STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES AND ENERGY

Technical Publication No. 74

SEEPAGE STUDY OF THE SEVIER RIVER AND THE CENTRAL UTAH, MCINTYRE, AND LEAMINGTON CANALS, JUAB AND MILLARD COUNTIES, UTAH

by

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Prepared by
the United States Geological Survey
in cooperation with the
Utah Department of Natural Resources and Energy,
Division of Water Rights

1982

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CONVERSION FACTORS

Most values are given in this report in inch-pound units followed by metric (SI) units. The conversion factors are shown to four significant figures. In the text, however, the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the value in inch-pound units.

Inch pound			Metric	
Unit (Multiply)	Abbreviation	(by)	Unit (to obtain)	Abbreviation
Cubic foot per second	ft^3/s	0.02832	Cubic meter per second	m^3/s
Cubic foot per second per mile	$(ft^3/s)/mi$	0.01760	Cubic meter per second per kilometer	$(m^3/s)/km$
Foot	ft	0.3048	Meter	m
Mile	mi	1.609	Kilometer	km

Water temperature is given in degrees Celsius (^oC), which can be converted to degrees Fahrenheit (^oF) by the following equation: $^oF=1.8(^oC)+32$.

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ABSTRACT

A study of the gains or losses of the Sevier River and the Central Utah, McIntyre, and Leamington Canals in the Leamington area, in Juab and Millard Counties, Utah, was made to determine changes in those reaches. Three to seven sets of seepage measurements made during 1980 were used in the analysis. Adjustments for fluctuations in flow were made from information obtained from water-stage recorders operated at selected locations during the time of each seepage run.

The study showed an overall net gain of about 9 cubic feet per second (0.25 cubic meter per second) in the Sevier River and about 1.3 cubic feet per second (0.04 cubic meter per second) in the Leamington Canal. It also showed a net loss of about 7 cubic feet per second (0.20 cubic meter per second) in the Central Utah Canal and about 0.8 cubic foot per second (0.02 cubic meter per second) in the McIntyre Canal. The gains in the Sevier River and Leamington Canal probably come chiefly as return seepage of water lost from the Central Utah and McIntyre Canals.

INTRODUCTION

This report gives the results of river and canal seepage studies made in the Leamington area, in Juab and Millard Counties, Utah. The study (fifth of a series) is part of the statewide water-resources program conducted by the U.S. Geological Survey in cooperation with the Utah Department of Natural Resources and Energy, Division of Water Rights. Information on canal and river gains or losses is needed by water managers, particularly the Division of Water Rights, for allocating water along irrigation systems. Detailed investigation of irrigation systems can aid in locating the loss or gain sections of the system.

GENERAL DESCRIPTION OF THE RIVER AND CANAL SYSTEMS

This report describes 30.6 miles (49.2 km) of the Sevier River near Leamington, Utah (fig. 1), which has an average annual regulated discharge of 223 cubic feet per second (6.32 m^3/s) from 1911 to 1979 (U.S. Geological Survey, 1980, p. 508) and is the main aqueduct into the Sevier Desert area; 13 miles (21 km) of Central Utah Canal (fig. 2), which has a capacity of about 250 cubic feet per second (7.1 m^3/s); 7.7 miles (12 km) of McIntyre Canal (fig. 3), which has a capacity of about 25 cubic feet per second (0.7 m^3/s); and 5.3 miles (8.5 km) of Leamington Canal (fig. 4), which has a capacity of about 35 cubic feet per second (1.0 m^3/s). Water is diverted to the canals from the Sevier River for irrigation on local benchlands and in the Sevier Desert.

Unconsolidated deposits ranging in age from Pleistocene to Holocene and consisting of fine sand to coarse gravel underlie most measured reaches of the above-mentioned system. Local exceptions are at the mouth of Leamington Canyon where sections of the Sevier River and Central Utah and McIntyre Canals are underlain by consolidated rocks mostly of Paleozoic and Mesozoic age (Mower and Feltis, 1968, p. 12).

Ground water in the area generally moves westward with local components of movement toward the Sevier River (Mower and Feltis, 1968, pl. 4). During this study numerous small seeps and springs were observed along the banks of the Sevier River. These springs probably are discharges of unconsumed irrigation water applied to crops on higher benches and terraces. The water apparently seeps to a poorly permeable zone and moves laterally along the zone to where it discharges. This indicates that the Sevier River and some sections of the canals downstream from irrigated lands may gain water from the seeps and springs during the irrigation season and possibly the entire year.

METHODS OF INVESTIGATION

A reconnaissance of the area was made in the fall of 1979. The sections of the river and canals selected for the study were examined for: (1) The location of controls, turnouts, or other diversion structures and for bridges; (2) the general condition of the river and canals (for example, whether the canals had been recently cleaned or other maintenance had been performed); and (3) the location of areas of natural and irrigation-return flow to the river and canals.

Using the information from the reconnaissance, the selected sections of the river and canals were divided into reaches, and measuring sites were selected within each reach. Water-stage recorders were operated at selected sites, mainly at the start and end of each reach. Because of the depth of the Central Utah Canal, it was necessary to locate measuring sites at existing bridges or to construct measuring bridges. Measurements of the river were made during low flow when it was possible to wade across the channel.

Seven sets of seepage measurements were made along Central Utah Canal during 1980--on September 11, 23, and 24, October 8 and 9, and November 20 and 21. The study section of the river had 13 selected measurement sites.

Four sets of seepage measurements were made along Central Utah Canal during 1980--on May 21, June 25, August 7, and September 10. The study section of the canal had 12 selected measuring sites.

Three sets of seepage measurements were made along McIntyre and Leamington Canals during 1980--on June 12 and 24, and August 6. Each set contained seven selected measurement sites for each canal.

Measurements of discharges in selected sections were made with a current meter, using methods adopted by the U.S. Geological Survey. Each person was assigned a reach for each day in which the required number of measurements could be completed. In each reach, measurements were made at all selected measuring sites, including both ends of the reach, all turnouts, and all inflow points. Sites where a measurement (or estimate) was made during at least one set of seepage measurements are shown in figures 1-4. For each measurement, the date, time, discharge, temperature, and specific conductance of the water are shown in tables 1-4.

The numbers used for the turnouts in figures 1-4 (for example, T2) were assigned in a downstream order to only those turnouts used on respective canals. Continuous water-stage records were obtained for each reach and are shown in figures 5-8.

PROCEDURES USED IN COMPUTING GAINS AND LOSSES

The results of the seepage measurements for reaches of the river and canals are given in table 5. The procedures used to obtain these results are described in the following pages.

A computation was made of the flow that would be expected at each main channel measuring site, assuming no loss or gain. Beginning with the flow at the head of each reach and proceeding in a downstream sequence, all turnout flows were subtracted. The computed value at each site was then adjusted for fluctuations in canal flow that originated upstream from the reach being analyzed. Information required to make this adjustment is the change in flow with time at the head of the reach, the time of measurements at the head of the reach and the downstream measuring site, and the time required for passage of water from the head of the reach to the downstream site.

The change in flow with time at the head of the reach was determined from the recorded gage height and the discharge measurement at the head of each reach. The times of the two measurements are available from tables 1-4, and the time of travel between the two points was determined from the stage recorders at or near the ends of each reach.

As an example, assume that the measurement at the head of the reach was 200 cubic feet per second (5.66 m^3/s) at 0800 hours, the measurement at the downstream measuring site was made at 1000 hours, the time required for flow to travel between the two sites is 1 hour, and the discharge at the head of the reach was decreasing at the rate of 5 cubic feet per second (0.1 m^3/s) per hour. To make the adjustment, the travel time is subtracted from the time of the downstream flow at the head of the reach. From the gage-height records and the measurements available for the head of the reach, the flow at 0900 hours was calculated at 195 cubic feet per second (5.5 m^3/s), or an adjustment of -5 cubic feet per second (-0.1 m^3/s). This adjustment was then applied to the computed value of the downstream measuring site.

The computed value was then subtracted from the measured value to determine the amount of gain or loss between the head of the reach and the downstream measuring site. The amount of gain or loss was then plotted as a function of distance downstream from the head of the reach. This was done for each main channel measuring site for each set of measurements.

In some instances, depending on the rate of gain or loss or the scatter of plotted points, the canals were segmented into shorter reaches. The data for each of the newly defined reaches were then plotted in figures 9-11 with the gain or loss at each main canal measuring site plotted as a function of distance from the head of the reach. A straight line was fitted through the plotted points for each reach, and the amount and rate of gain or loss from the reach were determined from this line. The amount and rate of gain or loss by reach are shown in table 5.

Within a given reach, the amount of gain or loss varied in each set of seepage measurements and among the several sets of measurements. This variation is shown by the scatter of the plotted points in figures 9-11. The scatter is attributed to one or more of the following: (1) Poor measuring conditions, (2) changes in the rate of seepage loss from the canal, (3) changes in the rate of seepage return to the canal of ground water and unconsumed irrigation water, (4) the inability to adjust completely for fluctuations in the amount of flow within a given reach, and (5) the possibility that a water user changed the flow in his turnouts during the time of the measurements.

EVALUATION OF THE RIVER AND CANAL SYSTEMS

Sevier River

Seven seepage runs were made on the Sevier River (fig. 1) and except for the first run the flow was about 50 cubic feet per second (1.4 m^3/s) downstream from the Central Utah Canal diversion. Most reaches that were studied had small gains or losses, although the reaches in the downstream section of the river were relatively stable. The net gain was about 9 cubic feet per second (0.25 m^3/s) with reaches of maximum gains of about 8 cubic feet per second (0.23 m^3/s) and maximum losses of about 4 cubic feet per second (0.11 m^3/s). The following is a brief description of each reach studied and the calculated change. (See also fig. 9.)

Reach SR1-SR2.--Site SR1 is about 300 feet (90 m) upstream from the State Highway 132 bridge over the Sevier River. The site is located where consolidated rocks crop out in the river bottom. A water-stage recorder was operated at this site to monitor changes of flow during the study. Site SR2 is about 200 feet (60 m) upstream from the Leamington Canal diversion. The river at this point is underlain by unconsolidated deposits of coarse gravel. Both the Central Utah and McIntyre Canals divert water in this reach. The measurements at site SR2 showed some scatter and indicated a loss of about 4 cubic feet per second (0.11 m^3/s) or 1.0 cubic feet per second per mile [0.02 $(m^3/s)/km$]. A possible explanation for the loss could be underflow passing site SR2 through the coarse gravel deposits.

Reach SR2-SR7.--Site SR7 is located about 100 feet (30 m) upstream from the bridge over the river at the southeast corner sec. 5, T. 15 S., R. 4 W., about 2 miles (3 km) northwest from Leamington. A water-stage recorder operated at this site was used to monitor changes in flow. This reach, which is underlain mainly by gravel and includes the Leamington Canal diversion, had a net gain of about 8 cubic feet per second (0.2 m^3/s) or 0.7 cubic foot per second per mile [0.01 $(m^3/s)/km$]. Some inflow from a swampy area was observed 400 feet (120 m) downstream from site SR2. The largest measured gains made in this reach were during the seepage run of September 23, and the smallest during the seepage run of November 20 (fig. 9). Gains in this reach of the river correspond to losses in the Central Utah Canal from its head to site CU6 (table 5). This indicates that seepage from this section of the canal probably eventually returns to the river.

Reach SR7-SR9.--Site SR9 is upstream from the bridge on the county road about 2 miles (3 km) east of Lynndyl. The measurements showed a net gain of about 5 cubic feet per second (0.1 m^3/s) or 1.4 cubic feet per second per mile [0.025 $(m^3/s)/km$] for this reach, which is the largest gain measured per unit length of river. The specific conductance increased an average of about 300

micromhos per centimeter at 25° Celsius in this reach (table 1), which indicates the specific conductance of the inflow was about 4,700 micromhos per centimeter at 25° Celsius. A possible explanation for this gain is unconsumed irrigation water moving from irrigated upland areas to the river through permeable unconsolidated deposits. (See Mower and Feltis, 1968, p. 27.)

Reach SR9-SR13.--Site SR13 is a long-term gaging station on the Sevier River about 3 miles (4.8 km) southwest of Lynndyl and was used to help monitor changes of flow during the study. The measurements in this reach had some scatter, but the net change indicated no detectable gain or loss. A pond on the right bank of the river between sites SR9 and SR10 does contribute inflow to this reach at times.

Central Utah Canal

Twelve measurement sites were selected throughout the 13 miles (21 km) of Central Utah Canal and four sets of measurements were made (fig. 2). Individual reaches that were studied had small gains or losses. The net loss was about 7 cubic feet per second (0.2 m^3/s) with reaches of maximum gains of about 2 cubic feet per second (0.06 m^3/s) and maximum losses of about 4 cubic feet per second (0.11 m^3/s). The range of flows during the study was from about 100 to 240 cubic feet per second (2.8 to 6.8 m^3/s) with an average of 180 cubic feet per second (5.1 m^3/s). The following is a brief description of each reach studied and the calculated changes (fig. 10).

Reach CU1-CU3.--Site CU1 is at a foot bridge constructed for measuring the canal about 500 feet (150 m) downstream from the head of the canal. Site CU3 is at a foot bridge constructed for measuring and is located about 600 feet (180 m) east of the head of the Leamington Canal (fig. 2). At site CU2 a water-stage recorder was used to monitor the change of water stages in the canal during the study. The measurements show considerable scatter. The net change was a loss of about 1 cubic foot per second (0.03 m^3/s) or 0.6 cubic foot per second per mile [0.01 $(m^3/s)/km$], which is less than 1 percent of the average measured discharge. The canal in this reach is cut into unconsolidated deposits underlain by fractured consolidated rocks with near vertical dips. Water probably moves through the unconsolidated deposits into the fractured consolidated rocks. The water then moves along these fractures to discharge points in the canyon bottom where it discharges to unconsolidated deposits, moves upward through these deposits, and eventually returns to the Sevier River.

Reach CU3-CU6.--Site CU6 is at a county road bridge near the south edge of sec. 11, T. 15 S., R. 4 W. A water-stage recorder was installed at this site to monitor conditions during the study. The measurements showed considerable scatter for this reach and indicated a net loss of about 4 cubic feet per second (0.1 m^3/s) or 1.0 cubic foot per second per mile [0.2 $(m^3/s)/km$], which is about 2 percent of the average measured discharge. The canal in this reach is cut through fractured consolidated rocks with near vertical dips. Water probably moves through these fractures and, like the previous reach, is eventually discharged to the river or to the Leamington Canal.

Reach CU6-CU9.--Site CU9 is at a county road bridge about 2 miles (3 km) southwest of Leamington. The measurements showed considerable scatter for this reach. The June 25 and August 7, 1980, measurements at site CU9 were not used because of poor measuring conditions on those days. The net change in

this reach was a loss of about 4 cubic feet per second (0.11 m^3/s) or 1 cubic foot per second per mile [0.02 $(m^3/s)/km$], which is about 2 percent of the average measured discharge. This reach of the canal is in unconsolidated deposits. Gravel pits located about 1,000 feet (300 m) northwest of site CU6 indicate that in this reach the canal could be underlain by permeable gravel. Water moving from the canal through the gravel would probably discharge into the Leamington Canal or the Sevier River. Phreatophytes are abundant along the banks of the canal in this reach and may account for a small percentage of the calculated loss.

Reach CU9-CU12.--Site CU12 is at a county road bridge about 300 feet (90 m) upstream from the Fool Creek Reservoir diversion and was the end of the study section. A water-stage recorder was installed at site CU12 to monitor changes during the study. The measurements showed considerable scatter for this reach and indicated a gain of about 2.0 cubic feet per second (0.06 m^3/s) or 0.6 cubic foot per second per mile [0.01 $(m^3/s)/km$], which is about 1 percent of the average measured discharge. The measurement at site CU11 on September 10, 1980, was not used in this analysis because of nonideal measuring conditions. A possible explanation for the gain is unconsumed water moving through shallow unconsolidated deposits into the canal from irrigated fields upgradient and adjacent to the canal in this reach.

McIntyre Canal

Seven measurement sites were selected throughout the 7.7 miles (12 km) of the McIntyre Canal to be studied (fig. 3). Three sets of measurements were made to determine the mean loss or gain in the canal. The two reaches that were studied had small losses. The net loss for both reaches was about 0.8 cubic foot per second (0.02 m^3/s) with a maximum loss of about 0.4 cubic foot per second (0.01 m^3/s). The average flow in the canal for the study was 16.3 cubic feet per second (0.46 m^3/s). The following is a brief description of each reach studied and the calculated change (fig. 11).

Reach M1-M6.--Site M1 is at the gage where the canal diverts water from the Sevier River. The water-stage recorder was used during the study to determine changes of flow during seepage runs down the canal. Site M6 was a measuring section just downstream from the east edge of sec. 4, T. 15 S., R. 4 W. The measurements showed some scatter for this reach and indicated a net loss of about 0.4 cubic foot per second (0.01 m^3/s) or 0.1 cubic foot per second per mile [0.002 $(m^3/s)/km$], which is about 2.5 percent of the average measured discharge. This reach of the canal is cut through unconsolidated and some consolidated deposits. These deposits probably transmit the small amount of water lost from the canal to discharge points in the Sevier River.

Reach M6-M7.--Site M7 is the end of the study section of the canal located in the northeast corner sec. 5, T. 15 S., R. 4 W., and upstream from the main diversion. A recorder was operated at this site to monitor changes in the flow of the canal. The measurements indicated a net loss of about 0.4 cubic foot per second (0.01 m^3/s) or 0.3 cubic foot per second per mile [0.005 $(m^3/s)/km$], which is about 2.5 percent of the average measured discharge. A gravel pit is located several hundred feet southwest of site M6 and indicates that parts of the canal in this reach are underlain by permeable gravel. Water moving from the canal through the gravel would probably discharge into the Sevier River.

Leamington Canal

Seven measurement sites were selected throughout the 5.3 miles (8.5 km) of the Leamington Canal to be studied (fig. 4). Three sets of measurements were made to determine the mean loss or gain in the canal. Most reaches that were studied had small gains or losses. The net gain was about 1.3 cubic feet per second (0.04 m^3/s) with reaches of maximum gains of about 1.5 cubic feet per second (0.04 m^3/s) and maximum losses of about 1.8 cubic feet per second (0.05 m^3/s). The average flow in the canal for the study was 23.5 cubic feet per second (0.67 m^3/s). The following is a brief description of each reach studied and the calculated change. (See fig. 11.)

Reach L1-L2.--Site L1 is the gage where the canal diverts water from the Sevier River. The water-stage recorder at the gage was used during the study to determine change in flow while the seepage runs were being made. Site L2 was a measuring section just downstream from the west edge of sec. 5, T. 15 S., R. 3 W. The measurements showed some scatter and indicated a net gain of about 1.5 cubic feet per second (0.04 m^3/s) or 1.7 cubic feet per second per mile [0.03 $(m^3/s)/km$] for this reach, which is about 6 percent of the average measured discharge. The gain in this reach is probably the result of water seeping from the Central Utah Canal and discharging into the Leamington Canal.

Reach L2-L4.--Site L4 is downstream from a bridge on State Highway 132, 1.7 miles (2.7 km) east of Leamington. The measurements showed considerable scatter and indicated a net gain of about 0.8 cubic foot per second (0.02 m^3/s) or 0.4 cubic foot per second per mile [0.007 $(m^3/s)/km$], which is about 3.5 percent of the average measured discharge. The gain in this reach of the canal, as in the L1-L2 reach, probably comes from seepage out of the Central Utah Canal.

Reach L4-L6.--Site L6 is on the downstream side of a bridge 0.5 mile (0.8 km) south of Leamington and 0.4 mile (0.6 km) east of State Highway 125. Measurements showed some scatter and a net loss of about 1.8 cubic feet per second (0.051 m^3/s) or 1.0 cubic foot per second per mile [0.02 $(m^3/s)/km$], which is about 7.5 percent of the average measured discharge. It is probable that some sections of the canal in this reach are underlain by permeable gravel as indicated by a gravel pit near site L6. Water seeping into the gravel from the canal probably eventually discharges to the Sevier River.

Reach L6-L7.--Site L7 is upstream from the State Highway 125 bridge across the canal 0.7 mile (1.1 km) south of Leamington. This was the end of the study section. A water-stage recorder was operated at site L7, and the record obtained there was used to help analyze changing flows during seepage runs. The measurements had little scatter and showed a net gain of about 0.8 cubic foot per second (0.02 m^3/s) or 1.1 cubic feet per second per mile [0.019 $(m^3/s)/km$], or about 3.5 percent of the average measured discharge. The gain in this reach probably is water seeping from the Central Utah Canal.

SUMMARY

The seepage study of the Sevier River and the Central Utah, McIntyre, and Leamington Canals showed a net gain of about 9 cubic feet per second (0.25 m^3/s) in the Sevier River, a net loss of about 7 cubic feet per second (0.2 m^3/s) in the Central Utah Canal, a net loss of about 0.8 cubic foot per second (0.02 m^3/s) in the McIntyre Canal, and a net gain of about 1.3 cubic feet per second (0.04 m^3/s) in the Leamington Canal.

Losses from the McIntyre Canal probably contribute to the gains in the Sevier River. Losses from the Central Utah Canal probably contribute to the gains in the Sevier River and the Leamington Canal. Additional gains in the Sevier River are probably the result of unconsumed irrigation water seeping into permeable unconsolidated deposits through which it moves to the river.

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Mower, R. W., and Feltis, R. D., 1968, Ground-water hydrology of the Sevier Desert, Utah: U.S. Geological Survey Water-Supply Paper 1854.

U.S. Geological Survey, 1980, Water resources data for Utah water year 1979: U.S. Geological Survey Water-Data Report UT-80-1.

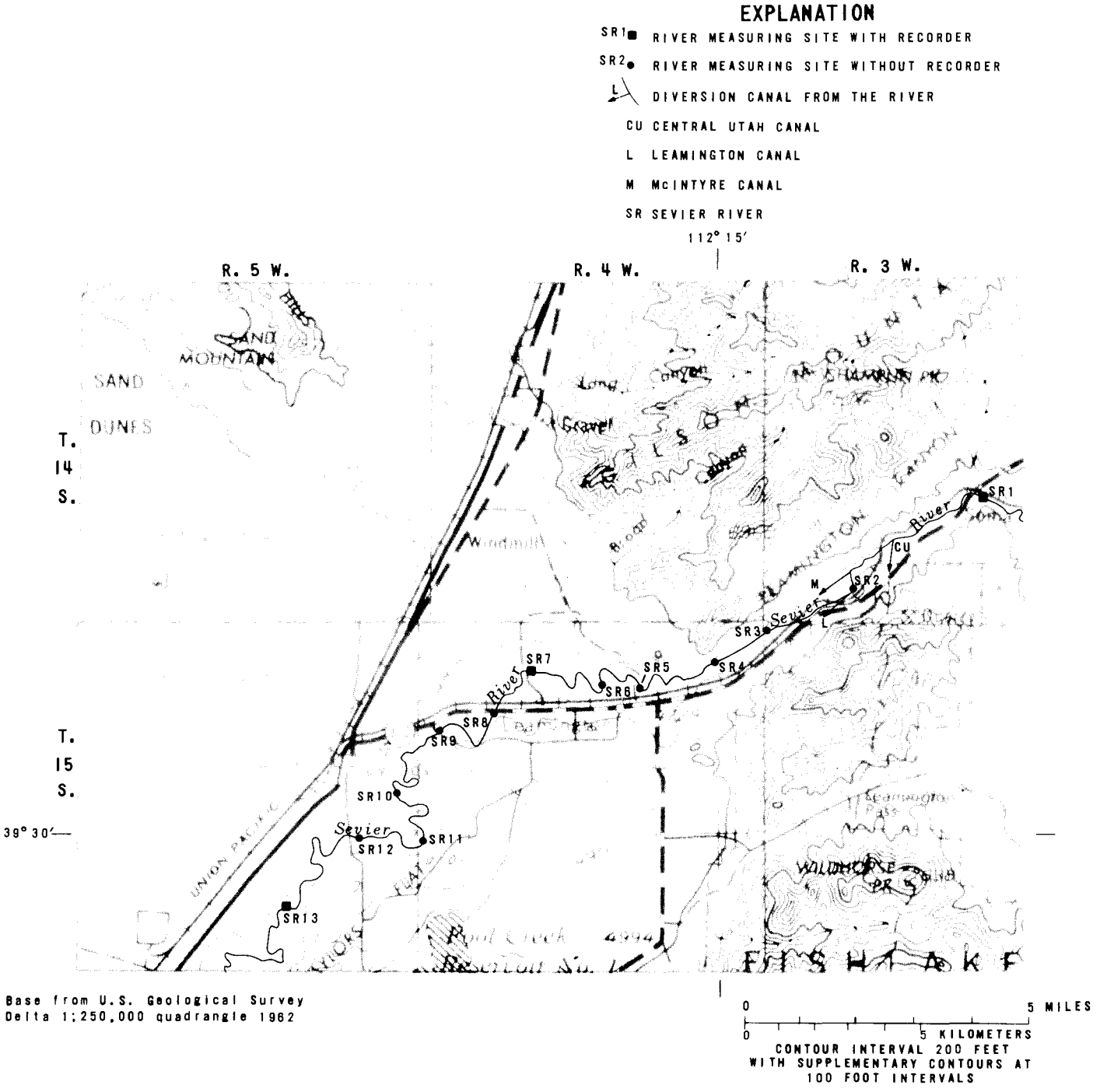


Figure 1.—Measuring sites along the Sevier River

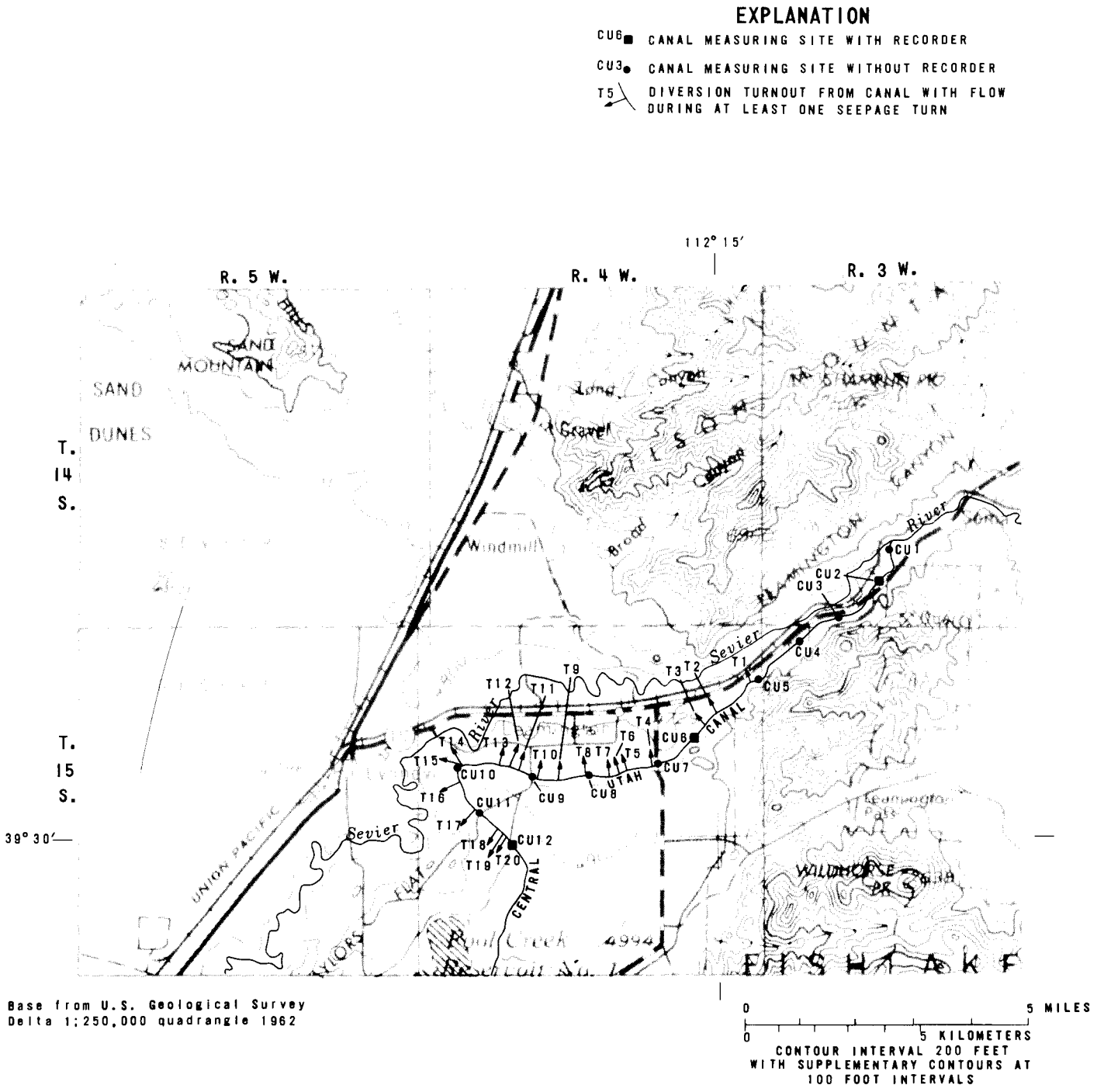


Figure 2.—Measuring sites along the Central Utah Canal.

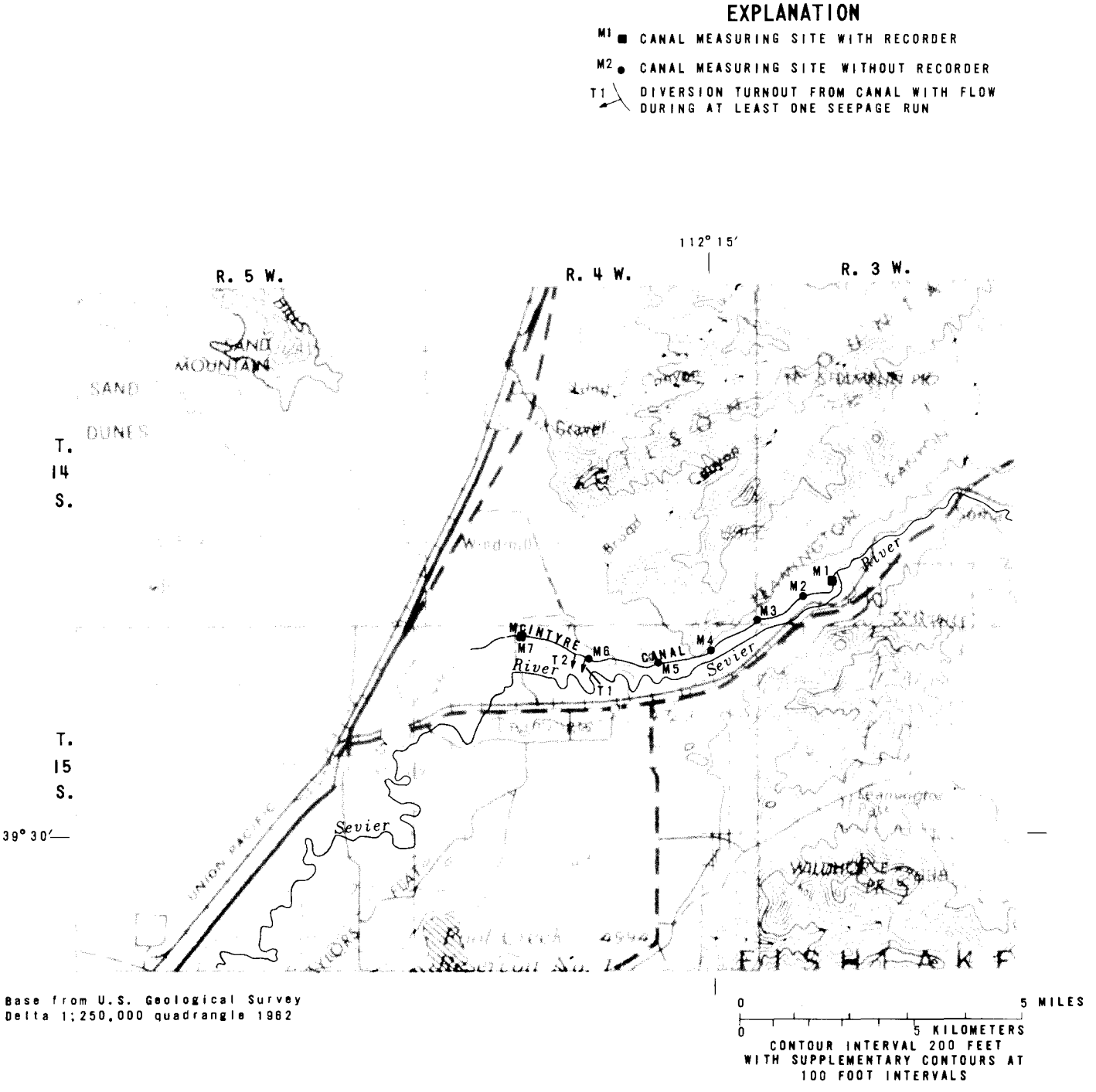


Figure 3.—Measuring sites along the McIntyre Canal.

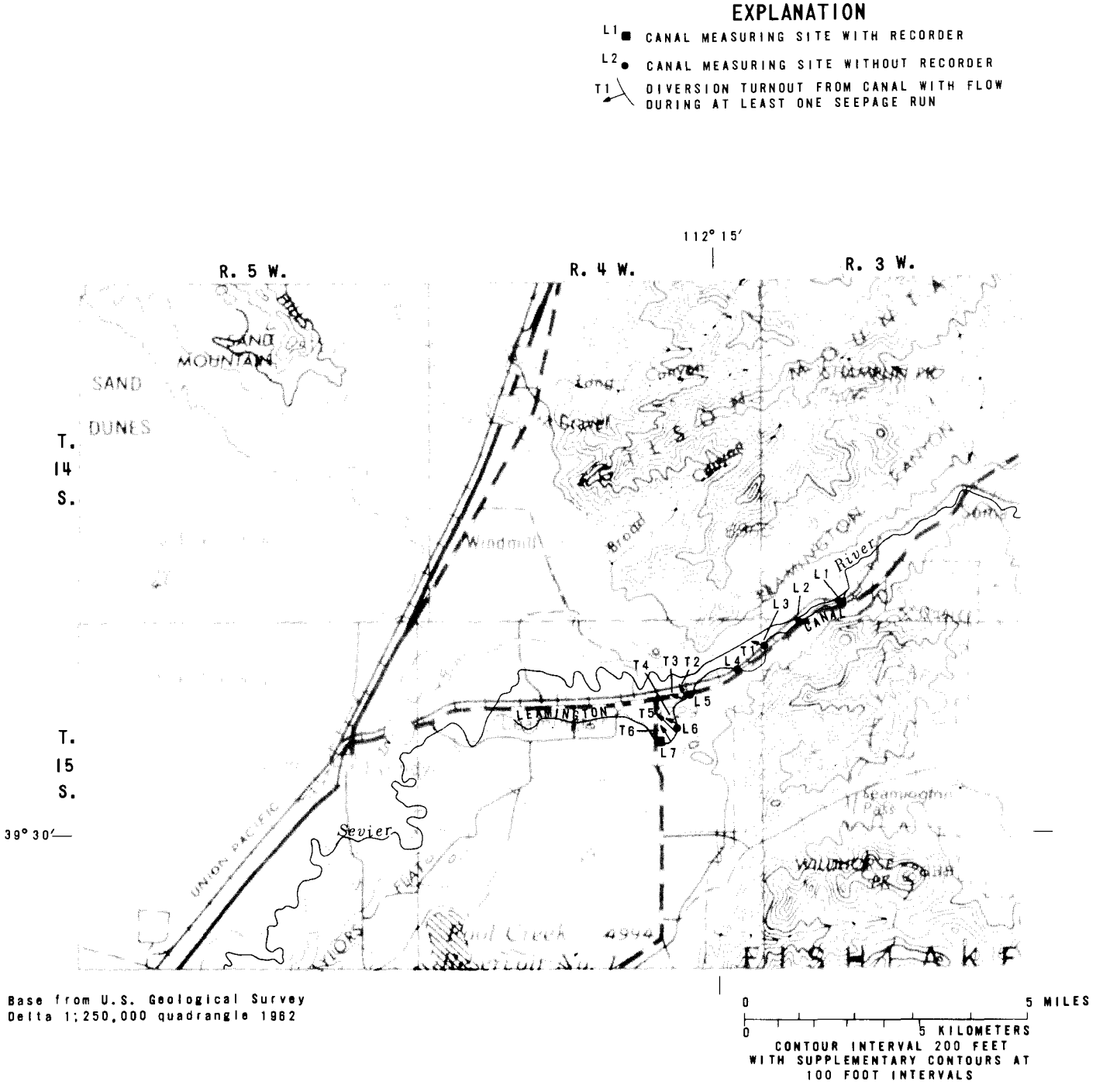


Figure 4.—Measuring sites along the Leamington Canal.

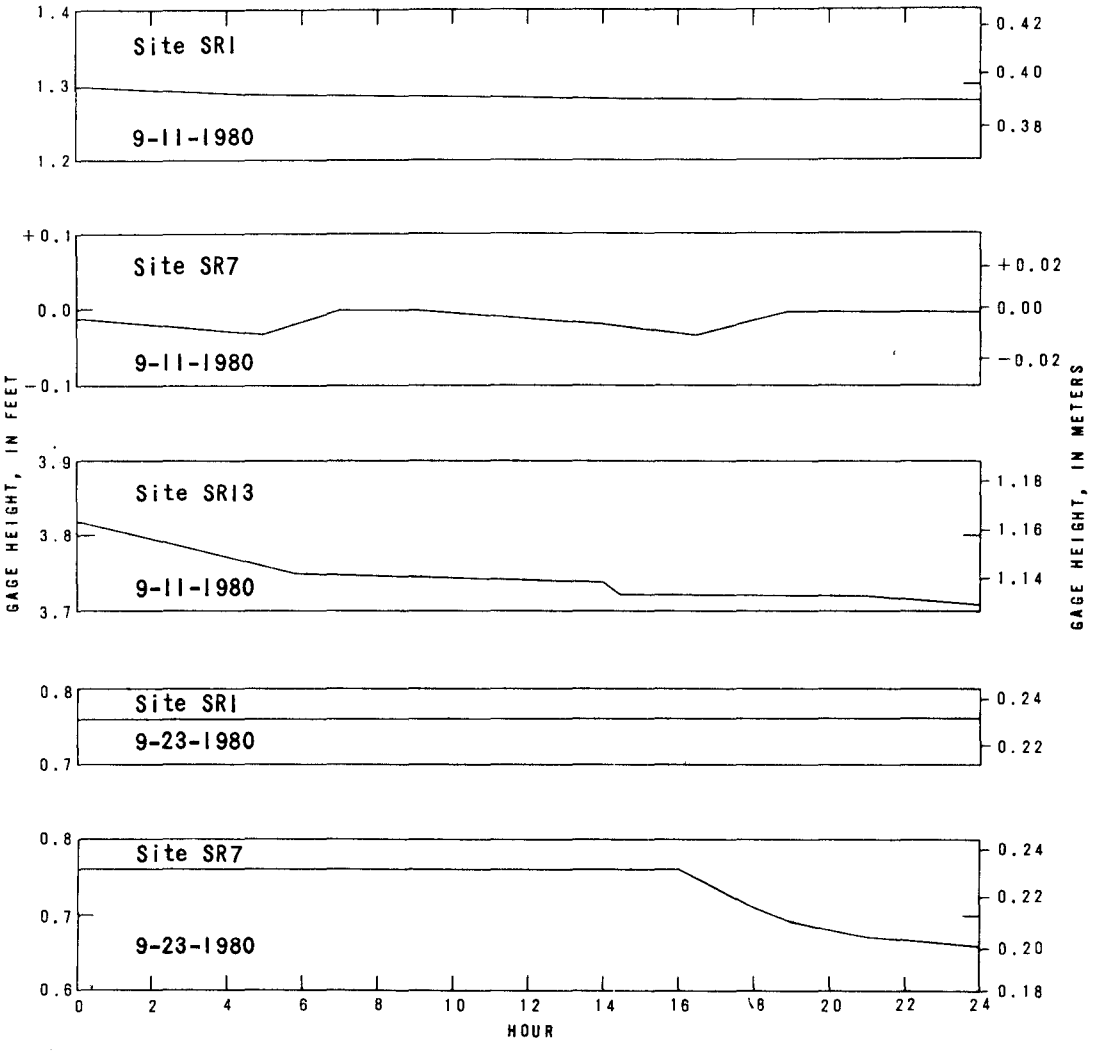
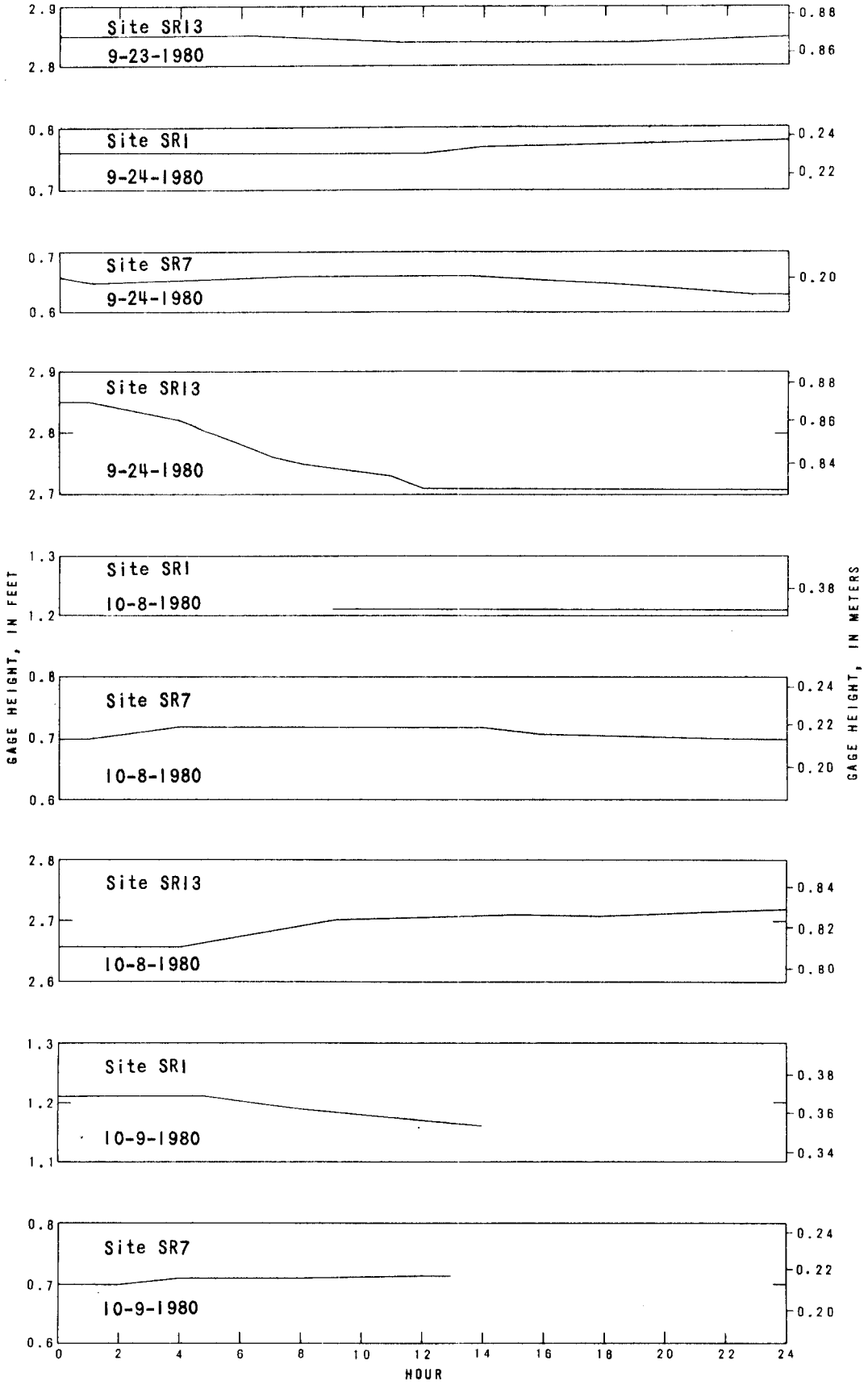


Figure 5.—Gage heights at recorder sites during seepage runs along the Sevier River.



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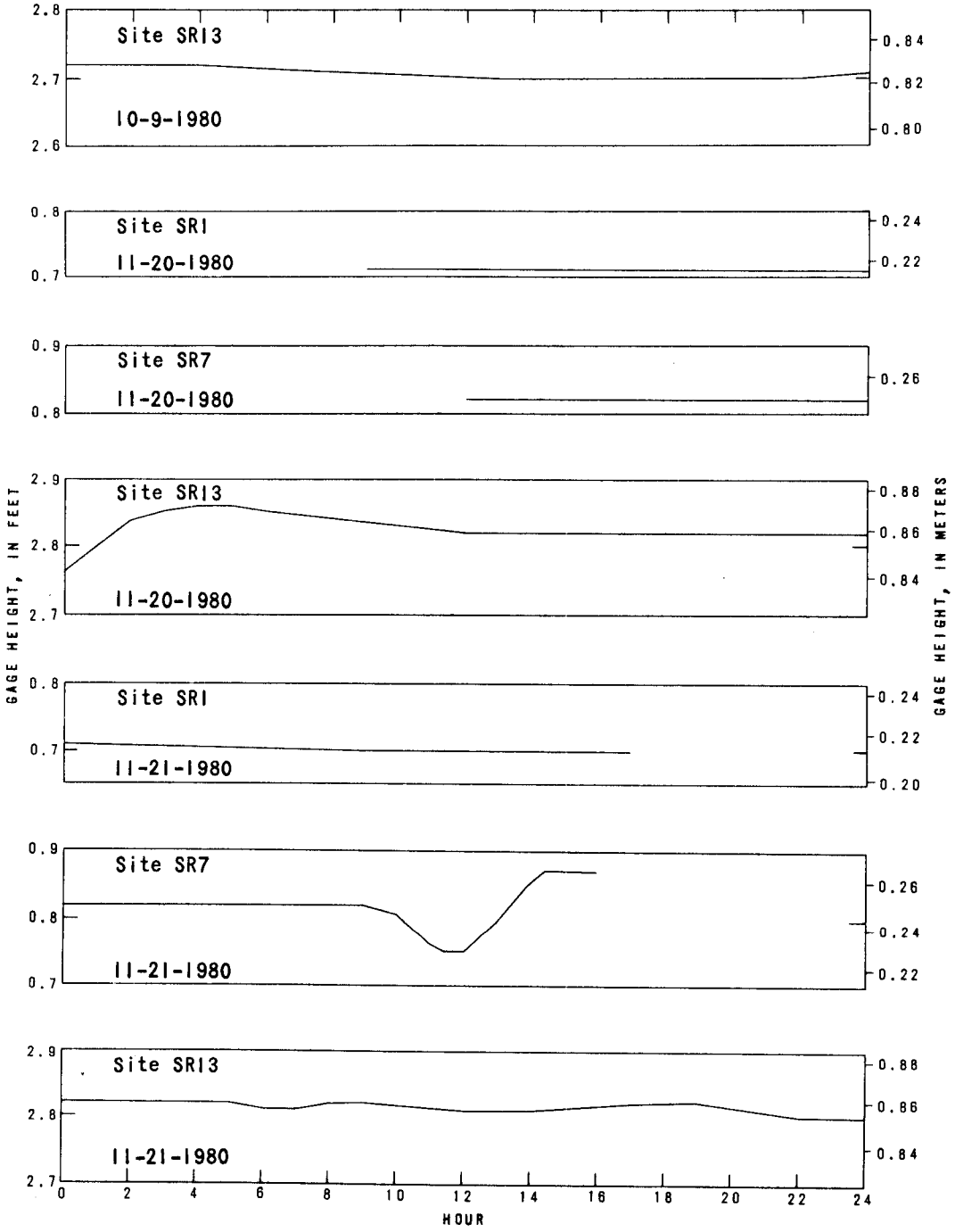

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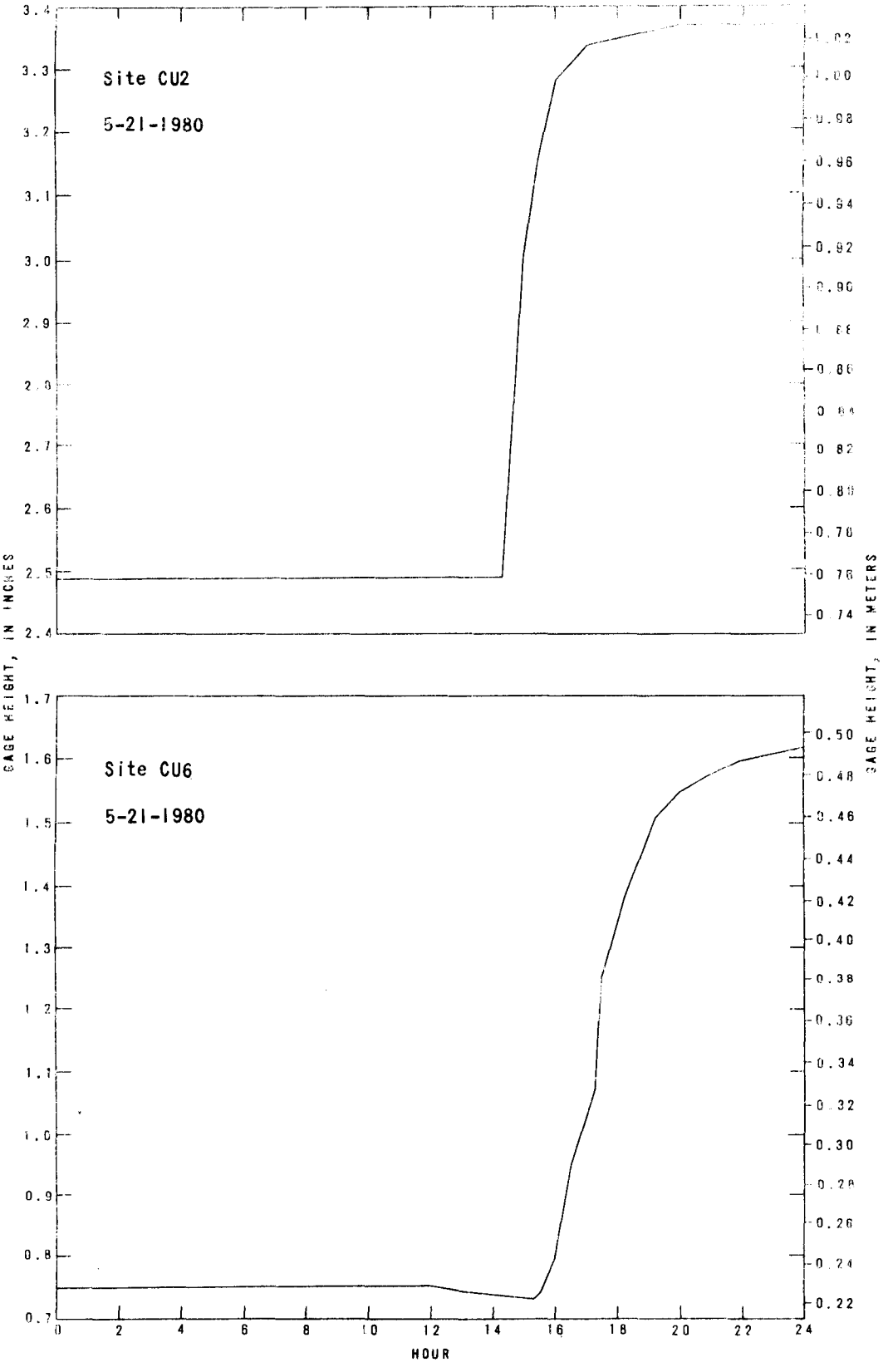
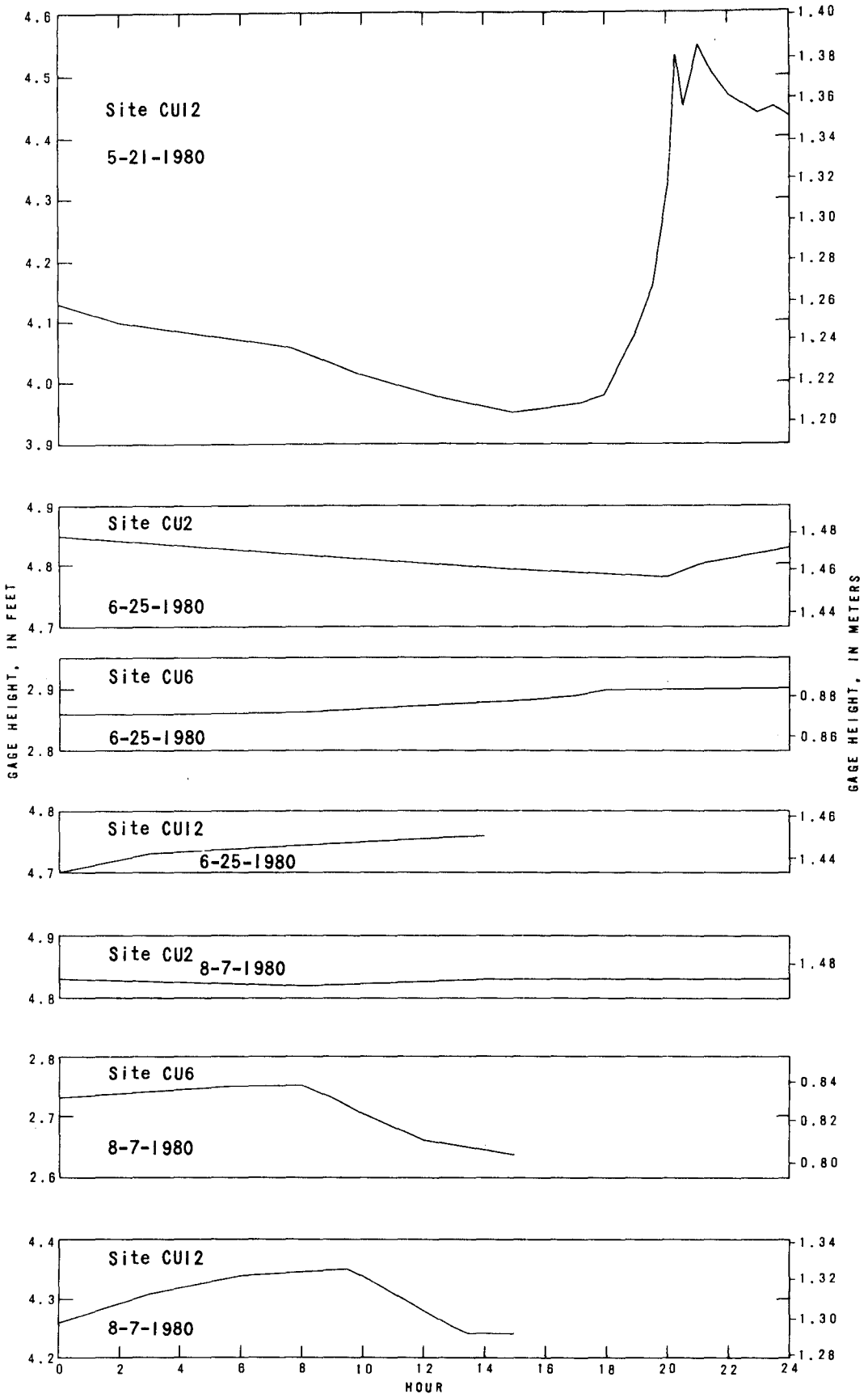


Figure 6.—Gage heights at recorder sites during seepage runs along the Central Utah Canal.



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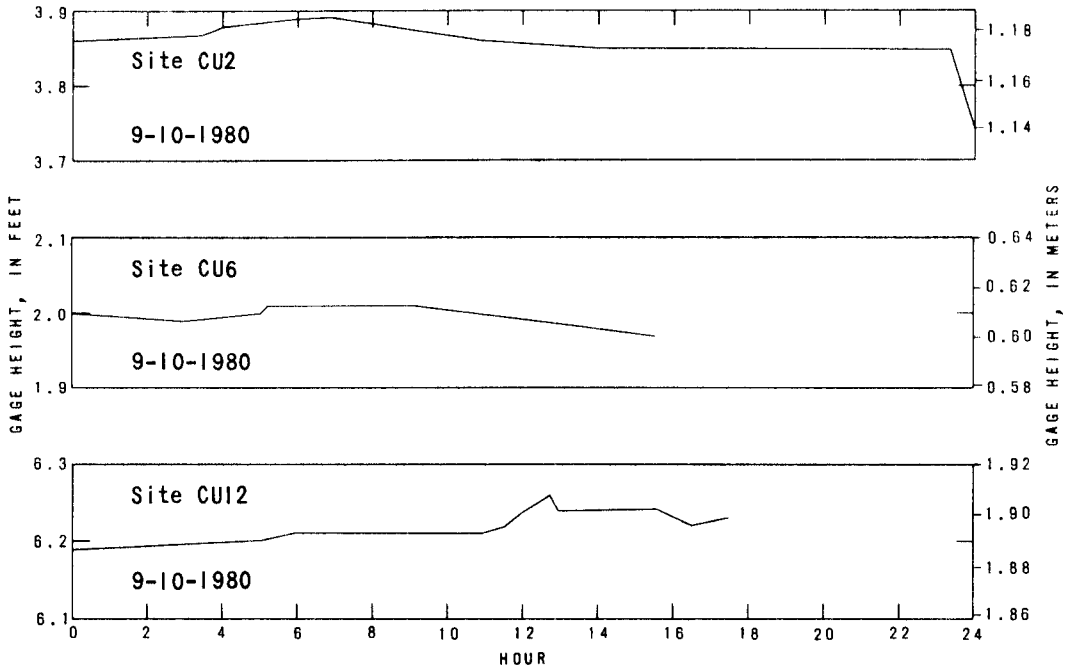

Figure 6.—Continued.

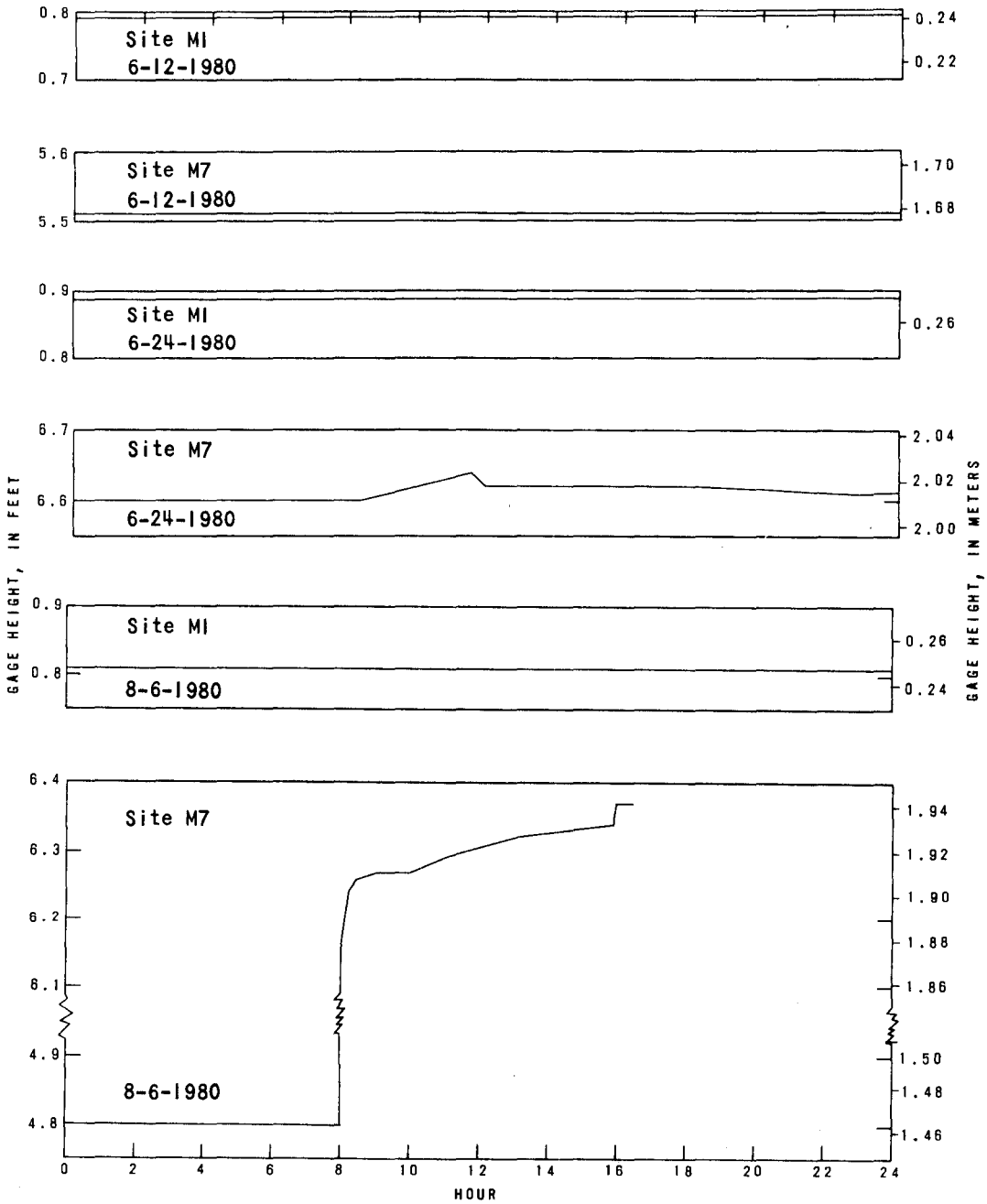

Figure 7.—Gage heights at recorder sites during seepage runs along the McIntyre Canal.

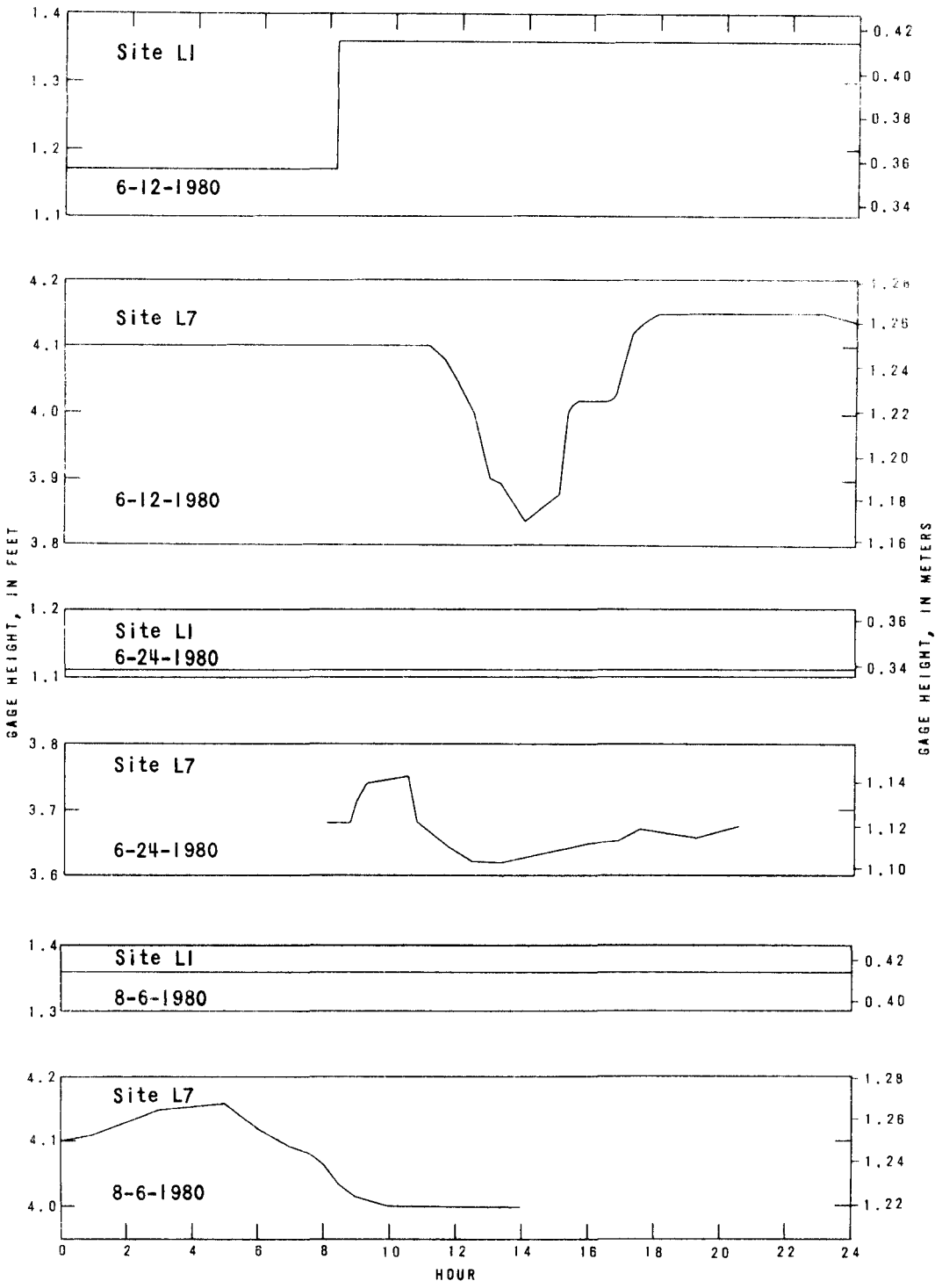

Figure 8.—Gage heights at recorder sites during seepage runs along the Leamington Canal.

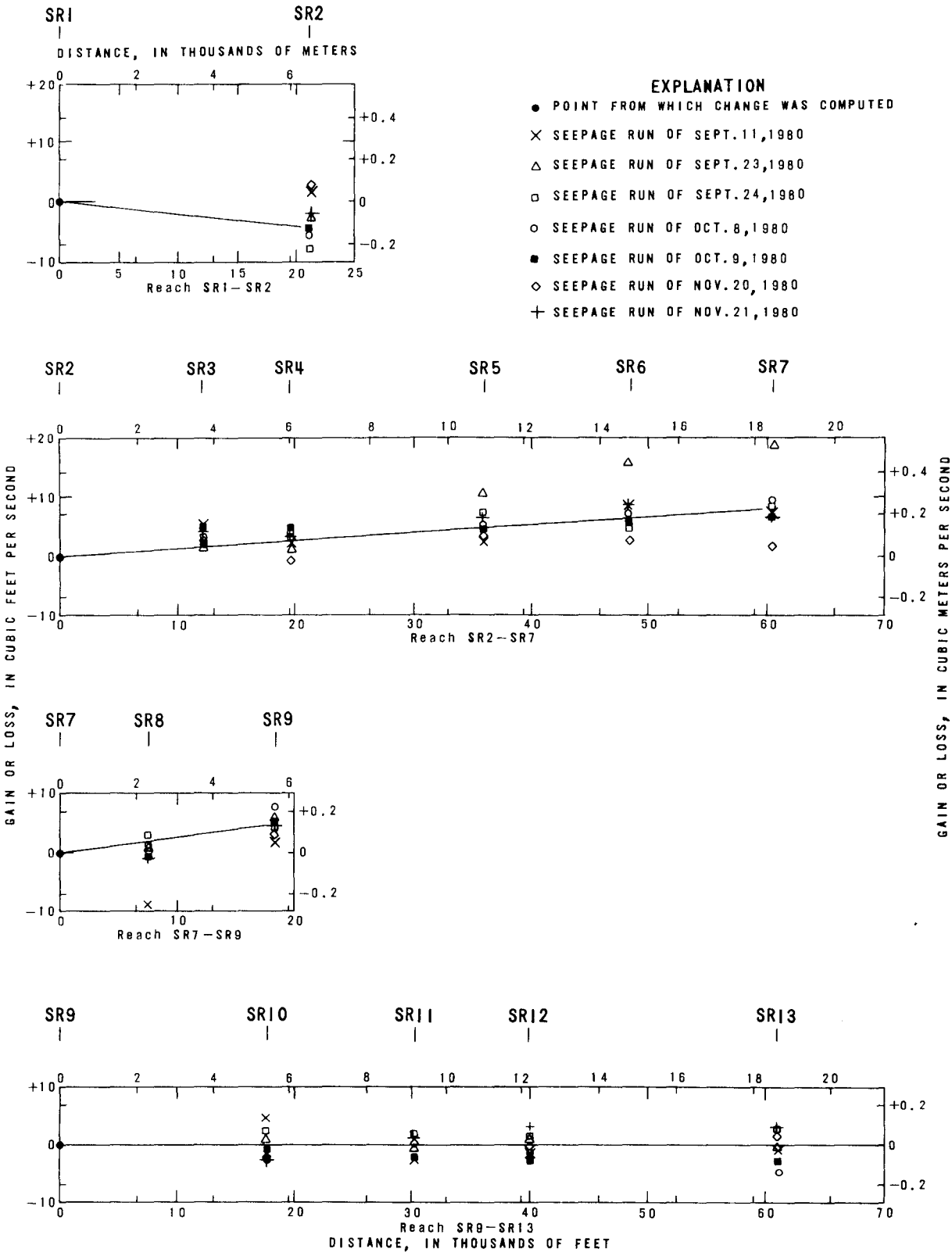

Figure 9.—Gain or loss for reaches of the Sevier River.

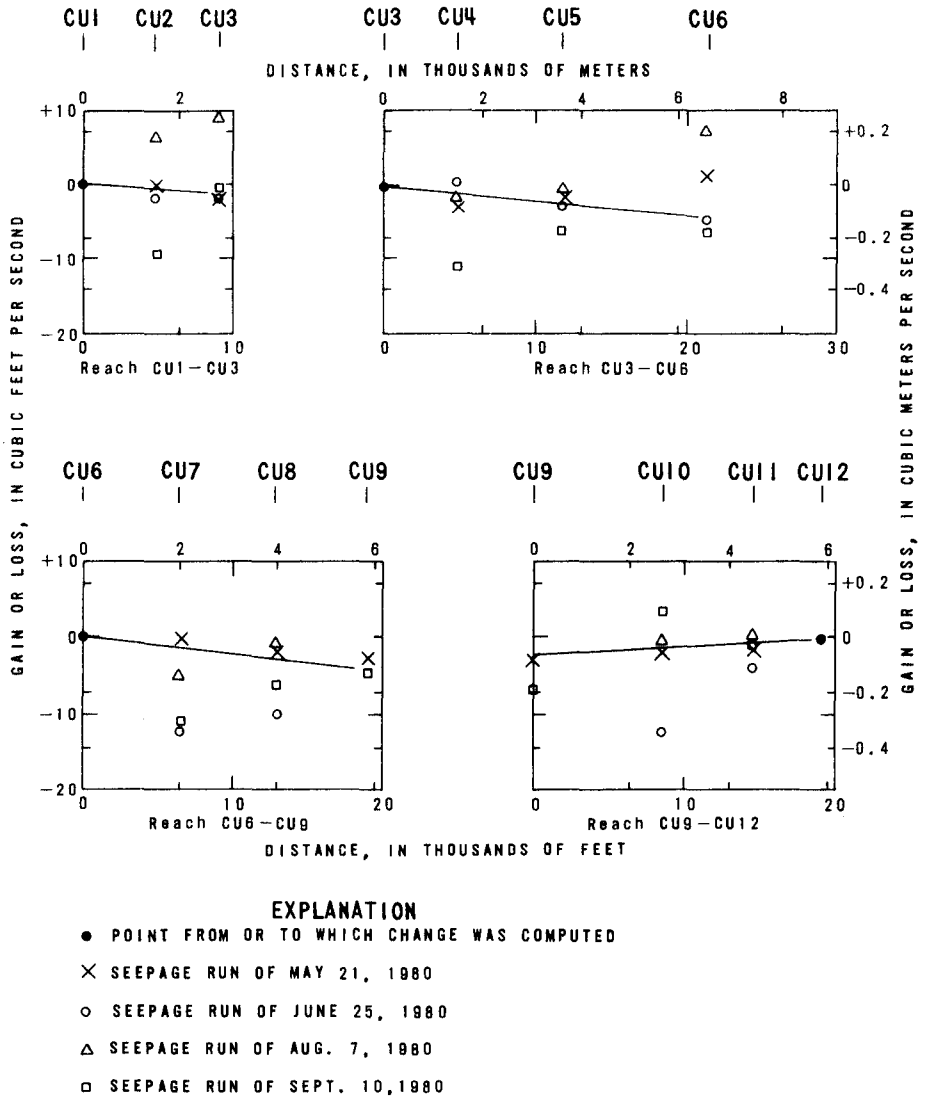

Figure 10.—Gain or loss for reaches of the Central Utah Canal.

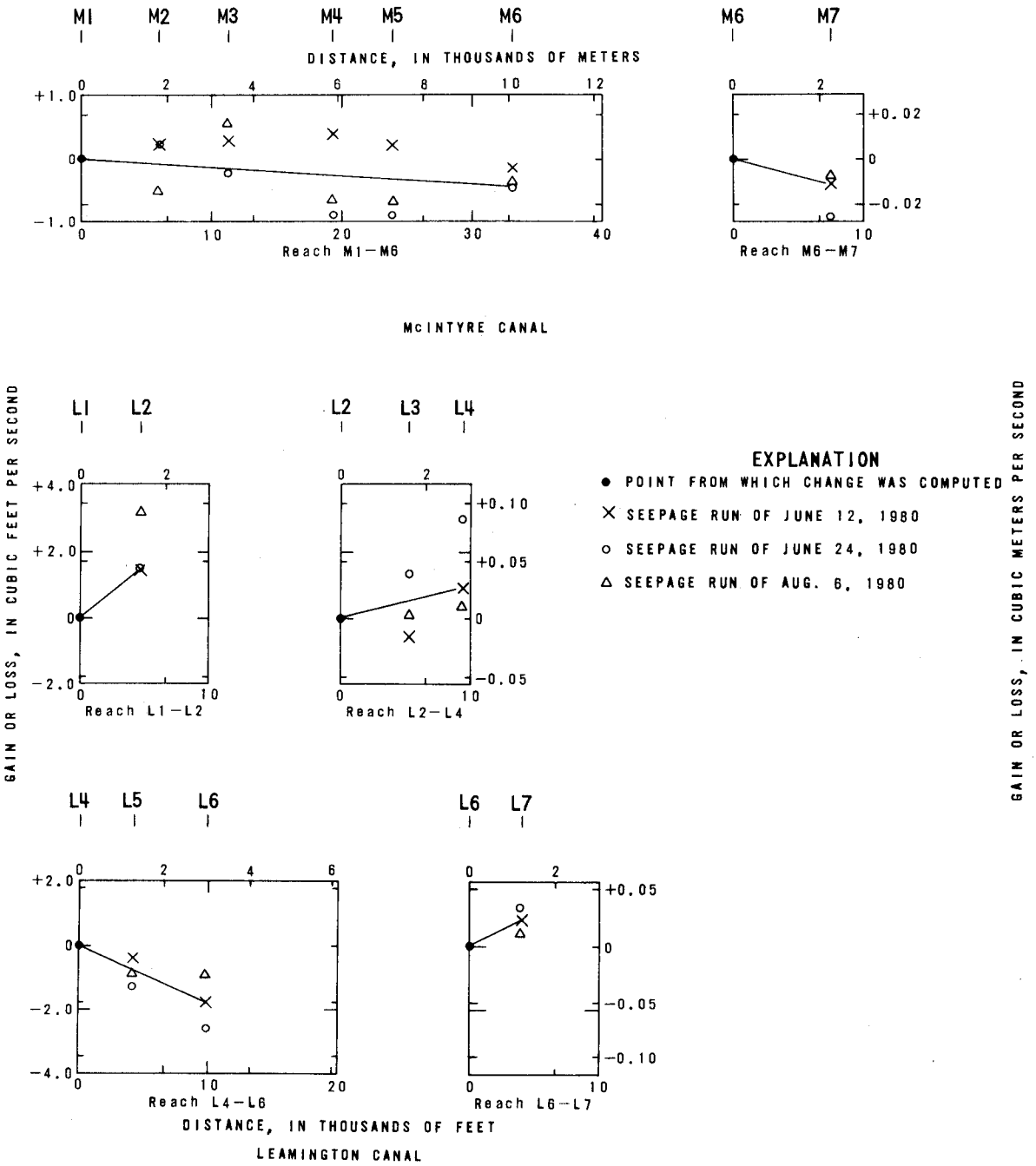

Figure 11.—Gain or loss for reaches of the McIntyre and Leamington Canals.

Table 1.—Measurements made along the Sevier River

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
SR1	Sept. 11, 1980	0705	290.5	1,470	17.0
CU2		0815	147.0	–	–
M1		0910	8.4	–	–
SR2		0830	136.4	1,500	16.5
L1		0820	3.8	–	–
SR3		0930	137.9	1,510	16.5
SR4		1030	135.2	1,550	16.5
SR5		1120	137.2	1,510	17.0
SR6		1215	140.8	1,510	17.0
SR7		1250	141.0	1,490	19.0
		0715	144.7	1,500	16.0
SR8		0835	136.0	1,560	16.0
SR9		0930	147.3	1,640	16.5
SR10		1045	151.8	1,700	17.0
SR11		1220	144.8	1,690	19.0
SR12		1320	147.9	1,770	18.5
SR13		1410	148.2	1,680	19.5
SR1	Sept. 23, 1980	0910	175.8	1,450	11.0
CU2		1015	133.0	–	–
M1		1105	1.70	–	–
SR2		1025	38.61	1,460	12.0
L1		1020	11.10	–	–
SR3		1120	29.28	1,460	12.5
SR4		1215	30.80	1,510	12.5
SR5		1305	37.91	1,520	13.0
SR6		1340	43.18	1,550	14.0
SR7		1420	46.28	1,490	16.5
		0950	48.38	1,670	11.5
SR8		1045	49.94	1,700	12.5
SR9		1130	53.98	1,930	13.0
SR10		1245	54.58	2,140	14.0
SR11		1400	54.34	2,220	15.5
SR12		1530	53.76	2,250	16.5
SR13		1630	52.86	2,250	19.0
SR1	Sept. 24, 1980	0710	179.1	1,450	12.5
CU2		0810	133.0	–	–
M1		0910	1.70	–	–

Table 1.—Measurements made along the Sevier River —Continued

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
SR2	Sept. 24, 1980	0825	36.60	1,460	11.5
L1		0815	11.10	—	—
SR3		0925	28.37	1,500	10.5
SR4		1010	29.26	1,530	11.0
SR5		1100	32.01	1,540	12.5
SR6		1140	31.53	1,590	13.0
SR7		1220	33.73	1,640	13.5
		0710	33.88	1,640	11.0
SR8		0805	36.87	1,760	11.0
SR9		0840	38.27	2,060	10.0
SR10		0930	39.68	2,390	11.5
SR11		1020	38.97	2,390	12.0
SR12		1100	39.37	2,290	13.5
SR13		1145	41.81	—	—
SR1	Oct. 8, 1980	0845	59.59	1,330	12.5
CU2		1130	6.07	—	—
M1		1250	2.84	—	—
SR2		1210	45.50	1,500	15.0
L1		1150	11.70	—	—
SR3		1320	38.04	1,530	16.0
SR4		1415	37.69	1,570	16.5
SR5		1500	40.67	1,690	16.0
SR6		1540	39.99	1,720	16.5
SR7		1620	42.40	1,750	18.0
		1045	41.59	1,860	13.0
SR8		1135	43.00	1,900	13.5
SR9		1220	49.39	2,040	14.5
SR10		1315	46.76	2,290	15.0
SR11		1415	47.53	—	—
SR12		1455	48.10	2,300	18.0
SR13		1545	44.73	2,320	19.0
SR1	Oct. 9, 1980	0725	57.20	1,260	12.5
CU2		0820	6.10	—	—
M1		0910	2.80	—	—
SR2		0830	44.62	1,310	11.5
L1		0825	11.70	—	—
SR3		0930	37.63	1,370	10.5

Table 1.—Measurements made along the Sevier River—Continued

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
SR4	Oct. 9, 1980	1020	37.71	1,380	10.5
SR5		1110	38.29	1,430	11.5
SR6		1150	38.47	1,560	13.5
SR7		1225	40.46	1,580	15.5
		0720	41.86	1,660	13.0
SR8		0800	41.56	—	—
SR9		0835	46.91	2,080	10.0
SR10		0925	45.88	2,420	11.0
SR11		1015	44.31	—	—
SR12		1115	43.36	2,280	14.0
SR13		1155	42.98	2,400	14.0
SR1	Nov. 20, 1980	1050	48.35	1,290	1.0
CU2		1140	4.36	—	—
M1		1250	.0	—	—
SR2		1215	46.21	1,380	4.0
L1		1205	.10	—	—
SR3		1310	48.41	1,400	3.5
SR4		1400	45.59	1,410	4.0
SR5		1450	52.52	1,430	3.5
SR6		1535	49.13	1,430	3.0
SR7		1615	48.14	1,500	3.0
		1000	48.33	1,400	2.0
SR8		1120	48.71	1,550	2.0
SR9		1225	51.65	1,700	3.0
SR10		1350	49.80	2,000	4.0
SR11		1505	52.32	2,100	4.5
SR12		1555	52.01	1,800	4.5
SR13		1700	51.95	2,000	4.5
SR1	Nov. 21, 1980	0940	51.79	1,310	.5
CU2		1025	5.16	—	—
M1		1130	.0	—	—
SR2		1050	44.65	1,370	3.0
L1		1045	.10	—	—
SR3		1145	48.70	1,390	2.5
SR4		1235	47.50	1,360	3.5
SR5		1320	50.91	1,380	3.0
SR6		1410	53.18	1,420	3.0

Table 1.—Measurements made along the Sevier River—Continued

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
SR7	Nov. 21, 1980	1455	52.64	1,460	4.0
		0930	46.28	1,450	2.0
SR8		1035	45.25	1,500	2.0
SR9		1120	51.52	1,700	3.0
SR10		1230	49.06	2,000	3.5
SR11		1350	52.25	2,000	4.0
SR12		1435	54.79	2,000	4.5
SR13		1530	54.96	2,000	5.0

Table 2.—Measurements made along the Central Utah Canal

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
CU1	May 21, 1980	0725	98.20	1,660	17.5
CU2		0835	98.11	1,660	17.5
CU3		0935	96.72	1,640	18.0
CU4		1045	94.26	1,640	18.0
CU5		1150	95.45	1,660	18.5
T1		0800	.06	—	—
T2		0820	4.24	—	—
CU6		1245	93.61	1,640	20.0
		0720	91.29	1,660	17.5
CU7		0830	91.18	1,670	17.5
T7		0930	6.36	—	—
CU8		0930	83.55	1,660	17.5
T8		0950	7.50	—	—
T10		1300	.32	—	—
CU9		1030	74.72	1,680	18.0
T13		1345	12.50	—	—
T14		1100	31.56	—	—
CU10		1130	31.49	1,650	19.0
CU11		1215	31.85	1,650	20.0
CU12		1255	32.91	1,660	21.5
CU1	June 25, 1980	0650	239.5	1,550	16.5
CU2		0815	238.1	1,550	16.5
CU3		0930	238.2	1,570	17.0
CU4		1115	239.0	1,560	18.0
CU5		1220	235.8	1,560	18.0
T3		1720	3.83	—	—
CU6		1335	229.5	—	—
		0630	227.0	—	—
CU7		0830	215.1	1,610	16.5
CU8		0940	217.2	1,610	16.5
CU9		1045	195.2	1,640	17.0
T11		1545	5.76	—	—
T12		1515	4.40	—	—
T14		1430	66.65	—	—
T15		—	3.38	—	—
CU10		1140	136.8	1,580	18.0
T16		—	3.15	—	—

Table 2.—Measurements made along the Central Utah Canal—Continued

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
CU11	June 25, 1980	1255	125.0	1,600	18.5
T18		1645	5.24	–	–
T19		1700	9.02	–	–
T20		1720	2.81	–	–
CU12		1345	111.6	1,540	19.0
CU1	Aug. 7, 1980	0730	219.3	1,460	19.0
CU2		0900	225.9	1,470	18.5
CU3		1025	228.7	1,450	20.0
CU4		1145	226.6	1,460	20.0
CU5		1300	228.1	1,450	21.5
T3		0735	3.97	–	–
CU6		1415	217.2	1,510	20.0
		0730	216.4	1,490	19.0
CU7		0845	211.6	1,450	20.0
T4		0914	5.45	–	–
T5		0935	6.73	–	–
T6		1010	6.67	–	–
CU8		0955	196.7	1,450	20.0
CU9		1055	180.6	1,450	20.0
T14		1155	47.18	–	–
CU10		1145	150.4	1,450	20.0
T17		1150	1.57	–	–
CU11		1245	149.2	1,380	21.5
CU12		1335	149.2	1,450	21.0
CU1	Sept. 10, 1980	0910	165.9	1,440	16.5
CU2		1010	156.8	1,450	16.5
CU3		1110	165.2	1,470	16.0
CU4		1200	154.0	1,450	16.5
CU5		1330	158.6	1,440	17.0
T3		0930	3.97	–	–
CU6		1430	154.7	1,430	17.5
		0900	162.7	1,410	17.0
CU7		1020	151.0	1,400	17.5
CU8		1155	155.8	1,430	17.0
T9			.04	–	–
CU9		1305	157.9	1,420	18.0
T14		1230	9.07	–	–

Table 2.—Measurements made along the Central Utah Canal—Continued

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
CU10	Sept. 10,1980	1450	138.0	1,420	18.5
CU11		1555	122.1	1,420	18.0
CU12		1640	141.9	1,390	18.5

Table 3.—Measurements made along McIntyre Canal

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
M1	June 12, 1980	0630	15.18	1,610	15.0
M2		0740	15.44	1,610	15.0
M3		0820	15.48	1,610	15.0
M4		0855	15.59	1,610	15.0
M5		0935	15.40	1,610	15.0
M6		1030	15.02	1,610	16.0
T1		1110	6.30	—	—
M7		1140	8.34	—	—
M1	June 24, 1980	1125	18.10	1,580	19.0
M2		1150	18.33	—	—
M3		1235	17.88	1,610	20.0
M4		1305	17.21	1,610	21.0
M5		1345	17.22	1,610	21.5
M6		1430	17.65	1,590	22.0
T1		1455	2.81	—	—
T2		1520	2.82	—	—
M7		1540	11.08	1,590	22.0
M1	Aug. 6, 1980	1230	15.70	1,410	21.0
M2		1255	15.20	1,460	22.0
M3		1325	16.29	1,450	24.0
M4		1400	15.05	1,490	24.0
M5		1430	15.00	1,500	25.0
M6		1515	15.36	1,480	25.0
T1		1515	2.72	—	—
T2		1550	3.74	—	—
M7		1600	8.62	1,420	25.0

Table 4.—Measurements made along Leamington Canal

Site	Date	Time	Discharge (ft^3/s)	Specific conductance (micromhos per cm at 25°C)	Water temperature (°C)
L1	June 12, 1980	0630	22.78	1,600	15.0
L2		0730	24.24	1,600	15.0
L3		0810	23.72	1,600	15.0
L4		0850	25.14	1,600	15.0
L5		0935	24.79	1,600	15.5
T2		1010	6.14	—	—
T4		1040	5.27	—	—
L6		1055	11.62	1,600	16.0
L7		1130	12.10	1,600	17.5
L1	June 24, 1980	0820	19.65	1,570	16.5
L2		0915	20.76	1,570	16.5
L3		0945	22.08	1,580	16.5
L4		1030	23.75	1,570	17.5
L5		1110	22.29	1,580	18.0
T2		1145	3.98	—	—
T3		1210	6.52	—	—
L6		1240	11.76	1,580	18.5
T6		1315	6.47	—	—
L7		1335	5.40	—	—
L1	Aug. 6, 1980	0800	28.15	1,460	19.0
L2		0850	31.36	1,460	19.0
L3		0935	31.45	1,500	18.0
T1		1025	5.52	—	—
L4		1050	26.23	1,480	19.5
L5		1125	25.35	1,460	20.0
T2		1200	5.88	—	—
L6		1215	19.51	1,510	19.5
T5		1250	6.44	—	—
L7		1320	13.48	1,450	22.5

Table 5.—Gains or losses determined from seepage measurements for reaches of the river and canals

Reach	Length (ft)	Graphic average (from figs. 9-11) Gain (+) or loss (−) (ft^3/s)	[(ft^3/s)/mi]
	Sevier River		
SR1-SR2	21,200	−4	−1.0
SR2-SR7	60,600	+8	+.7
SR7-SR9	18,400	+5	+1.4
SR9-SR13	61,200	0	0
Total	161,400	+9	
	Central Utah Canal		
CU1-CU3	9,100	−1	−.6
CU3-CU6	21,600	−4	−1.0
CU6-CU9	19,000	−4	−1.0
CU9-CU12	19,200	+2	+.6
Total	68,900	−7	
	McIntyre Canal		
M1-M6	33,200	−0.4	−.1
M6-M7	7,300	−.4	−.3
Total	40,500	−.8	
	Leamington Canal		
L1-L2	4,700	+1.5	+1.7
L2-L4	9,400	+.8	+.4
L4-L6	10,000	−1.8	−1.0
L6-L7	3,900	+.8	+1.1
Total	28,000	+1.3	

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