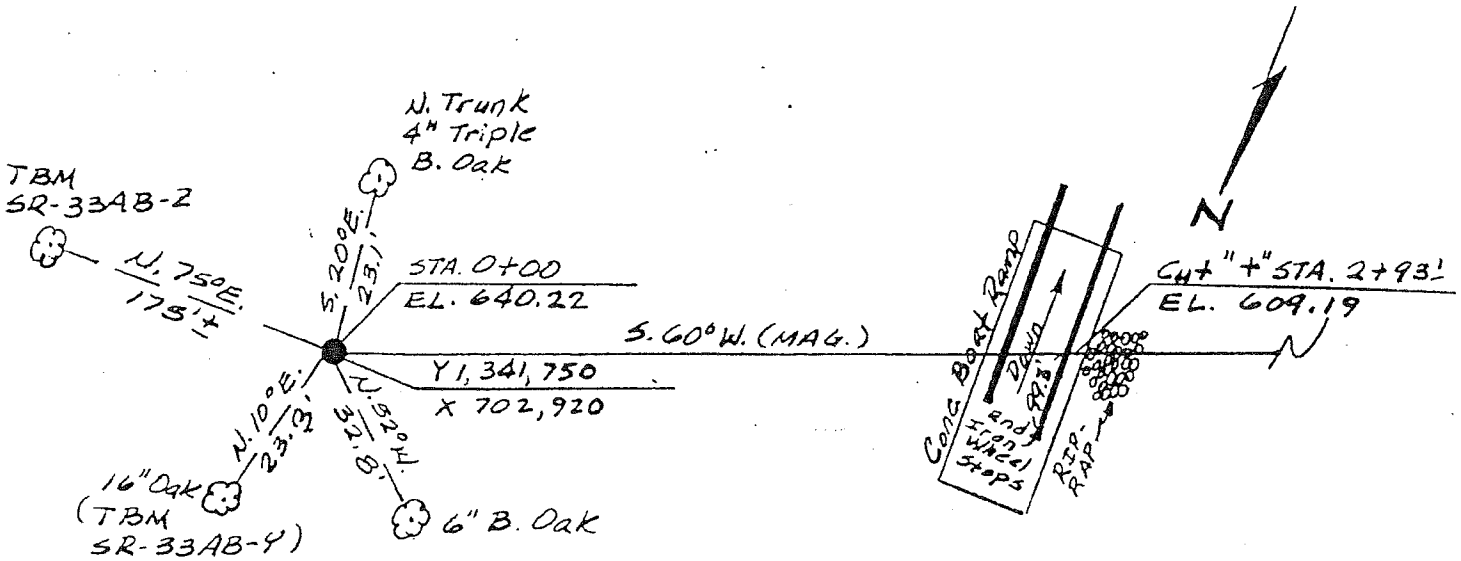
ORIGINAL

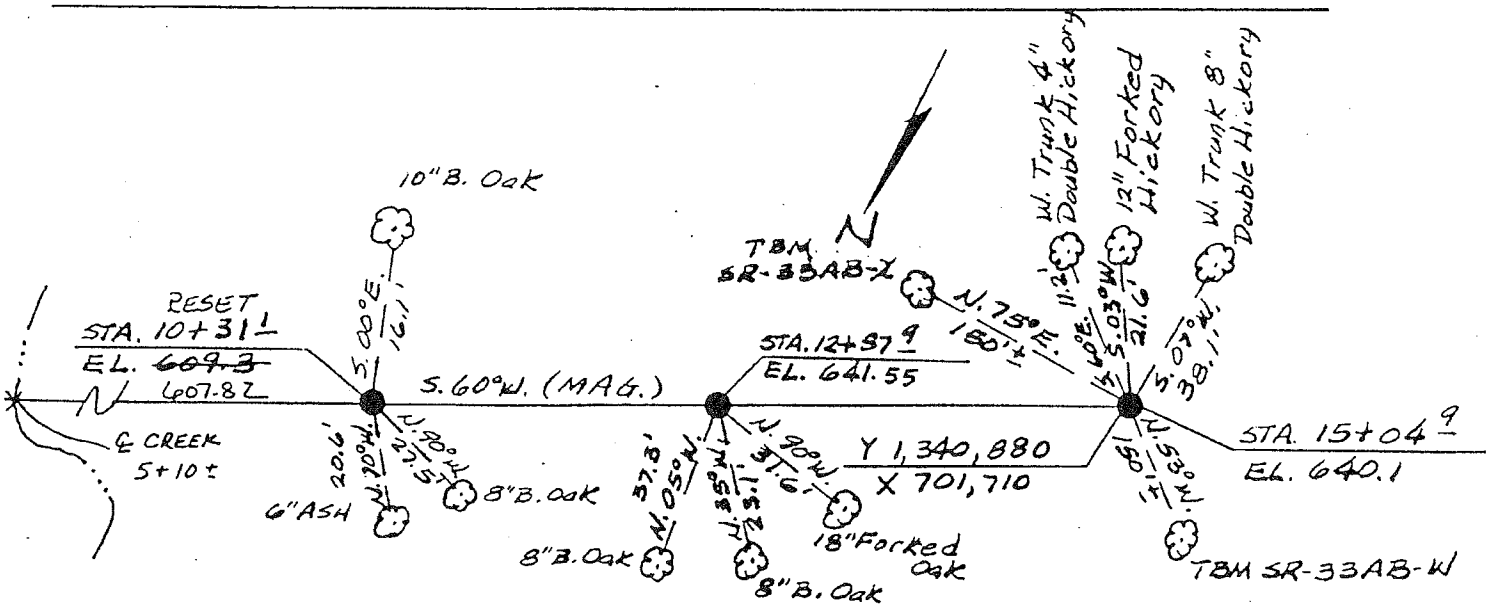
DACW43-82-D-0011 1-2151-22.9-S

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF [illegible] SEDIMENTATION RANGES.

RANGE NO. SR-33AB BY: Owen Zurowieste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 22
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



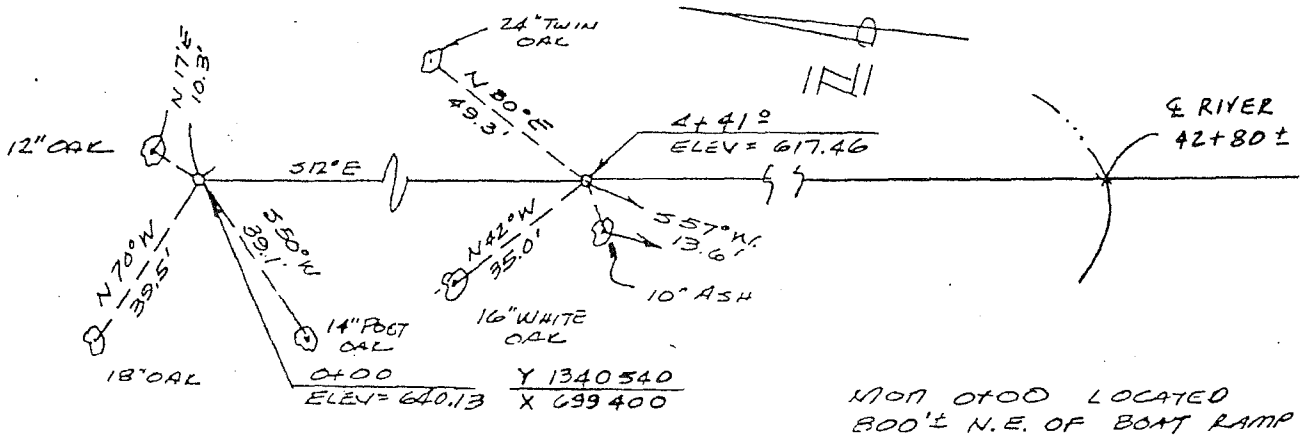


KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

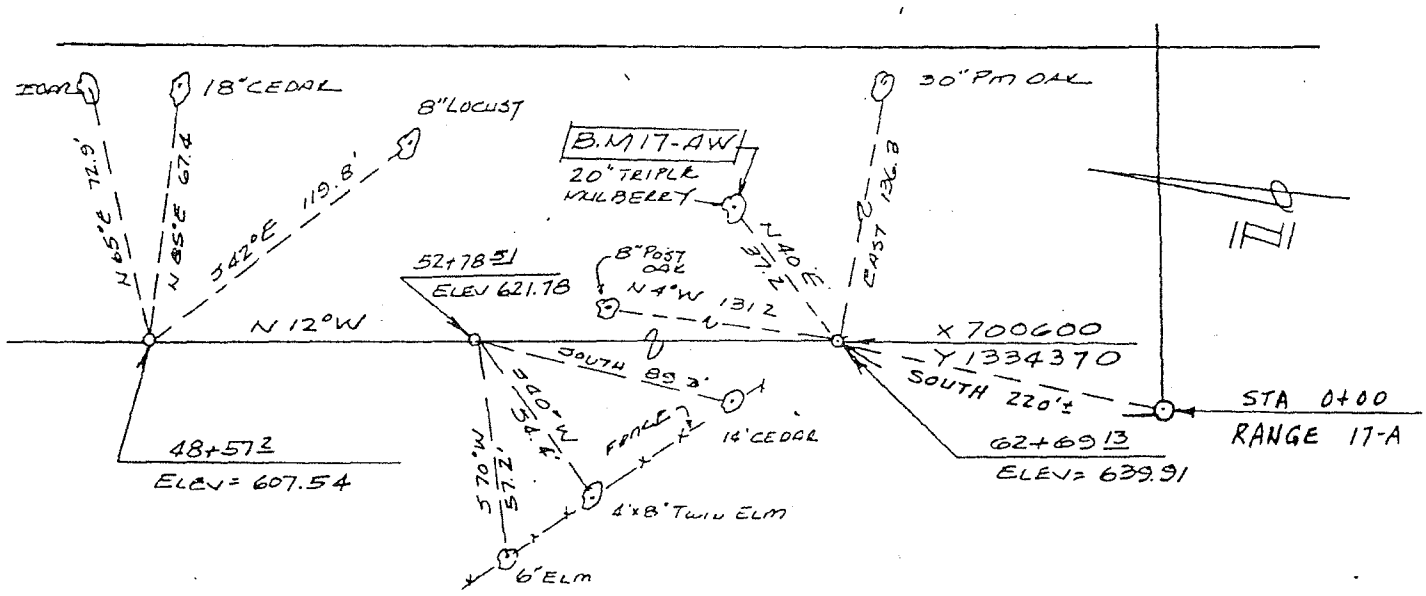
RANGE NO. SR 34-A BY: G. BUDDE DATE: 6/11/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 22, 23
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



B.M 34 A-ZA LOCATED
N 81°W 120' FROM 0+00

MON 0+00 LOCATED
800'± N.E. OF BOAT RAMP IN
SHELL BRANCH ACCESS AREA

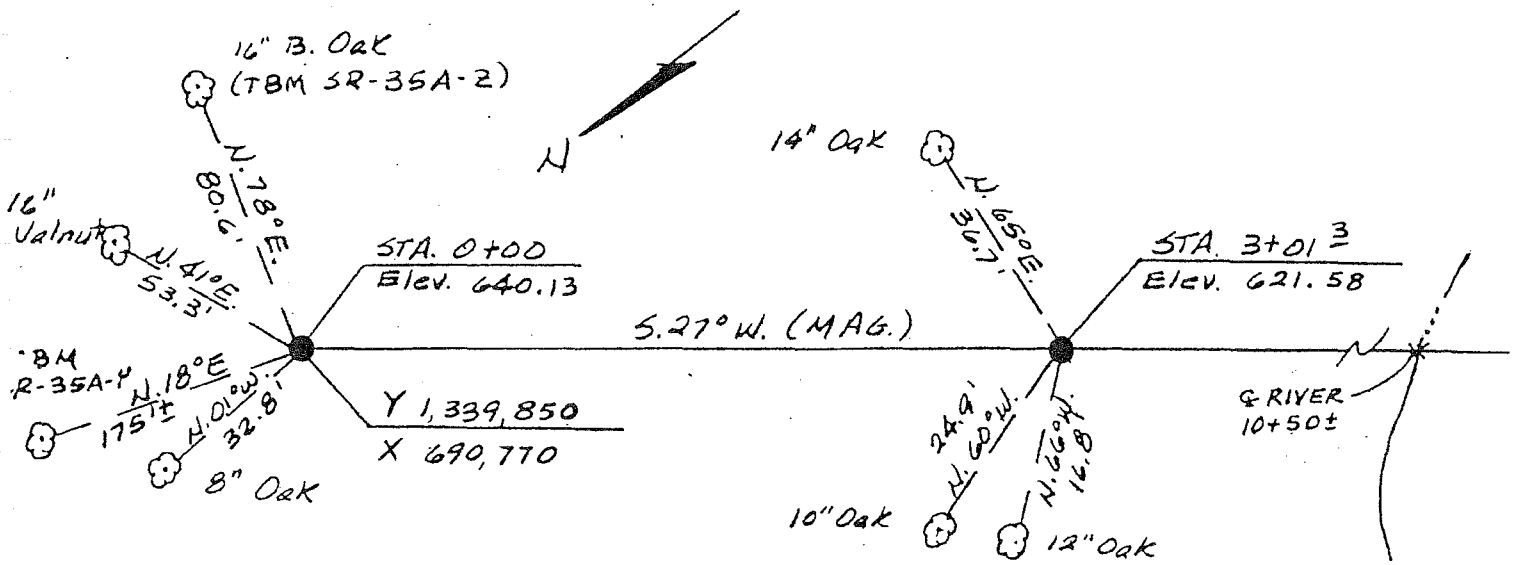


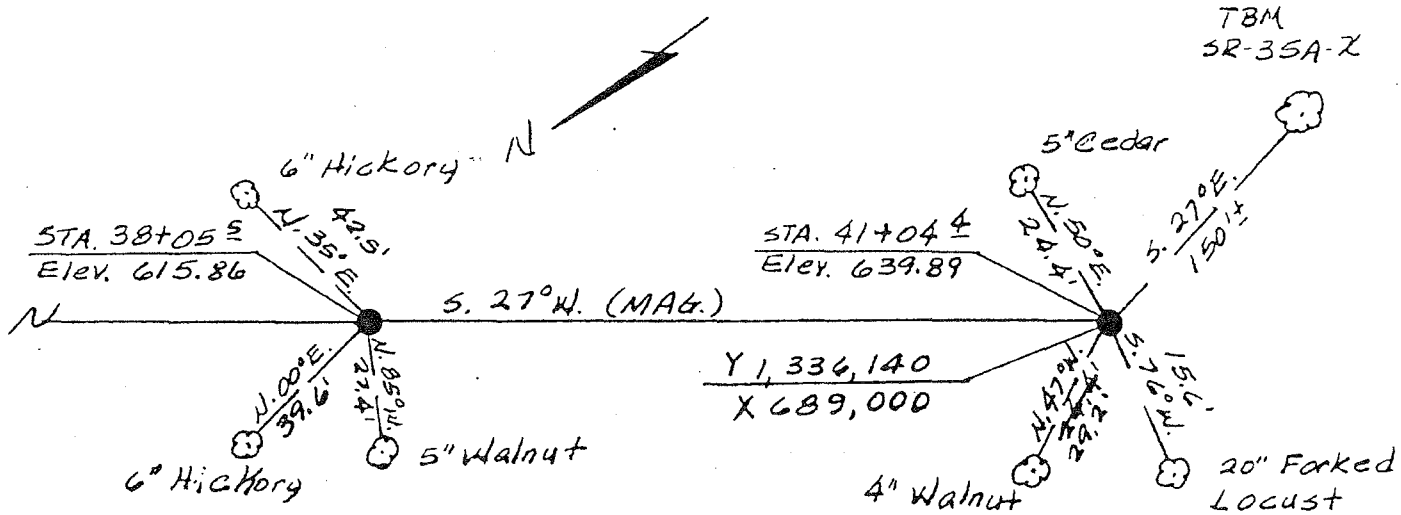
MON 62+69 13 LOCATED 800'±
N.W. OF THE END OF OLD PAVE OF OLD
HWY #107 AT NORTH EDGE OF FLORDA

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SR-35A RANGES.

RANGE NO. SR-35A BY: Owen Zurowieste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 29
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-33AB BY: Owen Zurowaste DATE: 3/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Hwy 24 and Hwy. HH travel South on Hwy HH 5.5 mi± to "T" intersection of gravel roads. Then West on gravel road 500'±. Range 500'± North.

Station 15+04.9:
From intersection of gravel roads (see above description) travel West on gravel road across creek 2000'±. Range 150'± to North.

ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-35A BY: Owen Zurcweste DATE: 6/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From the "T" intersection of gravel roads 150'± North of SEC. COR. 29|28 / 32|33 T. 55N., R. 8W., travel West on gravel road 3000'± to where gravel road turns into field road. Then South-West on field road 1000'± to where field road goes into woods. Then pack South 200'± along tree line, Range 100'± into woods.
4WD needed on field road in wet weather.

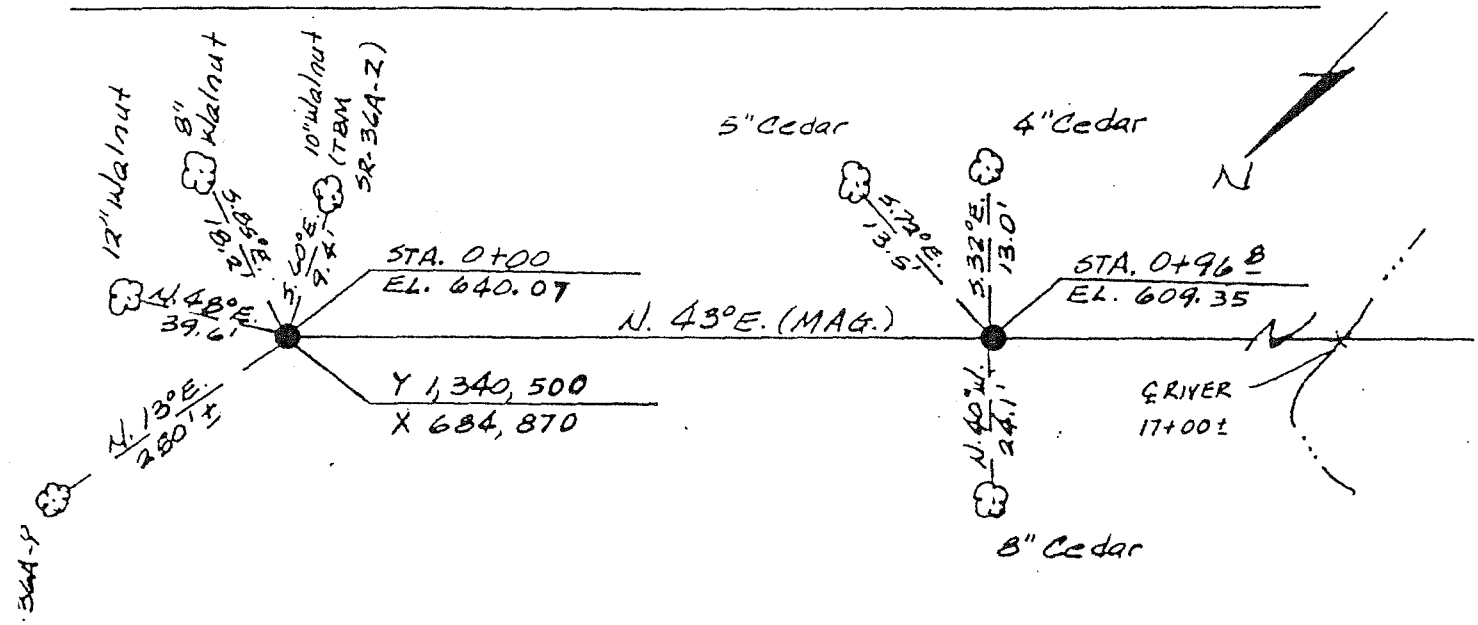
Station 41+04 ±
From the intersection of Hwy 107 & Hwy U travel West on Hwy U 2 mi ±, 1/4 mi ± past C.O.E. main. compound to dirt road on right. Then North on dirt road along West side tree line 1/4 mi ± to point where dirt road turns North-East through tree line. Then North-East on dirt road 1900'± to point where road starts going down hill. Then pack North 800'± to range
4WD needed on dirt road in wet weather.

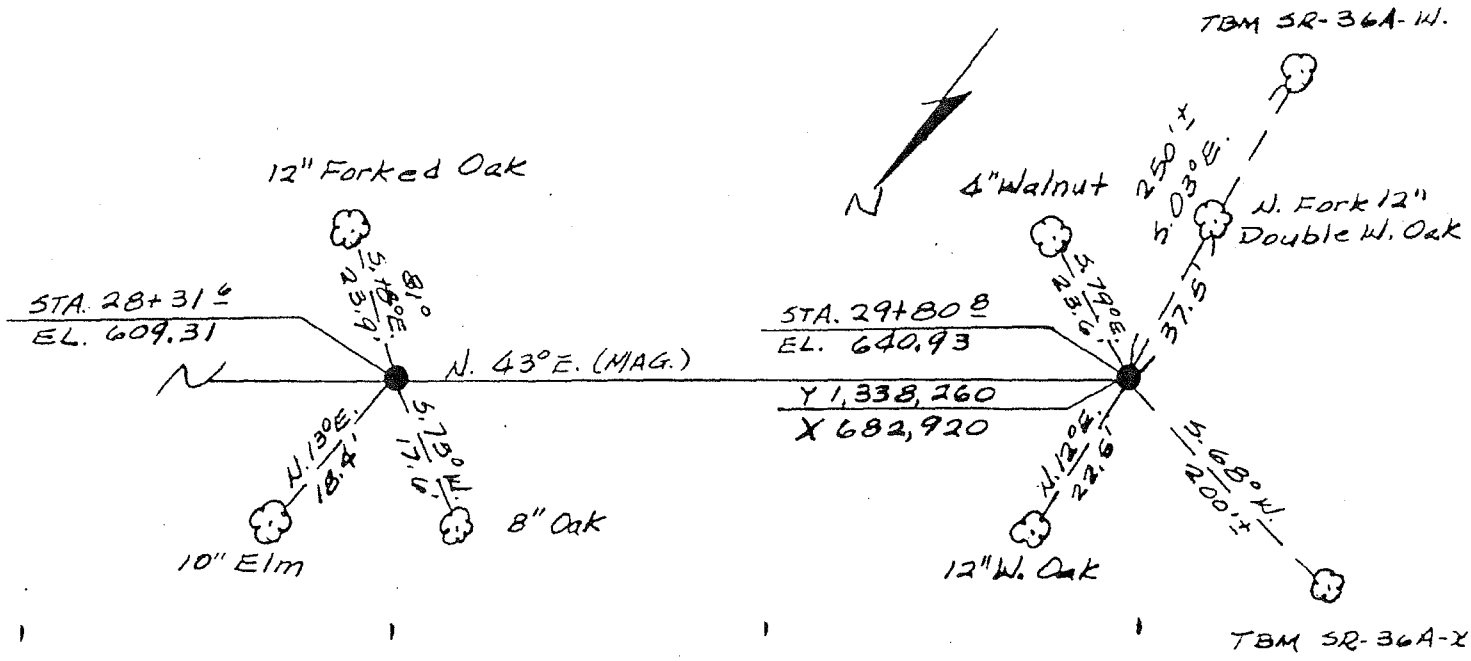
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-36A BY: Owen Zurowcste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 29, 39
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-36A BY: Owen Zyrowcste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

STATION 0+00:
From the intersection of Hwy 24 & Hwy 107 travel South on Hwy 107 2 mi. ± to intection of gravel road. Then West on gravel road 1mi ± to gravel road on left. Then South on gravel road 1 mi ± to left turn in road. Then East on gravel road 1/4 mi ± to gravel road on right. Then South on gravel road 1 mi ± to River Bottoms. Then West on field road along toe of slope of River Bottoms 1/4 mi ± to Range.
4 WD needed on field road in wet weather.

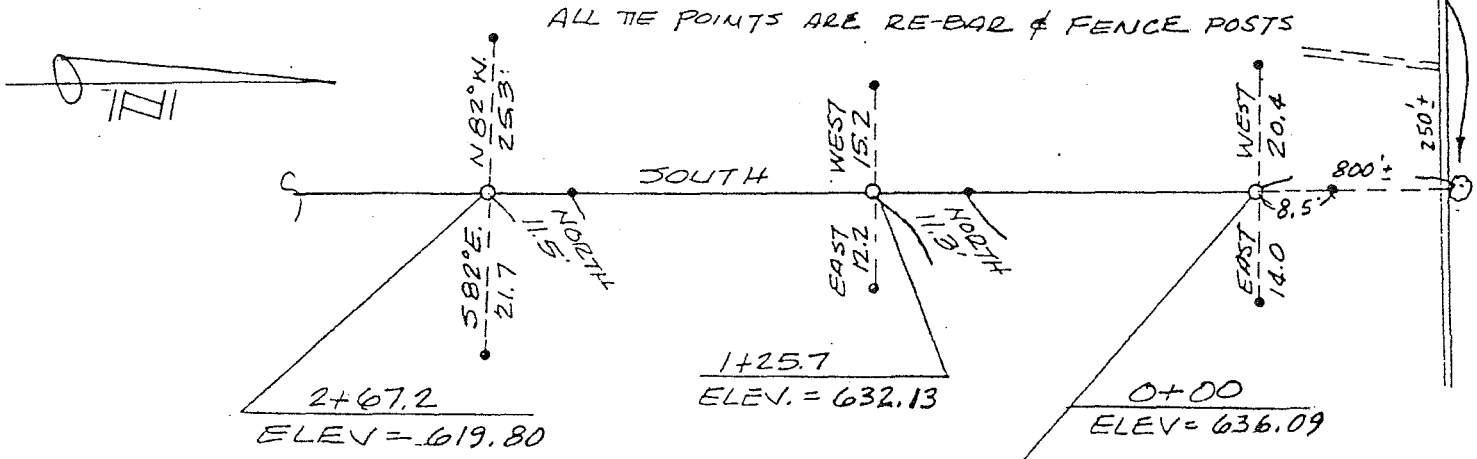
Station 29+80 ±:
From the intersection of Hwy 107 & Hwy U travel West on Hwy U 3 3/4 mi ± to intersection of gravel road at the S. 1/4 corner of SEC. 36, T. 55N., R. 7W. Then North on gravel road 1/2 mi. ± to intersection of gravel road. Then West on gravel road 1/2 mi. to E. 1/4 corner of SEC. 36, T. 55N., R. 7W. Then pace North 500' ± along fence line to Range.
4 WD needed last 1/2 mi.

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 37-A1 BY: GENE BUDDE DATE: 10/9/82

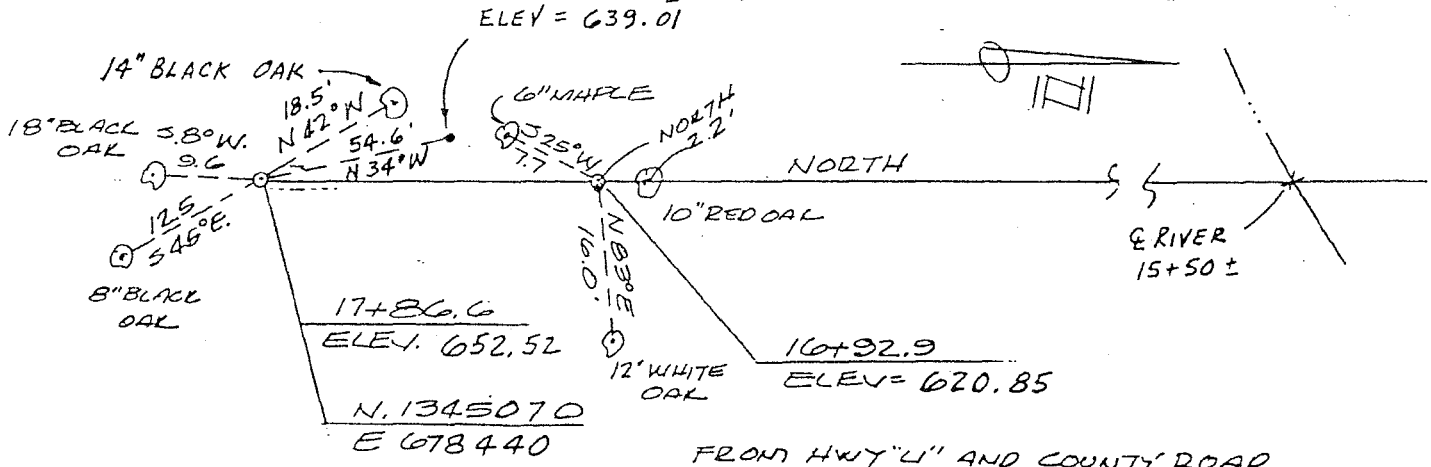
NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR E-2 TOPO 38
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TBM - NAIL IN ROOT OF 18" OAK ELEV = 667.78



FROM THE END OF COUNTY ROAD C-38 NEAR ENTRANCE TO ACCESS AREA GO WEST ON COUNTY (GRAVEL) ROAD 1.0 MILE THEN SOUTH ON DIRT ROAD 1000'± THEN WALK EAST IN FIELD 300' TO 0+00
- 4WD VEHICLE WOULD BE HELPFUL

TBM - TOP OF ½" REBAR
ELEV = 639.01

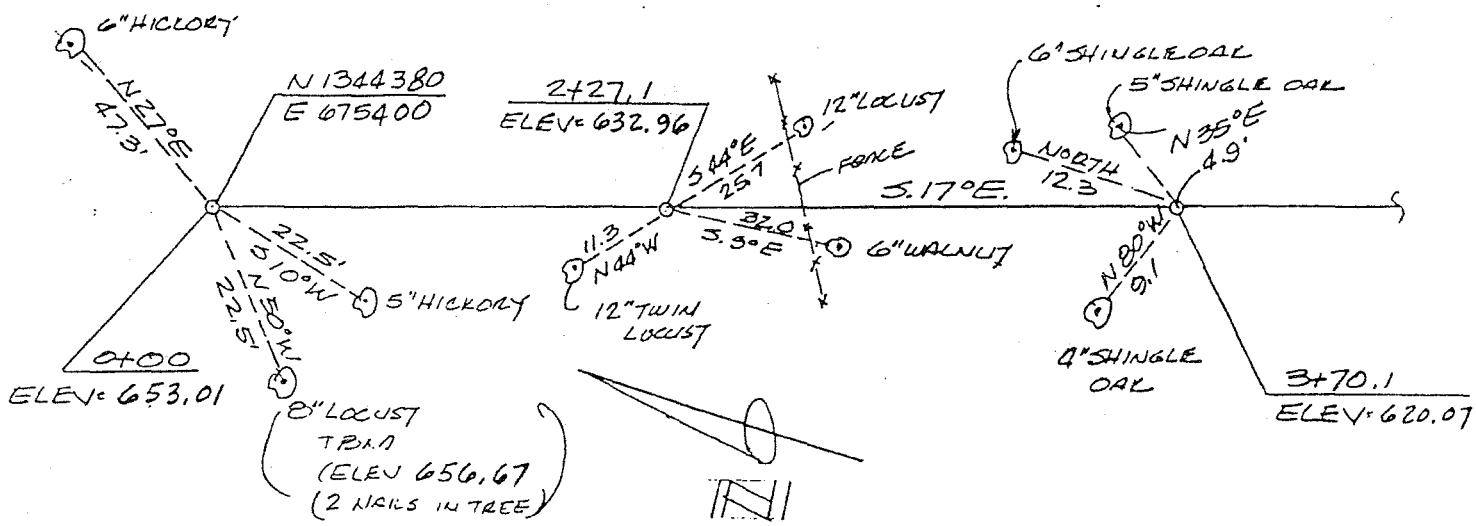


FROM HWY "U" AND COUNTY ROAD SW CORNER OF SE 1/4 SEC 36 T.55N, R.9W. GO NORTH 1.8 MILE ON GRAVEL ROAD THEN ON DIRT ROAD EAST 1100'± THEN NORTH 1000'± THEN N.E. AND EAST TO TOP OF RIDGE 300' SOUTH OF STA 17+86.6
4WD VEHICLE IS NEEDED

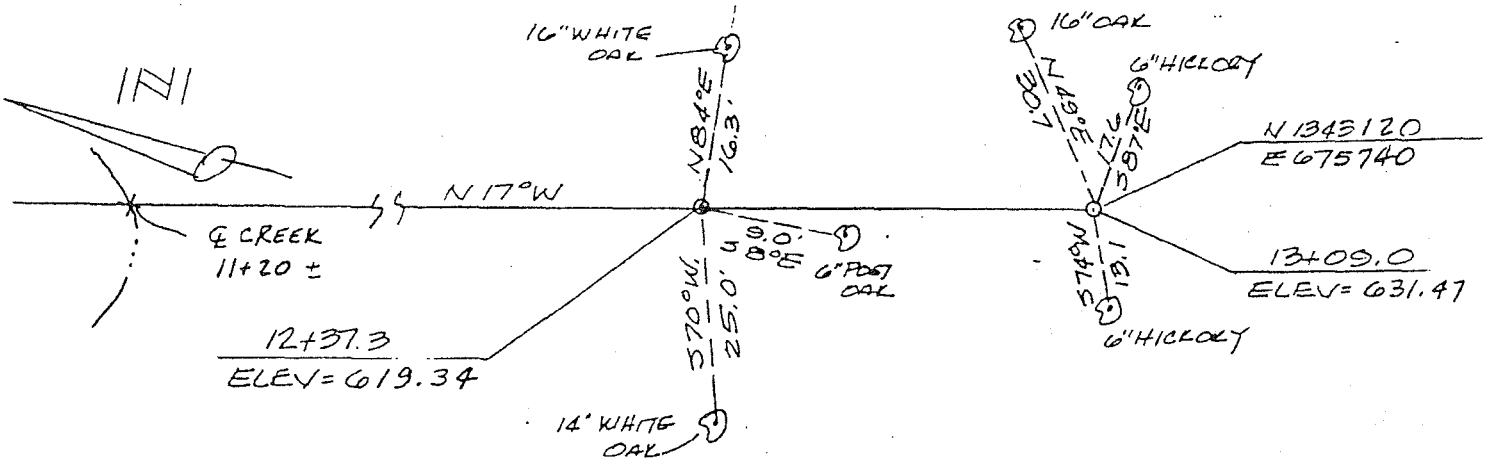
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 37-A2 BY: GENE BUDDE DATE: 10/9/82

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2 TOPO 38
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM A "T" INTESECTION OF DIRT ROADS 800' SOUTH OF SEC CORNER SEC. 22, 23, 27, & 26 T55N, R9W, GO 1200'± EAST THEN 700' SOUTH TO FORD. (AND FORD) NEED TRACTOR TO CROSS. FROM FORD FOLLOW FIELD ROAD 1/2 MILE TO 0+00. 4WD VEHICLE IS NEEDED TO GET TO FORD IN DRY CONDITIONS FORD MAY BE CROSSED WITH 4WD VEHICLE

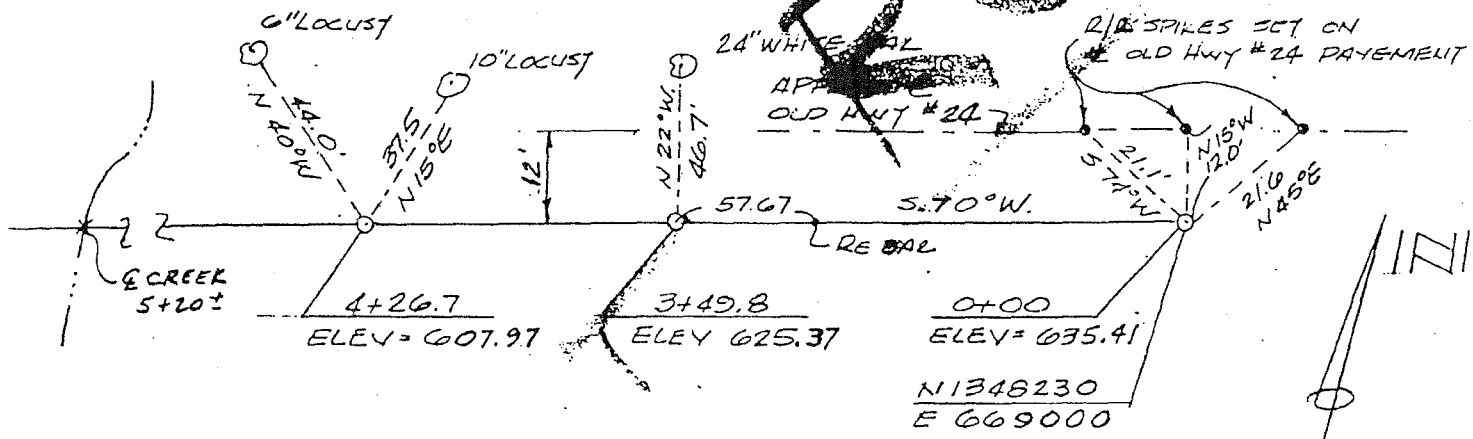


ACCESS IS FROM NORTH END OF RANGE ON FOOT

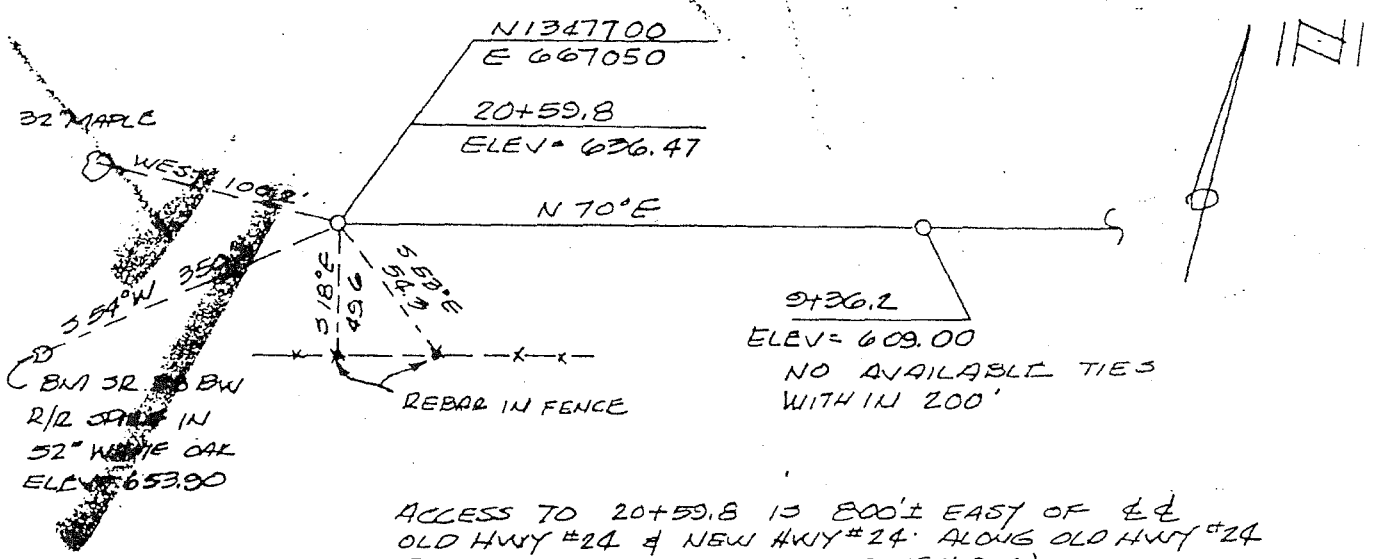
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES. (ORIGINAL LOCATION — SEE NEW LOCATION)

RANGE NO. SR 38-B BY: GENE BUDDE DATE: 9/[illegible]/82

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



ACCESS TO 0+00 IS 500' EAST OF OTTER CREEK ON OLD HWY #24 PAVEMENT



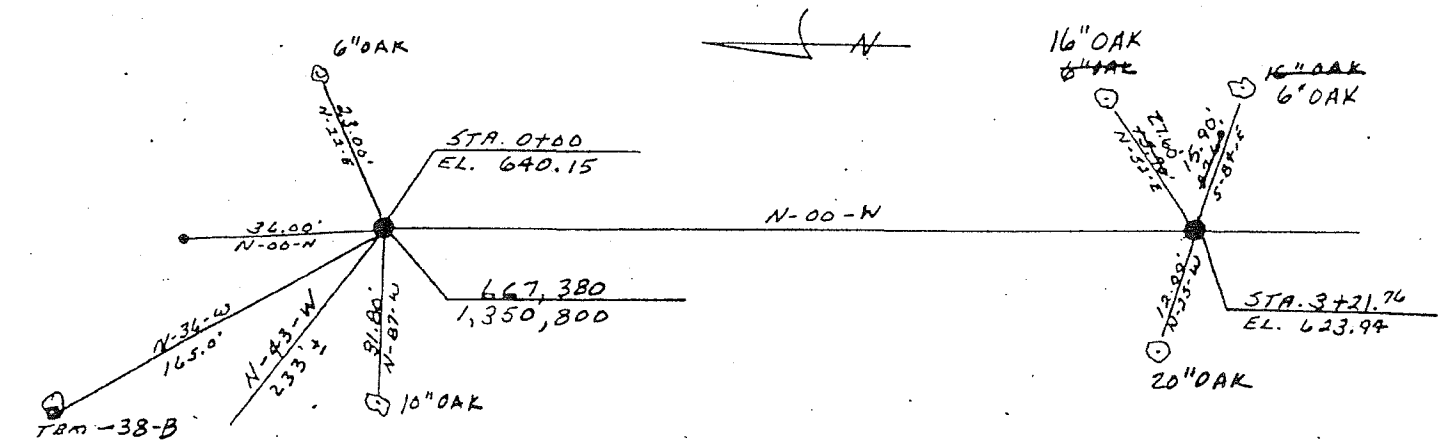
ACCESS TO 20+59.8 IS 800'± EAST OF ℄℄ OLD HWY #24 & NEW HWY #24 ALONG OLD HWY #24 RIGHT OF WAY (NEED 4WD VEHICLE)

DACW43-82-D-0011 1-2848-35

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES. NEW LOCATION

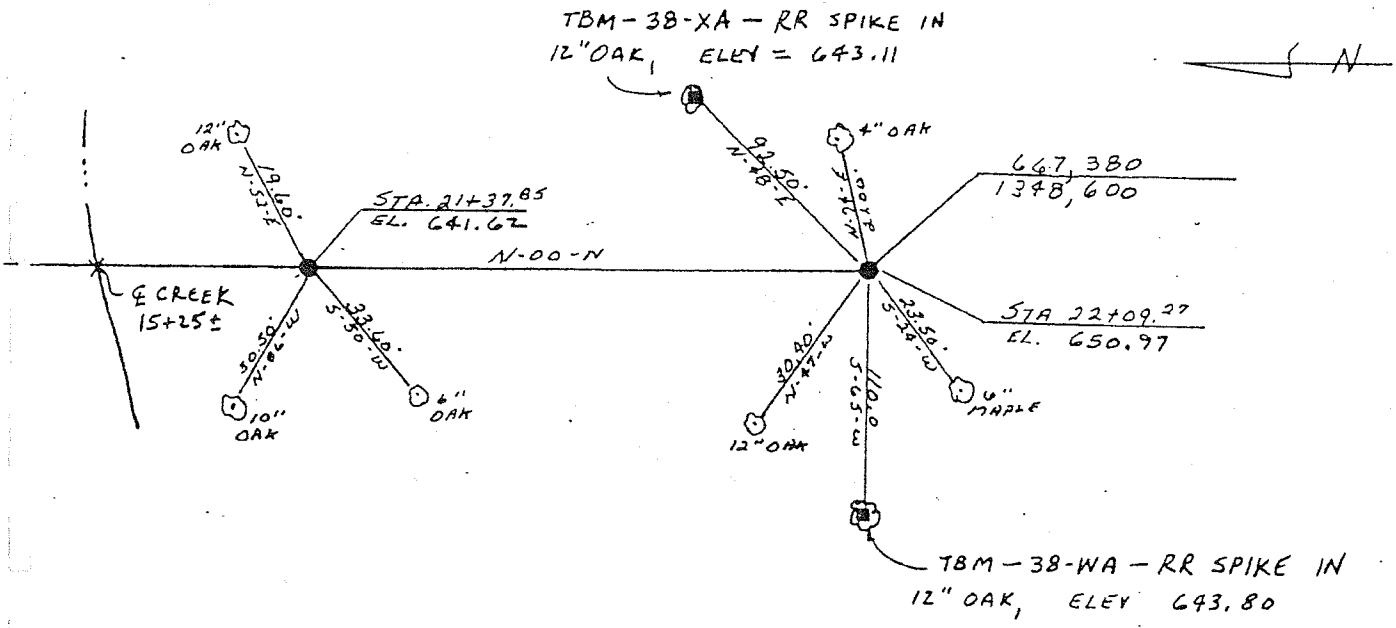
RANGE NO. SR-38B BY: J. CAIN DATE: 5-11-83

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 50
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECTION OF A COUNTY RD. + HWY 24 (1.5 MILES EAST OF LOUISIANA) GO TO 1ST GRAVEL RT. + GO TO BRIDGE ON DALE BRANCH CREEK + FOLLOW CREEK ± 2,000 FT. THEN GO EAST ± 300' TO 0+00

TBM — RR SPIKE IN 15" WHITE OAK, ELEV = 654.77



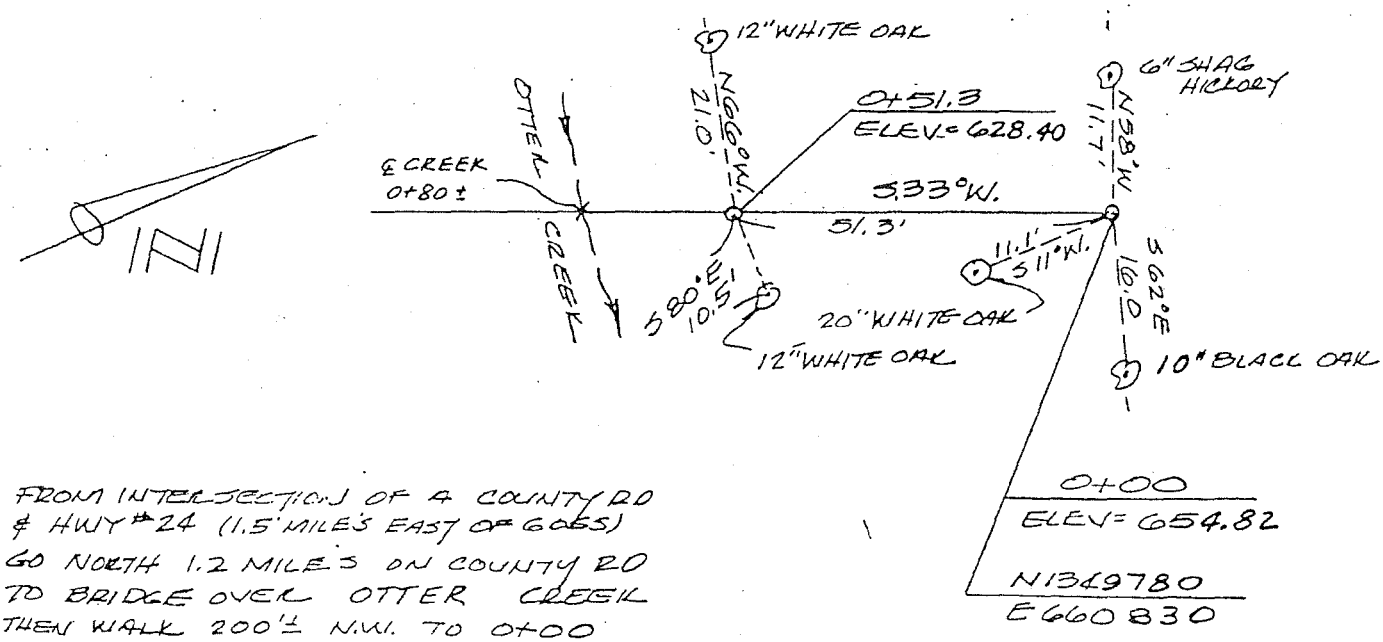
ACCESS GO WEST ON NEW HWY 24 ± 2,000 FT. PAST OTTER CREEK THEN ~~± 1100 FT~~ NORTH TO STA. 22+09 ± 1,600 FT.

KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

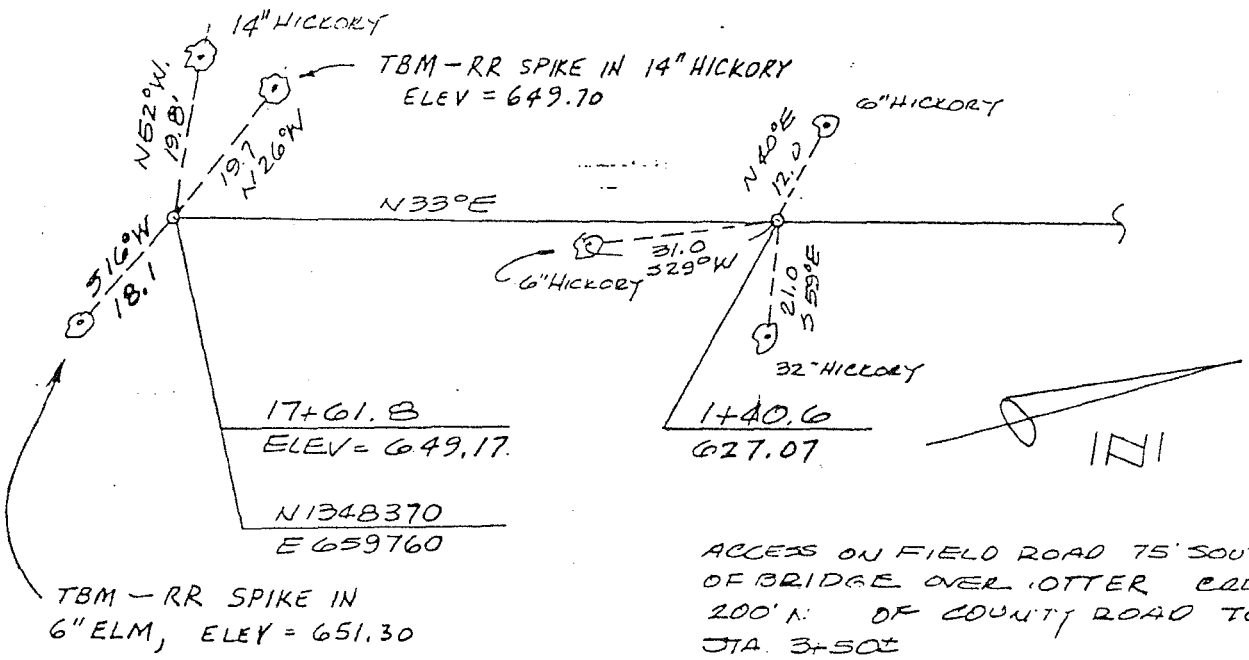
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 39-B BY: GENE BUDDE DATE: 10/9/82

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2 TOPO 50
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECTION OF 4 COUNTY RD & HWY #24 (1.5 MILES EAST OF GOES) GO NORTH 1.2 MILES ON COUNTY RD TO BRIDGE OVER OTTER CREEK THEN WALK 200'± N.W. TO 0+00

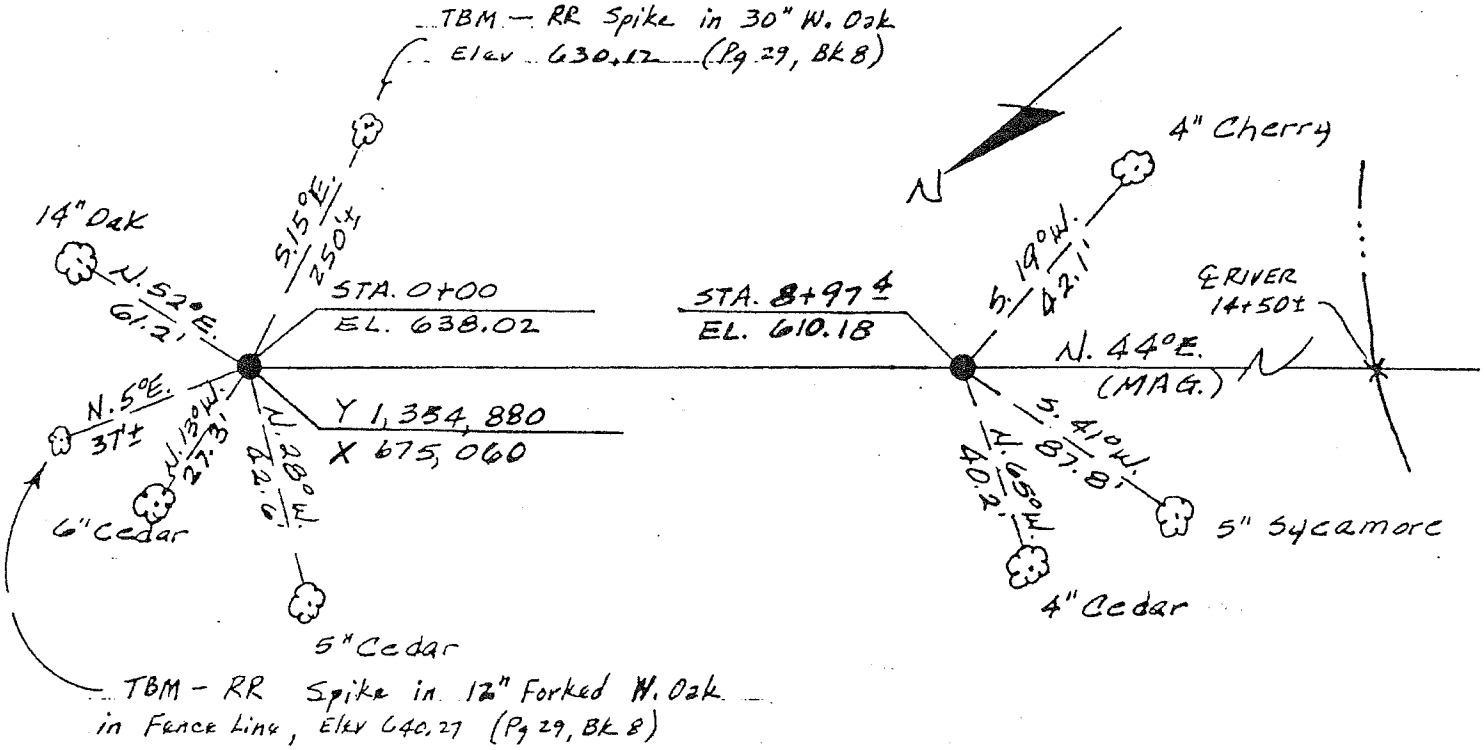


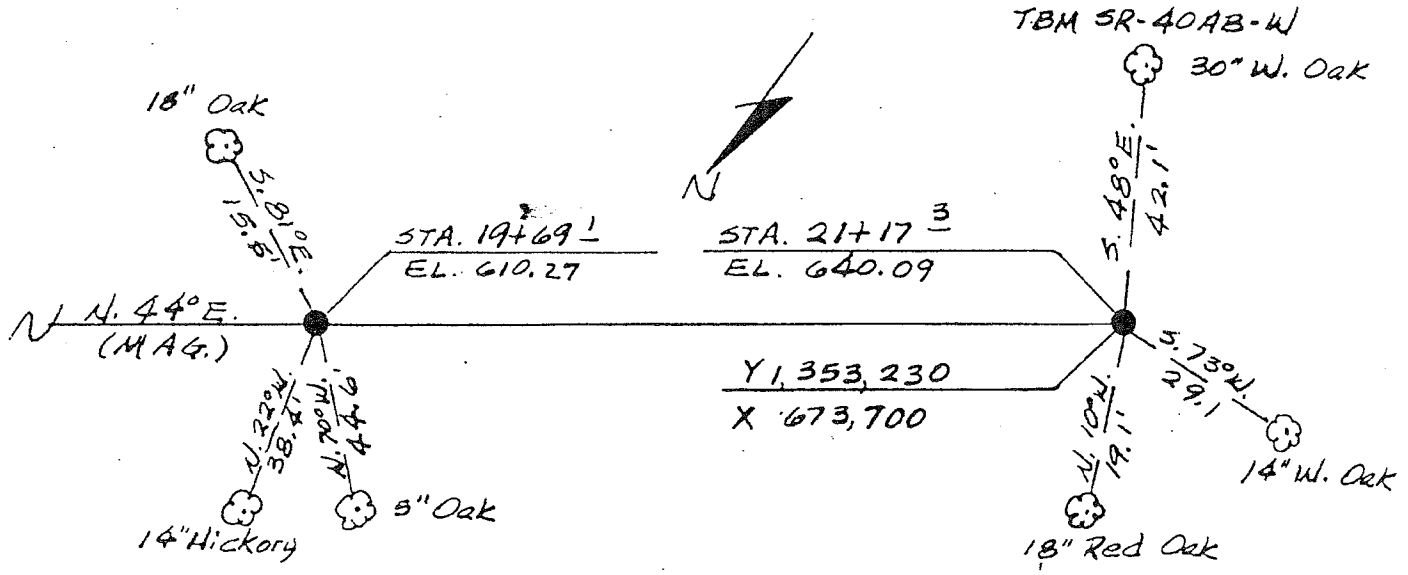
ACCESS ON FIELD ROAD 75' SOUTH OF BRIDGE OVER OTTER CREEK 200' N. OF COUNTY ROAD TO STA. 3+50±

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-40AB BY: Owen Zurowieste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 37
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-40AB BY: Owen Zuroweste DATE: 5/92

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
Take first gravel road, East of intersection of Hwy 24 and North Fork Salt River, North then West across creek 1/4 mi ± to where gravel road turns North. Then North on gravel road 1/4 mi ±. Range 150 ± to West.
Creek floods during heavy rains and lake will back up into creek.

Station 21+17 ±:
From East end of Old Hwy 24 on West side of North Fork of Salt River, pack North 300' ± to Range.

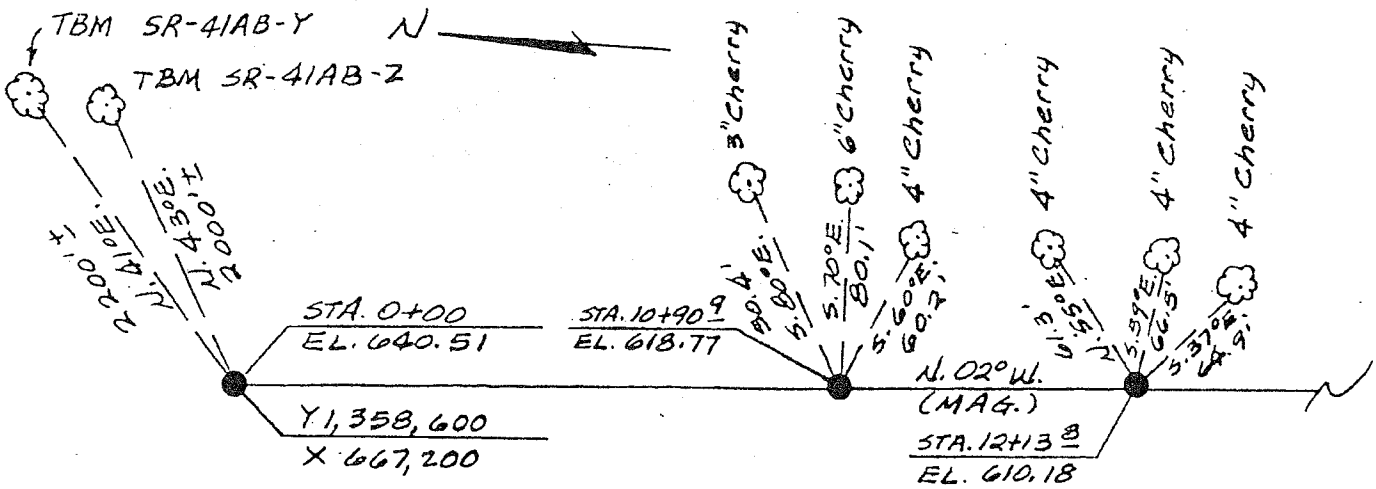
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

ORIGINAL

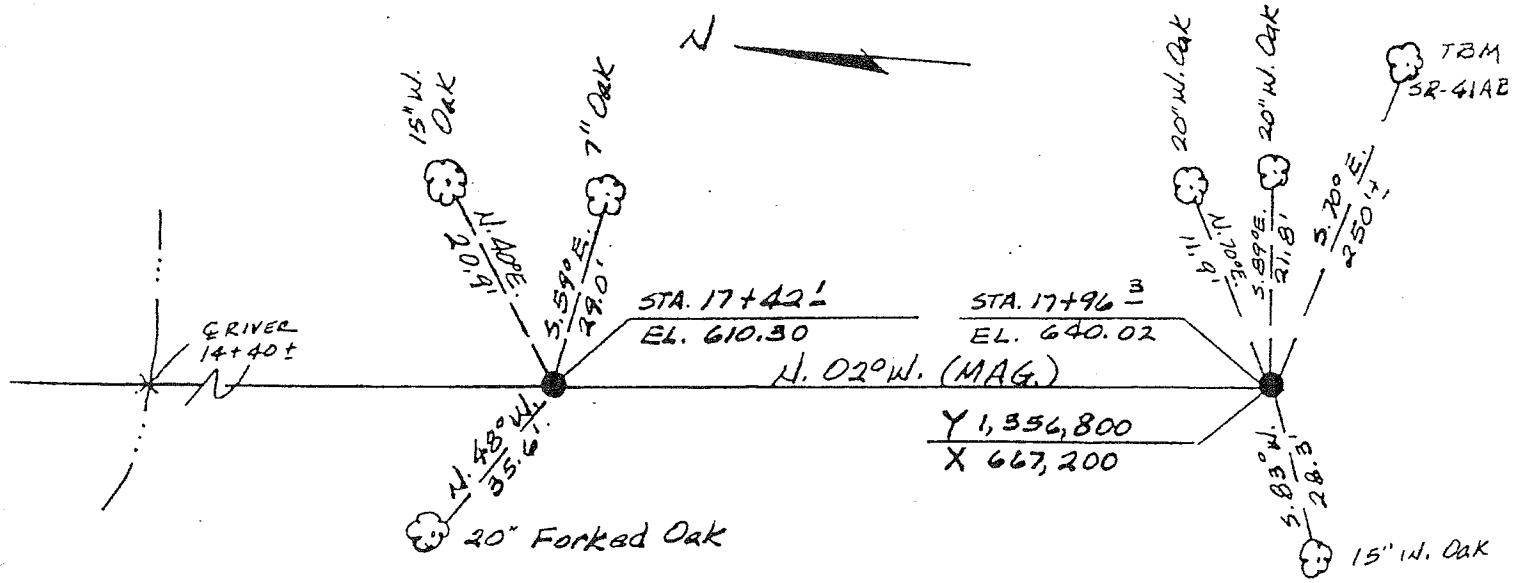
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-41AB BY: Owen Zuroweste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 49.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



No references available within 300'± for point 0+00 (Mon in cultivated field, may be knocked-out)



CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-41AB BY: Owen Zurowieste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

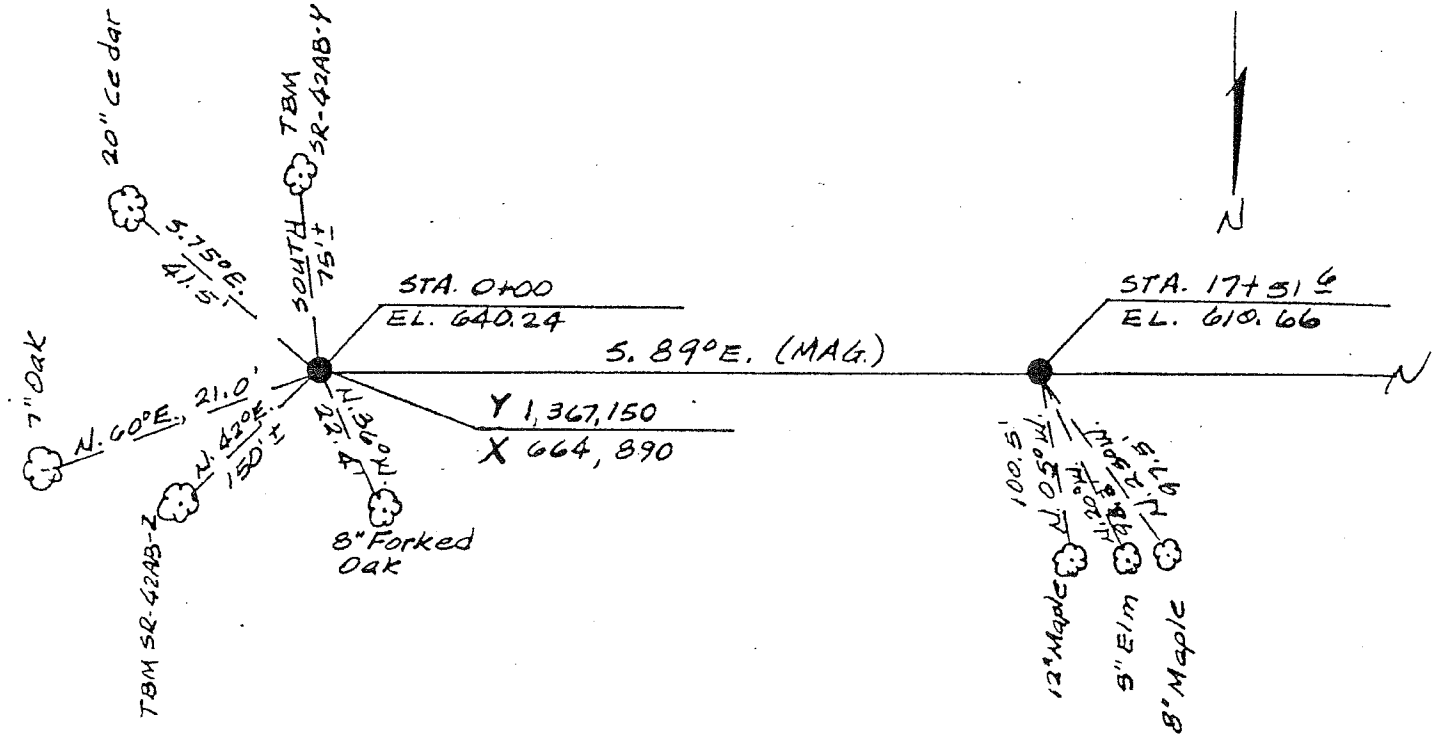
Station 0+00:
From intersection of Hwy 24 and Hwy V, travel North on Hwy V 2 mi ± to gravel road on left. Then West on gravel road 2 mi ± to "T" intersection of gravel roads. Then South on gravel road ½ mi ± to field road at end of gravel road. Then South-West on field past pond to West. Then pack South 500' ± to Range.
Field road continues around to cross Range 400' ± North of North Fork Salt River.

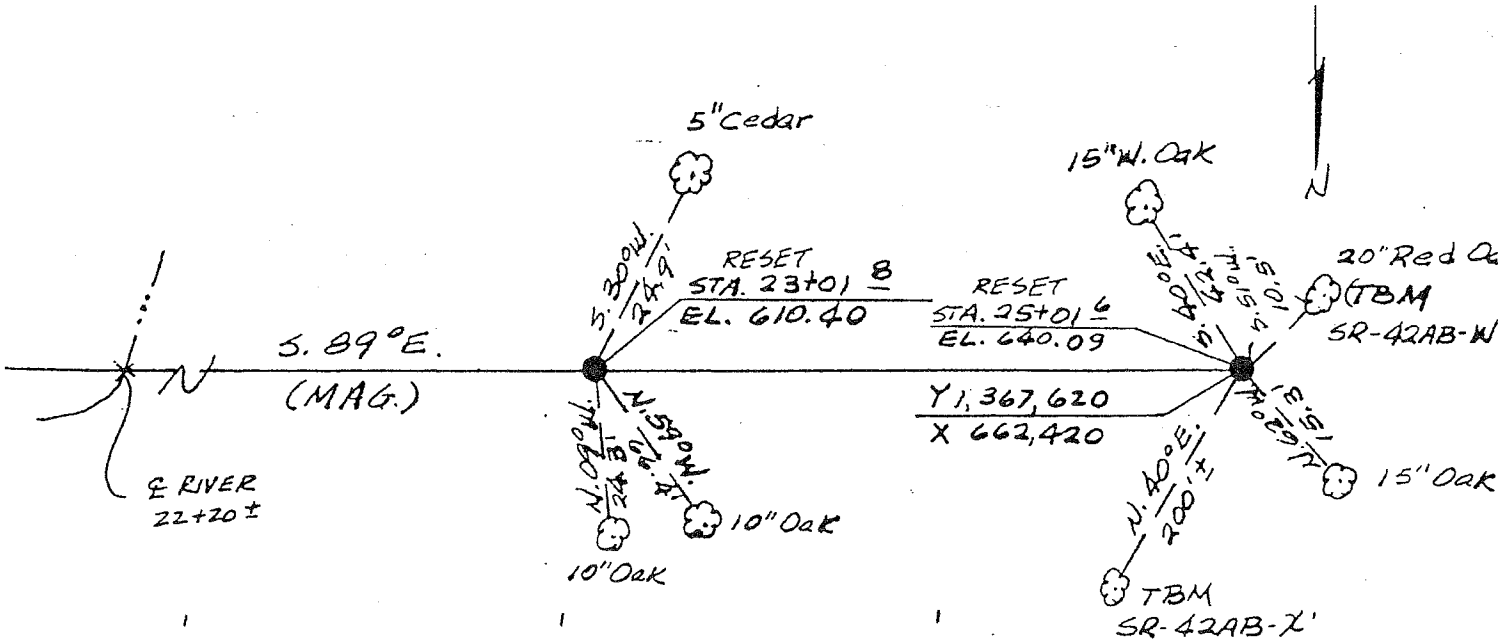
Station 17+29 ±:
From where field road crosses Range 400' ± North of River (see description above), pack West 500' ± where River is 2-3' deep during normal stage, then 500' ± East to Range.

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-42AB BY: Owen Zurowcste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 48
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-42AB BY: Owen Zuromiste DATE: 5/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

Station 0+00:
From intersection of Hwy 24 and Hwy. V, travel North on Hwy V 2 mi± to gravel road on left. Then West on gravel road 2 mi± to "T" intersection of gravel roads. Then North on gravel road 3/4 mi± to first farm on left. Stop here and talk to Mr. Lillie for permission and key to cross private property. Then North-West on old road through pasture and woods to toe of slope of hill. Range is 50'± North.
Road through pasture and woods passable only with 4WD during wet weather.

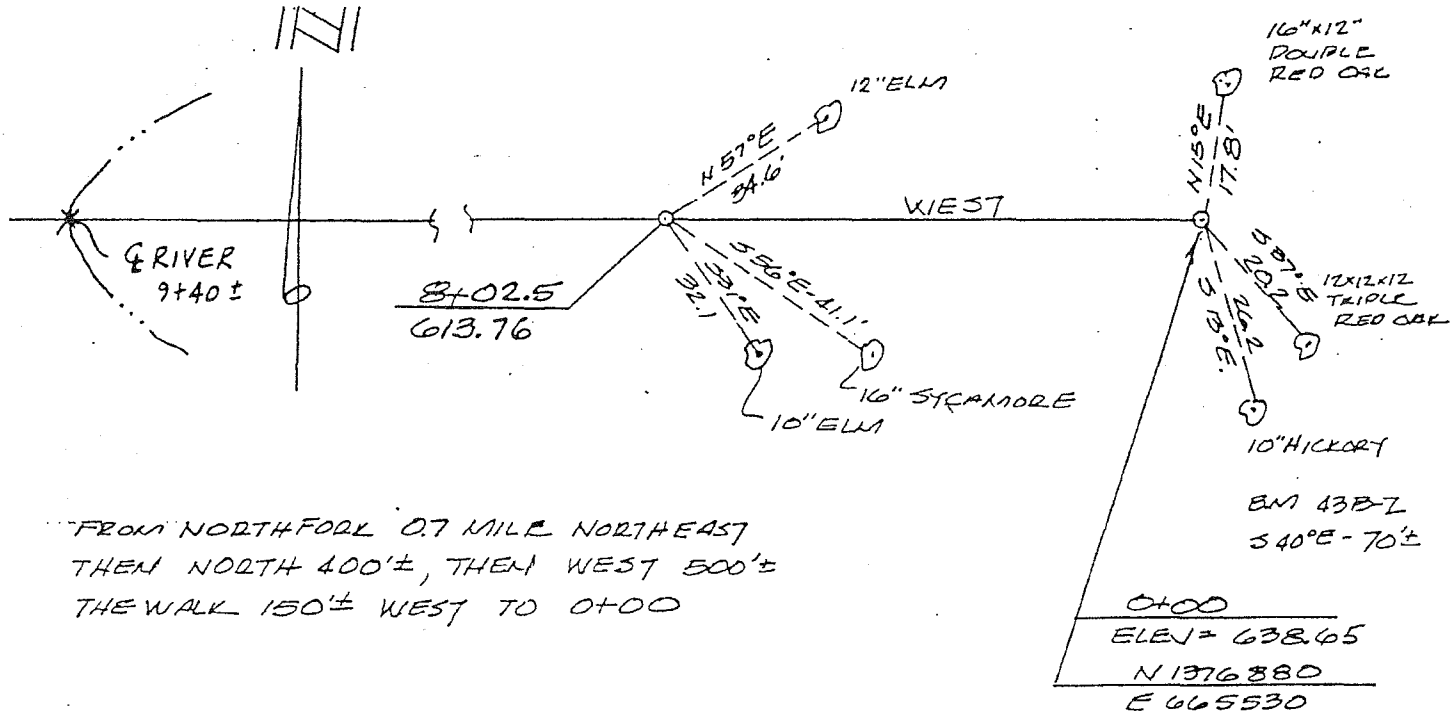
Station 2+70±:
From 0+00 (see above description) drive or pack west during wet weather 1/4 mi± to East bank of North Fork Salt River. Then pack North-East 700'± along River to where it is 5'± deep during normal stage. Then pack South West 700'± to Range.

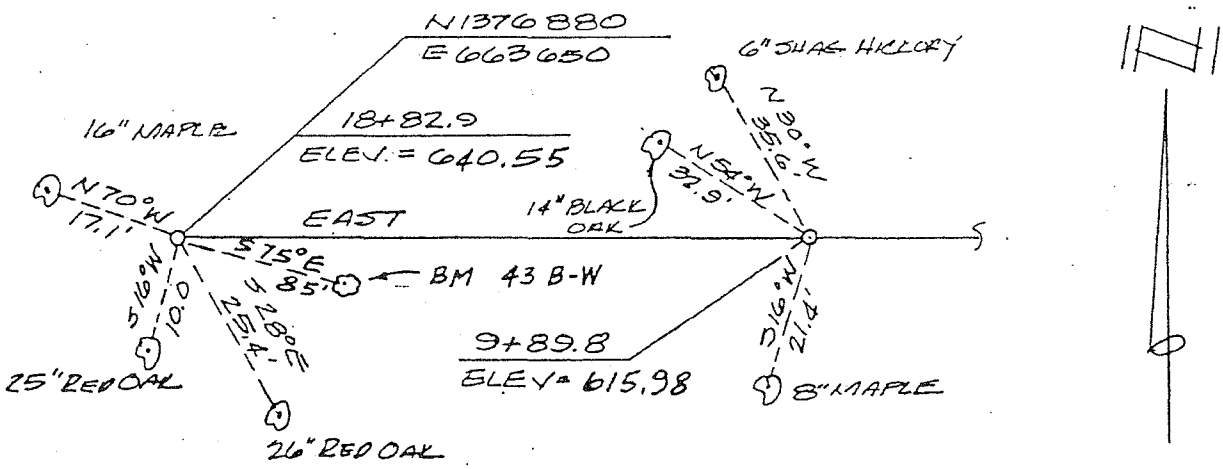
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 43B BY: GENE BUDDE DATE: 10/6/82

TOPO 47

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





ACCESS 100' ± EAST OF THE N.E. CORNER OF THE CEMETARY AT THE N.E. CORNER OF NORTH FORK

ORIGINAL

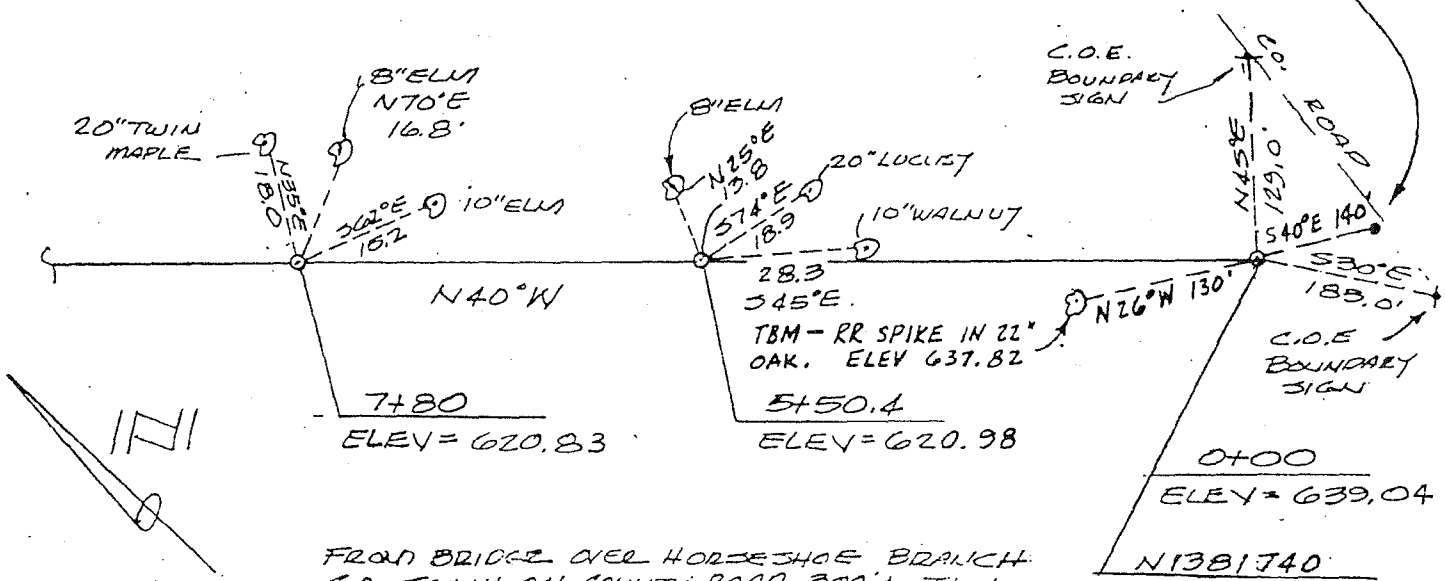
DACW43-82-D-0011 1-2757-22.18-S

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

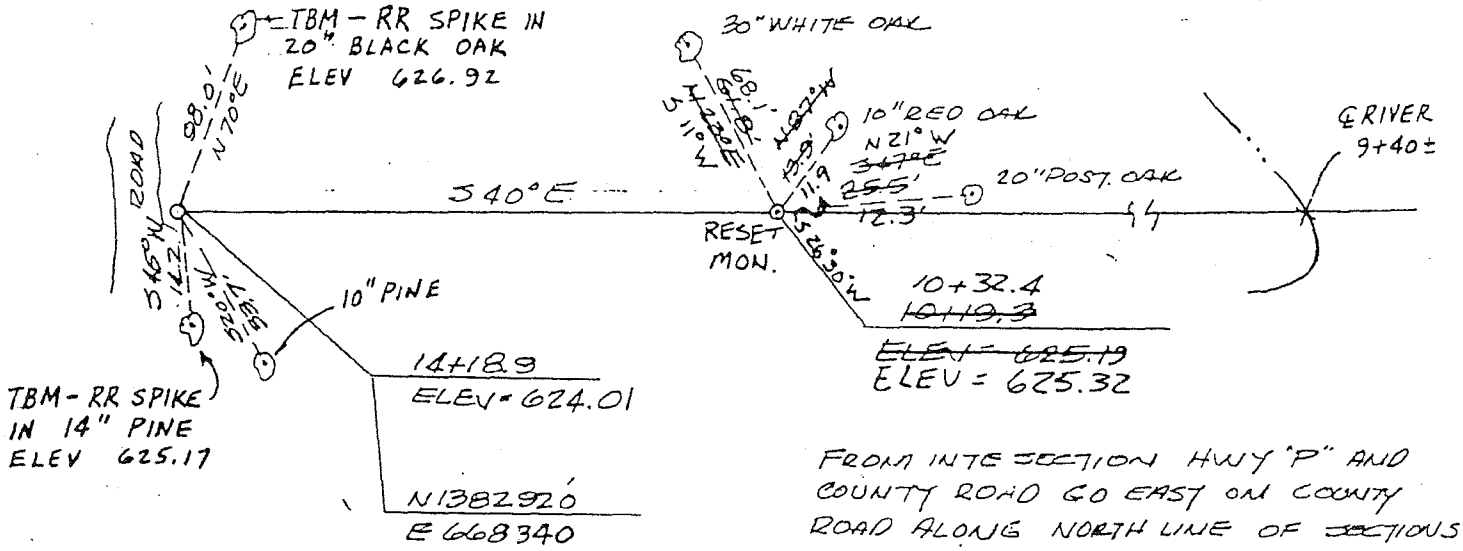
RANGE NO. 44-B BY: GENE BIDDE DATE: 10/6/82

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.

TOPO 46, 47
TBM - RR SPIKE IN PP
ELEV 645.04



FROM BRIDGE OVER HORSESHOE BRANCH GO SOUTH ON COUNTY ROAD 300'± THEN WALK 150'± WEST TO 0+00



FROM INTERSECTION HWY "P" AND COUNTY ROAD GO EAST ON COUNTY ROAD ALONG NORTH LINE OF SECTIONS 29, 28 & 27 T46N, R9W 1.2 MILES TO 14+18.9

NOTE - RANGE NOT EXTENDED NORTH TO 640 ELEV DUE TO UNFRIENDLY LANDOWNER.

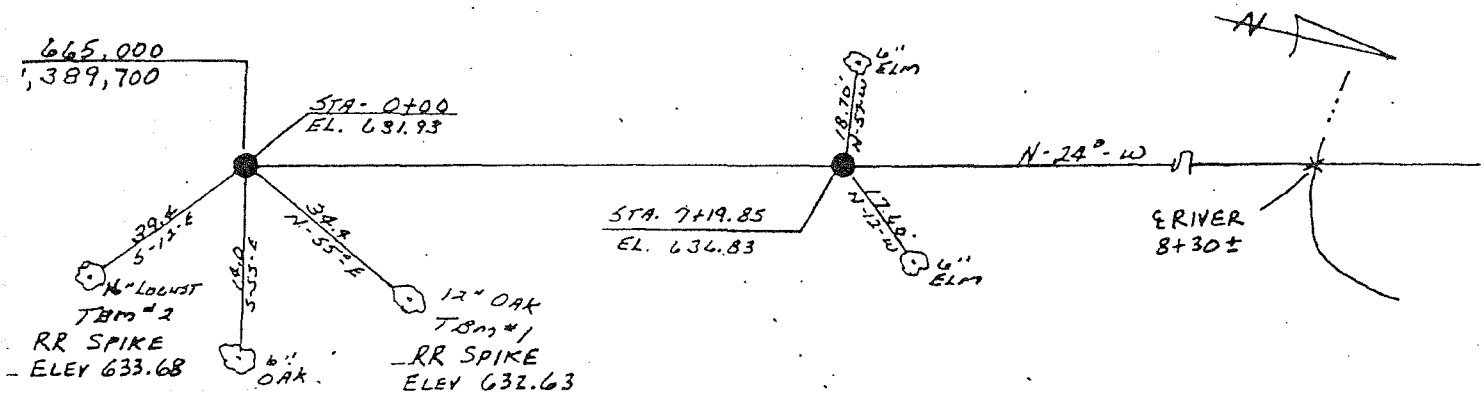
DACW43-82-D-0011 i-2848-22.35

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

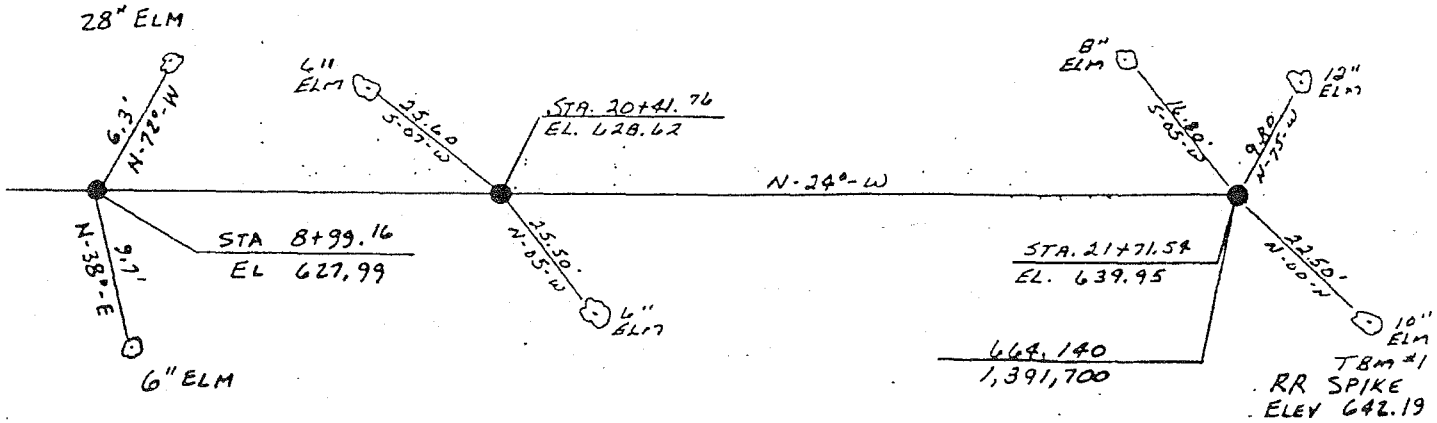
RANGE NO. SR-45-B BY: J. CAIN DATE: 5-5-83

TOPO 46

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1.
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



GO 3.3 MI. N. OF "FF" RD. ON GRAVEL RD. N.W. COR. SEC. 15 TO HOME OF A.L. SCHIRDMACHER ~~AS HOME~~ THEN W. ON FLD. RD. ± 3300' FT. THEN S.W. 2,500' FT. TO 0+00



ACCESS FROM 0+00

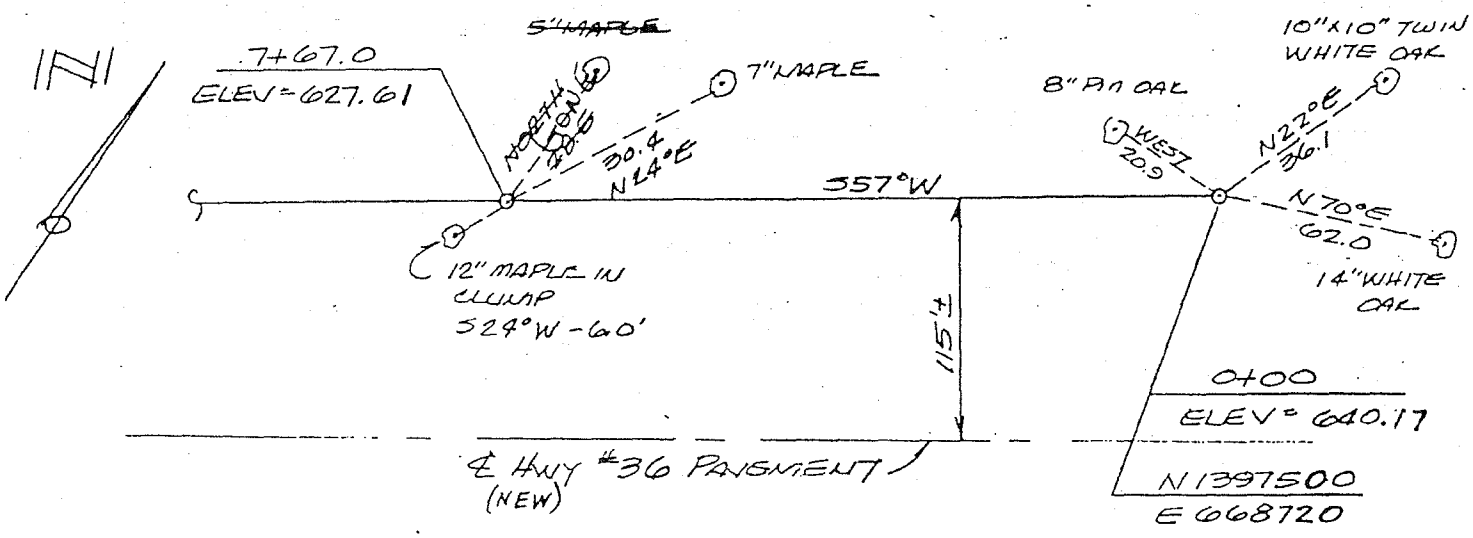
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

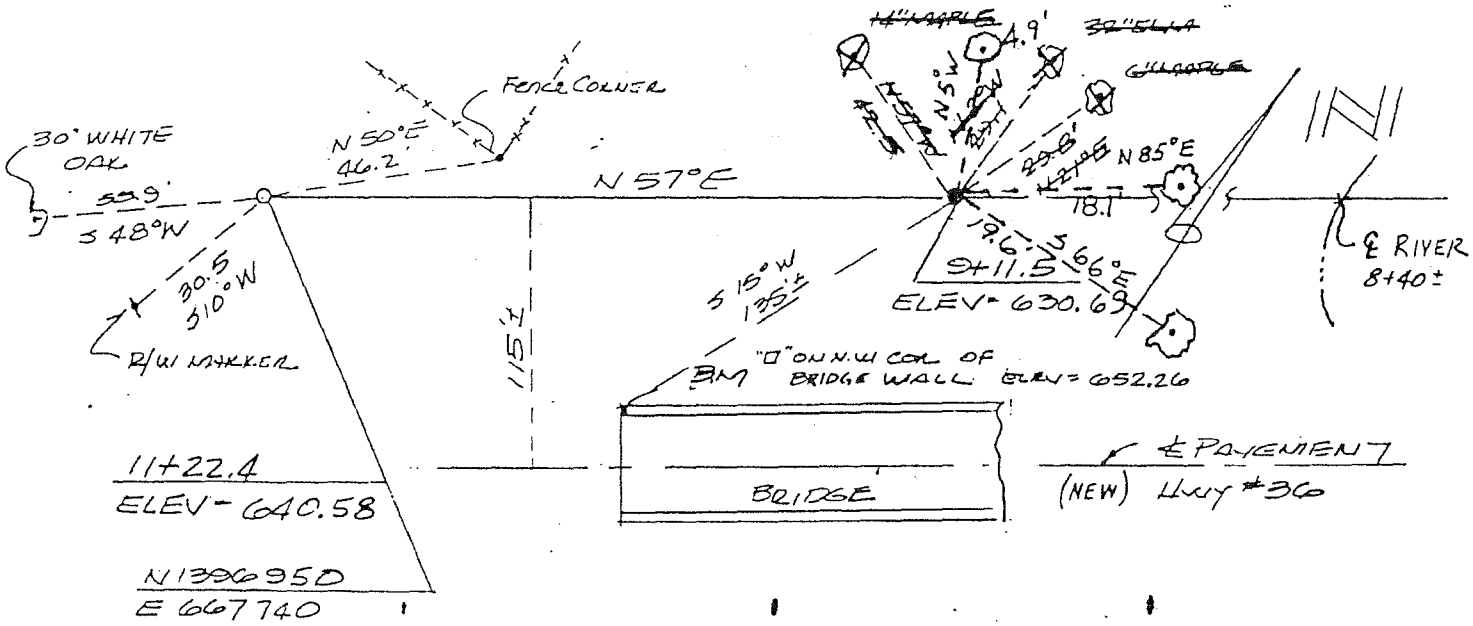
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 46-B BY: GENE BUDDE DATE: 10/6/82

TOPO 45

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.





KENNETH BALK AND ASSOCIATES, ST. LOUIS. MO. SHEET NO

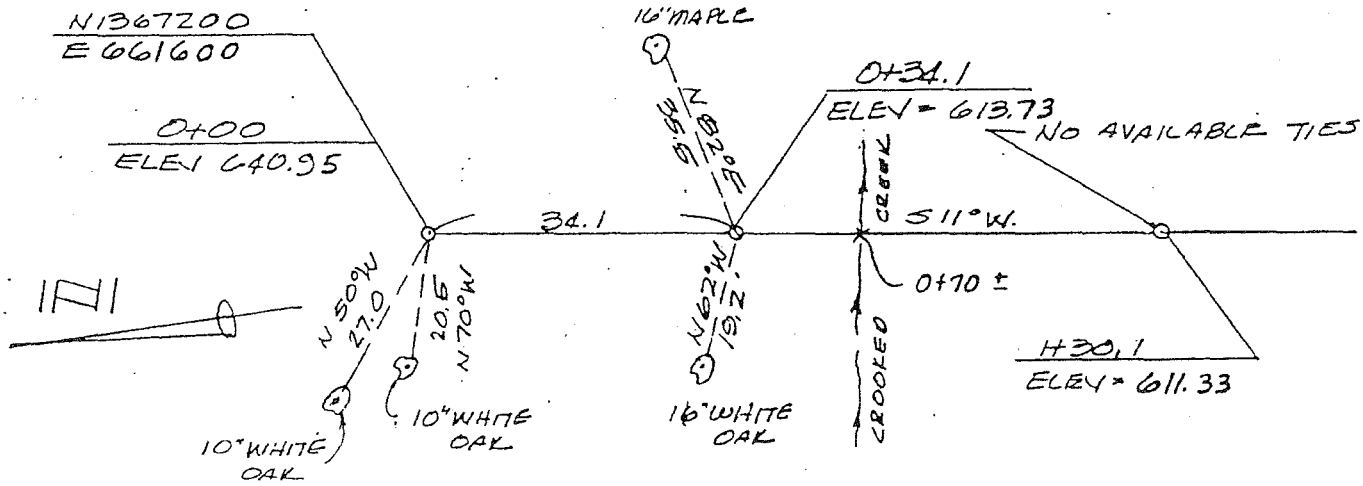
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

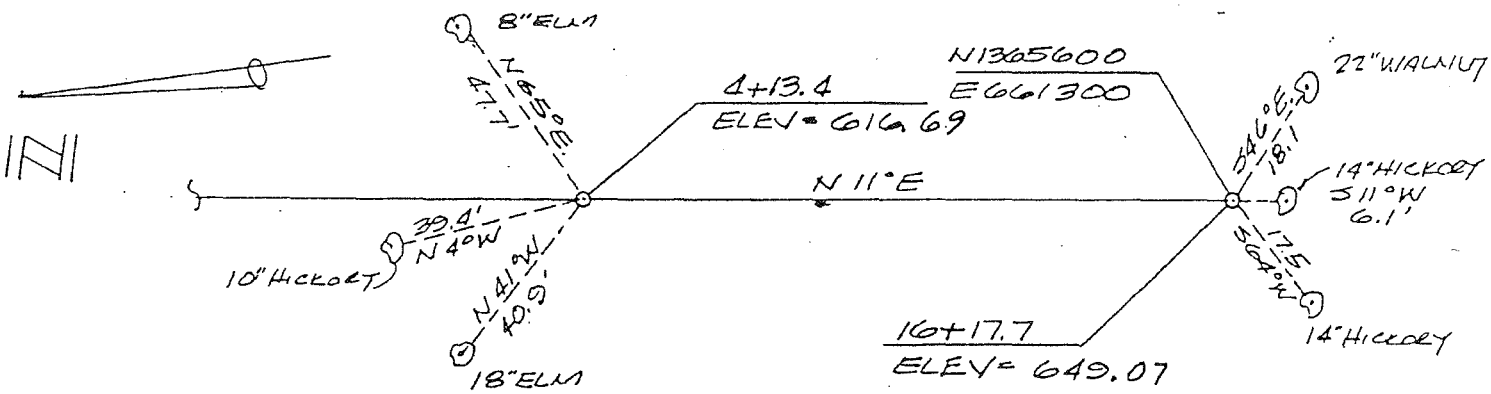
RANGE NO. 47-B BY: GENE BUDDE DATE: 10/9/82

TOPO 48

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM HERBERT HUNTER PROPERTY GO SOUTH 0.7 MILE TO FENCE @ C.O.E ℄ THEN WALK 1700'± TO 0+00 4WD VEHICLE NEEDED



ACCESS IS FROM NORTH END OF RANGE (0+00)

B.M. SR 47 B-W
LOCATED FROM 16+17.7
S 59° E - 280'

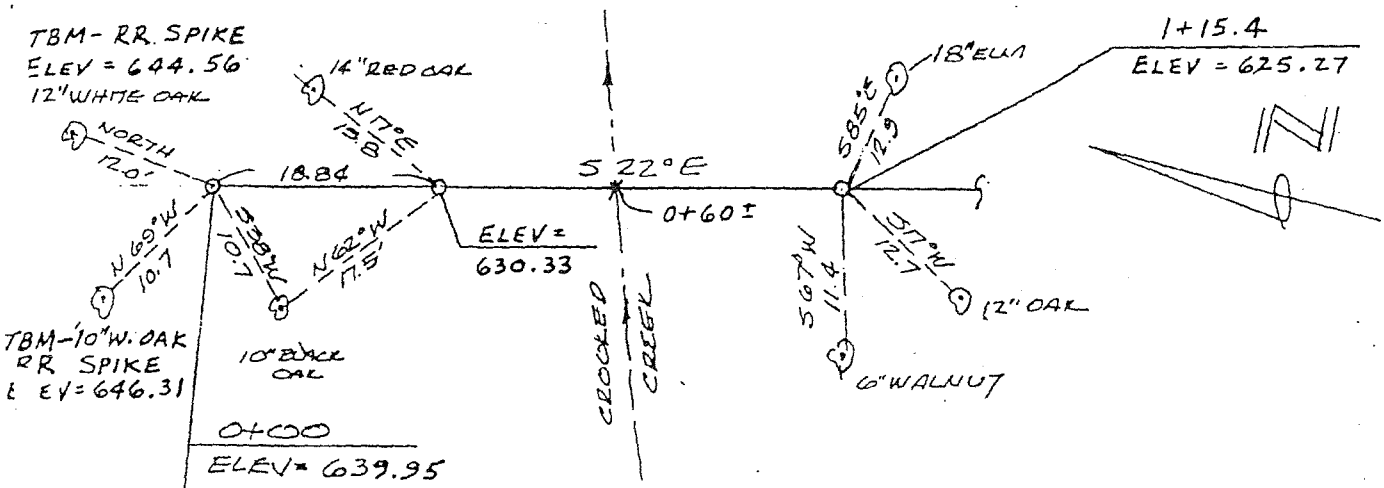
ORIGINAL

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

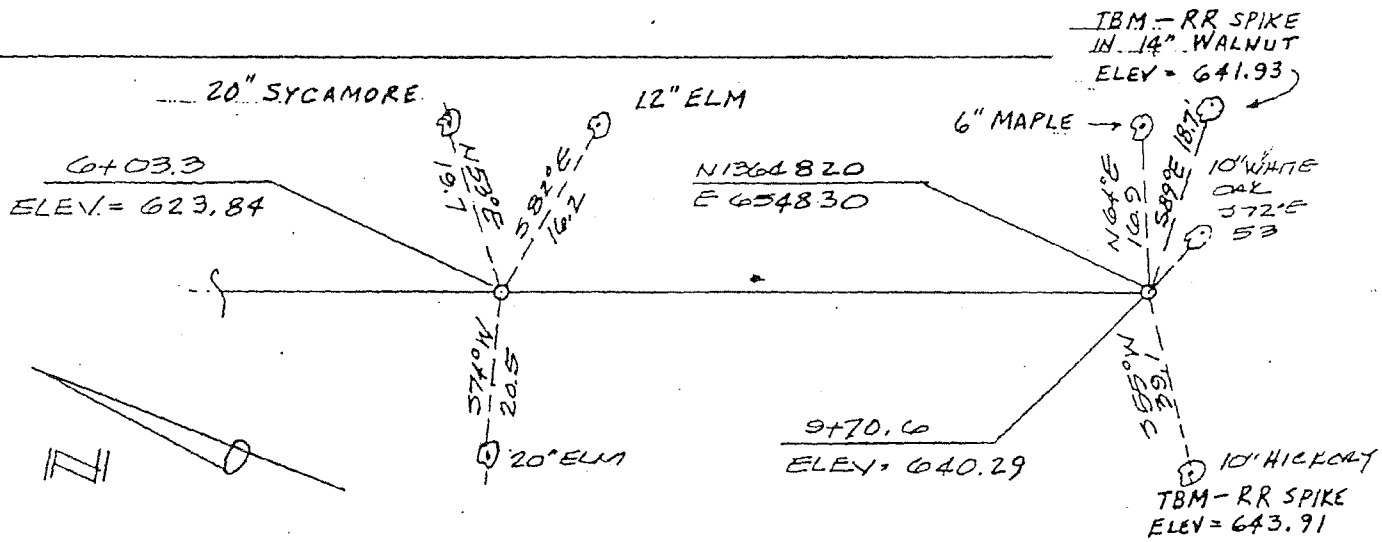
RANGE NO. 48-B BY: GENE BUDDE DATE: 10/6/82

TOPO 57

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR G-2
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECT OF A COUNTY RD AND THE WEST PROPERTY LINE OF DONALD DODGE PROPERTY GO SOUTH ALONG DONALD DODGE WEST LINE 1.0 MILE THEN WALK 300' EAST TO 0+00 - 4WD NEEDED

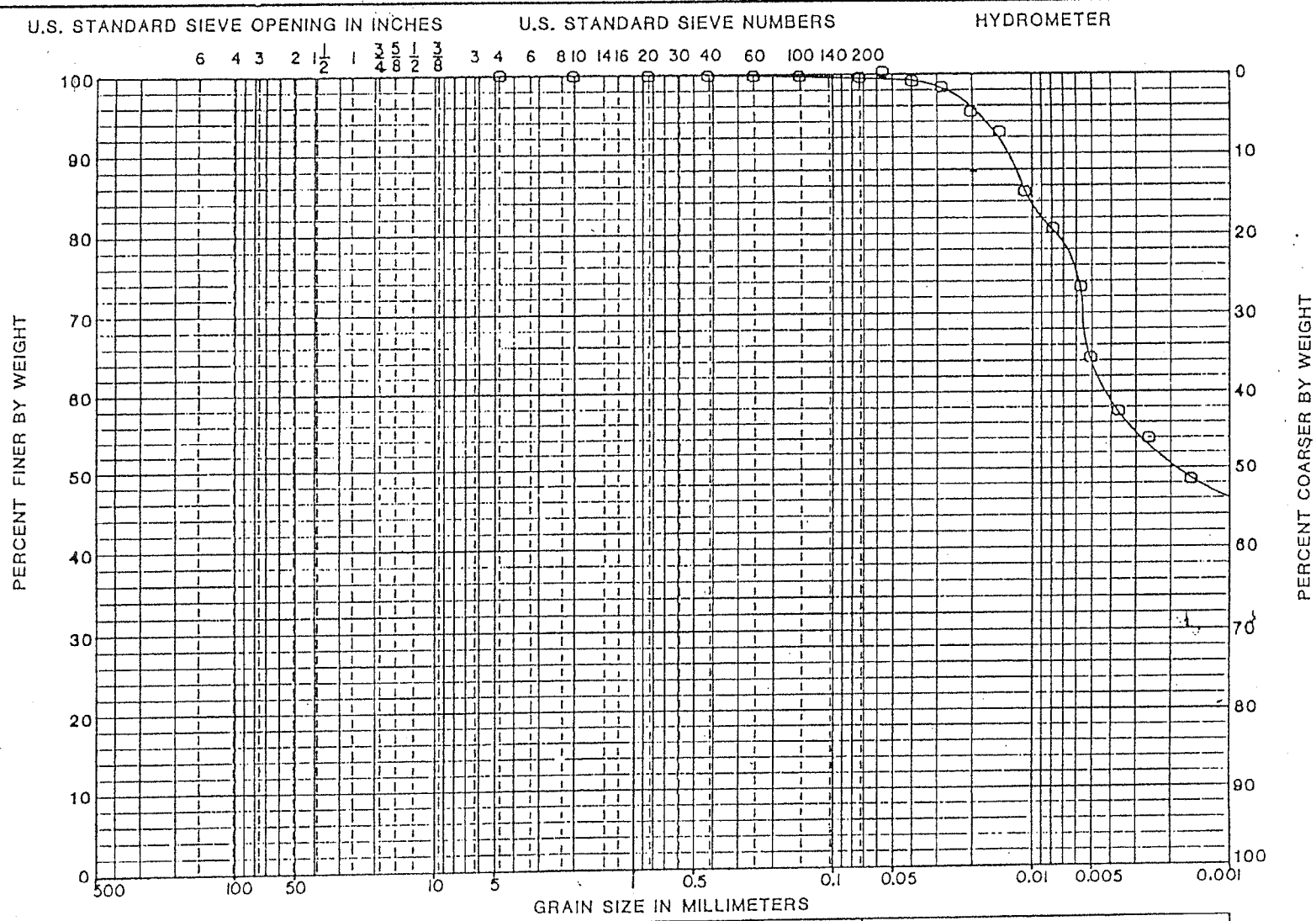


ACCESS IS FROM NORTH END OF RANGE

ORIGINAL

APPENDIX B

GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT EM		Gray CLAY	153.3			
		Dry Weight = 27.9 pcf				

PROJECT US CORPS OF ENGINEERS

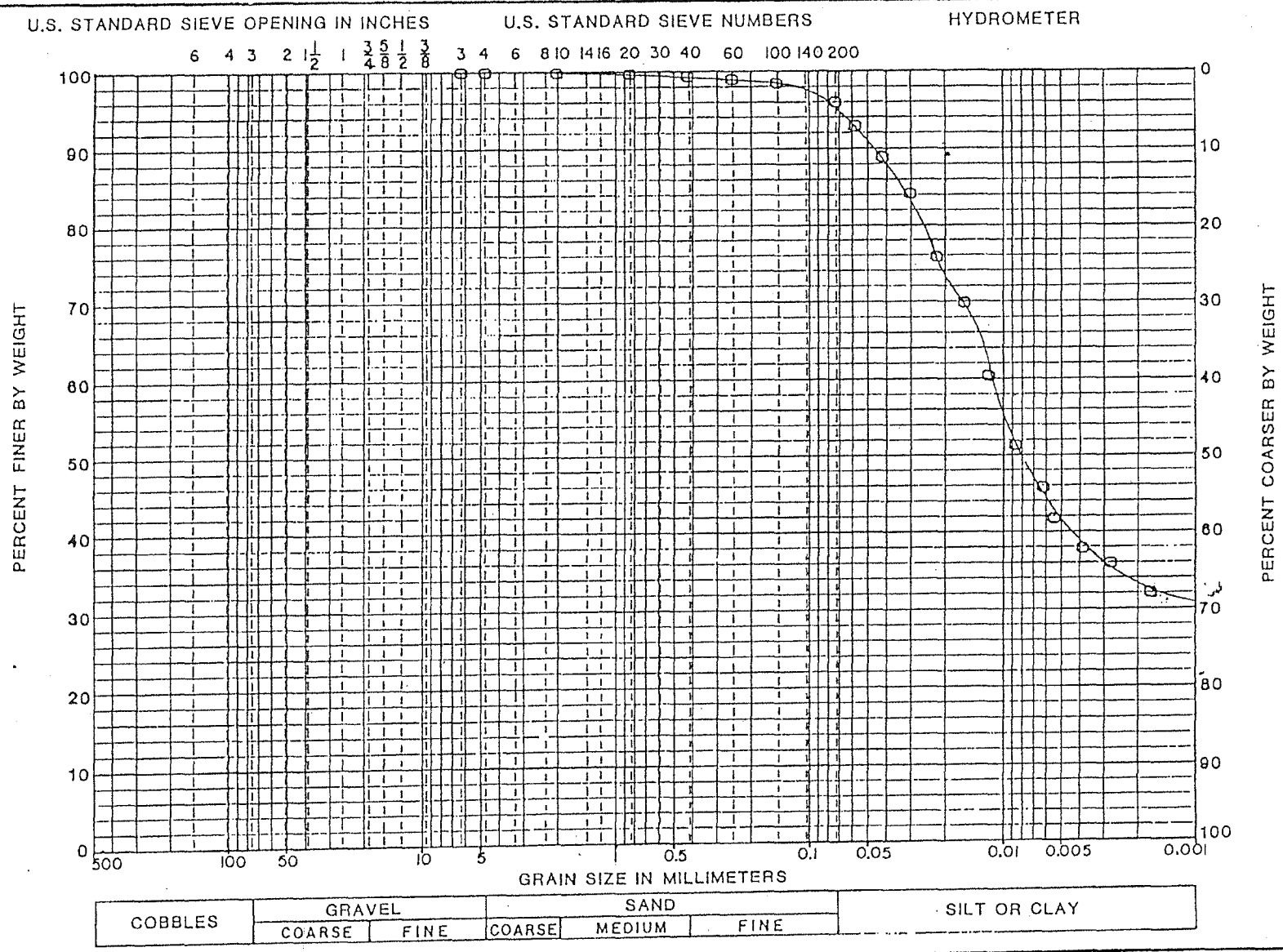
BORING NO.

DATE 6-28-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 57

GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT FF		Brown CLAY, trace sand	73.2			
		Dry Weight = 35.2 pcf				

PROJECT US CORPS OF ENGINEERS

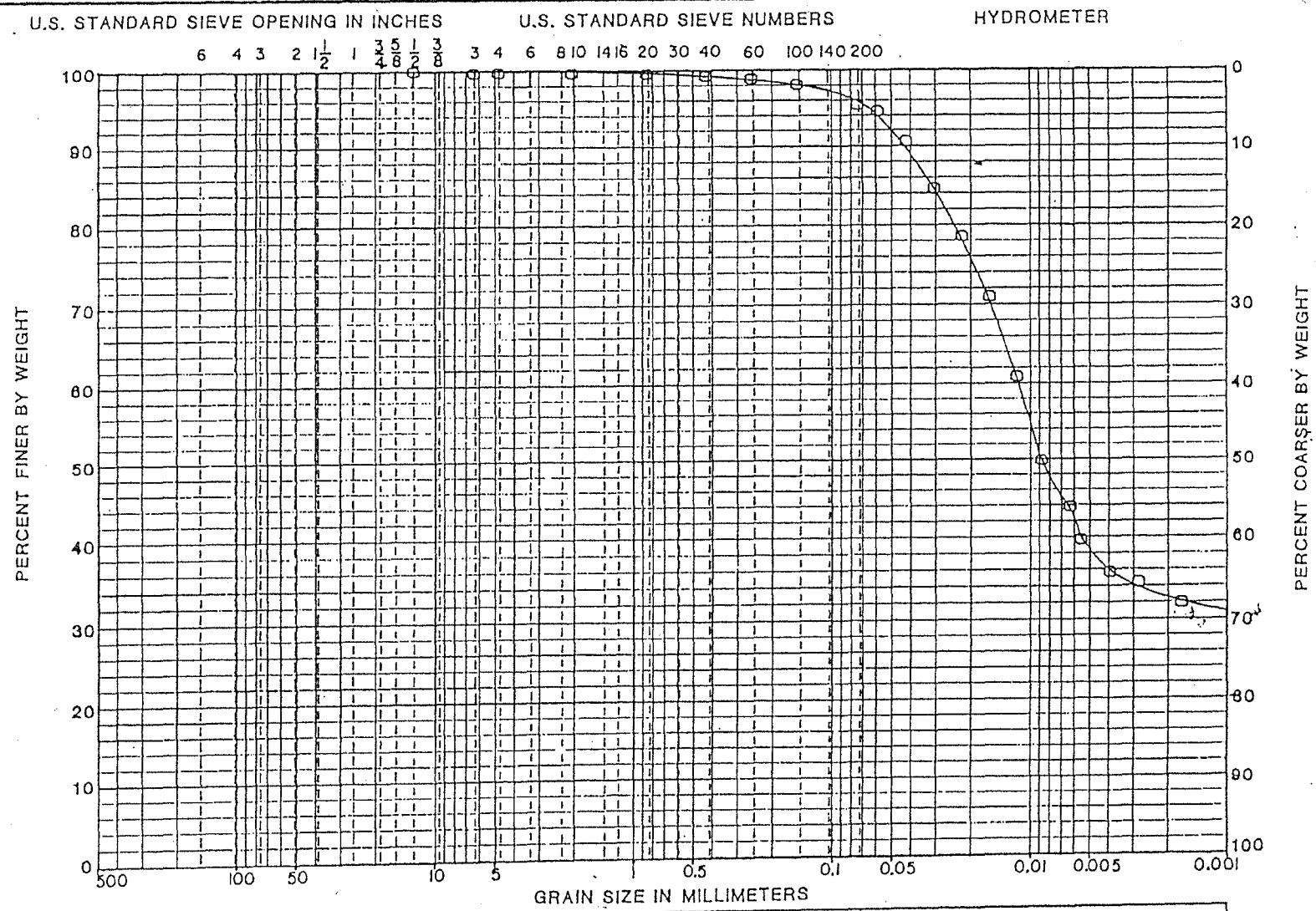
BORING NO.

DATE 6-30-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 58

GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT IC		Gray CLAY, trace sand	110.8			
		Dry Weight = 53.1 pcf				

PROJECT US CORPS OF ENGINEERS

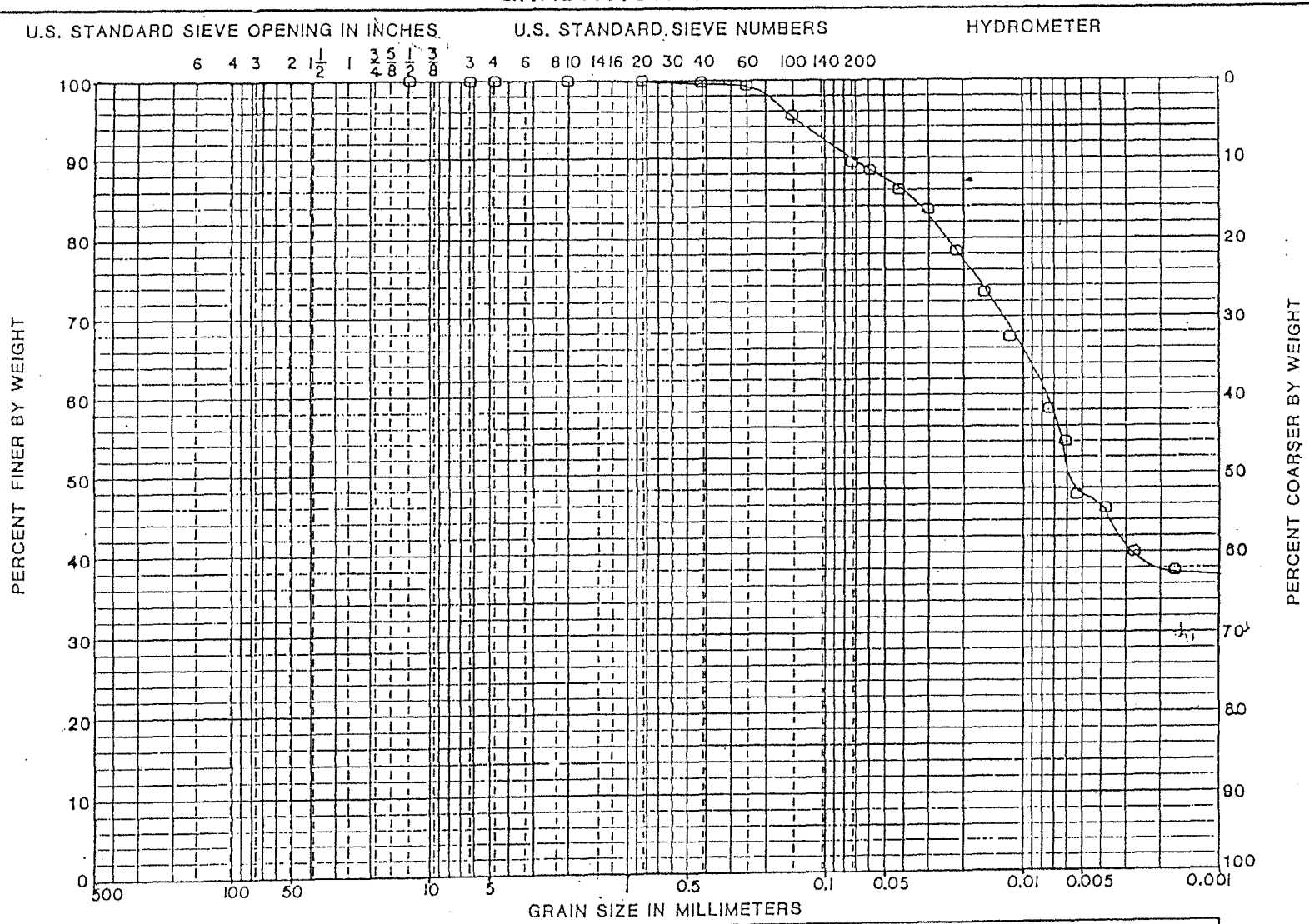
BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 59

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT LC		Gray CLAY, trace sand	104.7			
		Dry Weight = 41.0 pcf				

PROJECT US CORPS OF ENGINEERS

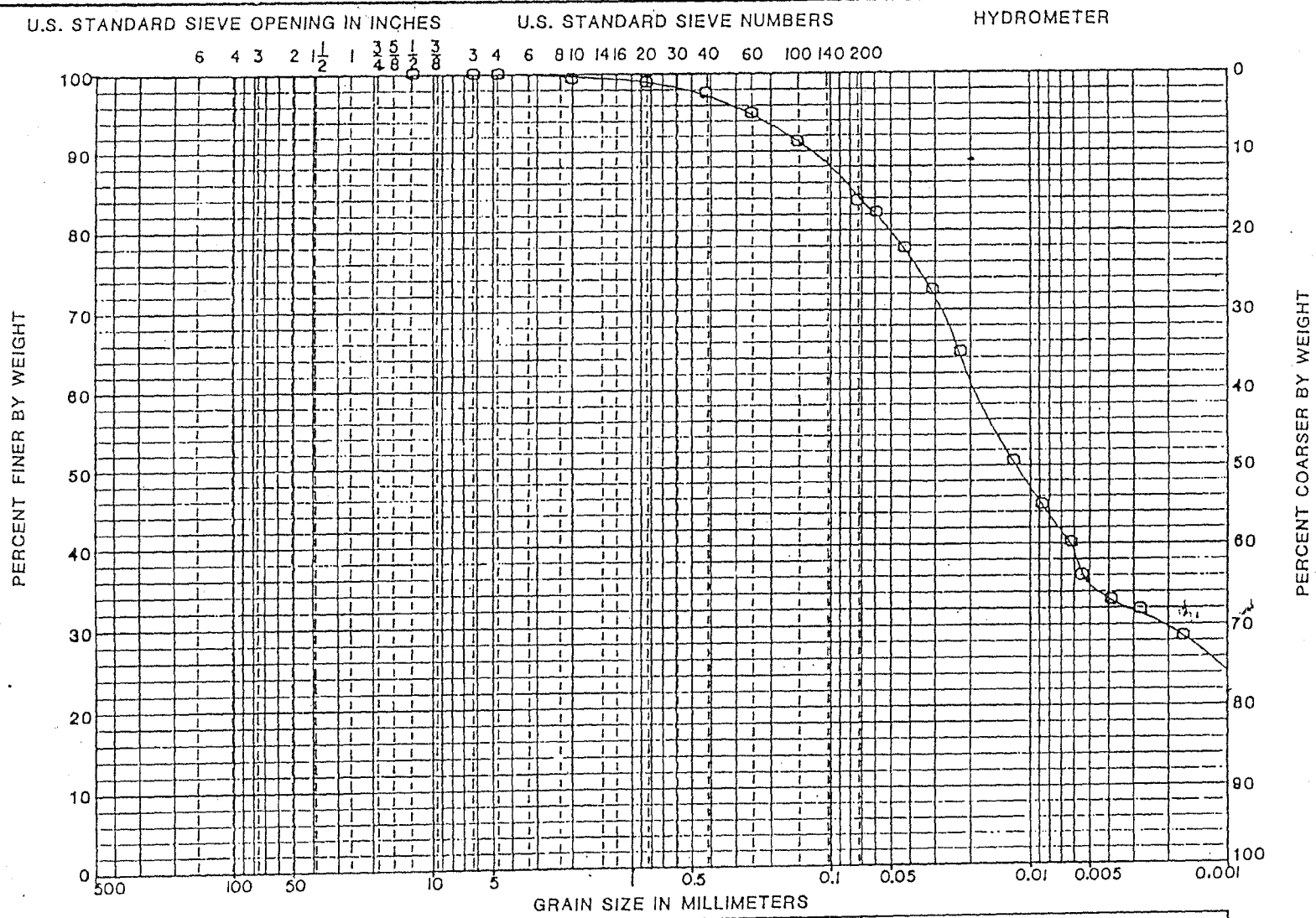
BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 60

GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT LI		Gray CLAY, trace sand	117.4			
		Dry Weight = 38.4 pcf				

PROJECT US CORPS OF ENGINEERS

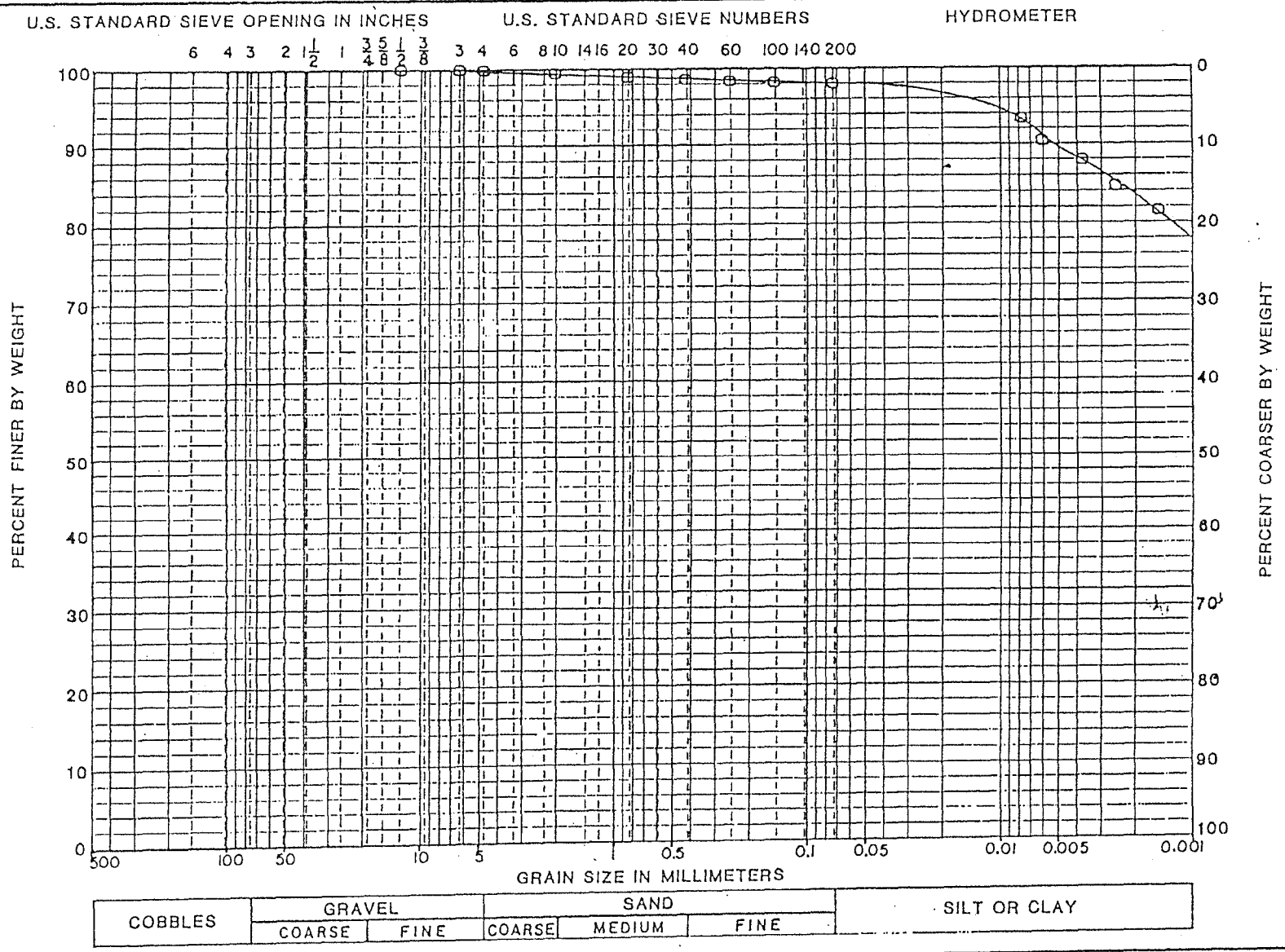
BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 61

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT 22		Gray CLAY with organics	434.5			
		Dry Weight = 12.9 pcf				

PROJECT US CORPS OF ENGINEERS

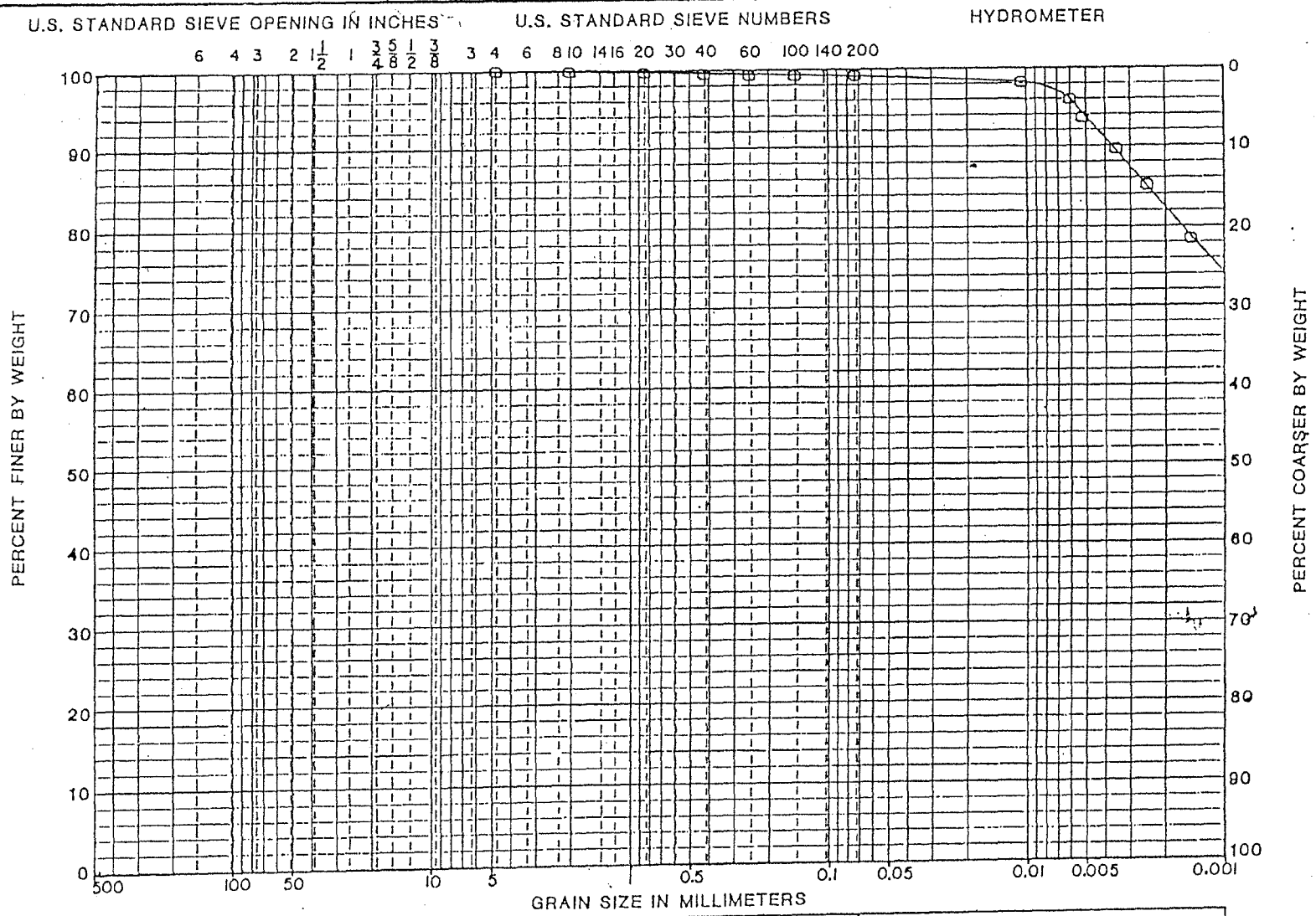
BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 62

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT 33		Gray CLAY	335.4			
		Dry Weight = 16.8 pcf				

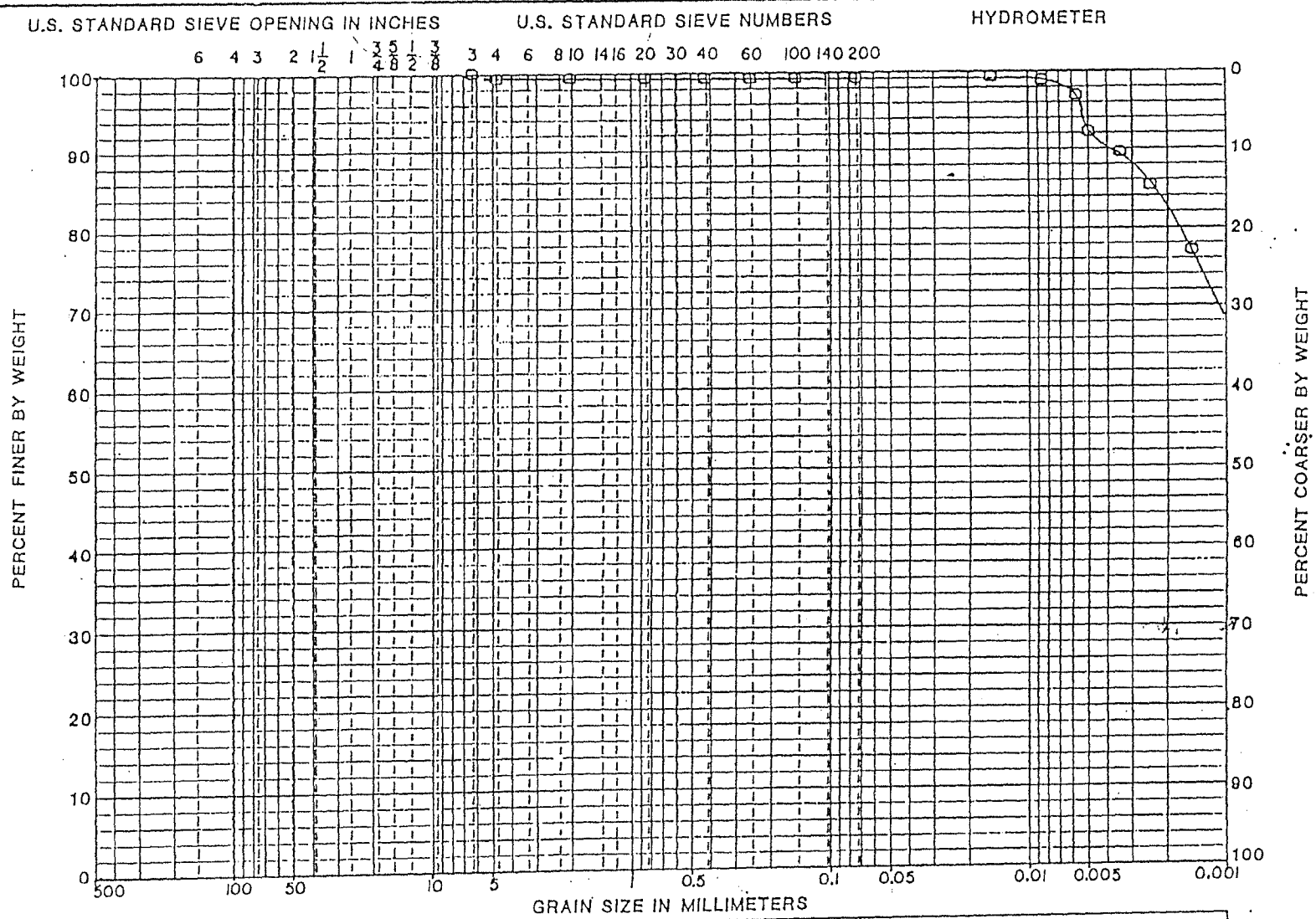
PROJECT US CORPS OF ENGINEERS

BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT 66		Gray CLAY	254.3			
		Dry Weight = 21.0 pcf				

PROJECT US CORPS OF ENGINEERS

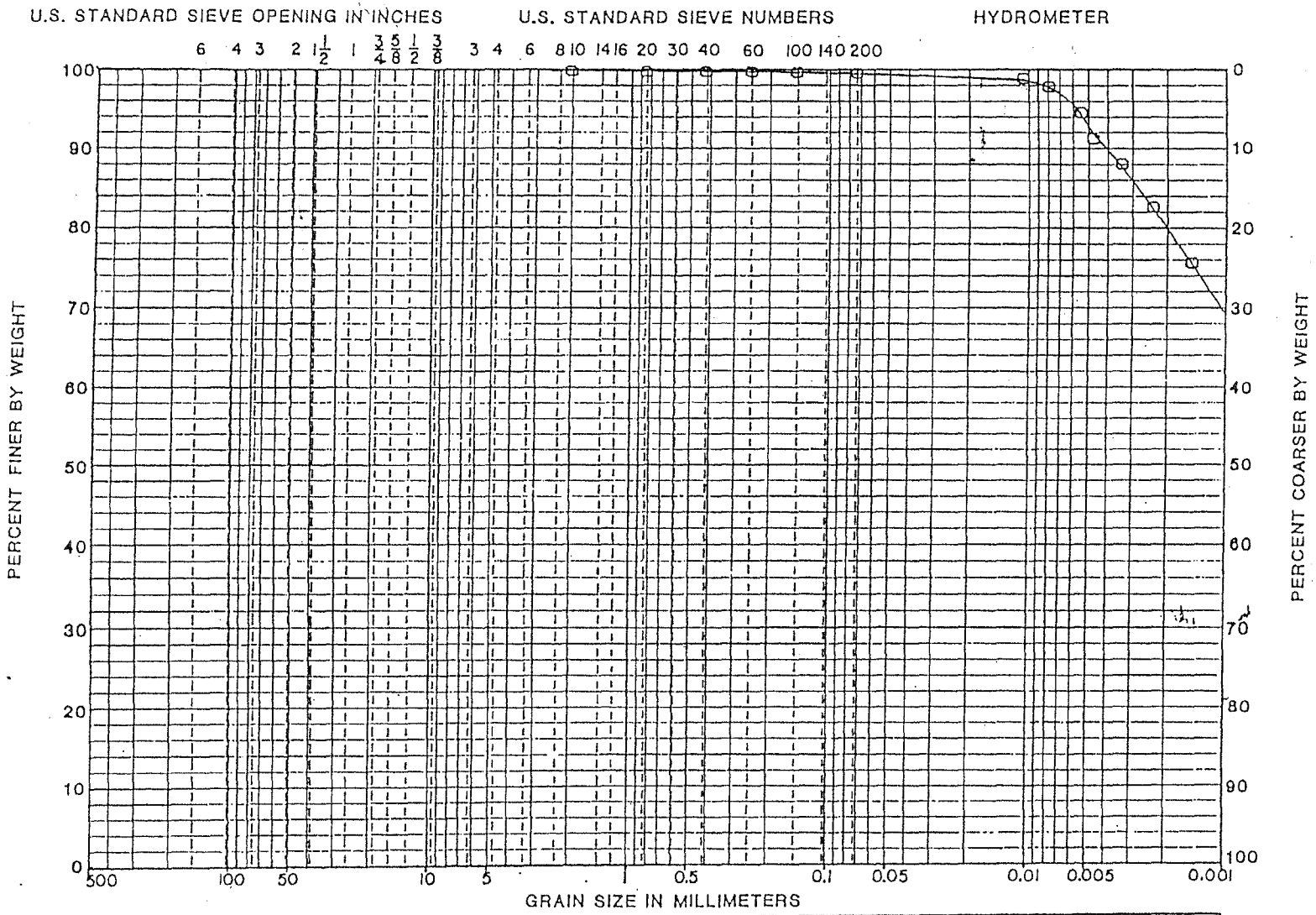
BORING NO.

DATE 6-28-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 64

GRADATION CURVES

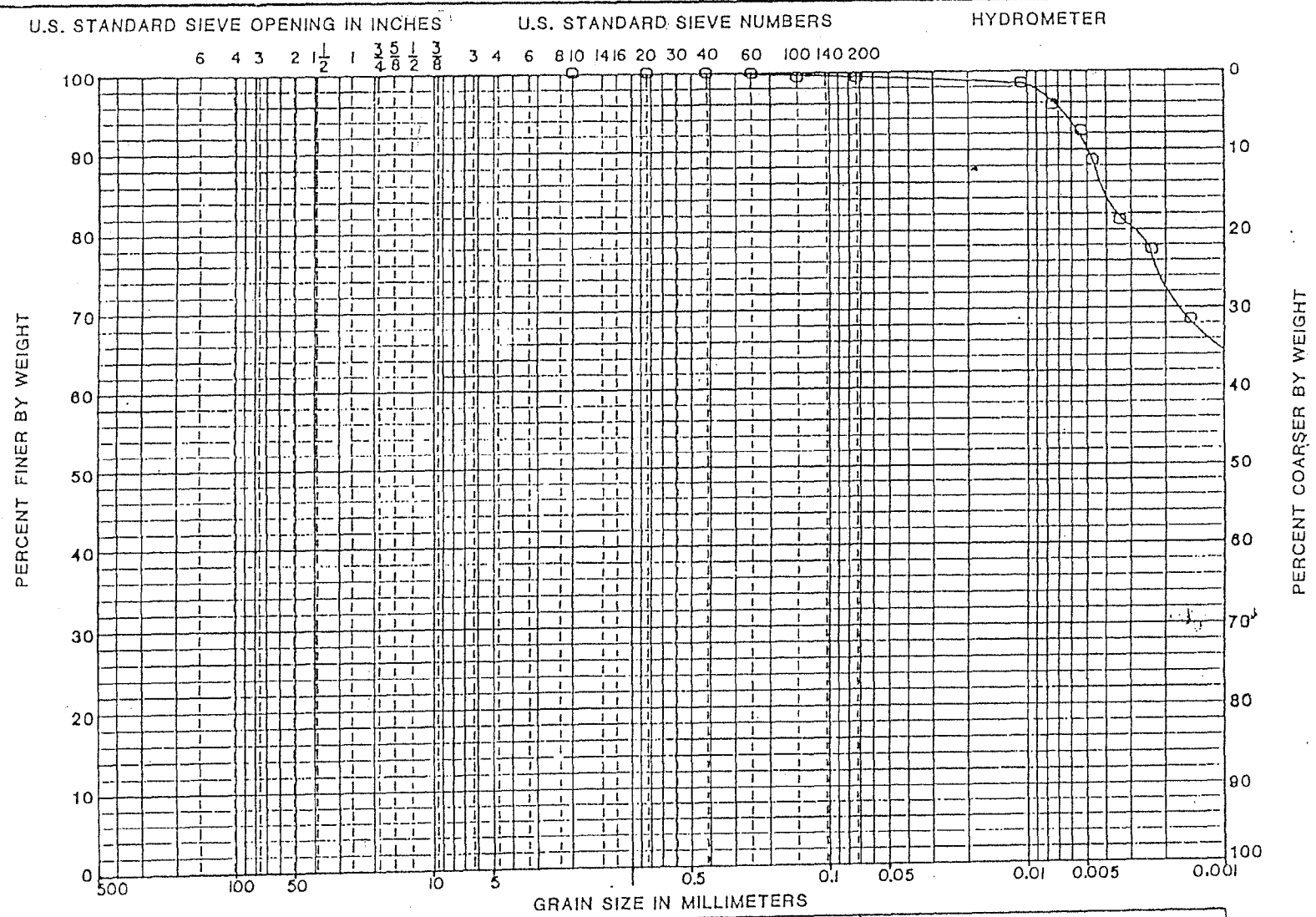


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI	PROJECT US CORPS OF ENGINEERS
MT 77		Gray CLAY	257.8				
							BORING NO.
		Dry Weight = 19.7 pcf					DATE 7-1-88
							GEOTECHNOLOGY ENGINEERING AND ENVIRONMENTAL SERVICES ST. LOUIS, MISSOURI
		Specific Gravity = 2.69					

PLATE 65

GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT 88		Gray CLAY	200.0			
		Dry Weight = 26.3 pcf				

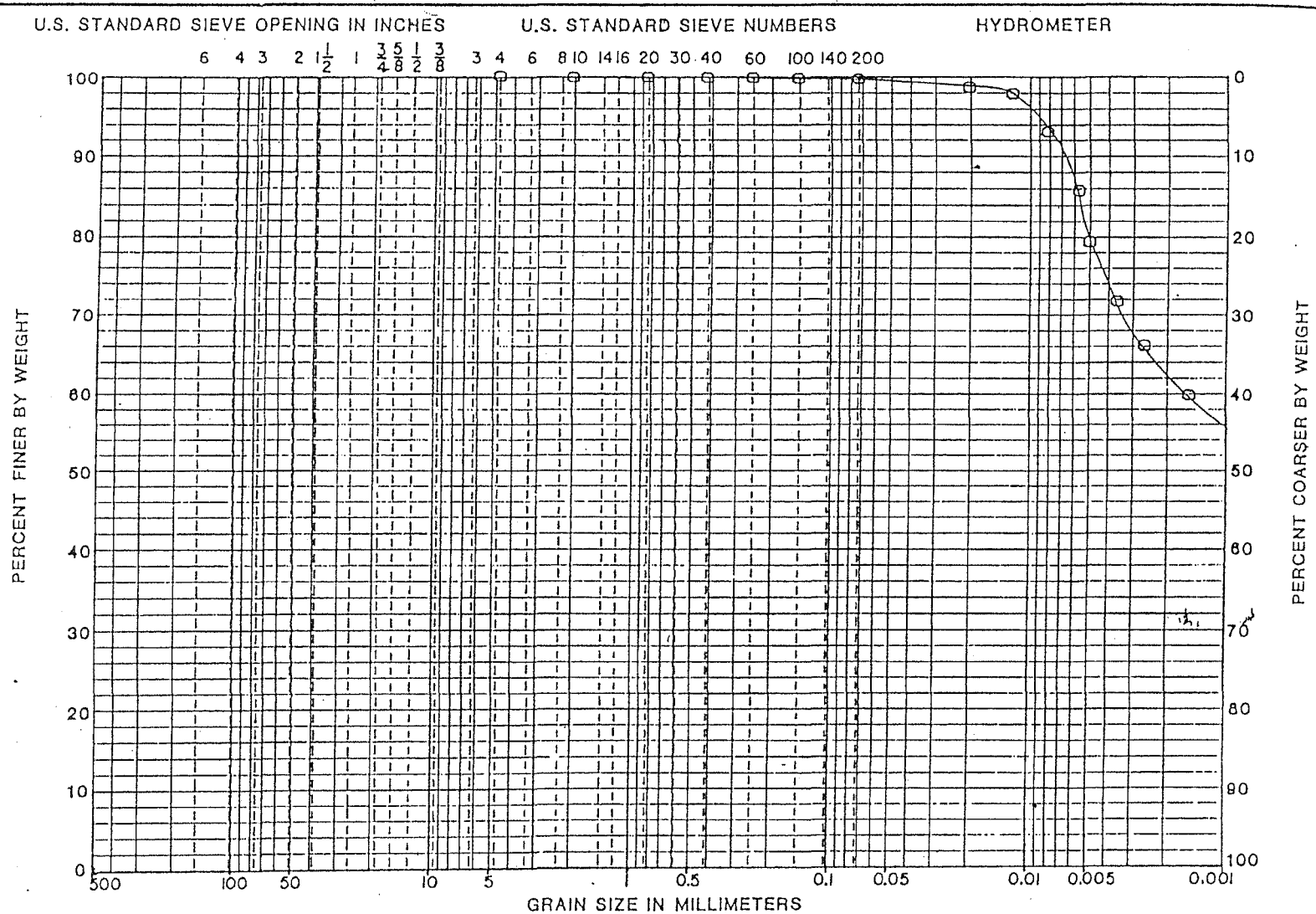
PROJECT US CORPS OF ENGINEERS

BORING NO.

DATE 6-28-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI
MT 99		Gray CLAY	171.0			
		Dry Weight = 28.2 pcf				

PROJECT US CORPS OF ENGINEERS

BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI