SIMULATION OF WATER-SURFACE ELEVATIONS FOR THE SNAKE RIVER IN THE DEER FLAT NATIONAL WILDLIFE REFUGE, IDAHO

By L.C. Kjelstrom

U.S. GEOLOGICAL SURVEY

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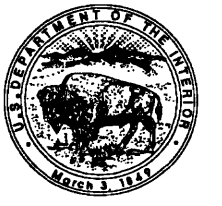
U.S. FISH AND WILDLIFE SERVICE



Boise, Idaho

1992

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ILLUSTRATIONS

TABLE

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
acre-foot (acre-ft)	1,233	cubic meter
cubic foot per second (ft^3/s)	0.0283	cubic meter per second
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer

In this report, NGVD of 1929 refers to the National Geodetic Vertical Datum of 1929—a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada and formerly called Sea Level Datum of 1929.

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ABSTRACT

Fish and wildlife habitats in the Deer Flat National Wildlife Refuge are being studied to assess the effects of decreased discharges in the Snake River downstream from Swan Falls Dam. One phase of the assessment was the use of a hydraulic model to simulate water-surface elevations for selected discharges at cross sections of the Snake River from Swan Falls Dam to the mouth of the Owyhee River. Water-surface elevations at 280 cross sections were measured for various discharges of the river. The hydraulic model was calibrated by adjusting roughness coefficients so that simulated water-surface elevations matched measured elevations. Relations between roughness coefficients and discharges were used to estimate roughness coefficients for other discharges. Water-surface elevations were simulated with the model for discharges of 3,900 and 5,600 cubic feet per second.

INTRODUCTION

Numerous dams and reservoirs in the Snake River upstream from the Deer Flat National Wildlife Refuge in southwestern Idaho allow strict regulation of flow in the river. Swan Falls Dam (fig. 1), at the upstream end of the refuge, was built in 1901 for hydroelectric power generation and is currently (1991) owned and operated by the Idaho Power Company. In 1977, some Idaho Power Company customers filed a complaint with the Idaho Public Utilities Commission. The customers claimed that diversions of the Snake River upstream from the dam reduced the quantity of water available for hydroelectric power generation at the dam. Idaho Power Company's water right, granted by the Federal Energy Regulatory Commission, was 8,400 ft^3/s (as measured at the U.S. Geological Survey stream-gaging station, Snake River near Murphy). Subsequently, Idaho Power Company filed a suit in State Court against some diverters of Snake River flow upstream from the dam. The Idaho Supreme Court determined that the water rights of Idaho Power Company at Swan Falls Dam were not subordinated to subsequent appropriations and remanded the case to the State District Court for resolution. In 1984, Idaho Power Company agreed to subordinate its water rights to future upstream development until discharge decreased to a minimum of 5,600 ft^3/s during the nonirrigation season (November through March) and 3,900 ft^3/s during the irrigation season (April through October).

Public Law 100–216, passed in 1987, requires that the U.S. Department of the Interior, the National Oceanic and Atmospheric Administration, the State of Idaho, and the Idaho Power Company recommend studies to determine effects of

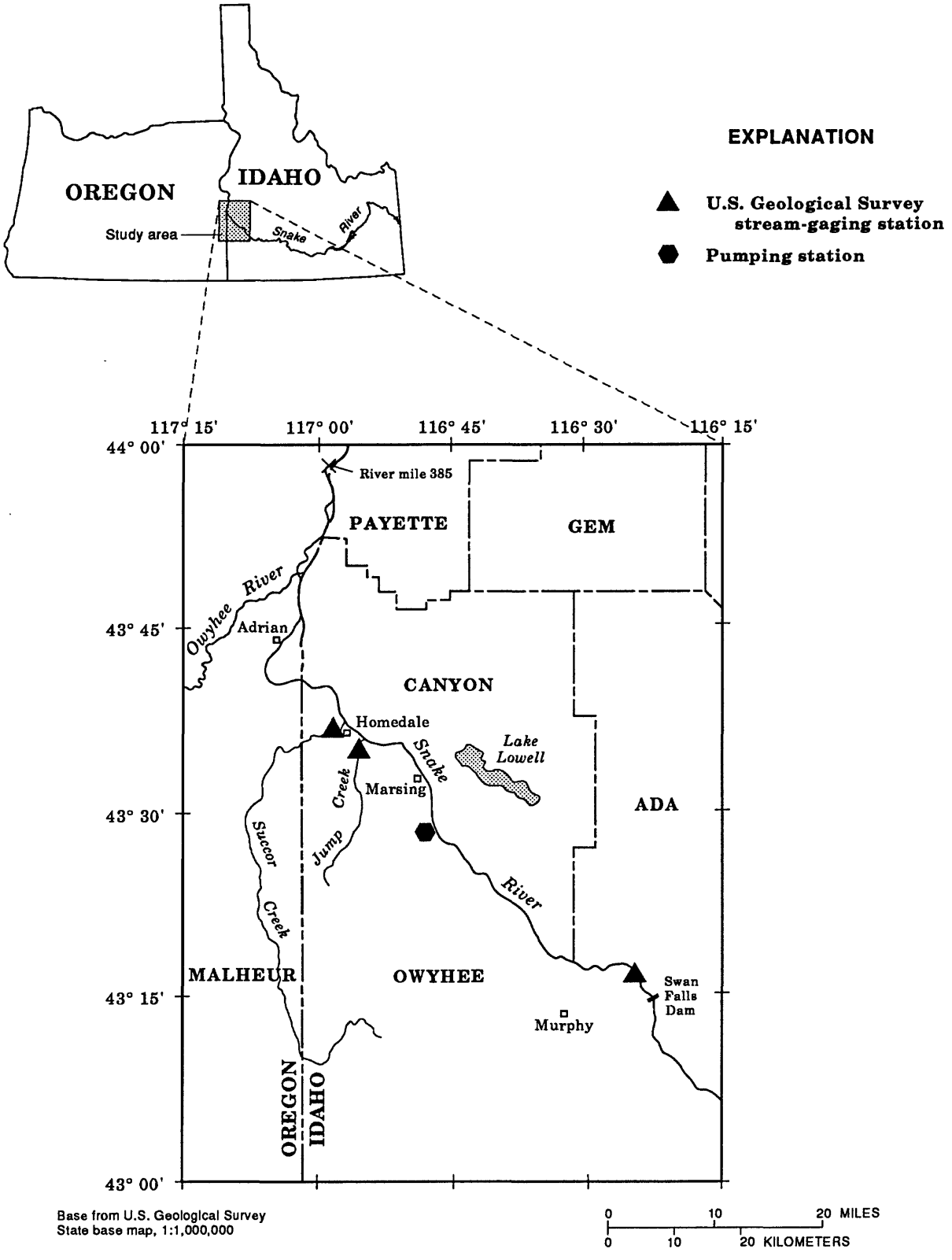

Figure 1.—Study area.

the decreased discharges allowed by the 1984 agreement. Some of the studies recommended would assess the effects of decreased discharges on fish and migratory bird habitats in the Deer Flat National Wildlife Refuge.

Numerous islands in the Snake River in the Deer Flat National Wildlife Refuge serve as habitat for many species of birds and other wildlife. A discharge of 3,900 ft^3/s downstream from Swan Falls Dam could lower the water surface in the river enough to cause slack or shallow water and possible formation of land bridges between many of the islands and riverbanks. These conditions might provide predators easy access to the islands, endangering birds nesting there. The altered chemical and physical conditions of the habitat caused by sustained decreased discharges during the warm summer months could endanger fish, particularly the white sturgeon, a species designated as sensitive (the species' survival could be endangered) in the State of Idaho.

Water-surface elevations and other channel and flow characteristics of the Snake River can be used to assess the effects of small discharges on the habitat for many species of fish, birds, and other wildlife. Water-surface elevations for selected discharges can be determined with hydraulic models. A study that used a hydraulic model to simulate water-surface elevations for selected discharges of the Snake River in the Deer Flat National Wildlife Refuge was made from 1989 through 1991 by the U.S. Geological Survey, in cooperation with the Federal Energy Regulatory Commission and the U.S. Fish and Wildlife Service.

PURPOSE AND SCOPE

The purpose of this report is to present data on the effect of simulated discharges of the Snake River on surface elevation, area, and mean velocity of water in channels at 280 cross sections in the Deer Flat National Wildlife Refuge.

The reach of the Snake River included in this study is from Swan Falls Dam to the confluence of the Snake and Owyhee Rivers (fig. 1). A computer model was used to determine surface elevations, areas, and mean velocities of the Snake River at cross sections for selected discharges.

ACKNOWLEDGMENTS

The assistance of personnel of the U.S. Fish and Wildlife Service at the Deer Flat National Wildlife Refuge who provided boat storage facilities and a boat and operator is gratefully acknowledged. The cooperation of many landowners who allowed access to benchmarks and riverbanks is appreciated. The support of the Idaho Power Company, which regulated water releases at Swan Falls Dam so that steady discharges could be obtained while calibrating the model, also is gratefully acknowledged.

DESCRIPTION OF STUDY AREA

The Deer Flat National Wildlife Refuge is located in southwestern Idaho and eastern Oregon. It includes about 90 islands in a 65-mi reach of the Snake River between Swan Falls Dam and the confluence of the Snake and Owyhee Rivers. Topography along the 65-mi reach is a plateau dissected by erosion into a series of mesas and intervening valleys. The rock sequence in the area consists of resistant layers of volcanic rock (basalt) underlain by less resistant layers of poorly consolidated sedimentary rock (clay, silt, sand). For about 10 mi downstream from Swan Falls Dam, the Snake River flows through a steep, narrow canyon. Farther downstream, the canyon gradually broadens; downstream from Marsing, rolling lowlands border the Snake River.

River channels at the 280 cross sections range from narrow and deep with rapidly moving water to broad and shallow with slowly moving water. The river is generally only a few hundred feet wide in the upstream part of the reach but is generally more than 1,000 ft wide in the downstream part of the reach.

Bed material in the Snake River for several miles downstream from Swan Falls Dam consists largely of cobbles and boulders. Farther downstream, gravel bars are present. Sand and silt deposits are present downstream from the confluence of the Snake River and tributary streams and wherever velocities are low. Generally, the bed material is stable. During the past 30 years at the Snake-River-near-Murphy stream-gaging station, the rated stage for a discharge of 6,500 ft^3/s ranged from 3.18 to 3.45 ft. Currently (1991), the rated stage is 3.37 ft.

Riparian vegetation includes thick growths of willows and other phreatophytes where riverbanks are wet; grass and sagebrush predominate where banks are dry. Willows generally grow along the edges of islands and cover many small, low-elevation islands. Larger islands are likely to include a grass-covered central plateau.

Inflow to the Snake River in the Deer Flat National Wildlife Refuge includes runoff from tributary drainage basins, irrigation return from field drainage ditches, and ground water. Runoff from precipitation or snowmelt in tributary drainage basins contributes substantially to river flow for only a few days in the winter or early spring. During the irrigation season, numerous drainage ditches return water diverted for irrigation to the river. Throughout 1990, banks on both sides of the river were wet several feet above the water surface in numerous places. Seepage water was observed moving toward the river from wet areas on the bank. Most wet areas were near irrigated fields. Outflow from the Snake River is mostly from pumping stations that divert water for irrigation along the reach.

DATA COLLECTION

Level lines were run to transfer elevation above the NGVD of 1929 from U.S. Coast and Geodetic or U.S. Geological Survey benchmarks to temporary benchmarks placed at various sites along the river and at one or both sides of the river where cross sections were located. About 500 temporary benchmarks were placed; the level-line network included 18 previously established benchmarks.

Field surveys were made to determine ground elevation at 280 cross sections of the Snake River and to measure water-surface elevations at left and right banks of cross sections for known discharges. Water releases from Swan Falls Dam were held steady at various discharges while water-surface elevations were measured. To assure that discharge was steady, the water-surface elevation at a given cross section was determined at the start and end of the day and the determined value was compared with the discharge record near Murphy.

Discharge information was obtained from records of the U.S. Geological Survey stream-gaging station near Murphy, about 4 mi downstream from Swan Falls Dam. Discharge also was measured at bridges at Marsing and Homedale, Idaho, and Adrian, Oreg. Tributary inflow data were obtained from records of stream-gaging stations near the mouths of Succor and Jump Creeks. Outflow at one pumping station (fig. 1) was measured by inline flow meters. Estimates from electrical power data (Goodell, 1988, p. 21) indicate that, in 1980, this station diverted about 40 percent of 140,000 acre-ft diverted by 124 pumping stations.

Discharge measurements and records indicate differences of inflow and outflow between the irrigation season and the nonirrigation season. Discharge values at the stream-gaging station near Murphy and the bridge at Adrian indicated a gain of 450 ft^3/s on July 31, 1990, and a gain of about 60 ft^3/s on March 28, 1991. On July 31, about 250 ft^3/s was being diverted at the pumping station as measured by the inline flow meters; irrigation withdrawal and return flow were near their annual high. No water was being diverted on March 28 and surface-water inflow was minimal.

HYDRAULIC MODEL

DESCRIPTION OF MODEL

WSPRO (Water-Surface PROfile), a step-backwater program developed by the U.S. Geological Survey (Shearman and others, 1986; Shearman, 1990), was used to simulate water-surface elevations at the cross sections in the Snake River for discharges of 3,900 and 5,600 ft^3/s. The model uses the standard step method (Chow, 1959, p. 265) to determine changes in water-surface elevation from a downstream cross section to an upstream cross section by balancing the total energy head at the sections. This method requires definition of the geometry and roughness coefficient of each of a series of cross sections which segment the river reach. Cross-section geometry is defined by a series of land-surface-elevation values measured at variably spaced distances from a reference point and along horizontal lines perpendicular to the direction of flow. The roughness coefficient

represents the resistance to flow in channels. Factors that affect roughness coefficients include the type and size of materials that compose the bed and banks of the channel, shape of the channel, variation in dimensions of channel cross sections, vegetation, and degree of channel meandering.

MODEL CALIBRATION

Information to calibrate the model was obtained by measuring water-surface elevations at the 280 cross sections for known discharges of the river. Discharge values at the stream-gaging station near Murphy were adjusted for inflow and outflow on the basis of discharge measurements at three downstream bridges and measured or estimated discharge in tributaries, drains, and diversion pipes. The adjusted discharge values, which ranged from 4,920 ft^3/s through 9,320 ft^3/s, were used for model calibration. Water-surface elevations were measured in various segments of the reach each day. About 55 combinations of discharges and segments of the reach were used to calibrate the model.

An equation commonly used to estimate velocity in streams is the Manning formula that relates flow velocity (V), friction slope (S), channel roughness (n), and hydraulic radius (R) of the channel cross section:

$$V = \frac{1.49}{n} R^{2/3} S^{1/2} \quad (1)$$

Roughness coefficients (n values) were adjusted for succeeding simulations so that the simulated water-surface elevations matched those measured by field survey. By establishing a relation between roughness coefficients and discharges, roughness coefficients can be estimated for selected discharges. Generally, roughness coefficients increase as discharges decrease and decrease as discharges increase, due to the greater effect of the streambed on discharge when water is shallow.

At cross sections where islands were located, the total discharge was distributed into two or more individual channels. At some of these cross sections, the surveyed water-surface elevations were different for the individual channels. When current-meter measurements of discharge were not available for such a cross section, the division of flow was computed. Initial discharge values for each channel were computed from mean velocities apportioned for the cross section. The hydraulic model apportions the velocity in a river channel by assigning 5 percent of the discharge to each of 20 equal-conveyance tubes and computing the mean velocity for each of the tubes. Velocities measured using a current meter and mean velocities apportioned by the hydraulic model at cross section 264 are shown in figure 2. Cross section 264 is at the cableway measuring site for the Snake-River-near-Murphy stream-gaging station.

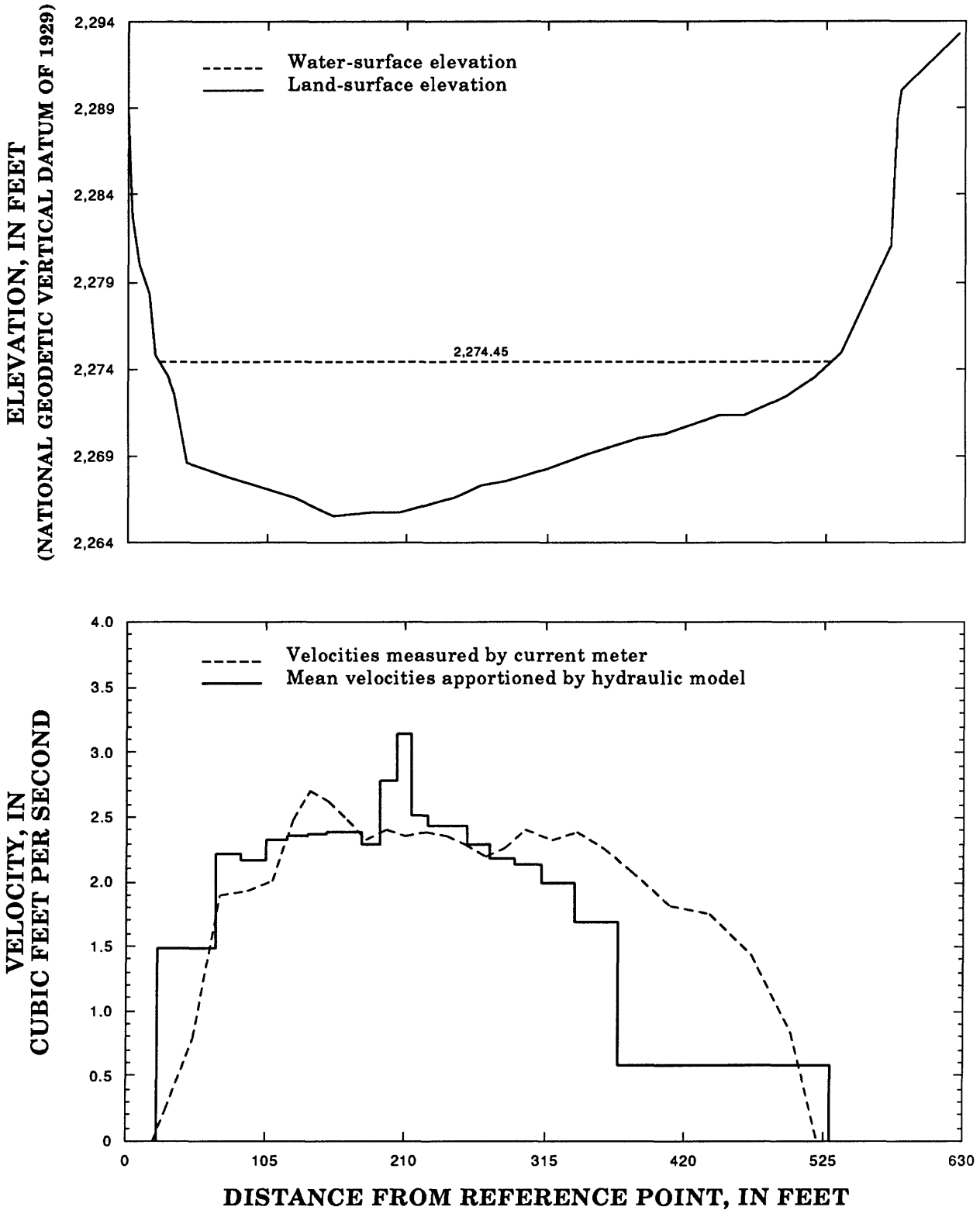

Figure 2.—Water- and land-surface elevations and measured velocities and apportioned mean velocities at cross section 264 at a discharge of 5,670 cubic feet per second.

Final discharge values were determined in combination with changes of roughness coefficient values. Because changing the roughness-coefficient value changes the discharge value, model calibration for individual channels of a cross section required adjusting both values until the simulated water-surface elevation matched the surveyed elevation.

SIMULATION OF WATER-SURFACE ELEVATIONS

The hydraulic model was used to simulate water-surface elevations at river discharges of 3,900 and 5,600 ft^3/s. Simulated elevations for a discharge of 5,600 ft^3/s are considered excellent because measured water-surface elevations for discharges of about 5,600 ft^3/s were used for calibration. For a discharge of 3,900 ft^3/s, the model was verified by extrapolating stage-discharge rating curves at only four discharge-measurement sites. If releases from Swan Falls Dam were about 3,900 ft^3/s, water-surface elevations at selected cross sections could be measured and model results checked. Water-surface elevations for discharges up to 20,000 ft^3/s were simulated; simulated values corresponded well with rated changes in stage for increases in discharge. Most roughness coefficients changed little for discharges from 9,000 to 20,000 ft^3/s. Simulated water-surface elevations for discharges greater than 20,000 ft^3/s probably should be checked by measuring water-surface elevations at selected cross sections.

Data on channel characteristics and effects of simulated discharges of 3,900 and 5,600 ft^3/s at cross sections are presented in table 1 (back of report). Locations of study subreaches are shown in figure 3 (back of report). Locations of cross sections in each subreach are shown in figure 4 (back of report). Graphs of water-surface elevations at a discharge of 3,900 ft^3/s and land-surface elevations at cross sections are shown in figure 5 (back of report).

SUMMARY

In 1984, water rights of the Idaho Power Company at Swan Falls Dam were subordinated to future upstream development. Idaho Power Company and the State of Idaho agreed on minimum discharges of 5,600 ft^3/s from November through March and 3,900 ft^3/s from April through October. Subsequent legislation required that an assessment be made of the effects of the minimum discharge requirements at Swan Falls Dam on fish and wildlife habitats in the Deer Flat National Wildlife Refuge. A hydraulic model that simulated water-surface elevations for selected discharges of the Snake River in the Deer Flat National Wildlife Refuge provided information needed for the assessment. A 65-mi reach of the Snake River from Swan Falls Dam to the mouth of the Owyhee River, which includes about 90 islands used by migratory birds for nesting in the Deer Flat National Wildlife Refuge, was modeled. The hydraulic model was calibrated using measured water-surface elevations at 280 cross sections for known discharges of the river. Roughness coefficients were adjusted for succeeding simulations so that the simulated water-surface elevations matched

measured elevations. Relations between roughness coefficients and known discharges were used to estimate roughness coefficients for other discharges.

Hydraulic properties such as area, mean velocity, and surface elevation of water at cross sections were simulated for discharges of 3,900 and 5,600 ft^3/s. The model can provide the same type of data for other discharges of the Snake River. Calibration discharges from 4,920 to 9,320 ft^3/s make it possible to reasonably simulate discharges from 3,900 to 20,000 ft^3/s. Simulations of water-surface elevations for discharges less than 3,900 ft^3/s and greater than 20,000 ft^3/s need to be checked by measuring water-surface elevations at selected cross sections.

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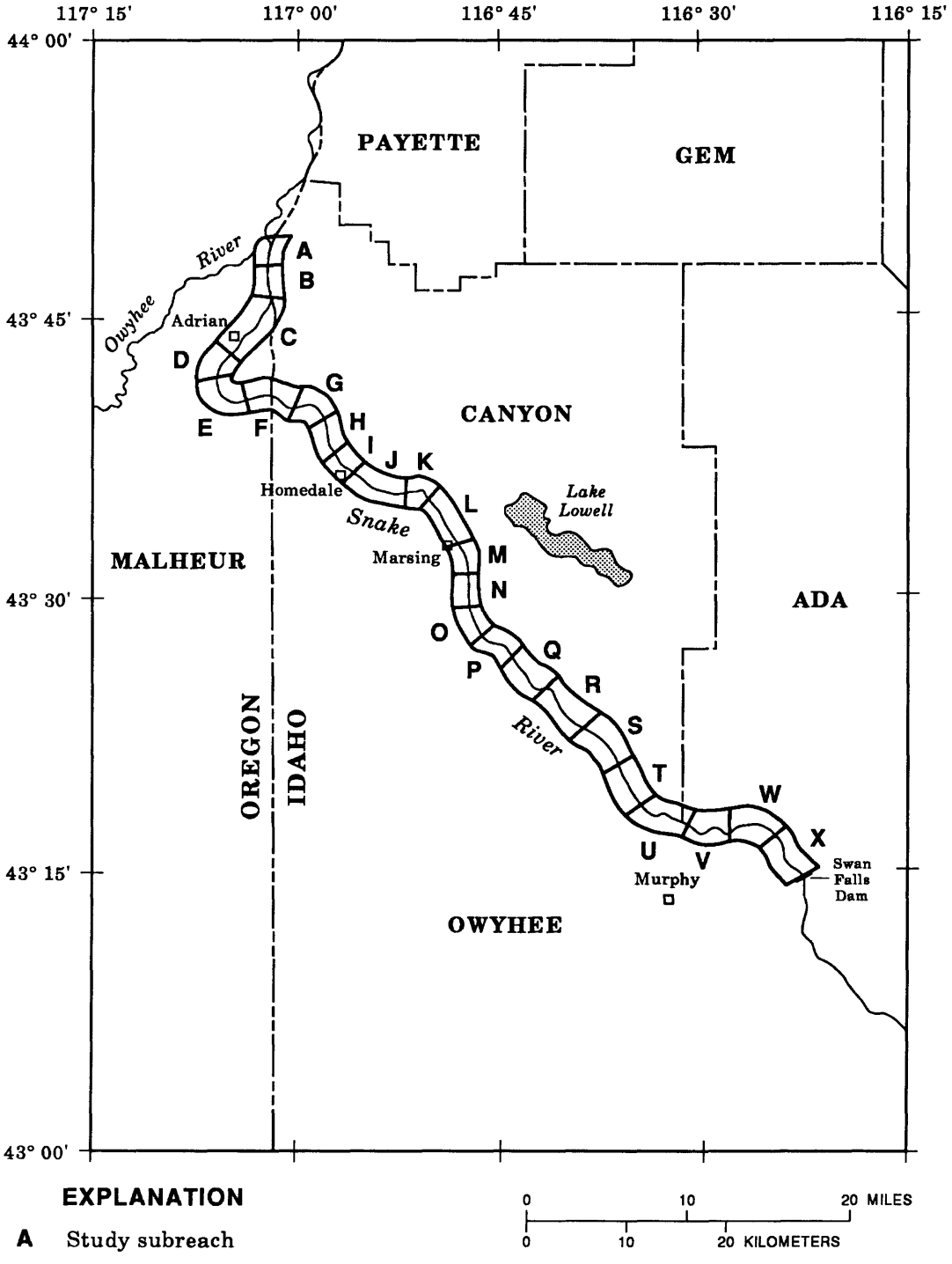

Figure 3.— Study subreaches A–X of the Snake River.

EXPLANATION FOR COLUMN HEADINGS IN TABLE 1

XSID	Identification number of cross section.
CHANNEL	"Main" indicates only one channel; "left" or "right" indicates location of multiple channels in cross section looking downstream; "mid" indicates centrally located channel.
SRD	Distance (Section Reference Distance), in feet, of cross section from river mile indicator 385 (as shown on the Nyssa, Idaho-Oreg., 7.5-minute topographic map).
Q	Discharge in channel at cross section, in cubic feet per second.
LEW	Distance of left edge of water from reference point, in feet.
REW	Distance of right edge of water from reference point, in feet.
AREA	Area of water in channel at cross section, in square feet.
VEL	Mean velocity of water in channel at cross section, in feet per second.
WSEL	Elevation of water surface in channel at cross section, in feet above National Geodetic Vertical Datum of 1929.

EXPLANATION FOR SYMBOLS IN FIGURE 4

—— 2400 ——	**Topographic contour. Interval, in feet, is variable. National Geodetic Vertical Datum of 1929**
225	**Cross section and number**

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach A)*

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
1	Main	40,478	37	648	2,615	1.49	3,900	2,179.10	34	652	2,992	1.87	5,600	2,179.72
2	Main	41,865	210	560	2,770	1.41	3,900	2,179.25						
	Left								67	174	18	0.28	5	2,179.85
	Right								203	564	2,985	1.87	5,595	2,179.85
3	Main	43,861	21	748	2,346	1.66	3,900	2,179.57	20	766	2,777	2.02	5,600	2,180.16
4	Main	45,397	51	899	2,035	1.92	3,900	2,180.83	32	903	2,529	2.21	5,600	2,181.40
5	Main	46,717	12	518	3,555	1.10	3,900	2,181.05	8	540	3,855	1.45	5,600	2,181.63
6	Main	47,686	71	882	3,315	1.18	3,900	2,181.11	59	890	3,794	1.48	5,600	2,181.70

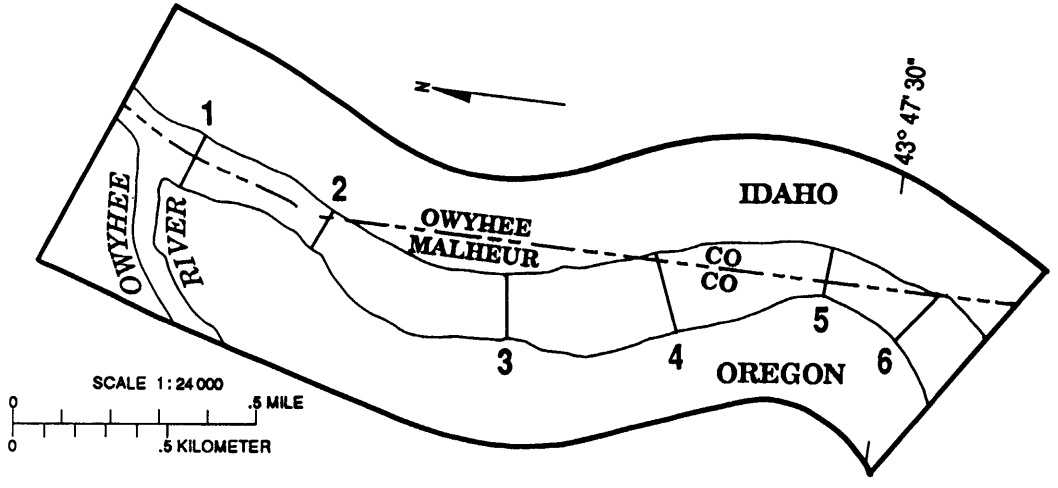

Figure 4.—Locations of cross sections (study subreach A) of the Snake River.

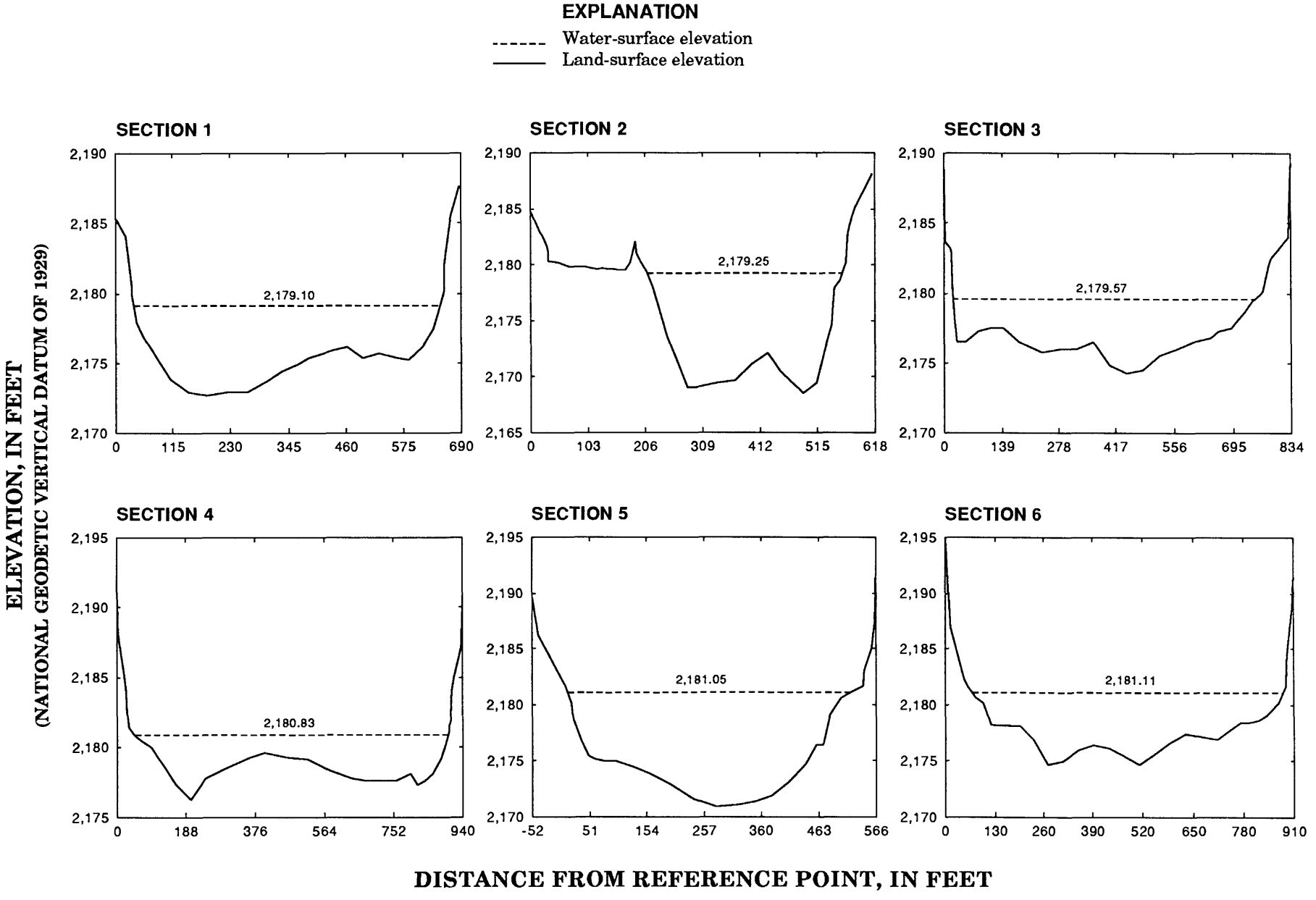

Figure 5.—Water- and land-surface elevations at cross sections (study subreach A) at a simulated discharge of 3,900 cubic feet per second.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach B)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
7	Main	49,159	167	1,091	2,390	1.63	3,900	2,181.19	33	1,098	2,962	1.89	5,600	2,181.79
8	Main	50,639	17	910	2,357	1.65	3,900	2,181.39	13	919	2,869	1.95	5,600	2,181.96
9	Main	52,230	95	1,035	1,833	2.13	3,900	2,181.70	81	1,045	2,334	2.40	5,600	2,182.22
10	Left	53,562	10	278	502	1.08	540	2,182.23	7	285	640	1.28	820	2,182.73
	Right		393	943	1,526	2.27	3,460	2,182.09	385	956	1,836	2.60	4,780	2,182.64
11	Left	55,187	44	253	325	1.48	480	2,182.97	36	258	427	1.66	710	2,183.44
	Mid		305	893	799	2.38	1,900	2,183.00	291	939	1,090	2.41	2,630	2,183.47
	Right		974	1,548	800	1.90	1,520	2,183.00	963	1,553	1,072	2.11	2,260	2,183.47
12	Left	56,119	16	530	1,607	1.94	3,110	2,183.37	15	533	1,816	2.32	4,220	2,183.78
	Right		741	1,415	1,138	0.69	790	2,183.20	734	1,421	1,415	0.97	1,380	2,183.61

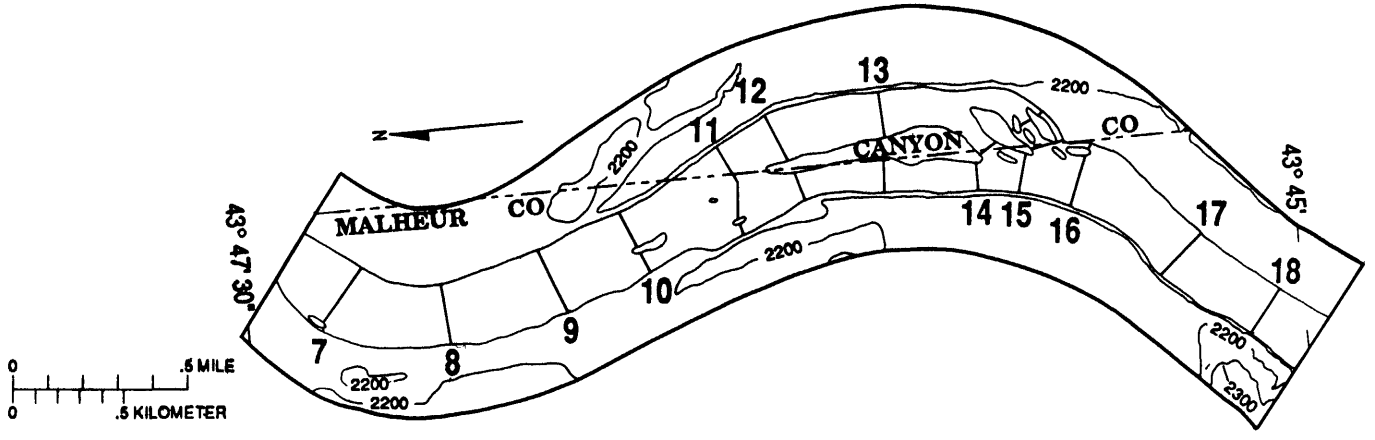

Figure 4.—Locations of cross sections (study subreach B) of the Snake River—Continued.

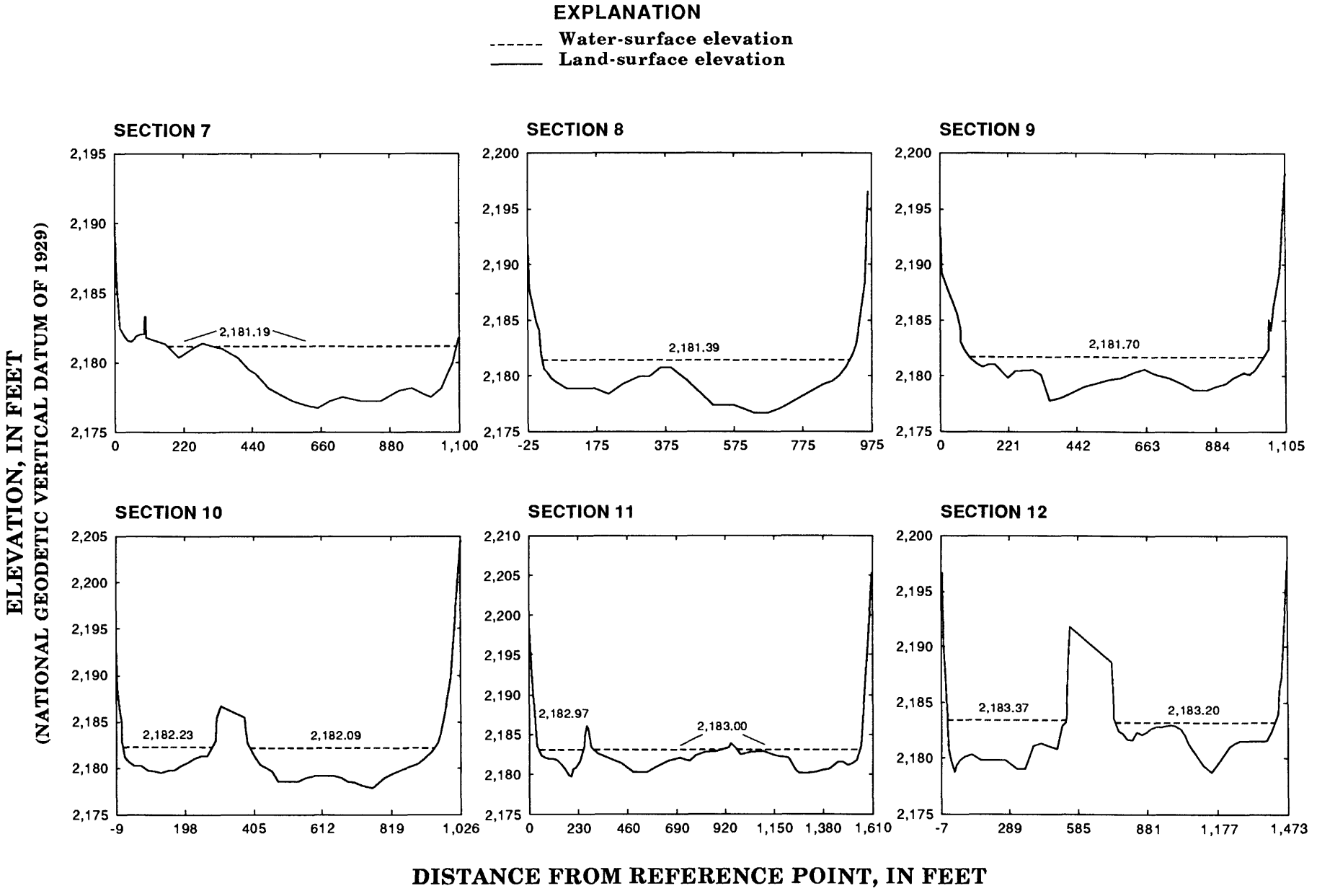

Figure 5.—Water- and land-surface elevations at cross sections (study subreach B) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach B)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
13	Left	57,323	35	523	1,322	2.35	3,110	2,183.66	31	530	1,535	2.75	4,220	2,184.09
	Right		837	1,453	981	0.81	790	2,183.31	832	1,479	1,271	1.09	1,380	2,183.78
14	Left	58,665	12	426	1,671	1.86	3,110	2,183.95	9	431	1,870	2.26	4,220	2,184.43
	Mid		488	758	220	1.46	320	2,183.94	475	761	339	1.54	520	2,184.43
	Mid		1,019	1,063	27	1.11	30	2,183.94	1,014	1,075	52	1.35	70	2,184.42
	Mid		1,211	1,377	105	2.67	280	2,183.94	1,187	1,383	194	2.84	550	2,184.42
	Right		1,487	1,548	67	2.40	160	2,183.94	1,485	1,553	97	2.47	240	2,184.42
15	Left	59,312	12	560	2,204	1.52	3,340	2,184.05	9	564	2,491	1.93	4,810	2,184.57
	Mid		642	946	498	1.02	510	2,184.05	640	955	659	1.05	690	2,184.57
	Right		990	1,061	60	0.83	50	2,184.05	978	1,071	103	0.97	100	2,184.57
16	Left	60,123	21	859	3,217	1.21	3,880	2,184.14	18	867	3,665	1.51	5,530	2,184.67
	Right		902	1,000	68	0.30	20	2,184.14	883	1,012	128	0.55	70	2,184.67
17	Main	61,939	18	817	3,285	1.19	3,900	2,184.20	12	828	3,737	1.50	5,600	2,184.76
18	Main	63,399	39	878	3,115	1.25	3,900	2,184.26	34	888	3,603	1.55	5,600	2,184.83

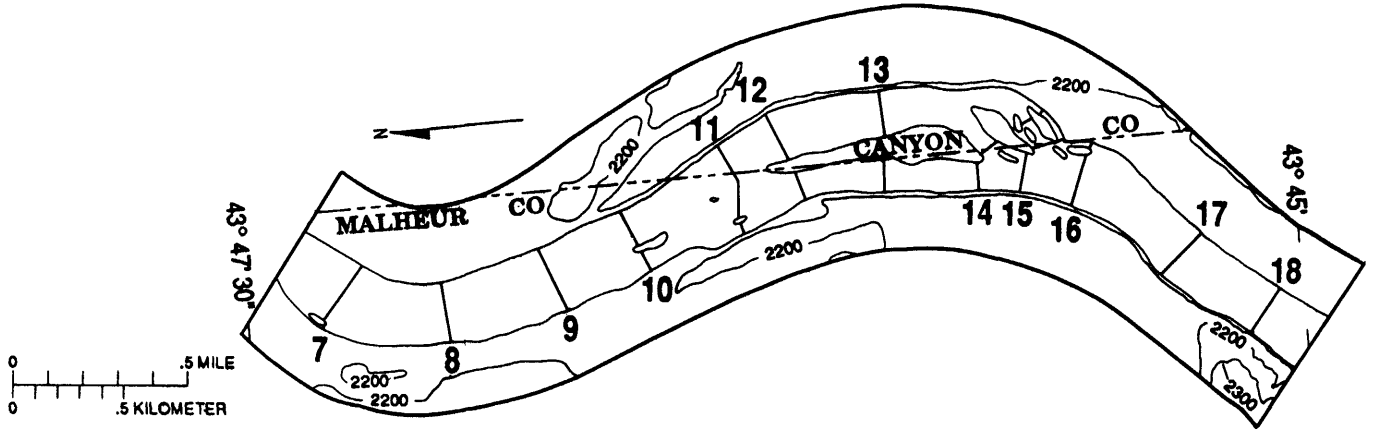

Figure 4.—Locations of cross sections (study subreach B) of the Snake River—Continued.

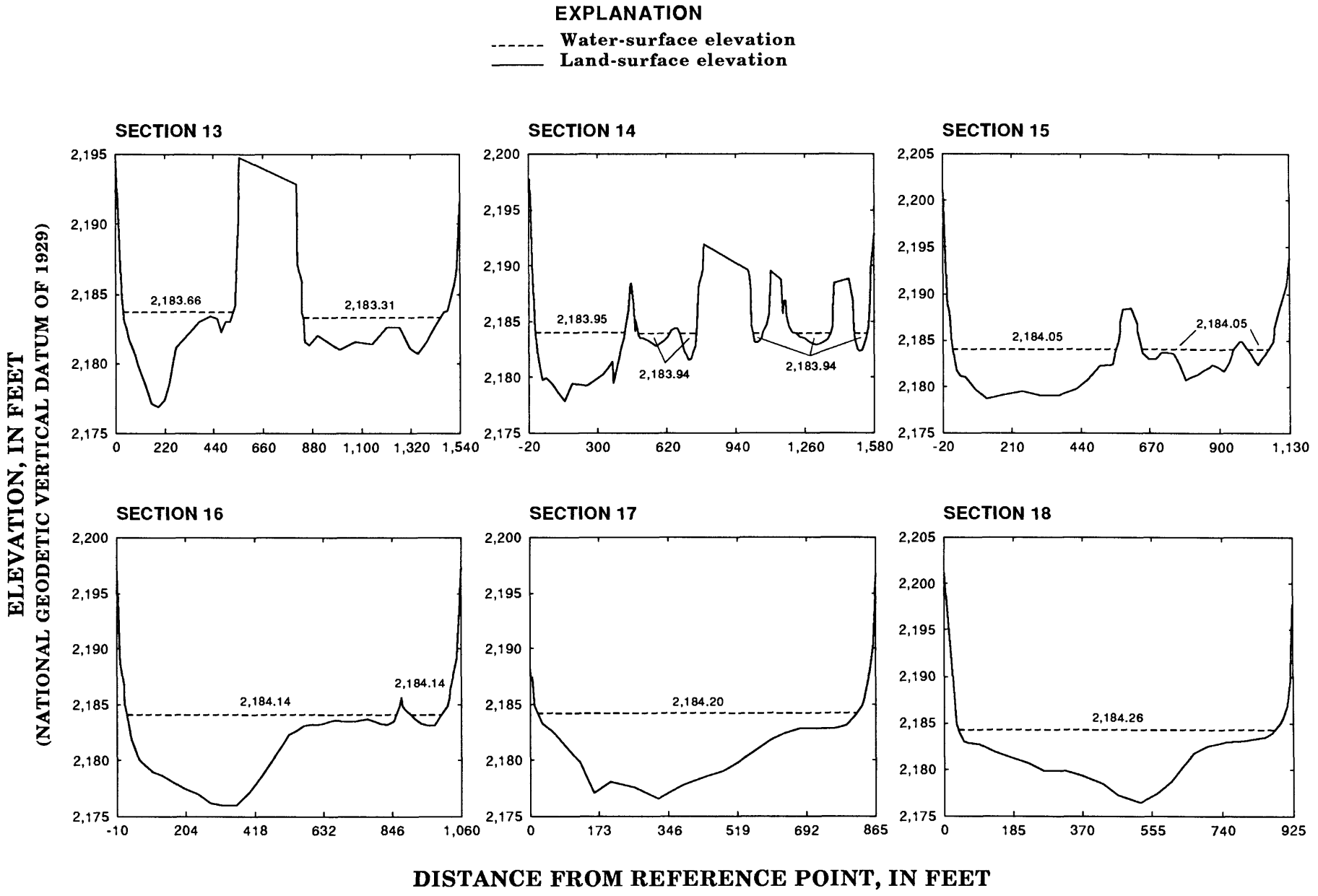

Figure 5.—Water- and land-surface elevations at cross sections (study subreach B) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach C)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
19	Main	64,467	25	979	2,696	1.45	3,900	2,184.35	17	998	3,261	1.72	5,600	2,184.93
20	Left	65,285	29	518	1,372	1.68	2,300	2,184.43	25	528	1,665	1.98	3,300	2,185.02
	Right		677	1,303	1,113	1.44	1,600	2,184.41	673	1,311	1,486	1.55	2,300	2,185.00
21	Left	66,866	48	450	1,189	1.93	2,300	2,184.60	36	455	1,443	2.29	3,300	2,185.22
	Mid		604	728	144	1.11	160	2,184.60	598	731	221	1.31	290	2,185.20
	Mid		804	842	17	0.59	10	2,184.60	796	847	44	0.91	40	2,185.20
	Right		869	1,120	1,060	1.35	1,430	2,184.60	866	1,144	1,219	1.62	1,970	2,185.20
22	Left	67,858	36	594	1,698	1.59	2,700	2,184.73	29	608	2,054	1.84	3,790	2,185.36
	Mid		711	947	699	1.44	1,010	2,184.78	702	952	854	1.62	1,380	2,185.41
	Right		1,062	1,271	173	1.10	190	2,184.78	1,045	1,273	310	1.39	430	2,185.41
23	Left	68,822	28	687	2,308	1.43	3,300	2,184.84	18	695	2,737	1.69	4,630	2,185.48
	Right		1,064	1,280	592	1.01	600	2,184.86	1,060	1,282	738	1.31	970	2,185.53
24	Left	70,152	40	539	2,243	1.47	3,300	2,184.94	37	542	2,569	1.80	4,630	2,185.59
	Mid		857	899	33	0.60	20	2,184.96	847	905	67	0.89	60	2,185.65
	Right		946	1,078	453	1.28	580	2,184.96	942	1,082	546	1.67	910	2,185.65

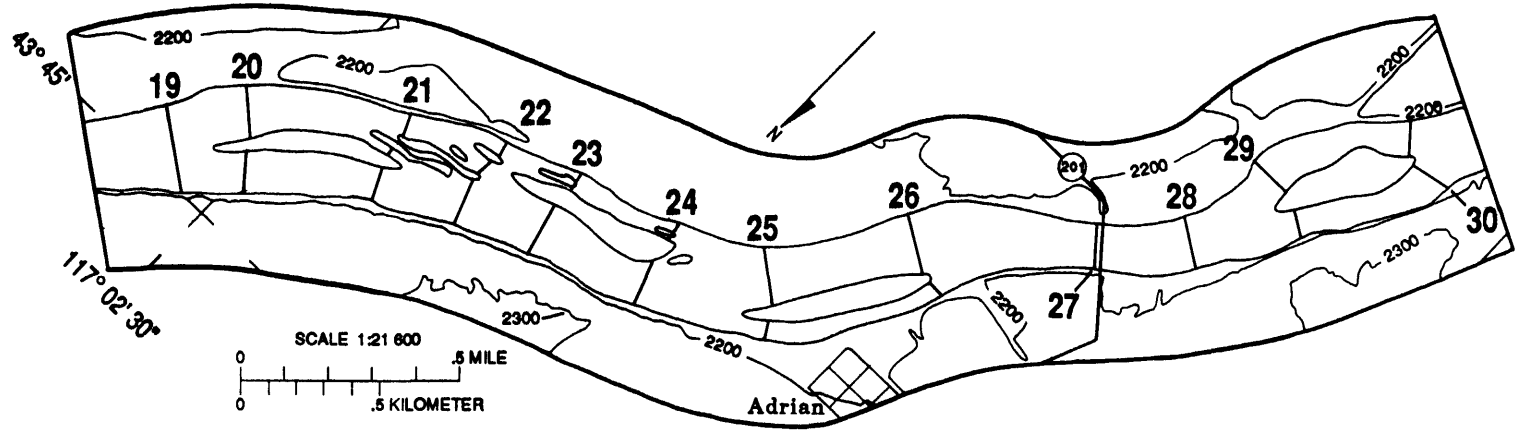

Figure 4.—Locations of cross sections (study subreach C) of the Snake River—Continued.

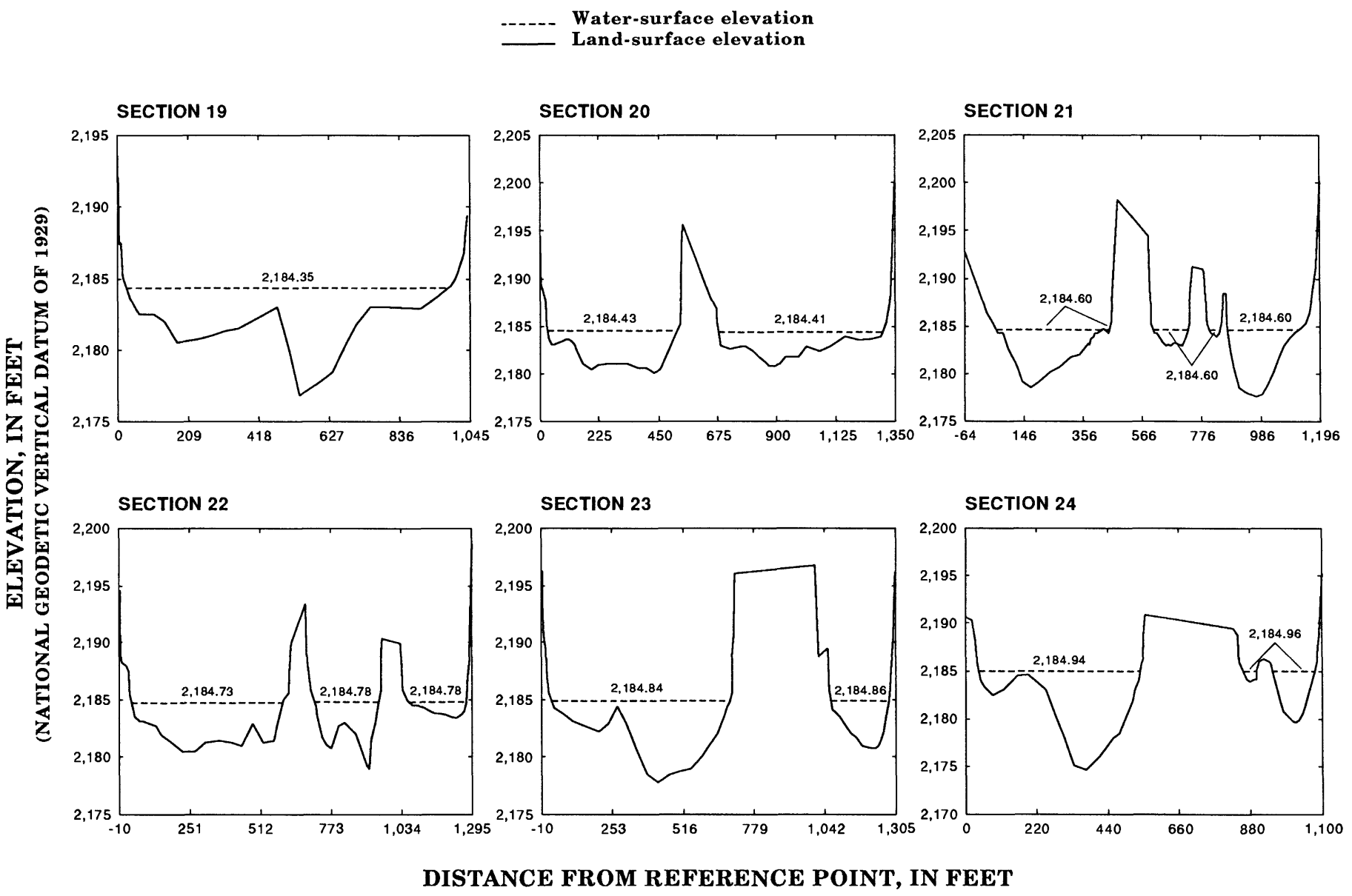

Figure 5.—Water- and land-surface elevations at cross sections (study subreach C) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach C)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
25	Left	71,583	8	248	386	1.30	500	2,185.03	6	257	547	1.50	820	2,185.69
	Right		422	1,213	2,191	1.55	3,400	2,185.08	420	1,220	2,726	1.75	4,780	2,185.75
26	Left	73,372	18	229	436	1.15	500	2,185.30	15	246	585	1.40	820	2,185.97
	Right		314	1,082	1,932	1.76	3,400	2,185.30	295	1,095	2,453	1.95	4,780	2,185.96
27	Main	75,491	28	576	3,433	1.14	3,900	2,185.50	24	581	3,780	1.48	5,600	2,186.13
28	Main	76,580	25	665	3,050	1.28	3,900	2,185.60	21	673	3,448	1.62	5,600	2,186.21
29	Left	77,838	8	385	1,406	1.95	2,740	2,185.76	6	390	1,627	2.30	3,740	2,186.34
	Right		630	1,074	654	1.77	1,160	2,185.79	629	1,111	928	2.00	1,860	2,186.38
30	Left	79,420	211	695	961	2.85	2,740	2,186.29	204	720	1,224	3.06	3,740	2,186.81
	Right		777	1,199	671	1.73	1,160	2,186.29	766	1,205	900	2.07	1,860	2,186.82

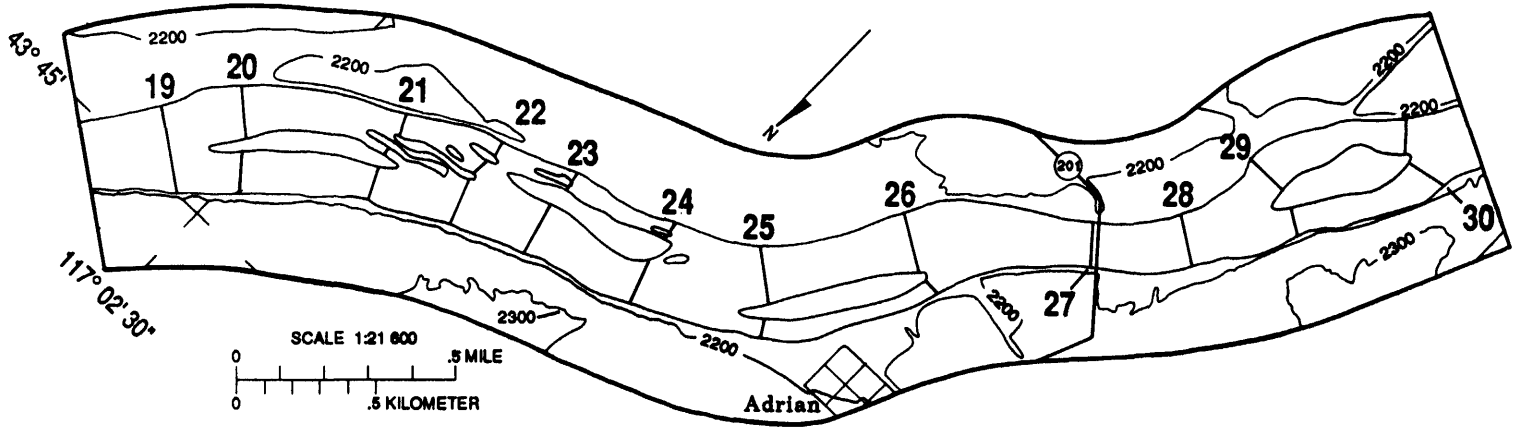

Figure 4.—Locations of cross sections (study subreach C) of the Snake River—Continued.

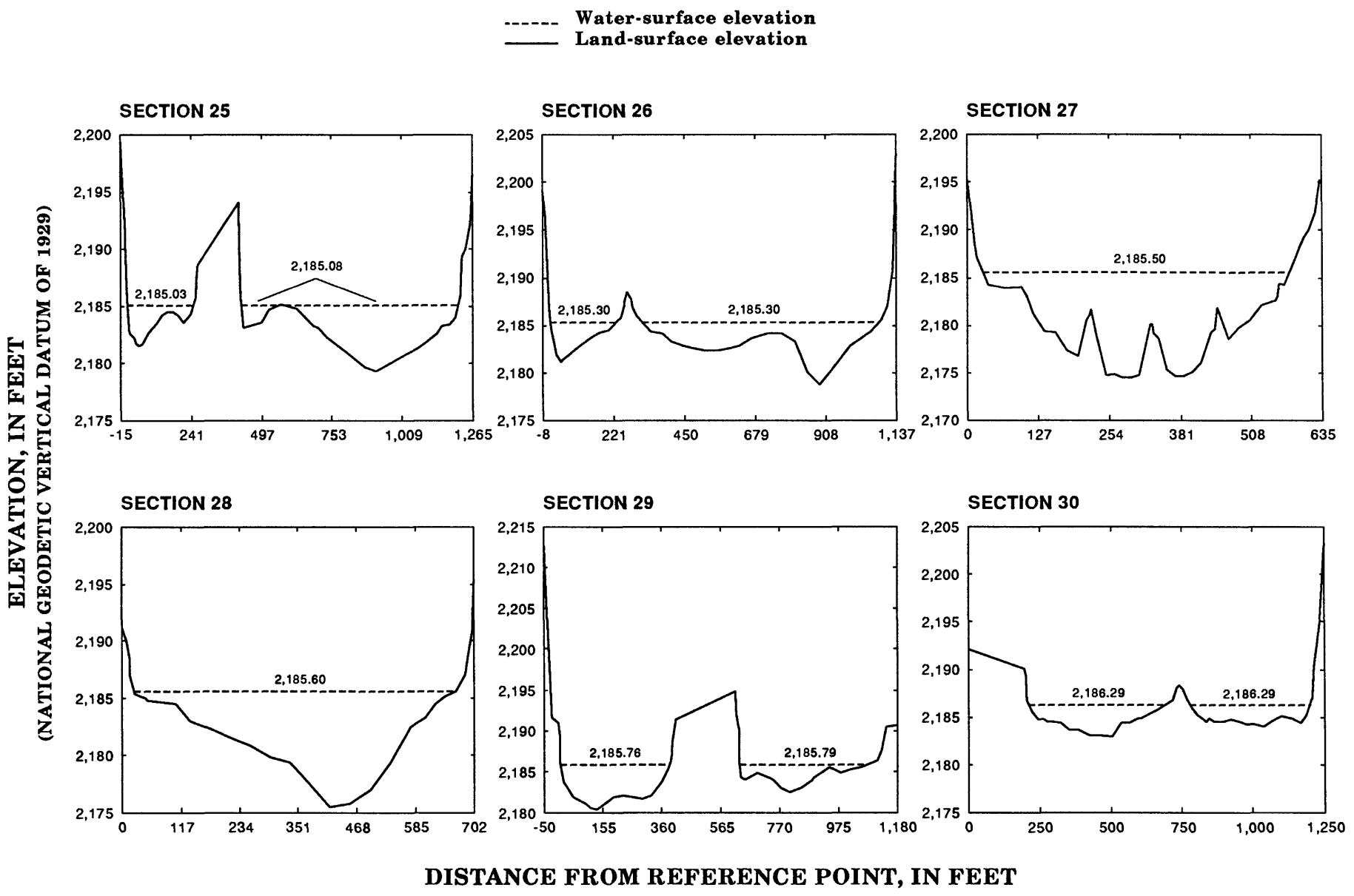

Figure 5.—Water- and land-surface elevations at cross sections (study subreach C) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach D)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
31	Main	80,379	15	734	2,458	1.59	3,900	2,186.60	12	742	2,840	1.97	5,600	2,187.13
32	Main	81,451	24	539	3,537	1.10	3,900	2,186.79	20	544	3,812	1.47	5,600	2,187.32
33	Left	82,235	13	355	534	2.17	1,160	2,187.12	10	358	720	2.85	2,050	2,187.66
	Right		579	1,057	1,196	2.29	2,740	2,186.90	483	1,065	1,466	2.42	3,550	2,187.43
34	Left	83,376	15	229	830	1.40	1,160	2,187.52	12	233	963	2.13	2,050	2,188.13
	Right		808	1,280	1,048	2.61	2,740	2,187.28	751	1,282	1,296	2.74	3,550	2,187.77
35	Main	84,353	12	757	2,181	1.79	3,900	2,187.77	8	762	2,663	2.10	5,600	2,188.42
36	Main	86,224	20	460	3,574	1.09	3,900	2,187.96	16	462	3,844	1.46	5,600	2,188.57

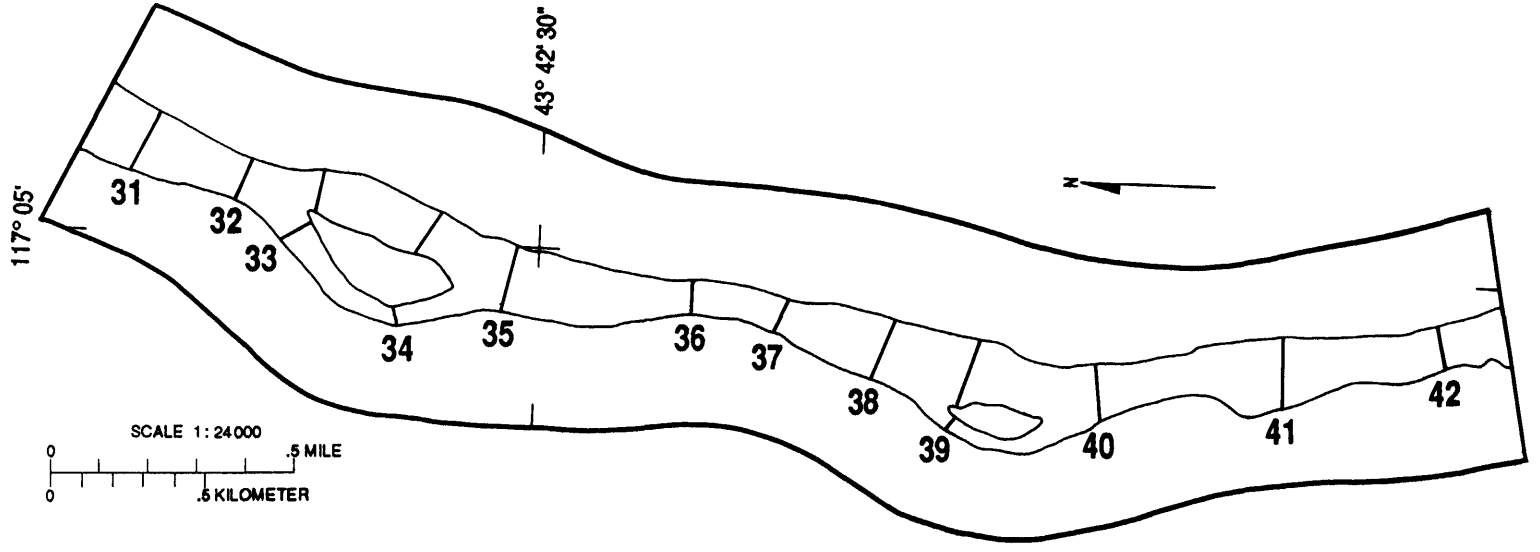

Figure 4.—Locations of cross sections (study subreach D) of the Snake River—Continued.

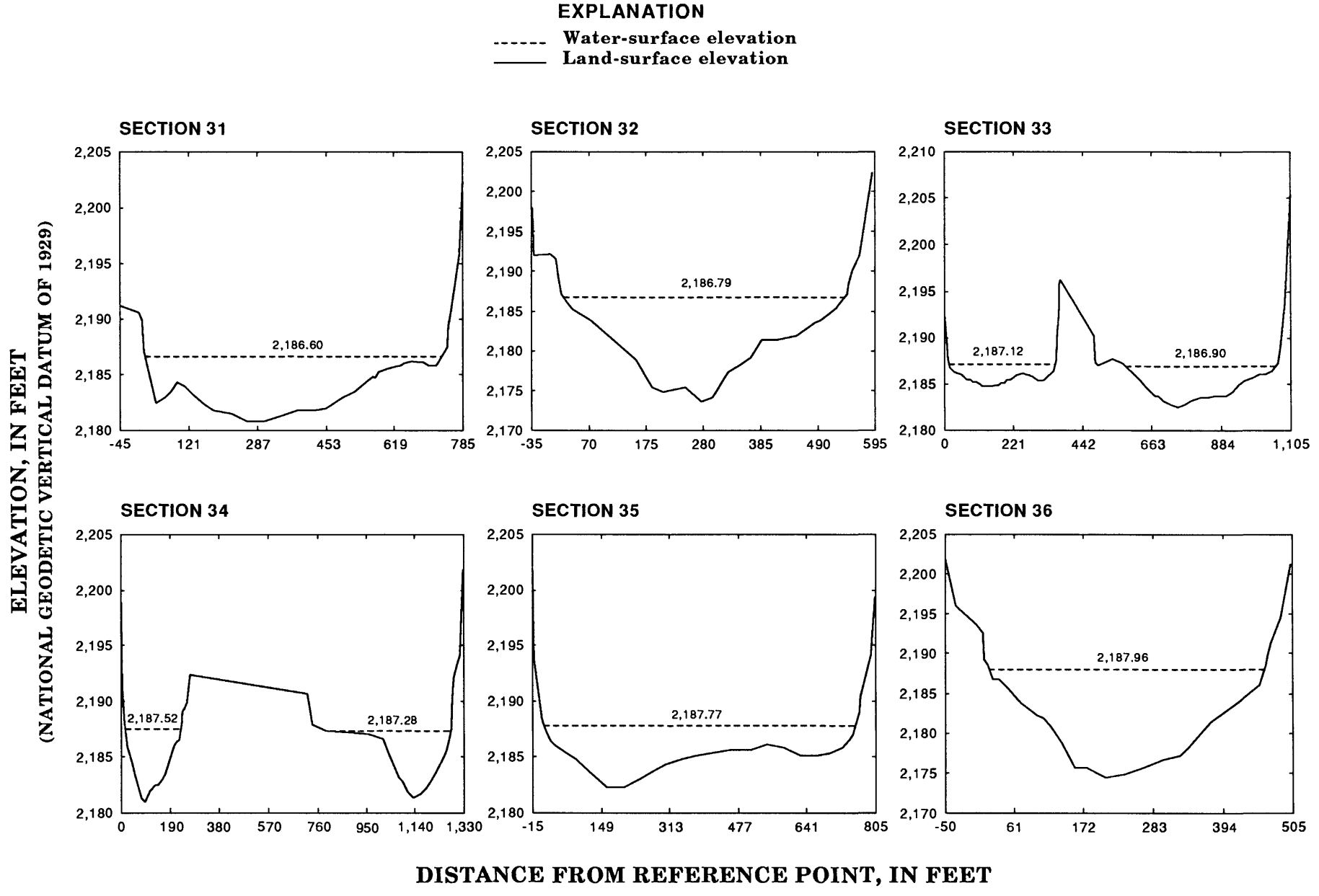

Figure 5.—Water- and land-surface elevations at cross sections (study subreach D) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach D)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
37	Main	87,150	14	431	2,853	1.37	3,900	2,188.01	9	438	3,107	1.80	5,600	2,188.61
38	Main	88,234	12	710	2,489	1.57	3,900	2,188.11	6	720	2,908	1.93	5,600	2,188.70
39	Left	89,161	35	229	325	2.09	680	2,188.37	32	231	432	2.27	980	2,188.91
	Right		417	1,119	1,126	2.86	3,220	2,188.37	350	1,123	1,517	3.05	4,620	2,188.91
40	Main	90,470	28	581	2,984	1.31	3,900	2,188.96	25	588	3,238	1.73	5,600	2,189.41
41	Main	92,374	50	749	2,472	1.58	3,900	2,189.23	36	753	2,870	1.95	5,600	2,189.79
42	Main	93,977	79	527	1,877	2.08	3,900	2,189.41	72	530	2,139	2.62	5,600	2,189.98

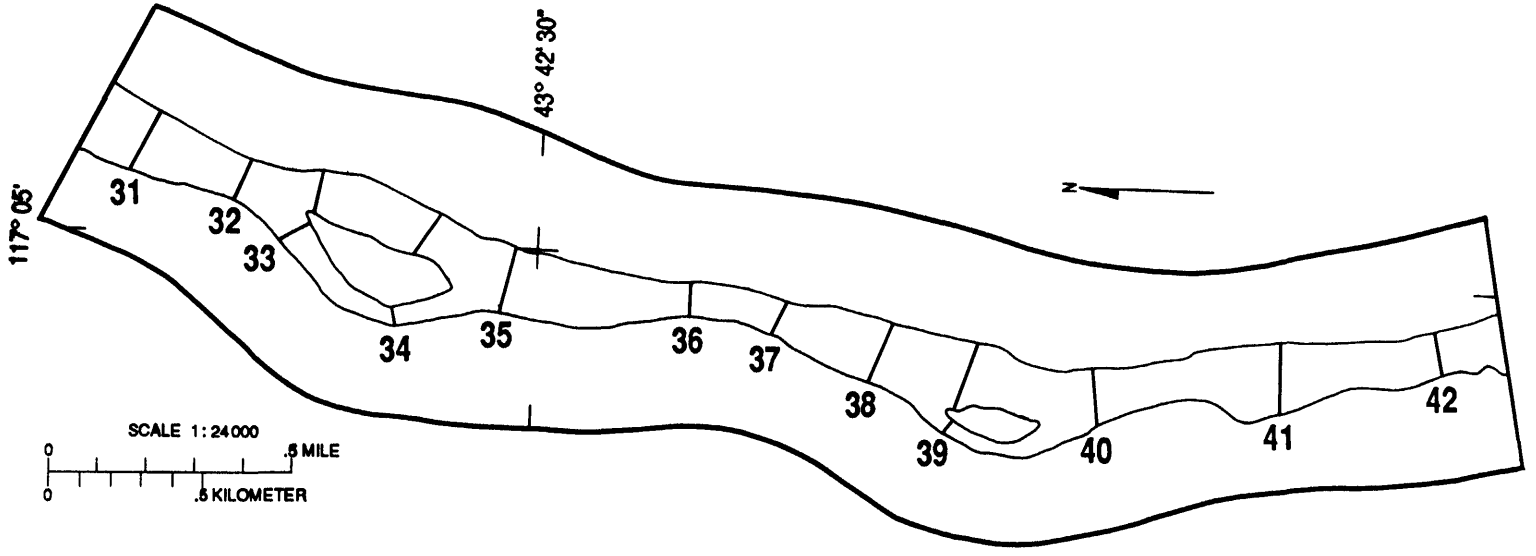

Figure 4.—Locations of cross sections (study subreach D) of the Snake River—Continued.

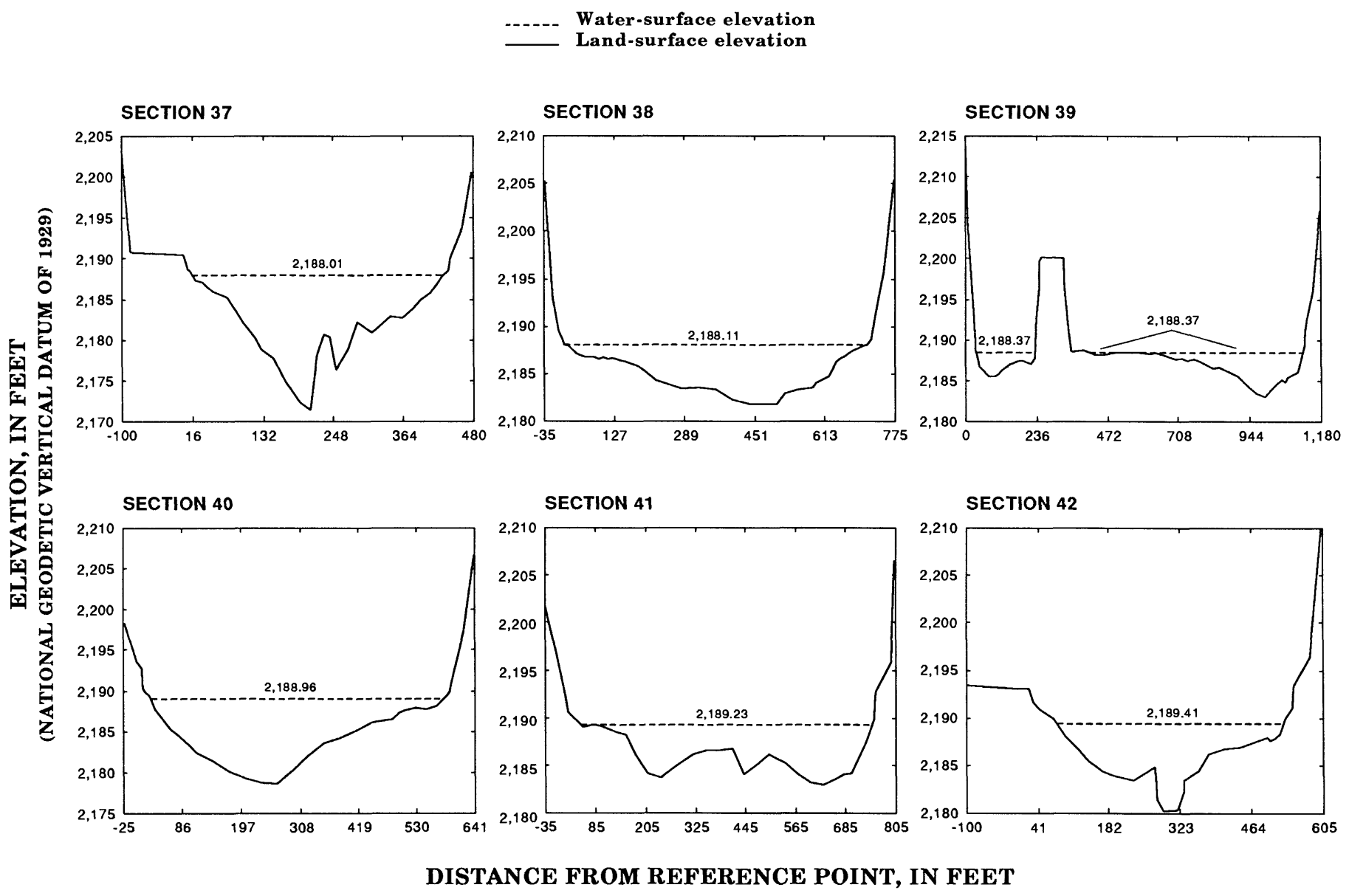

Figure 5.—Water- and land-surface elevations at cross sections (study subreach D) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach E)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
43	Main	95,809	43	581	1,905	2.05	3,900	2,189.63	34	587	2,229	2.51	5,600	2,190.22
44	Main	97,087	153	723	1,851	2.11	3,900	2,189.81	44	731	2,243	2.50	5,600	2,190.44
45	Main	99,648	73	557	1,448	2.69	3,900	2,190.31	57	575	1,761	3.18	5,600	2,190.94
46	Main	101,148	36	1,044	1,474	2.65	3,900	2,191.38	15	1,055	2,001	2.80	5,600	2,191.90
47	Left	102,108	20	838	1,610	2.31	3,720	2,192.15	16	841	1,943	2.71	5,270	2,192.59
	Right		895	1,021	132	1.37	180	2,192.10	892	1,030	191	1.73	330	2,192.54
48	Left	103,002	50	427	1,485	2.49	3,700	2,192.42	27	429	1,661	3.12	5,180	2,192.87
	Mid		494	1,029	98	0.20	20	2,192.60	462	1,063	339	0.27	90	2,193.07
	Right		1,108	1,248	152	1.18	180	2,192.60	1,101	1,250	220	1.50	330	2,193.07

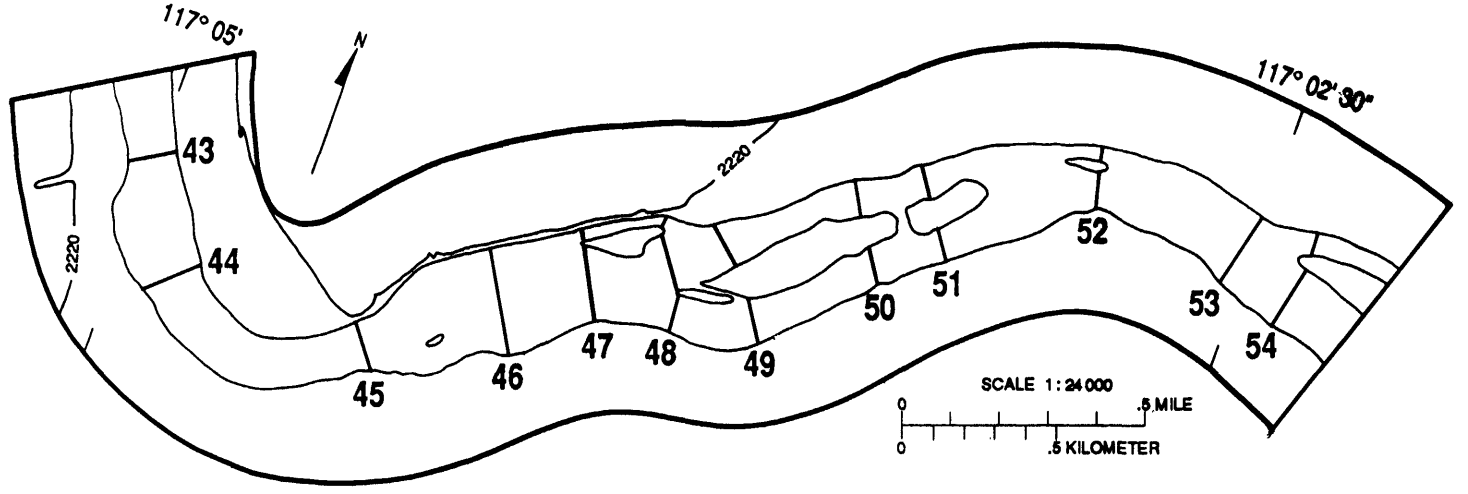

Figure 4.—Locations of cross sections (study subreach E) of the Snake River—Continued.

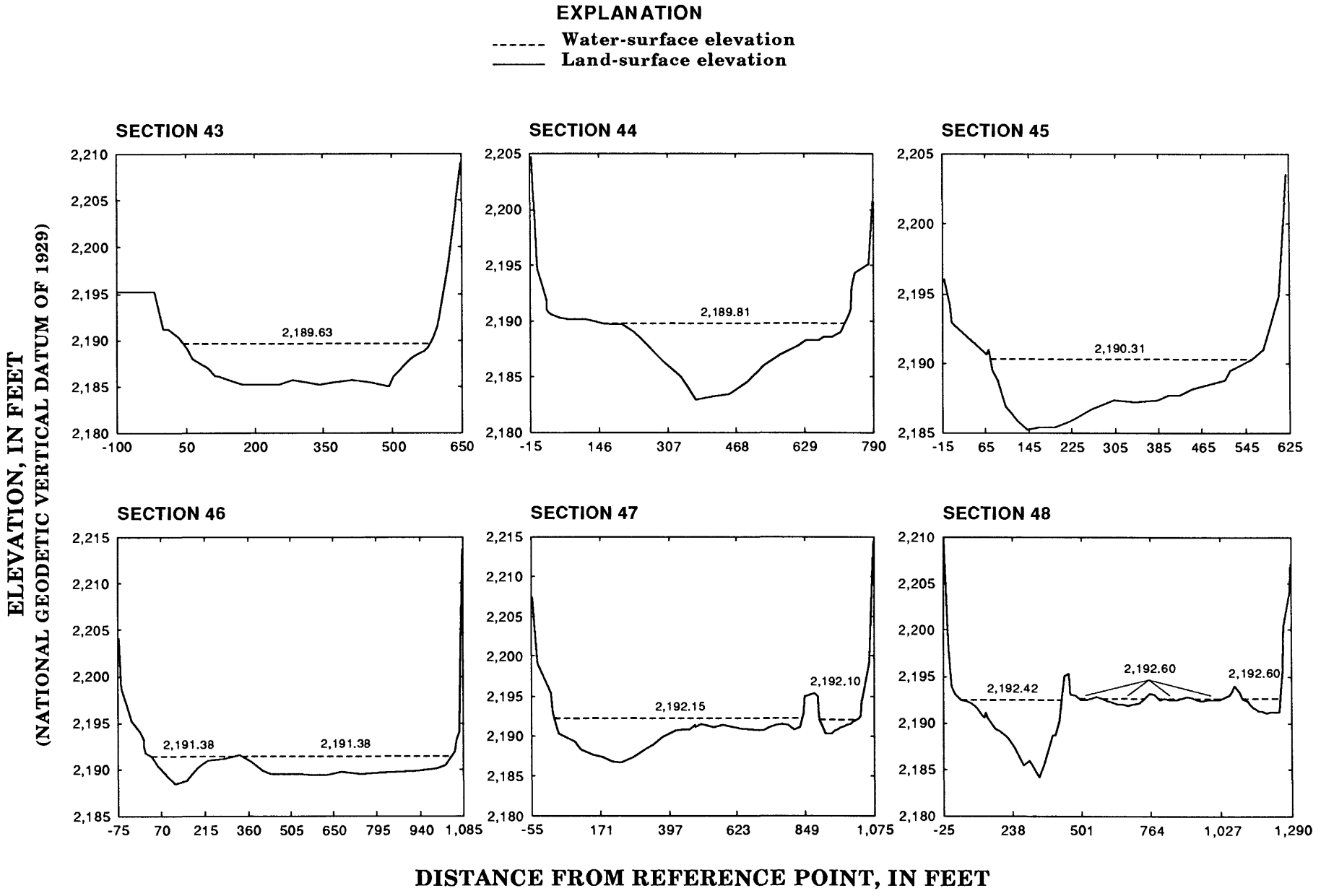

Figure 5.—Water- and land-surface elevations at cross sections (study subreach E) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach E)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
49	Left	103,810	48	488	1,771	2.08	3,680	2,192.61	34	499	1,996	2.60	5,180	2,193.11
	Right		921	1,375	609	0.36	220	2,192.72	913	1,377	835	0.50	420	2,193.21
50	Left	105,226	37	461	1,474	2.50	3,680	2,192.89	32	469	1,714	3.02	5,180	2,193.45
	Right		730	1,144	563	0.39	220	2,192.75	725	1,145	770	0.55	420	2,193.24
51	Left	105,887	18	340	1,359	2.74	3,720	2,192.91	14	360	1,546	3.44	5,310	2,193.47
	Right		722	1,046	440	0.41	180	2,192.77	713	1,050	602	0.48	290	2,193.26
52	Left	107,551	28	450	1,529	2.41	3,680	2,193.37	23	462	1,805	2.90	5,240	2,194.01
	Right		609	737	208	1.06	220	2,193.29	598	742	296	1.21	360	2,193.94
53	Main	109,181	55	748	2,895	1.35	3,900	2,193.49	36	765	3,388	1.65	5,600	2,194.18
54	Left	109,868	26	713	1,625	2.26	3,670	2,193.59	21	728	2,085	2.44	5,080	2,194.25
	Right		904	1,144	246	0.93	230	2,193.66	902	1,198	428	1.22	520	2,194.32

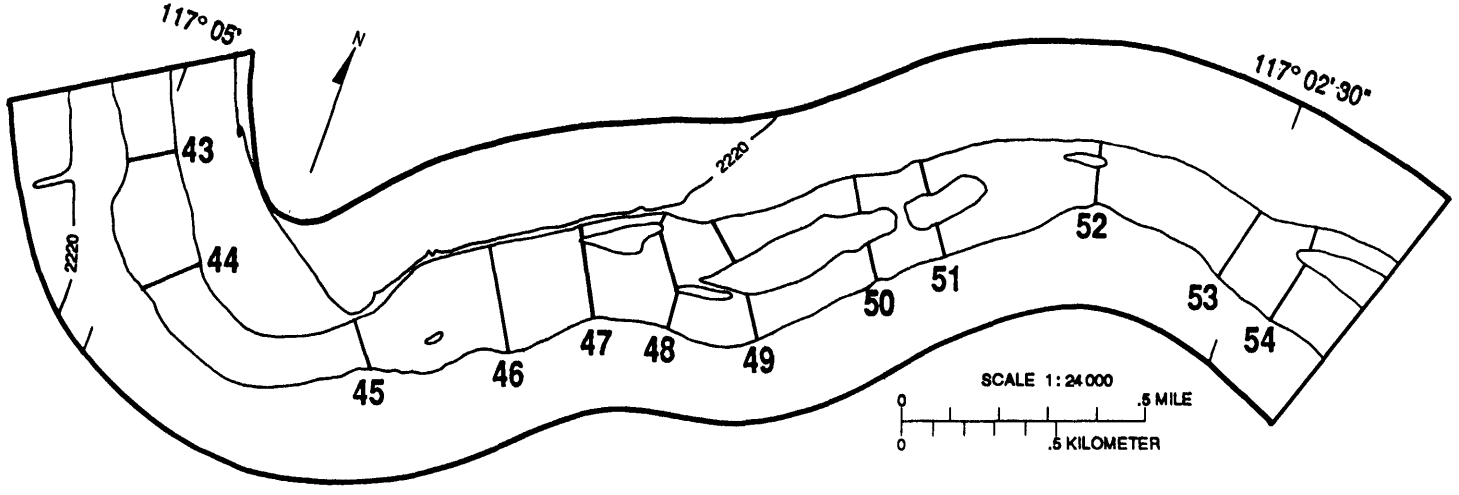

Figure 4.—Locations of cross sections (study subreach E) of the Snake River—Continued.

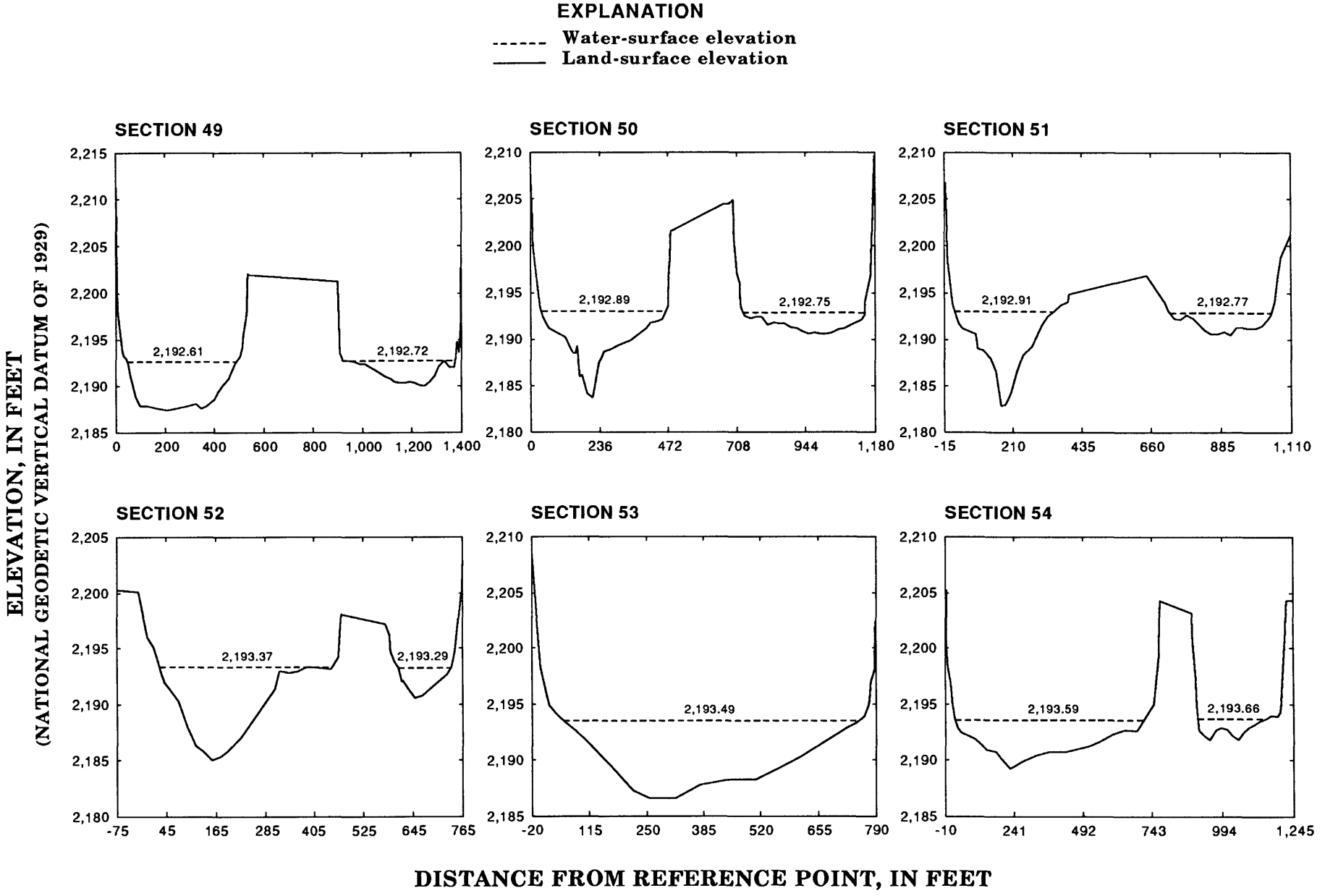

Figure 5.—Water- and land-surface elevations at cross sections (study subreach E) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach F)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
55	Left	111,175	23	677	1,607	2.28	3,670	2,193.88	18	682	2,017	2.52	5,080	2,194.50
	Right		1,196	1,386	517	0.44	230	2,193.87	1,192	1,411	645	0.81	520	2,194.51
56	Left	112,231	44	784	1,600	2.29	3,670	2,194.13	33	790	2,057	2.47	5,080	2,194.74
	Right		1,102	1,303	356	0.65	230	2,193.98	1,099	1,309	484	1.07	520	2,194.59
57	Main	113,820	81	750	2,952	1.32	3,900	2,194.32	46	753	3,361	1.67	5,600	2,194.91
58	Main	115,650	79	729	2,572	1.52	3,900	2,194.42	69	737	2,971	1.88	5,600	2,195.02
59	Main	117,963	84	733	2,726	1.43	3,900	2,194.62	61	746	3,160	1.77	5,600	2,195.27
60	Main	119,699	228	758	2,697	1.45	3,900	2,194.83	162	766	3,107	1.80	5,600	2,195.56

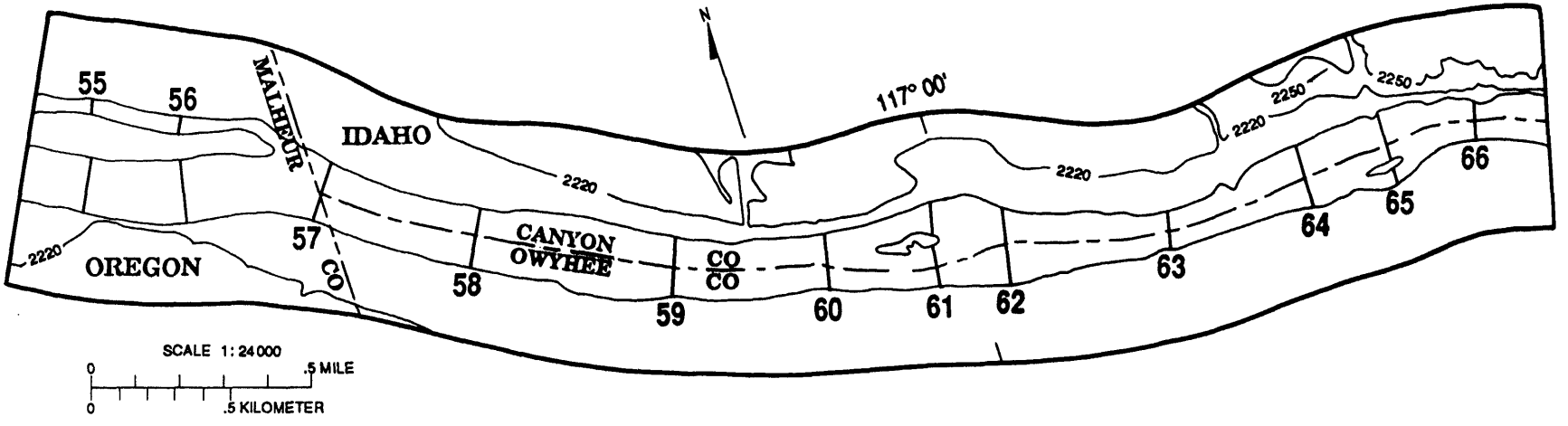

Figure 4.—Locations of cross sections (study subreach F) of the Snake River—Continued.

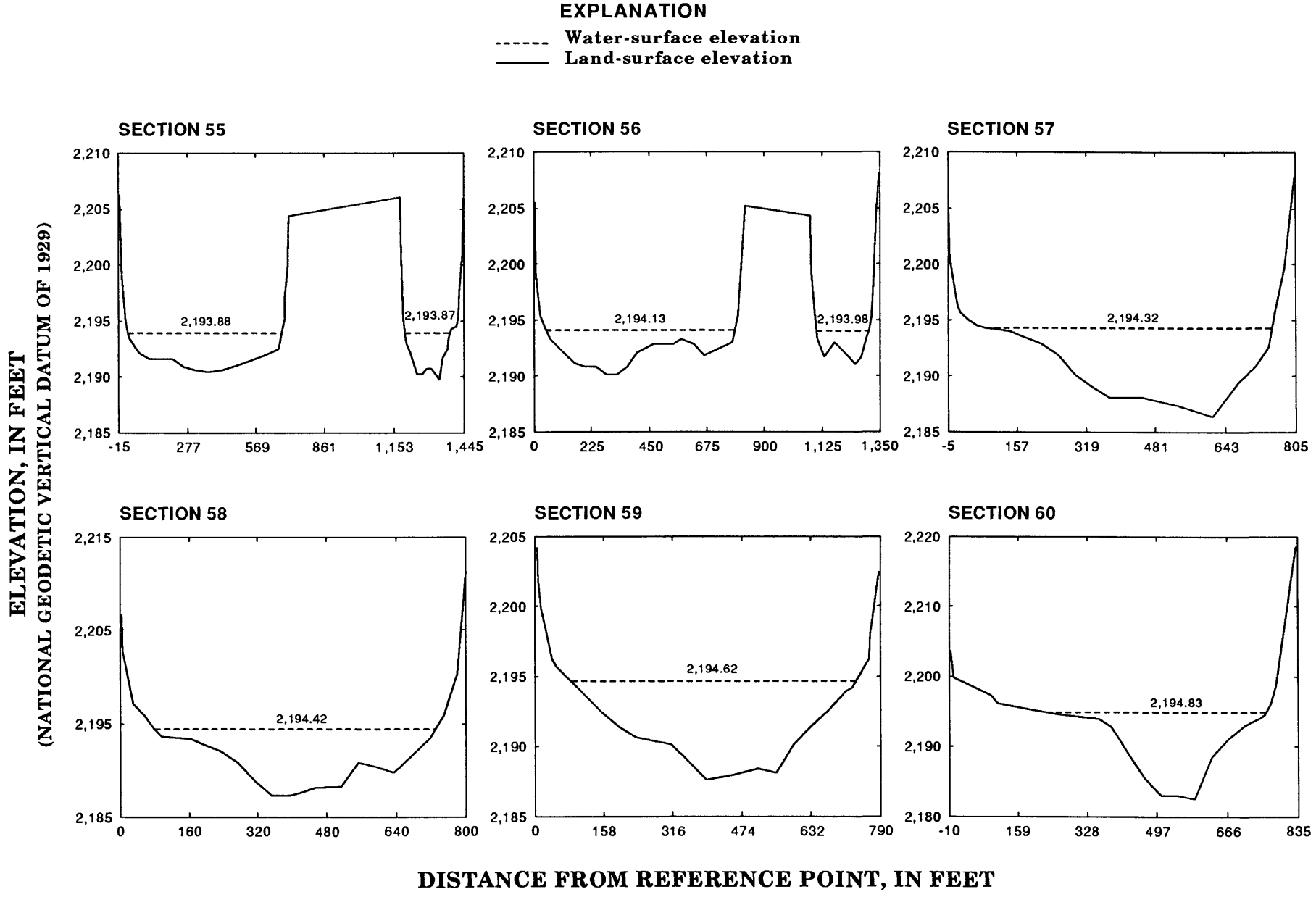

Figure 5.—Water- and land-surface elevations at cross sections (study subreach F) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach F)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
61	Left	120,685	86	410	391	2.86	1,120	2,195.52	37	530	728	2.77	2,020	2,196.32
	Right		774	1,082	1,027	2.71	2,780	2,195.11	722	1,087	1,293	2.77	3,580	2,195.90
62	Main	121,841	43	710	2,955	1.32	3,900	2,195.58	34	729	3,499	1.60	5,600	2,196.38
63	Main	123,680	86	466	4,316	0.90	3,900	2,196.04	79	471	4,604	1.22	5,600	2,196.79
64	Main	125,374	41	729	1,935	2.02	3,900	2,196.30	30	751	2,431	2.30	5,600	2,197.00
65	Left	126,414	17	213	164	1.83	300	2,196.30	14	218	307	2.02	620	2,197.01
	Right		366	843	1,580	2.28	3,600	2,196.60	345	853	1,930	2.58	4,980	2,197.31
66	Main	127,563	84	492	2,293	1.70	3,900	2,196.67	75	495	2,593	2.16	5,600	2,197.39

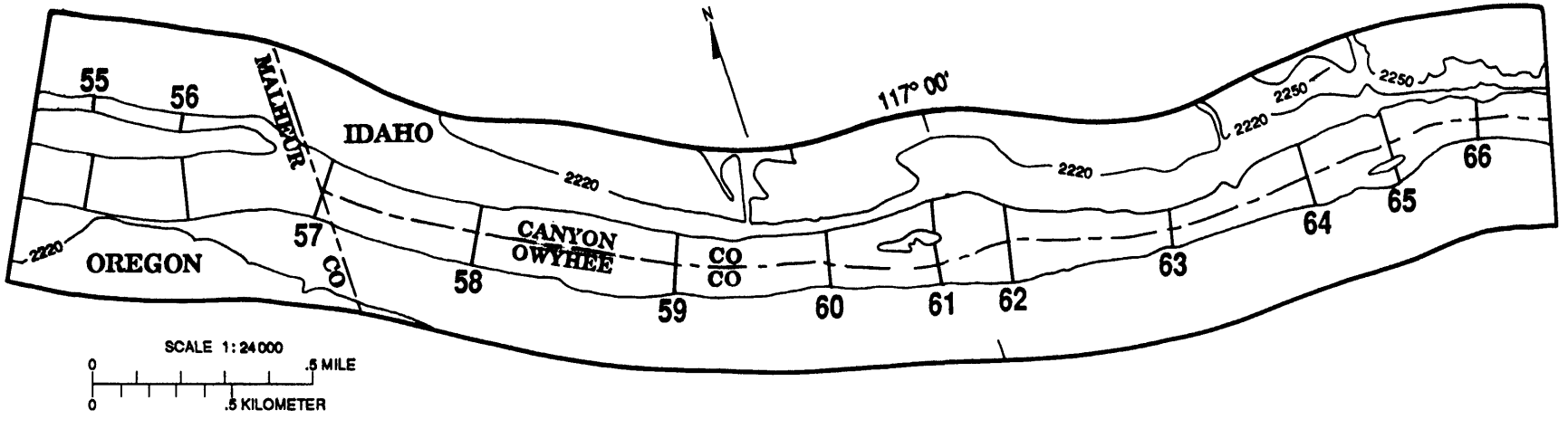

Figure 4.—Locations of cross sections (study subreach F) of the Snake River—Continued.

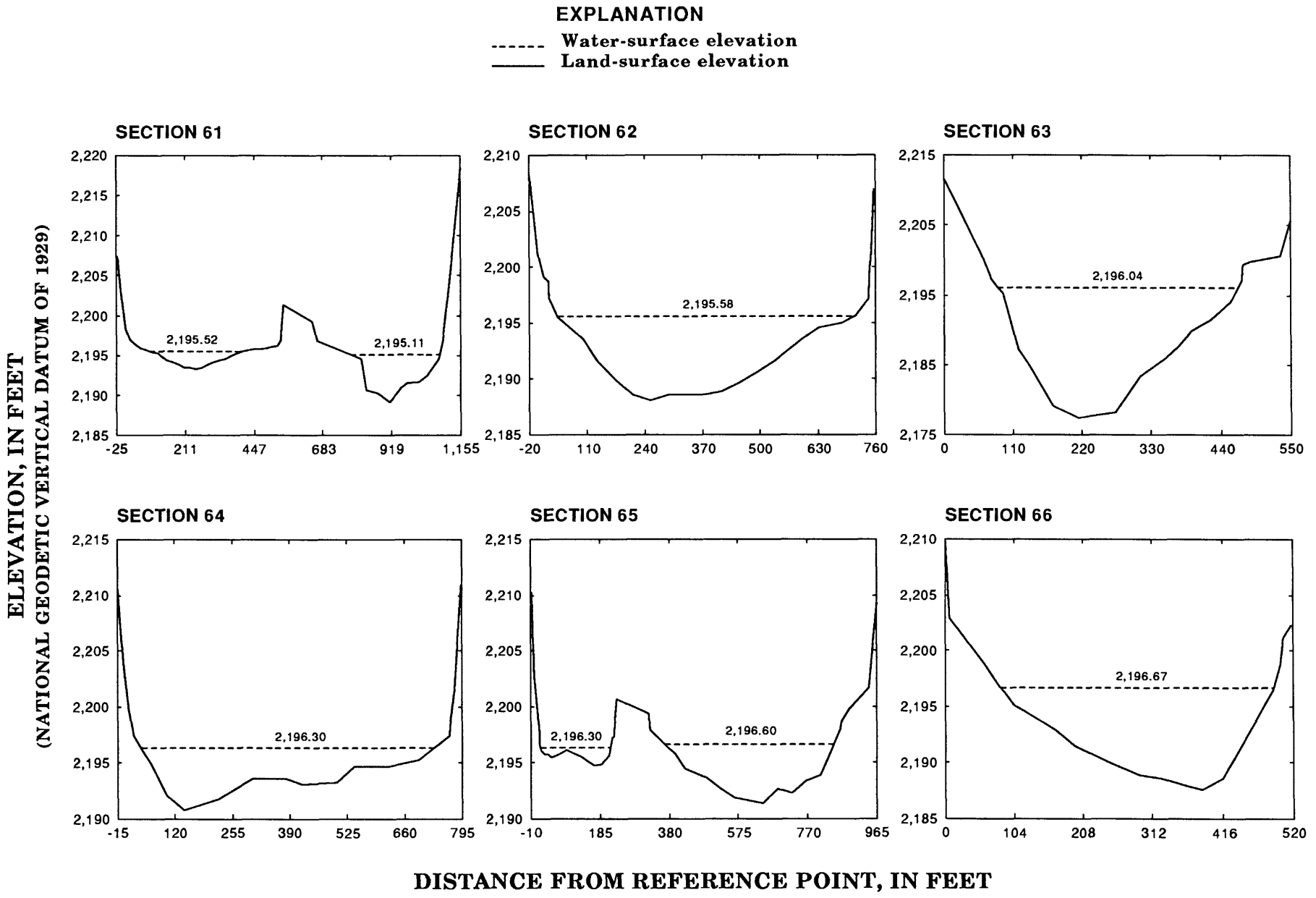

Figure 5.—Water- and land-surface elevations at cross sections (study subreach F) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach G)*—Continued

XSID.	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
67	Main	128,932	104	609	2,493	1.56	3,900	2,196.80	78	614	2,892	1.94	5,600	2,197.57
68	Left	130,837	57	236	604	3.44	2,080	2,197.34	49	239	705	4.17	2,940	2,197.89
	Right		378	959	859	2.12	1,820	2,197.65	367	975	1,181	2.25	2,660	2,198.20
69	Left	131,874	40	307	533	3.90	2,080	2,198.35	36	310	647	4.54	2,940	2,198.77
	Right		597	1,271	684	2.66	1,820	2,198.38	590	1,276	954	2.79	2,660	2,198.80
70	Left	132,775	21	268	454	1.32	600	2,199.46	19	270	541	1.61	870	2,199.81
	Right		579	1,089	1,601	2.06	3,300	2,199.54	578	1,094	1,817	2.60	4,730	2,199.96
71	Main	133,610	28	550	3,795	1.03	3,900	2,199.60	25	552	4,004	1.40	5,600	2,200.00
72	Main	135,068	35	631	3,229	1.21	3,900	2,199.74	32	633	3,468	1.61	5,600	2,200.15

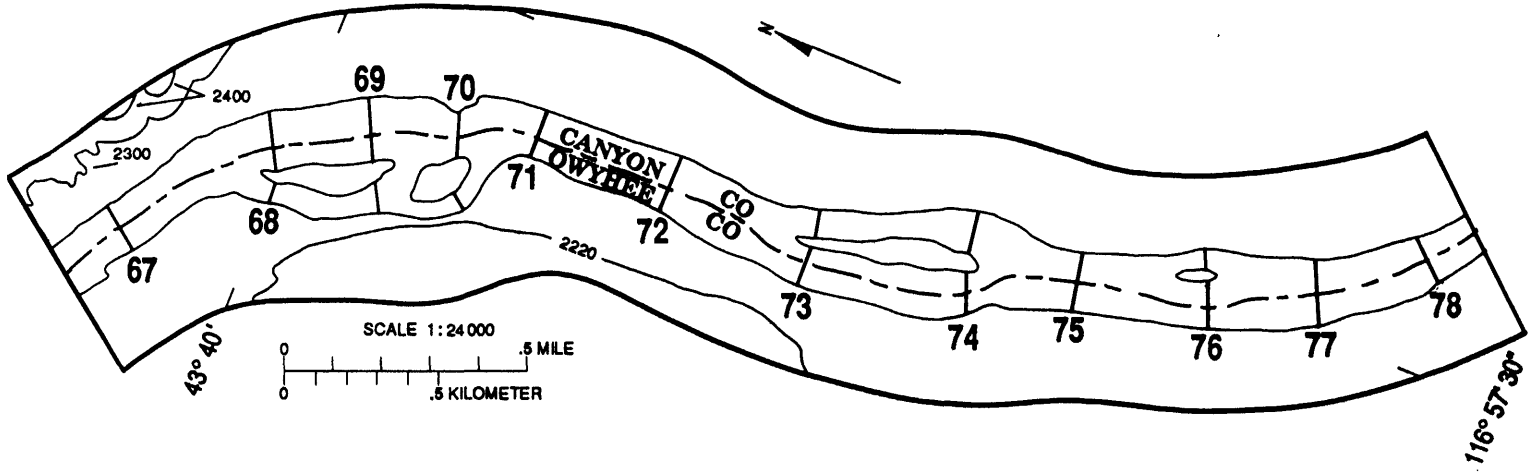

Figure 4.—Locations of cross sections (study subreach G) of the Snake River—Continued.

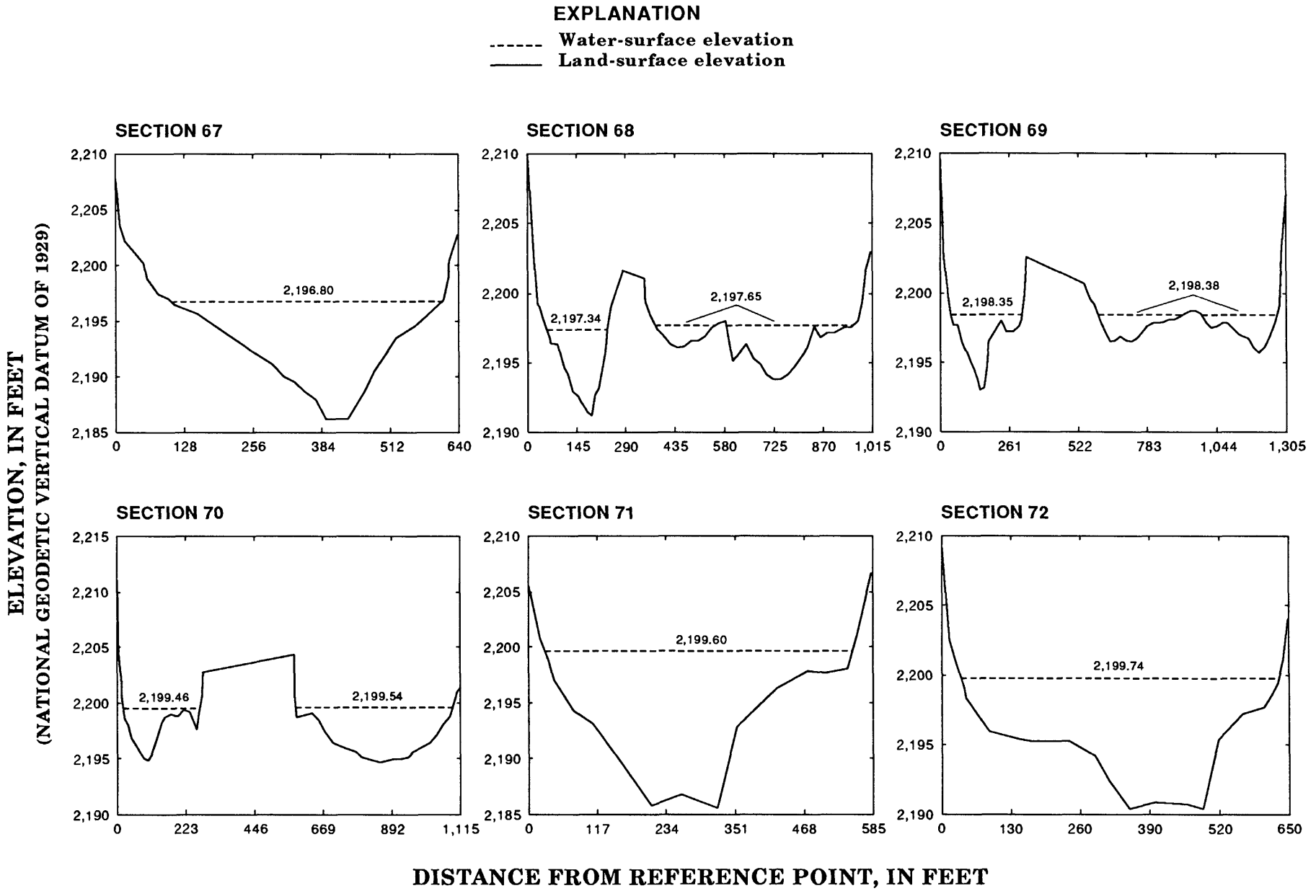

Figure 5.—Water- and land-surface elevations at cross sections (study subreach G) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach G)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
73	Left	136,690	40	488	374	1.12	420	2,199.86	29	494	562	1.42	800	2,200.27
	Right		609	936	1,903	1.83	3,480	2,199.78	607	939	2,034	2.36	4,800	2,200.18
74	Left	138,371	35	465	452	0.93	420	2,200.58	33	475	641	1.25	800	2,201.01
	Right		692	1,119	949	3.67	3,480	2,200.12	690	1,121	1,126	4.26	4,800	2,200.54
75	Main	139,583	32	675	2,654	1.47	3,900	2,200.77	26	680	2,967	1.89	5,600	2,201.25
76	Left	140,941	39	483	1,722	2.24	3,850	2,200.87	33	488	1,943	2.83	5,490	2,201.36
	Right		626	727	69	0.73	50	2,200.80	611	739	125	0.88	110	2,201.29
77	Main	142,112	42	649	2,672	1.46	3,900	2,201.14	38	653	2,988	1.87	5,600	2,201.65
78	Main	143,537	37	590	3,228	1.21	3,900	2,201.23	33	593	3,526	1.59	5,600	2,201.76

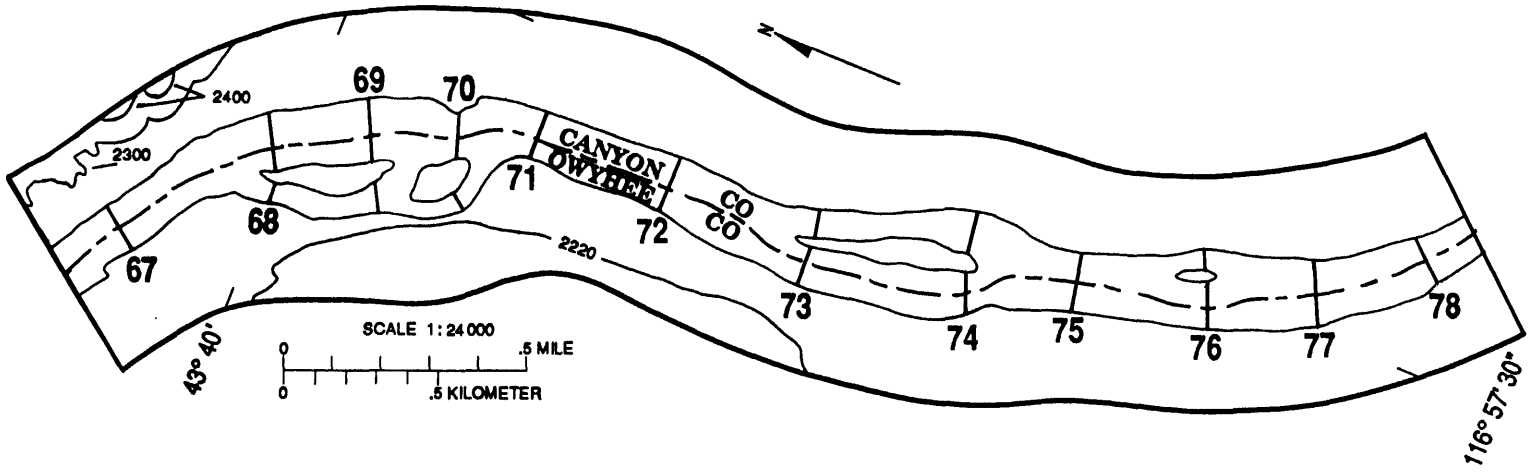

Figure 4.—Locations of cross sections (study subreach G) of the Snake River—Continued.

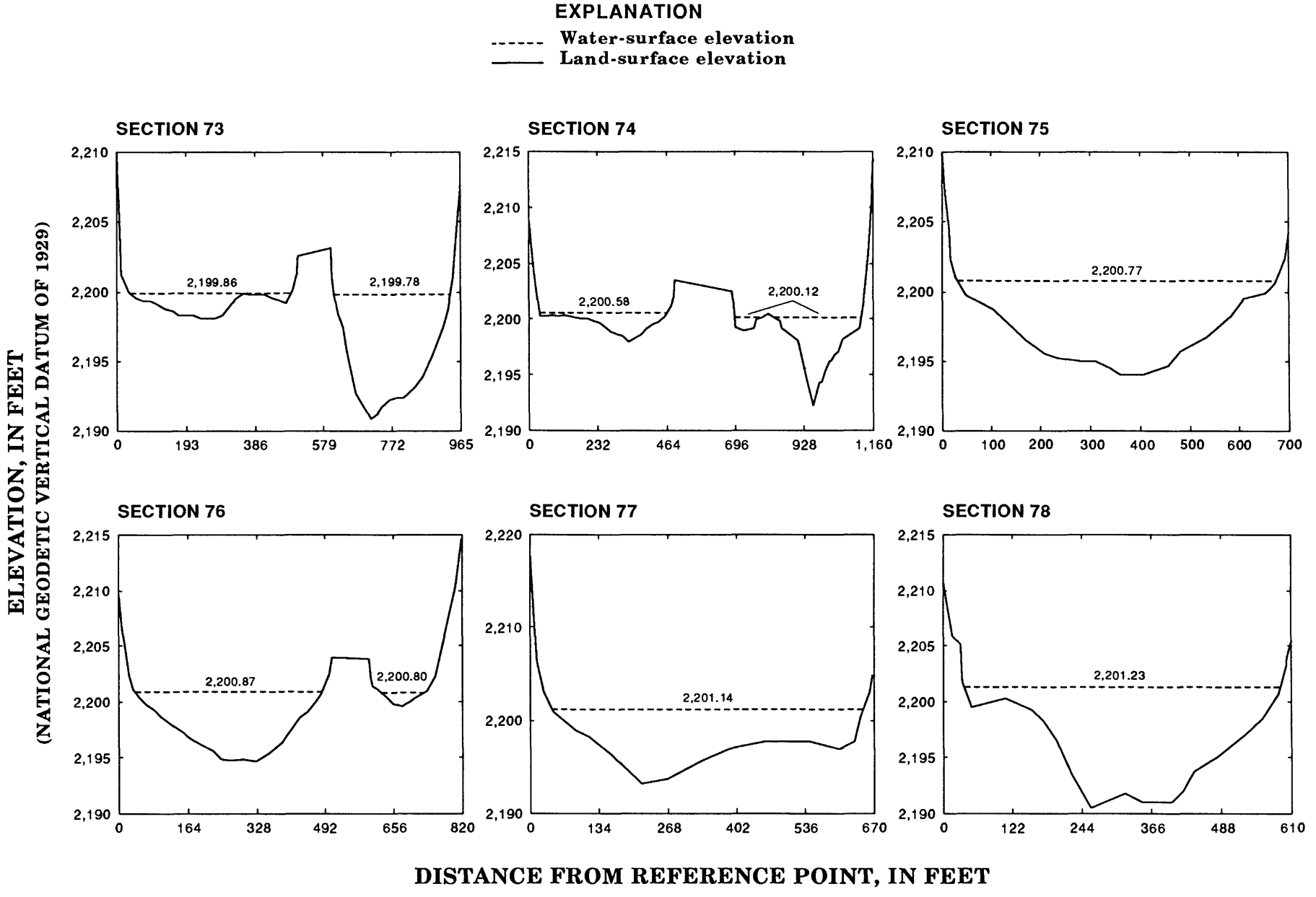

Figure 5.—Water- and land-surface elevations at cross sections (study subreach G) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach H)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
79	Main	145,364	28	326	4,132	0.94	3,900	2,201.29	27	328	4,298	1.30	5,600	2,201.84
80	Main	146,265	45	313	2,609	1.49	3,900	2,201.31	30	314	2,766	2.02	5,600	2,201.87
81	Main	148,028	69	638	3,442	1.13	3,900	2,201.44	63	641	3,774	1.48	5,600	2,202.02
82	Left	149,204	29	338	724	1.73	1,250	2,201.61	25	341	897	2.00	1,790	2,202.16
	Right		771	1,193	1,752	1.51	2,650	2,201.52	753	1,198	1,992	1.91	3,810	2,202.07
83	Left	150,636	15	225	511	2.45	1,250	2,201.99	12	228	629	2.84	1,790	2,202.54
	Right		678	1,232	1,056	2.51	2,650	2,201.87	656	1,235	1,363	2.80	3,810	2,202.41
84	Main	152,430	22	479	3,009	1.30	3,900	2,202.39	19	482	3,258	1.72	5,600	2,202.93

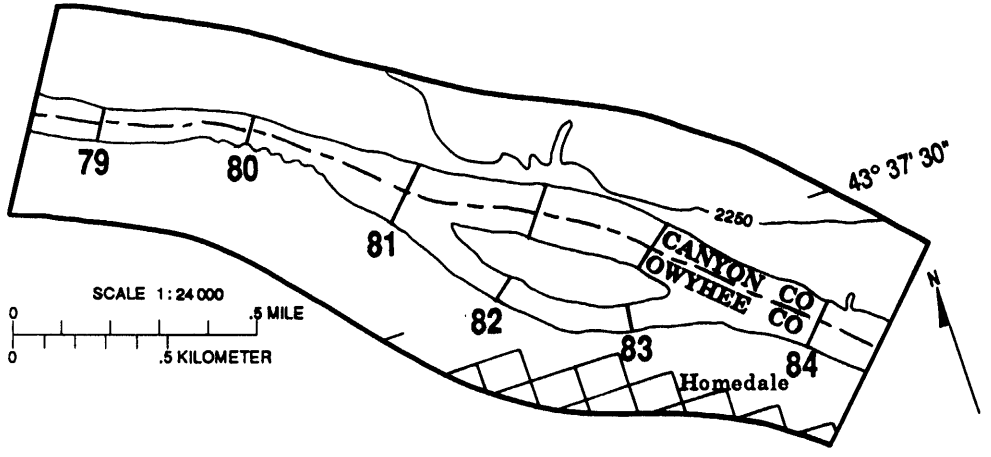

Figure 4.—Locations of cross sections (study subreach H) of the Snake River—Continued.

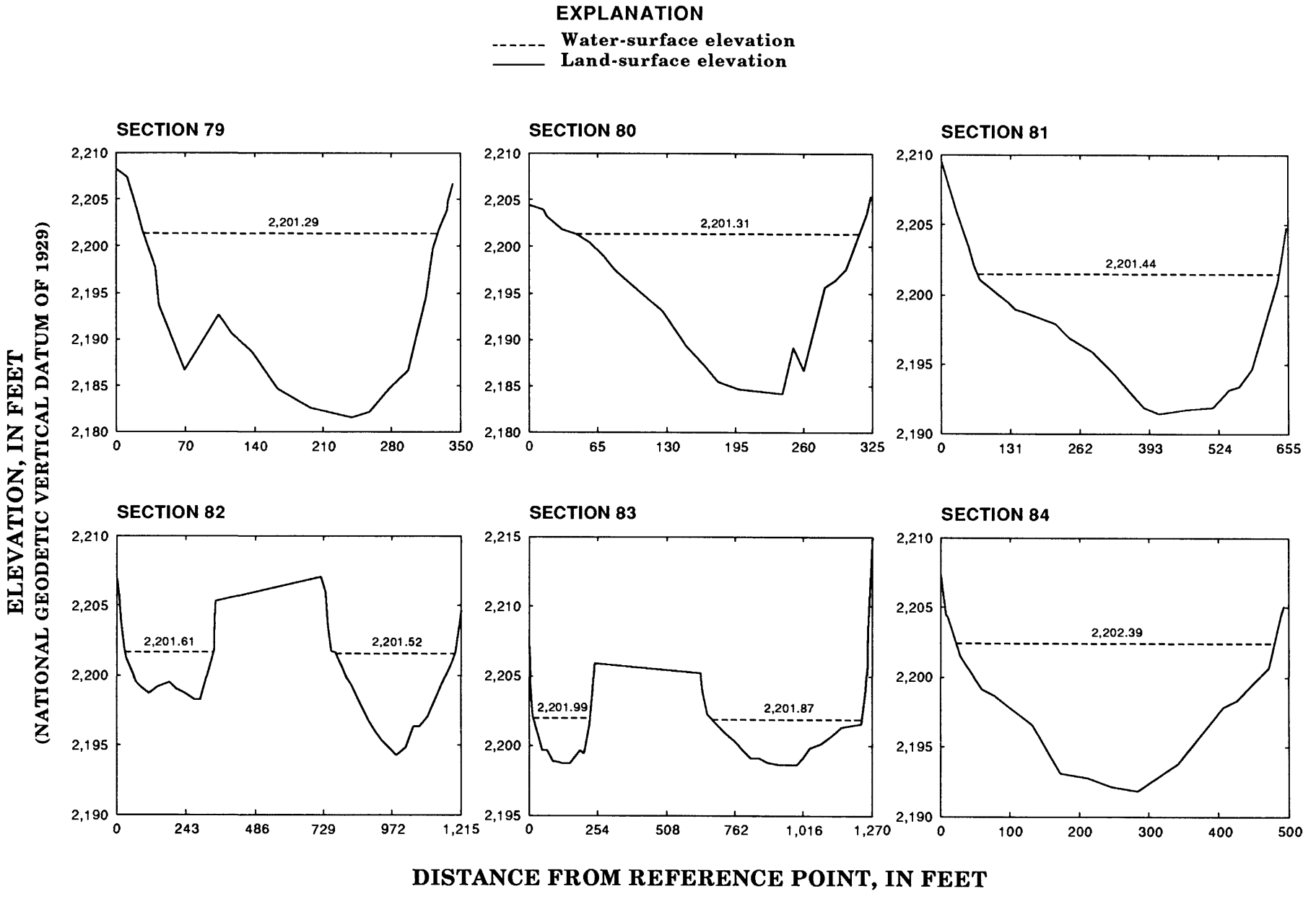

Figure 5.—Water- and land-surface elevations at cross sections (study subreach H) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach I)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
85	Main	153,648	82	504	2,715	1.44	3,900	2,202.55	58	512	2,958	1.89	5,600	2,203.11
86	Main	155,087	57	741	2,560	1.52	3,900	2,202.77	49	744	2,967	1.89	5,600	2,203.36
87	Left	156,742	56	643	1,302	2.95	3,840	2,203.16	29	646	1,651	3.22	5,320	2,203.74
	Right		825	974	159	0.38	60	2,203.16	812	976	250	1.12	280	2,203.74
88	Left	157,711	83	367	242	2.65	640	2,203.66	44	379	433	2.73	1,180	2,204.28
	Mid		485	737	981	3.26	3,200	2,203.66	484	795	1,149	3.60	4,140	2,204.28
	Right		1,108	1,248	57	1.05	60	2,203.88	1,093	1,253	153	1.83	280	2,204.52
89	Left	159,446	90	497	340	1.53	520	2,204.64	56	498	612	1.78	1,090	2,205.32
	Mid								576	635	11	0.89	10	2,205.32
	Right		1,100	1,443	1,004	3.37	3,380	2,204.57	1,081	1,449	1,246	3.61	4,500	2,205.25
90	Left	160,520	85	428	931	0.56	520	2,204.84	71	432	1,172	0.94	1,100	2,205.52
	Mid		958	1,014	22	1.39	30	2,205.30	948	1,067	90	2.33	210	2,205.97
	Right		1,232	1,477	989	3.39	3,350	2,205.30	1,231	1,479	1,154	3.72	4,290	2,205.97

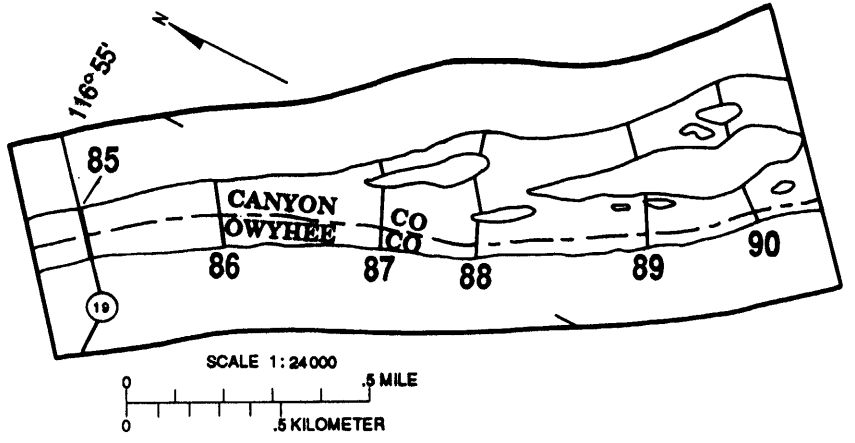

Figure 4.—Locations of cross sections (study subreach I) of the Snake River—Continued.

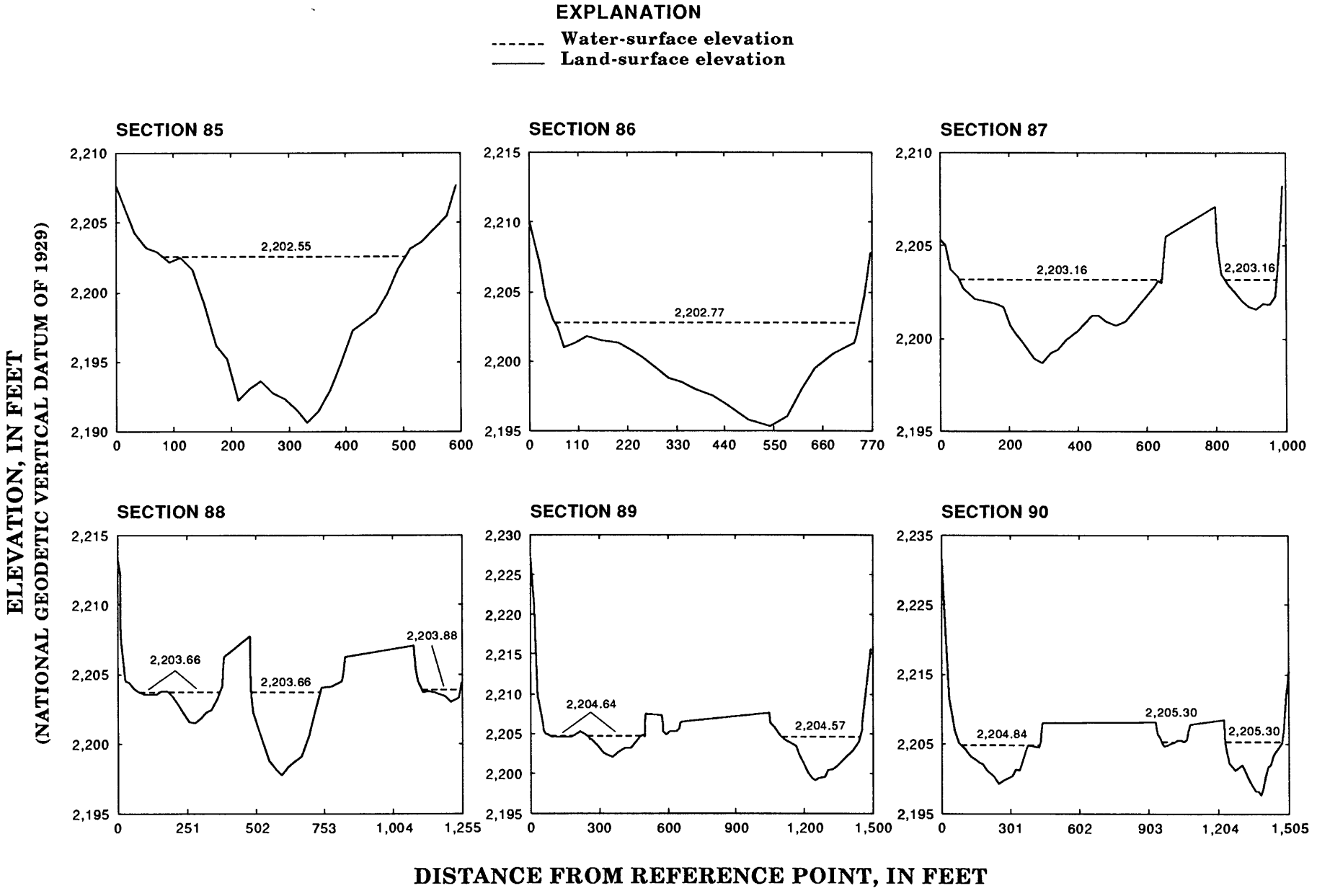

Figure 5.—Water- and land-surface elevations at cross sections (study subreach I) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach J)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
91	Main	162,474	38	822	3,600	1.08	3,900	2,205.62	35	829	4,182	1.34	5,600	2,206.36
92	Main	163,116	23	507	4,792	0.81	3,900	2,205.70	18	509	5,153	1.09	5,600	2,206.44
93	Main	164,723	52	557	2,429	1.61	3,900	2,205.81	32	561	2,812	1.99	5,600	2,206.55
94	Main	166,351	54	915	1,932	2.02	3,900	2,206.08	31	928	2,505	2.24	5,600	2,206.76
95	Left	168,305	95	360	577	2.10	1,210	2,206.62	18	369	752	2.33	1,750	2,207.23
	Right		591	1,065	1,021	2.63	2,690	2,206.66	584	1,077	1,322	2.91	3,850	2,207.28
96	Main	169,242	51	1,047	1,835	2.13	3,900	2,207.15	46	1,064	2,418	2.32	5,600	2,207.73

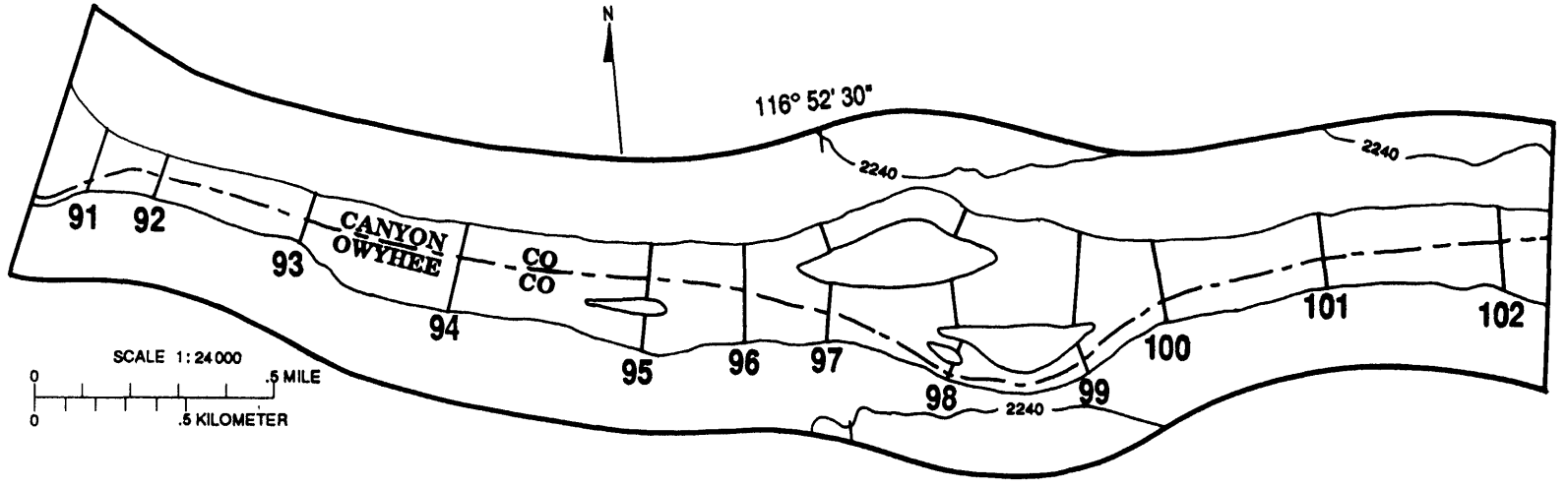

Figure 4.—Locations of cross sections (study subreach J) of the Snake River—Continued.

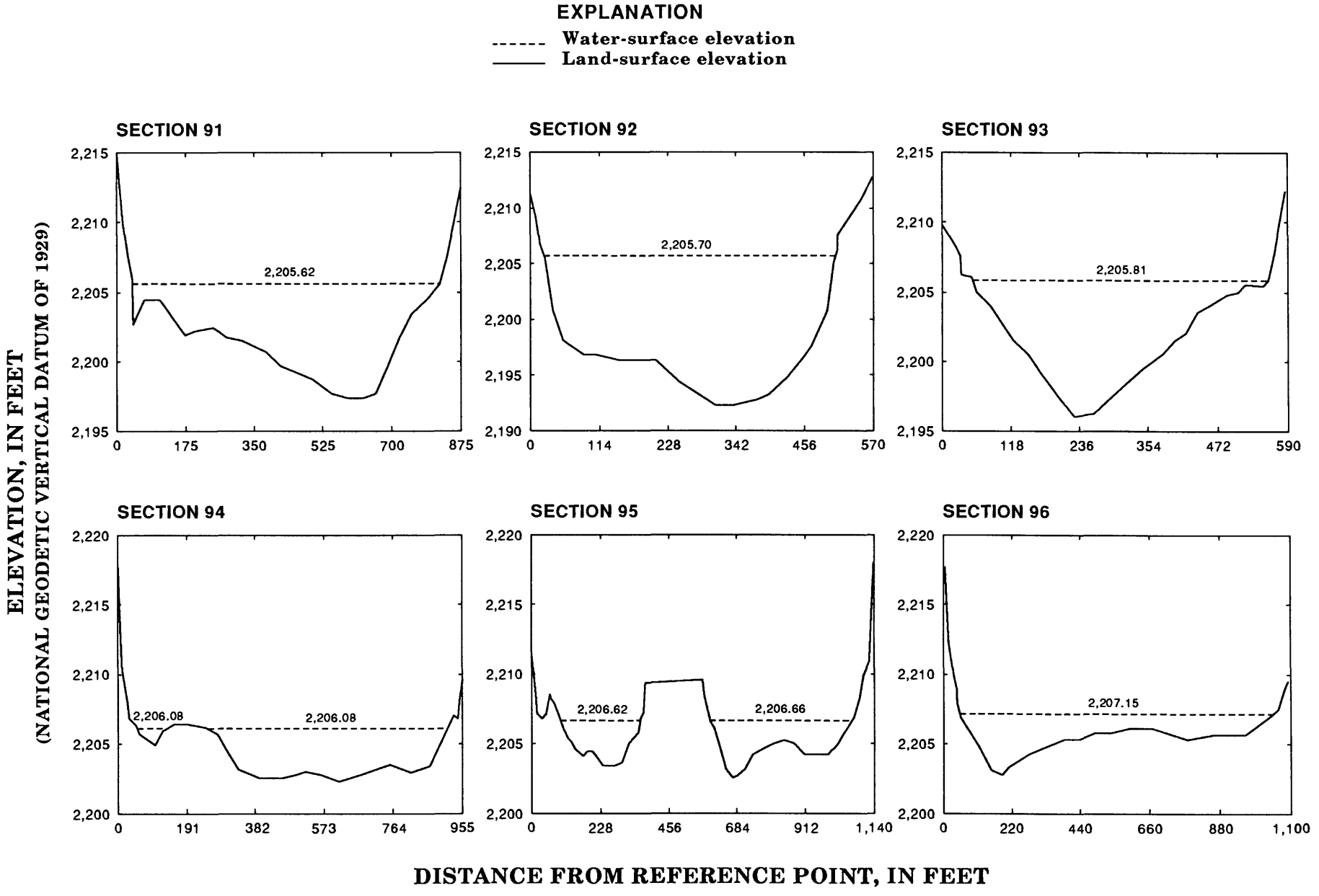

Figure 5.—Water- and land-surface elevations at cross sections (study subreach J) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach J)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
97	Main	170,225	20	655	1,845	2.11	3,900	2,207.62	16	709	2,167	2.57	5,560	2,208.11
	Right								1,126	1,394	308	0.13	40	2,207.91
98	Left	171,592	44	205	276	3.01	830	2,208.64	39	223	386	3.11	1,200	2,209.28
	Mid		352	422	242	2.48	600	2,208.64	282	424	313	2.75	860	2,209.28
	Mid								710	1,140	901	3.89	3,500	2,208.38
	Right		724	1,113	705	3.50	2,470	2,207.90	1,594	1,924	51	0.79	40	2,208.38
99	Left	173,031	36	339	468	3.06	1,430	2,209.36	31	355	639	3.22	2,060	2,209.90
	Right		587	1,433	679	3.64	2,470	2,209.60	580	1,438	1,021	3.47	3,540	2,210.05
100	Main	173,964	37	817	3,143	1.24	3,900	2,209.66	32	832	3,565	1.57	5,600	2,210.19
101	Main	175,785	38	791	3,430	1.14	3,900	2,209.81	35	799	3,847	1.46	5,600	2,210.36
102	Main	177,583	29	851	2,013	1.94	3,900	2,210.02	23	871	2,480	2.26	5,600	2,210.58

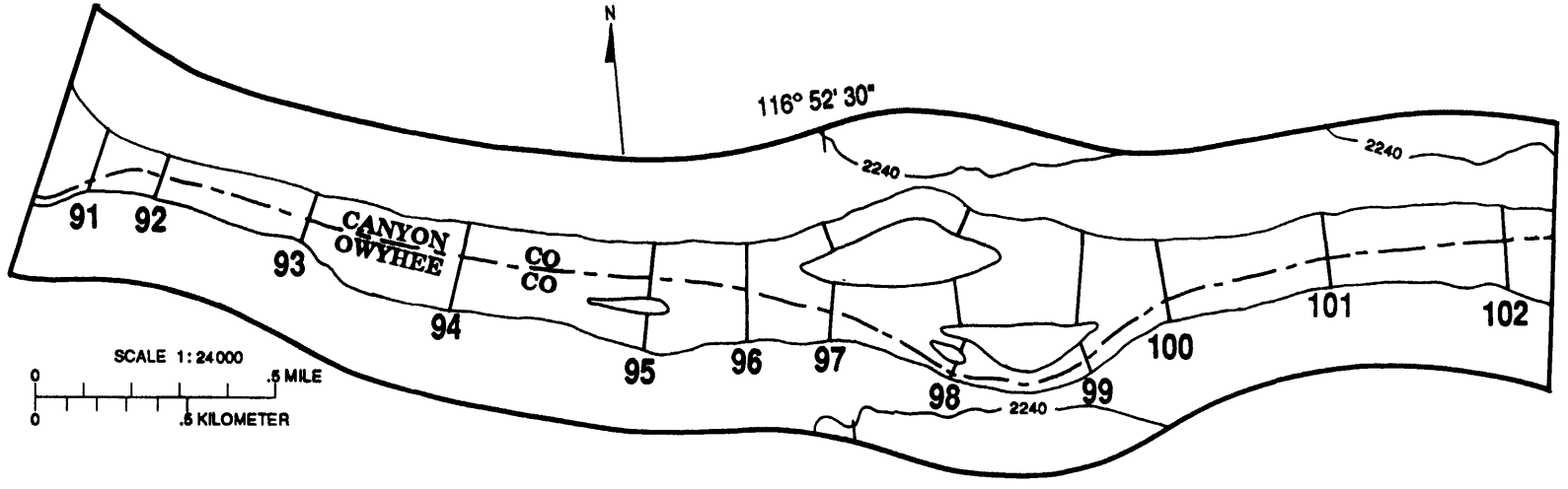

Figure 4.—Locations of cross sections (study subreach J) of the Snake River—Continued.

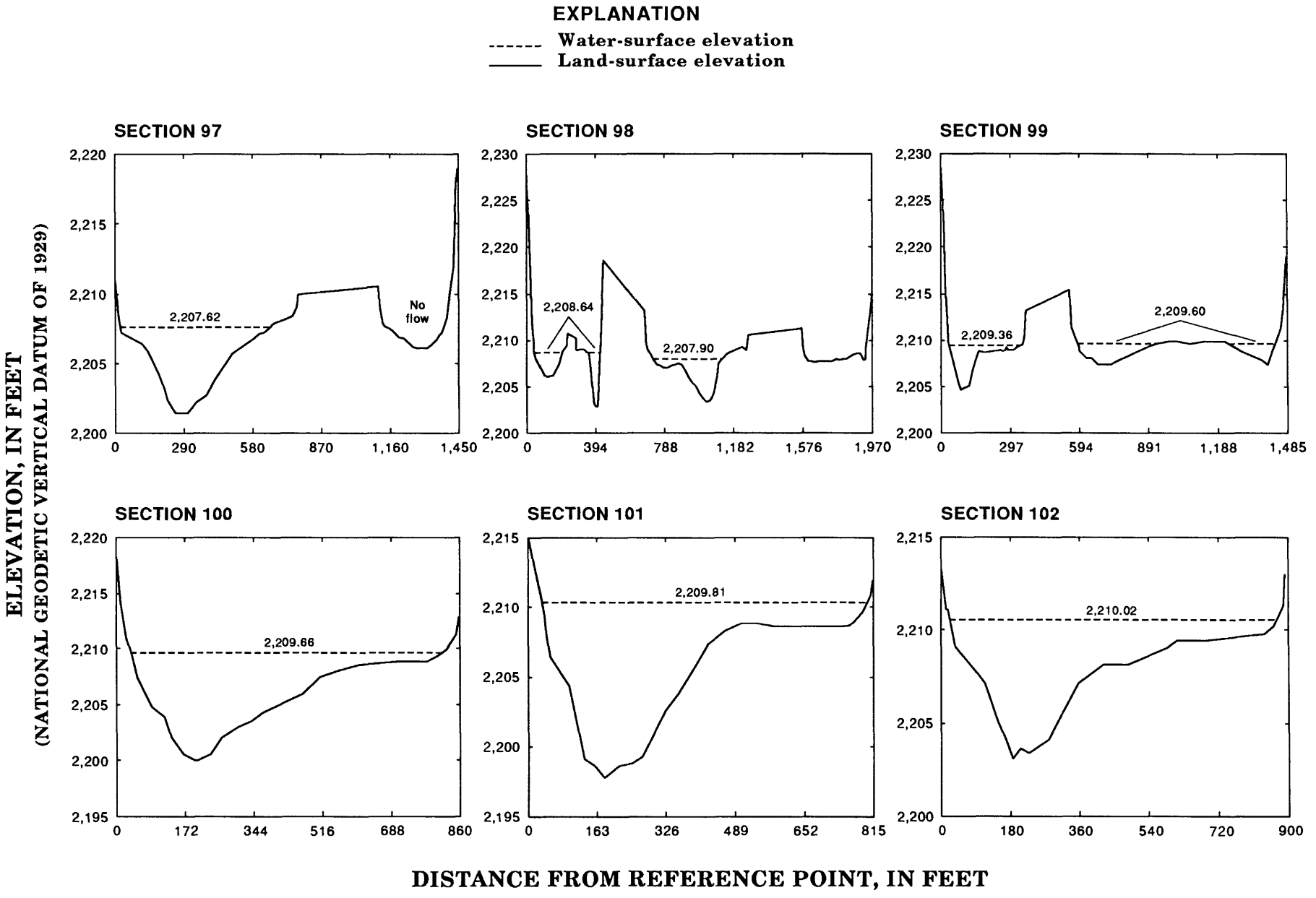

Figure 5.—Water- and land-surface elevations at cross sections (study subreach J) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach K)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
103	Left	178,823	25	366	594	2.51	1,490	2,210.08	21	370	784	2.73	2,140	2,210.64
	Right		696	1,207	1,098	2.19	2,410	2,210.71	689	1,217	1,385	2.50	3,460	2,211.27
104	Left	180,038	43	125	135	0.24	32	2,210.40	40	130	188	1.43	270	2,211.02
	Mid								215	250	13	0.79	10	2,211.02
	Right		571	1,138	3,318	1.17	3,870	2,211.02	563	1,146	3,743	1.42	5,320	2,211.76
105	Left	181,128	38	260	52	0.61	32	2,210.91	32	272	211	1.33	280	2,211.67
	Right		544	992	3,309	1.17	3,870	2,211.05	537	994	3,649	1.46	5,320	2,211.80
106	Main	182,108	55	984	3,520	1.11	3,900	2,211.15	50	987	4,253	1.32	5,600	2,211.94
107	Main	183,469	68	595	3,689	1.06	3,900	2,211.25	64	616	4,100	1.37	5,600	2,212.01
108	Main	184,371	57	892	3,839	1.02	3,900	2,211.33	55	896	4,456	1.26	5,600	2,212.07

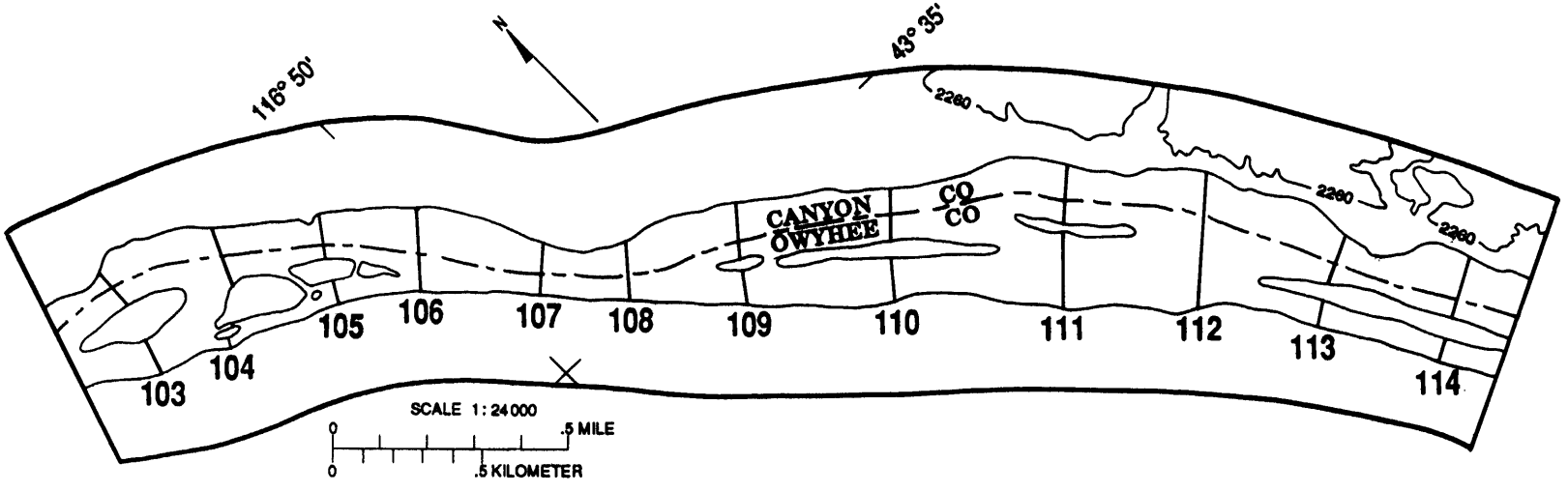

Figure 4.—Locations of cross sections (study subreach K) of the Snake River—Continued.

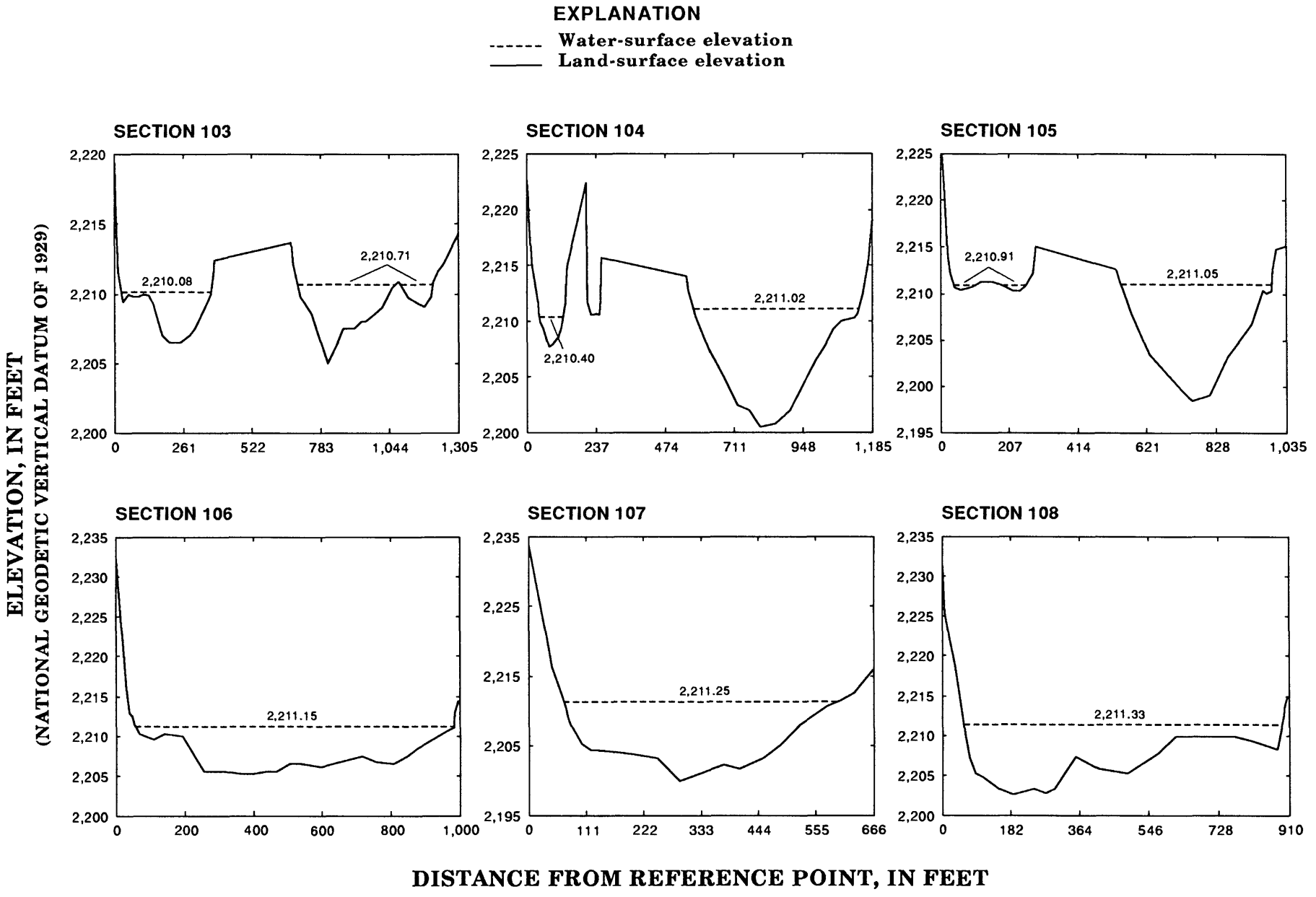

Figure 5.—Water- and land-surface elevations at cross sections (study subreach K) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach K)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
109	Left	185,593	60	450	804	2.59	2,080	2,211.45	54	458	1,062	2.68	2,850	2,212.10
	Right		618	1,189	770	2.36	1,820	2,211.60	606	1,213	1,153	2.38	2,750	2,212.25
110	Left	187,127	63	455	745	2.79	2,080	2,212.95	59	461	934	3.05	2,850	2,213.45
	Right		685	1,205	1,085	1.68	1,820	2,212.55	679	1,211	1,274	2.16	2,750	2,212.91
111	Left	188,982	156	742	1,326	2.31	3,060	2,213.70	73	748	1,662	2.49	4,140	2,214.22
	Right		883	1,361	390	2.16	840	2,213.57	860	1,380	653	2.24	1,460	2,214.09
112	Main	190,452	36	1,406	2,195	1.78	3,900	2,214.37	34	1,419	2,821	1.99	5,600	2,214.83
113	Left	191,960	40	298	399	0.35	140	2,214.63	37	302	501	0.52	260	2,215.02
	Right		514	1,081	2,657	1.41	3,760	2,214.74	511	1,235	2,928	1.82	5,340	2,215.13
114	Left	193,273	31	291	349	0.40	140	2,214.70	25	295	455	0.57	260	2,215.10
	Right		610	1,511	3,717	1.01	3,760	2,214.88	605	1,517	4,138	1.29	5,340	2,215.35

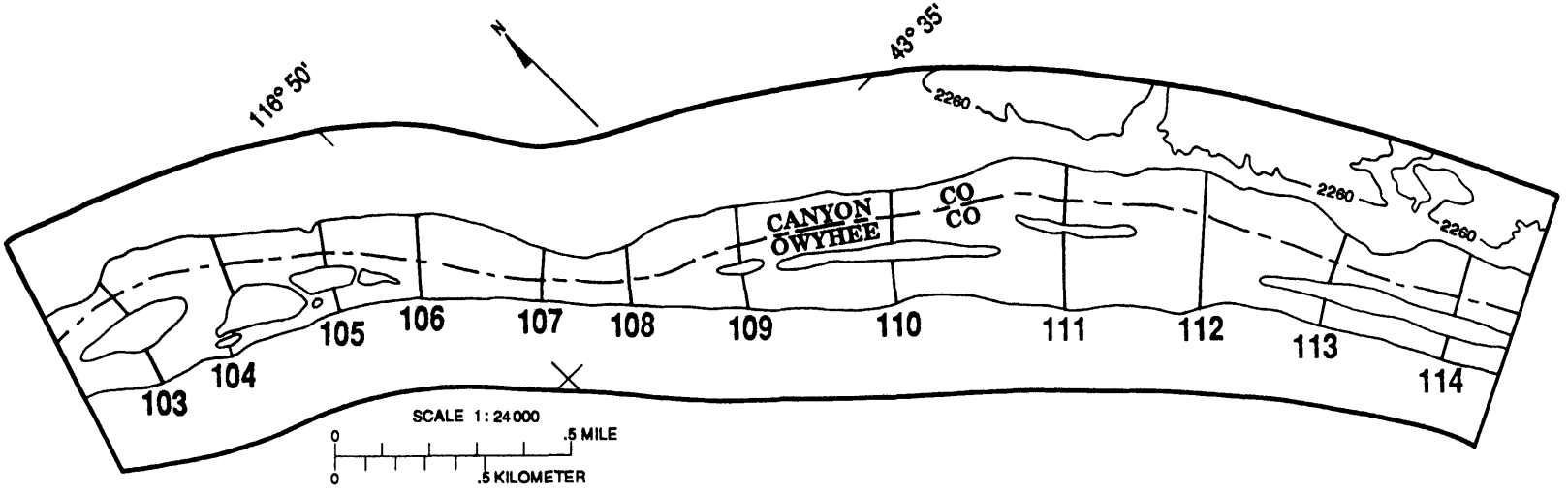

Figure 4.—Locations of cross sections (study subreach K) of the Snake River—Continued.

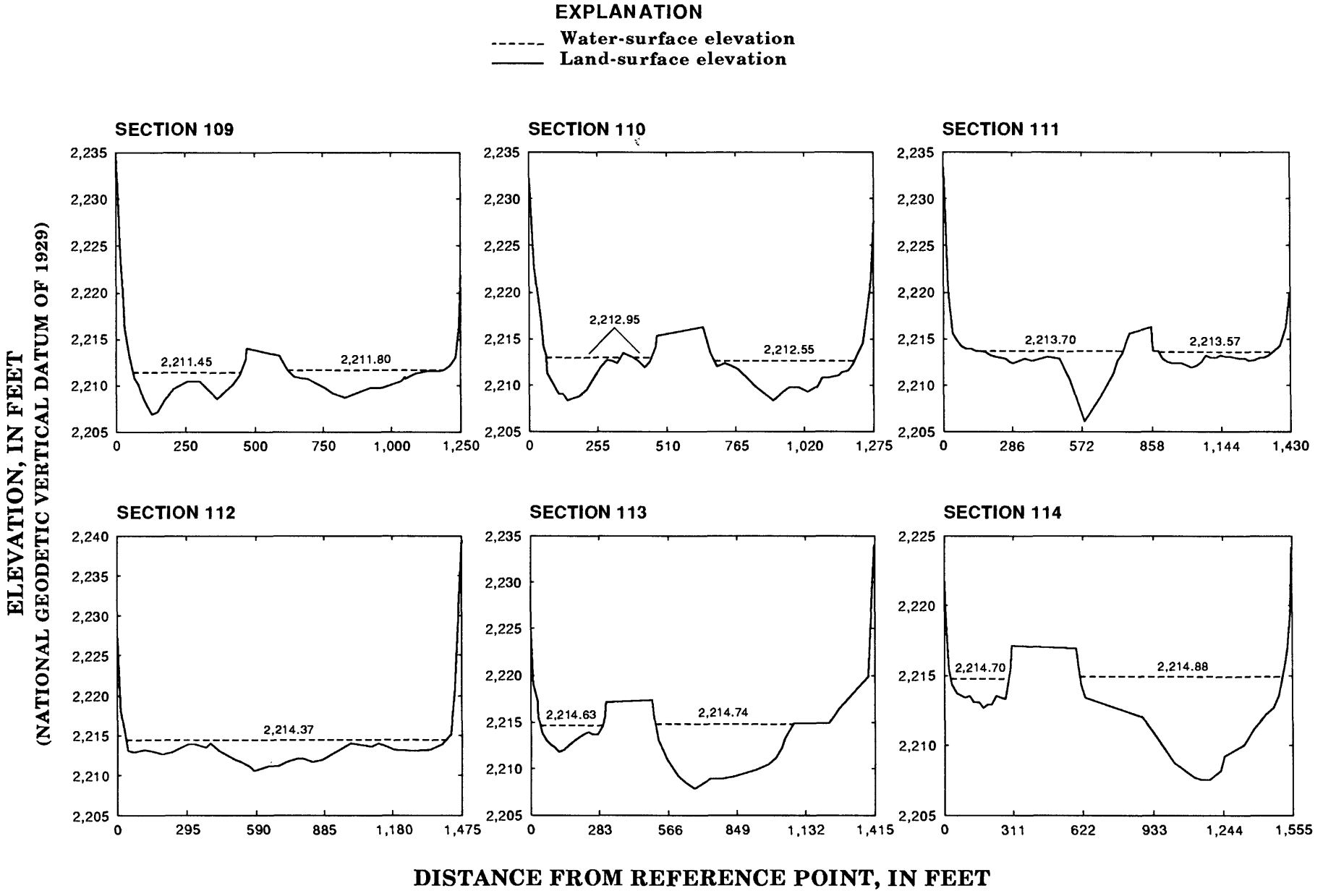

Figure 5.—Water- and land-surface elevations at cross sections (study subreach K) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach L)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
115	Main	195,727	67	966	3,676	1.06	3,900	2,215.06	61	969	3,987	1.40	5,600	2,215.40
116	Main	196,836	62	920	4,178	0.93	3,900	2,215.11	54	922	4,462	1.26	5,600	2,215.44
117	Main	198,462	45	772	3,780	1.03	3,900	2,215.16	41	775	4,012	1.40	5,600	2,215.48
118	Main	200,112	46	649	2,872	1.36	3,900	2,215.22	43	652	3,064	1.83	5,600	2,215.53
119	Left	201,631	114	588	354	0.96	340	2,215.36	24	596	561	1.35	760	2,215.76
	Right		657	1,168	1,676	2.12	3,560	2,215.36	651	1,181	1,896	2.55	4,840	2,215.78
120	Left	203,253	14	170	646	0.53	340	2,215.70	11	174	729	1.04	760	2,216.22
	Right		706	1,159	2,025	1.76	3,560	2,215.70	703	1,164	2,263	2.14	4,840	2,216.22

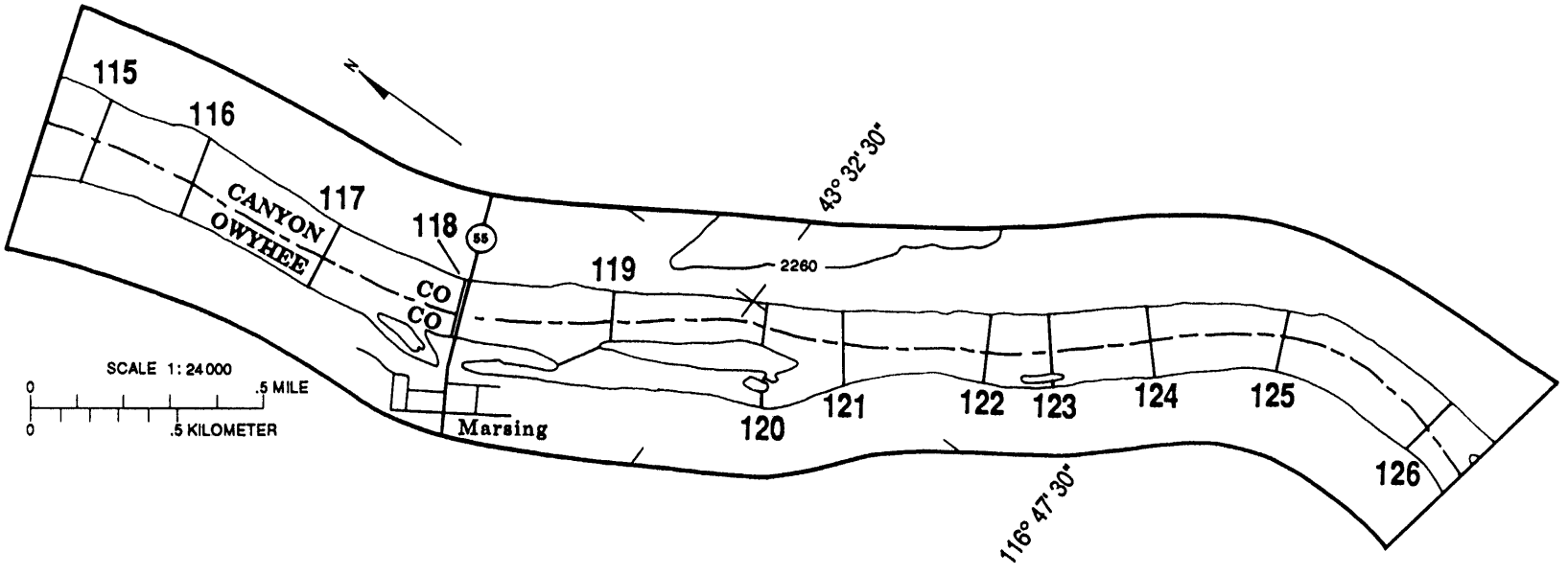

Figure 4.—Locations of cross sections (study subreach L) of the Snake River—Continued.

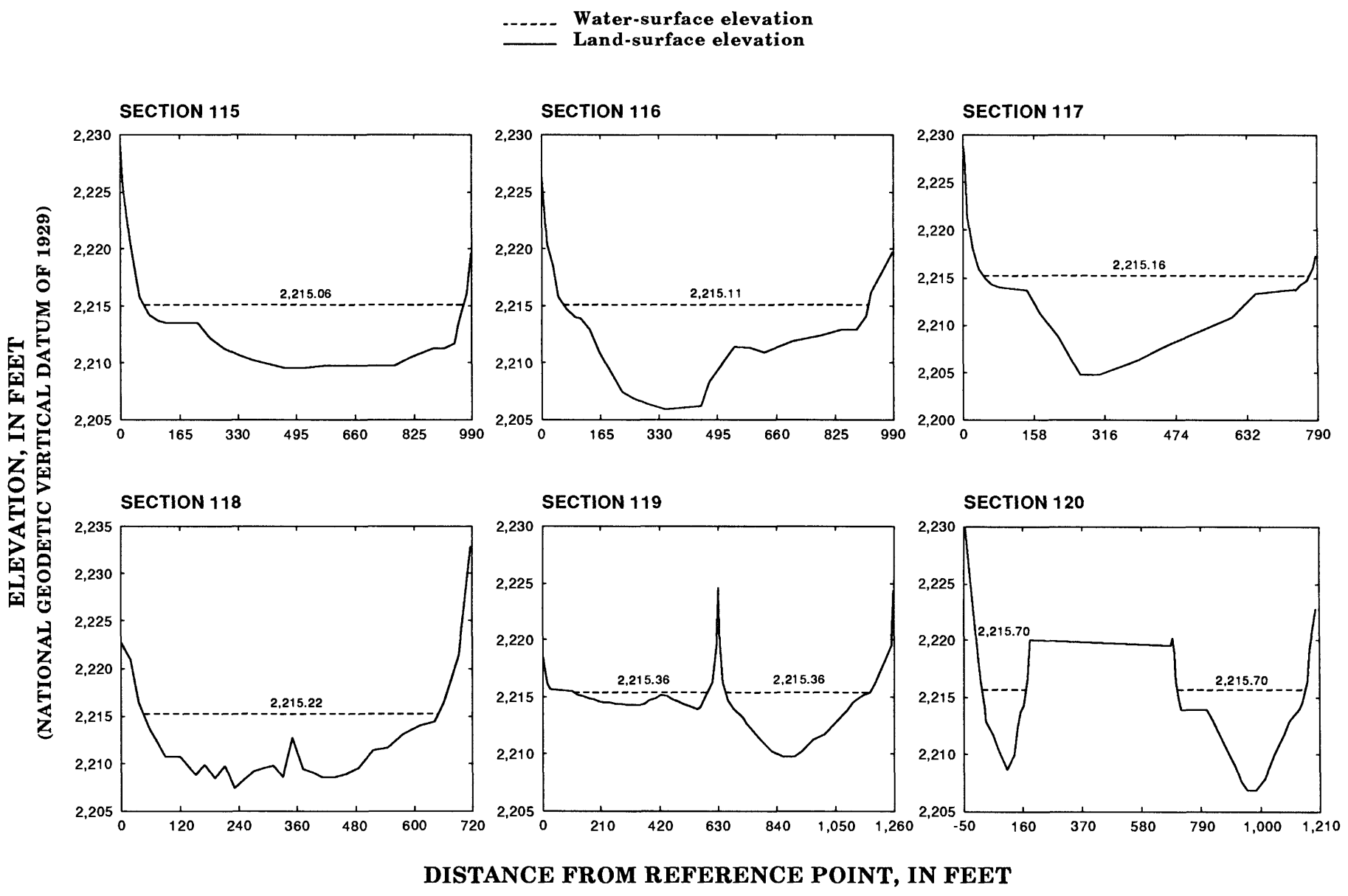

Figure 5.—Water- and land-surface elevations at cross sections (study subreach L) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach L)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
121	Main	204,088	40	762	3,110	1.25	3,900	2,215.74	36	771	3,500	1.60	5,600	2,216.28
122	Main	205,657	66	762	3,468	1.12	3,900	2,215.82	56	774	3,869	1.45	5,600	2,216.39
123	Left	206,309	23	87	46	0.86	40	2,215.84	18	96	88	1.36	120	2,216.42
	Right		190	821	2,931	1.32	3,860	2,215.84	175	829	3,303	1.66	5,480	2,216.42
124	Main	207,381	25	761	2,493	1.56	3,900	2,215.89	18	778	2,922	1.92	5,600	2,216.49
125	Main	208,822	72	756	2,746	1.42	3,900	2,216.01	64	769	3,188	1.76	5,600	2,216.65
126	Main	210,692	70	703	2,656	1.47	3,900	2,216.24	56	713	3,109	1.80	5,600	2,216.94

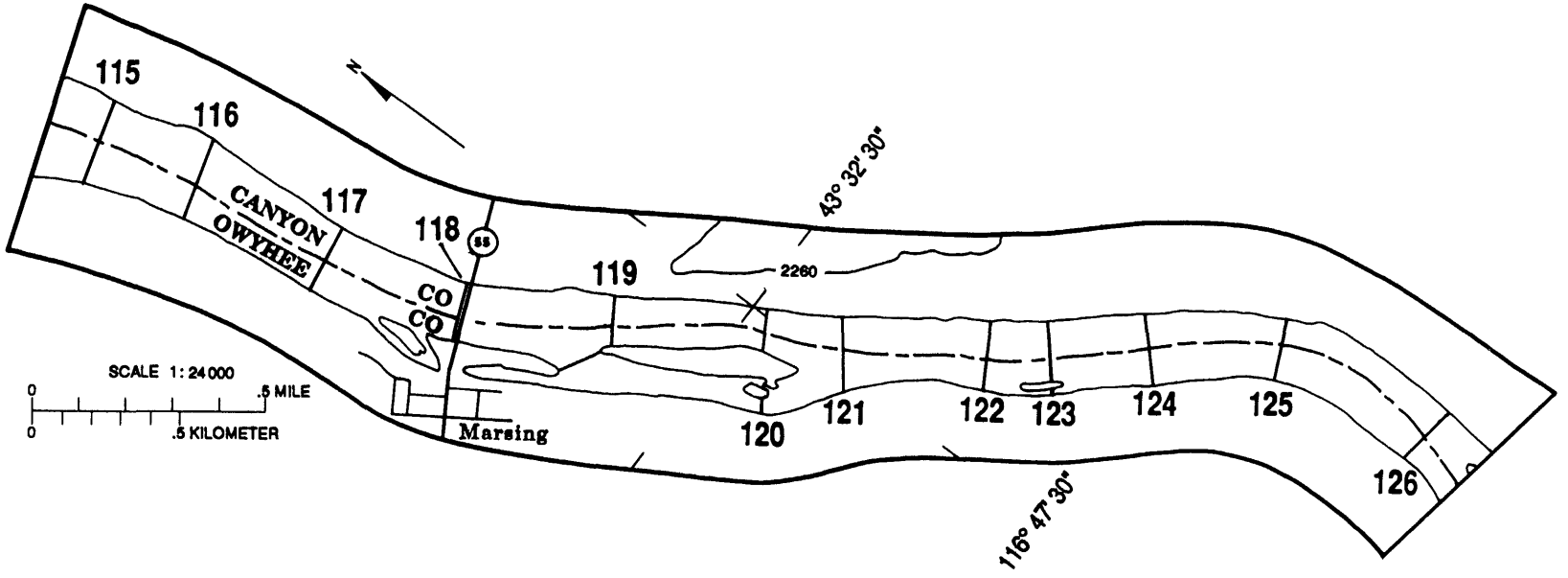

Figure 4.—Locations of cross sections (study subreach L) of the Snake River—Continued.

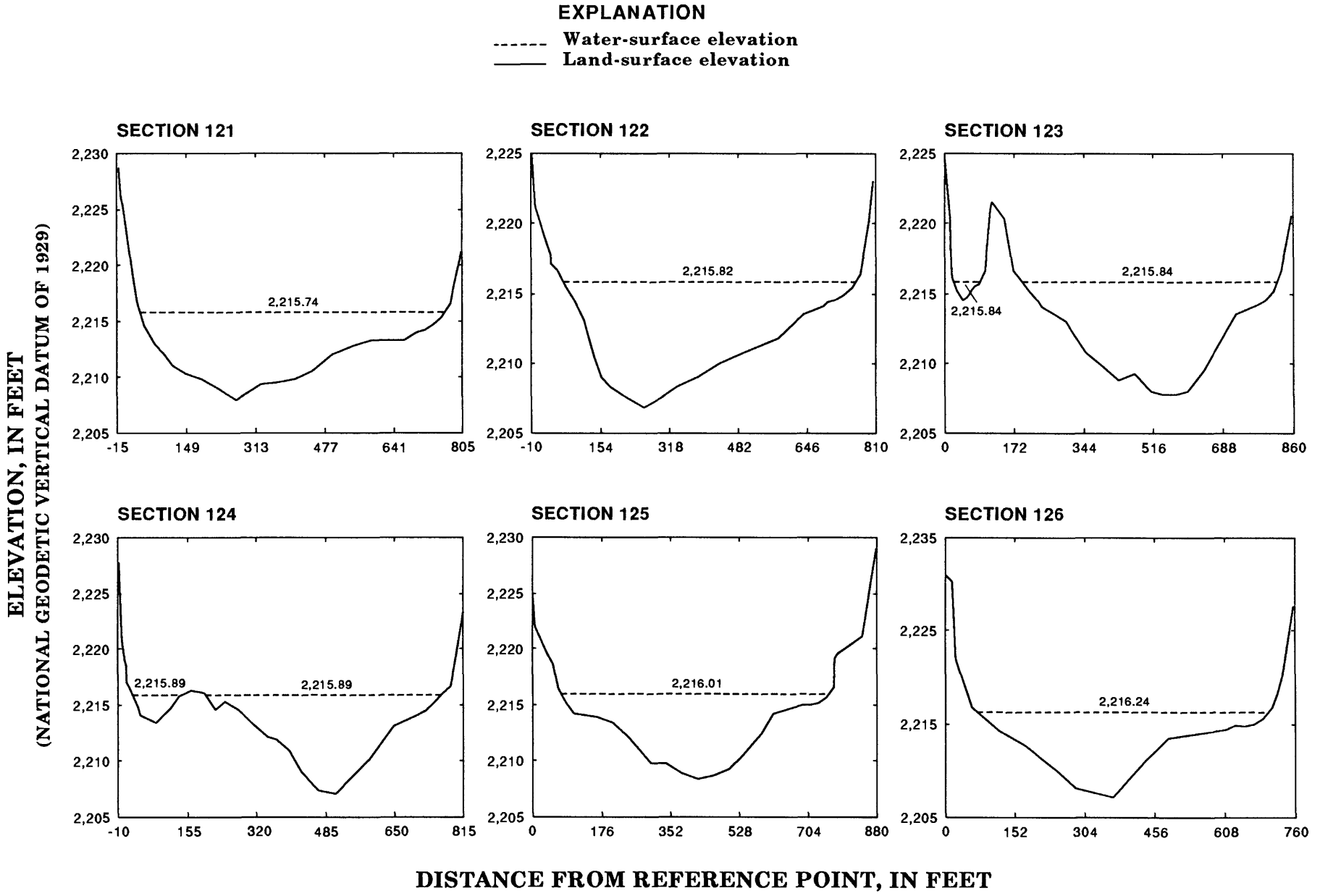

Figure 5.—Water- and land-surface elevations at cross sections (study subreach L) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach M)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
127	Left	212,036	50	458	1,292	3.01	3,890	2,216.46	43	473	1,602	3.40	5,450	2,217.20
	Right		630	740	14	0.73	10	2,216.65	569	1,235	182	0.83	150	2,217.29
128	Main	213,368	70	663	2,773	1.41	3,900	2,216.85	58	698	3,259	1.72	5,600	2,217.64
129	Main	214,765	17	533	3,658	1.07	3,900	2,216.91	13	543	4,079	1.37	5,600	2,217.71
130	Main	216,260	17	465	3,744	1.04	3,900	2,216.94	13	473	4,117	1.36	5,600	2,217.76
131	Left	217,318	84	438	1,134	2.53	2,870	2,217.14	71	446	1,425	2.85	4,060	2,217.94
	Right		806	1,085	562	1.83	1,030	2,217.56	795	1,093	785	1.96	1,540	2,218.33
132	Left	218,690	8	810	1,442	1.99	2,870	2,219.06	8	826	1,916	2.12	4,060	2,219.64
	Right		1,178	1,431	489	2.11	1,030	2,218.25	1,166	1,434	657	2.34	1,540	2,218.90

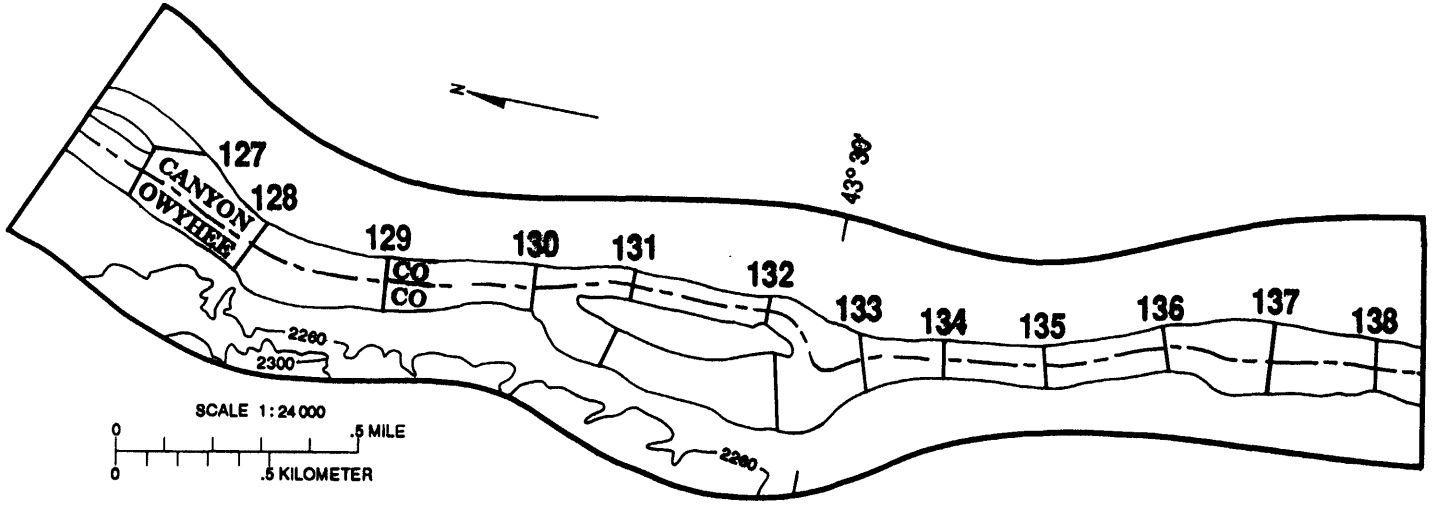

Figure 4.—Locations of cross sections (study subreach M) of the Snake River—Continued.

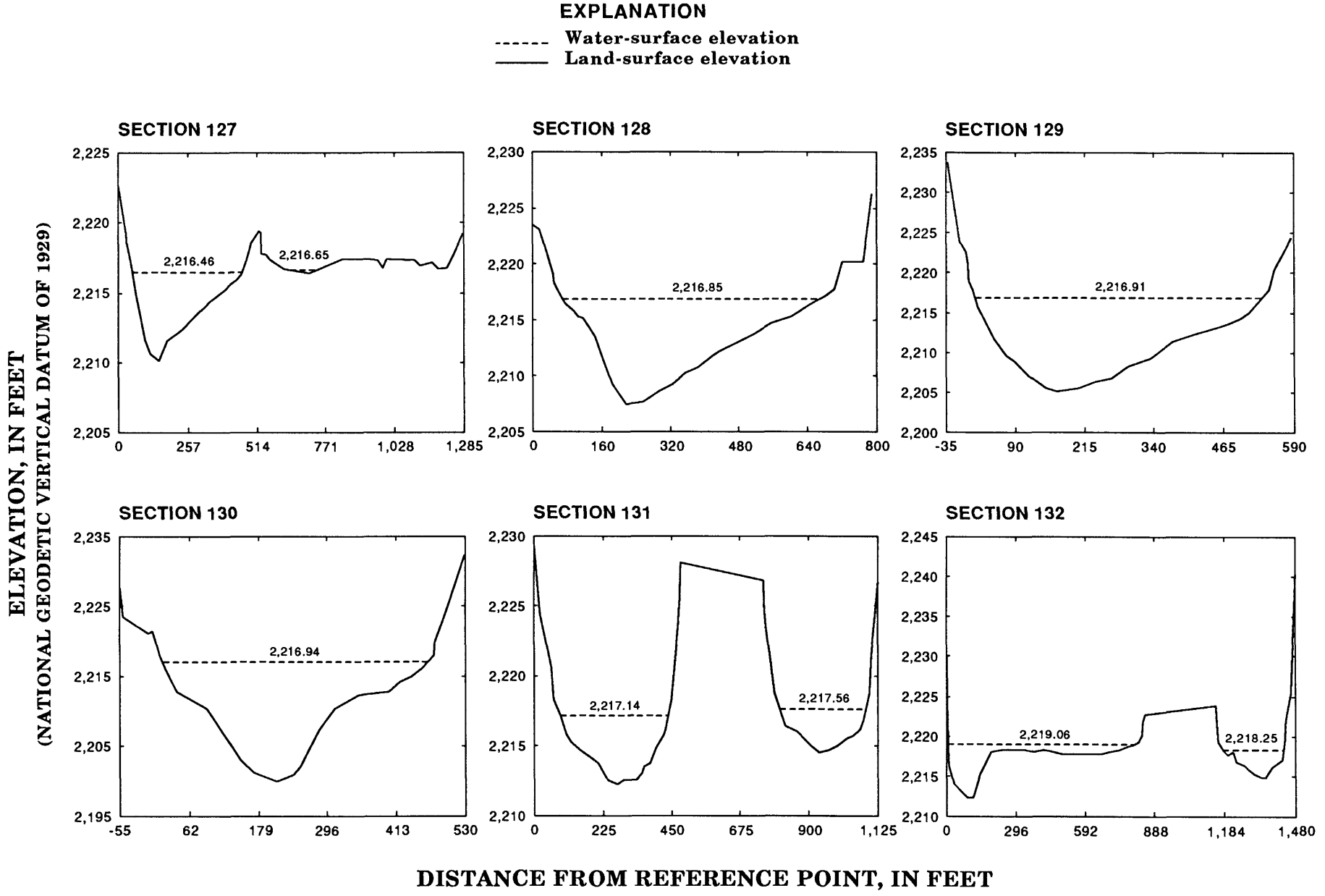

Figure 5.—Water- and land-surface elevations at cross sections (study subreach M) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach M)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
133	Main	220,019	20	553	4,473	0.87	3,900	2,219.25	18	558	4,713	1.19	5,600	2,219.70
134	Main	220,909	34	430	4,735	0.82	3,900	2,219.27	30	432	4,920	1.14	5,600	2,219.73
135	Main	221,913	20	469	4,422	0.88	3,900	2,219.29	17	471	4,638	1.21	5,600	2,219.76
136	Main	223,169	30	478	4,300	0.91	3,900	2,219.31	25	481	4,524	1.24	5,600	2,219.81
137	Main	224,239	25	697	3,111	1.25	3,900	2,219.33	19	703	3,458	1.62	5,600	2,219.84
138	Main	225,315	31	587	3,120	1.25	3,900	2,219.37	22	599	3,421	1.64	5,600	2,219.90

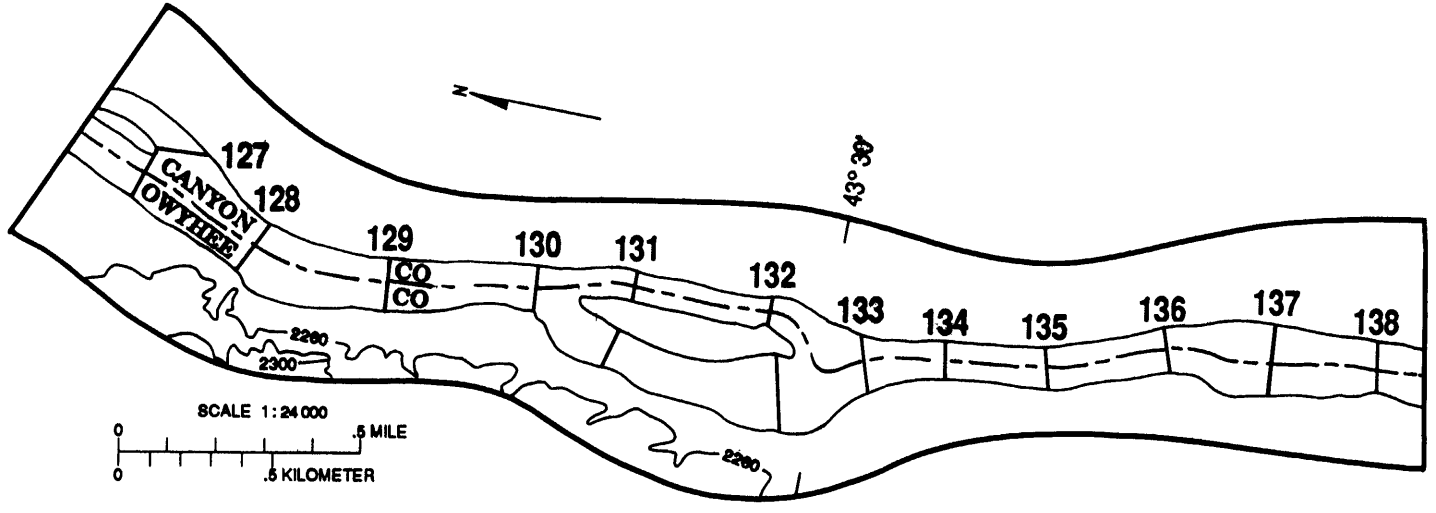

Figure 4.—Locations of cross sections (study subreach M) of the Snake River—Continued.

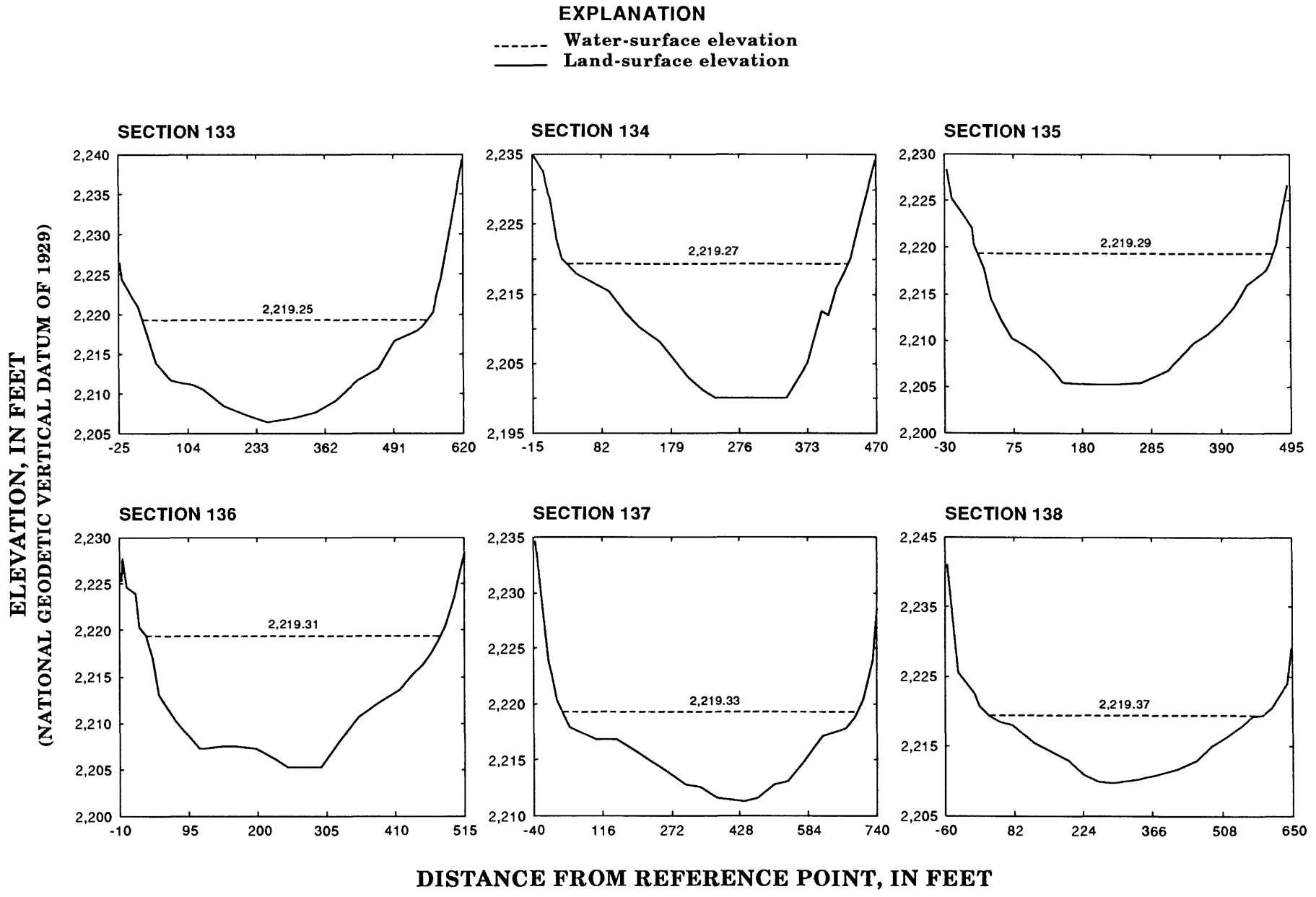

Figure 5.—Water- and land-surface elevations at cross sections (study subreach M) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach N)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
139	Main	226,476	32	718	2,080	1.88	3,900	2,219.53	23	729	2,462	2.27	5,600	2,220.08
140	Left	227,685	7	292	264	1.36	360	2,220.19	6	337	415	1.78	740	2,220.69
	Right		643	1,159	1,292	2.74	3,540	2,220.23	639	1,167	1,558	3.12	4,860	2,220.74
141	Left	229,352	11	244	257	1.40	360	2,220.77	7	255	395	1.87	740	2,221.34
	Mid		586	817	712	2.42	1,720	2,221.06	583	820	777	3.09	2,400	2,221.34
	Right		1,099	1,389	853	2.13	1,820	2,221.01	1,098	1,395	930	2.65	2,460	2,221.27
142	Left	230,237	31	552	1,005	2.07	2,080	2,221.52	29	591	1,264	2.48	3,140	2,221.99
	Mid								1,220	1,300	7	1.48	10	2,221.99
	Right		1,407	1,692	832	2.19	1,820	2,221.52	1,370	1,693	978	2.51	2,450	2,221.99
143	Left	231,648	37	492	1,199	1.74	2,080	2,221.86	21	494	1,444	2.17	3,140	2,222.39
	Right		797	1,078	870	2.09	1,820	2,221.86	785	1,079	1,017	2.42	2,460	2,222.37
144	Main	232,822	49	700	2,592	1.50	3,900	2,222.05	39	712	3,020	1.85	5,600	2,222.69

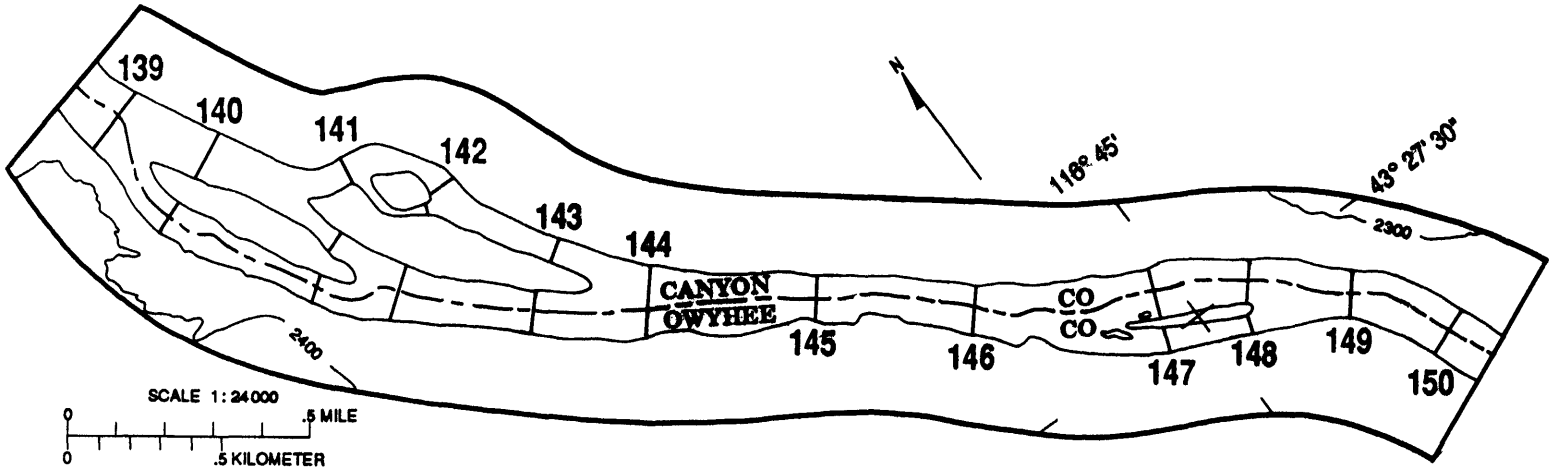

Figure 4.—Locations of cross sections (study subreach N) of the Snake River—Continued.

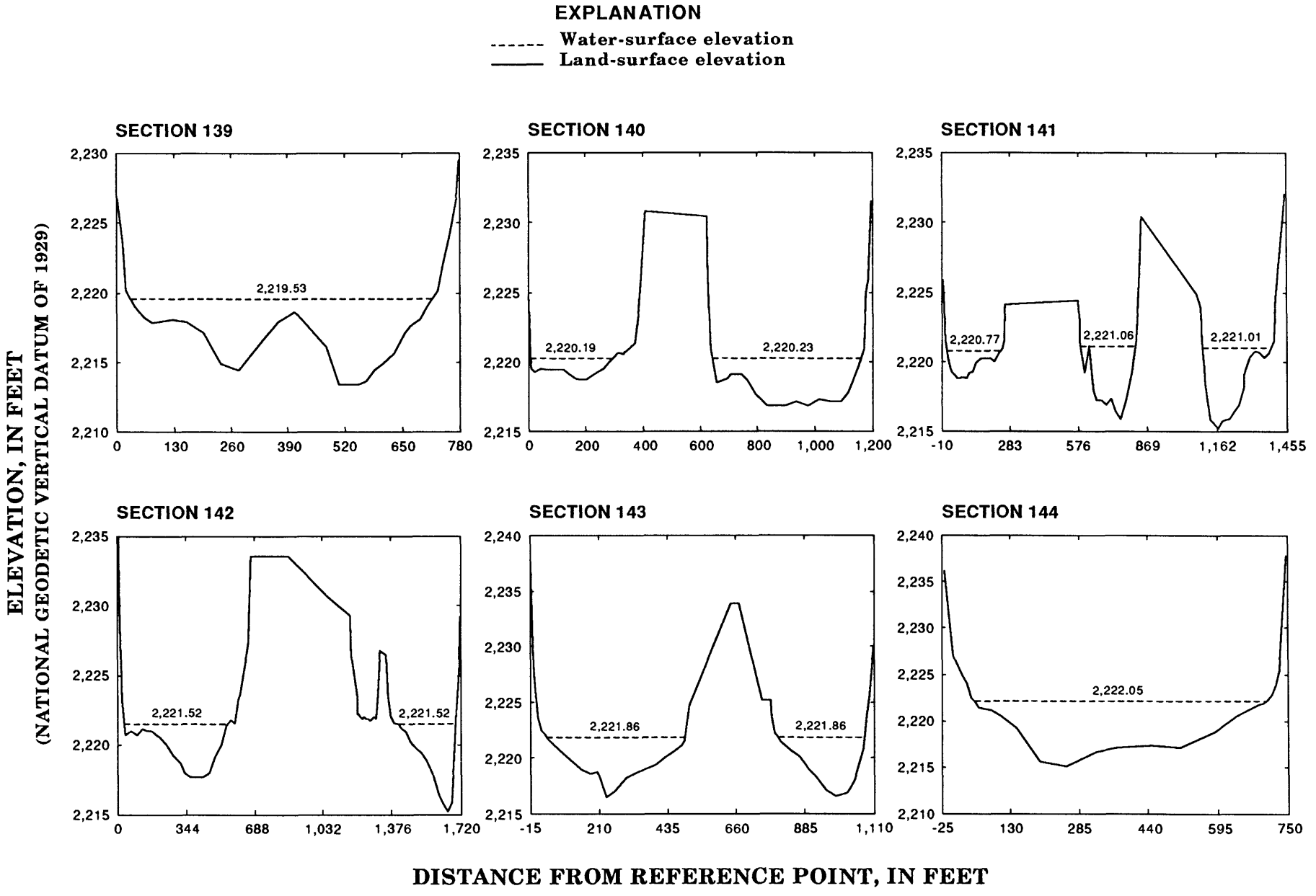

Figure 5.—Water- and land-surface elevations at cross sections (study subreach N) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach N)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
145	Main	234,530	43	488	4,213	0.93	3,900	2,222.21	41	492	4,521	1.24	5,600	2,222.90
146	Main	236,179	61	524	3,836	1.02	3,900	2,222.31	53	528	4,167	1.34	5,600	2,223.02
147	Left	237,985	39	164	188	0.59	110	2,222.57	34	180	286	0.94	270	2,223.29
	Right		386	897	1,785	2.12	3,790	2,222.42	225	901	2,163	2.46	5,330	2,223.14
148	Left	238,962	27	152	224	0.49	110	2,222.60	22	164	324	0.83	270	2,223.34
	Right		354	808	1,917	1.98	3,790	2,222.60	336	819	2,266	2.35	5,330	2,223.34
149	Main	240,038	35	545	3,240	1.20	3,900	2,222.65	24	553	3,636	1.54	5,600	2,223.41
150	Main	241,134	42	596	2,904	1.34	3,900	2,222.71	35	600	3,335	1.68	5,600	2,223.48

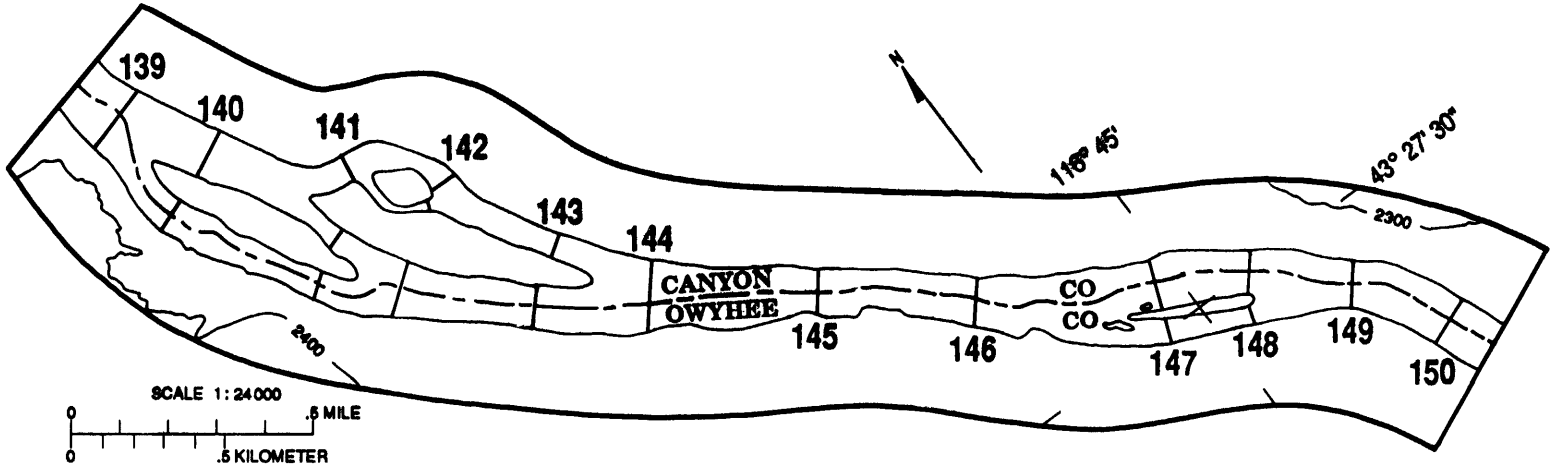

Figure 4.—Locations of cross sections (study subreach N) of the Snake River—Continued.

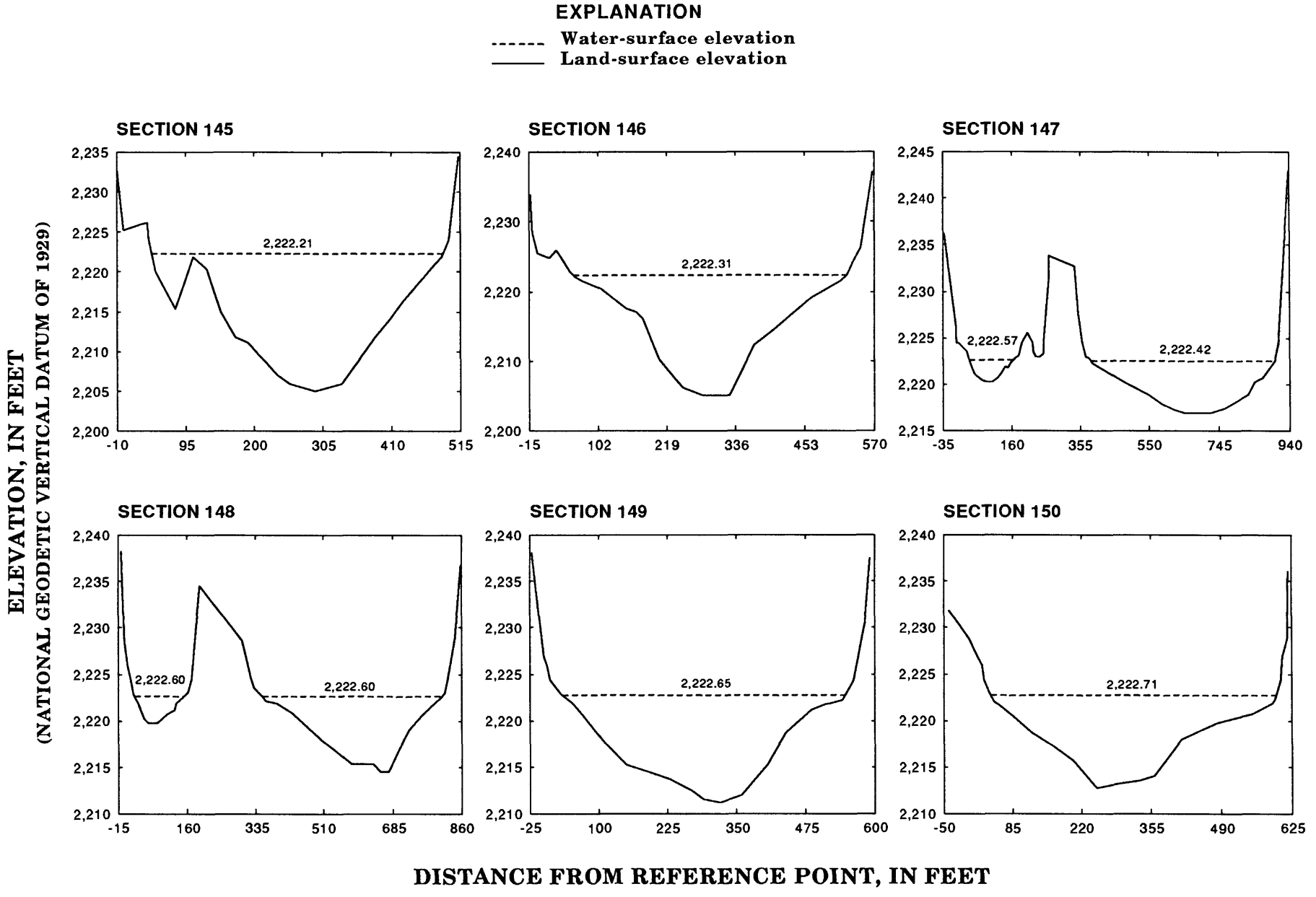

Figure 5.—Water- and land-surface elevations at cross sections (study subreach N) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach O)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
151	Main	242,207	39	610	2,432	1.60	3,900	2,222.79	25	618	2,890	1.94	5,600	2,223.58
152	Main	243,346	29	537	2,518	1.55	3,900	2,222.90	20	623	2,968	1.89	5,600	2,223.70
153	Main	244,263	53	494	3,008	1.30	3,900	2,222.97	44	498	3,375	1.66	5,600	2,223.79
154	Main	245,022	64	840	2,034	1.92	3,900	2,223.04						
	Left								57	562	2,407	2.32	5,580	2,223.84
	Right								783	856	79	0.25	20	2,223.87
155	Main	246,298	40	519	1,531	2.55	3,900	2,223.37						
	Left								14	522	1,920	2.91	5,580	2,224.16
	Right								869	963	24	0.82	20	2,224.71
156	Left	246,946	61	425	935	3.30	3,080	2,223.70	51	429	1,227	3.51	4,310	2,224.51
	Right		650	957	559	1.47	820	2,224.30	637	962	816	1.58	1,290	2,225.11

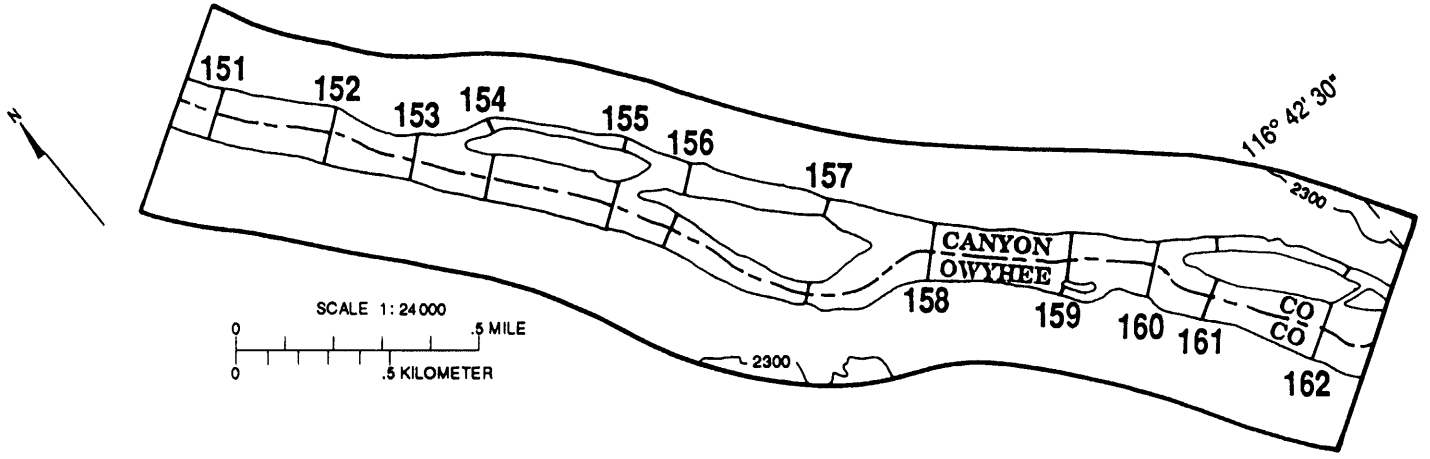

Figure 4.—Locations of cross sections (study subreach O) of the Snake River—Continued.

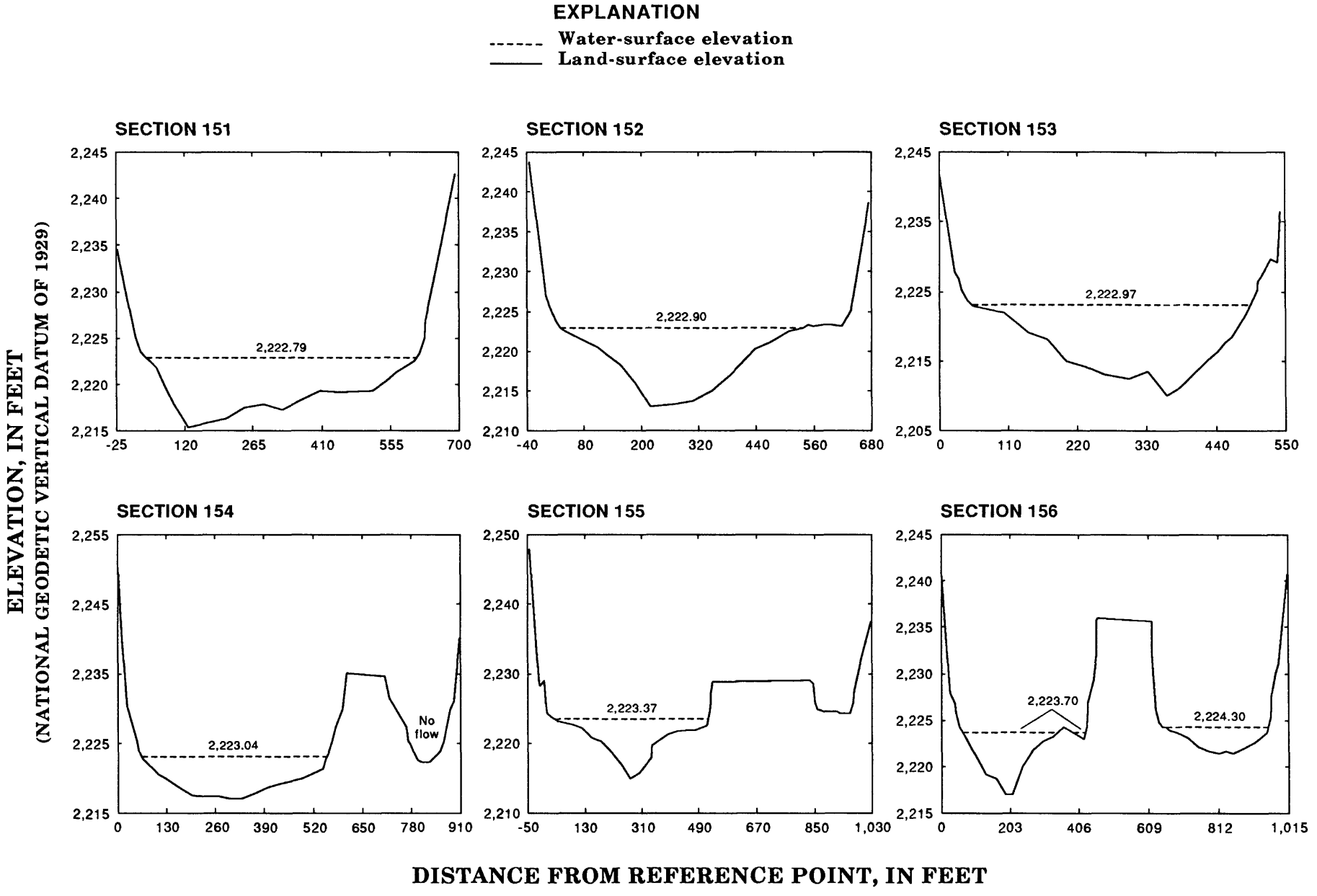

Figure 5.—Water- and land-surface elevations at cross sections (study subreach O) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach O)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
157	Left	248,548	34	273	1,027	3.00	3,080	2,224.34	21	276	1,206	3.57	4,310	2,225.07
	Right		1,018	1,179	493	1.66	820	2,224.73	994	1,182	627	2.06	1,290	2,225.48
158	Main	249,902	37	511	2,720	1.43	3,900	2,225.06	20	517	3,051	1.84	5,600	2,225.74
159	Main	251,310	122	584	1,506	2.59	3,900	2,225.43	121	602	1,829	3.06	5,600	2,226.11
160	Main	252,197	35	588	1,204	3.24	3,900	2,225.98	31	607	1,572	3.56	5,600	2,226.63
161	Left	252,845	18	497	2,125	1.83	3,890	2,226.52	13	501	2,440	2.27	5,540	2,227.17
	Right		806	879	14	0.71	10	2,227.44	785	890	75	0.80	60	2,228.09
162	Left	254,032	30	617	1,295	3.00	3,890	2,227.19	20	635	1,676	3.31	5,540	2,227.82
	Right		927	1,042	113	0.09	10	2,227.70	917	1,044	188	0.32	60	2,228.32

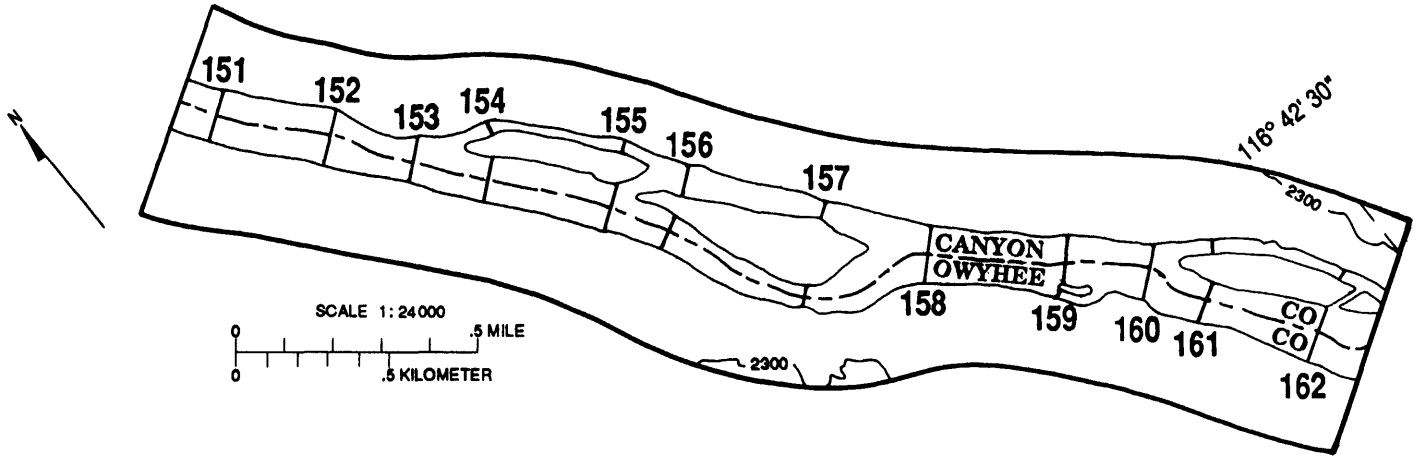

Figure 4.—Locations of cross sections (study subreach O) of the Snake River—Continued.

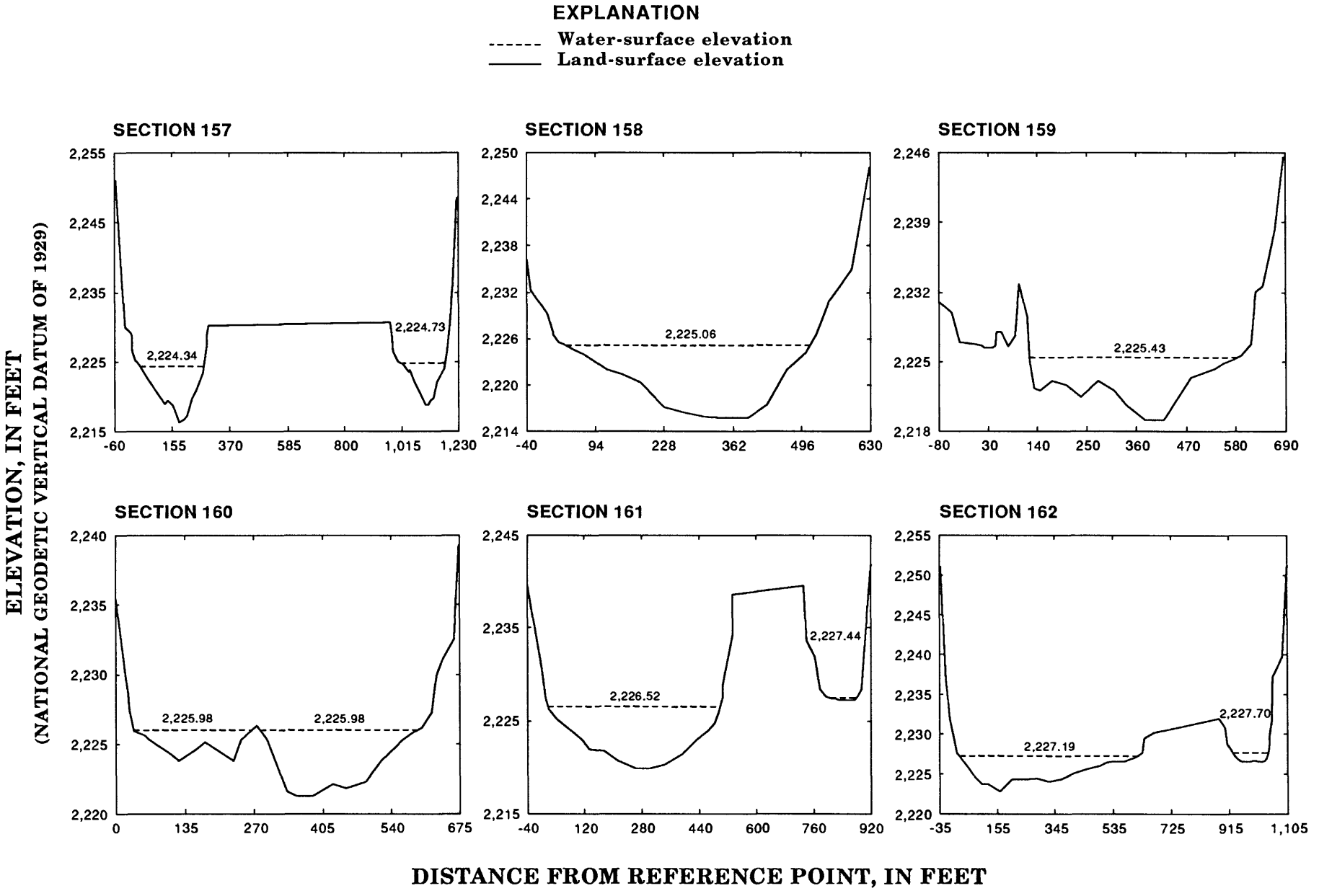

Figure 5.—Water- and land-surface elevations at cross sections (study subreach O) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach P)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
163	Main	255,162	59	626	2,162	1.80	3,900	2,227.82	27	634	2,509	2.23	5,600	2,228.41
164	Main	256,180	51	356	5,041	0.77	3,900	2,228.07	48	360	5,227	1.07	5,600	2,228.67
165	Main	257,502	37	284	2,080	1.87	3,900	2,228.16	31	286	2,223	2.52	5,600	2,228.73
166	Main	258,931	137	503	2,851	1.37	3,900	2,228.28	126	507	3,069	1.82	5,600	2,228.86
167	Main	260,263	47	700	2,134	1.83	3,900	2,228.36	37	711	2,532	2.21	5,600	2,228.96
168	Left	261,224	52	407	1,365	2.75	3,750	2,228.44	32	409	1,607	3.15	5,060	2,229.09
	Mid		517	657	187	0.78	145	2,228.94	511	696	293	1.64	480	2,229.59
	Right		830	873	7	0.75	5	2,228.94	787	892	55	1.08	60	2,229.29

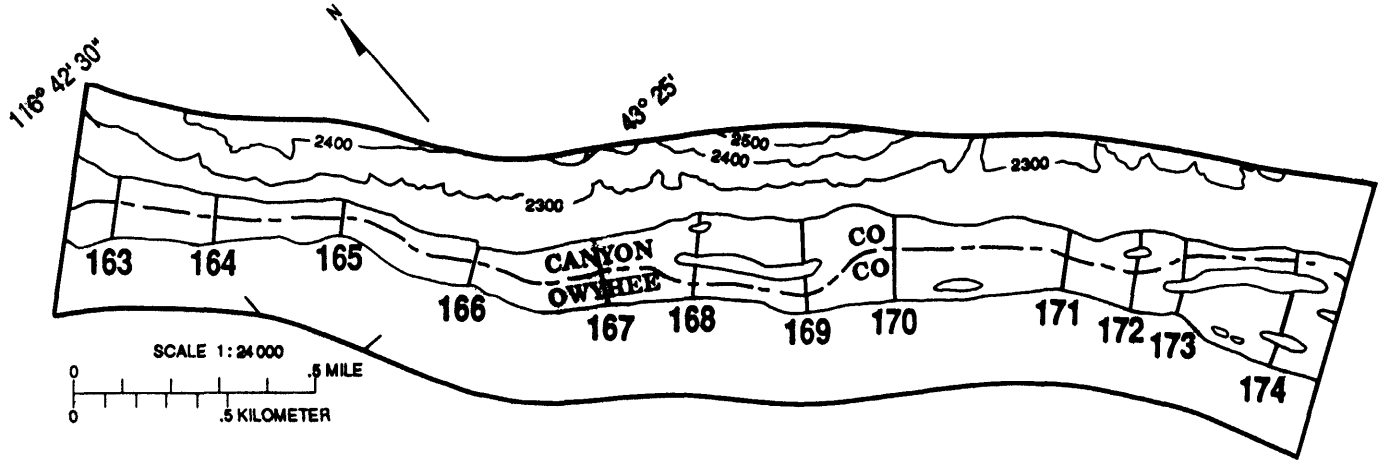

Figure 4.—Locations of cross sections (study subreach P) of the Snake River—Continued.

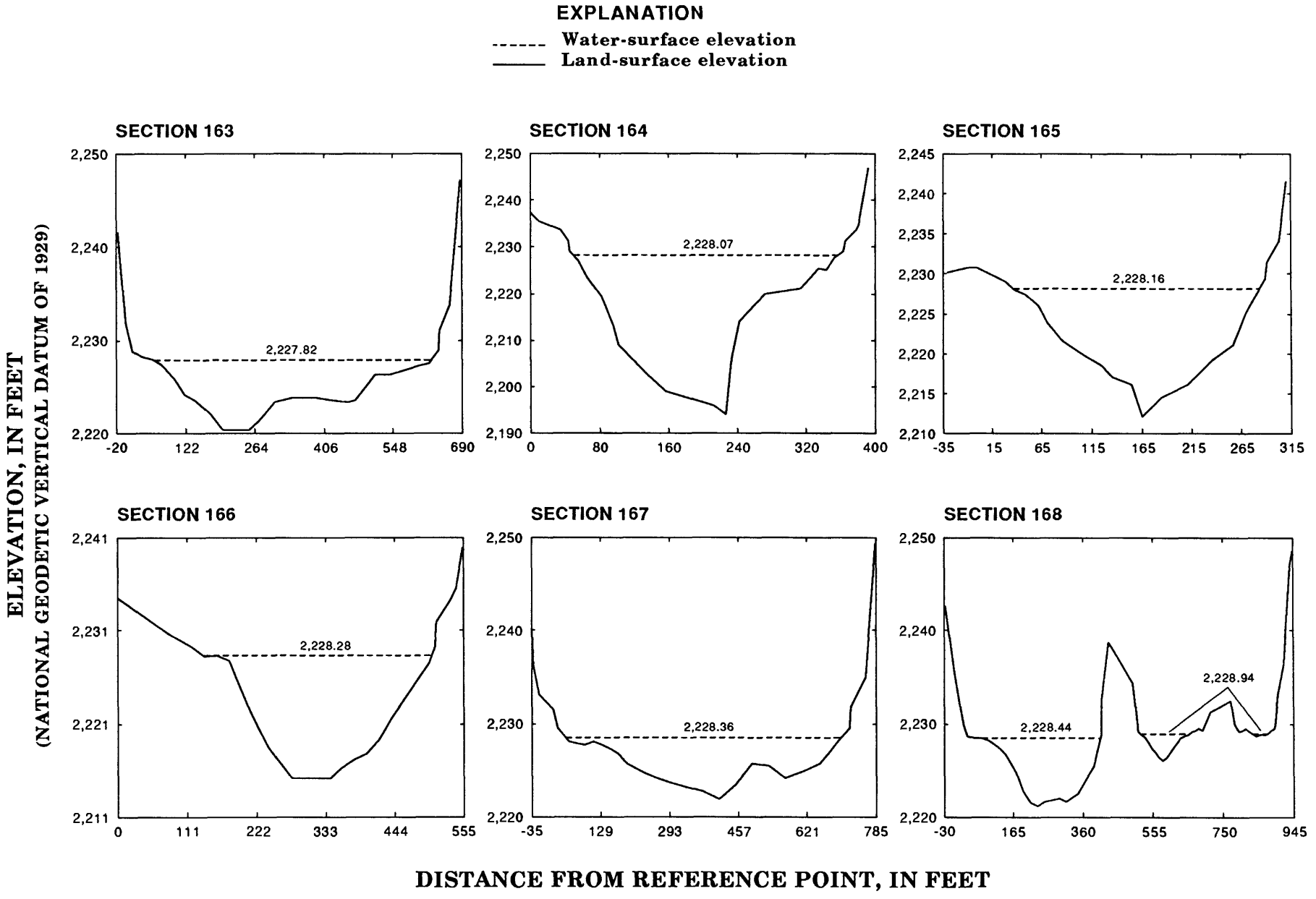

Figure 5.—Water- and land-surface elevations at cross sections (study subreach P) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach P)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
169	Left	262,362	24	436	1,379	2.72	3,750	2,229.18	16	438	1,679	3.01	5,060	2,229.90
	Right		641	978	446	0.34	150	2,229.50	604	993	767	0.70	540	2,230.38
170	Main	263,417	195	869	1,629	2.39	3,900	2,229.64	33	877	2,212	2.53	5,600	2,230.43
171	Main	265,204	74	691	2,292	1.70	3,900	2,230.11	47	692	2,741	2.04	5,600	2,230.83
172	Left	265,955	50	582	1,375	2.79	3,840	2,230.26	28	596	1,756	3.09	5,430	2,230.95
	Right		717	798	50	1.21	60	2,230.87	714	807	110	1.54	170	2,231.56
173	Left	266,514	39	350	1,471	2.37	3,490	2,230.44	29	352	1,700	2.89	4,920	2,231.16
	Right		515	712	587	0.70	410	2,231.38	512	716	731	0.93	680	2,232.10
174	Left	267,647	22	185	84	2.27	190	2,231.82	18	210	192	2.66	510	2,232.42
	Mid		354	746	1,042	3.17	3,300	2,231.82	347	751	1,281	3.44	4,410	2,232.42
	Right		990	1,152	418	0.98	410	2,231.63	976	1,161	548	1.24	680	2,232.38

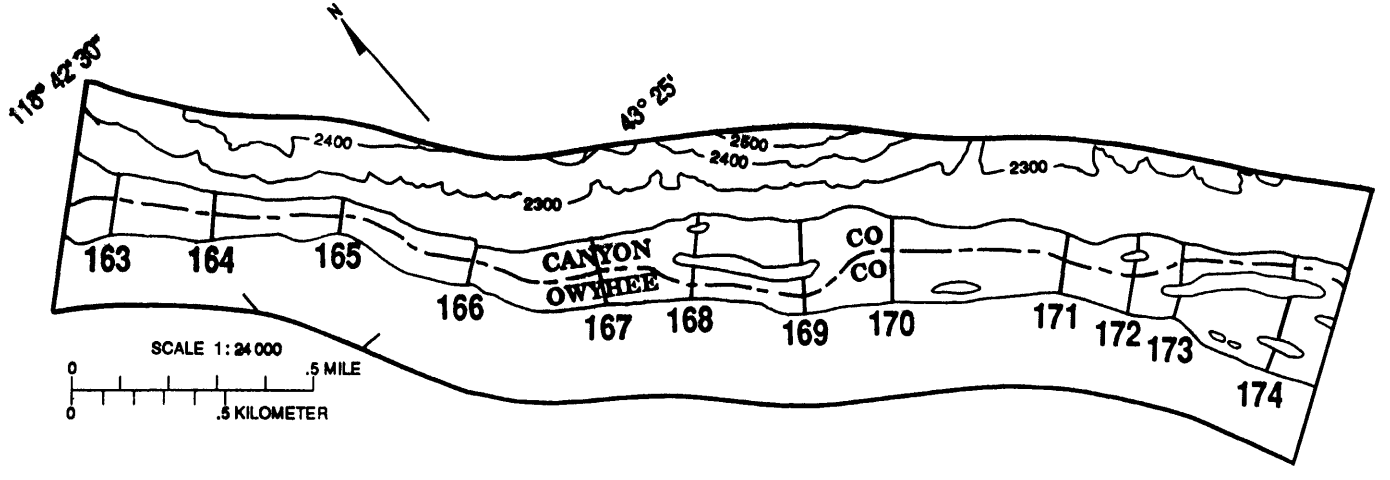

Figure 4.—Locations of cross sections (study subreach P) of the Snake River—Continued.

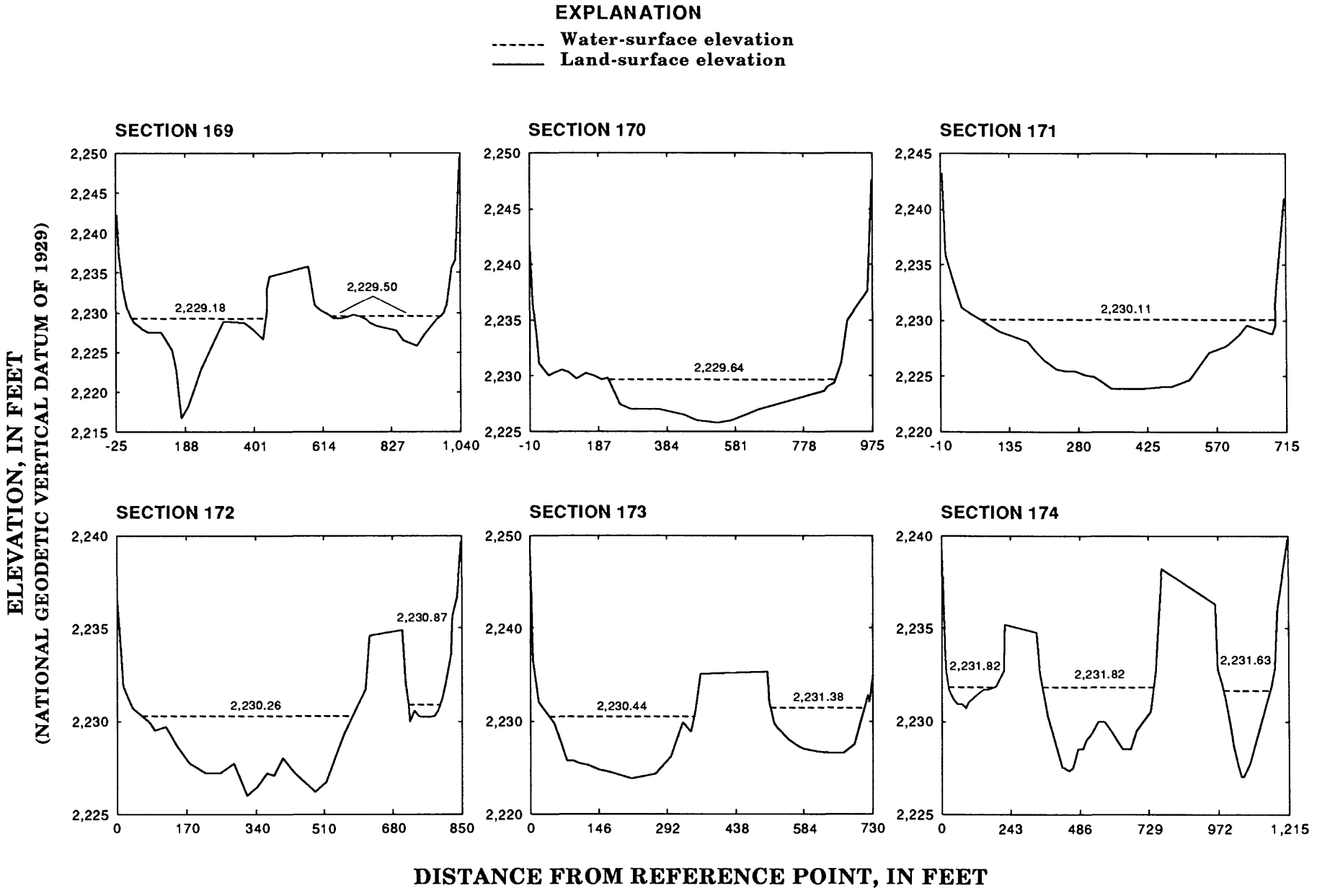

Figure 5.—Water- and land-surface elevations at cross sections (study subreach P) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach Q)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
175	Left	268,402	44	497	774	1.97	1,520	2,232.33	25	501	1,071	2.07	2,220	2,232.97
	Right		659	1,115	907	2.62	2,380	2,232.25	656	1,121	1,206	2.80	3,380	2,232.90
176	Left	269,033	56	328	767	2.06	1,580	2,232.53	45	332	935	2.36	2,210	2,233.13
	Right		850	1,208	1,499	1.55	2,320	2,232.51	842	1,213	1,718	1.97	3,390	2,233.11
177	Left	269,793	45	342	776	2.04	1,580	2,232.93	37	347	965	2.29	2,210	2,233.55
	Right		1,084	1,387	1,405	1.65	2,320	2,232.55	1,080	1,402	1,598	2.12	3,390	2,233.16
178	Left	270,508	59	246	658	2.40	1,580	2,233.22	50	248	776	2.85	2,210	2,233.83
	Mid		830	1,021	105	1.63	170	2,233.03	810	1,062	252	1.82	460	2,233.69
	Right		1,197	1,379	602	3.57	2,150	2,233.03	1,188	1,382	726	4.04	2,930	2,233.69
179	Main	271,351	42	1,270	2,607	1.50	3,900	2,233.50	38	1,291	3,441	1.63	5,600	2,234.17
180	Main	272,154	51	434	3,319	1.17	3,900	2,233.66	48	441	3,567	1.57	5,600	2,234.30

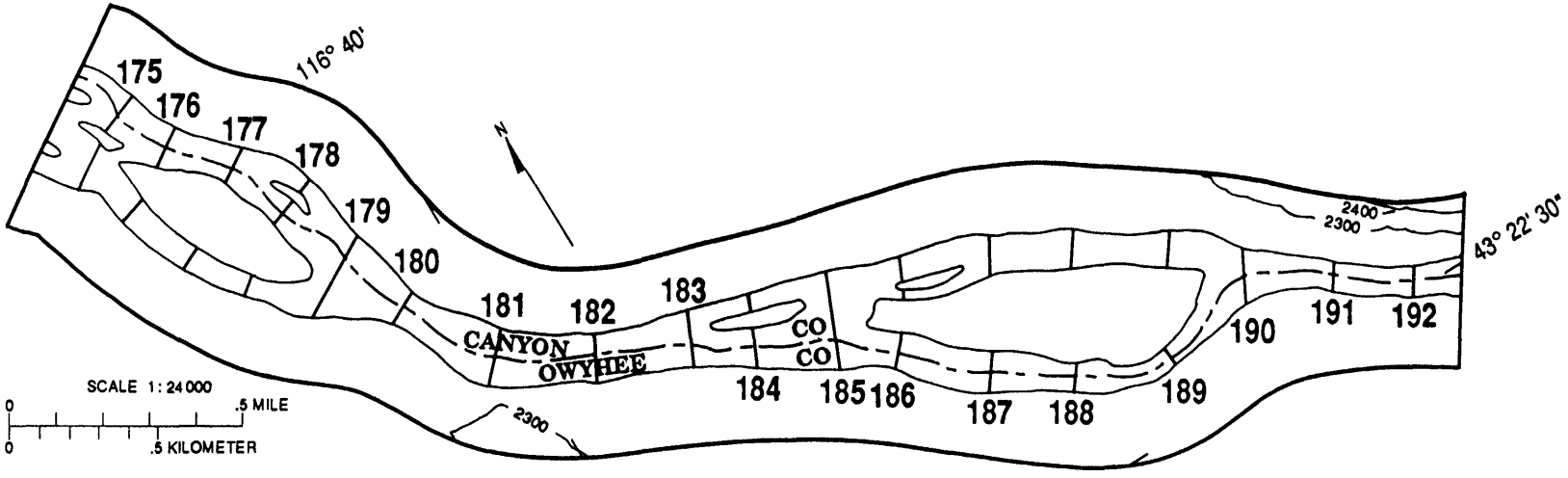

Figure 4.—Locations of cross sections (study subreach Q) of the Snake River—Continued.

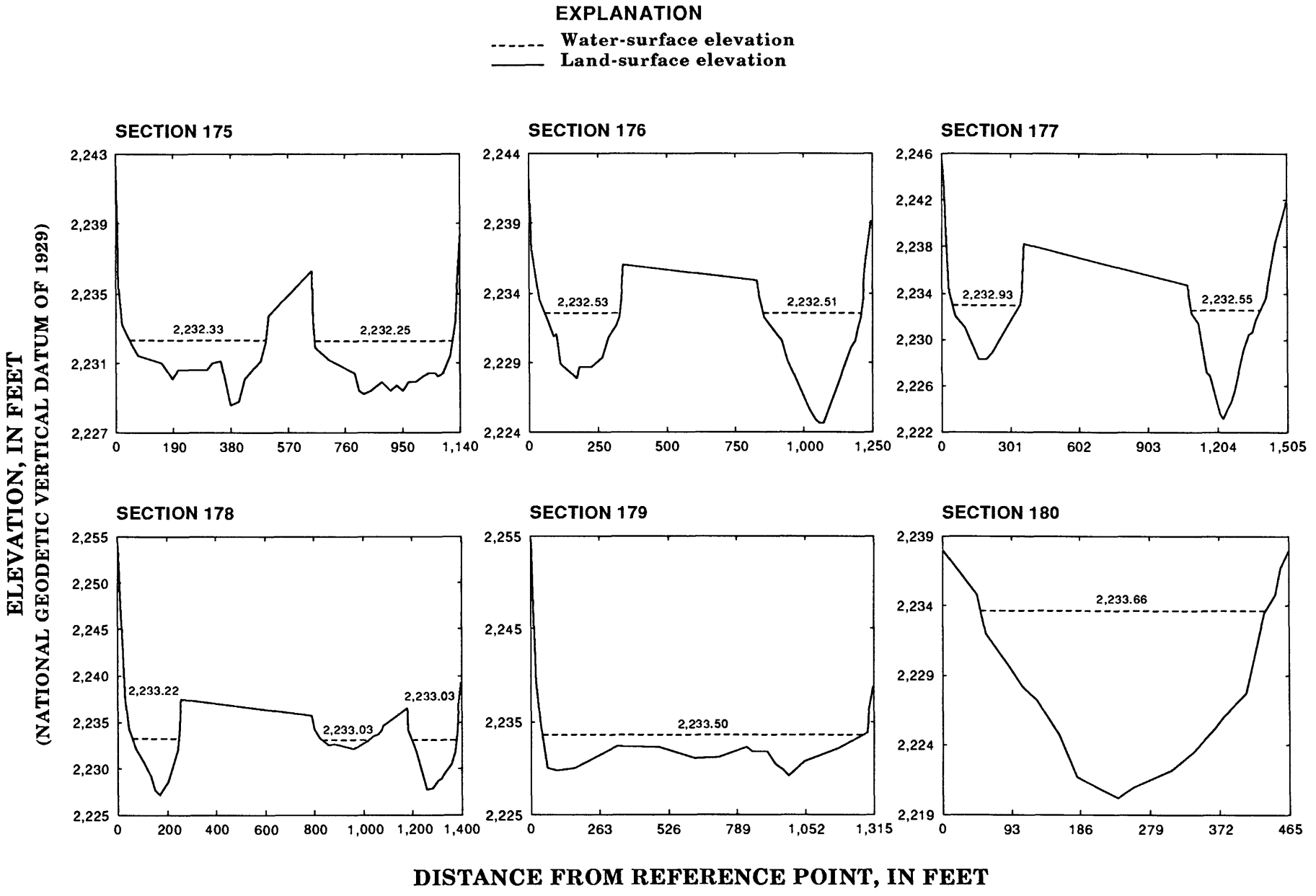

Figure 5.—Water- and land-surface elevations at cross sections (study subreach Q) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach Q)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
181	Main	273,250	22	646	3,883	1.00	3,900	2,233.79	20	667	4,274	1.31	5,600	2,234.41
182	Main	274,317	88	553	2,707	1.44	3,900	2,233.87	78	568	2,993	1.87	5,600	2,234.47
183	Main	275,273	28	583	3,407	1.14	3,900	2,233.95	21	587	3,751	1.49	5,600	2,234.56
184	Left	275,939	93	439	1,879	2.06	3,870	2,233.98	39	445	2,108	2.60	5,470	2,234.59
	Right		697	859	62	0.48	30	2,233.96	676	871	171	0.76	130	2,234.57
185	Main	276,782							33	1,009	1,965	2.85	5,600	2,234.98
	Left		36	479	1,366	2.83	3,870	2,234.29						
	Right		611	919	52	0.58	30	2,234.42						
186	Left	277,454	57	358	733	3.75	2,750	2,234.74	14	402	980	4.03	3,950	2,235.44
	Mid								857	916	33	1.83	60	2,235.94
	Right		877	1,341	684	1.68	1,150	2,235.24	1,069	1,350	876	1.82	1,590	2,235.94

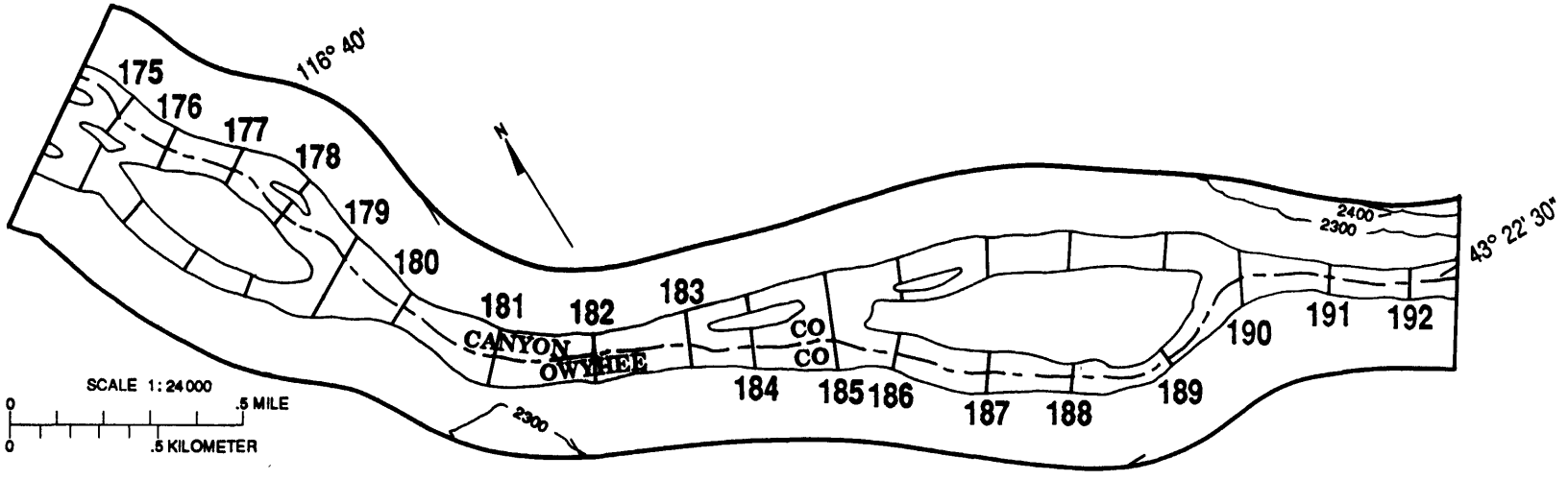

Figure 4.—Locations of cross sections (study subreach Q) of the Snake River—Continued.

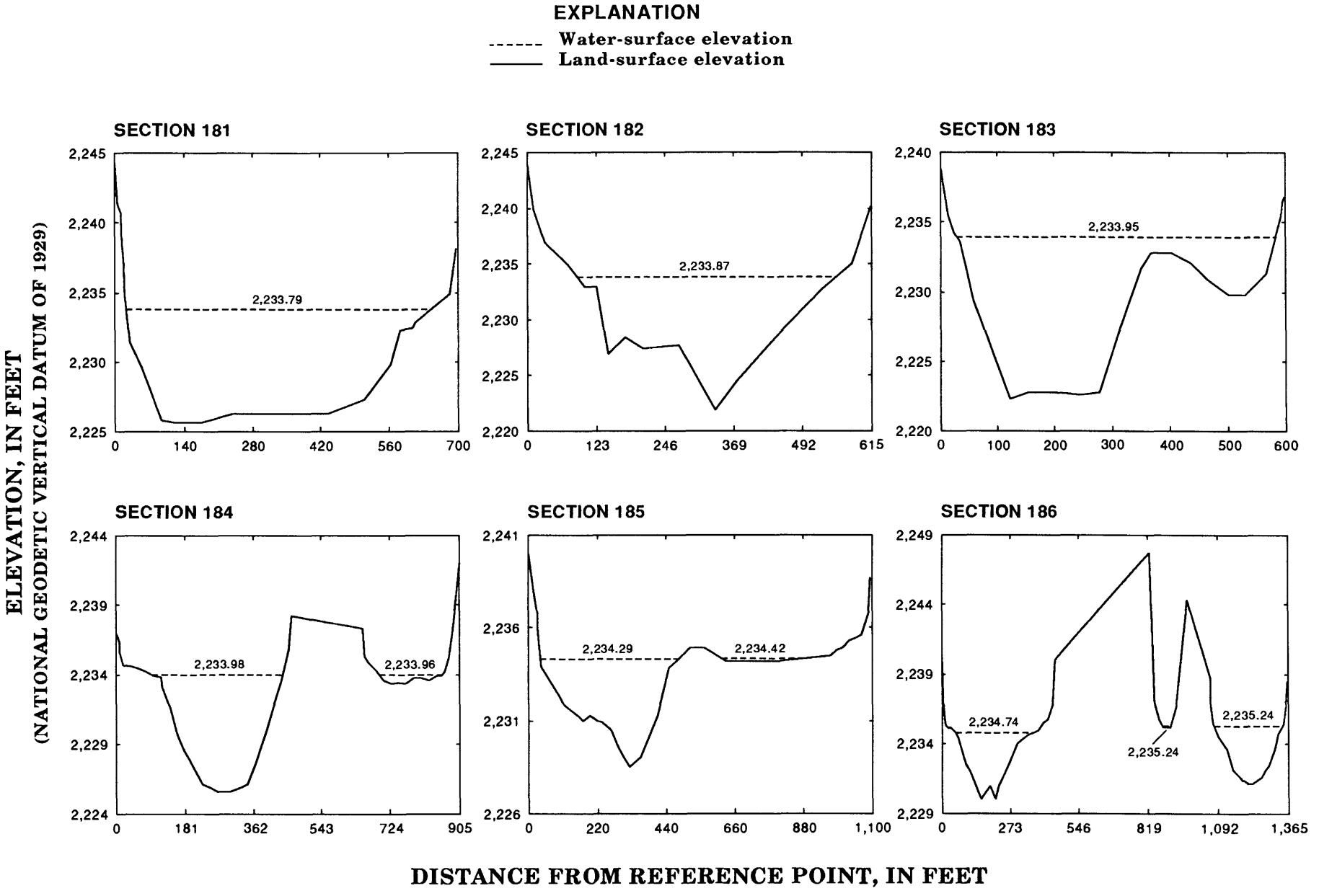

Figure 5.—Water- and land-surface elevations at cross sections (study subreach Q) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach Q)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
187	Left	278,357	25	430	894	3.07	2,750	2,235.17	20	439	1,179	3.35	3,950	2,235.86
	Right		1,329	1,641	1,027	1.12	1,150	2,236.08	1,300	1,647	1,259	1.31	1,650	2,236.79
188	Left	279,237	18	296	1,207	2.28	2,750	2,235.58	14	298	1,402	2.82	3,950	2,236.28
	Right		1,334	1,638	905	1.27	1,150	2,236.34	1,314	1,645	1,132	1.46	1,650	2,237.05
189	Left	280,211	29	235	825	3.33	2,750	2,235.90	14	244	991	3.99	3,950	2,236.65
	Right		1,233	1,568	543	2.12	1,150	2,236.44	1,215	1,571	785	2.10	1,650	2,237.14
190	Main	281,485	63	582	3,701	1.05	3,900	2,236.51	26	583	4,156	1.35	5,600	2,237.35
191	Main	282,422	56	398	4,598	0.85	3,900	2,236.60	41	399	4,903	1.14	5,600	2,237.48
192	Main	283,300	43	345	3,835	1.02	3,900	2,236.66	32	349	4,115	1.36	5,600	2,237.57

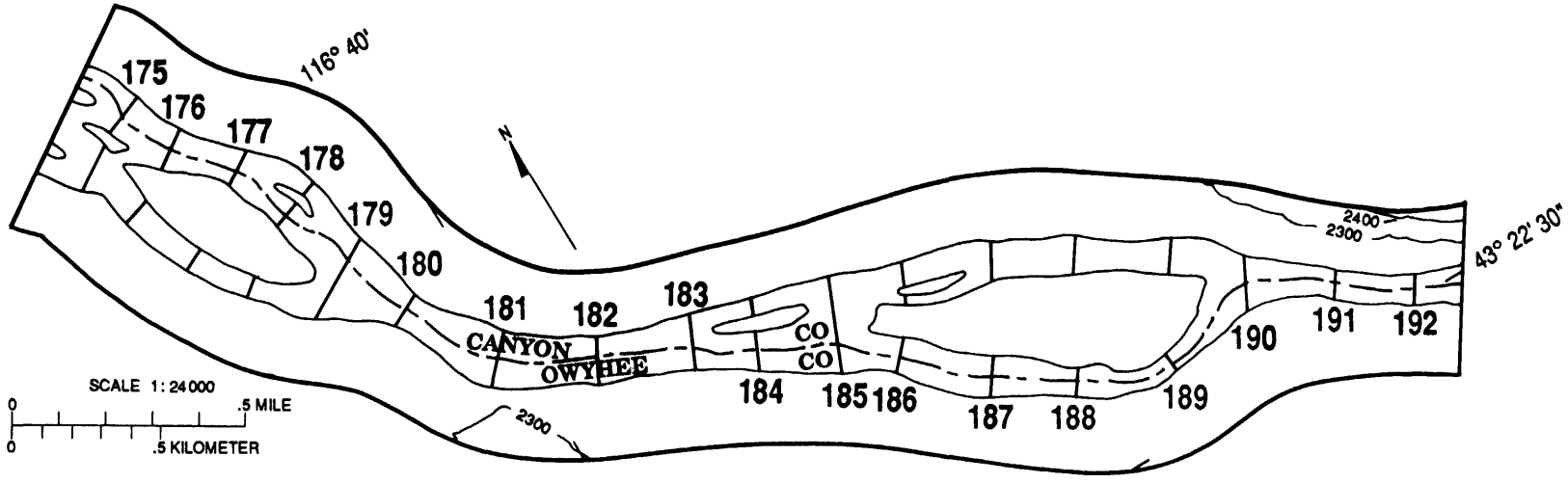

Figure 4.—Locations of cross sections (study subreach Q) of the Snake River—Continued.

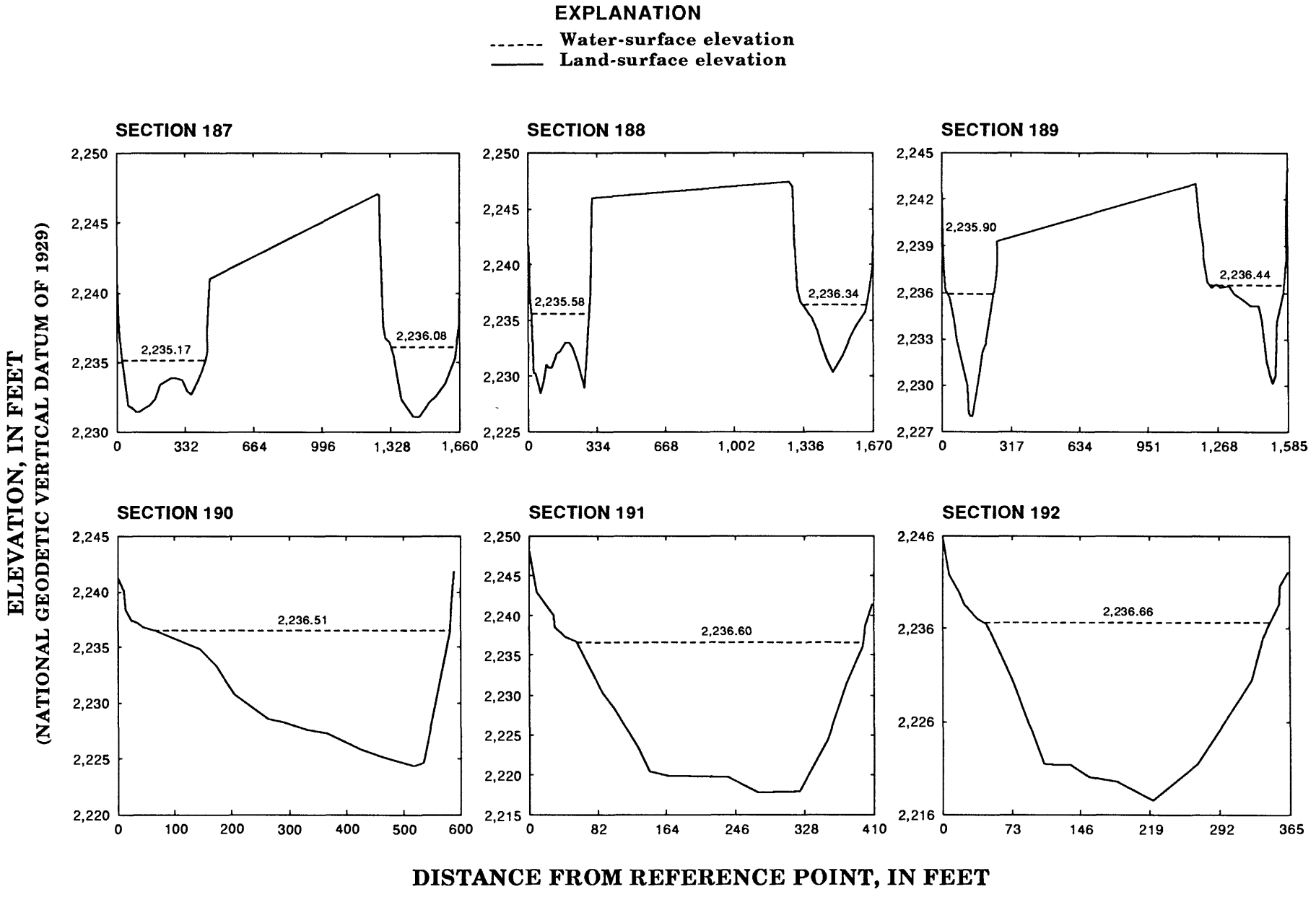

Figure 5.—Water- and land-surface elevations at cross sections (study subreach Q) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach R)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
193	Main	284,327	162	432	1,576	2.48	3,900	2,236.73	158	440	1,832	3.06	5,600	2,237.66
194	Left	285,224	28	40	2	0.82	2	2,237.28	22	45	18	1.40	25	2,238.17
	Right		258	685	1,751	2.23	3,898	2,237.02	158	697	2,194	2.54	5,575	2,237.91
195	Left	286,182	52	294	259	1.12	290	2,237.88	35	304	451	1.57	710	2,238.63
	Right		510	965	1,213	2.98	3,610	2,237.44	507	984	1,562	3.13	4,890	2,238.19
196	Left	286,742	39	297	233	1.24	290	2,238.54	24	312	418	1.70	710	2,239.21
	Right		720	1,269	1,173	3.08	3,610	2,238.01	716	1,277	1,530	3.20	4,890	2,238.65
197	Left	287,596	64	363	1,616	1.88	3,040	2,238.86	57	367	1,790	2.35	4,210	2,239.43
	Right		929	1,395	1,048	0.82	860	2,238.54	921	1,405	1,300	1.07	1,390	2,239.07
198	Left	288,274	40	399	2,196	1.38	3,040	2,238.94	35	402	2,416	1.74	4,210	2,239.54
	Right		693	1,232	917	0.94	860	2,238.67	680	1,239	1,225	1.14	1,390	2,239.24

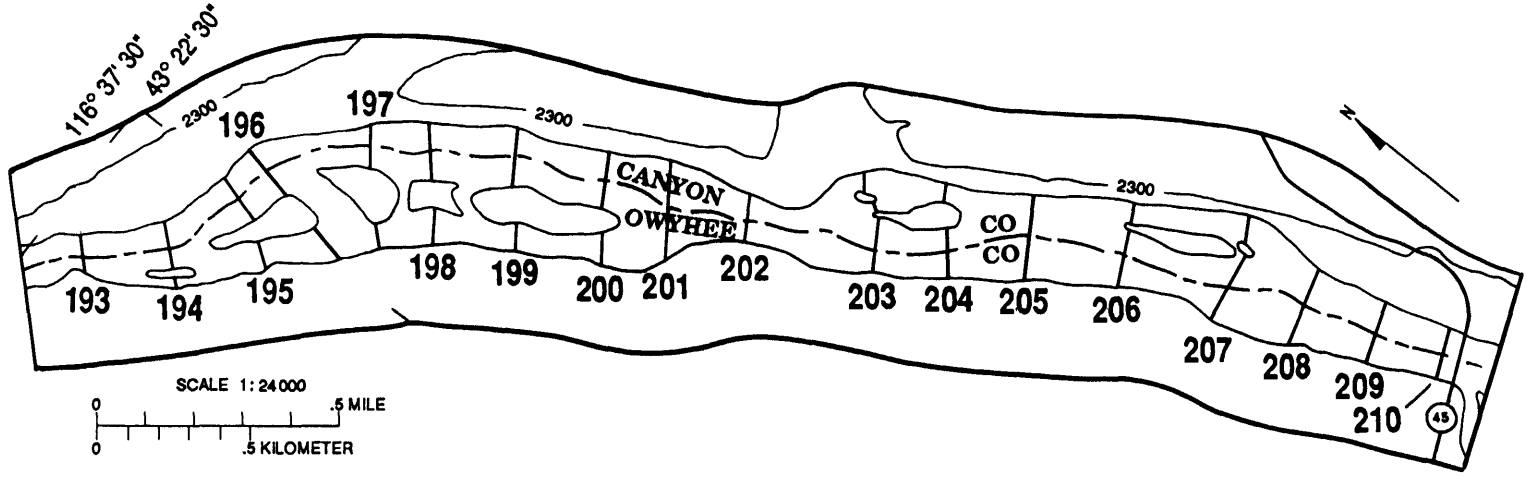

Figure 4.—Locations of cross sections (study subreach R) of the Snake River—Continued.

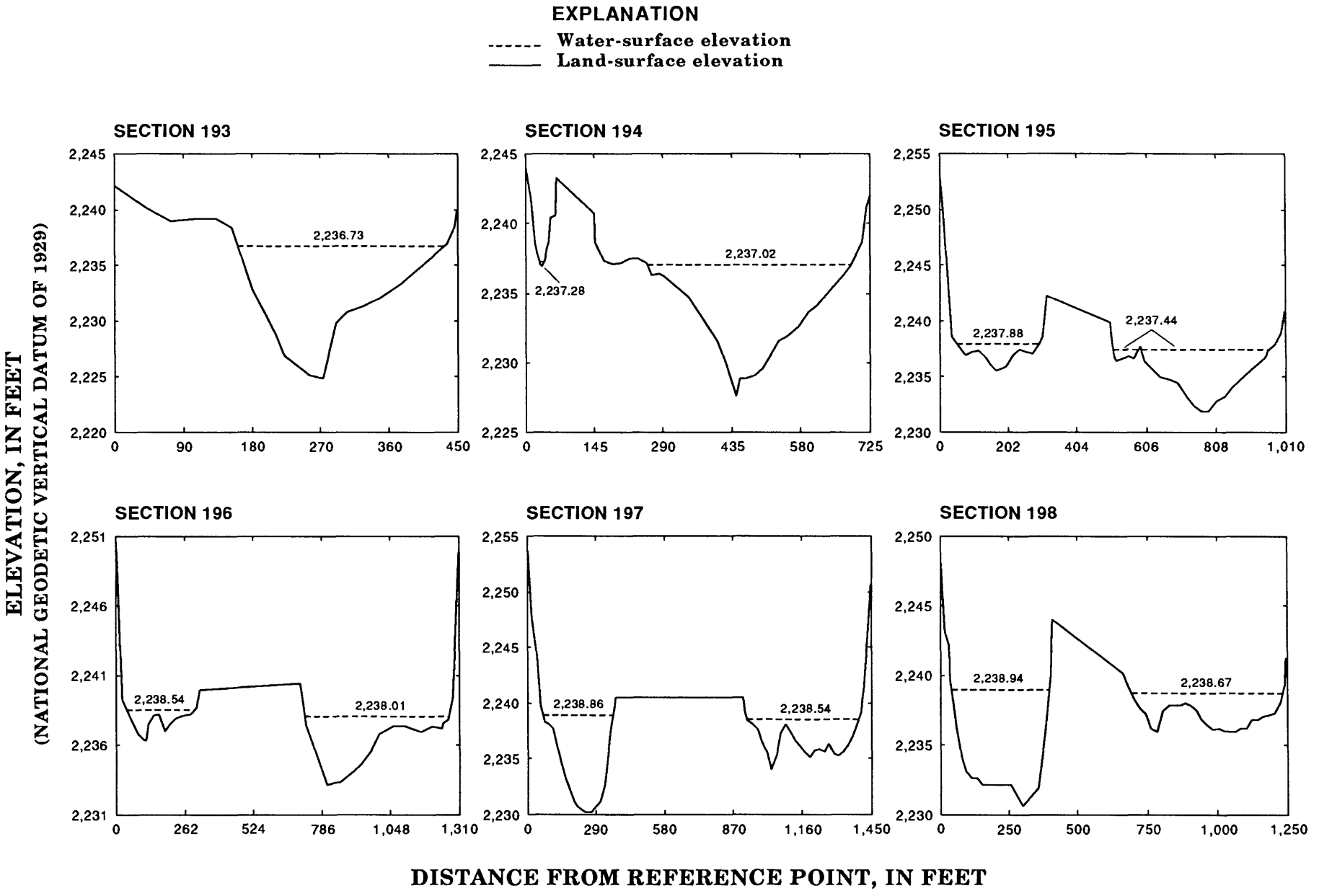

Figure 5.—Water- and land-surface elevations at cross sections (study subreach R) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach R)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
199	Left	289,154	24	245	985	3.05	3,000	2,239.12	22	248	1,094	3.82	4,180	2,239.61
	Right		665	1,294	675	1.33	900	2,239.77	657	1,296	958	1.48	1,420	2,240.28
200	Left	290,157	20	268	895	3.35	3,000	2,239.35	16	275	1,036	4.03	4,180	2,239.91
	Right		557	1,053	897	1.00	900	2,240.02	546	1,060	1,158	1.23	1,420	2,240.54
201	Main	290,877	68	902	2,595	1.50	3,900	2,240.06	53	904	3,085	1.82	5,600	2,240.64
202	Main	291,691	41	519	2,905	1.34	3,900	2,240.31	30	529	3,181	1.76	5,600	2,240.87
203	Left	293,107	41	563	2,310	1.64	3,800	2,240.53	32	563	2,584	2.09	5,400	2,241.05
	Mid		651	853	40	0.25	10	2,241.03	641	863	116	0.26	30	2,241.59
	Right		909	1,048	183	0.49	90	2,241.03	903	1,052	263	0.65	170	2,241.59
204	Left	293,871	56	484	1,866	2.04	3,800	2,240.67	42	499	2,120	2.55	5,400	2,241.24
	Right		779	965	504	0.20	100	2,241.10	772	970	615	0.33	200	2,241.68

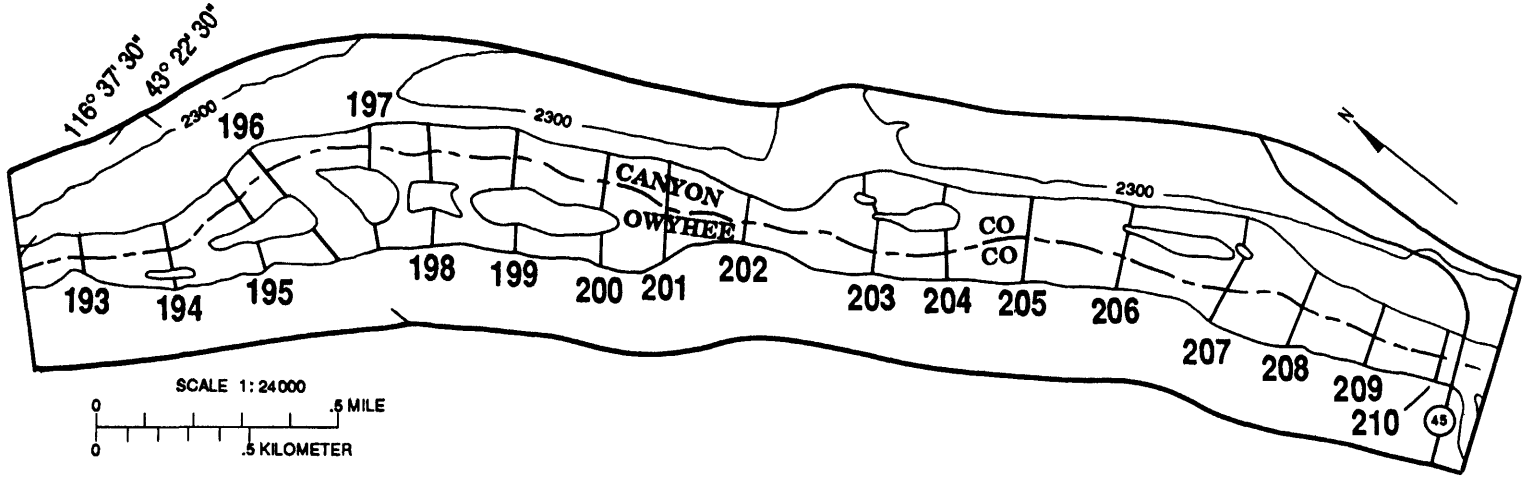

Figure 4.—Locations of cross sections (study subreach R) of the Snake River—Continued.

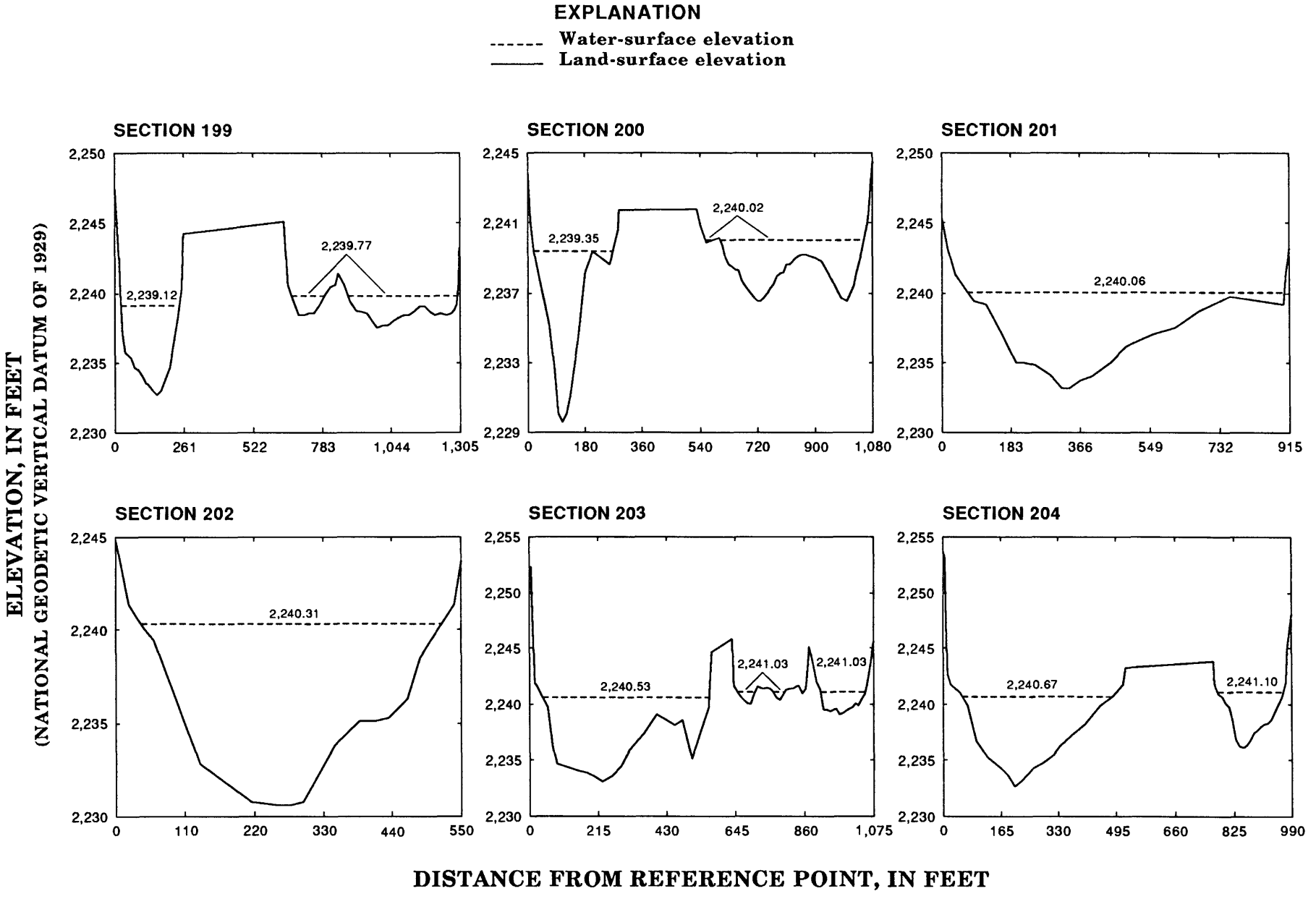

Figure 5.—Water- and land-surface elevations at cross sections (study subreach R) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach R)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
205	Main	294,723	32	881	1,669	2.34	3,900	2,241.12	28	903	2,159	2.59	5,600	2,241.69
206	Left	295,774	42	498	2,348	1.59	3,740	2,241.31	36	502	2,611	2.01	5,260	2,241.88
	Right		588	807	428	0.37	160	2,241.35	583	810	555	0.61	340	2,241.92
207	Left	296,883	49	526	1,700	2.20	3,740	2,241.42	41	552	1,992	2.64	5,260	2,242.01
	Right		960	1,111	171	0.93	160	2,241.46	769	1,117	305	1.11	340	2,242.07
208	Main	297,958	12	724	2,219	1.76	3,900	2,241.66	7	736	2,633	2.13	5,600	2,242.24
209	Main	298,873	34	635	3,487	1.12	3,900	2,241.75	26	653	3,847	1.46	5,600	2,242.33
210	Main	299,376	29	555	4,270	0.91	3,900	2,241.77	25	561	4,582	1.22	5,600	2,242.36

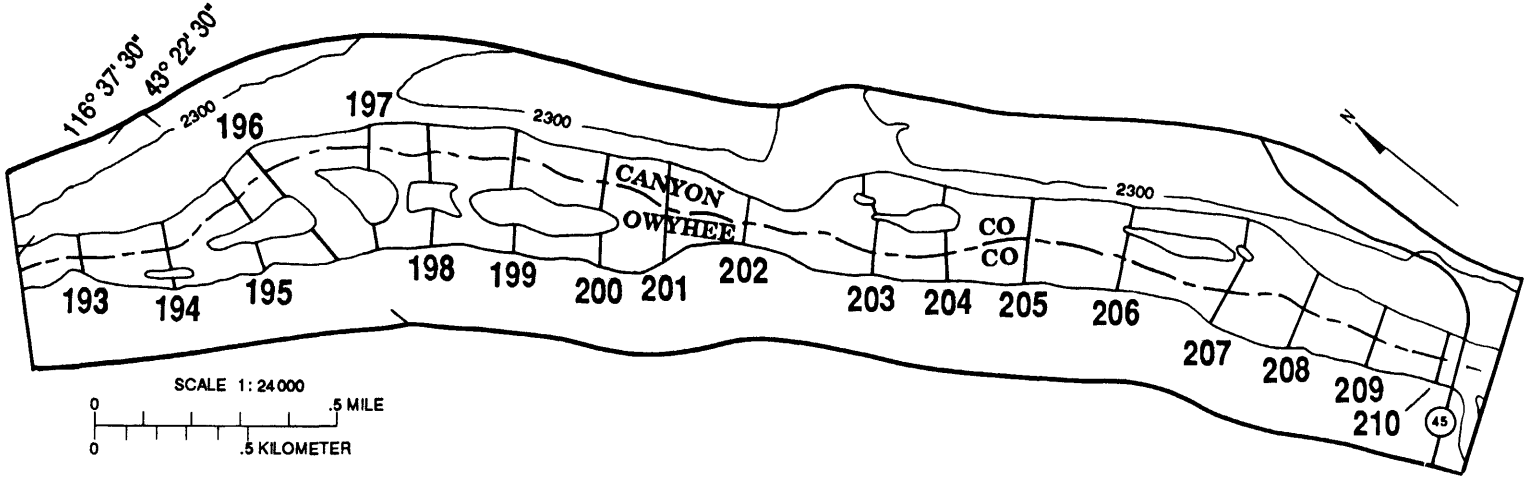

Figure 4.—Locations of cross sections (study subreach R) of the Snake River—Continued.

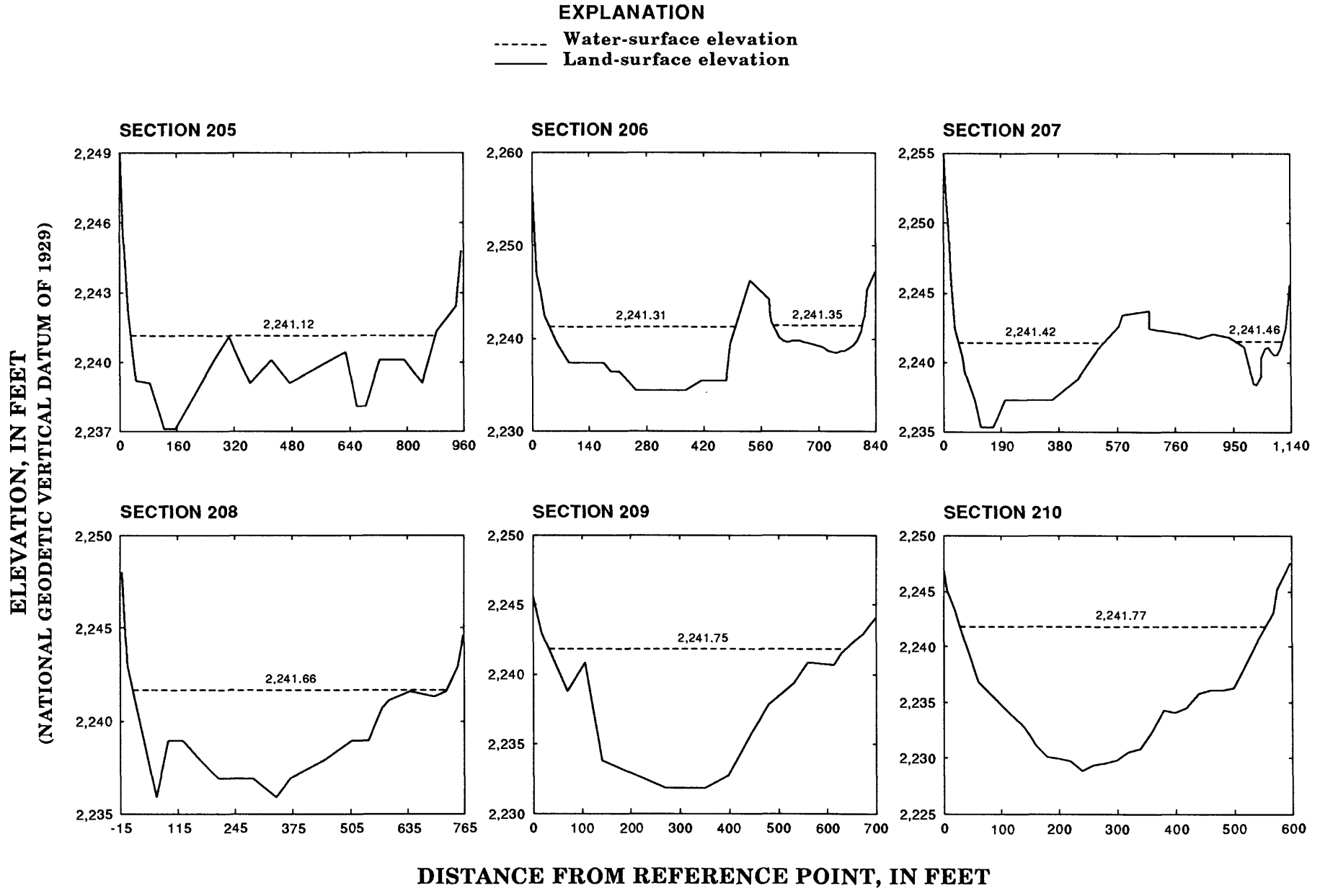

Figure 5.—Water- and land-surface elevations at cross sections (study subreach R) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach S)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
211	Left	300,011	39	128	169	0.65	110	2,241.80	32	133	225	1.60	360	2,242.38
	Right		554	1,065	2,634	1.44	3,790	2,241.84	541	1,069	2,940	1.78	5,240	2,242.43
212	Left	300,795	13	123	69	1.59	110	2,242.30	8	135	142	2.53	360	2,242.91
	Right		454	1,060	1,407	2.69	3,790	2,241.98	403	1,064	1,734	3.02	5,240	2,242.53
213	Left	301,916	51	530	1,832	2.07	3,800	2,242.50	48	532	2,126	2.44	5,190	2,243.11
	Mid		785	921	17	0.59	10	2,243.05	785	944	77	0.78	60	2,243.66
	Right		1,108	1,287	170	0.53	90	2,243.05	1,071	1,296	294	1.19	350	2,243.66
214	Left	303,630	19	642	1,676	2.27	3,800	2,242.84	15	338	1,861	2.78	5,179	2,243.50
	Mid								542	651	84	0.13	11	2,243.50
	Right		1,368	1,650	533	0.19	100	2,243.25	1,352	1,656	825	0.50	410	2,244.24
215	Left	304,553	25	468	1,322	2.87	3,800	2,243.32	22	547	1,697	3.05	5,179	2,244.10
	Mid								794	842	12	0.95	11	2,244.10
	Right		1,078	1,384	492	0.20	100	2,243.32	1,061	1,395	839	0.49	410	2,244.41
216	Main	305,542	44	705	2,429	1.61	3,900	2,243.65	35	711	2,927	1.91	5,600	2,244.40

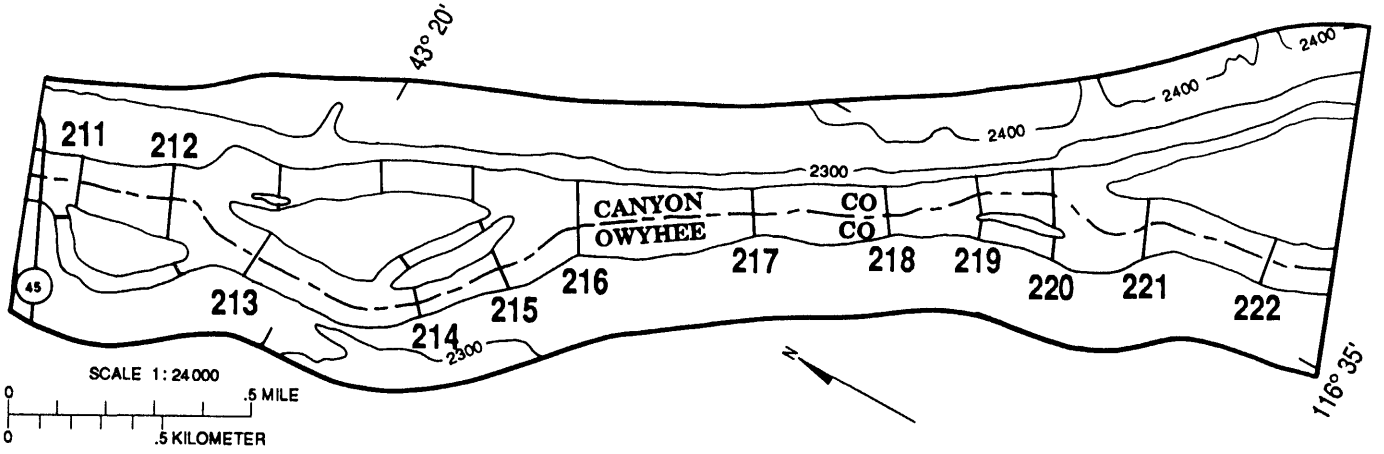

Figure 4.—Locations of cross sections (study subreach S) of the Snake River—Continued.

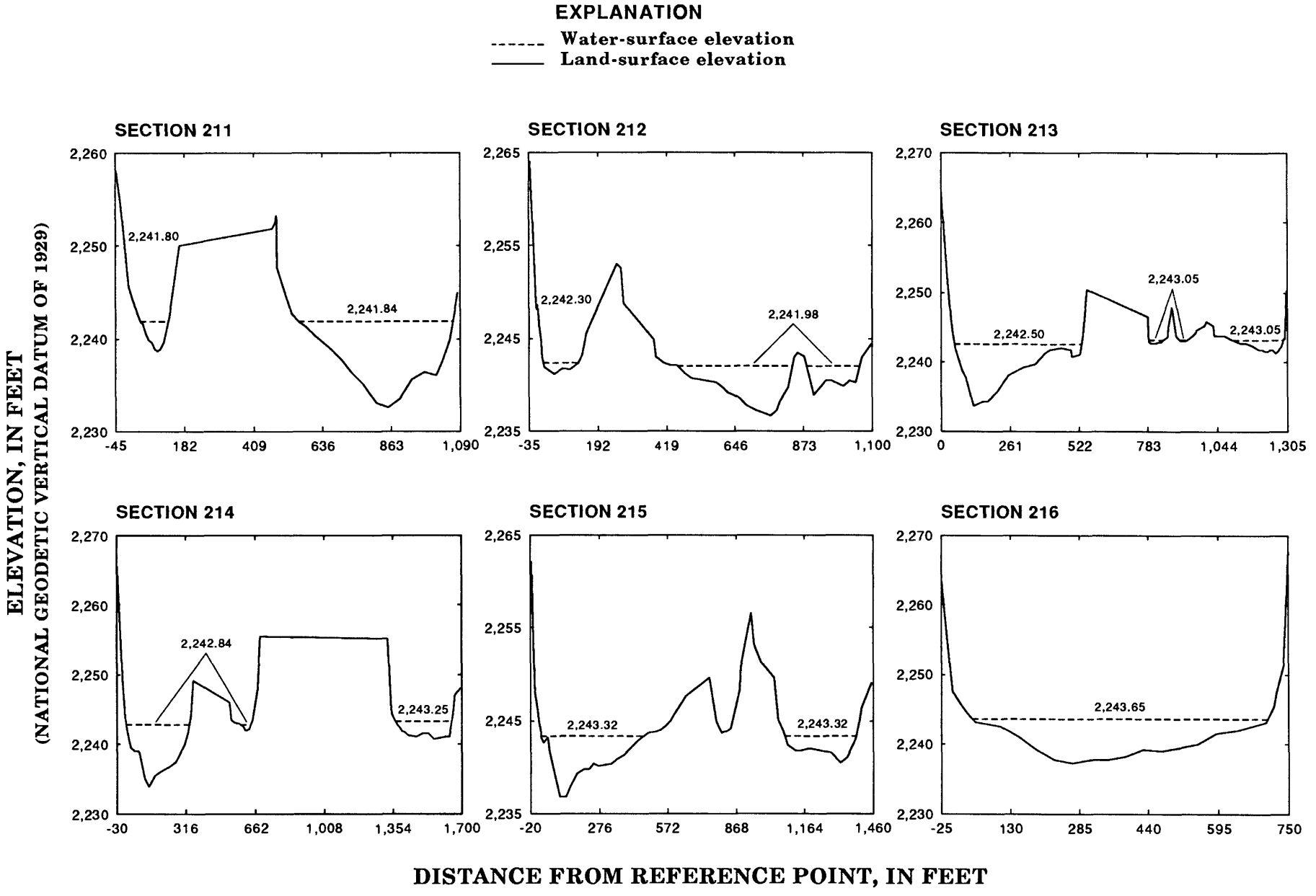

Figure 5.—Water- and land-surface elevations at cross sections (study subreach S) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach S)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
217	Main	307,354	29	500	3,991	0.98	3,900	2,243.84	23	505	4,362	1.28	5,600	2,244.61
218	Main	308,760	47	576	3,768	1.04	3,900	2,243.93	38	581	4,191	1.34	5,600	2,244.72
219	Left	309,705	35	209	385	1.09	420	2,243.96	27	217	529	1.42	750	2,244.75
	Right		287	646	2,355	1.48	3,480	2,243.96	277	653	2,645	1.83	4,850	2,244.75
220	Left	310,498	46	294	359	1.17	420	2,244.25	43	311	563	1.33	750	2,245.04
	Right		464	1,031	1,285	2.71	3,480	2,244.40	428	1,044	1,750	2.77	4,850	2,245.19
221	Main	311,593	18	694	2,182	1.79	3,900	2,244.64	11	703	2,624	2.13	5,600	2,245.34
222	Main	312,894	27	464	2,165	1.80	3,900	2,244.88	22	473	2,489	2.25	5,600	2,245.61

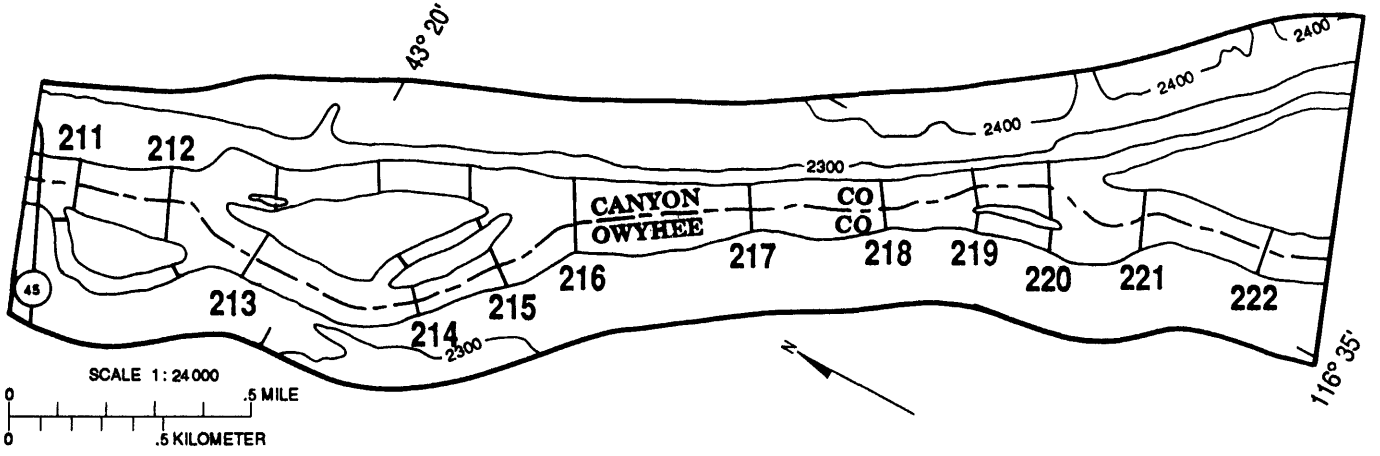

Figure 4.—Locations of cross sections (study subreach S) of the Snake River—Continued.

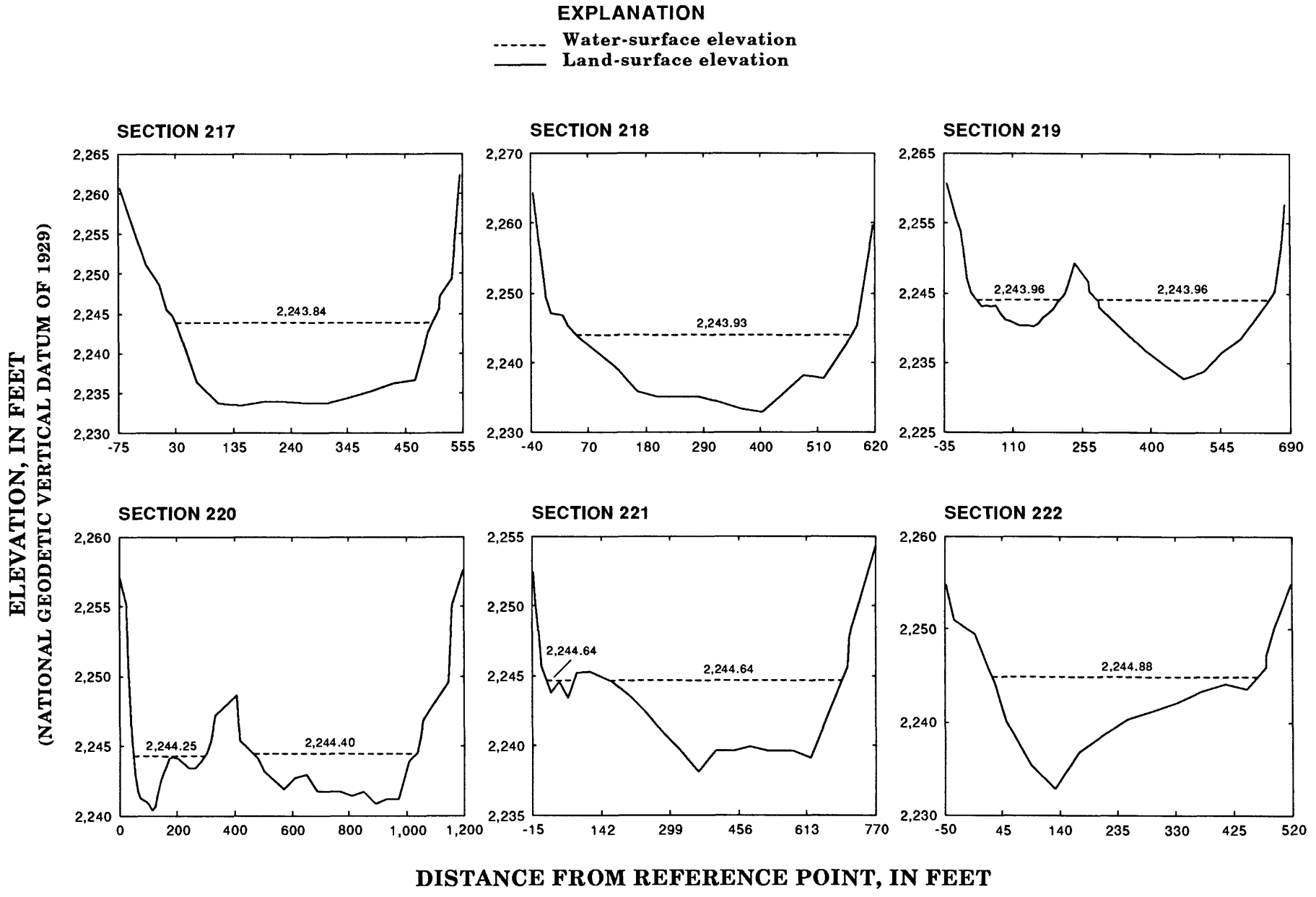

Figure 5.—Water- and land-surface elevations at cross sections (study subreach S) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach T)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
223	Main	314,211	48	494	2,269	1.72	3,900	2,245.11	33	503	2,632	2.13	5,600	2,245.90
224	Main	315,522	37	542	1,560	2.50	3,900	2,245.34	19	557	1,981	2.83	5,600	2,246.15
225	Main	316,547	39	547	2,398	1.63	3,900	2,245.62	27	555	2,824	1.98	5,600	2,246.45
226	Main	317,486	41	440	2,896	1.35	3,900	2,245.74	27	441	3,233	1.73	5,600	2,246.57
227	Main	318,765	100	405	1,744	2.24	3,900	2,245.83	86	408	3,637	1.54	5,600	2,246.71
228	Left	319,556	27	371	631	3.07	1,940	2,246.97	18	385	872	3.23	2,820	2,247.65
	Right		540	814	617	3.18	1,960	2,246.63	531	817	807	3.44	2,780	2,247.31

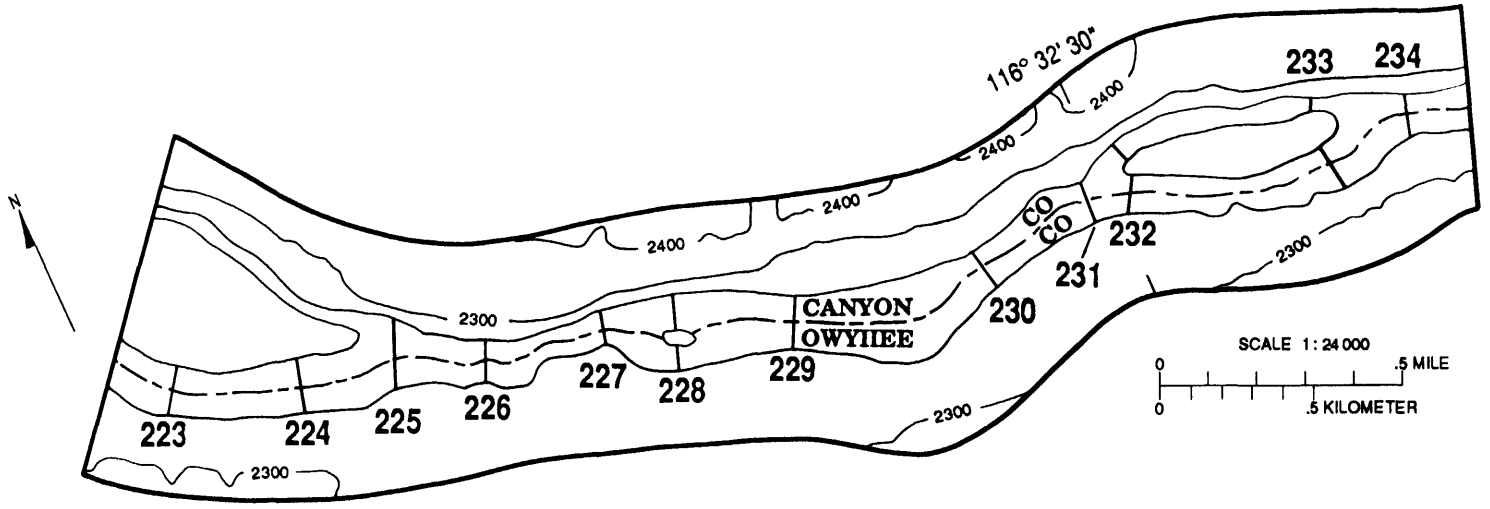

Figure 4.—Locations of cross sections (study subreach T) of the Snake River—Continued.

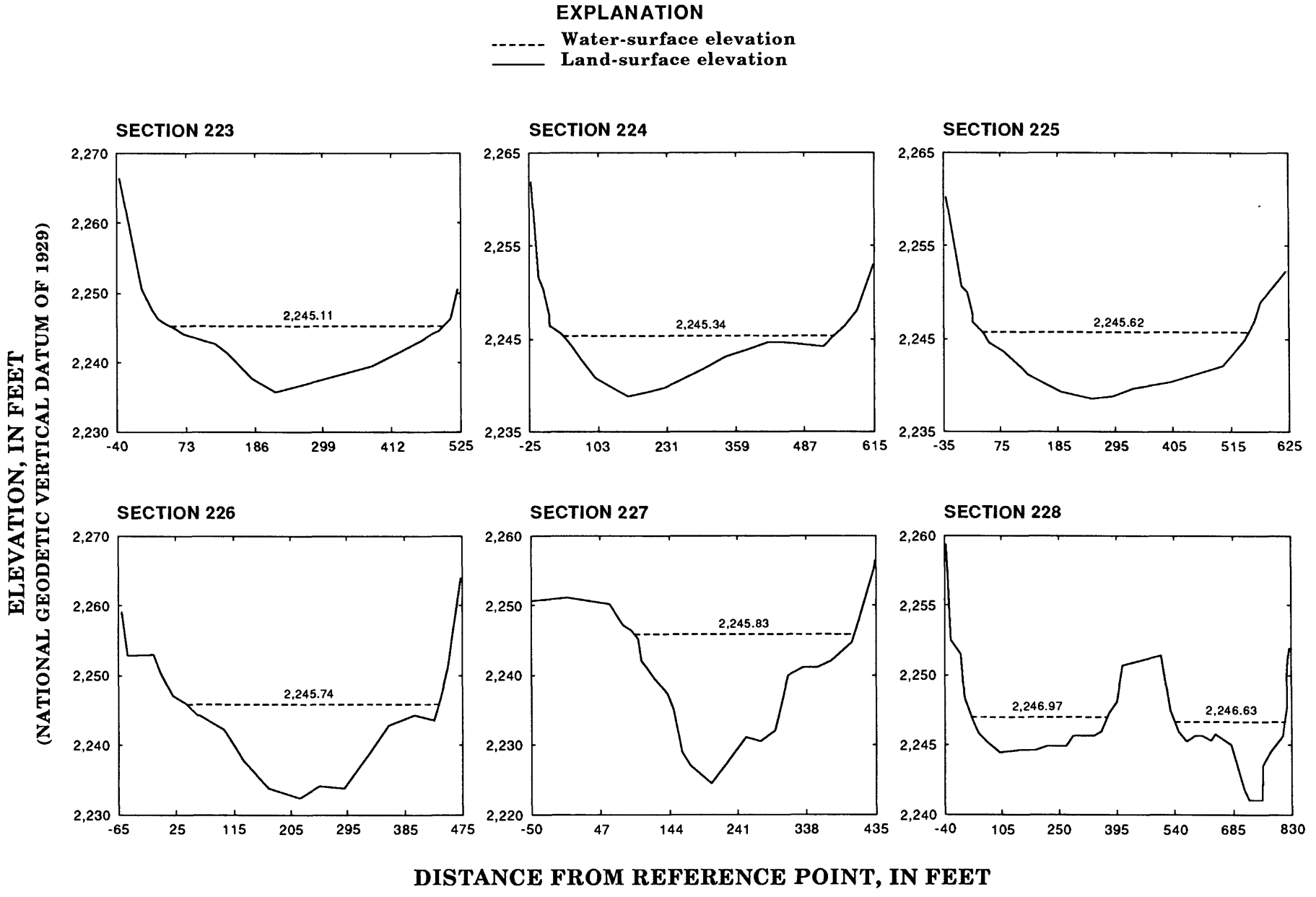

Figure 5.—Water- and land-surface elevations at cross sections (study subreach T) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach T)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
229	Main	320,794	89	576	2,010	1.94	3,900	2,248.48	49	580	2,250	2.49	5,600	2,248.96
230	Main	322,884	31	419	5,476	0.71	3,900	2,248.72	20	422	5,719	0.98	5,600	2,249.33
231	Main	324,150	44	499	5,600	0.70	3,900	2,248.79	39	504	5,903	0.95	5,600	2,249.45
232	Left	324,620	21	465	2,597	1.33	3,460	2,248.81	17	467	2,897	1.69	4,900	2,249.48
	Right		674	811	322	1.36	440	2,248.81	672	819	416	1.68	700	2,249.48
233	Left	326,697	15	437	1,684	2.05	3,460	2,249.12	11	470	2,013	2.43	4,900	2,249.86
	Right		855	988	410	1.07	440	2,249.25	846	993	517	1.35	700	2,250.02
234	Main	327,713	12	448	4,359	0.89	3,900	2,249.27	10	450	4,711	1.19	5,600	2,250.08

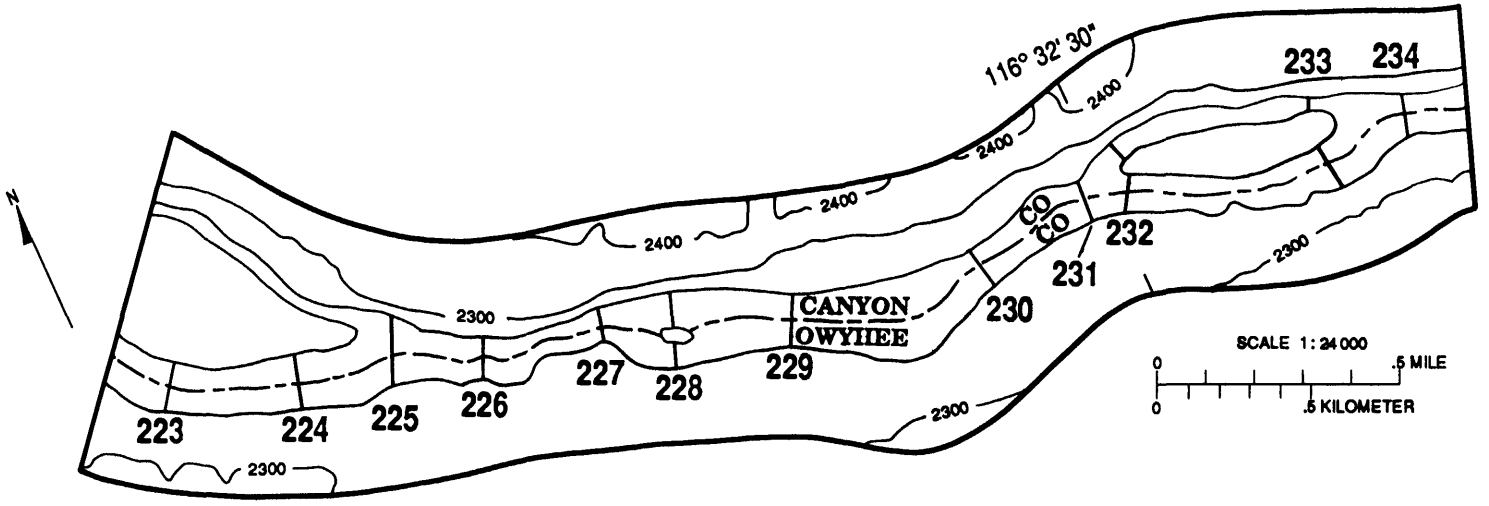

Figure 4.—Locations of cross sections (study subreach T) of the Snake River—Continued.

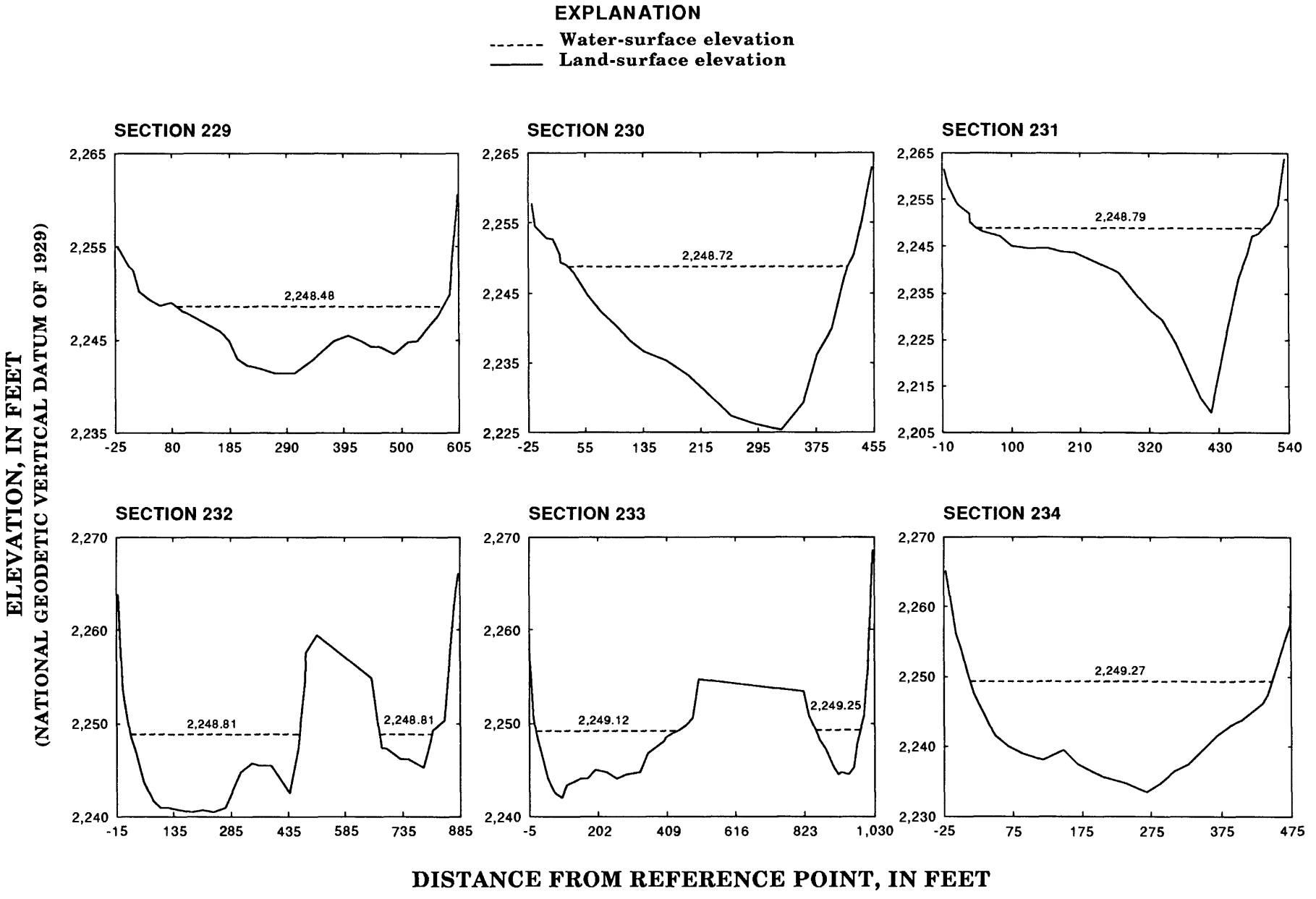

Figure 5.—Water- and land-surface elevations at cross sections (study subreach T) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach U)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
235	Main	329,500	67	457	3,285	1.19	3,900	2,249.42	59	461	3,607	1.55	5,600	2,250.23
236	Left	330,677	33	317	868	3.33	2,890	2,250.58	30	324	1,082	3.51	3,800	2,251.32
	Mid		623	773	291	2.71	790	2,250.58	596	777	413	3.10	1,280	2,251.32
	Right		889	1,020	91	2.42	220	2,250.58	884	1,023	191	2.73	520	2,251.32
237	Left	331,339	32	298	1,242	2.33	2,890	2,250.98	27	304	1,441	2.64	3,800	2,251.71
	Mid		561	700	471	1.44	680	2,251.23	558	702	574	1.76	1,010	2,251.96
	Right		821	1,044	389	0.85	330	2,251.23	807	1,049	559	1.41	790	2,251.96
238	Left	332,289	69	497	1,291	2.76	3,570	2,251.42	56	510	1,619	2.97	4,810	2,252.16
	Right		730	940	481	0.69	330	2,251.68	721	946	677	1.17	790	2,252.59
239	Left	333,530	43	396	1,359	2.63	3,570	2,252.44	23	408	1,640	2.93	4,810	2,253.20
	Right		531	754	263	1.25	330	2,252.56	517	757	466	1.70	790	2,253.43
240	Main	334,105	57	567	2,446	1.59	3,900	2,252.70	44	570	2,885	1.94	5,600	2,253.55

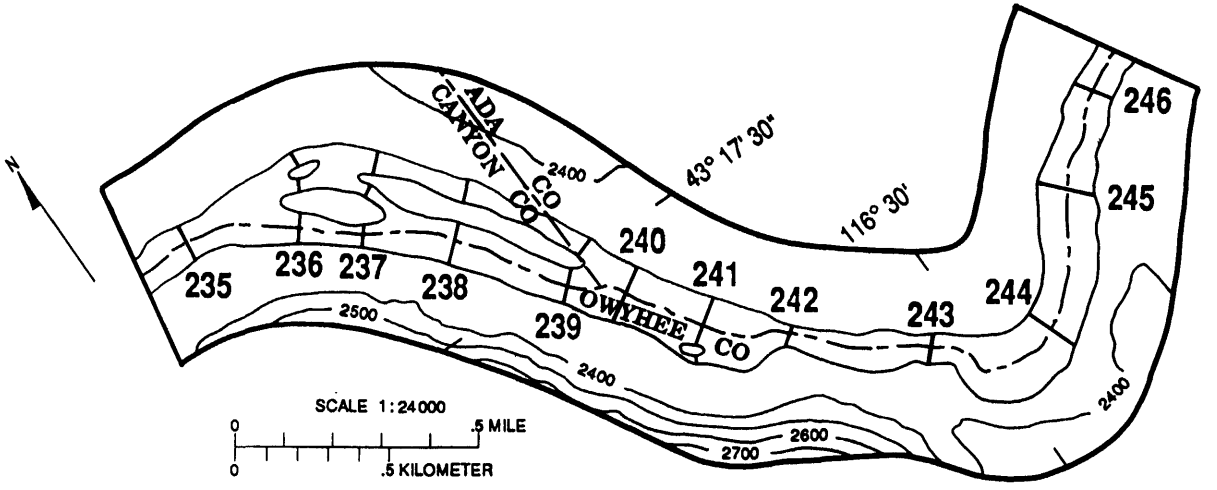

Figure 4.—Locations of cross sections (study subreach U) of the Snake River—Continued.

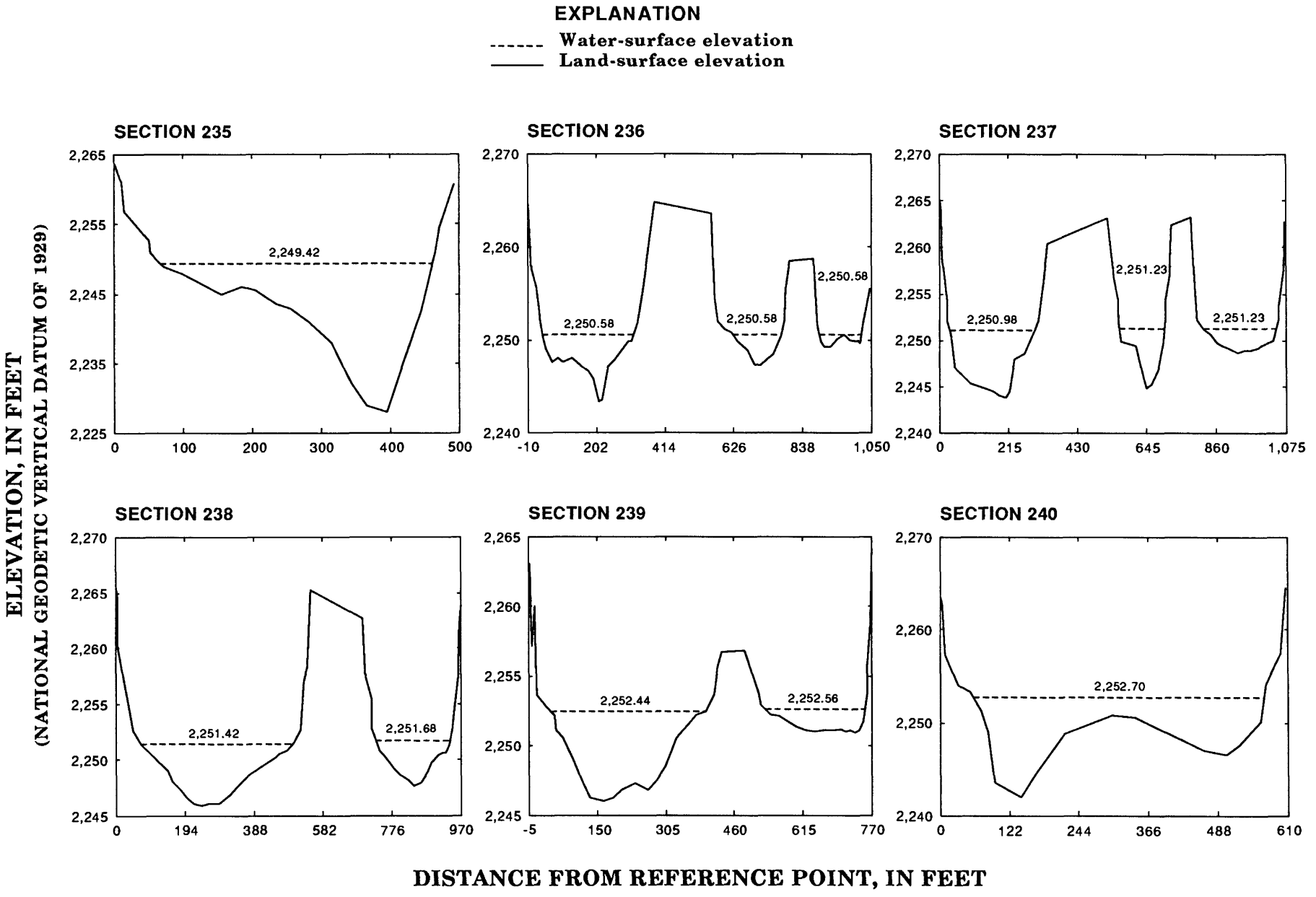

Figure 5.—Water- and land-surface elevations at cross sections (study subreach U) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach U)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
241	Left	334,836	25	130	180	0.67	120	2,252.80	16	138	279	1.00	280	2,253.68
	Right		262	784	5,661	0.67	3,780	2,252.80	250	790	6,129	0.87	5,320	2,253.68
242	Main	335,860	27	259	5,165	0.76	3,900	2,252.85	20	263	5,378	1.04	5,600	2,253.75
243	Main	337,304	27	314	5,767	0.68	3,900	2,252.89	24	316	6,035	0.93	5,600	2,253.82
244	Main	338,612	462	598	1,442	2.70	3,900	2,254.65	68	615	1,865	3.00	5,600	2,255.91
245	Main	340,077	43	308	1,566	2.49	3,900	2,256.32	31	582	2,036	2.75	5,600	2,257.58
246	Main	341,126	43	469	2,030	1.92	3,900	2,258.09	22	508	2,877	1.95	5,600	2,259.91

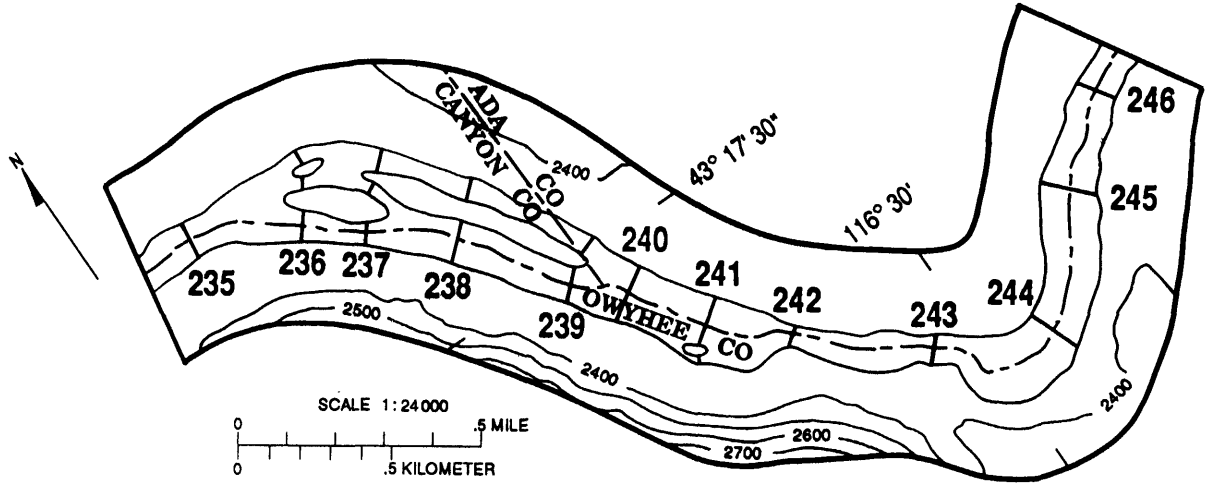

Figure 4.—Locations of cross sections (study subreach U) of the Snake River—Continued.

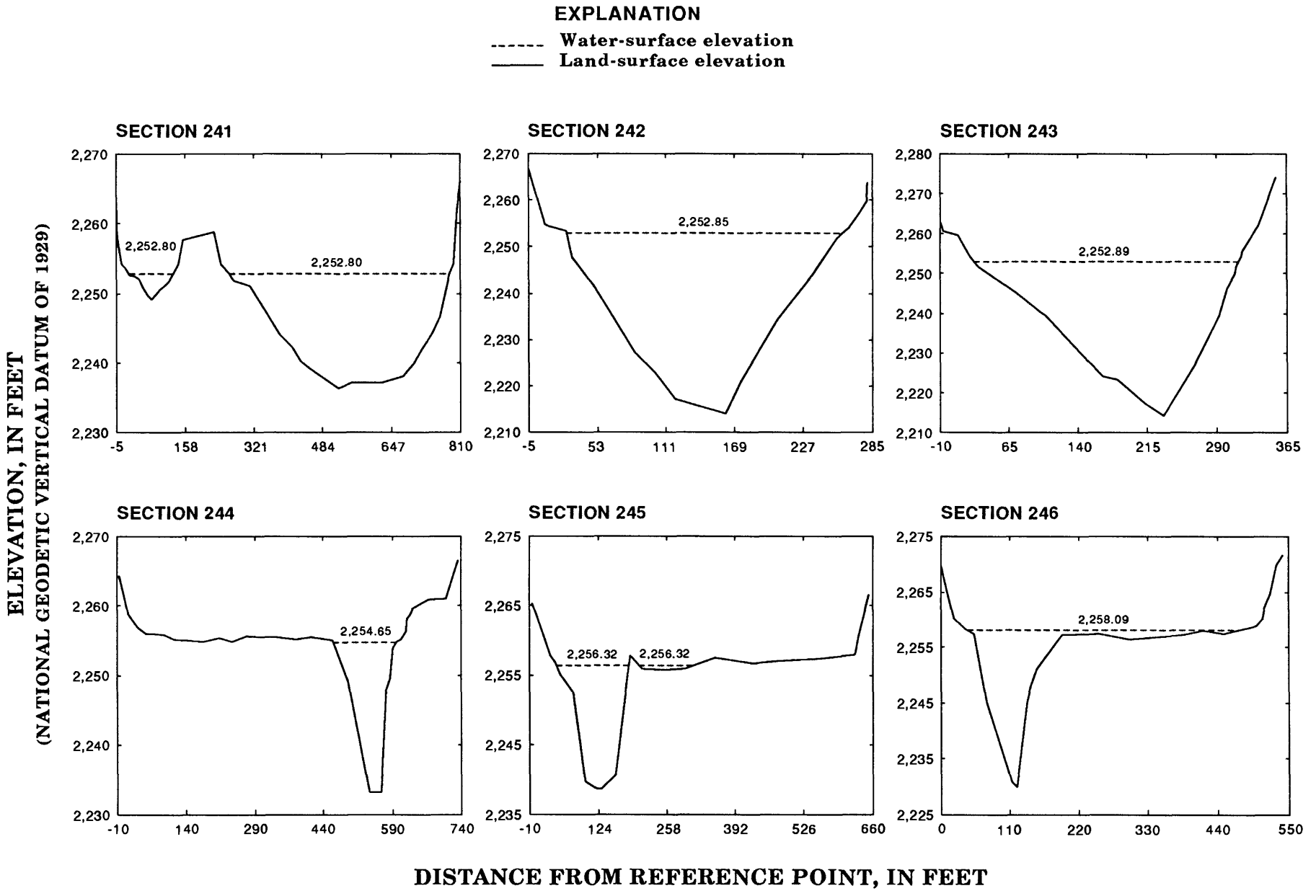

Figure 5.—Water- and land-surface elevations at cross sections (study subreach U) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach V)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
247	Main	342,544	178	408	2,424	1.61	3,900	2,258.59	41	448	3,022	1.85	5,600	2,260.30
248	Main	343,814	101	372	1,285	3.04	3,900	2,258.92	71	416	1,783	3.14	5,600	2,260.52
249	Main	345,209	43	237	1,458	2.68	3,900	2,259.95	23	403	2,014	2.78	5,600	2,261.74
250	Main	346,002	19	247	1,875	2.08	3,900	2,261.38	13	393	2,503	2.24	5,600	2,263.63
251	Main	347,423	51	330	3,413	1.14	3,900	2,261.55	41	333	4,069	1.38	5,600	2,263.84
252	Main	348,645	110	288	3,347	1.17	3,900	2,261.61	68	324	3,834	1.46	5,600	2,263.93

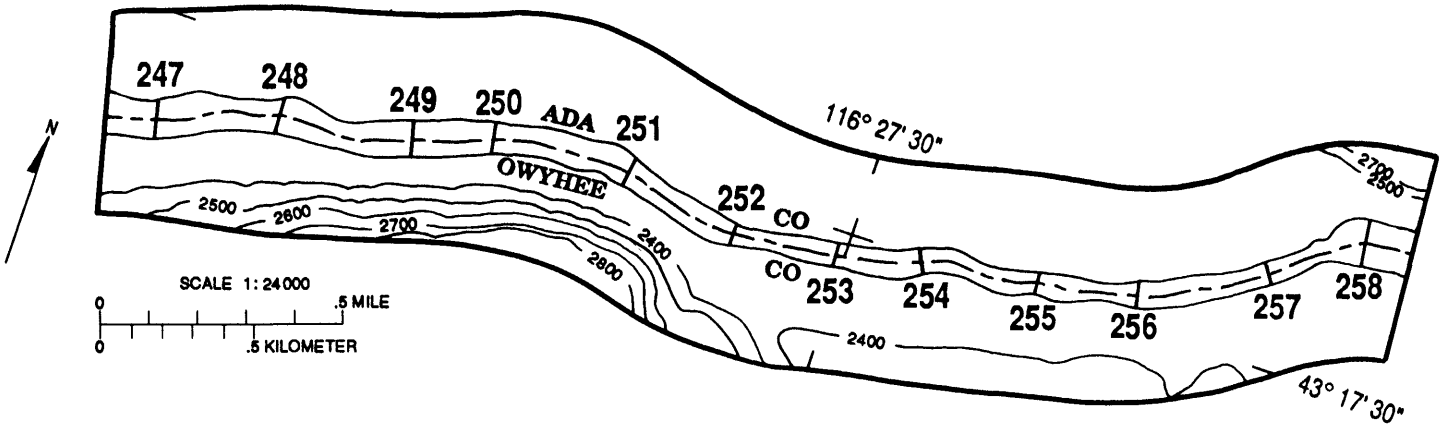

Figure 4.—Locations of cross sections (study subreach V) of the Snake River—Continued.

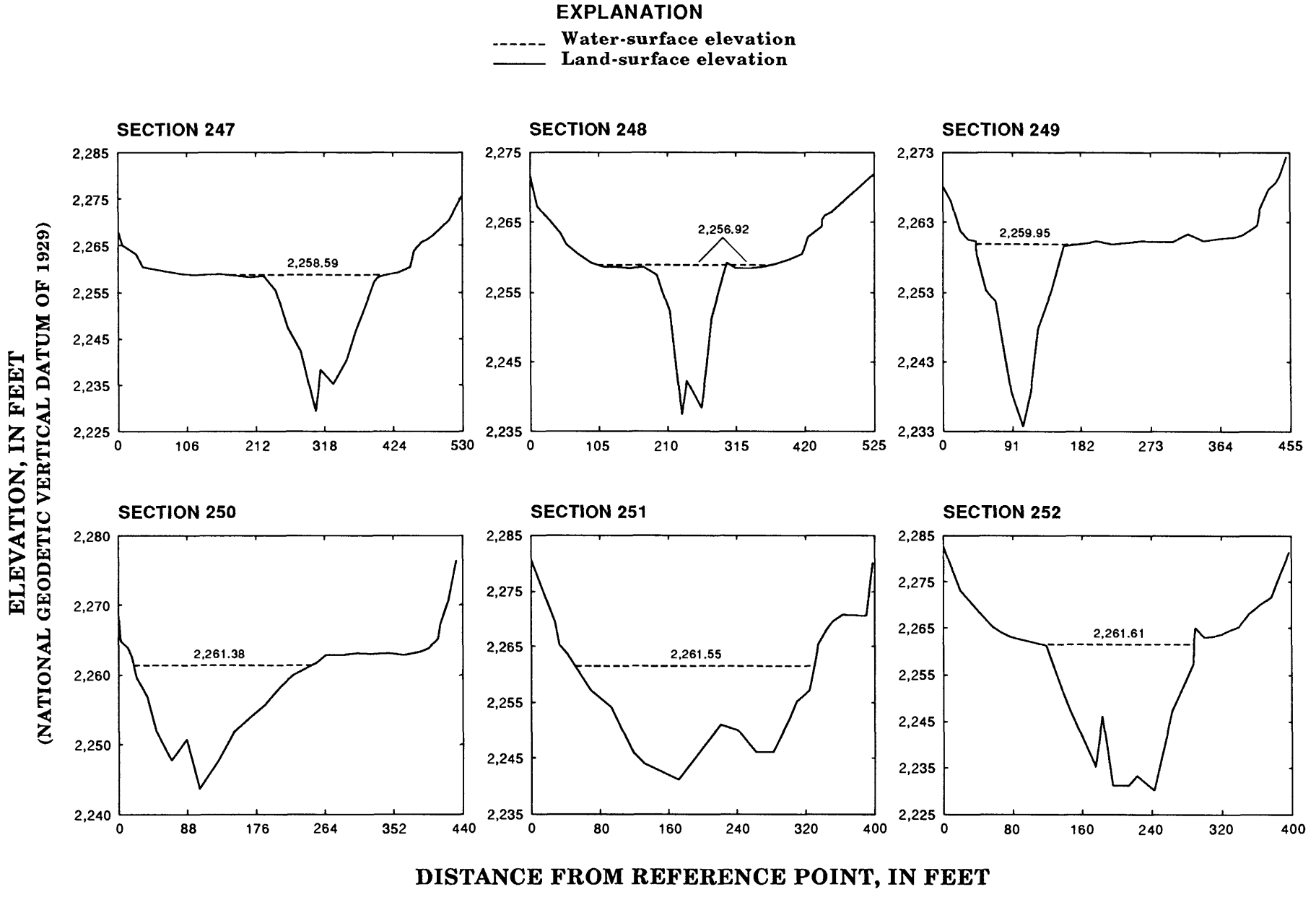

Figure 5.—Water- and land-surface elevations at cross sections (study subreach V) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach V)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
253	Main	349,677	35	313	3,836	1.02	3,900	2,261.65	30	319	4,495	1.25	5,600	2,263.99
254	Main	350,534	127	268	2,144	1.82	3,900	2,261.66	53	274	2,520	2.22	5,600	2,264.01
255	Main	351,748	139	288	2,659	1.47	3,900	2,261.73	127	291	3,027	1.85	5,600	2,264.11
256	Main	352,741	183	291	1,152	3.39	3,900	2,262.82	105	340	1,496	3.74	5,600	2,265.48
257	Main	354,057	128	253	1,027	3.80	3,900	2,264.04	72	257	1,407	3.98	5,600	2,266.55
258	Main	355,106	33	463	1,233	3.16	3,900	2,268.41	27	472	1,578	3.55	5,600	2,269.20

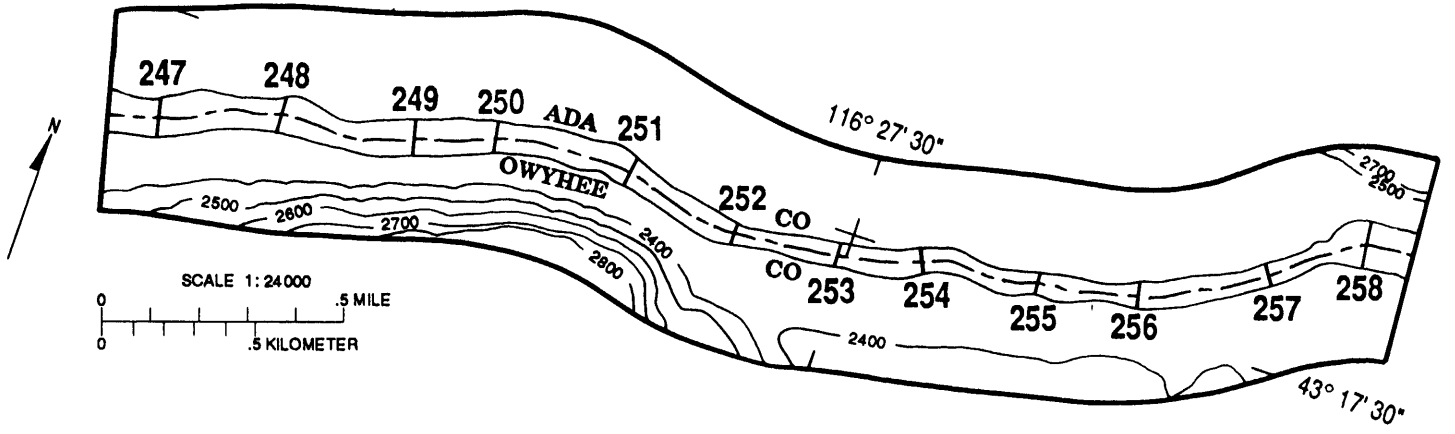

Figure 4.—Locations of cross sections (study subreach V) of the Snake River—Continued.

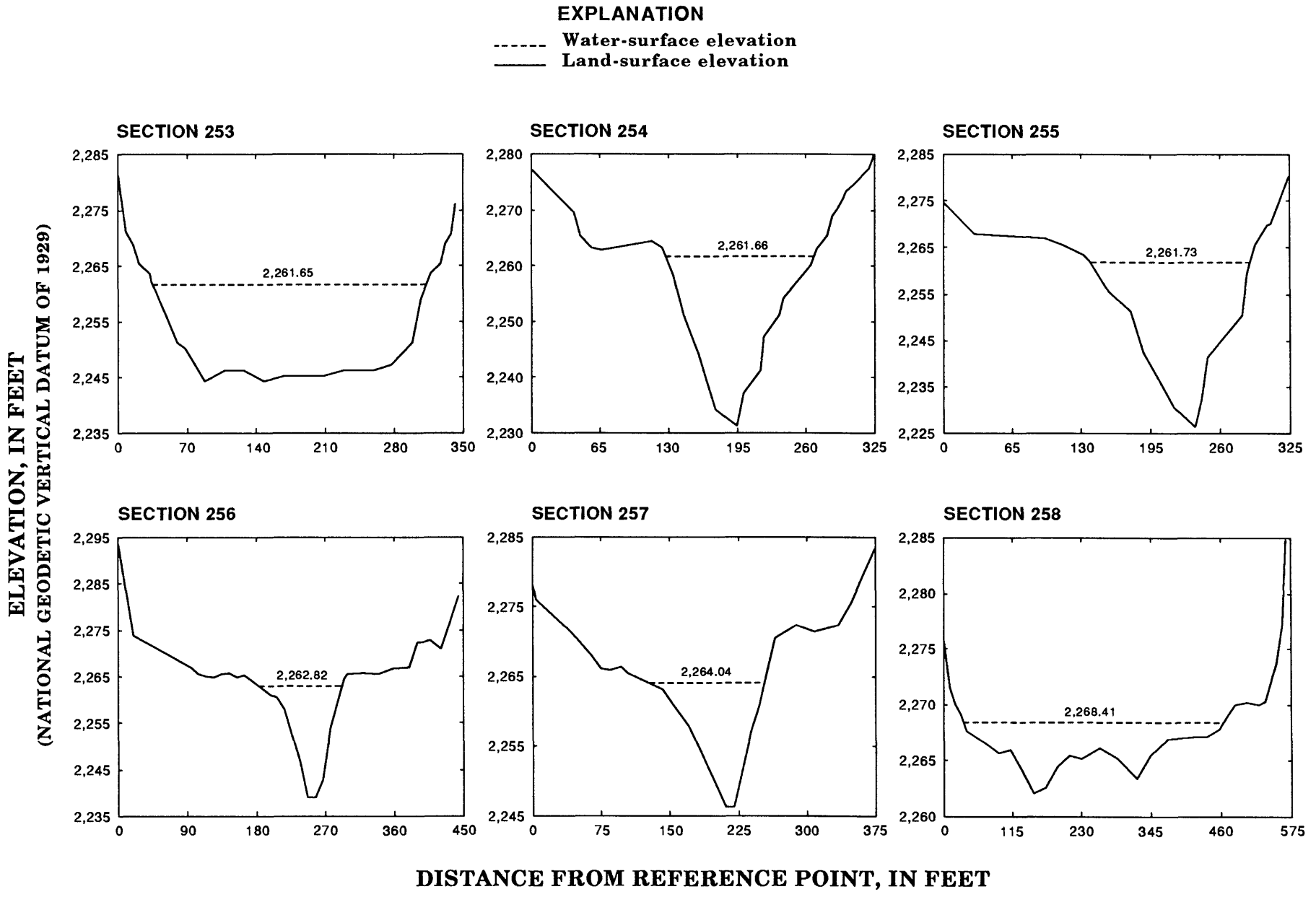

Figure 5.—Water- and land-surface elevations at cross sections (study subreach V) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach W)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
259	Left	356,277	7	102	111	0.54	60	2,270.66	-2	114	180	0.67	120	2,271.31
	Mid		166	429	944	3.86	3,640	2,270.14	164	436	1,118	4.56	5,100	2,270.79
	Right		505	557	56	3.60	200	2,270.14	501	559	91	4.18	380	2,270.79
260	Left	357,148	88	181	97	0.62	60	2,270.84	79	194	163	0.74	120	2,271.46
	Right		409	701	1,545	2.48	3,840	2,270.84	407	701	1,762	3.11	5,480	2,271.58
261	Main	357,968	22	449	1,335	2.92	3,900	2,271.50	14	459	1,569	3.57	5,600	2,272.04
262	Main	358,843	340	720	1,387	2.81	3,900	2,272.25	336	723	1,608	3.48	5,600	2,272.83
263	Main	359,726	106	791	1,591	2.45	3,900	2,273.11	103	792	2,025	2.77	5,600	2,273.76
264	Main	360,622	28	520	2,557	1.53	3,900	2,273.80	23	529	2,873	1.95	5,600	2,274.43

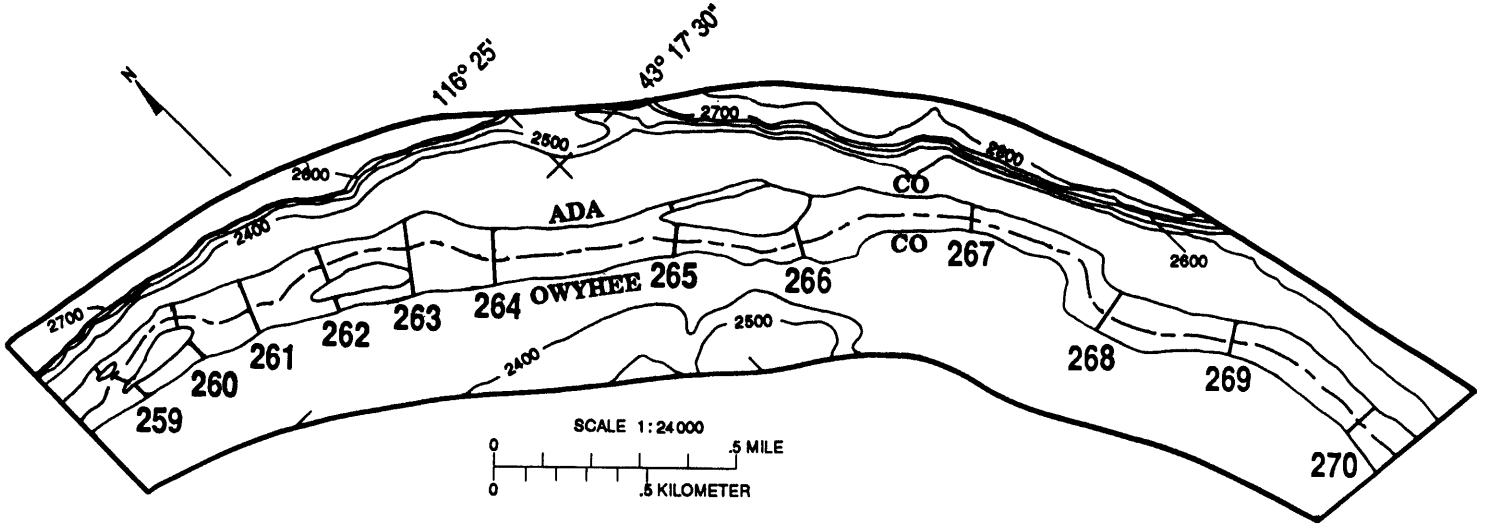

Figure 4.—Locations of cross sections (study subreach W) of the Snake River—Continued.

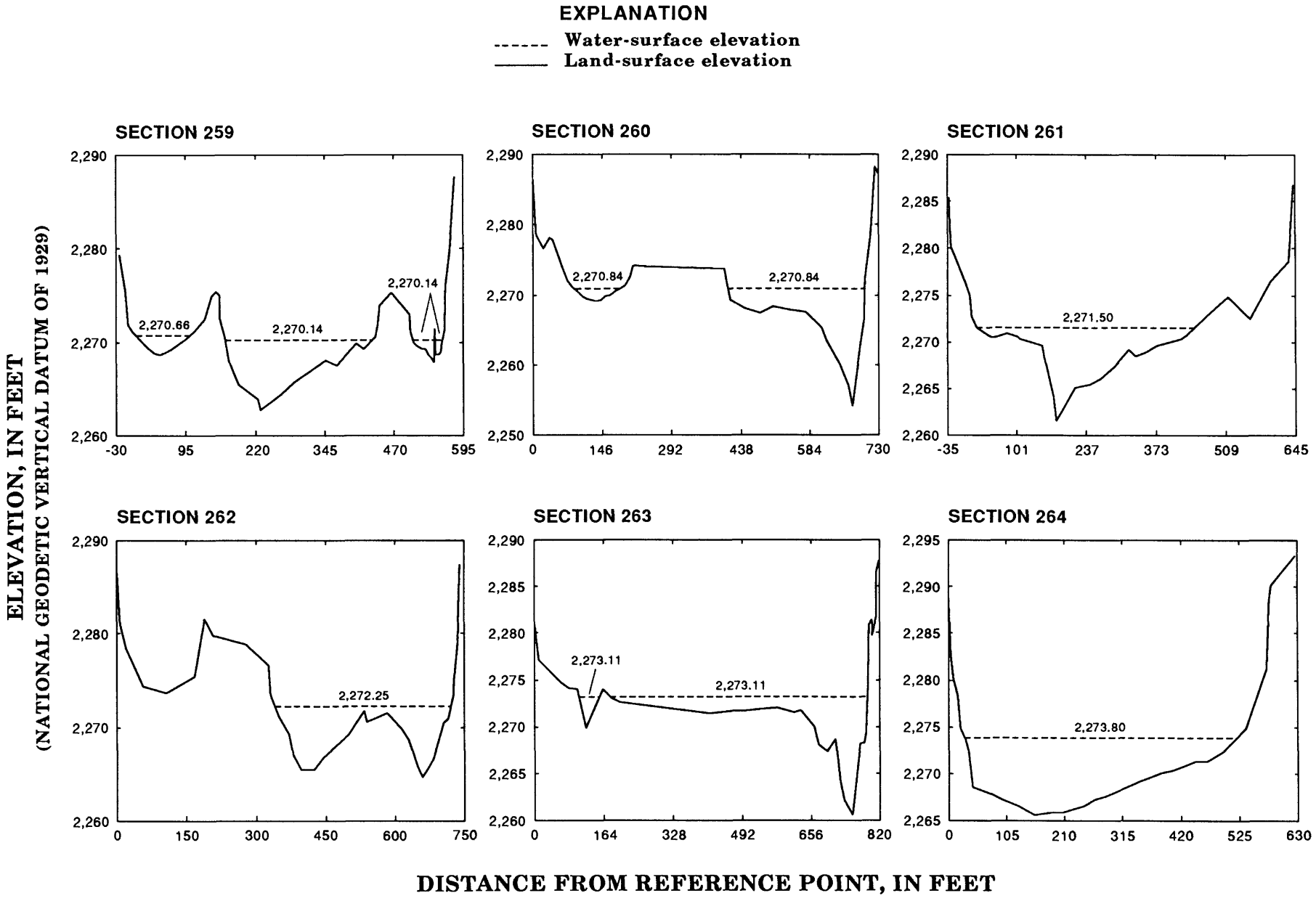

Figure 5.—Water- and land-surface elevations at cross sections (study subreach W) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach W)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
265	Main	362,508	70	401	2,487	1.57	3,900	2,273.92	65	408	2,723	2.06	5,600	2,274.62
266	Main	363,736	27	252	2,248	1.73	3,900	2,273.98	22	275	2,425	2.31	5,600	2,274.72
267	Main	365,588	73	254	2,581	1.51	3,900	2,274.06	70	259	2,728	2.05	5,600	2,274.85
268	Main	367,428	39	388	1,778	2.19	3,900	2,276.62	31	511	2,315	2.42	5,600	2,278.13
269	Main	368,748	77	423	2,031	1.92	3,900	2,276.96	47	452	2,575	2.18	5,600	2,278.43
270	Main	370,339	121	421	2,234	1.75	3,900	2,277.19	82	429	2,693	2.08	5,600	2,278.63

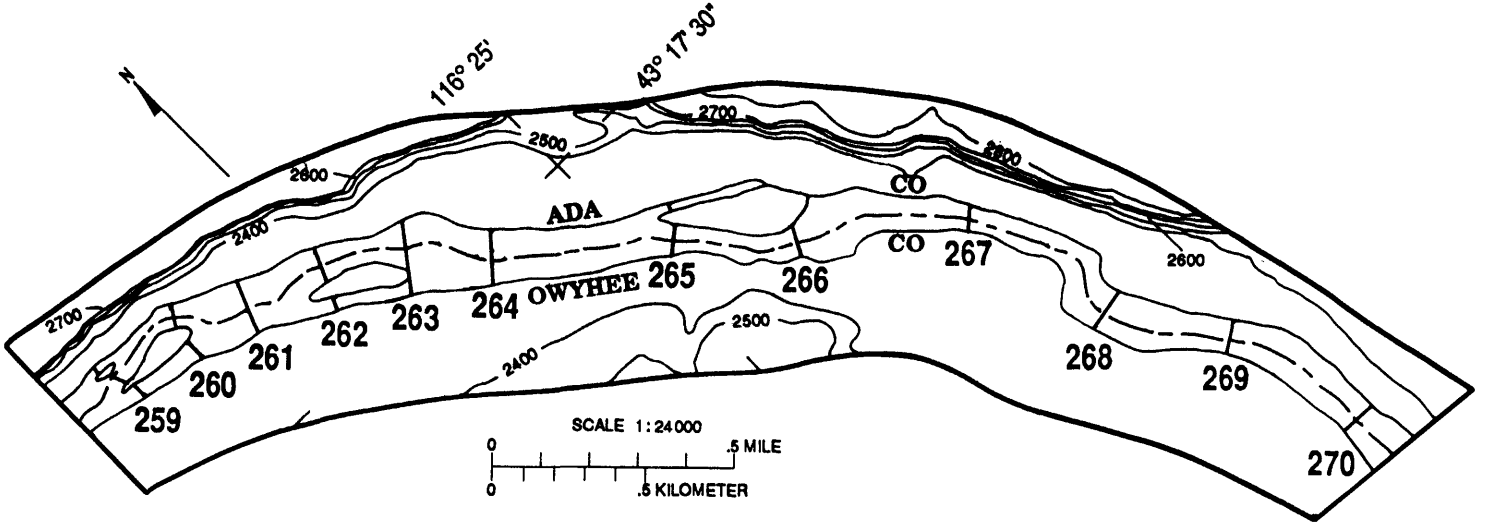

Figure 4.—Locations of cross sections (study subreach W) of the Snake River—Continued.

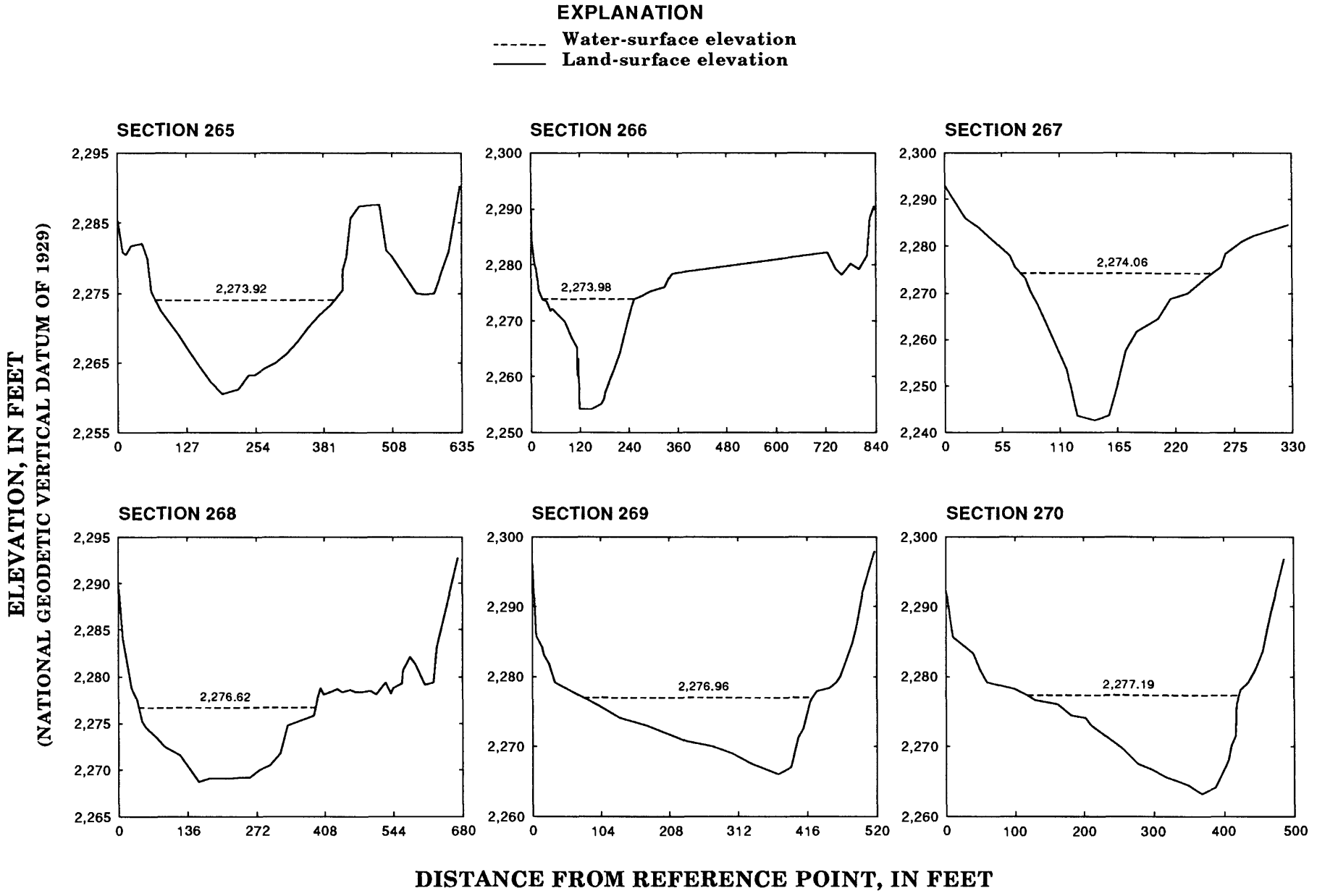

Figure 5.—Water- and land-surface elevations at cross sections (study subreach W) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach X)*—Continued

			3,900 cubic feet per second						5,600 cubic feet per second					
XSID	Channel	SRD	LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
271	Main	371,847	611	775	1,410	2.77	3,900	2,277.51	601	777	1,670	3.35	5,600	2,279.04
272	Main	372,890	41	541	5,219	0.75	3,900	2,277.85	34	549	6,055	0.92	5,600	2,279.50
273	Main	373,977	60	229	2,425	1.61	3,900	2,278.01	48	259	2,739	2.04	5,600	2,279.73
274	Main	374,953	108	218	1,337	2.92	3,900	2,278.17	106	308	1,584	3.53	5,600	2,280.05
275	Main	376,186	158	229	1,121	3.48	3,900	2,278.25	154	233	1,266	4.42	5,600	2,280.19
276	Main	377,483	27	202	2,394	1.63	3,900	2,279.49	26	209	2,832	1.98	5,600	2,281.93

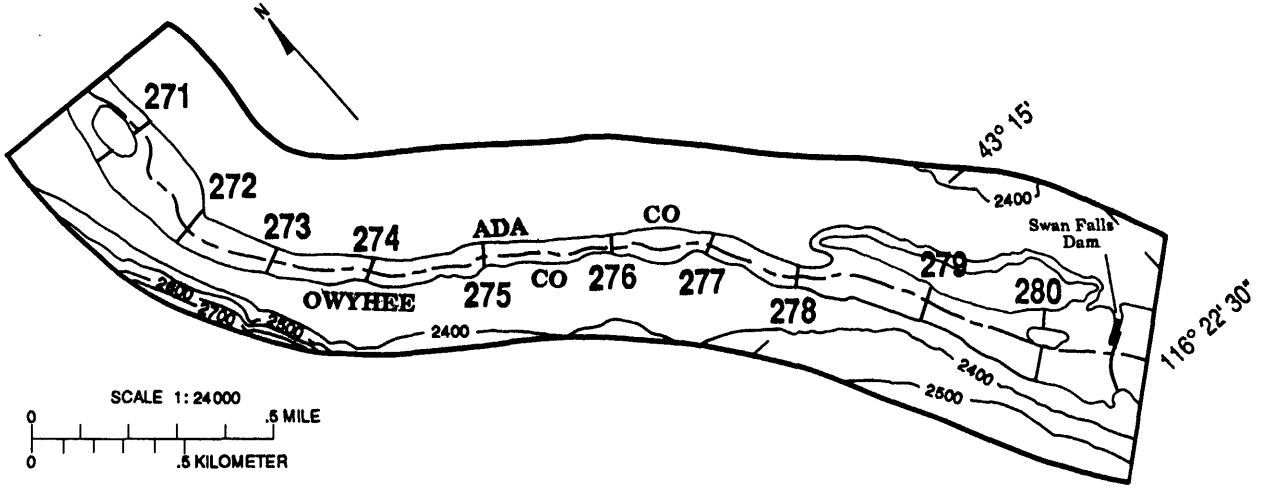

Figure 4.—Locations of cross sections (study subreach X) of the Snake River—Continued.

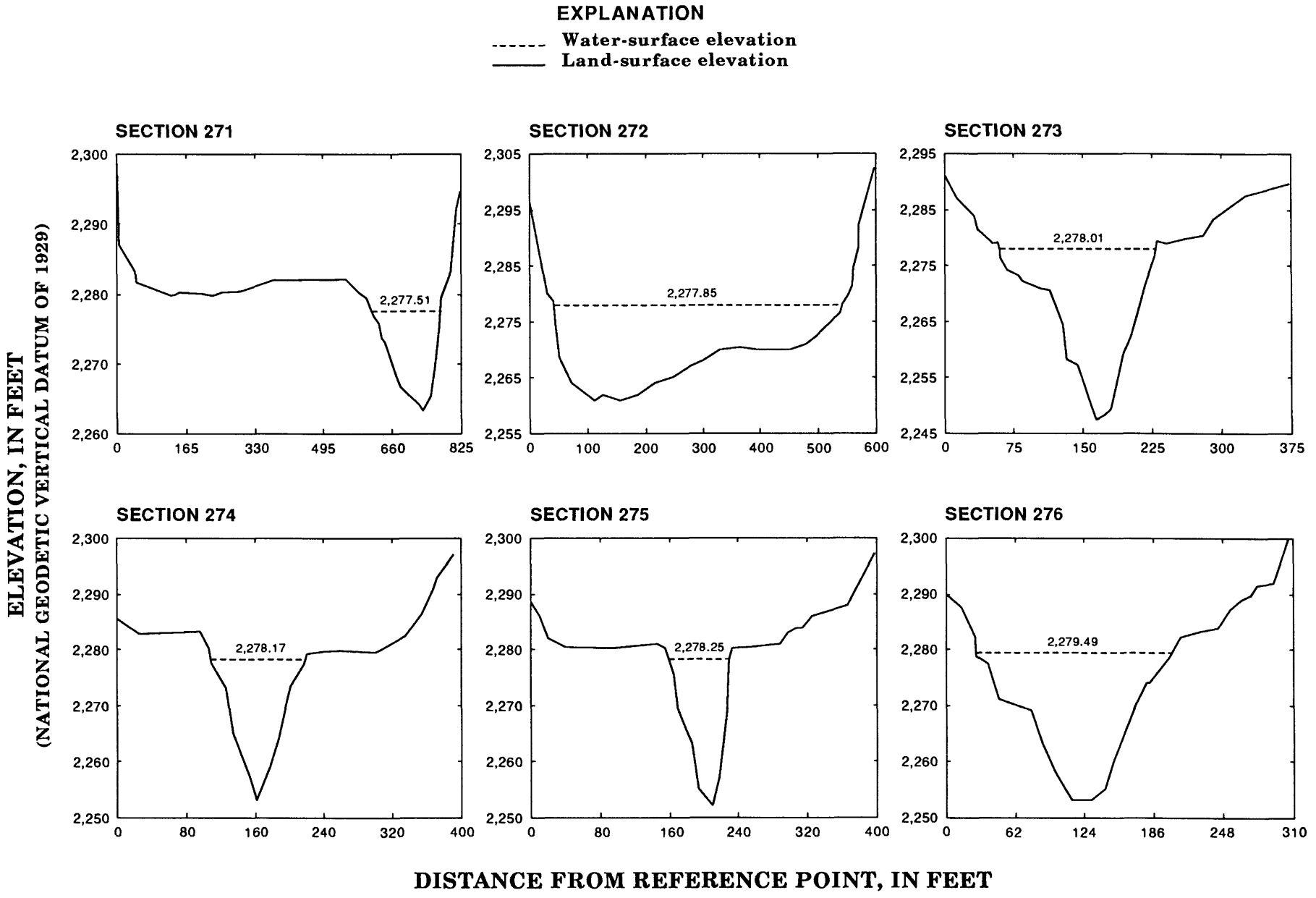

Figure 5.—Water- and land-surface elevations at cross sections (study subreach X) at a simulated discharge of 3,900 cubic feet per second—Continued.

Table 1. — *Channel and flow characteristics of simulated discharges of 3,900 and 5,600 cubic feet per second at cross sections (study subreach X)*—Continued

XSID	Channel	SRD	3,900 cubic feet per second						5,600 cubic feet per second					
			LEW	REW	Area	VEL	Q	WSEL	LEW	REW	Area	VEL	Q	WSEL
277	Main	378,518	50	204	1,657	2.35	3,900	2,279.57	39	212	2,057	2.72	5,600	2,282.02
278	Main	379,470	79	236	1,793	2.18	3,900	2,279.77	76	243	2,192	2.56	5,600	2,282.25
279	Main	380,799	126	352	720	5.41	3,900	2,282.57	115	367	1,103	5.08	5,600	2,284.17
280	Left	382,060	89	363	854	1.76	1,500	2,284.58	89	366	1,063	2.22	2,360	2,285.38
	Right		577	750	1,312	1.83	2,400	2,284.58	576	753	1,451	2.23	3,240	2,285.38

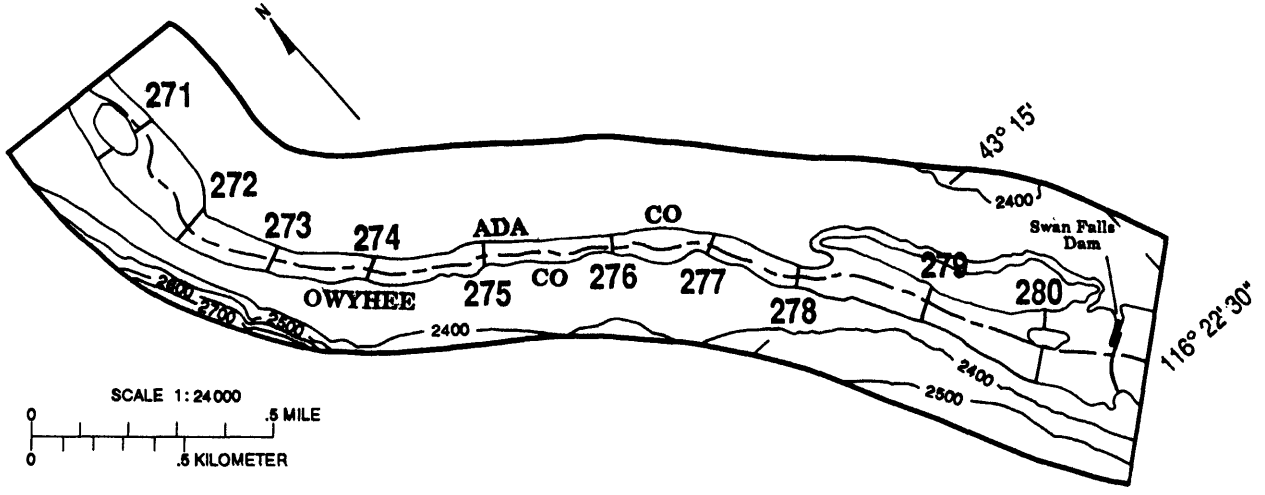

Figure 4.—Locations of cross sections (study subreach X) of the Snake River—Continued.

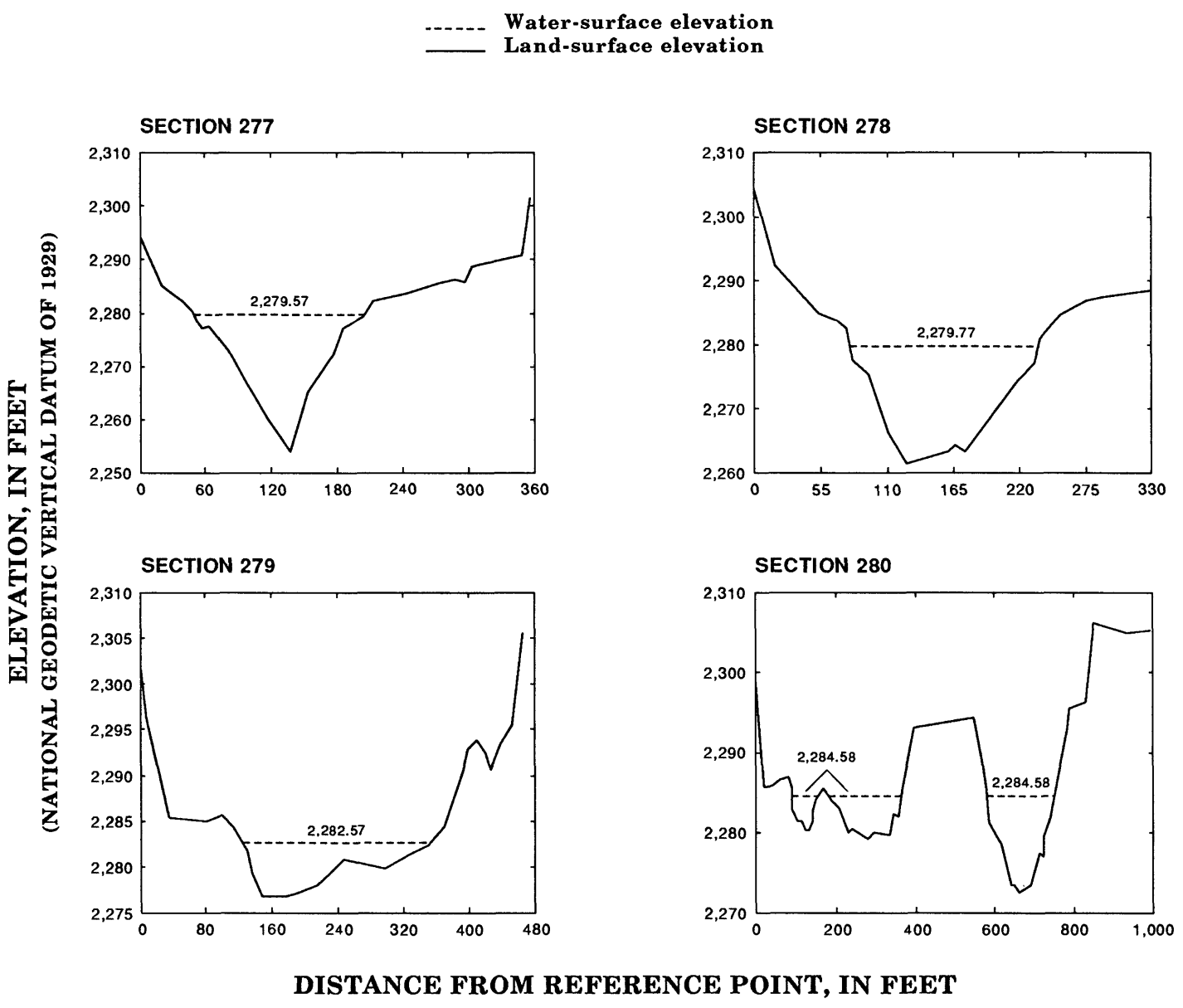

Figure 5.—Water- and land-surface elevations at cross sections (study subreach X) at a simulated discharge of 3,900 cubic feet per second—Continued.