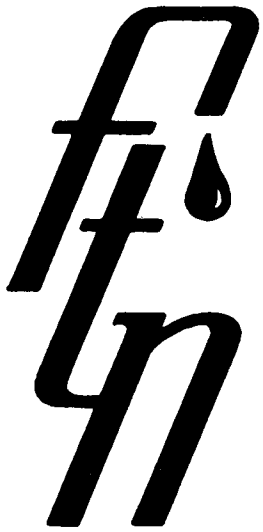

REPORT OF SEDIMENTATION
1987 RESURVEY
MARK TWAIN LAKE
UPPER MISSISSIPPI RIVER BASIN
SALT RIVER, MISSOURI

5 February 1992

REPORT OF SEDIMENTATION
1987 RESURVEY
MARK TWAIN LAKE
UPPER MISSISSIPPI RIVER BASIN
SALT RIVER, MISSOURI

Submitted to
U.S. Army Engineer District, St. Louis
St. Louis, Missouri

Submitted by
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FTN Project Number 1110-036

5 February 1992

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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. statute)	1.609344	kilometers
square miles	2.589988	square kilometers
cubic yards	0.7645549	cubic meters
acre-feet	1233.482	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

Reservoir storage and area values (below elevation 638.0) are based on the results of the 1987 sedimentation resurvey.

Item	Unit	
DRAINAGE AREA	sq mi	2318
INACTIVE STORAGE POOL		
Elevation	feet NGVD	520-567.2
Top Surface Area	acres	5,741
Storage	acre-feet	83,699
Storage (runoff)	inches	0.68
JOINT-USE POOL		
Elevation	feet NGVD	567.2-606.0
Top Surface Area	acres	18,283
Storage	acre-feet	449,601
Storage (runoff)	inches	3.64
Regulated Discharge		
Maximum	cfs	12,000
Minimum	cfs	0
HYDROELECTRIC POWER POOL		
Elevation	feet NGVD	592.0-606.0
FLOOD CONTROL POOL (LOWER ZONE)		
Elevation	feet NGVD	606.0-624.8
Top Surface Area	acres	28,361
Storage	acre-feet	441,475
Storage (runoff)	inches	3.57
Regulated Discharge		
Maximum	cfs	12,000
Minimum	cfs	0

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	38,580
Storage	acre-feet	436,212
Storage (runoff)	inches	3.53
Regulated Discharge		
Mississippi River below flood stage from Louisiana to St. Louis, Missouri		
Maximum	cfs	12,000
Minimum	cfs	12,000
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 (damsite)	cfs	210,560
Peak Inflow (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
Elevation of Crest	feet NGVD	600.0
Tainter Gates		
Number	each	4
Size	feet	50(W)x39(H)
Top Elevation, Closed	feet NGVD	639.0
Outlet Structure		
Number of Sluices	each	1
Size (diameter)	inches	24

REPORT ON RESURVEY OF SEDIMENTATION
MARK TWAIN LAKE
SALT RIVER, MISSOURI, 1987

1. INTRODUCTION

This report is prepared according to instructions in EM 1110-2-4000, dated December 15, 1989,, and represents the results of the 1987 resurvey of the Mark Twain Lake sedimentation ranges. The purpose of the investigation was to analyze the 1987 resurvey data to determine the distribution of sediment depletion of storage in the reservoir and trap efficiency of the reservoir. Initial operation of the reservoir began in September 1983.

2. LOCATION OF RESERVOIR

Mark Twain Lake is located in the Counties of Ralls, Monroe, Audrain and Shelby in northeastern Missouri, on the Salt River. Clarence Cannon Dam is approximately 63 miles* 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. The basin is shown on 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 page vi, contains pertinent data concerning the dam, outlet, and spillway structures; and the elevations, areas, and capacities of the inactive, joint-use, hydroelectric power, flood control, and surcharge pools.

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* A table of factors for converting U.S. customary units of measurement to metric (SI) units is presented on page v.

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 the top of the flood control pool (elevation 638.0**). 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.

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 and it becomes 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 in 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 zero are not uncommon. The minimum and maximum temperatures of record are -21°F during the winter and 108°F during the summer. The average annual temperature 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.

** All elevations cited herein are in feet referred to National Geodetic Vertical Datum (NGVD).

7. RESERVOIR OPERATION

The objective of regulating 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 one hundred 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 very little 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, so as to insure satisfactory water quality downstream primarily for fish life. When the lake level is within the lower part of the flood control pool (elevation 606.0 to 624.8), the total release from 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 1987 (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 1987 is shown on Plate 3.

9. ORIGINAL RESERVOIR SURVEY

Reservoir area and volume were determined from U.S. Geological Survey quadrangle sheets. A tabulation of the reservoir storage for 5-foot intervals is shown in Table 3. Item 46 of Plate 56, ENG Form 1787, gives an area and storage (capacity) tabulation at 5-foot intervals for the 1987 resurvey. Elevation versus 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 location of the sediment ranges. The cross sections of the ranges for the original survey and the resurvey are shown on Plates 6 through 54. Appendix A shows detailed locations of the 49 sediment ranges.

11. TYPE AND SCOPE OF SEDIMENT RESURVEYS

A detailed sediment resurvey of the 49 sediment ranges, by direct leveling and by a Raytheon Recording Depth Sounder, was made during 1987. The 1987 resurvey was conducted in September and October 1987. The average pool elevation during the measurements was about 603.8.

12. METHODS OF SEDIMENT COMPUTATIONS

A procedure based on the prismoidal formula for computing reservoir capacities and developed by the U.S. Soil Conservation Service (SCS) was used in this study. The procedure was 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). This paper described a 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-sectional area, square feet
- W = width of the main stream range at a given elevation, feet
- A = total surface area of the segment bounded the ranges, acres
- h = perpendicular distance from the 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 4 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

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

where: V, A, E, 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 the distances on the dam describing that volume of water displaced by the upstream face of the dam.

In the study, the quadrilateral area A' was determined from USGS topographic maps of the reservoir by electronic digitization of the areas bounded by the ranges and utilizing the area computation capability of AutoCad (Release 11). The surface area, A, was also determined through the application of digitization and the area computation ability of AutoCad. The values for E and W were computed based on the surveyed cross-sectional data. Values for A', A, E, and W were computed at four reservoir elevations: 567.2 feet, 606.0 feet, 624.8 feet, and 638.0 feet. These elevations correspond to the tops of the inactive pool, the joint-use pool, the lower zone of the flood control pool and the upper zone of the flood control pool. Those elevations falling between contours on the USGS topographic maps were interpolated from the areas of the contours above and below the given elevations.

Using these values, reservoir volumes were calculated using the same methodology for the original conditions and the 1987 resurvey. These volumes were then consistent to one another. In order to calculate 1987 capacities which would be consistent to the original capacities which have been published, the following relationship was used:

$$V = V_O + \frac{V_O}{V_O'}(V' - V_O')$$

where V = 1987 reservoir volume, consistent with original published volume
V_O = original published volume
V' = reservoir volume based on resurvey, calculated with range-end formula
V_O' = original reservoir volume, calculated with range-end formula

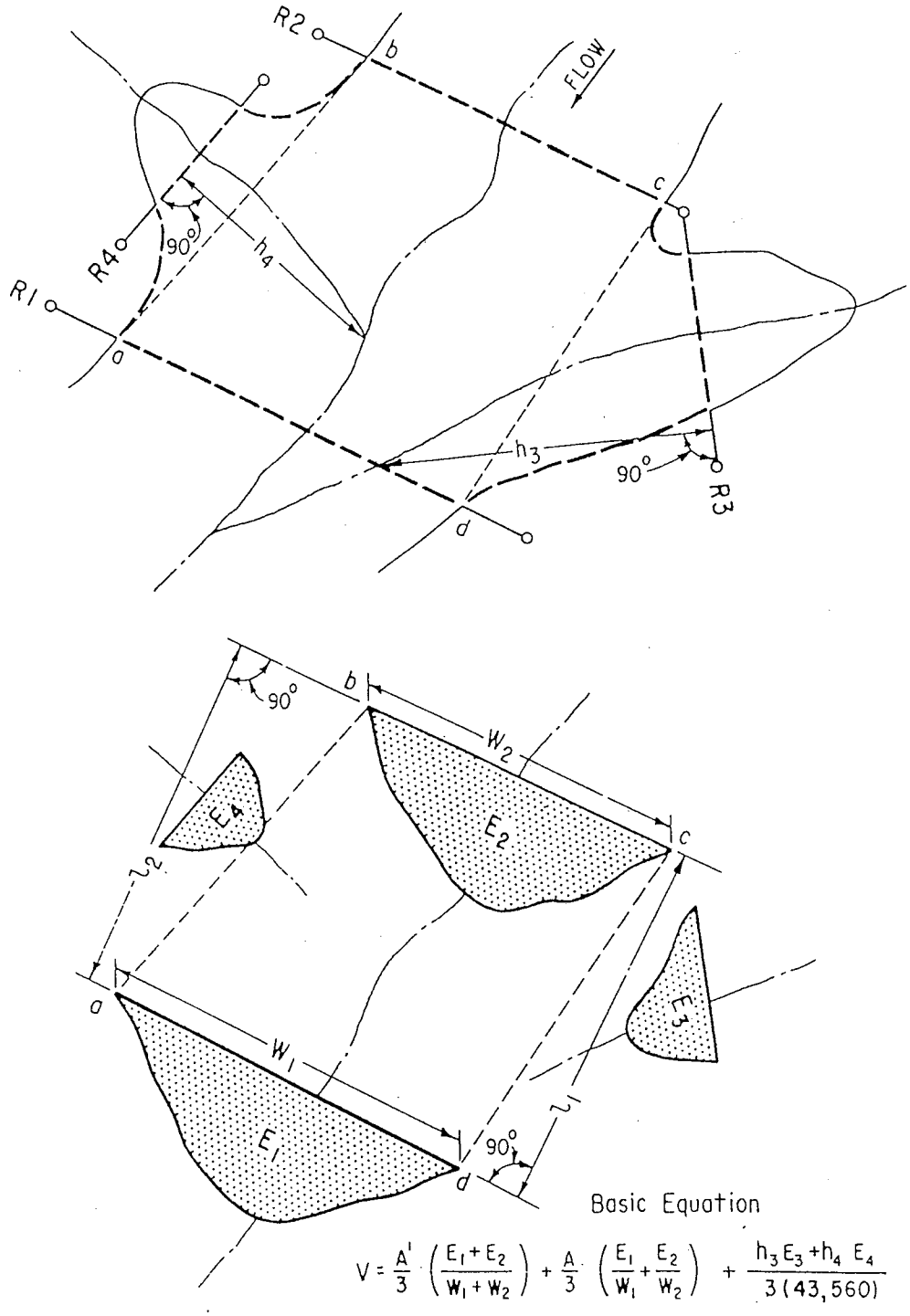


Figure 1. Terms of range-end formula for determining capacity of a reservoir. (Taken from ASCE M&R No. 54, "Sedimentation Engineering," V.A. Vanoni, Editor, 1975, pp. 378-379).

The term, $V' - V_O'$, describes the change in volume over time. This change is then multiplied by the original published volume divided by the original volume calculated by the above methodology and added to the original published volume. This relationship was applied at the four reservoir stages which were evaluated. Other reservoir volumes at intermediate elevations were interpolated from these results. Table 3 lists the original and the resultant 1987 capacities. The changes in volume for 1983-1987 (from beginning of operation through resurvey) at the four elevations, are presented in Table 3A. Item 46 of Plate 56, ENG Form 1787, gives a storage tabulation at 5-foot intervals for 1987.

In reporting reservoir volumes, or sediment volumes, values were given to the nearest acre-foot. Due to some inescapable 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 in comparison of one value to another within this analysis, precision to the nearest acre-foot was maintained.

Table 4 lists digitized quadrilateral and surface areas between ranges and approximate distances between ranges. The quadrilateral areas were generally smaller than the surface areas because the quadrilateral areas do not reflect inlets and coves along the reservoir shore line which are included in the surface area. The areas given are areas found at elevation 638. The difference between the original published total area and the total area and the total of digitized surface areas can be attributed to cumulative error in the digitizing process. However, this difference is compensated for by the adjustment of the calculated volumes as described above. Tables 5A through 5D list the original range cross-sectional areas and the changes in cross-sectional areas during the period 1982-1987. These data are presented for elevations 567.2, 606.0, 624.8, and 638.0.

Item 46 of Plate 56, ENG Form 1787, also lists elevation versus reservoir surface area for 1987. In solving for 1987 reservoir areas, the reservoir volumes computed from the 1987 resurvey, as adjusted above, were used. The surface area at each elevation interval was calculated by the following equation:

$$A_{87} = \frac{V_{87}}{V_O} (A_O)$$

where V_{87} = volume of reservoir in 1987
V_O = published original volume
A_O = published original area

It may be assumed that the surface area does not change over time at elevations above the maximum pool elevation. Area-elevation computations were performed at 5-foot intervals and are listed in Item 46 of Plate 35 and plotted on Plate 4.

13. SEDIMENT QUANTITIES

A summary of the volume of sediment deposited between each range in the reservoir for the period 1983-1987 is presented in Tables 6A, 6B, 6C, and 6D for elevations 567.2, 606.0, 624.8, and 638.0, respectively. A summation of the volume of sediment deposited in each reach indicates that during the period 1983-1987 about 1.2 percent of the total reservoir capacity was lost to sedimentation. This is an average depletion rate of about 0.3 percent per year.

The 1987 resurvey data show that of the 17,068 acre-feet of sediment calculated to be deposited from 1983 to 1987 (period of operation), about 3,328 acre-feet was deposited within the inactive pool (below elevation 567.2). This decreased the amount of storage in the inactive pool by 3.8 percent. In the joint-use pool (elevation 567.2 to 606.0), about 7,366 acre-feet of sediment accumulated. This reduced the joint-use pool capacity by 1.6 percent. The flood control pool experienced a storage loss of about 6,374 acre-feet, or 0.7 percent over the same period. Of the 6,374 acre-feet calculated to be deposited in the flood control zone, 5,764 acre-feet was calculated to be in the upper zone between elevations 624.8 and 638.0. This volume differential may be attributed to variance between the 1982 and 1987 surveys rather than actually representing sediment deposition. However, an examination of the daily pool stages for Mark Twain Lake indicates that the pool was above elevation 624.8 for 73 days, or about five (5) percent of the time. Since high pool levels coincide with significant runoff periods, the sedimentation which the 1987 survey indicates could have actually occurred. Additional care will be directed to these upper elevation areas during the next survey to better analyze this area. For purposes of this report, the sedimentation above elevation 624.8 will be included. The following table summarizes the sediment deposition in Mark Twain Lake based on the 1987 resurvey. A 4.08-year time period (September 1983 through September 1987) was used to compute the rate of sediment deposition.

Summary of Mark Twain Lake Sedimentation.

Reservoir Portion	Amount of Sediment Deposited 1983-1987 (acre-feet)	Average Annual Rate of Deposition, 1983-1987* (acre-feet/year)
Entire Reservoir	17,068	4,183
Inactive Storage	3,328	816
Joint-use Storage	7,366	1,805
Flood Control Storage	6,374	1,562

* Based on 4.08 years, Plate 55, Item 27.

The 1987 resurvey also showed that, for the entire reservoir, the greatest amount of sediment was deposited between Ranges 11A, 16A, and 34A; Ranges 2A and 3A; and Ranges 6A and 7A. These sections accounted for about 59 percent of the total sediment accumulation. The area between Ranges 11A and 34A is approximately 3,170 acres, making it one of the larger sections of the reservoir. The large volume of sediment (2,587 acre-feet) deposited between Ranges 2A and 3A below elevation 606.0 appears to be the result of a deposition of material from the segment between elevations 606.0 and 624.8. The total increase in volume of sediment below elevation 624.8 was calculated to be only 217 acre-feet.

14. TRAP EFFICIENCY OF THE RESERVOIR

For the period of operation from 1983 to 1987, Mark Twain Lake has a trap efficiency of 92 percent. This was based on the method of Gunnar M. Brune, presented in Transactions of the American Geophysical Union, Volume 34, Number 3, June 1953, pages 407-418. A capacity-inflow ratio of 1.23 was used (Item 33, Plate 35). Table 7 presents descriptions of the sampling site locations. Plates 57-67 provide the sediment size distributions based on sediment samples collected 29 April 1988.

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. Higher priority work requested by the Lower Salt River Basin Association did not allow this data to be prepared in a suitable format for inclusion in this Report of Sedimentation. 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, only 7,366 acre-feet had been depleted by 1987, a reduction of 1.6 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

The computed rate of sediment deposition, 4,183 acre-feet per year, is substantially lower than the predicted rate of 11,500 acre-feet per year, which was the expected yearly sedimentation rate computed before the operation of the project. The results show that an insignificant amount of sedimentation is occurring in the lower-zone of the flood control pool. For the period 1983-1987, the calculations indicate that 37.3 percent of the sedimentation occurred above the joint-use pool. As previously stated, a significant portion of the volume of sediment above elevation 624.8 may be attributed to variances between the 1982 and previous surveys. Future surveys should be conducted in a manner to be consistent with the previous surveys. For the entire period of operation, the amount of storage lost below elevation 606.0 is only about 2,621 acre-feet per year, or about 23 percent of the predicted rate.

Based on the results of the 1987 resurvey, in 20 years (2007) the inactive pool will have lost approximately 19,640 acre-feet of storage to sediment accumulation, or about 23 percent of its capacity; the joint-use pool will have lost in 20 years approximately 43,470 acre-feet of capacity, or about 9.5 percent. A summary of reservoir sedimentation is shown on ENG Form 1787 (Plates 55 and 56).

18. RECOMMENDATION

Current budgeting guidance limits potential funding for future sediment surveys. A resurvey schedule of five to ten years for the sedimentation ranges will be maintained until the sedimentation rate has been verified. After the sedimentation rate has been verified, funding for additional surveys will be unlikely until the sediment deposition is anticipated to impact on project operations.

Table 1. Monthly Precipitation and Runoff for Mark Twain Lake (Sept. 1983 - Sept. 1987).

Month	Maximum Rainfall (inches)	Minimum Rainfall (inches)	Average Rainfall (inches)	Average Runoff (inches)	Runoff (percent)
January	2.43	0.05	1.24	0.44	35.5
February	4.11	0.33	2.41	1.63	67.6
March	4.77	0.99	3.16	1.90	60.1
April	6.05	1.46	2.82	1.16	41.1
May	5.17	3.90	4.56	1.08	23.7
June	4.12	3.99	3.74	0.78	20.9
July	5.95	2.20	4.24	0.36	8.5
August	5.87	1.04	3.44	0.34	9.9
September	9.58	3.04	4.88*	0.36	7.4
October	7.47	4.17	5.60	1.64	29.3
November	11.29	1.77	6.49	1.97	30.4
December	3.95	2.51	3.27	1.36	41.6

* September average based on five years. All others based on four years.

Table 2. Annual Precipitation and Runoff for Mark Twain Lake (1983-1987).*

Water Year	Rainfall (inches)	Runoff (inches)	Runoff (percent)	Average Daily Runoff (cfs)
1984	48.34	15.31	31.7	2,615
1985	48.85	14.74	30.2	2,518
1986	46.89	15.26	32.6	2,606
1987	41.11	10.05	24.4	1,715
Maximum	48.85	15.31	32.6	2,615
Minimum	41.11	10.05	24.4	1,715
Average	46.30	13.84	29.7	2,364

* Precipitation based on Monroe City gage. Runoff based on USGS flow data at Center and Mark Twain Lake inflows.

Table 3. Elevation Versus Capacity for Mark Twain Lake (1987).

Elevation (feet, NGVD)	Original Capacity (acre-feet)	1987 Capacity (acre-feet)
520	0	0
525	172	0
530	743	210
535	1,985	927
540	4,285	2,875
545	9,035	7,272
550	17,867	15,752
555	31,406	28,938
560	50,150	47,330
565	74,448	71,275
567.2	87,027	83,699
570	104,716	100,856
575	141,508	136,699
580	185,196	179,438
585	236,332	229,625
590	295,388	287,732
595	362,886	354,280
600	439,401	429,846
605	525,560	515,056
606.0	543,994	533,300
610	622,607	611,783
615	732,139	721,152
620	854,997	843,849
624.8	986,079	974,775
625	991,779	980,388
630	1,145,045	1,131,470
635	1,316,103	1,300,345
638.0	1,428,055	1,410,987

Table 3A. Elevation Versus Change in Capacity for Mark Twain Lake.

Elevation (feet, NGVD)	Change in Capacity 1983-87 (acre-feet)
567.2	-3,328
606.0	-10,694
624.8	-11,304
638.0	-17,068

Table 4. Area Data by Reach for Mark Twain Lake, Elevation 638.0 feet.

Reach	Quadrilateral Area (acres)	Surface Area (acres)
Dam-1A	112	198
1A-2A	640	1,887
9A-11A	865	1,272
11A-16A	953	1,531
16A-34A	1,820	2,348
34A-35A	1,252	1,708
35A-36A	463	1,032
36A-37A1	416	1,095
37A1-40AB	271	1,241
40AB-41AB	324	775
41AB-42AB	330	745
42AB-43B	445	765
43B-44B	287	630
44B-45B	224	680
45B-46B	384	416
46B-END	265	1,419
2A-3A	161	494
3A-4AB	284	953
4AB-5B	201	362
5B-END	99	334
6A-7A	526	2,278
7A-8B	288	427
8B-END	151	521
10AB-END	67	169
12A-13B	151	257
13B-END	126	182
14A-15B	434	536
15B-END	153	199
17A-18A	767	1,086
18A-26A	1,078	1,411
26A-28A	1,014	1,878
28A-31AB	647	1,727
31AB-32B	323	646
32B-END	212	800
19A-20A	616	1,125

Table 4. Area Data by Reach for Mark Twain Lake, Elevation 638.0 feet (Continued).

Reach	Quadrilateral Area (acres)	Surface Area (acres)
20A-21B	572	1,304
21B-22B	242	999
22B-23B	73	388
23B-END	30	130
24B-END	82	195
25B-END	41	55
27B-END	74	126
29AB-30B	230	528
30B-END	341	480
33AB-END	133	292
37AB-38B	395	679
38B-39B	289	425
39B-END	93	144
47B-48B	145	200
48B-END	65	194
TOTAL		39,266*

* Published surface area at elevation 638.0 is 38,500 acres. Difference represents 1.78% increase which can be attributed to error in digitization. Discrepancy is compensated for in adjustment of final sediment volumes.

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
1A	56,897	-1,149
2A	54,635	-873
3A	22,012	-1,470
4AB	--*	--
5B	--	--
6A	61,941	-1,536
7A	--	--
8B	--	--
9A	64,256	-832
10AB	4,520	-131
11A	54,261	-2,966
12A	9,075	-661
13B	--	--
14A	9,816	-780
15B	--	--
16A	85,947	-6,773
17A	4,952	-1,141
18A	2,913	-216
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
34A	17,862	-832

* "--" indicates cross-section does 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 (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
35A	3,386	-108
36A	1,597	-217
37A1	521	-191
37A2	--*	--
38B	--	--
39B	--	--
40AB	--	--
41AB	--	--
42AB	--	--
43B	--	--
44B	--	--
45B	--	--
46B	--	--
47B	--	--
48B	--	--

* "--" indicates cross-section does not extend below elevation 567.2.

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
1A	142,390	-1,505
2A	127,809	-323
3A	61,506	-1,080
4AB	23,914	-611
5B	2,354	-541
6A	153,207	-1,611
7A	27,878	-1,510
8B	1,883	-482
9A	213,828	-740
10AB	33,507	+81
11A	175,761	-3,187
12A	41,491	-284
13B	11,596	-70
14A	97,482	-868
15B	2,972	-459
16A	321,486	-7,761
17A	183,305	-3,730
18A	72,377	-602
19A	89,553	-314
20A	45,171	-1,070
21B	13,063	-967
22B	596	+105
23B	--*	--
24B	--	--
25B	--	--
26A	56,642	-639
27B	5,956	-435
28A	27,931	+248
29AB	3,283	-809
30B	--	--
31AB	2,841	-498
32B	1,058	-146
33AB	22,056	+407
34A	140,175	-1,564

* "--" 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 (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
35A	102,433	-2,026
36A	68,537	-807
37A1	24,651	-819
37A2	13,522	-139
38B	42	+30
39B	--*	--
40AB	14,091	-657
41AB	7,000	-1,264
42AB	2,687	-486
43B	554	+67
44B	--	--
45B	--	--
46B	--	--
47B	16	+16
48B	--	--

* "--" indicates cross-section did not extend below elevation 606.0.

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
1A	185,987	-1,629
2A	164,963	-283
3A	82,245	-1,082
4AB	57,145	-1,921
5B	14,392	-435
6A	200,018	-1,535
7A	56,479	-1,473
8B	8,124	-554
9A	292,210	-769
10AB	55,281	+110
11A	236,618	-3,172
12A	61,243	-258
13B	26,945	-12
14A	169,755	-602
15B	14,921	-735
16A	443,206	-7,756
17A	297,698	-3,449
18A	119,252	-568
19A	150,415	-144
20A	91,572	-1,129
21B	37,669	-1,068
22B	6,407	+191
23B	1,265	+77
24B	1,904	+17
25B	4,305	-144
26A	134,376	-602
27B	21,839	-578
28A	94,911	-62
29AB	25,288	-1,038
30B	3,289	-167
31AB	24,634	-454
32B	10,573	-464
33AB	37,709	+387
34A	231,753	-1,807

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
35A	167,328	-2,206
36A	120,670	-665
37A1	50,317	-597
37A2	28,968	-160
38B	23,020	-75
39B	408	-41
40AB	38,818	-715
41AB	20,244	-1,530
42AB	24,503	-1,427
43B	20,566	+39
44B	5,217	-234
45B	1,192	-33
46B	1,277	-343
47B	6,371	-53
48B	1,420	+28

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
1A	217,433	-1,660
2A	191,665	-250
3A	97,401	-1,083
4AB	81,375	-1,891
5B	25,626	-348
6A	234,613	-1,548
7A	80,239	-1,513
8B	16,102	-380
9A	348,955	-761
10AB	73,246	+174
11A	279,817	-3,149
12A	76,636	-305
13B	43,957	+49
14A	228,335	-753
15B	26,281	-868
16A	531,249	-8,014
17A	385,795	-3,377
18A	153,417	-507
19A	194,234	-112
20A	132,043	-1,072
21B	58,451	-1,114
22B	18,489	+43
23B	9,804	+250
24B	10,170	+46
25B	15,151	-292
26A	194,033	-558
27B	35,498	-593
28A	149,428	-729
29AB	50,771	-1,005
30B	18,103	-48
31AB	47,180	-328
32B	26,322	-516
33AB	52,266	+410
34A	310,986	-1,955

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

Range	Original Cross-Sectional Area (sq. ft)	Change in Cross-Sectional Area, 1982-1987 (sq. ft)
35A	218,066	-2,168
36A	158,914	-624
37A1	71,566	-435
37A2	43,245	-105
38B	49,578	-64
39B	10,693	-155
40AB	63,270	-585
41AB	39,532	-1,572
42AB	54,176	-1,420
43B	44,928	+108
44B	27,513	-267
45B	23,979	-161
46B	8,769	-351
47B	19,258	-575
48B	11,560	+11

Table 6A. Sediment Deposition by Reach for Mark Twain Lake, Elevation 567.2 feet.

Reach	Sediment Deposited 1983-1987 (acre-feet)
Dam-1A	54
1A-9A	308
9A-11A	394
11A-16A	852
16A-34A	872
34A-35A	96
35A-36A	79
36A-37A1	45
37A1-40AB	4
40AB-41AB	--*
41AB-42AB	--
42AB-43B	--
43B-44B	--
44B-45B	--
45B-46B	--
46B-END	--
2A-3A	136
3A-4AB	213
4AB-5B	--
5B-END	--
6A-7A	127
7A-8B	--
8B-END	--
10AB-END	0
12A-13B	21
13B-END	--
14A-15B	13
15B-END	--
17A-18A	47
18A-26A	30
26A-28A	10
28A-31AB	--
31AB-32B	--
32B-END	--
19A-20A	26

* "--" indicates cross-section did not extend below elevation 567.2.

Table 6A. Sediment Deposition by Reach for Mark Twain Lake, Elevation 567.2 feet (Continued).

Reach	Sediment Deposited 1983-1987 (acre-feet)
20A-21B	--*
21B-22B	--
22B-23B	--
23B-END	--
24B-END	--
25B-END	--
27B-END	--
29AB-30B	--
30B-END	--
33AB-END	2
37A2-38B	--
38B-39B	--
39B-END	--
47B-48B	--
48B-END	--
TOTAL	3,328

* "--" indicates cross-section did not extend below elevation 567.2.

Table 6B. Sediment Deposition by Reach for Mark Twain Lake, Elevation 606.0 feet.

Reach	Sediment Deposited 1983-1987 (acre-feet)
Dam-1A	99
1A-9A	505
9A-11A	519
11A-16A	1,249
16A-34A	1,474
34A-35A	423
35A-36A	275
36A-37A1	491
37A1-40AB	511
40AB-41AB	394
41AB-42AB	-172*
42AB-43B	-247
43B-44B	0
44B-45B	--**
45B-46B	--
46B-END	--
2A-3A	2,587
3A-4AB	-195
4AB-5B	-63
5B-END	21
6A-7A	1,025
7A-8B	266
8B-END	23
10AB-END	-1
12A-13B	25
13B-END	3
14A-15B	197
15B-END	22
17A-18A	387
18A-26A	267
26A-28A	71
28A-31AB	-402
31AB-32B	-24

* Negative sign indicates increase in storage.
** "--" indicates cross-section did not extend below elevation 606.0.

Table 6B. Sediment Deposition by Reach for Mark Twain Lake, Elevation 606.0 feet (Continued).

Reach	Sediment Deposited 1983-1987 (acre-feet)
32B-END	5
19A-20A	256
20A-21B	491
21B-22B	155
22B-23B	1
23B-END	--**
24B-END	--
25B-END	--
27B-END	6
29AB-30B	32
30B-END	--
33AB-END	-42*
37A2-38B	57
38B-39B	2
39B-END	--
47B-48B	--
48B-END	--
TOTAL	10,694

* Negative sign indicates increase in storage.
** "--" indicates cross-section did not extend below elevation 606.0.

Table 6C. Sediment Deposition by Reach for Mark Twain Lake, Elevation 624.8 feet.

Reach	Sediment Deposited 1983-1987 (acre-feet)
Dam-1A	87
1A-9A	487
9A-11A	603
11A-16A	1,419
16A-34A	1,478
34A-35A	504
35A-36A	342
36A-37A1	-422*
37A1-40AB	379
40AB-41AB	422
41AB-42AB	401
42AB-43B	150
43B-44B	33
44B-45B	14
45B-46B	143
46B-END	178
2A-3A	211
3A-4AB	577
4AB-5B	211
5B-END	44
6A-7A	831
7A-8B	417
8B-END	262
10AB-END	1
12A-13B	41
13B-END	13
14A-15B	91
15B-END	33
17A-18A	430
18A-26A	280
26A-28A	-115
28A-31AB	57
31AB-32B	157
32B-END	66

* Negative sign indicates increase in storage.

Table 6C. Sediment Deposition by Reach for Mark Twain Lake, Elevation 624.8 feet (Continued).

Reach	Sediment Deposited 1983-1987 (acre-feet)
19A-20A	187
20A-21B	351
21B-22B	744
22B-23B	2
23B-END	8
24B-END	2
25B-END	1
27B-END	22
29AB-30B	94
30B-END	10
33AB-END	-26*
37A2-38B	40
38B-39B	31
39B-END	2
47B-48B	9
48B-END	--**
TOTAL	11,304

* Negative sign indicates increase in storage.
** "--" indicates cross-section did not extend below elevation 624.8

Table 6D. Sediment Deposition by Reach for Mark Twain Lake, Elevation 638.0 feet.

Reach	Sediment Deposited 1983-1987 (acre-feet)
Dam-1A	127
1A-9A	656
9A-11A	648
11A-16A	1,519
16A-34A	1,770
34A-35A	671
35A-36A	334
36A-37A1	449
37A1-40AB	623
40AB-41AB	464
41AB-42AB	479
42AB-43B	178
43B-44B	6
44B-45B	25
45B-46B	57
46B-END	165
2A-3A	2,990
3A-4AB	710
4AB-5B	242
5B-END	73
6A-7A	1,142
7A-8B	168
8B-END	23
10AB-END	5
12A-13B	29
13B-END	14
14A-15B	188
15B-END	85
17A-18A	360
18A-26A	303
26A-28A	337
28A-31AB	265
31AB-32B	132
32B-END	104
19A-20A	246

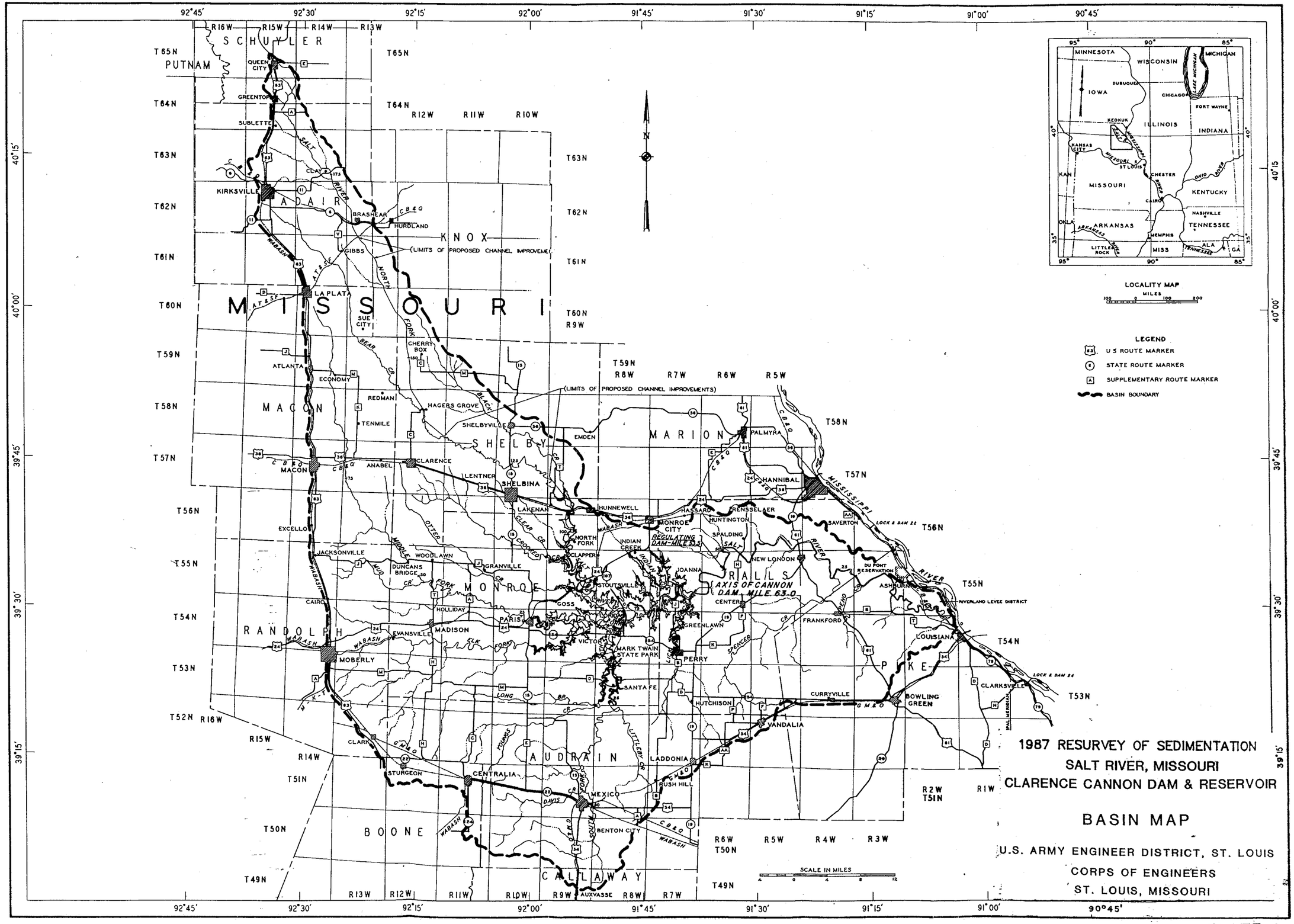
Table 6D. Sediment Deposition by Reach for Mark Twain Lake, Elevation 638.0 feet (Continued).

Reach	Sediment Deposited 1983-1987 (acre-feet)
20A-21B	559
21B-22B	839
22B-23B	-70*
23B-END	-17
24B-END	-7
25B-END	5
27B-END	-22
29AB-30B	139
30B-END	32
33AB-END	-5
37A2-38B	92
38B-39B	-51
39B-END	-21
47B-48B	4
48B-END	5
TOTAL	17,068

* Negative sign indicates increase in storage.

Table 7. 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	Upstream 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.



LOCALITY MAP

MILES 100 0 100 200

LEGEND

- U S ROUTE MARKER
- STATE ROUTE MARKER
- SUPPLEMENTARY ROUTE MARKER
- BASIN BOUNDARY

1987 RESURVEY OF SEDIMENTATION
SALT RIVER, MISSOURI
CLARENCE CANNON DAM & RESERVOIR

BASIN MAP

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

PLATE 1

SALT RIVER BASIN, MISSOURI

MARK TWAIN LAKE

1987 RESURVEY OF SEDIMENTATION

AVERAGE MONTHLY POOL ELEVATIONS

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

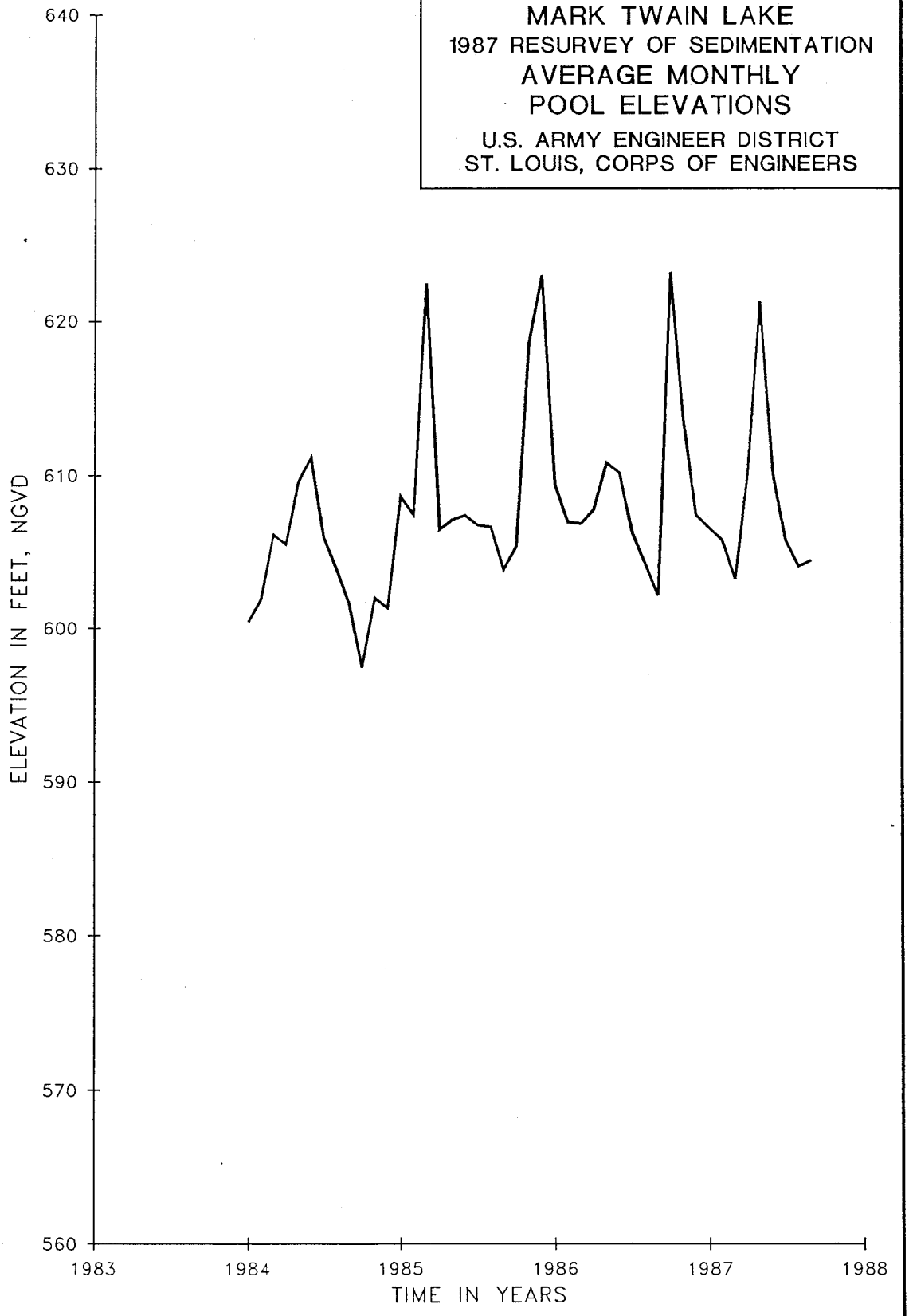


PLATE 2

SALT RIVER BASIN, MISSOURI

MARK TWAIN LAKE

1987 RESURVEY OF SEDIMENTATION

AVERAGE MONTHLY
INFLOW HYDROGRAPH

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

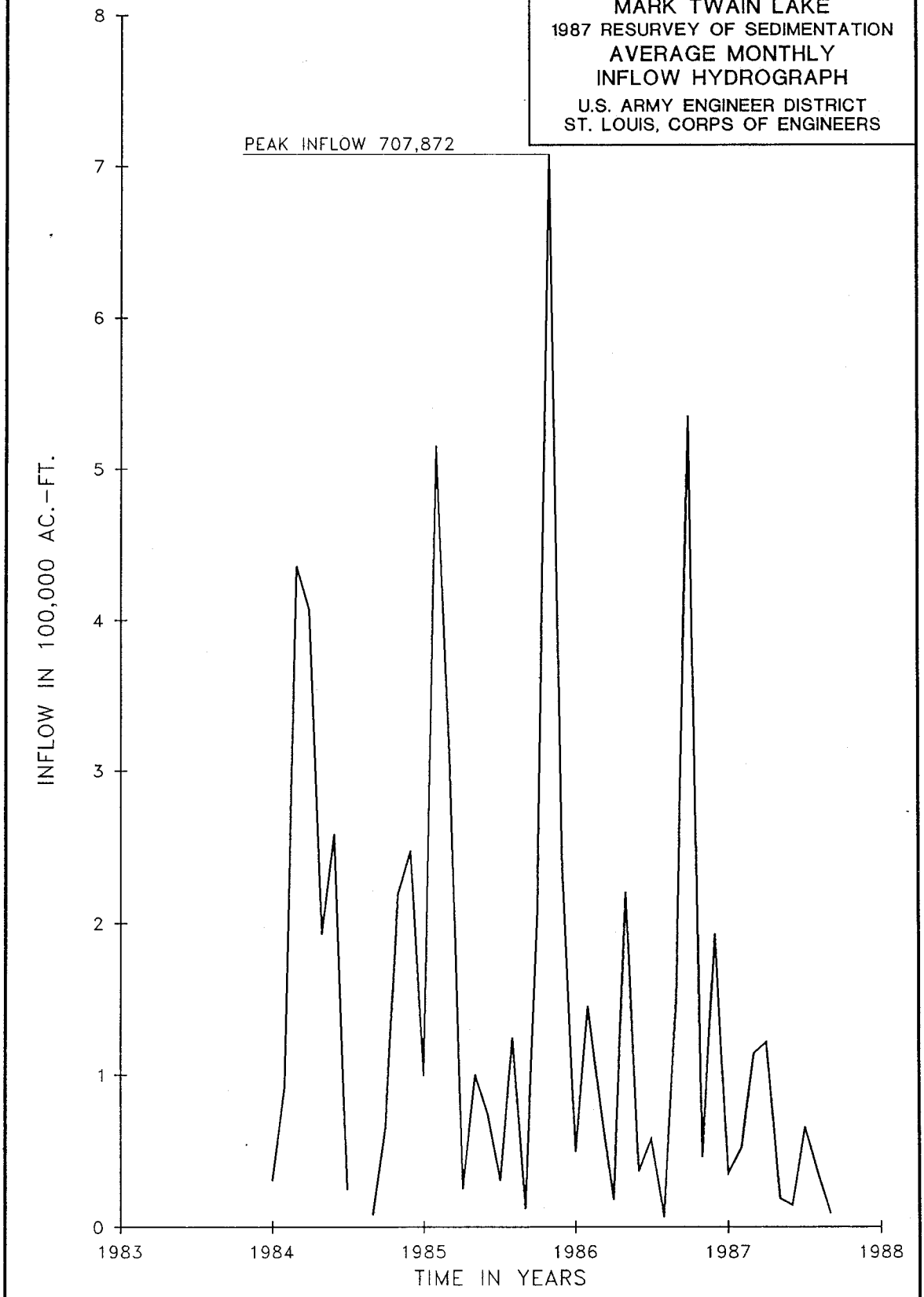
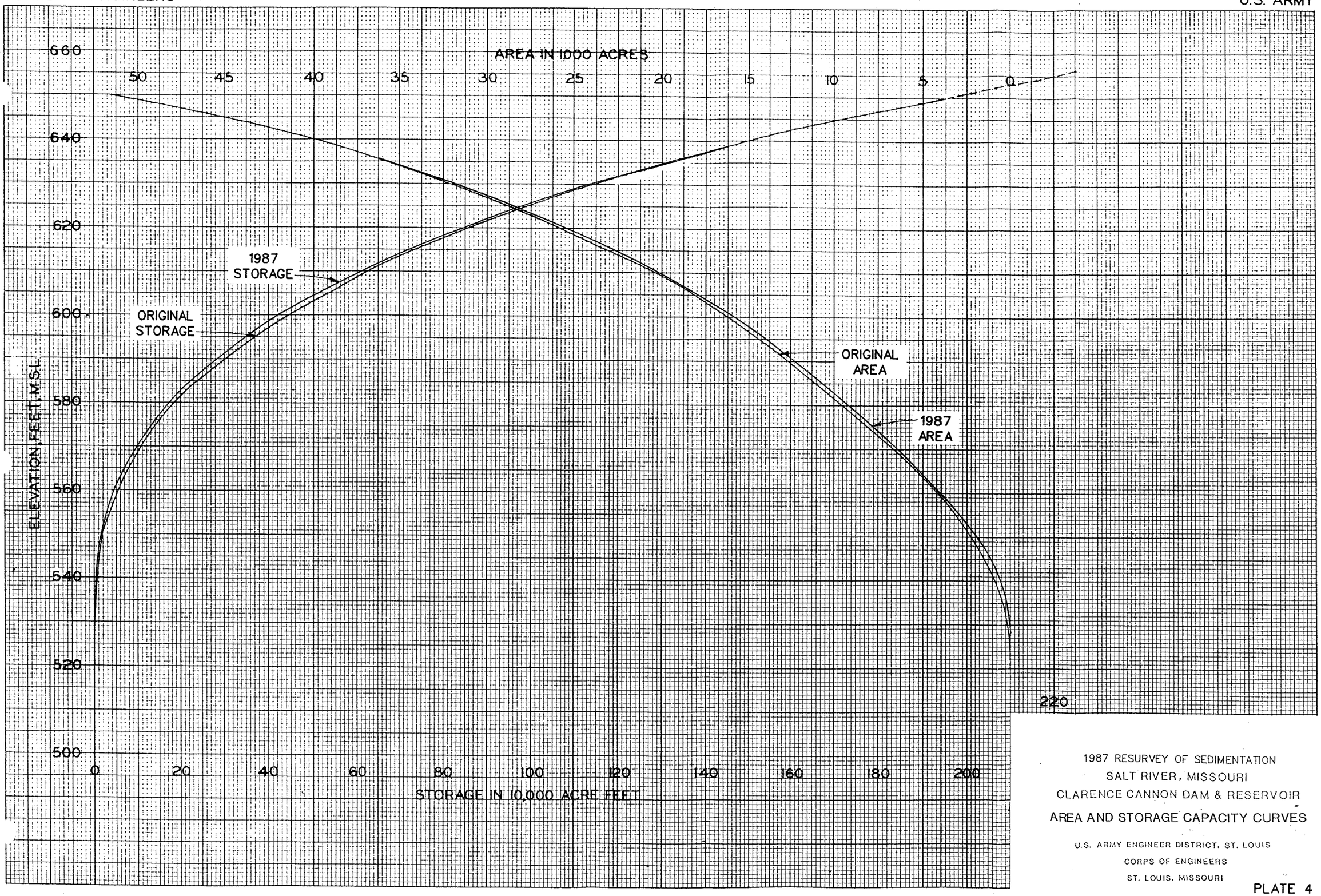


PLATE 3

CORPS OF ENGINEERS

U.S. ARMY



1987 RESURVEY OF SEDIMENTATION
SALT RIVER, MISSOURI
CLARENCE CANNON DAM & RESERVOIR
AREA AND STORAGE CAPACITY CURVES

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

PLATE 4

CLARENCE CANNON DAM & MARK TWAIN LAKE

US Army Corps of Engineers
St. Louis District

All Public lands shown in this brochure are governed by the regulations set forth in Title 36, Section 327, U.S. Federal Code of Regulations. Copies of the "Rules and Regulations" brochure are available from park rangers and at the Visitor Center. All local, state and federal regulations are applicable.

ATTENTION SEAPLANE OPERATORS

Seaplane takeoff and landing operations are prohibited in no-wake zones and the re-regulation pool; and 600 feet from the dam and the shoreline. Seaplane operations are restricted in the waterfowl refuge during the period October 15 through December 31. Operation of a seaplane is at the risk of the plane's owner, operator and/or passengers.

LEGEND

- Mark Twain Lake Normal Pool Elev. (606.0 msl)
- Mark Twain Lake Flood Pool Elev. (638.0 msl)
- Lands Managed by the Corps of Engineers
- Corps of Engineers Recreation Areas
- Lands Managed by the Missouri Dept. of Natural Resources
- Towns
- Hard-Surfaced Roads
- Gravel Roads
- Recreation Area Road System
- Hiking Trails
- Hunter/Fisherman Parking Lots
- Hunter/Fisherman Boat Ramps
- (A) Day Navigation Marker
- 22B Sedimentation Range

SCALE
0 — 6,000 — 6,000 — 12,000 — 18,000 ft.
1 mile

STANDARD LAKE MARKERS

- Diamond: Danger
- Red Flag with White Diagonal: Diver — Keep clear 25 yards.
- Diamond with Cross: Boats Keep Out!
- Circle: Controlled area — (explanation within circle).
- Square or Rectangle: Gives information.

CAUTION - BOATERS

This lake contains underwater obstructions such as trees, stumps, logs, rocks, and other debris. Boaters are warned to watch for these unknown hazards, especially when the pool level fluctuates. Boat ramps many be slippery due to the growth of algae, other vegetation and mud. PLEASE USE CAUTION.

Lake Information
Radio Station 530 AM

RANGE 23B 18,000' UPSTREAM OF 22B

1987 RESURVEY OF SEDIMENTATION
MARK TWAIN LAKE
SALT RIVER BASIN, MISSOURI

RESERVOIR SEDIMENTATION RANGES
UPSTREAM OF CANNON DAM

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

PLATE 5

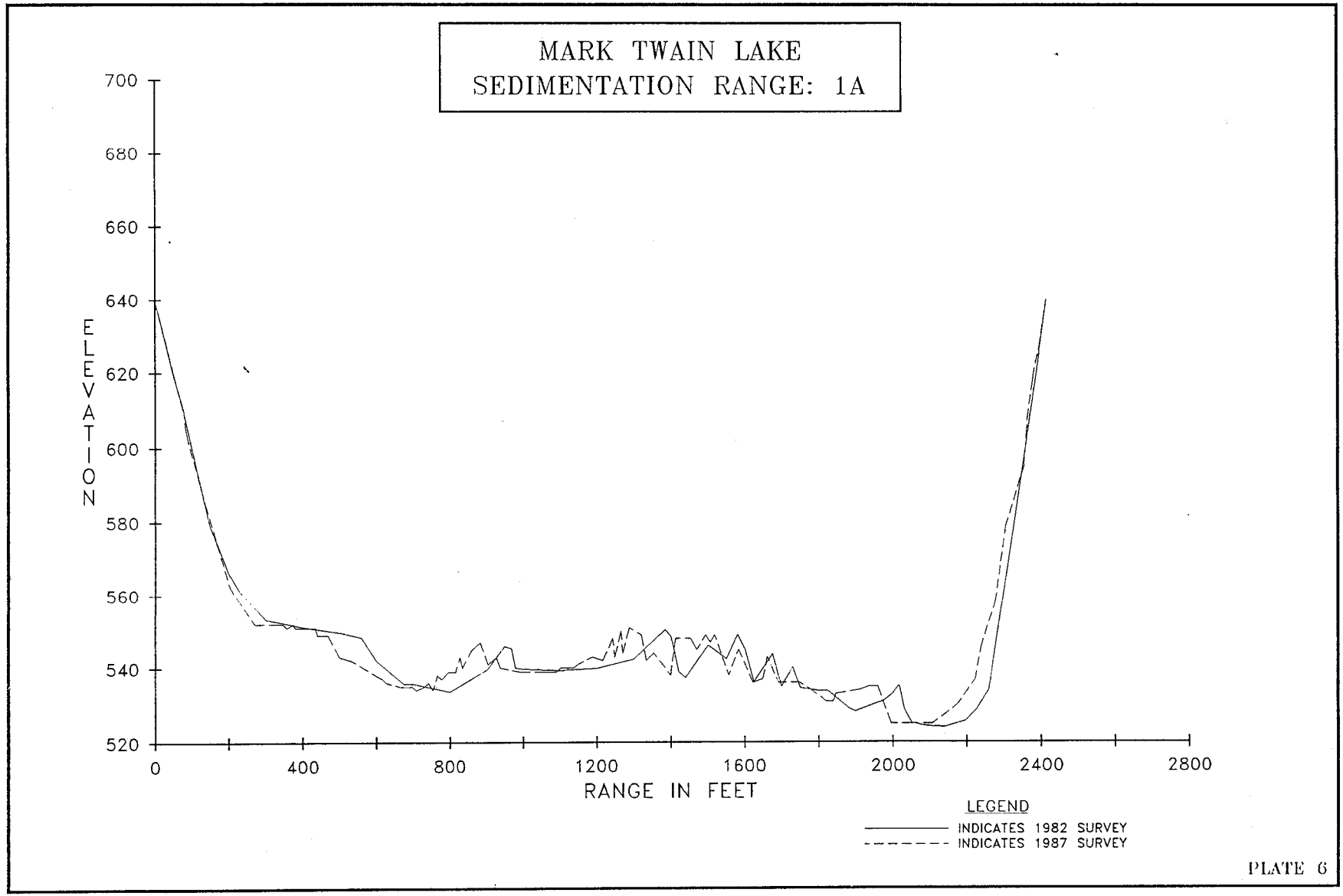

MARK TWAIN LAKE
SEDIMENTATION RANGE: 1A
ELEVATION
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 6

MARK TWAIN LAKE
SEDIMENTATION RANGE: 2A

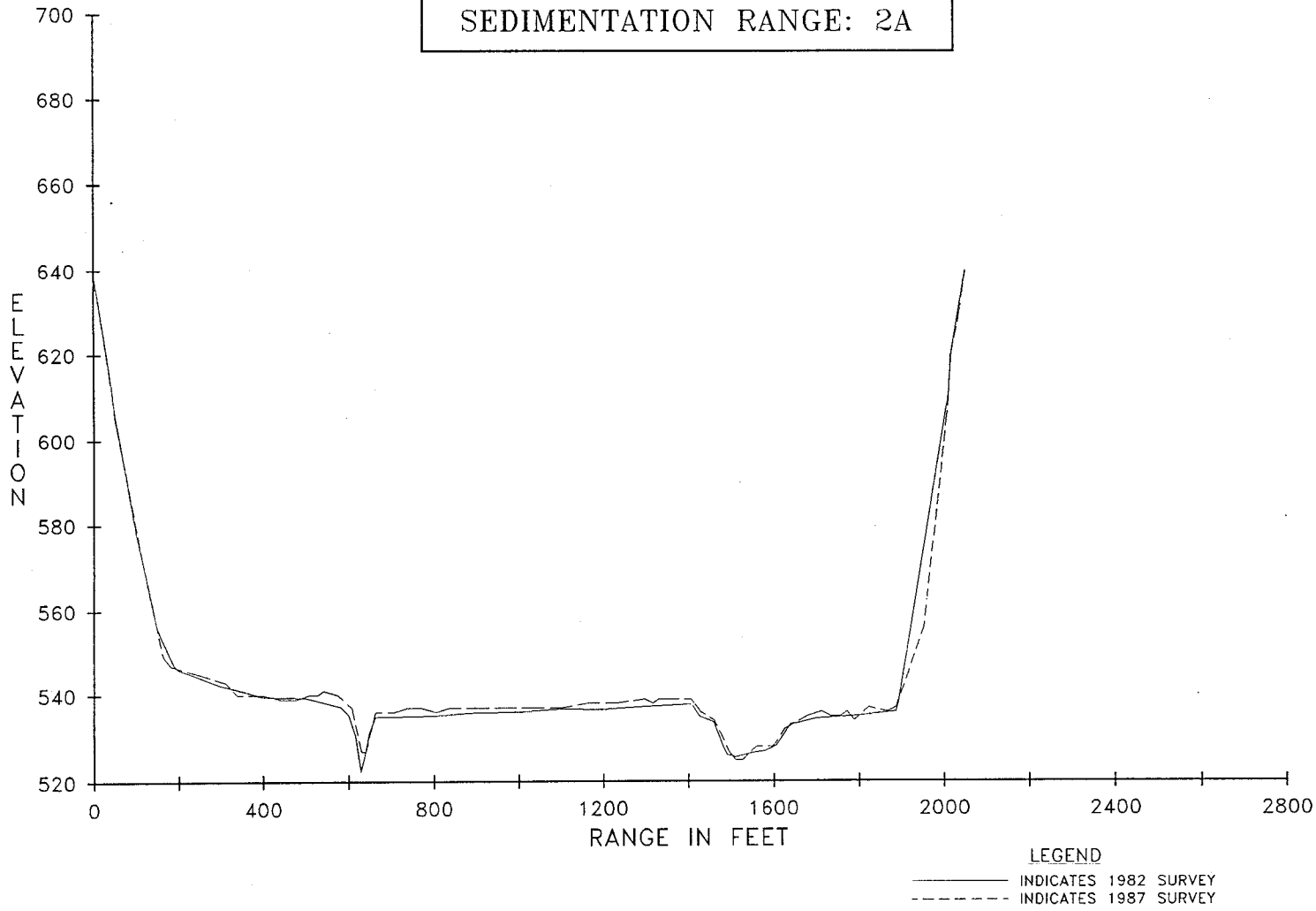


PLATE 7

MARK TWAIN LAKE
SEDIMENTATION RANGE: 3A

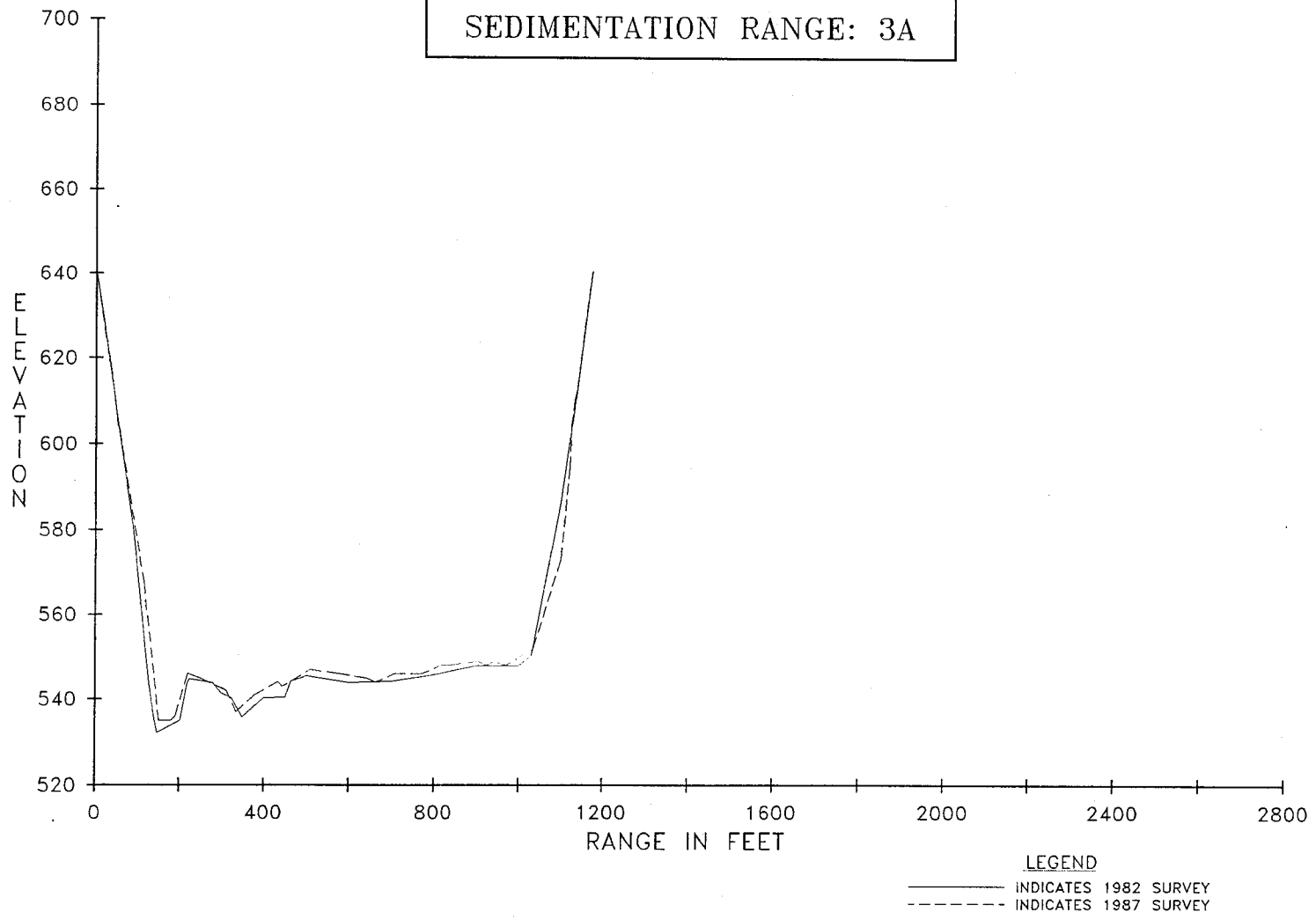


PLATE 8

MARK TWAIN LAKE
SEDIMENTATION RANGE: 4AB

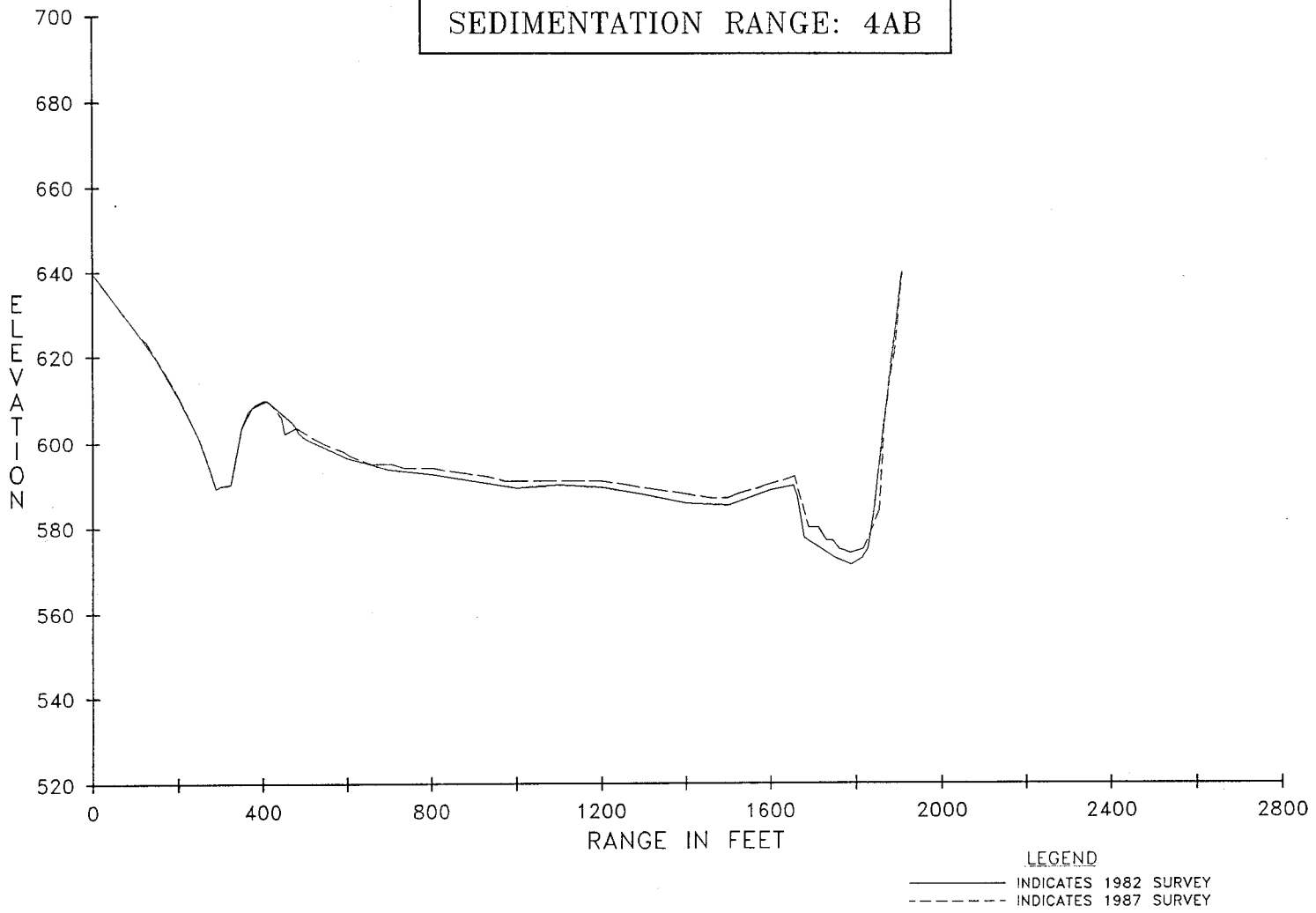


PLATE 9

MARK TWAIN LAKE
SEDIMENTATION RANGE: 5B

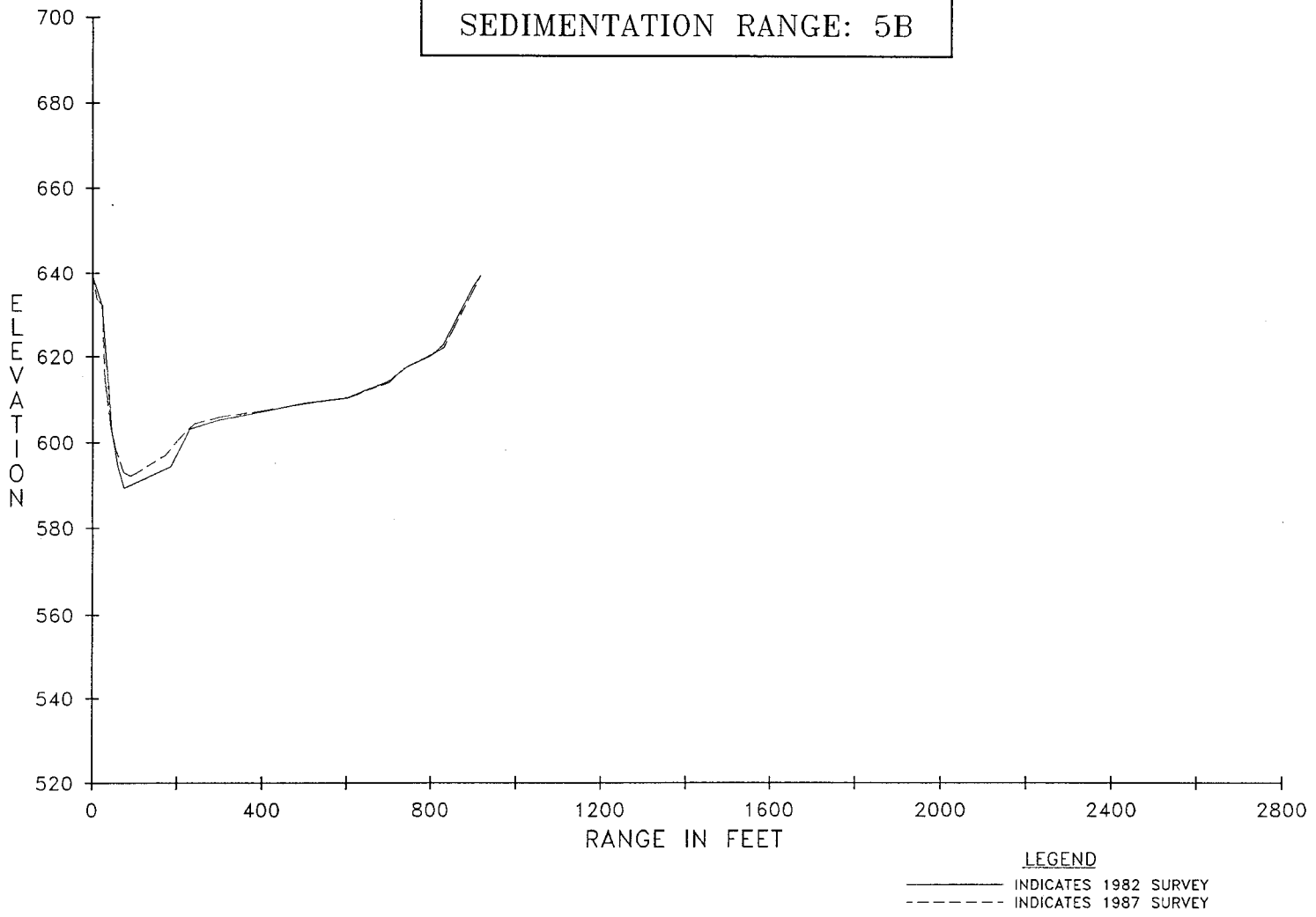


PLATE 10

MARK TWAIN LAKE
SEDIMENTATION RANGE: 6A

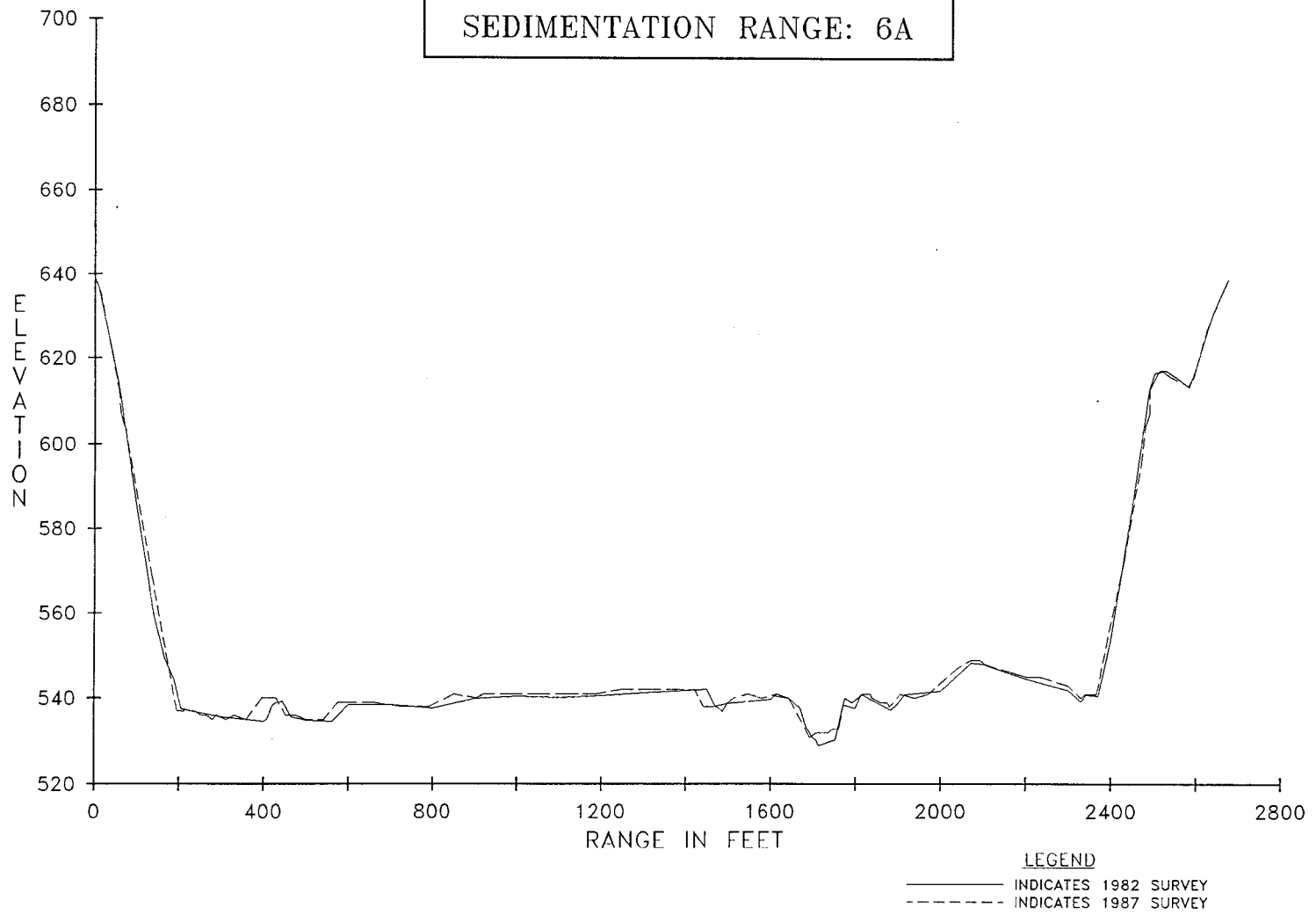


PLATE 11

MARK TWAIN LAKE
SEDIMENTATION RANGE: 7A

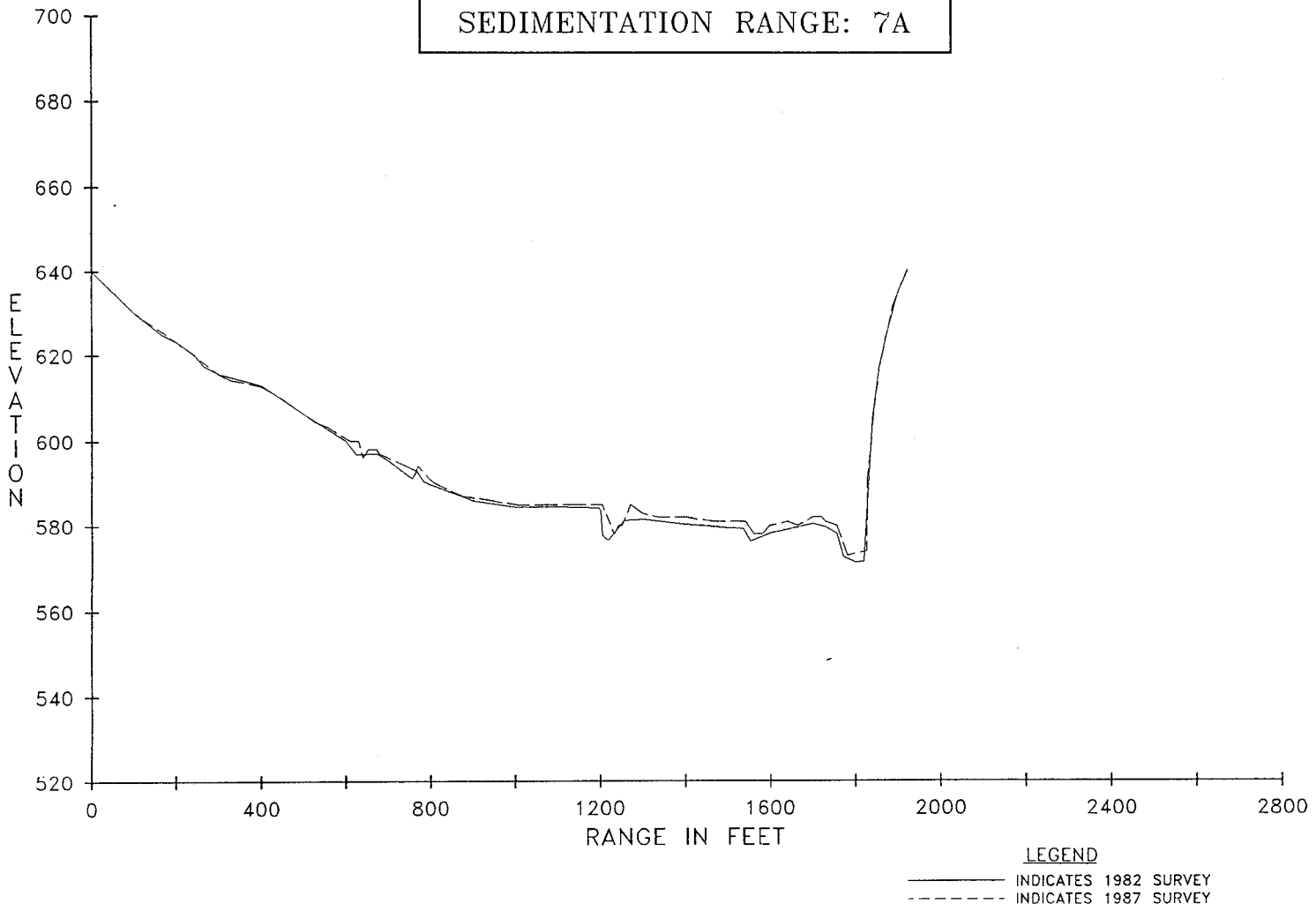


PLATE 12

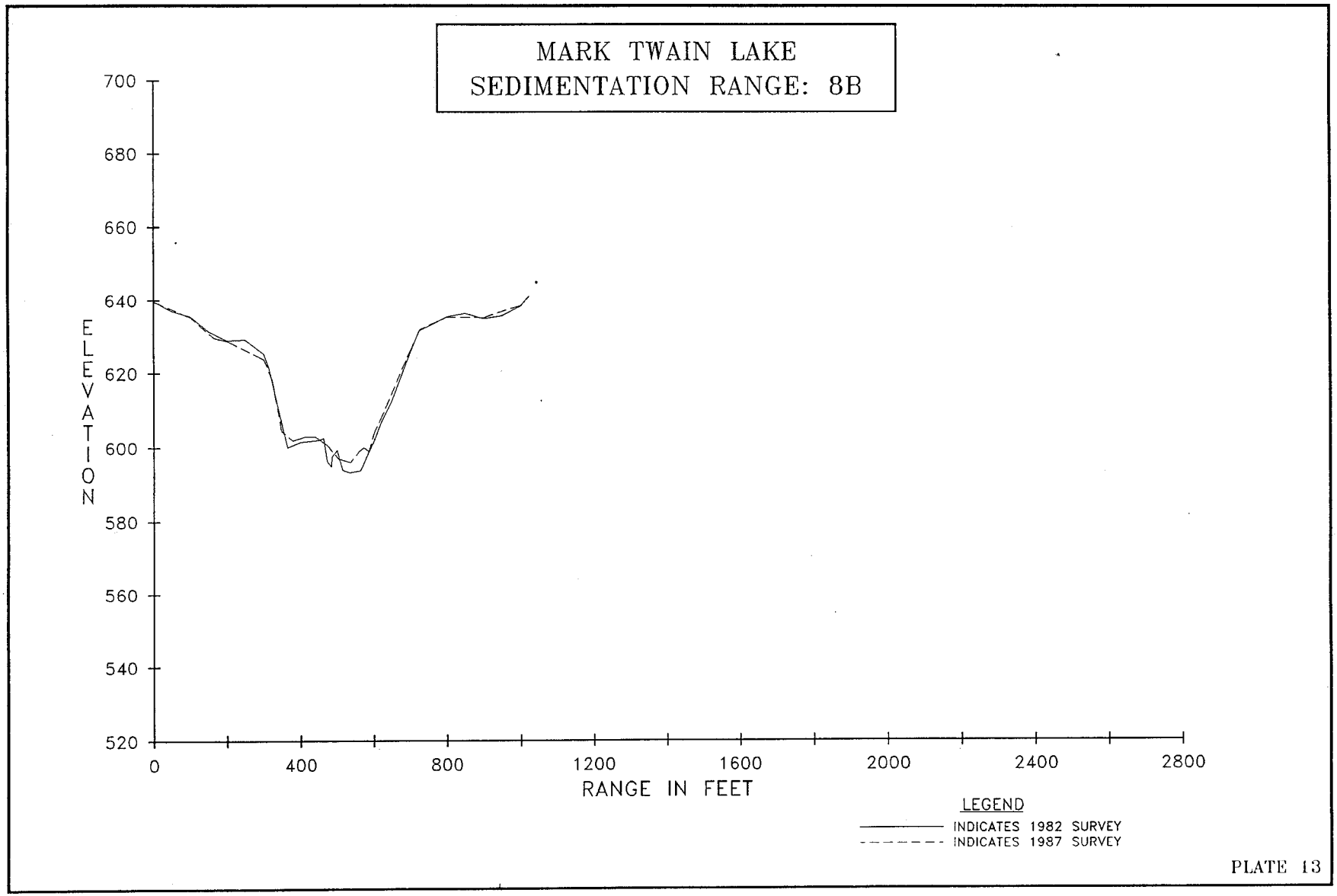

MARK TWAIN LAKE
SEDIMENTATION RANGE: 8B
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 13

MARK TWAIN LAKE
SEDIMENTATION RANGE: 9A

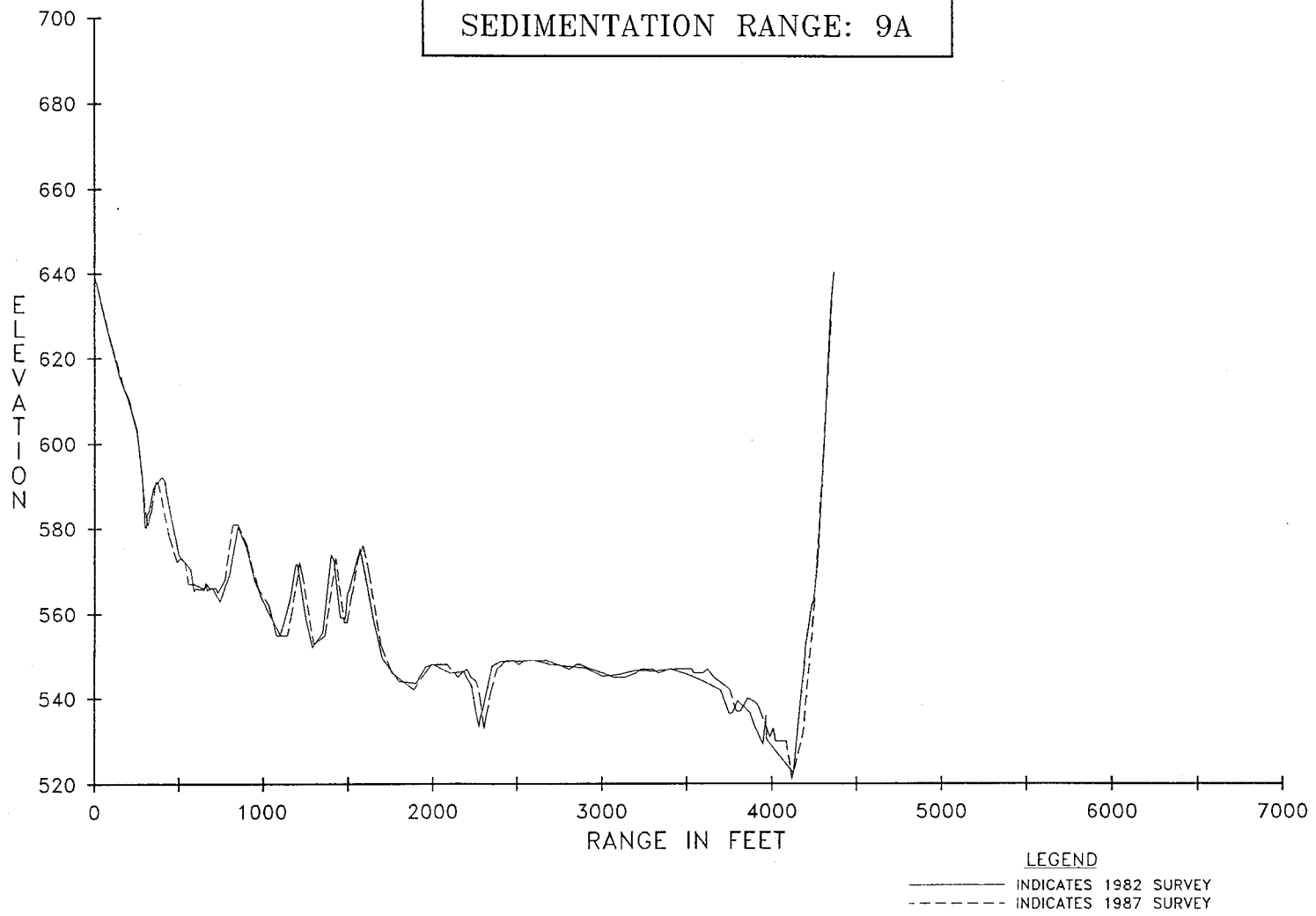


PLATE 14

MARK TWAIN LAKE
SEDIMENTATION RANGE: 10AB

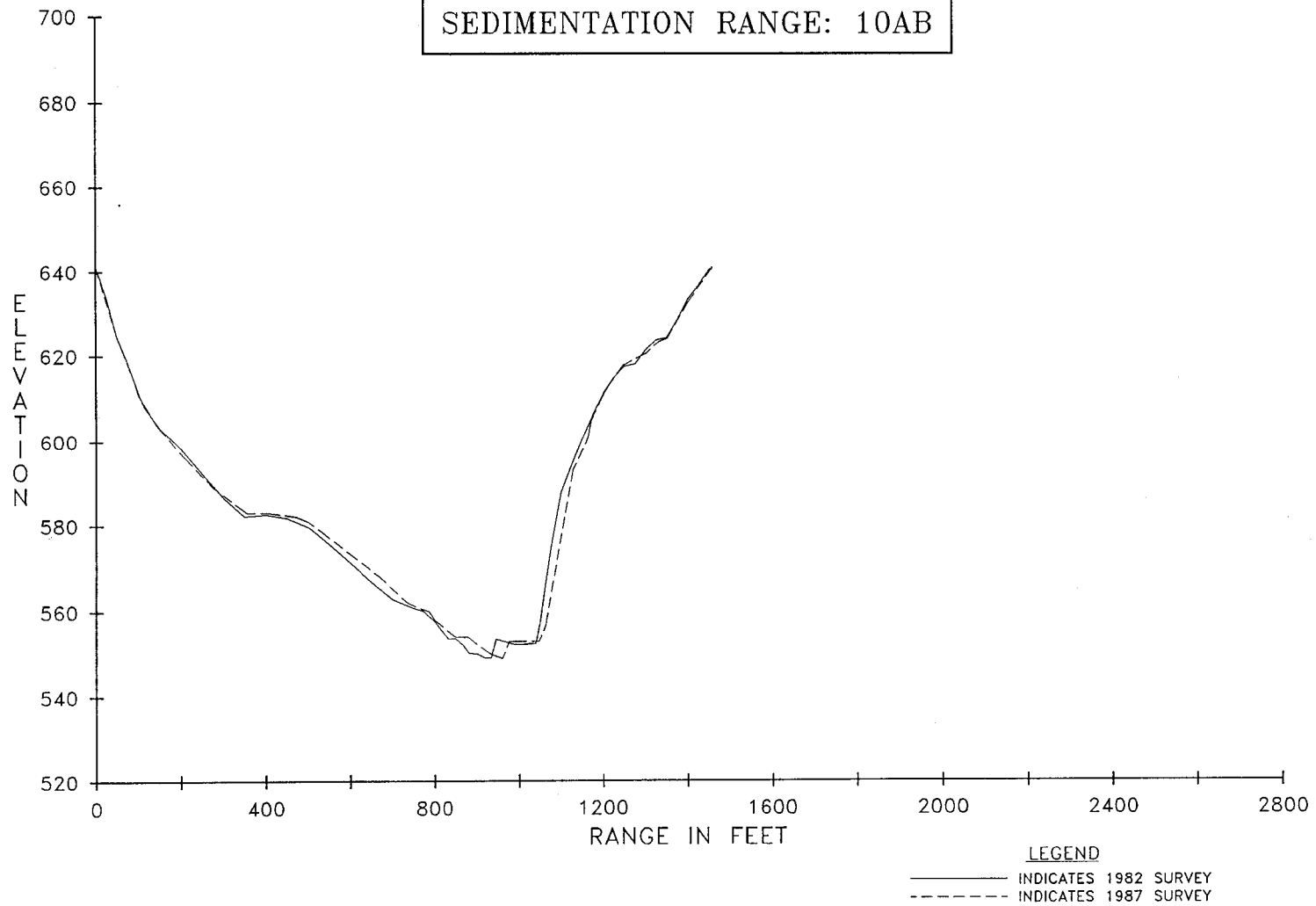


PLATE 15

MARK TWAIN LAKE
SEDIMENTATION RANGE: 11A

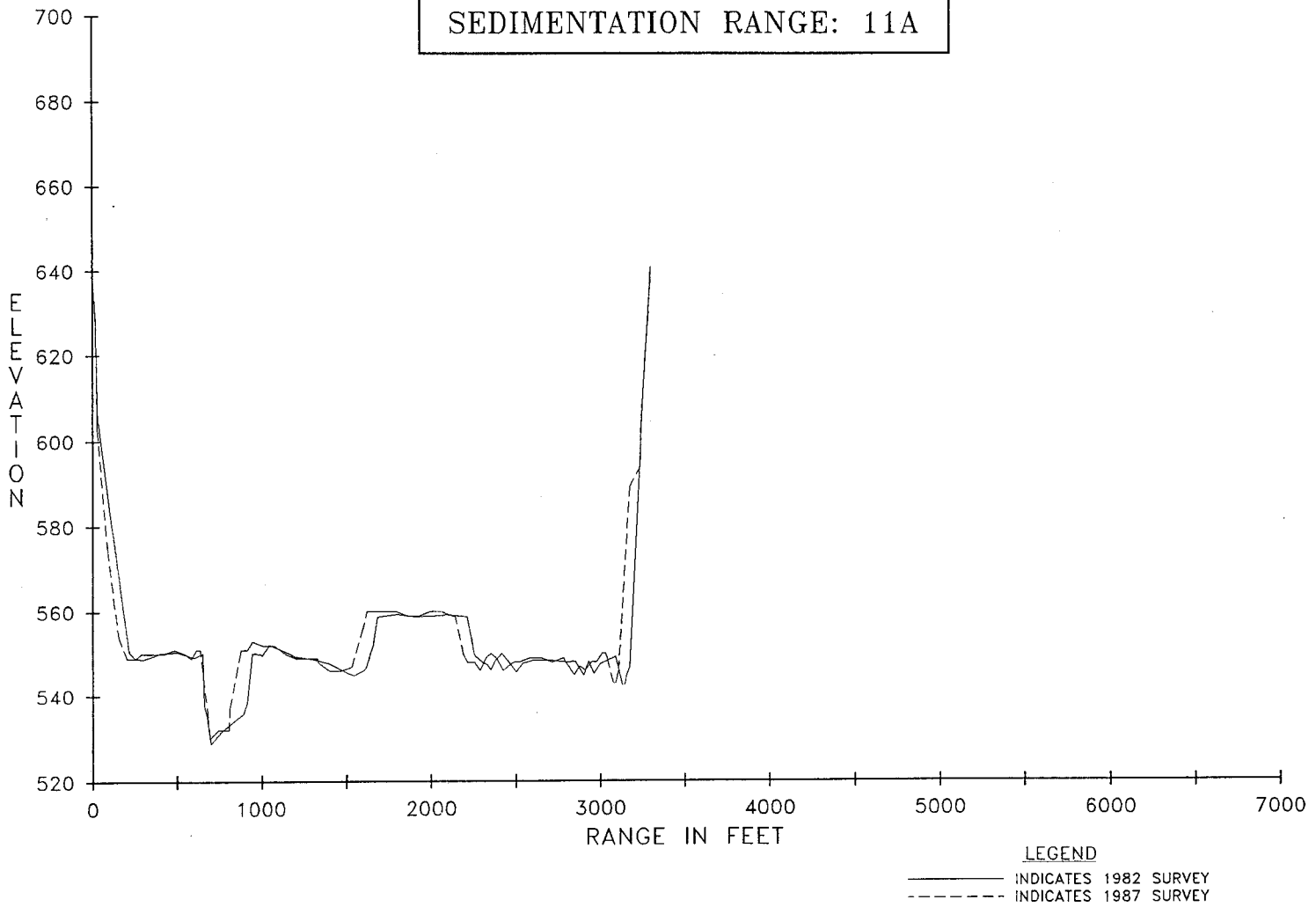


PLATE 16

MARK TWAIN LAKE
SEDIMENTATION RANGE: 12A

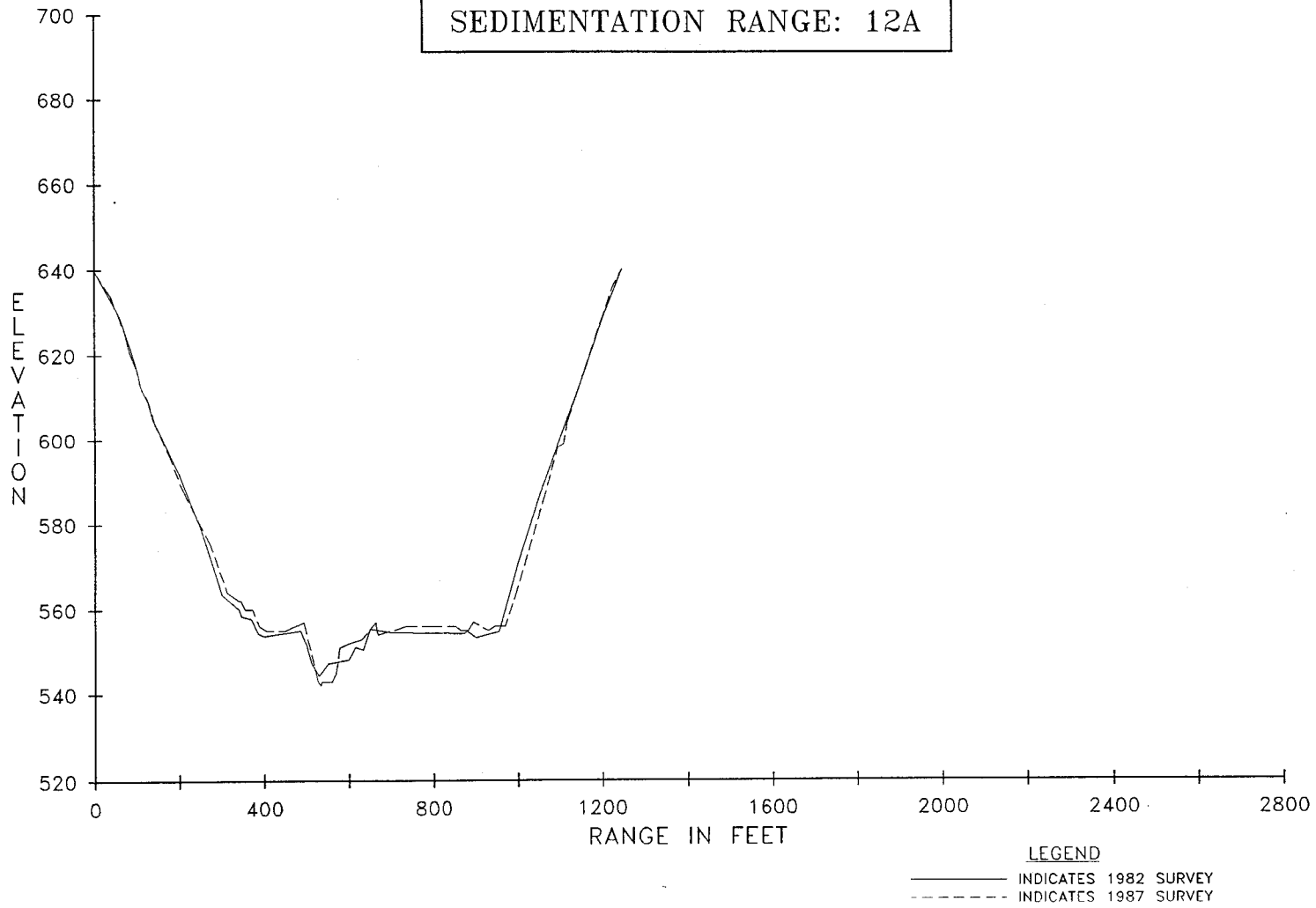


PLATE 17

MARK TWAIN LAKE
SEDIMENTATION RANGE: 13B

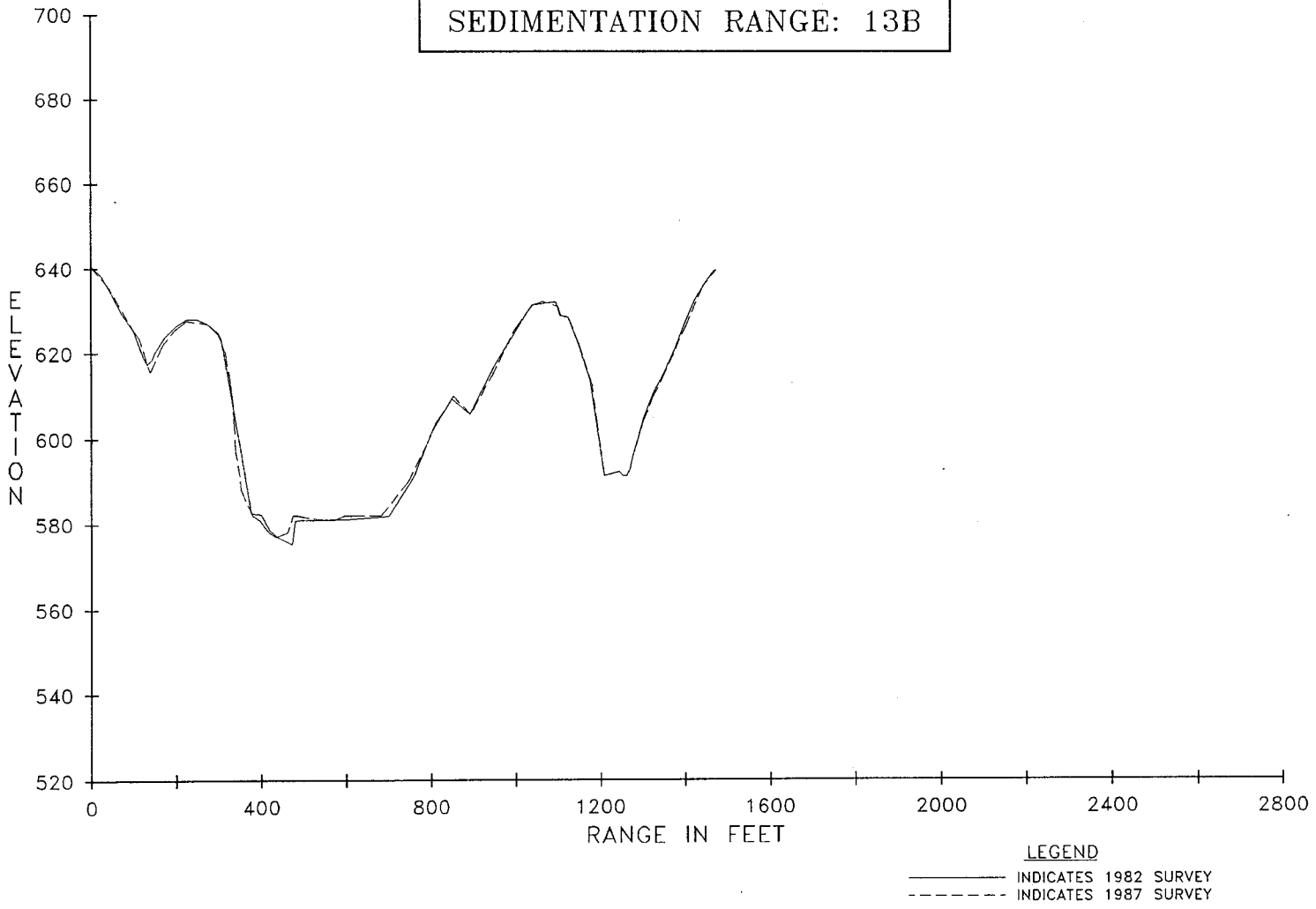


PLATE 18

MARK TWAIN LAKE
SEDIMENTATION RANGE: 14A

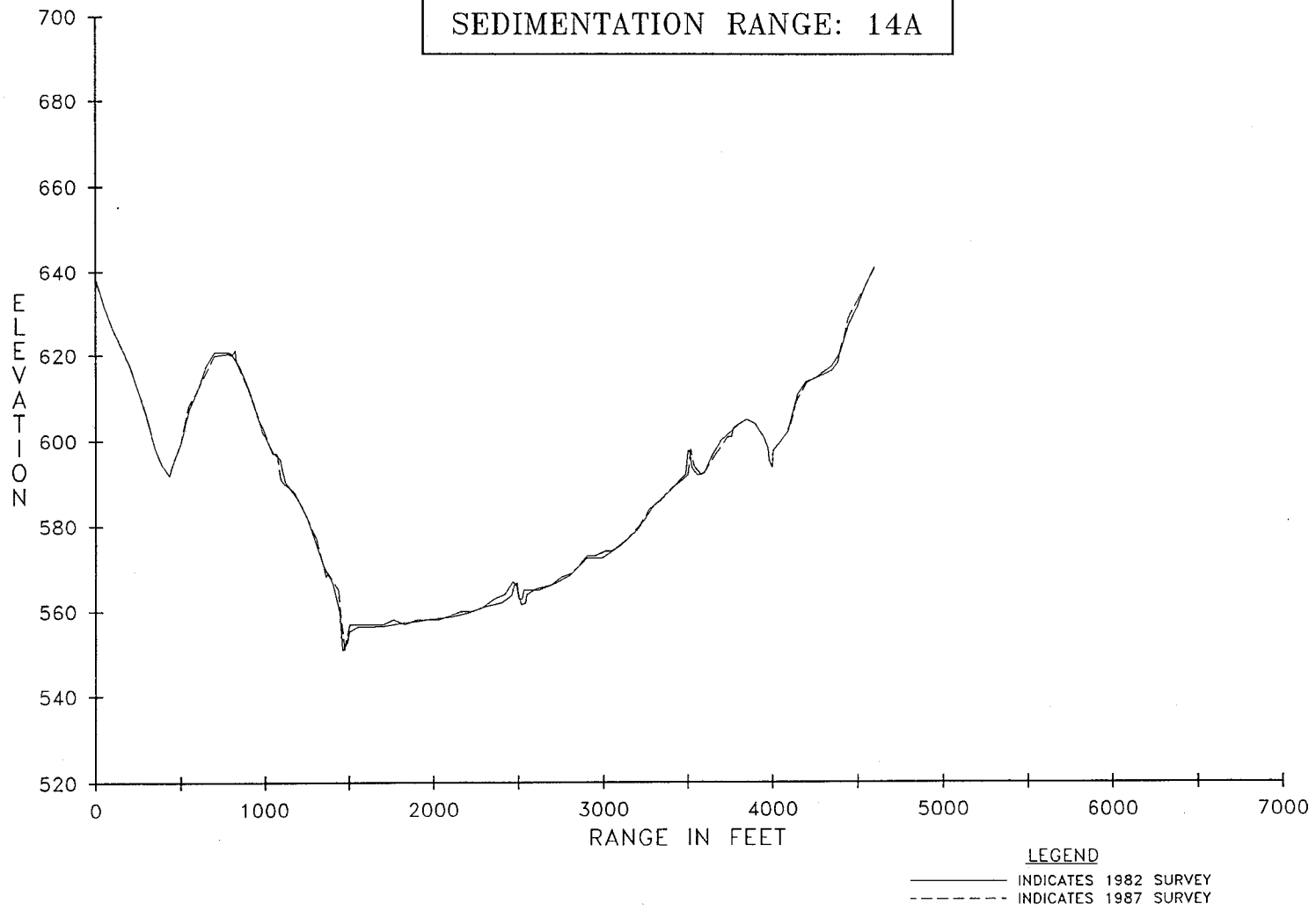


PLATE 19

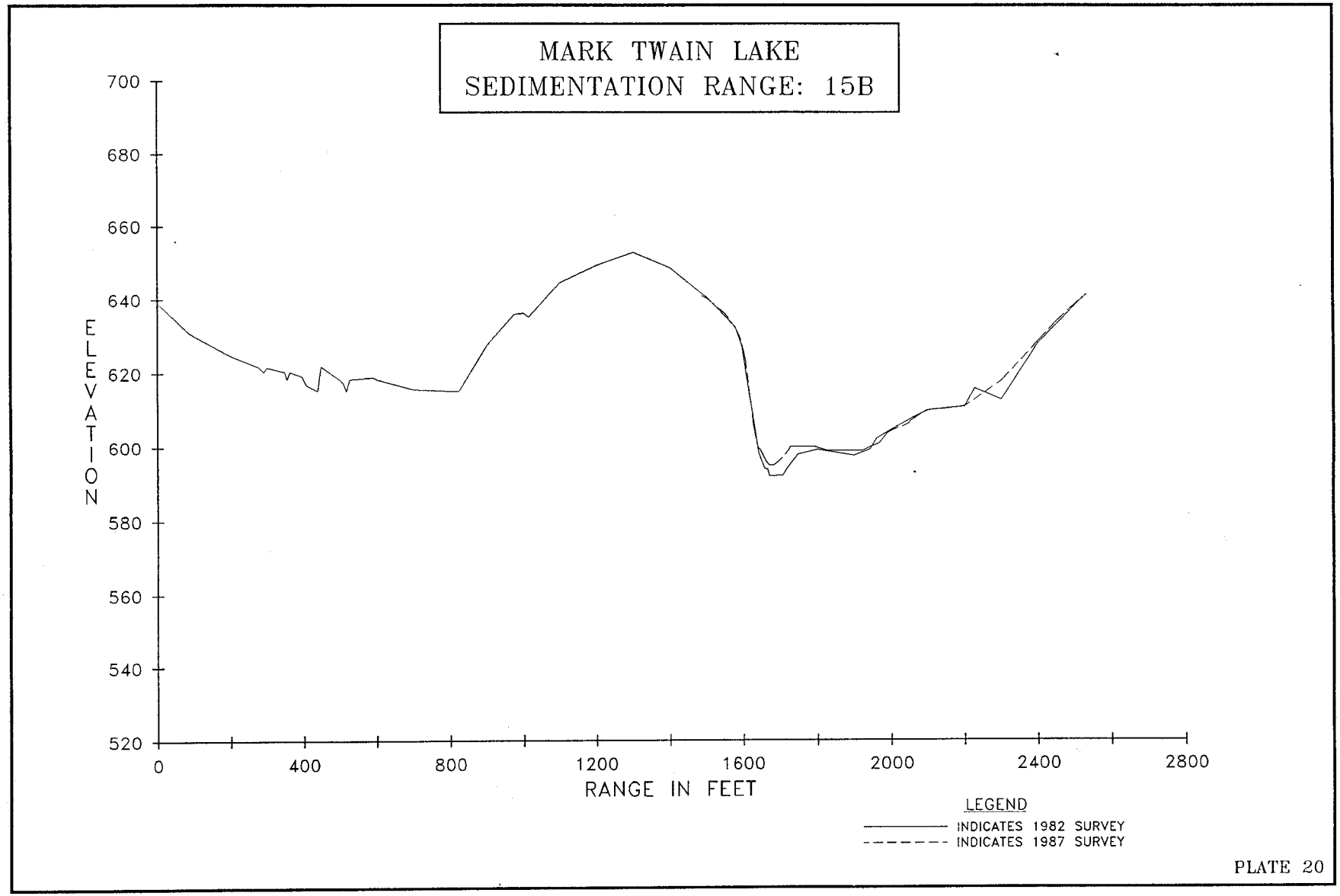

MARK TWAIN LAKE
SEDIMENTATION RANGE: 15B
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 20

MARK TWAIN LAKE
SEDIMENTATION RANGE: 16A

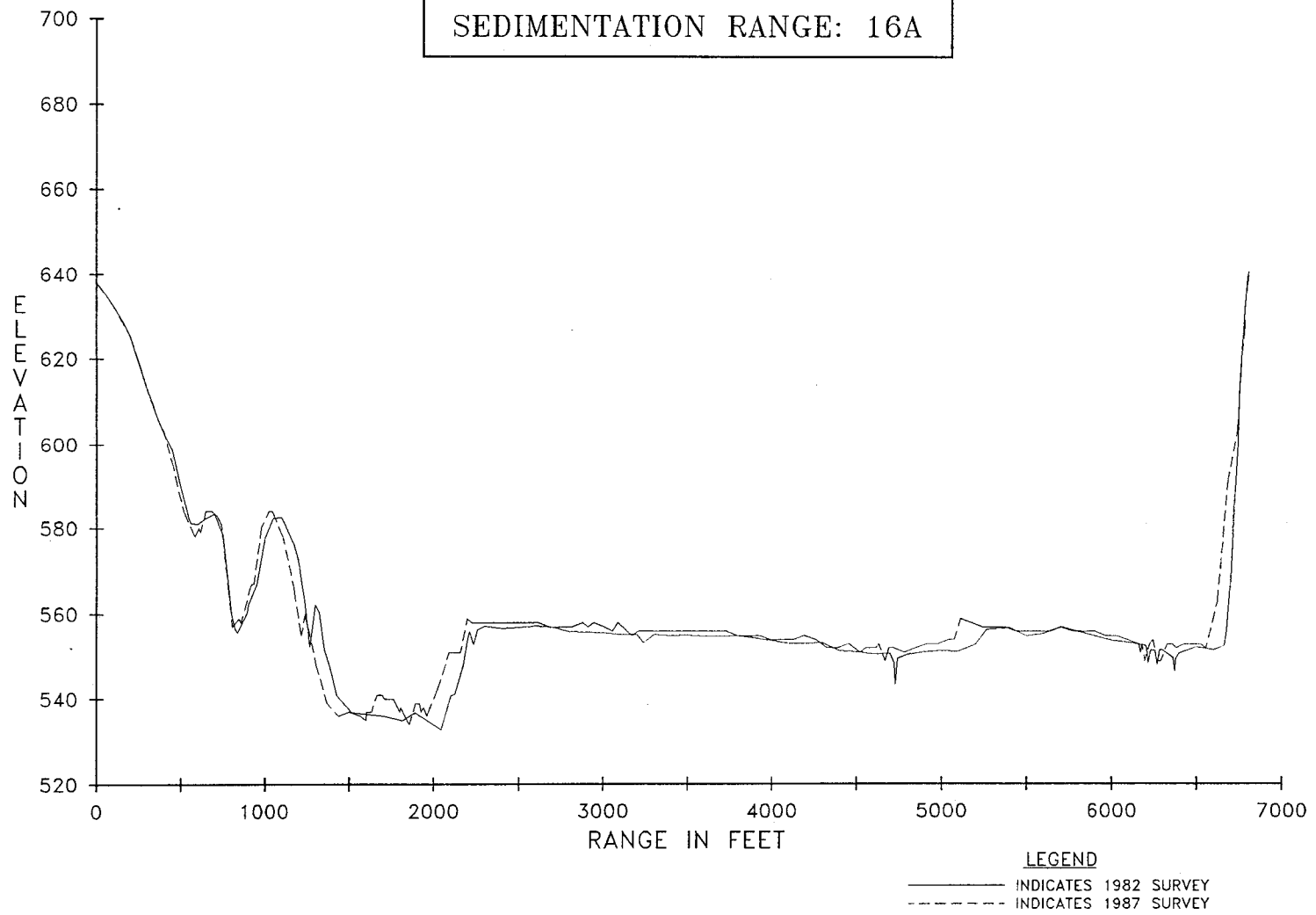


PLATE 21

MARK TWAIN LAKE
SEDIMENTATION RANGE: 17A

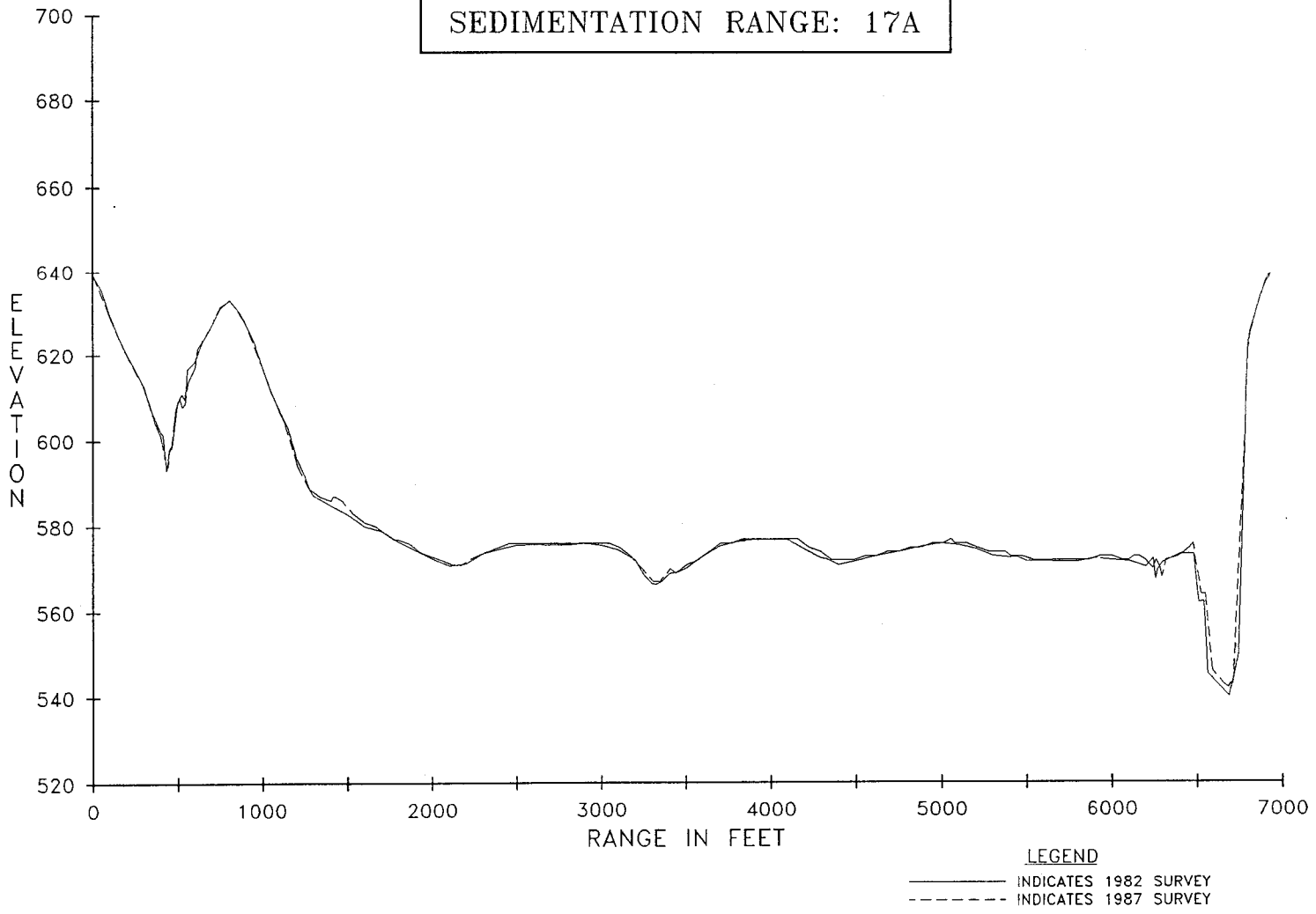


PLATE 22

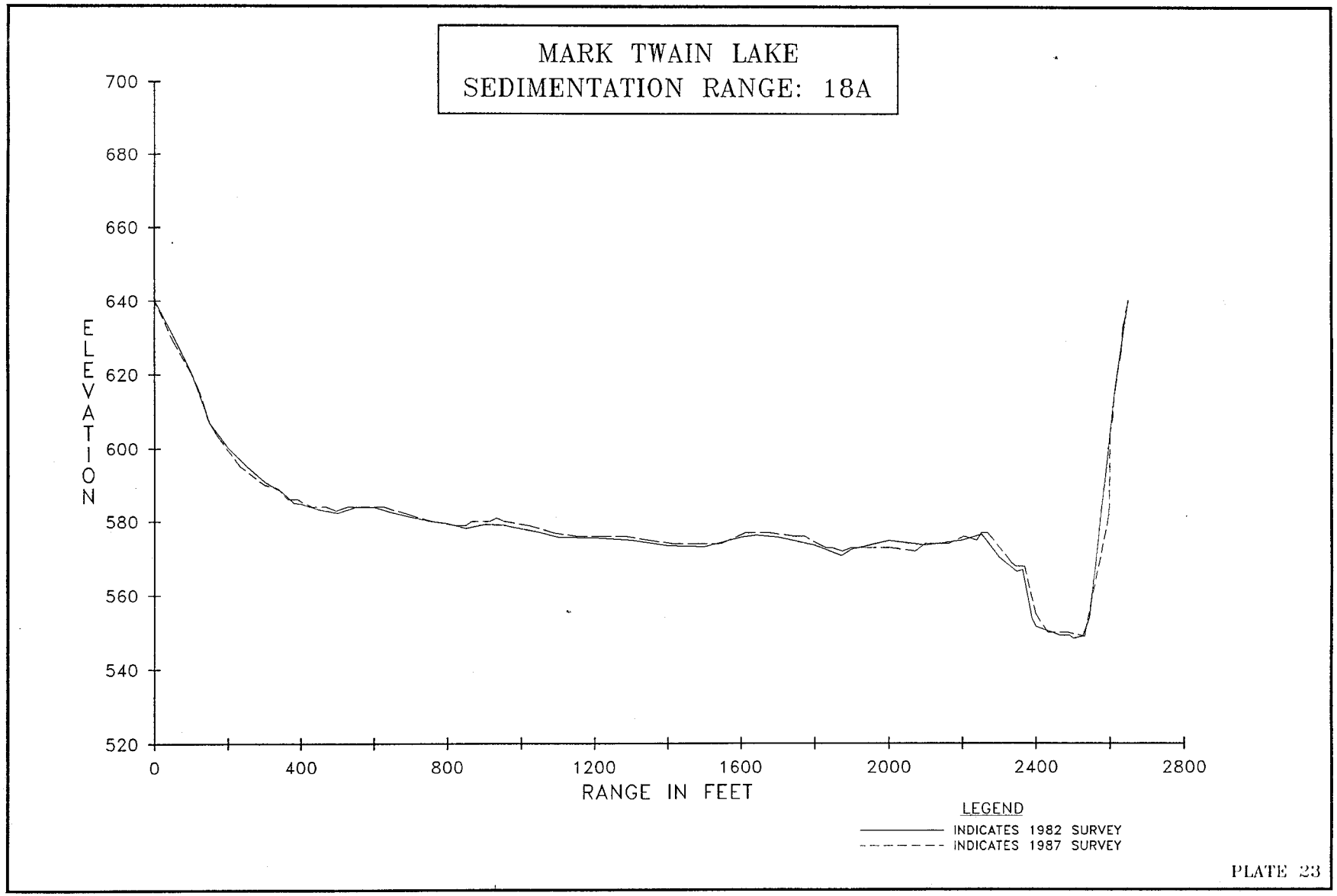

MARK TWAIN LAKE
SEDIMENTATION RANGE: 18A
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 23

MARK TWAIN LAKE
SEDIMENTATION RANGE: 19A

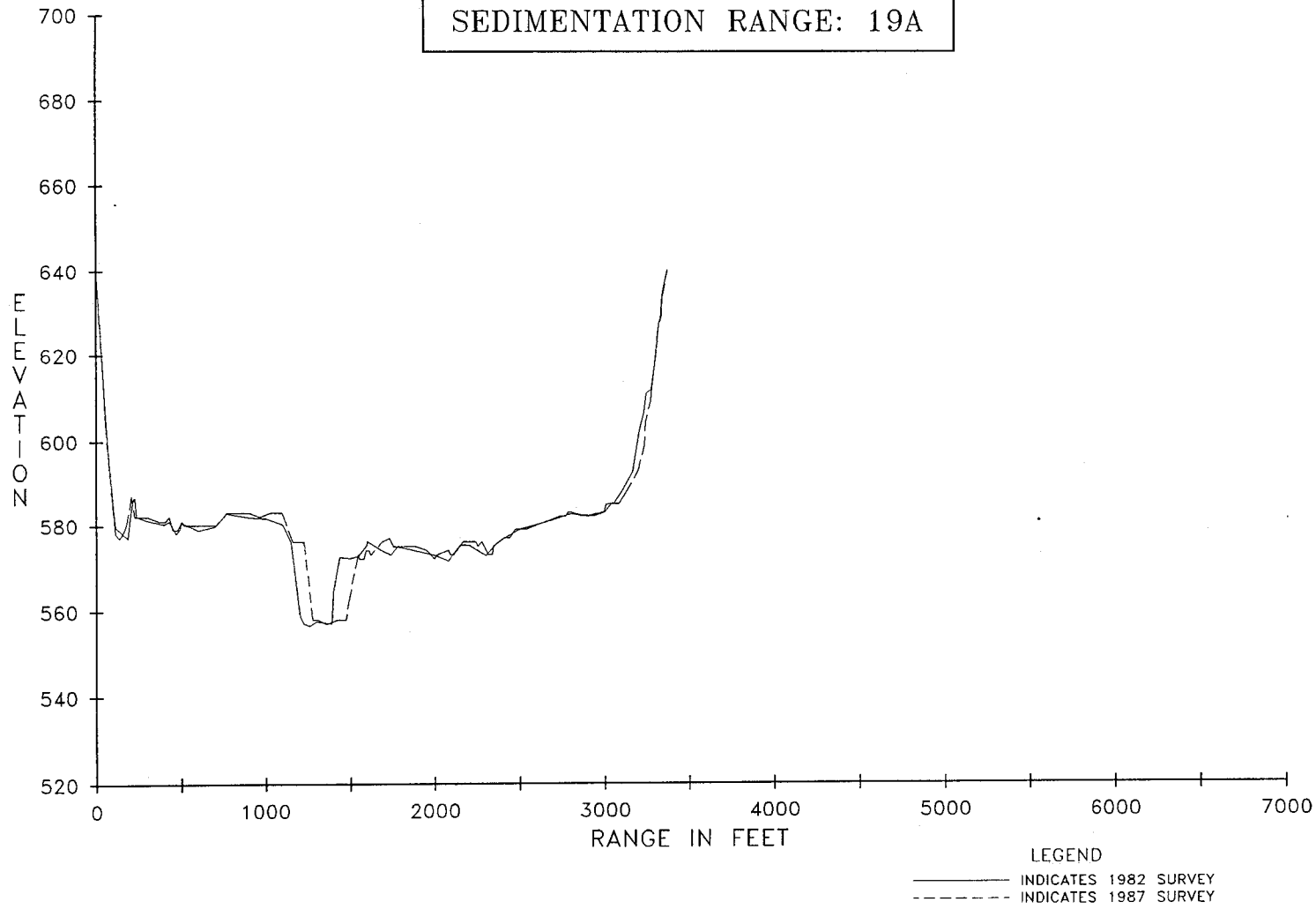


PLATE 24

MARK TWAIN LAKE
SEDIMENTATION RANGE: 20A

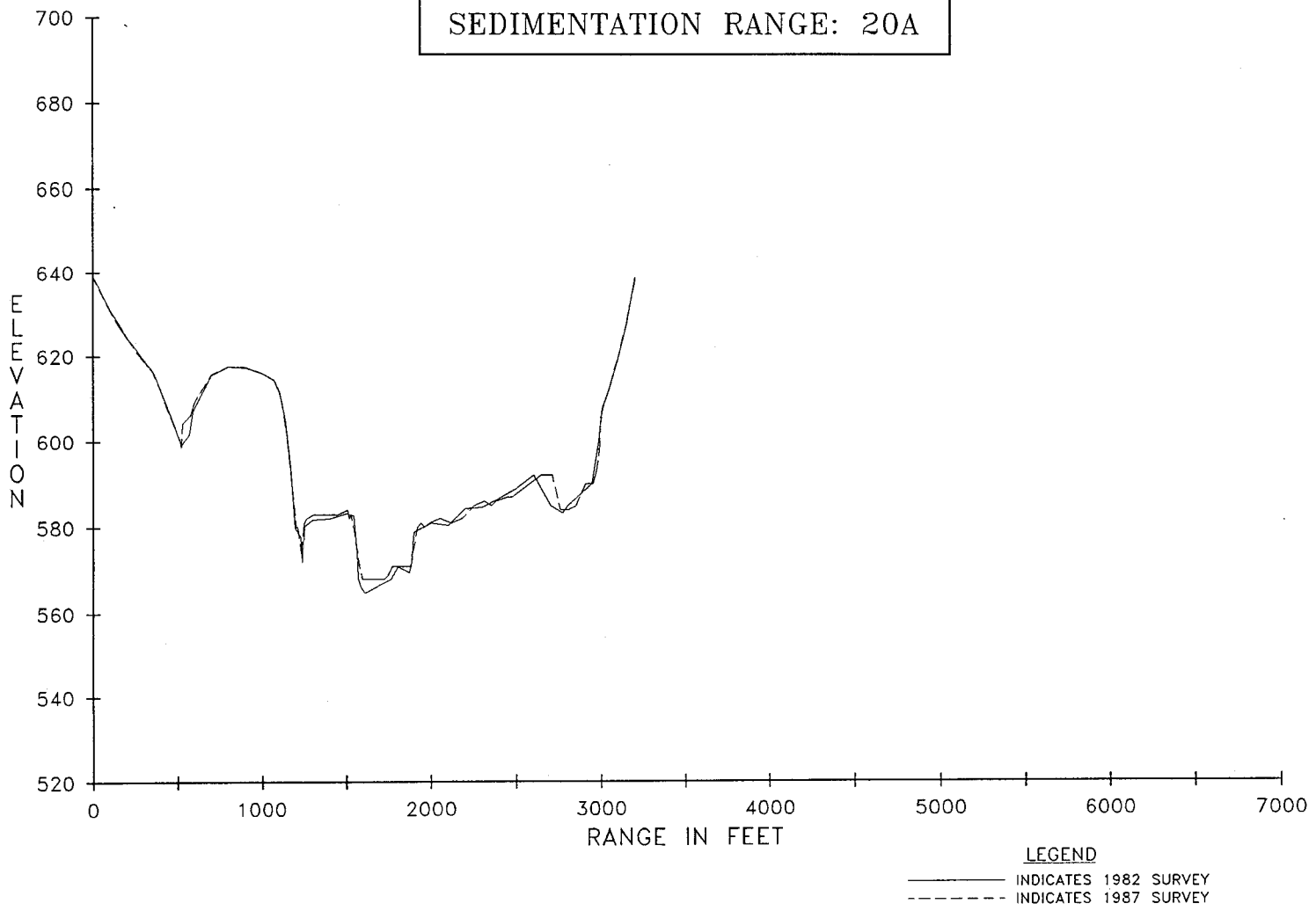


PLATE 25

MARK TWAIN LAKE
SEDIMENTATION RANGE: 21B

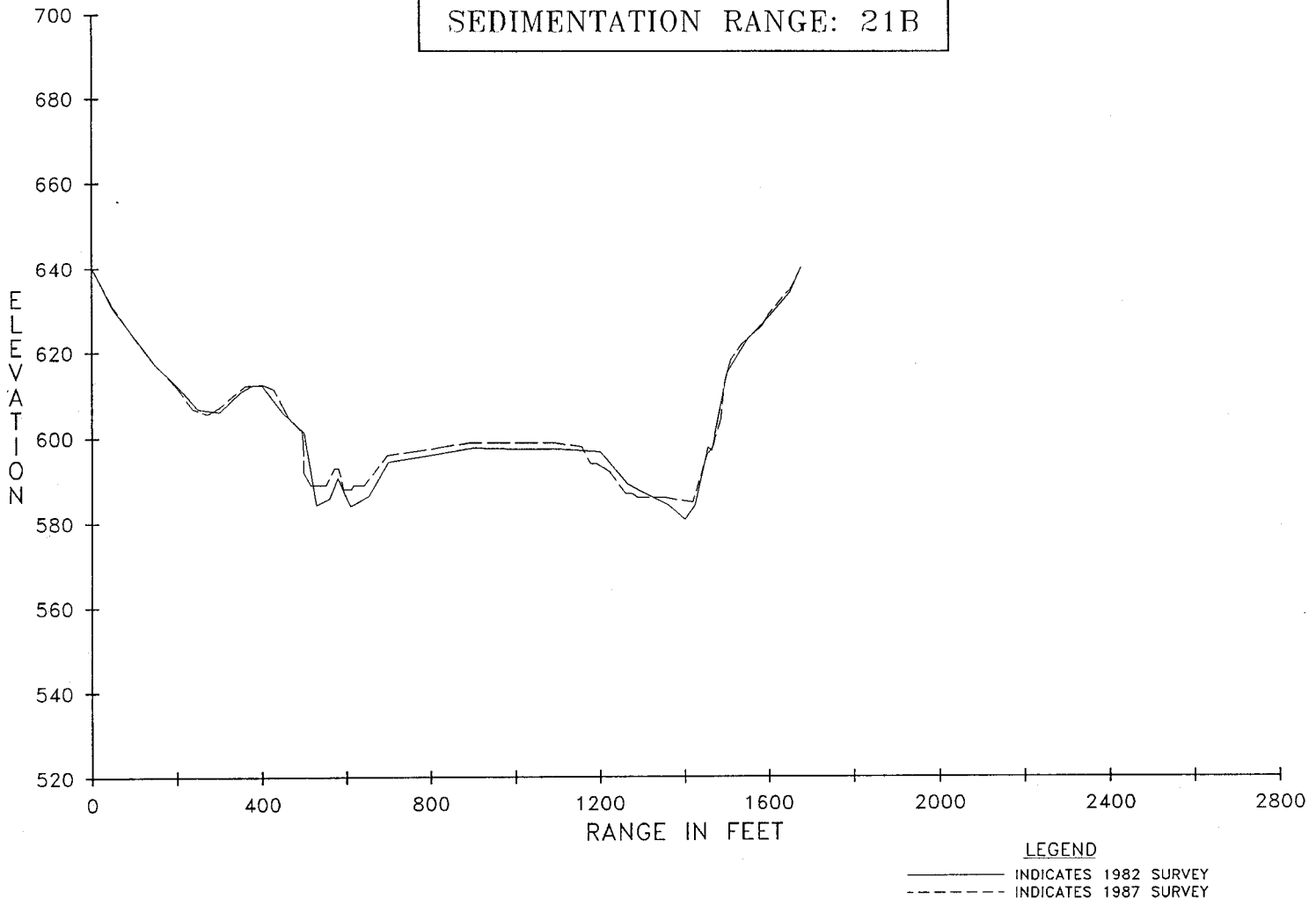


PLATE 26

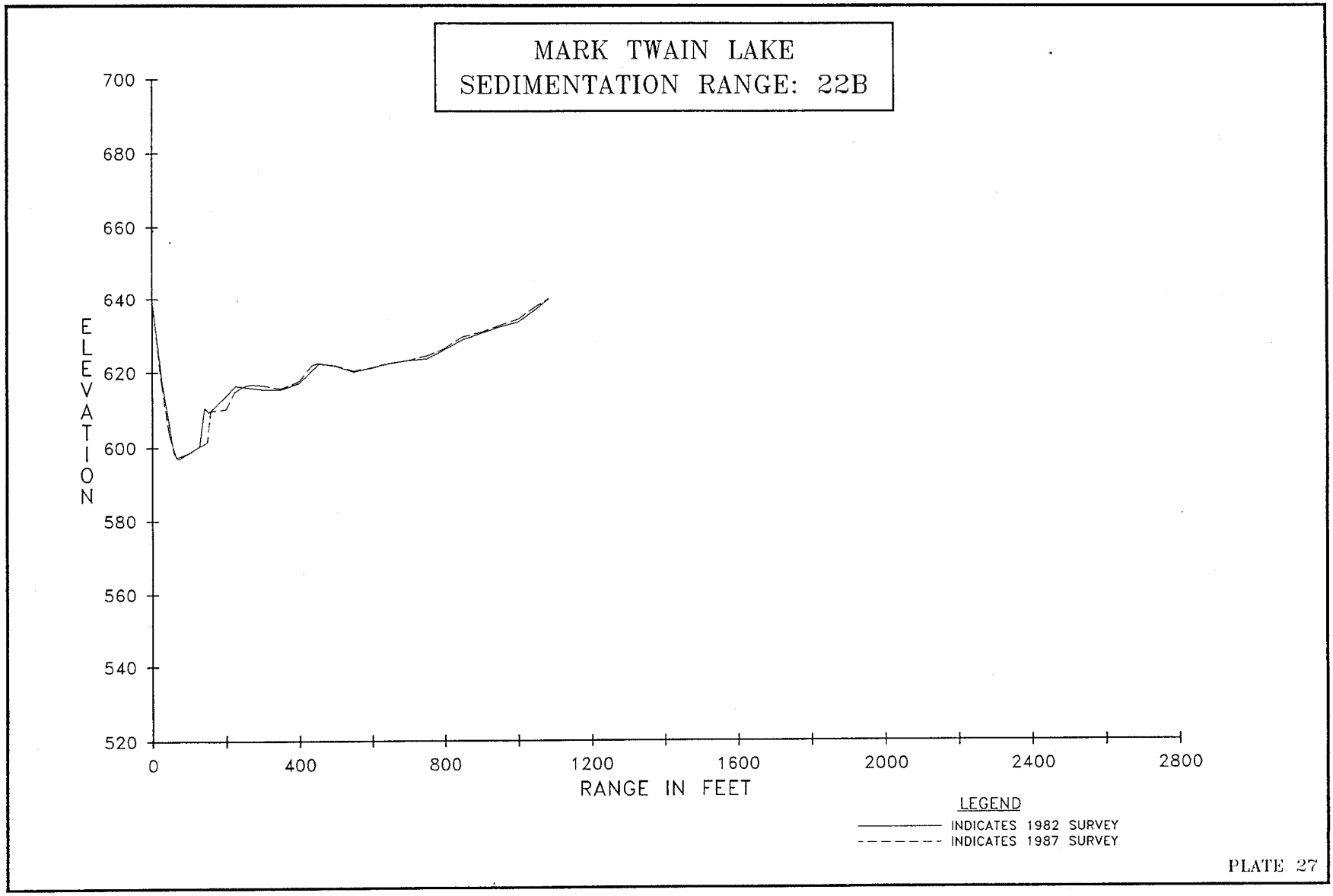

MARK TWAIN LAKE
SEDIMENTATION RANGE: 22B
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 27

MARK TWAIN LAKE
SEDIMENTATION RANGE: 23B

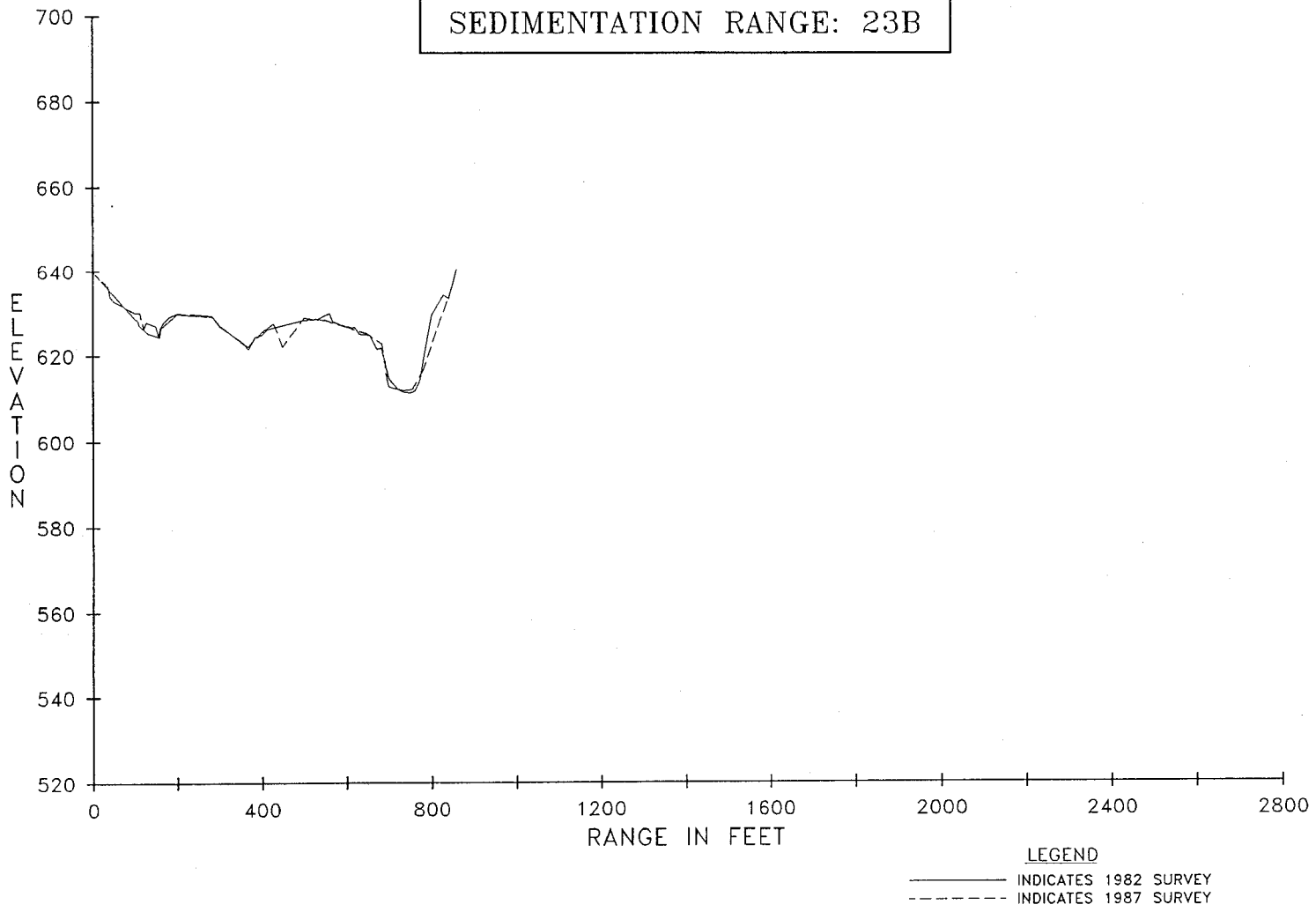


PLATE 28

MARK TWAIN LAKE
SEDIMENTATION RANGE: 24B

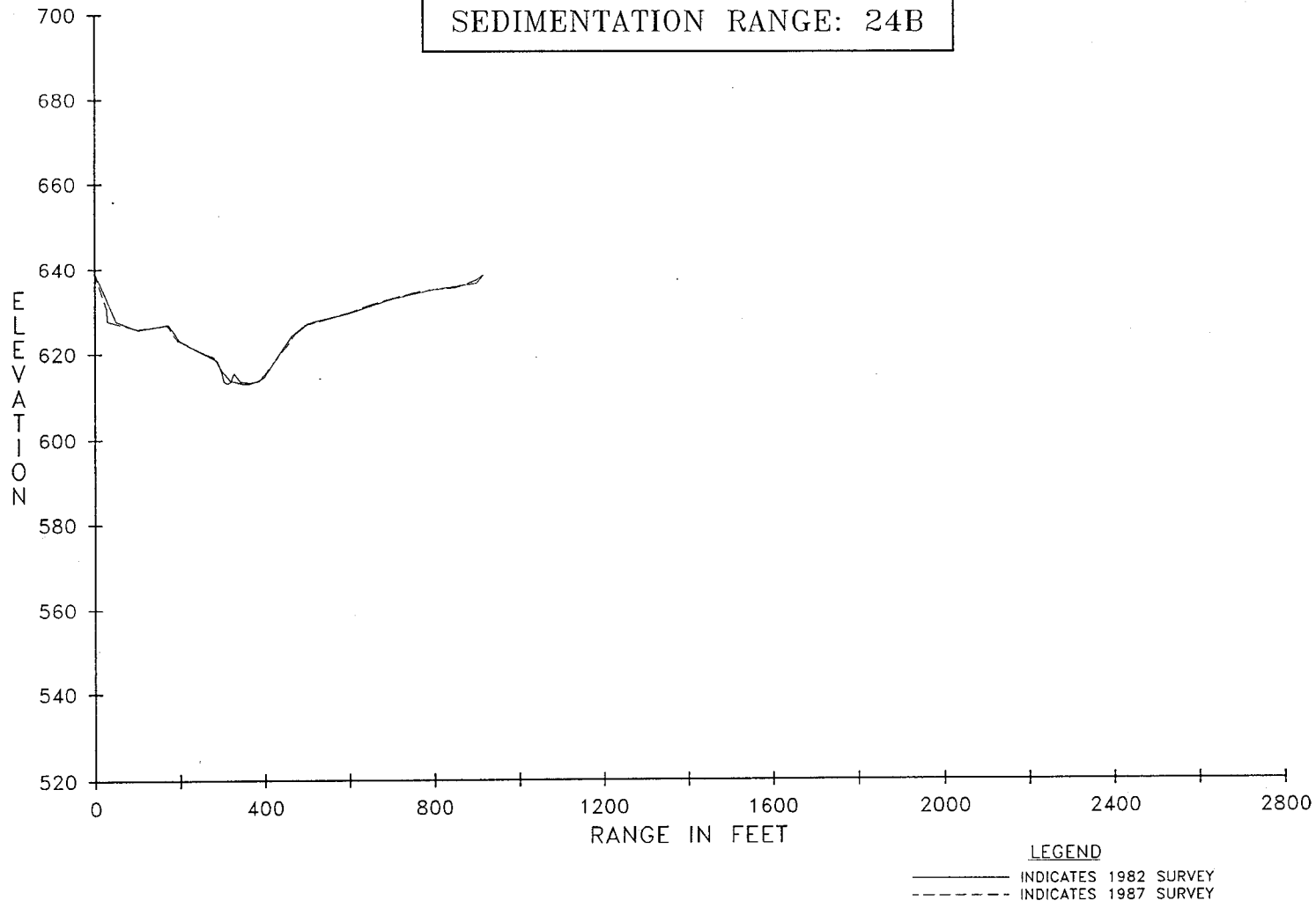


PLATE 29

MARK TWAIN LAKE
SEDIMENTATION RANGE: 25B

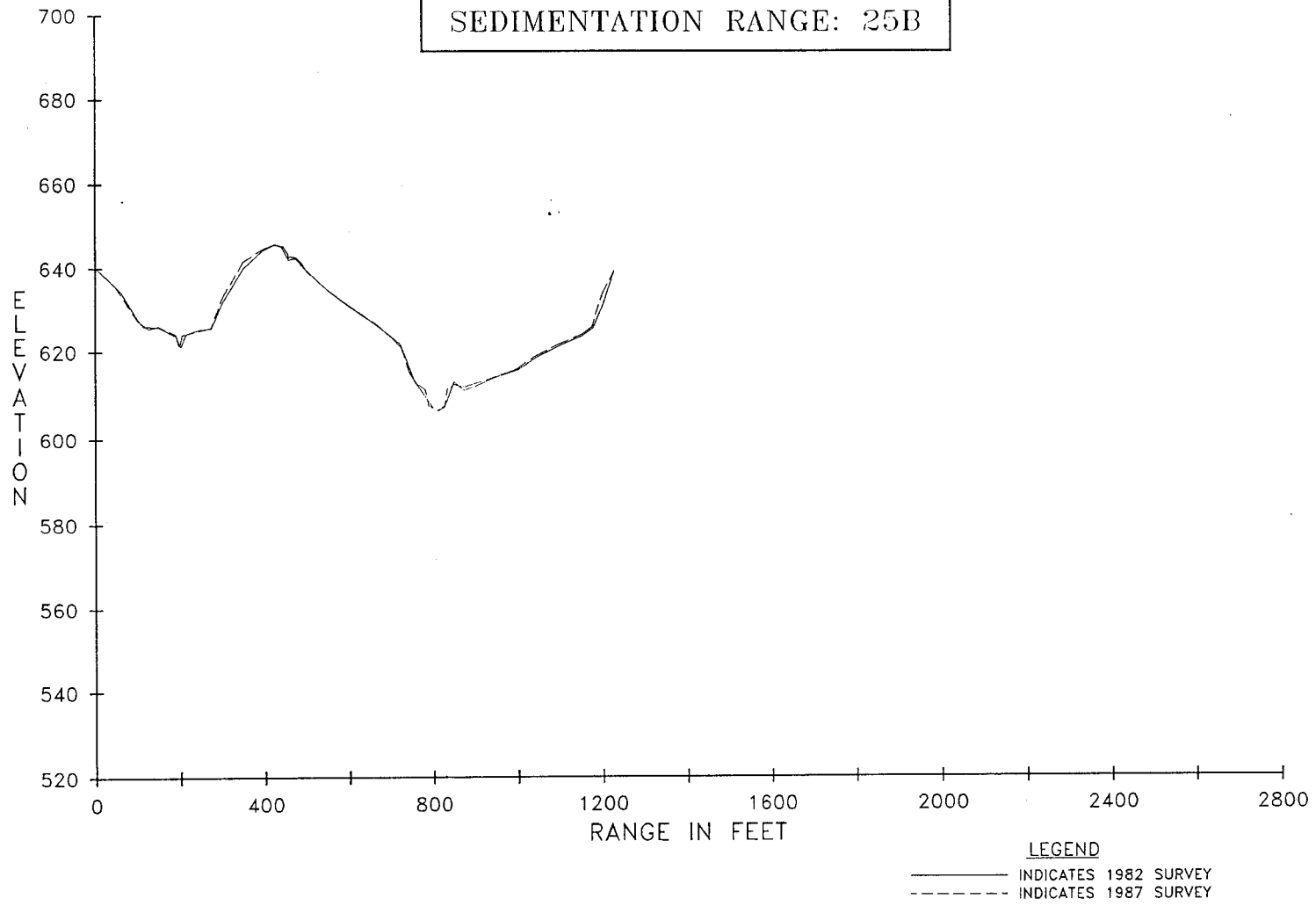


PLATE 30

MARK TWAIN LAKE
SEDIMENTATION RANGE: 26A

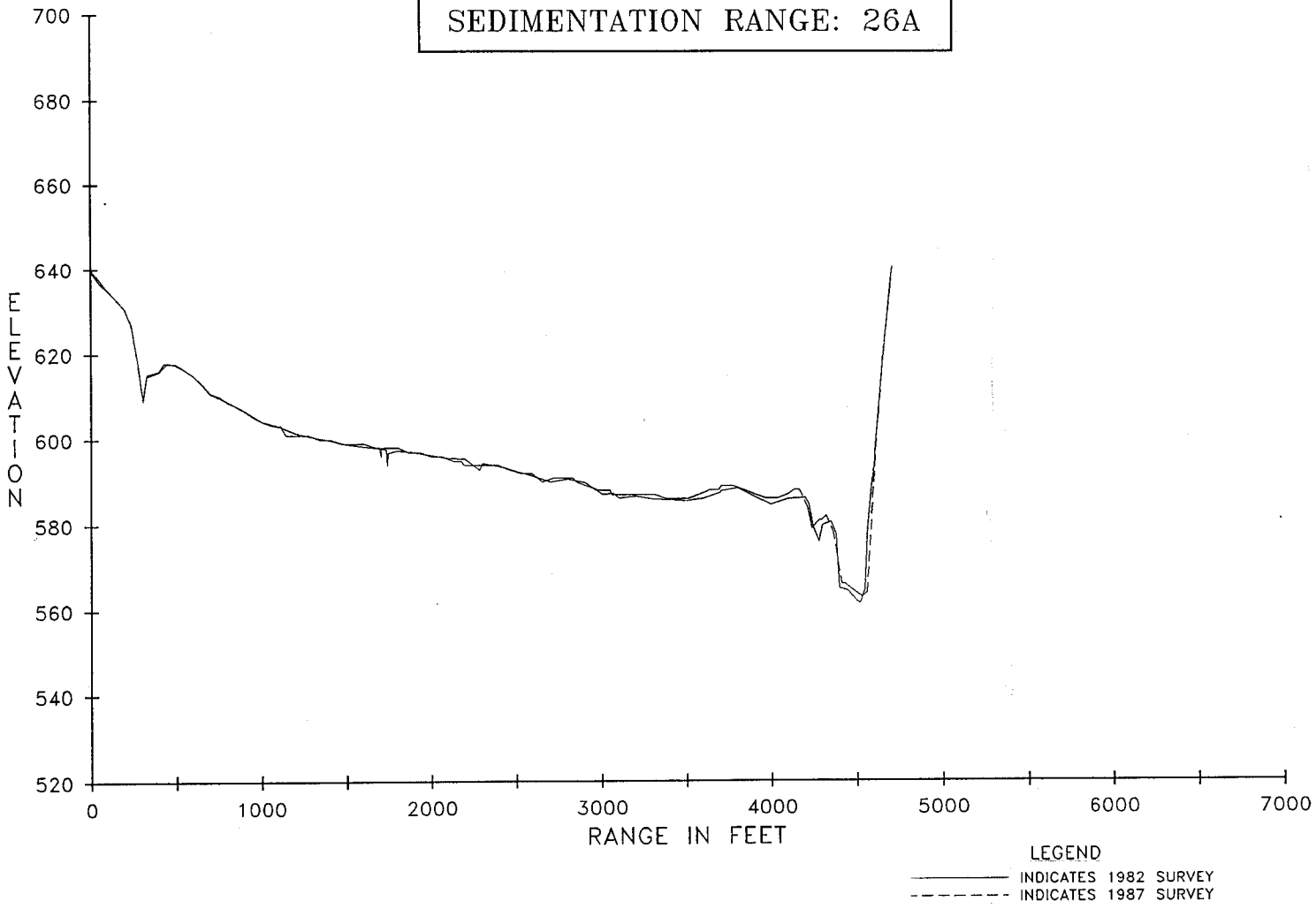


PLATE 31

MARK TWAIN LAKE
SEDIMENTATION RANGE: 27B

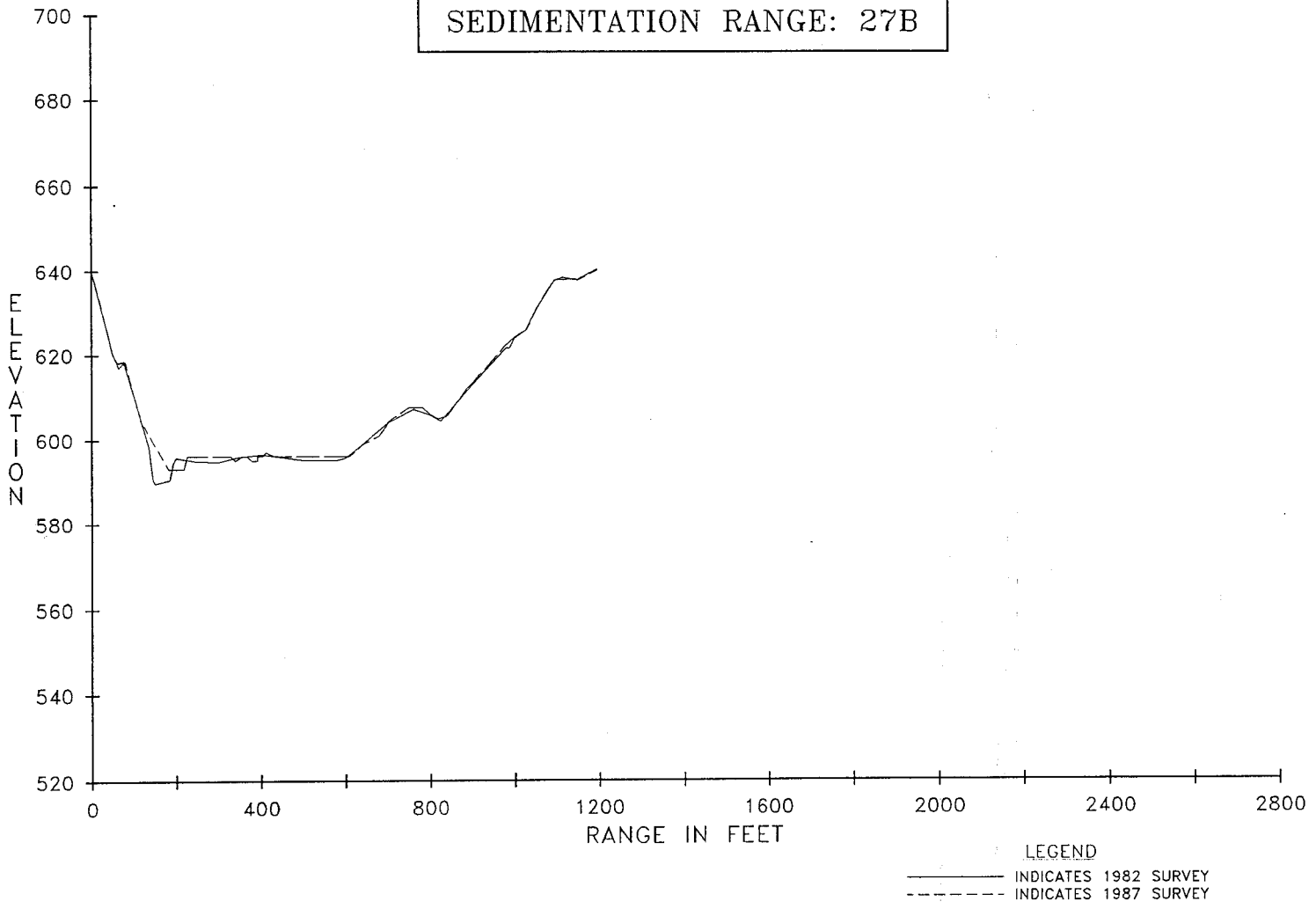


PLATE 32

MARK TWAIN LAKE
SEDIMENTATION RANGE: 28A

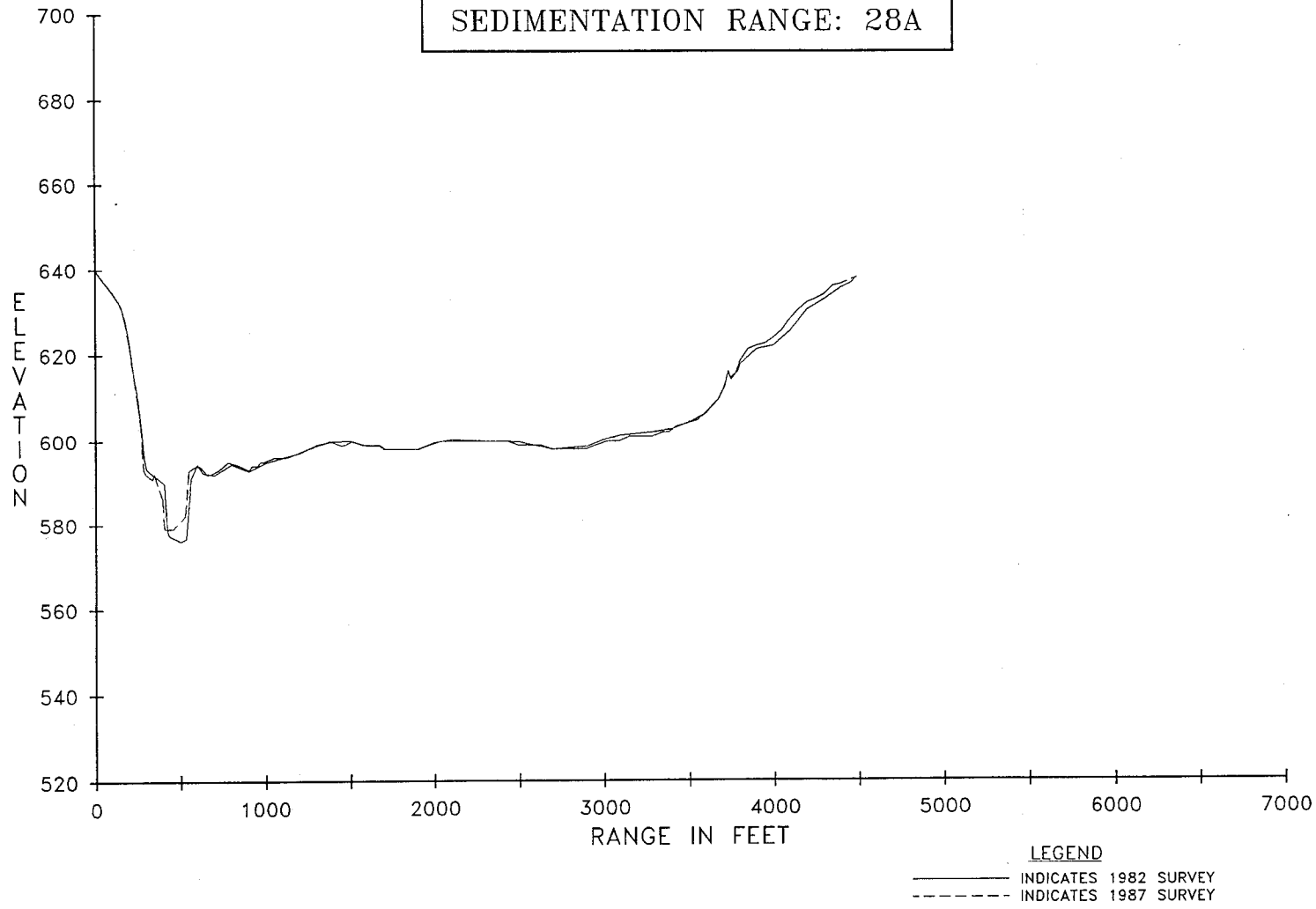


PLATE 33

MARK TWAIN LAKE
SEDIMENTATION RANGE: 29AB

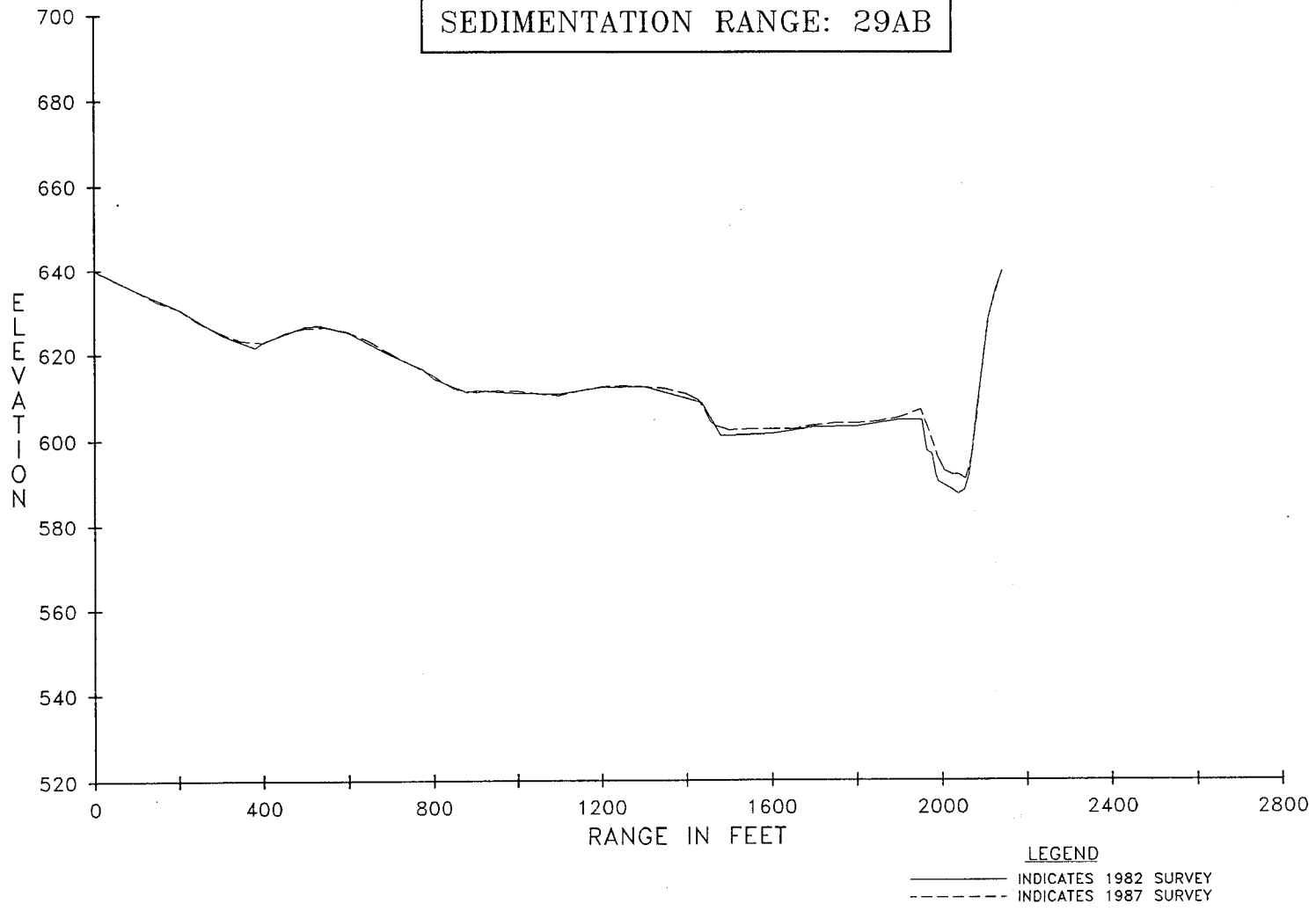


PLATE 34

MARK TWAIN LAKE
SEDIMENTATION RANGE: 30B

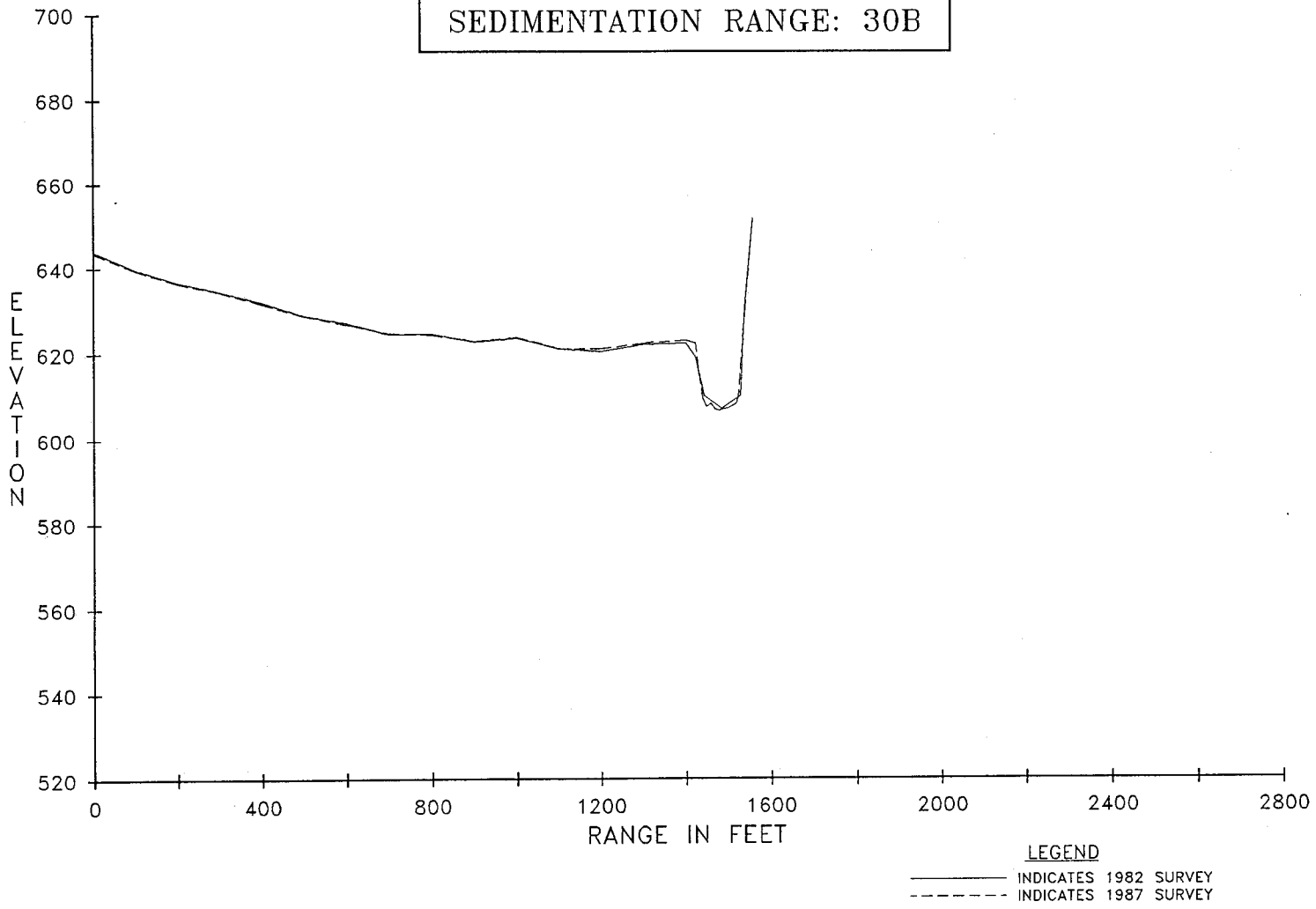


PLATE 35

MARK TWAIN LAKE
SEDIMENTATION RANGE: 31AB

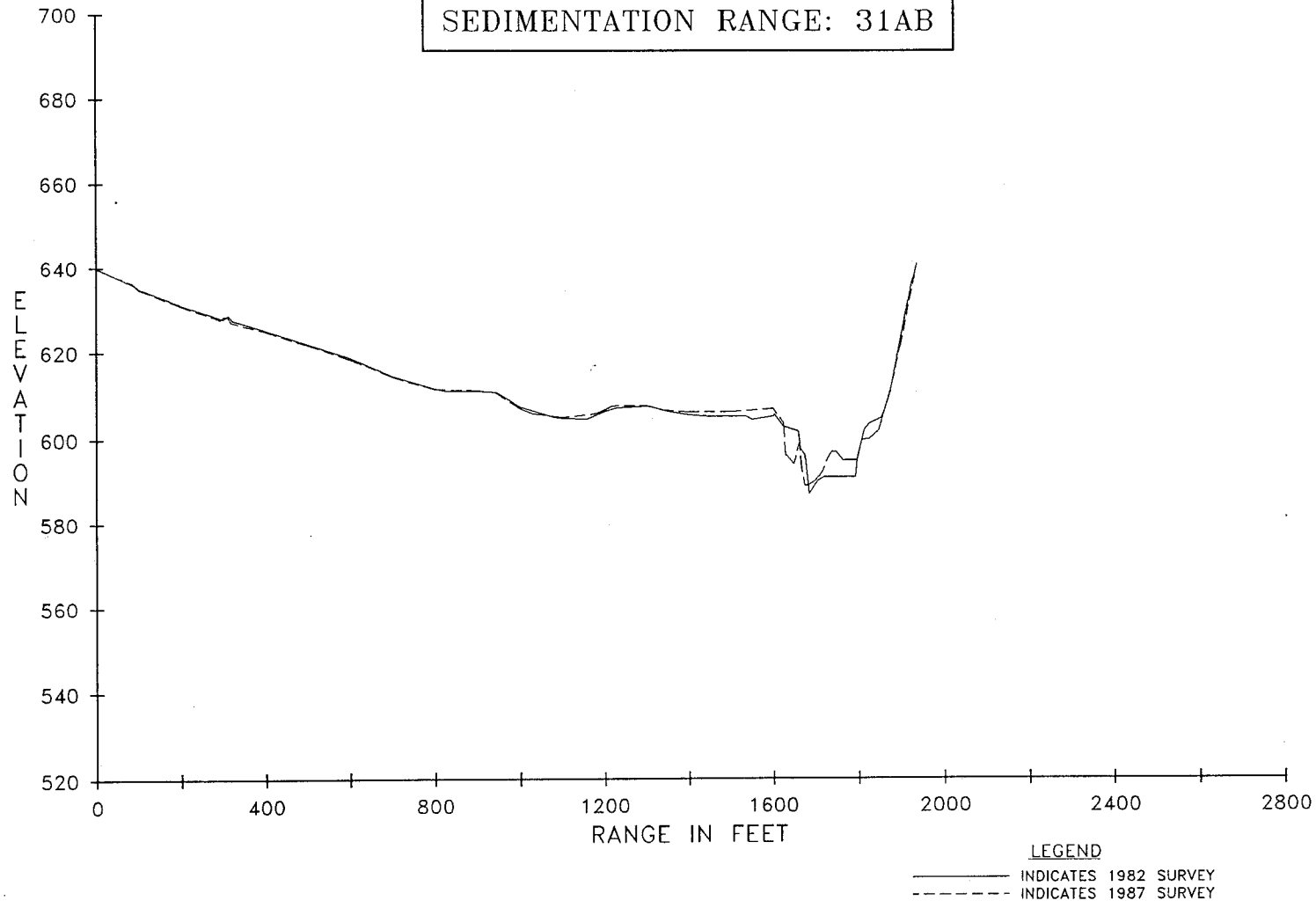


PLATE 36

MARK TWAIN LAKE
SEDIMENTATION RANGE: 32B

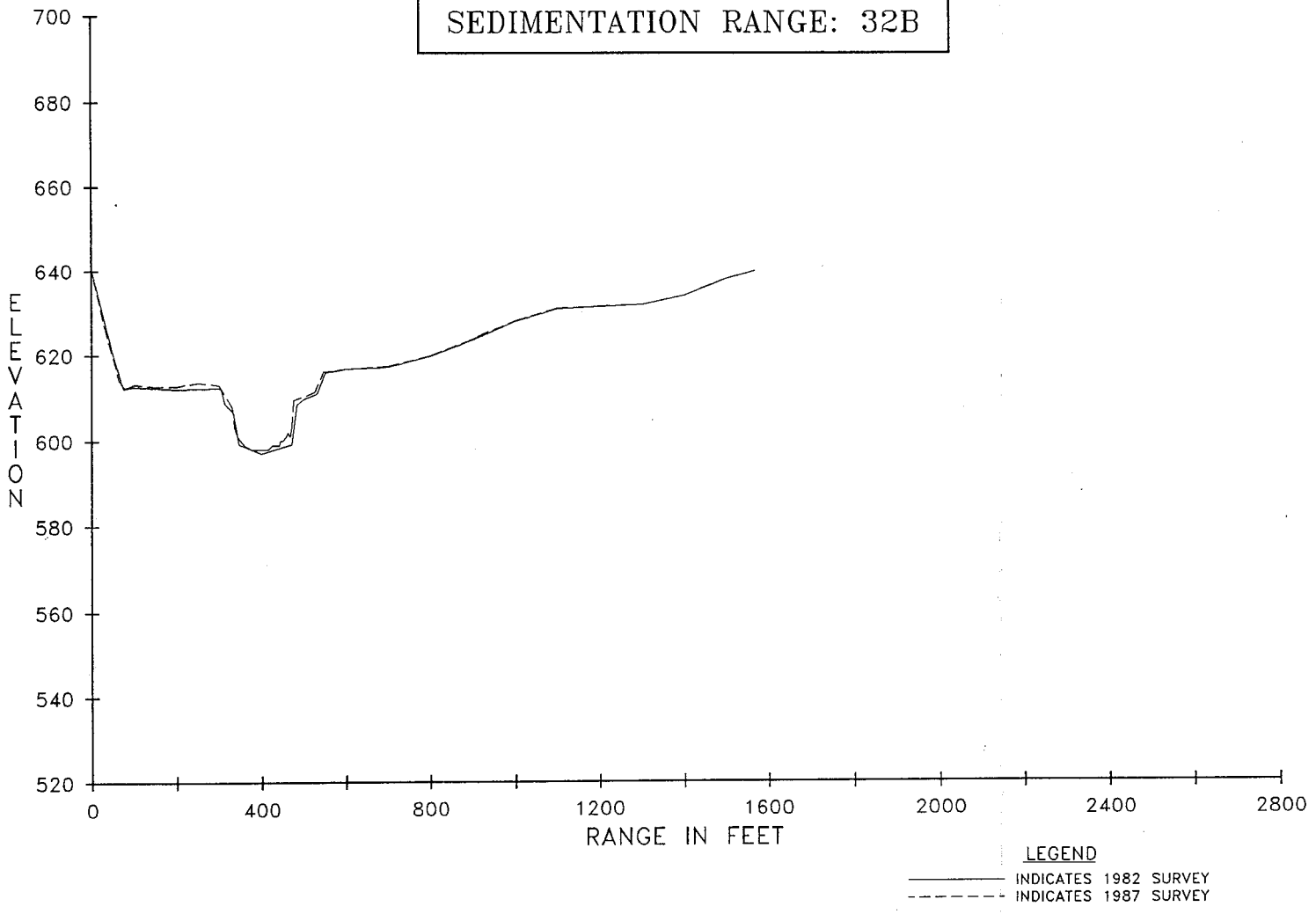


PLATE 37

MARK TWAIN LAKE
SEDIMENTATION RANGE: 33AB

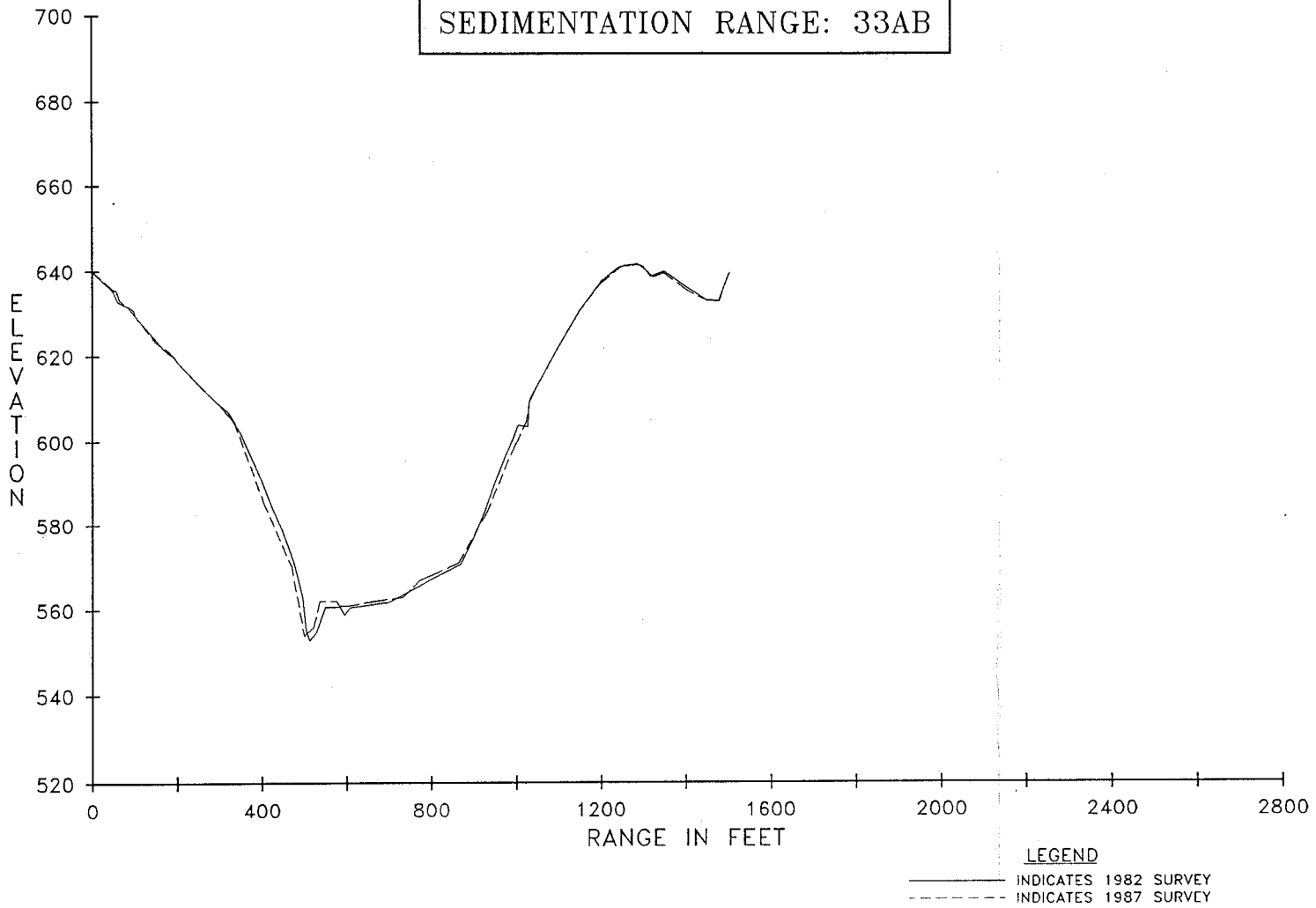


PLATE 38

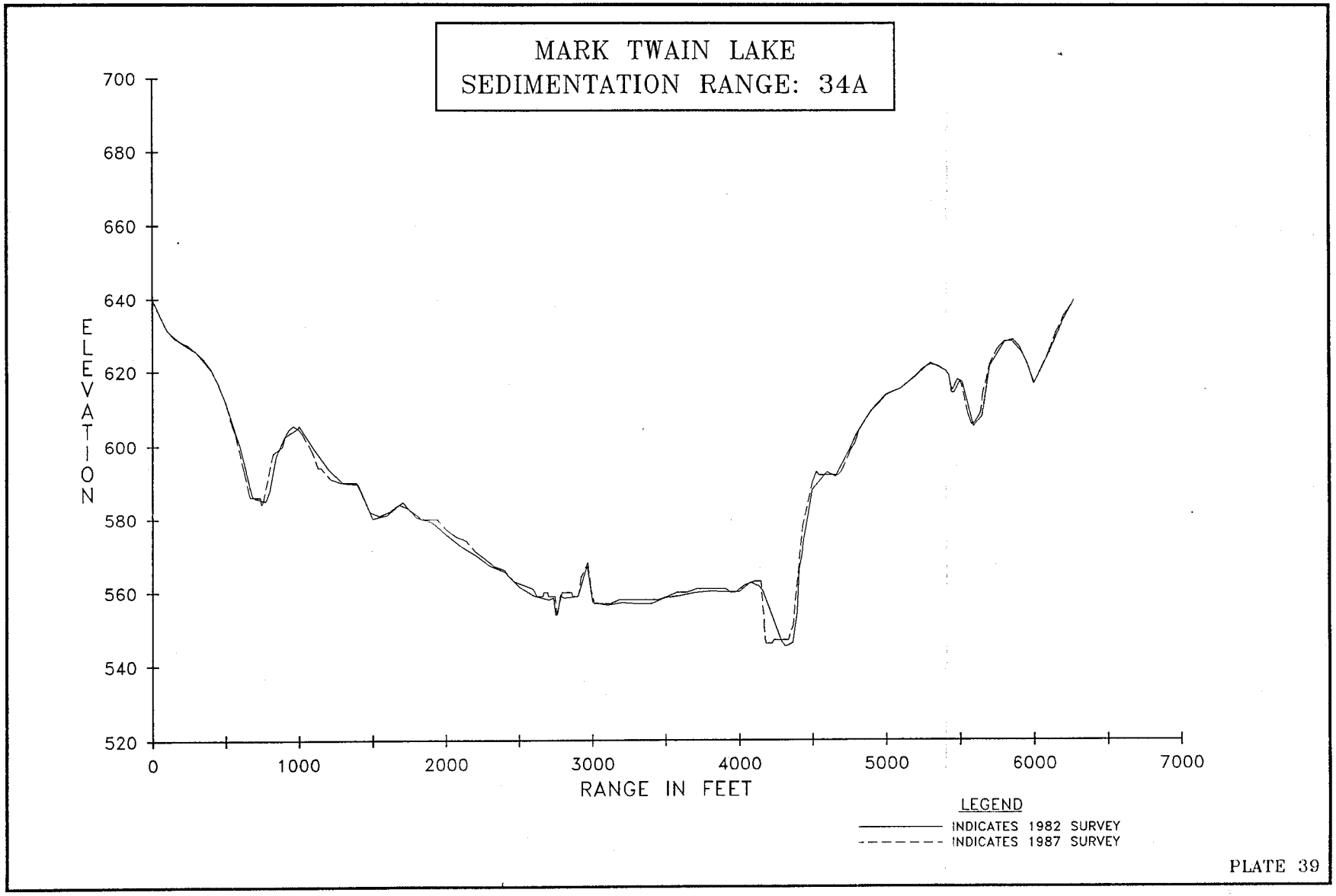

MARK TWAIN LAKE
SEDIMENTATION RANGE: 34A
ELEVATION
700
680
660
640
620
600
580
560
540
520
0
1000
2000
3000
4000
5000
6000
7000
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 39

MARK TWAIN LAKE
SEDIMENTATION RANGE: 35A

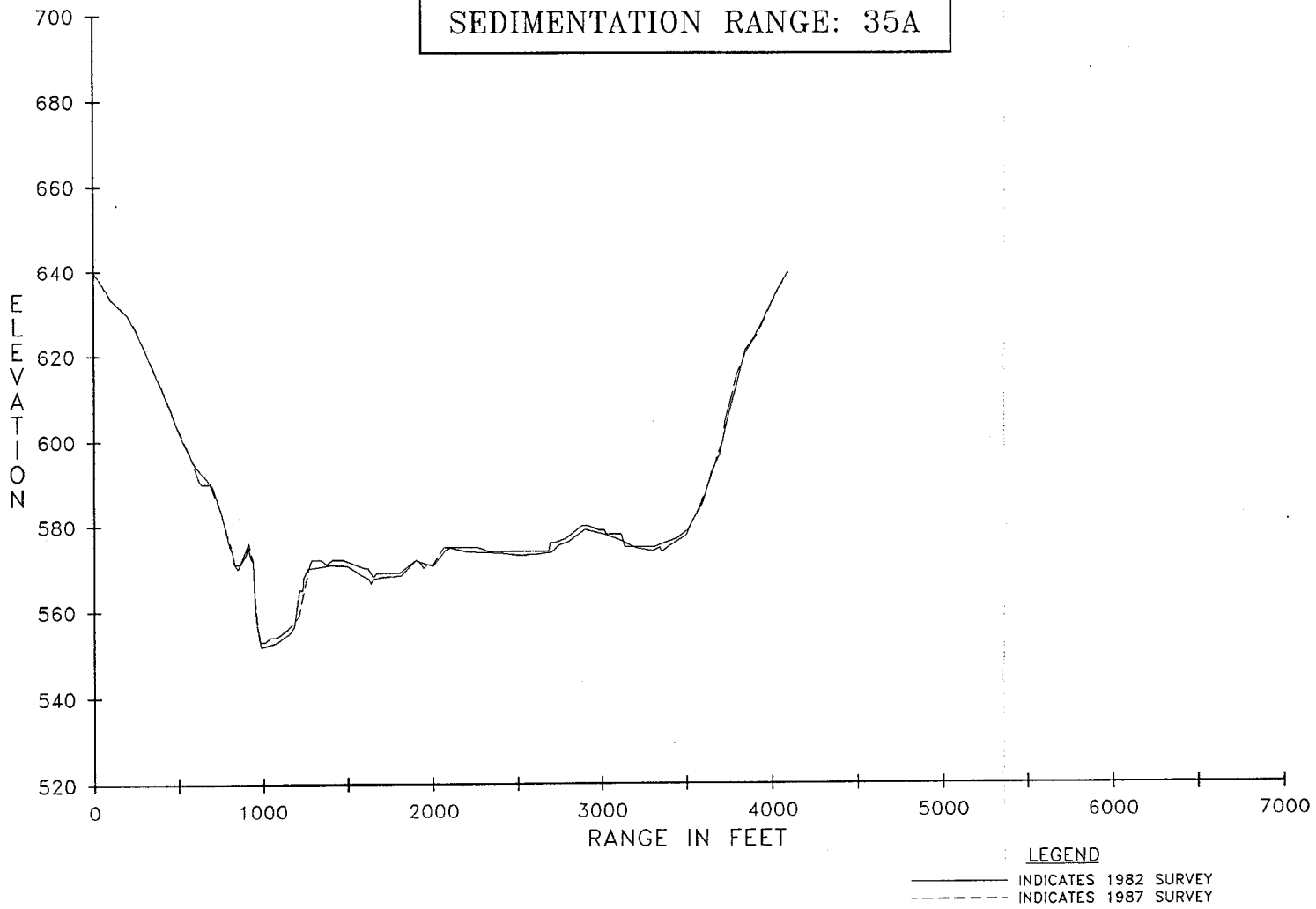


PLATE 40

MARK TWAIN LAKE
SEDIMENTATION RANGE: 36A

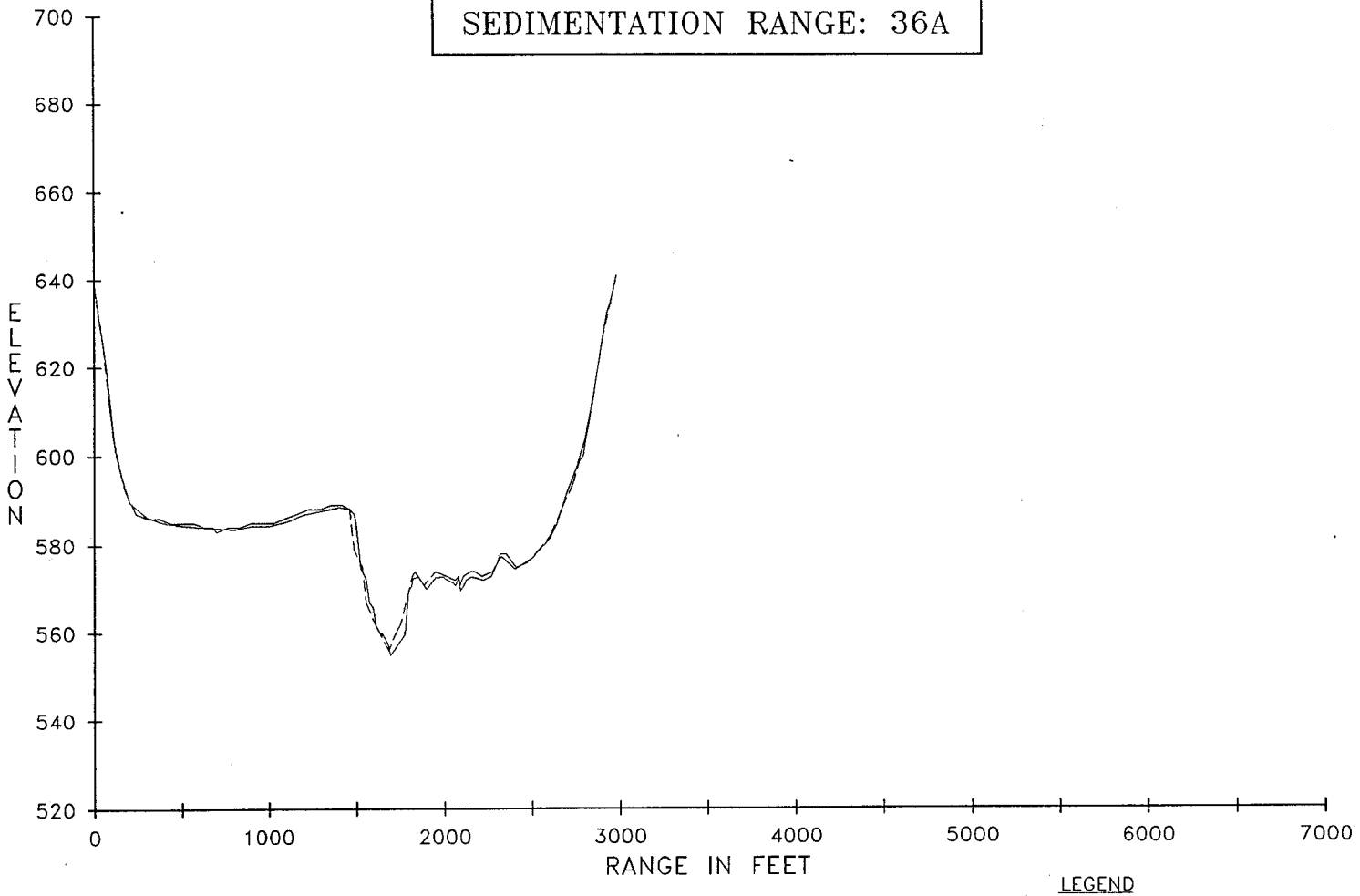


PLATE 41

MARK TWAIN LAKE
SEDIMENTATION RANGE: 37A1

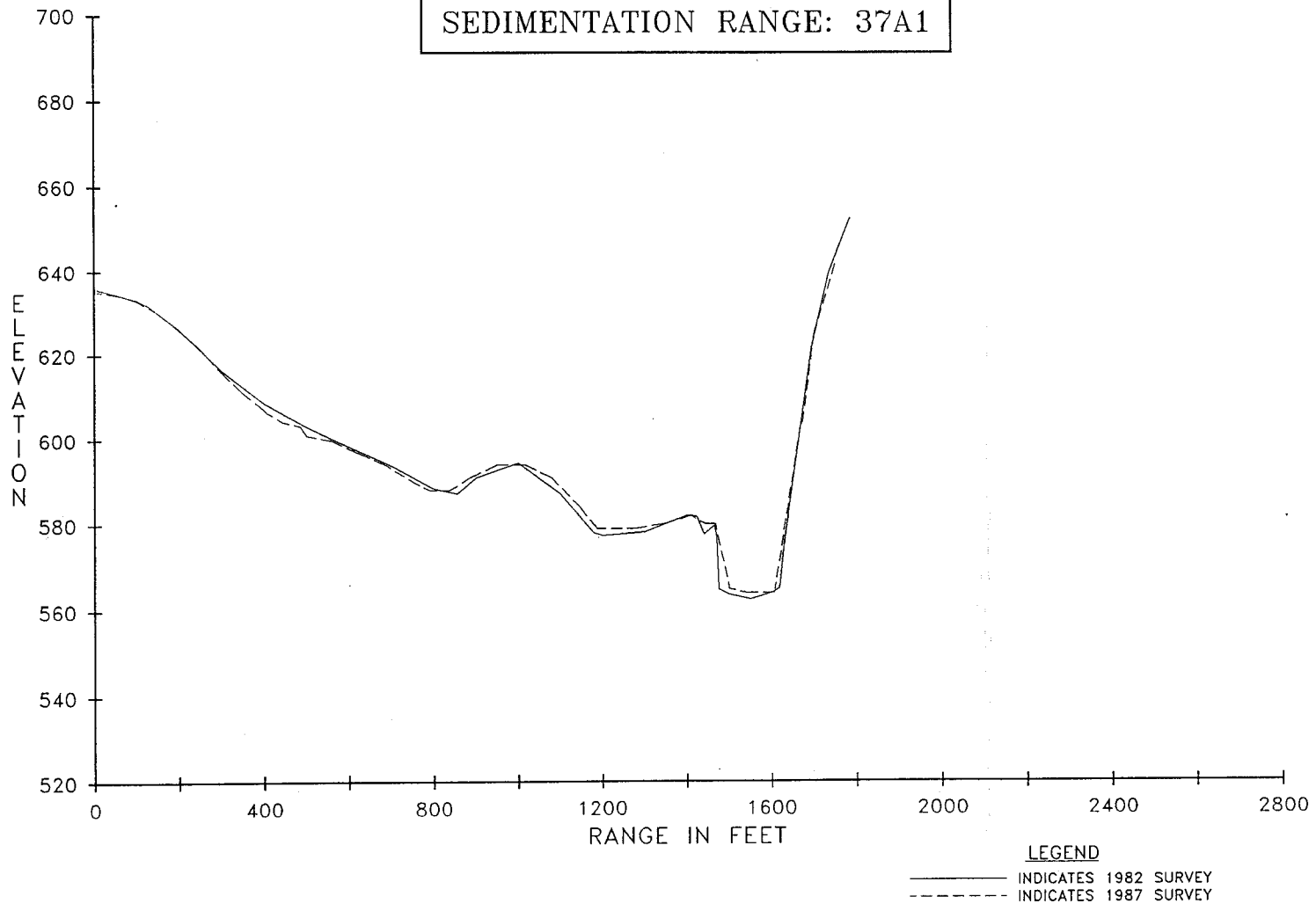


PLATE 42

MARK TWAIN LAKE
SEDIMENTATION RANGE: 37A2

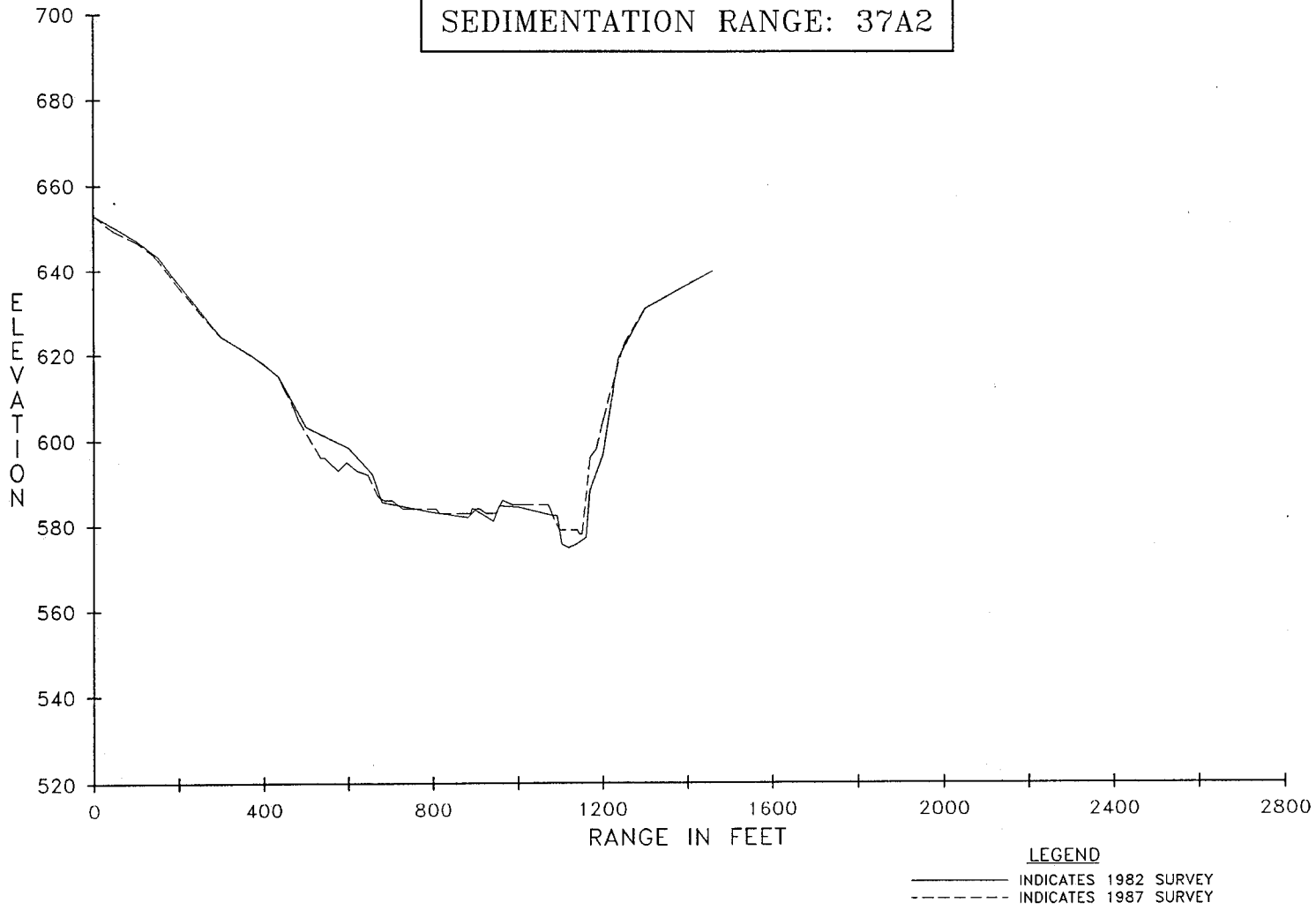


PLATE 43

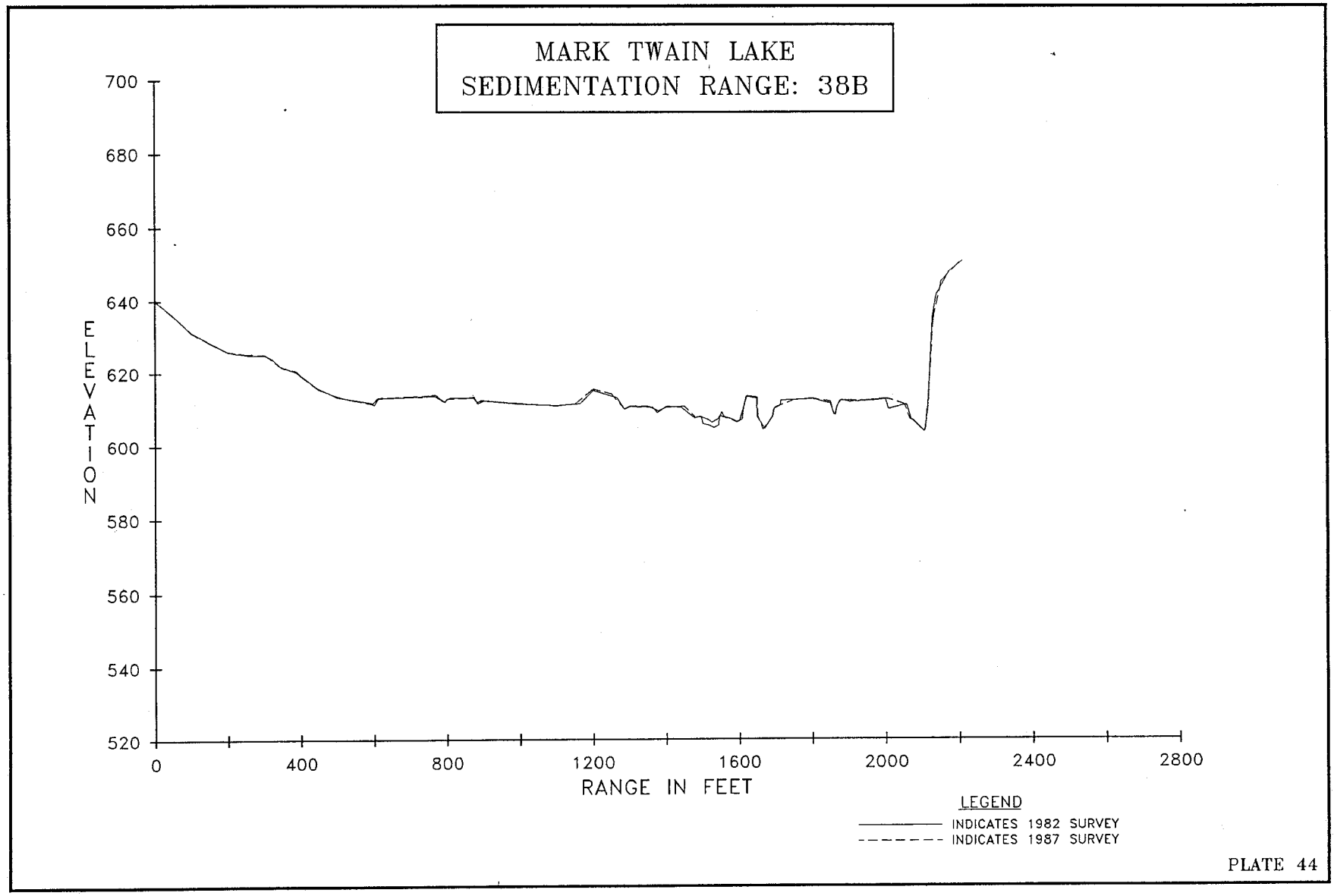

MARK TWAIN LAKE
SEDIMENTATION RANGE: 38B
ELEVATION
700
680
660
640
620
600
580
560
540
520
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 44

MARK TWAIN LAKE
SEDIMENTATION RANGE: 39B

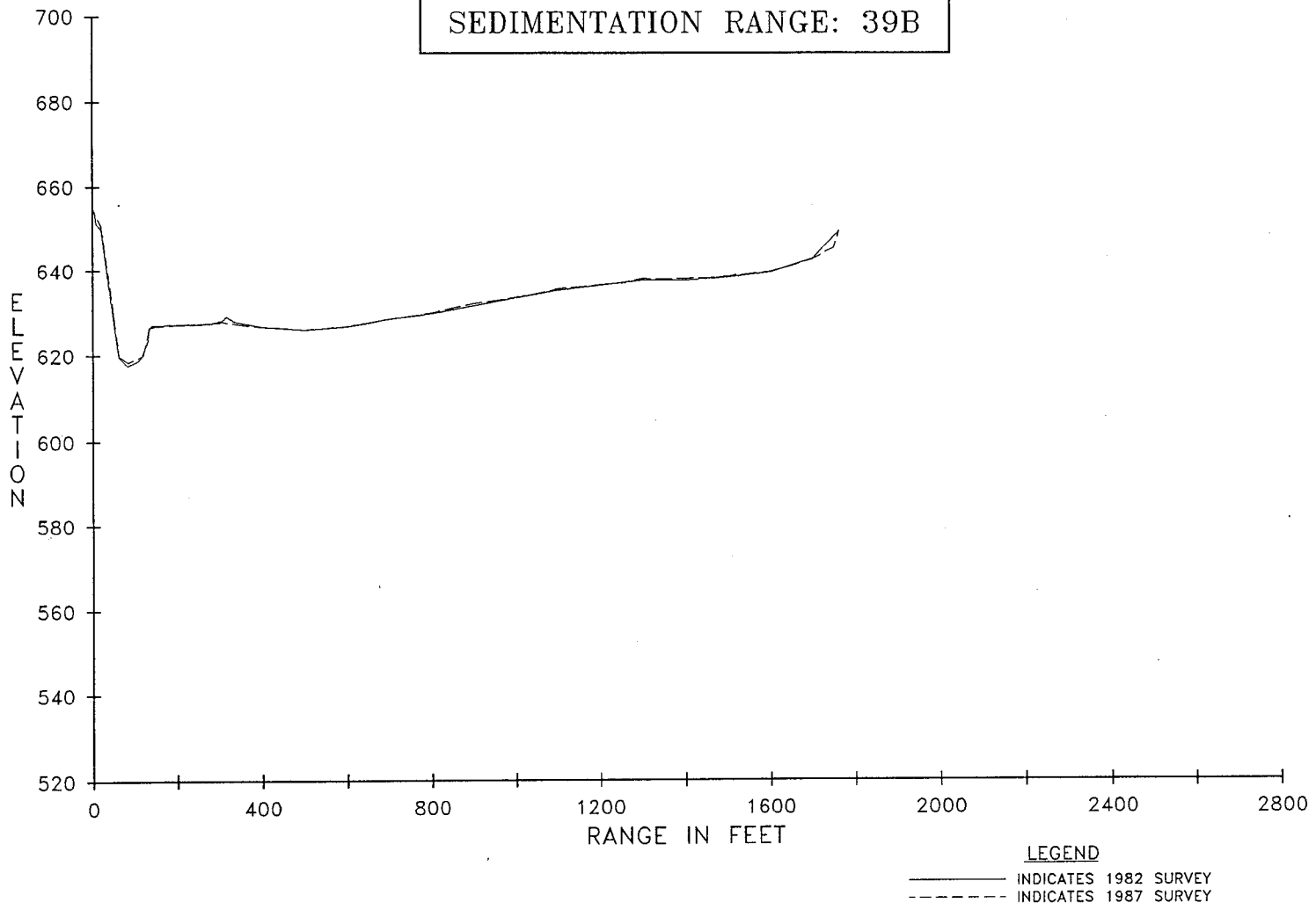


PLATE 45

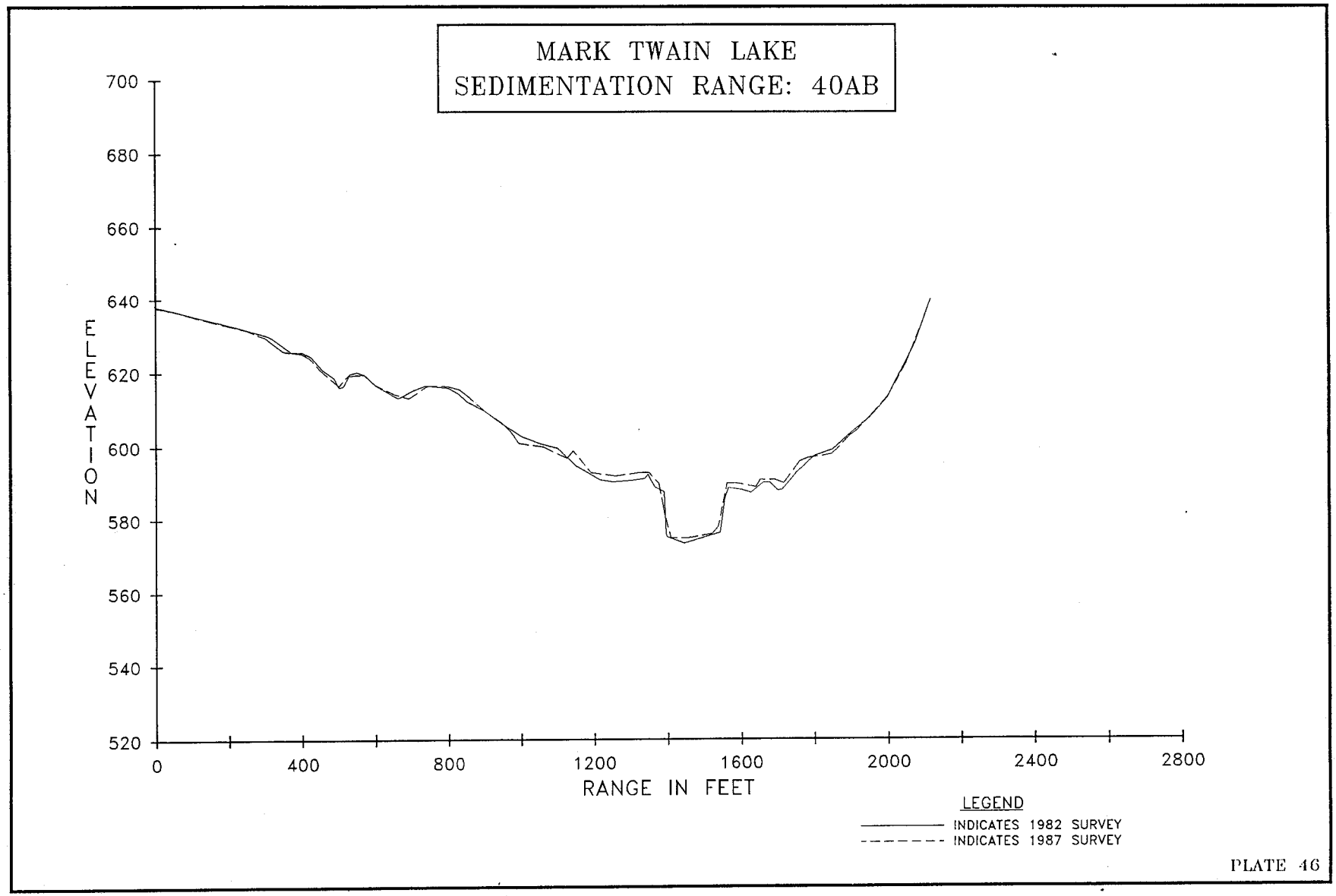

MARK TWAIN LAKE
SEDIMENTATION RANGE: 40AB
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 46

MARK TWAIN LAKE
SEDIMENTATION RANGE: 41AB

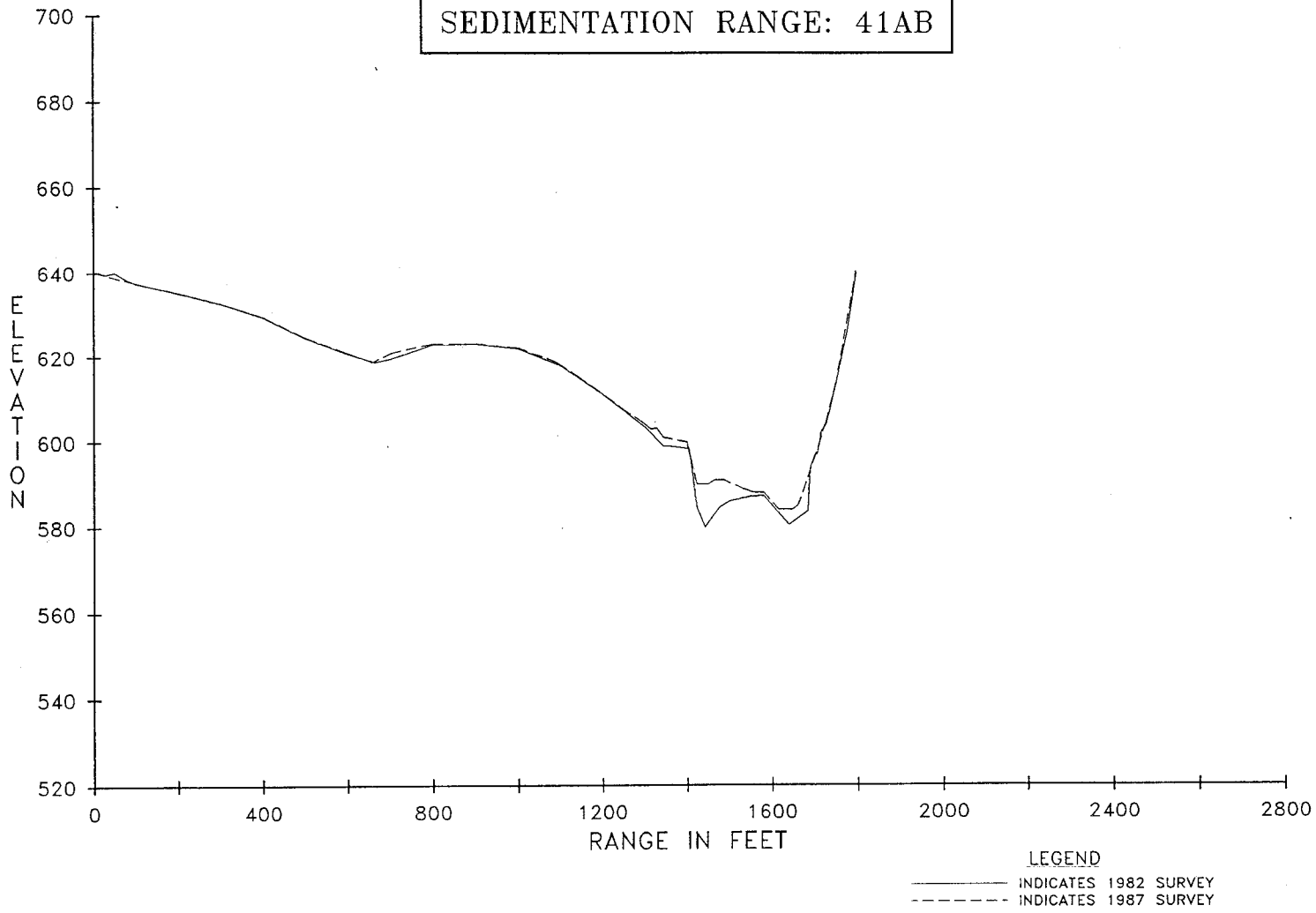


PLATE 47

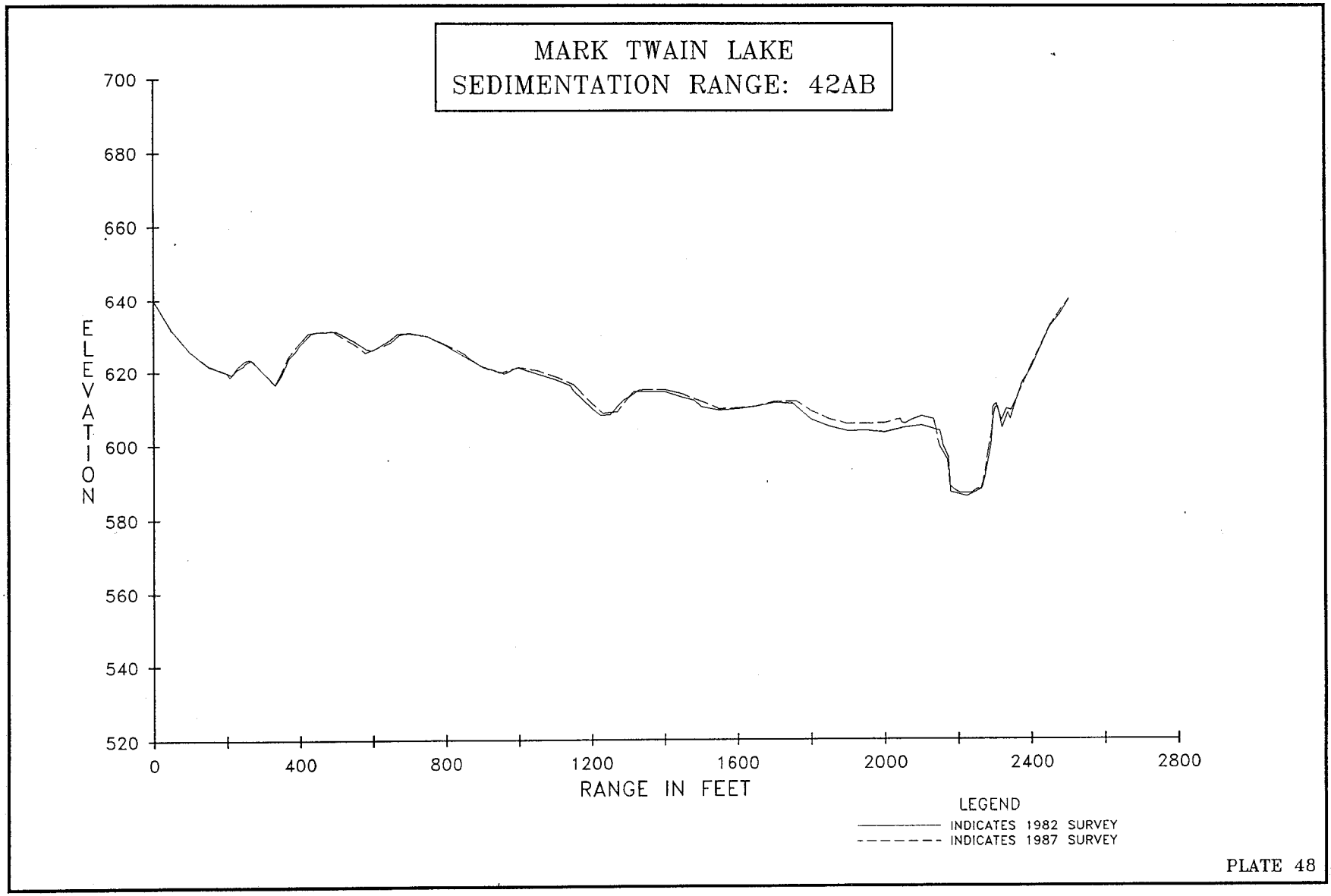

MARK TWAIN LAKE
SEDIMENTATION RANGE: 42AB
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 48

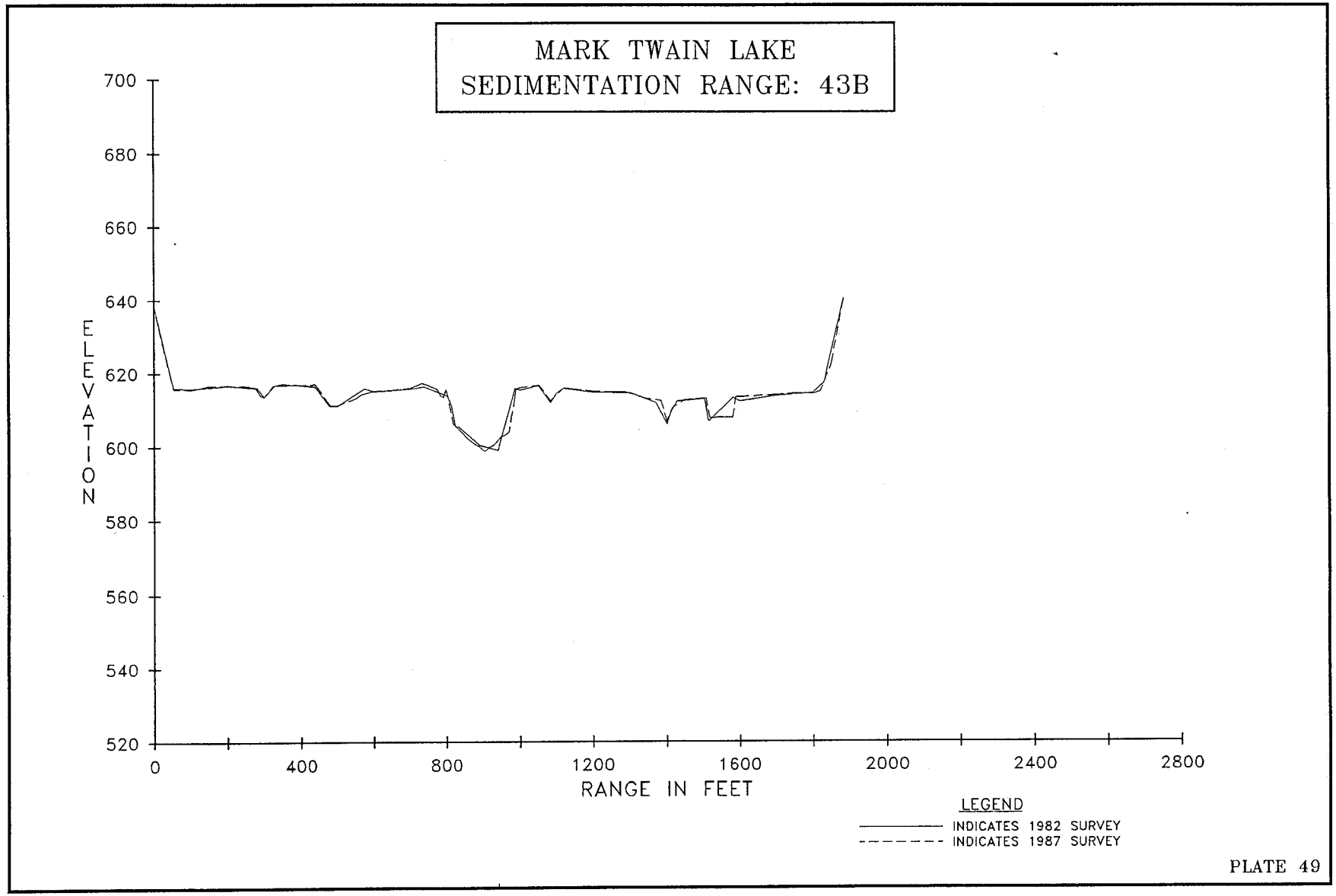

MARK TWAIN LAKE
SEDIMENTATION RANGE: 43B
700
680
660
640
620
600
580
560
540
520
ELEVATION
0
400
800
1200
1600
2000
2400
2800
RANGE IN FEET
LEGEND
INDICATES 1982 SURVEY
INDICATES 1987 SURVEY

PLATE 49

MARK TWAIN LAKE
SEDIMENTATION RANGE: 44B

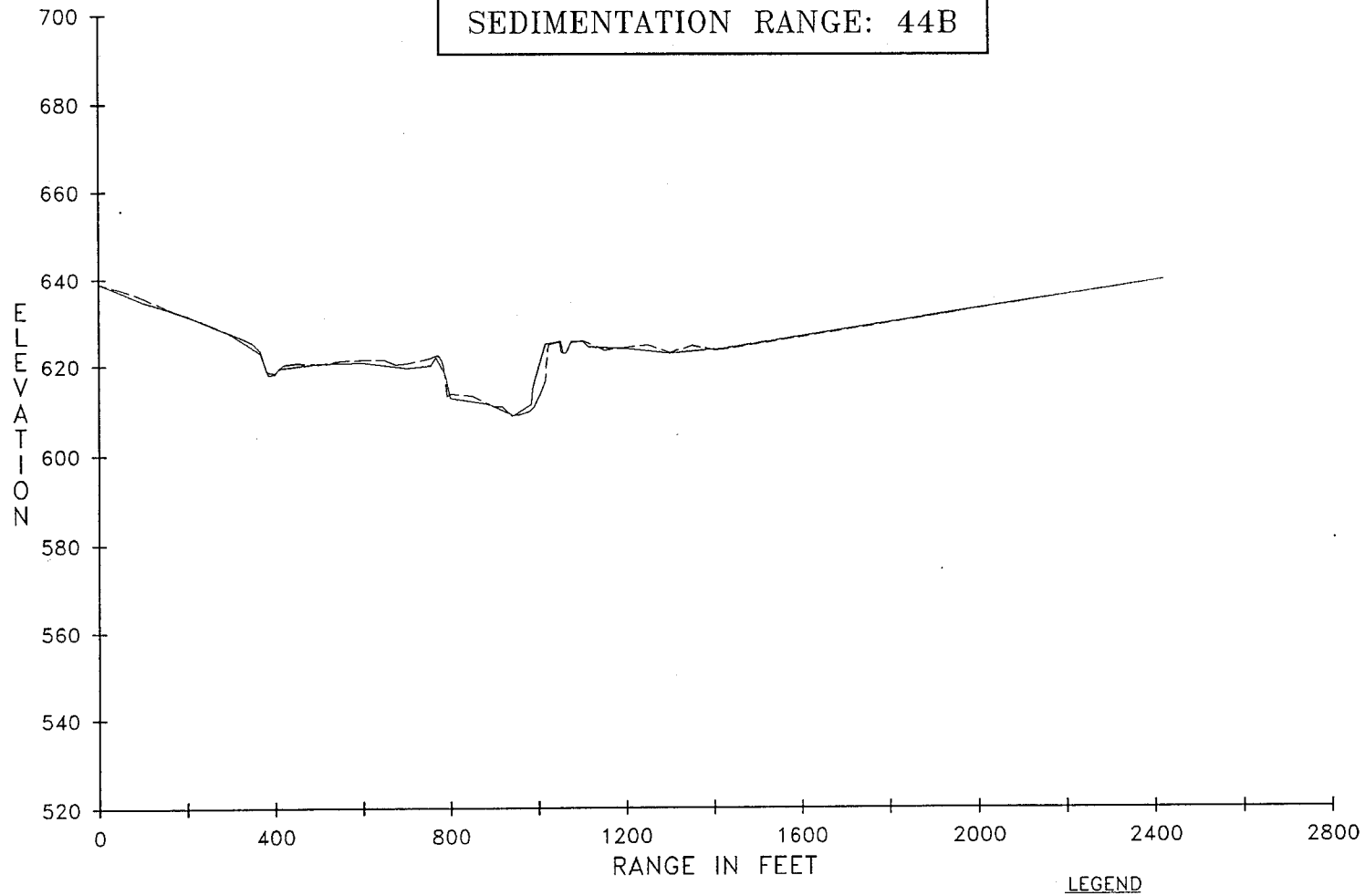


PLATE 50

MARK TWAIN LAKE
SEDIMENTATION RANGE: 45B

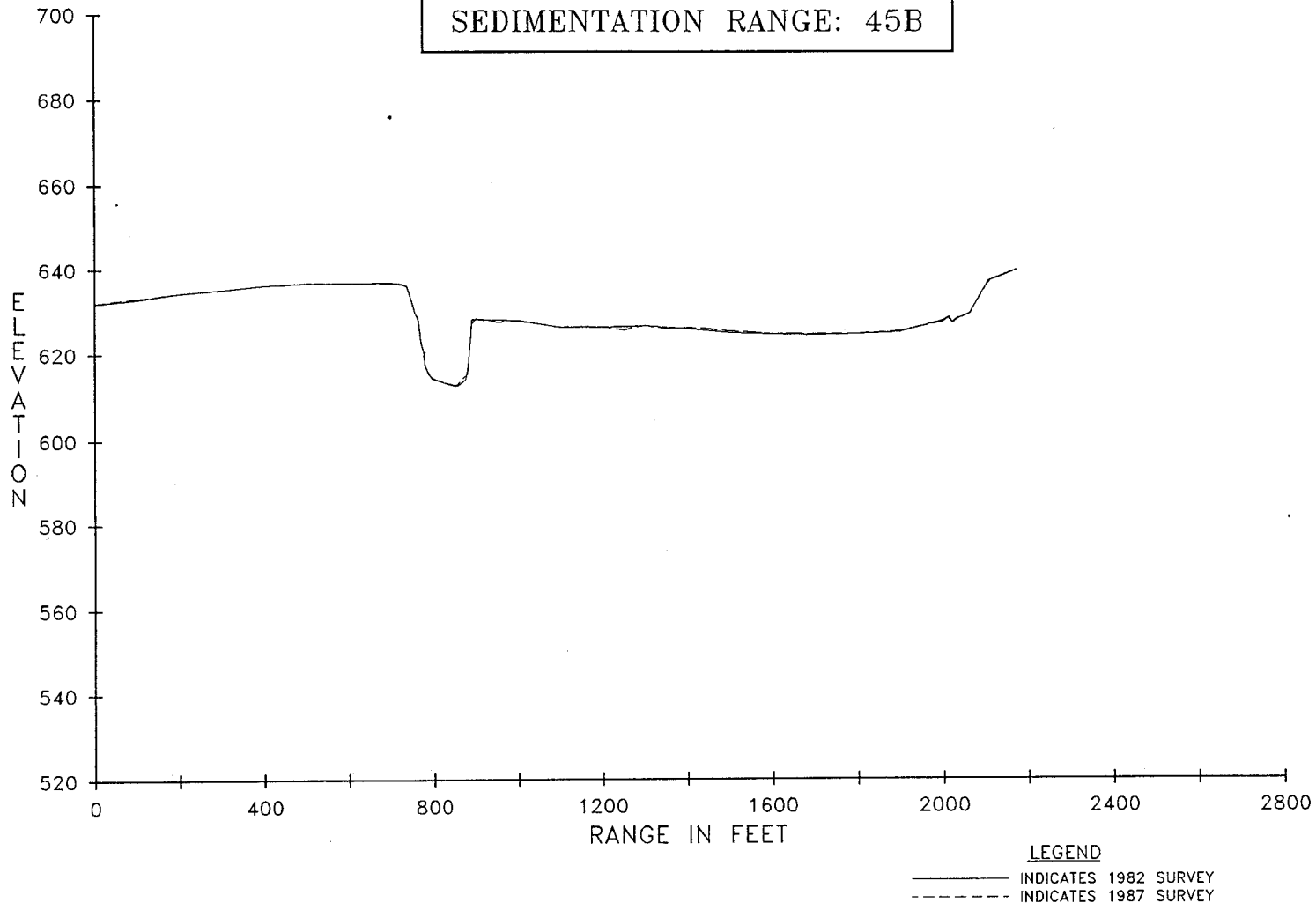


PLATE 51

MARK TWAIN LAKE
SEDIMENTATION RANGE: 46B

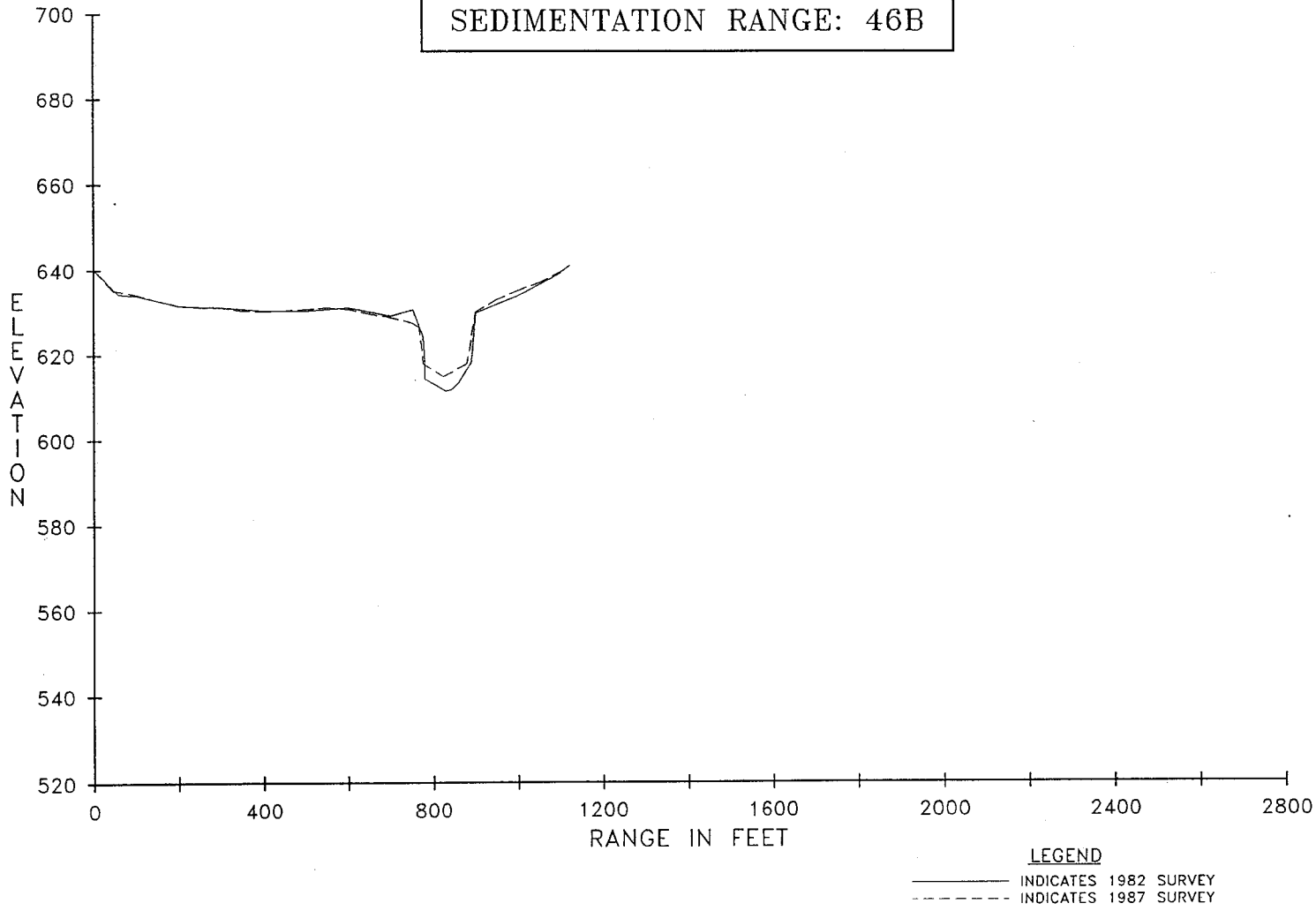


PLATE 52

MARK TWAIN LAKE
SEDIMENTATION RANGE: 47B

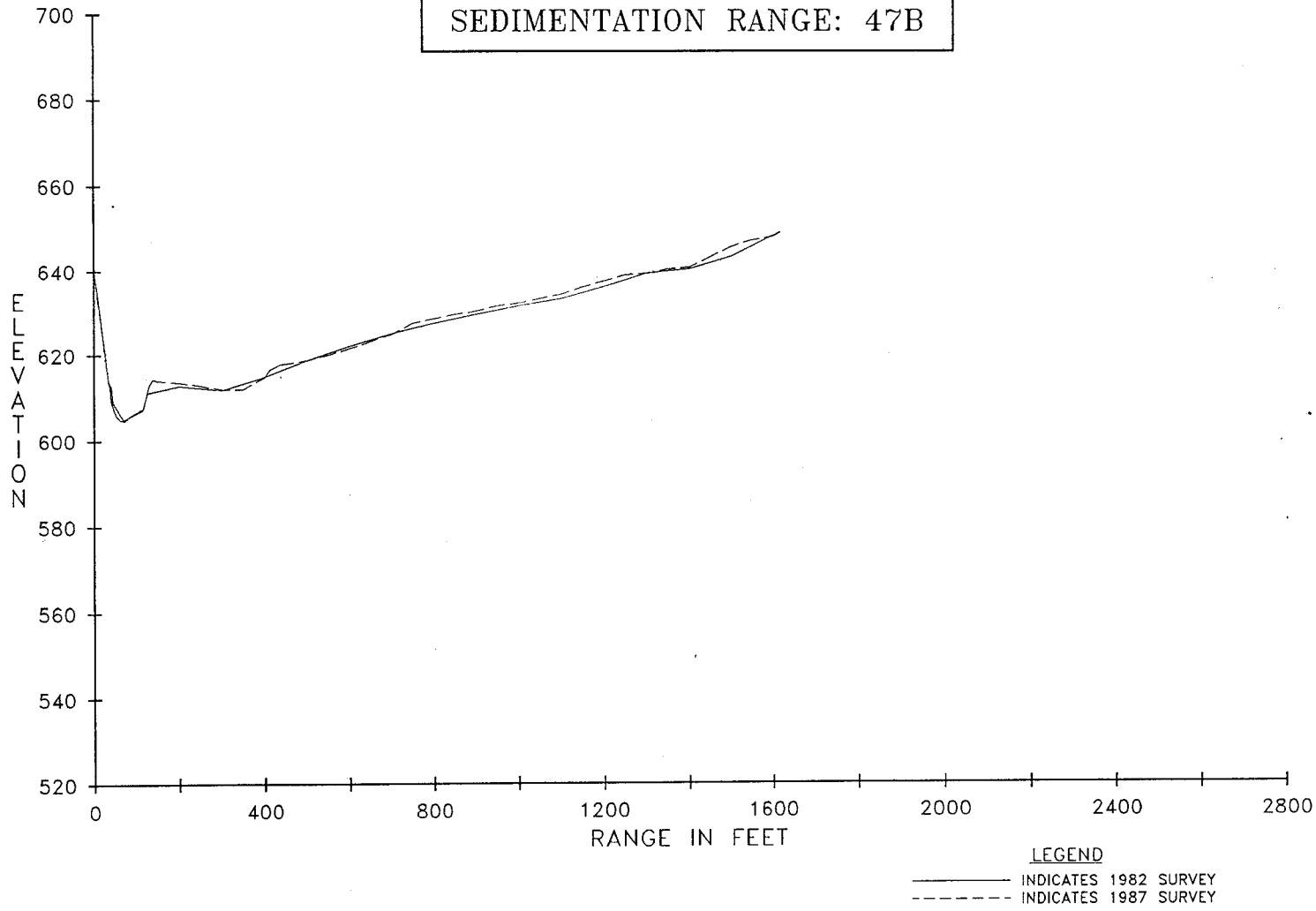


PLATE 53

MARK TWAIN LAKE
SEDIMENTATION RANGE: 48B

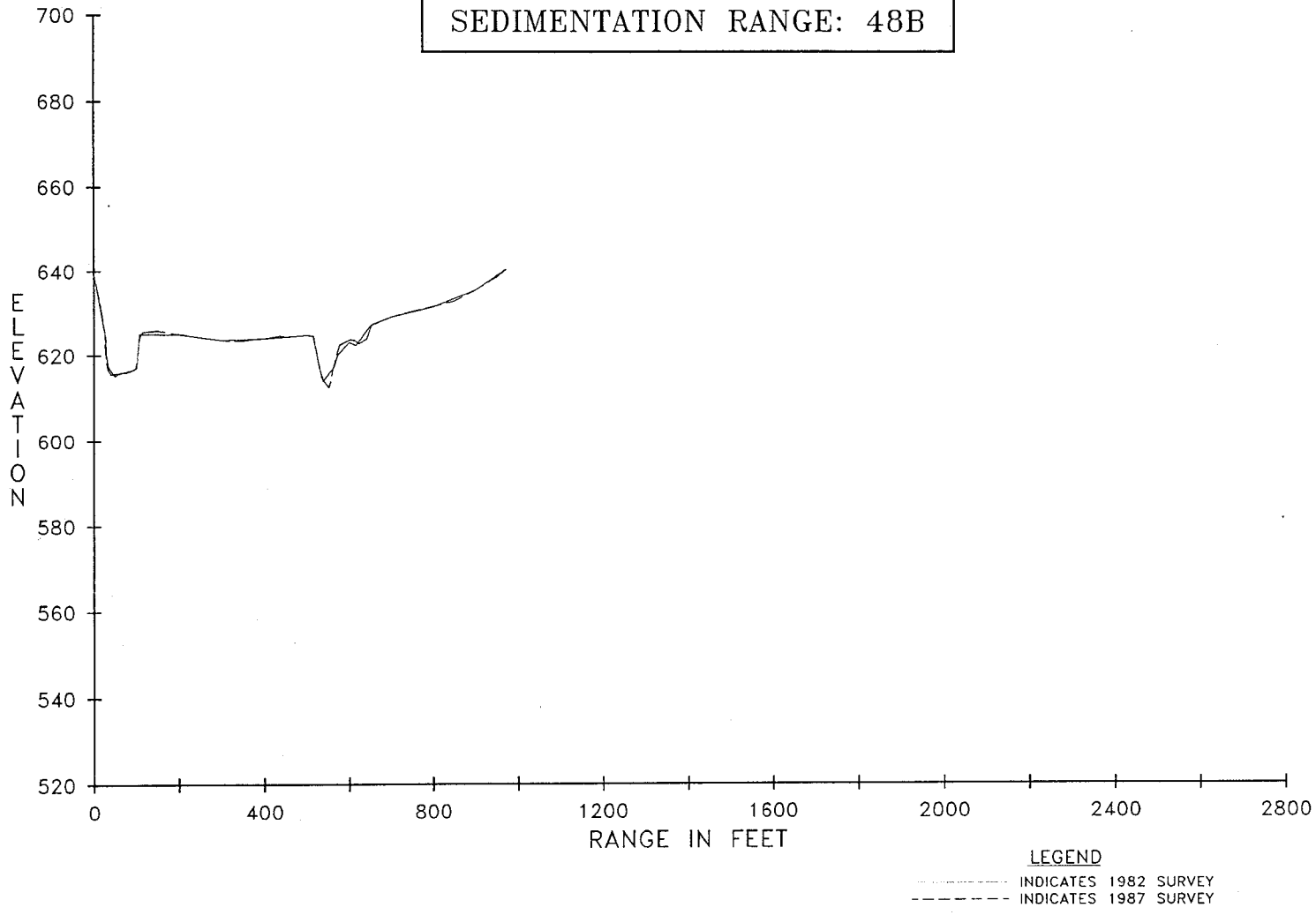


PLATE 54

RESERVOIR SEDIMENT
DATA SUMMARY

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

Mark Twain Lake
NAME OF RESERVOIR

DATA SHEET NO.

DAM

1. OWNER D.A. 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	Sept. 1983
b. MULTIPLE USE	606.0	18,650	456,967 2/	543,994	
c. POWER	---	---	---	---	16. DATE NORMAL OPER. BEGAN
d. WATER SUPPLY	---	---	---	---	
e. IRRIGATION	---	---	---	---	
f. CONSERVATION	---	---	---	---	Sept. 1983
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 39.75 (39)	INCHES
19. NET SEDIMENT CONTRIBUTING AREA 2,258 SQ. MI.		23. MEAN ANNUAL RUNOFF 9.43 (66)	INCHES
20. LENGTH 129 MILES	AV. WIDTH 18 MILES	24. MEAN ANNUAL RUNOFF 1,165,727 (66)	AC.-FT
21. MAX. ELEV. 1000	MIN. ELEV. 515	25. ANNUAL TEMP.: MEAN 54.6° RANGE -21° to 108°	

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
Sept. 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

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	36. WATER INFL. TO DATE, AC.-FT a. MEAN ANNUAL	b. TOTAL TO DATE
Sept. 1983	46.1	1,714,942 4/	1,898,303 4/	6,859,768 4/	1,714,942 4/	6,859,768 4/
Sept.-Oct. 1987						

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
Sept. 1983	17,068	4,183	1.85	17,068	4,183	1.85
Sept.-Oct. 1987						

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

ENG FORM 1787
NOV 66

PREVIOUS EDITIONS ARE OBSOLETE.

PLATE 55

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											
Sept. 1983	7.4	6.2	6.8	16.7	16.7	10.2	10.4	25.6				
Sept.-Oct. 1987												

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														
Sept. 1983	26.3	22.0	12.5	8.0	15.3	8.7	5.0	0.9	0.3	1.0					
Sept. -Oct. 1987															

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				
1985	629.87	596.60	1,832,823				
1986	630.56	600.22	1,886,852				
1987	627.12	600.12	1,241,790				

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
520	0	0	565	5,208	71,275	605	17,866	515,056
525	0	0	567.2	5,741	83,699	606.0	18,283	533,300
530	46	210	570	6,434	100,856	610	20,251	611,783
535	163	927	575	7,752	136,699	615	22,872	721,152
540	395	2,875	580	9,180	179,438	620	25,601	843,849
545	1,079	7,272	585	10,688	229,625	624.8	28,361	974,775
550	1,948	15,752	590	12,298	287,732	625	28,479	980,388
555	2,958	28,938	595	14,034	354,280	630	31,996	1,131,470
560	4,039	47,330	600	15,897	429,846	635	35,673	1,300,345
						638.0	38,580	1,410,987

47. REMARKS AND REFERENCES

1/ Elevation of top of gates in closed position. Flood control pool (638.0) was used in items 19, 31, 32, 33, 41, 43.

2/ Includes 20,000 acre-feet for 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

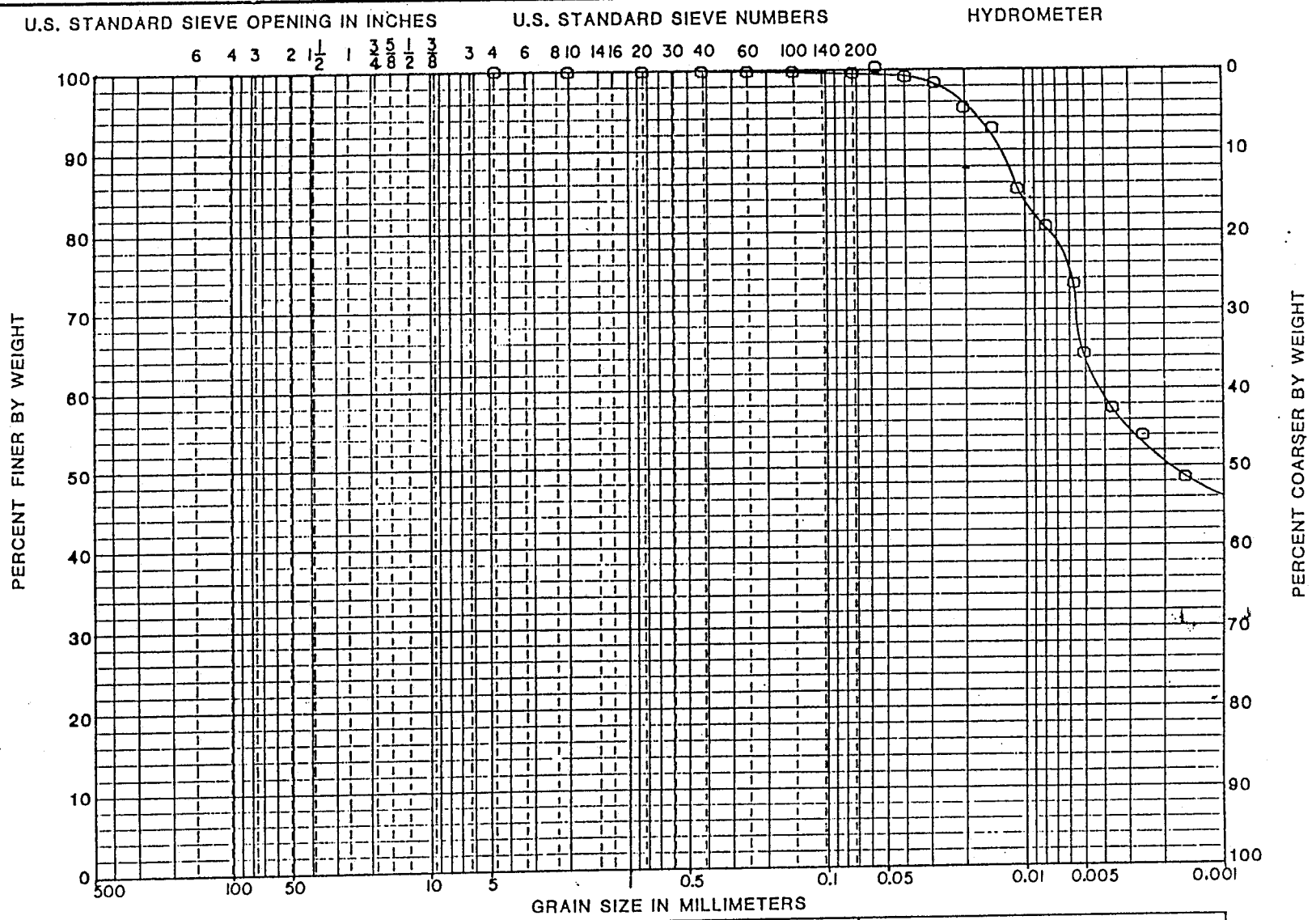
48. AGENCY MAKING SURVEY

49. AGENCY SUPPLYING DATA U.S. Army Corps of Engineers, SLD

50. DATE FEB 92

U.S. GOVERNMENT PRINTING OFFICE: 1987 [illegible]

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

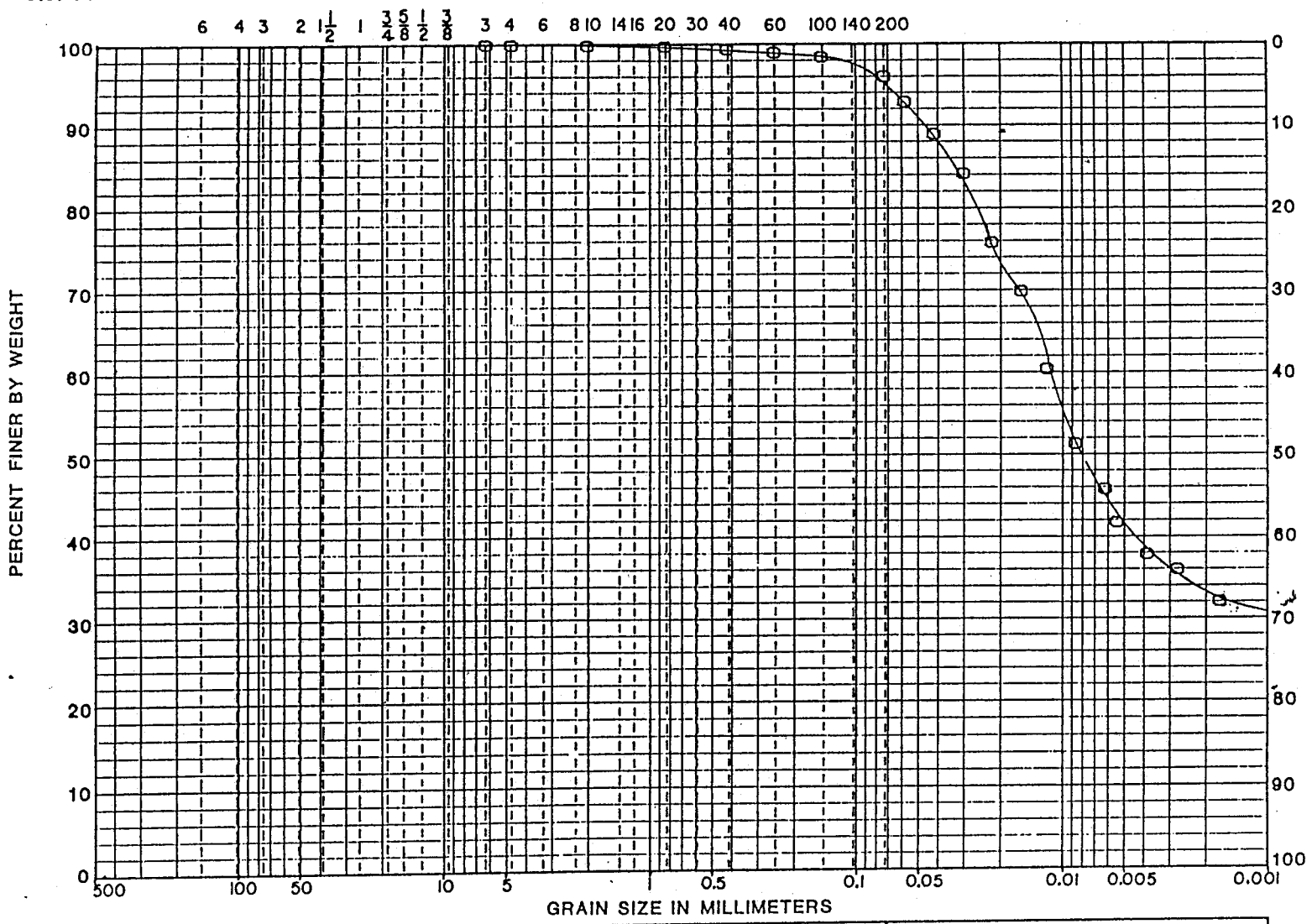
BORING NO.

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

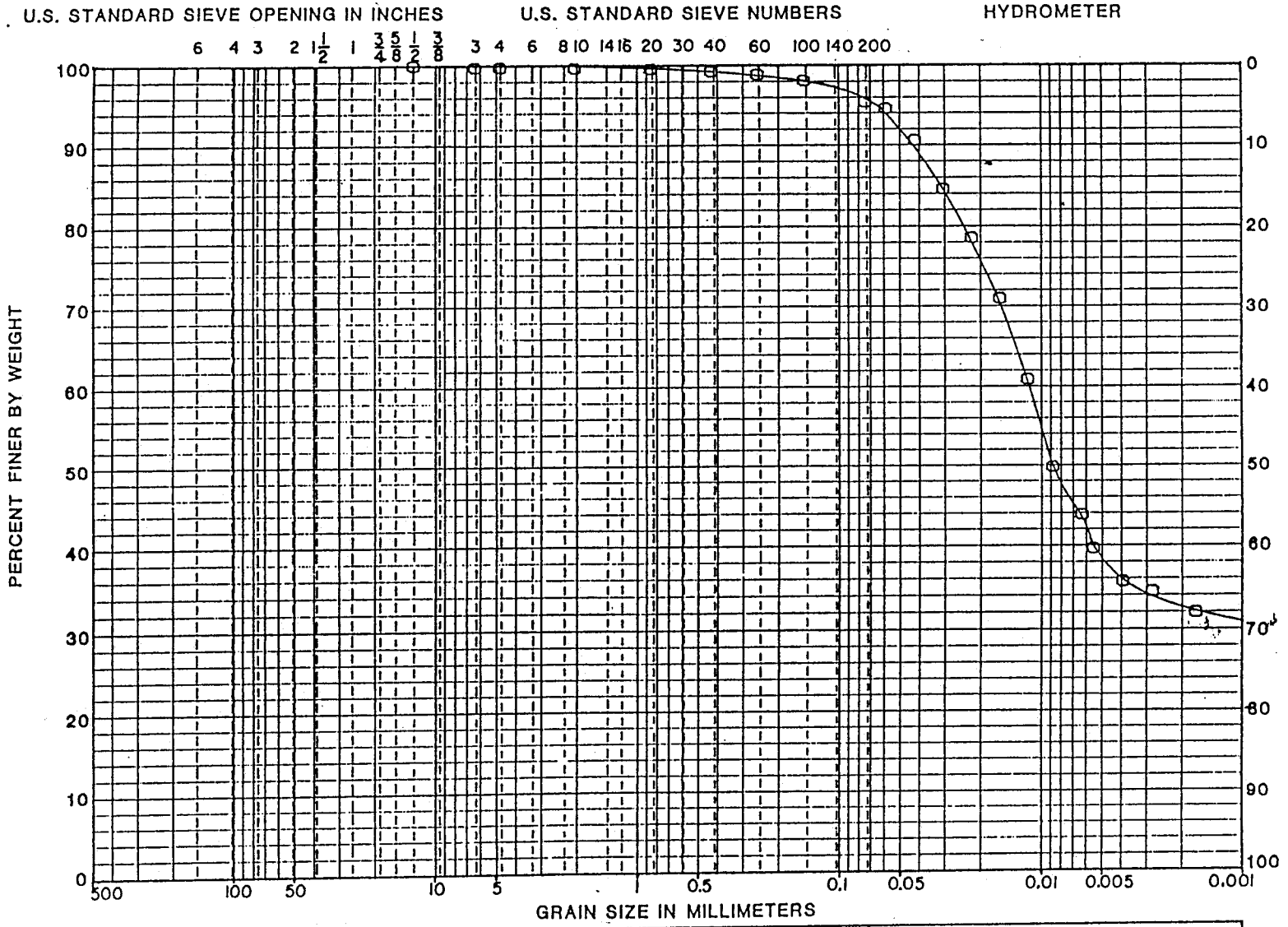
BORING NO.

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

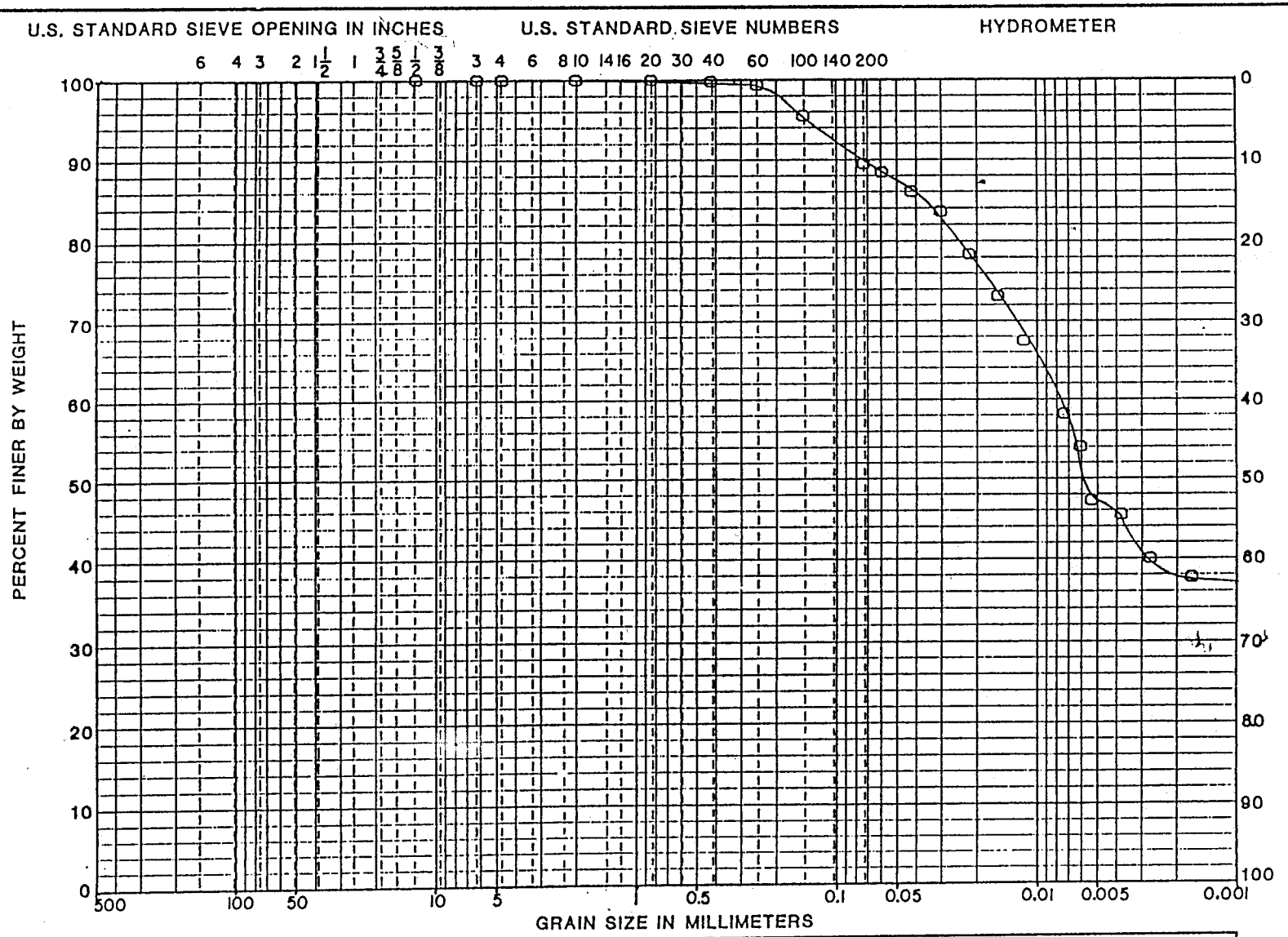
BORING NO.

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

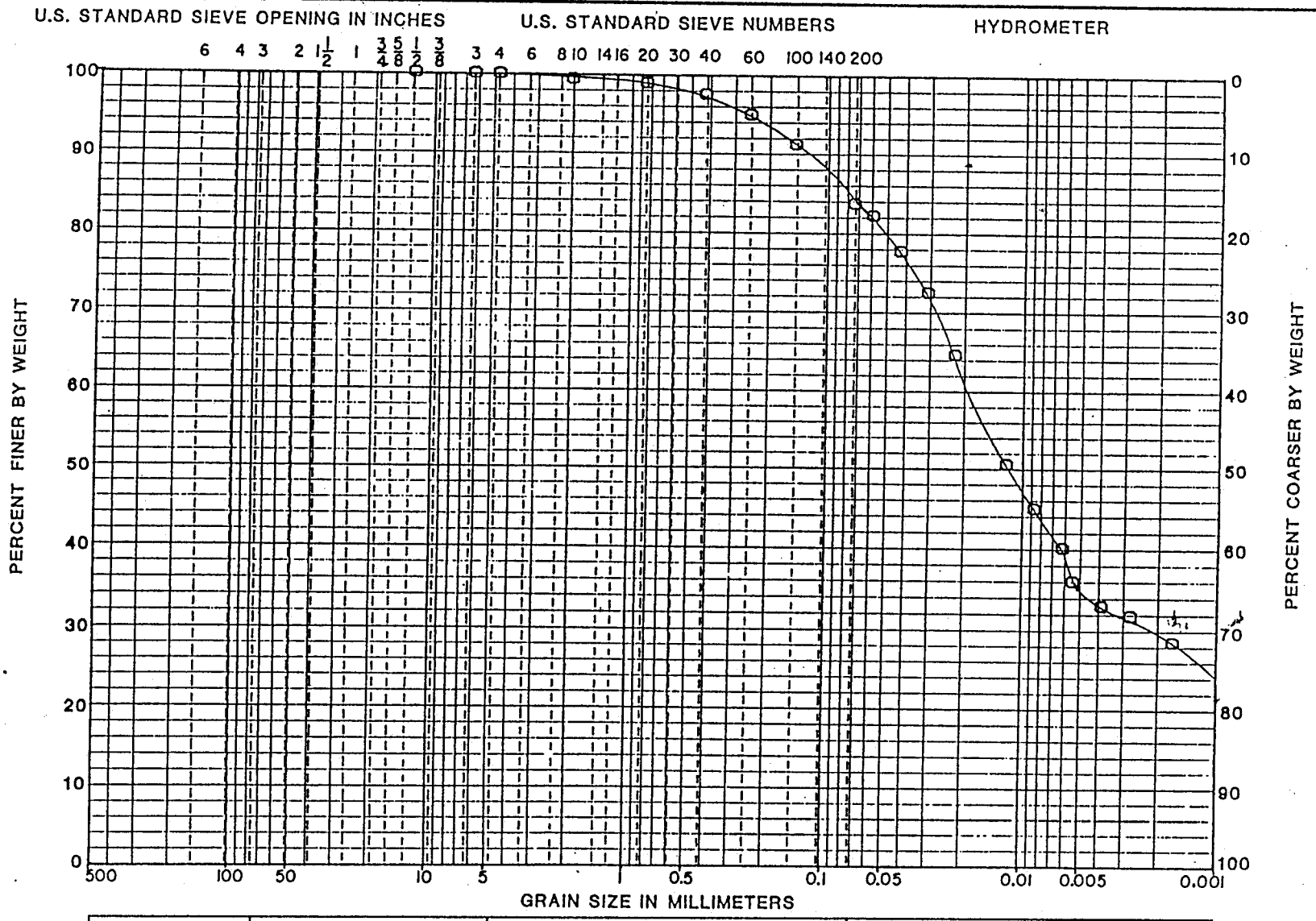
BORING NO.

DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 60

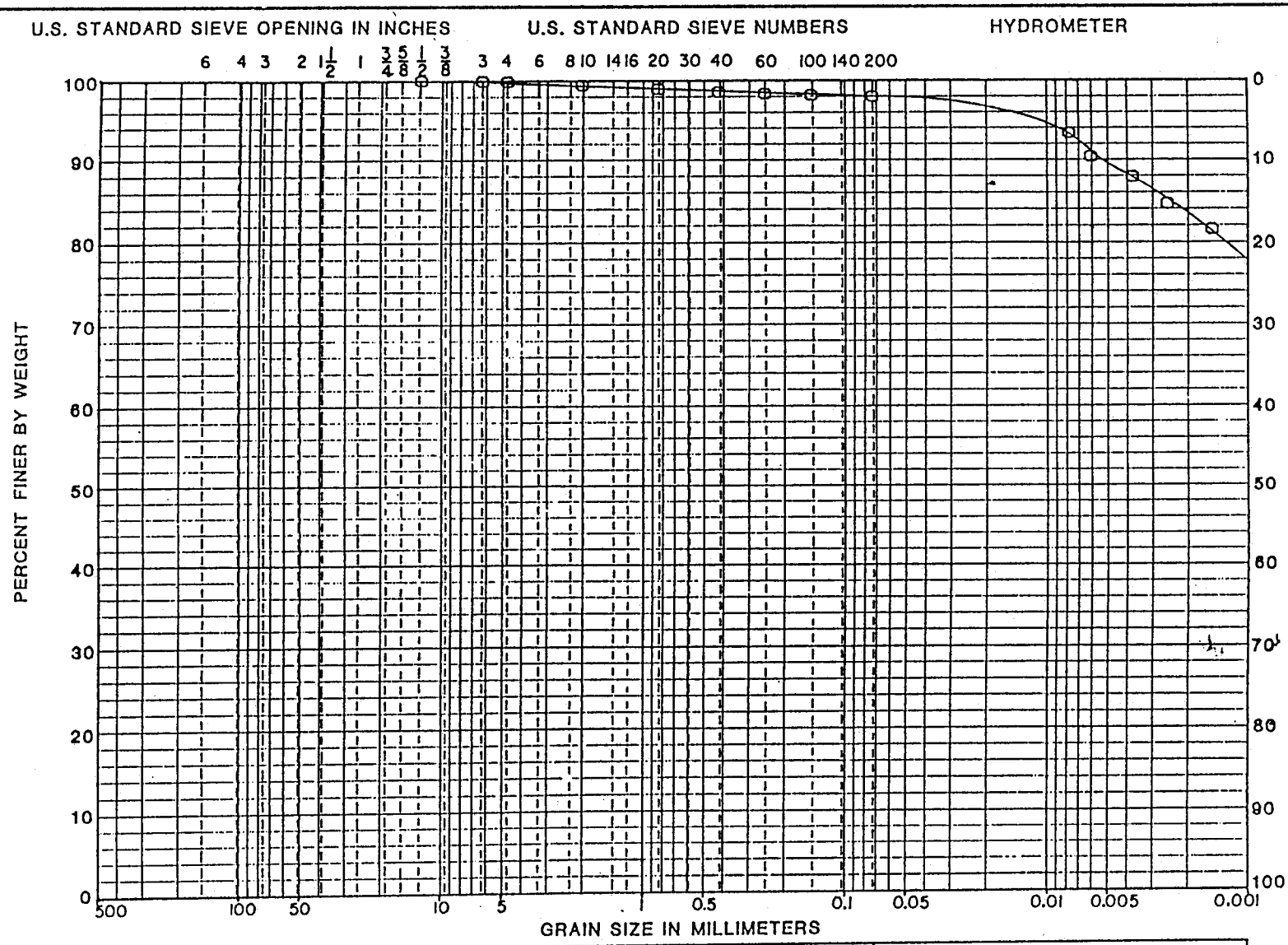
GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI	PROJECT US CORPS OF ENGINEERS
MT LI		Gray CLAY, trace sand	117.4				
							BORING NO.
		Dry Weight = 38.4 pcf					DATE 7-1-88
							GEOTECHNOLOGY ENGINEERING AND ENVIRONMENTAL SERVICES SAINT LOUIS, MISSOURI

PLATE 61

GRADATION CURVES

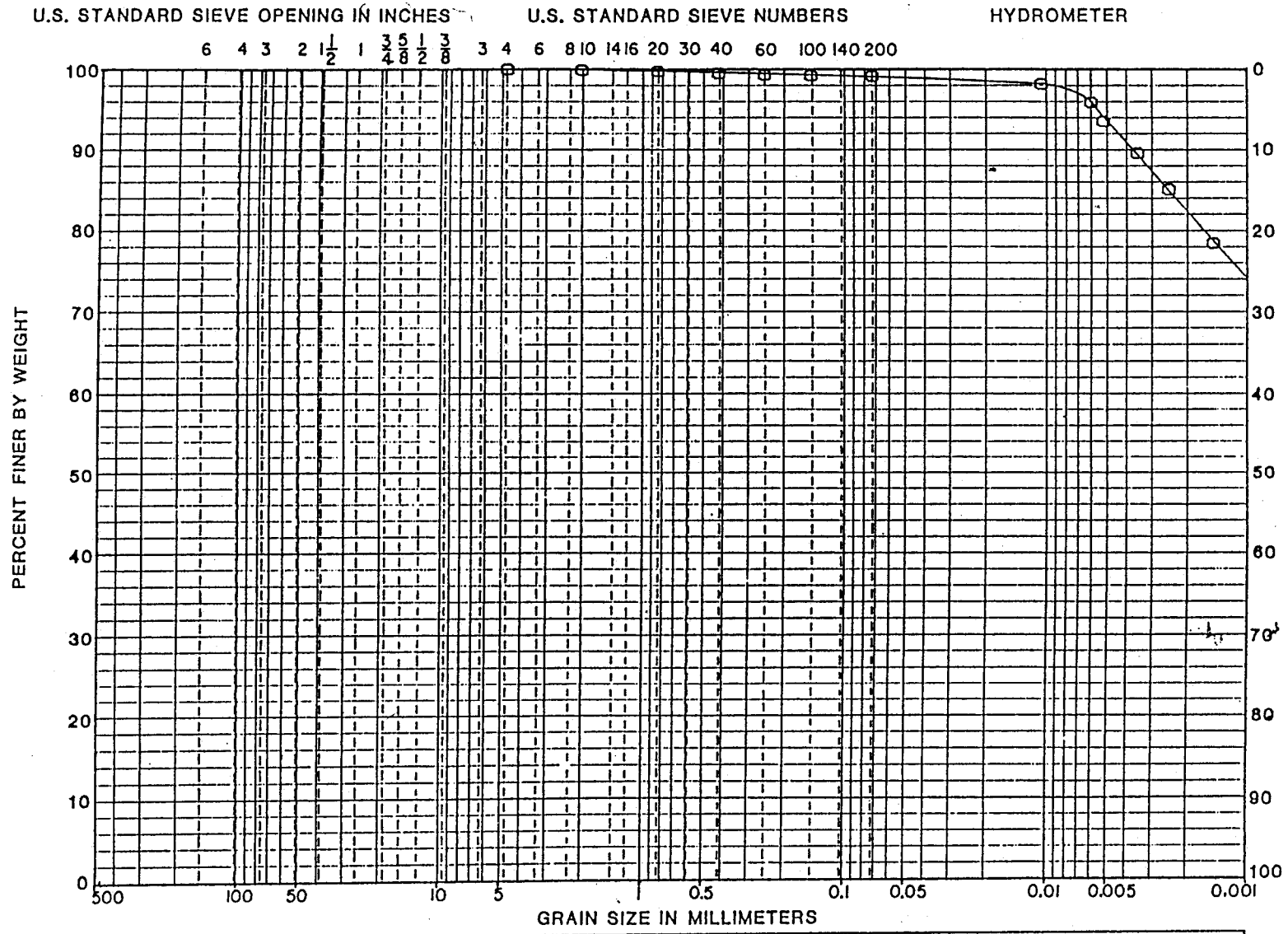


SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI	PROJECT US CORPS OF ENGINEERS
MT 22		Gray CLAY with organics	434.5				
							BORING NO.
		Dry Weight = 12.9 pcf					DATE 7-1-88
							GEOTECHNOLOGY ENGINEERING AND ENVIRONMENTAL SERVICES SAINT LOUIS, MISSOURI

10989

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.

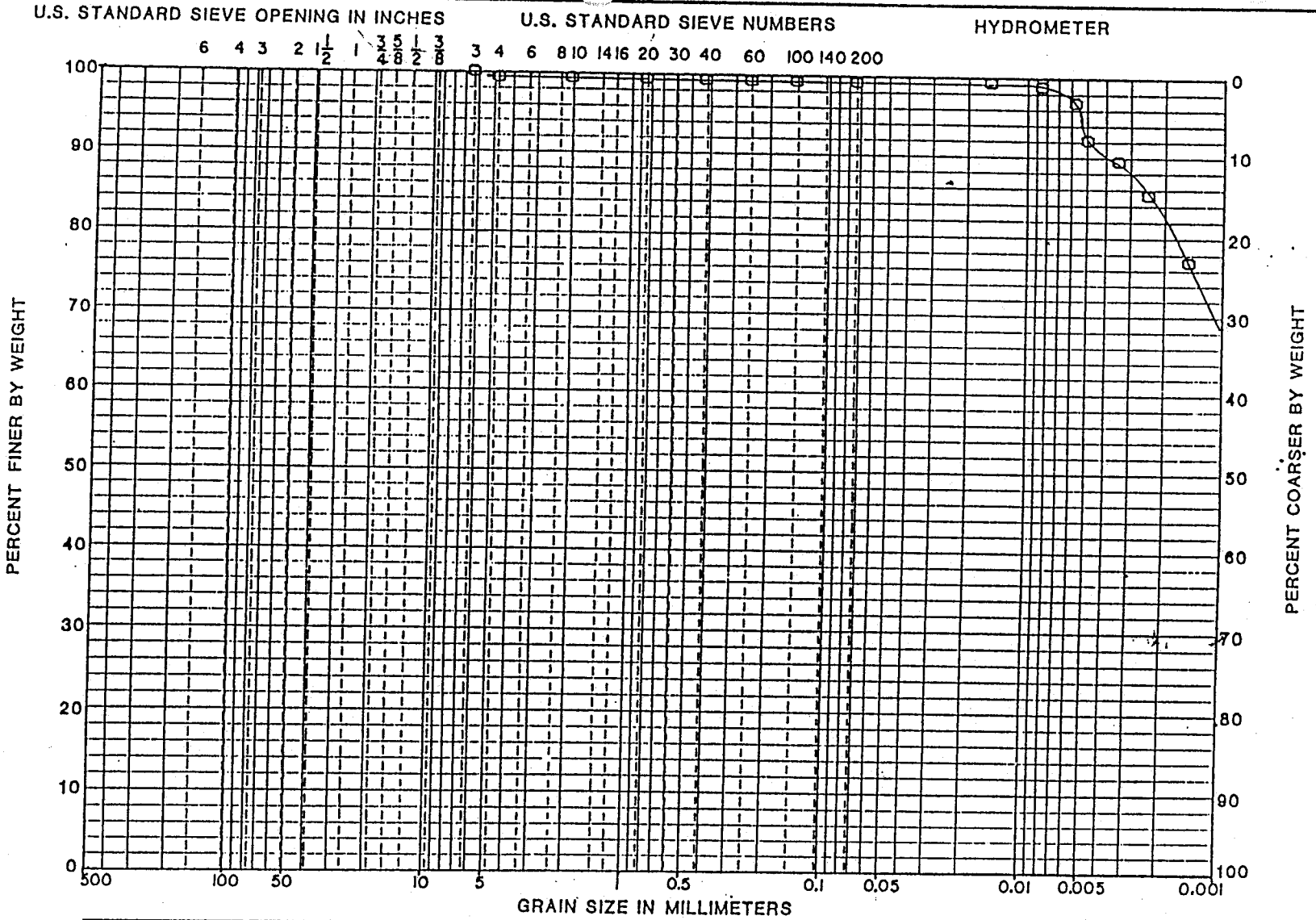
DATE 7-1-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

10989

PLATE 63

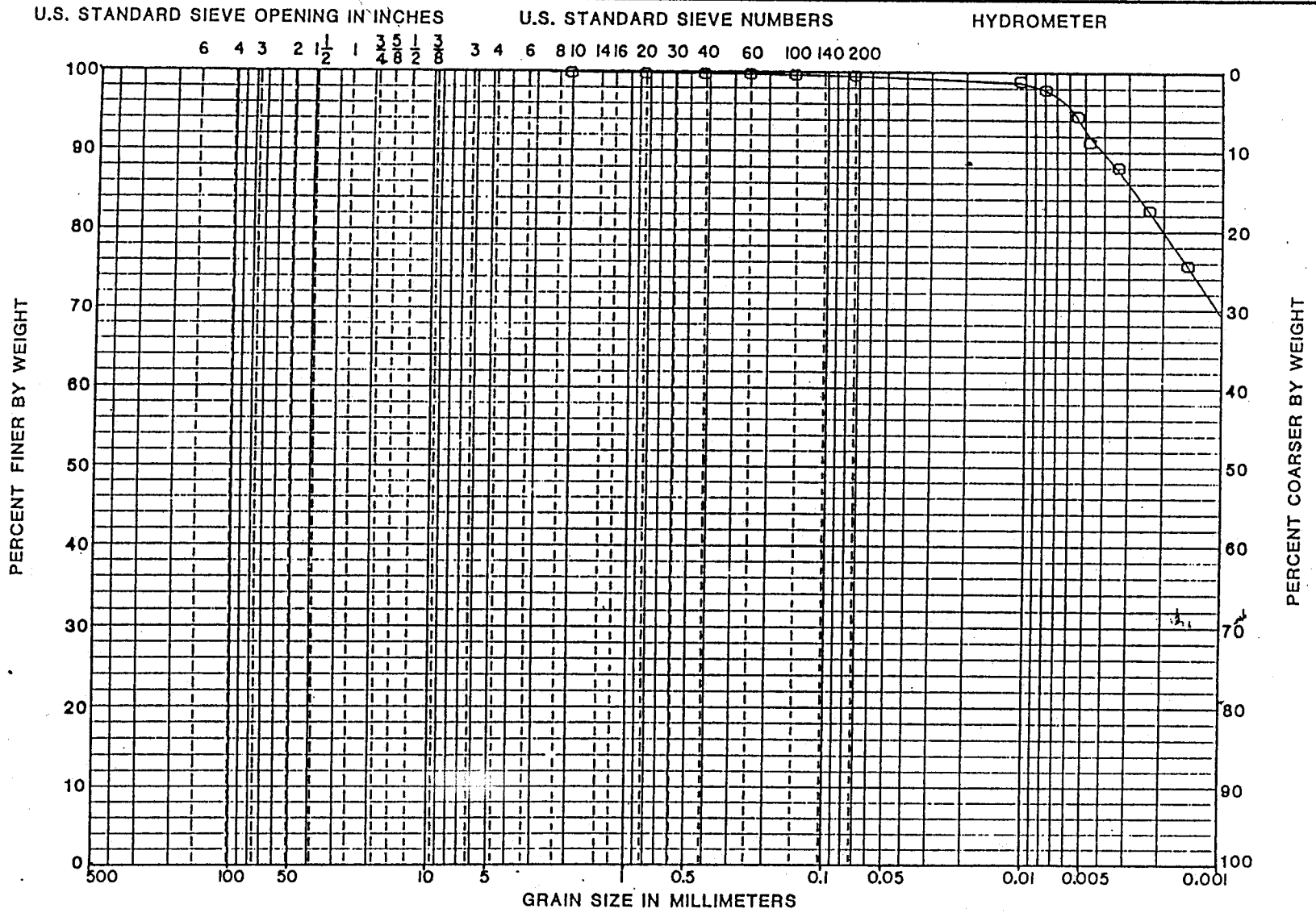
GRADATION CURVES



SAMPLE NO.	EL. or DEPTH	CLASSIFICATION	NAT.WT.%	LL	PL	PI	PROJECT US CORPS OF ENGINEERS
MT 66		Gray CLAY	254.3				
							BORING NO.
		Dry Weight = 21.0 pcf					DATE 6-28-88
							GEOTECHNOLOGY ENGINEERING AND ENVIRONMENTAL SERVICES SAINT LOUIS, MISSOURI

PLATE 64

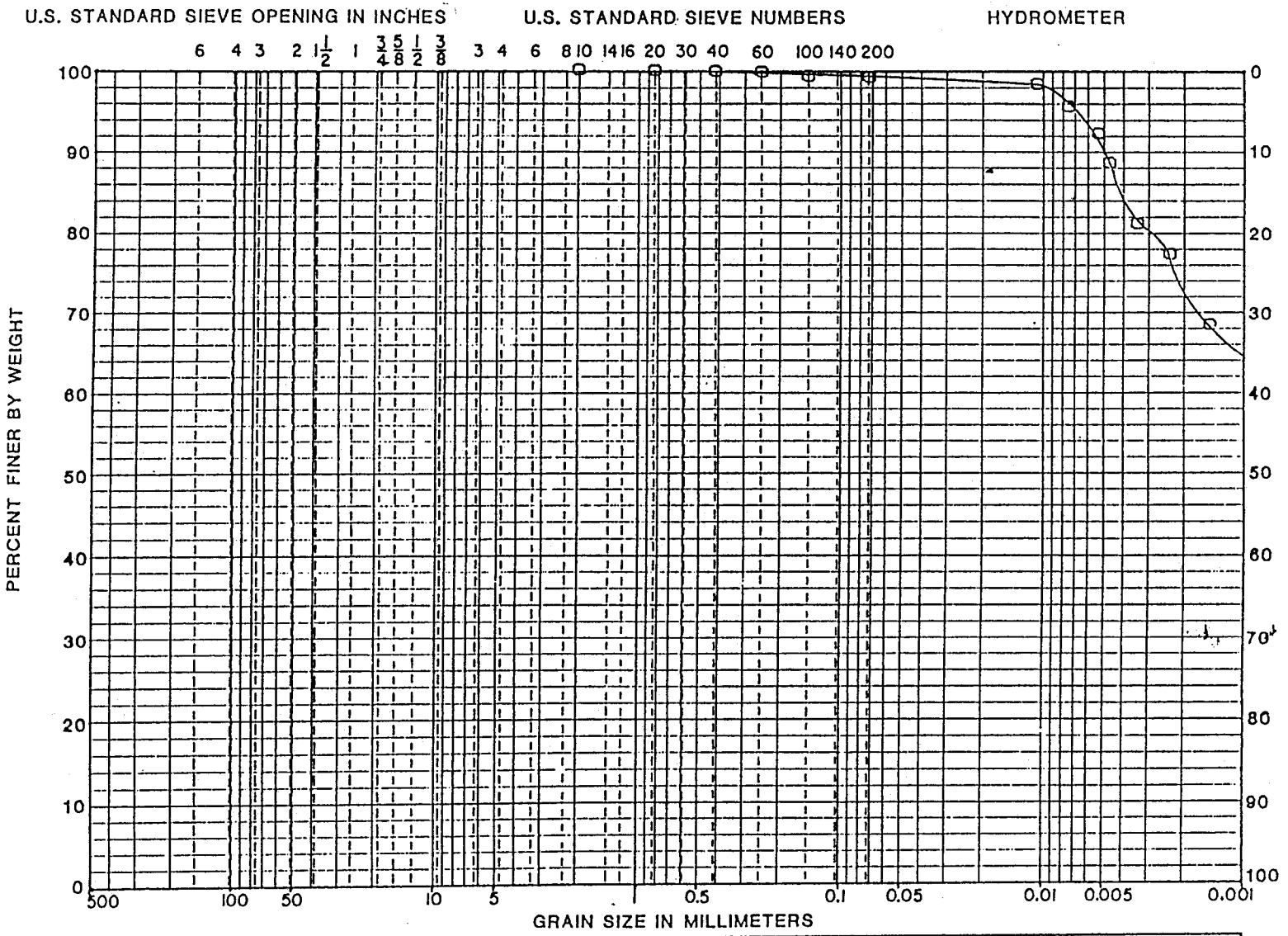
GRADATION CURVES



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 SAINT 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

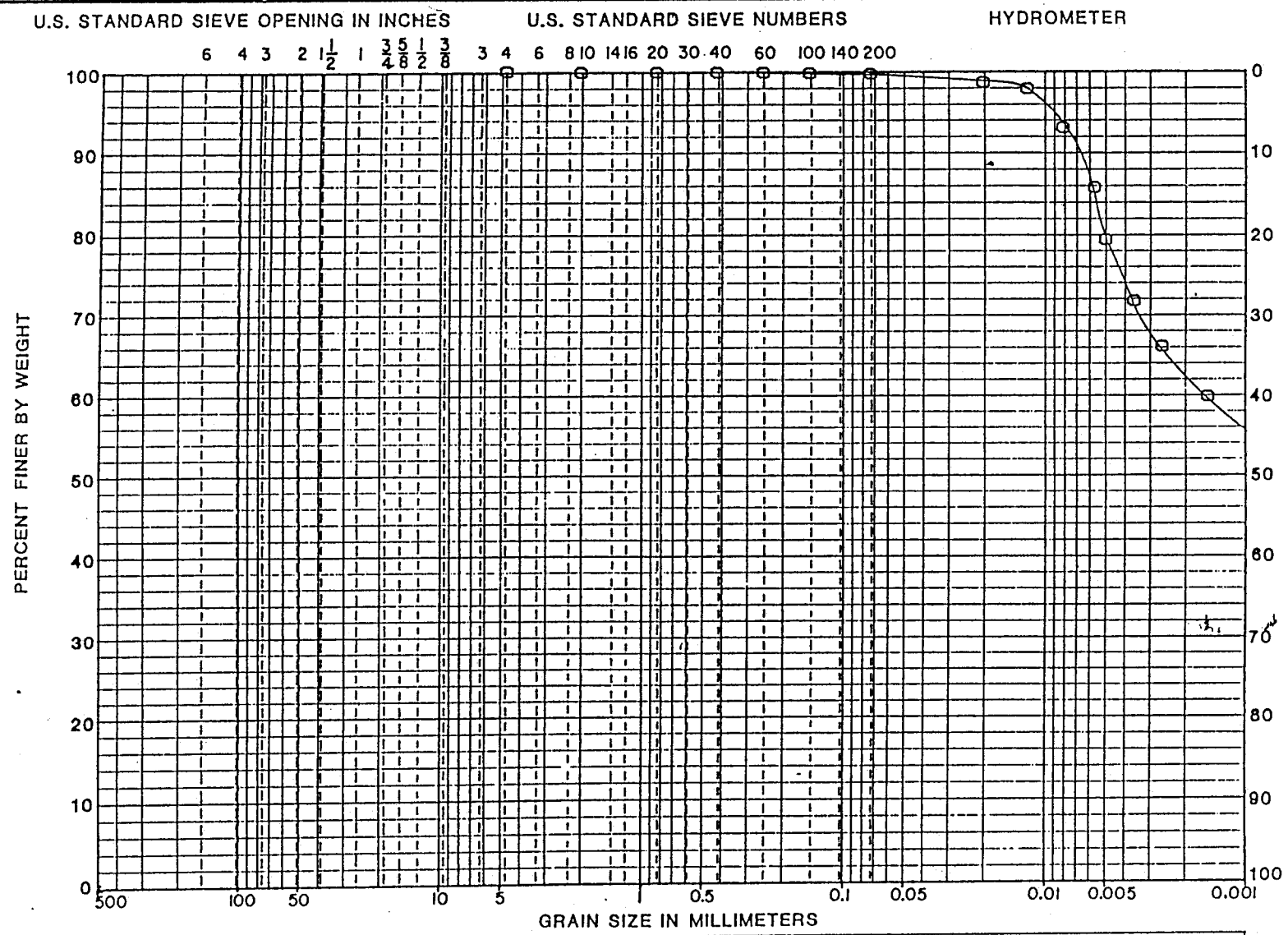
BORING NO.

DATE 6-28-88

GEOTECHNOLOGY
ENGINEERING AND ENVIRONMENTAL SERVICES
SAINT LOUIS, MISSOURI

PLATE 66

GRADATION CURVES



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

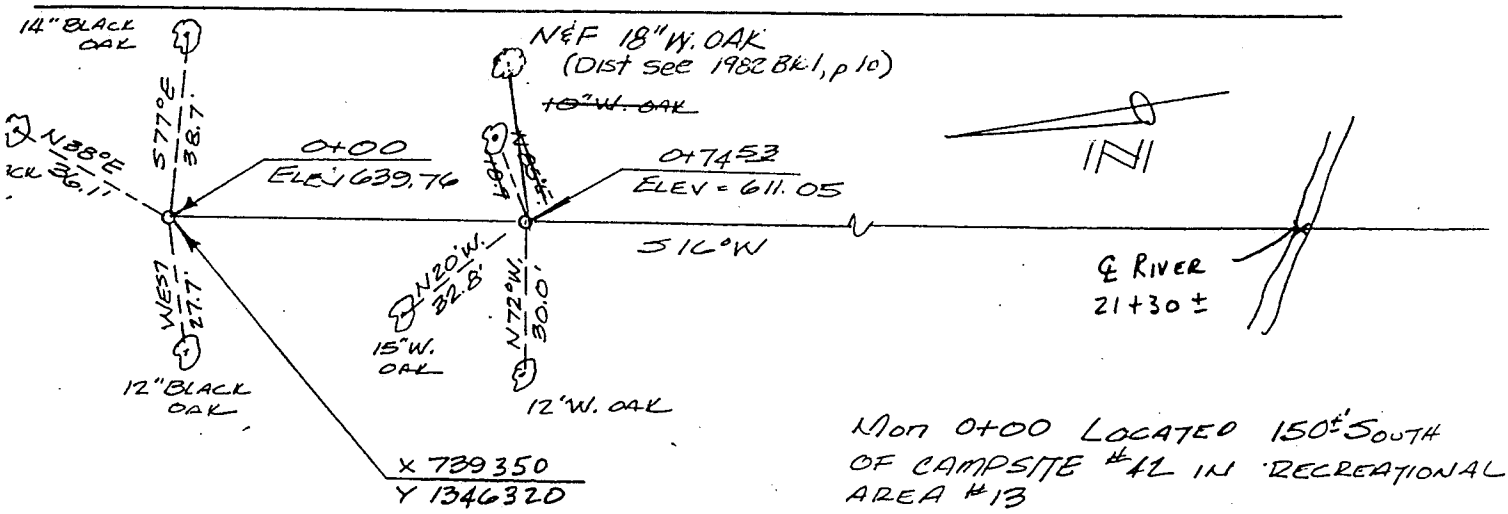
PLATE 67

APPENDIX A

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

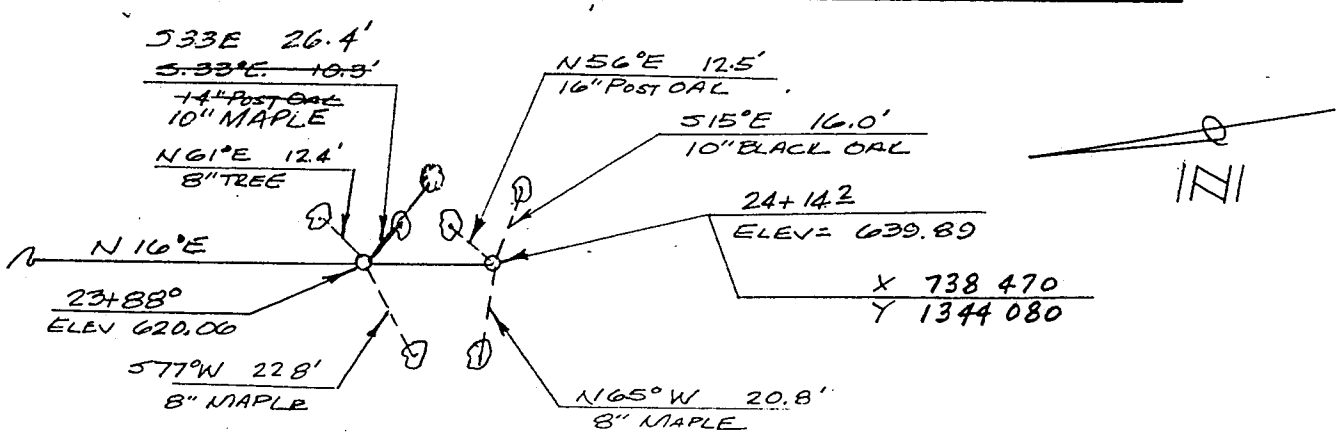
RANGE NO. SR. 1-A BY: G. BUDDE DATE: 6/10/82

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.



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

Mon 0+00 LOCATED 150' SOUTH OF CAMPSITE #42 IN RECREATIONAL AREA #13



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

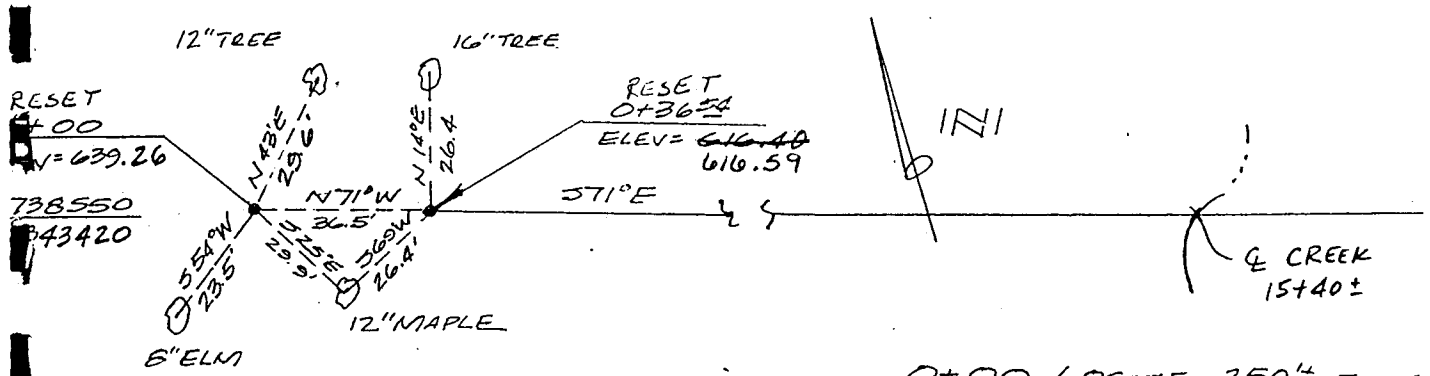
Mon 24+14.2 LOCATED 280' NE OF CAMPSITE #134 IN REC. AREA 2

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

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

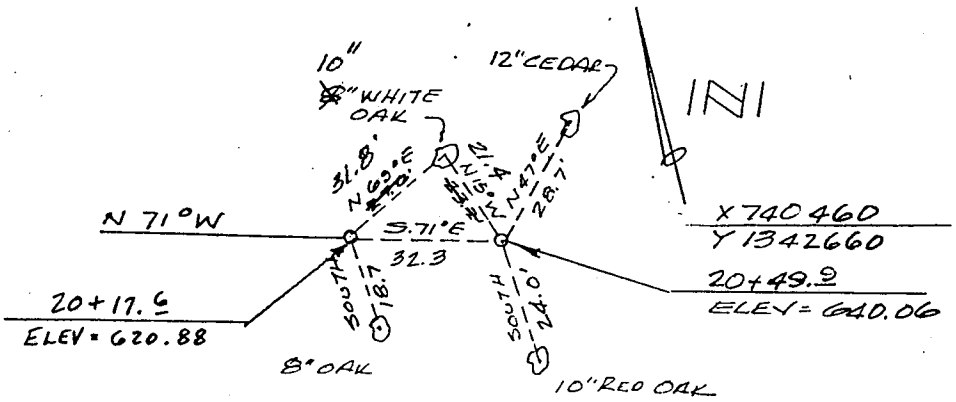
RANGE NO. SR-2A BY: G. BUDDE DATE: 6/11/82

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 4 & 9
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



BM SR 2A-2 LOCATED
N 69°W 80'± FROM
MON 20+49.2

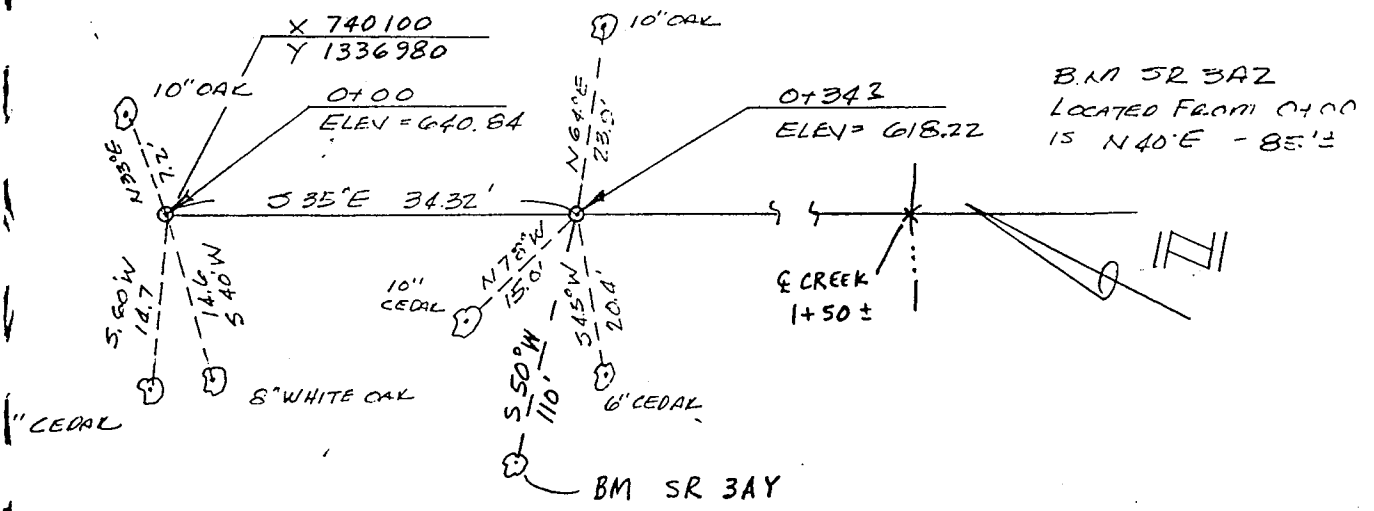
MON 20+49.2 LOCATED
400'± WEST OF C.O.E PARKING AND
STORAGE COMPOUND

DACW43-82-D-0011

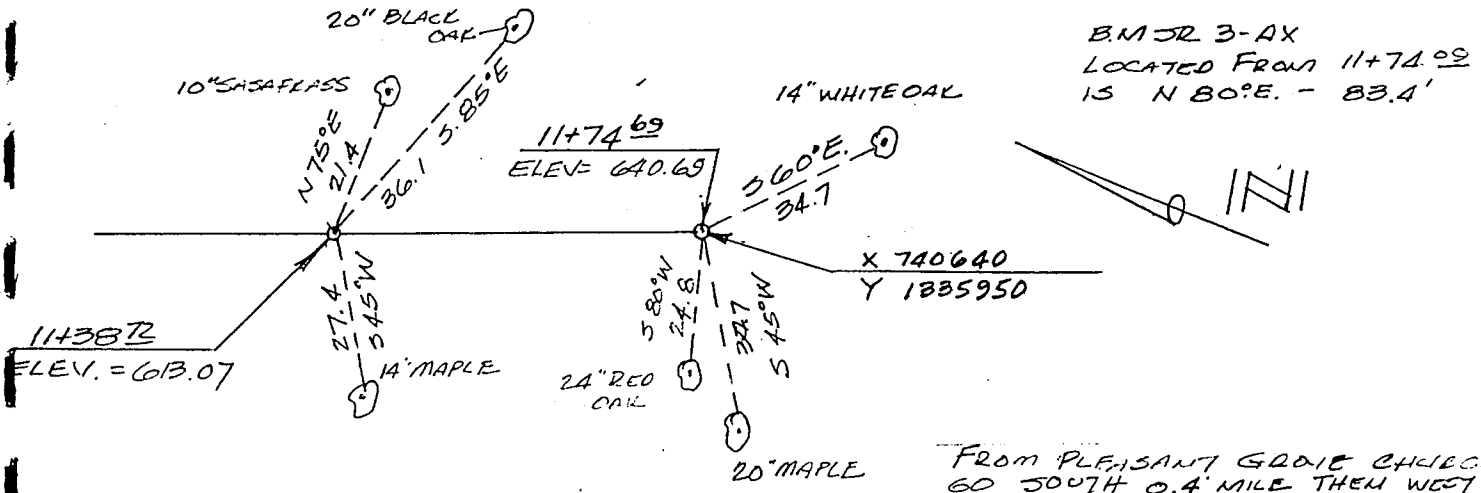
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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 CHUCH ON HWY "J" GO SOUTH 0.6 MILE, THEN EAST 1.0 MILE AND SOUTH 0.8 MILE ON COUNTY ROAD, THEN WALK 0.5 MILE TO 0+00

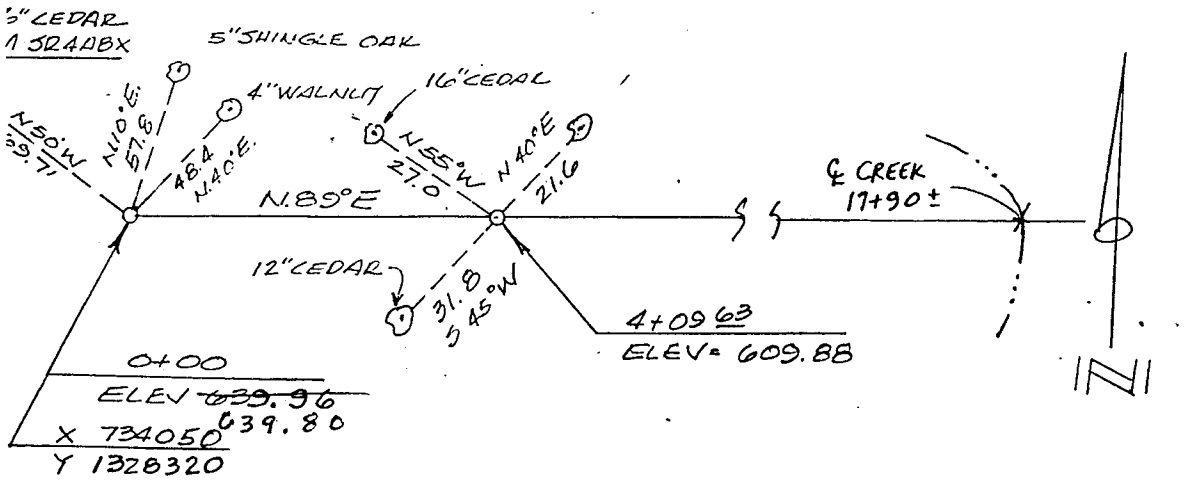


FROM PLEASANT GROVE CHURCH GO SOUTH 0.4 MILE THEN WEST 0.3 THEN SOUTH 0.1 MILE, THEN SOUTH AND WEST ON DIRT ROAD 0.6 MILE THEN WALK, THEN WALK 1700± TO SOUTH END OF RANGE

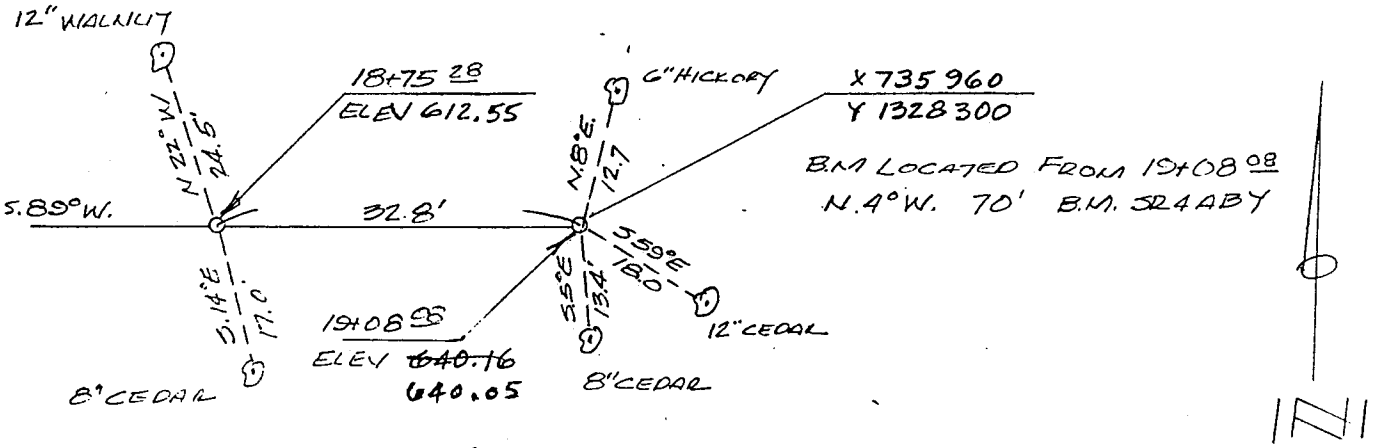
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO II
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

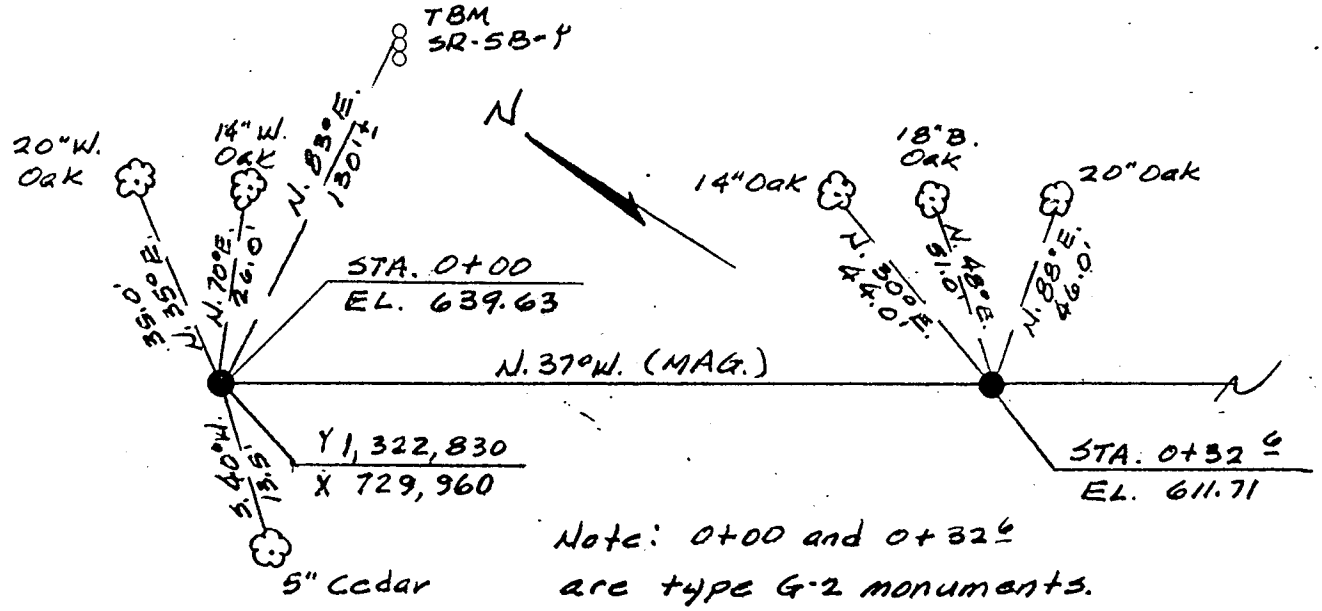


ACCESS SAME AS FROM WEST END OF RANGE

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

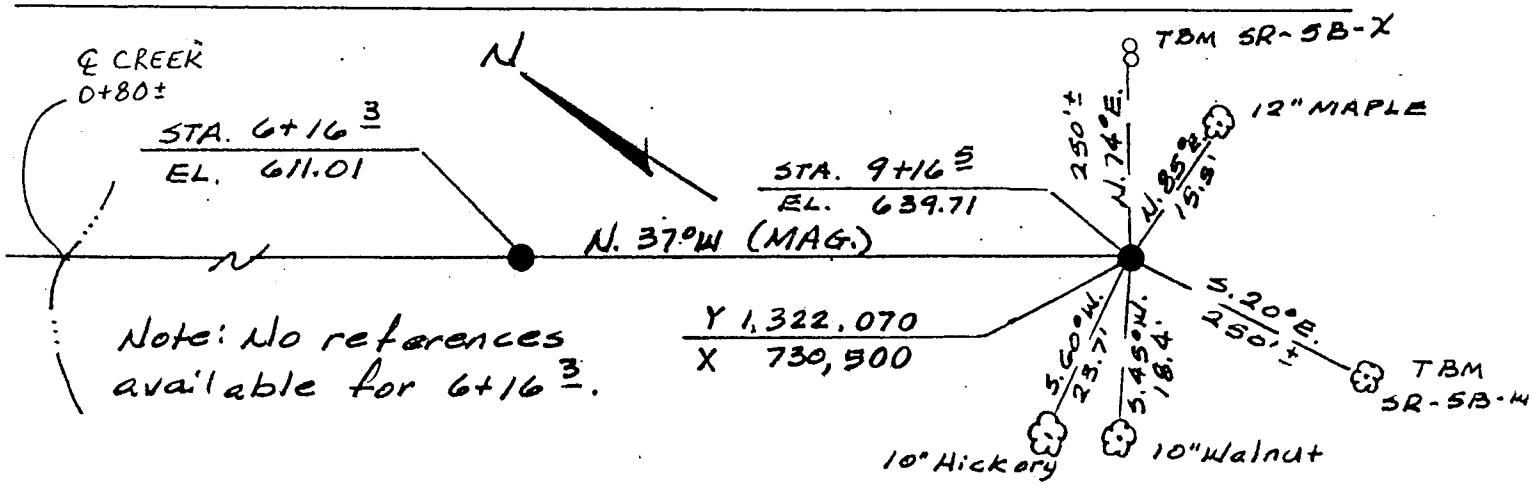
RANGE NO. SR-5B BY: Owen Zuroweste DATE: 7/82

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



Note: 0+00 and 0+32 6 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.



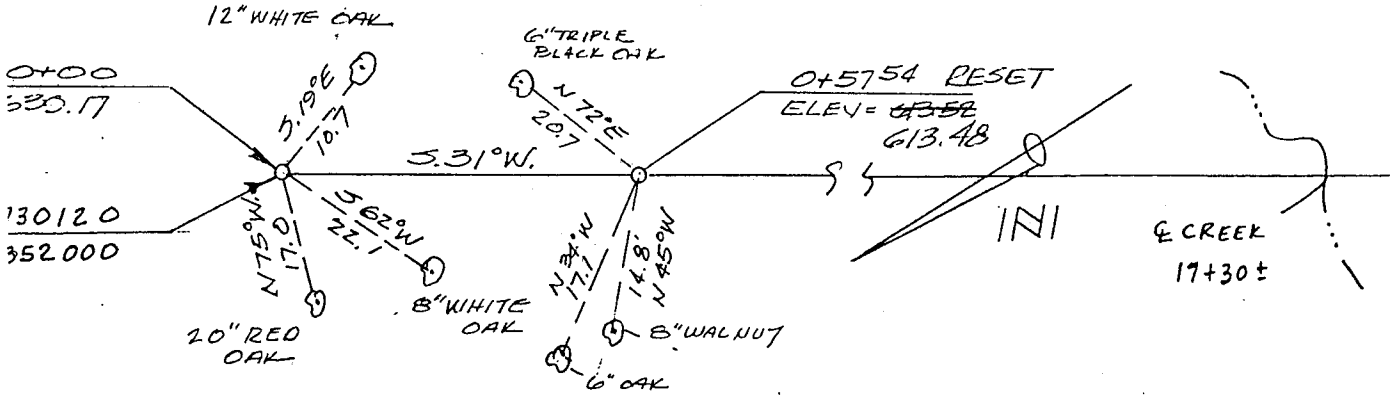
Note: No references available for 6+16 3.

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.

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

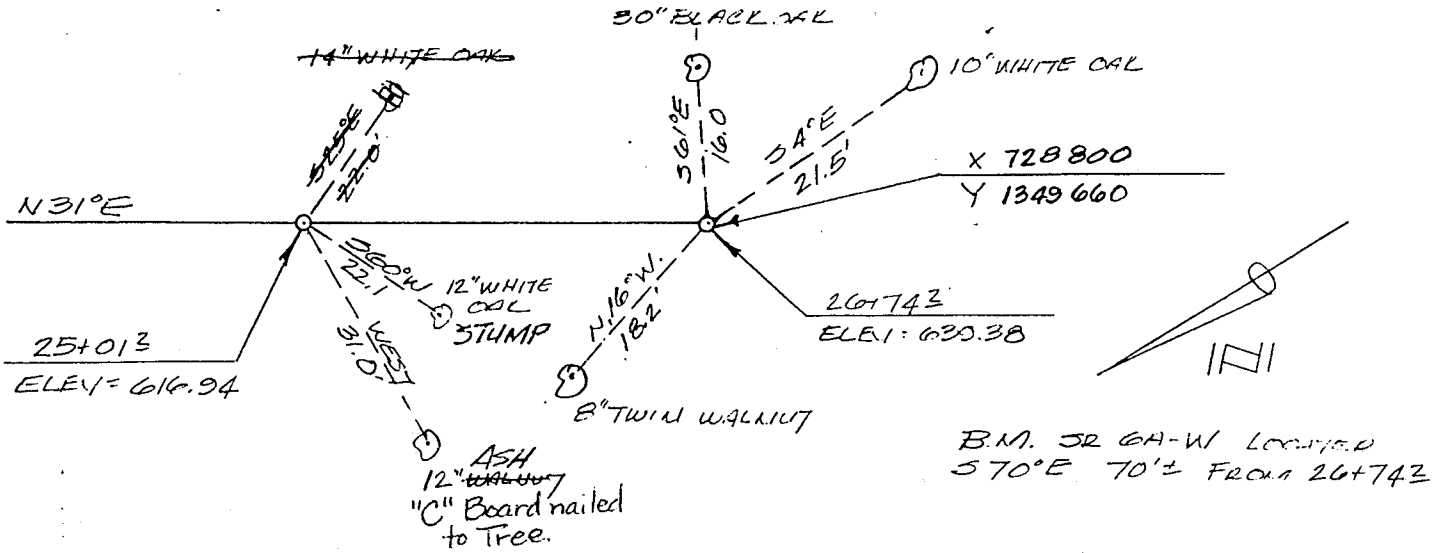
RANGE NO. SR 6A BY: G. BRIDGE DATE: 6/21/82

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

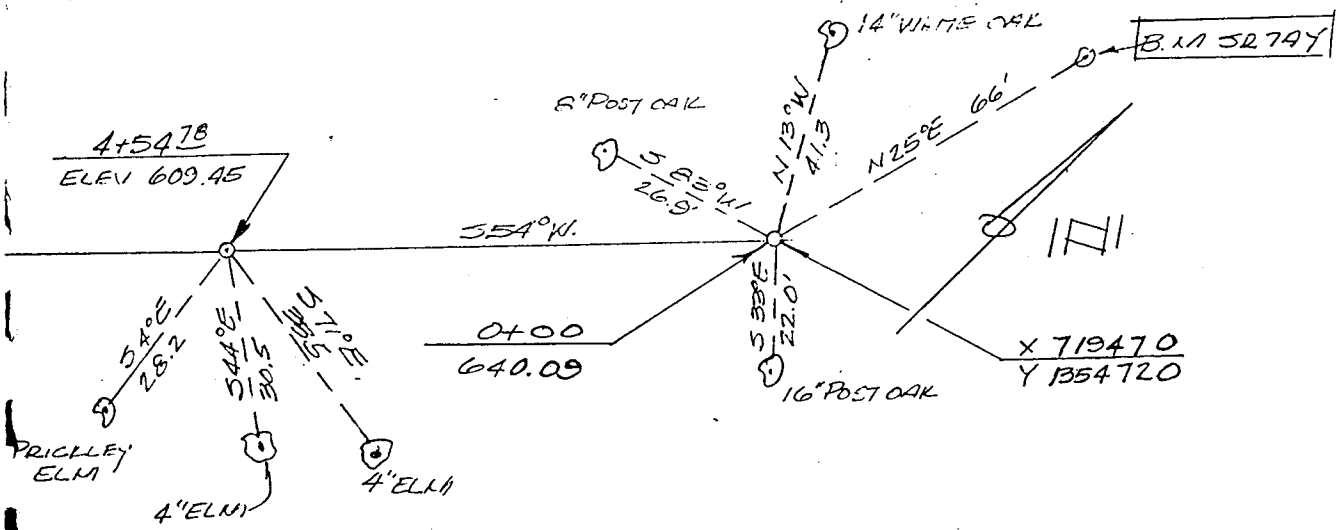
DACW43-82-D-0011

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

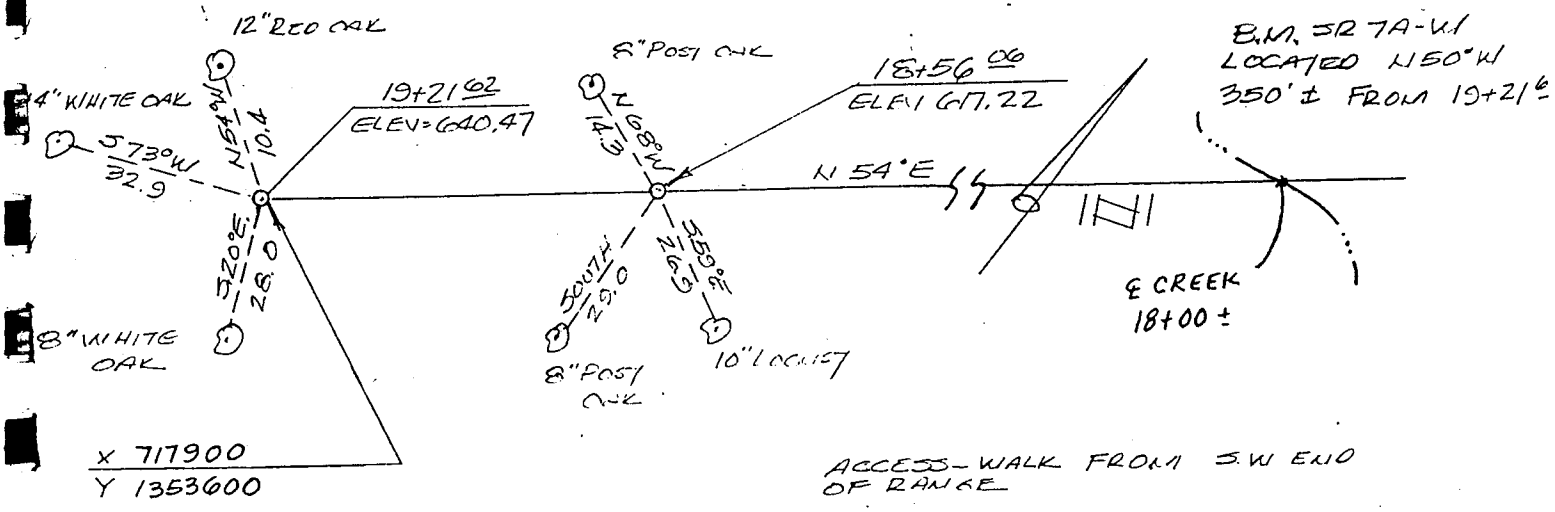
RANGE NO. SR 7A BY: G. BUDDE DATE: 6/21/82

TOPO 16

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.



0.5 MILE WEST OF N.E COR SEC 18 T 55 N R 7E ON HWY 'N' THEN 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

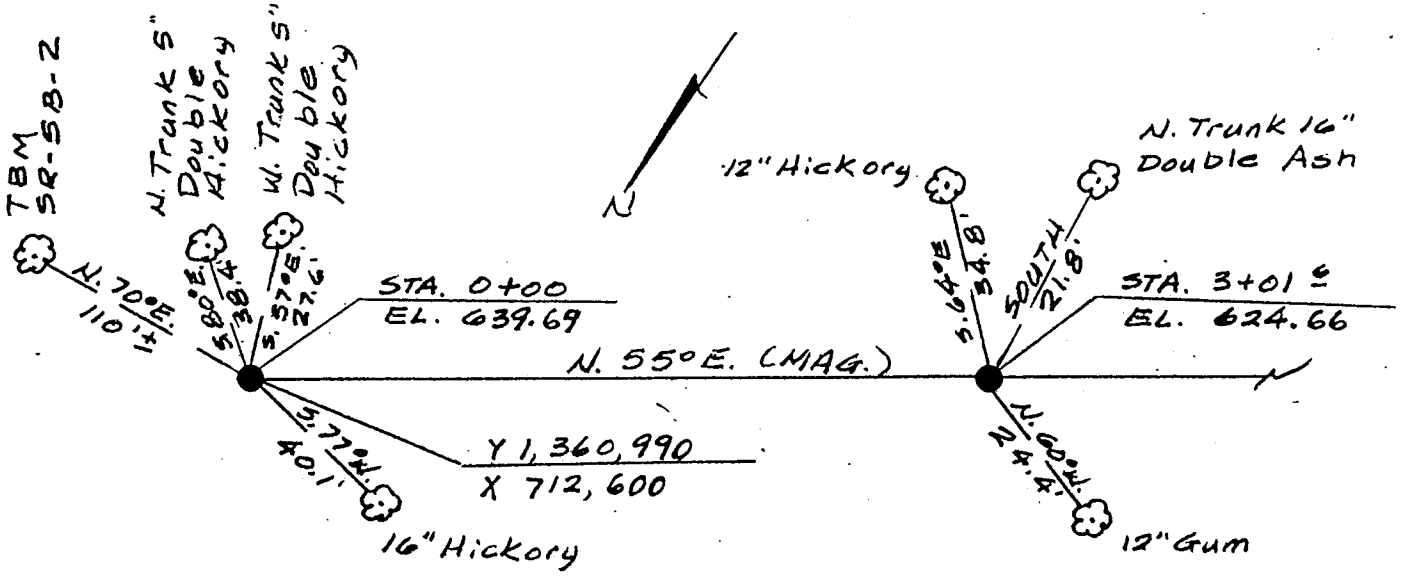
DACW43-82-D-0011 1-2151-22.9-5

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

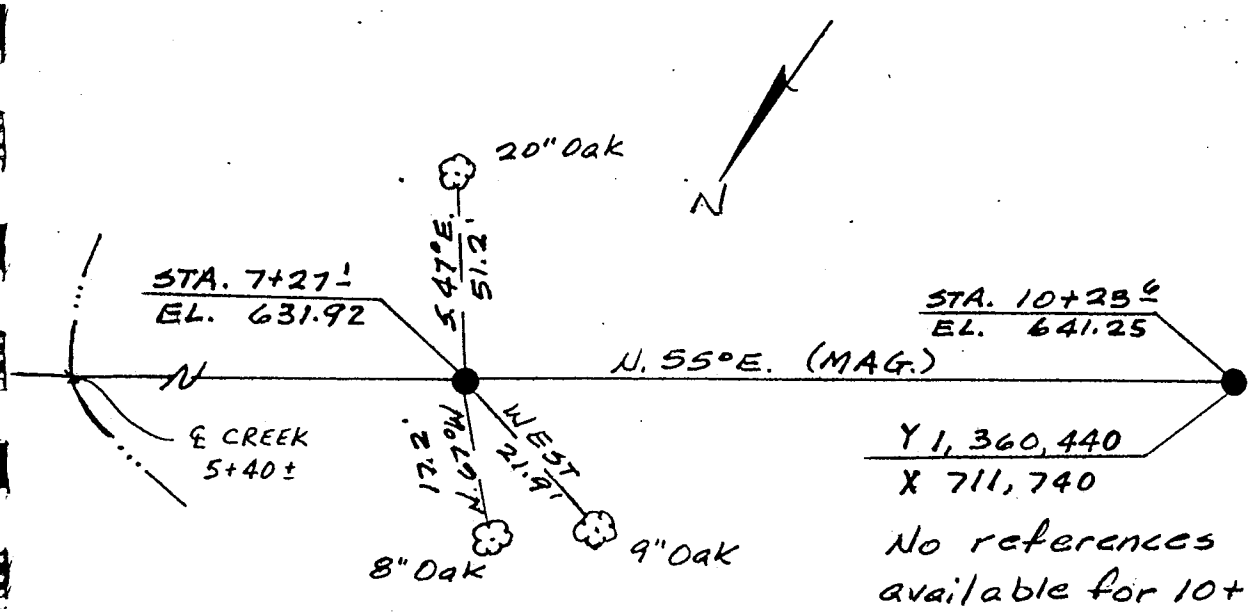
RANGE NO. SR-8B BY: Owen Zuroweste DATE: 7/82

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.

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. _____

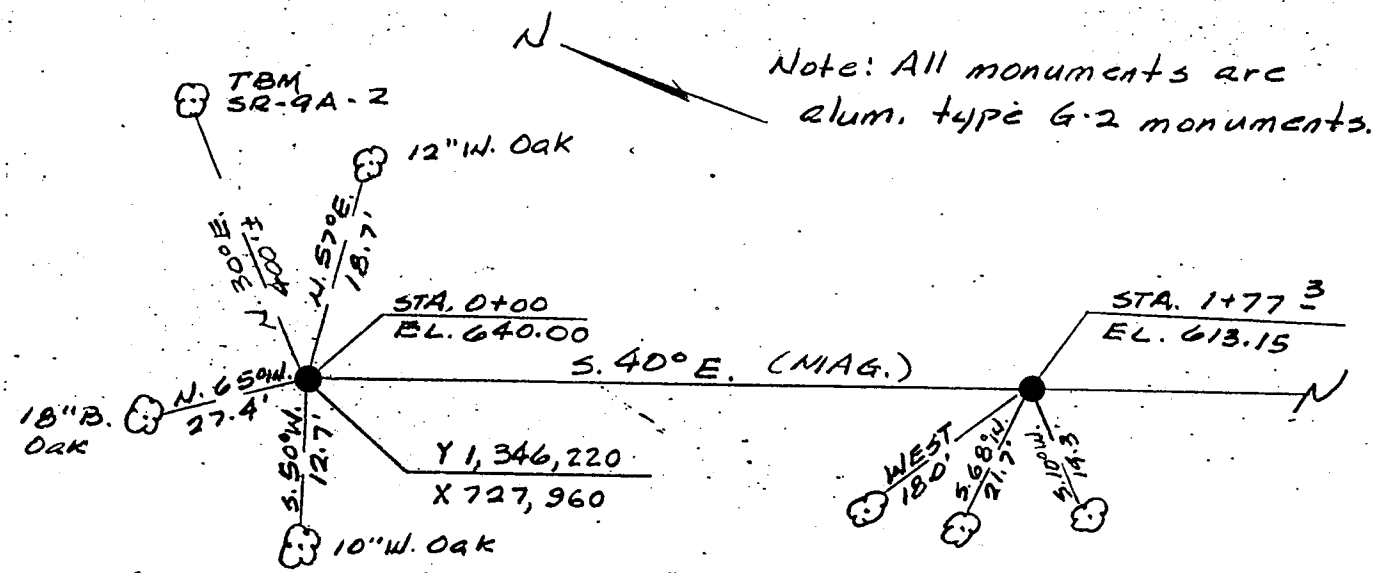
ORIGINAL

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

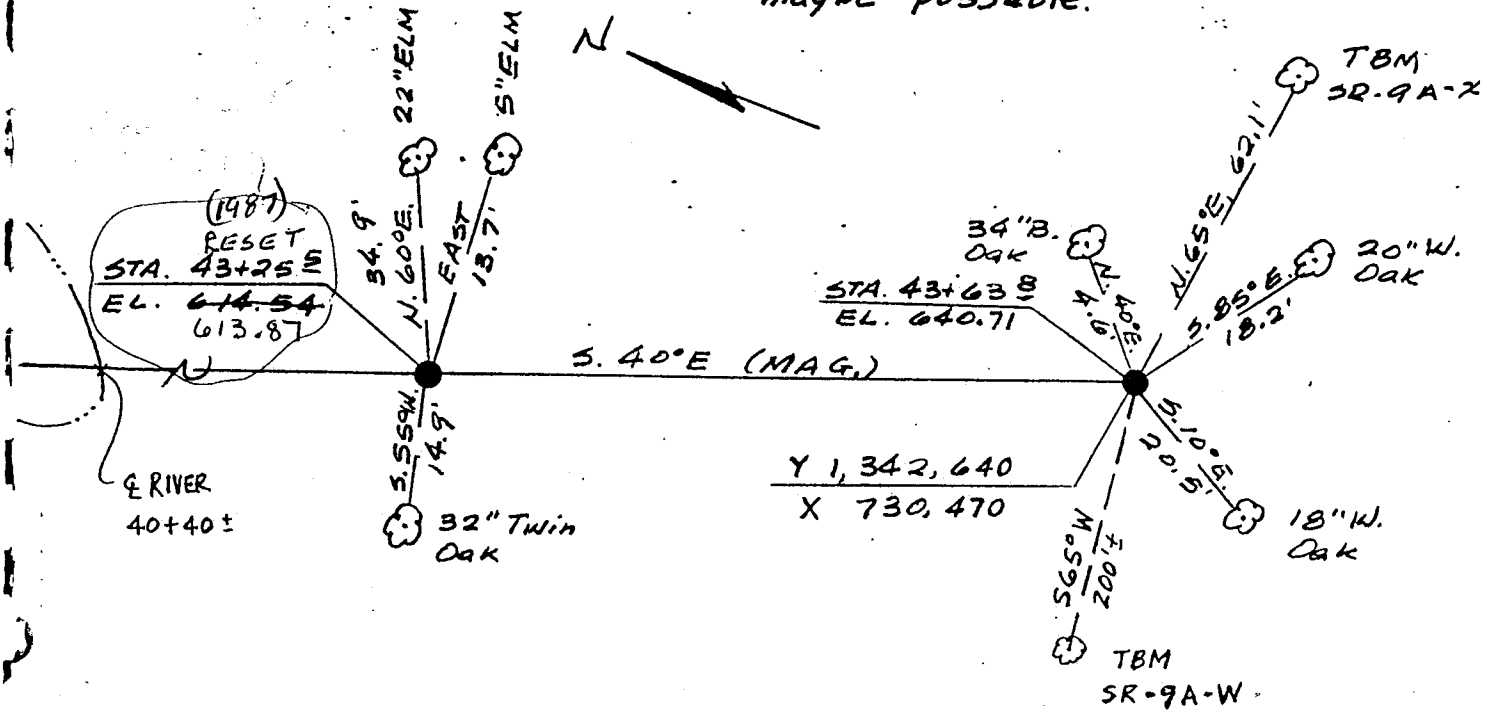
RANGE NO. SR-9A BY: Owen Zurowestc DATE: 6/82

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 9



From intersection of Hwy. "I" 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 48+63 ±. Crossed river in boat and packed North 4000'± to 0+00. Other access maybe possable.



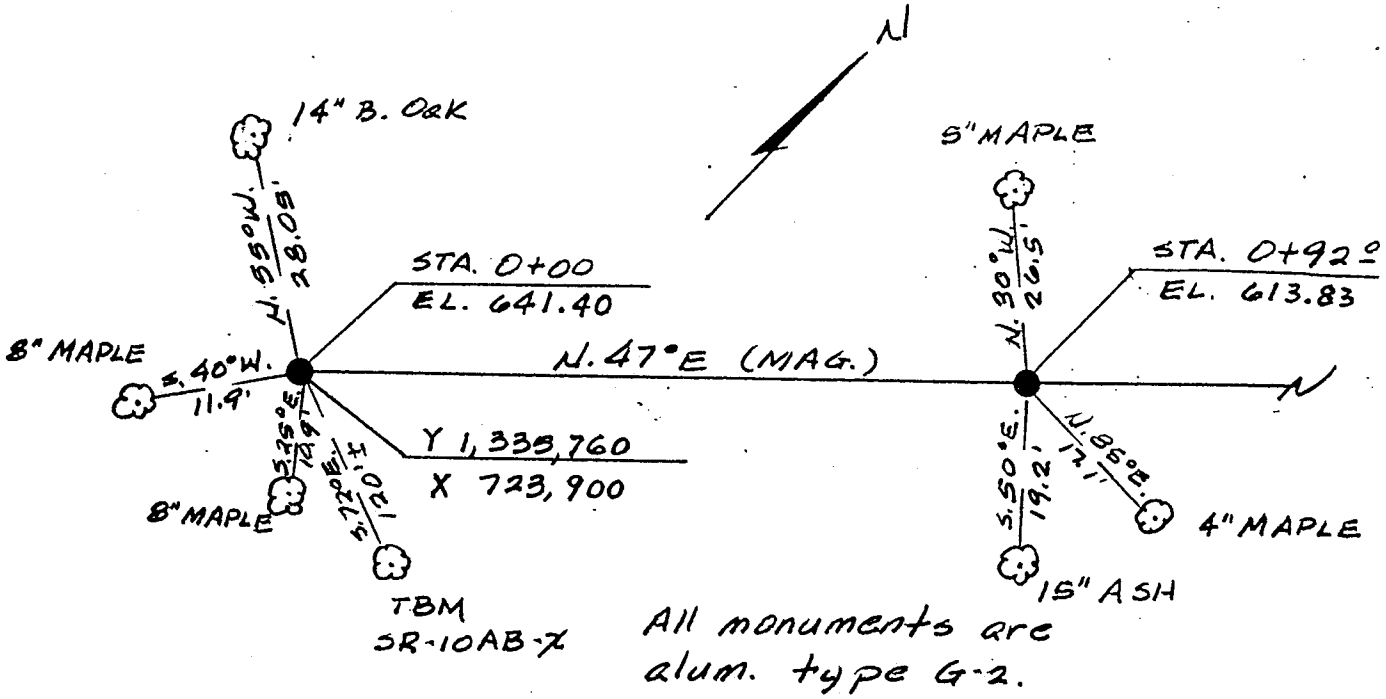
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

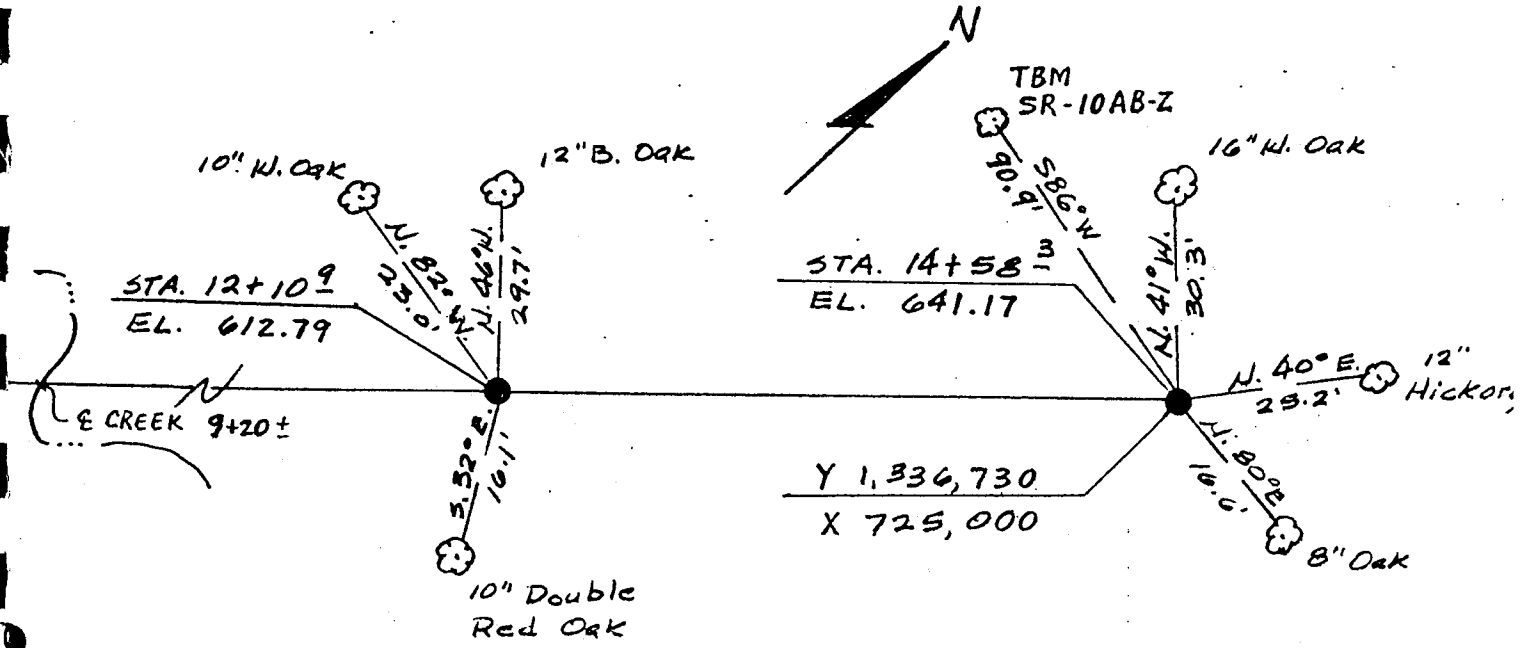
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-10AB 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.

TOPO 18





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

RANGE NO. SR-10AB 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 "J" and Hwy "BB", travel West on Hwy "BB" 1.25 ± mi. Then pack North 0.75 ± mi. to range.

Station 14+58 ³:
Same as above.

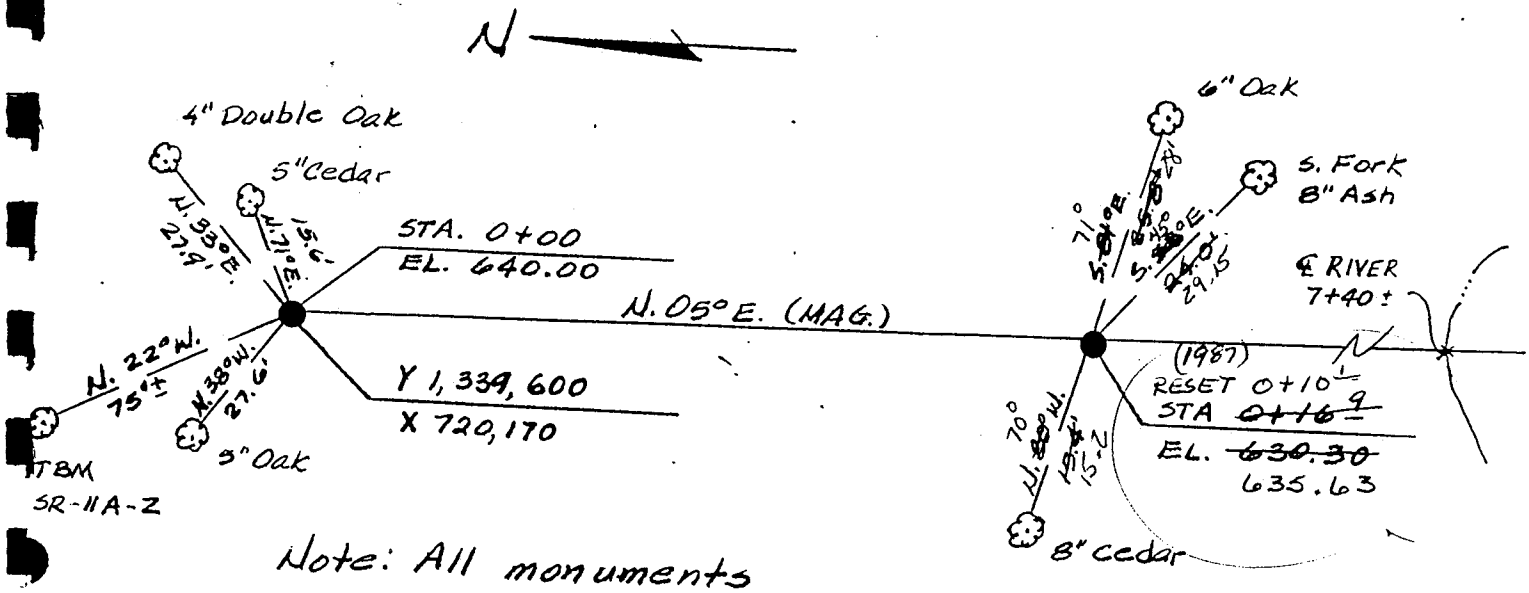
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

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

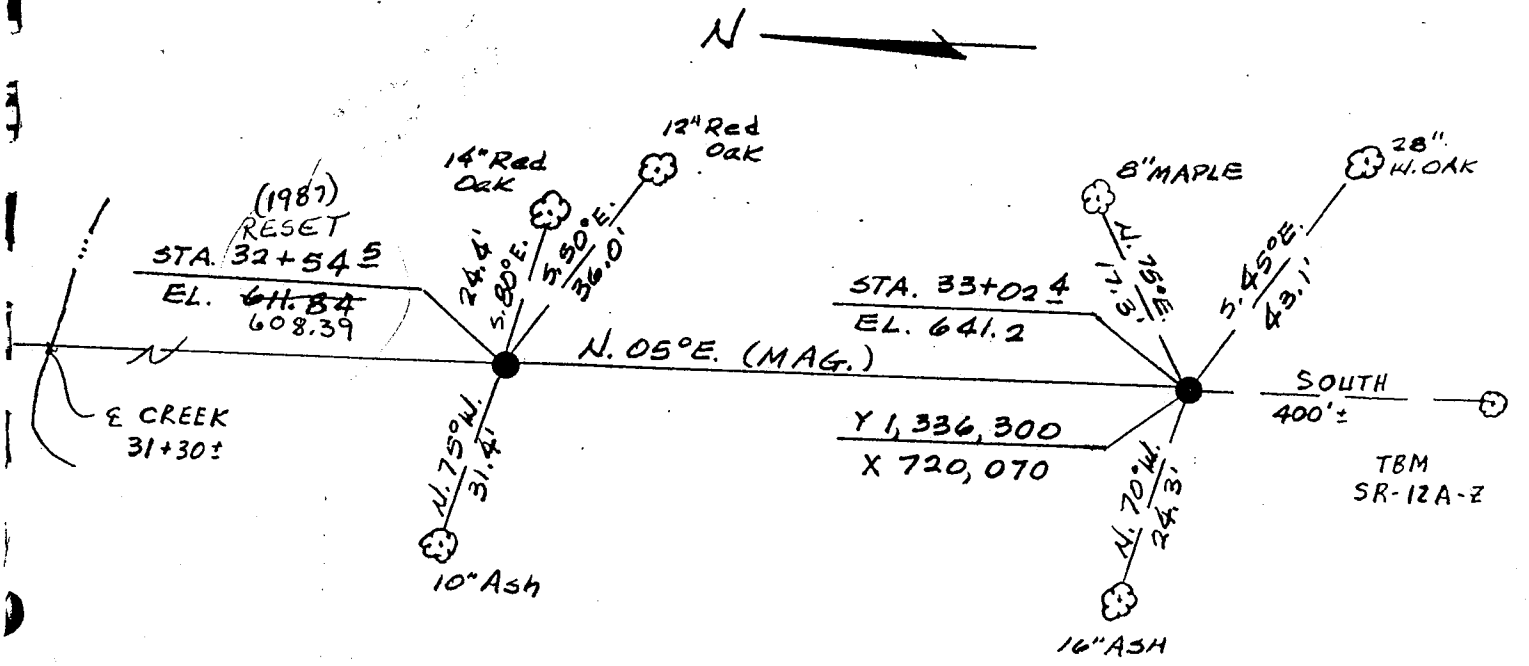
RANGE NO. SR-11A BY: Owen Zurowleste DATE: 6/82

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.



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.

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.

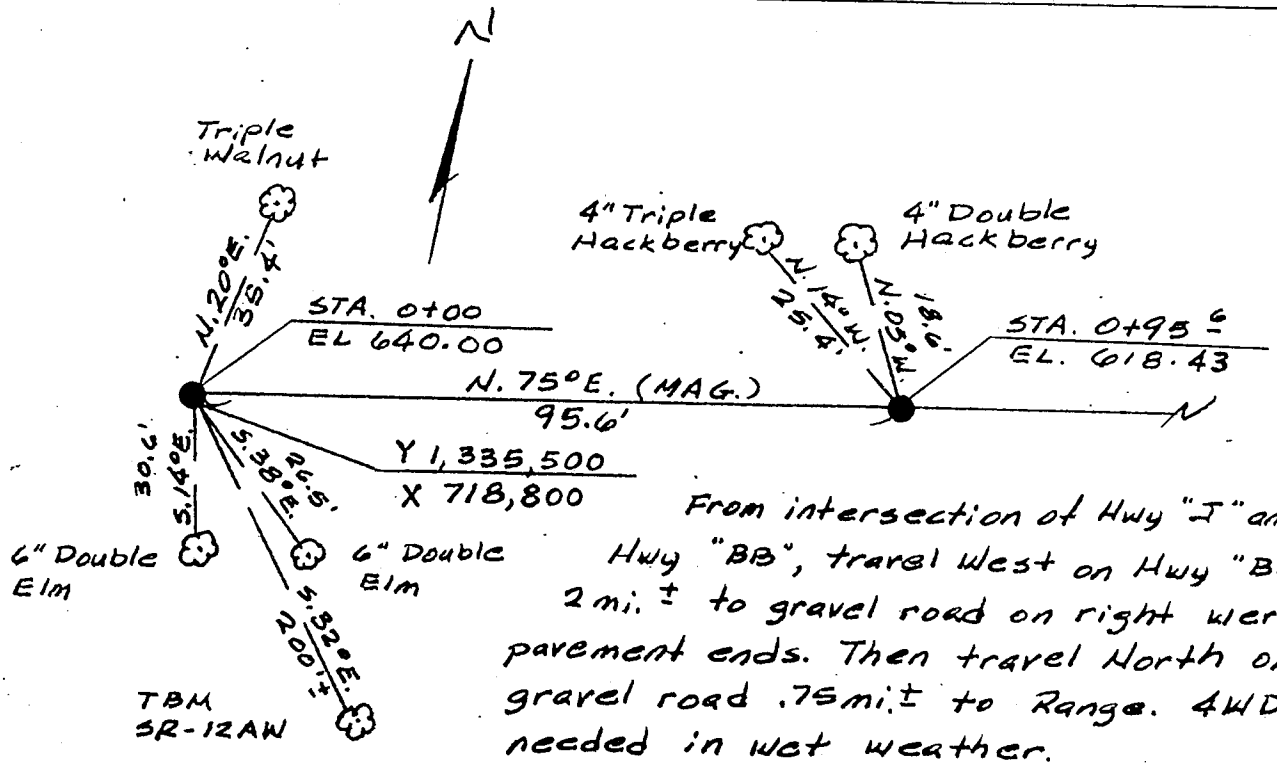
Station 33+02±:
Same access as for 0+00 except pack South 1500'±.

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

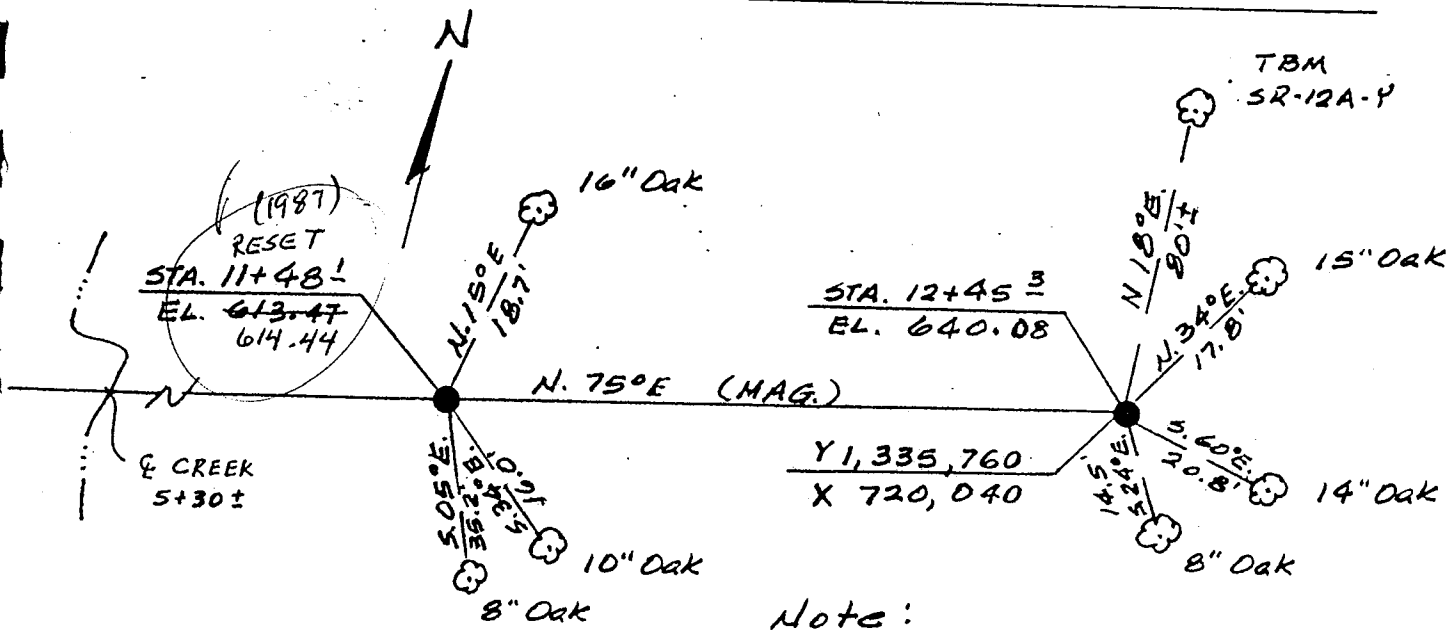
RANGE NO. SR-12A BY: Owen Zuroweste DATE: 5/82

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 "J" and Hwy "BB", travel West on Hwy "BB" 2 mi. ± to gravel road on right where 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.

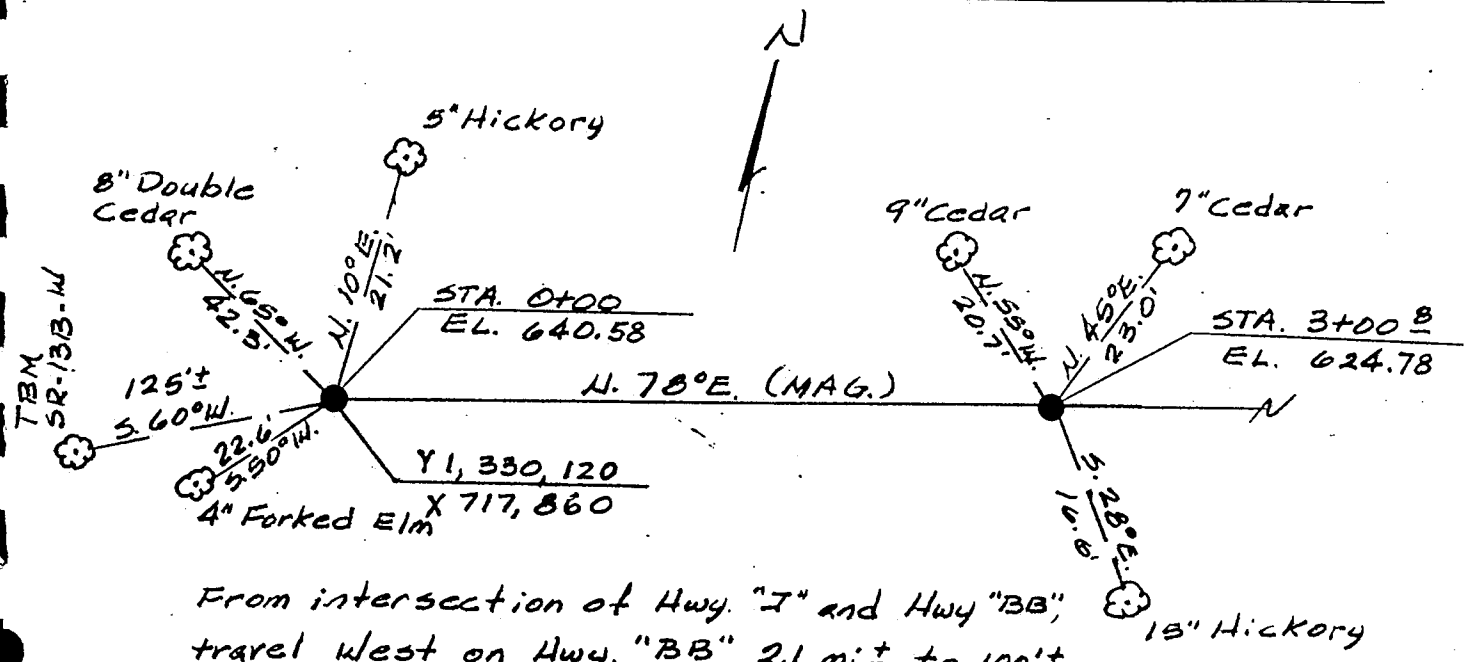
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

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

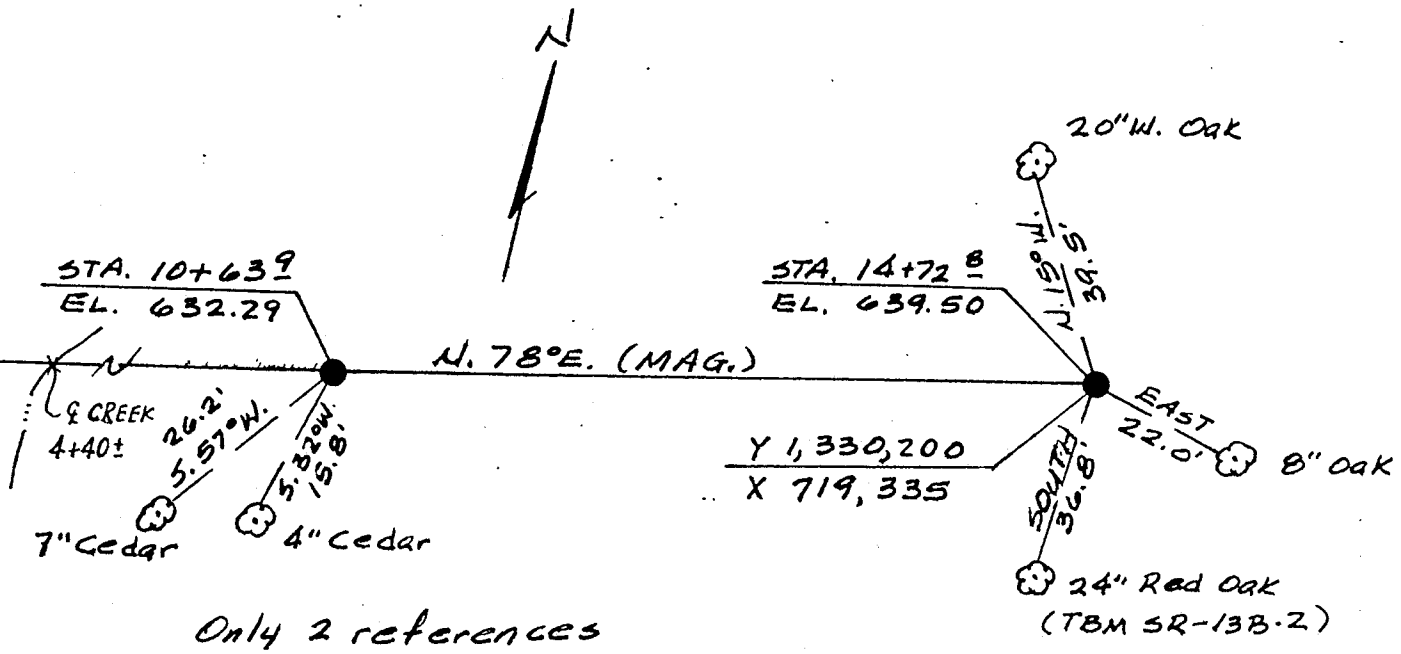
RANGE NO. SR-13B BY: Owen Zuroweste DATE: 7/82

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

TOPO 18



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 ?

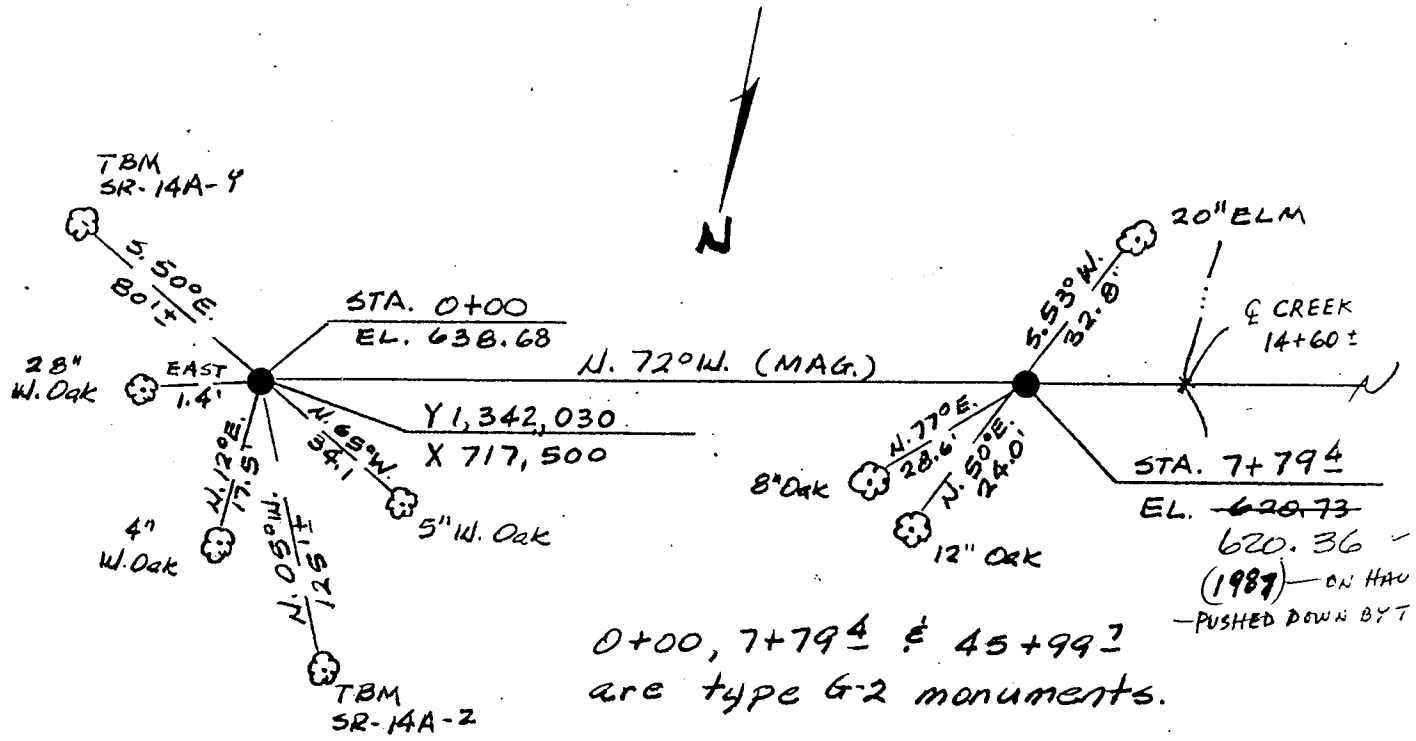
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

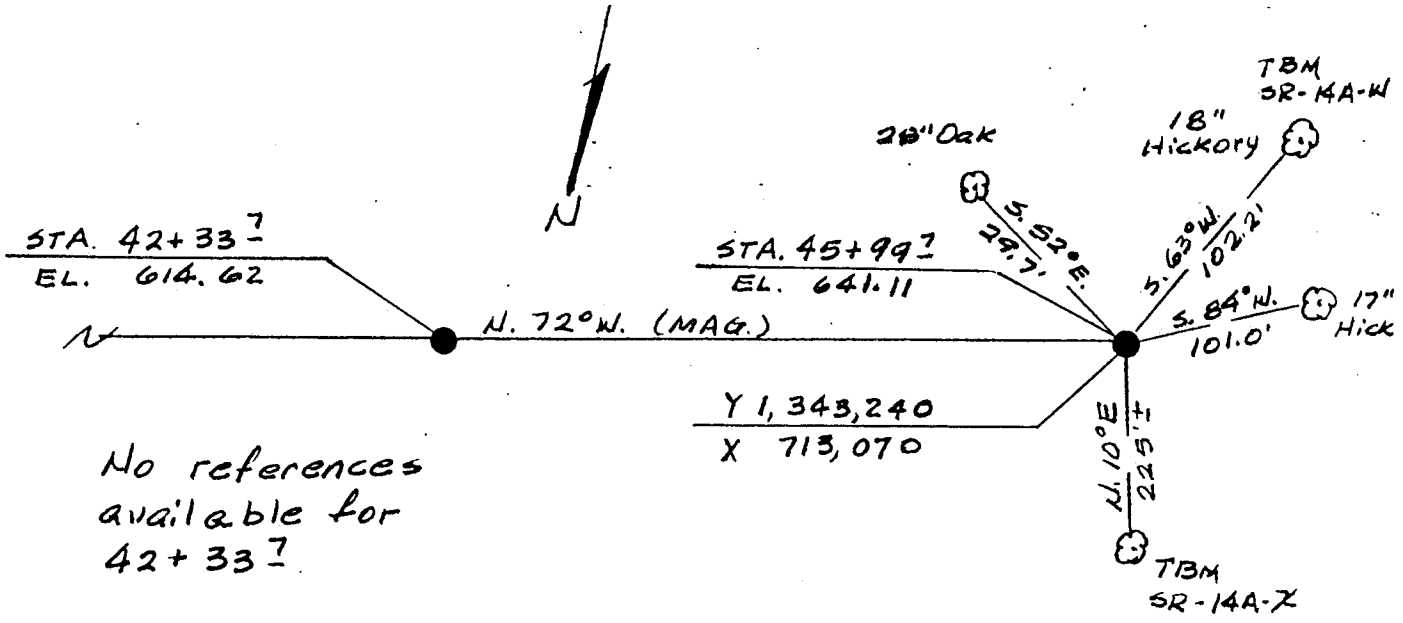
ORIGINAL

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

RANGE NO. SR-14A BY: Owen Zurowestе 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.





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

CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION 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 2.3 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.

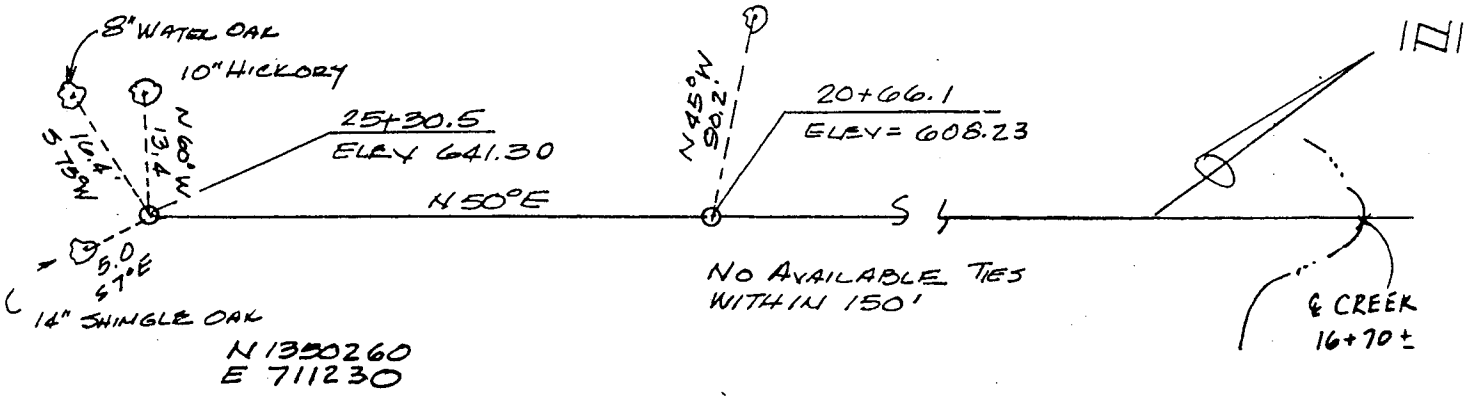
ORIGINAL

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

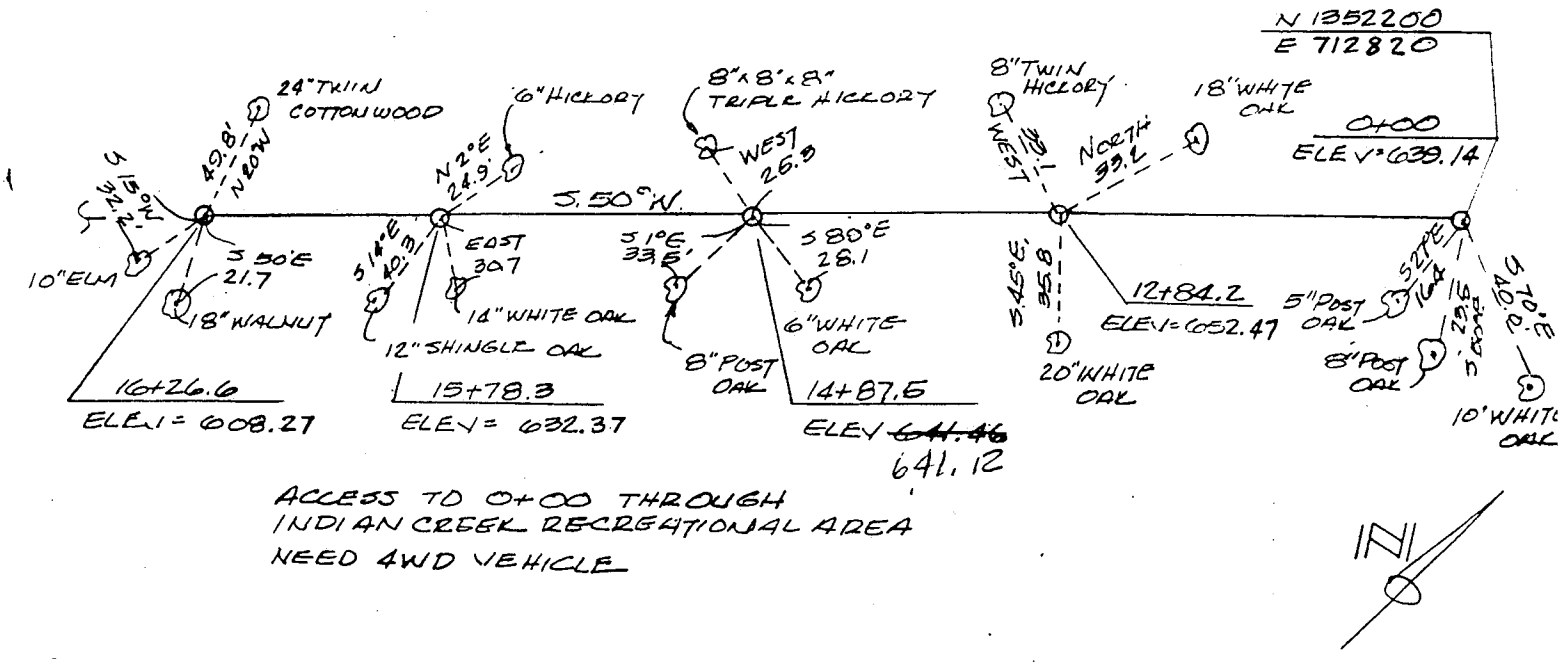
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

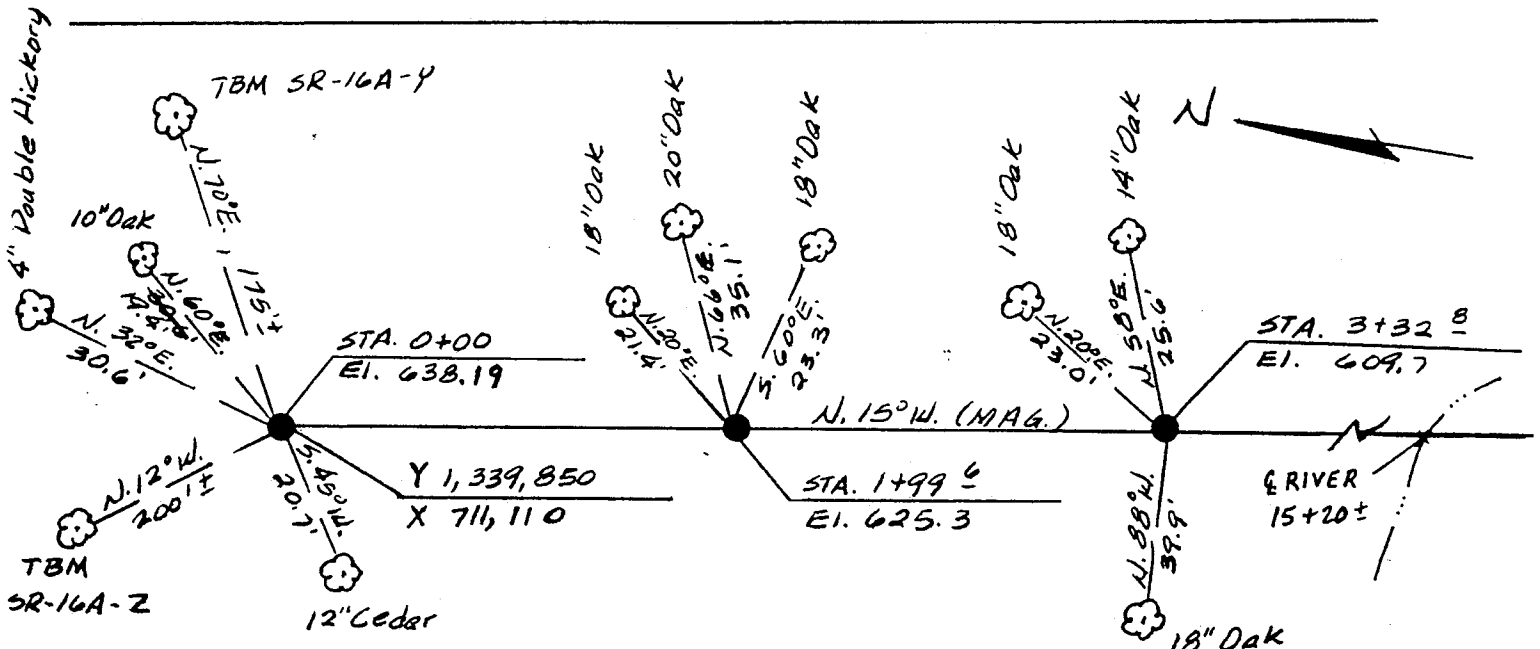
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO.

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

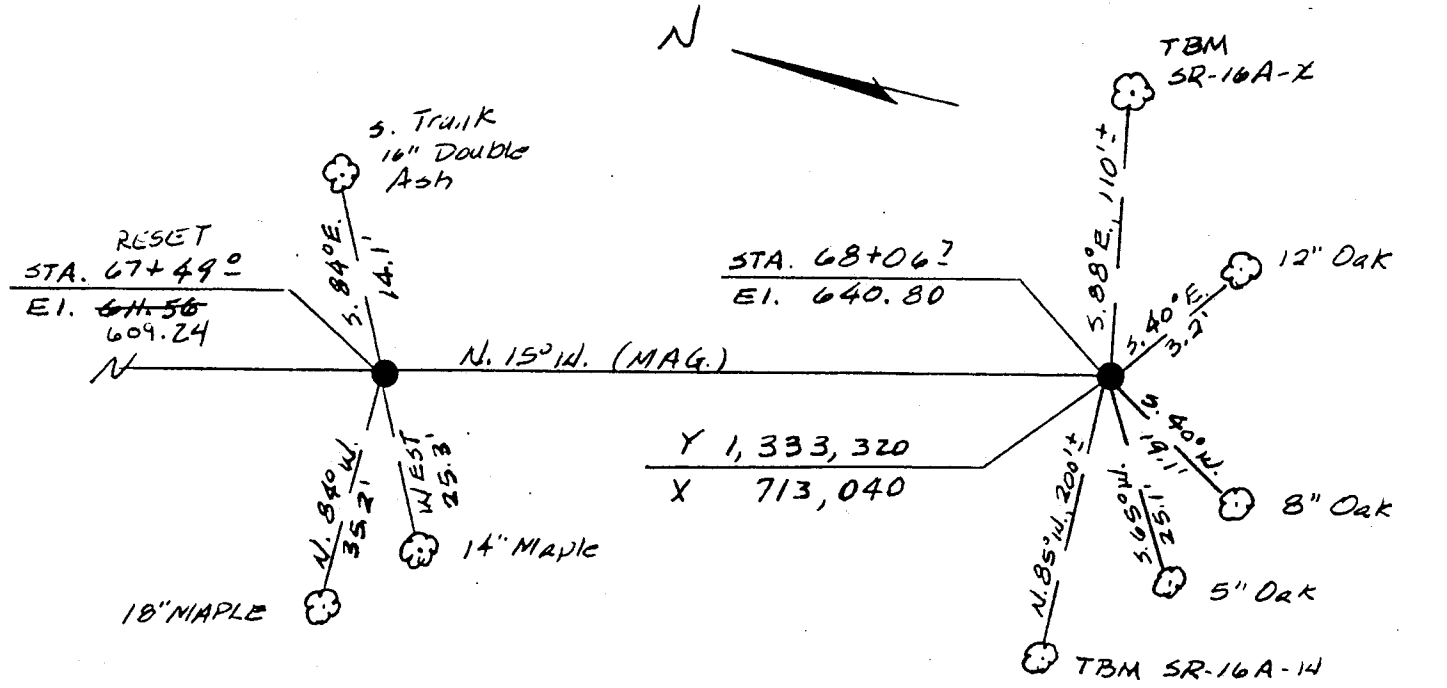
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 18, 23
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



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



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

Station 0+00:
From intersection of Hwy 24 and Hwy H H, travel South on H H 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.
4 W D needed on field road.

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

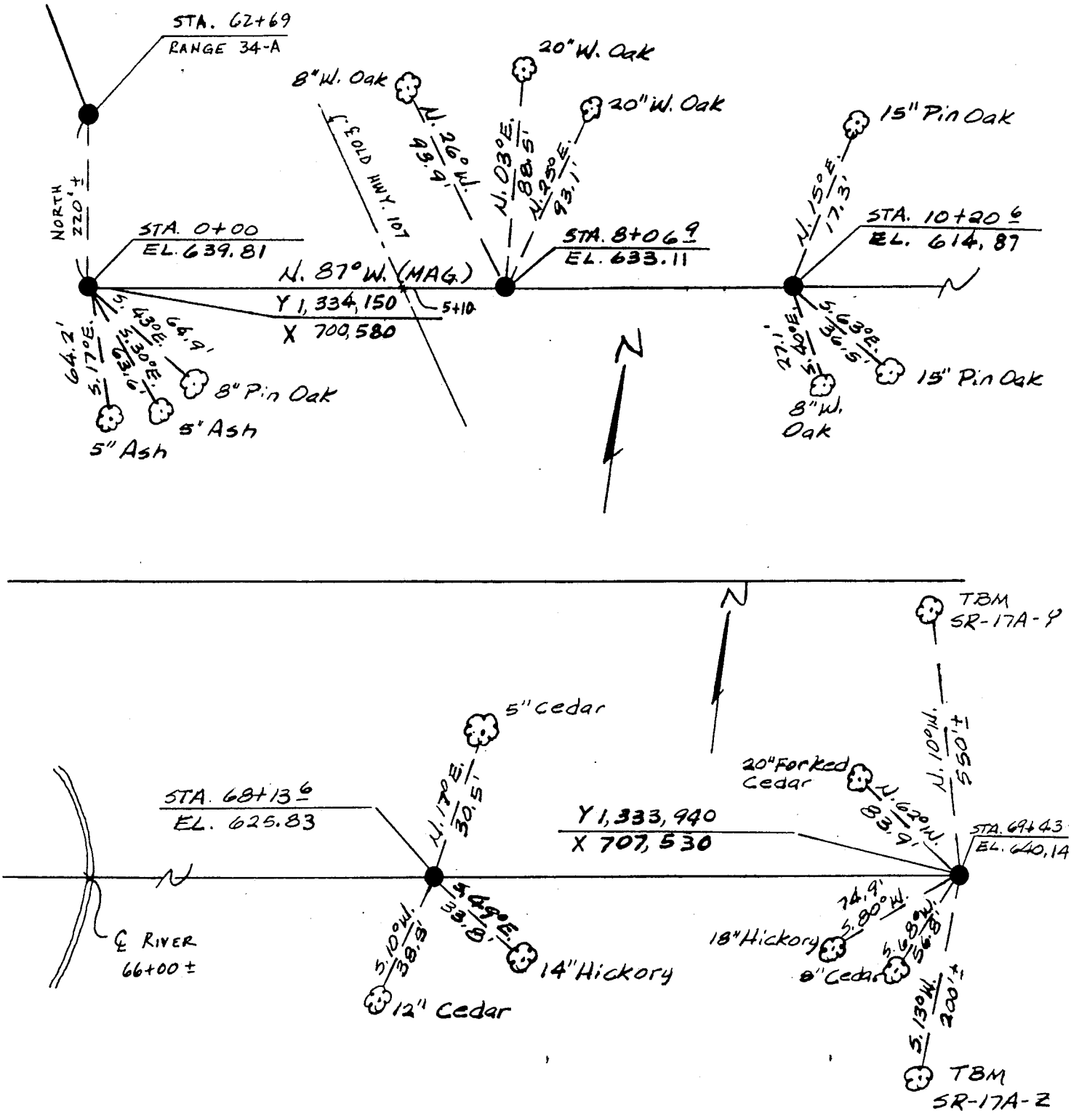
DACW43-82-D-0011 1-2757-22.9-S

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

RANGE NO. SR-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.



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

ORIGINA

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

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

RANGE NO. SR-17A BY: Owen Zurowski 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. Then park West 500'± to station 0+00.

STATION 69+43.3:
From "T" intection of gravel road and County Road J-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-23W.). Then North on old gravel road 3/4 mi.± to Range.

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

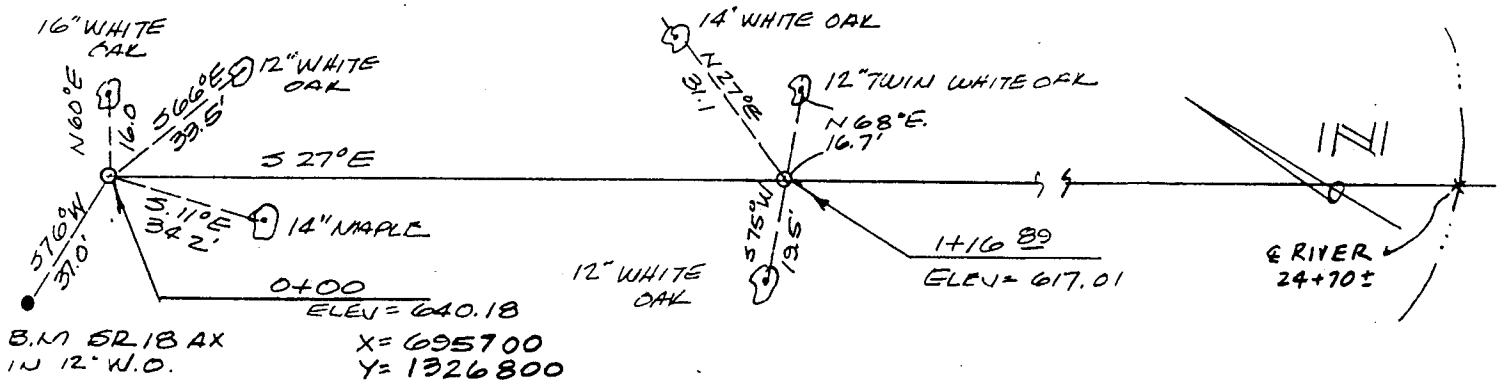
ORIGINAL

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

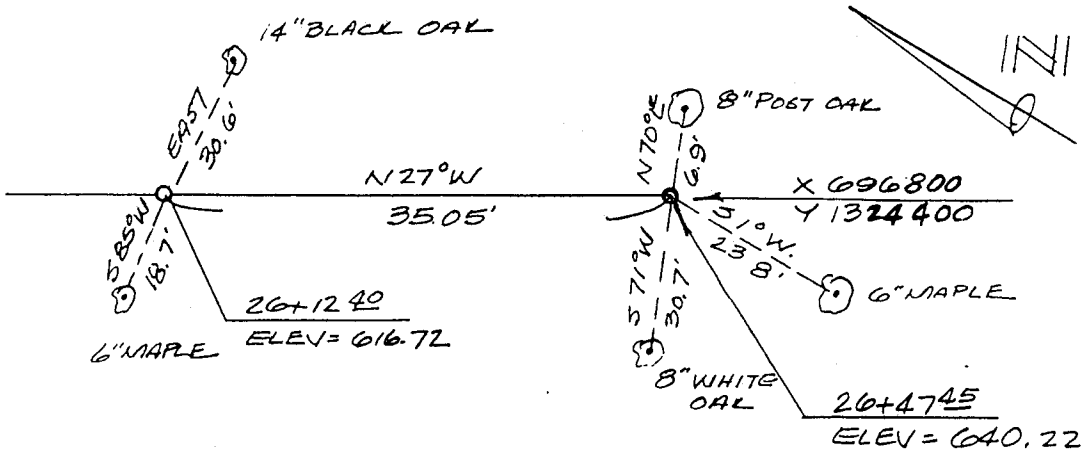
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR18-A BY: G. BUDDE DATE: 6/11/82

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



FROM INTESECTION 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 S62°E
110'± FROM 26+47

FROM INTESECTION 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 DRT ROAD 0.5 MIL THEN LEAVING ROAD WALK THRU WOODS IN S.W DIRECTION 800'± TO 26+47 45

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

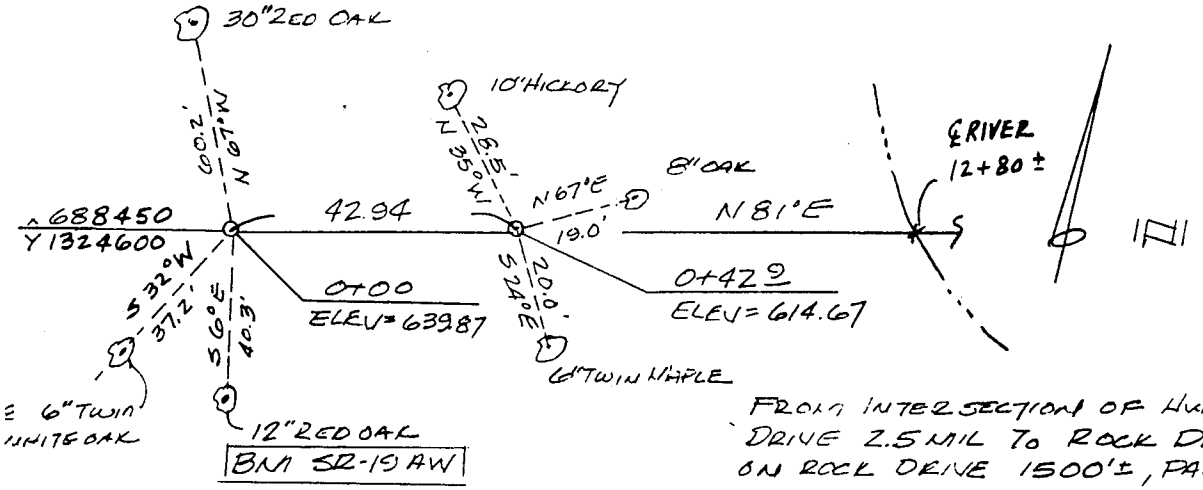
DACW43-82-D-0011 1-2757-22.9-S

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

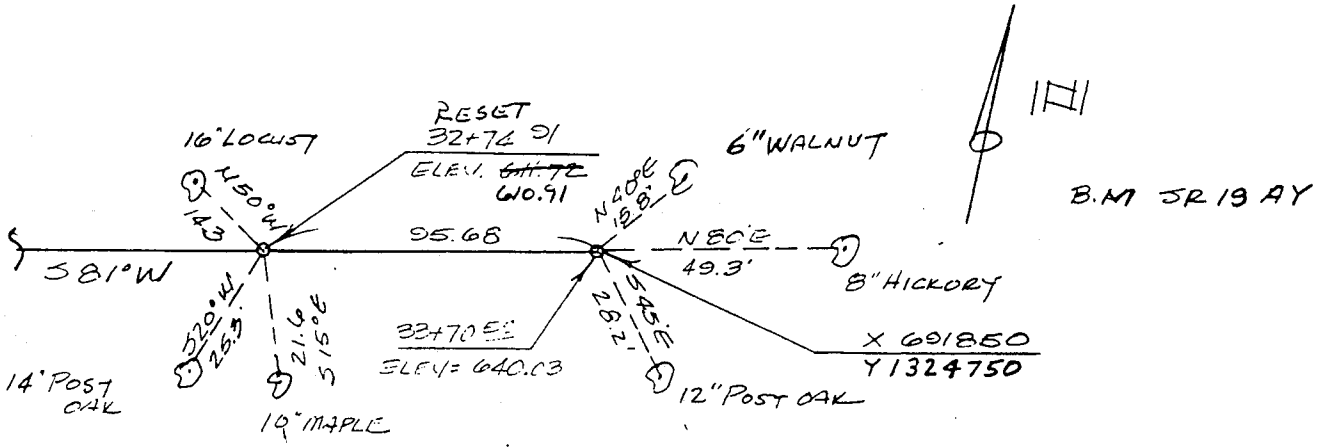
RANGE NO. SR-19A BY: G. BUDDE DATE: 6/11/82

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

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

ORIGINAL

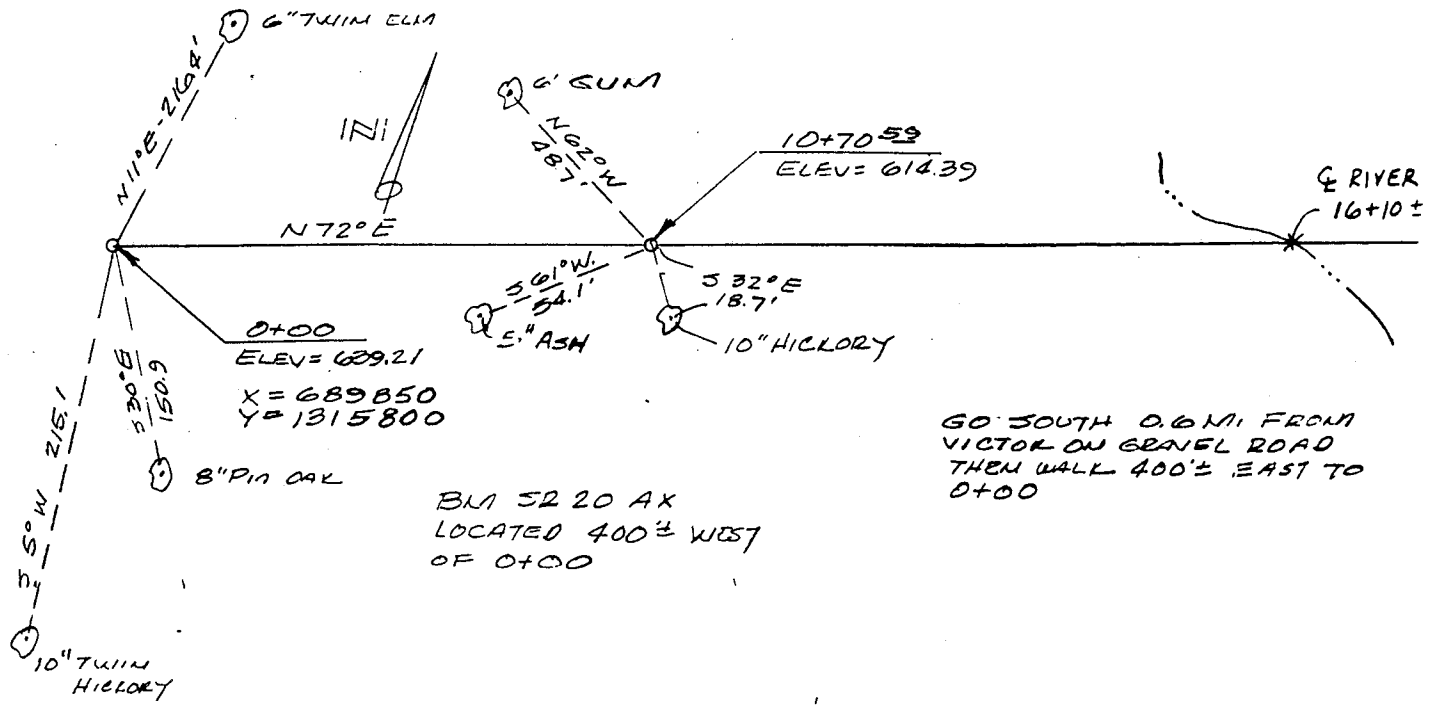
DACW43-82-D-0011 1-2757-22.9-S

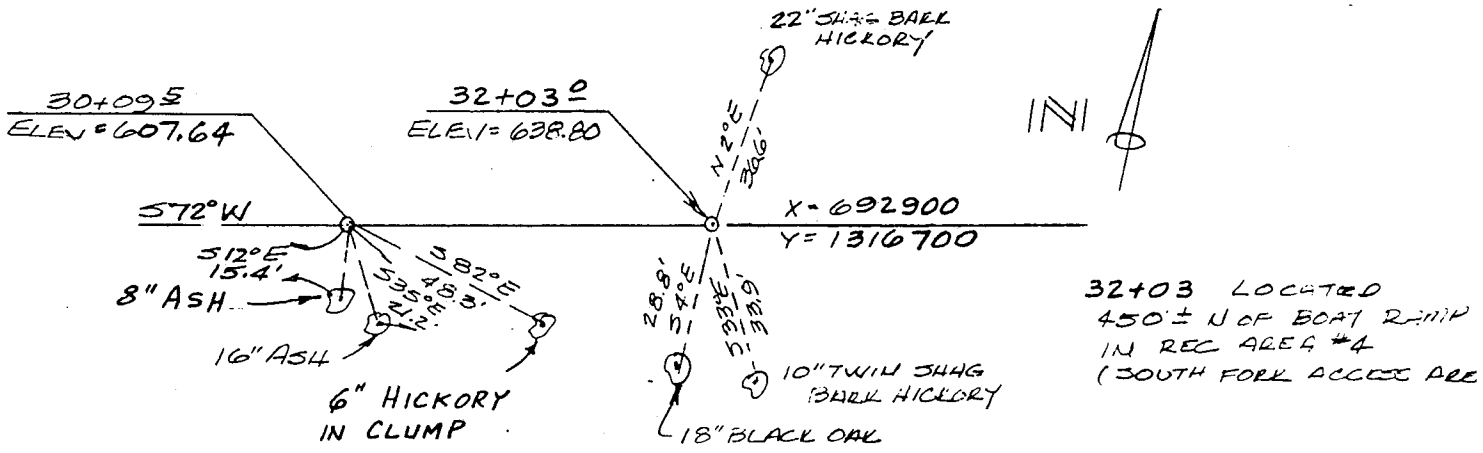
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

TOPO 31

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

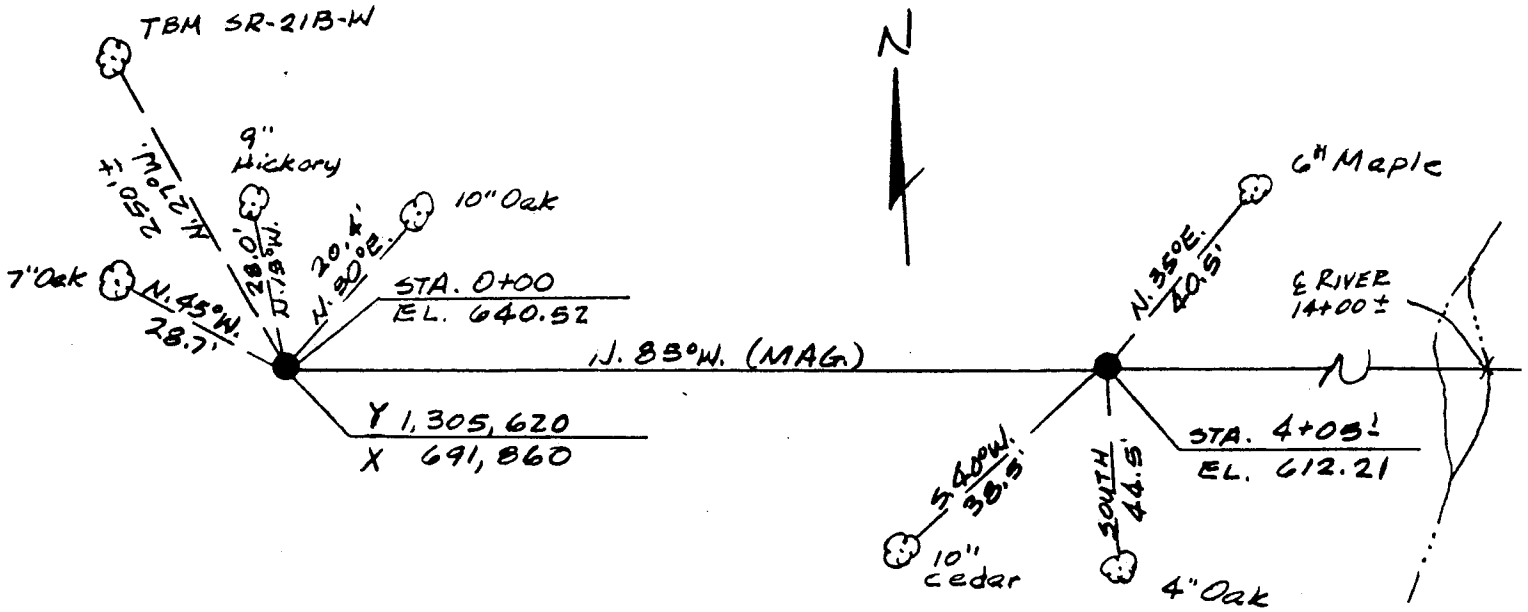
DACW43-82-D-0011 1-2757-22.9-S

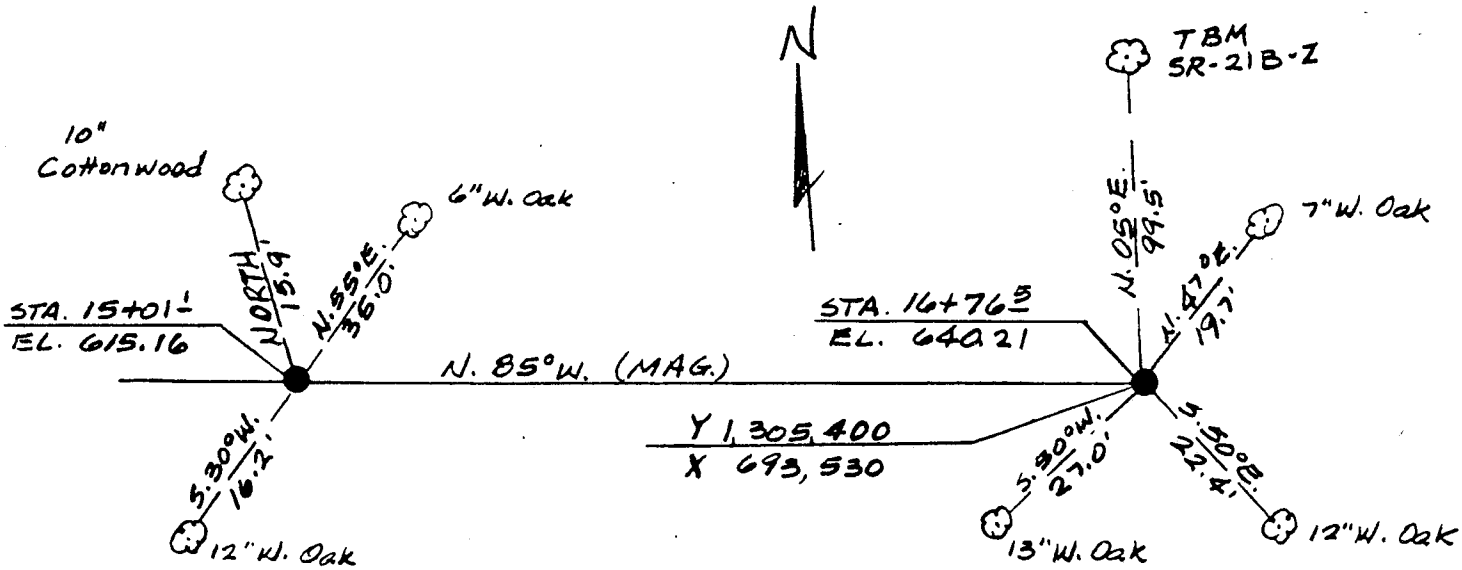
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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.





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

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-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 ±:
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

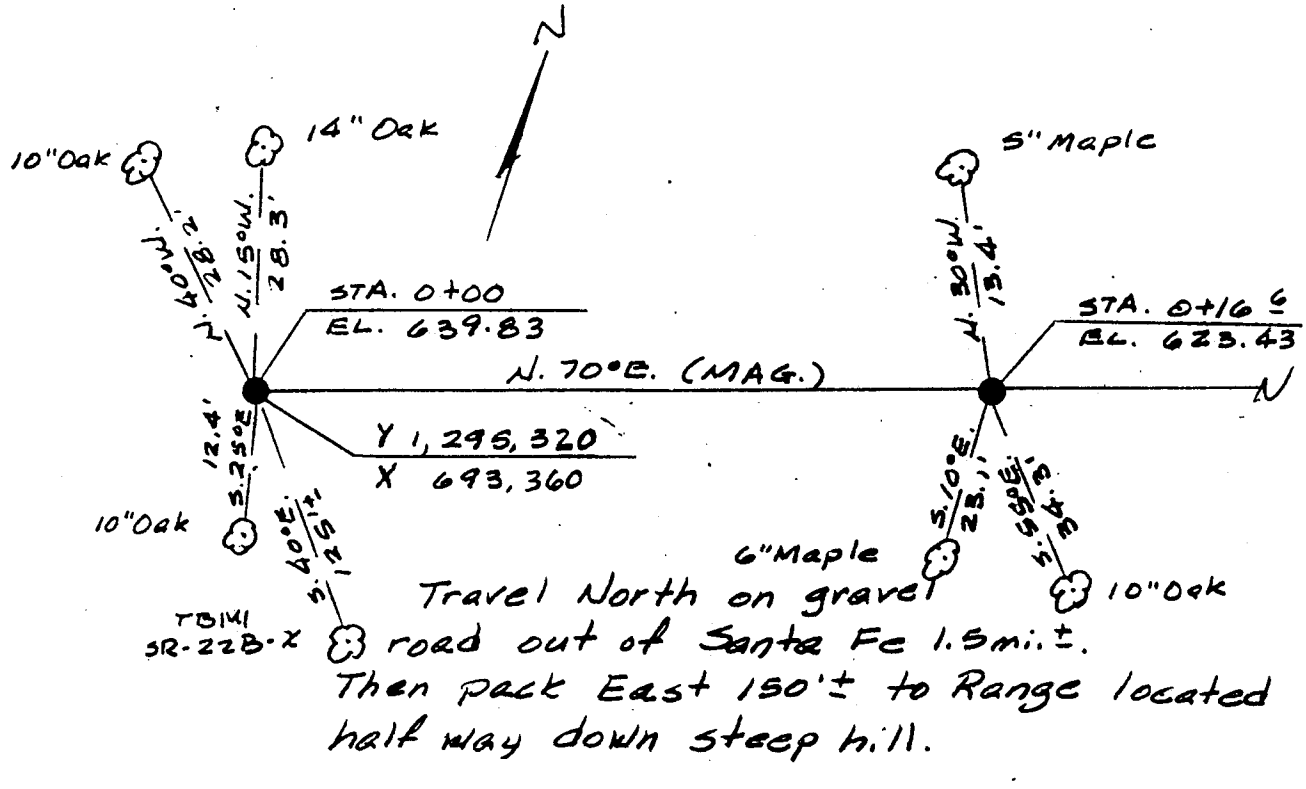
DACW43-82-D-0011 1-2757-22.9-S

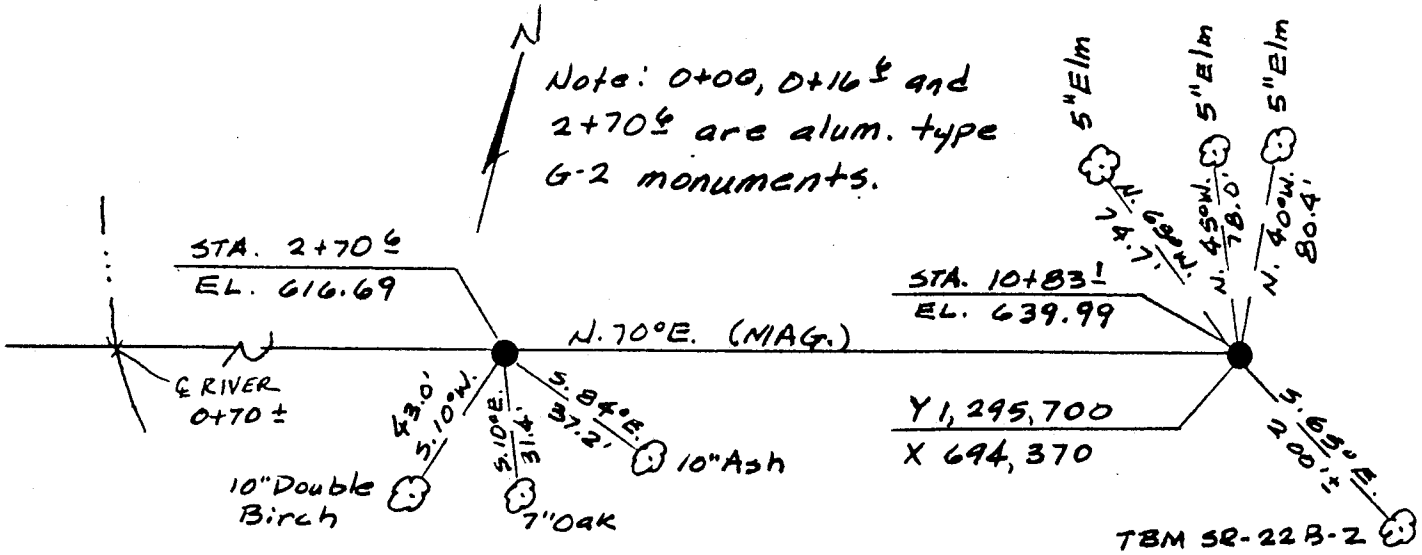
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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.





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

ORIGINAL

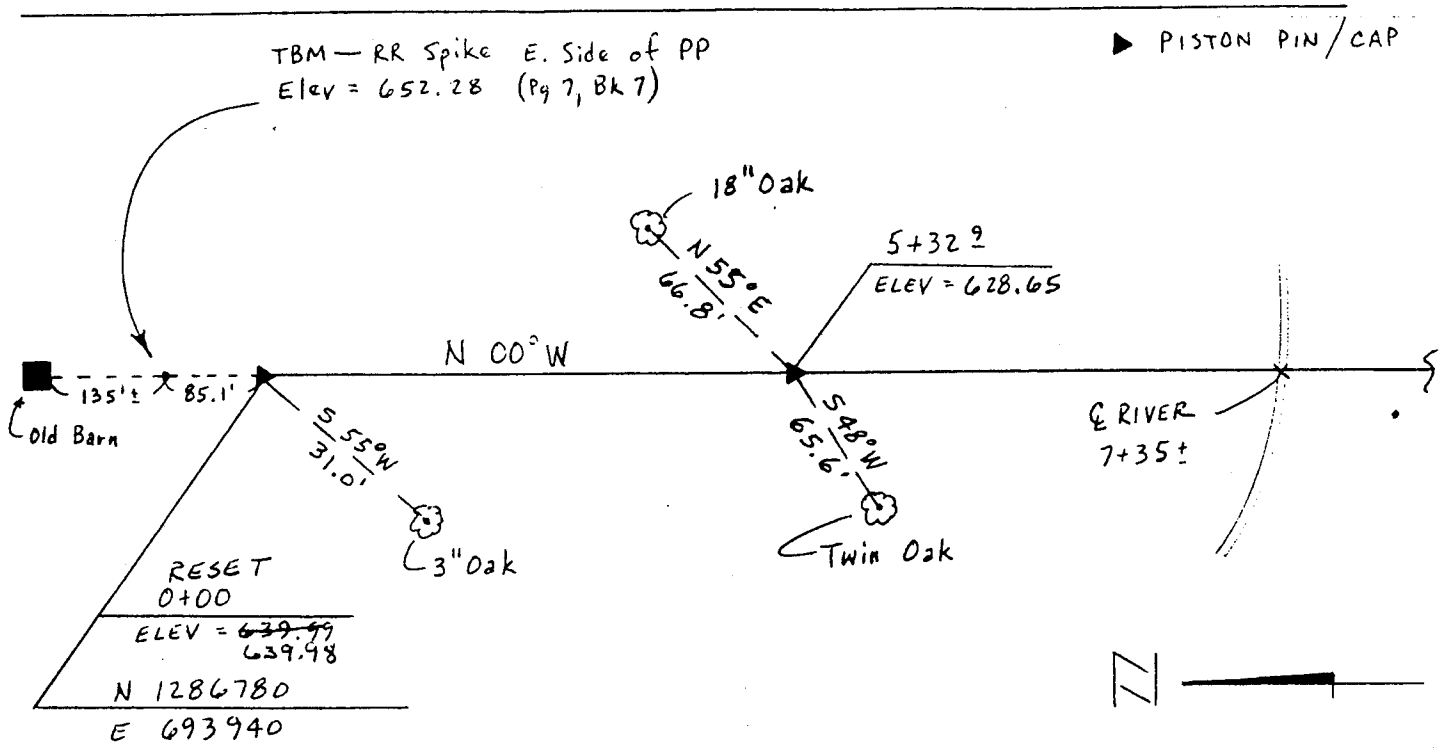
DACW43-82-D-0011 1-2757-22.9-S

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

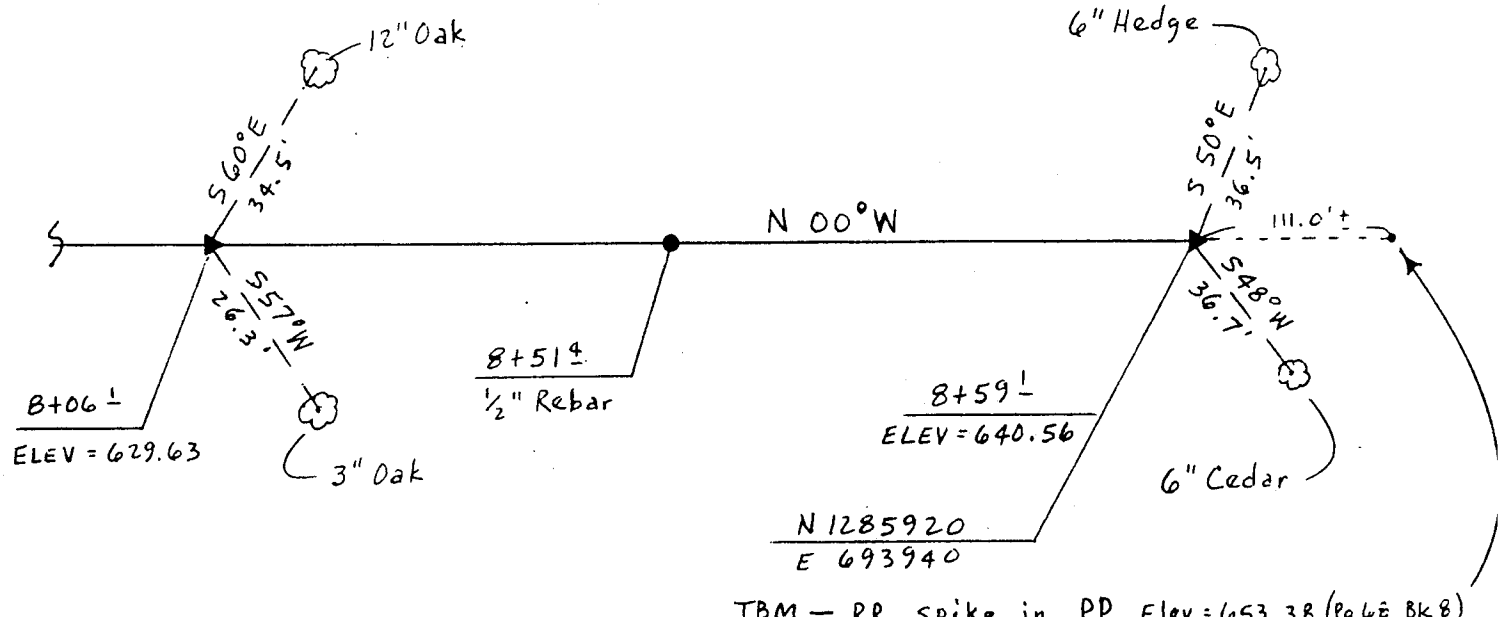
RANGE NO. SR 23-B BY: JIM CAIN / WFM DATE: 5/83

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

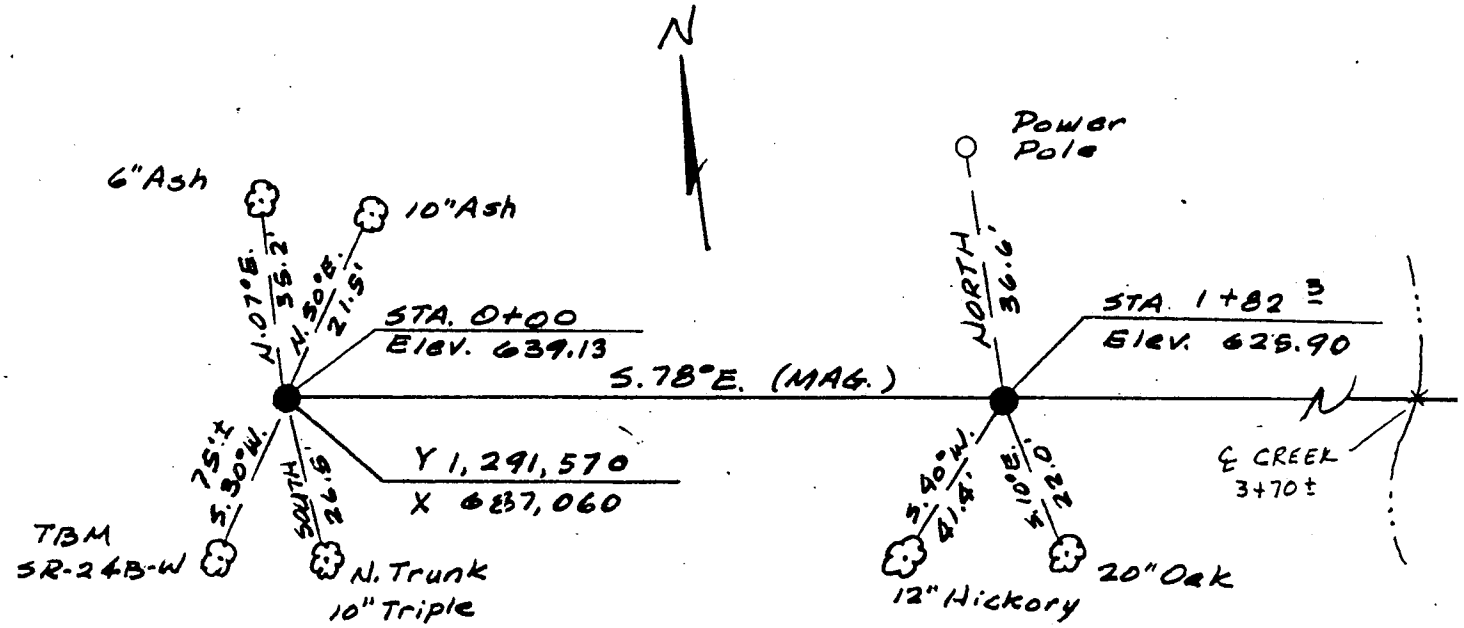


KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

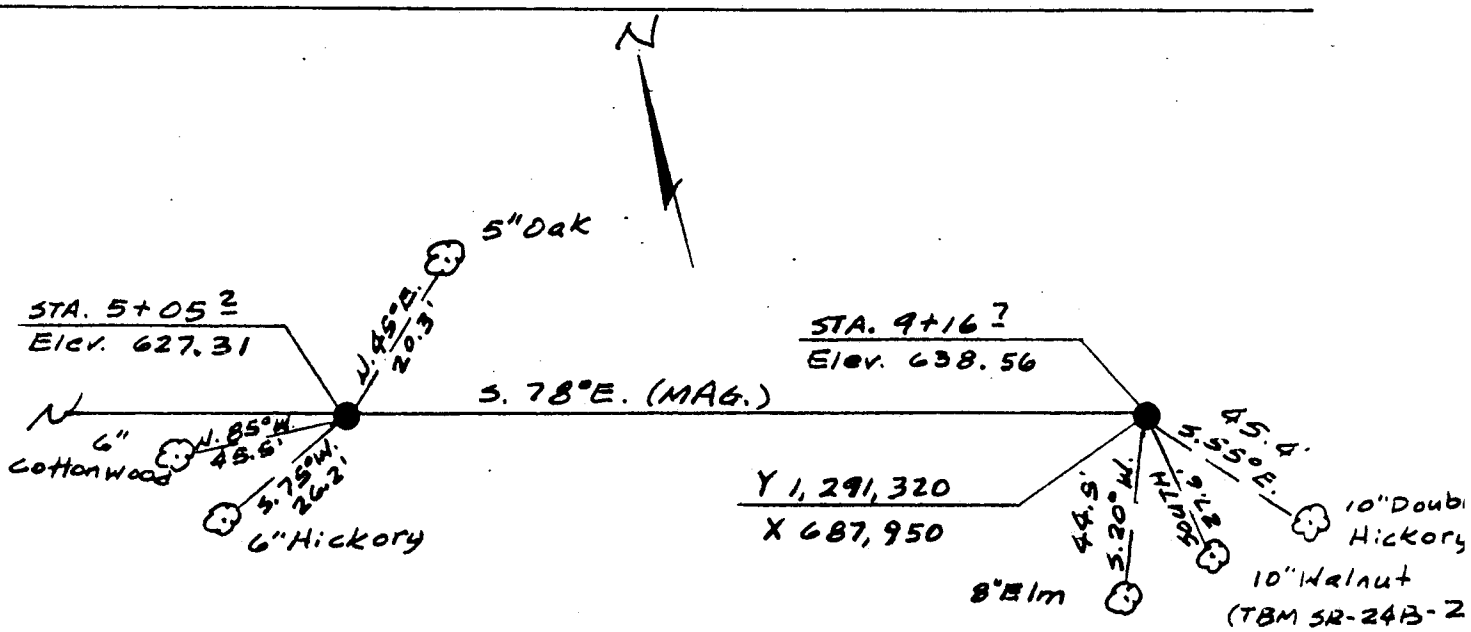
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-24B BY: Owen Zuroweste 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.



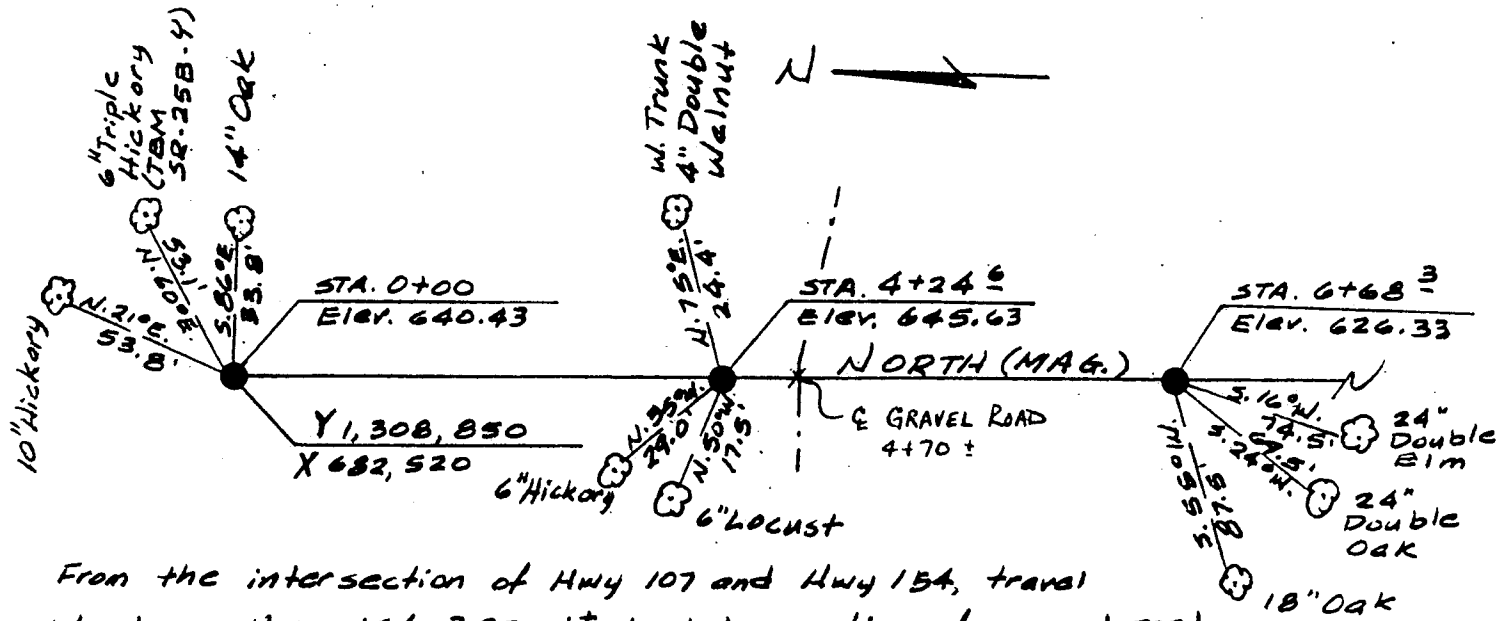
From the town of Santa Fe, travel North West on Hwy. "D" 1.25 mi. ± to Long Branch Creek. Then pack North 150'± to Range.



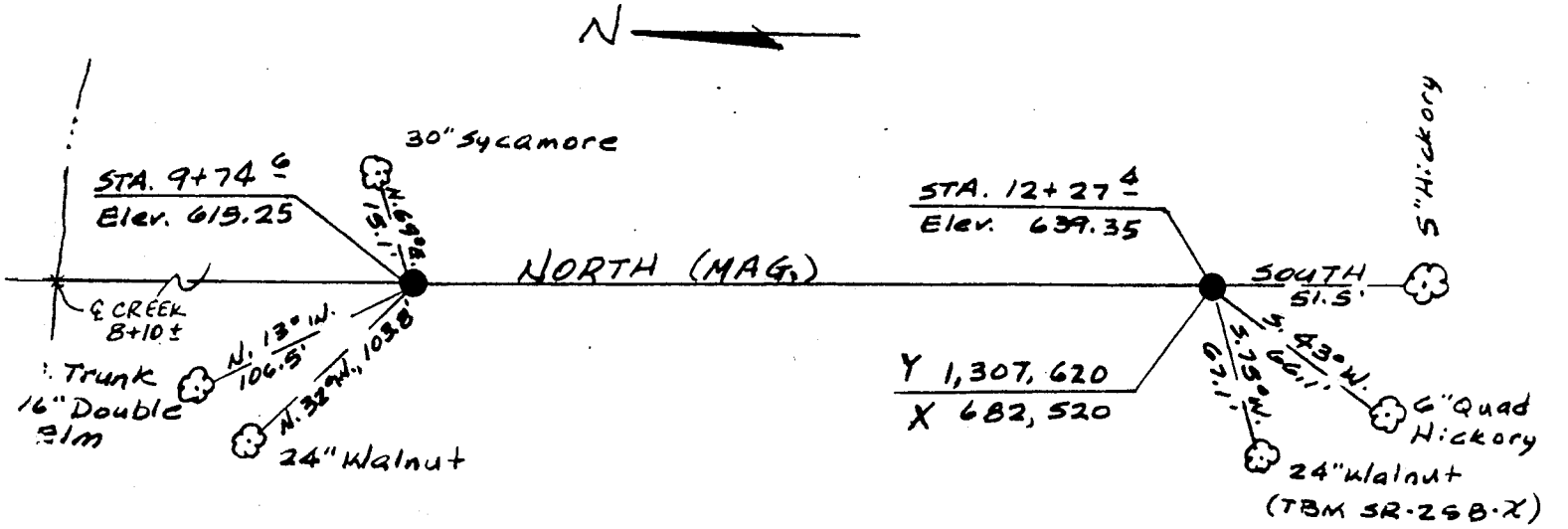
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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 3.25 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 ± is 100'± West of South end of guard rail.

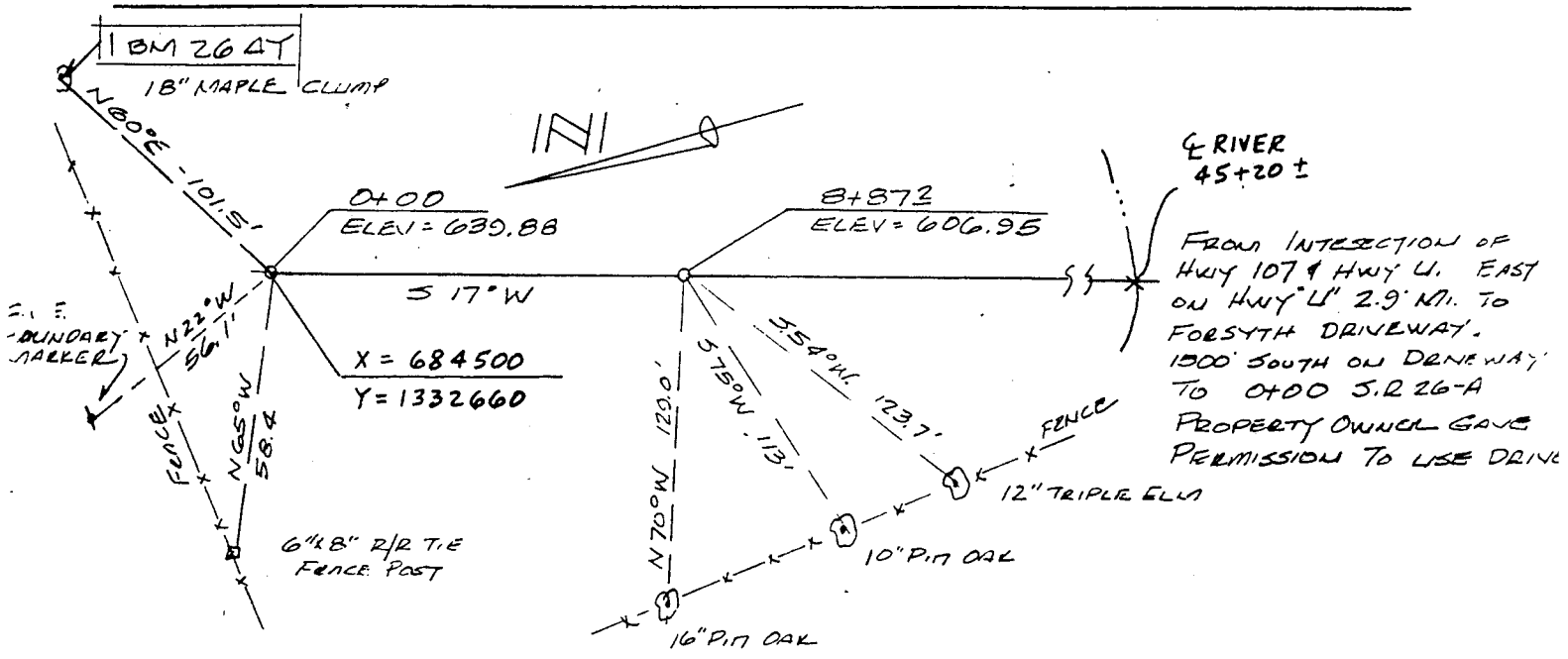


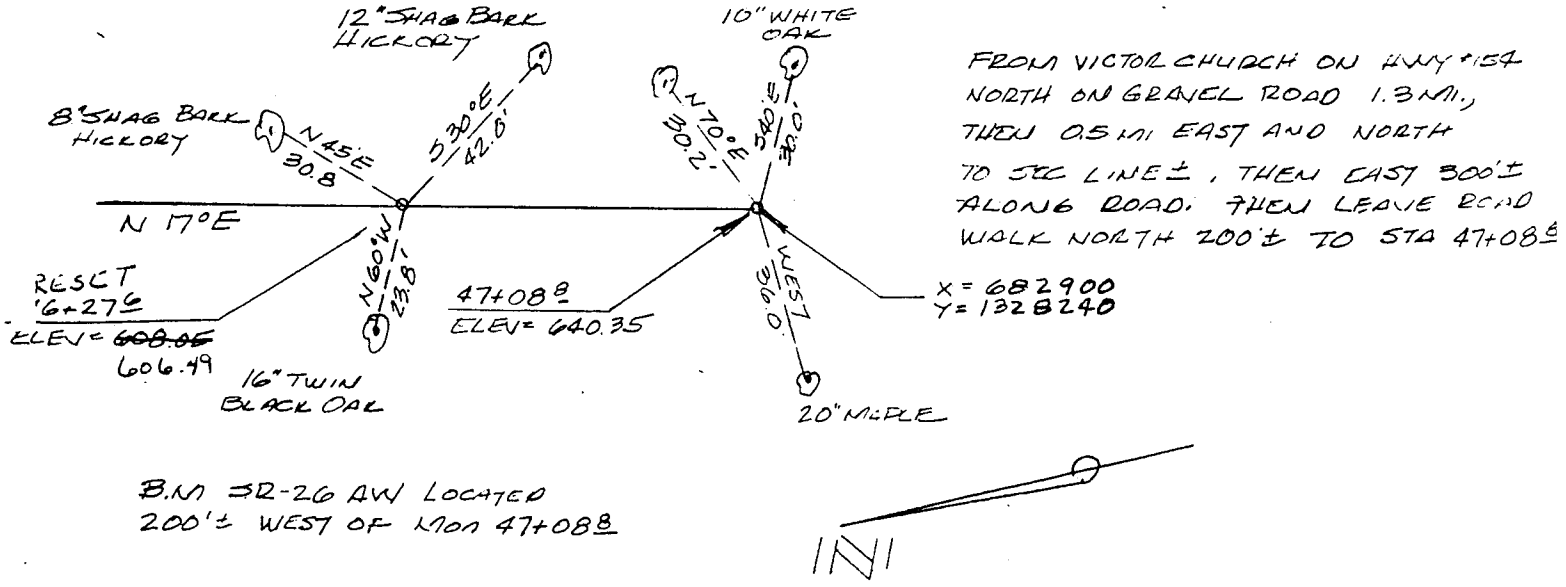
DACW43-82-D-0011 1-2757-22.9-S

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.



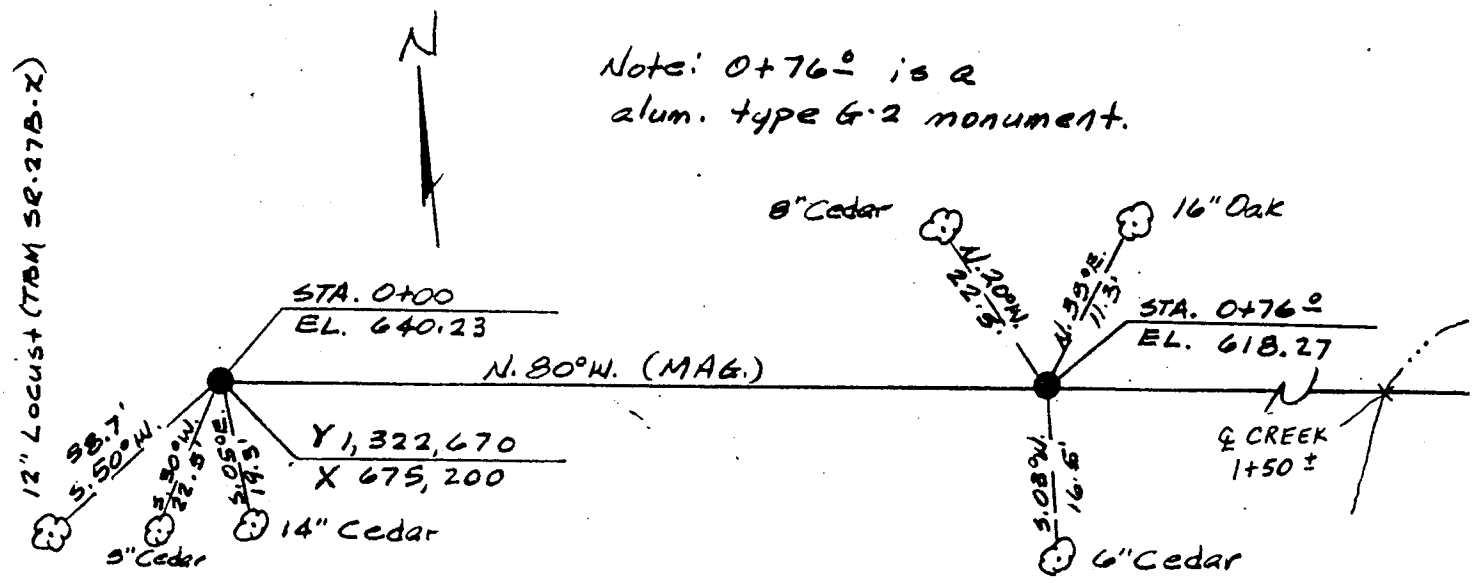


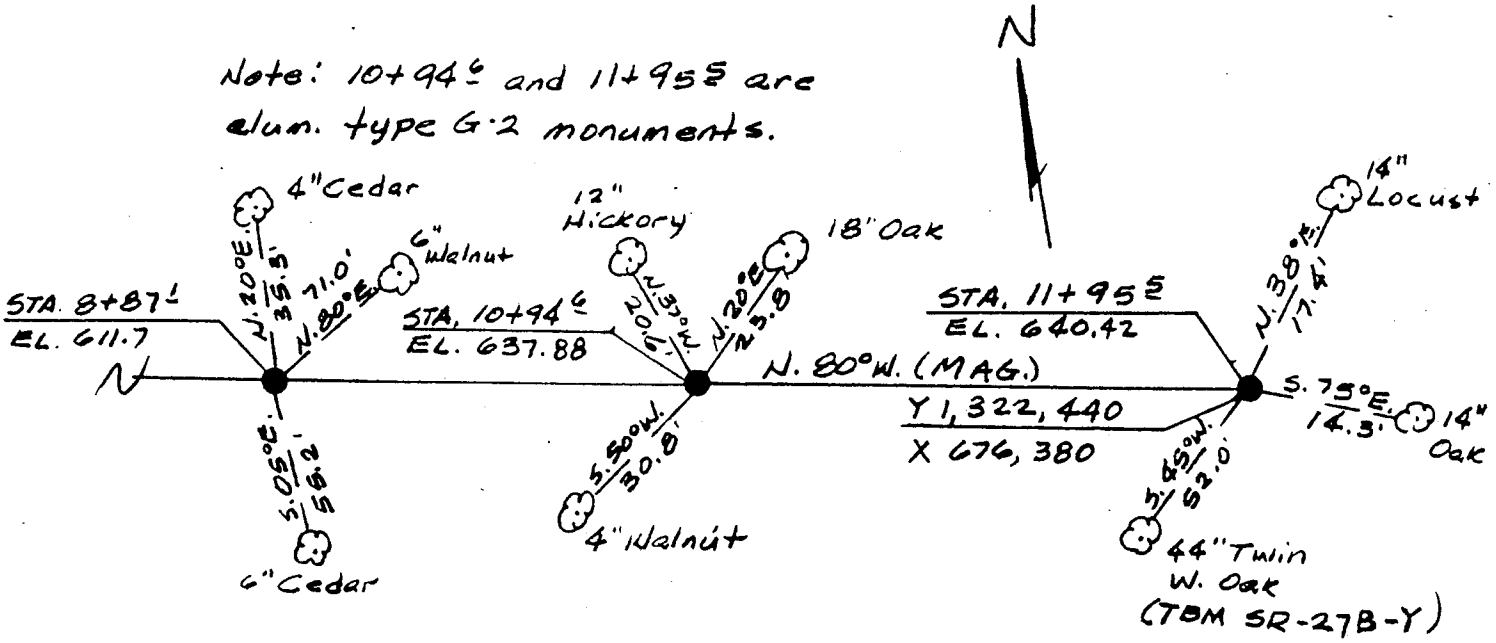
DACW43-82-D-0011 1-2757-22.9-S

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

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

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 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

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

RANGE NO. SR-27B BY: Owen Zurowestc 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 Hiwy 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 130'±.

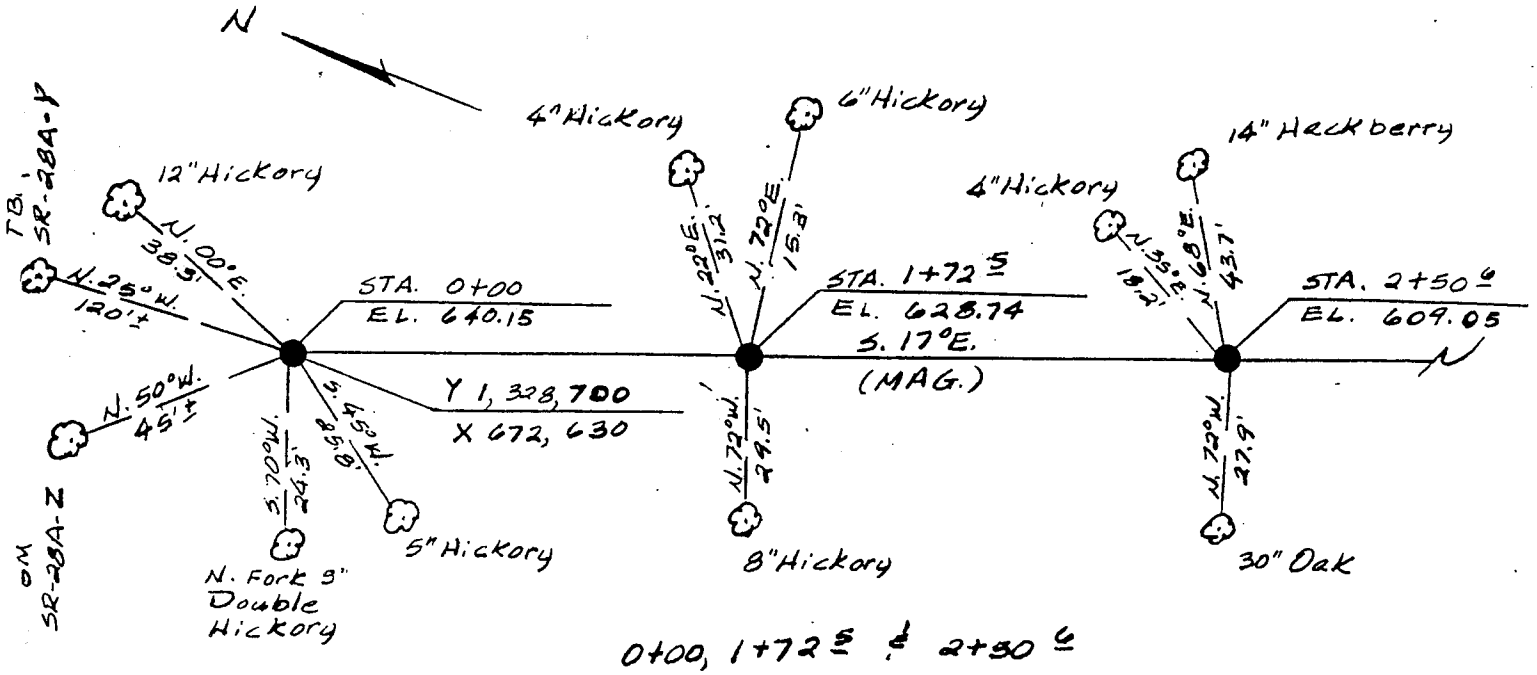
ORIGINAL

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

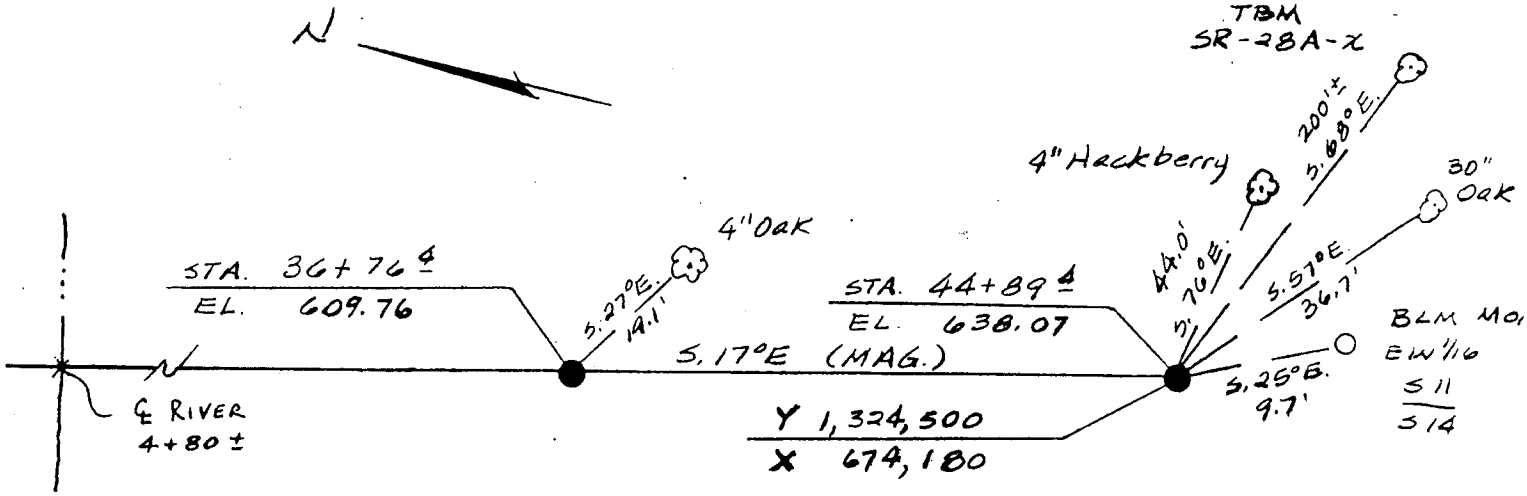
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

NOTE: ALL MONUMENTS ARE 2-3/8" DIA. ALUM. TYPE B-1. TOPO 40
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.

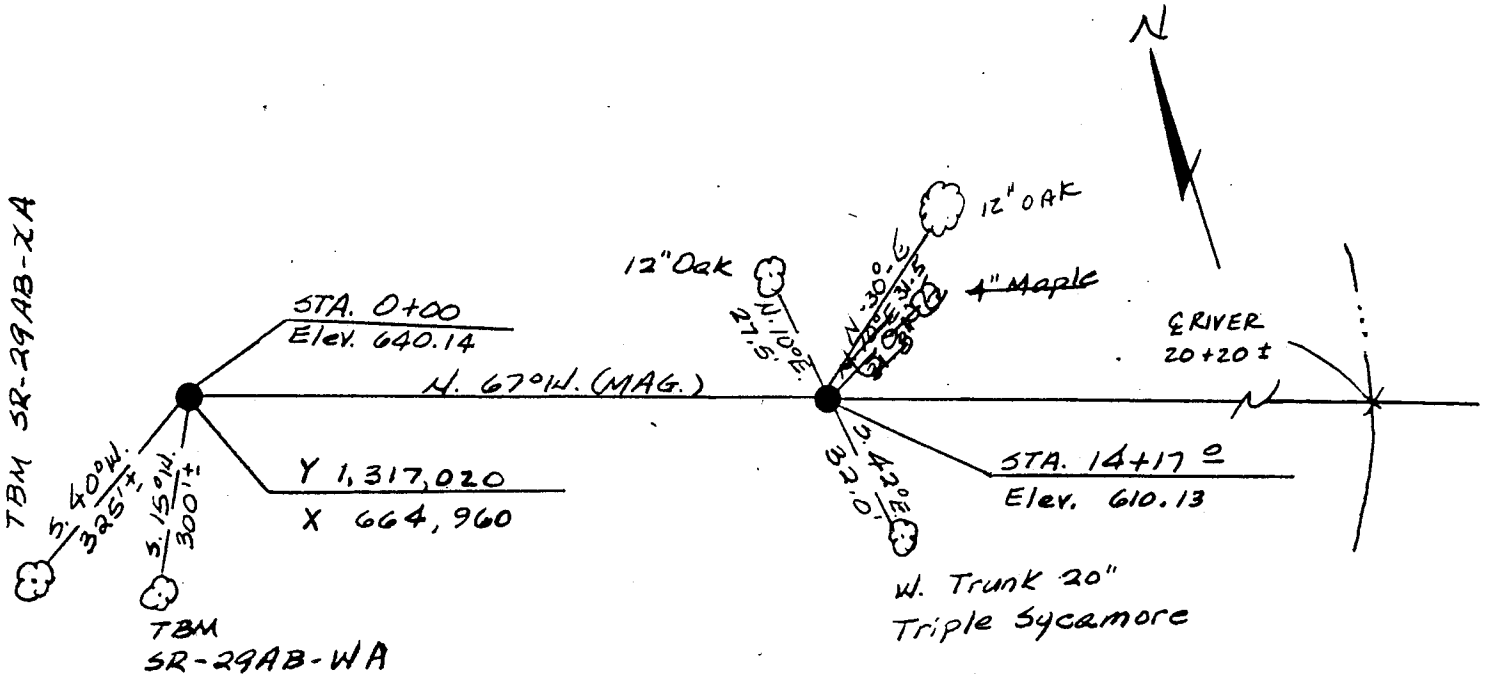
Station 44+89 ±:
From the intersection of Hwy 107 and Hwy 154, travel West on Hwy 154 5 1/4 mi ± to road on right. Then travel back East 1/4 mi ± on Old Hwy 154 to gravel road on left. Then travel North 1/2 mi ± to point where road turn West. Then pack North 1/2 mi ± to range.

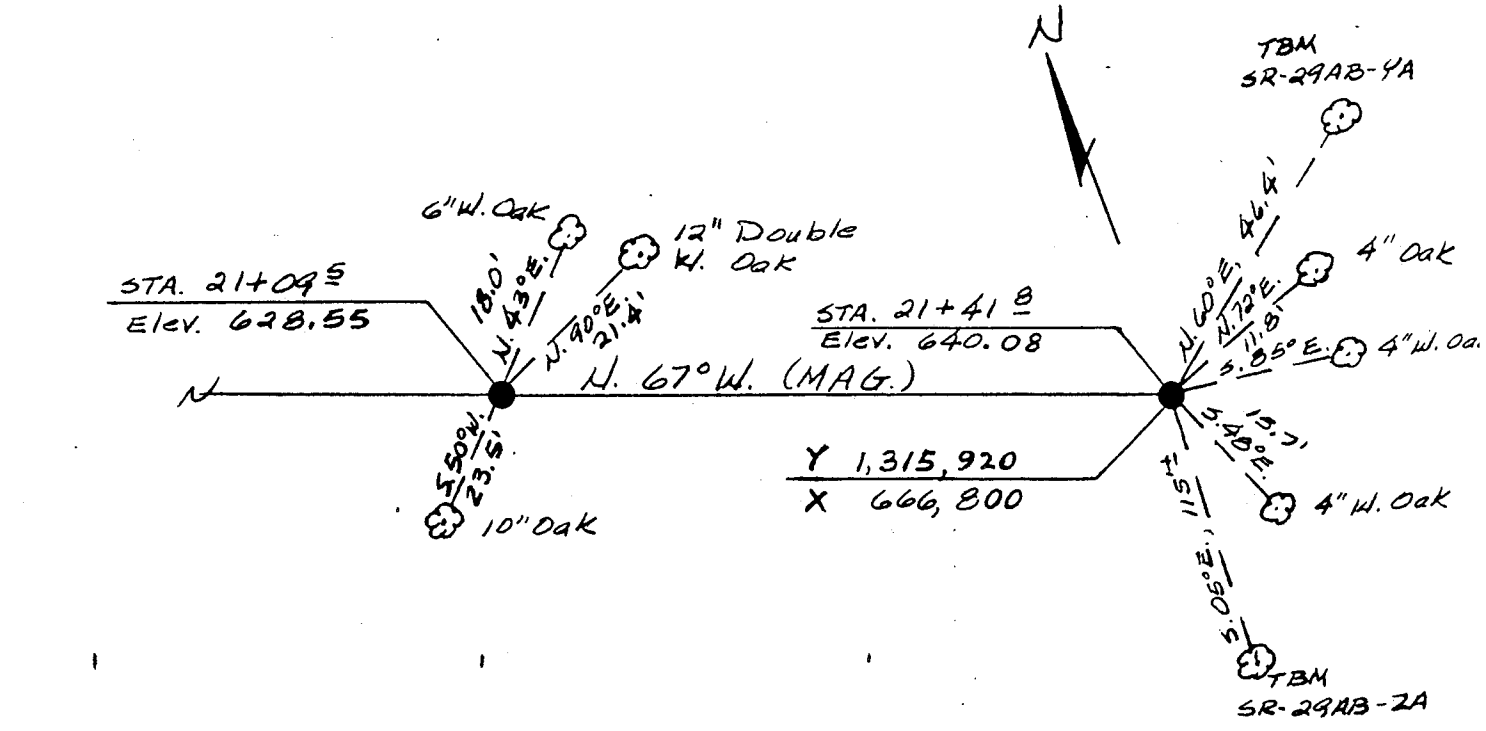
DACW43-82-D-0011 1-2757-22.9-S

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

RANGE NO. SR-29AB BY: Owen Zurowestc 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.





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-29AB BY: Owen Zurowestc 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.

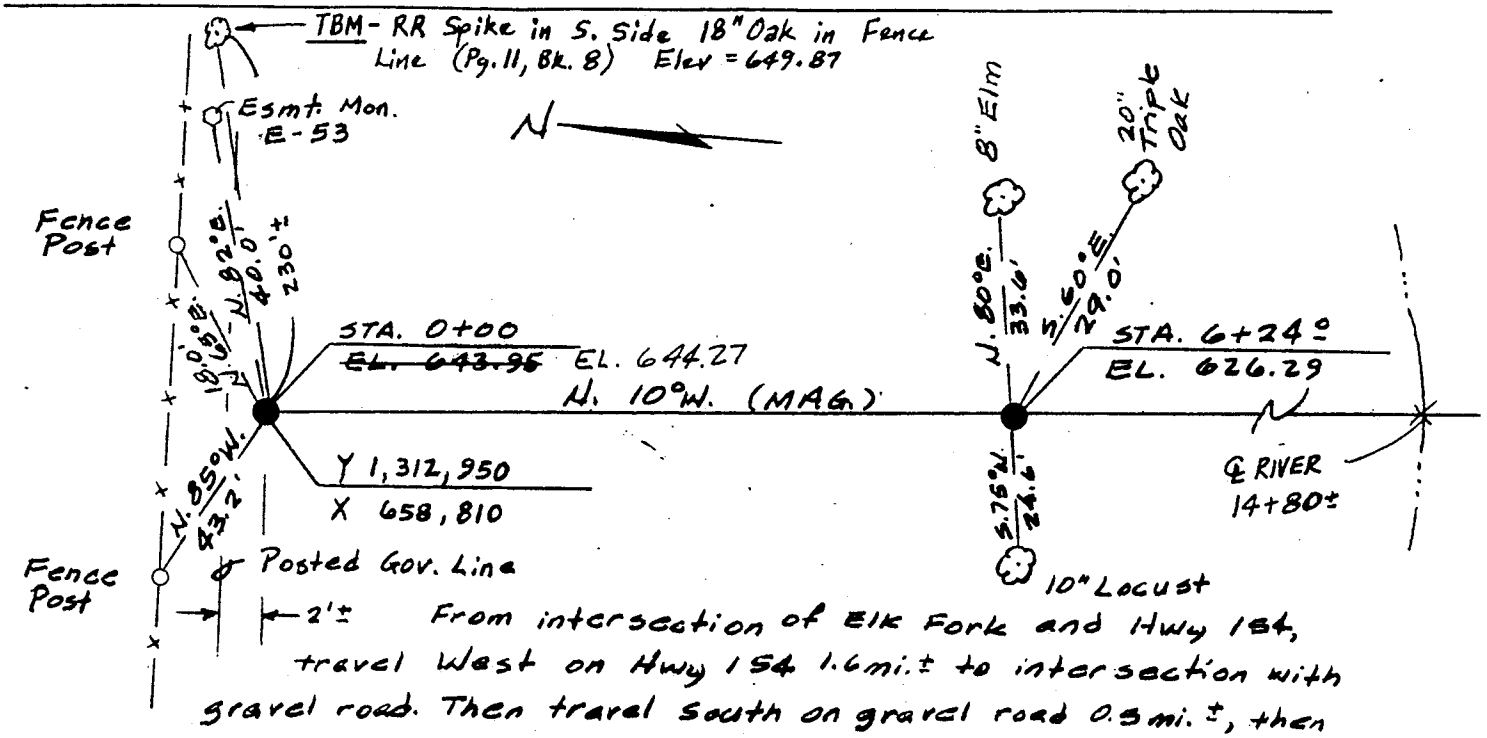
STATION 21+41 B:
From intersection of Hwy 154 and Elk Fork Salt River, travel East on Hwy 154 2000'± to gravel road on right. Then South on gravel road .6 mi. Then pack West 1/2 mi ± through gully and over hill to Range.

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

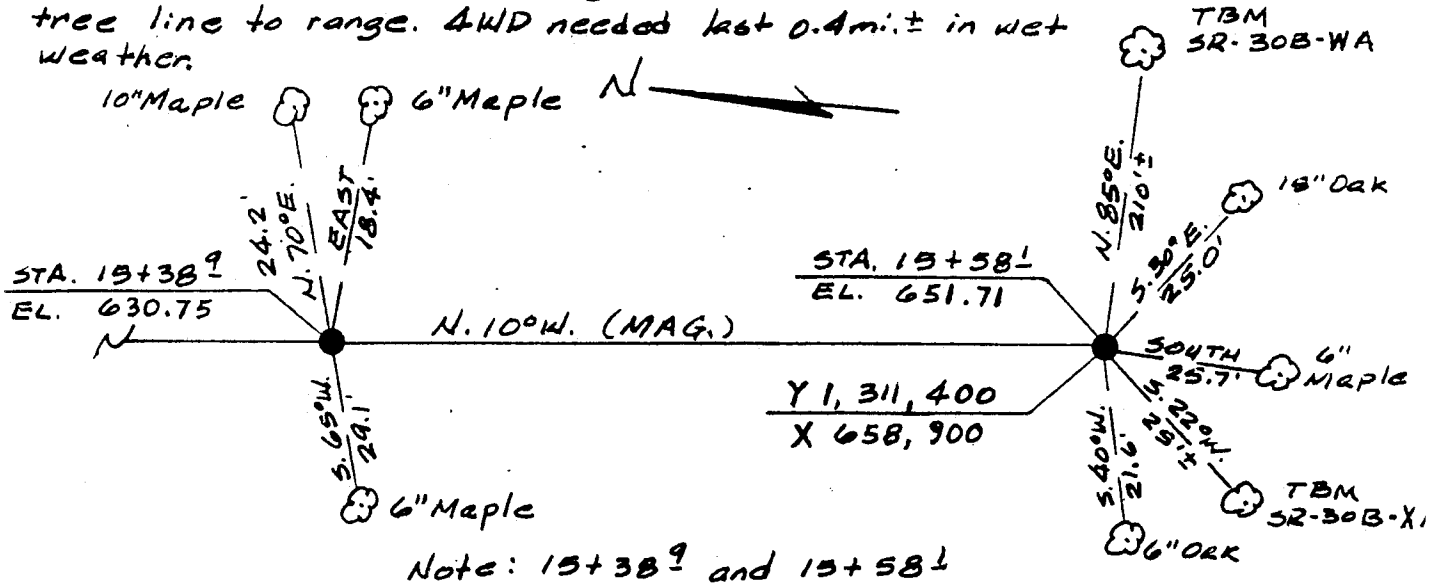
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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 0.3 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: 13+38? and 13+58! are alum. type G-2 monuments.

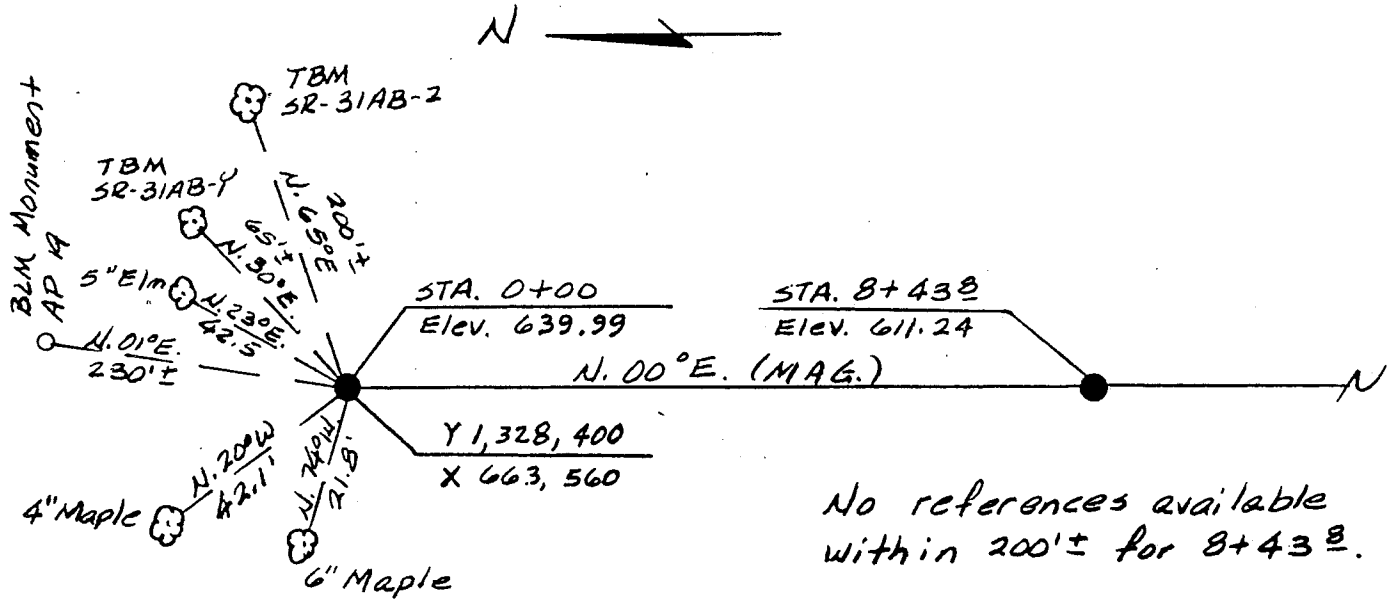
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

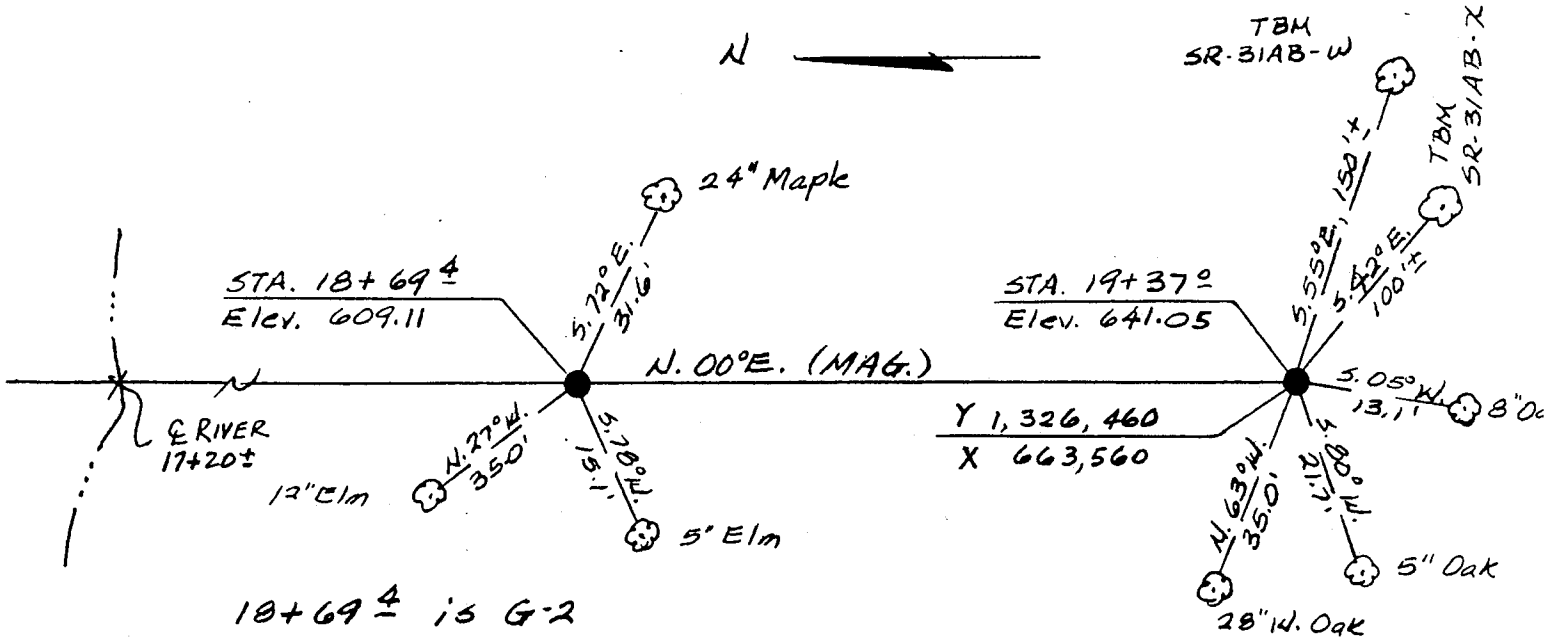
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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.





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 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 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. 9W. 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.

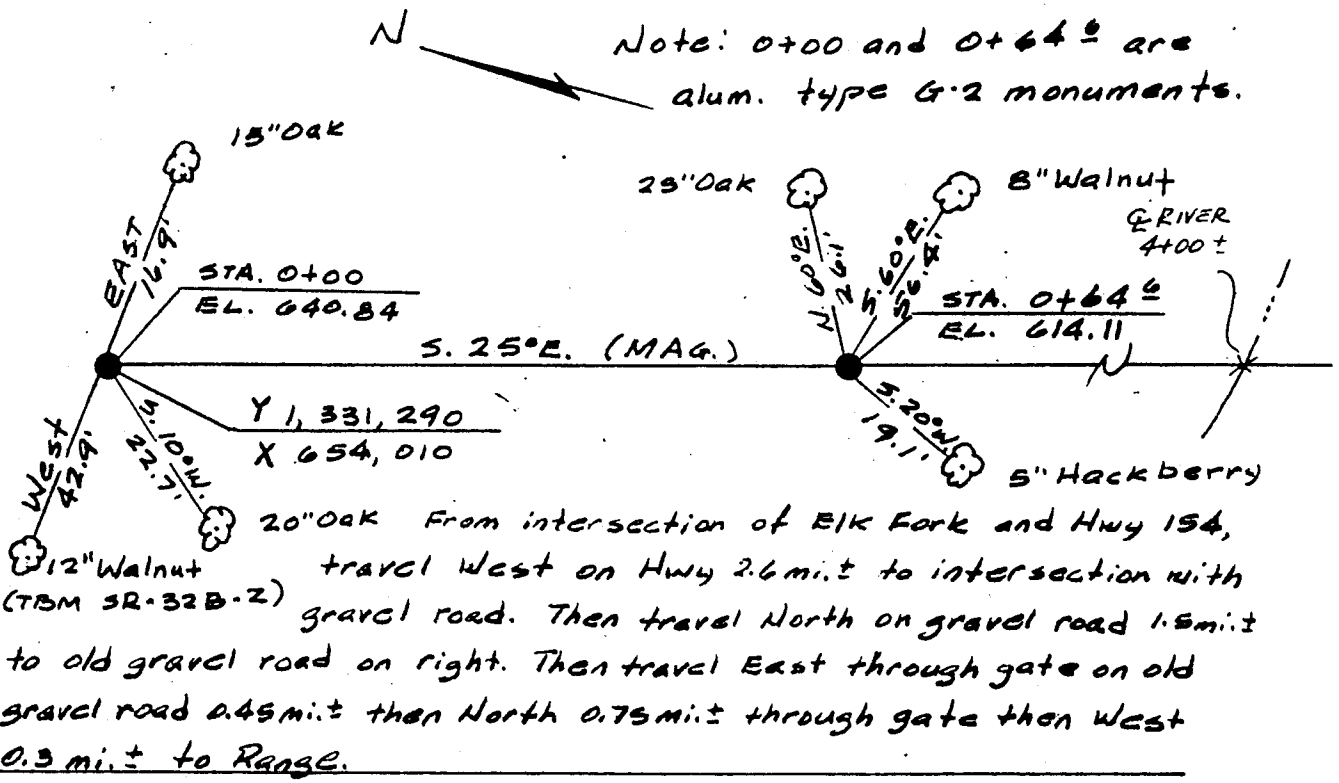
ORIGINA

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

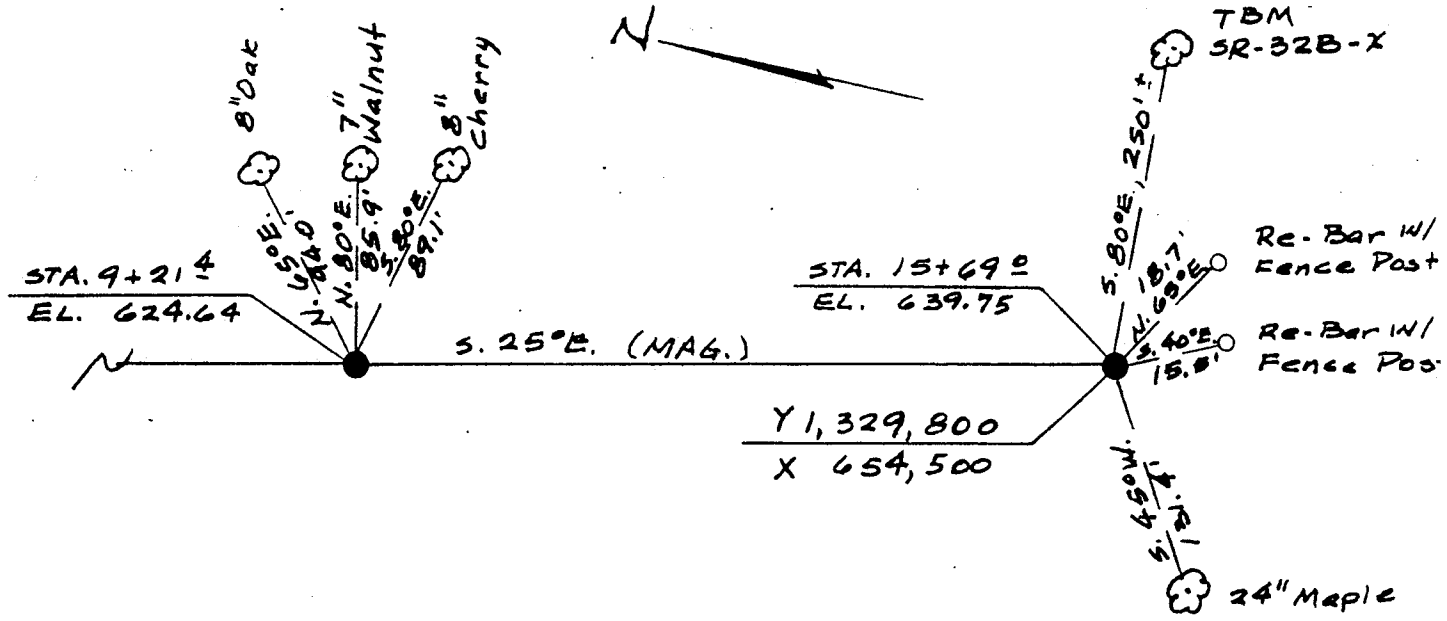
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR. 32 B BY: Owen Zuroweste 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.



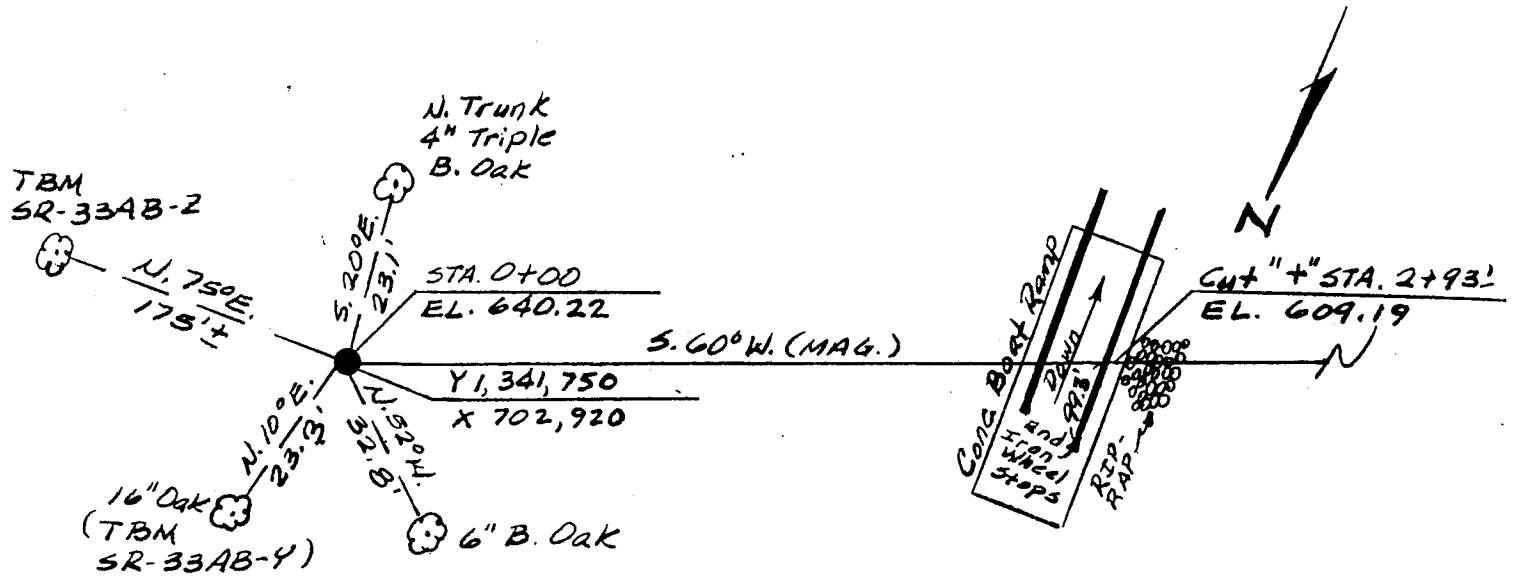
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

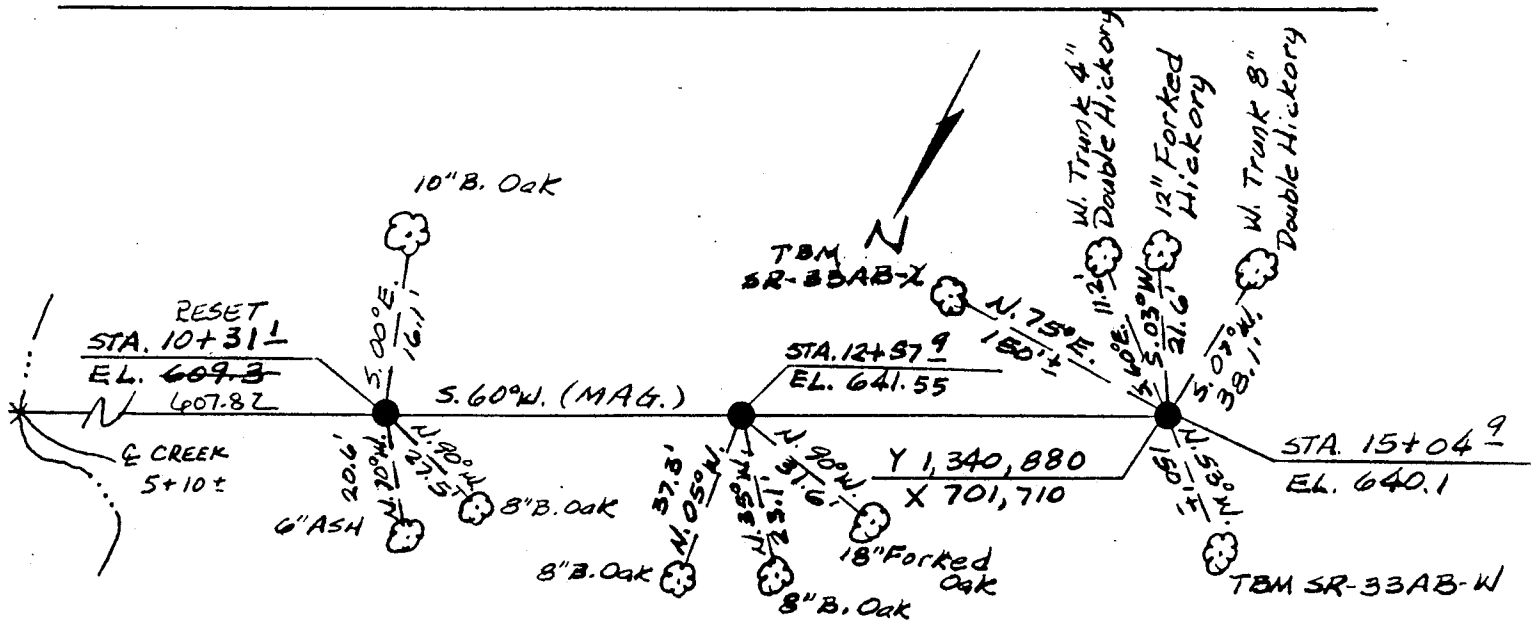
DACW43-82-D-0011 1-2757-22.9-S

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

RANGE NO. SR-33AB BY: Owen Zuroweste 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.





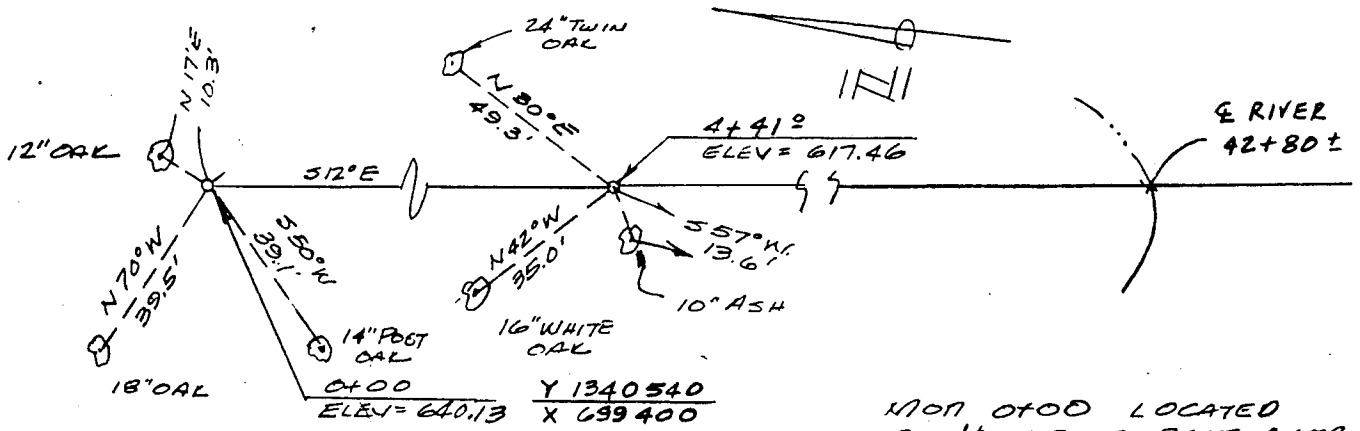
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINA

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

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

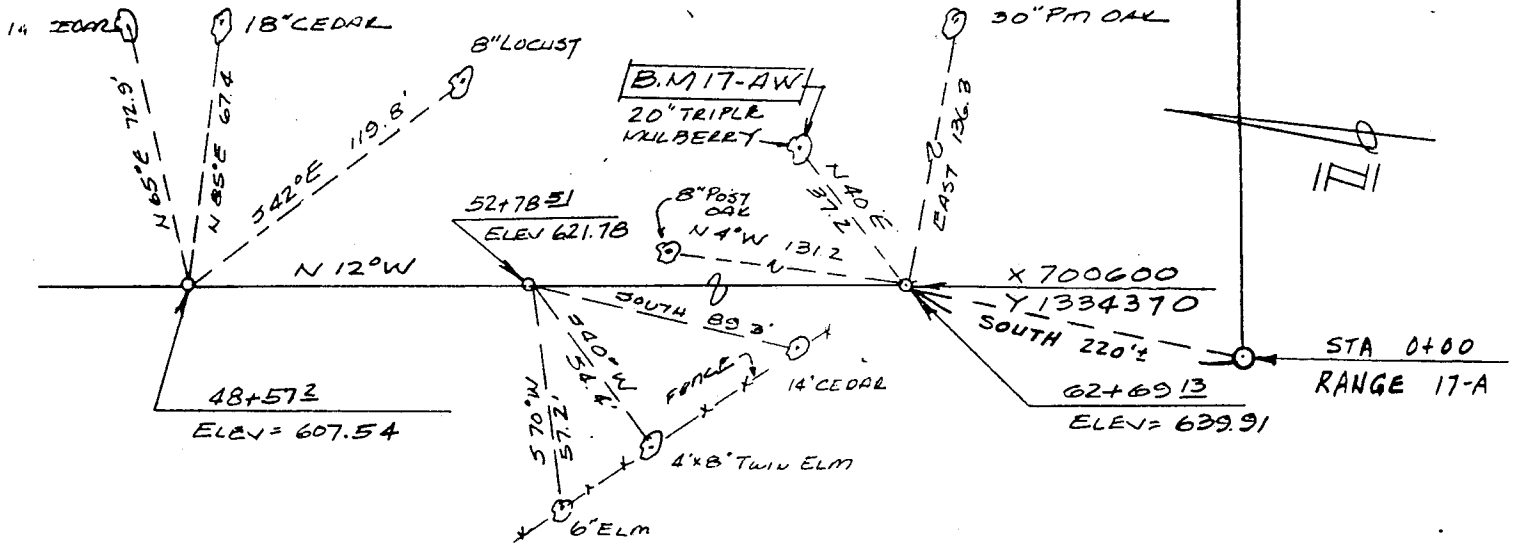
RANGE NO. SR 34-A BY: G. BUDDE DATE: 6/11/82

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-1A 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 FLORIDA

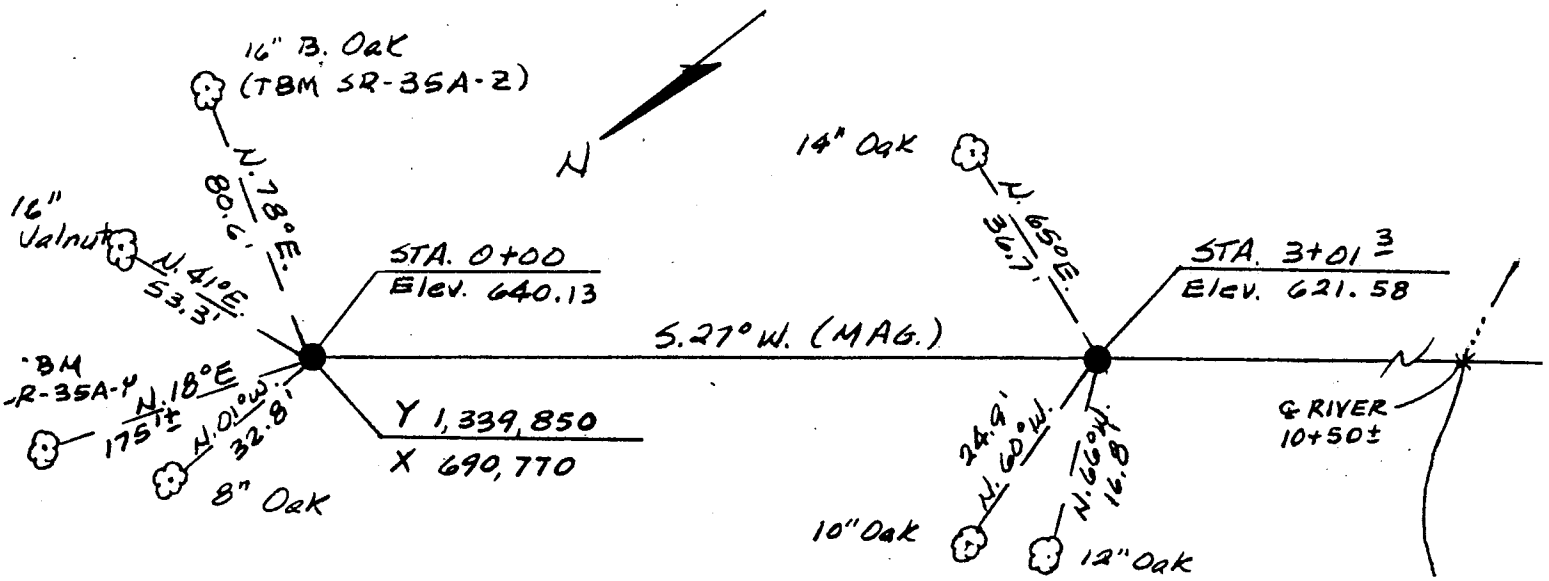
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

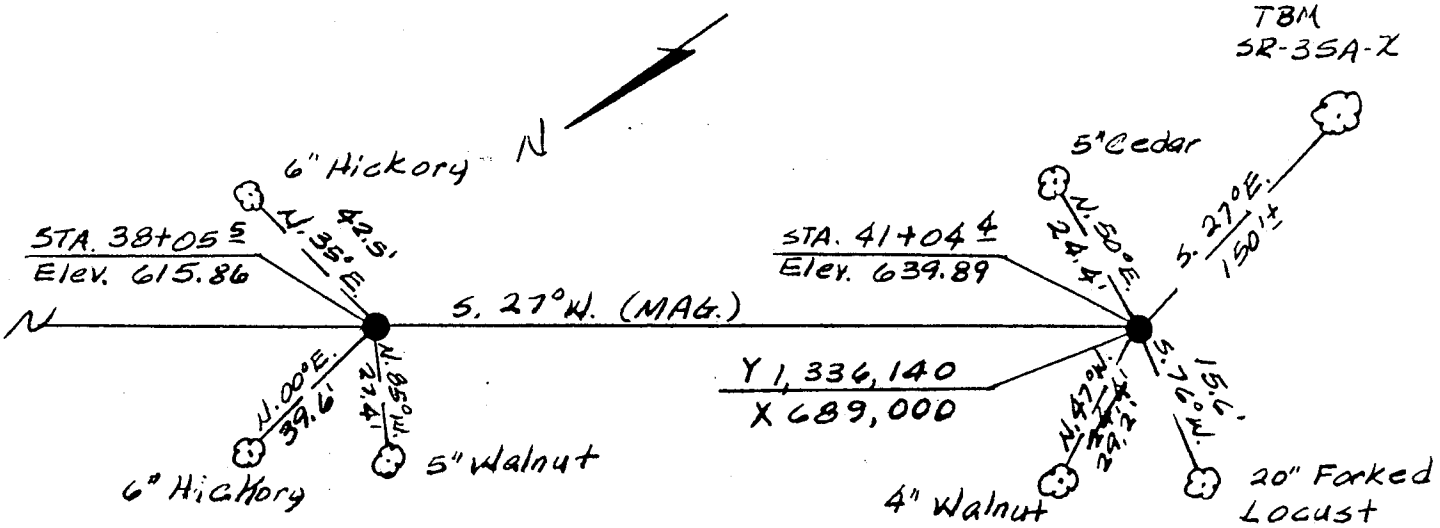
DACW43-82-D-0011 1-2757-22.9-S

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

RANGE NO. SR-35A BY: Owen Zuroweste 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. SK-33AB BY: Owen Zurowski 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 64 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.

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-35A 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 the "T" intersection of gravel roads 150'± North of SEC. COR. $\frac{29|28}{32|33}$ T. 55 N., R. 8 W., 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.

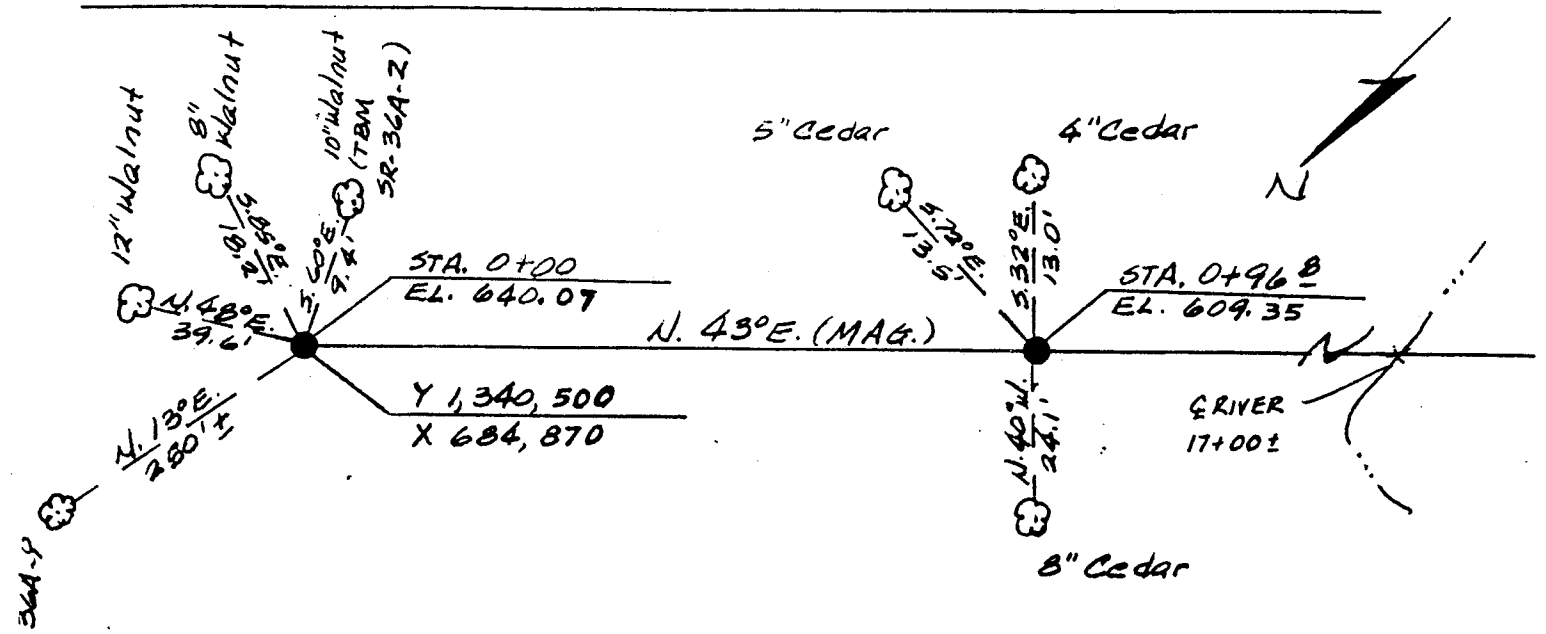
Station 41+04 ±
From the intersection of Hwy 107 & Hwy U travel West on Hwy U 2 mi ±, 1/4 mi ± past C.O.E. main. compound to dirt road on right. Then North on dirt road along West side tree line 1/4 mi ± to point where dirt road turns North-East through tree line. Then North-East on dirt road 1900'±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

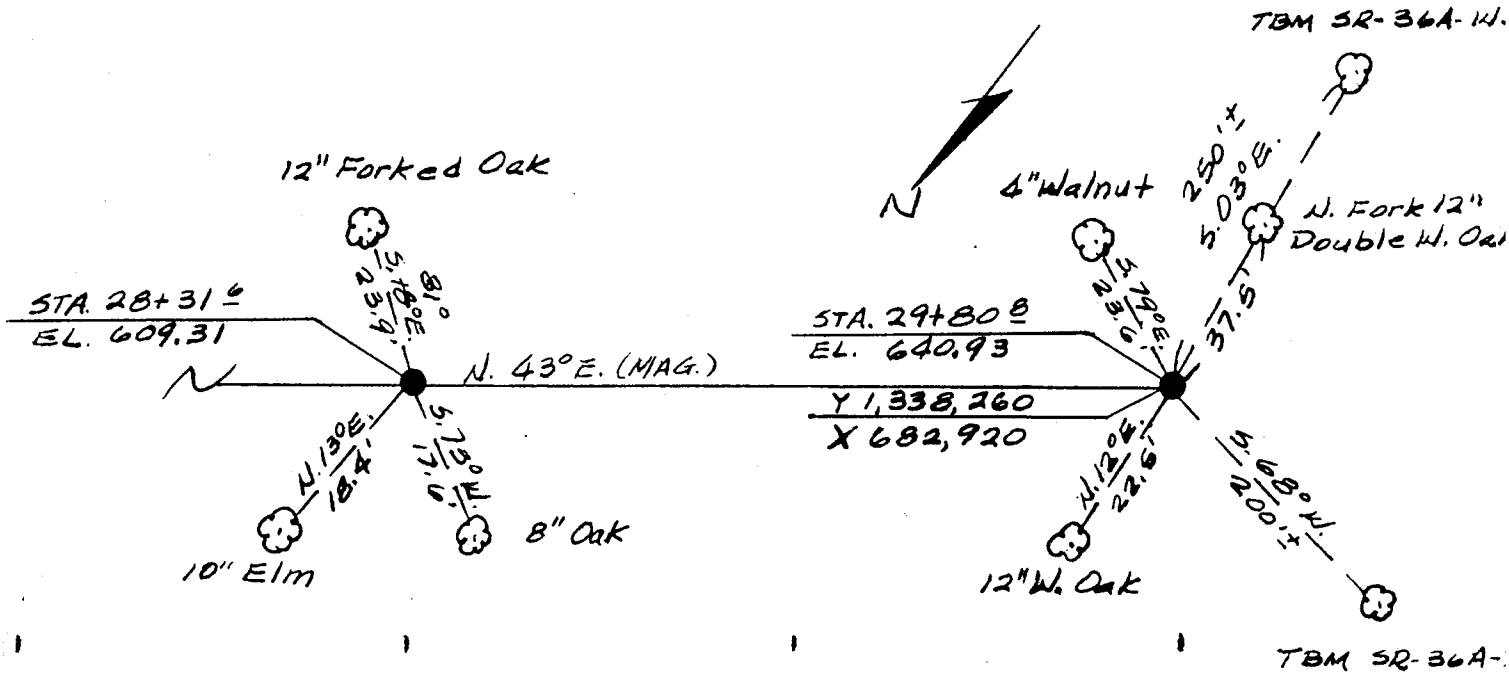
DACW43-82-D-0011 1-2757-22.9-S

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

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

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

RANGE NO. SR-36A BY: Owen Zurowski 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+30.3:
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 pack North 300'± along fence line to Range.
4 WD needed last 1/2 mi.

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

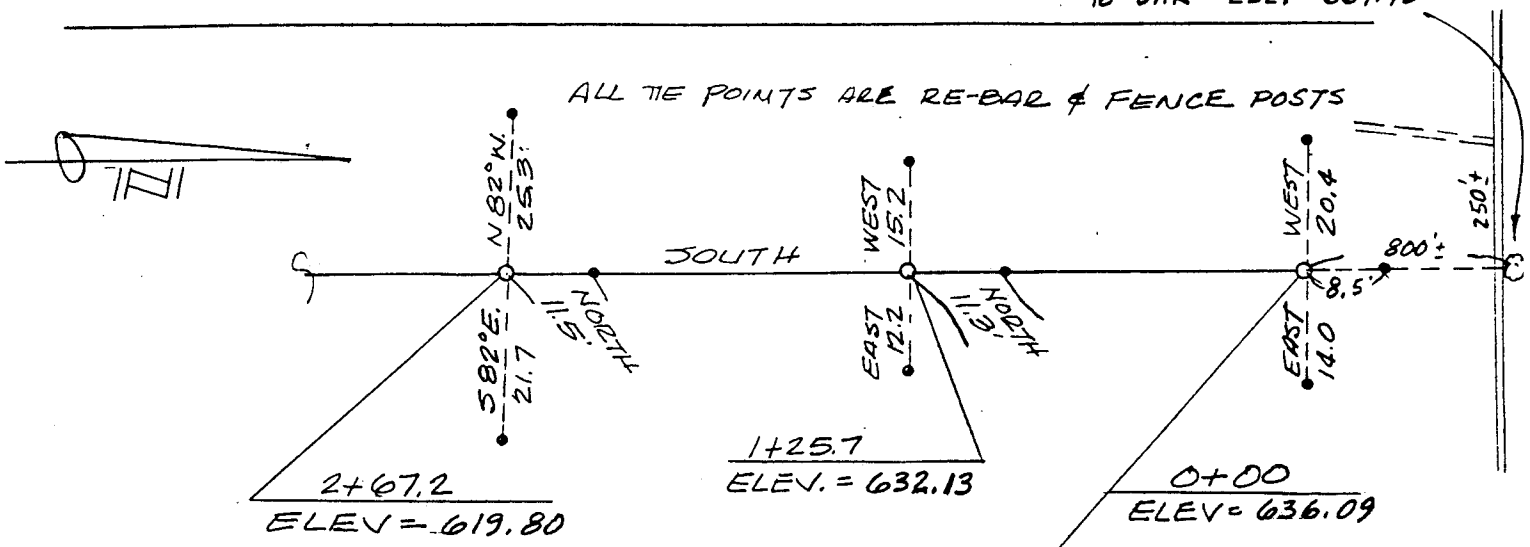
DACW43-82-D-0011 1-2757-22.18-S

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

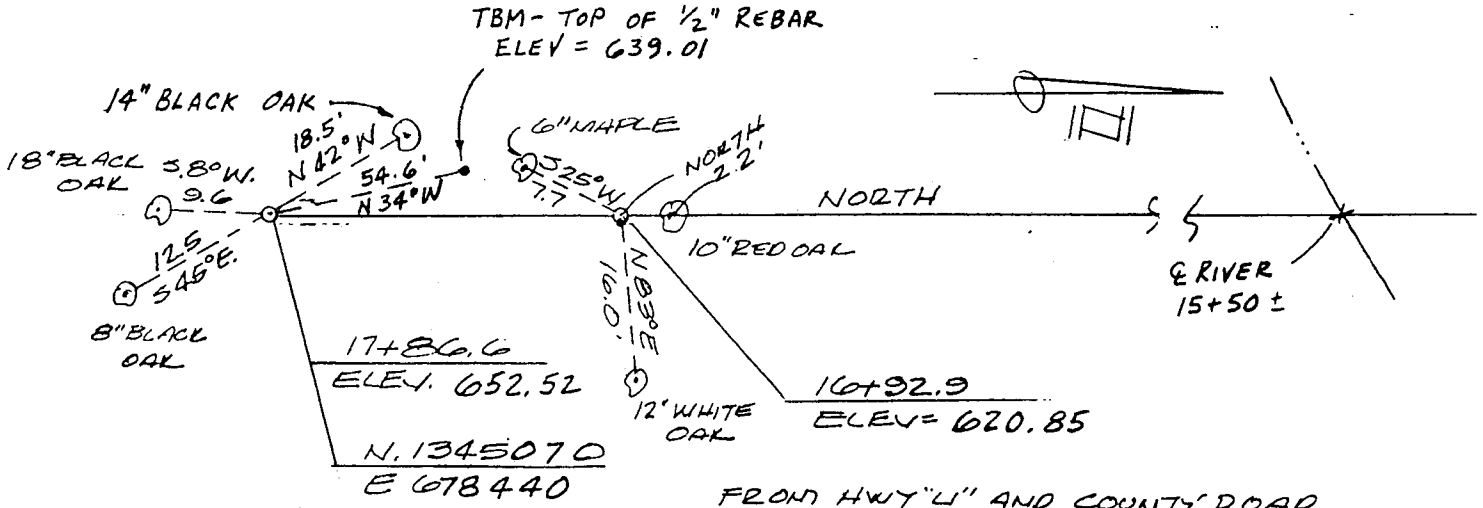
RANGE NO. 37-A1 BY: GENE BUDDE DATE: 10/9/82

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



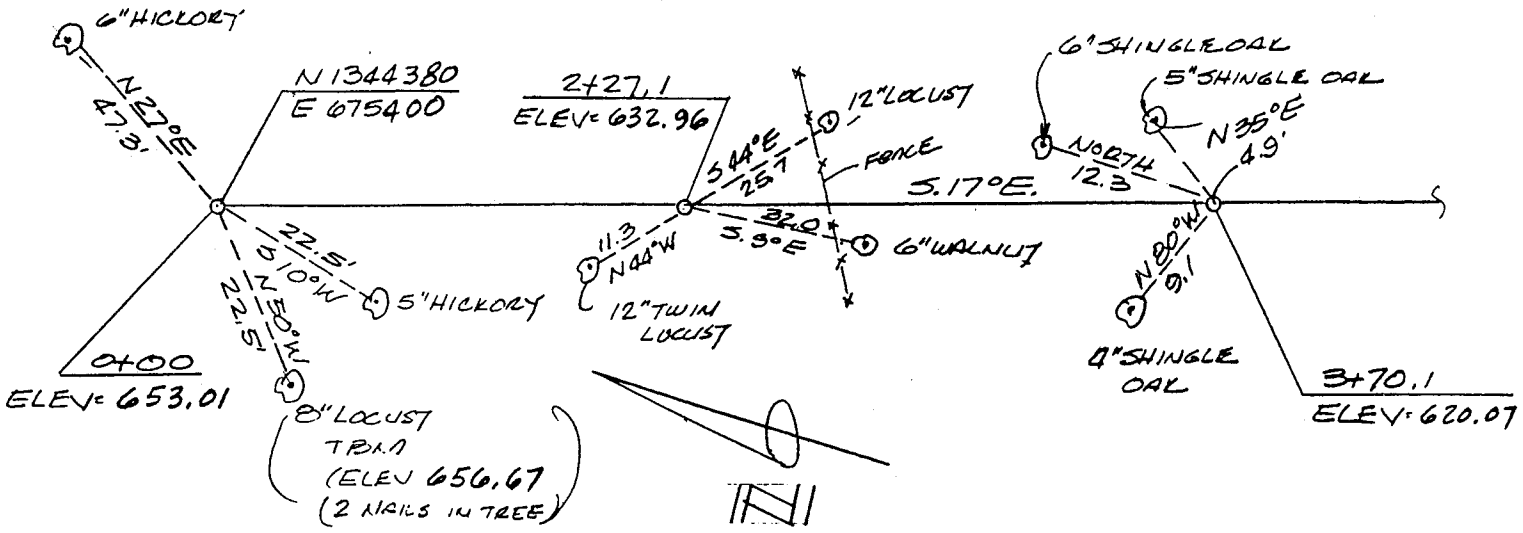
FROM HWY "U" AND COUNTY ROAD SW CORNER OF SE 1/4 SEC 36 T.55N, R.9W. GO NORTH 1.8 MILE ON GRAVEL ROAD THEN ON DIRT ROAD EAST 1100'± THEN NORTH 1000± THEN N.E. AND EAST TO TOP OF RIDGE 300' SOUTH OF STA 17+86.6
4WD VEHICLE IS NEEDED

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

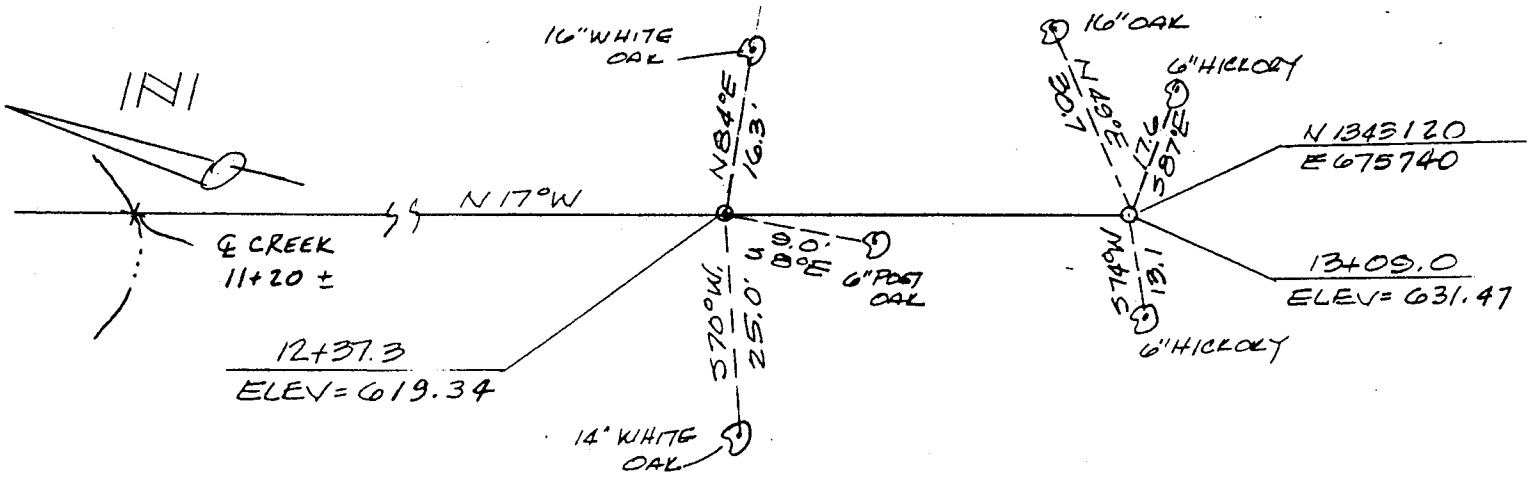
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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" INTERSECTION 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

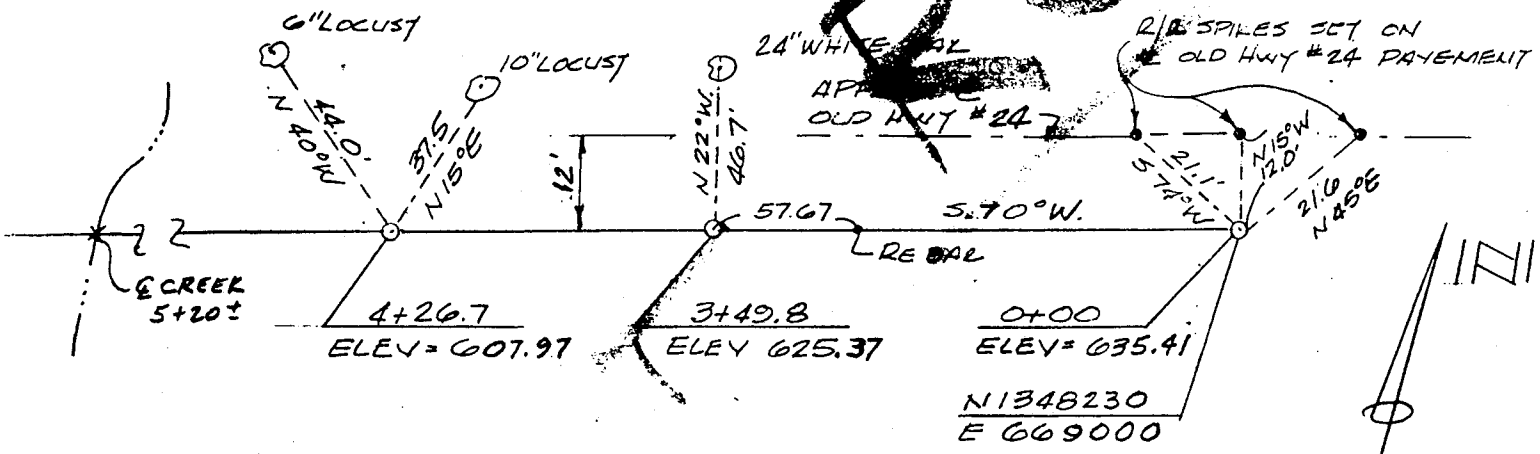
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

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

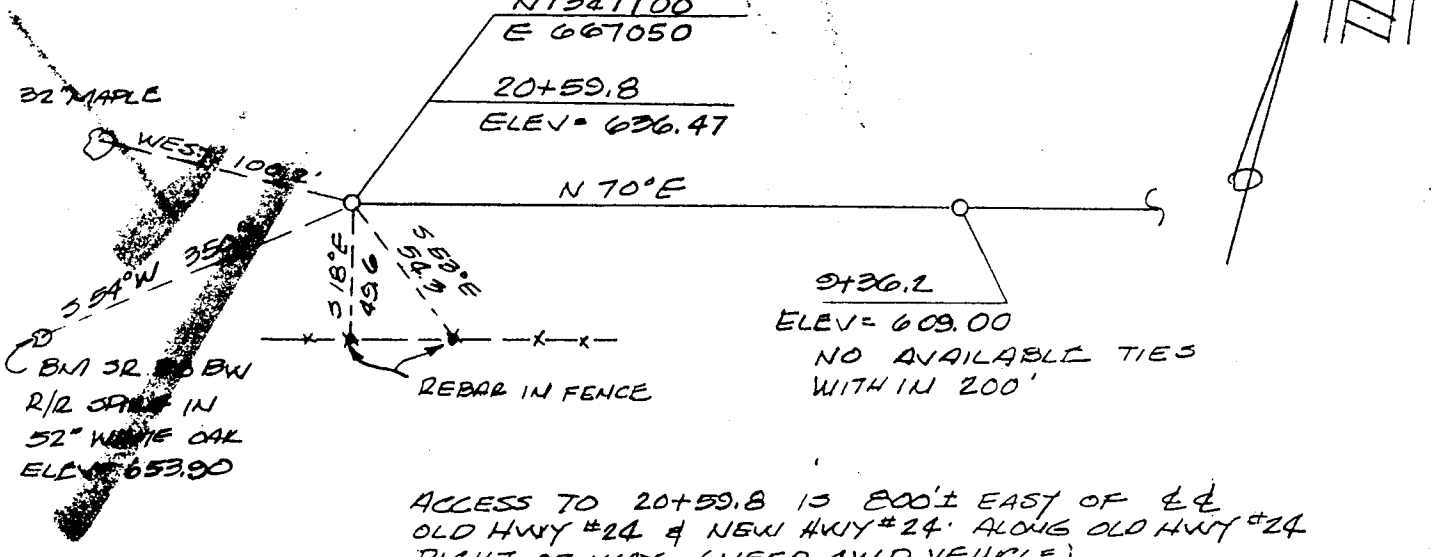
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES. (ORIGINAL LOCATION — SEE NEW LOCATION)

RANGE NO. SR 38-B BY: GENE RUDDE 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)

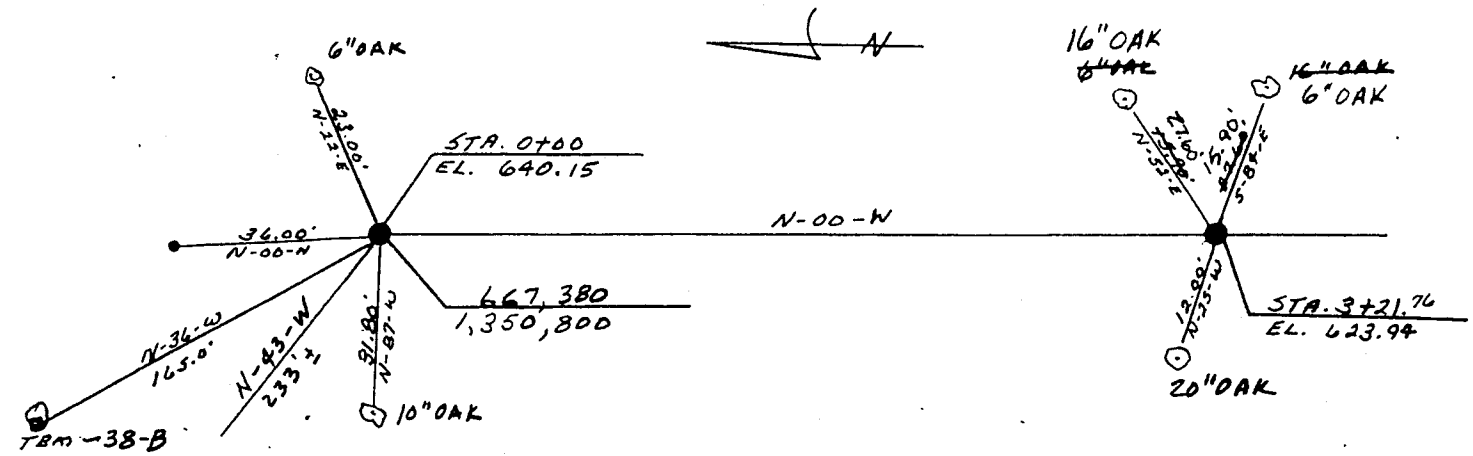
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

DACW43-82-D-0011 1-2848-22.35

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

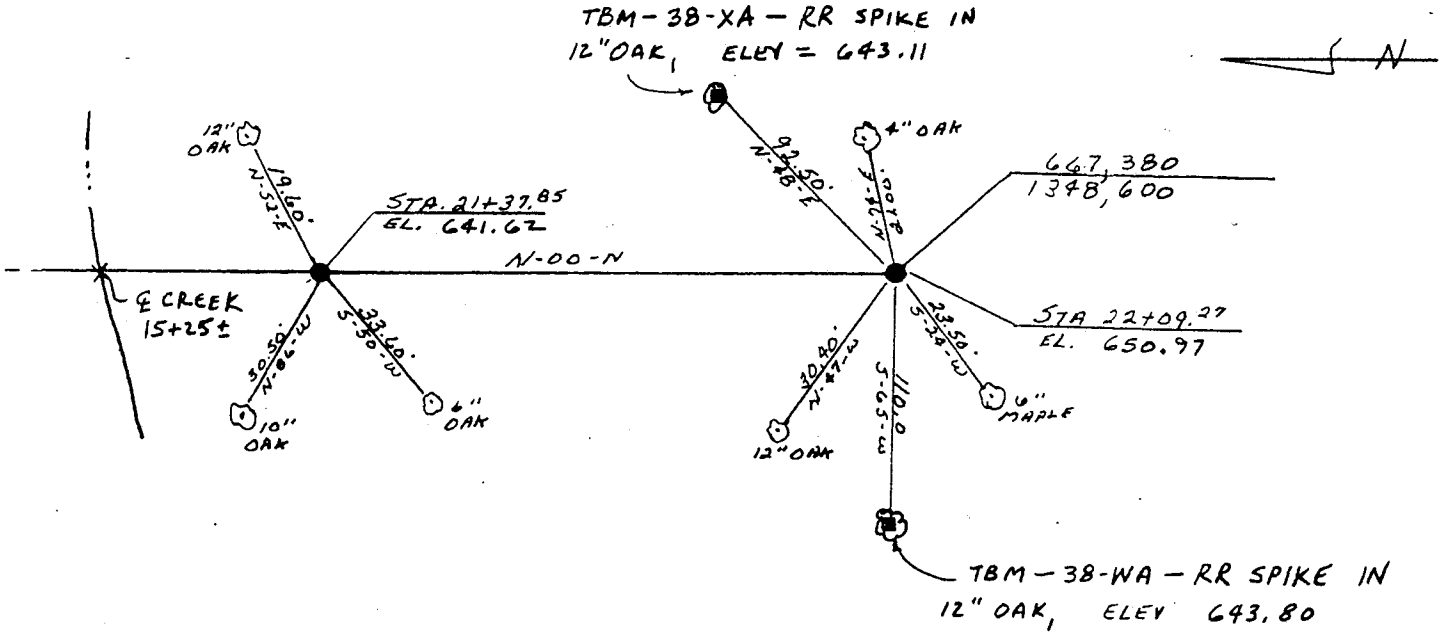
RANGE NO. SR-38B BY: J. CAIN DATE: 5-11-83

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 GOSS) 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.

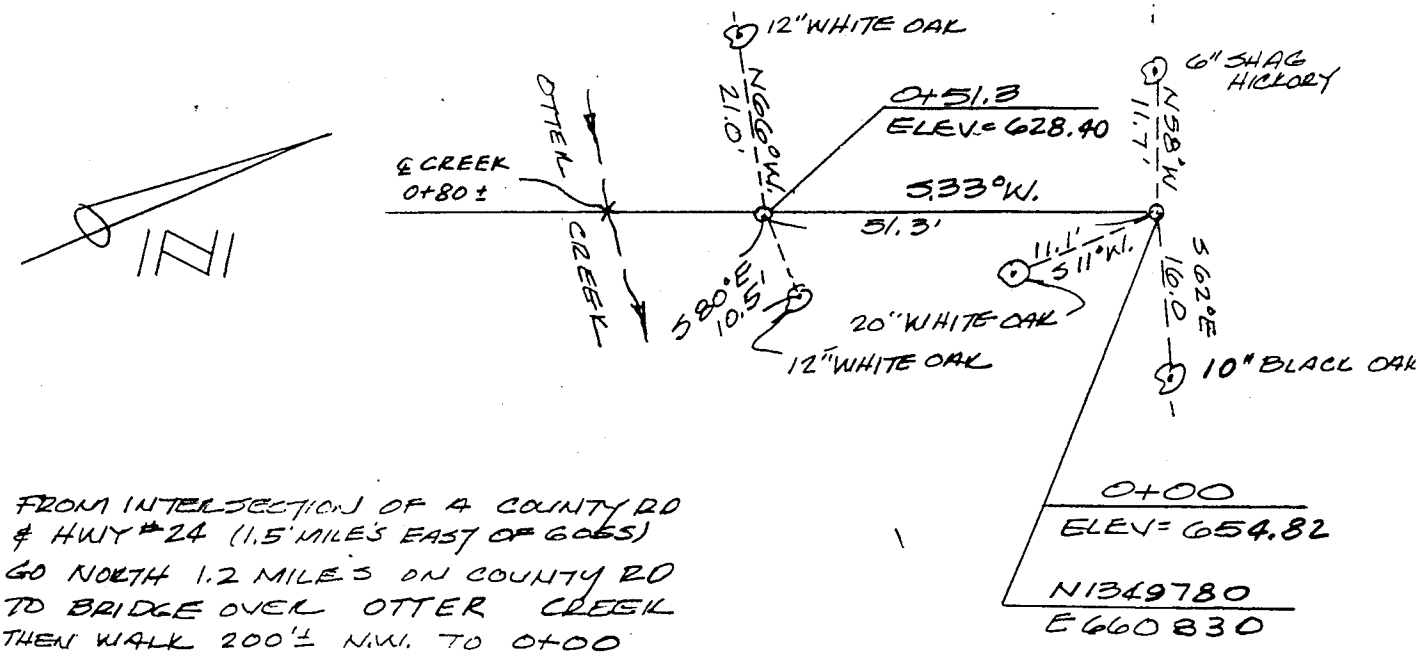
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. ORIGINAL

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

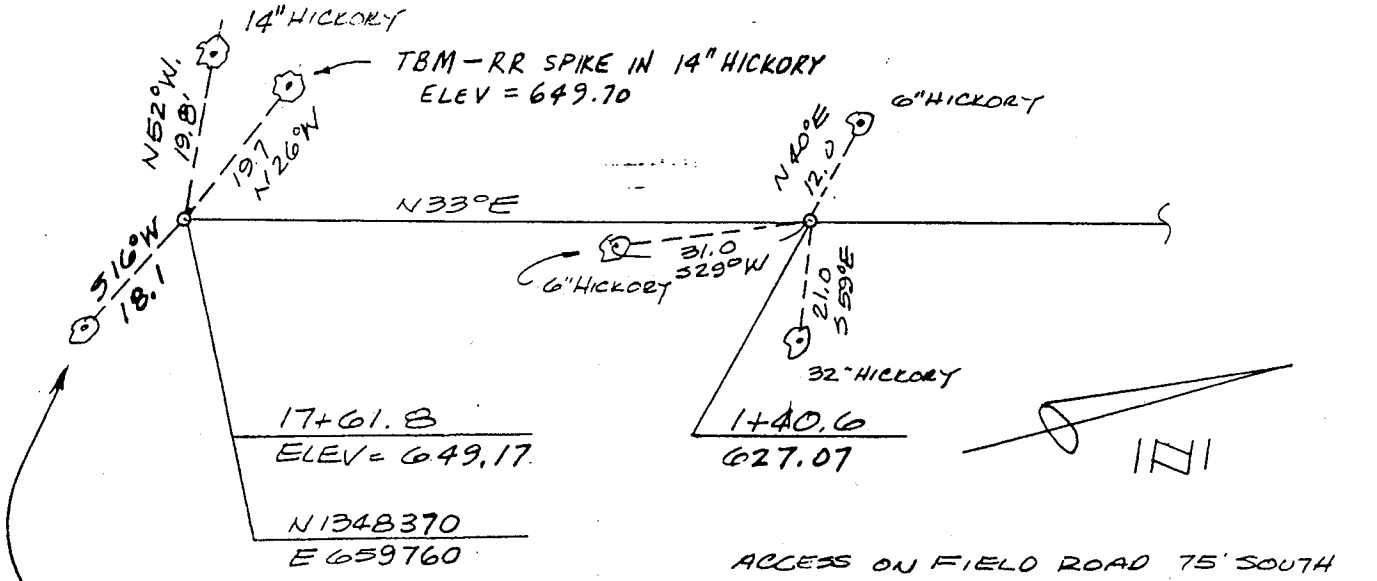
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. 39-B BY: GENE BLODE 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



TBM — RR SPIKE IN 6" ELM, ELEV = 651.30

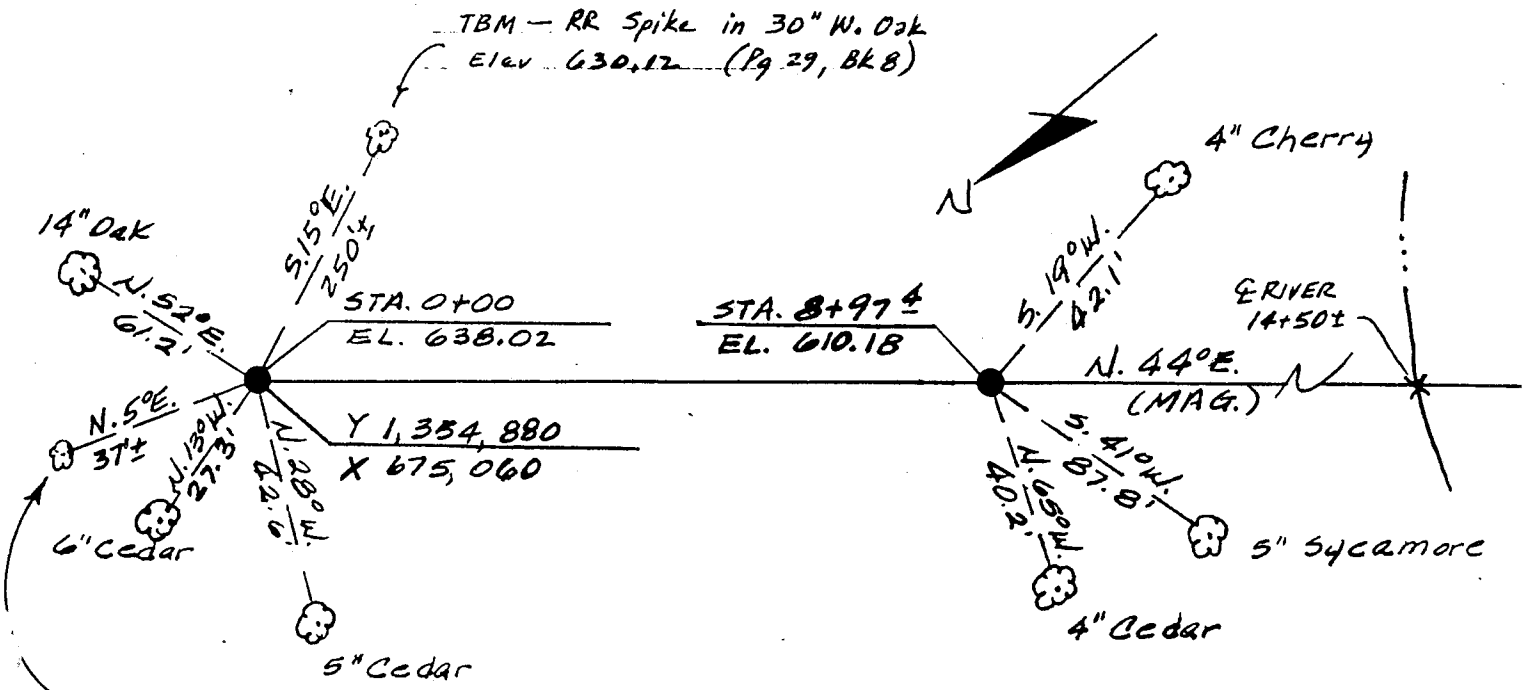
ACCESS ON FIELD ROAD 75' SOUTH OF BRIDGE OVER OTTER CREEK 200' N. OF COUNTY ROAD TO STA. 3+50±

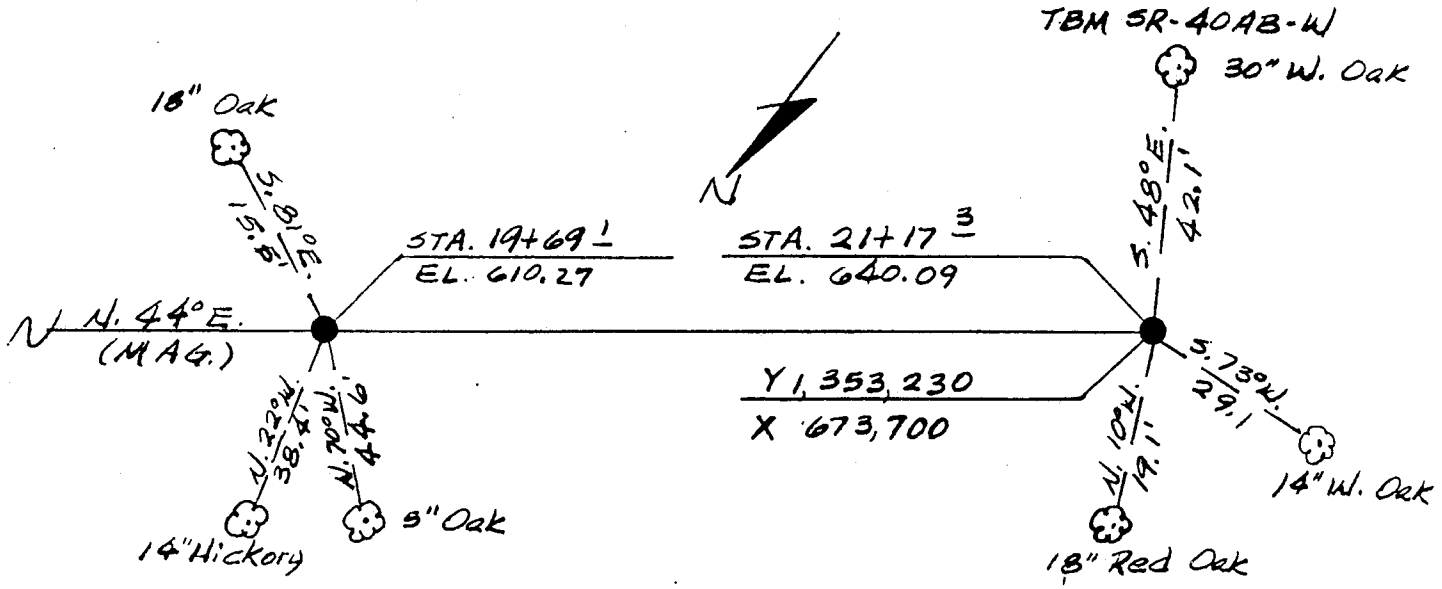
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINA

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.





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

RANGE NO. SR-40AB BY: Owen Zuroweste 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:
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, pace North 300' ± to Range.

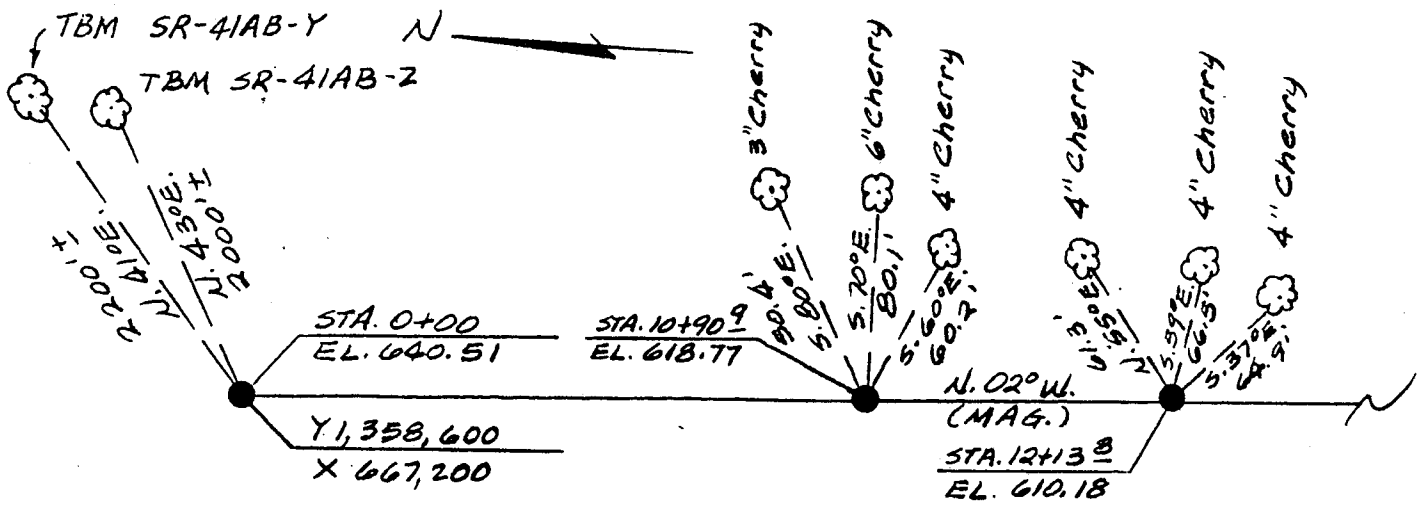
KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ ORIGINAL

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

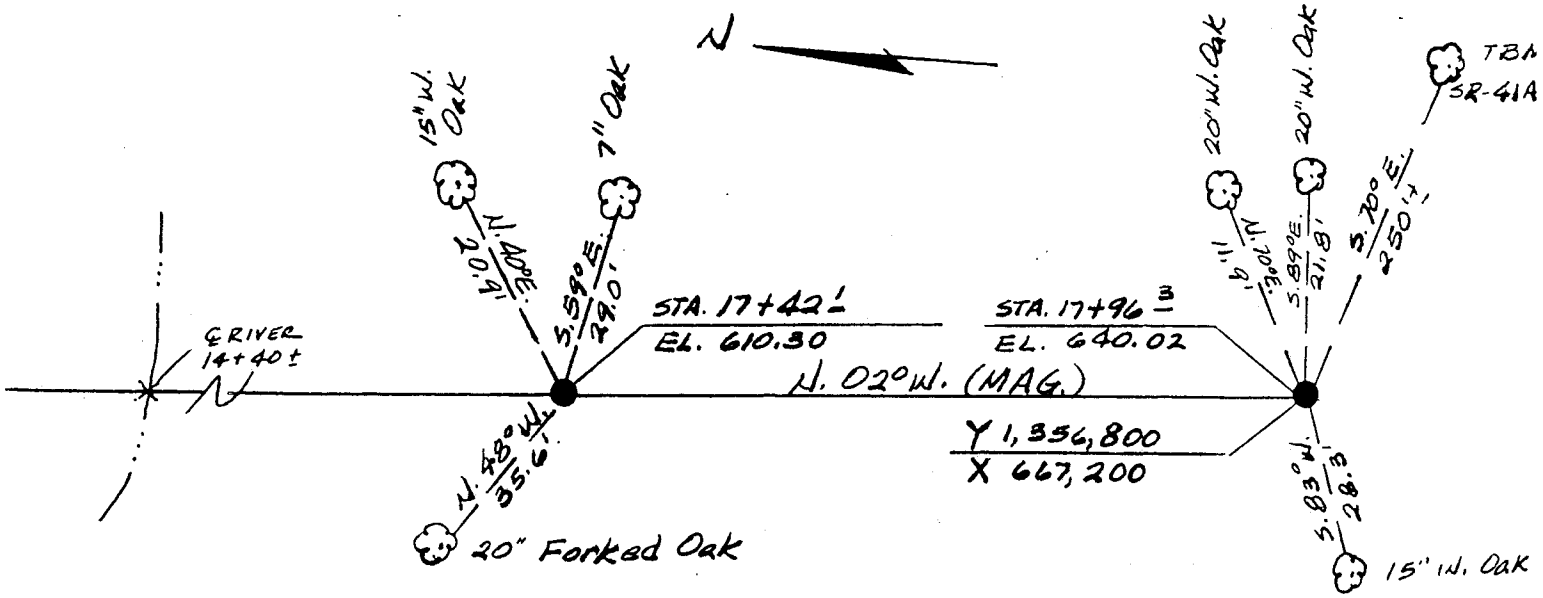
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

RANGE NO. SR-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)



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 Zurowski 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 back South 500' ± to Range.
Field road continues around to cross Range 400' ± North of North Fork Salt River.

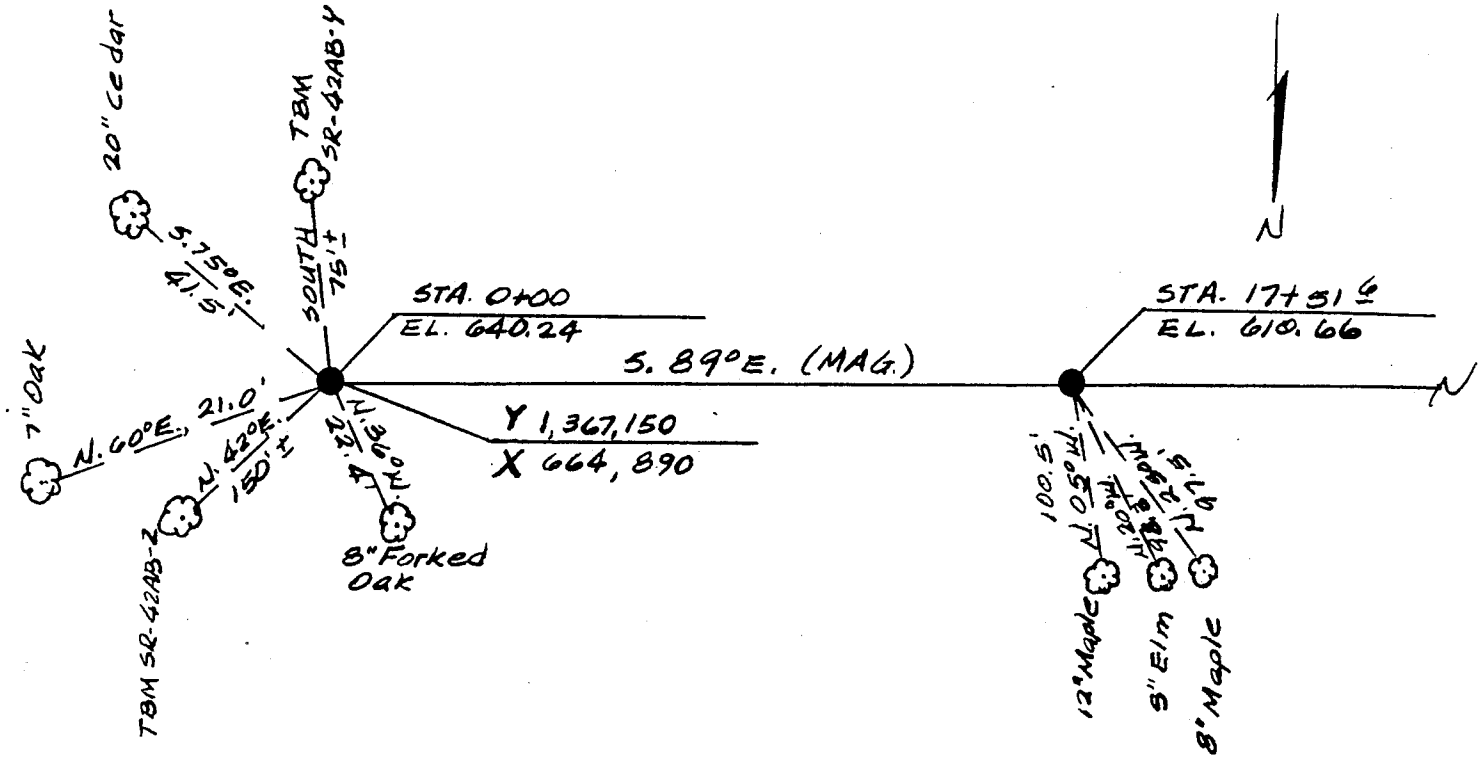
Station 17+95 ±:
From where field road crosses Range 400' ± North of River (see description above), back West 200' ± where River is 2-3' deep during normal stage, then 200' ± East to Range.

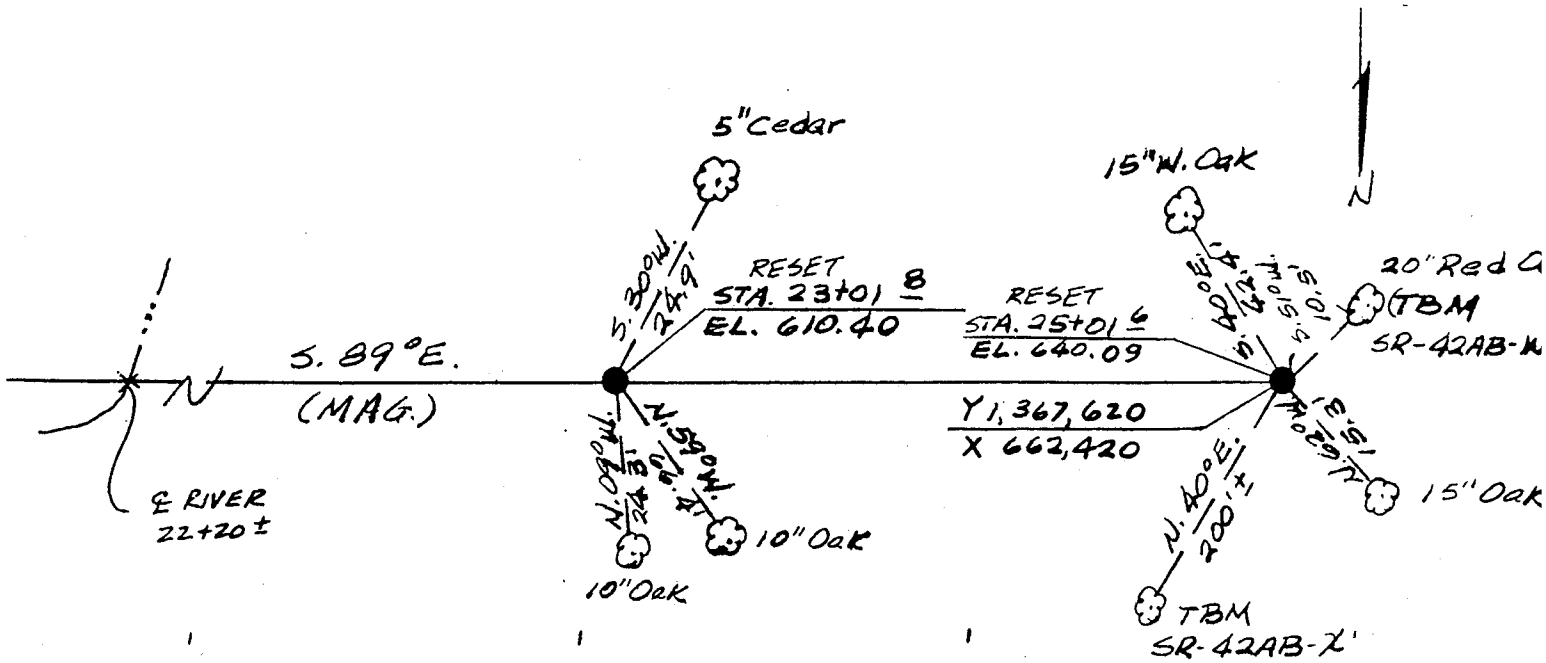
DACW43-82-D-0011 1-2757-22.9-S

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

RANGE NO. SR-42AB BY: Owen Zurowieste 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.





KENNETH BALK AND ASSOCIATES, ST. LOUIS, MO. SHEET NO. _____ 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-42AB BY: Owen Zurowiecke 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+70.2:
From 0+00 (see above description) drive or pack west during wet weather 1/2 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.

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

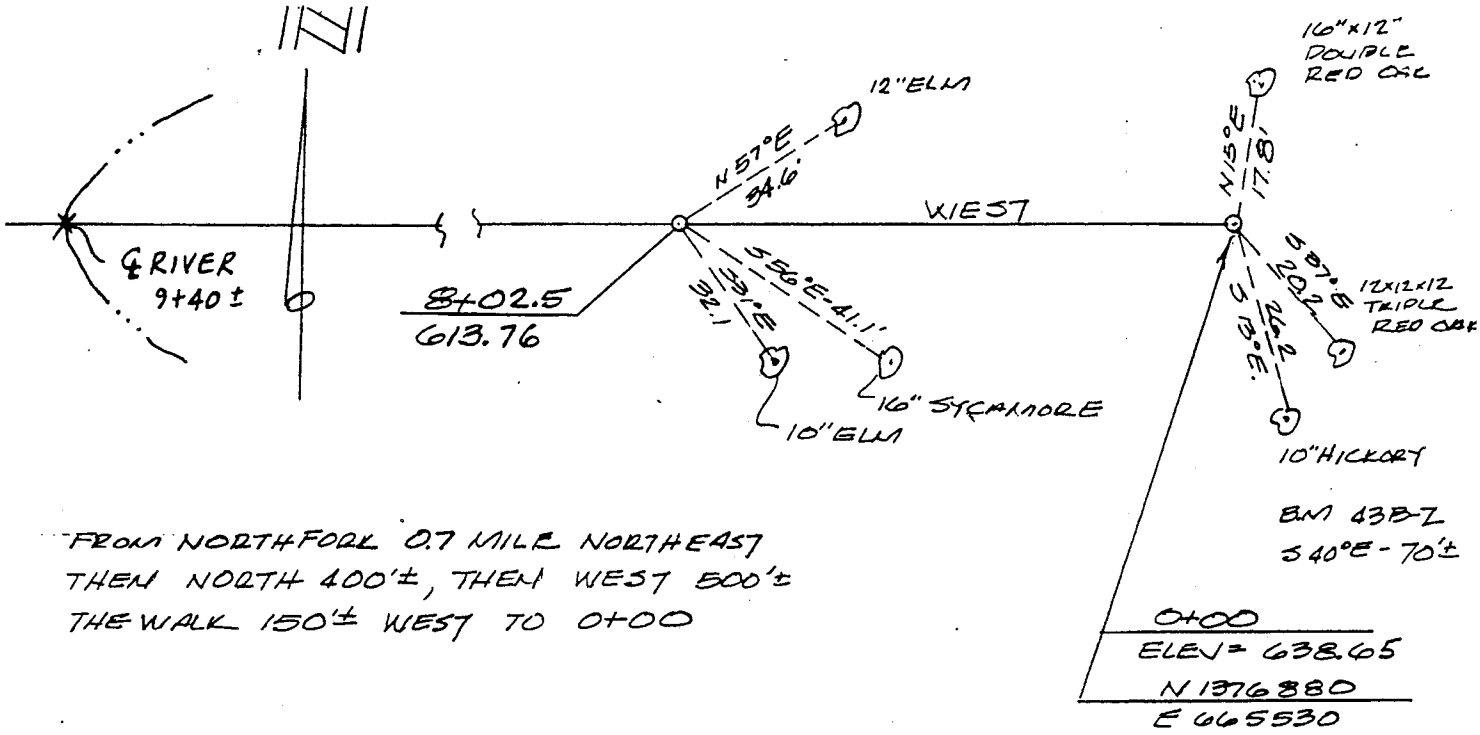
DACW43-82-D-0011 1-2757-22.18-S

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

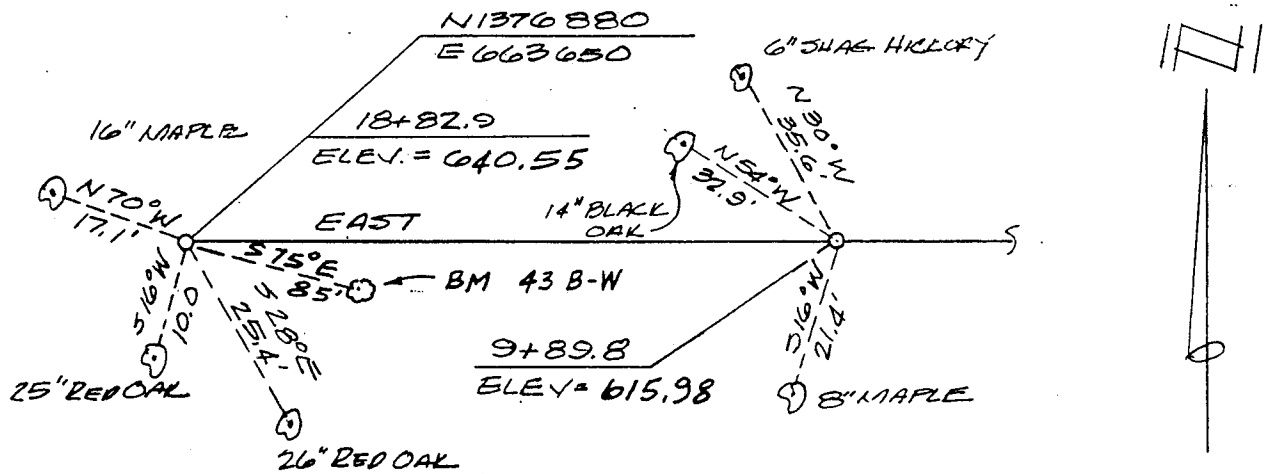
RANGE NO. 43B BY: GENE BUDDE DATE: 10/6/82

TOPO 47

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



FROM NORTH FORK 0.7 MILE NORTHEAST
THEN NORTH 400'±, THEN WEST 500'±
THE WALK 150'± WEST TO 0+00



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

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

ORIGINAL

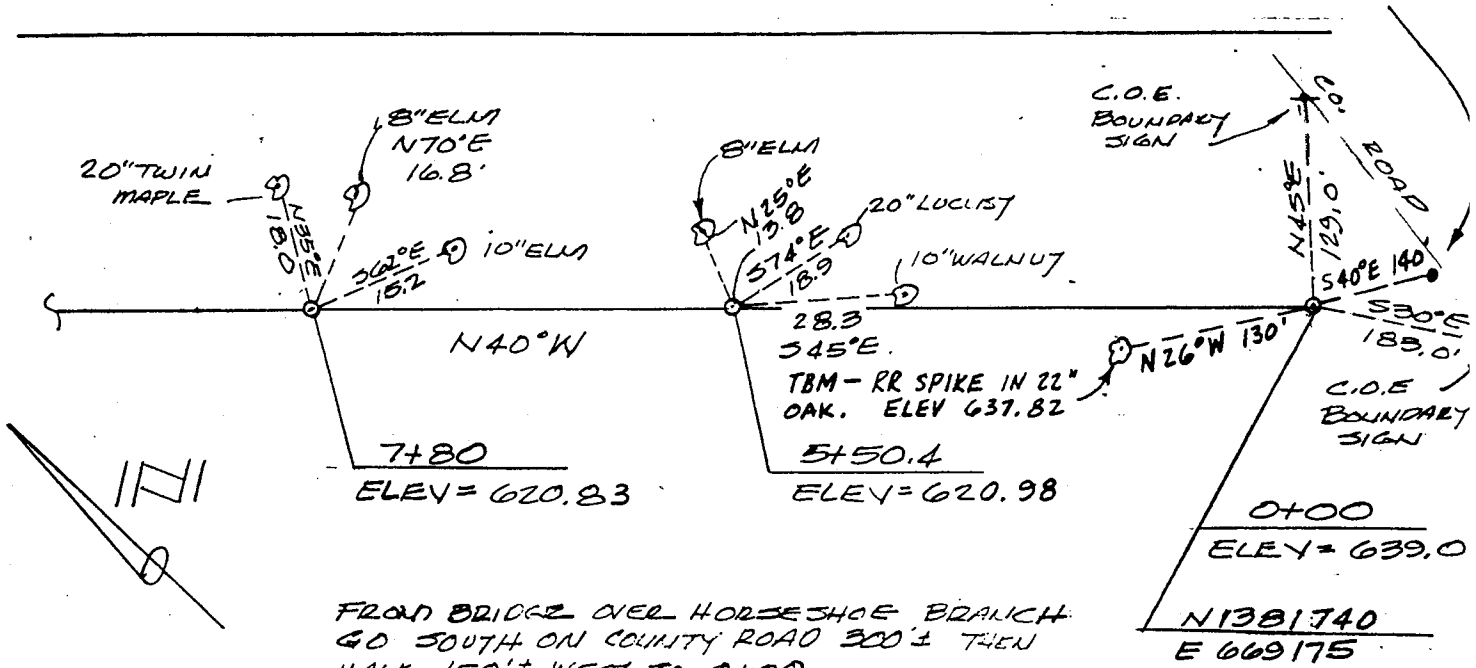
DACW43-82-D-0011 1-2757-22.18-S

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

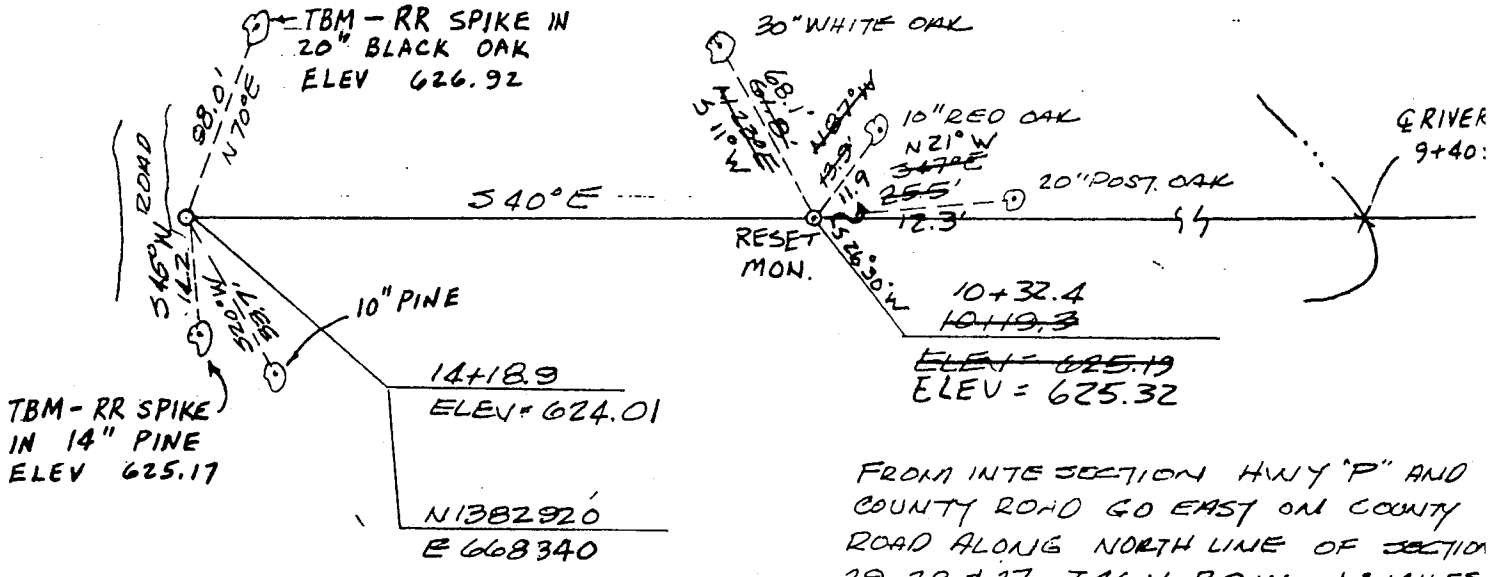
RANGE NO. 44-B BY: GENE BUDDE DATE: 10/6/82

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 SECTION 29, 28 & 27 T46N, R9W 1.2 MILES TO 14+18.9

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

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

ORIGINAL

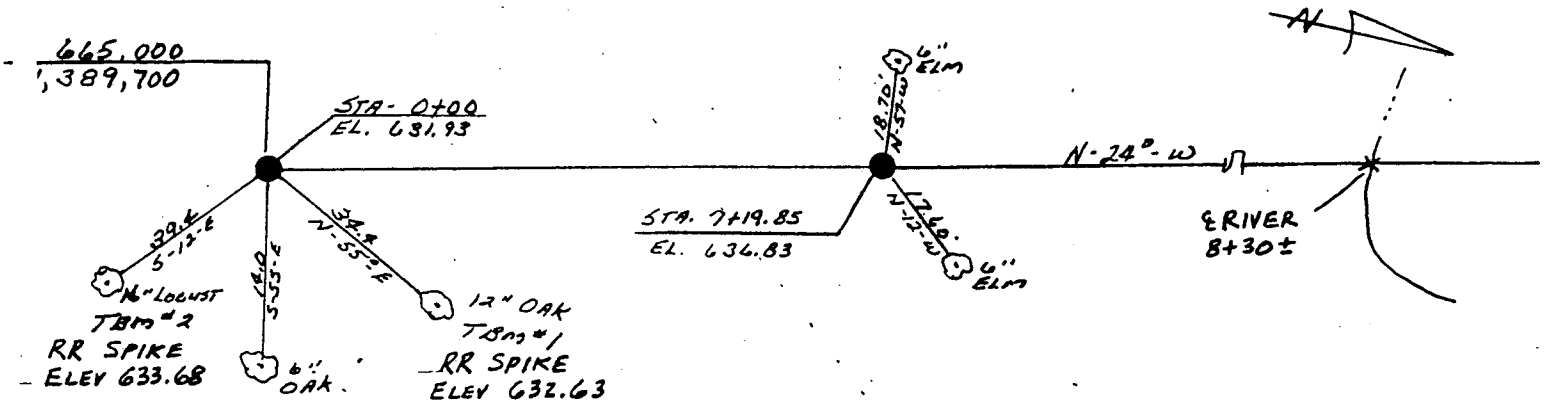
DACW43-82-D-0011 1-2848-22.35

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

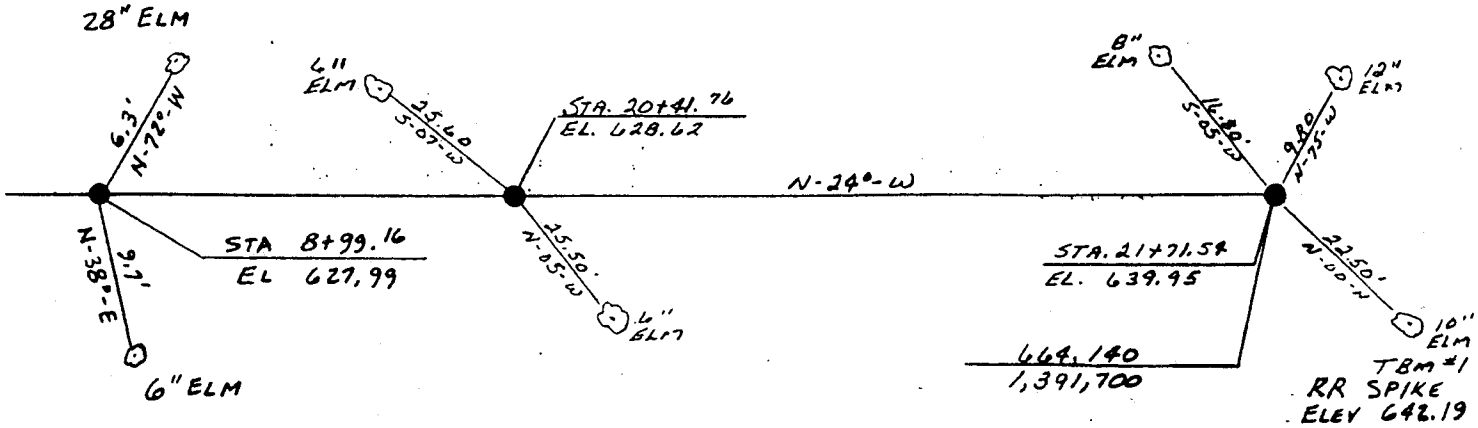
RANGE NO. SR-45-B BY: J. CAIN DATE: 5-5-83

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. SCHIERMACHER ~~TO HOME~~ THEN W. ON FLO. 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

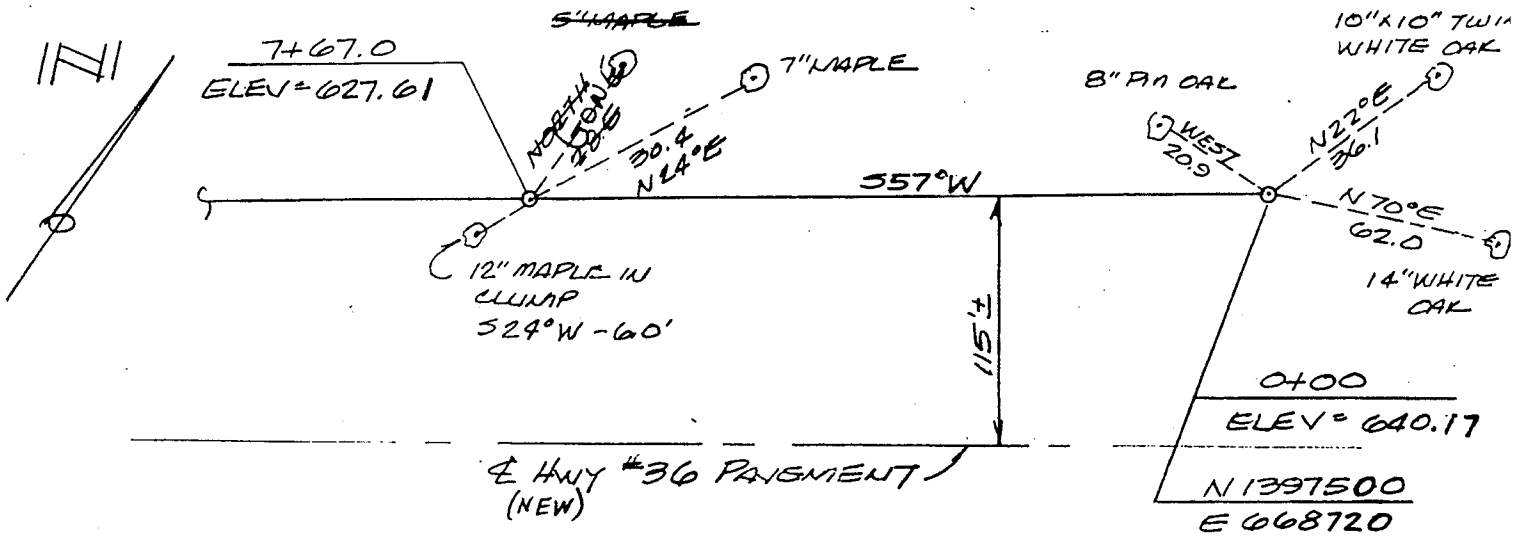
DACW43-82-D-0011 1-2757-22.18-S

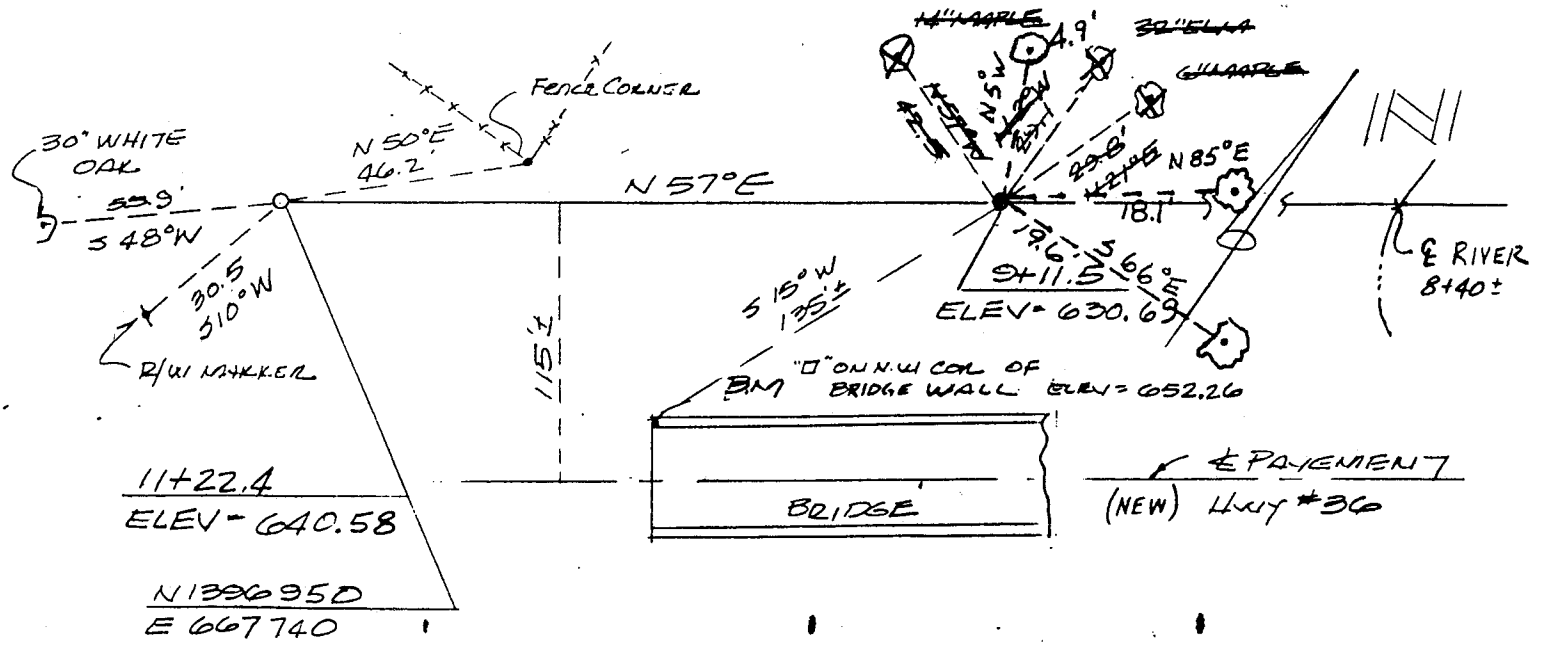
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

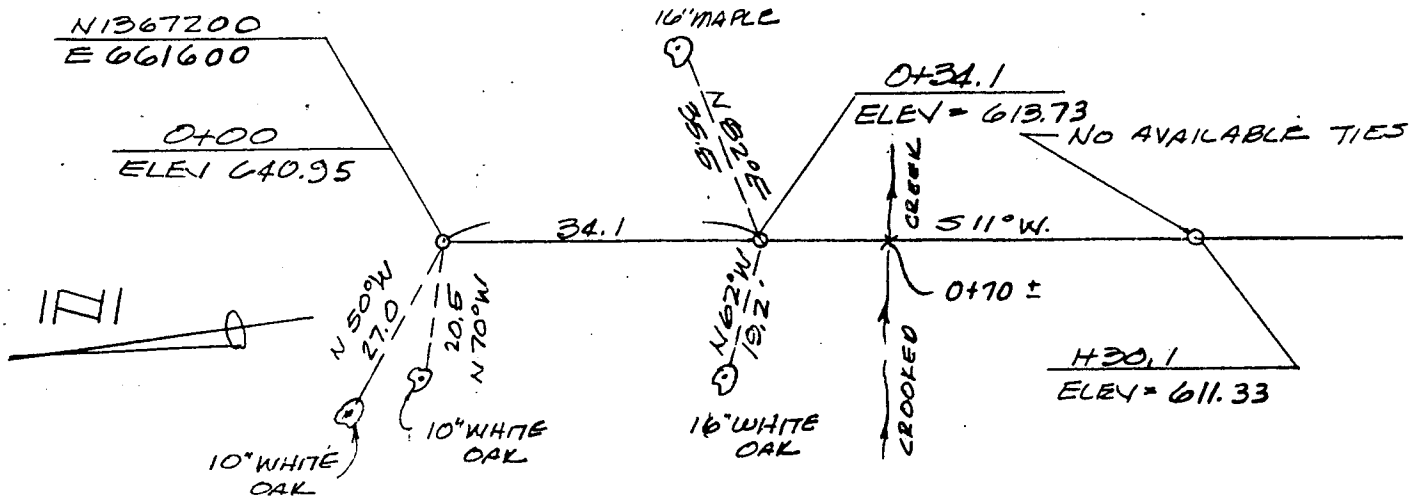
DAC:143-82-D-0011 1-2757-22.18-S

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

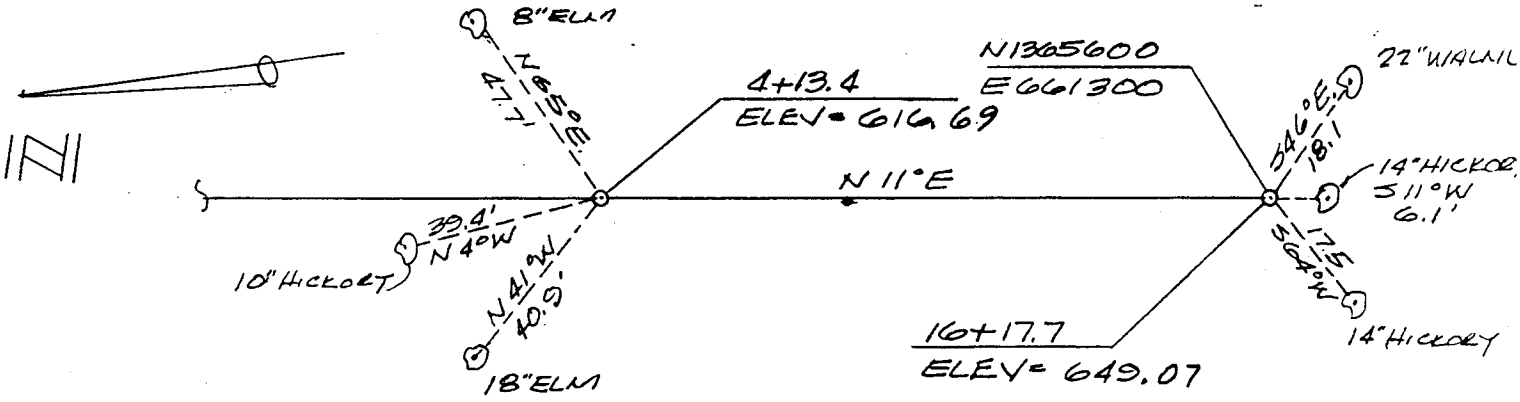
RANGE NO. 47-B BY: GENE BUDDE DATE: 10/9/82

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 R/W 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'

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

ORIGINA

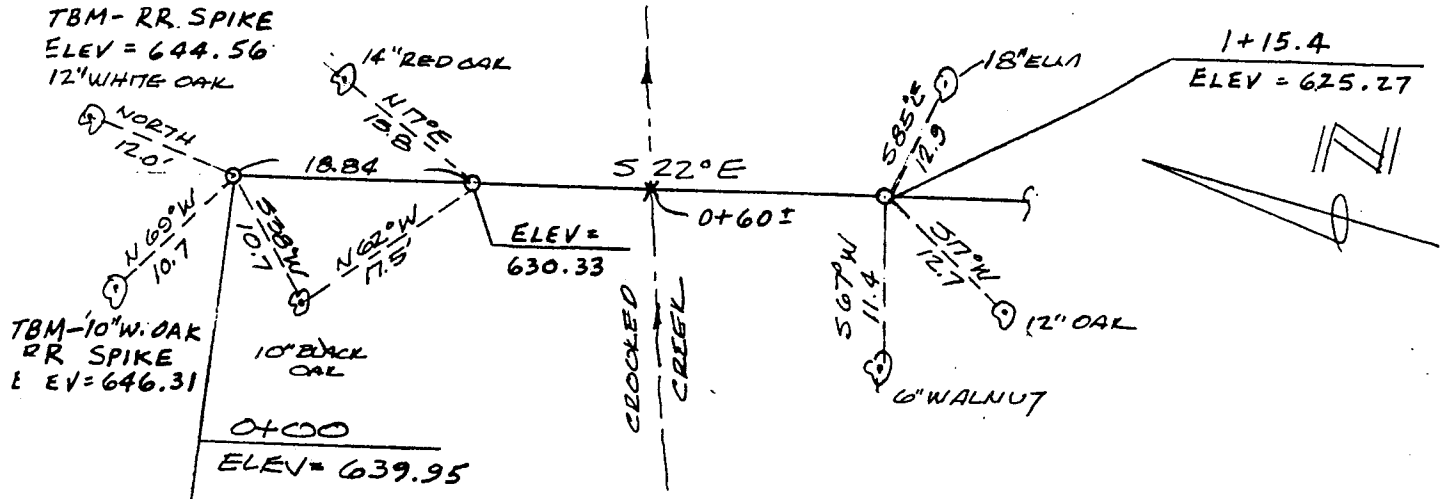
DACW43-82-D-0011

1-2757-22.18-S

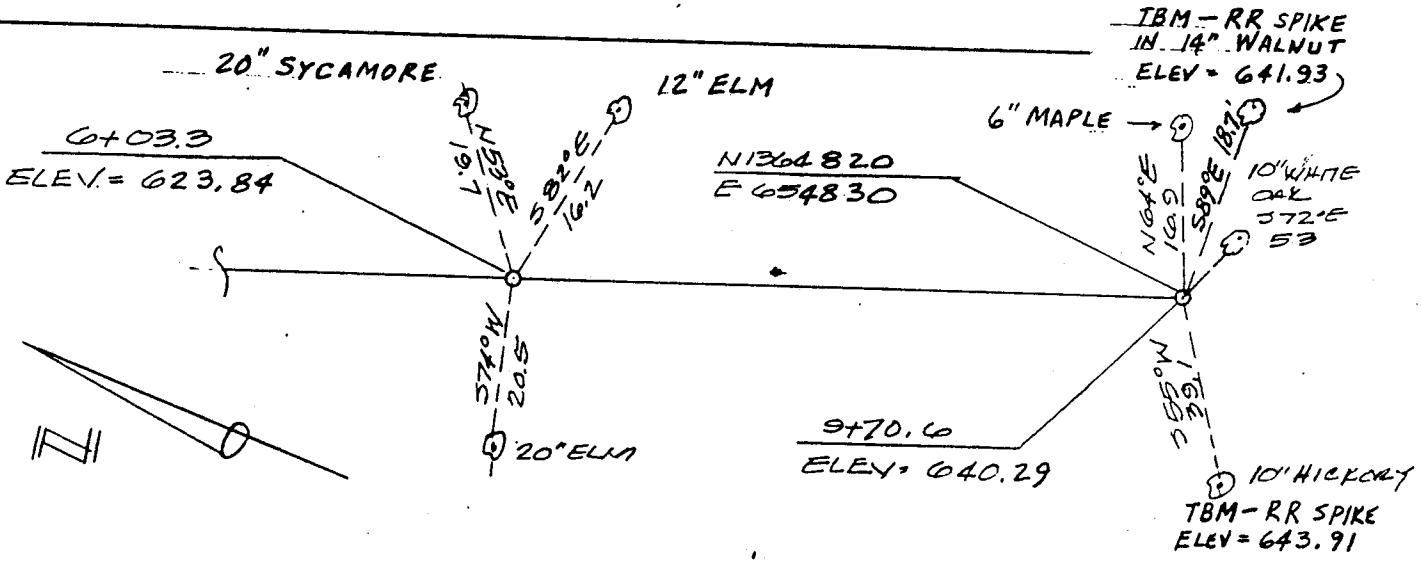
CLARENCE CANNON DAM AND MARK TWAIN RESERVOIR MONUMENTATION OF THE SEDIMENTATION RANGES.

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

NOTE: ALL MONUMENTS ARE 3" DIA. ALUM. TYPE B-1 OR B-2 TOPO 57
ALL COORDINATES ARE SCALE MISSOURI STATE PLANE EAST ZONE.
ALL TIE POINTS IN TREES ARE NAILS IN WASHERS.



FROM INTERSECT OF 4 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

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