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ANGOSTURA RESERVOIR

1979 Sedimentation Survey

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16. ABSTRACT
Angostura Reservoir was surveyed in 1979 to acquire the field data necessary for computing revised reservoir capacity. The data were also used to determine the volume of sediment that had accumulated in the reservoir since the dam was closed in 1949. Sixteen sediment samples were collected from reservoir deposits at various sediment ranges in the upstream portion of the reservoir. Sonic depth recording equipment was used to profile the sediment ranges. Reservoir capacity was determined using contour surface areas computed by the width-adjustment method.

The capacity of the reservoir is now 130,768 acre-feet, and the reservoir has a surface are of 4,612 acres. Since 1949, 29,151 acre-feet of sediment has accumulated, which represents an 18 percent loss in storage capacity.

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ANGOSTURA RESERVOIR

1979 Sedimentation Survey

by

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August 1983

Hydrology Branch

Division of Planning Technical Services

Engineering and Research Center

Denver, Colorado

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INTRODUCTION

The Angostura Unit, of the Pick-Sloan Missouri Basin Program, was included in Senate Document 191 (78th Congress, 2nd session) and was reauthorized by the Flood Control Act of 1944 (Public Law 534). Construction of Angostura Dam began in August 1946 and was completed in December 1949. The first delivery of irrigation water was made in 1953. The dam is located about 9 miles southeast of Hot Springs, South Dakota, on the Cheyenne River. The dam is part of the Angostura Unit and provides multipurpose benefits including irrigation, flood control, fish and wildlife conservation, recreation, and sediment control.

The dam is a 193-foot-high concrete gravity structure and earth embankment. It has a crest length of 2,030 feet; the concrete section is 970 feet long and the earth embankment 1,060 feet long. The spillway is an overflow section in the concrete portion of the dam, controlled by 50- by 30-foot radial gates. The general plan and sections of the dam and spillway are shown on figure 1 at the end of this report.

The original surface area of Angostura Reservoir in 1949 was 4,841 acres and the capacity was 159,919 acre-feet at the normal water surface elevation of 3187.2 feet. The 1979 survey resulted in a surface area of 4,612 acres and a capacity of 130,768 acre-feet at the same normal water surface elevation. This indicated a loss of 29,151 acre-feet in capacity in the 29.6 years since the dam was built.

The reservoir extends 17 miles in length along the Cheyenne River and 7.6 miles in length along Horsehead Creek, a major tributary. Average reservoir widths are 0.44 and 0.32 mile on the Cheyenne River and Horsehead Creek, respectively.

Records of the inflow (fig. 2) to the reservoir indicated an average of 91,270 acre-feet per year for 29.6 years. An inflow-duration curve based on the records compiled for the monthly inflow discharge is shown on figure 3. According to monthly records, about 2 percent of the time the inflow was less than 50 acre-feet per month.

During the 29.6-year period of record, the monthly outflow discharge (fig. 4) indicates an average total outflow of 82,700 acre-feet per year and an average discharge to the river of 47,300 acre-feet per year, the difference being the releases made to the irrigation canal from the reservoir.

Angostura Reservoir operations ranged from a minimum elevation, observed since normal operating level was reached, of 3162.90 feet in 1960 to a maximum elevation of 3189.37 feet in 1978. End-of-month reservoir elevations from December 1950 through May 1979 are plotted on figure 5.

SUMMARY AND CONCLUSIONS

This report includes a discussion of methods used to measure and study 29.6 years of reservoir sediment accumulations. It also briefly describes the field surveying and sediment sampling procedures and equipment. The primary purpose of running the 1979 survey was to gather data needed to compute the capacity of Angostura Reservoir.

Standard land surveying equipment was used to establish horizontal control points for the survey. The hydrographic survey was run using sonic depth recording equipment in conjunction with either a distance-measuring machine mounted in the boat or a triangulation method to measure the horizontal distance across each range line. The total system continuously recorded reservoir depths and horizontal distances from a fixed point as the boat was steered across the range line. Reservoir water surface elevations read on the gage at the dam were used as a control in converting sonic depth measurements to true bottom elevation and to delineate the cross-sectional profiles.

Sixteen sediment samples of the reservoir deposits were collected with a gravity core sampler. From analyses of the samples, the average unit weight of deposited sediment was determined to be 59.6 pounds per cubic foot and the average particle size was 58 percent clay, 26 percent silt, 15 percent sand, and 1 percent gravel.

The capacity of the reservoir determined from the 1979 survey is 130,768 acre-feet with a surface area of 4,612 acres at normal water surface elevation (3187.2 ft). The reservoir area and capacity tables were produced by a computer capacity program using measured contour surface areas and a curve-fitting technique to compute both area and capacity at prescribed elevation increments.

A comprehensive summary of the reservoir sediment data for the 1979 survey is contained in table 3. The sediment volumes deposited in the reservoir during intervals between surveys were:

Period interval between surveys	Period (years)	Capacity loss (acre-ft)	Average annual loss (acre-ft)	Deposits (acre-ft/mi^2 per·yr)
10/1949 - 9/1965	16.0	21,158	1,322	0.145
9/1965 - 5/1979	13.6	7,993	588	0.065
10/1949 - 5/1979	29.6	29,151	985	0.108

The total volume of sediment accumulated in the reservoir since the original survey amounts to 29,151 acre-feet, indicating a loss in capacity of about 18 percent. An average annual sediment accumulation rate of 985 acre-feet was found for the period from 1949 to 1979. Sediment yield rate from the drainage area was 0.108 acre-foot per square mile per year for the same period.

DESCRIPTION OF BASIN

Drainage Area and Topography

The Cheyenne River drainage area (fig. 6) above the dam is 9,100 square miles, of which 9,093 square miles is the net sediment contributing area. The drainage area covers parts of three States: southwestern South Dakota, northwestern Nebraska, and east-central Wyoming. The Cheyenne River has its source in several tributaries that rise in Campbell and Converse Counties, Wyoming, on the west side of the basin. About 50 miles from the western divide, two of the larger tributaries, Antelope Creek and Dry Fork, join to form the Cheyenne River. From this confluence, the river flows generally east to a point just east of the Wyoming-South Dakota line where it is deflected to the southeast by the Black Hills. It follows the flanks of the Black Hills to Angostura Reservoir, located about 30 miles east of the Wyoming-South Dakota line.

Numerous tributaries of about equal length enter the Cheyenne River from both the north and south. Horsehead Creek, a principal tributary of the reservoir, enters from the southeast and has a drainage area of 295 square miles. Other tributaries that flow directly into the reservoir and may contribute minor quantities of sediment are Dry Creek, Sheps Canyon, and Tepee Creek. The combined drainage area of these and other minor tributaries of the reservoir is about 95 square miles.

Most of the river basin is a gently rolling plain dissected by moderately to widely spaced stream valleys. This type of terrain extends from a low ridge on the west and northwest that forms the drainage divide between the Cheyenne and the Powder and Belle Fourche Rivers eastward to the Black Hills on the northwest side of the basin and southward to Pine Ridge. Maximum relief within this extensive area is about 500 feet, with most of the area being 250 feet or less, measured from the flood plains of the stream channels to the tops of the intervening ridges. An east-facing escarpment of the Rochelle Hills, about 500 feet high and extending north and south across the west-central part of the basin, is the only prominent relief feature within this interior area.

Geology

The basin can be briefly described in three sections: the eastern third which includes that part of the Black Hills lying within the basin, the western two-thirds that form a part of the Great Plains area, and the extreme southern boundary that includes the Pine Ridge escarpment.

In the eastern third of the basin, hard, resistant, igneous, and metamorphic rocks form the core of the Black Hills with highly folded sedimentary rocks cropping out along the flanks. The various rock formations are of the Cretaceous, Permian, and Triassic ages. The rocks are composed of black marine shales, limestones, sandstones, and siltstone.

The western two-thirds of the basin is underlain by Tertiary sedimentary rocks that are nearly flat or have low to moderate westerly dips. Sandstones and shales are the more prominent rocks. The stream pattern developed in this terrain is essentially dendritic, there being little if any, structural control. The extreme western part is underlain by the Wasatch Formation and is composed of variegated sands and clays. The sparse grass and sagebrush reflect the aridity of the area which probably has the lowest precipitation in the entire basin. Nearly all streams are ephemeral and flow only in response to heavy rains or spring snowmelt.

The Pine Ridge escarpment that forms the southeast boundary of the basin is part of the Tertiary White River Group. This group includes soft, white, and pinkish clays with some sandstone and limestone. A few streams in the area are springfed and are perennial.

SURVEYS, SAMPLING, AND EQUIPMENT

History of Surveys

The first known surveys, in 1913, of a portion of the area now encompassed by Angostura Reservoir were made by South Dakota State personnel. A followup to these surveys was made by the Reclamation Service in 1917-18. The damsite considered at that time was known as Jackson Narrows and located in sec. 10, T. 9 S., R. 5 E. In 1928-29, the U.S. Army Corps of Engineers ran a topographic survey of the reservoir and damsite at Jackson Narrows and another at Horse Camp Draw 6 miles down the river. Horse Camp damsite was located about 1 mile downstream of where Angostura Dam was built. The Corps of Engineers carried the Horse Camp Reservoir topography up to elevation 3160.

In 1940-41, the Bureau of Reclamation made a detailed topographic survey of Angostura damsite and a general topographic survey of the reservoir area with a contour interval of 5 feet. Data from this survey were used to plot a base reservoir topographic map. Original surface areas were measured from the map and the original reservoir capacity was computed.

The first resurvey of Angostura Reservoir was completed in September 1965. The field work included the resurvey of 39 sediment ranges, 7 degradation ranges, and collection of 18 sediment core samples from the reservoir. At select locations, a radioactive gamma probe was used to sample the in-place bulk density of some of the inundated reservoir deposits. The resurvey data were used to produce revised reservoir area capacity tables and to predict future sediment accumulations in the reservoir.

The second Angostura Reservoir resurvey of the sedimentation and degradation ranges was begun on April 2 and completed on May 4, 1979. Forty-four reservoir sedimentation ranges and seven degradation ranges were profiled during this resurvey. Layouts of the reservoir sedimentation range and degradation range systems are shown on figures 7 and 8. Ranges 17 and 18 on the Cheyenne River and Ranges 49, 50, and 51 on Horsehead Creek are all above the reservoir and are not plotted on figure 7.

Surveying Methods

Field survey work consisted initially of locating and flagging all reservoir sedimentation range ends for use in running the profiles. Where possible, all ranges were profiled across their full length using standard land surveying procedures for leveling. For the 24 ranges that were partially inundated, levels were run down to the reservoir water surface from the range monuments located on each side of the reservoir. Stations were established at water's edge of each range to run the hydrograhic survey.

The hydrographic survey began on April 30 and was completed May 4, 1979, using sonic depth recording equipment to sound 11 range lines in the Cheyenne River and 13 range lines in the tributaries. The equipment was installed on the deck of a pontoon boat (fig. 9). The boat was positioned on a range line as near to the shore as possible; then, the line was profiled from the station at water's edge using a tape to measure the distance to the center point of the transducer. The depth recorder was turned on and the boat was steered across the range at speeds of about 3 to 5 feet per second. A man on shore kept the boat on line through radio communication with the boat operator. A distance measuring machine was used to measure horizontal distances across the reservoir for some ranges. A "cutting-in" method was used for other ranges. Vertical control was maintained by referencing the recorded soundings to the reservoir water surface elevation that was read off the gage at the dam each day of the survey operation.

Sampling Method and Equipment

A gravity core sampler was used to take 16 samples of the underwater reservoir sediment deposits. The sampler was suspended over the side of the boat from a cable reeled off a power-operated winch. The sampler was allowed to free-fall into the sediment deposits to maximum possible penetration. When the sampler was retrieved on the boat deck, the cutterhead at the bottom was removed and the plastic liner withdrawn from the coring pipe. A hacksaw was used to cut that part of the liner holding the sample. The samples were capped with plastic caps on each end of the liner, sealed, and labeled for analysis.

RESERVOIR SEDIMENT DISTRIBUTION

Longitudinal Distribution

Longitudinal profiles of the Cheyenne River (fig. 10) and Horsehead Creek (fig. 11) were plotted for the original and 1979 reservoir conditions to study the distribution of sediments in each tributary arm. The profiles were also plotted in dimensionless form (figs. 12 and 13), relating percent of depth to percent of distance for both the original and 1979 reservoir conditions. Percent of depth for both the Cheyenne River and Horsehead Creek arms was computed as the ratio of the thalweg depth at each range to the total depth. Thalweg depth was computed as the difference in elevation between the lowest point in the range and the lowest point on the profile. For 1949 reservoir conditions, a total depth of 133.1 feet for the Cheyenne River arm was computed as the difference between the original low point of the reservoir, 3065 feet, and the maximum water surface elevation, 3,198.1 feet. Similarly for Horsehead Creek, a total depth of 88.9 feet [3,198.1 feet - 3,109.2 feet (thalweg elevation of the confluence point of the Cheyenne River and Horsehead Creek)] was computed. Percent of distance for the Cheyenne River arm was computed as the ratio of the distance between the dam and each range to the total distance, 95,700 feet measured between the dam and the point where the longitudinal profile intersects the original thalweg elevation (3195.7 feet) at the upstream end of the reservoir. Similarly for Horsehead Creek, percent of distance was computed as the ratio of the distance between the confluence of the Cheyenne River and Horsehead Creek and each range to the total distance of 40,150 feet measured between the confluence point and the point where the longitudinal profile intersects the thalweg elevation.

Based on the longitudinal profile of the Cheyenne River (fig. 10), maximum sediment deposits of 53 feet occurred near the dam. From Range 2 to Range 6, an average sediment deposition of 35 feet was noted. An average sediment deposition of 28 feet occurred between Ranges 6 and 7 upstream. The delta or topset beds begin at Range 8 where the sediment deposits vary from 4 to 34 feet.

Maximum sediment deposits of 27.5 feet occurred at the most downstream point (confluence of Horsehead Creek and Cheyenne River), as seen on the longitudinal profile (fig. 11) of Horsehead Creek. These deposits decreased to 7 feet at Range 40. Between Range 40 and Range 46, the sediment deposits averaged 6.5 feet. At Range 47, above Range 46, there were no deposits.

For further practical interest, a theoretical distribution of sediment in the reservoir was computed (table 1) using the Empirical Area-Reduction Method [1].* A sediment inflow volume of 29,151 acre-feet was assumed to be distributed. This volume was equal to the sediment volume measured by the 1979 survey. Plotting the depth-capacity relationship (fig. 14) using the original data indicated the reservoir to be a type I [1]. Sediment distribution computational results are retabulated in columns 8, 9, and 10 of table 2 for a type I reservoir. These computations show the sediment would reach an elevation of 3086 feet, as compared to the elevation of 3115 feet determined from the 1979 survey. The sediment distribution curves on figure 15 show how the actual distribution compares with the theoretical distribution of a type I reservoir. The curves show percentages of depth plotted against sediment deposited. The greatest differences in the actual and type I curves lie between the 45 to 70 percent depths.

Using the end-of-month data (fig. 5), a stage-duration curve (fig. 16) was derived. This relationship is useful in classifying the reservoir for computing sediment distribution. It may also be used in predicting the delta formation of a reservoir [1]. For delta computations, data from the curve are used to determine the pivot point (where the topset and foreset beds

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* Numbers in brackets refer to items in the bibliography.

intersect). Using the 50 percent duration as a mean, the curve shows an end-of-month elevation stage of 3181 feet. This compares to a pivot point occurring at elevation 3180 feet, as seen at Range 8 in the longitudinal profile (fig. 10). For a sediment distribution study, the end-of-month stage of 3181 feet shows the reservoir remains relatively full and, therefore, would indicate a lake-type (type I) reservoir where the incoming sediments deposit in a typical profile pattern [2]. However, the bottomset bed profile (Range 6A downstream to the dam) for Angostura Reservoir is different from the typical pattern. The difference is probably due to the type and texture of the inflowing sediments and the effect of sediment inflows from Horsehead Creek that joins the main stem (Cheyenne River) at Range 6.

Lateral Distribution

Ground profiles of 44 reservoir sedimentation ranges are plotted on figures 17 through 60 for the 1949 (original) and 1979 surveys. These graphs indicate how the sediments are deposited laterally across each sediment range. Downstream of Range 8 on the main stream, the sediment has filled the space at each range line to some approximate elevation common to the particular range. Upstream of and including Range 8, the effect of reservoir drawdown is evidenced by the appearance of a channel incised into the deposited sediments. The deposition pattern, which extends laterally across the range lines with a channel cutting through the deposited sediments, continues upstream to Range 18, a range line which is entirely above the maximum water surface elevation 3198.1. The deposition above the flood control pool is caused by the backwater effect from the reservoir during large inflow events.

The graphs of range lines on Horsehead Creek (figs. 45 through 56) indicate a similar lateral distribution as on the main stream. Remains of the original main channel continue to exist on each range line. Above Range 43 (fig. 48), most of the deposition has taken place in the channel with some deposition occurring below areas of active bank erosion.

SEDIMENT ANALYSES

Sediment Accumulation

Sediments have accumulated in Angostura Reservoir to a total volume of 29,151 acre-feet at normal water surface elevation (3187.2) since the dam was constructed nearly 30 years ago. An average annual accumulation rate of 985 acre-feet was computed for a 29.6-year period. Sediments from the drainage area were deposited at a rate of 0.108 acre-foot per square mile per year. A graphical portrayal of the sediment accumulation is shown by the mass curve of figure 61 using the values in columns (1) and (6) of table 2. Sediment accumulations within reservoir elevation intervals are shown on figure 62.

The amount of sediment which accumulated between closure and the 1965 resurvey was 21,158 acre-feet for an annual rate of 1,322 acre-feet for the period and a basin yield rate of 0.145 acre-foot per square mile per year.

The volume of sediment accumulated from September 1965 to May 1979 was 7,993 acre-feet at normal water surface elevation. The average annual rate for the latest period was 588 acre-feet for a basin yield rate of 0.065 acre-feet per square mile per year. A reduction in sediment yield from the drainage basin is supported in a study made by the Wyoming District, USGS (U.S. Geological Survey) of Lance Creek, one of the major tributaries to the Cheyenne River in Wyoming. The average Qw (water discharge) and Qs (suspended sediment discharge) for the two time periods is compared:

Period of record	Qw (ft^3/s)	Qs (tons)
1950-1954	9,500	914,280
1976-1980	11,190	204,372

The reduced suspended sediment discharge from Lance Creek has been attributed by USGS to a change in land use due to fewer domestic livestock grazing in the basin, resulting in improved vegetation cover.

Particle Size and Unit Weight Analyses

A total of 16 samples of the reservoir sediment deposits were collected in 1979. They varied from 10-1/2 to 57-1/4 inches in length. The samples were analyzed in the laboratory first by freezing them, then cutting them to appropriate lengths, and selecting representative sections of the cores for testing. These sections were identified as specimens A, B, C, etc., and were measured from the top of the sample. The individual specimens were then weighed and measured for determination of wet densities, after which they were extruded for moisture content determinations. A representative (50- to 100-g) sample of the ovendry material was then used for the gradation analyses. Particle size analyses curves for the samples are shown on figures 63 through 72. A summary of the results of each sample is contained in table 4 showing range number and station, sample number, sample length, percentages of clay, silt, sand and gravel, unit weight, and median diameter.

From the data of the 33 samples in table 4, an average particle size was computed to be 58 percent clay, 26 percent silt, 15 percent sand, and 1 percent gravel. An empirical method [1] was used to compute the unit weight by applying this average size gradation. Assuming a type I reservoir operation, an initial unit weight of 47.8 pounds per cubic foot was computed. Correcting for compaction, a unit weight of 59.6 pounds per cubic foot was computed for a 30-year period (age of the dam). This compared to the average unit weight of 51.8 pounds per cubic foot computed for the 33 samples listed in table 4. It also compared favorably with a weighted unit weight of 56.4 pounds per cubic foot determined for the 1965 survey and used as a representative value in compiling the reservoir sediment data summary in table 3 (item 39).

Reservoir Sedimentation Summary

A summary of the reservoir sediment data for the 1979 survey is contained in table 3. The data include a tabulation of incremental sediment inflow volume and sediment accumulation computed for the periods between 1949 (original) and the 1965 and 1979 surveys. These data and other information in the table are valuable for future surveys and other reservoir sediment investigations.

DEGRADATION BELOW THE DAM

A system of seven degradation ranges was established extending to 15 miles below Angostura Dam (fig. 8). The ranges were originally surveyed in 1949 and resurveyed in 1965 and 1979. Ground profiles of the ranges for the 1949 and 1979 surveys are plotted on figures 73 through 79. An estimate of the degradation depth at each range was made:

Range	Approximate degradation depth - feet
0.2	3.3
0.7	2.2
1.75	1.3
4.0	1.5
5.0	2.2
10.0	0.7
15.0	2.0

Based on the above values, an average depth of degradation was computed to be 1.9 feet for the channel downstream of the dam.

The longitudinal degradation profiles for the 1949 and 1979 surveys are shown in figure 80.

A curve of the outflow-duration is shown on figure 81. Data used to plot the monthly outflows (fig. 4) were applied to derive this curve. Information from the curve can be used in making degradation and channel stability studies for the channel downstream of a dam. The curve also provides a pattern of the range of discharges for which the sediment transport volumes are computed and can be used to determine the dominant discharge (2- or 5-year flood) for these studies.

RESERVOIR AREA AND CAPACITY

The 1979 reservoir surface areas were computed by the Width Adjustment Method described by Pemberton [3]. The method entailed computing the 1979 contour areas between any two ranges by applying an adjustment factor to the 1949 contour area between the two ranges. The adjustment factor was determined as a ratio of the average width from the 1979 survey to the original (1949) average width for both the upstream and downstream ranges at a given contour. Computations were facilitated by subdividing the reservoir into segments using the sedimentation range lines to delineate the limit of each segmental boundary. For any given contour elevation, the 1949 surface areas were multiplied by the adjustment factor to compute the 1979 surface area of each segment. The total surface area at the given contour elevation was then computed by adding all the segmental areas at that elevation.

The 1979 surface areas were used as control parameters for computing the reservoir capacities by electronic computer. The programed procedure included the computation of 0.01- to 1-foot area increments by linear interpolation between 5-foot contour intervals. The progressive computational procedure began by testing the initial capacity equation over successive intervals to determine whether it was within an allowable error limit (0.00001 in this case). This capacity equation was then used over the whole range that fits within the allowable error limit. For the next interval, beginning where the initial allowable error limit was exceeded, a new capacity equation (integrated from the basic area equation over that interval) began testing the fit until the limit was exceeded. Thus, the capacity curve was defined by a series of curves or splines, each falling within a specific elevation interval as constrained by the limiting error. The final area equations were subsequently derived by differentiation of the capacity equations. Capacity equations are of second order polynomial form:

$$y = a_1 + a_2x + a_3x^2$$

where:

y = capacity
x = elevation above an elevation base
a_1 = intercept, and
a_2 and a_3 = coefficients

Results of the 1979 area and capacity computations are listed in columns (4) and (5) of table 2. Listed in columns (2) and (3) of this table are the original (1949) area and capacity values. A special set of area-capacity tables has been published separately [4] for the 0.01-, 0.10-, and 1-foot elevation increments. Both the original and 1979 area-capacity curves are plotted on figure 81. At normal water surface elevation 3187.2, the 1979 capacity is 130,768 acre-feet and the surface area is 4,612 acres.

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Table 1. - Sediment distribution computations

ANGOSTURA RESERVOIR -- CHEYENNE RIVER -- TYPE I
RESERVOIR SEDIMENT DEPOSITION STUDY
EMPIRICAL AREA REDUCTION METHOD
SEDIMENT INFLOW 29151.AF RESERVOIR TYPE 1

	O R I G I N A L		RELATIVE		S E D I M E N T		R E V I S E D	
ELEV (FT)	AREA (AC)	CAPACITY (AF)	DEPTH	AREA	AREA (AC)	VOLUME (AF)	AREA (AC)	CAPACITY (FT)
3187.2	4841.0	159919.	1.000	0.000	0.0	29151.	4841.0	130768.
3185.0	4650.0	149471.	.982	1.149	275.3	28848.	4374.7	120623.
3180.0	4210.0	127307.	.941	1.628	389.9	27185.	3820.1	100122.
3175.0	3720.0	107474.	.900	1.812	434.2	25125.	3285.8	82349.
3170.0	3245.0	90082.	.859	1.882	450.9	22912.	2794.1	67170.
3165.0	2860.0	74845.	.818	1.885	451.6	20656.	2408.4	54189.
3160.0	2520.0	61401.	.777	1.844	441.9	18422.	2078.1	42979.
3155.0	2170.0	49677.	.736	1.773	424.9	16255.	1745.1	33422.
3150.0	1840.0	39669.	.696	1.680	402.6	14186.	1437.4	25483.
3145.0	1580.0	31118.	.655	1.572	376.6	12238.	1203.4	18880.
3140.0	1260.0	24030.	.614	1.452	348.0	10427.	912.0	13603.
3135.0	1065.0	18235.	.573	1.326	317.6	8763.	747.4	9472.
3130.0	835.0	13482.	.532	1.194	286.2	7253.	548.8	6229.
3125.0	630.0	9825.	.491	1.062	254.3	5902.	375.7	3923.
3120.0	441.0	7167.	.450	.929	222.6	4710.	218.4	2457.
3115.0	340.0	5236.	.409	.799	191.5	3674.	148.5	1562.
3110.0	266.0	3725.	.368	.674	161.5	2792.	104.5	933.
3105.0	193.0	2583.	.327	.554	132.8	2056.	60.2	527.
3100.0	152.0	1723.	.286	.442	106.0	1459.	46.0	264.
3095.0	99.0	1097.	.245	.339	81.3	991.	17.7	106.
3090.0	77.0	659.	.205	.247	62.5	632.	14.5	27.
3086.0	46.0	416.	.172	.182	46.0	416.	0.0	0.
3085.0	38.0	373.	.164	.166	38.0	373.	0.0	0.
3080.0	22.0	230.	.123	.099	22.0	230.	0.0	0.
3075.0	18.0	128.	.082	.048	18.0	128.	0.0	0.
3070.0	16.0	42.	.041	.013	16.0	42.	0.0	0.
3065.0	0.0	0.	0.000	0.000	0.0	0.	0.0	0.

Table 2. - Summary of 1979 survey results and sediment distribution computations

(1) Elevation (ft)	(2) 1949 area (acres)	(3) 1949 capacity (acre-ft)	(4) 1979 area (acres)	(5) 1979 capacity (acre-ft)	(6) Measured sediment volume (acre-ft)	(7) Percent of measured sediment	(8) 1979 computed capacity (acre-ft)	(9) Computed sediment volume (acre-ft)	(10) Percent of computed sediment
3187.2	4,841	159,919	4,612	130,768	29,151	100.0	130,768	29,151	100.0
3185	4,650	149,471	4,340	130,920	28,551	97.9	120,623	28,848	99.0
3180	4,210	127,307	3,861	100,417	26,890	92.2	100,122	27,185	93.3
3175	3,720	107,474	3,317	82,472	25,002	85.8	82,349	25,125	86.2
3170	3,245	90,082	2,892	66,950	23,132	79.4	67,170	22,912	78.6
3165	2,860	74,845	2,556	53,330	21,515	73.8	54,189	20,656	70.9
3160	2,520	61,401	2,288	41,220	20,181	69.2	42,979	18,422	63.2
3155	2,170	49,677	1,998	30,505	19,172	65.8	33,422	16,255	55.8
3150	1,840	39,669	1,517	21,717	17,952	61.6	25,483	14,186	48.7
3145	1,580	31,118	1,275	14,737	16,381	56.2	18,880	12,238	42.0
3140	1,260	24,030	1,074	8,865	15,165	52.0	13,603	10,427	35.8
3135	1,065	18,235	889	3,957	14,278	49.0	9,472	8,763	30.1
3130	835	13,482	275	1,047	12,435	42.7	6,229	7,253	24.9
3125	630	9,825	69	187	9,638	33.1	3,923	5,902	20.2
3120	441	7,167	3	7	7,160	24.6	2,457	4,710	16.2
3115	340	5,236	0	0	5,236	18.0	1,562	3,674	12.6
3110	266	3,725			3,725	12.8	933	2,792	9.6
3105	193	2,583			2,583	8.9	527	2,056	7.1
3100	152	1,723			1,723	5.9	264	1,459	5.0
3095	99	1,097			1,097	3.8	106	991	3.4
3090	77	659			659	2.3	27	632	2.2
3086	46	416			416	1.4	0	416	1.4
3085	38	373			373	1.3	0	373	1.3
3080	22	230			230	0.8	0	230	0.8
3075	18	128			128	0.4	0	128	0.4
3070	16	42			42	0.1	0	42	0.1
3065	0	0			0	0	0	0	0

Explanation of columns:
(1) Elevation of reservoir water surface.
(2) Original reservoir surface area surveyed in 1949.
(3) Original reservoir capacity from 1949 survey.
(4) Reservoir surface area surveyed in 1979.
(5) Reservoir capacity from 1979 survey.
(6) Measured sediment volume equals column (3) minus column (5).
(7) Measured sediment expressed in percent of total sediment (25,151 acre-feet).
(8) Computed 1979 reservoir capacity using Empiricl Area-Reduction Method [1].
(9) Computed sediment volumne for period 1949-1979 equals column (3) minus column (8).
(10) Computed sediment expressed in percent of total measured sediment (29,151 acre-feet).

Table 3. - Reservoir sediment data summary

ANGOSTURA

NAME OF RESERVOIR

DAM	1. OWNER Dept. of Int. - USBR	2. STREAM Cheyenne River	3. STATE South Dakota
	4. SEC. 20 TWP. 8S RANGE 6E	5. NEAREST P.O. Hot Springs	6. COUNTY Fall River
	7. LAT 43° 20' 35" LONG 103° 26' 16"	8. TOP OF DAM ELEVATION 3199.0	9. SPILLWAY CREST ELEV. 3157.2

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					10/3/49
	b. MULTIPLE USE					
	c. POWER					
	d. WATER SUPPLY					16. DATE NORMAL OPER. BEGAN
	e. IRRIGATION					
	f. CONSERVATION	3187.2	4841	90,655	159,919	1949
	g. INACTIVE	3163.0	2722	45,544	69,264	
	17. LENGTH OF RESERVOIR 17.0 3/ MILES			AV. WIDTH OF RESERVOIR 0.44 MILES		

WATERSHED	18. TOTAL DRAINAGE AREA 9100 SQ. MI.		22. MEAN ANNUAL PRECIPITATION 17.5 INCHES
	19. NET SEDIMENT CONTRIBUTING AREA 9093 SQ. MI.		23. MEAN ANNUAL RUNOFF 0.18 (27) INCHES
	20. LENGTH 184 MILES	AV. WIDTH 49.5 MILES	24. MEAN ANNUAL RUNOFF 88690 4/ (27) AC.-FT.
	21. MAX. ELEV. 7165	MIN. ELEV. 3065	25. ANNUAL TEMP MEAN 48° F RANGE

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.
10/3/49	0	0	Contour (D)	5 ft.	4841	159,919	0.866
9/22/65	16	16	Range (D)	39	4706	138,761	0.752
5/4/79	13.6	29.6	Range (D)	45	4612	130,768	0.669

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET			36. WATER INFL. TO DATE, AC. FT.	
		a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE
9/22/65	6-19	96,500	328,300	1,544,020	96,500	1,544,020
5/4/79	6-19	91,270	282,218	1,185,689	94,128	2,729,709

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET			38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET		
	a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
9/22/65	21,158 (21,483)	1322 (1343)	0.145 (0.147)	21,158 (21,483)	1322 (1343)	0.145 (0.147)
5/4/79	7,993 (9,093)	588 (669)	0.065 (0.074)	29,151 (30,576)	985 (1033)	0.108 (0.114)

26. DATE OF SURVEY	39. AV. DRY WGT., LBS. PER CU. FT.	40. SED. DEP., TONS PER SQ. MI.-YR.		41. STORAGE LOSS, PCT.		42. SED. INFLOW, PPM	
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANN.	b. TOT. TO DATE	a. PERIOD	b. TOT. TO DATE
9/22/65	56.4	178 (181)	178 (181)	0.827 (0.617)	13.2 (9.87)	12,300 (12,500)	

Table 3. - Reservoir sediment data summary - Continued

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											

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													

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1966	3187.31	3182.58	58,124				
1967	3188.00	3181.54	170,347				
1968	3187.57	3180.80	67,106				
1969	3187.63	3181.51	85,434				
1970	3187.24	3176.88	23,959				
1971	3188.42	3176.78	181,239				
1972	3187.54	3178.54	44,287				
1973	3187.29	3178.99	66,862				
1974	3187.31	3174.84	37,604				
1975	3184.20	3174.63	42,077				
1976	3182.14	3174.60	38,446				
1977	3179.16	3169.20	25,584				
1978	3189.37	3170.27	282,118				

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
3115	0	0	3155	1998	30,505			
3120	3	7	3160	2288	41,220			
3125	69	187	3165	2556	53,330			
3130	275	1,047	3170	2892	66,950			
3135	889	3,957	3175	3317	82,472			
3140	1,074	8,865	3180	3861	100,417			
3145	1,275	14,737	3185	4340	120,920			
3150	1,517	21,717	3190	4959	144,167			

47. REMARKS AND REFERENCES

3/ At normal water surface elevation 3187.2.

4/ Net inflow - Evaporation has been included.

48. AGENCY MAKING SURVEY Bureau of Reclamation

49. AGENCY SUPPLYING DATA Bureau of Reclamation

50. DATE October 5, 1981

April 1966

Table 4. - Summary of sediment sample analyses for 1979 survey

Sample identification			Sample length (in)	Physical properties Percent				Unit weight (lb/ft^3)	Median diameter (mm)
Range No.	Range station	Sample No.		Clay	Silt	Sand	Gravel		
6	26+00	598A	48.5	78.0	20.7	1.1	0.2	30.1	0.0012
6	26+00	598A		78.0	20.7	1.1	0.2	35.6	0.0012
6	26+00	598A		36.0	51.9	11.8	0.3	56.1	0.0083
6A	14+10	594	18.75	12.0	40.0	47.7	0.6	72.0	0.053
6A	24+60	597A	57.25	83.0	16.3	0.6	0.1	29.4	<0.001
6A	24+60	597B		74.0	25.3	0.6	0.1	39.6	0.001
6A	24+60	597C		74.0	25.3	0.6	0.1	39.6	0.001
7	10+00	590A	43.75	74.0	24.6	1.2	0.2	37.1	0.0015
7	10+00	590B		70.0	24.3	5.4	0.3	37.5	0.0015
7	10+00	590C		72.0	13.5	14.1	0.4	58.7	0.001
7	10+00	590D		67.0	32.3	0.6	0.1	46.4	0.0015
7	19+75	596A	39	69.0	30.3	0.6	0.1	34.2	0.0014
7	19+75	596B		68.0	29.5	2.3	0.2	38.7	0.0015
7	19+75	596C		78.0	16.4	5.3	0.3	51.7	<0.001
7	19+75	596D		72.0	27.3	0.6	0.1	41.0	0.0011
8	7+43	588	25	77.0	22.3	0.6	0.1	41.7	0.001
8	1+00	600A	44.25	68.0	31.3	0.6	0.1	23.3	0.0016
8	1+00	600B		85.0	14.4	0.5	0.1	31.0	<0.001
8	1+00	600C		74.0	24.7	1.1	0.2	35.6	0.0012
9	10+84	591	16.25	53.0	45.6	1.2	0.2	75.5	0.0032
9	15+89	595A	43.25	72.0	21.2	6.5	0.3	38.9	0.0013
9	15+89	595B		74.0	23.5	2.2	0.3	56.7	0.0012
9	15+89	595C		76.0	23.3	0.6	0.1	47.3	0.0012
10	midchannel	599A	27.25	76.0	23.3	0.6	0.1	30.1	0.0012
10	midchannel	599B		76.0	23.3	0.6	0.1	35.3	0.0012
12	1+69	585	24.75	1.8	2.0	75.2	21.0	108.9	0.7
12	2+75	586A	14.5	2.8	4.0	92.8	0.4	101.1	0.2
12	2+75	586B		12.0	35.0	52.7	0.3	82.5	0.074
12	3+02	587	15.75	8.4	39.6	51.8	0.2	85.6	0.068
14	8+54	589	20	0.9	2.8	77.3	19.0	112.6	0.8
40	12+80	593A	17	55.0	43.6	1.2	0.2	38.6	0.0032
40	12+80	593B		64.0	34.6	1.2	0.2	71.3	0.002
42	12+50	592	10.5	37.0	31.0	31.5	0.5	46.3	0.013

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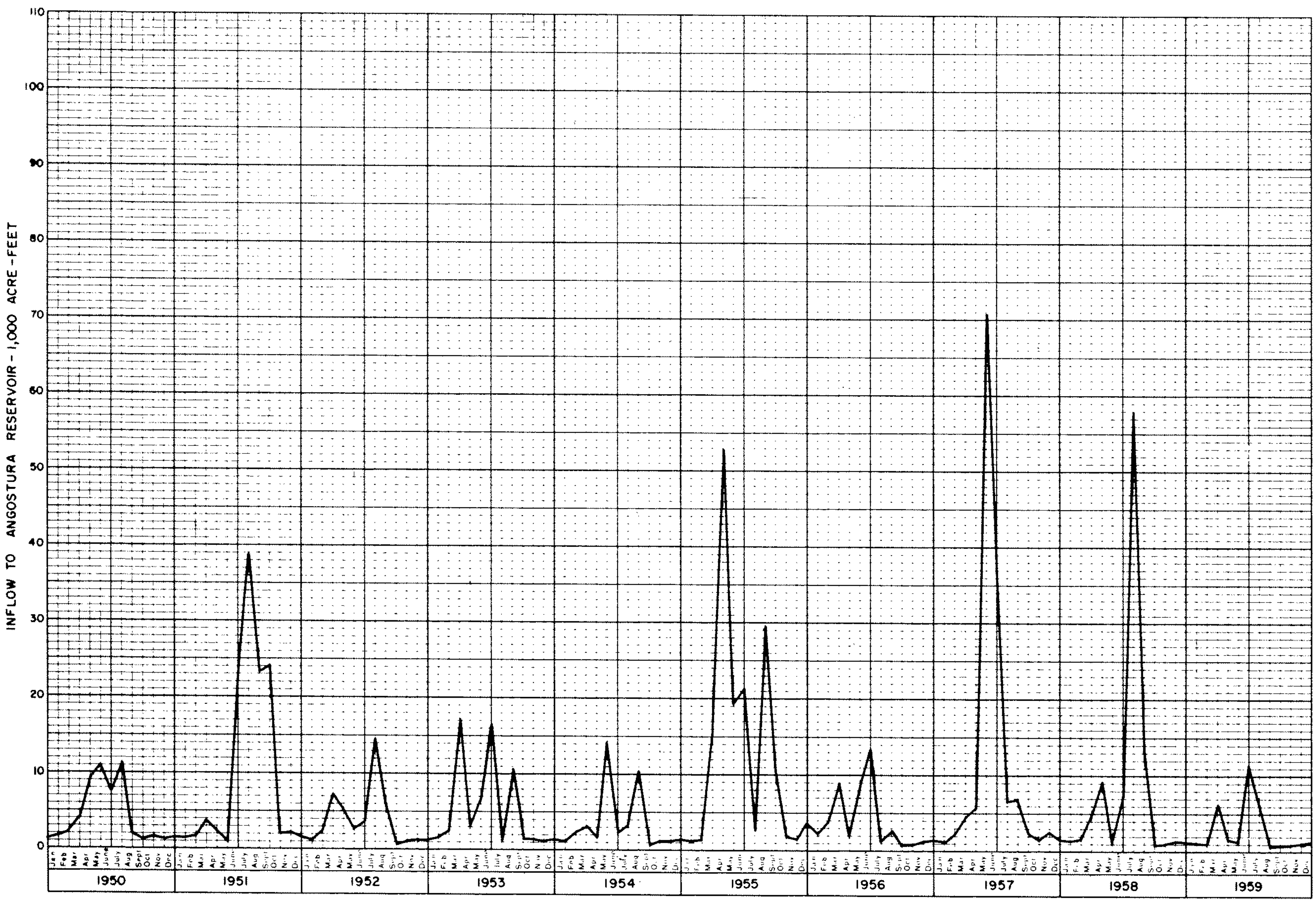

Figure 2. - Monthly inflow to Angostura Reservoir - Sheet 1 of 3.

Figure 2. - Monthly inflow to Angostura Reservoir - Sheet 2 of 3.

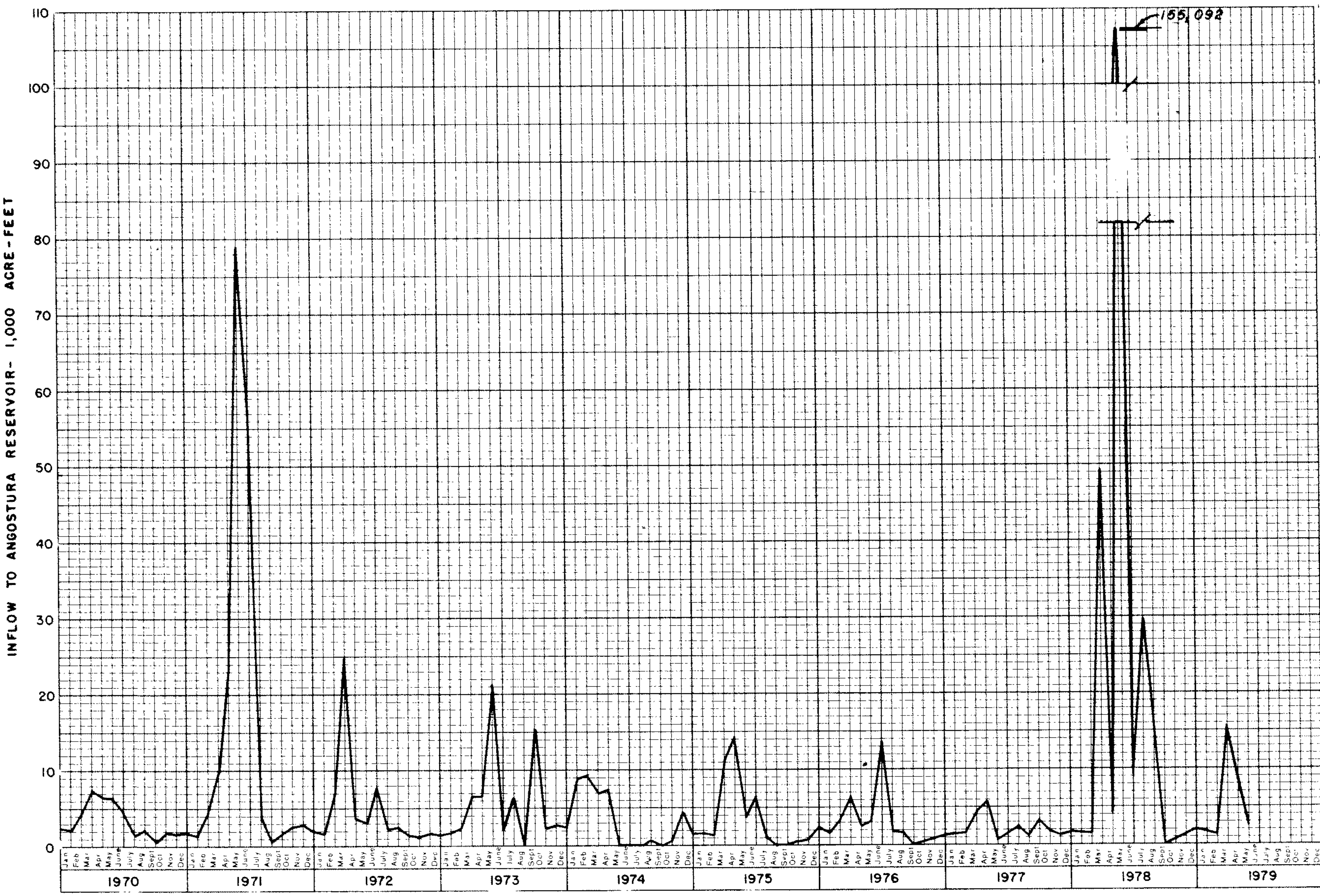

Figure 2. - Monthly inflow to Angostura Reservoir - Sheet 3 of 3.

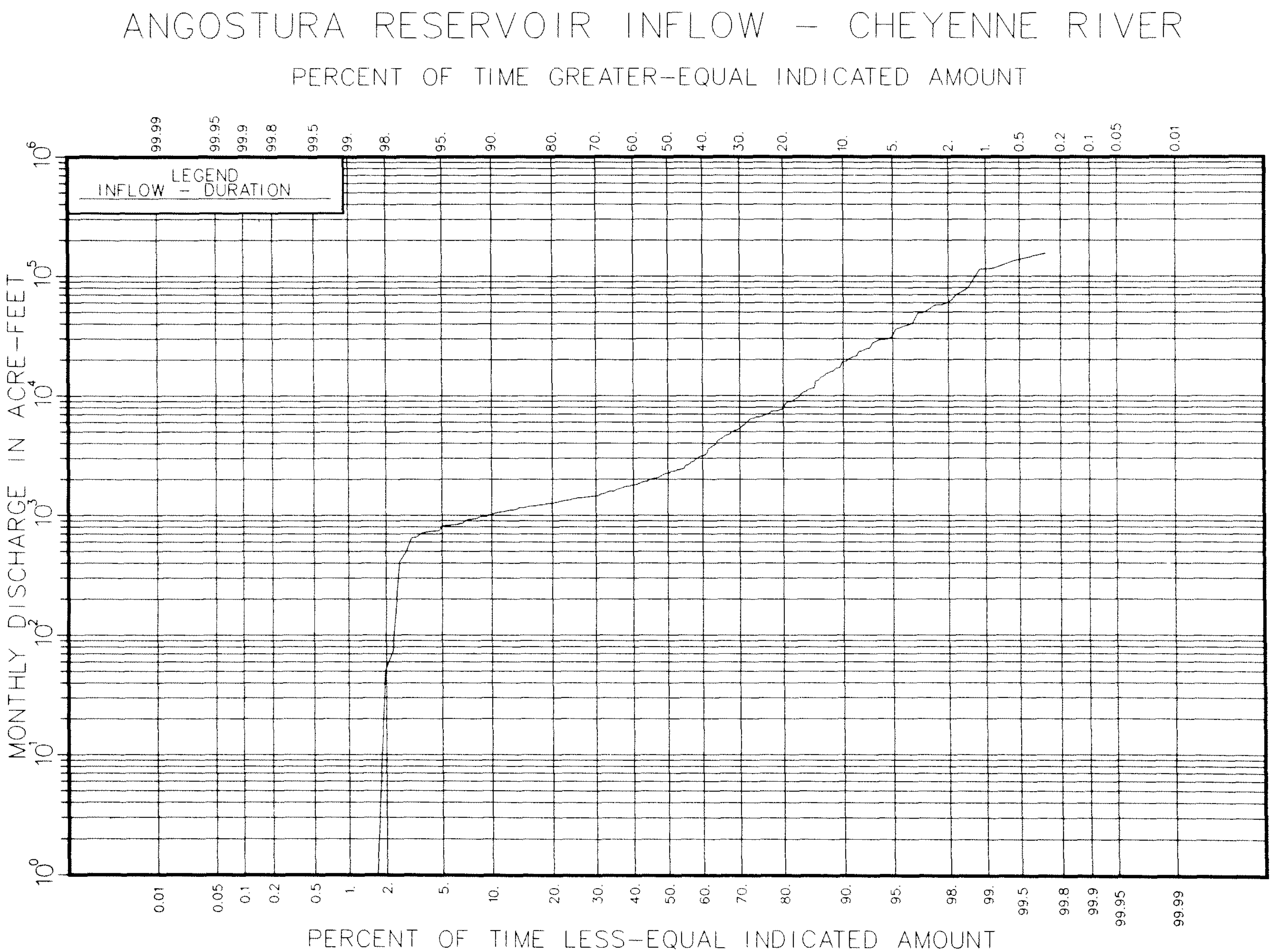

Figure 3. - Inflow-duration curve for monthly inflow discharges.

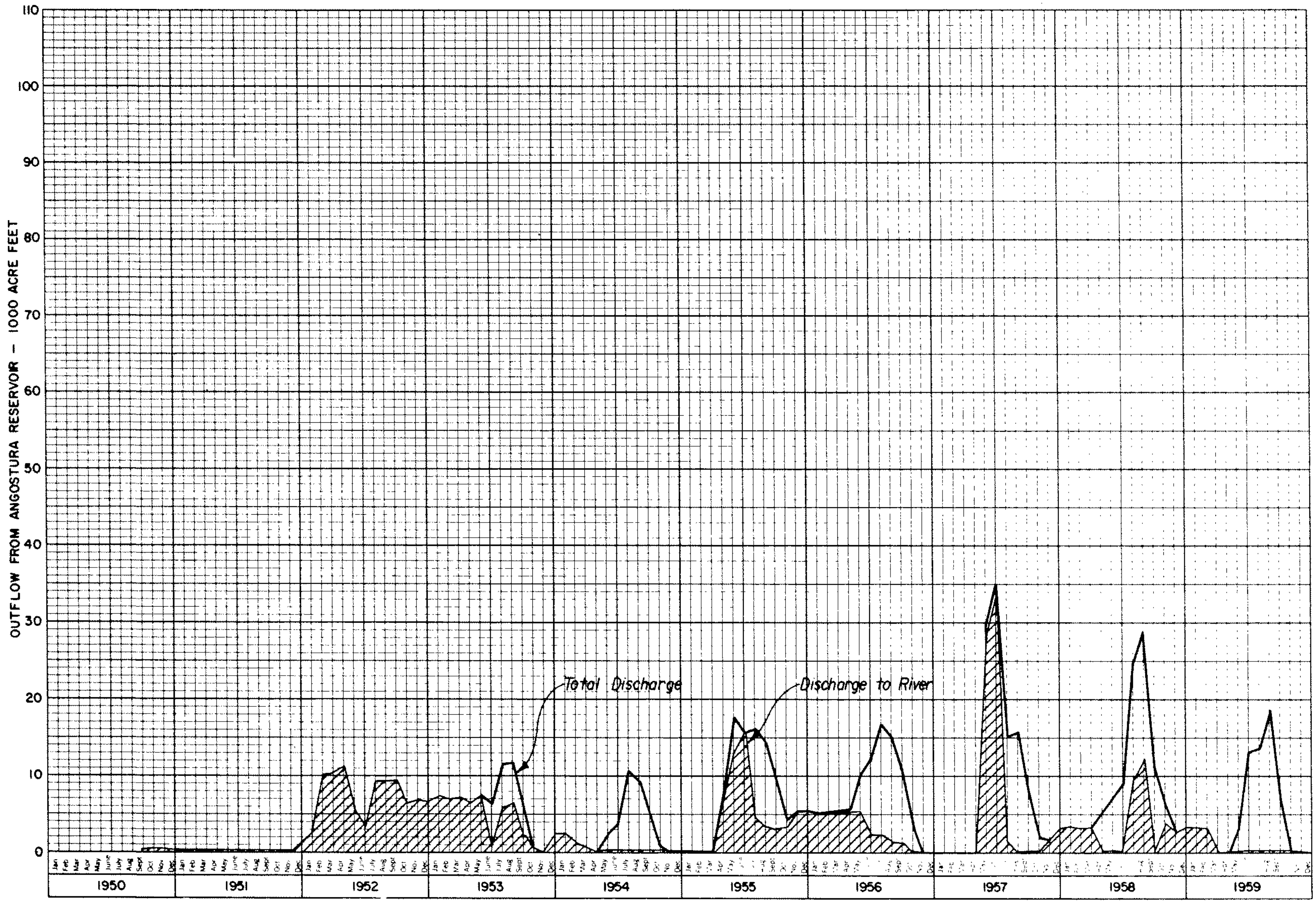

Figure 4. - Monthly outflow from Angostura Reservoir - Sheet 1 of 3.

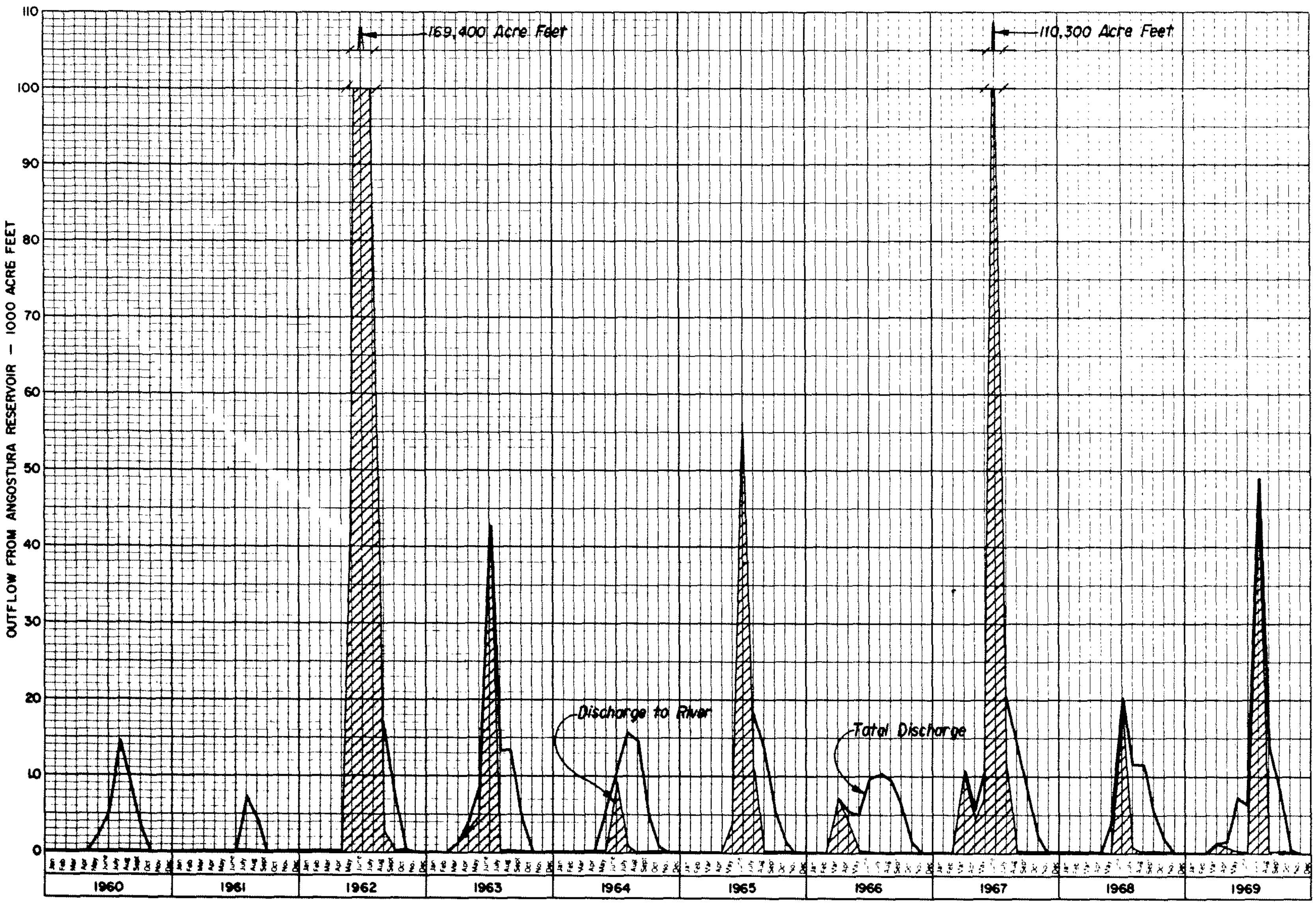

Figure 4. - Monthly outflow from Angostura Reservoir - Sheet 2 of 3.

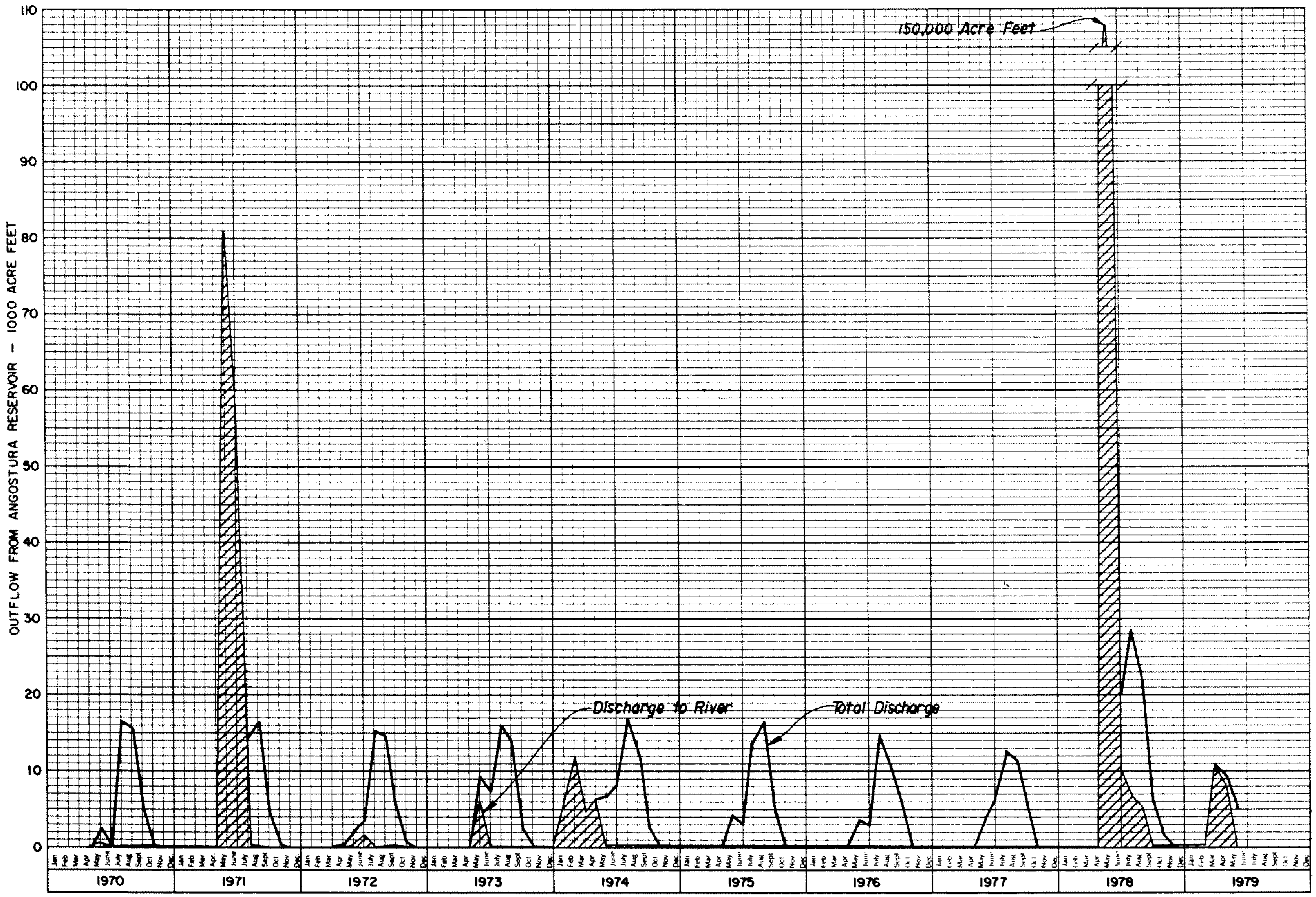

Figure 4. - Monthly outflow from Angostura Reservoir - Sheet 3 of 3.

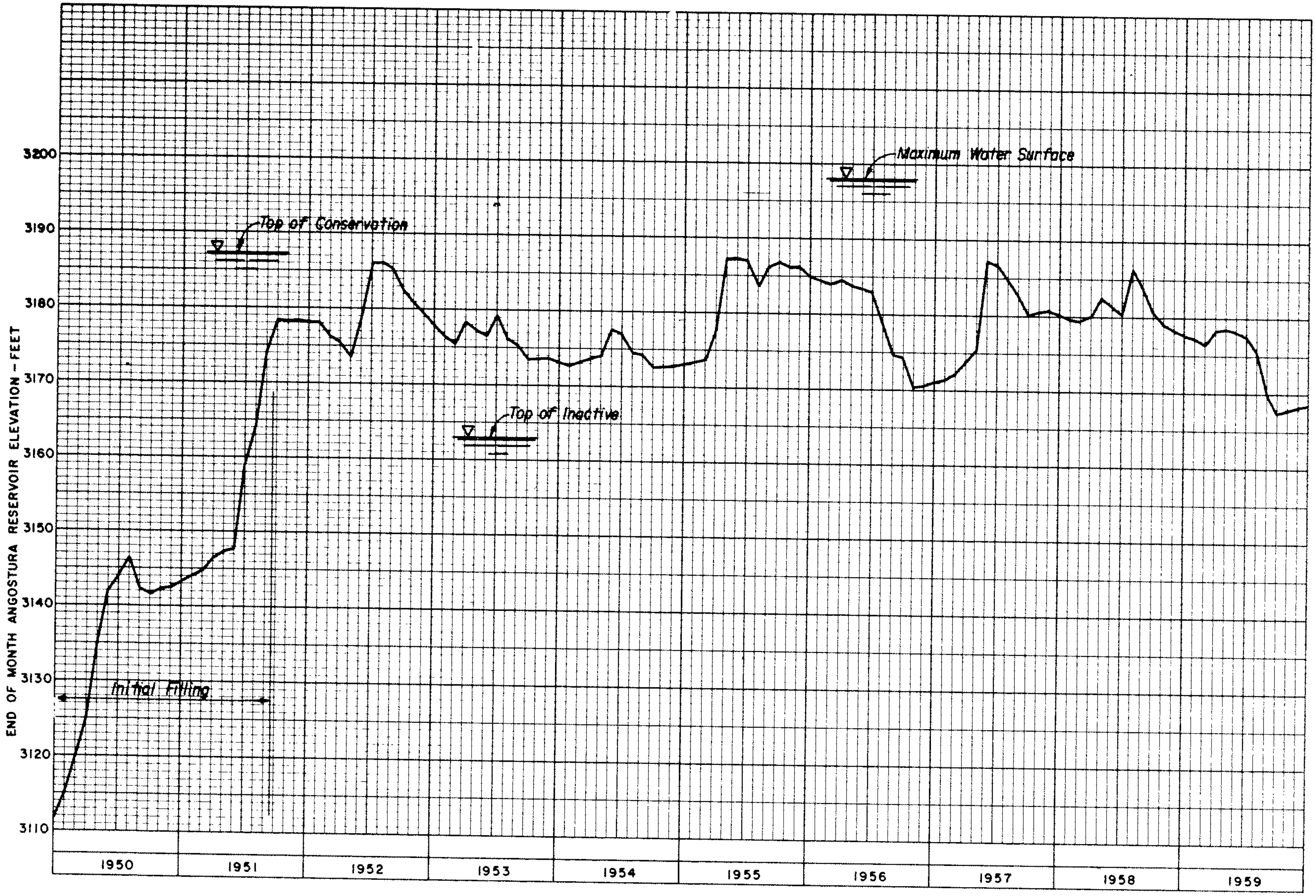

Figure 5. - End-of-month Angostura Reservoir elevation - Sheet 1 of 3.

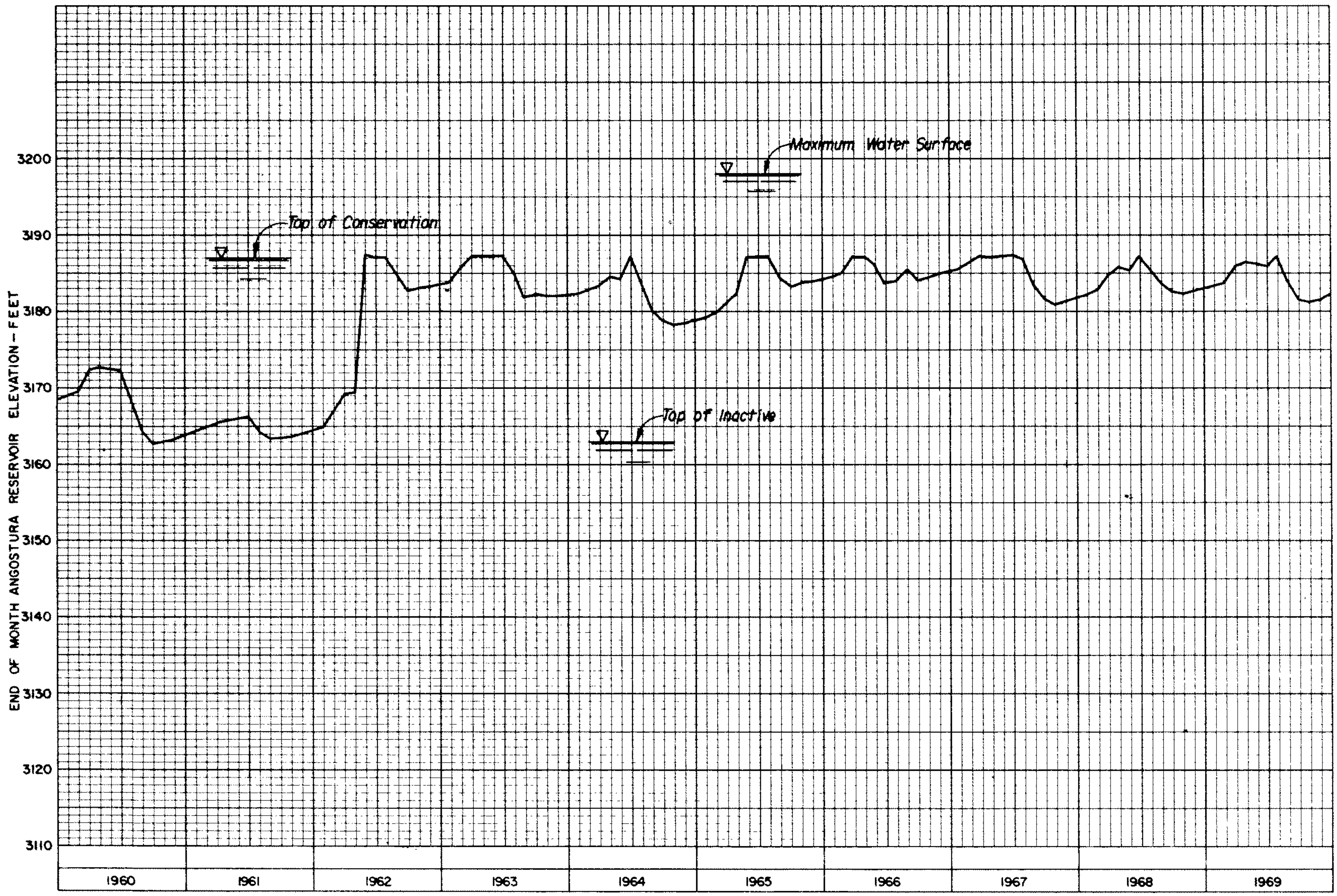

Figure 5. - End-of-month Angostura Reservoir elevation - Sheet 2 of 3.

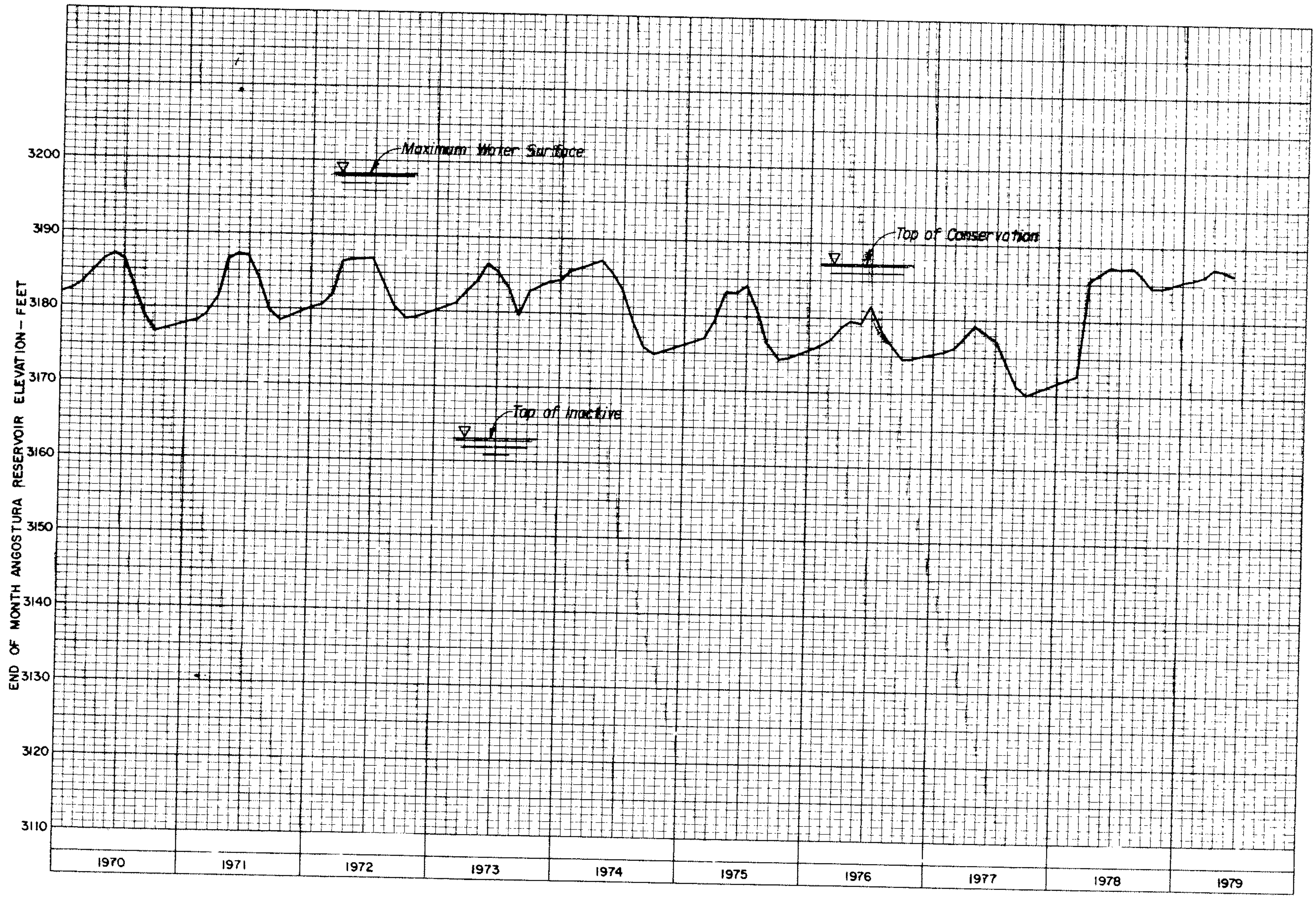

Figure 5. - End-of-month Angostura Reservoir elevation - Sheet 3 of 3.

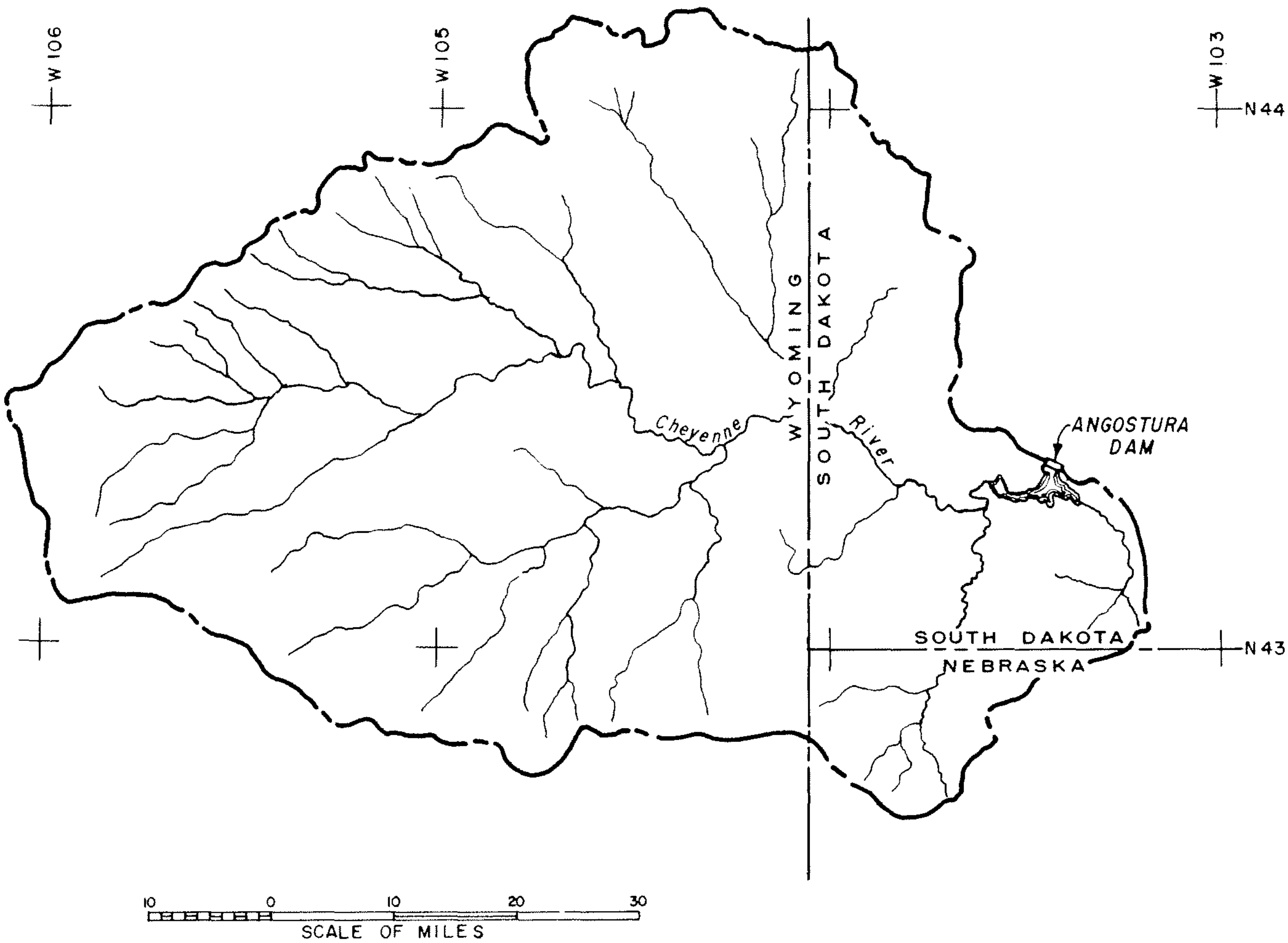

Figure 6. - Reservoir drainage area.

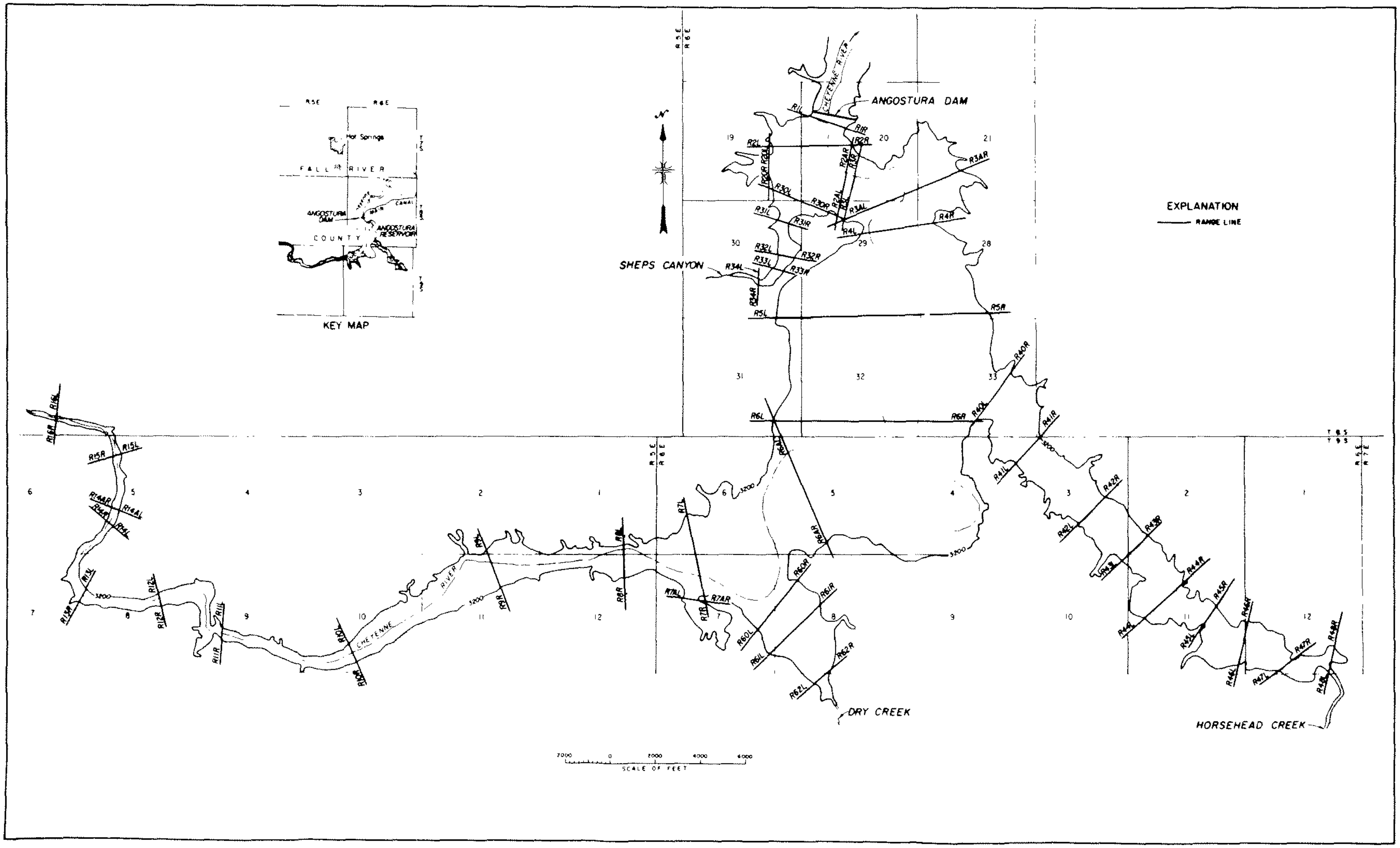

Figure 7. - Layout of reservoir sedimentation ranges.

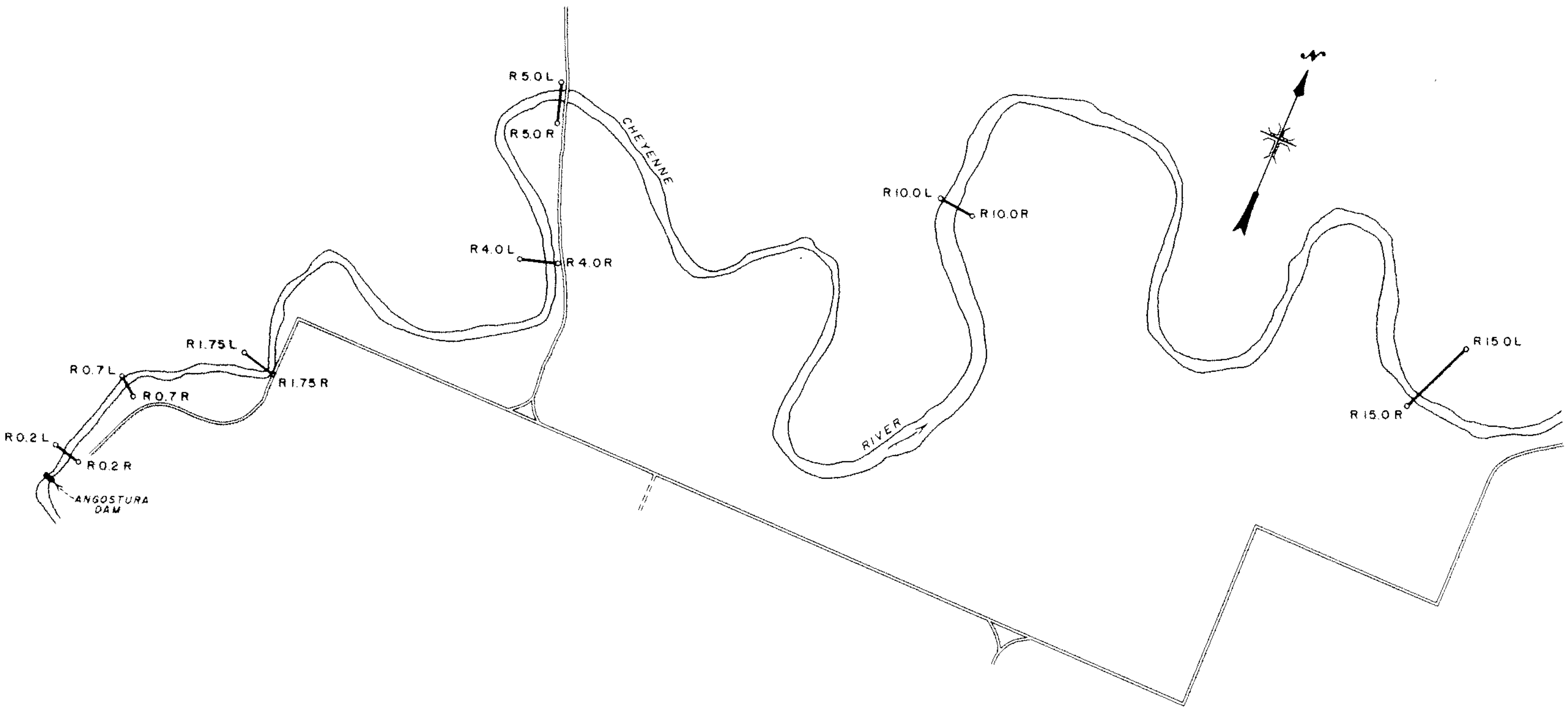

Figure 8. - Layout of degradation ranges.

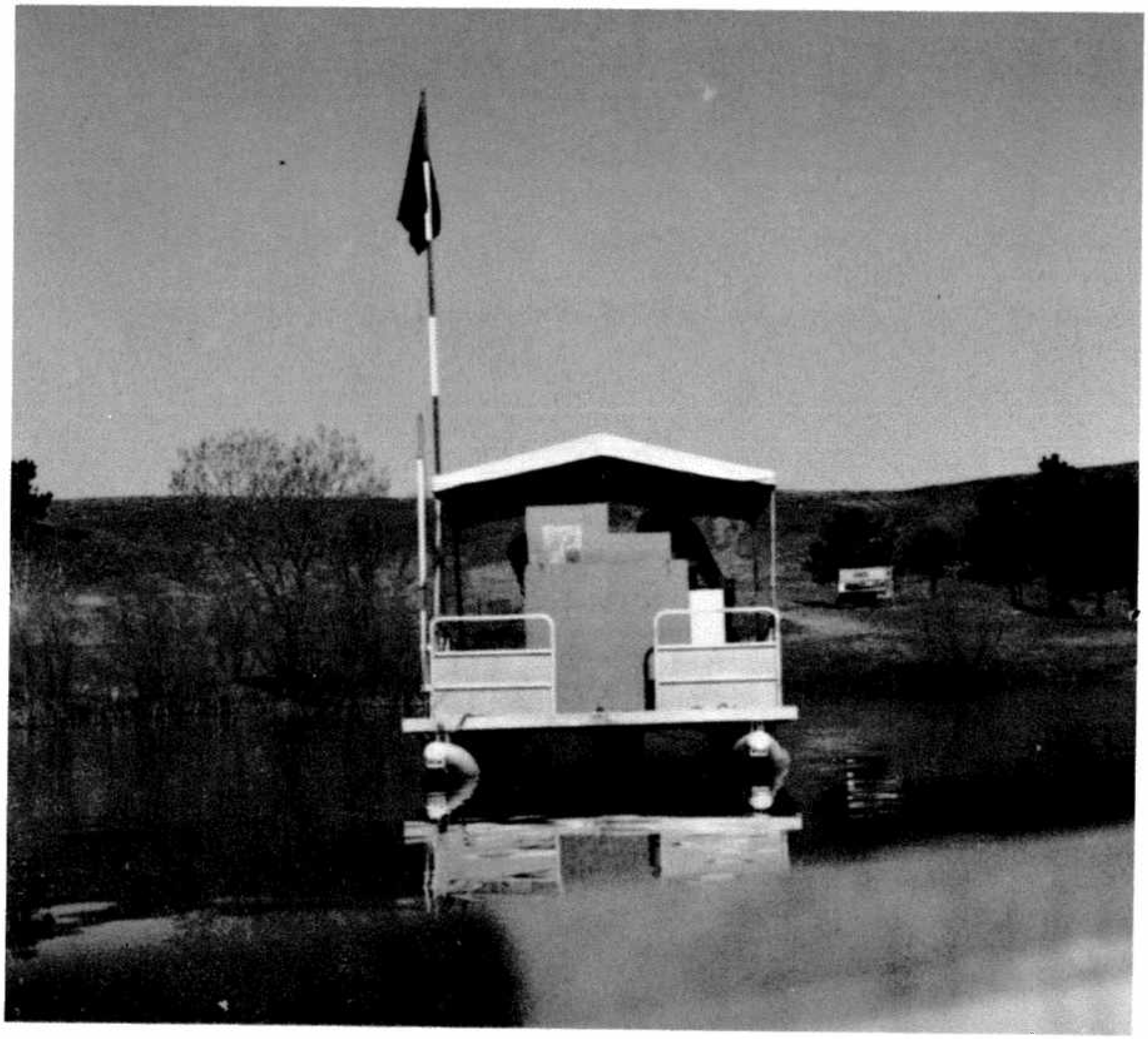

Figure 9. - Sounding boat for hydrographic survey.

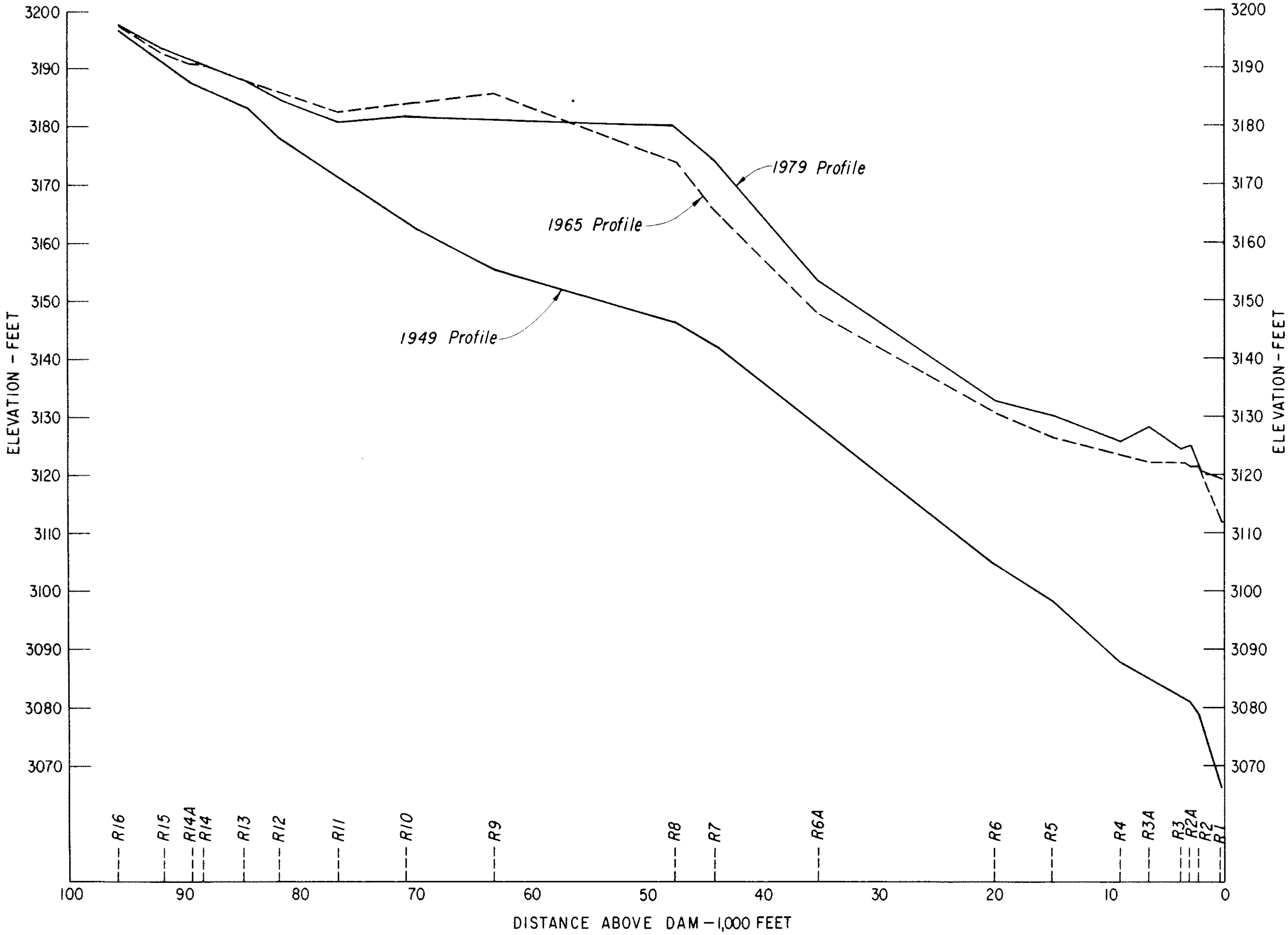

Figure 10. - Longitudinal profiles for Cheyenne River.

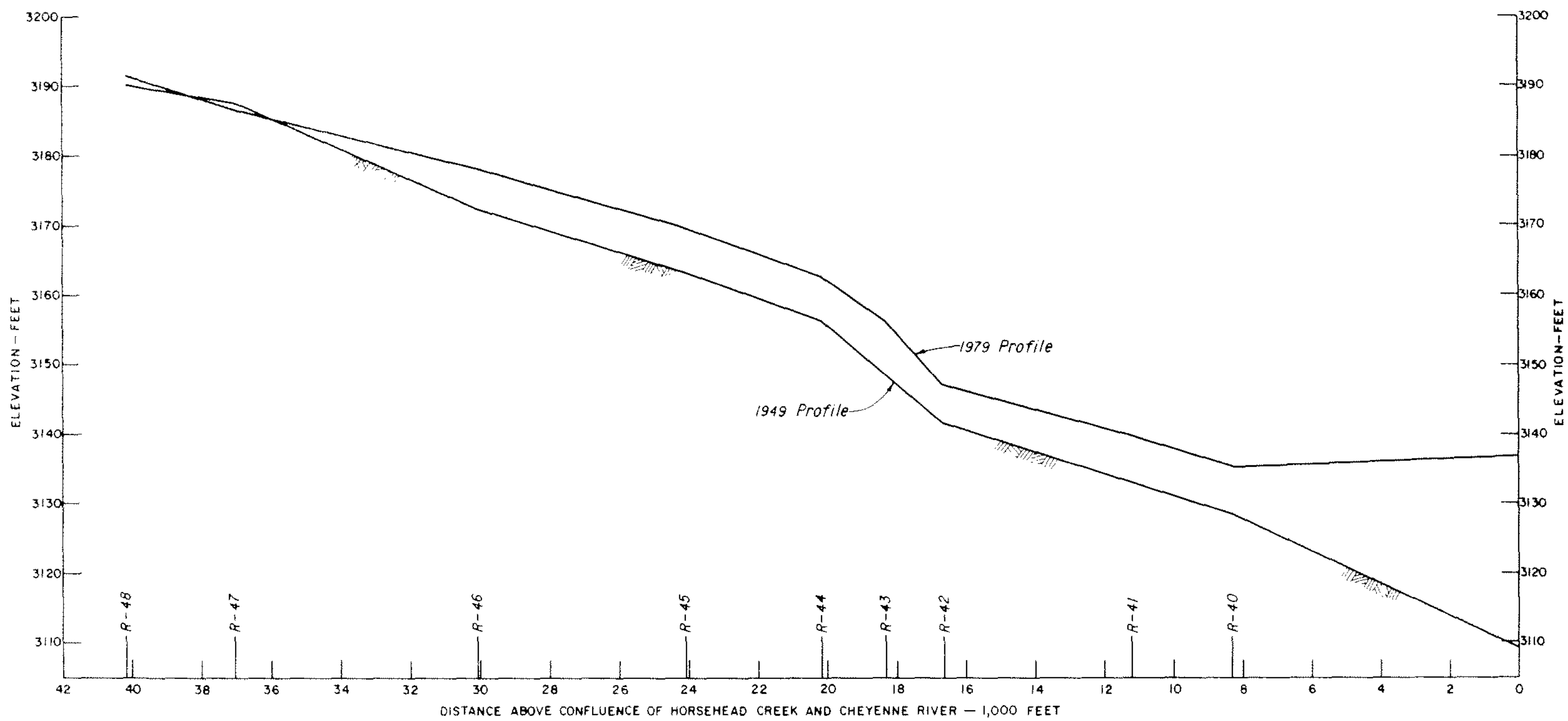

Figure 11. - Longitudinal profiles for Horsehead Creek.

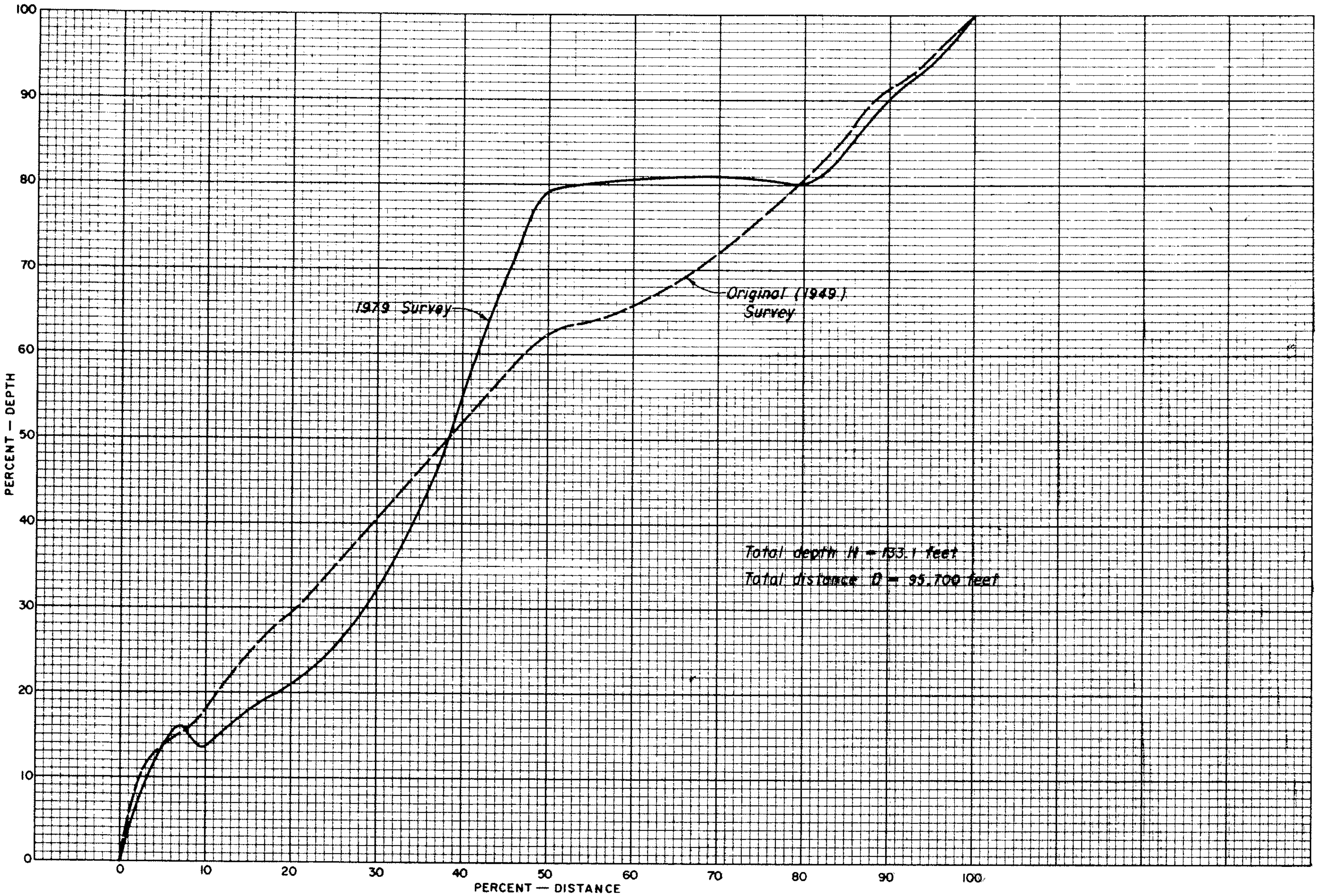

Figure 12. - Percent depth-percent distance relationship for Cheyenne River above Angostura Dam.

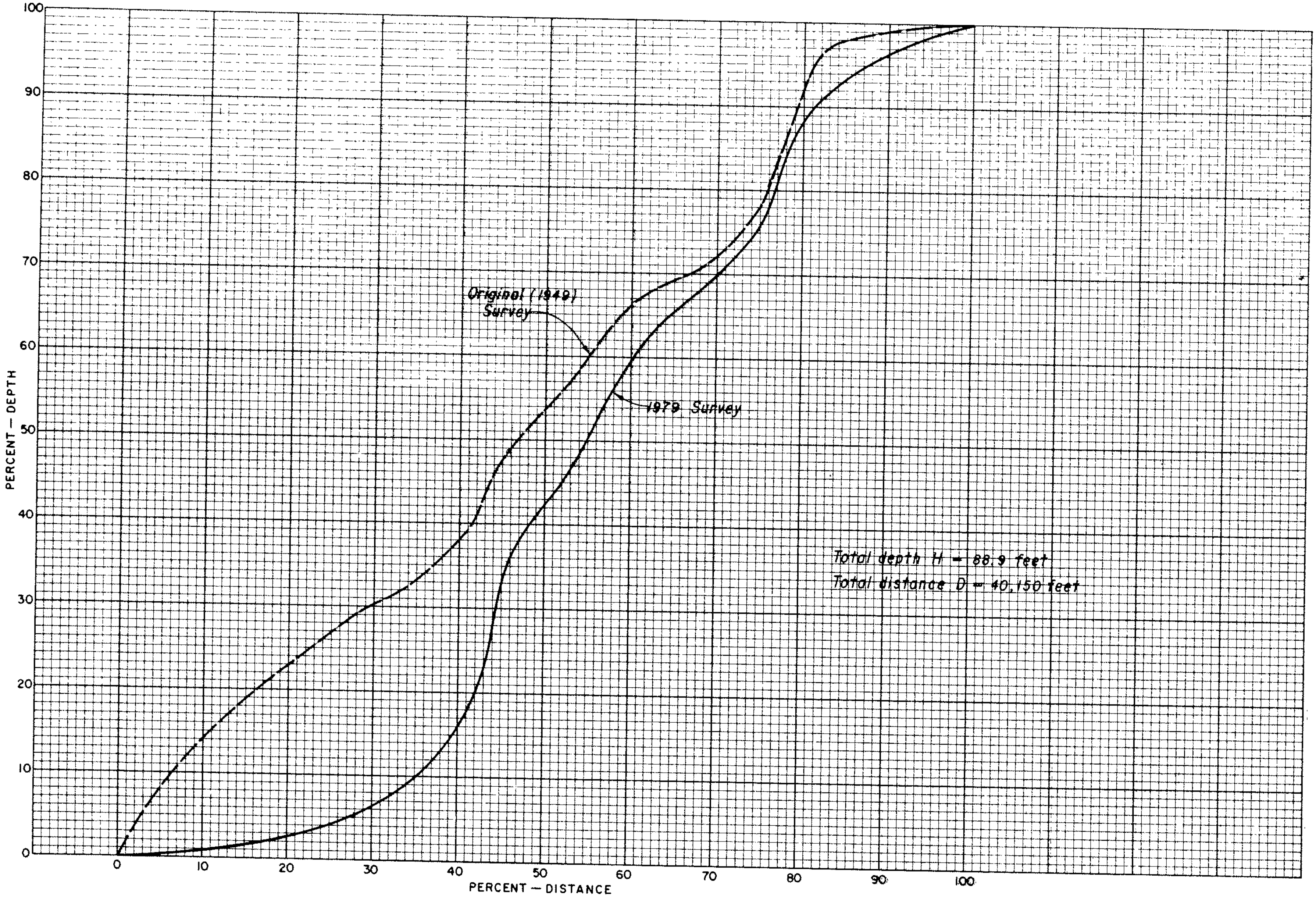

Figure 13. - Percent depth-percent distance for Horsehead Creek above confluence of Cheyenne River and Horsehead Creek.

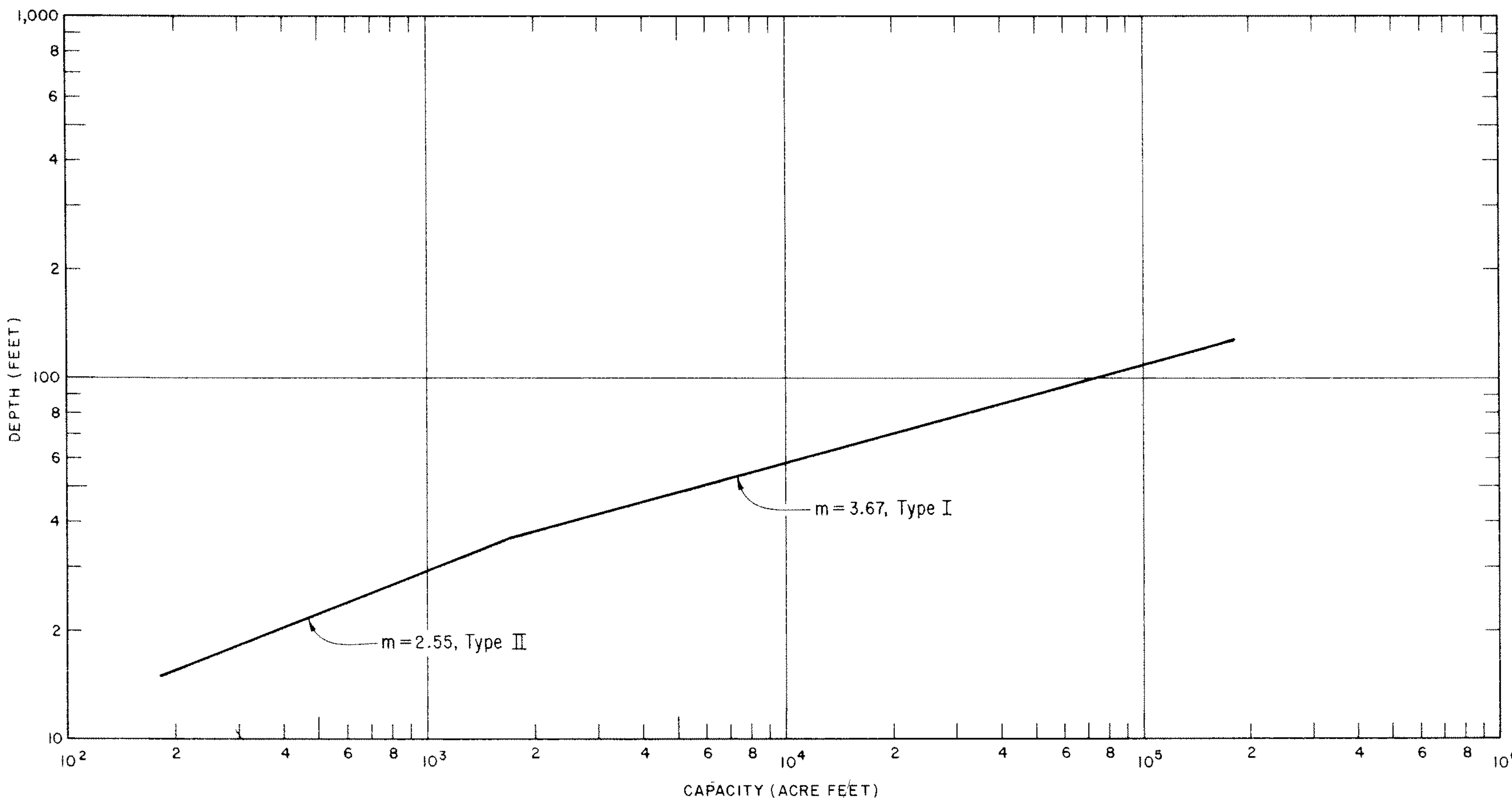

Figure 14. - Depth-capacity relationship.

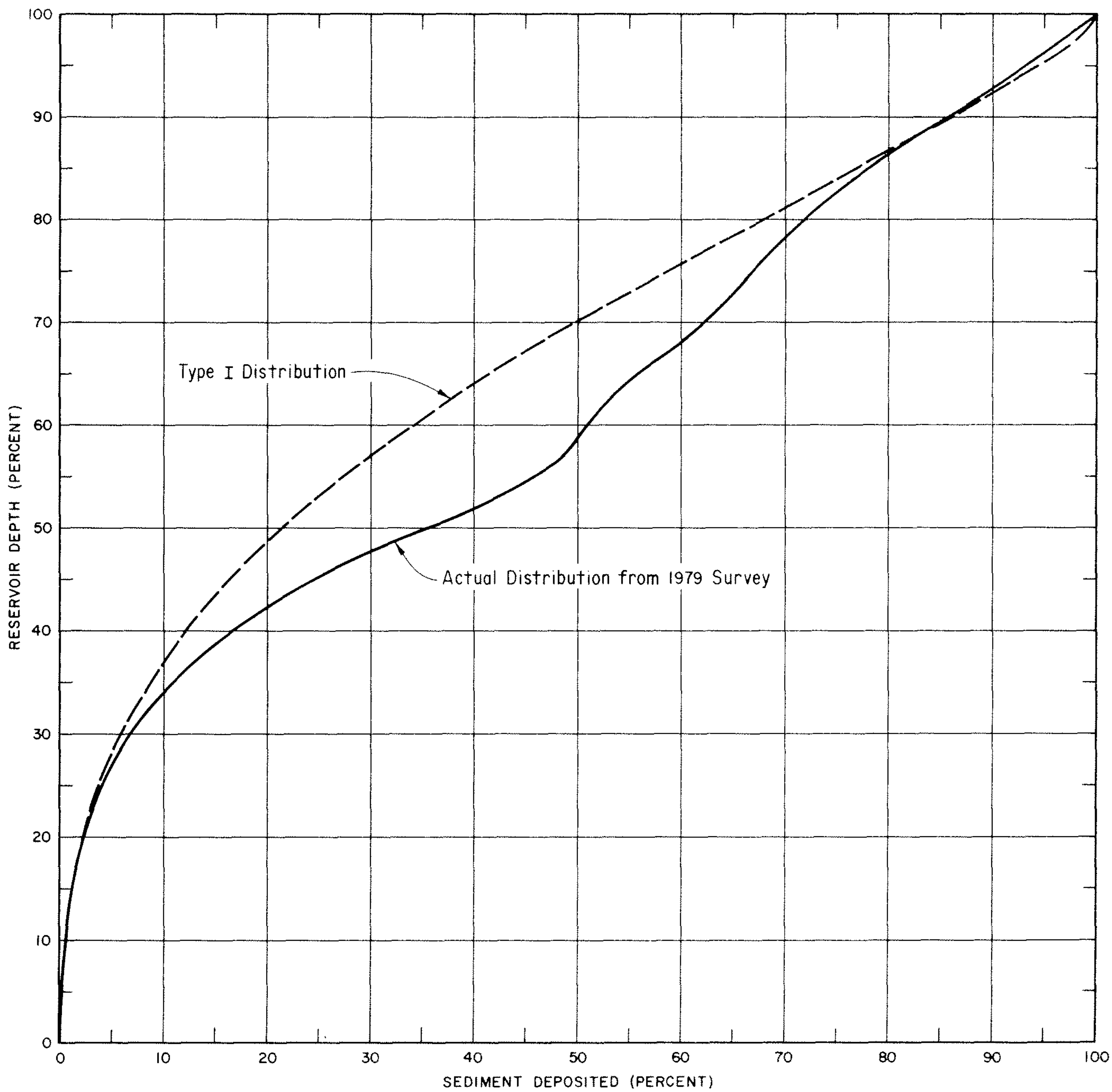

Figure 15. - Sediment distribution curves.

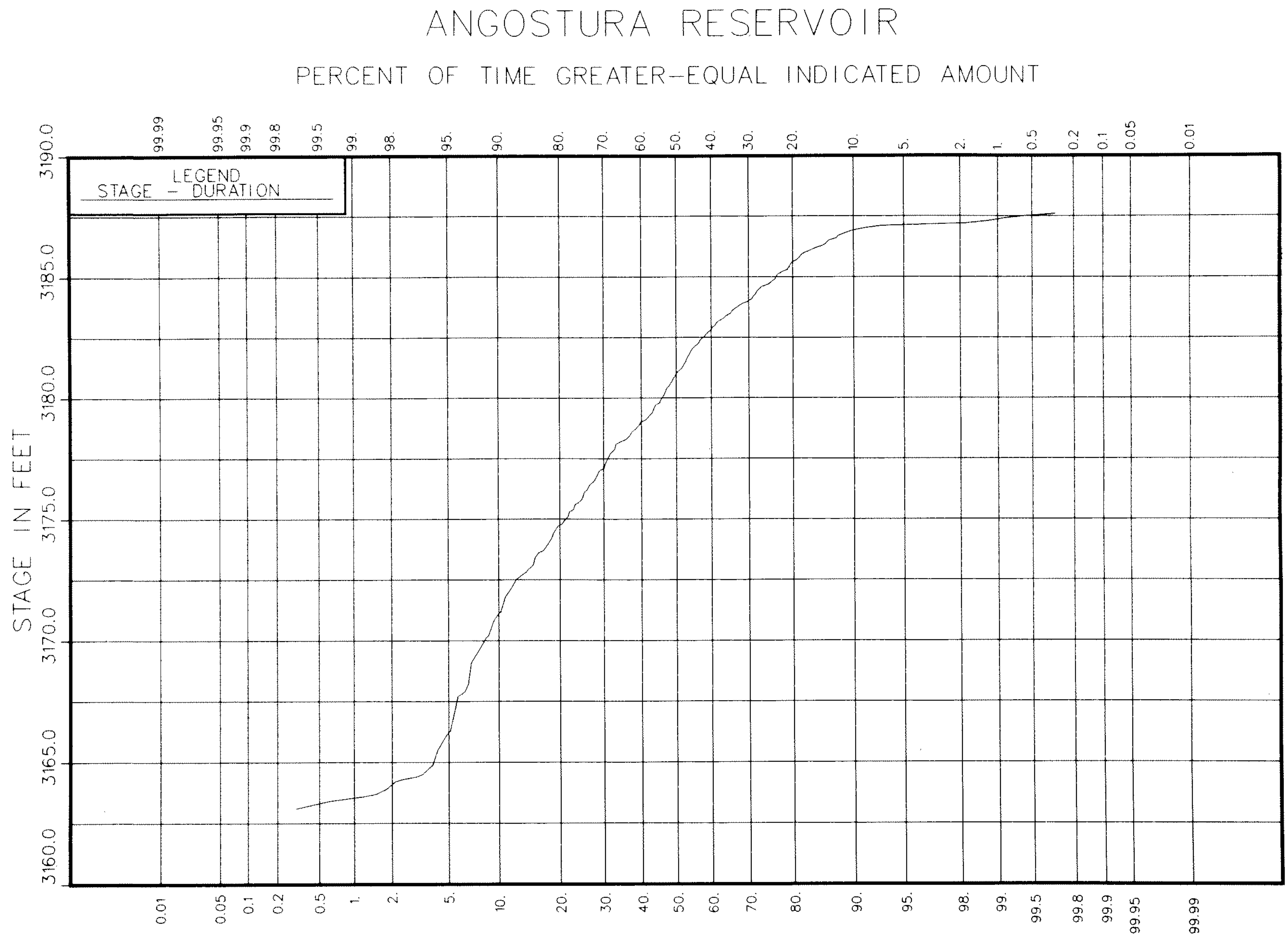

Figure 16. - Stage-duration curve for end-of-month elevations.

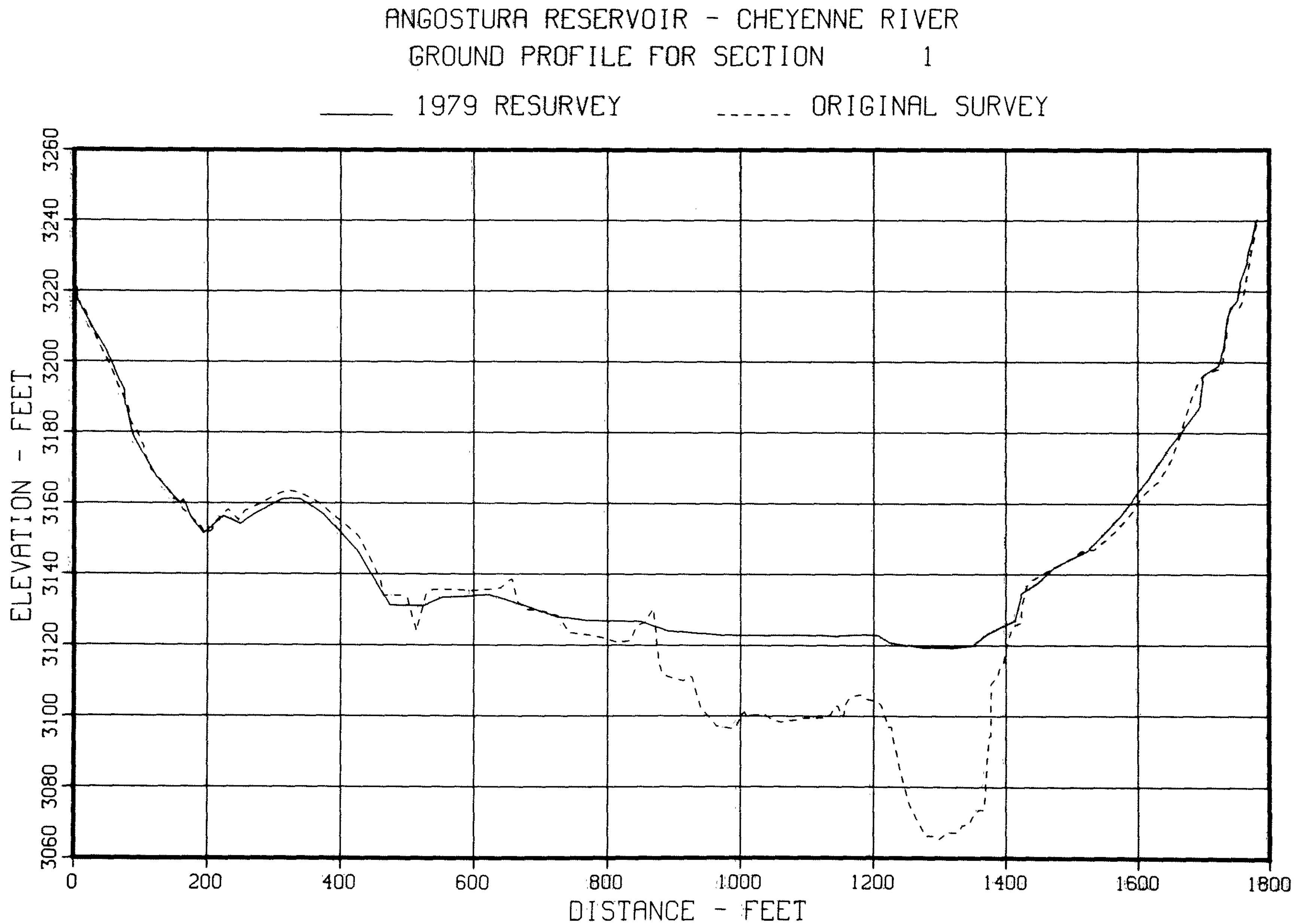

Figure 17. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 1.

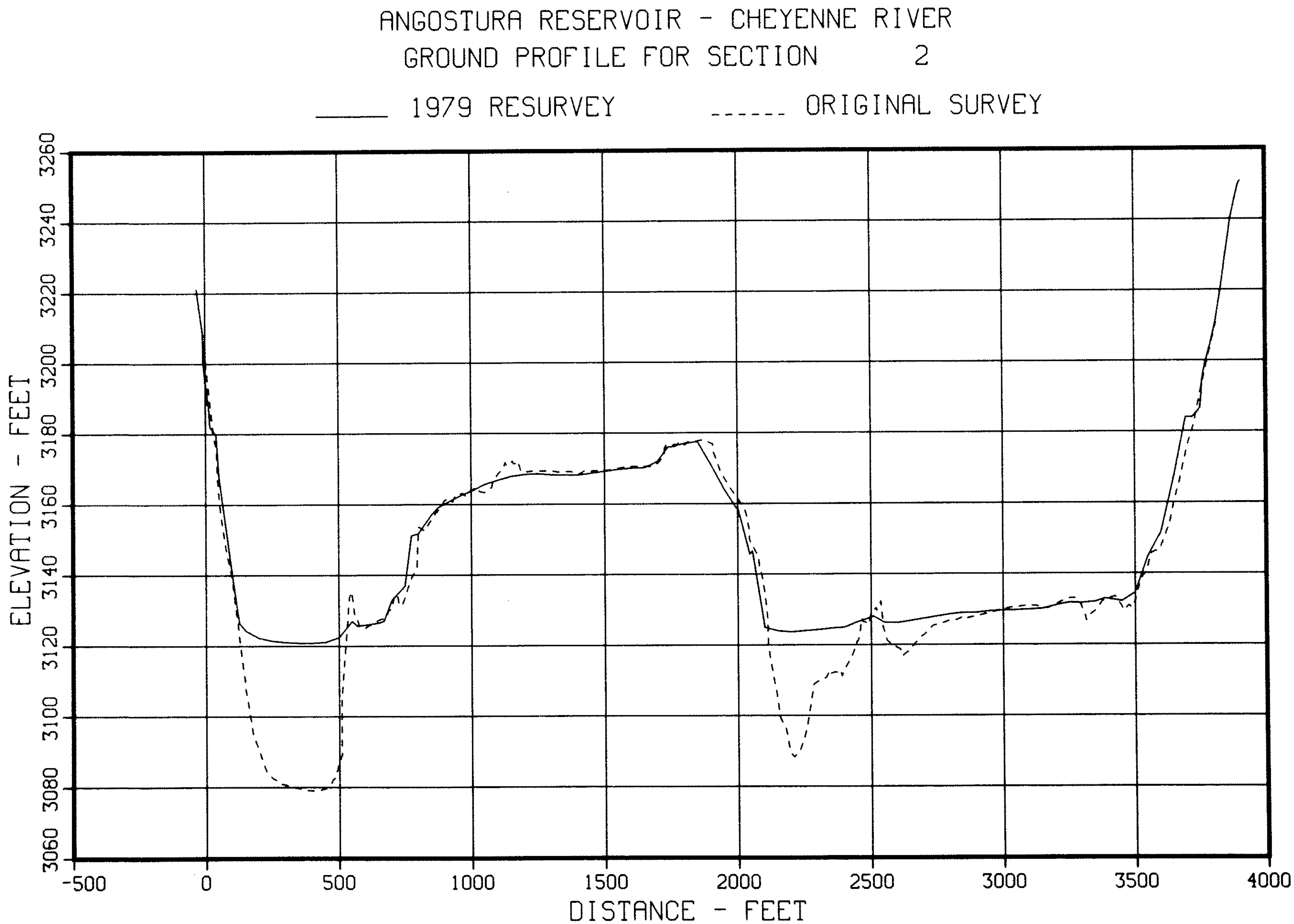

Figure 18. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 2.

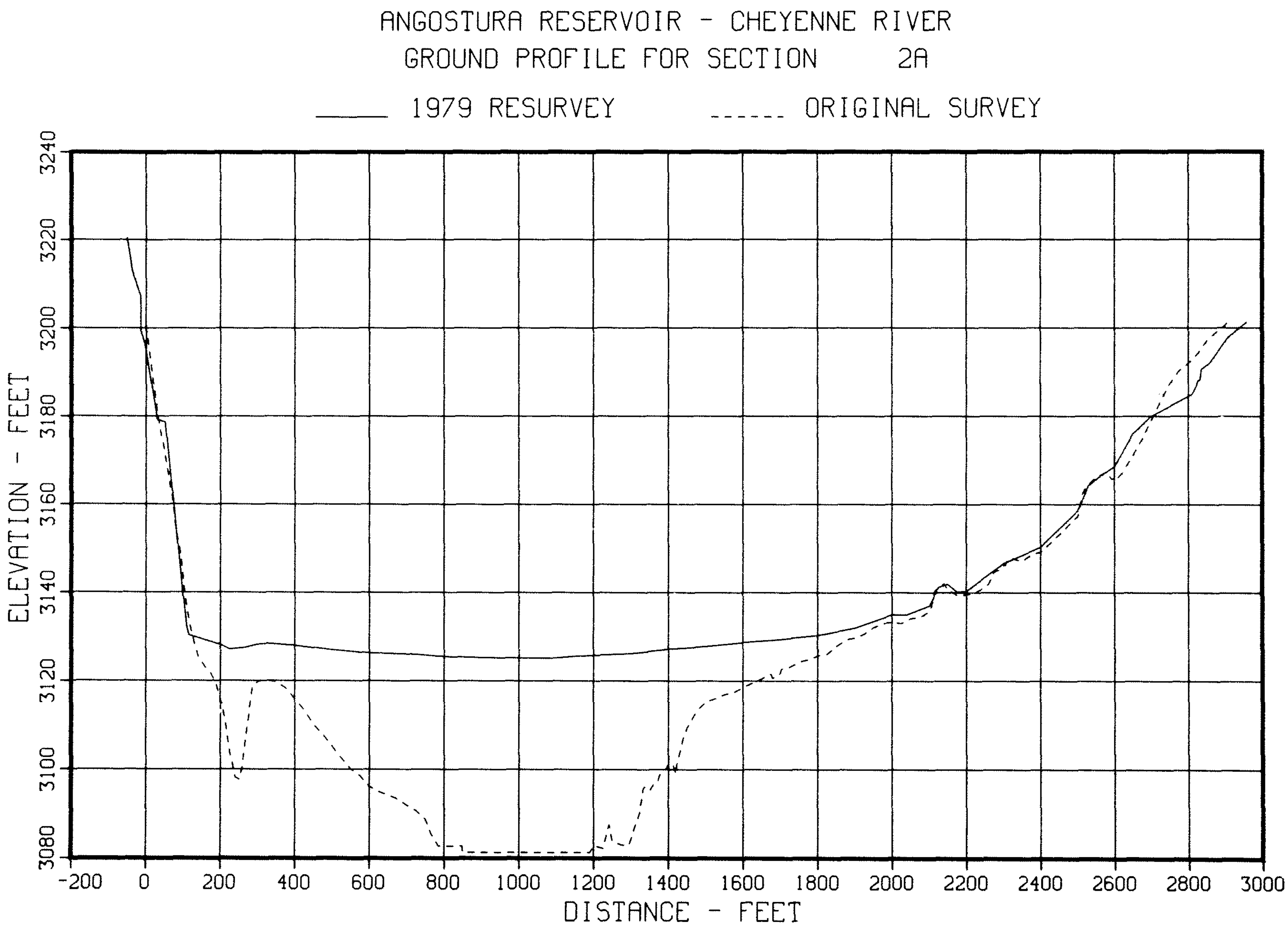

Figure 19. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 2A.

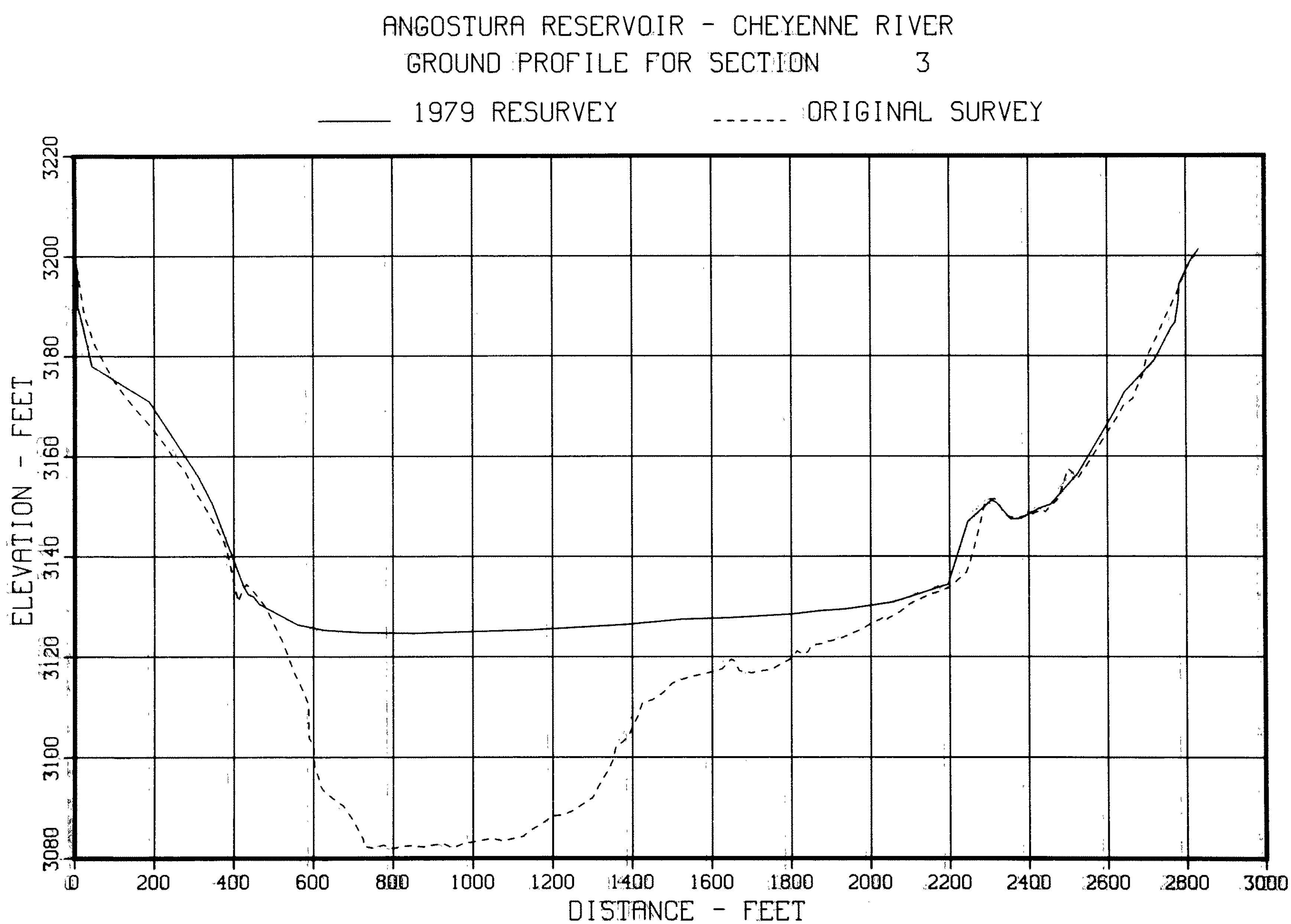

Figure 20. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 3.

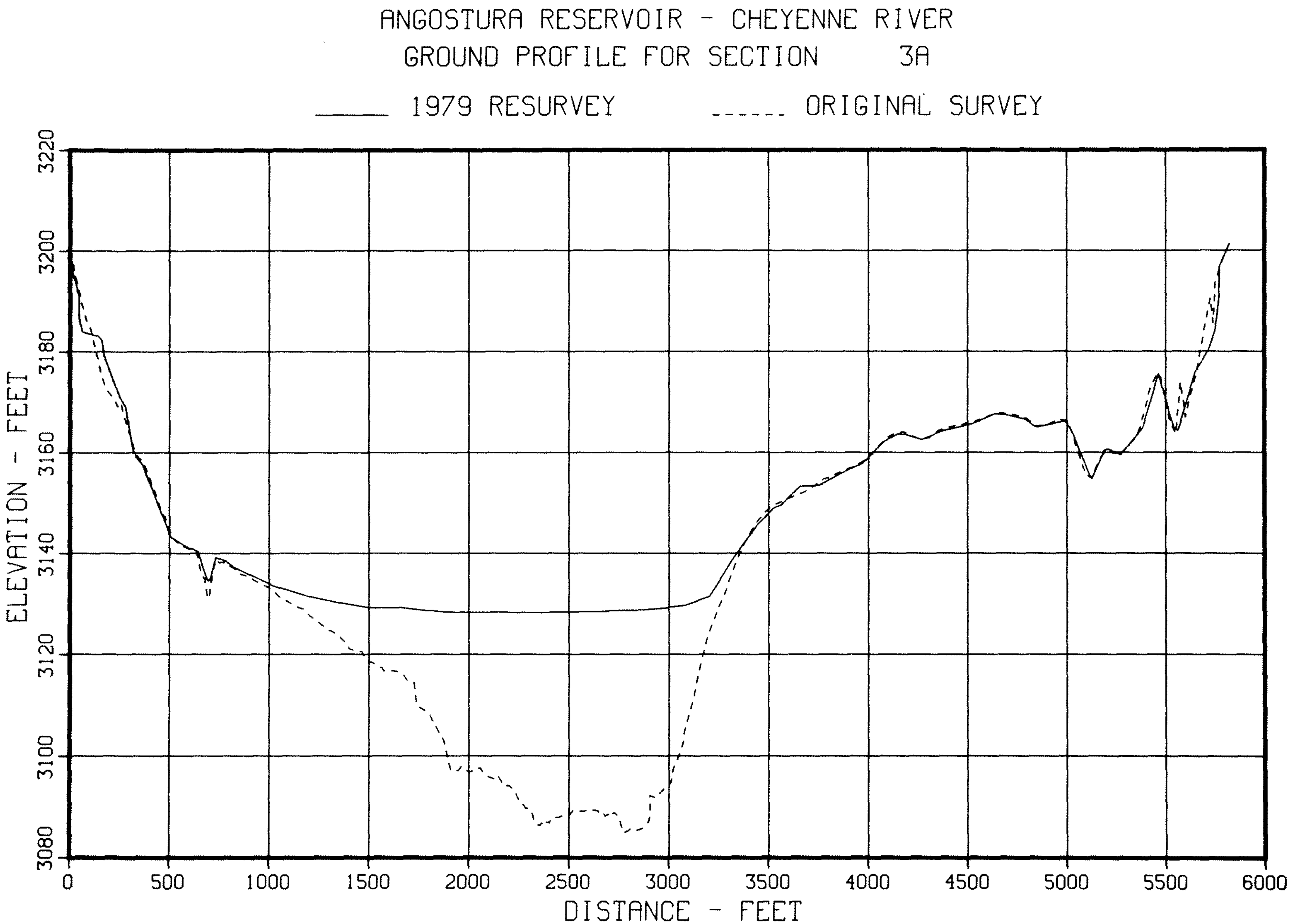

Figure 21. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 3A.

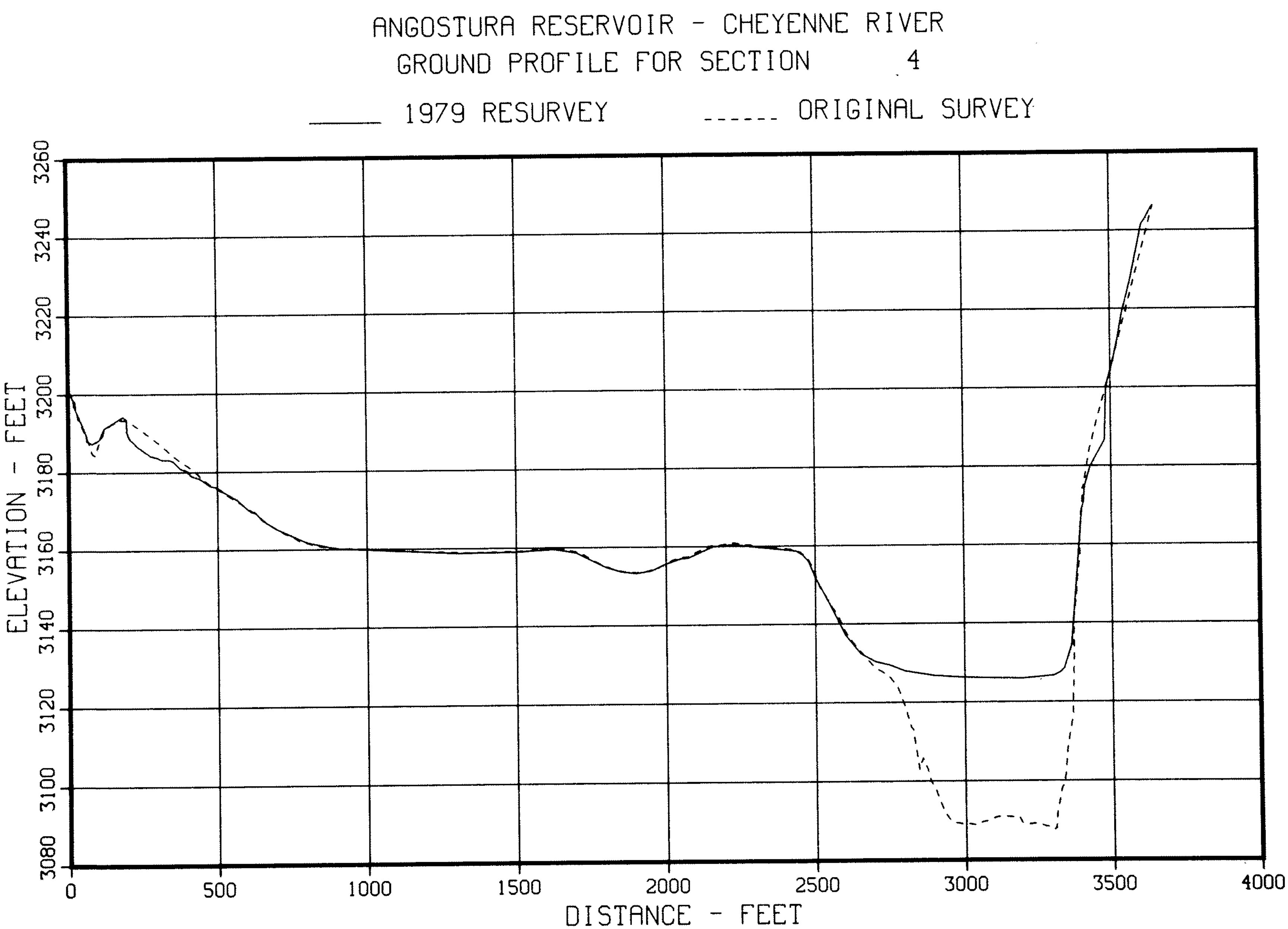

Figure 22. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 4.

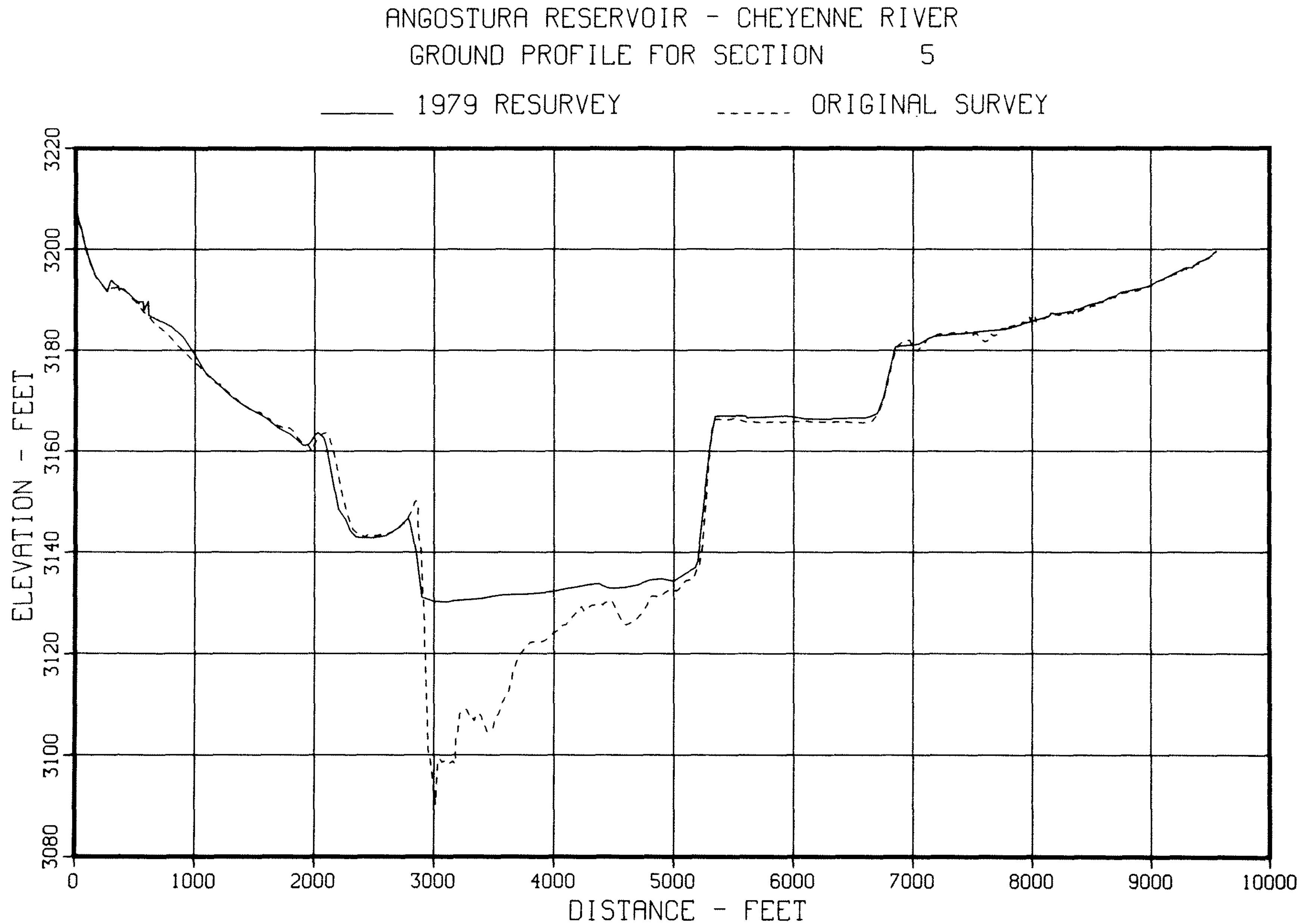

Figure 23. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 5.

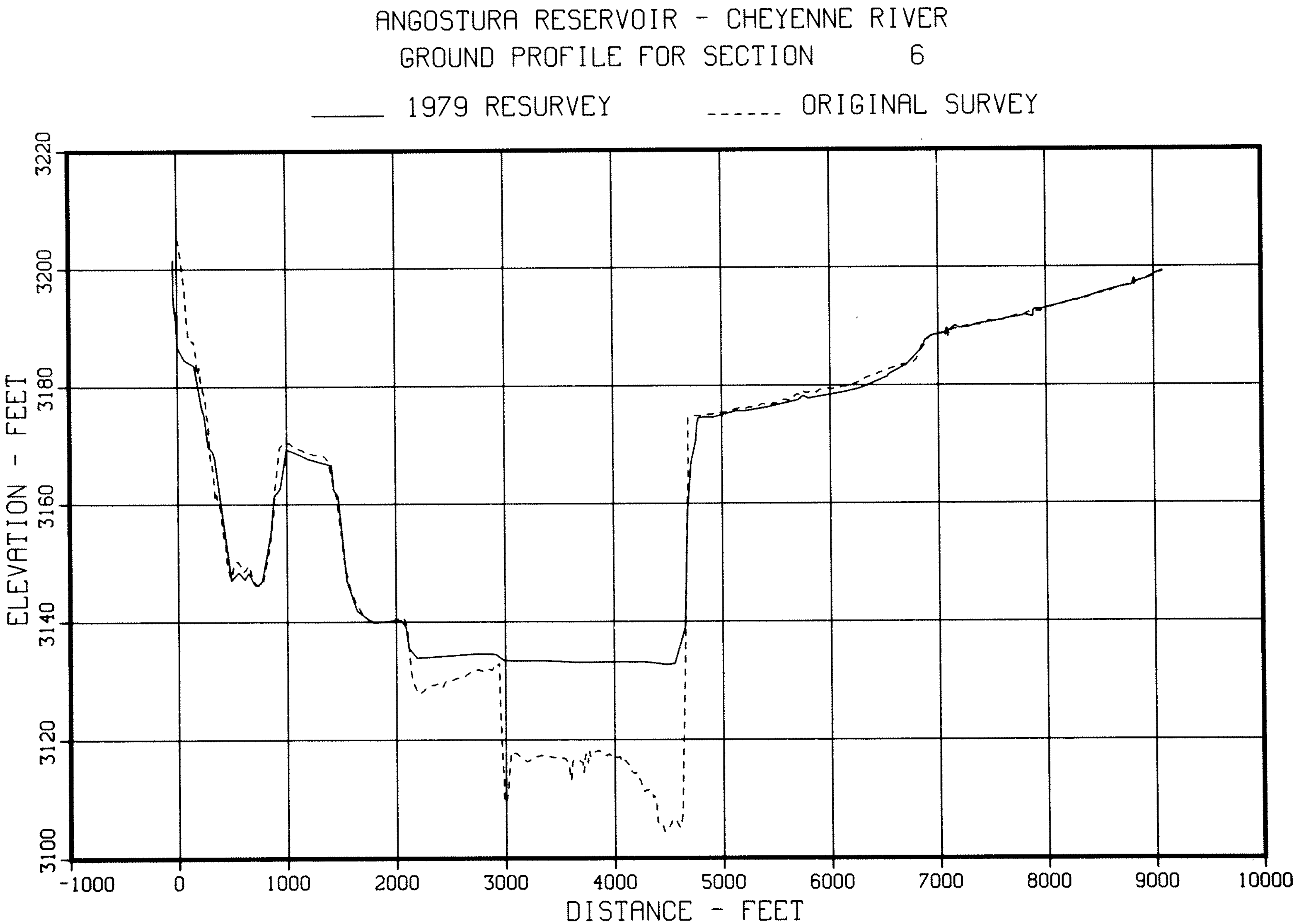

Figure 24. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 6.

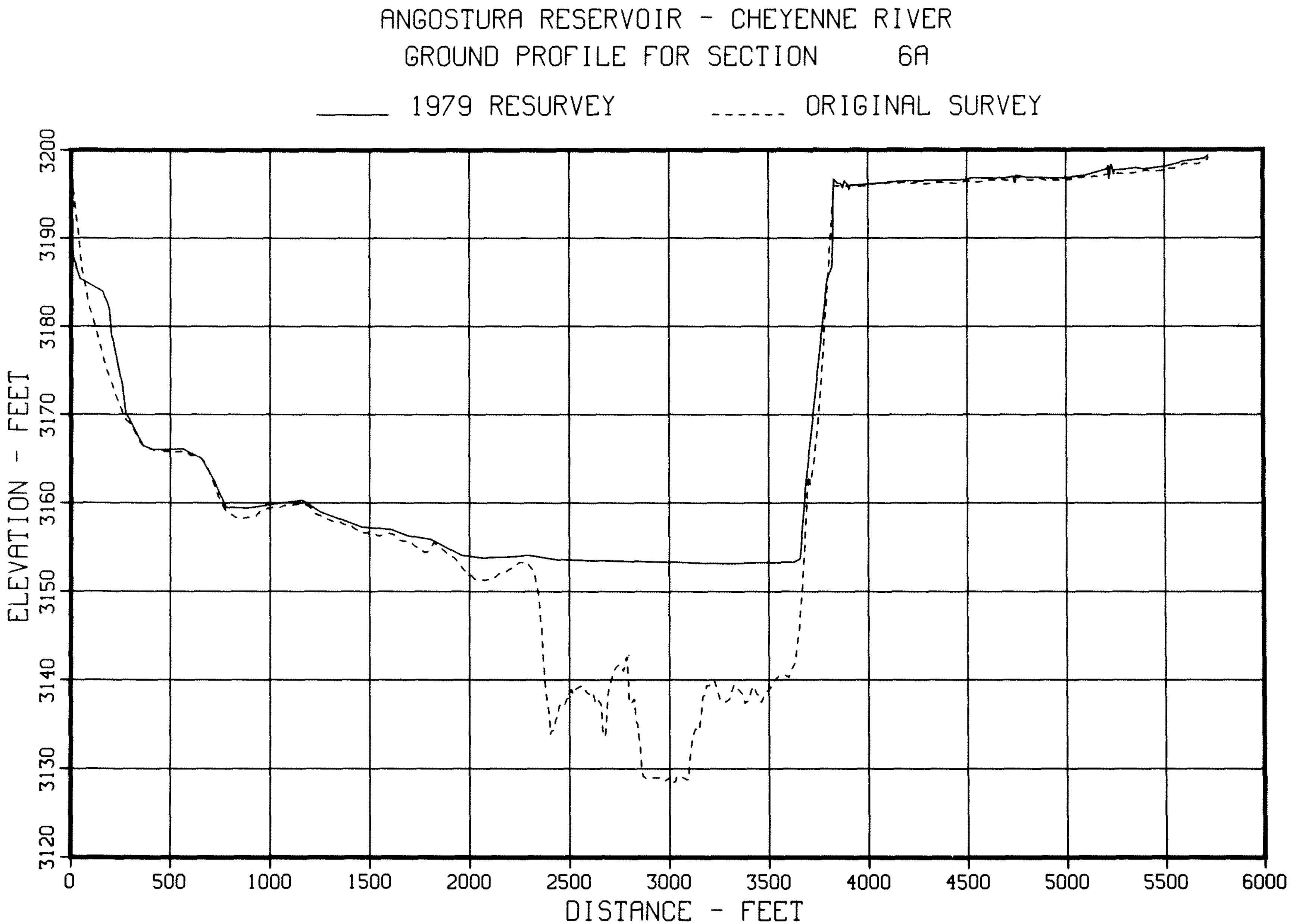

Figure 25. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 6A.

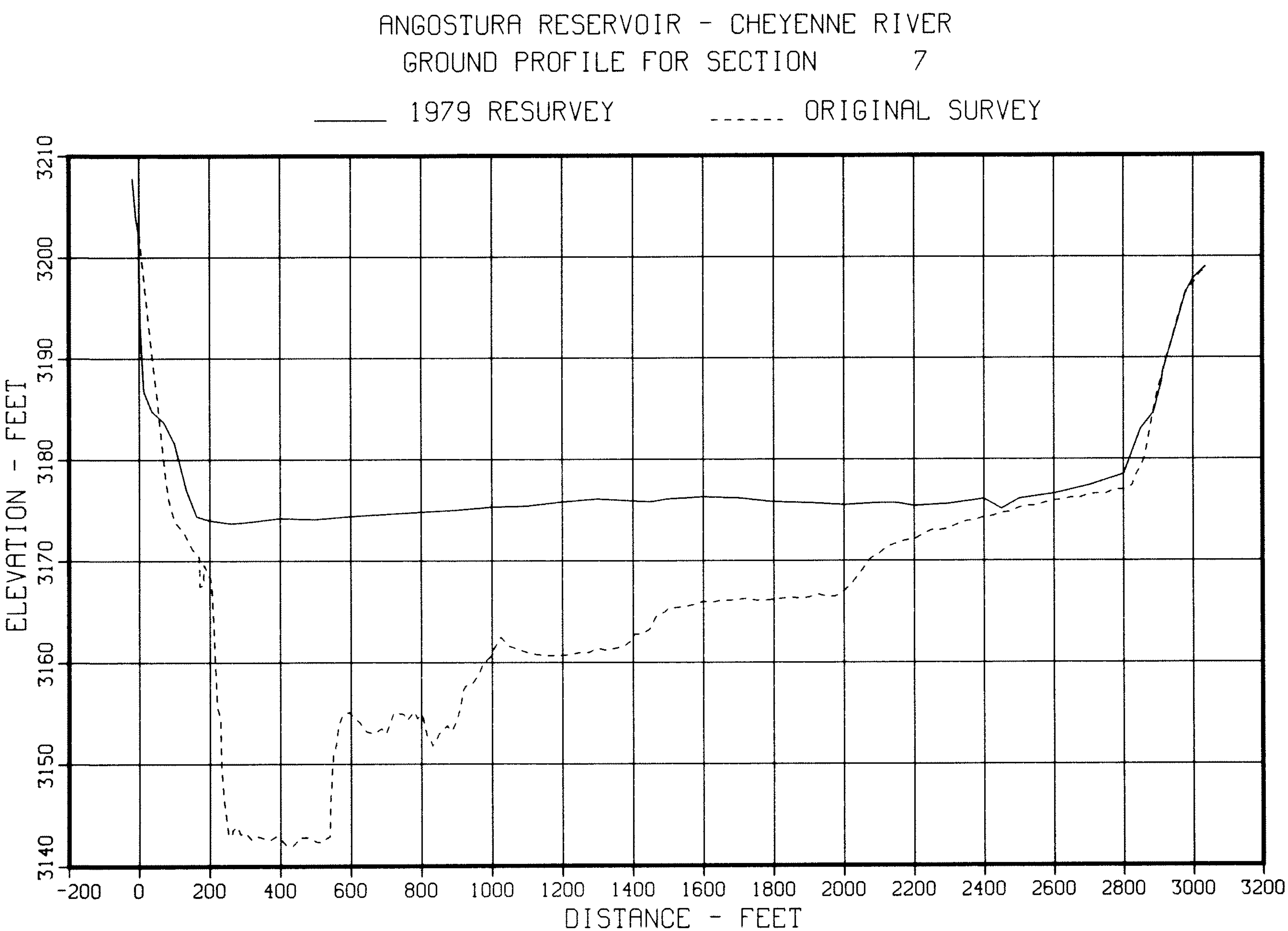

Figure 26. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 7.

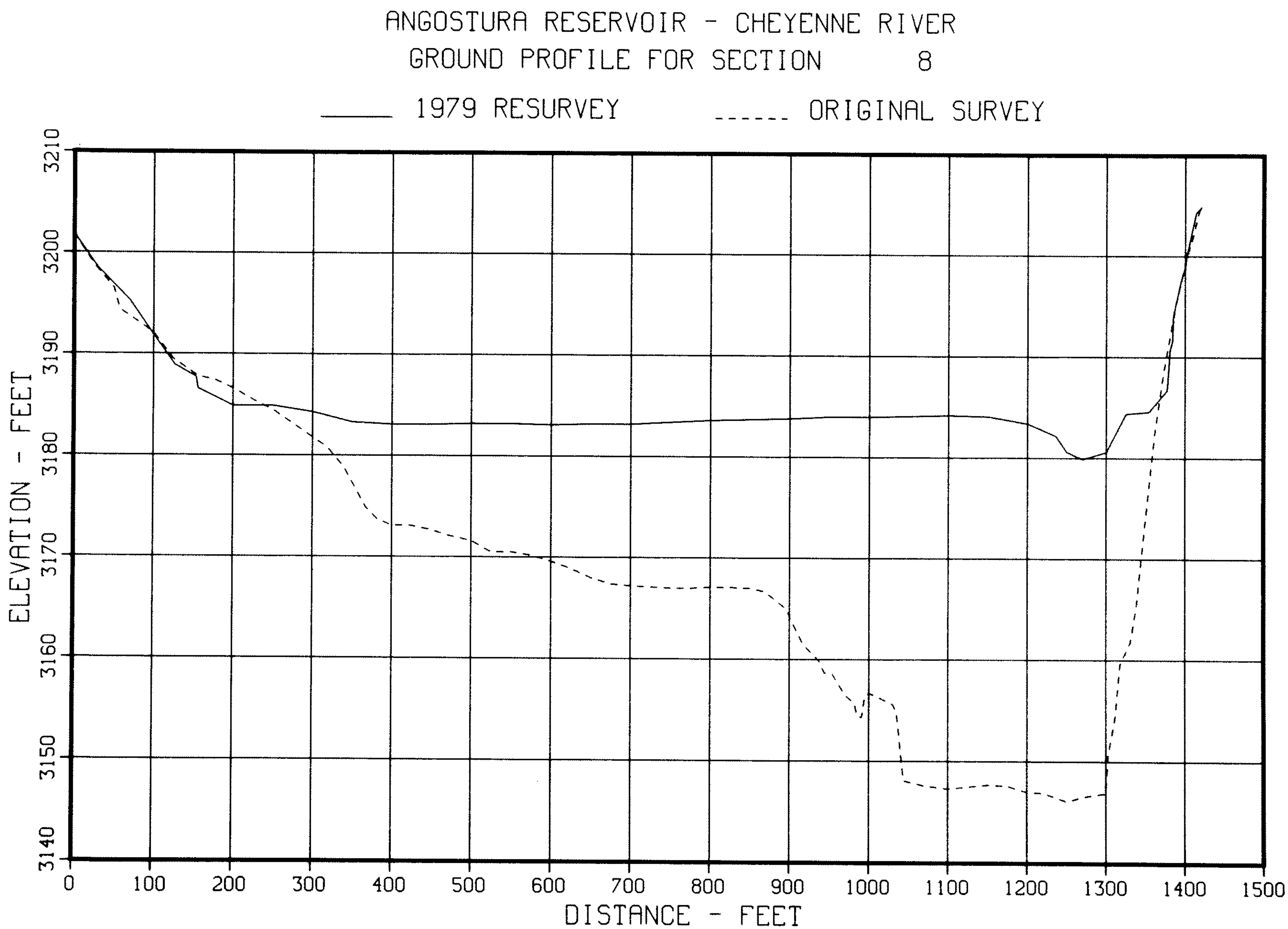

Figure 27. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 8.

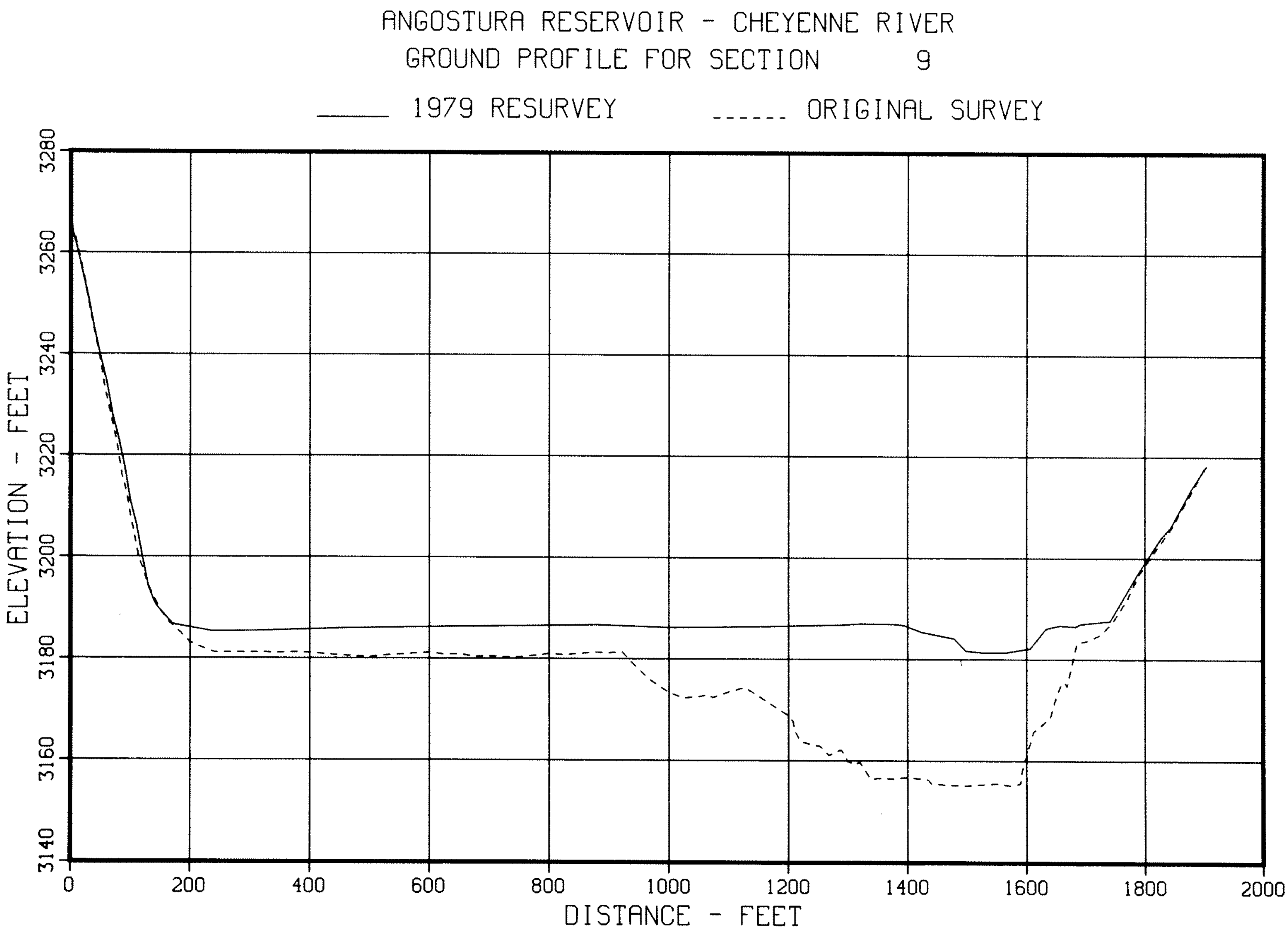

Figure 28. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 9.

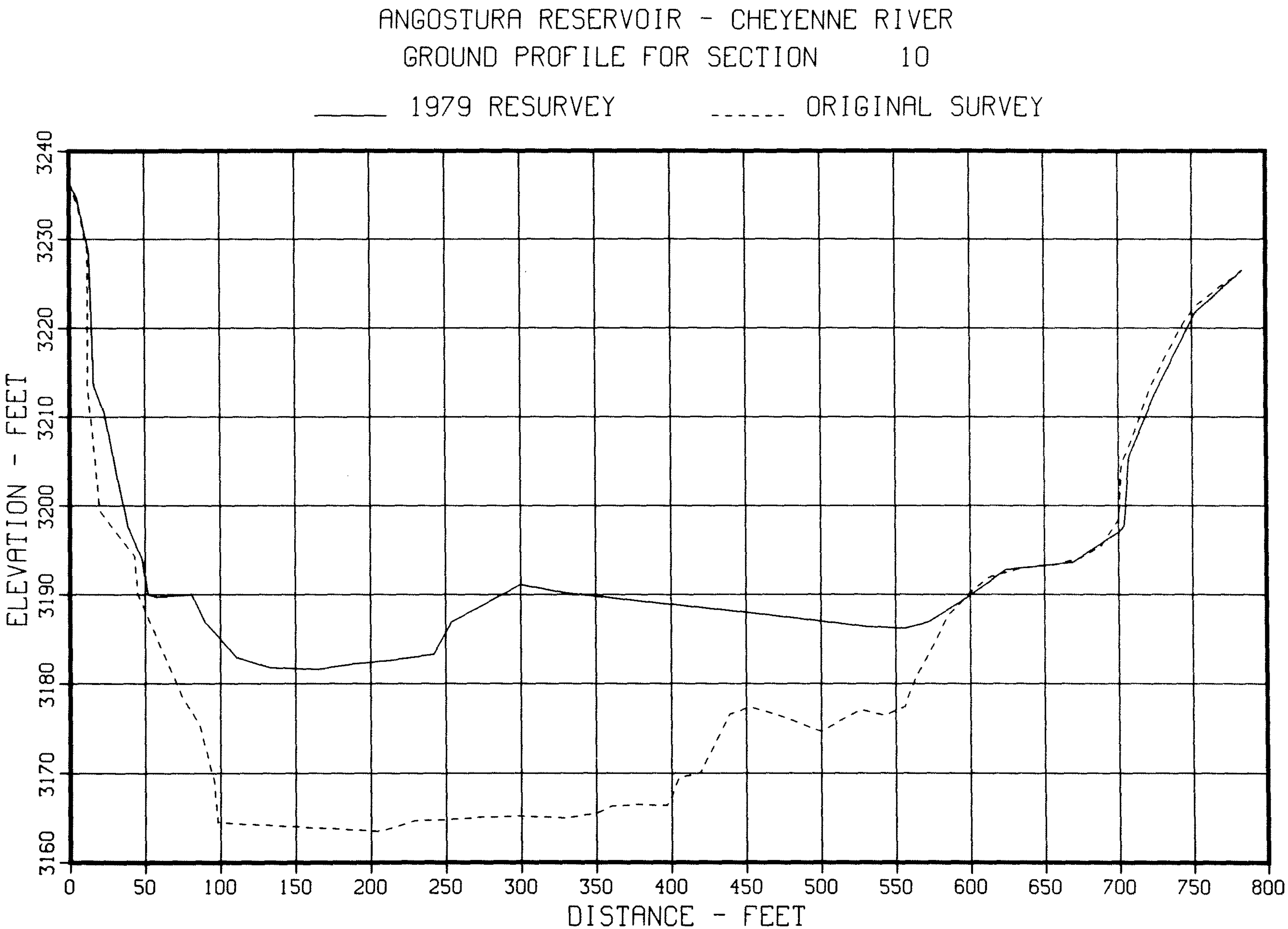

Figure 29. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 10.

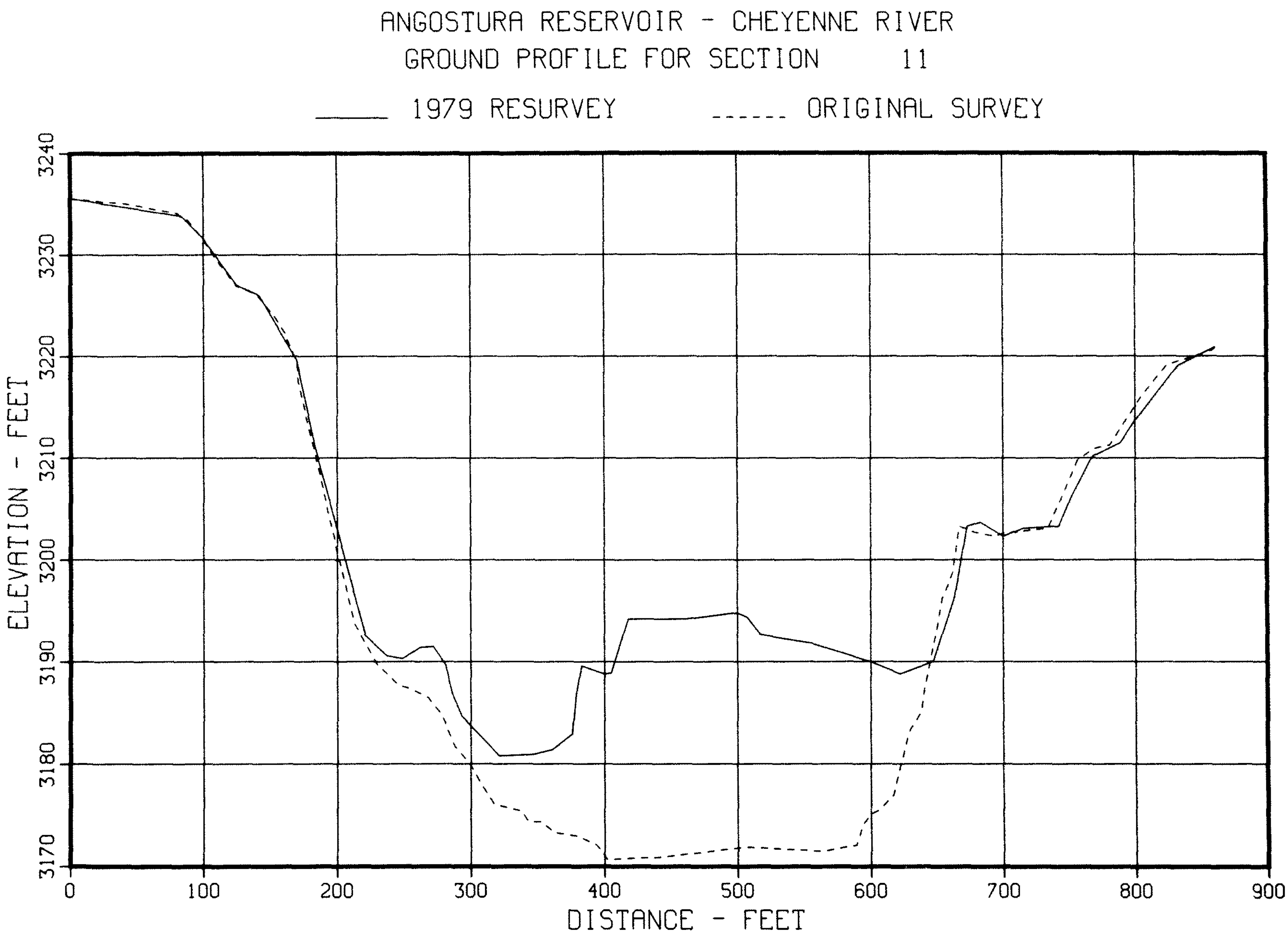

Figure 30. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 11.

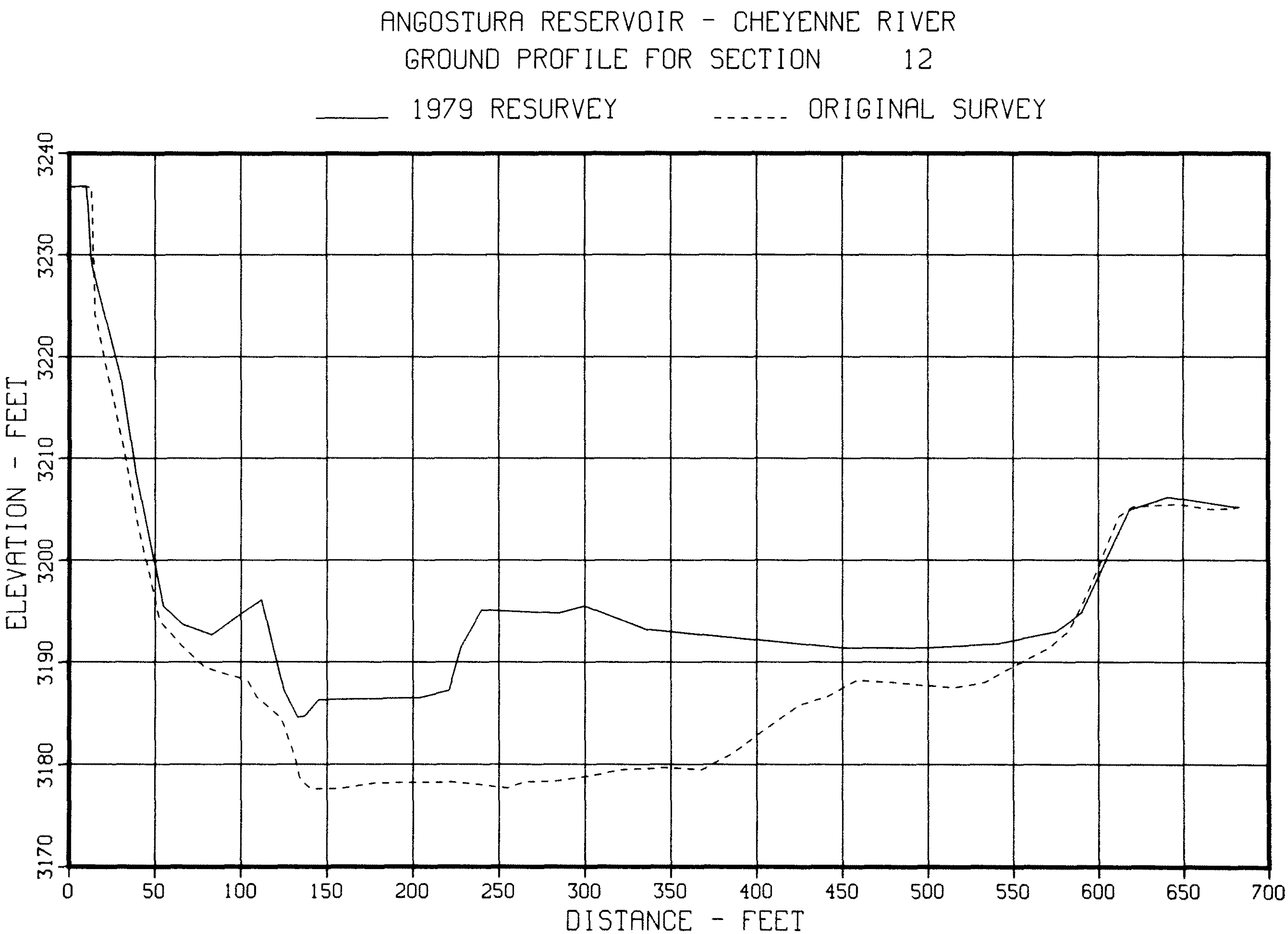

Figure 31. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 12.

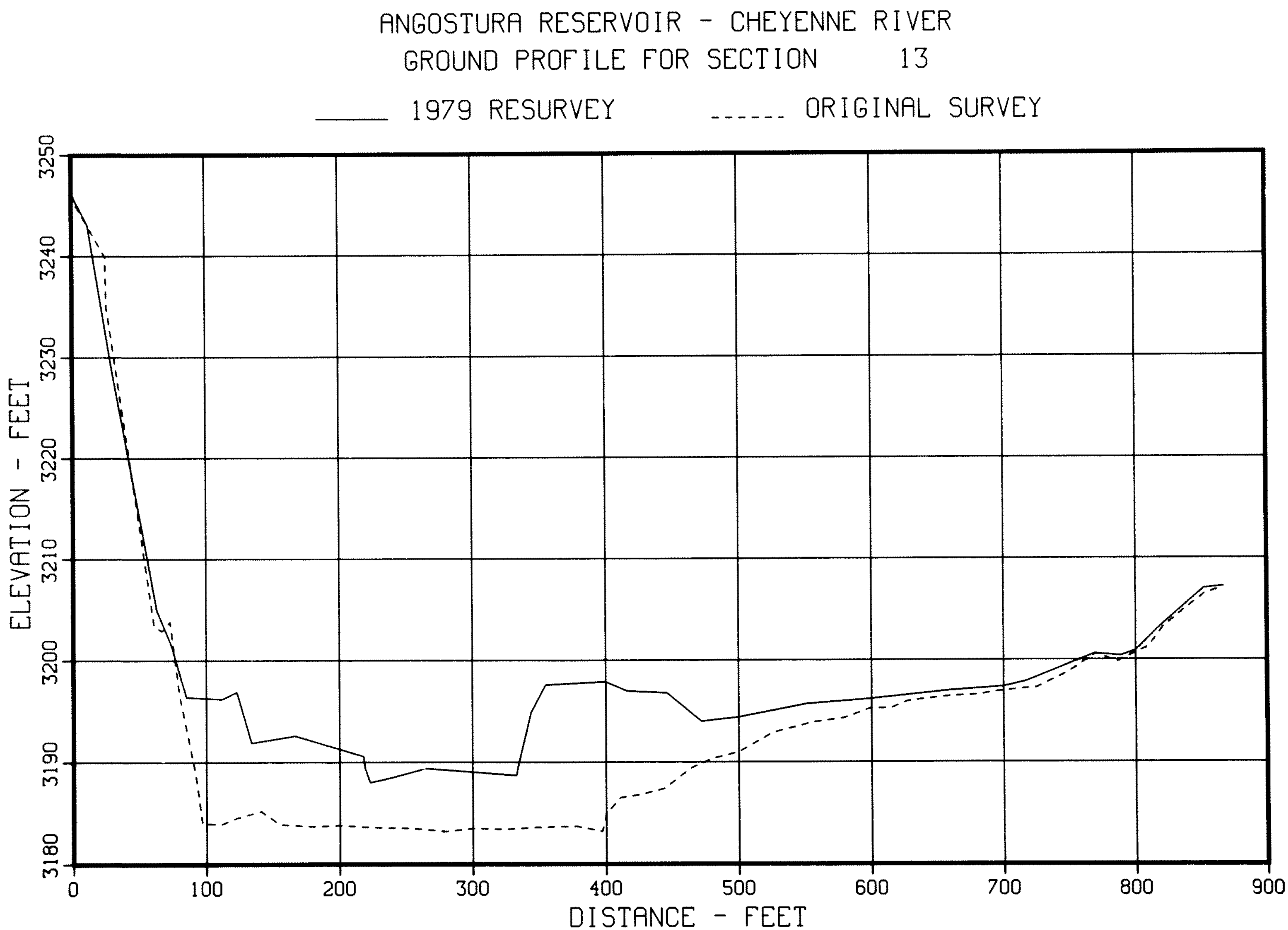

Figure 32. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 13.

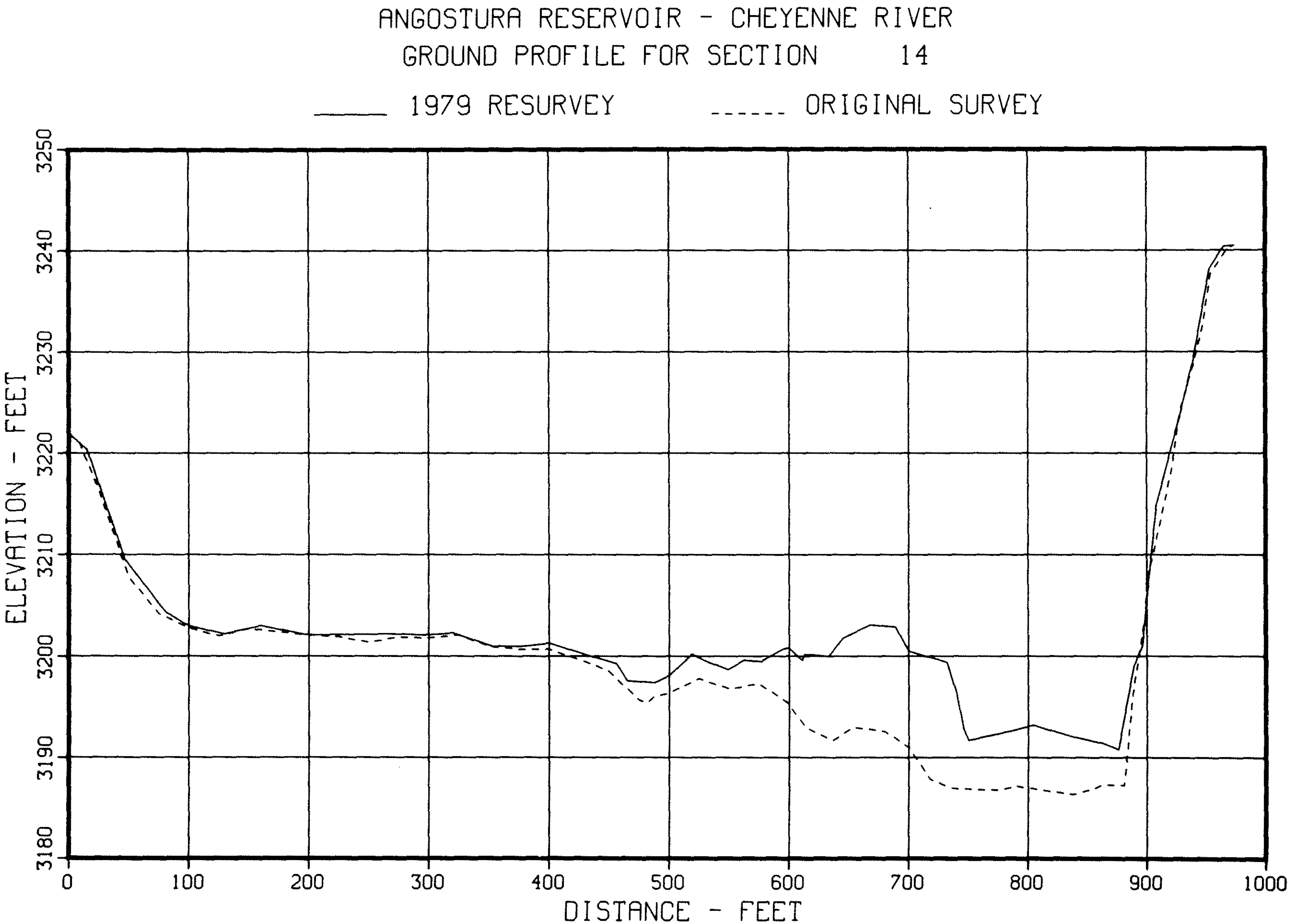

Figure 33. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 14.

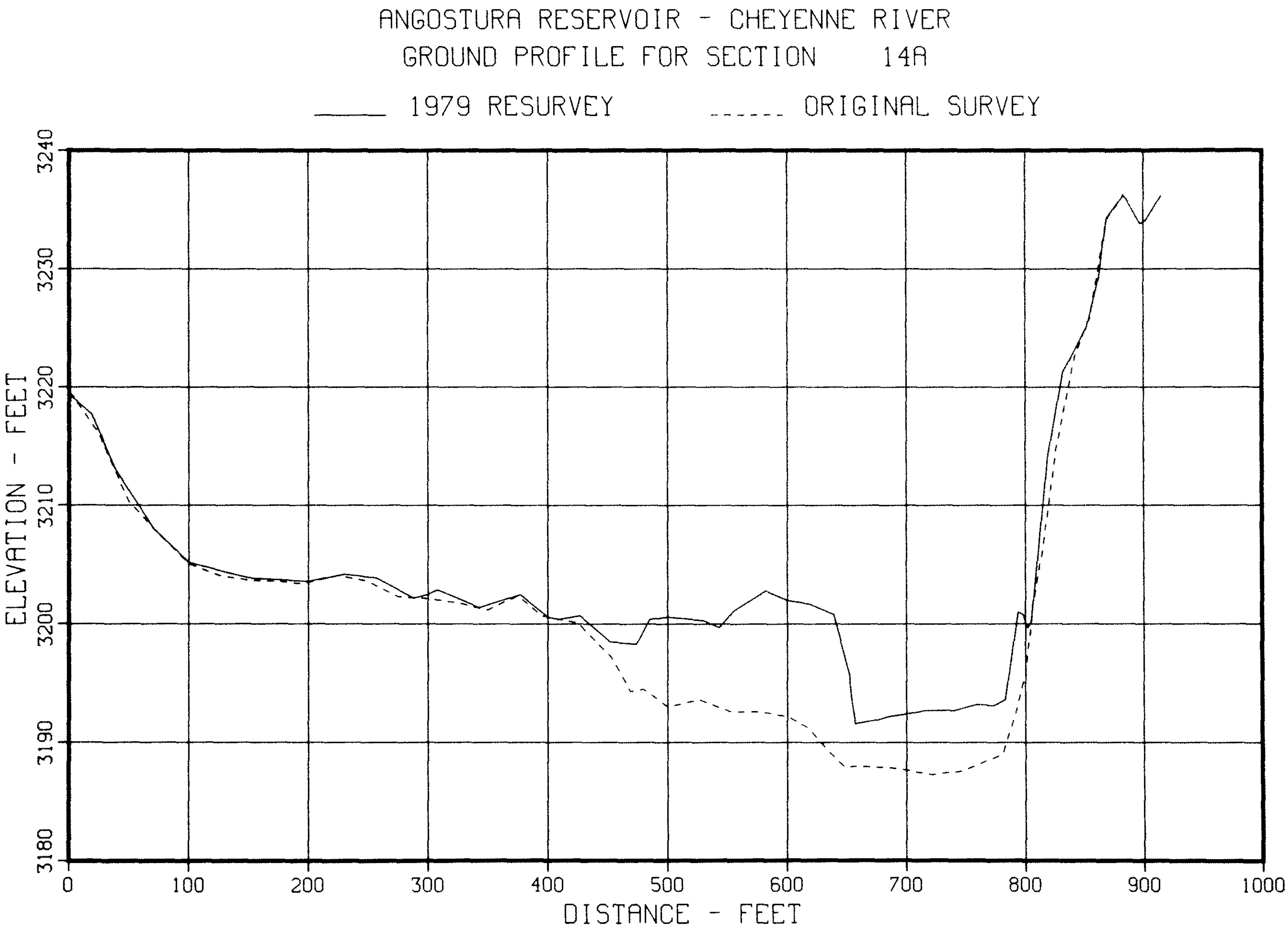

Figure 34. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 14A.

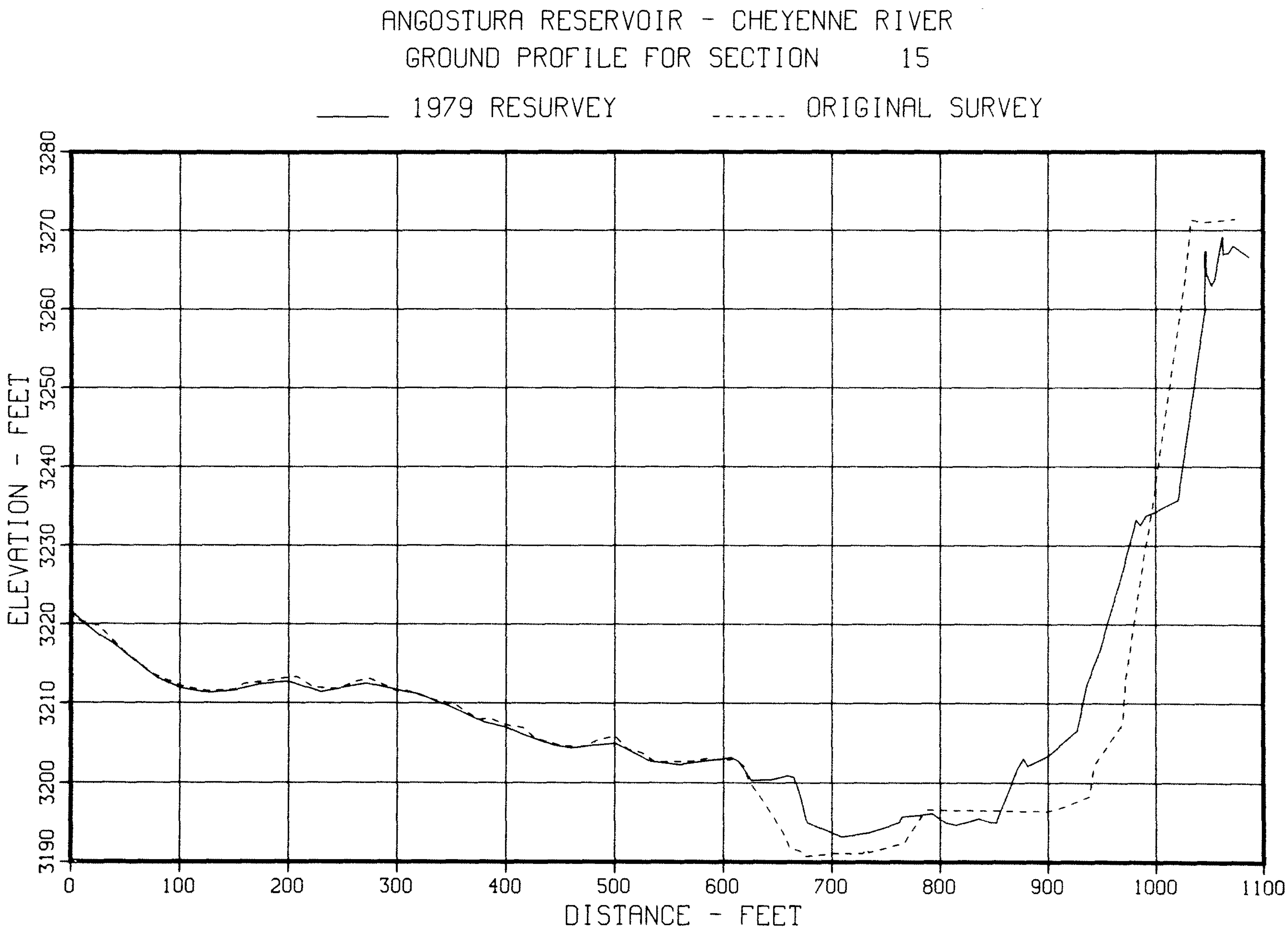

Figure 35. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 15.

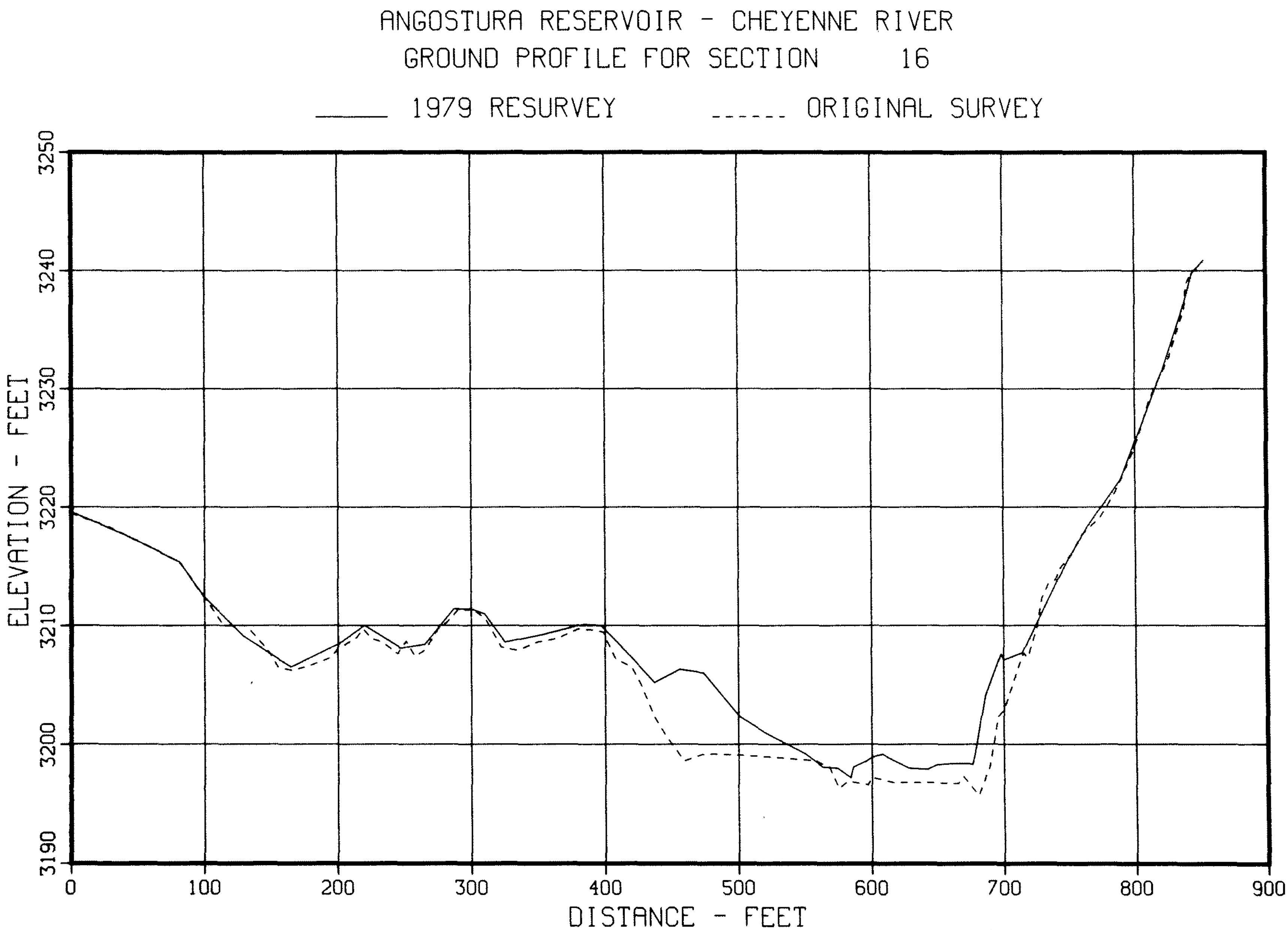

Figure 36. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 16.

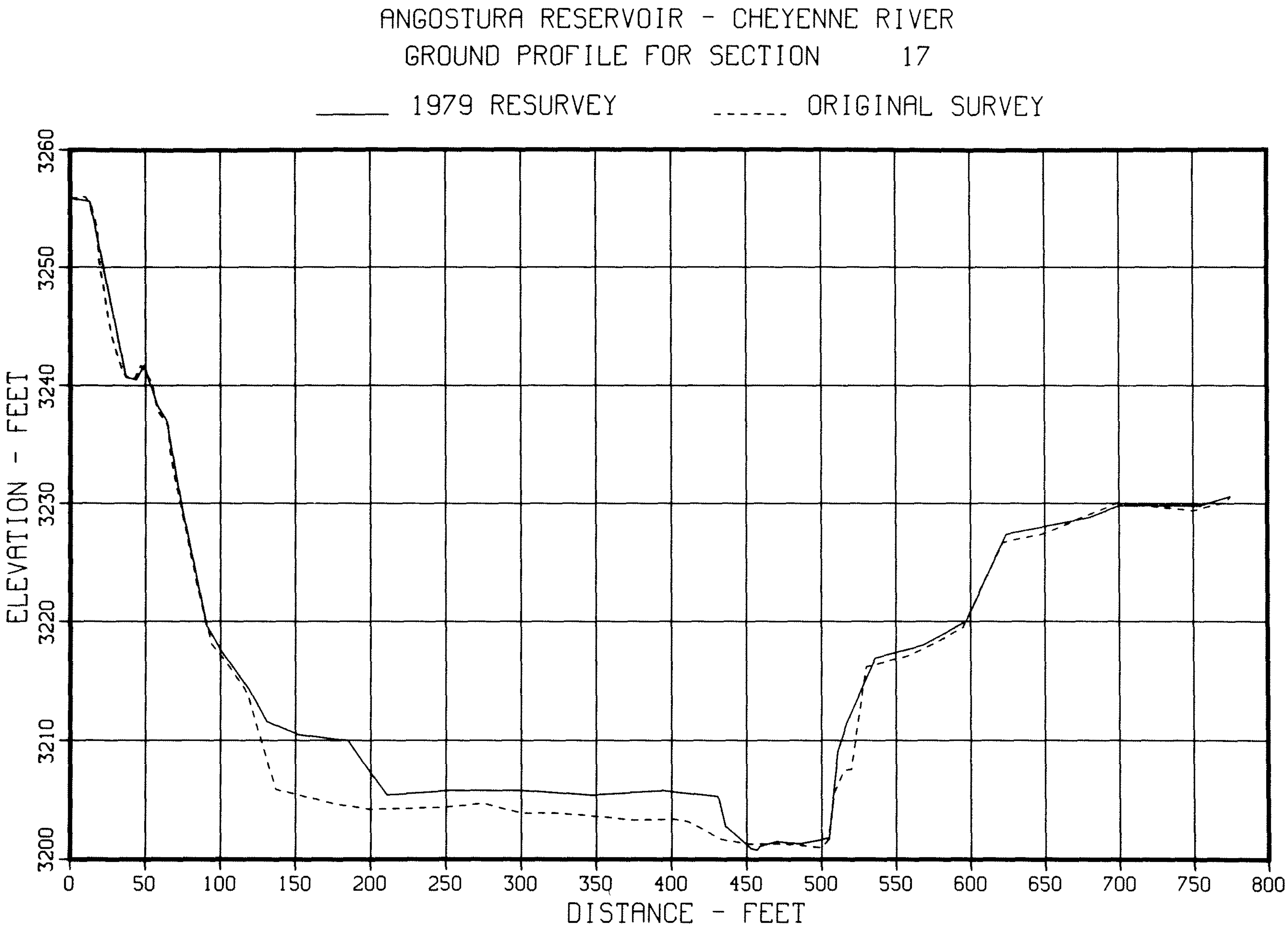

Figure 37. - 1949 and 1979 sedimentation range profiles, Cheyenne River - Range 17.

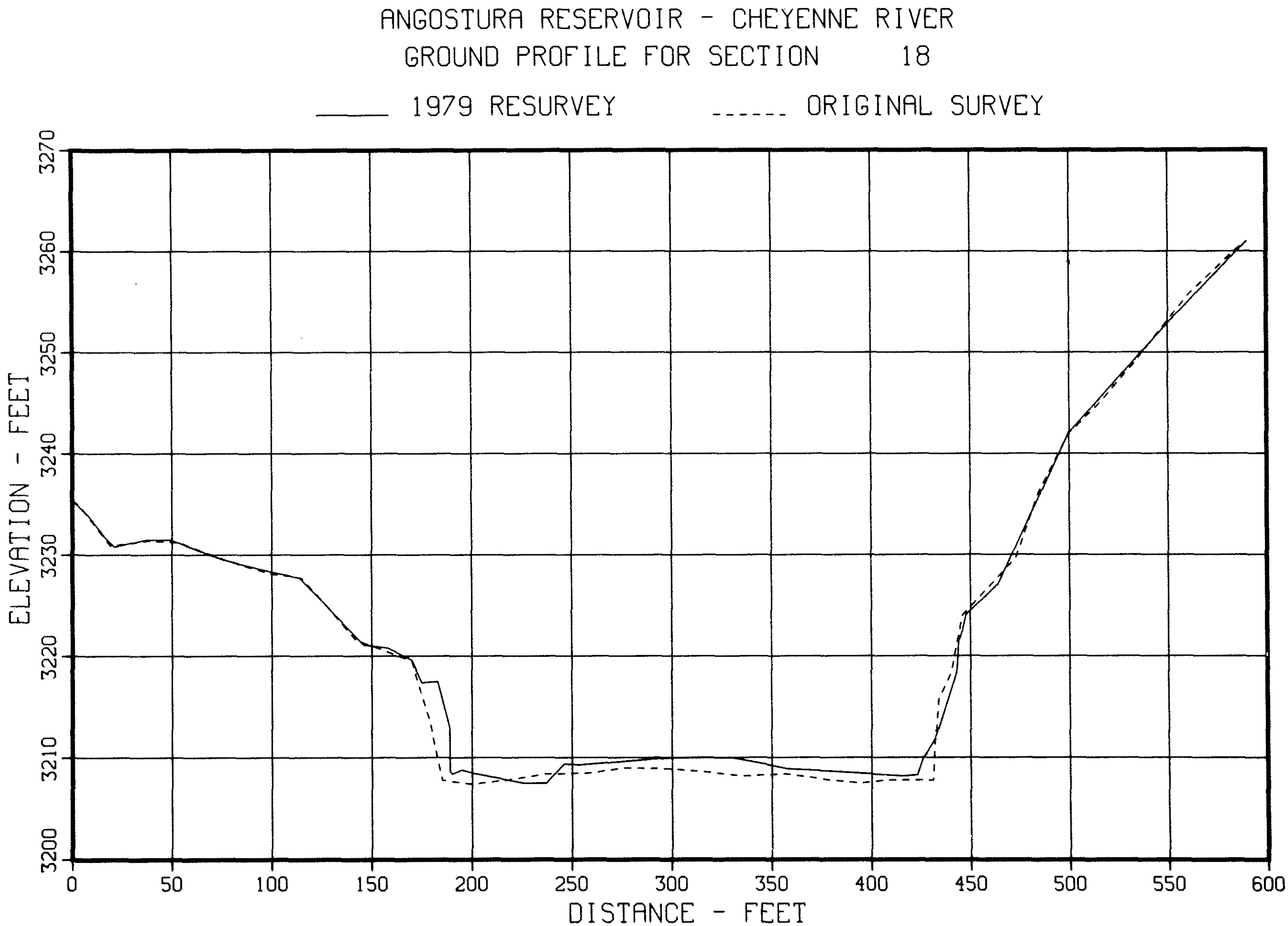

Figure 38. - 1949 and 1979 sedimentation range profiles,
Cheyenne River - Range 18.

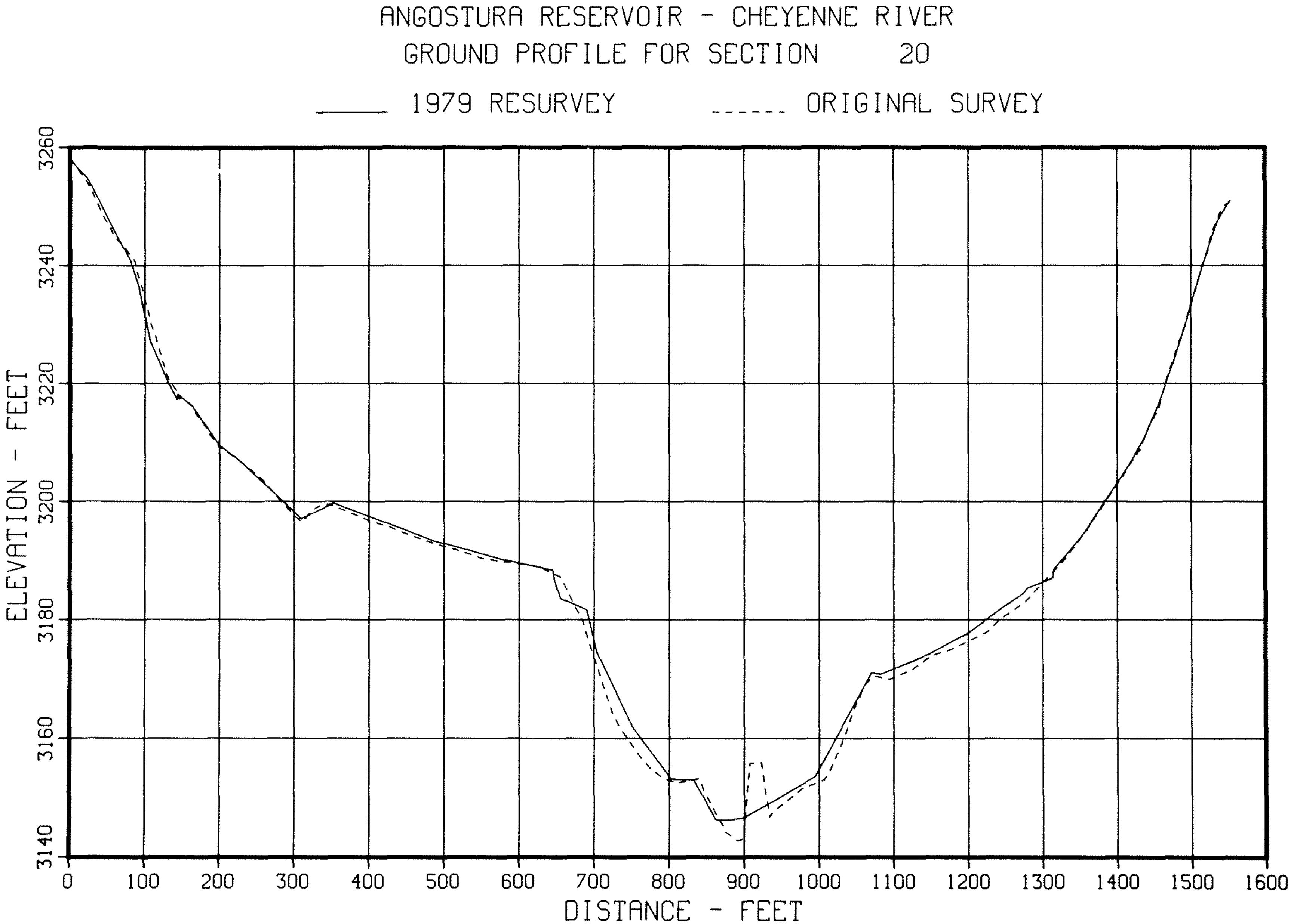

Figure 39. - 1949 and 1979 sedimentation range profiles at mouth of first downstream unnamed canyon - Range 20.

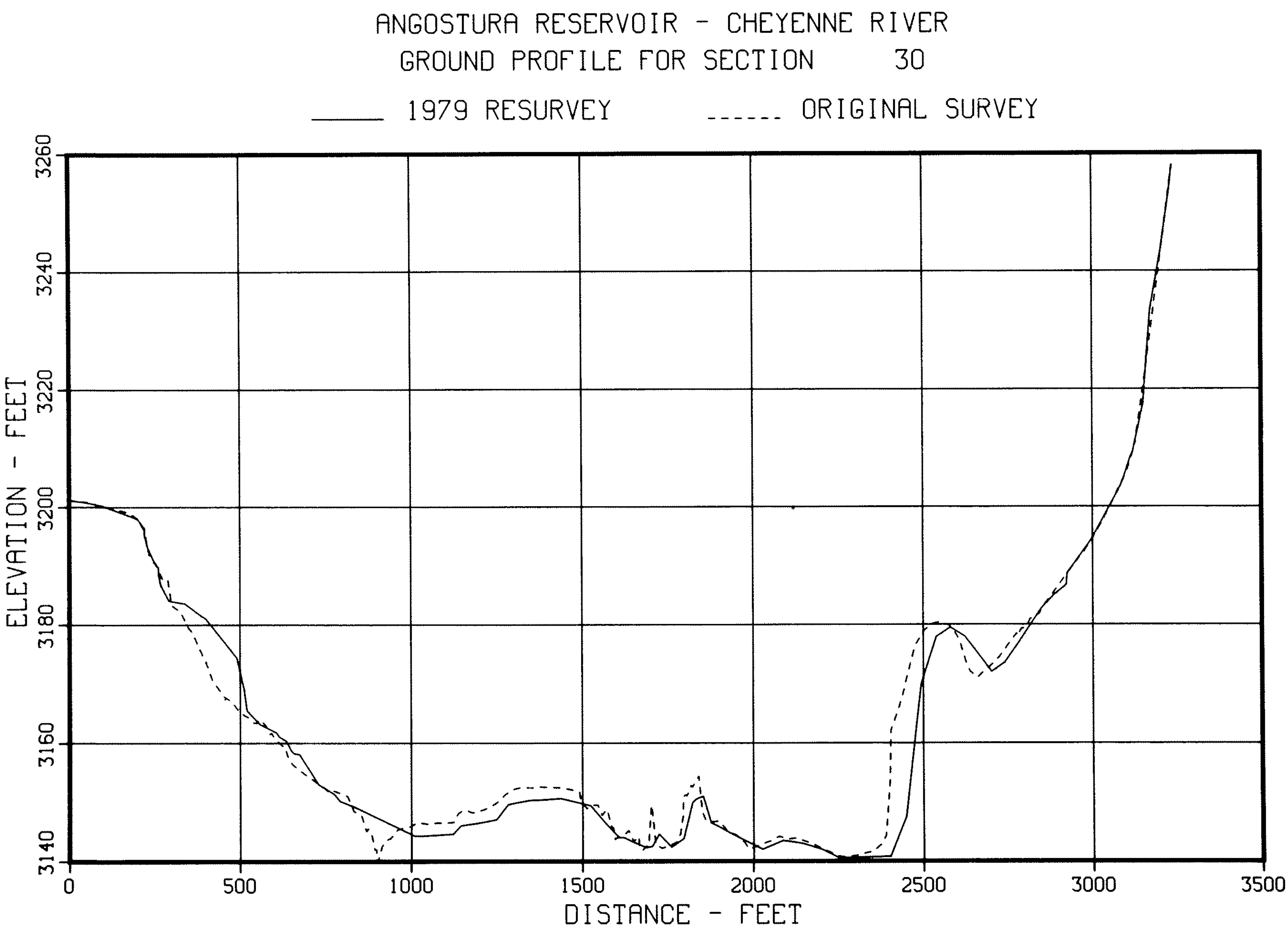

Figure 40. - 1949 and 1979 sedimentation range profiles,
Sheps Canyon, Range 30.

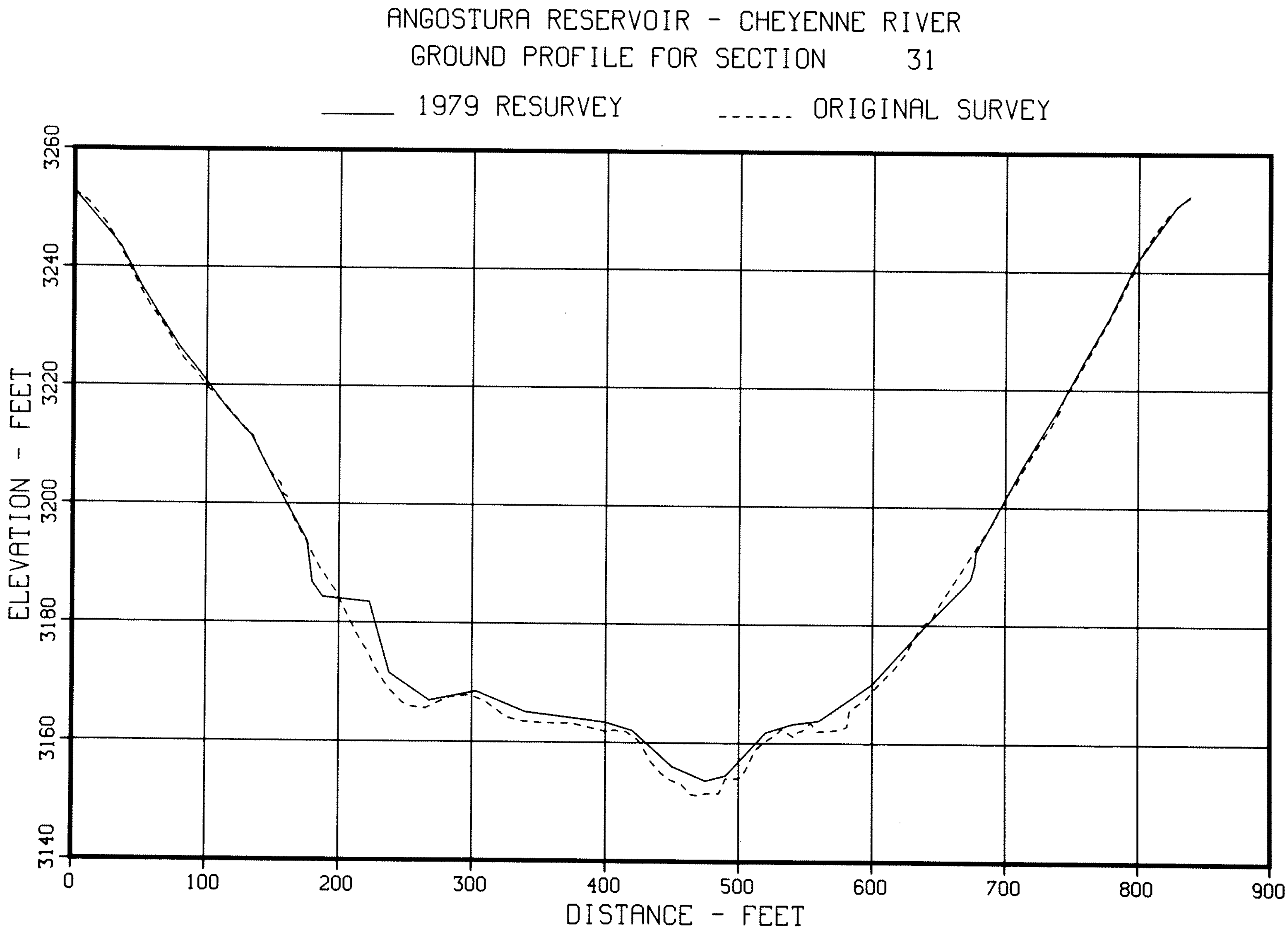

Figure 41. - 1949 and 1979 sedimentation range profiles,
Sheps Canyon, Range 31.

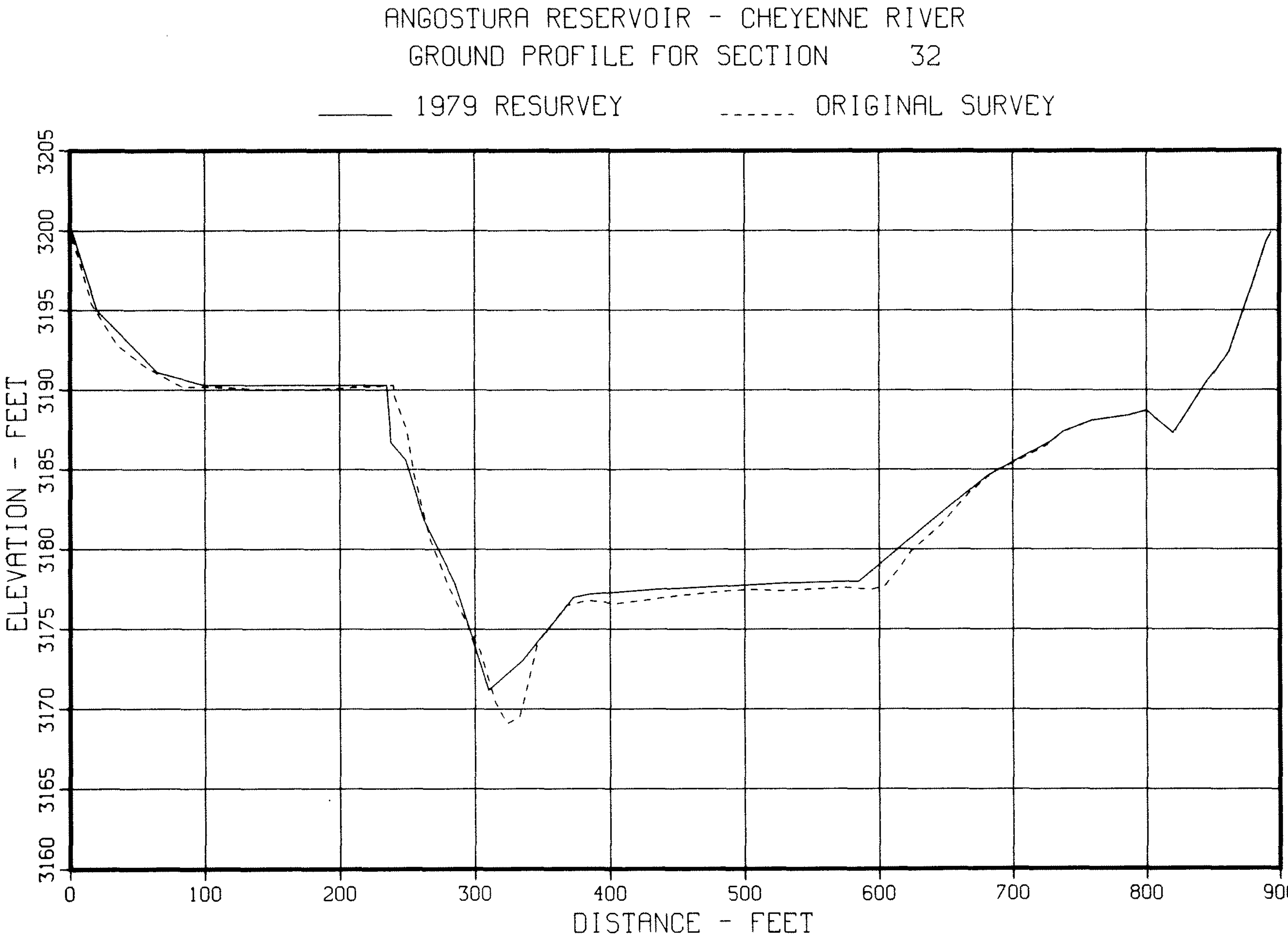

Figure 42. - 1949 and 1979 sedimentation range profiles,
Sheps Canyon - Range 32.

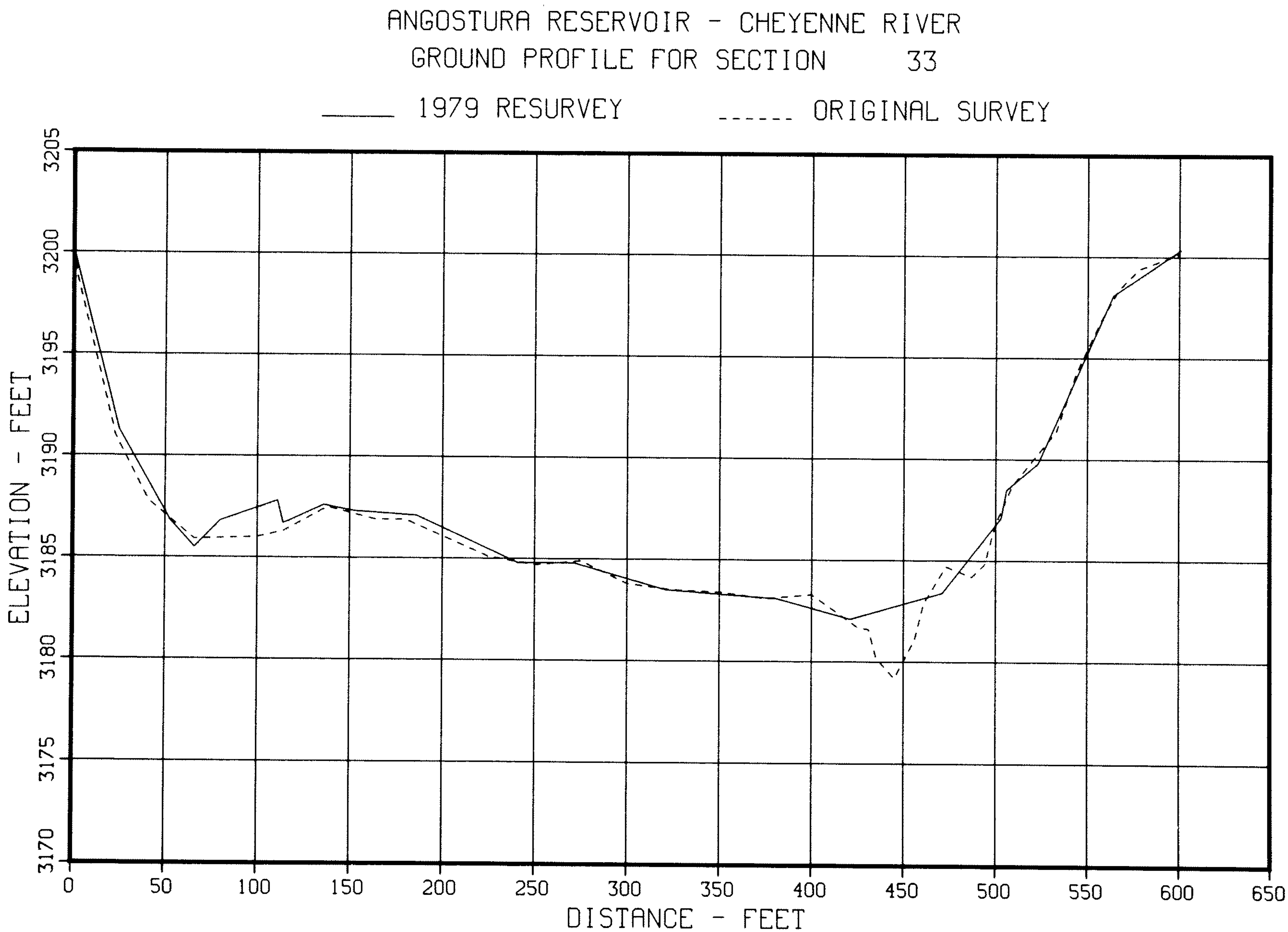

Figure 43. - 1949 and 1979 sedimentation range profiles, Sheps Canyon - Range 33.

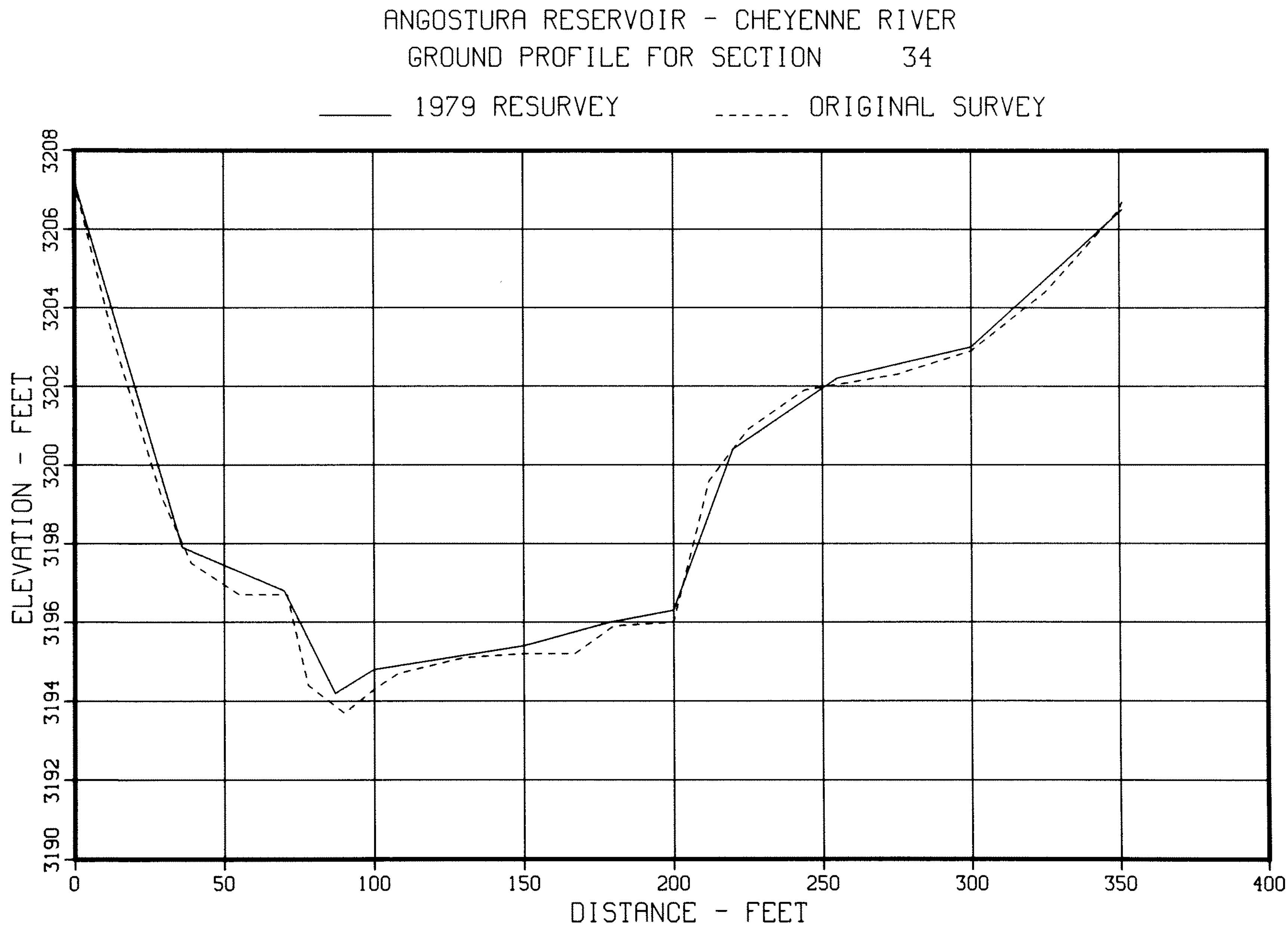

Figure 44. - 1949 and 1979 sedimentation range profiles, Sheps Canyon - Range 34.

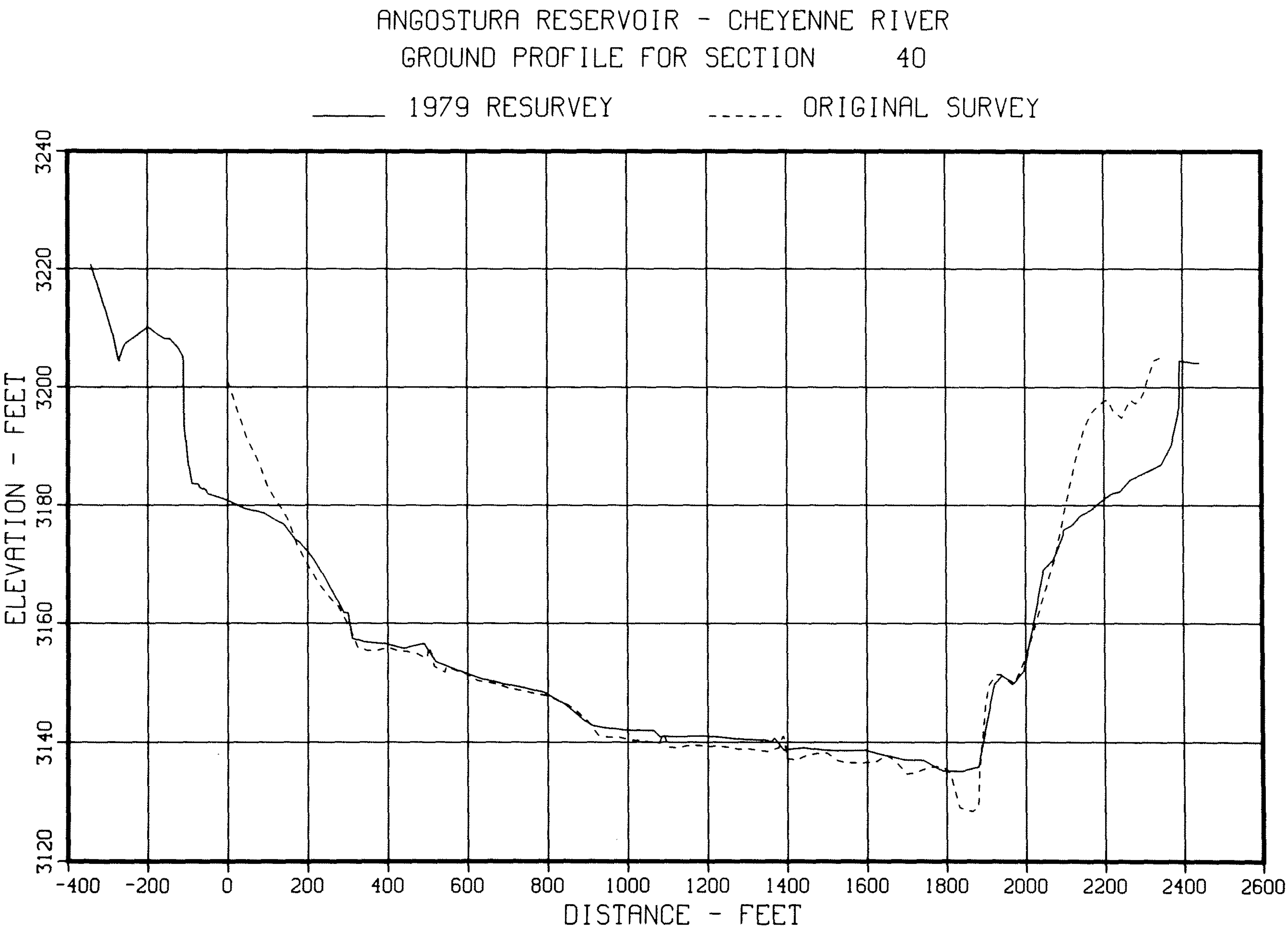

Figure 45. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 40.

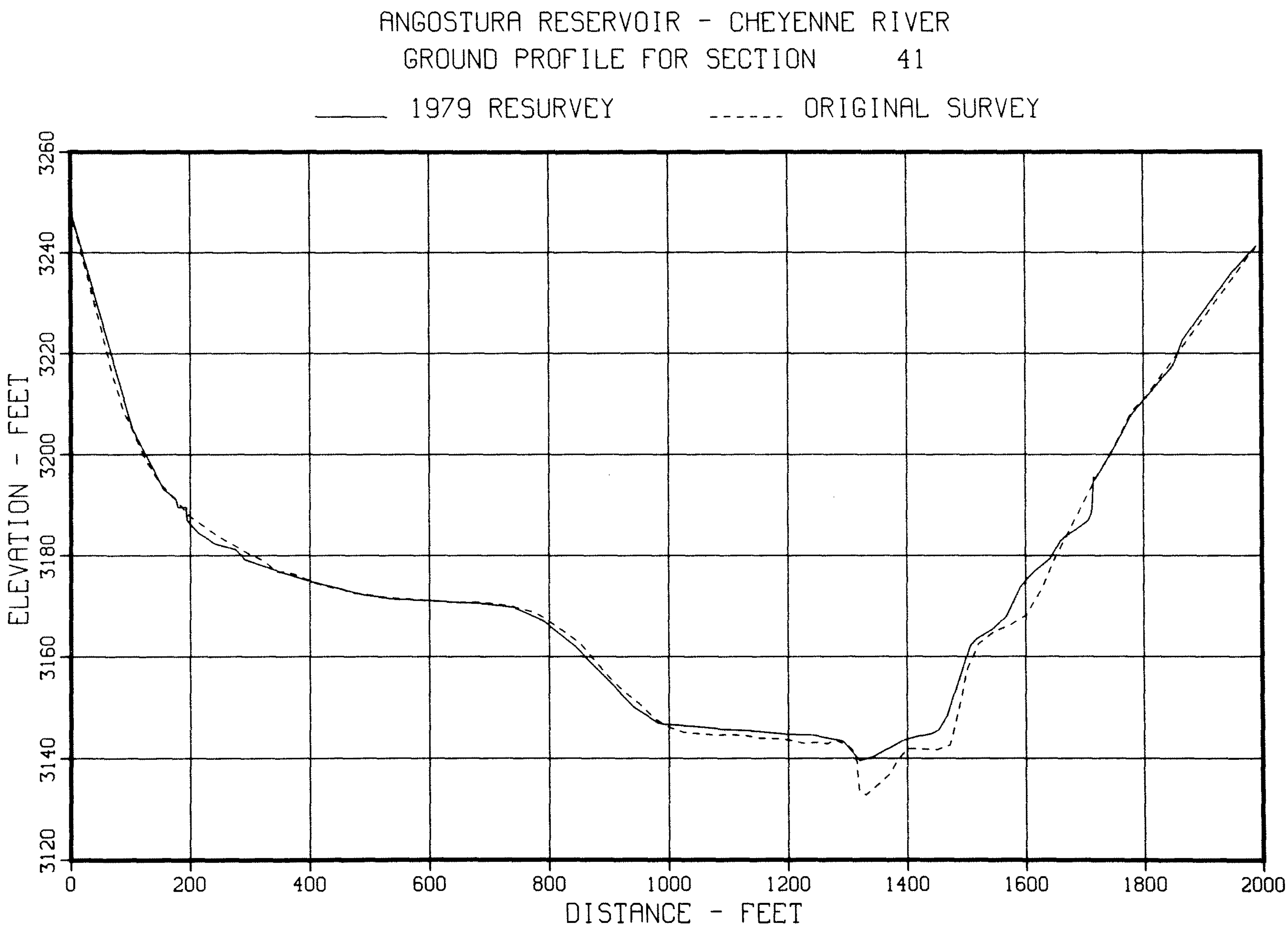

Figure 46. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 41.

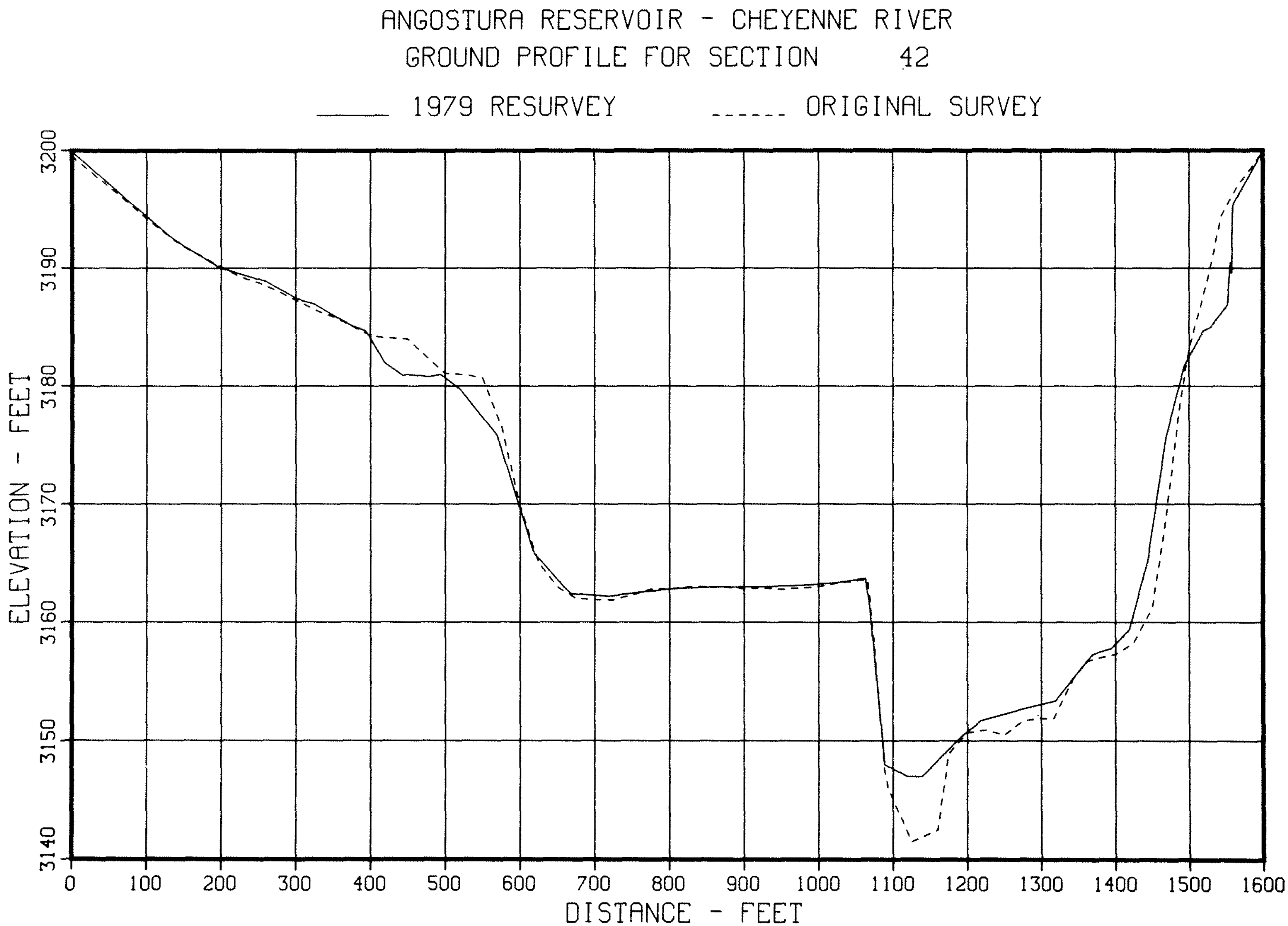

Figure 47. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 42.

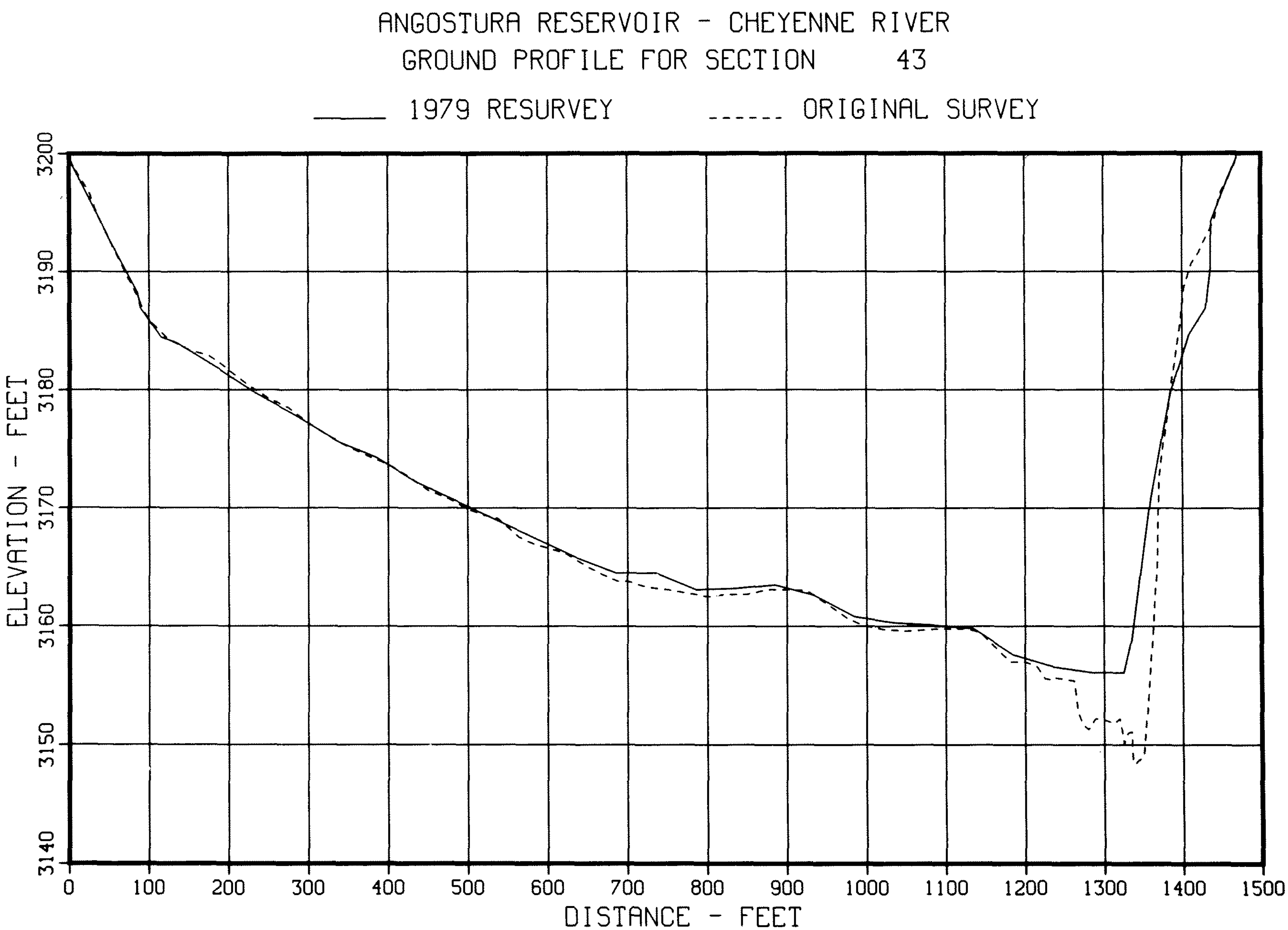

Figure 48. - 1949 and 1979 sedimentation range profiles,
Horsehead Creek - Range 43.

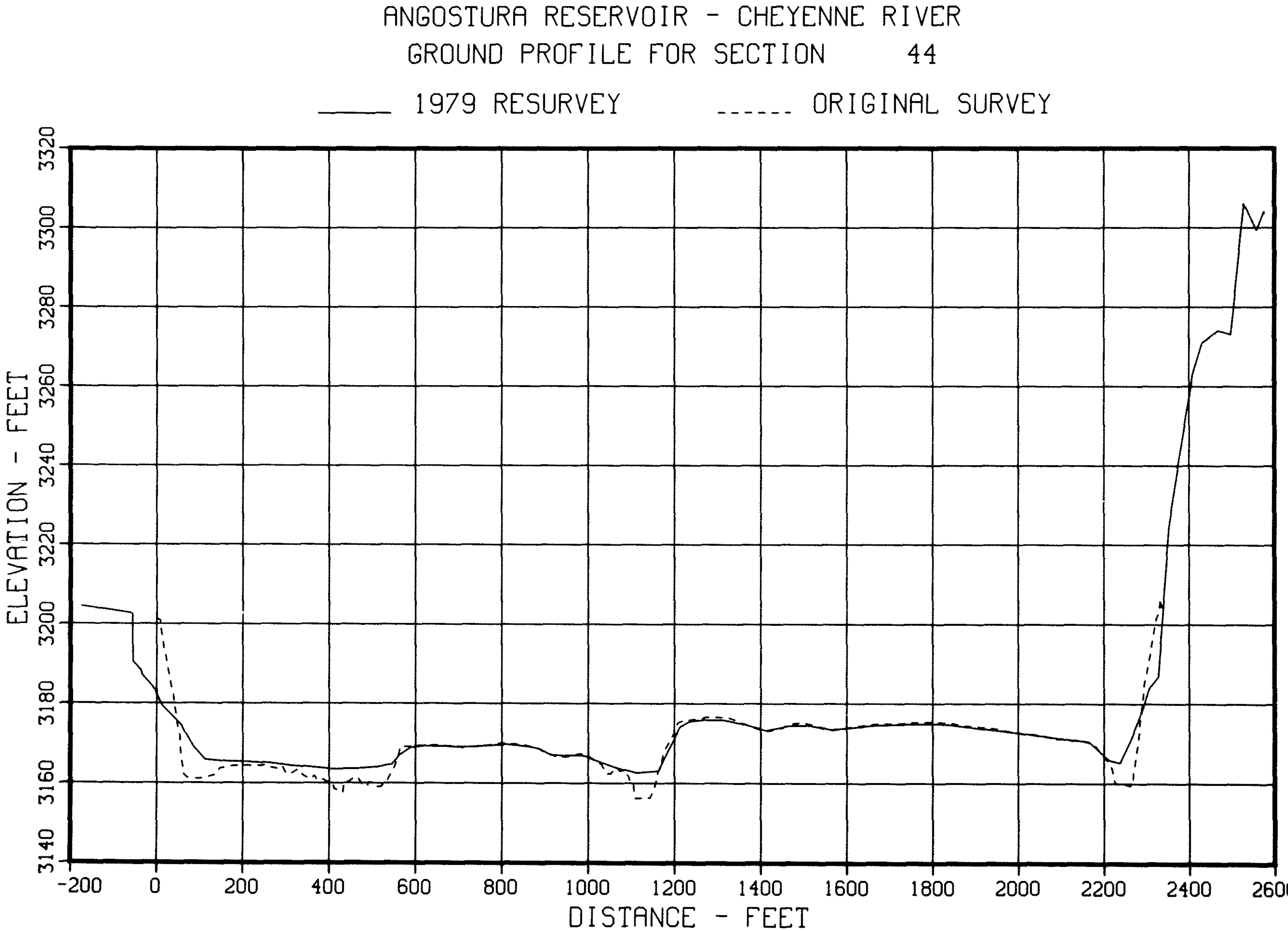

Figure 49. - 1949 and 1979 sedimentation range profiles,
Horsehead Creek - Range 44.

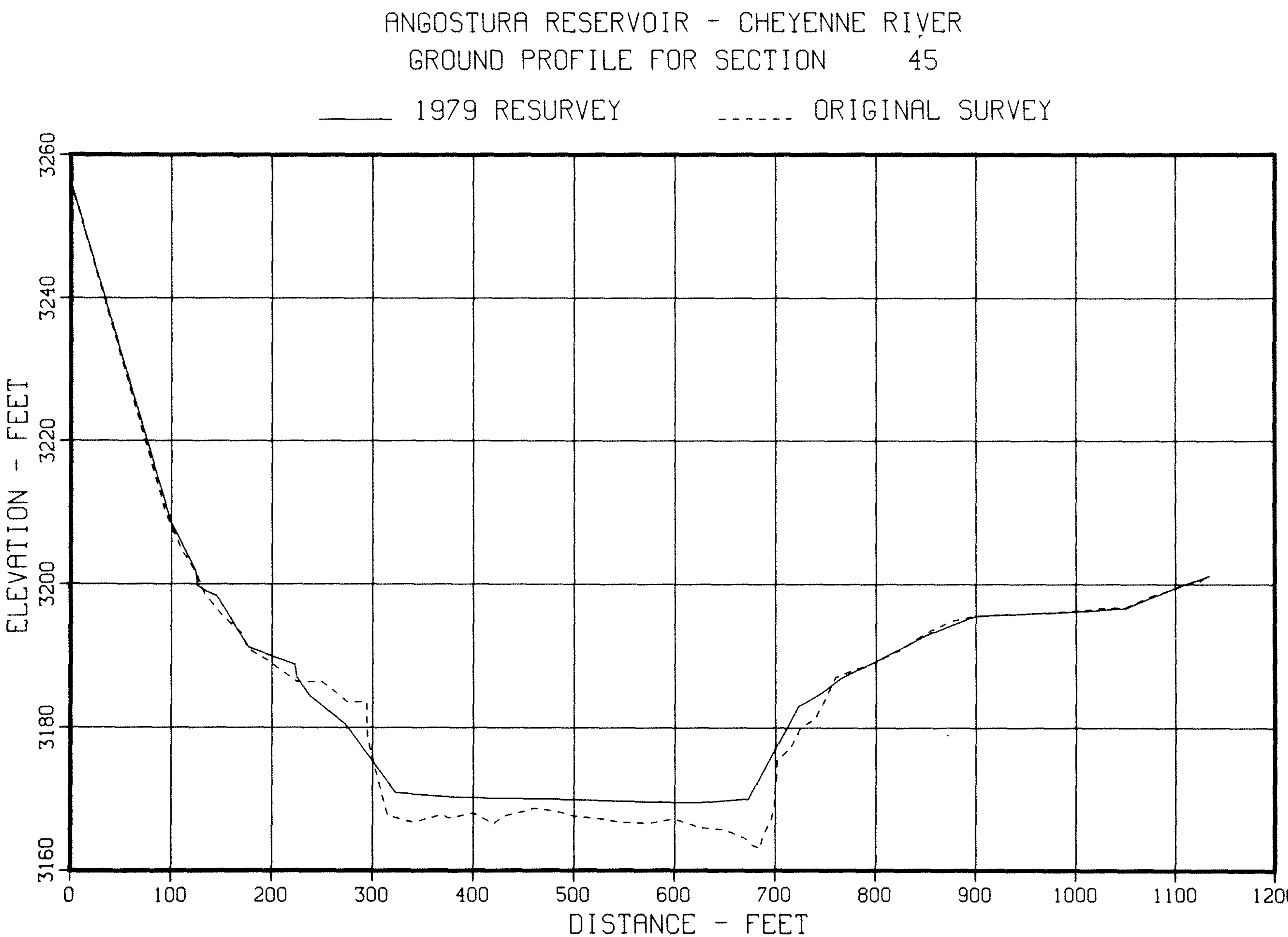

Figure 50. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 45.

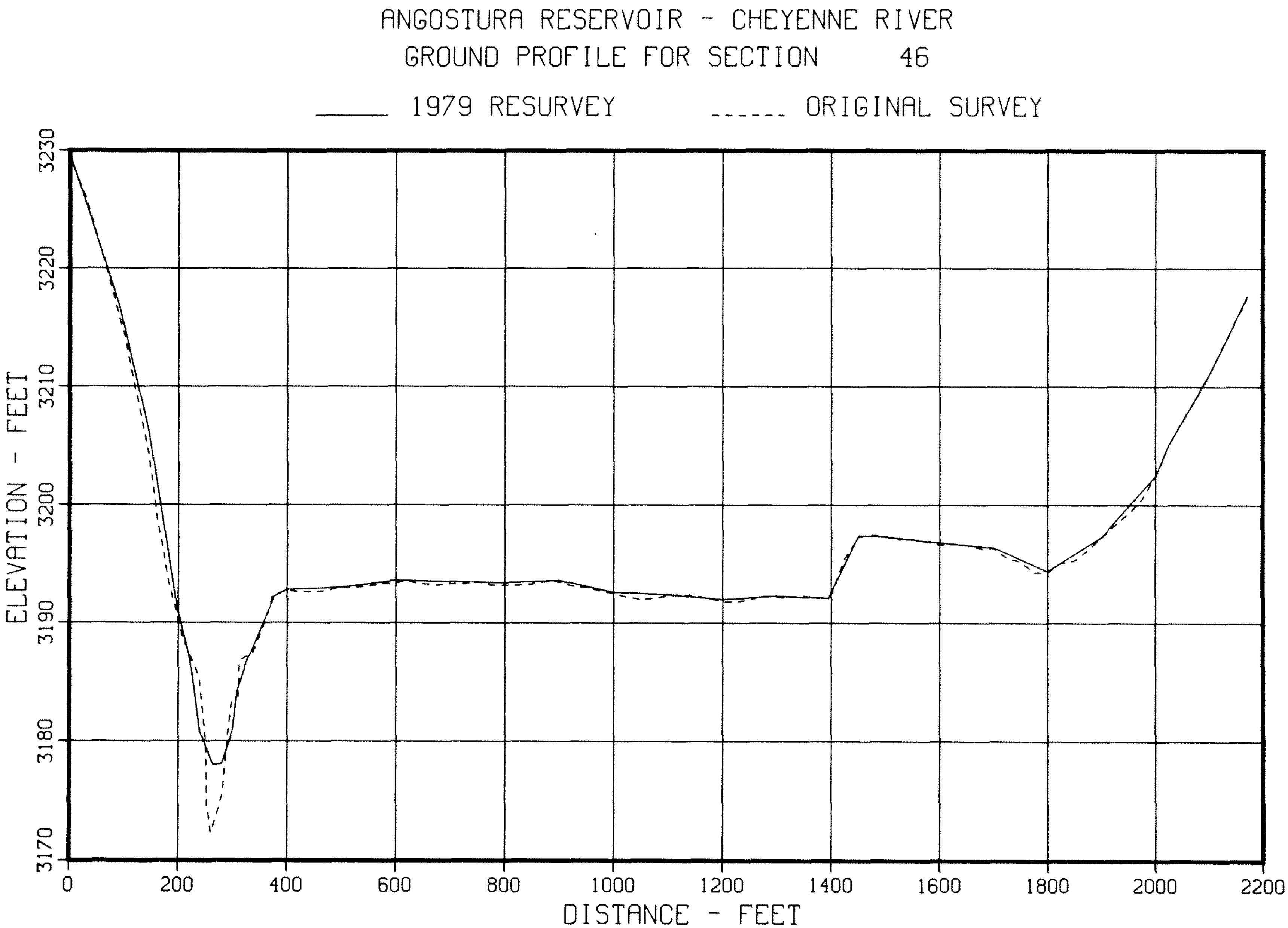

Figure 51. - 1949 and 1979 sedimentation range profiles,
Horsehead Creek - Range 46.

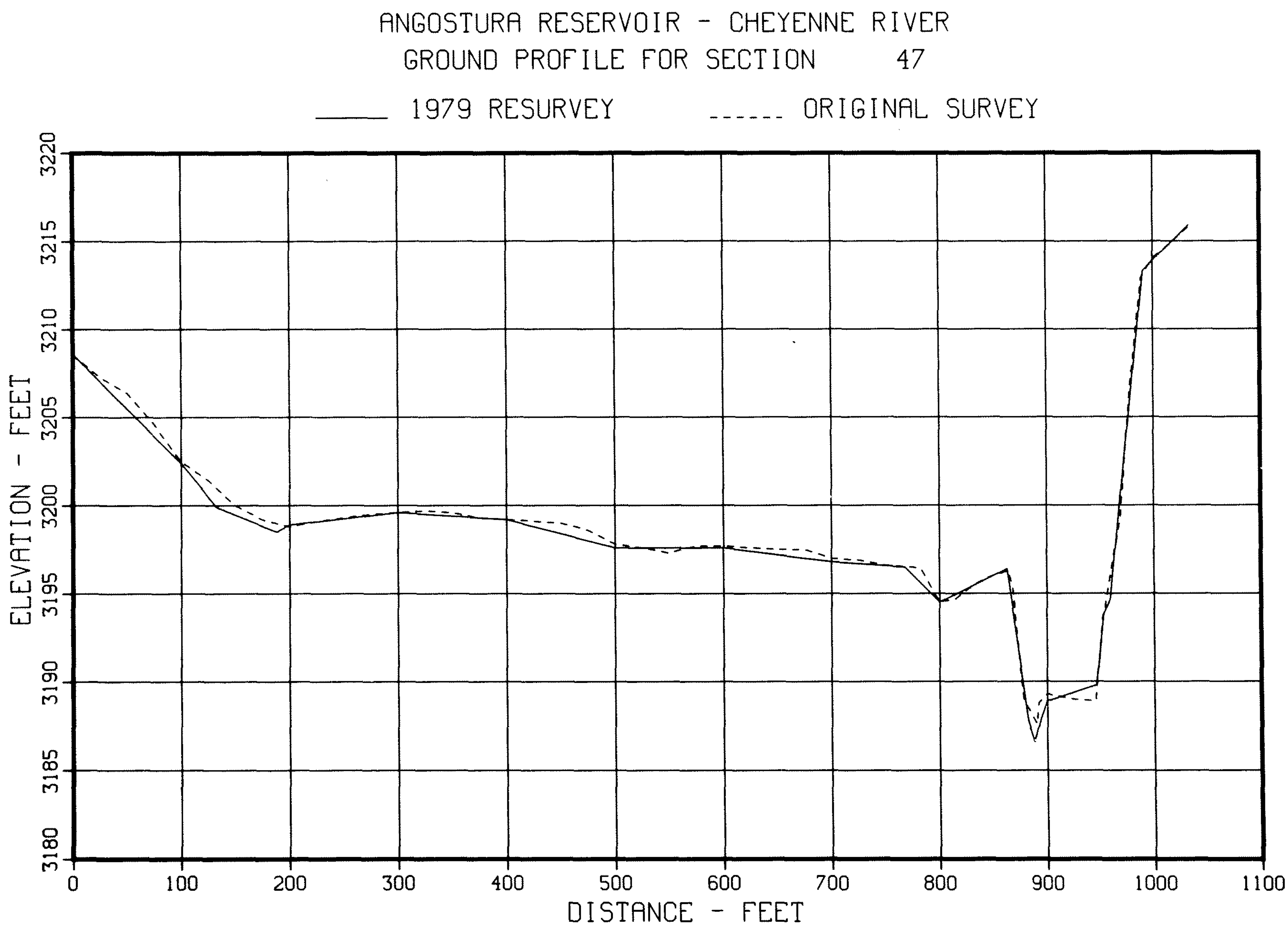

Figure 52. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 47.

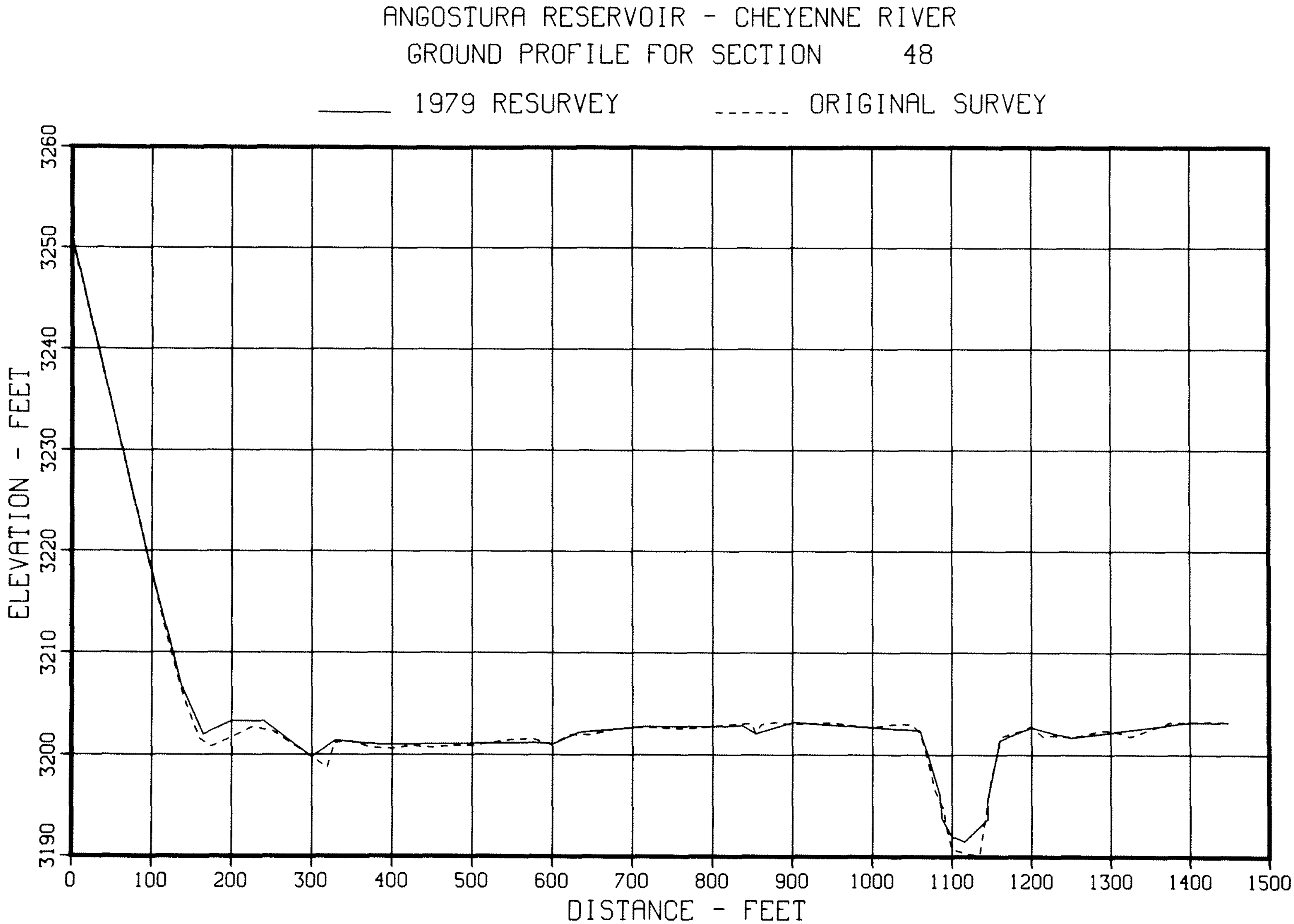

Figure 53. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 48.

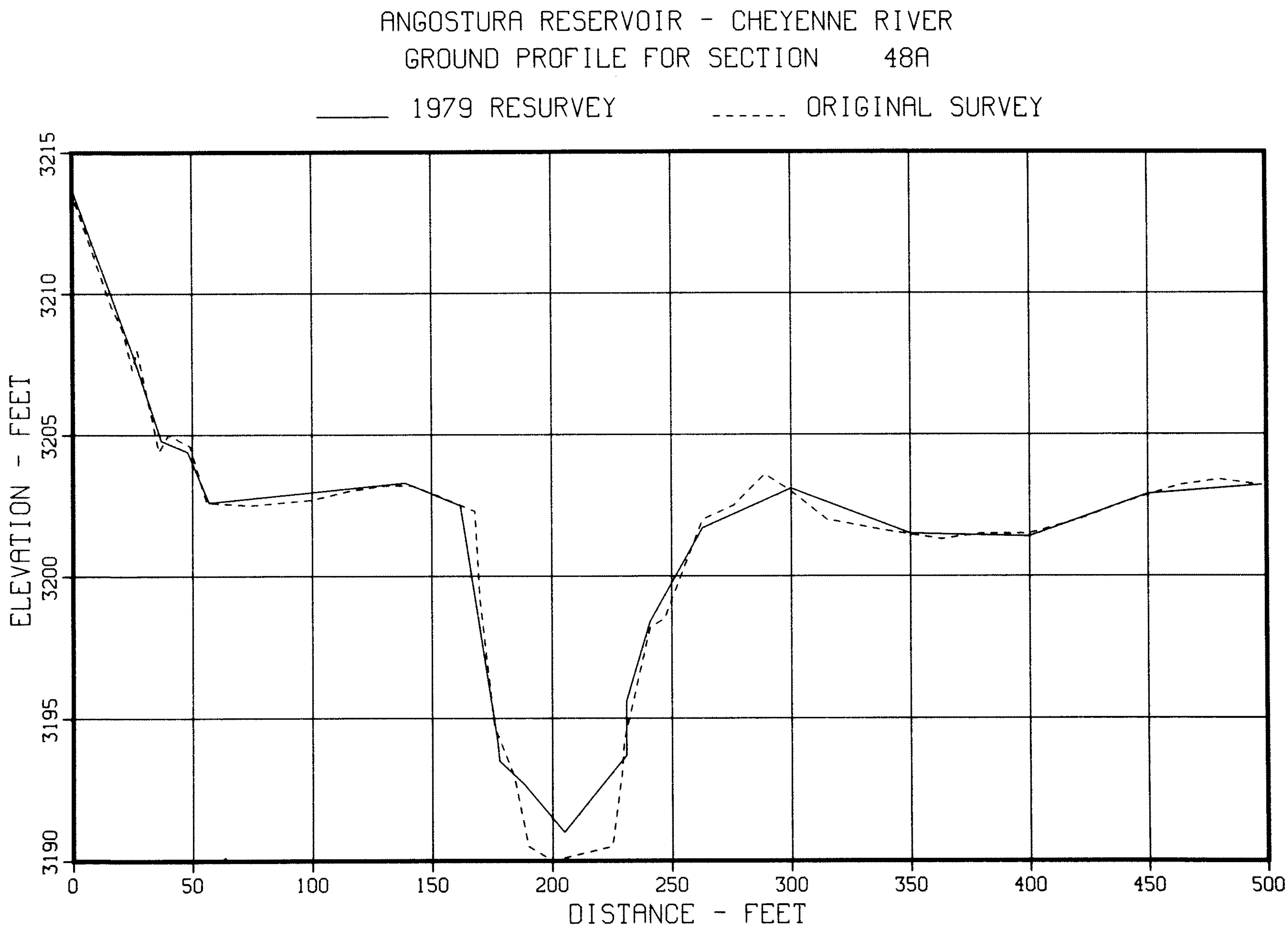

Figure 54. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 48A.

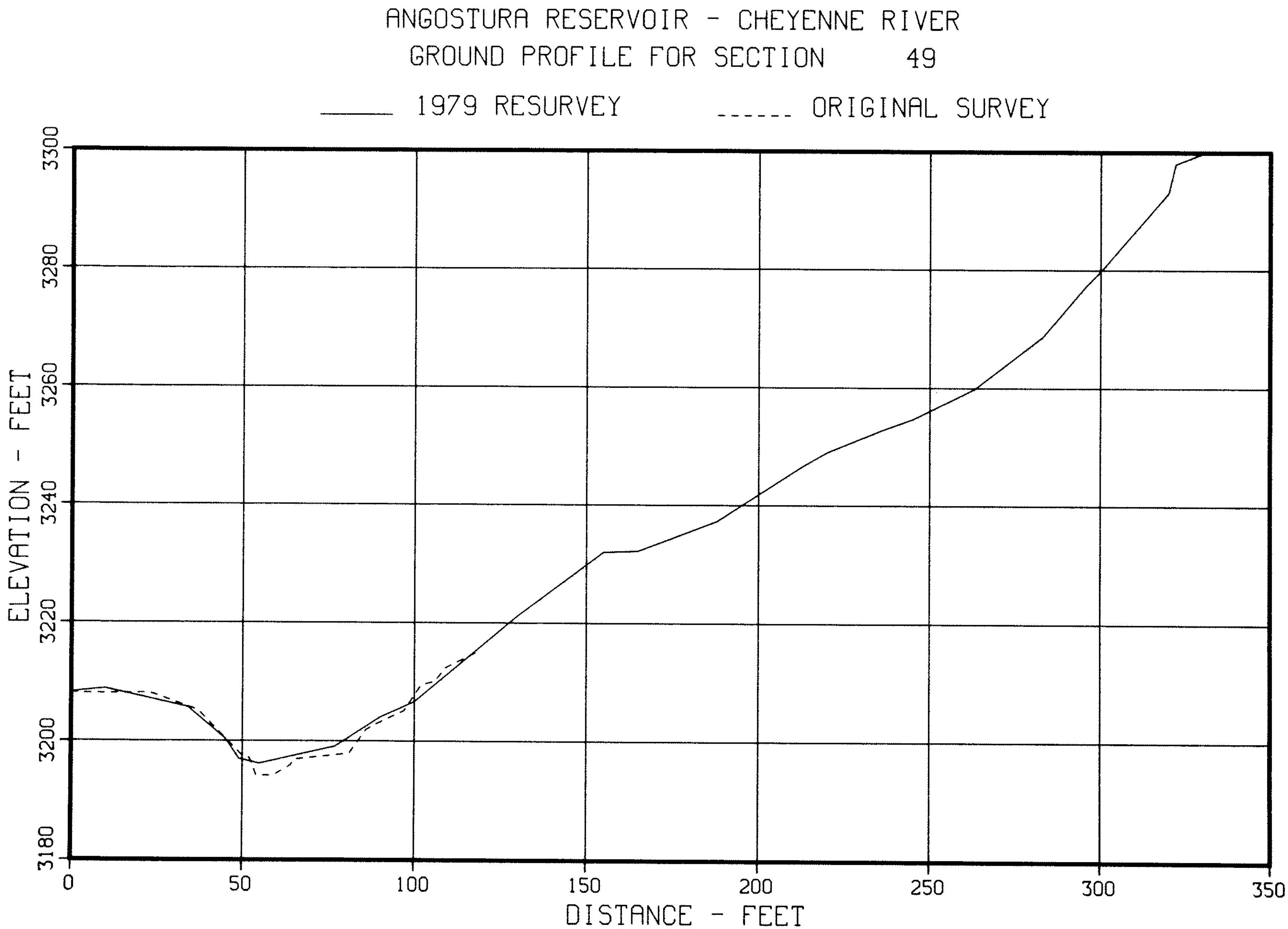

Figure 55. - 1949 and 1979 sedimentation range profiles, Horsehead Creek - Range 49.

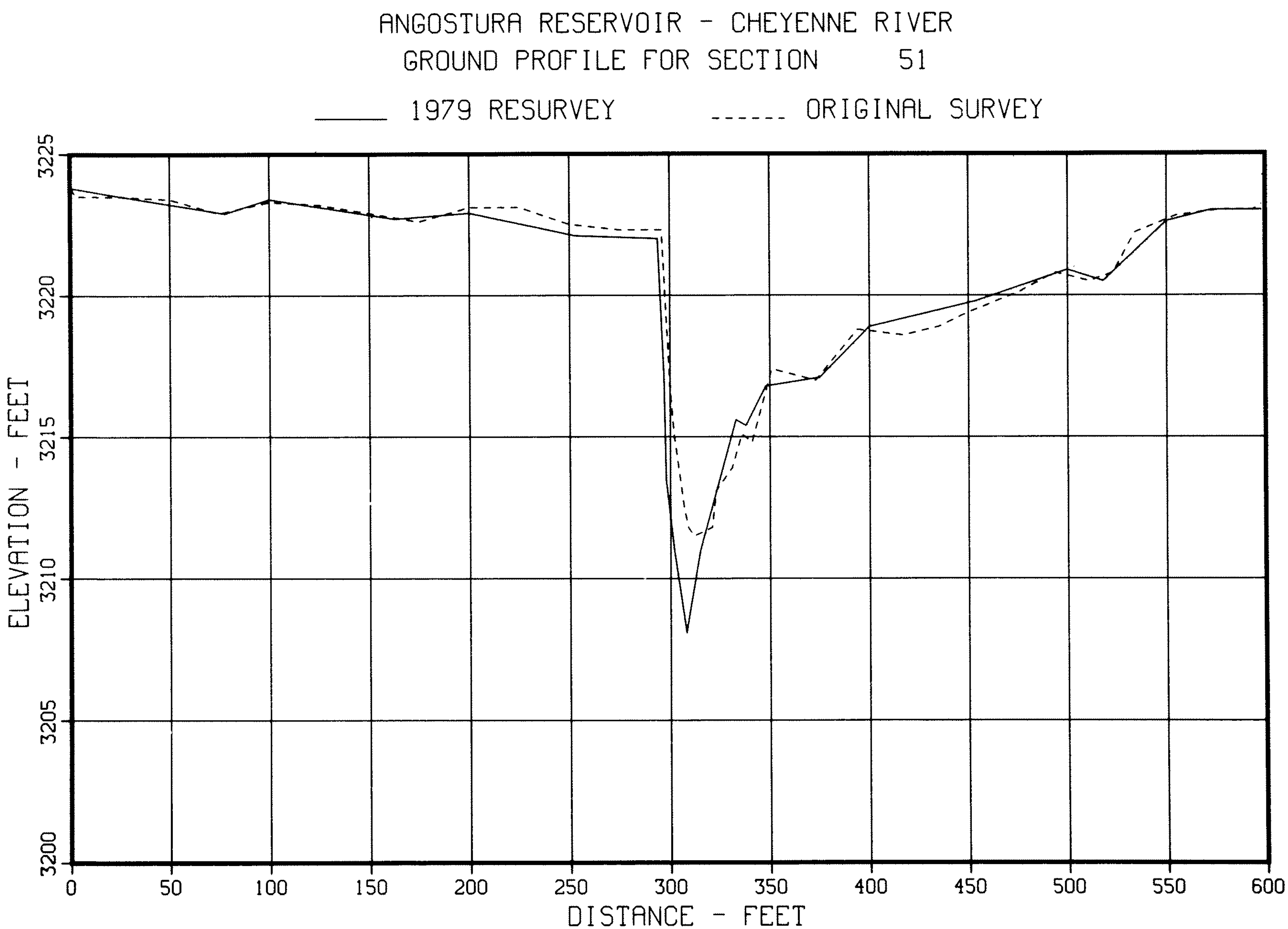

Figure 56. - 1949 and 1979 sedimentation range profiles,
Horsehead Creek - Range 51.

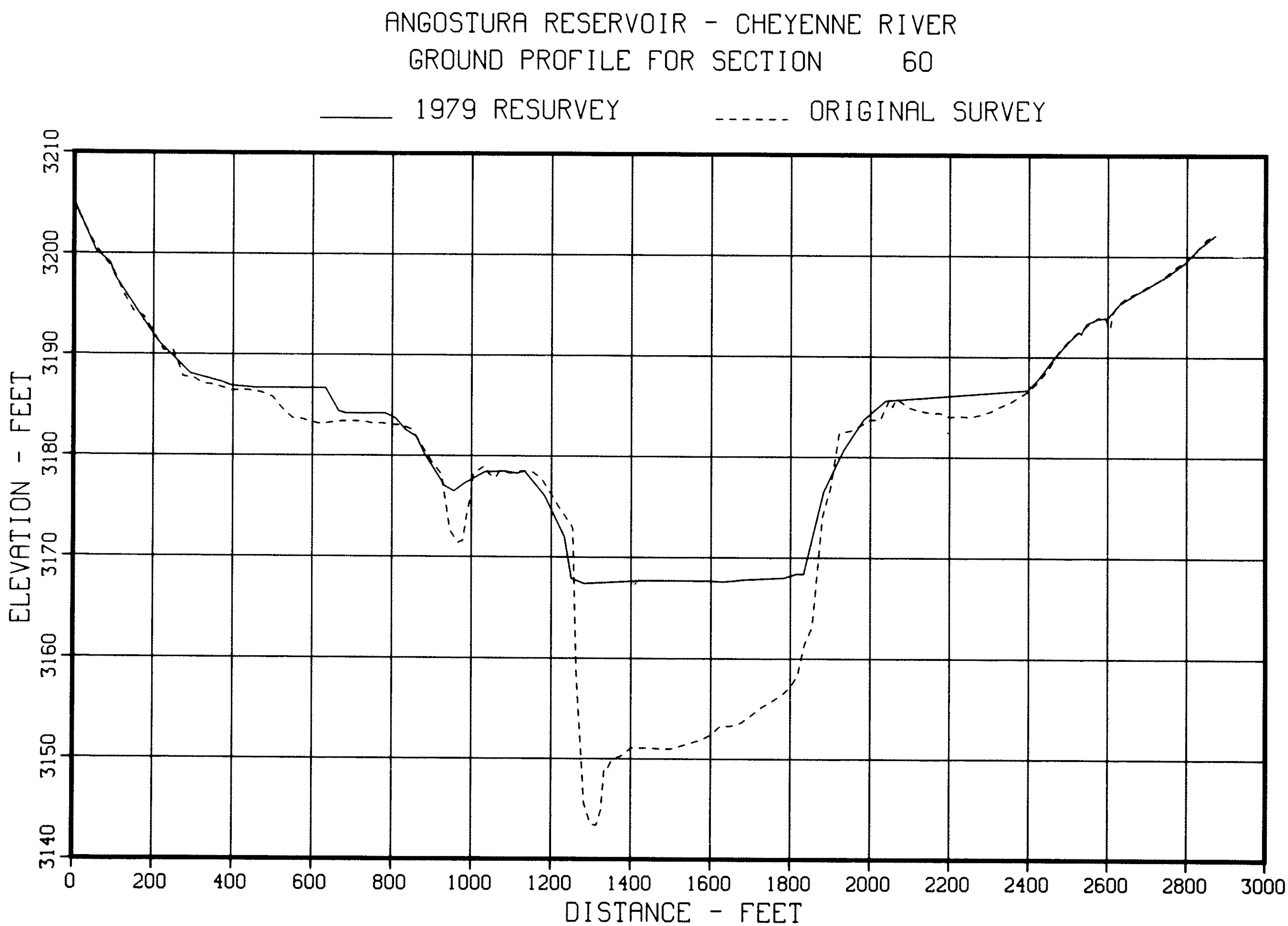

Figure 57. - 1949 and 1979 sedimentation range profiles, Dry Creek - Range 60.

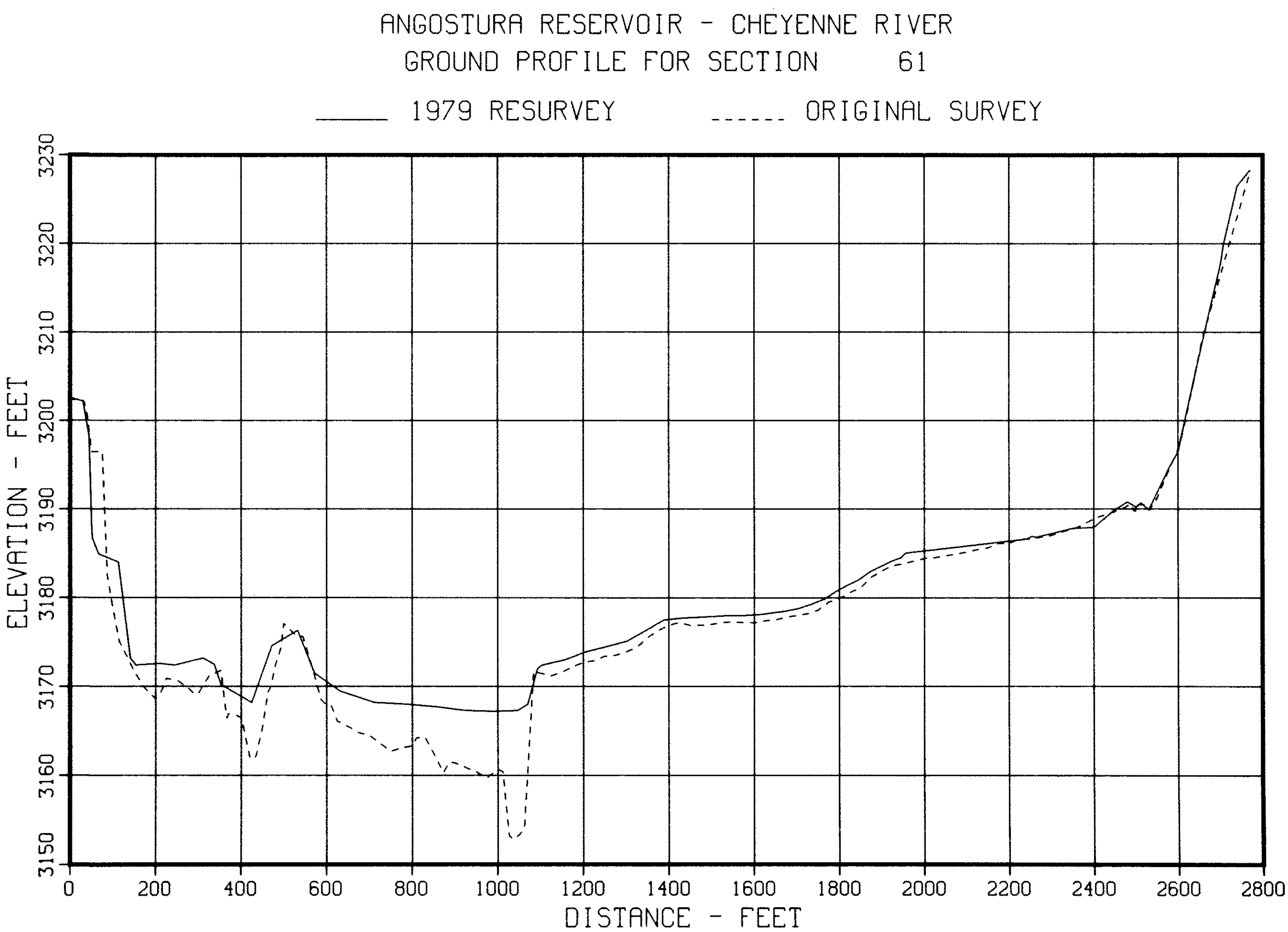

Figure 58. - 1949 and 1979 sedimentation range profiles,
Dry Creek - Range 61.

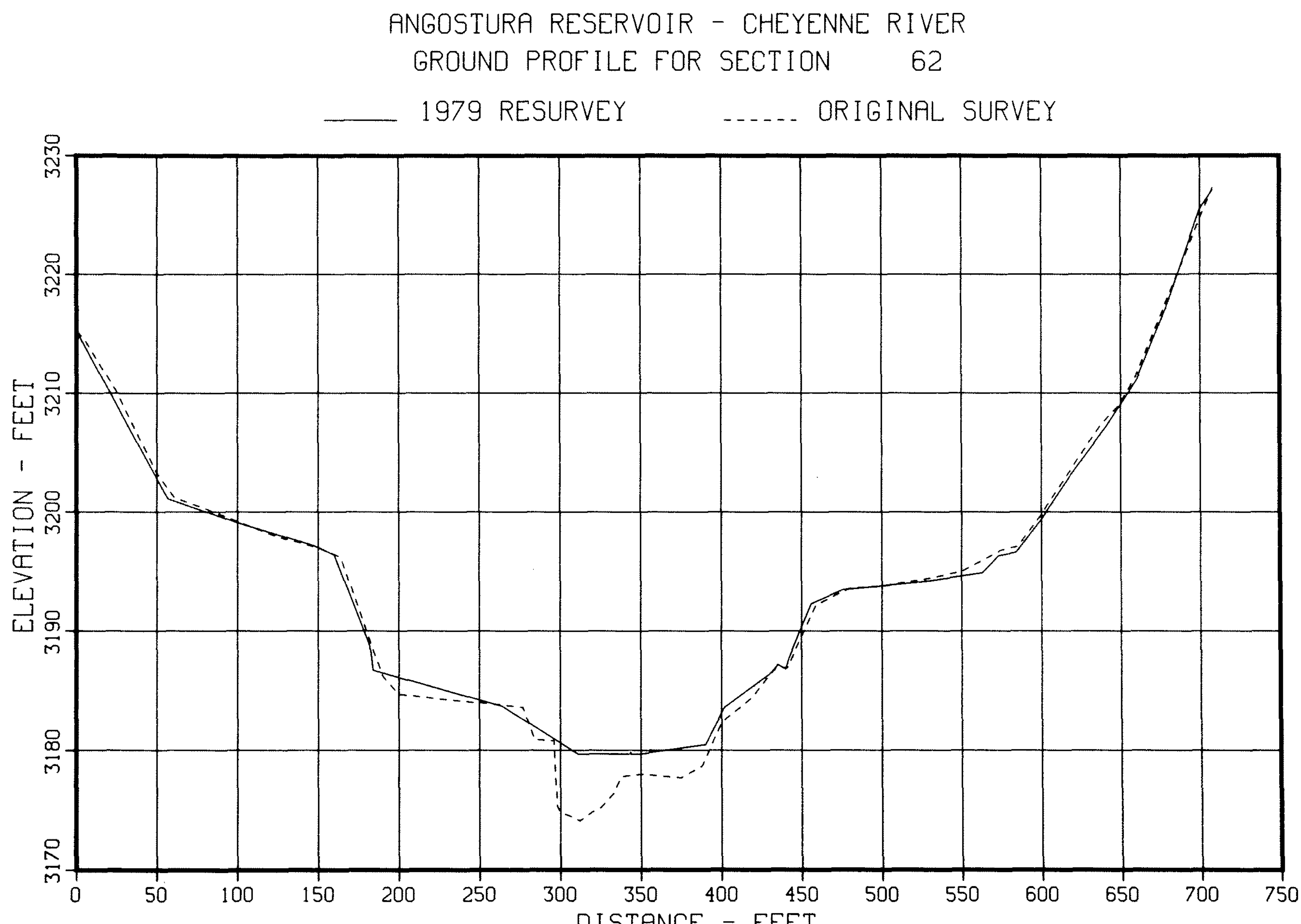

Figure 59. - 1949 and 1979 sedimentation range profiles, Dry Creek - Range 62.

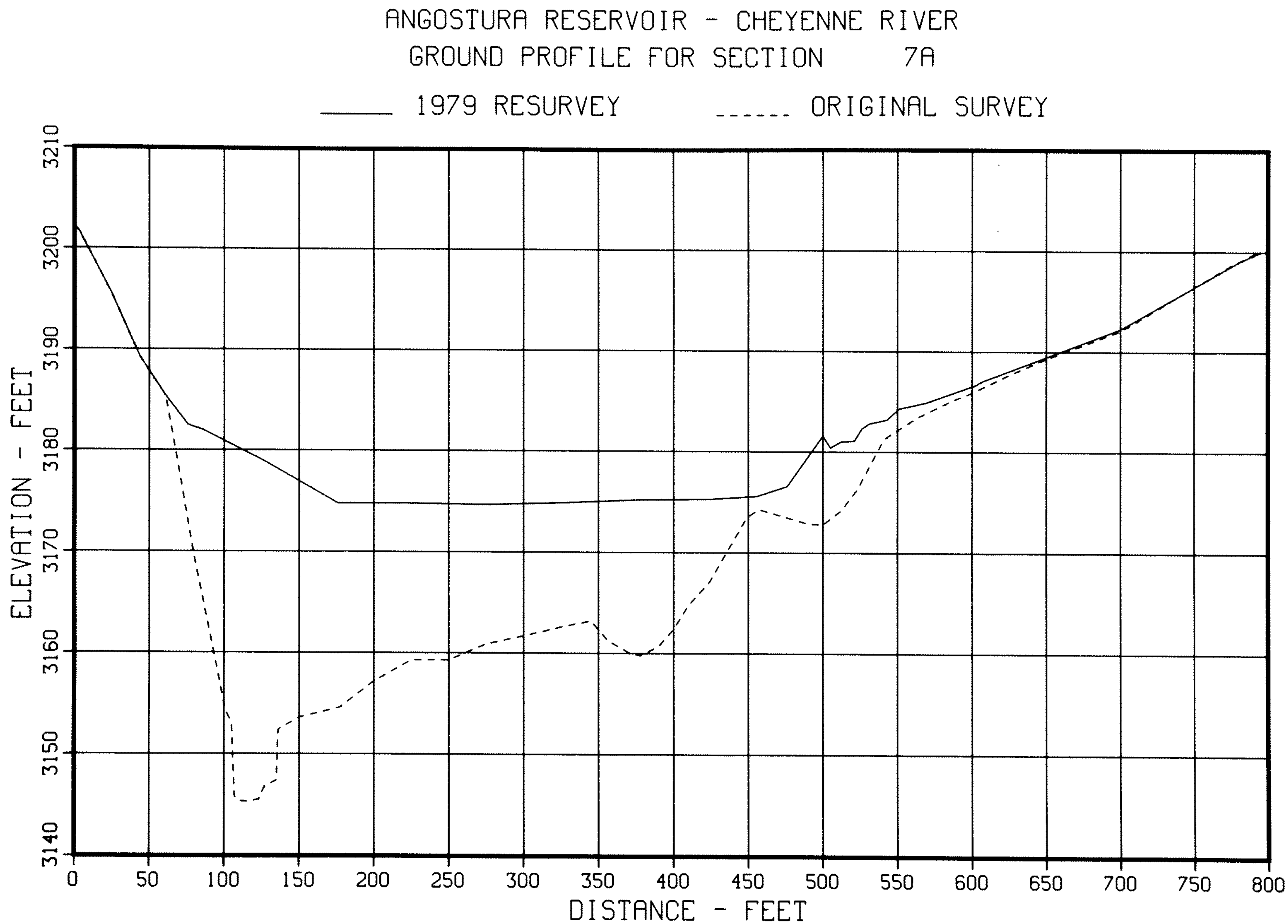

Figure 60. - 1949 and 1979 sedimentation range profiles at mouth of unnamed canyon entering reservoir upstream of Range 7 - Range 7A.

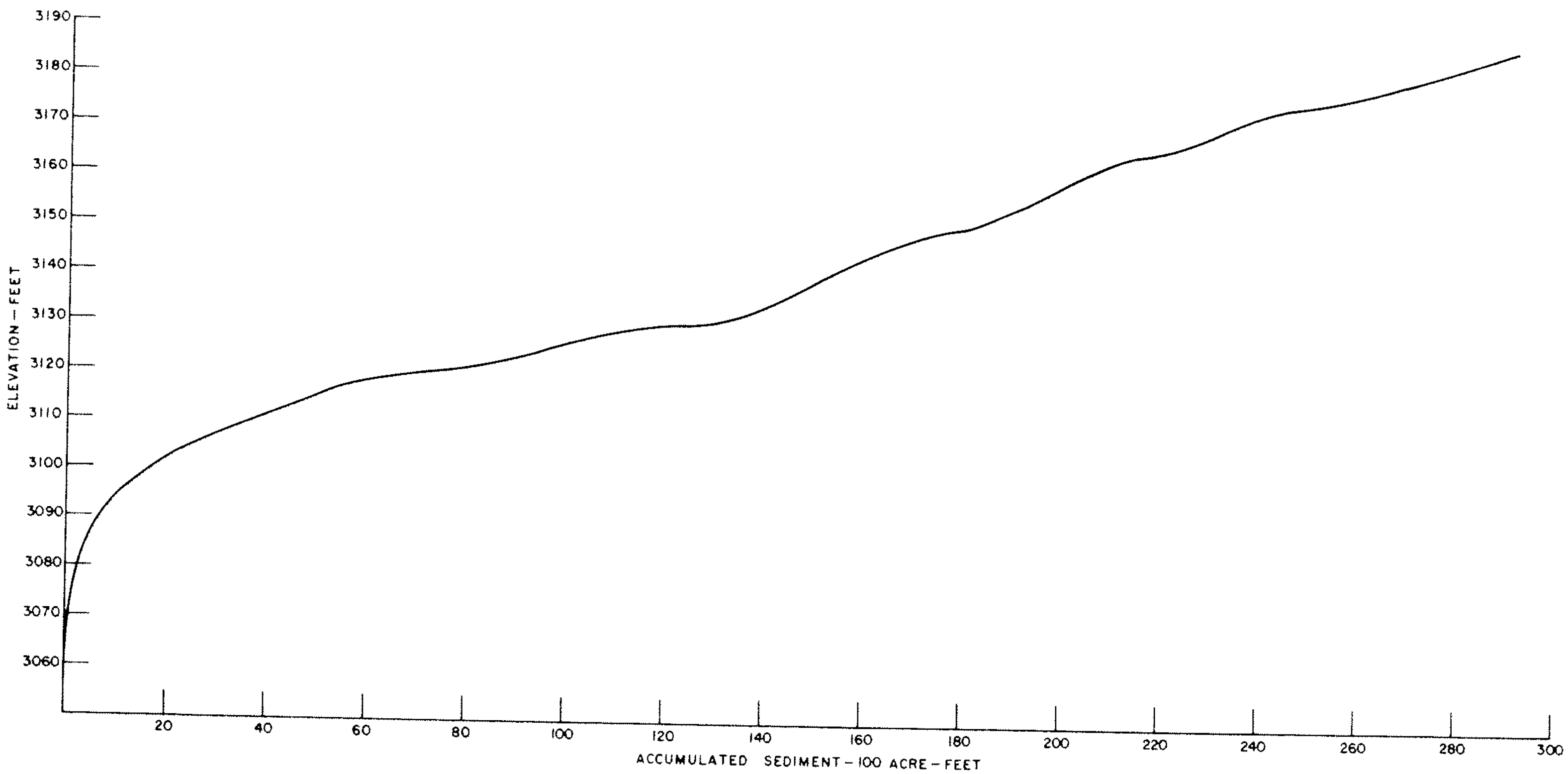

Figure 61. - Sediment accumulation curve.

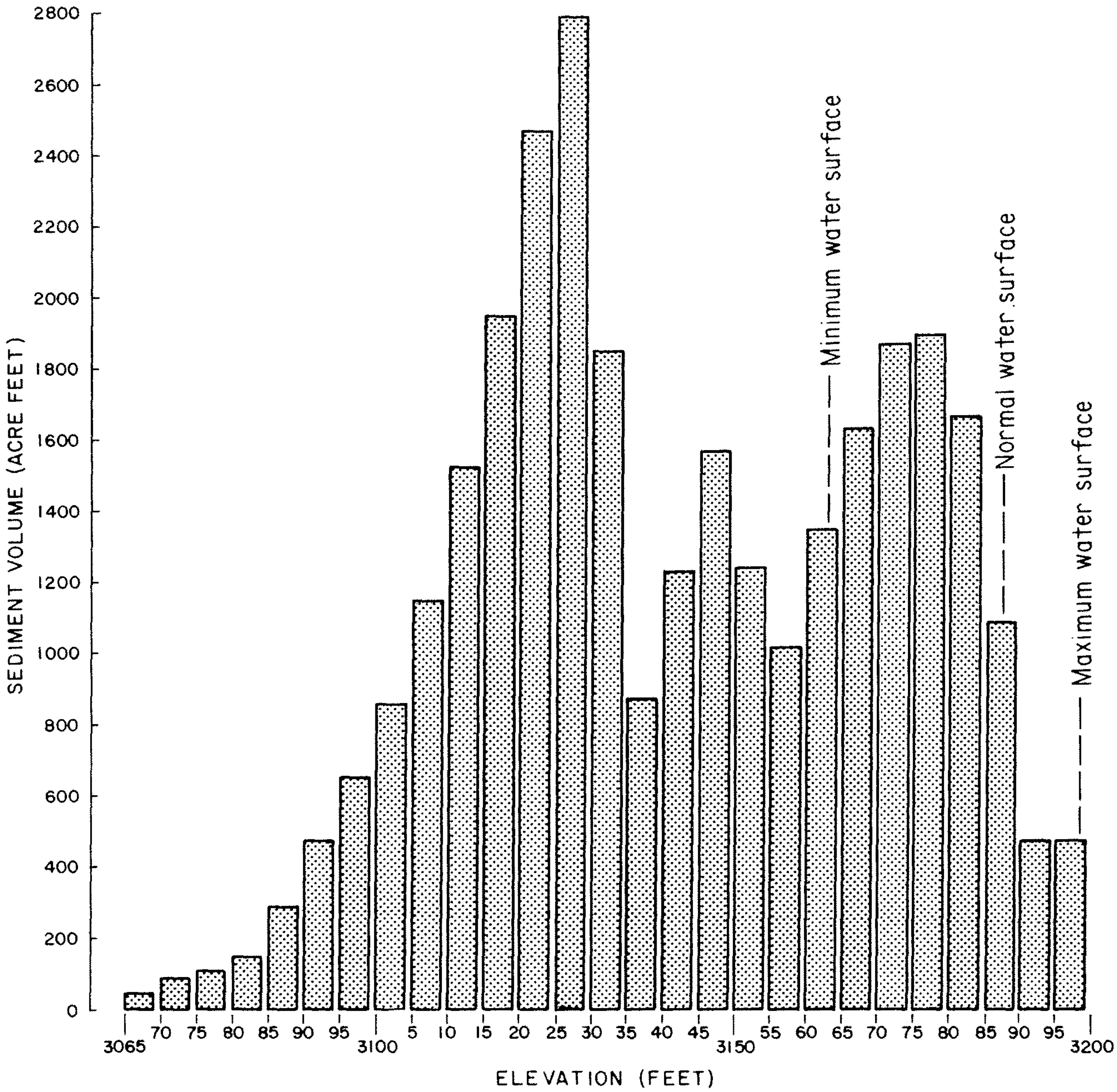

Figure 62. - Sediment accumulations in elevation intervals.

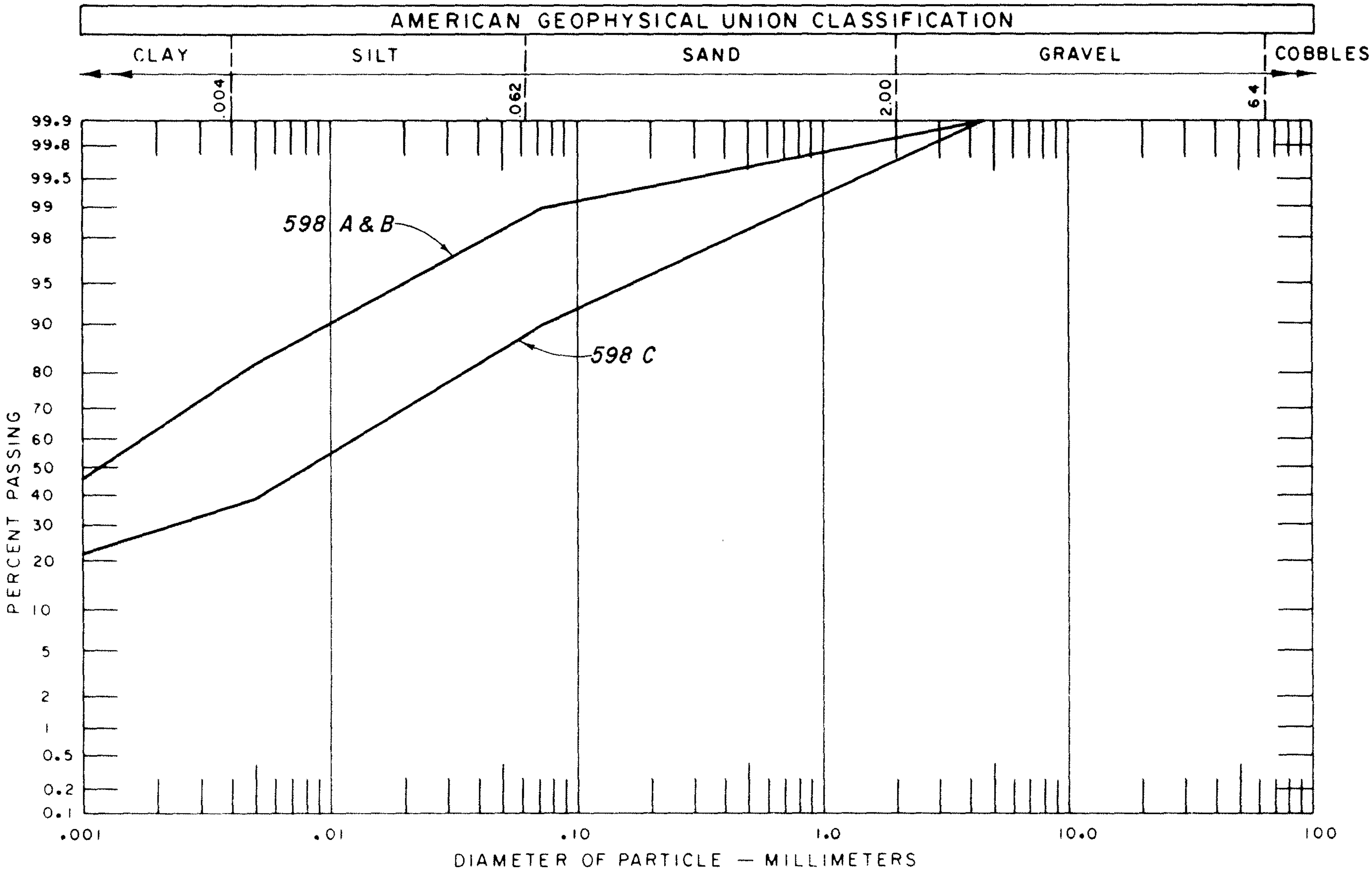

Figure 63. - Particle size analyses curves - Range 6.

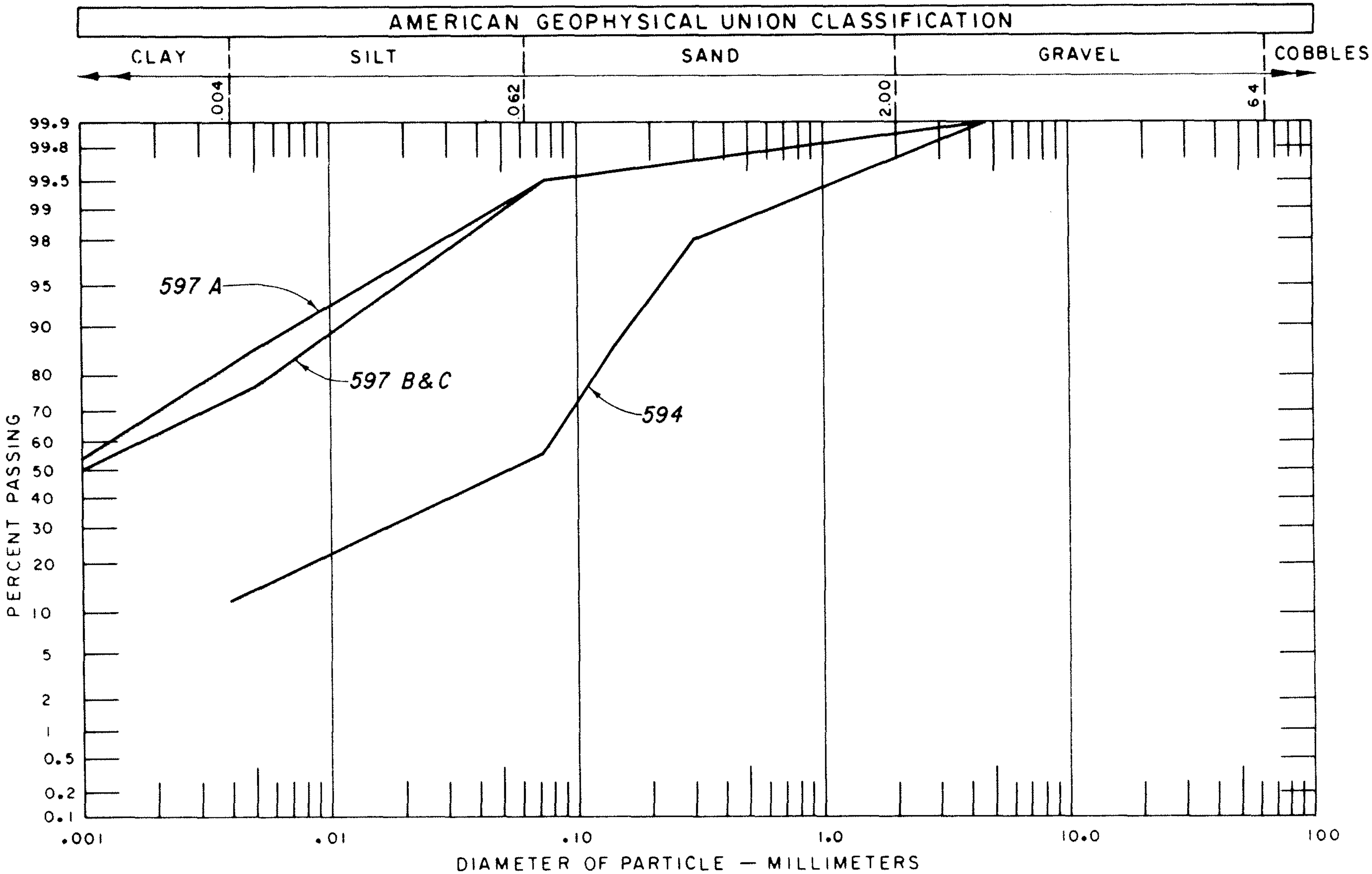

Figure 64. - Particle size analyses curves - Range 6A.

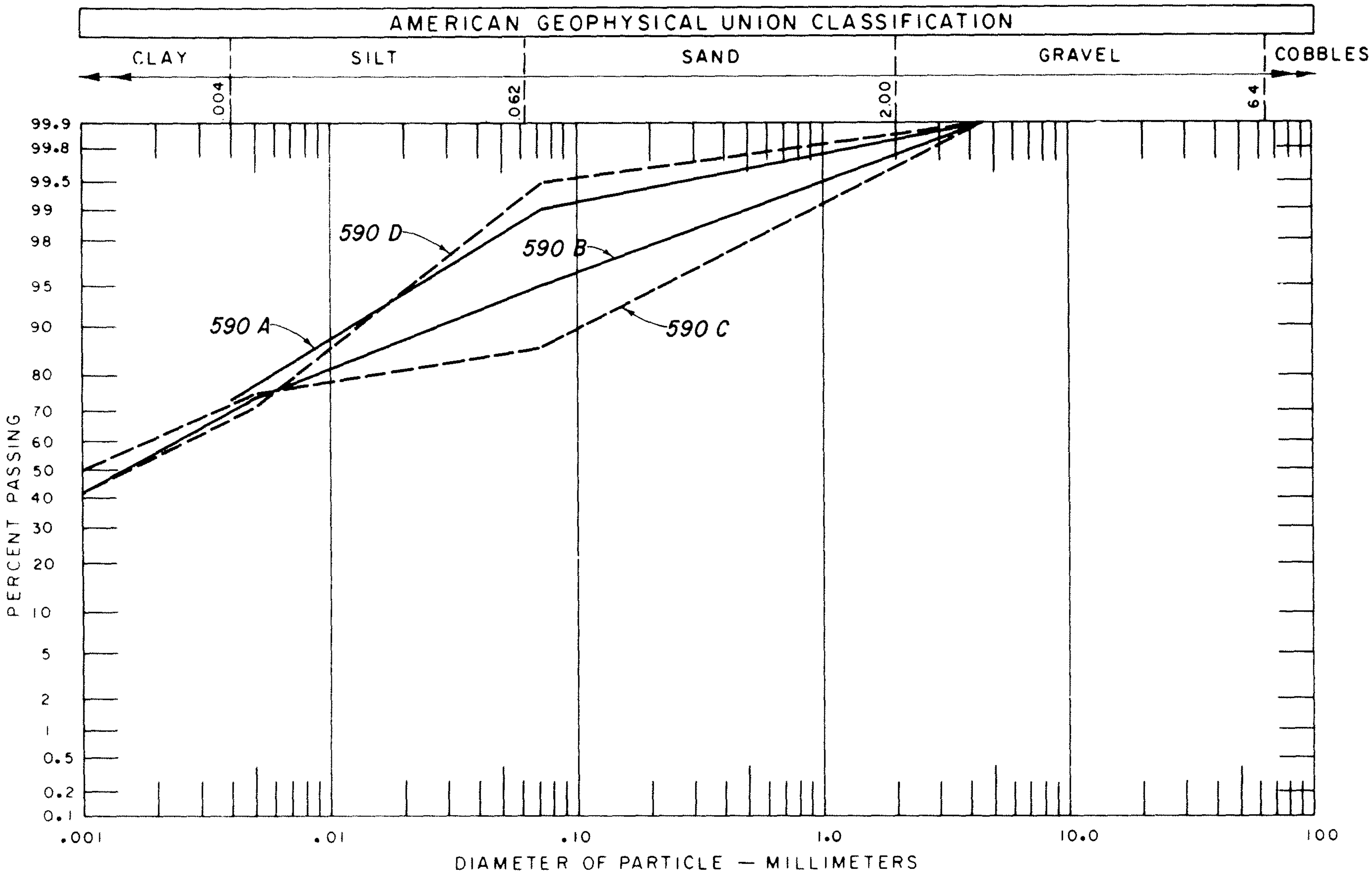

Figure 65. - Particle size analyses curves - Range 7 - Sheet 1 of 2.

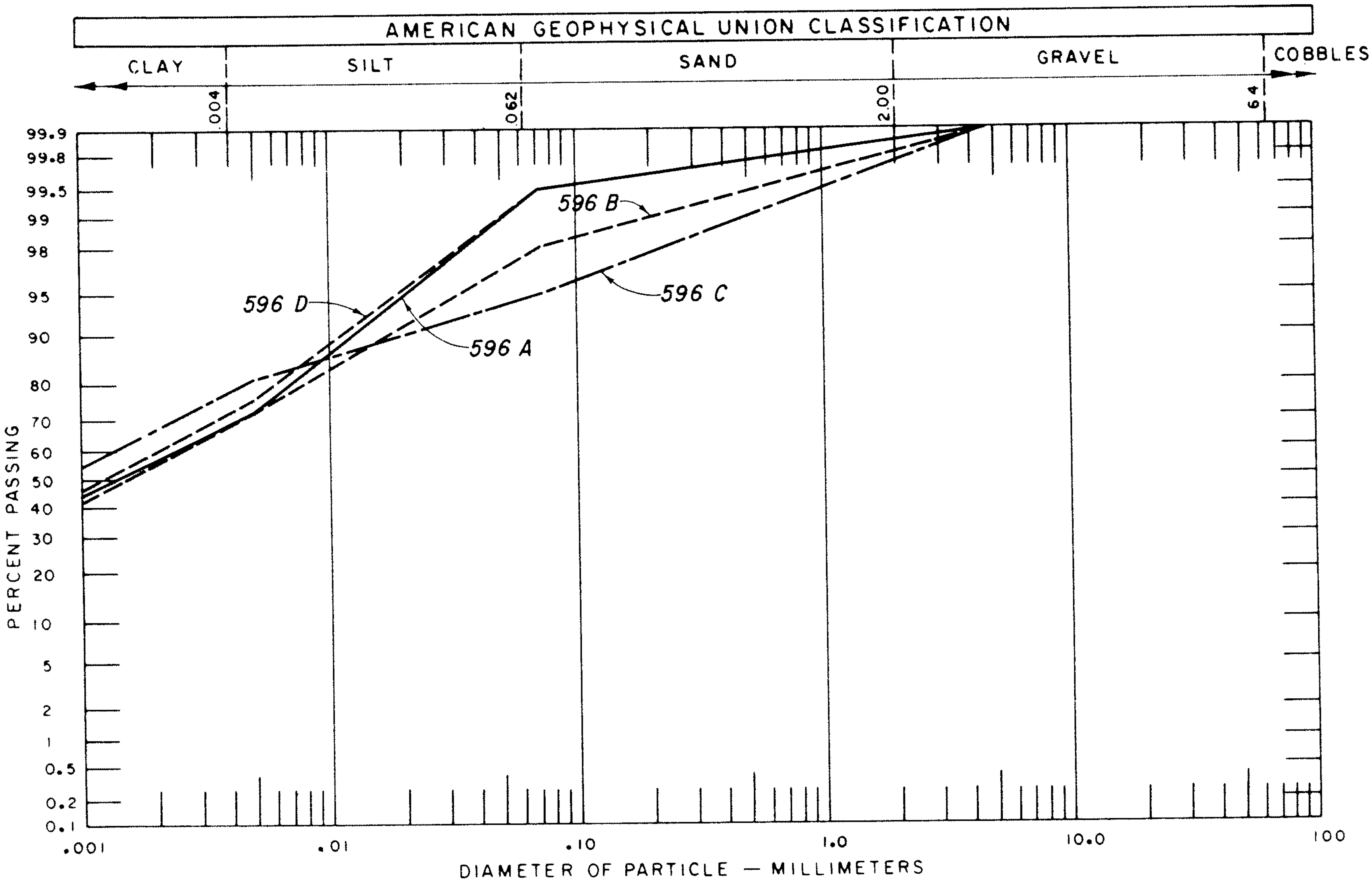

Figure 65. - Particle size analyses curves - Range 7 - Sheet 2 of 2.

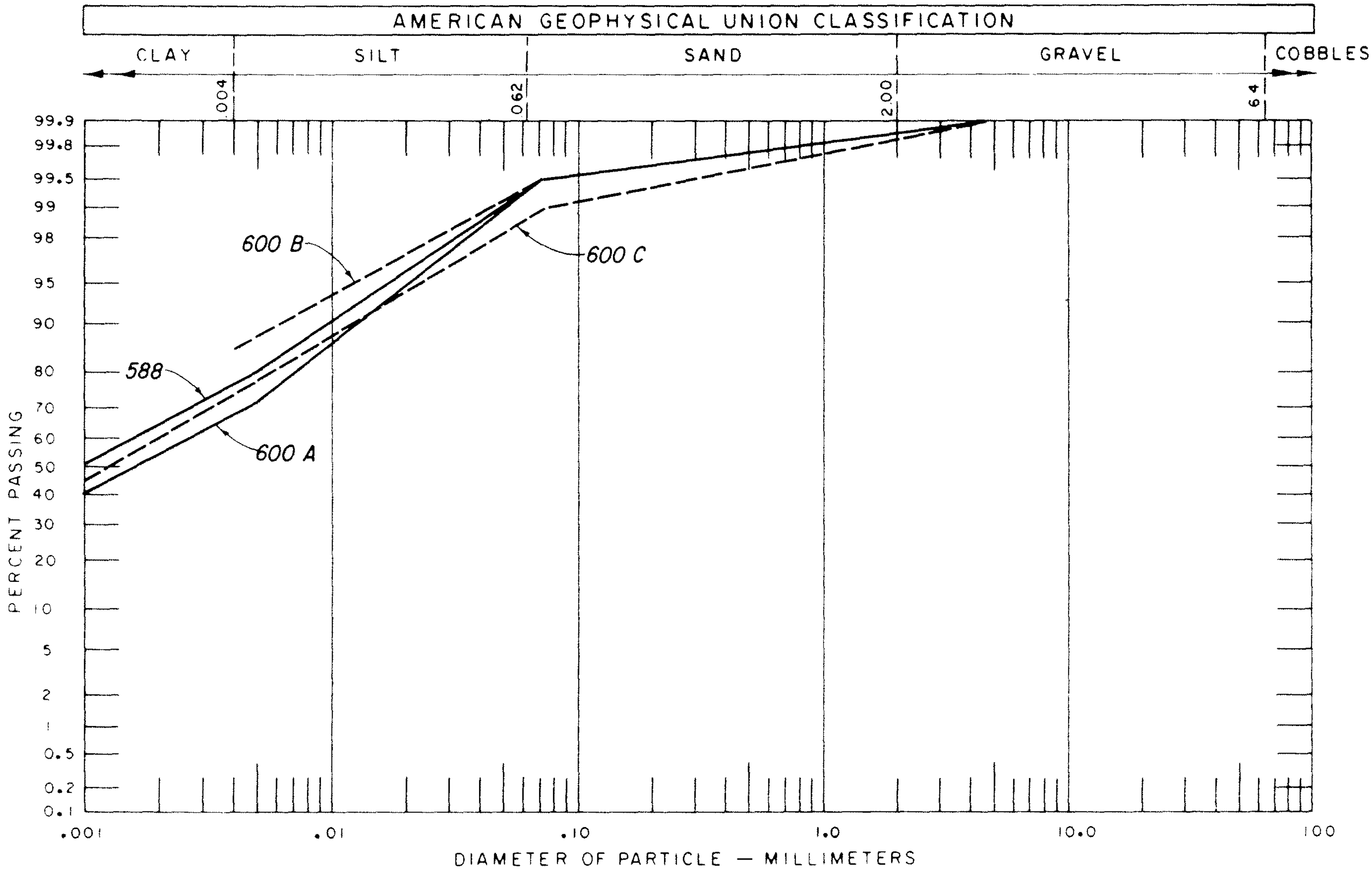

Figure 66. - Particle size analyses curves - Range 8.

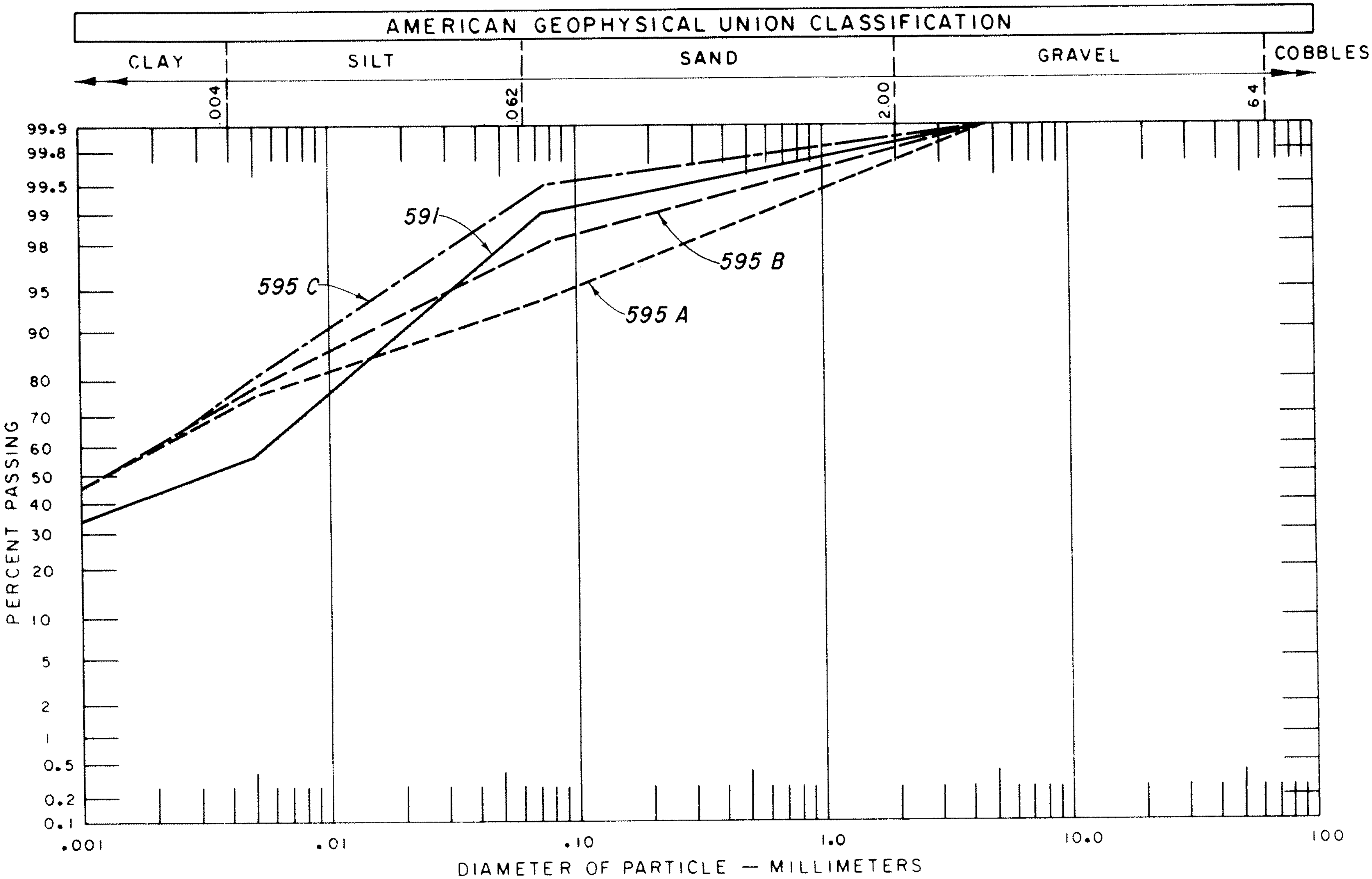

Figure 67. - Particle size analyses curves - Range 9.

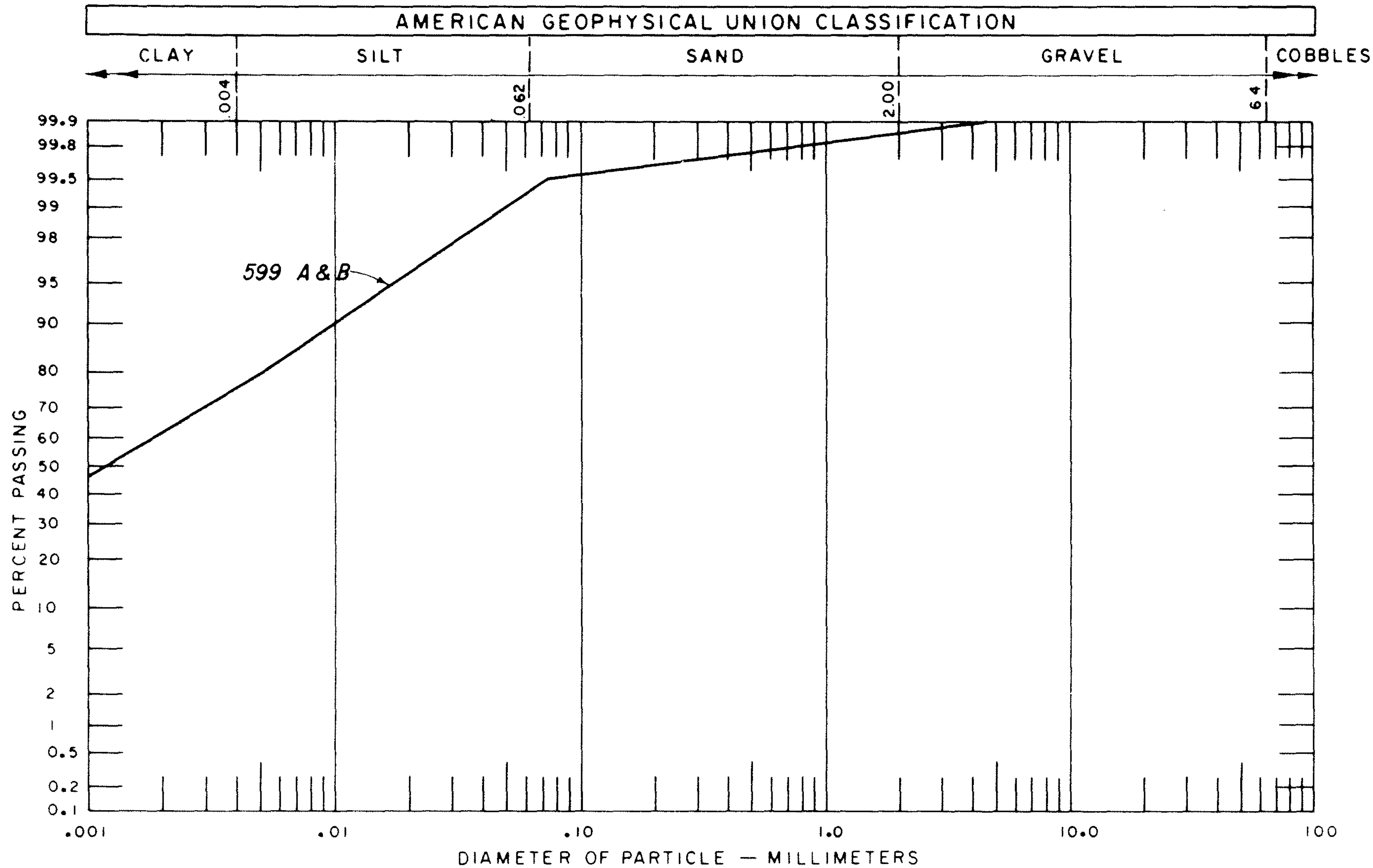

Figure 68. - Particle size analyses curve - Range 10.

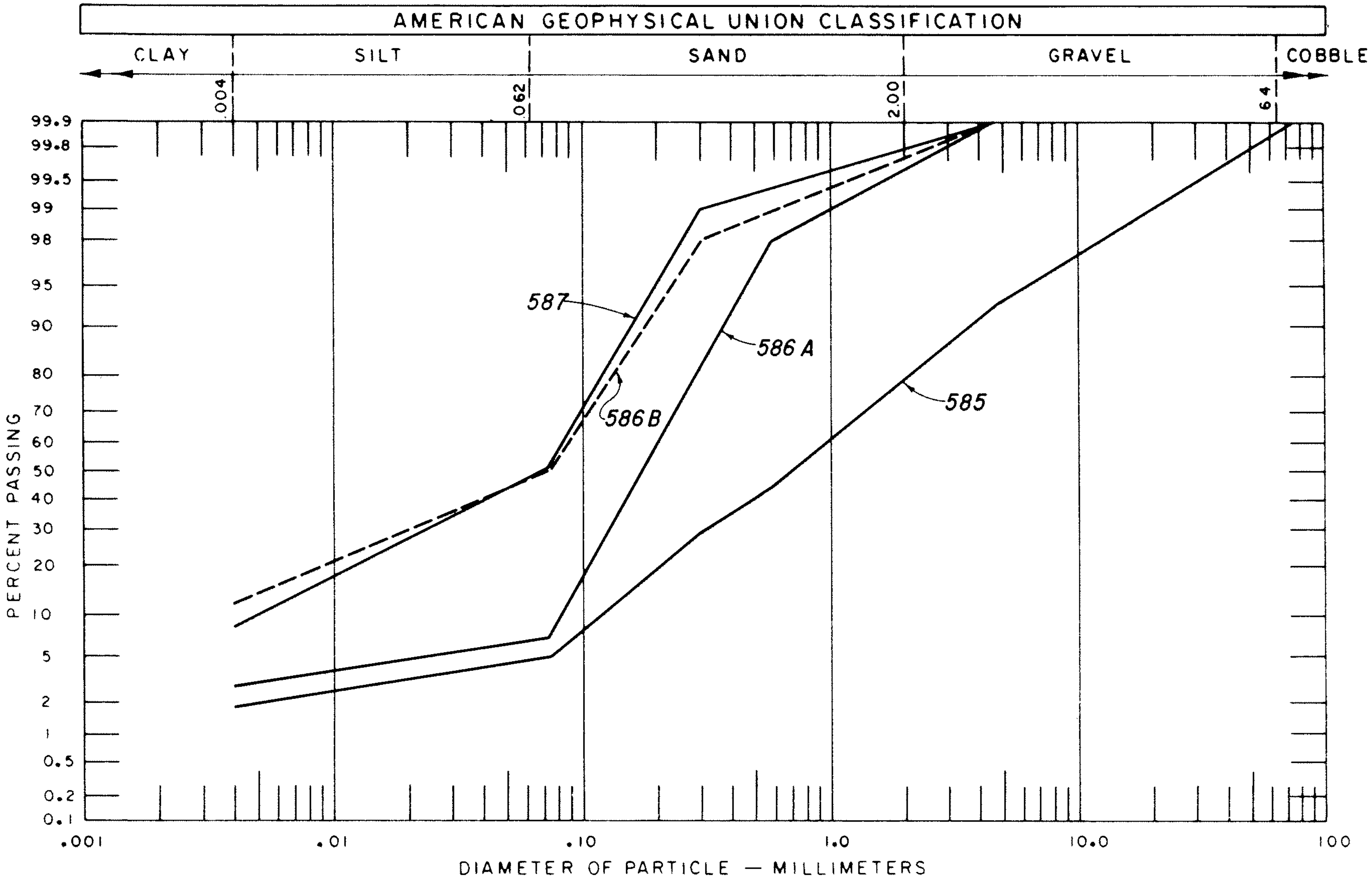

Figure 69. - Particle size analyses curves - Range 12.

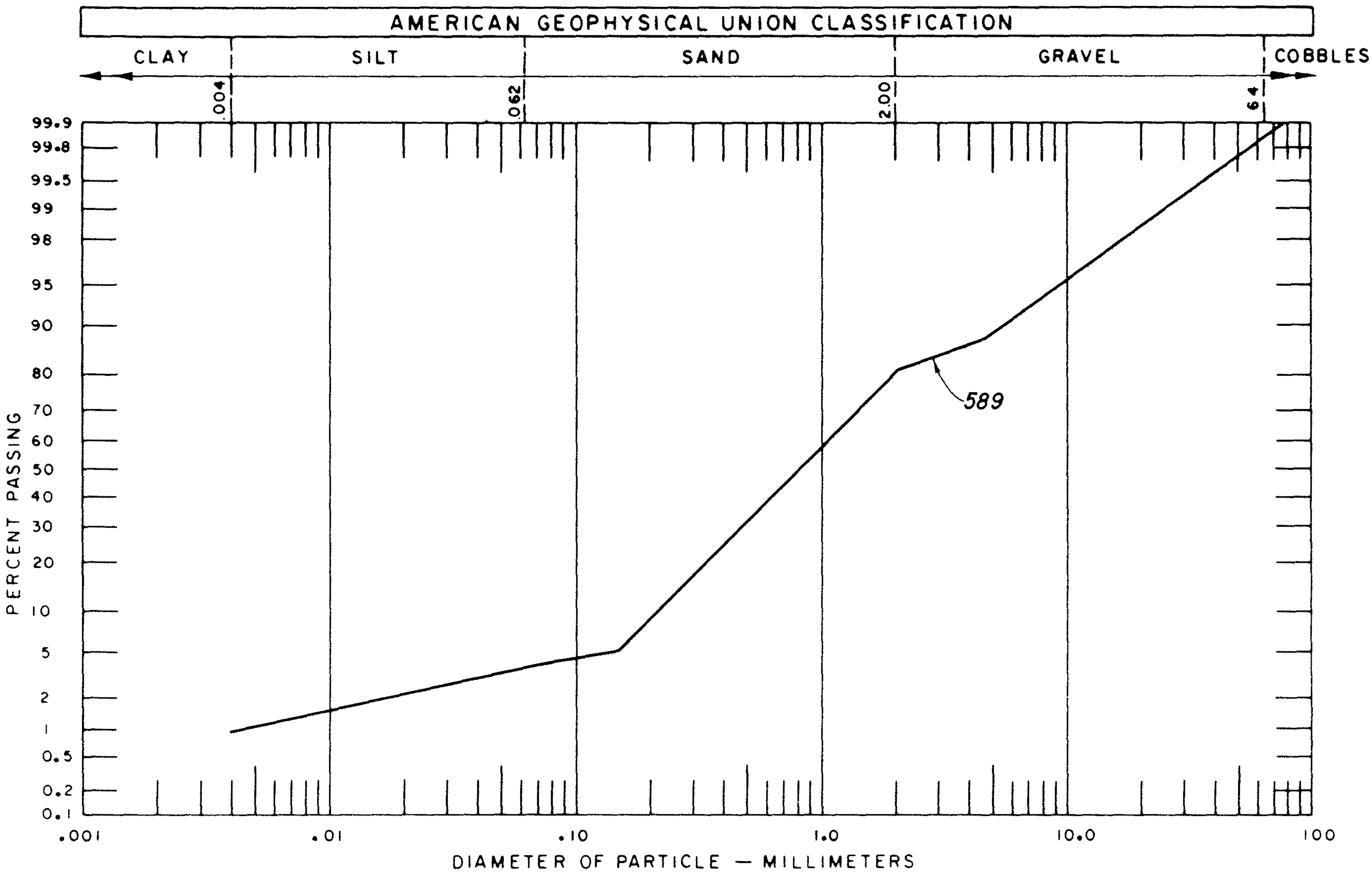

Figure 70. - Particle size analyses curve - Range 14.

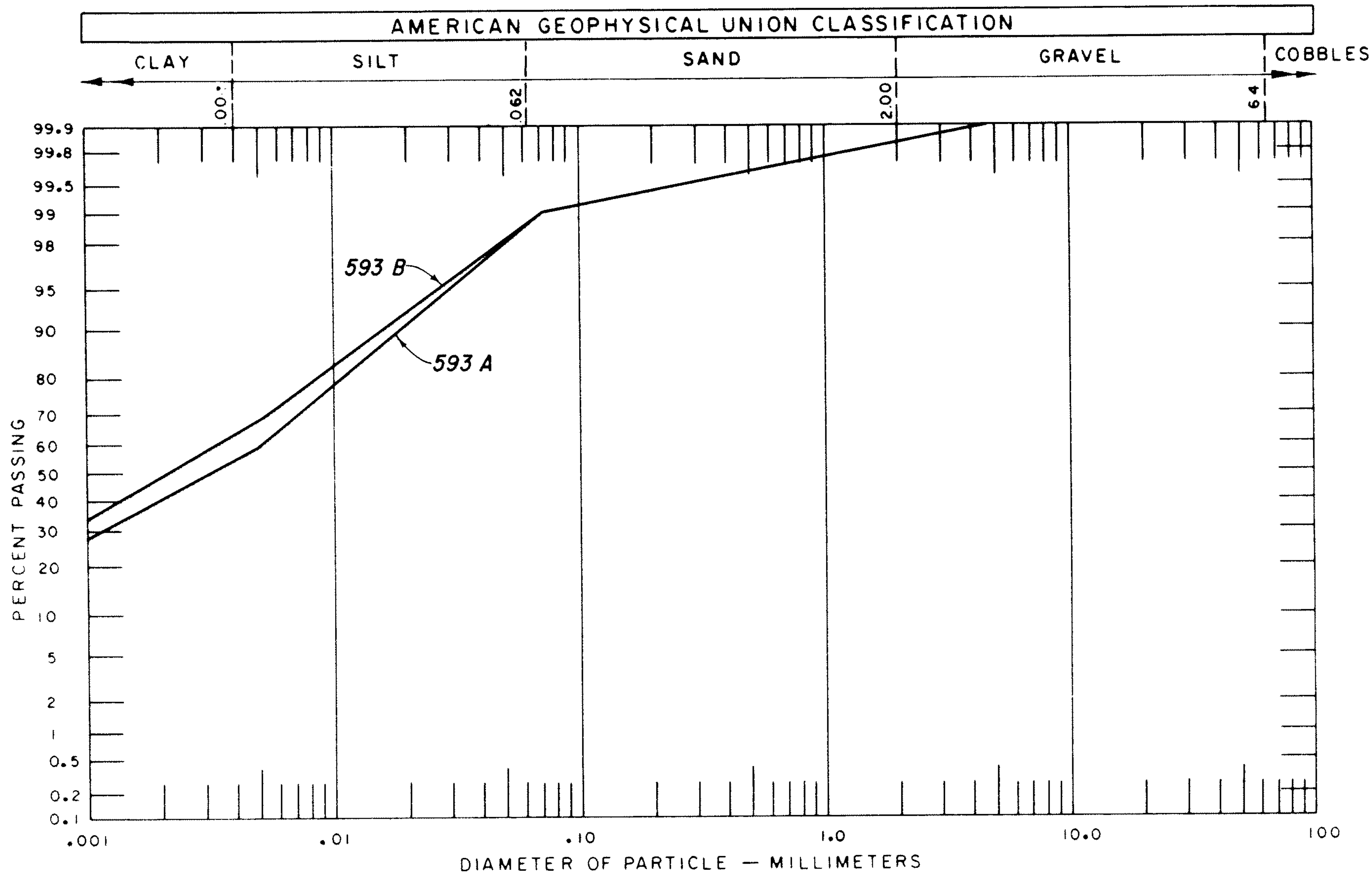

Figure 71. - Particle size analyses curves - Range 40.

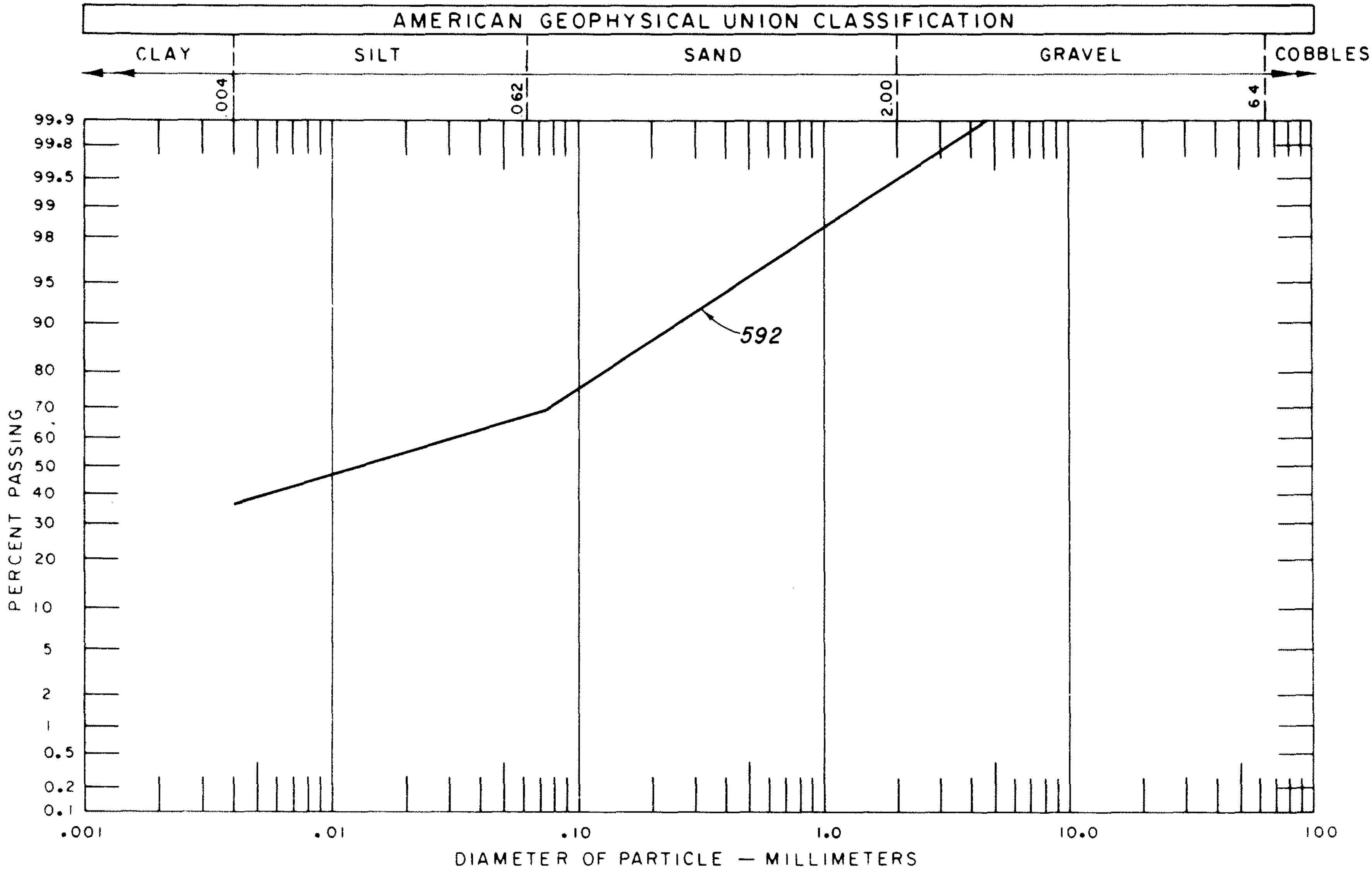

Figure 72. - Particle size analyses curve - Range 42.

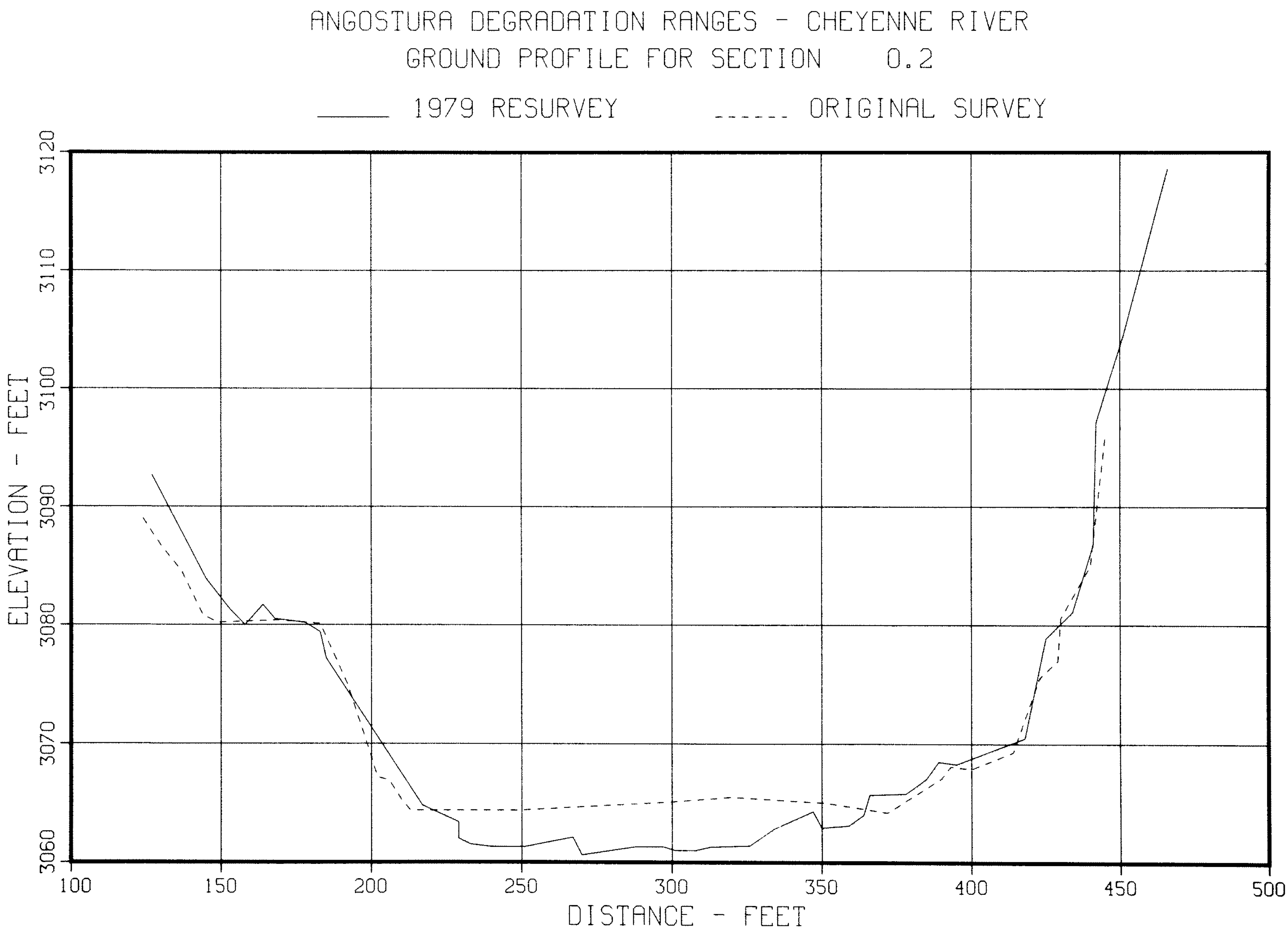

Figure 73. - Degradation range profiles - Range 0.2.

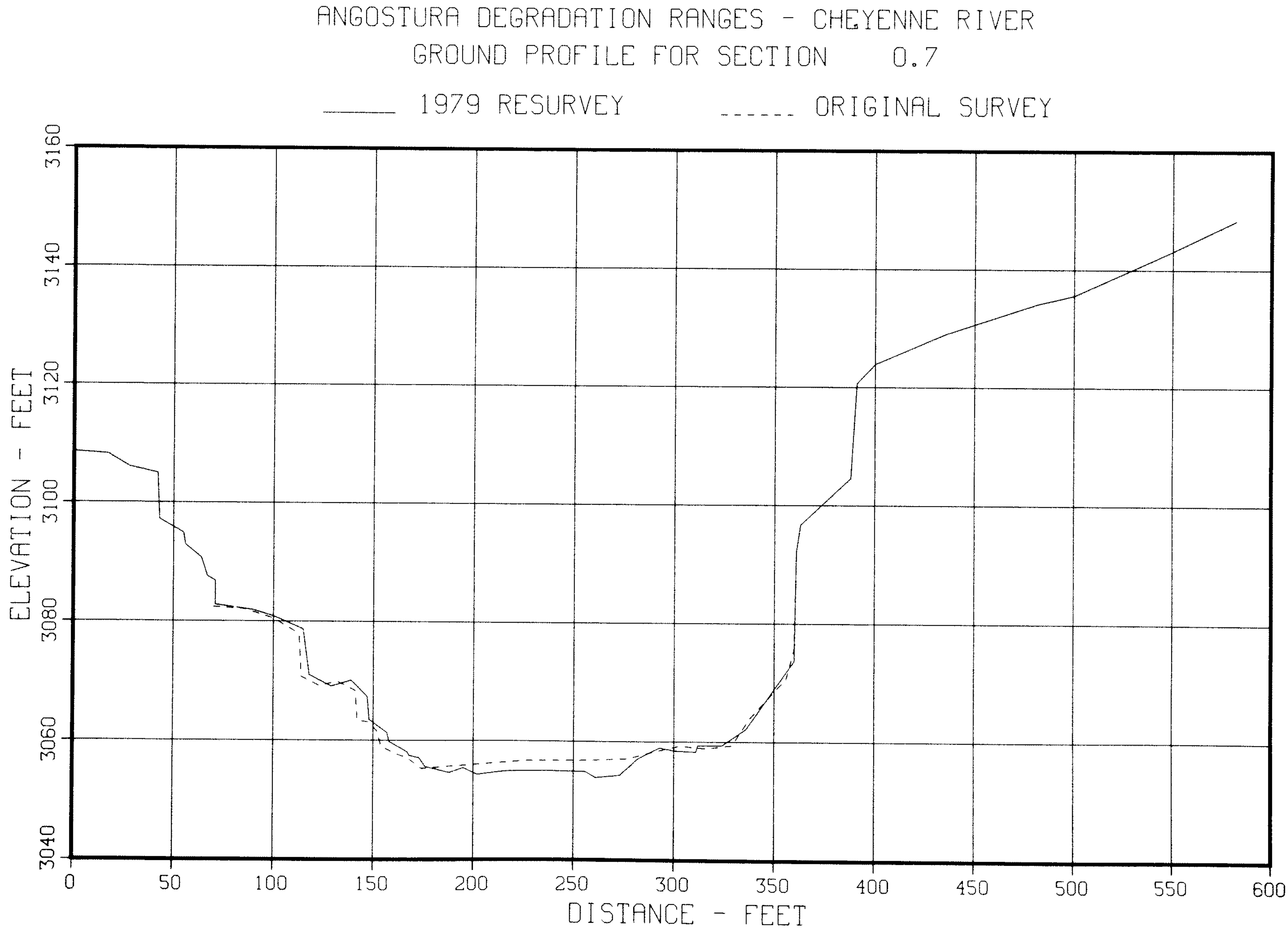

Figure 74. - Degradation range profiles - Range 0.7.

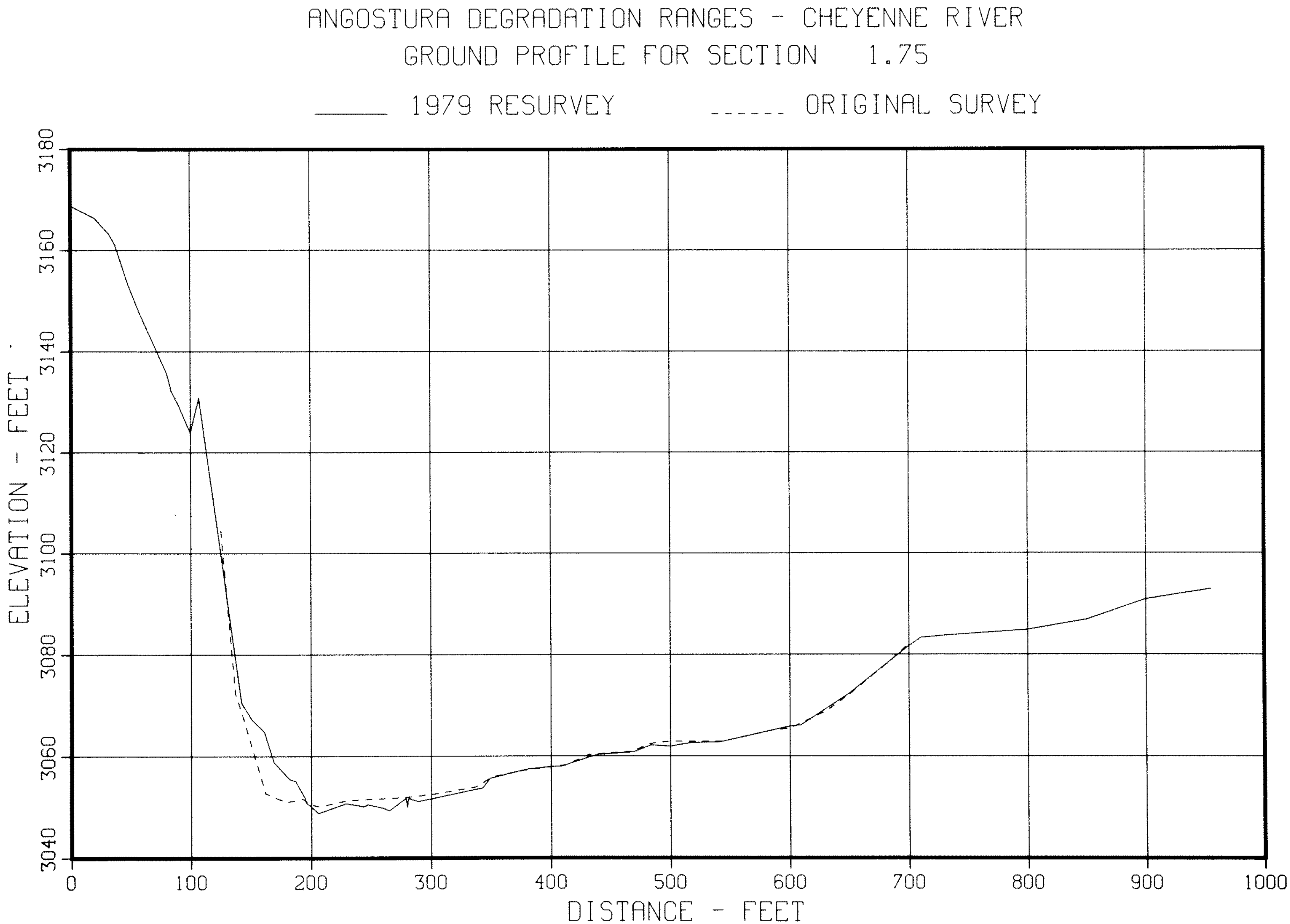

Figure 75. - Degradation range profiles - Range 1.75.

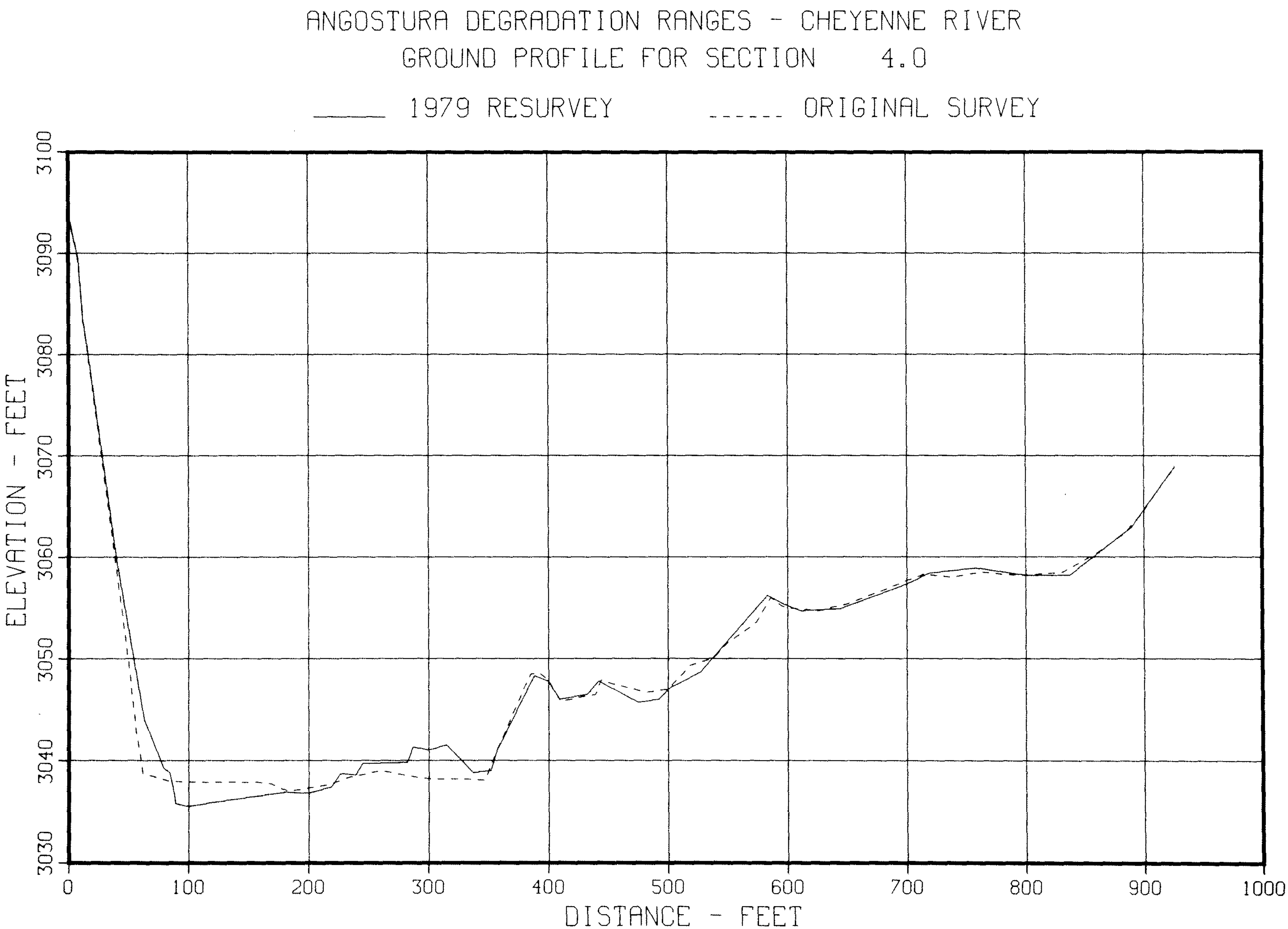

Figure 76. - Degradation range profiles - Range 4.0.

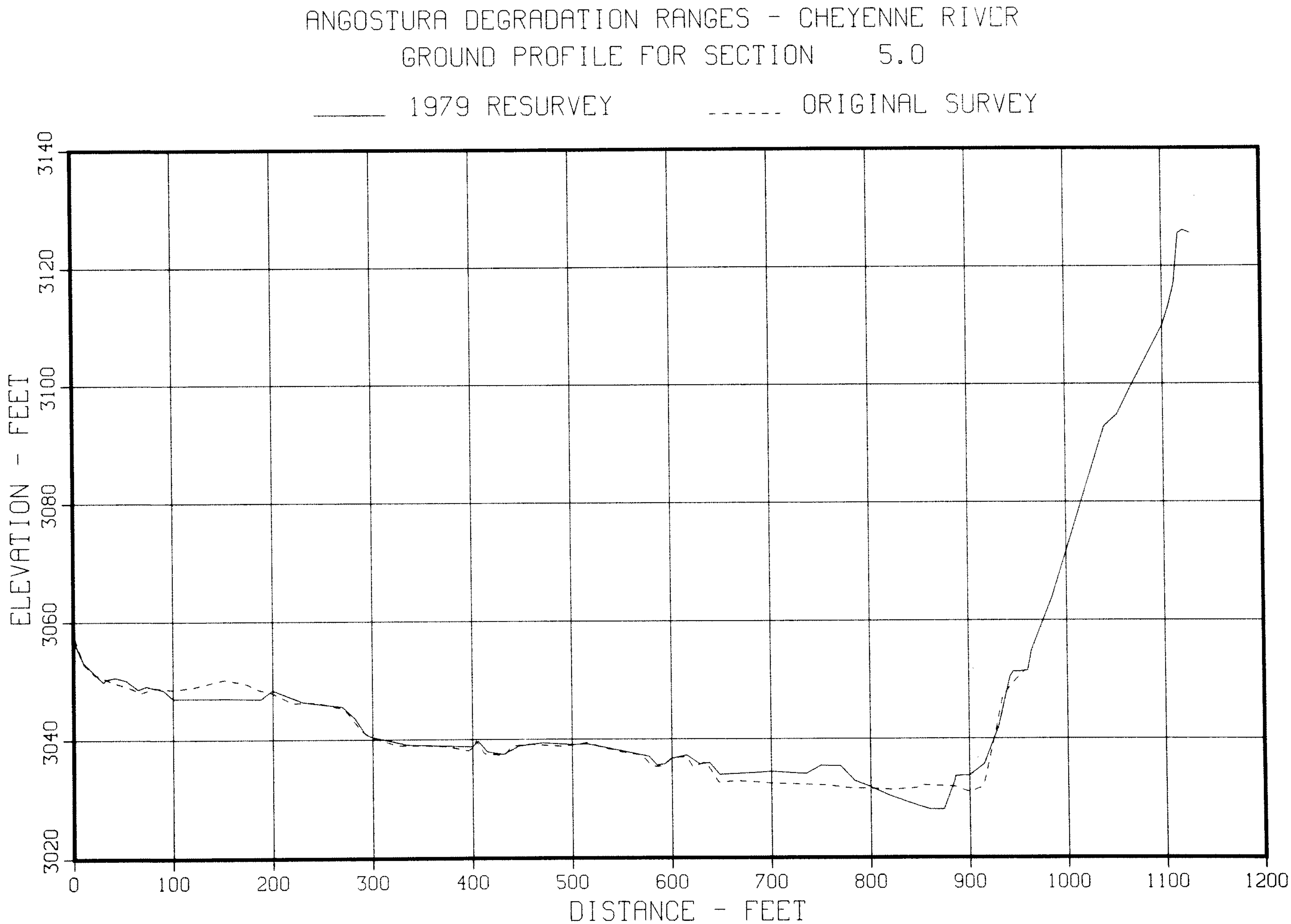

Figure 77. - Degradation range profiles - Range 5.0.

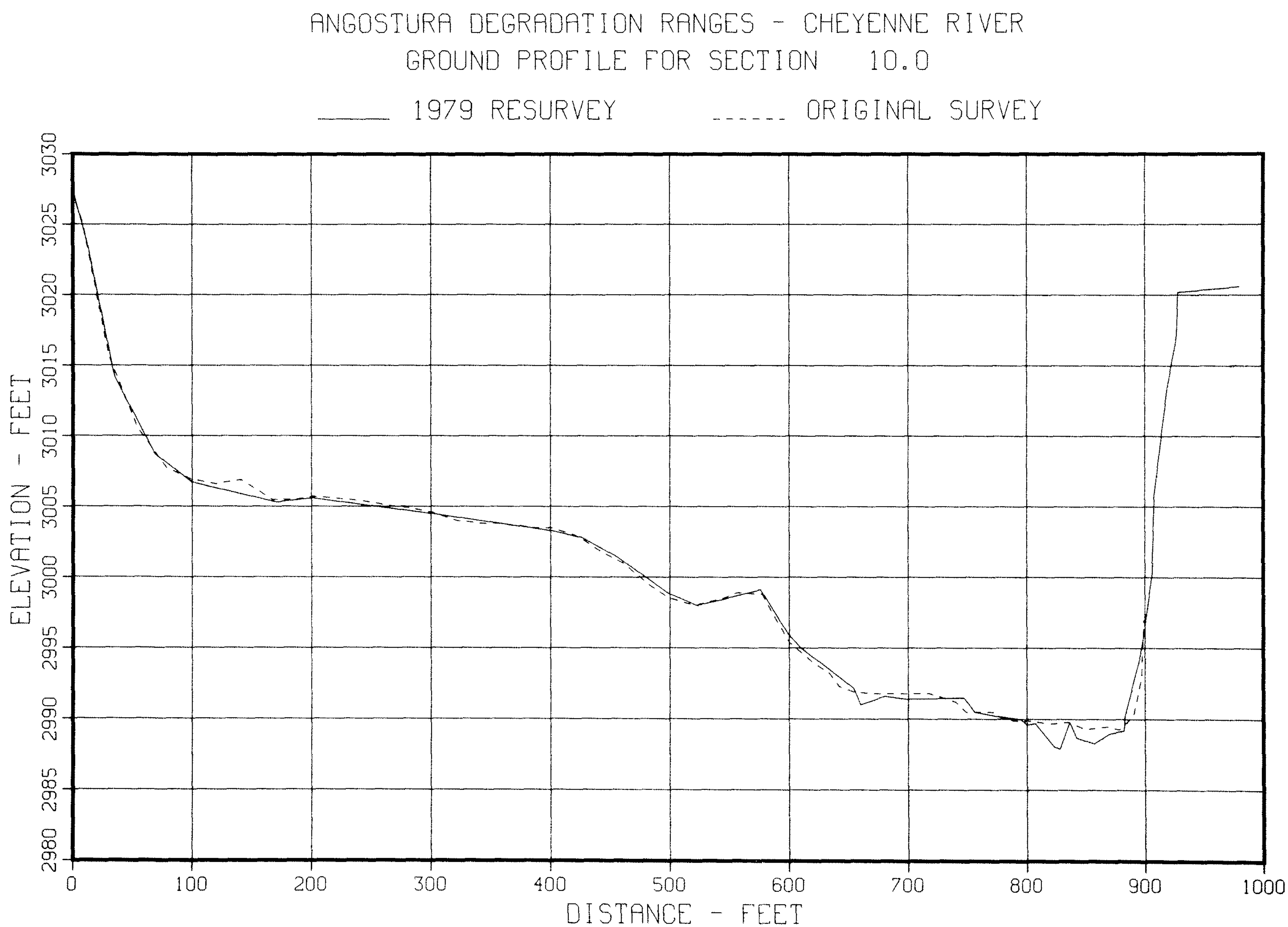

Figure 78. - Degradation range profiles - Range 10.0.

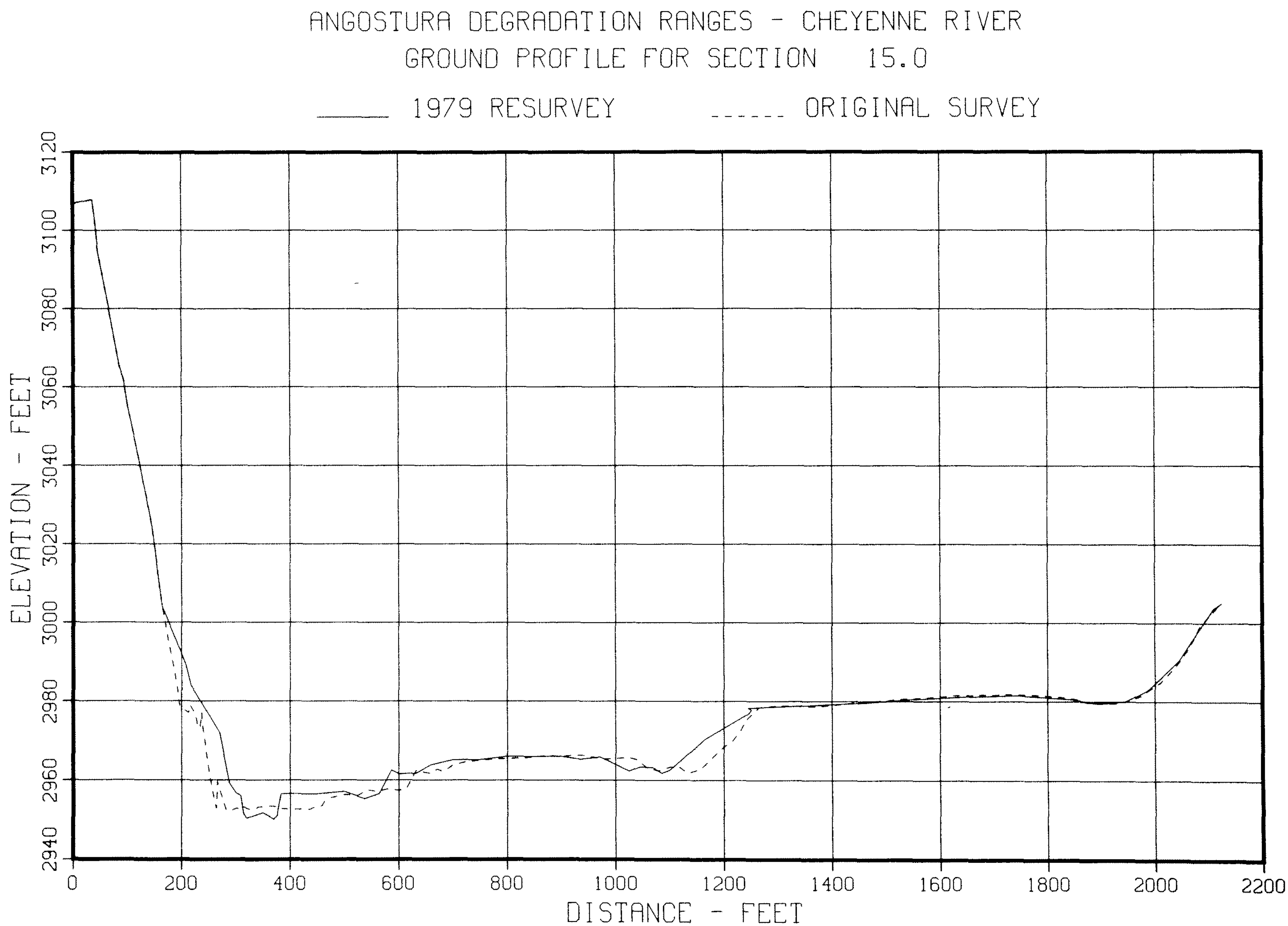

Figure 79. - Degradation range profiles - Range 15.0.

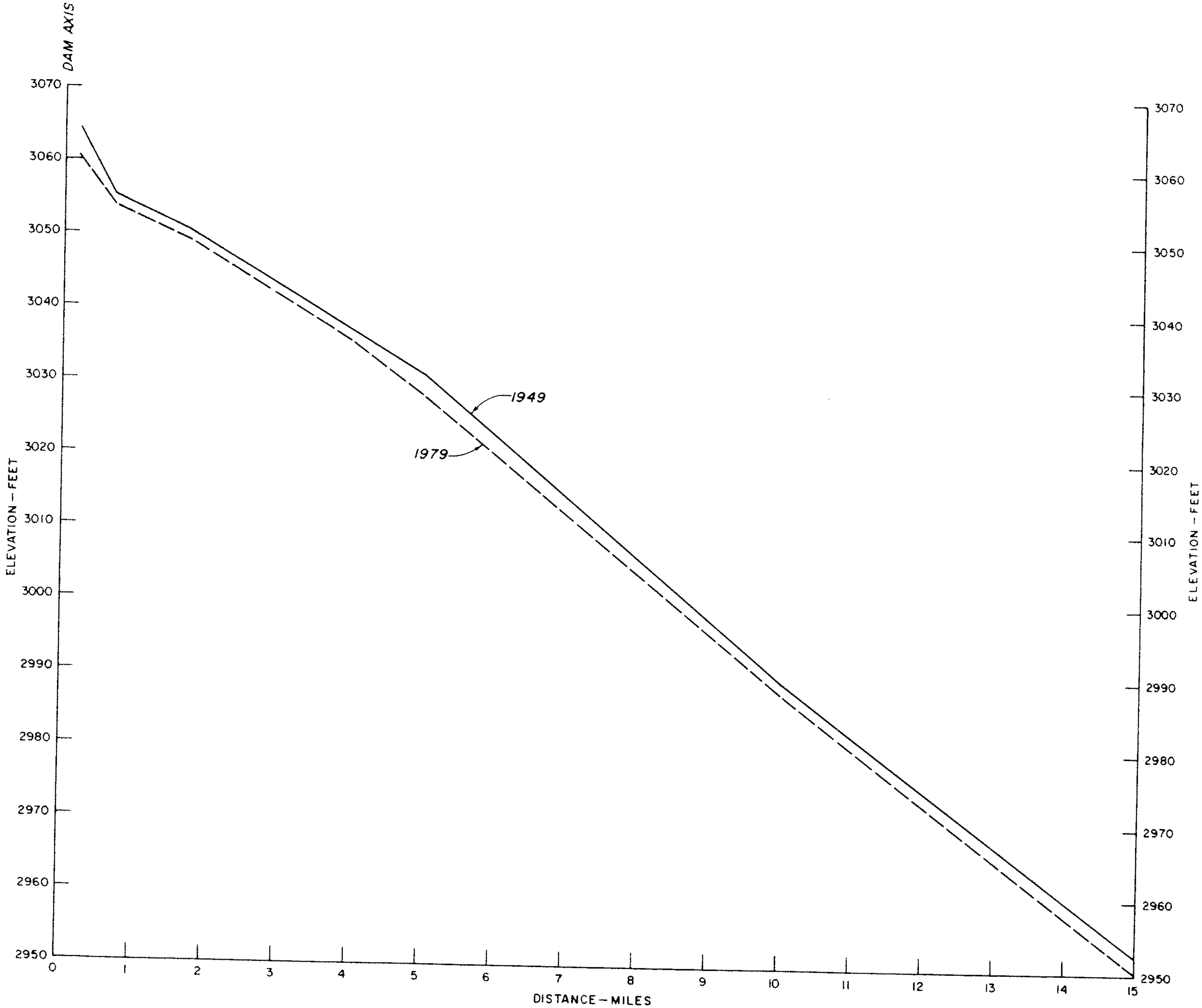

Figure 80. - Longitudinal degradation profiles.

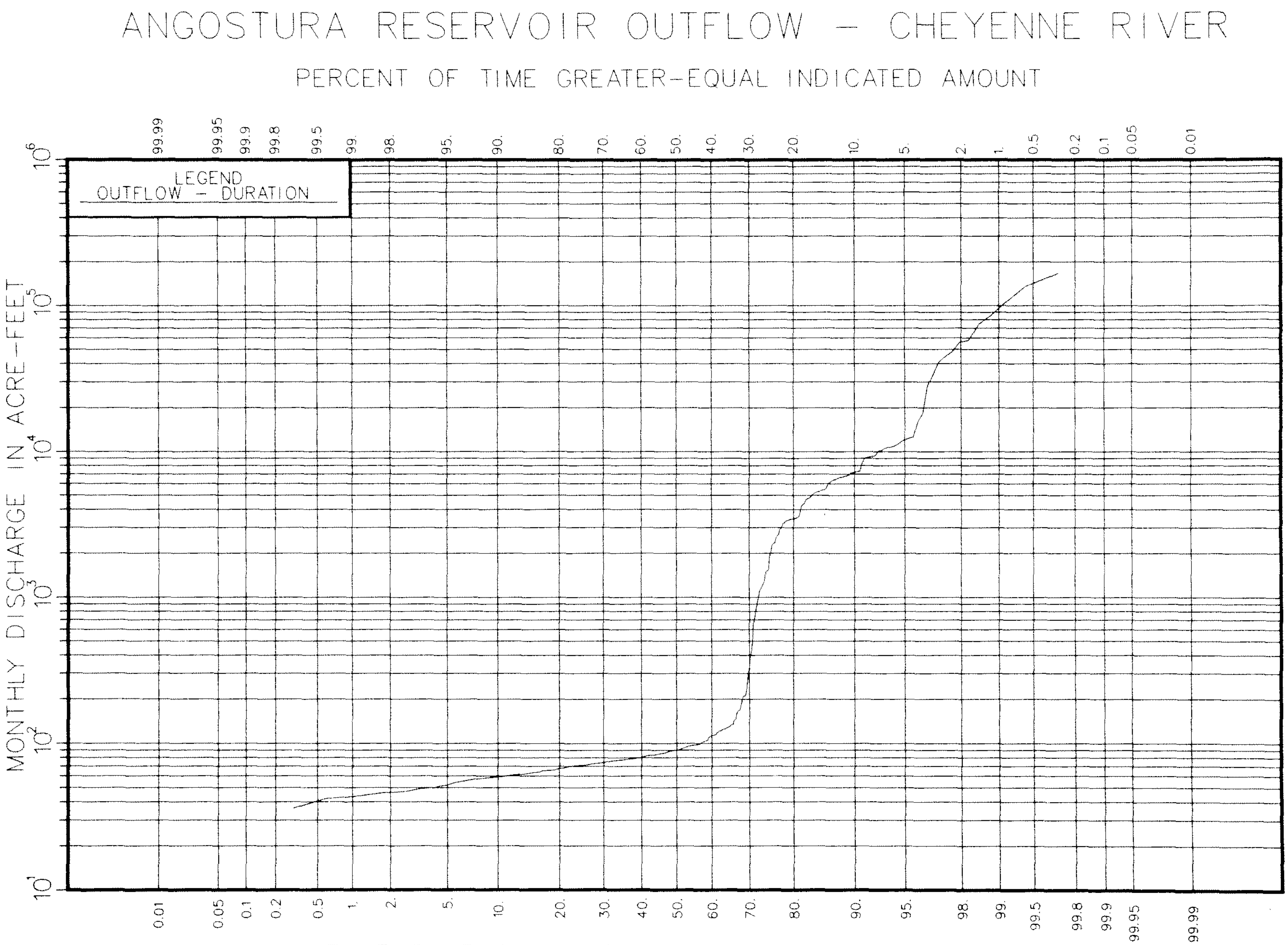

Figure 81. - Outflow duration curve for monthly outflow discharges.

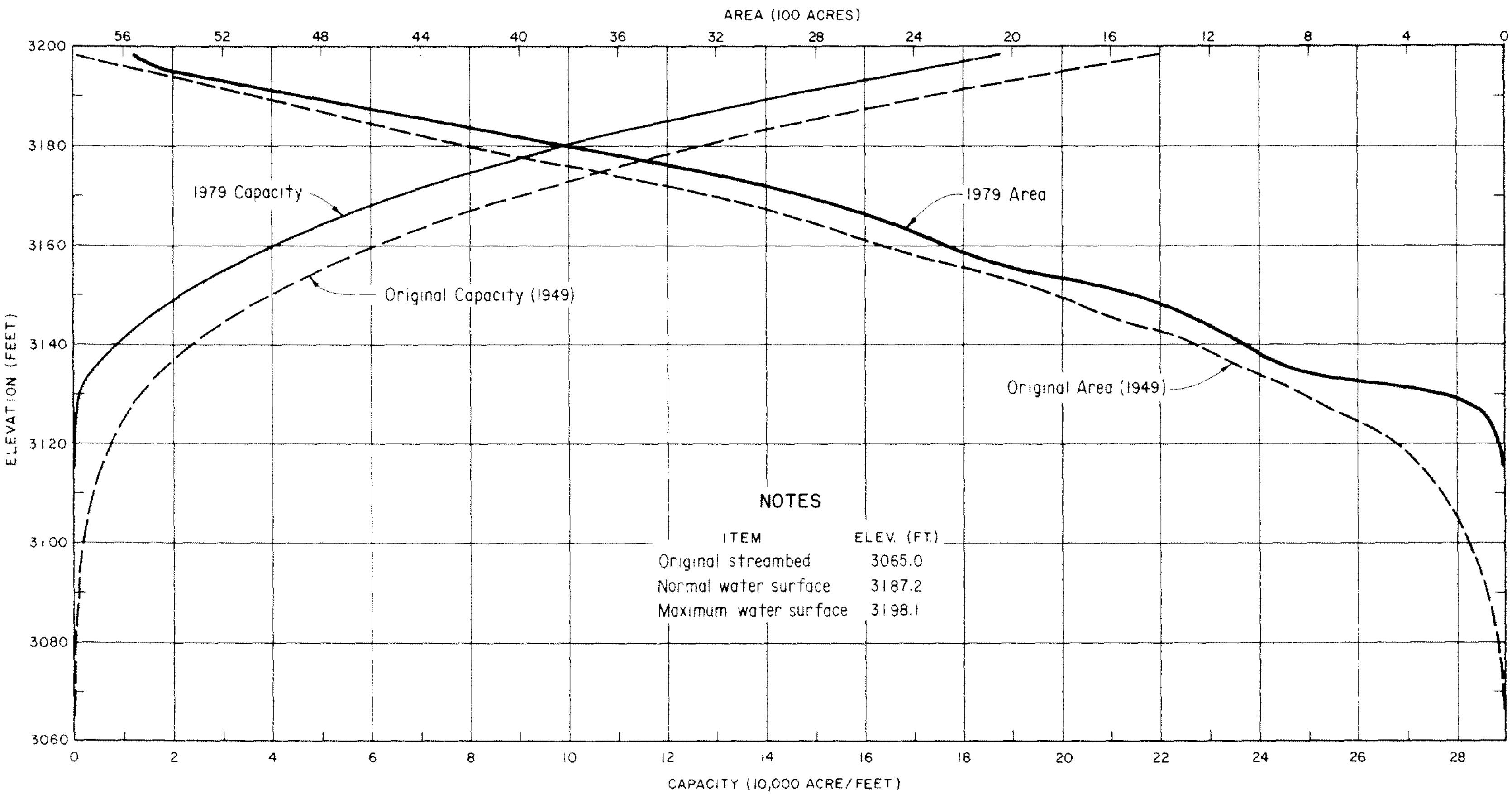

Figure 82. - Area-capacity curves for Angostura Reservoir.

GPO 841-190

Mission of the Bureau of Reclamation

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.