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SEEPAGE STUDY OF THE SEVIER RIVER BASIN ABOVE SEVIER BRIDGE RESERVOIR, UTAH, 1988

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CONVERSION FACTORS

Multiply	By	To obtain
cubic foot per second	0.02832	cubic meter per second
cubic foot per second per mile	0.0176	cubic meter per second per kilometer
foot	0.3048	meter
mile	1.609	kilometer

Water temperature is reported in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by the following equation:

$$°F = 1.8\ (°C) + 32.$$

SEEPAGE STUDY OF THE SEVIER RIVER BASIN ABOVE SEVIER BRIDGE RESERVOIR, UTAH, 1988

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ABSTRACT

A seepage study was done during 1988 on selected reaches of the Sevier River in Utah above Sevier Bridge Reservoir, the East Fork Sevier River in Black Canyon and Kingston Canyon, Long-East Bench and McEwen Canals in the upper Sevier River basin, and the San Pitch River in Sanpete Valley to determine gain or loss of flow from seepage. A net gain occurred in all of the reaches except Kingston Canyon on the East Fork Sevier River, which had a net loss. In the upper Sevier River basin, the Sevier River between Hatch and Circleville Canyon had a net gain of about 125 cubic feet per second; Long-East Bench Canal had a net gain of about 0.7 cubic foot per second; McEwen Canal had a net gain of about 0.9 cubic foot per second; the East Fork Sevier River in Black Canyon had a net gain of about 3.0 cubic feet per second; and the East Fork Sevier River in Kingston Canyon had a net loss of about 8.0 cubic feet per second. In central Sevier Valley, both the south and the north sections had large gains. The net gain for both sections, combined, was about 213 cubic feet per second for August 1988 and about 230 cubic feet per second for October 1988. The reach of the San Pitch River studied had a net gain of about 23.4 cubic feet per second.

INTRODUCTION

Because surface water in the Sevier River drainage basin is used mostly for irrigation, information on seepage gains or losses is needed by water managers for allocating irrigation water. A detailed investigation of rivers and canals in the basin assists in identifying the losing or gaining sections of the hydrologic systems. This study (thirteenth in 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, Division of Water Rights. This report describes the results of seepage studies done on 52.24 miles of the Sevier River from Hatch to Circleville Canyon, 5.60 miles of Long-East Bench Canal, 5.46 miles of McEwen Canal, 6.42 miles of the East Fork Sevier River in Black Canyon, 8.19 miles of the East Fork Sevier River in Kingston Canyon; 78.14 miles of the Sevier River in central Sevier Valley; and 49.85 miles of the San Pitch River above Gunnison Reservoir in Sanpete Valley (fig. 1).

METHODS OF INVESTIGATION

A reconnaissance study was done prior to each set of seepage runs to determine (1) location of measurement sites, diversion structures, and return-flow points; (2) the general condition of the rivers and canals; and (3) areas of natural and irrigation-return flow to the rivers and canals. From the information collected during the reconnaissance study, sections of the rivers and canals were divided into reaches, and measuring sites were chosen within each reach. Water-stage recorders were installed, and existing gaging stations were used to determine fluctuations in discharge.

Three sets of seepage runs were made on each section, usually on consecutive days. In the upper Sevier River basin, seepage runs were made on (1) the Sevier River from Hatch to Circleville Canyon (sites 6-18), (2) Long-East Bench Canal (sites L1-L6), and (3) McEwen Canal (sites M1-M7). On the East Fork Sevier River, seepage runs were made on reaches in (4) Black Canyon (sites 27-32) and (5) Kingston Canyon (sites 40-45). In central Sevier Valley, seepage runs were made on (6) the south section of the Sevier River (sites 54-64) and (7) the north section of the Sevier River (sites 65-75). In the San Pitch River basin, seepage runs were made on (8) the San Pitch River (sites 84-109). Sites where a discharge measurement or estimate was made at least once are shown in figures 2 to 5.

Only diversion turnouts and return-flow points that had discharge during at least one seepage run were reported, but all diversion turnouts and return-flow points were checked during the seepage runs. Data sites for this study were assigned numbers in consecutive order from the upstream end of the Sevier River down-

stream to a major tributary, thence to the upstream end of that tributary and downstream to the confluence with the main stream. Return-flow points for seepage runs on the main stream of the Sevier River are identified by a number with a decimal fraction such as 6.1; diversion turnouts are identified by a number with a letter, such as 6A. Data sites on Long-East Bench and McEwen Canals (upper Sevier River basin) are numbered independently of the main stream but follow a similar sequence (for example, R1 for a return-flow point and T1 for diversion turnout). Continuous water-stage records were obtained in each section and are shown in figures 6 to 10.

Discharge measurements were made with a current meter, using standard methods of the U.S. Geological Survey (Buchanan and Somers, 1969). Each person making discharge measurements was given an area in which the required number of measurements could be completed in 1 day. Discharge measurements were made in each reach at all selected measuring sites, including the upstream and downstream ends of the reach, all diversion turnouts, and all return-flow points. Water temperature and specific conductance also were measured at most sites. For each main-channel discharge measurement, the date and time of the measurement, discharge, and specific conductance and temperature of the water, when noted, are listed in tables 1 to 4. For diversion turnouts and return-flow points, the date and discharge, and sometimes the temperature and specific conductance of the water, also are listed in tables 1 to 4.

PROCEDURE USED IN COMPUTING SEEPAGE GAINS AND LOSSES

Average seepage gain or loss was determined from discharge measurements for the reaches on the Sevier River and the East Fork Sevier River in the upper Sevier River basin (table 5), for McEwen and Long-East Bench Canals near Panguitch (table 5), Utah, on the Sevier River in the central Sevier River basin above the Sevier Bridge Reservoir (tables 6 and 7), and on the San Pitch River (table 8). The procedure used to obtain these results is described in the following pages.

A computation was made of the discharge that would be expected at each main river- or canal-measuring site, assuming no gain or loss from seepage. Beginning with the discharge at the upstream end of each reach and proceeding downstream, all diversion-turnout discharges were subtracted and all return-flow discharges were added.

The corrected discharge was subtracted from the measured discharge to determine the seepage gain or loss from the upstream measuring site to the downstream measuring site. The gain or loss was plotted as a function of distance downstream from the start of the reach for each set of measurements at each main river- or canal-measuring site in the reach. The data obtained from the water-stage recorders showed that adjustments for fluctuations in flow were not necessary.

Under some conditions, depending on the rate of gain or loss, or the scatter of plotted points, the river or canal was divided into shorter reaches. Data for each of the reaches were then plotted (figs. 11-17) with the gain or loss at each main river- or canal-measuring site plotted as a function of distance from the upstream measuring site of the reach. A dashed line was fitted through the plotted points for each reach, and the quantity and rate of gain or loss were estimated from this line.

Within a certain reach, the seepage gain or loss varied between each set of discharge measurements and among the several sets of discharge measurements. This variation is illustrated by the scatter of the plotted points in figures 11 and 15 to 17 and is attributed to one or more of the following: (1) poor measuring conditions, (2) changes in the rate of seepage loss from the river or canal, (3) changes in the rate of seepage return to the river or canal from ground water and unconsumed irrigation water, (4) the inability to adjust completely for fluctuation in discharge within a given reach, and (5) the possibility that a water user changed the volume of flow in his turnouts or return-flow points during the time of discharge measurements.

SEEPAGE GAIN OR LOSS

Upper Sevier River Basin

Three sets of seepage runs were made on five sections in the upper Sevier River basin. The seepage runs were made on (1) the Sevier River from Hatch to Circleville during August 17-19, 1988; (2) Long-East Bench Canal on July 26 and during August 1-2, 1988; (3) McEwen Canal on July 27 and during August 2-3, 1988; (4) the East Fork Sevier River in Black Canyon during August 17-19, 1988; and (5) the East Fork Sevier River in Kingston Canyon during August 17-19, 1988.

Sevier River from Hatch to Circleville Canyon

Discharge measurements were made at 13 sites on the Sevier River from Hatch to Circleville Canyon (fig. 2). The 13 sites were divided into 5 reaches to facilitate analysis. The river gained water in the second, fourth, and fifth reaches; the first reach had a slight loss; and the third reach had no gain or loss. The entire section had a net gain of about 125 cubic feet per second. A brief description of each reach and the calculated changes in discharge follows (figs. 6 and 11 and tables 1 and 5).

Reach 6-9.—Site 6 is about 1.2 miles southwest of Hatch, Utah. Site 7 is a U.S. Geological Survey gaging station about 0.2 mile east of Hatch. Site 9 is about 4.5 miles northeast of Hatch. The plot of discharge measurements for this reach had considerable scatter and showed a net loss of about 3.0 cubic feet per second or about 0.3 cubic foot per second per mile.

Reach 9-10.—Site 10 is at the bridge on Highway 12, about 3.0 miles northeast of Site 9. The plot of discharge measurements had some scatter and showed a net gain of about 14.0 cubic feet per second or about 3.4 cubic feet per second per mile.

Reach 10-11.—Site 11 is about 2.1 miles northwest of Site 10. The plot of discharge measurements for this reach had some scatter but indicated no net gain or loss in discharge.

Reach 11-15.—Site 12 is a temporary gage where a water-stage recorder was operated to monitor changes in the river and is about 1.5 miles east of Panguitch. Site 15 is about 8.8 miles northwest of Site 12. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 92.0 cubic feet per second or about 5.1 cubic feet per second per mile.

Reach 15-18.—Site 18 is a U.S. Geological Survey station about 6 miles southwest of Circleville. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 22.0 cubic feet per second or about 1.4 cubic feet per second per mile.

Long-East Bench Canal

Seepage runs were made at six sites on Long-East Bench Canal (fig. 2). These sites were divided into four reaches. The canal had gains in the first and third reaches, a loss in the second reach, and the fourth reach had no gain or loss. The canal had a net gain of about 0.7 cubic foot per second. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 6 and 12 and tables 1 and 5).

Reach L1-L3.—Site L1 is below the diversion about 3.5 miles southeast of Panguitch. Site L3 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal about 2.0 miles east of Panguitch. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 2.7 cubic feet per second or about 1.0 cubic foot per second per mile.

Reach L3-L4.—Site L4 is about 1.5 miles northwest of Site L3. The plot of discharge measurements for this reach had some scatter and showed a net loss of about 4.0 cubic feet per second or about 3.0 cubic feet per second per mile.

Reach L4-L5.—Site L5 is at the East Bench Parshall flume about 1.0 mile north of Site L4. The plot of discharge measurements had little scatter and showed a net gain of about 2.0 cubic feet per second or about 2.0 cubic feet per second per mile.

Reach L5-L6.—Site L6 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal about 0.5 mile northeast of Site L5. The plot of discharge measurements had some scatter but they indicated no net gain or loss in discharge.

McEwen Canal

Seepage runs were made at seven sites on McEwen Canal (fig. 2). These sites were divided into four reaches. McEwen Canal had gains in the first and fourth reaches, a loss in the third reach, and the second reach had no gain or loss. The canal had a net gain of about 0.9 cubic foot per second. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 7 and 13 and tables 1 and 5).

Reach M1-M2.—Site M1 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal about 3.5 miles northeast of Panguitch, Utah. Site M2 is about 1.0 mile northeast of Site M1. The plot of discharge measurements had little scatter and showed a net gain of about 3.5 cubic feet per second or about 3.5 cubic feet per second per mile.

Reach M2-M4.—Site M4 is about 1.4 miles northeast of Site M2. The plot of discharge measurements had little scatter but showed no net gain or loss in discharge.

Reach M4-M5.—Site M5 is about 1.0 mile northeast of Site M4. The plot of discharge measure-

ments had very little scatter and showed a net loss of about 4.6 cubic feet per second or about 3.3 cubic feet per second per mile.

Reach M5-M7.—Site M7 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal and is about 1.5 miles northeast of Site M5. The plot of discharge measurements had little scatter and showed a net gain of about 2.0 cubic feet per second or about 1.3 cubic feet per second per mile.

East Fork Sevier River in Black Canyon

Seepage runs were made at six sites on the East Fork Sevier River in Black Canyon (fig. 2). These sites were divided into five reaches. The first and third reaches had no gain or loss; the second and fifth reaches in this section had losses, and the fourth reach had a gain. This section had a net gain of about 3.0 cubic feet per second. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 7 and 14 and tables 1 and 5).

Reach 27-28.—Site 27 is about 7.4 miles southeast of Antimony, Utah. Site 28 is a temporary gage where a water-stage recorder was operated to monitor changes in the river about 0.9 mile northeast of Site 27. The plot of discharge measurements for this reach had little scatter but indicated no net gain or loss in discharge.

Reach 28-29.—Site 29 is about 1.1 miles northwest of Site 28. The plot of discharge measurements for this reach had little scatter and showed a net loss of about 2.0 cubic feet per second or about 1.6 cubic feet per second per mile.

Reach 29-30.—Site 30 is about 0.8 mile north of Site 29. The plot of discharge measurements for this reach had little scatter but indicated no net gain or loss in discharge.

Reach 30-31.—Site 31 is about 0.6 mile northwest of Site 30. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 6.0 cubic feet per second or about 2.8 cubic feet per second per mile.

Reach 31-32.—Site 32 is about 4.0 miles southeast of Antimony. The plot of discharge measurements for this reach had some scatter and showed a net loss of about 1.0 cubic foot per second or about 0.8 cubic foot per second per mile.

East Fork Sevier River in Kingston Canyon

Seepage runs were made at six sites on the East Fork Sevier River in Kingston Canyon (fig. 2). These sites were divided into four reaches. The second reach showed a gain; all other reaches in this section had losses. The section had a net loss of about 8.0 cubic feet per second. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 7 and 14 and tables 1 and 5).

Reach 40-41.—Site 40 is about 8.0 miles southeast of Kingston, Utah. Site 41 is about 0.8 mile northwest of Site 40. The plot of discharge measurements for this reach had some scatter and showed a net loss of about 1.0 cubic foot per second or about 0.7 cubic foot per second per mile.

Reach 41-42.—Site 42 is about 1.5 miles northwest of Site 41. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 3.0 cubic feet per second or about 1.5 cubic feet per second per mile.

Reach 42-44.—Site 44 is about 2.4 miles west of Site 42. The plot of discharge measurements for this reach had some scatter and showed a net loss of about 4.0 cubic feet per second or about 1.2 cubic feet per second per mile.

Reach 44-45.—Site 45 is a U.S. Geological Survey gaging station about 1.8 miles southeast of Kingston. The plot of discharge measurements for this reach had considerable scatter and showed a net loss of about 6.0 cubic feet per second or about 4.3 cubic feet per second per mile.

Central Sevier Valley

The Sevier River in central Sevier Valley includes the Sevier River from Kingston to Sevier Bridge Reservoir. Seepage runs were made on two sections in the central Sevier Valley that consist of (1) the south section and (2) the north section. Three sets of seepage runs were made during August 9-11, 1988 (fig. 3). Three more seepage runs were made during October 25-27, 1988 (fig. 4), which was after the irrigation season. The net gain for the combined sections was about 213 cubic feet per second for August and about 230 cubic feet per second for October.

South Section Sevier River

Seepage runs were made at 11 sites on the south section of the Sevier River in central Sevier Valley during August 9-11, 1988 (fig. 3). These sites were divided into nine reaches. During this set of runs, the south section had a net gain of about 96 cubic feet per second. Only the first and fourth reaches had losses; the rest showed gains. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 8 and 15 and tables 2 and 6).

Reach 54-55.—Site 54 is a U.S. Geological Survey station about 1.0 mile south of Sevier, Utah. Site 55 is about 1.3 miles southeast of Joseph, Utah. The plot of discharge measurements for this reach had considerable scatter and showed a net loss of about 8.0 cubic feet per second or about 2.1 cubic feet per second per mile.

Reach 55-56.—Site 56 is on Highway 118 about 0.8 mile northeast of Joseph, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 7.0 cubic feet per second or about 3.3 cubic feet per second per mile.

Reach 56-57.—Site 57 is about 1.5 miles south of Elsinore, Utah. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 37.0 cubic feet per second or about 8.2 cubic feet per second per mile.

Reach 57-58.—Site 58 is at a bridge on Highway 118 about 0.3 mile north of Austin, Utah. The plot of discharge measurements for this reach had little scatter and showed a net loss of about 6.0 cubic feet per second or about 1.9 cubic feet per second per mile.

Reach 58-59.—Site 59 is a temporary gage where a water-stage recorder was operated to monitor changes in the river and is about 0.8 mile east of Central, Utah. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 14.0 cubic feet per second or about 3.4 cubic feet per second per mile.

Reach 59-61.—Site 61 is about 2.0 miles east of Richfield, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 25.0 cubic feet per second or about 2.6 cubic feet per second per mile.

Reach 61-62.—Site 62 is about 2.8 miles northeast of Richfield. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 14.0 cubic feet per second or about 3.8 cubic feet per second per mile.

Reach 62-63.—Site 63 is about 2.5 miles northwest of Glenwood, Utah. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 1.0 cubic foot per second or about 0.2 cubic foot per second per mile.

Reach 63-64.—Site 64 is a temporary gage where a water-stage recorder was operated to monitor changes in the river at a bridge in Sigurd, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 12.0 feet per second or about 2.3 cubic feet per second per mile.

Seepage runs were made again during October 25-27, 1988, which was after the irrigation season for this area. The same 11 sites and 9 reaches were used (fig. 4). In this set of runs, only the fourth reach had a loss with the rest showing gains, so the south section had a net gain of about 86.0 cubic feet per second. Following are the calculated changes in discharge for each (figs. 9 and 16 and tables 3 and 7).

Reach 54-55.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 4.0 cubic feet per second or about 1.0 cubic foot per second per mile.

Reach 55-56.—The plot of discharge measurements for this reach had no scatter and showed a net gain of about 6.0 cubic feet per second or about 2.9 cubic feet per second per mile.

Reach 56-57.—The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 26.0 cubic feet per second or about 5.7 cubic feet per second per mile.

Reach 57-58.—The plot of discharge measurements for this reach had very little scatter and showed a net loss of about 1.0 cubic foot per second or about 0.3 cubic foot per second per mile.

Reach 58-59.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 12.0 cubic feet per second or about 2.9 cubic feet per second per mile.

Reach 59-61.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 12.0 cubic feet per second or about 1.3 cubic feet per second per mile.

Reach 61-62.—The plot of discharge measurements for this reach had little scatter and showed a net gain of about 12.0 cubic feet per second or about 3.2 cubic feet per second per mile.

Reach 62-63.—The plot of discharge measurements for this reach had very little scatter and showed a

net gain of about 4.0 cubic feet per second or about 1.0 cubic foot per second per mile.

Reach 63-64.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 11.0 cubic feet per second or about 2.1 cubic feet per second per mile.

North Section Sevier River

Seepage runs were made at 11 sites on the north section of the Sevier River in central Sevier Valley during August 9-11, 1988 (fig. 3). These sites were divided into six reaches. The north section had a net gain of about 117 cubic feet per second; the second reach had a loss and the rest showed gains. Following is a brief description of each reach studied and the calculated changes in discharge (figs. 8 and 15 and tables 2 and 6).

Reach 65-70.—Site 65 is a U.S. Geological Survey gaging station located about 2.3 miles northeast of Sigurd. Site 70 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal and is at a bridge on old Highway 89, about 1.2 miles northeast of Redmond. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 84.0 cubic feet per second or about 4.6 cubic feet per second per mile.

Reach 70-71.—Site 71 is about 1.8 miles west of Axtell, Utah. The plot of discharge measurements for this reach had considerable scatter and showed a net loss of about 2.0 cubic feet per second or about 0.7 foot per second per mile.

Reach 71-72.—Site 72 is about 1.8 miles northwest of Axtell. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 5.0 cubic feet per second or about 2.2 cubic feet per second per mile.

Reach 72-73.—Site 73 is about 2.8 miles southwest of Centerfield, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 3.0 cubic feet per second or about 0.7 cubic foot per second per mile.

Reach 73-74.—Site 74 is about 3.0 miles southwest of Gunnison, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 26.0 cubic feet per second or about 3.7 cubic feet per second per mile.

Reach 74-75.—Site 75 is a U.S. Geological Survey gaging station about 3.2 miles northwest of Gunnison. The record during the seepage run from this station was unusable. The plot of the discharge measurements for this reach had little scatter and showed a net gain of about 1.0 cubic foot per second or about 0.4 cubic foot per second per mile.

During the October 25-27, 1988, seepage run, the 11 sites were again measured, but this time they were divided into 8 reaches. This time period is after the irrigation season. The north section had gains in all reaches except for the fourth and eighth reaches, which had small losses. The net gain of about 144 cubic feet per second was larger than the net gain in August. Following is a brief summary of the plotting and calculated changes in discharge in each reach and a brief description for only the reaches that differ from the August study (figs. 9 and 16 and table 3 and 7).

Reach 65-68.—Site 65 is a U.S. Geological Survey gaging station located about 2.3 miles northeast of Sigurd. The record during the seepage run from this station was unusable. Site 68 is about 1.4 miles west of Salina, Utah. The plot of discharge measurements for this reach had some scatter and showed a net gain of about 35.0 cubic feet per second or about 2.9 cubic feet per second per mile.

Reach 68-69.—Site 69 is about 0.8 mile southeast of Redmond, Utah. The plot of discharge measurements for this reach had considerable scatter and showed a net gain of about 48.0 cubic feet per second or about 13.9 cubic feet per second per mile.

Reach 69-70.—Site 70 is a temporary gage where a water-stage recorder was operated to monitor changes in the canal and is at a bridge on old Highway 89, about 1.2 miles northeast of Redmond. The plot of discharge measurements for this reach had considerable scatter and showed a net gain of about 5.0 cubic feet per second or about 1.8 cubic feet per second per mile.

Reach 70-71.—The plot of discharge measurements for this reach had little scatter and showed a net loss of about 1.0 cubic foot per second or about 0.3 cubic foot per second per mile.

Reach 71-72.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 3.0 cubic feet per second or about 1.3 cubic feet per second per mile.

Reach 72-73.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 2.0 cubic feet per second or about 0.5 cubic foot per second per mile.

Reach 73-74.—The plot of discharge measurements for this reach had some scatter and showed a net gain of about 54.0 cubic feet per second or about 7.6 cubic feet per second per mile.

Reach 74-75.—The plot of the discharge measurements for this reach had considerable scatter and showed a net loss of about 2.0 cubic feet per second or about 0.7 cubic foot per second per mile.

Sanpete Valley

The San Pitch River in Sanpete Valley begins on the Wasatch Plateau north of Fairview and ends where it flows into the Sevier River at Gunnison, Utah. Three sets of seepage runs were made during October 4-6, 1988, on this eighth and final section of the study.

San Pitch River Above Gunnison Reservoir

Seepage runs were made at 26 sites on the San Pitch River from the north end of Sanpete Valley to Gunnison Reservoir (fig. 5) in October 1988. These sites were divided into 17 reaches. Gains were substantially larger than losses; 12 reaches had gains, and the second, fifth, twelfth, fifteenth, and sixteenth reaches had losses. The net gain was about 23.4 cubic feet per second. The following is a brief description of each reach studied and the calculated changes in discharge (figs. 10 and 17 and tables 4 and 8).

Reach 84-85.—Site 84 is located about 4.3 miles north of Fairview, Utah. Site 85 is about 0.8 mile southeast of Site 84. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 1.0 cubic foot per second or about 1.2 cubic feet per second per mile.

Reach 85-86.—Site 86 is about 0.4 mile southwest of Site 85. The plot of discharge measurements for this reach had no scatter and showed a net loss of about 0.2 cubic foot per second or about 0.3 cubic foot per second per mile.

Reach 86-87.—Site 87 is about 0.4 mile below where Oak Creek enters the river. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 4.0 cubic feet per second or about 1.1 cubic feet per second per mile.

Reach 87-88.—Site 88 is about 1.2 miles north of Fairview, Utah. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 0.5 cubic foot per second or about 0.9 cubic foot per second per mile.

Reach 88-89.—Site 89 is near a bridge on U.S. Highway 89, about 0.8 mile northwest of Fairview. The plot of discharge measurements for this reach had no scatter and showed a net loss of about 0.9 cubic foot per second or about 1.0 cubic foot per second per mile.

Reach 89-90.—Site 90 is about 0.6 mile west of Fairview. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 0.7 cubic foot per second or about 0.9 cubic foot per second per mile.

Reach 90-91.—Site 91 is about 0.6 mile southeast of Site 90. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 3.3 cubic feet per second or about 3.4 cubic feet per second per mile.

Reach 91-94.—Site 93 is a temporary gage where a water-stage recorder was operated to monitor changes in the river and is about 2.3 miles southwest of Site 91. Site 94 is about 2.0 miles northwest of Mount Pleasant, Utah. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 2.9 cubic feet per second or about 0.6 cubic foot per second per mile.

Reach 94-96.—Site 96 is a U.S. Geological Survey gaging station about 3.5 miles west of Mount Pleasant. The plot of discharge measurements for this reach had little scatter and showed a net gain of about 6.2 cubic feet per second or about 1.3 cubic feet per second per mile.

Reach 96-97.—Site 97 is about 1.0 mile southwest of Site 96. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 0.4 cubic foot per second or about 0.2 cubic foot per second per mile.

Reach 97-98.—Site 98 is about 2.0 miles southeast of Moroni, Utah. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 2.7 cubic feet per second or about 1.2 cubic feet per second per mile.

Reach 98-99.—Site 99 is about 0.9 mile west of Site 98. The plot of discharge measurements for this reach had no scatter and showed a net loss of about 0.4 cubic foot per second or about 0.2 cubic foot per second per mile.

Reach 99-100.—Site 100 is about 1.5 miles south of Moroni. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 1.8 cubic feet per second or about 0.8 cubic foot per second per mile.

Reach 100-101.—Site 101 is about 2.0 miles southeast of Wales, Utah. The plot of discharge measurements for this reach had very little scatter and showed a net gain of about 1.1 cubic feet per second or about 0.3 cubic foot per second per mile.

Reach 101-102.—Site 102 is about 2.8 miles southwest of Site 101. The plot of discharge measurements had no scatter and showed a net loss of about 0.2 cubic foot per second or 0 cubic foot per second per mile.

Reach 102-104.—Site 104 is about 4.2 miles southwest of Ephraim, Utah. The plot of discharge measurements for this reach had no scatter and showed a net loss of all the water in the channel, which was about 0.4 cubic foot per second or 0 cubic foot per second per mile.

Reach 104-109.—Site 108 is a U.S. Geological Survey gaging station about 2.2 miles northwest of Manti, Utah. Site 109 is about 1.0 mile above Gunnison Reservoir. The plot of discharge measurements for this reach had no scatter and showed a net gain of about 0.9 cubic foot per second or about 0.1 cubic foot per second per mile.

SUMMARY

In the upper Sevier River basin, the section of the Sevier River between the town of Hatch and Circleville Canyon had a net gain of about 125 cubic feet per second; Long-East Bench Canal had a net gain of about 0.7 cubic foot per second; McEwen Canal had a net gain of about 0.9 cubic foot per second; the East Fork Sevier River in Black Canyon had a net gain of about 3.0 cubic feet per second; and the East Fork Sevier River in Kingston Canyon had a net loss of about 8.0 cubic feet per second.

In central Sevier Valley, the south section of the Sevier River had a net gain of about 96.0 cubic feet per second during the August set of seepage runs and a net gain of about 86.0 cubic feet per second during the October set of seepage runs. The north section had a net gain of about 117 cubic feet per second during the August set of seepage runs and a net gain of about 144 cubic feet per second during the October set of seepage runs. The net gain for the combined sections was about 213 cubic feet per second for August and about 230 cubic feet per second for October.

In Sanpete Valley, the San Pitch River above Gunnison Reservoir had substantially larger gains than losses. The net gain was about 23.4 cubic feet per second.

REFERENCE CITED

Buchanan, T.J., and Somers, W.P., 1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A8, 66 p.

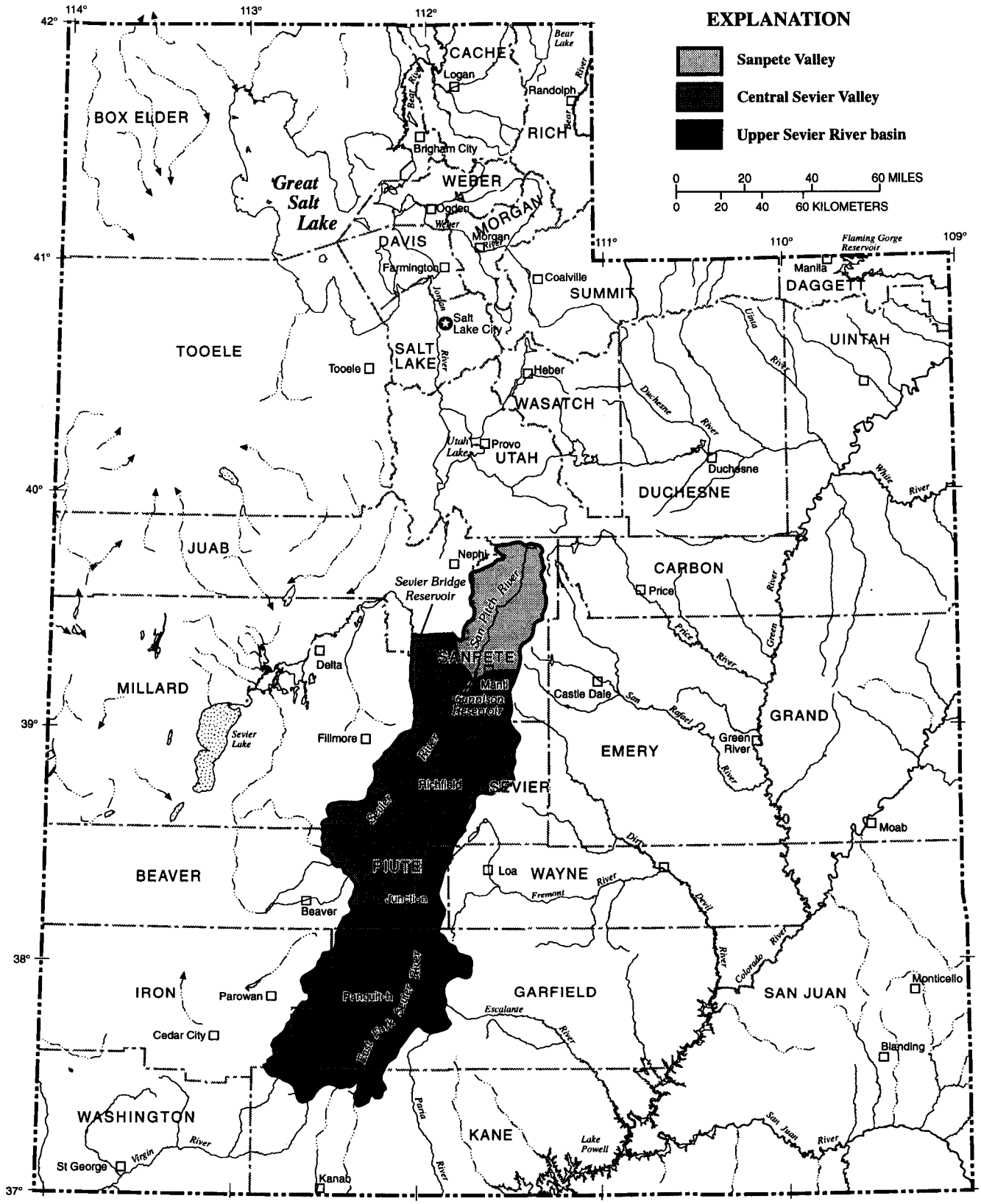
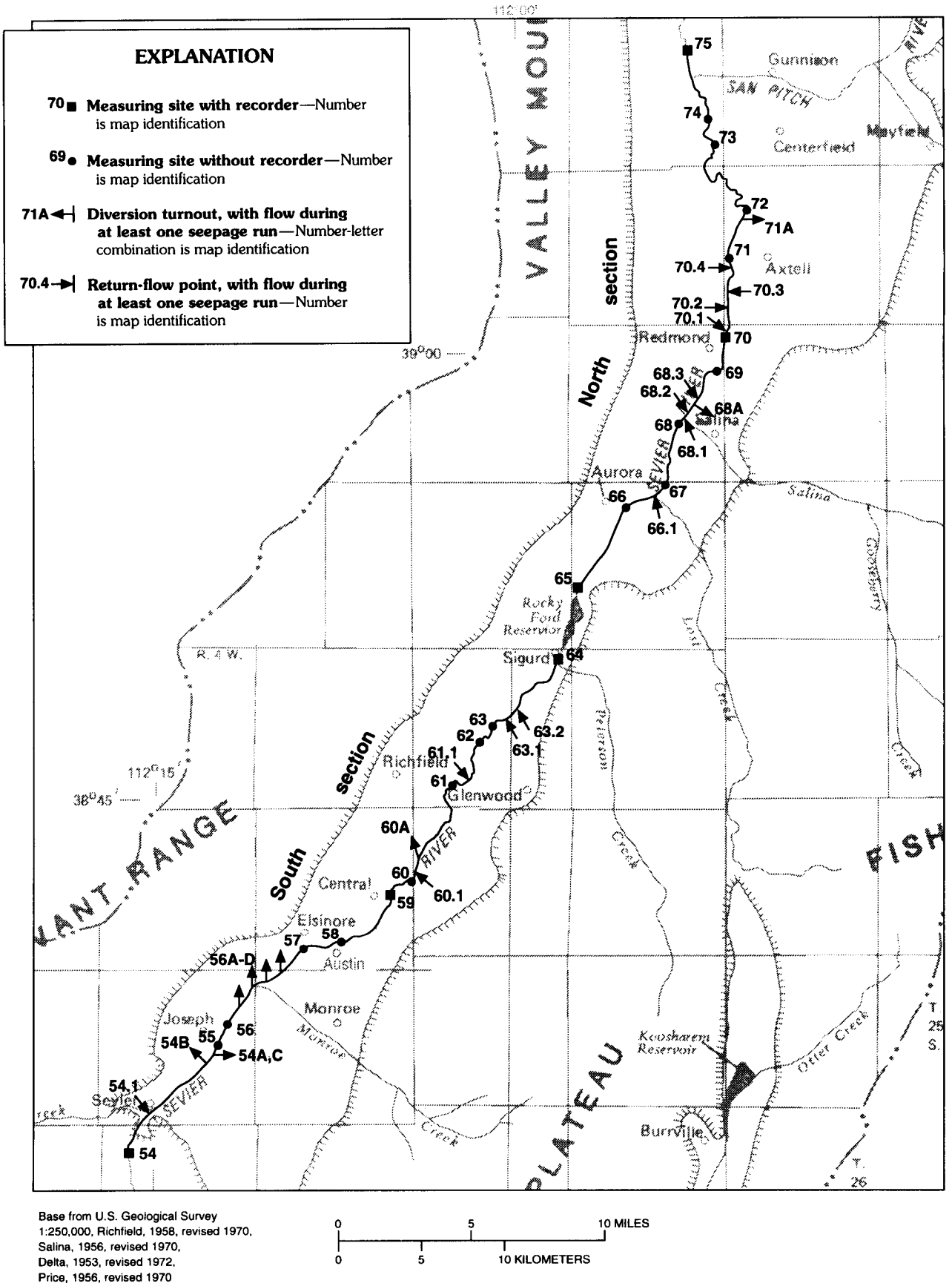


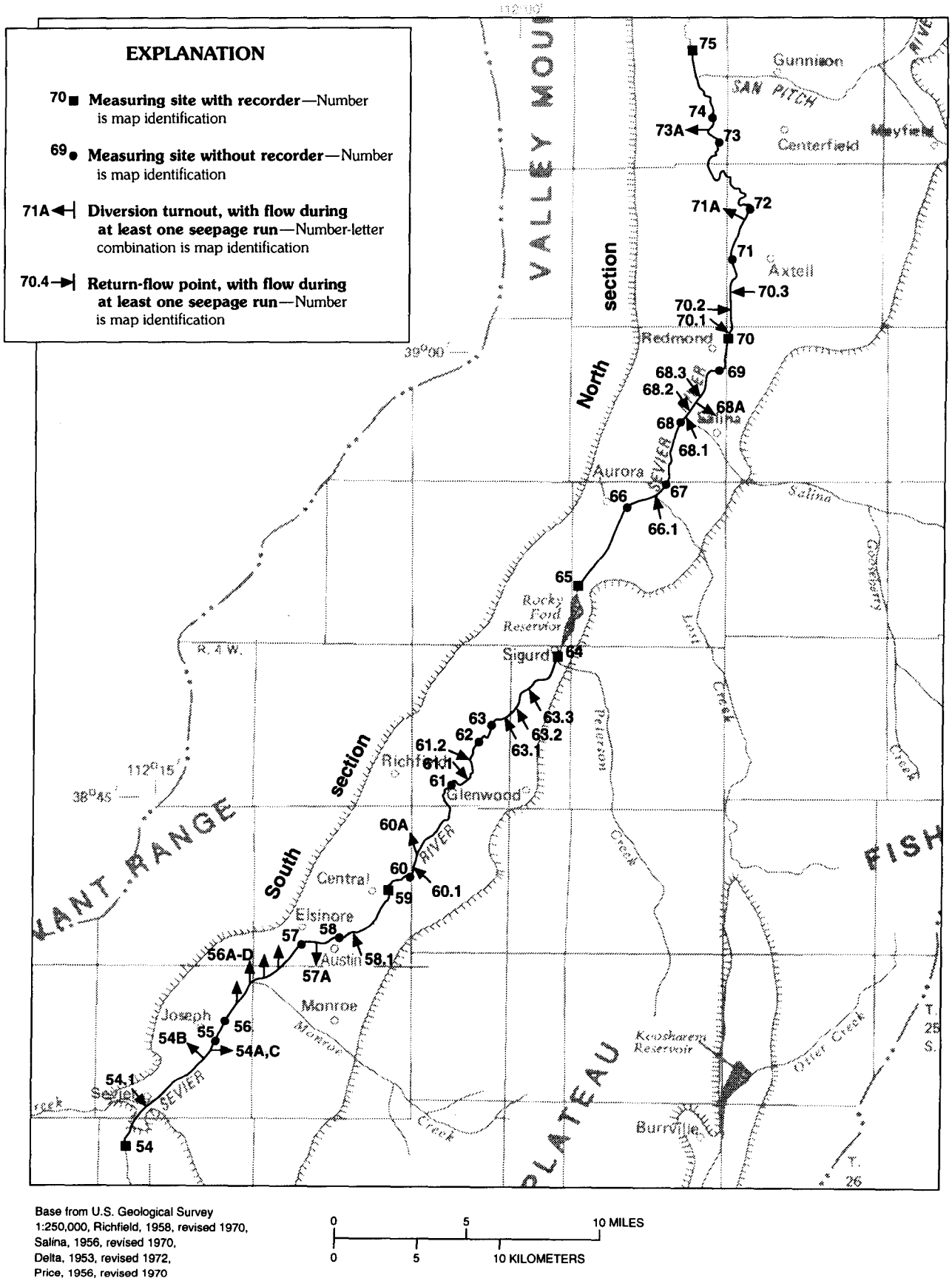
Figure 1. Location of Sevier River basin above Sevier Bridge Reservoir, Utah.



Base from U.S. Geological Survey
1:250,000, Richfield, 1958, revised 1970,
Salina, 1956, revised 1970,
Delta, 1953, revised 1972,
Price, 1956, revised 1970

0 5 10 MILES
0 5 10 KILOMETERS

Figure 3. Measuring sites in central Sevier Valley, Utah, August 9-11, 1988.



Base from U.S. Geological Survey
1:250,000, Richfield, 1958, revised 1970,
Salina, 1956, revised 1970,
Delta, 1953, revised 1972,
Price, 1956, revised 1970

Figure 4. Measuring sites in central Sevier Valley, Utah, October 25-27, 1988.

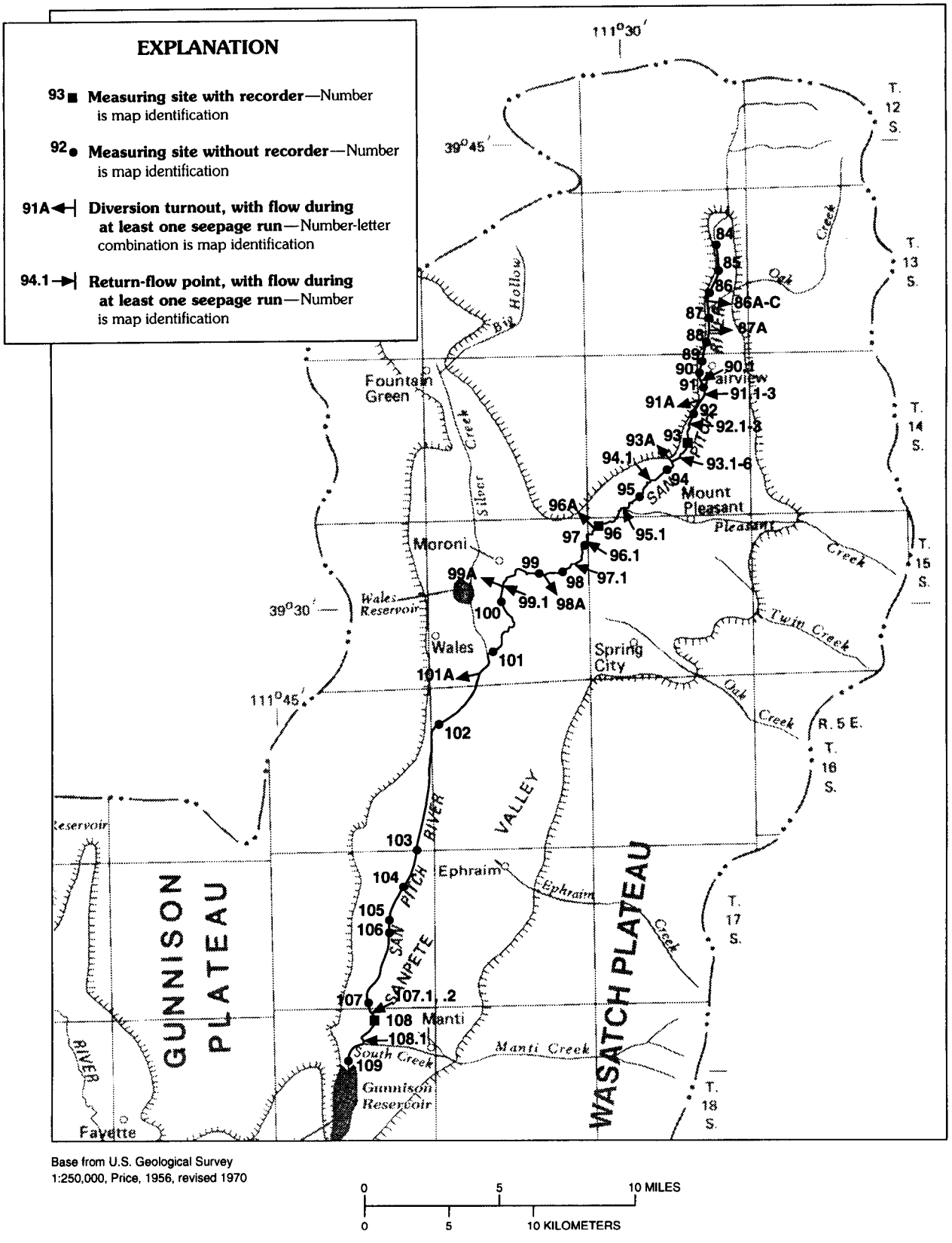


Figure 5. Measuring sites in Sanpete Valley, Utah, October 4-6, 1988.

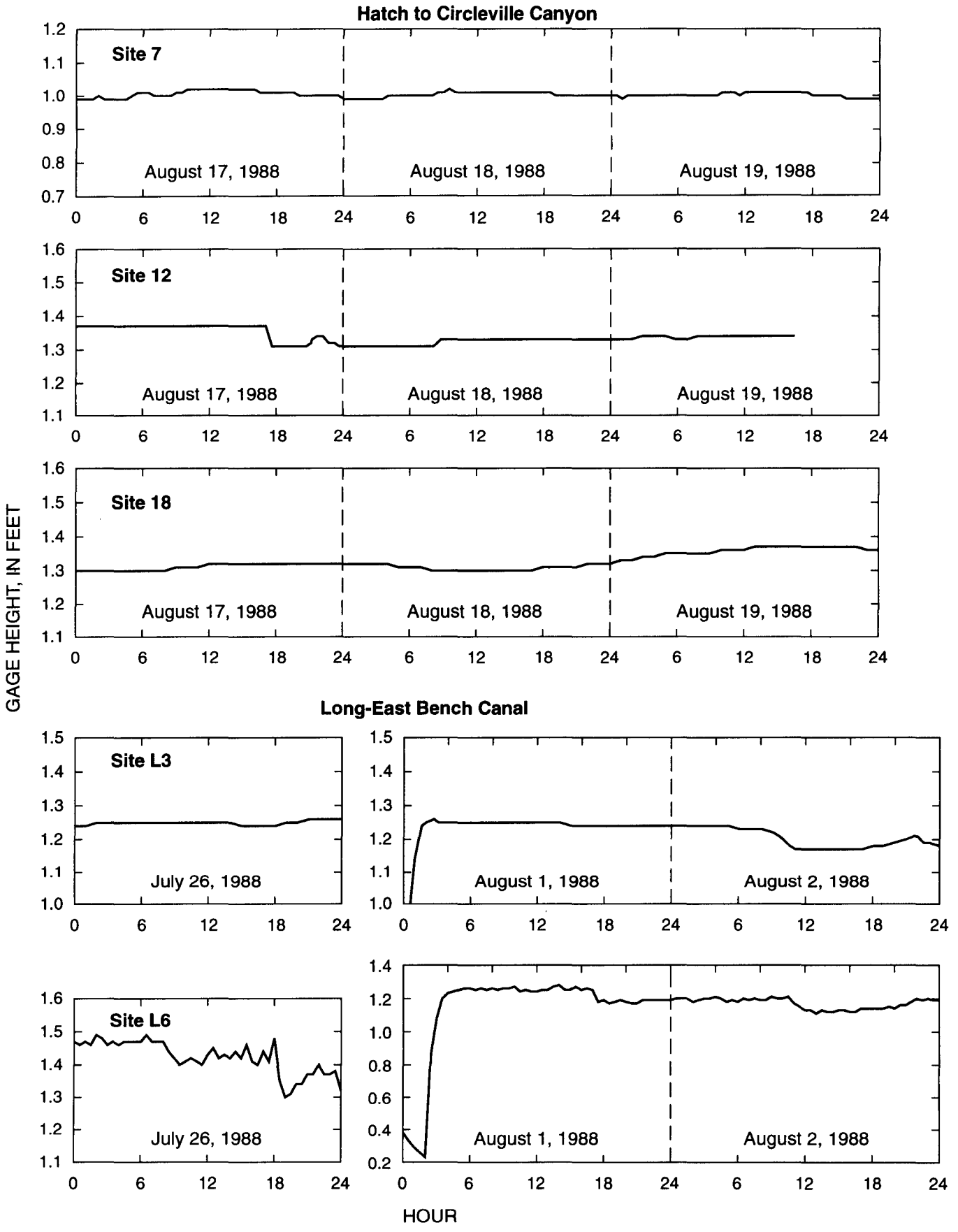


Figure 6. Gage height at measuring sites with recorder during seepage runs on the Sevier River from Hatch to Circleville Canyon and on Long-East Bench Canal, Utah, 1988.

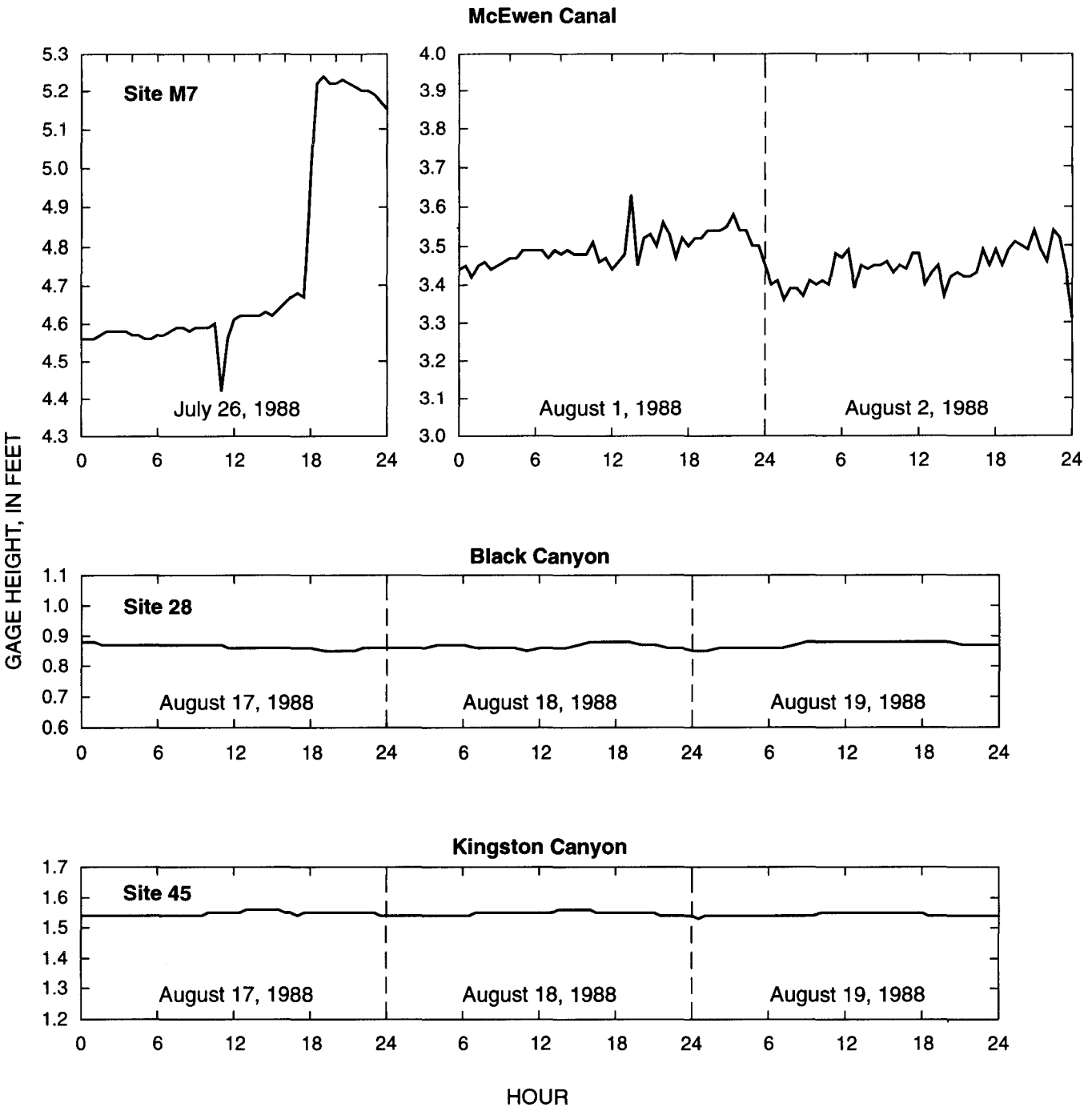


Figure 7. Gage height at measuring sites with recorder during seepage runs on McEwen Canal and in Black and Kingston Canyons on the East Fork Sevier River, Utah, 1988.

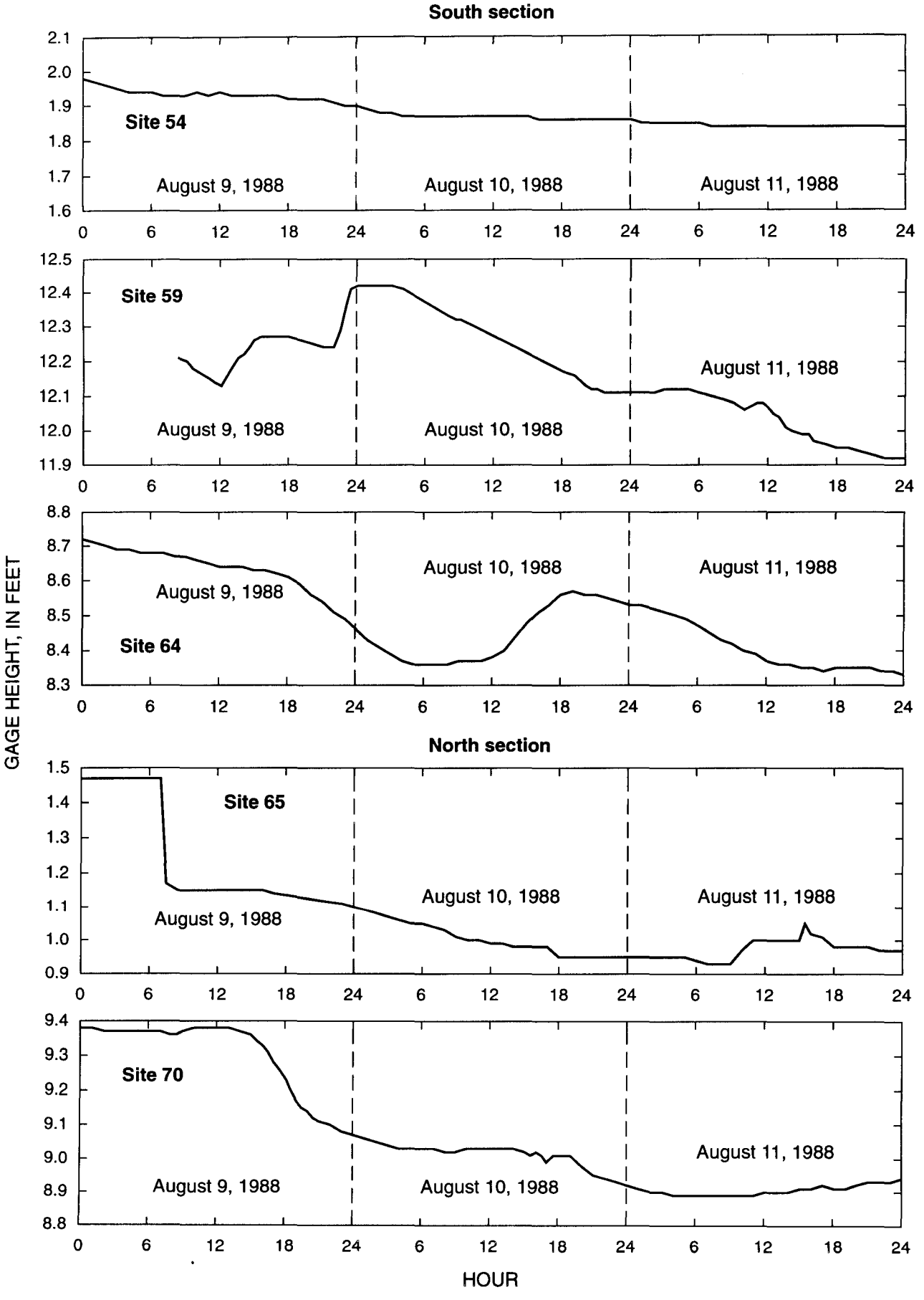


Figure 8. Gage height at measuring sites with recorder during seepage runs on the Sevier River in central Sevier Valley, Utah, August 9-11, 1988.

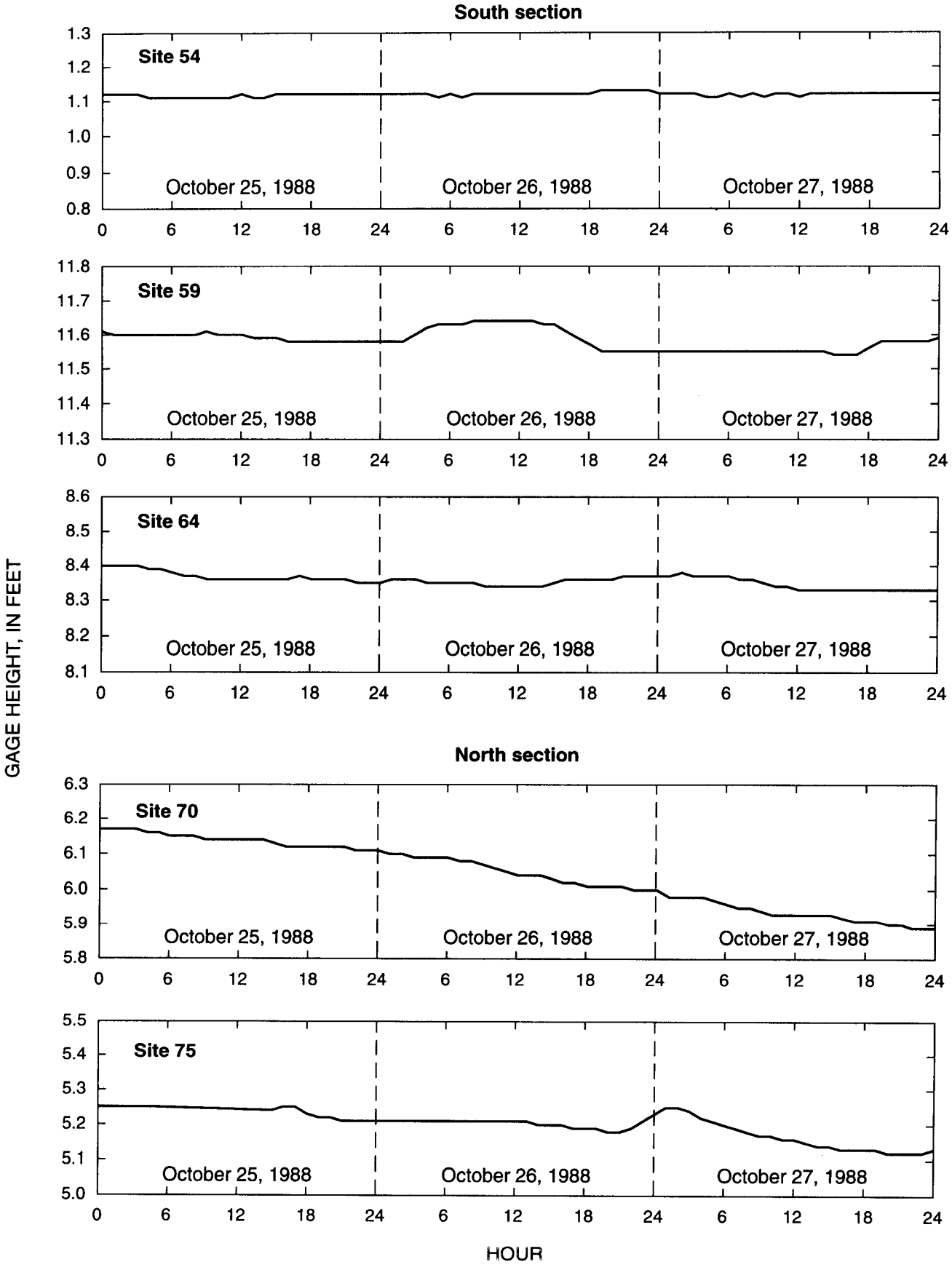


Figure 9. Gage height at measuring sites with recorder during seepage runs on the Sevier River in central Sevier Valley, Utah, October 25-27, 1988.

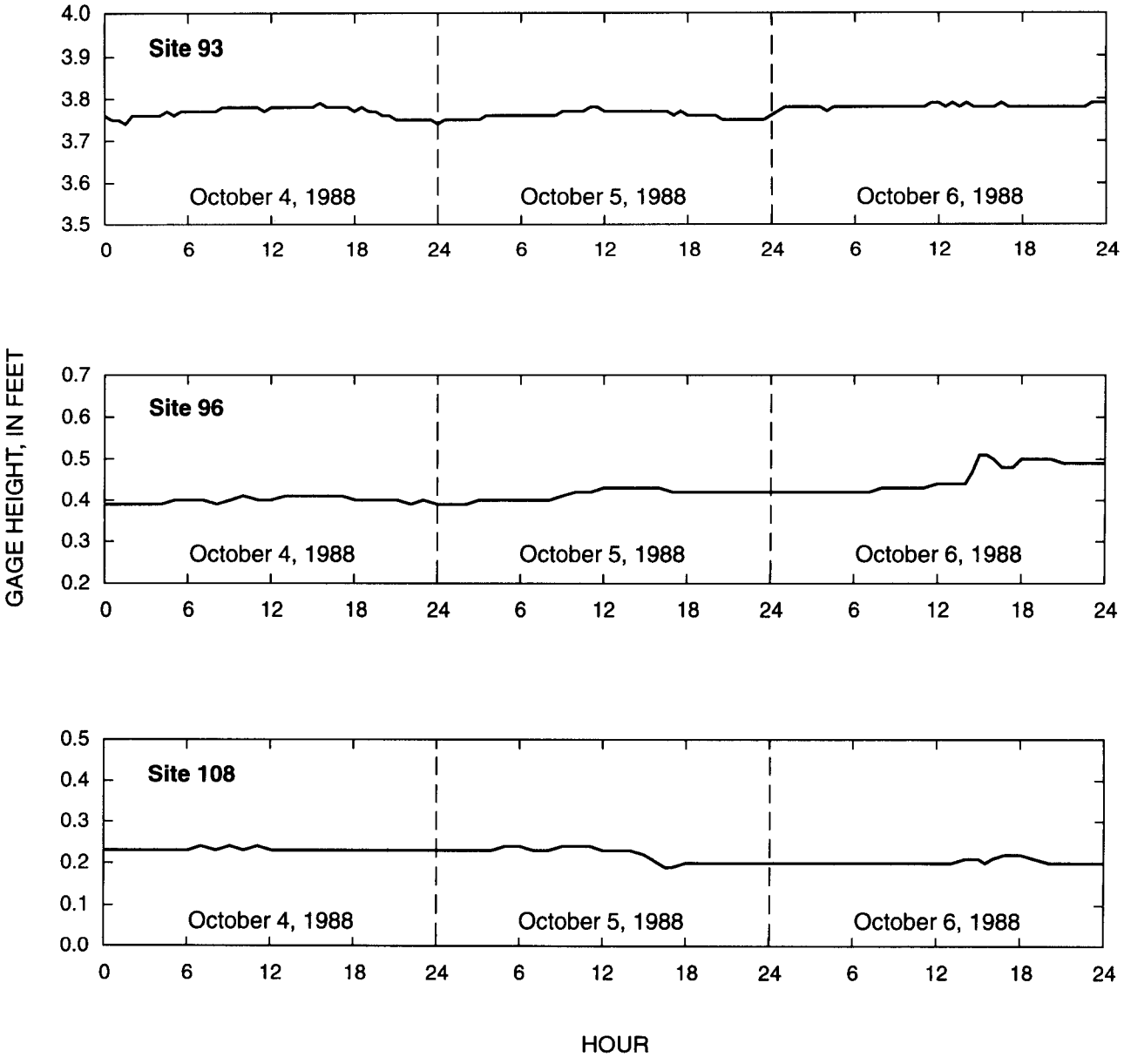


Figure 10. Gage height at measuring sites with recorder during seepage runs on the San Pitch River in Sanpete Valley, Utah, October 4-6, 1988.

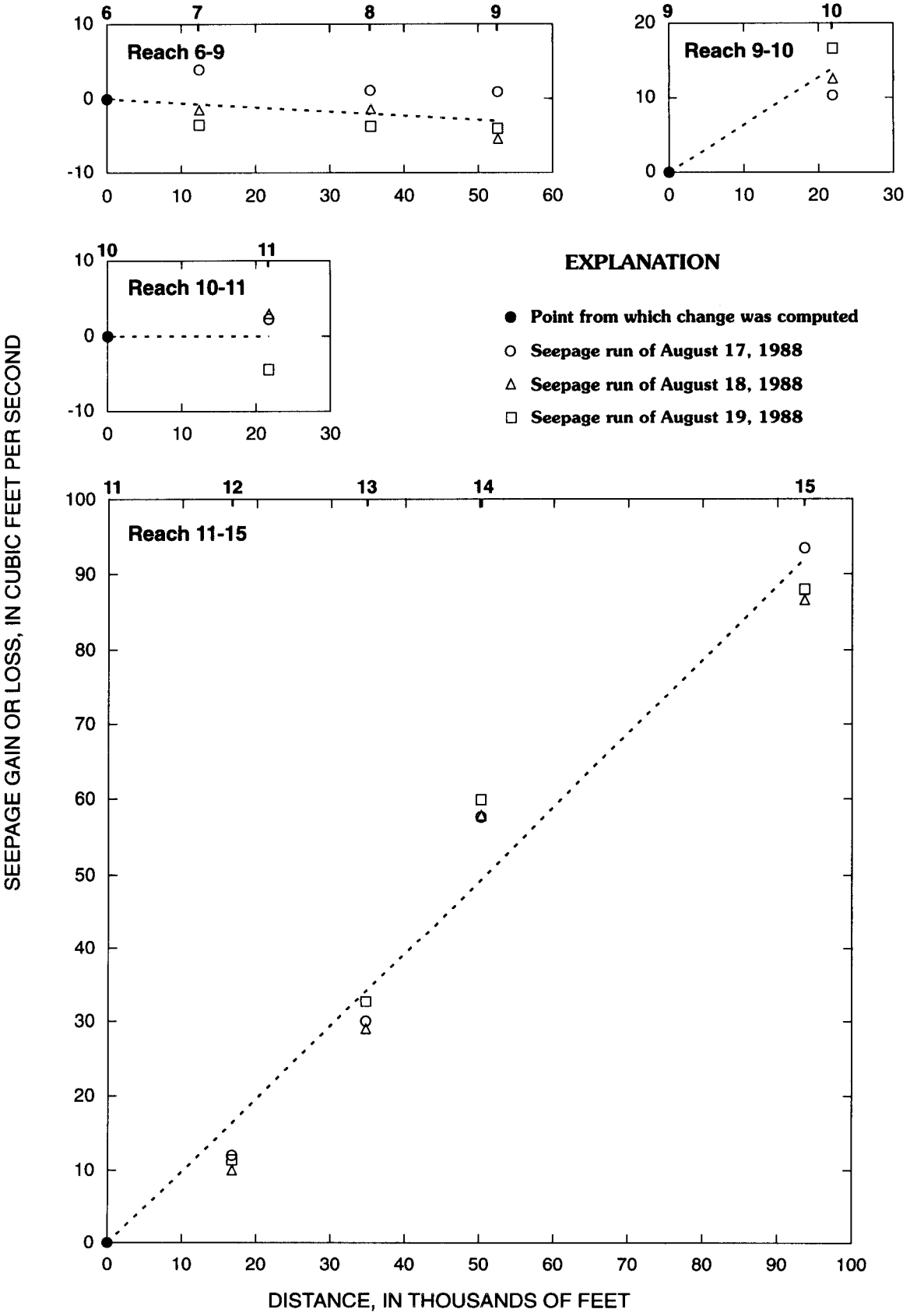


Figure 11. Estimated average seepage gain or loss for reaches of the Sevier River from Hatch to Circleville Canyon, Utah, August 17-19, 1988.

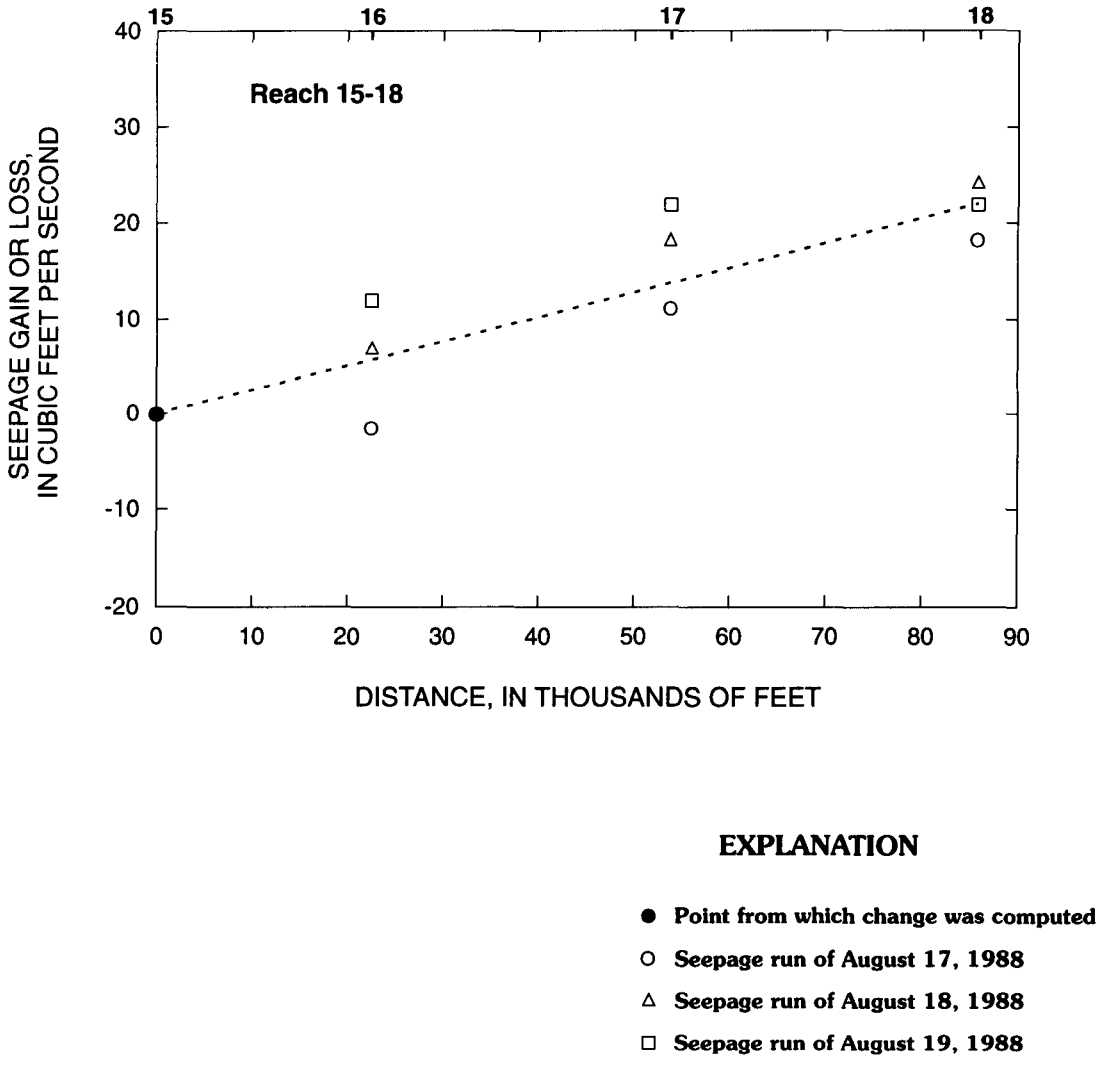


Figure 11. Estimated average seepage gain or loss for reaches of the Sevier River from Hatch to Circleville Canyon, Utah, August 17-19, 1988—Continued.

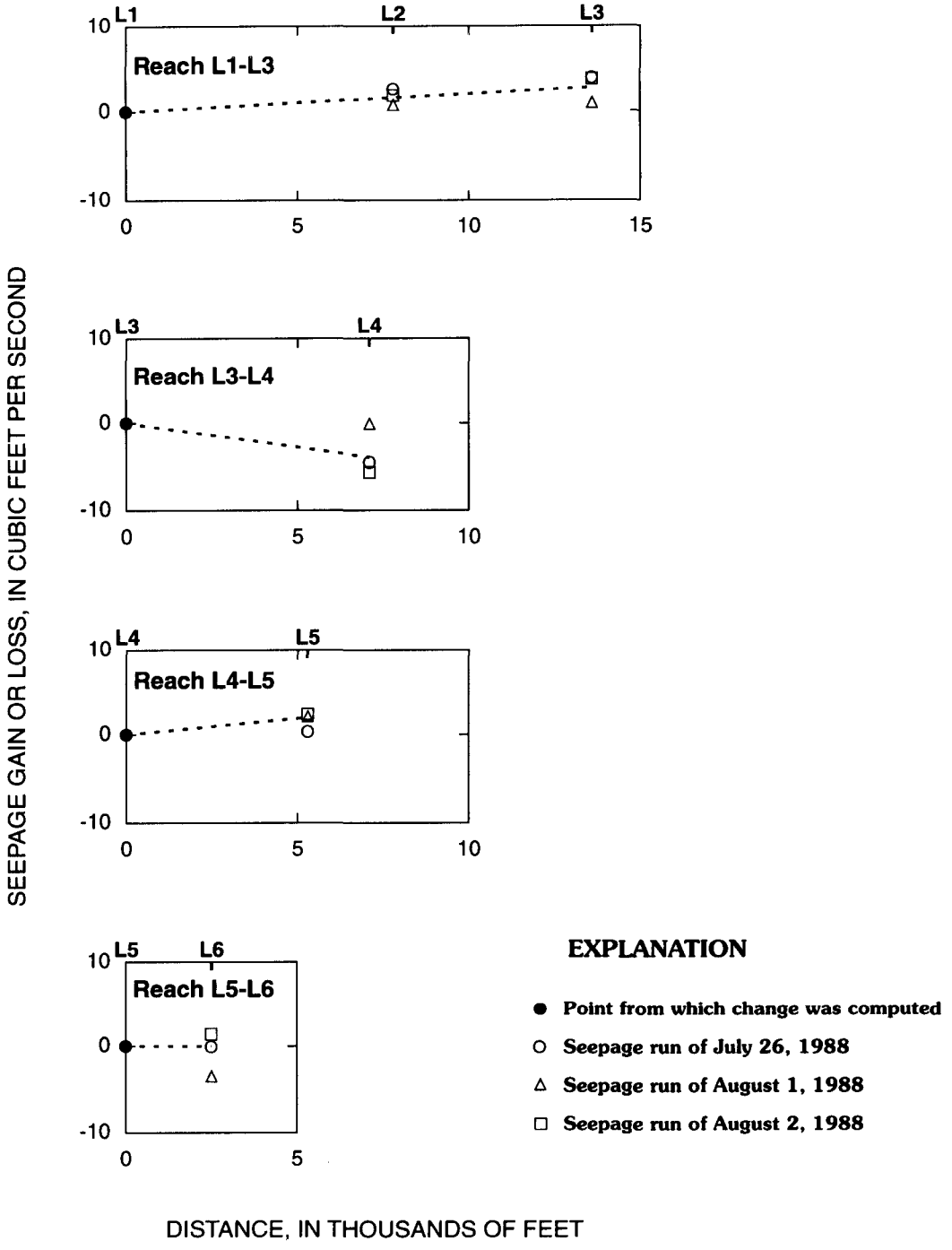


Figure 12. Estimated average seepage gain or loss for reaches of Long-East Bench Canal, Utah, July 26 to August 2, 1988.

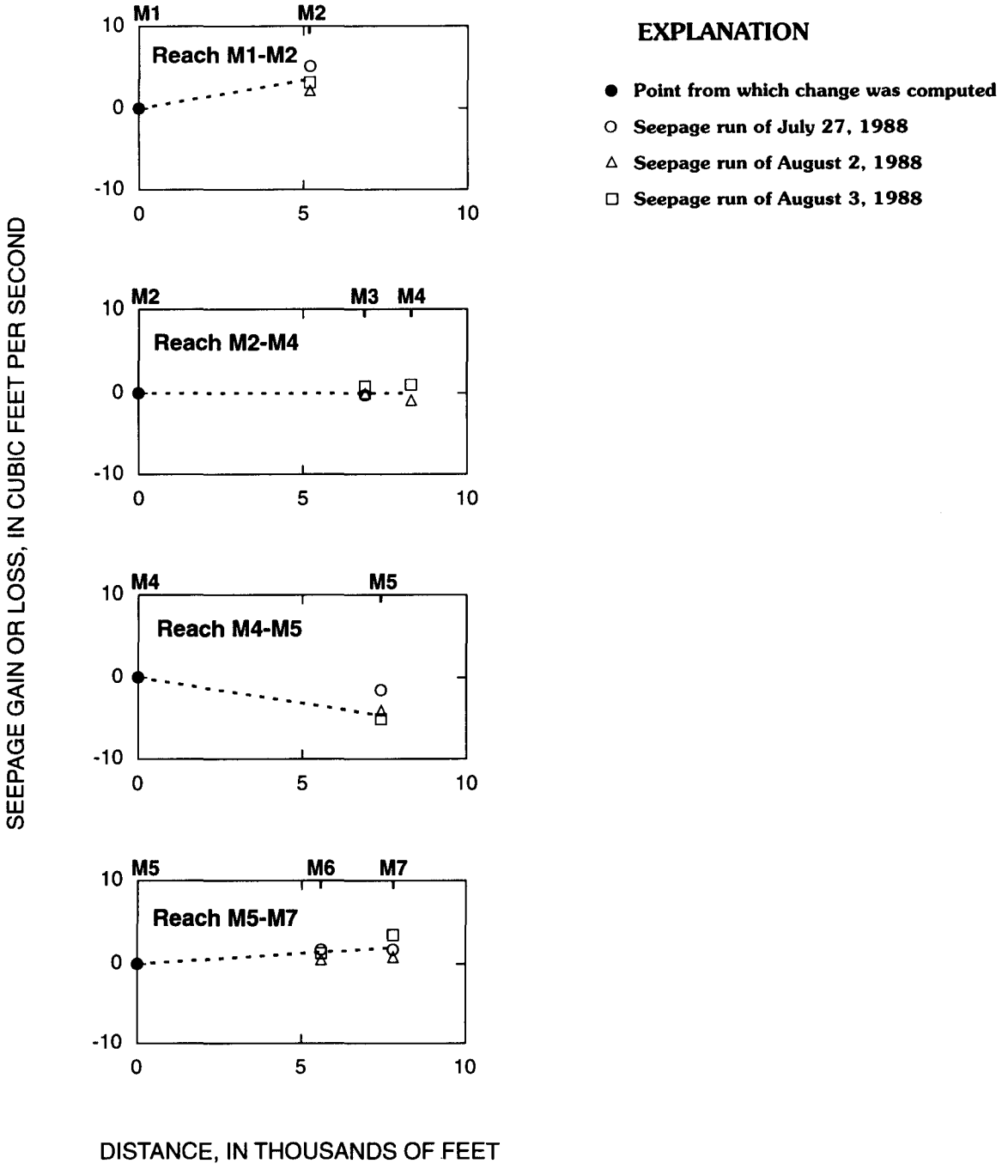


Figure 13. Estimated average seepage gain or loss for reaches of McEwen Canal, Utah, July 27 to August 3, 1988.

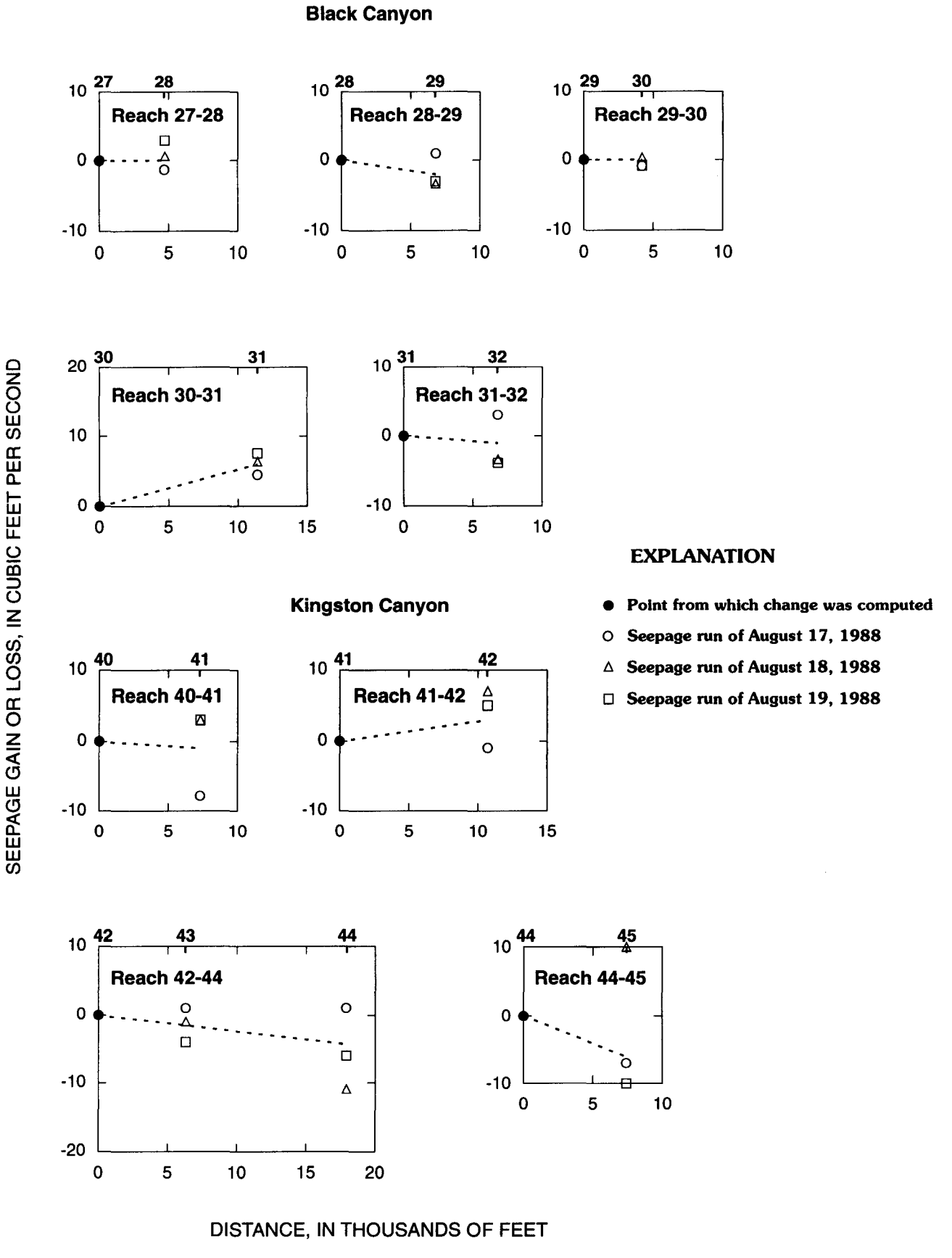


Figure 14. Estimated average seepage gain or loss for reaches of the East Fork Sevier River in Black and Kingston Canyons, Utah, August 17-19, 1988.

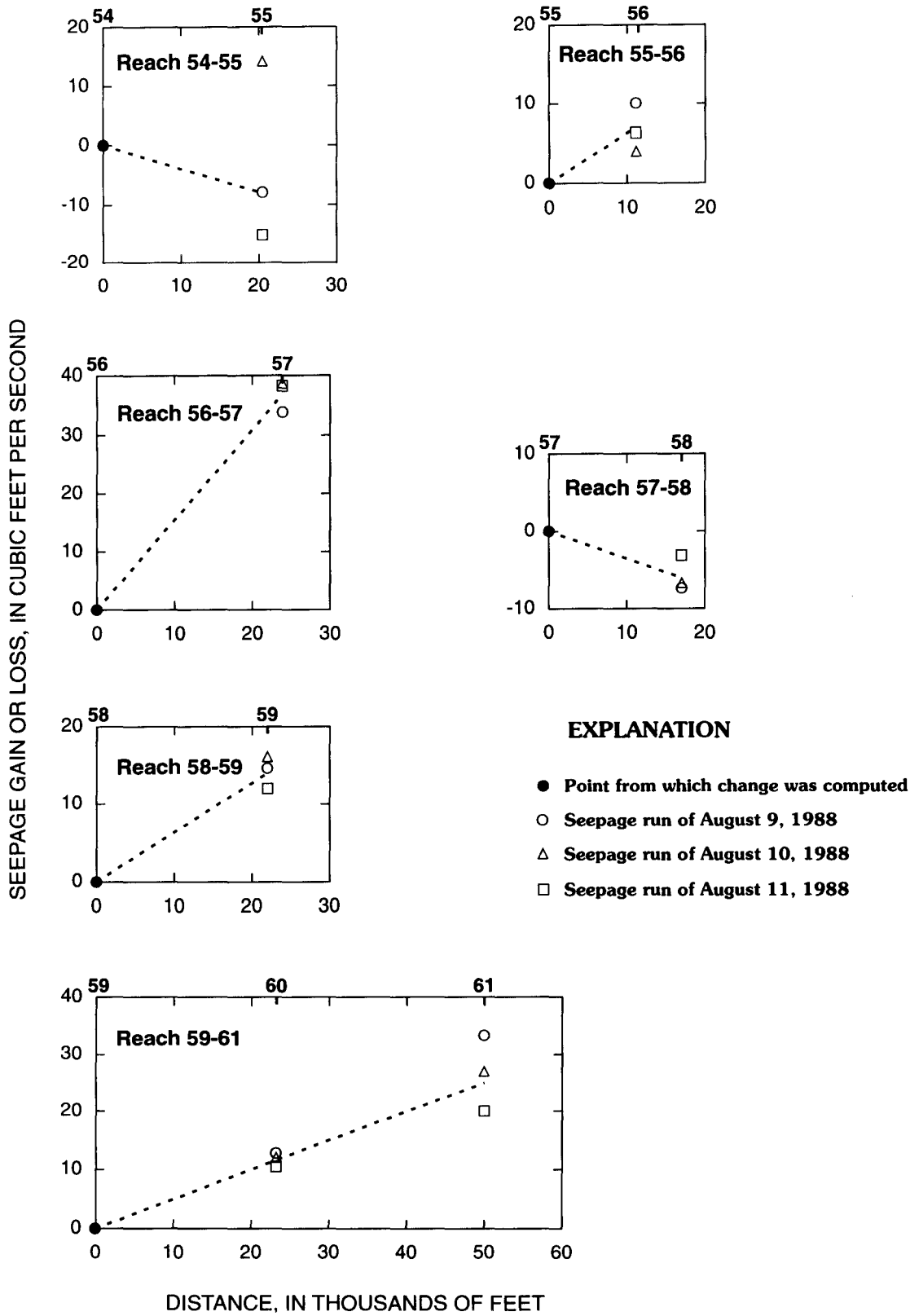


Figure 15. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, August 9-11, 1988.

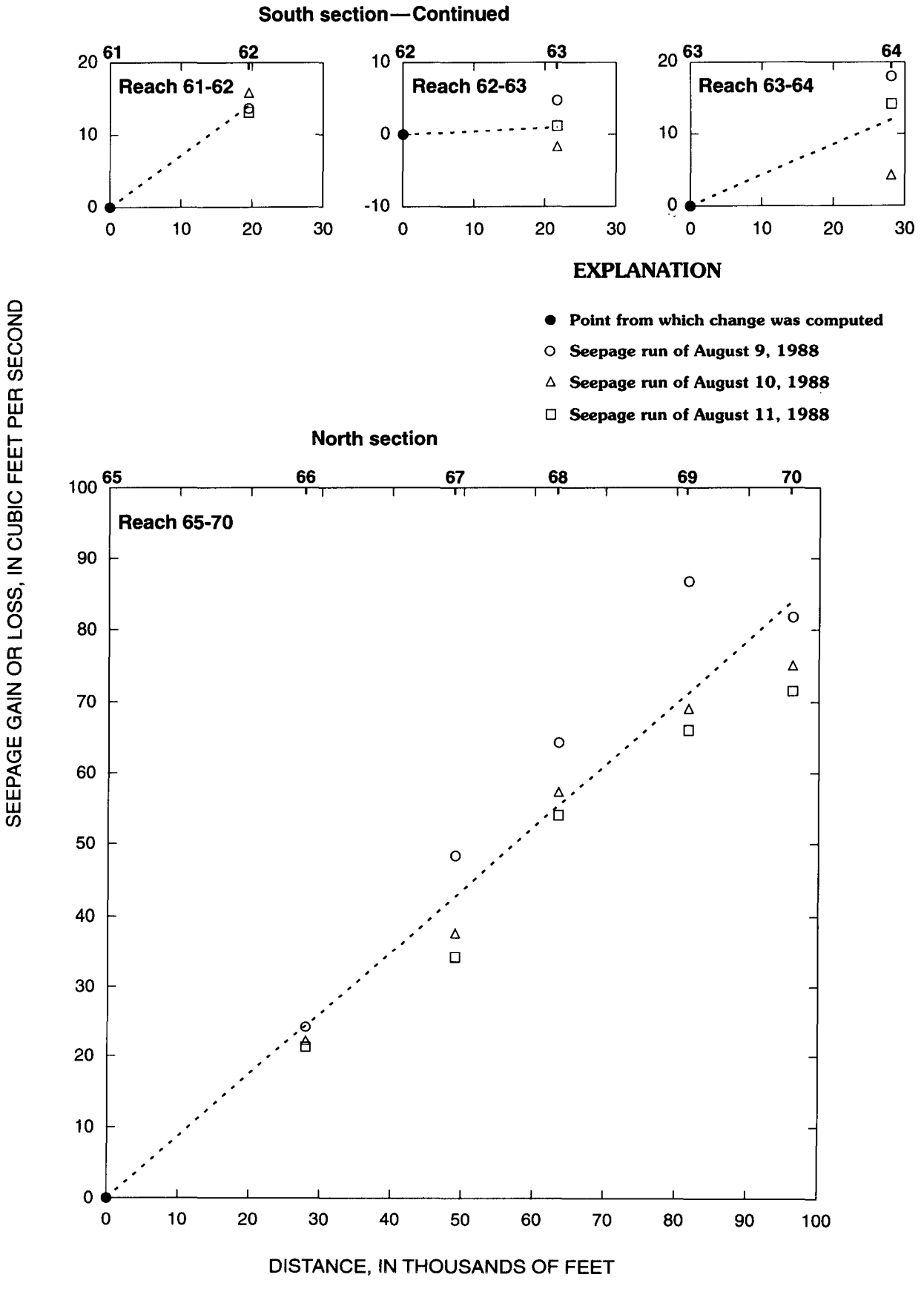


Figure 15. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, August 9-11, 1988—Continued.

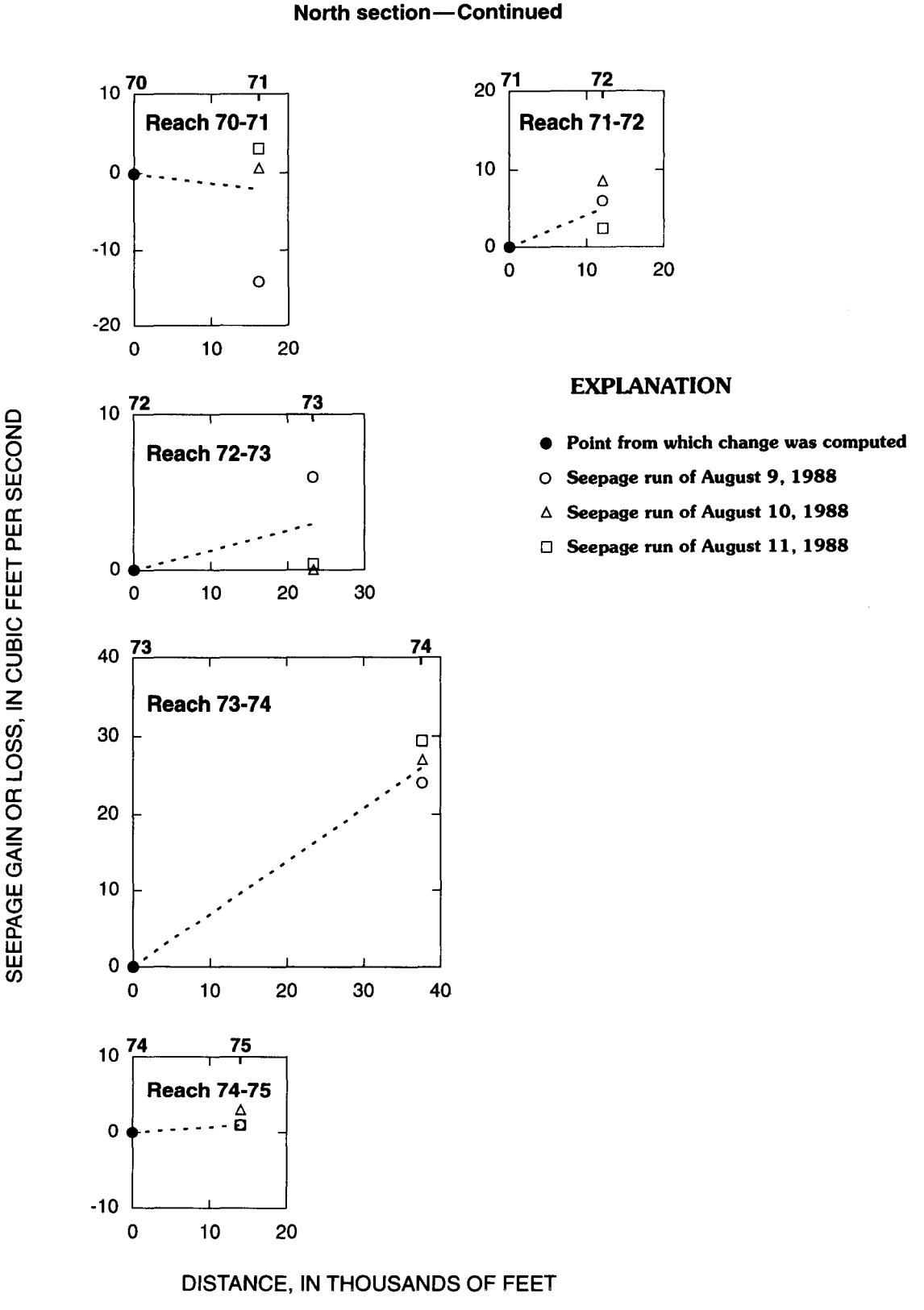


Figure 15. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, August 9-11, 1988—Continued.

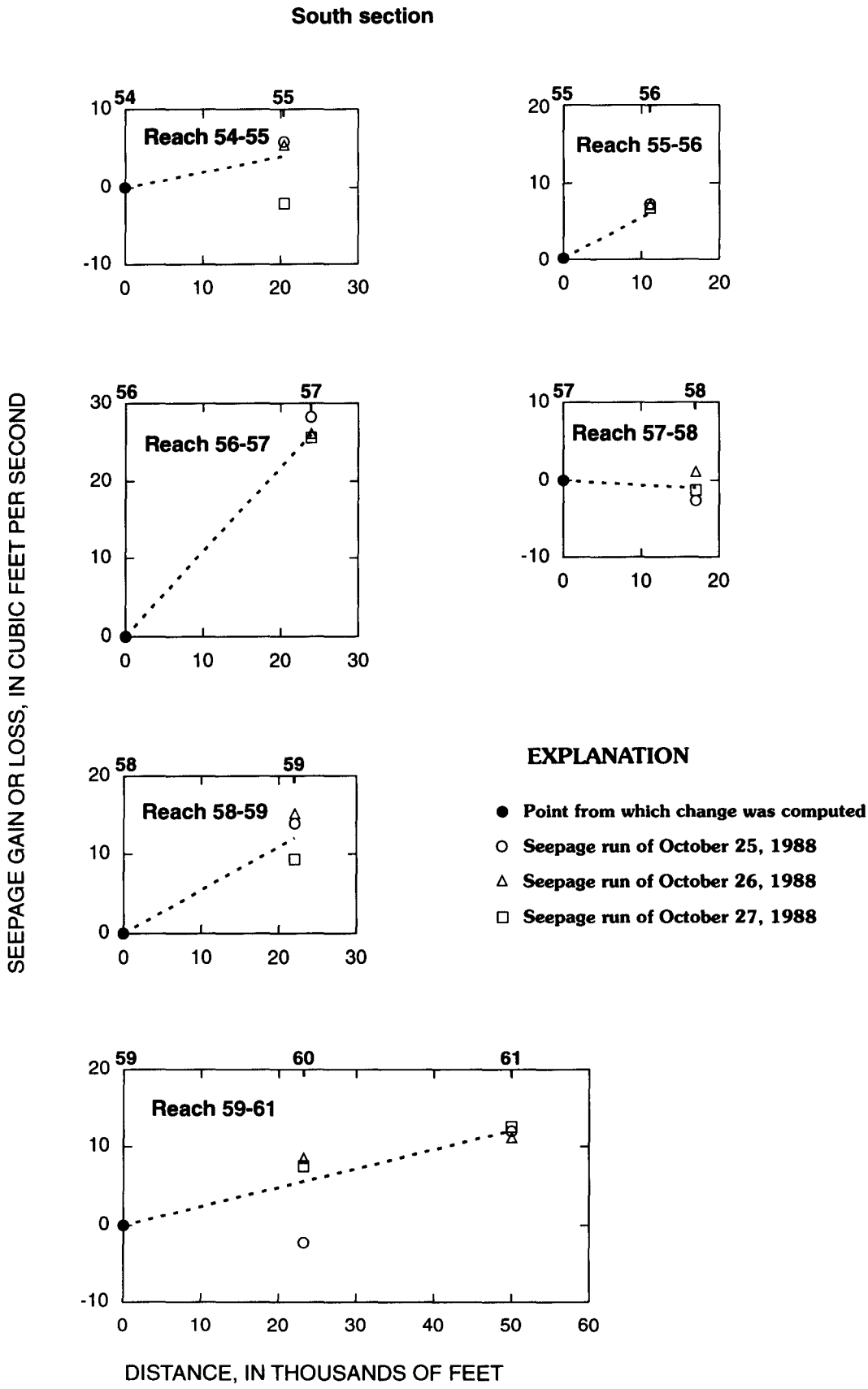


Figure 16. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, October 25-27, 1988.

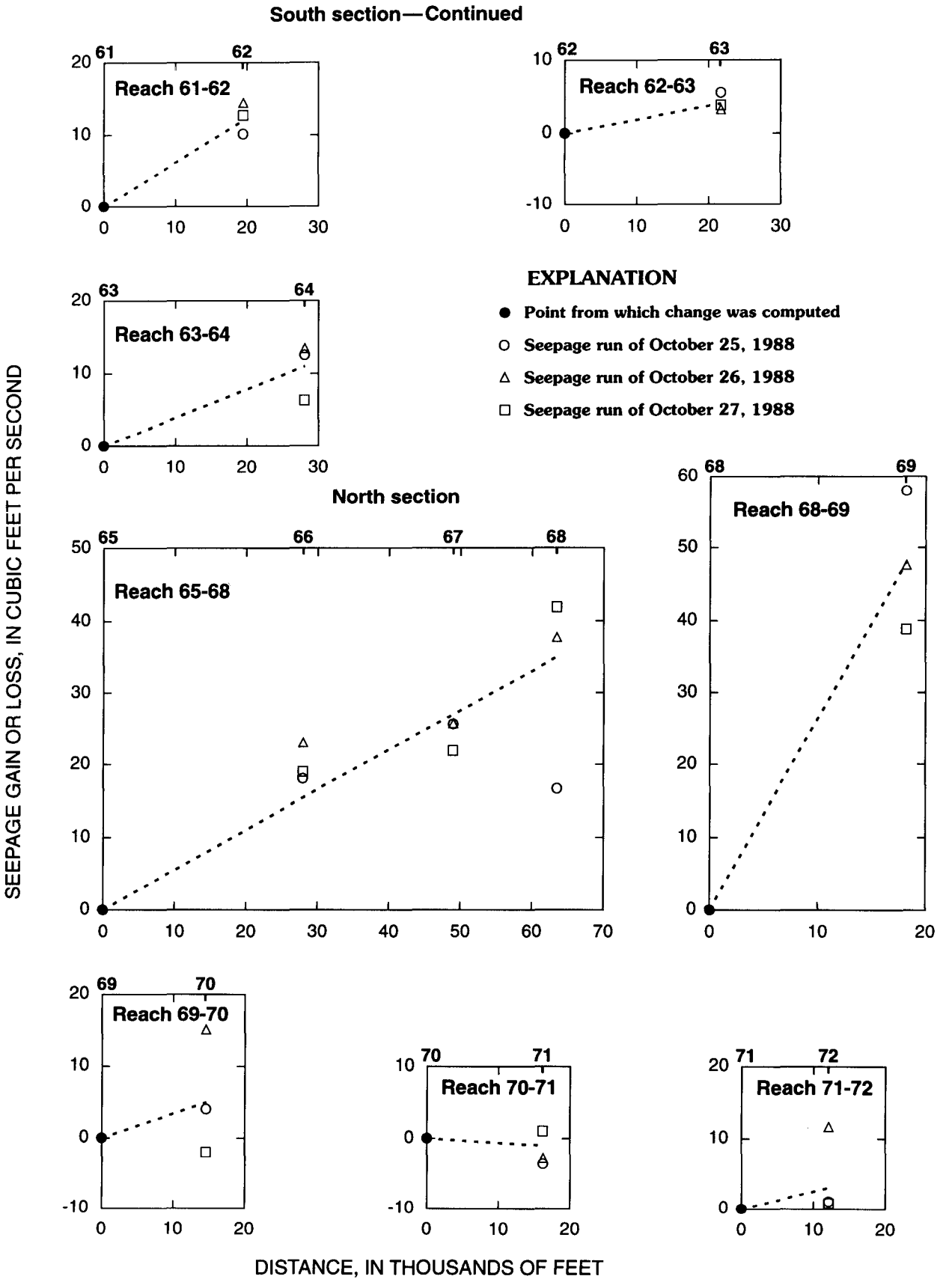


Figure 16. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, October 25-27, 1988—Continued.

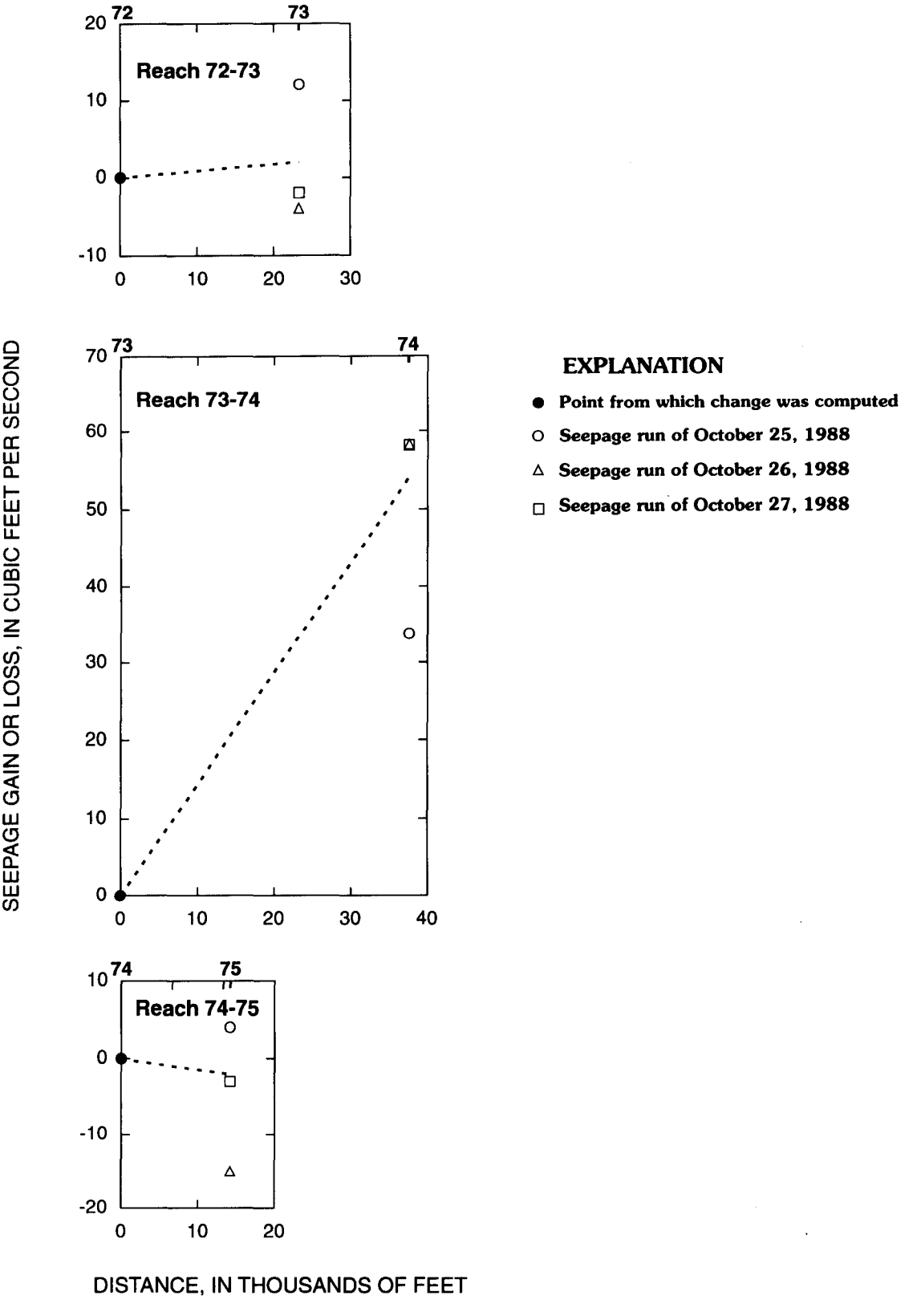


Figure 16. Estimated average seepage gain or loss for reaches of the Sevier River in central Sevier Valley, Utah, October 25-27, 1988—Continued.

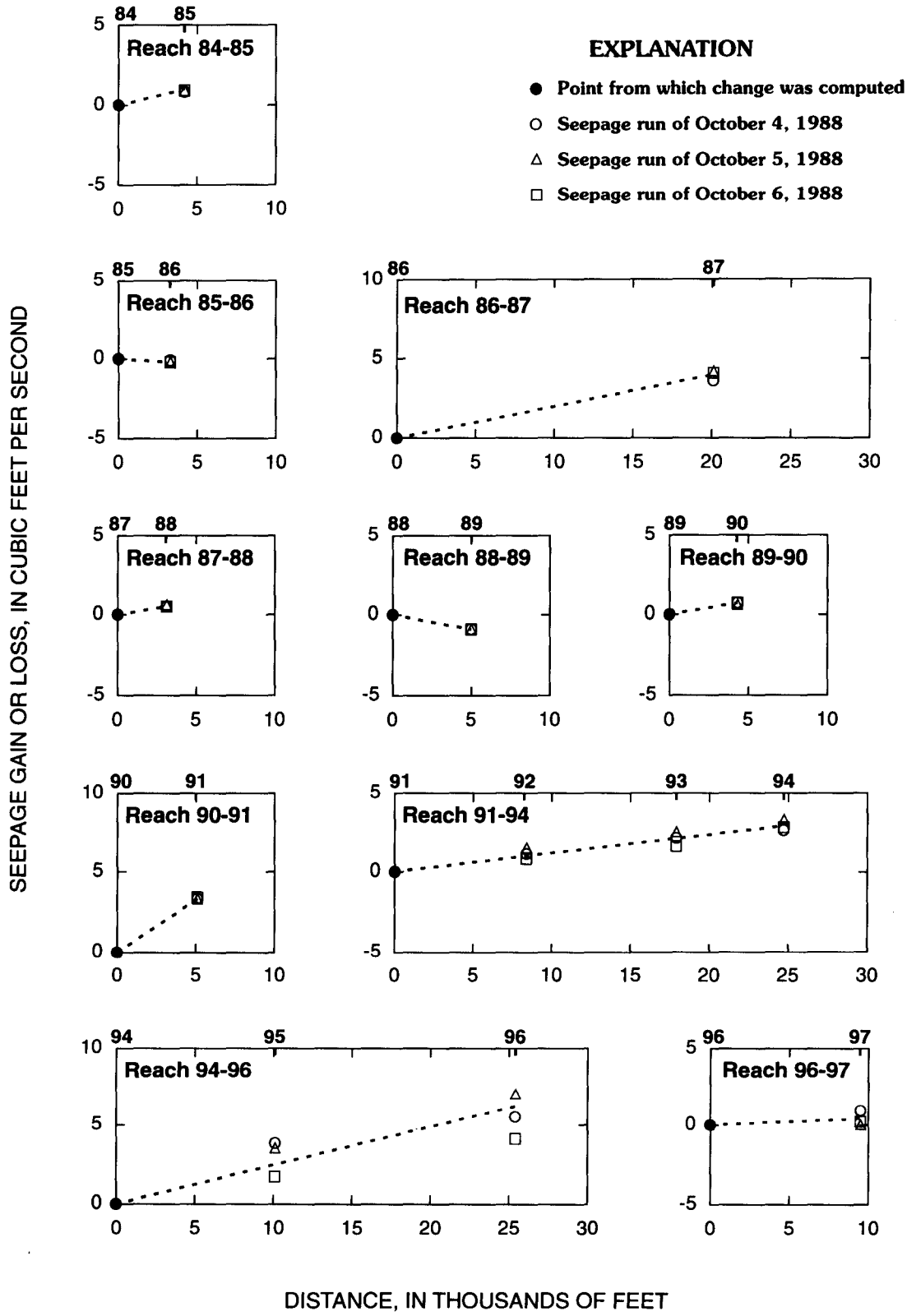


Figure 17. Estimated average seepage gain or loss for reaches of the San Pitch River in Sanpete Valley, Utah, October 4-6, 1988.

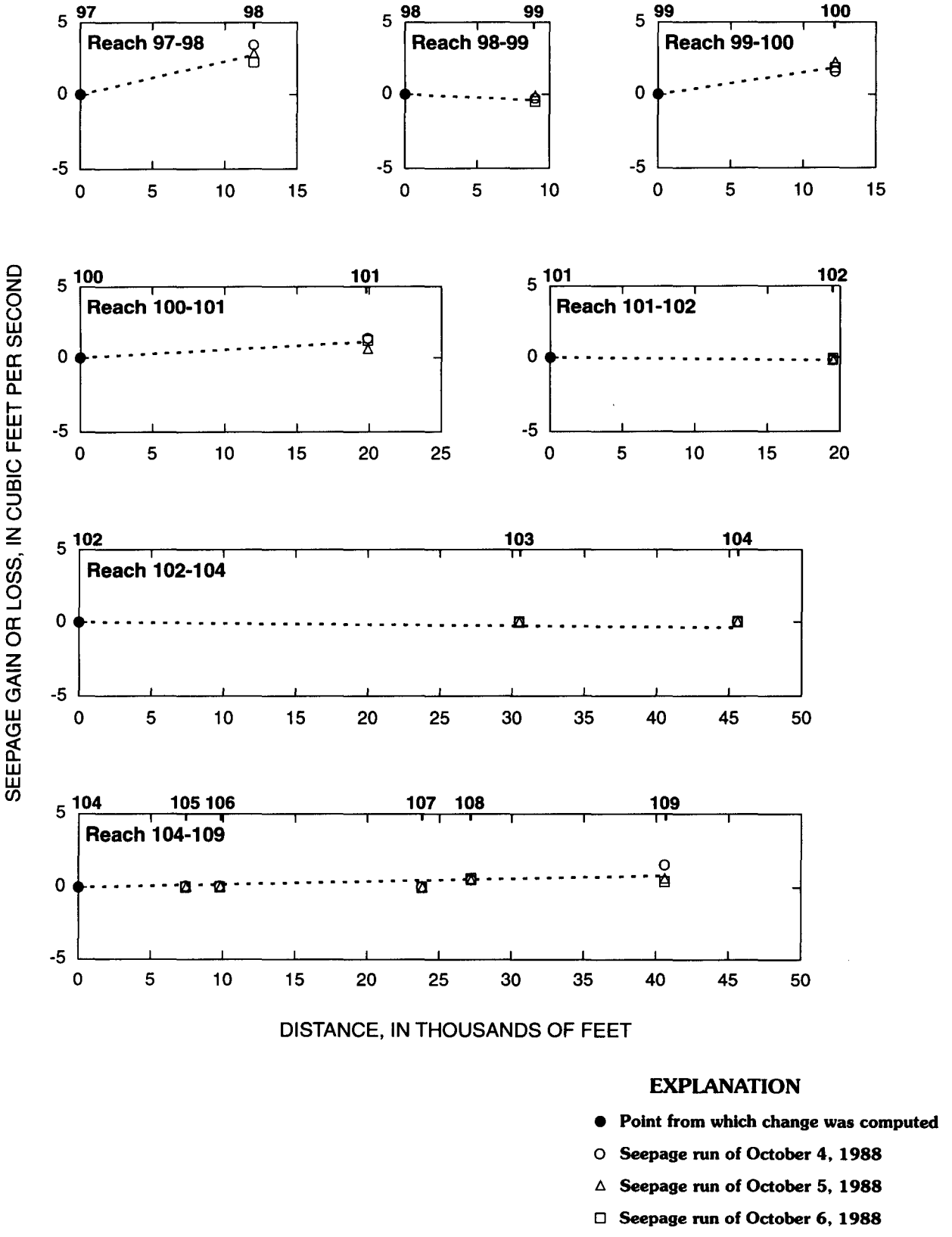


Figure 17. Estimated average seepage gain or loss for reaches of the San Pitch River in Sanpete Valley, Utah, October 4-6, 1988—Continued.

Table 1. Discharge measurements made in the upper Sevier River basin, Utah

[—, no data]

Site number: Example: 6, main stream; 6.1, return-flow point; 6A, diversion turnout. L1, Long-East Bench Canal; M, McEwen Canal; R, return-flow point; T, diversion turnout.
Discharge: e, estimated.

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Hatch to Circleville Canyon		
		Measurements made on August 17, 1988		
6	0905	80.4	12.0	—
6.1	—	.1	12.5	520
6 A	—	2.4	11.0	—
7	0955	82.0	13.0	—
8	1100	79.3	14.5	—
9	1150	79.0	16.0	—
9 A	—	9.5	16.0	325
9 B	—	4.7	15.0	330
10	1300	75.1	18.0	—
10.1	1350	.5	18.0	—
10.2	1250	.3	25.0	485
10 A	1320	49.2	19.0	350
11	1420	28.9	20.5	—
11 A	1620	26.6	22.0	—
12	1510	14.3	21.0	—
12	0900	14.3	12.5	375
12.1	—	.7	22.0	470
13	1030	33.0	12.0	450
13.1	—	.1	29.0	280
14	1140	60.1	15.0	475
14.1	—	.9	17.5	520
14 A	—	7.4	19.0	485
14 B	—	15.4	19.0	480
14.2	1630	.2	15.0	640
15	1245	74.8	17.0	520
15 A	—	7.7	21.0	500
16	1350	65.5	18.5	510
17	1630	78.2	20.5	475
18	1530	85.3	21.0	465
		Measurements made on August 18, 1988		
6	0845	82.3	12.5	315
6.1	—	.2	8.5	480
6 A	—	2.6	12.0	320
7	0940	79.0	13.5	320
8	1030	79.1	15.5	305
9	1120	75.1	16.0	305
9 A	—	8.3	—	—
9 B	—	4.3	14.0	330
10	1230	75.2	19.5	330

Table 1. Discharge measurements made in the upper Sevier River basin, Utah—Continued

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Hatch to Circleville Canyon—Continued		
		Measurements made on August 18, 1988—Continued		
10.1	1340	0.4	21.0	450
10.2	—	.4	22.0	495
10 A	—	50.0	17.5	355
11	1410	28.8	22.5	340
11 A	1625	28.8	23.0	350
12	1515	10.6	22.5	365
12	0700	9.3	13.0	375
12.1	—	.8	18.0	640
13	0750	28.6	11.0	470
13.1	—	.1	23.0	280
14	0840	57.9	11.0	500
14.1	—	1.8	17.0	520
14 A	—	8.4	18.0	—
14 B	—	15.0	18.0	500
14.2	1520	.2	17.5	630
15	0935	65.2	12.5	520
15 A	1550	8.1	20.0	520
16	1025	64.1	14.0	520
17	1125	75.4	16.5	475
18	1215	81.3	18.0	460
		Measurements made on August 19, 1988		
6	0830	84.6	12.5	310
6.1	—	.1	8.5	—
6 A	0820	2.4	12.5	—
7	1000	77.2	—	315
8	1140	79.1	15.5	315
9	1225	78.8	17.0	305
9 A	—	8.5	13.5	—
9 B	—	4.2	13.5	330
10	1315	82.8	19.0	330
10.1	1410	.5	21.0	440
10.2	—	.3	15.5	500
10 A	—	49.8	14.5	355
11	1450	29.4	22.5	345
11 A	1655	28.9	22.0	—
12	1545	11.9	23.0	360
12	0650	11.0	13.5	385
12.1	1145	.2	—	325
13	0740	32.5	11.5	470
13.1	—	.1	24.0	290
14	0825	59.8	11.5	500
14.1	1230	2.3	17.0	520
14 A	—	7.8	16.5	—
15	0915	68.3	12.0	530
15 A	1435	8.4	20.0	530
16	1000	71.9	12.5	530
17	1055	81.1	16.5	485
18	1145	81.1	15.5	475

Table 1. Discharge measurements made in the upper Sevier River basin, Utah—Continued

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Long-East Bench Canal		
		Measurements made on July 26, 1988		
L1	1015	51.2	15.5	345
T1	0900	3.8	15.0	340
T2	—	.1e	17.0	340
T3	—	.1e	—	—
T4	1025	3.5	15.5	340
L2	1120	45.3	17.0	345
L3	1230	46.6	17.5	340
T5	—	.1	16.0	340
L4	1330	41.9	17.5	340
T6	1320	35.5	17.0	340
L5	1245	6.7	17.0	—
L6	1420	6.6	17.5	340
		Measurements made on August 1, 1988		
L1	1145	51.2	17.0	335
T1	—	4.1	20.0	340
T2	—	0	—	—
T3	—	.7	20.0	330
T4	—	0	—	—
L2	1250	47.1	18.0	335
L3	1430	47.3	19.5	335
T5	—	.2	21.0	—
L4	1610	47.0	21.0	330
T6	—	36.6	—	—
L5	1530	12.5	20.0	335
L6	1745	9.0	20.5	330
		Measurements made on August 2, 1988		
L1	1435	49.5	18.0	335
T1	—	4.5	18.5	340
T2	—	0	—	—
T3	—	3.3	—	340
T4	—	0	—	—
L2	1515	43.4	18.5	335
L3	—	45.3	18.5	335
T5	—	.1	18.5	330
L4	1640	39.5	18.5	3356
T6	—	34.8	—	—
L5	1620	7.1	18.5	340
L6	1725	8.5	18.5	335
14 B	—	14.2	16.5	500
14.2	—	0	—	—
		McEwen Canal		
		Measurements made on July 27, 1988		
M1	0915	15.1	13.0	500
R1	—	0	—	—
R2	0900	.1	18.0	730

Table 1. Discharge measurements made in the upper Sevier River basin, Utah—Continued

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		McEwen Canal—Continued		
		Measurements made on July 27, 1988—Continued		
M2	1100	20.3	—	—
M3	1200	20.0	14.0	510
R3	—	0	—	—
R4	—	0	—	—
M4	—	—	14.0	500
M5	1250	18.4	15.0	500
T1	—	.1e	15.0	500
T2	1235	.1	15.0	500
T3	1350	8.7	—	—
M6	1345	11.0	15.0	500
T4	535	7.4	—	500
M7	1510	3.6	17.5	500
		Measurements made on August 2, 1988		
M1	0825	16.5	—	—
R1	—	1.1	14.5	400
R2	—	0	—	680
M2	0925	19.9	13.0	485
M3	1030	19.8	13.5	485
R3	—	5.2	20.5	340
R4	—	.1e	—	—
M4	1155	24.1	16.0	480
M5	1130	20.0	15.0	470
T1	—	0	—	—
T2	—	0	—	—
T3	—	0	—	—
M6	1210	20.4	16.0	470
T4	—	0	—	—
M7	1305	20.7	17.5	465
		Measurements made on August 3, 1988		
M1	0845	16.6	14.0	430
R1	—	.3	16.0	445
R2	—	0	—	—
M2	0930	20.2	14.0	450
M3	1025	21.0	14.5	450
R3	—	1.8	16.5	—
R4	—	0	—	—
M4	—	23.8	15.0	440
M5	1110	18.7	15.5	425
T1	—	0	—	—
T2	—	0	—	—
T3	—	0	—	—
M6	—	20.0	—	430
T4	—	.1e	—	—
M7	1200	22.1	17.0	420

Table 1. Discharge measurements made in the upper Sevier River basin, Utah—Continued

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		East Fork Sevier River in Black Canyon		
		Measurements made on August 17, 1988		
27	1100	23.0	11.0	520
27.1	1125	1.2	12.0	235
27.2	1215	.2	15.0	200
27.3	1245	1.0	12.0	190
28	1355	24.0	14.5	345
28.1	1320	.5	13.0	210
29	1505	25.4	17.5	415
29 A	1605	.6	19.0	405
30	1645	23.9	19.0	—
31	1730	28.4	19.0	—
31	1710	.2	—	—
32	1740	31.2	21.0	370
		Measurements made on August 18, 1988		
27	0800	24.9	—	—
27.1	0840	1.3	—	—
27.2	0905	.2	—	—
27.3	0920	1.0	—	—
28	0930	28.0	—	—
28.1	1030	.5	—	—
29	1100	25.1	—	—
29 A	1140	.5	—	—
30	1155	24.9	—	—
31	1330	31.3	—	—
31 A	1245	.2	—	—
32	1240	27.8	—	—
		Measurements made on August 19, 1988		
27	0735	22.7	11.0	550
27.1	0810	1.3	12.0	245
27.2	0835	.2	14.5	—
27.3	0855	1.1	12.0	—
28	0915	28.2	—	470
28.1	0955	.5	11.0	—
29	1040	25.7	15.0	425
29 A	1115	.6	—	—
30	1135	24.3	—	—
31	1220	31.9	17.0	—
31 A	1305	.3	20.0	400
32	1215	27.8	—	—
		East Fork Sevier River in Kingston Canyon		
		Measurements made on August 17, 1988		
40	1400	140	16.5	—
41	1325	132	16.5	—
42	1210	131	16.0	—

Table 1. Discharge measurements made in the upper Sevier River basin, Utah—Continued

Site number (fig. 2)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		East Fork Sevier River in Kingston Canyon—Continued		
		Measurements made on August 17, 1988—Continued		
43	1130	132	16.5	—
44	1030	132	16.0	—
45	0930	125	16.0	—
		Measurements made on August 18, 1988		
40	1030	134	16.5	405
41	0935	137	16.5	405
42	0855	144	16.5	405
43	0815	143	—	405
44	0715	133	16.5	410
45	1350	143	19.0	405
		Measurements made on August 19, 1988		
40	1010	132	—	—
41	0915	135	—	—
42	0835	140	—	—
43	0800	136	—	—
44	0720	134	—	—
45	1310	124	—	—

Table 2. Discharge measurements made in central Sevier Valley, Utah, August 9-11, 1988

[—, no data]

Site number: Example: 54, main stream; 54.1, return-flow point; 54A, diversion turnout.

Site number (fig. 3)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on August 9, 1988		
		South section, sites 54-64		
54	0820	386	18.5	465
54.1	0900	17.0	—	—
54 A	1130	233	19.5	460
54 B	1005	20.4	—	—
54	1125	44.7	20.0	485
55	1005	97.0	19.0	460
56	1335	107	22.5	455
56 A	1250	30.7	22.0	510
56 B	1410	11.1	22.0	940
56 C	1605	26.0	23.0	520
56 D	1600	4.4	24.0	560
57	1445	68.7	23.0	510
58	1700	61.3	24.5	495
58.1	—	—	—	—
59	1745	75.9	23.5	520
59	0820	69.0	15.0	560
60	—	81.7	15.5	570
60.1	—	.1	31.0	650
60 A	1035	66.8	18.0	580
61	1225	35.6	19.5	780
61.1	—	—	—	—
62	1335	49.2	23.0	850
63	1410	53.9	22.0	850
63.1	1830	11.5	28.0	980
63.2	—	15.8	14.5	720
64	1525	99.2	22.0	980
		North section, sites 65-75		
65	0905	57.2	—	—
66	1110	81.4	—	—
66.1	1210	.4	18.5	48,800
67	1300	106	21.0	1,520
68	1425	122	22.0	1,610
68.1	1330	1.2	27.0	3,480
68.2	1500	.3	26.5	990
68.3	1600	1.4	—	—
68 A	1710	9.3	23.0	1,610
69	1555	138	22.5	1,600
70	1830	133	22.0	1,700
70	0815	166	17.5	1,630
70.1	—	1.0	29.5	1,160
70.2	0730	6.1	19.5	1,670

Table 2. Discharge measurements made in central Sevier Valley, Utah, August 9-11, 1988—Continued

Site number (fig. 3)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on August 9, 1988—Continued		
		North section, sites 65-75—Continued		
70.3	0900	0.1	21.5	830
70.4	—	2.0	—	—
71	1000	161	18.0	1,730
71 A	—	—	—	—
72	1130	167	19.0	1,780
73	1340	173	22.0	1,820
74	1600	197	24.0	1,840
75	1740	198	24.0	1,940
		Measurements made on August 10, 1988		
		South section, sites 54-64		
54	0810	345	18.5	460
54.1	0840	10.4	16.0	270
54 A	1010	200	19.0	460
54 B	0940	27.6	—	—
54 C	1030	59.7	20.0	480
55	1120	82.2	20.0	465
56	1250	86.2	21.5	460
56 A	1215	25.7	22.0	495
56 B	1315	11.6	21.5	910
56 C	1420	26.5	22.0	530
56 D	1415	4.0	22.0	550
57	1335	57.1	22.0	520
58	1505	50.4	23.0	495
58.1	—	.7	28.0	550
59	1640	67.2	22.5	550
59	0810	78.4	15.0	540
60	0940	90.4	16.0	560
60.1	—	.1	—	-
60 A	1000	62.2	18.0	580
61	1230	43.3	19.0	730
61.1	1630	.2	15.0	-
62	1320	59.3	21.5	780
63	1410	57.6	21.0	950
63.1	1645	10.8	—	—
63.2	1510	15.6	15.5	590
64	1535	88.2	20.0	1,080
		North section, sites 65-75		
65	0840	44.3	21.0	1,120
66	1020	66.5	19.0	1,210
66.1	1030	.4	15.5	49,200
67	1150	82.4	19.0	1,640
68	1330	102	19.5	1,400
68.1	1200	1.2	23.0	3,880
68.2	1400	.4	26.0	980
68.3	1500	1.8	—	—
68 A	1500	9.2	20.5	1,760
69	1615	108	21.0	1,770
70	1750	114	20.0	1,870

Table 2. Discharge measurements made in central Sevier Valley, Utah, August 9-11, 1988—Continued

Site number (fig. 3)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
Measurements made on August 10, 1988—Continued				
North section, sites 65-75—Continued				
70	0830	119	17.0	1,780
70.1	1530	1.1	26.5	1,600
70.2	1800	1.2	18.0	1,780
70.3	0715	.1	22.0	800
70.4	—	2.0	—	—
71	0945	124	17.5	1,870
71 A	—	1.6	23.0	2,420
72	1230	131	19.0	-
73	1345	131	22.0	-
74	1545	158	20.0	1,980
75	1640	161	21.0	1,980
Measurements made on August 11, 1988				
South section, sites 54-64				
54	0830	360	17.0	470
54.1	0845	10.3	—	—
54 A	0950	193	17.0	465
54 B	—	24.4	—	—
54 C	0950	60.1	19.0	495
55	1040	77.6	18.0	465
56	1130	83.9	19.0	460
56 A	1145	27.9	20.0	500
56 B	1220	21.7	—	—
56 C	1300	24.3	18.5	540
56 D	—	12.9	—	—
57	1220	35.4	18.5	530
58	1345	32.3	18.5	510
58.1	1330	.8	—	—
59	1450	45.1	17.5	600
59	0800	58.1	14.0	580
60	0930	68.6	14.5	600
60.1	—	.1	—	—
60 A	0945	55.9	16.0	630
61	1140	22.3	18.0	810
61.1	—	.2	—	—
62	1220	35.6	20.0	940
63	1345	36.8	18.0	1,110
63.1	1425	11.0	21.5	1,110
63.2	—	15.5	—	—
64	1450	77.6	17.0	1,090
North section, sites 65-75				
65	0810	39.1	20.5	1,110
66	1000	60.4	18.0	1,310
66.1	1000	.4	17.0	50,000
67	1120	73.8	18.0	1,780
68	1305	93.6	18.5	1,890
68.1	1200	1.2	21.5	4,030
68.2	1420	1.3	23.5	970
68.3	1500	1.8	—	—

Table 2. Discharge measurements made in central Sevier Valley, Utah, August 9-11, 1988—Continued

Site number (fig. 3)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
Measurements made on August 11, 1988—Continued				
North section, sites 65-75—Continued				
68 A	1535	12.5	18.5	1,840
69	1425	97.5	18.5	1,820
70	1700	103	18.0	1,950
70	0830	100	15.0	1,860
70.1	1530	1.8	21.5	1,580
70.2	1745	1.1	16.5	1,850
70.3	1920	.8	18.5	830
70.4	1030	2.1	17.2	1,340
71	0945	109	16.0	1,990
71 A	1230	20.2	18.0	2,020
72	1130	91.2	18.0	1,850
73	1330	91.6	20.5	2,020
74	1500	121	21.0	2,080
75	1630	122	19.0	2,270

Table 3. Discharge measurements made in central Sevier Valley, Utah, October 25-27, 1988

[—, no data]

Site number: Example: 54, main stream; 54.1, return-flow point; 54A, diversion turnout.
Discharge: e, estimated.

Site number (fig. 4)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 25, 1988		
		South section, sites 54-64		
54	0830	126	8.5	485
54.1	1015	19.0	8.5	305
54 A	0830	59.2	8.5	500
54 B	—	—	—	—
54 C	0935	39.5	10.0	490
55	1145	52.1	10.5	470
56	1310	59.2	12.0	475
56 A	1045	14.8	9.5	490
56 B	1100	13.8	10.5	840
56 C	1130	30.7	11.0	560
56 D	1155	.5	11.5	560
57	1425	27.6	14.0	540
57 A	1225	13.8	—	540
58	1545	11.1	14.5	510
58.1	—	.1	—	—
59	1705	25.0	14.5	670
59	0855	25.0	8.0	670
60	1045	22.7	9.0	700
60.1	1345	8.4	—	—
60 A	1455	9.3	10.0	990
61	1210	36.0	10.0	1,100
61.1	—	.2	—	—
61.2	—	10.0 e	15.0	660
62	1340	56.3	14.0	1,040
63	1520	61.8	13.5	1,000
63.1	1715	22.9	16.0	700
63.2	1700	14.6	14.5	670
63.3	0845	.2	3.5	16,600
64	1815	112	13.0	980
		North section, sites 65-75		
65	0830	149	10.5	1,010
66	1030	167	10.5	1,060
66.1	1015	7.4	8.5	4,700
67	1140	182	11.0	1,260
68	1250	173	11.5	1,400
68.1	1210	11.1	10.0	1,260
68.2	1410	13.8	15.0	970
68.3	1345	.4	14.5	990
68 A	1515	14.2	13.0	1,400
69	1410	242	12.0	1,360
70	1540	246	13.0	1,430
70	0830	247	9.0	1,370

Table 3. Discharge measurements made in central Sevier Valley, Utah, October 25-27, 1988—Continued

Site number (fig. 4)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 25, 1988—Continued		
		North section, sites 65-75—Continued		
70.1	1555	0	11.0	1,960
70.2	1640	.4	13.0	2,040
70.3	1745	.1	15.0	920
70.4	1800	.2	15.0	2,340
71	1000	244	9.0	1,310
71 A	—	21.0	—	—
72	1100	224	12.0	1,570
73	1230	236	10.5	1,410
73 A	1840	3.7	13.0	1,700
74	1600	266	12.5	1,590
75	1350	270	12.0	1,490
		Measurements made on October 26, 1988		
		South section, sites 54-64		
54	0940	124	8.5	435
54.1	0820	19.2	6.5	300
54 A	0840	62.8	8.5	470
54 B	—	9.0	—	—
54 C	0940	37.0	9.0	490
55	1140	39.8	10.5	470
56	1320	46.8	12.0	475
56 A	1115	7.7	11.0	840
56 B	1130	13.8	11.0	570
56 C	1135	30.2	11.0	570
56 D	1200	.5	12.0	540
57	1500	20.7	14.5	540
57 A	1230	14.1	12.0	560
58	1625	7.7	14.5	500
58.1	1310	.1	14.0	620
59	1735	22.9	14.0	660
59	0925	26.3	8.0	660
60	1040	34.8	9.0	750
60.1	1400	7.7	16.0	760
60 A	1540	9.2	10.5	960
61	1145	35.9	9.5	1,060
61.1	1500	.1	15.0	1,850
61.2	—	10.0	—	—
62	1250	60.5	13.0	1,030
63	1410	63.7	13.0	1,000
63.1	1640	24.6	15.0	720
63.2	1530	14.6	15.0	630
63.3	0825	.2	3.0	17,900
64	1710	117	13.0	990
		North section, sites 65-75		
65	0830	131	10.0	1,020
66	1000	154	10.0	1,060
66.1	1010	7.3	8.0	4,700
67	1055	164	10.0	1,280

Table 3. Discharge measurements made in central Sevier Valley, Utah, October 25-27, 1988—Continued

Site number (fig. 4)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 26, 1988—Continued		
		North section, sites 65-75—Continued		
68	1200	176	11.0	1,420
68.1	1125	11.4	8.5	1,270
68.2	1440	13.7	16.0	970
68.3	1355	.4	14.5	970
68 A	—	12.0	—	—
69	1320	237	11.5	1,380
70	1420	252	12.0	1,430
70	0820	235	9.0	1,410
70.1	1555	0	11.0	1,970
70.2	1640	.7	13.0	1,490
70.3	1310	.1	10.5	930
70.4	1745	.1	15.0	2,370
71	0925	233	9.0	1,460
71 A	1200	21.6	10.0	1,510
72	1030	223	11.5	1,410
73	1315	219	10.0	1,560
73	1720	10.2	13.0	1,660
74	1425	267	11.5	1,720
75	1500	252	12.0	1,810
		Measurements made on October 27, 1988		
		South section, sites 54-64		
54	0935	130	9.0	500
54.1	0815	20.0	7.0	295
54 A	0815	63.7	9.0	475
54 B	—	3.2	—	—
54 C	0930	35.1	10.0	490
55	1125	45.9	10.0	470
56	1230	52.5	11.5	475
56 A	1050	6.7	10.0	520
56 B	1105	13.5	11.0	880
56 C	1135	30.6	12.0	580
56 D	1210	.5	13.0	560
57	1400	26.8	14.0	540
57 A	1230	14.4	11.0	570
58	1515	11.1	14.5	530
58.1	1245	.1	13.0	580
59	1625	20.5	14.5	690
59	0920	19.9	8.5	680
60	1010	27.4	8.5	800
60.1	1325	7.7	—	—
60 A	1430	8.8	9.5	980
61	1050	31.2	10.0	1,060
61.1	—	.2	—	—
61.2	—	10.0	—	—
62	1140	54.1	11.5	1,040
63	1230	57.9	11.0	920
63.1	1530	24.2	—	—
63.2	1330	15.2	15.5	650

Table 3. Discharge measurements made in central Sevier Valley, Utah, October 25-27, 1988—Continued

Site number (fig. 4)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
Measurements made on October 27, 1988—Continued				
South section, sites 54-64—Continued				
63.3	0825	0.4	4.0	14,000
64	1430	104	12.5	1,010
North section, sites 65-75				
65	0900	119	10.5	1,060
66	1035	138	11.0	1,090
66.1	1000	8.1	8.5	4,740
67	1150	149	11.0	1,420
68	1315	169	12.0	1,540
68.1	1130	10.9	10.0	1,230
68.2	1430	14.2	13.5	990
68.3	1350	.3	13.5	990
68 A	1550	11.2	12.5	1,460
69	1435	222	12.5	1,450
70	1645	220	12.5	1,550
70	0910	214	9.0	1,470
70.1	1620	.2	14.0	1,850
70.2	1700	1.6	12.5	1,230
70.3	1830	.1	13.0	840
70.4	1900	.1	13.5	2,330
71	1015	217	9.3	1,580
71 A	1210	17.8	10.0	1,550
72	1115	200	10.0	1,650
73	1320	198	10.0	1,650
73 A	1640	10.1	11.5	1,720
74	1415	246	11.0	1,620
75	1530	243	12.0	1,740

Table 4. Discharge measurements made in Sanpete Valley for the San Pitch River, Utah, October 4-6, 1988

[—, no data]

Site number: Example: 91, main stream; 91.1, return-flow point; 91A, diversion turnout.
Discharge: e, estimated.

Site number (fig. 5)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 4, 1988		
84	0940	0.5	8.0	860
85	1120	1.3	9.5	740
86	—	1.2	10.0	730
86 A	—	1.0	11.0	730
86 B	1440	.8	12.0	710
86 C	—	2.5	15.0	700
87	1645	.5	17.0	680
87 A	1535	.3	17.0	780
88	0930	.9	10.5	720
89	—	0	—	—
90	1115	.7	12.0	860
90.1	1245	.4	15.0	720
91	—	4.4	16.5	840
91.1	1550	.4	17.0	740
91.2	1710	3.6	15.5	690
91.3	—	.3	—	—
91 A	—	8.1	16.0	740
92	1755	1.7	16.0	740
92.1	—	—	—	—
92.2	—	.2	16.5	650
92.3	—	.4	15.0	610
93	1000	3.4	11.0	710
93.1	1150	.4	13.0	1,120
93.2	1210	.1	13.0	—
93.3	1230	.1	16.0	700
93.4	1300	.3	13.5	670
93.5	1410	.4	12.0	620
93.6	1630	.1	13.0	—
93	1610	3.8	15.0	—
94	1525	1.4	14.5	—
94. 1	—	0	—	—
95	1750	5.2	16.5	—
95.1	1940	1.2	13.0	—
96	1900	8.1	16.0	—
96	0910	8.9	10.0	1,040
96 A	0930	8.9	10.0	1,020
96.1	1115	.4	10.5	770
97	1105	1.3	11.0	—
97.1	1325	7.7	13.0	—
98	1315	12.4	15.5	890
98 A	1410	11.6	14.0	880
99	1440	.5	13.5	1,340
99 A	1515	1.2	13.0	1,260
99.1	—	.1	22.0	650
99 B	1615	.7	15.5	1,190

Table 4. Discharge measurements made in Sanpete Valley for the San Pitch River, Utah, October 4-6, 1988—Continued

Site number (fig. 5)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 4, 1988—Continued		
100	1555	0.2	15.5	1,190
101	1705	1.5	18.5	1,160
101	0910	1.6	10.5	1,250
101 A	1240	1.0	13.0	1,140
102	1120	.3	12.0	3,720
103	—	0	—	—
104	—	0	—	[1]16,300
105	—	0	—	[1]31,900
106	—	0	—	—
107	—	0	—	—
107.1	1550	.6	18.0	700
107.2	1430	.6	—	—
108	1300	1.8	16.5	2,000
108.1	1640	.8	18.5	810
109	1620	3.5	18.0	1,560
		Measurements made on October 5, 1988		
84	0920	.5	7.5	850
85	1015	1.4	8.5	740
86	—	1.2	10.0	720
86 A	1130	1.1	10.0	720
86 B	1510	.8	12.0	700
86 C	—	2.9	14.0	700
87	1215	.5	14.5	680
87 A	1400	.1e	—	—
88	1340	.9	12.0	710
89	—	0	—	—
90	—	.6	11.0	800
90.1	1130	.4	13.0	700
91	1025	4.3	11.5	840
91.1	1205	.4	12.5	760
91.2	1335	3.8	14.5	680
91.3	—	.2	11.0	570
91 A	1550	8.6	14.5	730
92	1650	1.6	14.5	730
92.1	—	.1	15.0	620
92.2	—	.2	—	—
92.3	—	.4	14.5	610
93	0950	3.3	10.5	710
93.1	1140	.4	13.0	1,130
93.2	1105	.1	11.0	860
93.3	1200	.1	15.5	690
93.4	1035	.3	10.0	680
93.5	1245	.4	11.5	610
93.6	1430	.1	13.0	1,290
93 A	1425	4.0	13.5	770
94	1335	1.5	13.0	750
94.1	1625	.2	14.0	900
95	1600	5.2	14.0	960
95.1	1740	1.2	10.5	700

Table 4. Discharge measurements made in Sanpete Valley for the San Pitch River, Utah, October 4-6, 1988—Continued

Site number (fig. 5)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 5, 1988—Continued		
96	1745	9.8	13.5	970
96	0845	10.4	9.5	1,030
96 A	0935	9.3	9.5	1,030
96.1	1040	.2	8.5	790
97	1025	1.3	10.0	1,110
97.1	1200	7.0	9.5	760
98	1145	11.2	10.5	840
98 A	1330	10.5	12.0	850
99	1350	.6	12.5	1,370
99 A	1445	1.4	11.0	1,330
99.1	1445	.8	19.5	1,240
99 B	—	1.1	14.0	1,370
100	1520	1.1	14.0	1,150
101	1610	1.6	14.5	1,180
101	0910	1.4	8.0	1,200
101 A	1015	.8	8.0	1,260
102	1045	.4	10.5	3,800
103	—	0	—	—
104	—	0	13.0	[1]16,300
105	—	0	20.0	[1]33,400
106	—	0	—	[1]13,820
107	—	0	—	—
107.1	1620	.5	16.0	710
107.2	1515	.2	16.0	840
108	1450	1.2	15.5	2,200
108.1	1135	.9	14.0	850
109	1220	2.3	14.5	1,830
		Measurements made on October 6, 1988		
84	1010	.5	8.5	840
85	1125	1.4	9.0	740
86	—	1.1	10.0	720
86 A	1210	1.0	10.5	720
86 B	1505	.8	11.0	700
86 C	—	3.0	14.0	690
87	1245	.5	15.0	680
87 A	—	.1e	—	—
88	1340	.9	12.0	720
89	—	0	—	—
90	1430	.7	11.5	800
90.1	—	.3	10.0	700
91	0920	4.2	9.0	830
91.1	1035	.5	10.0	760
91.2	1140	4.4	10.0	610
91.3	1150	.2	11.0	570
91 A	1255	8.3	12.0	740
92	1835	2.0	12.0	740
92.1	—	.1	—	620
92.2	—	.2	15.0	690
92.3	—	.4	16.0	620

Table 4. Discharge measurements made in Sanpete Valley for the San Pitch River, Utah, October 4-6, 1988—Continued

Site number (fig. 5)	Time (24-hour)	Discharge (cubic feet per second)	Water temperature (degrees Celsius)	Specific conductance (microsiemens per centimeter at 25 degrees Celsius)
		Measurements made on October 6, 1988—Continued		
93	0945	3.5	10.5	710
93.1	1140	.4	13.0	1,120
93.2	1120	.1	11.0	860
93.3	1155	.1	14.5	690
93.4	1030	.3	10.0	680
93.5	1250	.4	11.5	620
93.6	—	.1e	—	—
93 A	—	0	—	—
94 1	410	6.1	12.0	750
94.1	1600	.4	13.5	800
95	1535	8.2	13.0	920
95.1	1650	1.1	11.0	720
96	1700	11.7	12.5	920
96	0830	11.3	9.5	1,010
96 A	0830	10.5	6.0	1,010
96.1	0945	.3	8.0	—
97	0925	1.3	9.5	1,020
97.1	1055	8.1	10.0	760
98	1055	11.5	10.5	870
98 A	1215	10.4	11.5	850
99	1240	.6	12.5	1,310
99 A	1255	1.4	11.0	1,340
99.1	—	.2	24.5	640
99 B	1335	1.1	15.0	1,170
100	1320	.1	15.0	1,170
101	1410	1.2	16.0	1,190
101	0915	1.3	8.5	1,210
101 A	1005	.8	10.5	1,160
102	1030	.4	11.0	3,550
103	1110	0	13.0	[1]600
104	1115	0	13.0	[1]16,900
105	1205	0	16.5	[1]32,300
106	—	0	—	[1]8,650
107	—	0	17.5	[1]5,240
107.1	1300	.8	15.5	730
107.2	1215	0	—	—
108	1200	1.4	14.0	2,500
108.1	1040	.8	13.0	670
109	1105	2.0	13.0	1,850

[1] No flow, standing water.

Table 5. Estimated average seepage gain or loss determined from discharge measurements for reaches of the Sevier River and the East Fork Sevier River in the upper Sevier River basin, Utah

[ft^3/s, cubic feet per second; $ft^3/s/mi$, cubic feet per second per mile]

Reach (figs. 2, 11 to 14)	Length (feet)	Graphic average gain (+) or loss (-) (from figs. 11 to 14)	
		ft^3/s	$ft^3/s/mi$
	Hatch to Circleville Canyon		
6-9	52,590	-3	-0.3
9-10	21,910	+14	+3.4
10-11	21,750	0	0
11-15	93,830	+92	+5.1
15-18	85,750	+22	+1.4
Total	275,830	+125	
	Long-East Bench Canal		
L1-L3	14,570	+2.7	+1.0
L3-L4	7,130	-4.0	-3.0
L4-L5	5,330	+2.0	+2.0
L5-L6	2,530	0	0
Total	29,560	+0.7	
	McEwen Canal		
M1-M2	5,230	+3.5	+3.5
M2-M4	8,290	0	0
M4-M5	7,440	-4.6	-3.3
M5-M7	7,870	+2.0	+1.3
Total	28,830	+.9	
	Black Canyon		
27-28	4,700	0	0
28-29	6,810	-2	-1.6
29-30	4,220	0	0
30-31	11,400	+6	+2.8
31-32	6,760	-1	-.8
Total	33,890	+3	
	Kingston Canyon		
40-41	7,290	-1	-.7
41-42	10,670	+3	+1.5
42-44	17,850	-4	-1.2
44-45	7,440	-6	-4.3
Total	43,250	-8	

Table 6. Estimated average seepage gain or loss determined from discharge measurements for reaches of the Sevier River in central Sevier Valley, Utah, August 9-11, 1988

[ft^3/s, cubic feet per second; $ft^3/s/mi$, cubic feet per second per mile]

Reach (figs. 3 and 15)	Length (feet)	Graphic average gain (+) or loss (-) (from fig. 15)	
		ft^3/s	$ft^3/s/mi$
	South section, sites 54-64		
54-55	20,490	-8	-2.1
55-56	11,090	+7	+3.3
56-57	23,920	+37	+8.2
57-58	17,000	-6	-1.9
58-59	22,020	+14	+3.4
59-61	50,110	+25	+2.6
61-62	19,540	+14	+3.8
62-63	21,750	+1	+.2
63-64	28,090	+12	+2.3
Section total	214,010	+96	
	North section, sites 65-75		
65-70	96,200	+84	+4.6
70-71	16,210	-2	-.7
71-72	12,040	+5	+2.2
72-73	22,280	+3	+.7
73-74	37,590	+26	+3.7
74-75	14,260	+1	+.4
Section total	198,580	+117	
River total	412,590	+213	

Table 7. Estimated average seepage gain or loss determined from discharge measurements for reaches of the Sevier River in central Sevier Valley, Utah, October 25-27, 1988

[ft^3/s, cubic feet per second; $ft^3/s/mi$, cubic feet per second per mile]

Reach (figs. 4 and 16)	Length (feet)	Graphic average gain (+) or loss (-) (from fig. 16)	
		ft^3/s	$ft^3/s/mi$
	South section, sites 54-64		
54-55	20,490	+4	+1.0
55-56	11,090	+6	+2.9
56-57	23,920	+26	+5.7
57-58	17,000	-1	-.3
58-59	22,020	+12	+2.9
59-61	50,110	+12	+1.3
61-62	19,540	+12	+3.2
62-63	21,750	+4	+1.0
63-64	28,090	+11	+2.1
Section total	214,010	+86	
	North section, sites 65-75		
65-68	63,470	+35	+2.9
68-69	18,160	+48	+13.9
69-70	14,570	+5	+1.8
70-71	16,210	-1	-.3
71-72	12,040	+3	+1.3
72-73	22,280	+2	+.5
73-74	37,590	+54	+7.6
74-75	14,260	-2	-.7
Section total	198,580	+144	
River total	412,590	+230	

Table 8. Estimated average seepage gain or loss determined from discharge measurements for reaches of the San Pitch River in Sanpete Valley, Utah, October 4-6, 1988

[ft^3/s, cubic feet per second; $ft^3/s/mi$, cubic feet per second per mile]

Reach (figs. 5 and 17)	Length (feet)	Graphic average gain (+) or loss (-) (from fig. 17)	
		ft^3/s	$ft^3/s/mi$
84-85	4,220	+1.0	+1.2
85-86	3,270	-.2	-.3
86-87	20,060	+4.0	+1.1
87-88	3,060	+.5	+.9
88-89	4,800	-.9	-1.0
89-90	4,280	+.7	+.9
90-91	5,120	+3.3	+3.4
91-94	24,660	+2.9	+.6
94-96	25,390	+6.2	+1.3
96-97	9,560	+.4	+.2
97-98	11,990	+2.7	+1.2
98-99	8,980	-.4	-.2
99-100	12,250	+1.8	+.8
100-101	19,850	+1.1	+.3
101-102	19,480	-.2	0
102-104	45,650	-.4	0
104-109	40,580	+.9	+.1
Total	263,200	+23.4	

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