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SUBSIDENCE MONITORING REPORT
1991
STAR POINT MINE
ACT/007/006

Cyprus Plateau Mining Corporation
P.O. Box PMC
Price, Utah 84501

INTRODUCTION

During the months May through September, subsidence monitoring was conducted on surface lands above underground mining. The land surface above all full extraction mining was visually searched for evidence of surface disturbance. Monitoring points on the north half of the area above longwall panels 1 through 7 were surveyed for vertical movement. The monitoring points on the south half of this area have reached effective maximum subsidence and therefore were not surveyed in 1991. Monitoring points U1, U2, U3, U4, and were surveyed once for horizontal and vertical movement. Monitoring points U-5 through U-17 and GS-1 were not surveyed because the area was hazardous due to falling rocks; these points will be surveyed again in 1992.

Mining during 1991 was conducted in the areas shown on Maps 1 and 2.

SURFACE EFFECTS

Surface cracks, as shown on Map 521.121e, over the longwall mining in Sections 18, T15S, R8E, and Section 12, T15S, R7E, are associated with known faults in the south half and in the northeast quarter of Section 12, and with fractures in Section 18.

The cracks in the south half and in the northeast quarter of Section 12 originally varied in width from hairline to 6 inches, and displacement across the cracks varied from none to two feet. These cracks are continuing to heal nicely; there are no known open holes or unsafe areas. The cracks do not pose a safety hazard to humans, livestock or wildlife. The cracks in the northwest quarter of Section 12 developed during the winter of 1990; they vary in width from hairline to about 2 feet. These cracks were fenced during the summer of 1991 in compliance with the Manti La-Sal National Forest on site evaluation and recommendations.

Subsidence contours have been plotted using survey data in the Section 12 area. As can be seen on Map 521.121e, subsidence contours reflect a reaction to the east-west trending faults. On the west side of Section 12, two short cracks appeared in 1989 at north-south trending faults. These cracks are very small, and have healed to a point where they are barely noticeable.

Two short longwall panels mined in the Third Seam in 1990 continued to cause the land surface in the northern half of the 7 panel area to subside as can be seen on Figure 1.

Overburden in the Section 12 area ranges from 800 to 1,500 feet. The area is characterized by a mounded ridge with a steeply incised canyon on the north end.

The cracks in Section 18 vary in width from hairline to 30 inches. Displacement across the cracks varies from none to 2 feet.

Several small areas of outcropping sandstone channels in Section 18 failed due to surface and near surface movement. No massive failures have occurred.

Overburden in the Section 18 area ranges from 0 to 1,100 feet. The area is characterized by a ridge at the north end with a cliff of exposed Castle Gate Sandstone. The majority of the area comprises the headwaters of a small drainage basin characterized by steep canyon sides and very rugged, tree covered terrain. Because the terrain in Section 18 is so rugged, a grid of monitoring points is impractical. Subsidence contours cannot be plotted for this reason.

Cross sections have been plotted through Panels 1-7 (Figure 1), Panel 2 (Figure 2), and Panel 4 (Figure 3). Please refer to Map 521.121e for cross section locations.

As can be seen on Figures 2 and 3, subsidence has basically stopped at Panels 2 and 4. Subsidence reached its maximum during the third year after mining. Figure 1 shows the subsidence profile diagonally through the seven longwall panels. The progression of subsidence can be seen to the north as successive panels were mined.

A cross section through Points U5-U17 in Section 18 (Figure 4) indicates a maximum vertical drop of 3.36 feet. These monitoring points were not monitored in 1991 due to hazardous conditions. Stabilization of the overburden since mining in the Third Seam should allow monitoring again in 1992.

Horizontal and vertical movement graphs have been made of monitoring points U1, U2, U3, and U4, Figures 5, 6, 7, and 8 respectively. Point U1, which is located directly above the north edge of longwall mining in the Wattis coal seam, shows the most vertical and horizontal movement. Point U4 is farthest from mining and shows the least movement.

A horizontal and vertical movement graph (Figure 9) has been made of monitoring point GS-1 near the stream in Section 18. Probably because of the shallow overburden at the GS-1 point location, maximum subsidence occurred within 15 weeks of the longwall face passing the point. This monitoring point was not surveyed in 1991 because of the hazardous condition previously discussed.

MITIGATION

The surface cracks crossing the U.S. Forest Service development road in Section 12 were repaired in 1987, and have shown no further cracking, or movement.

A portion of the surface cracks near monitoring points U1 and U2 in Section 18 have been repaired to reduce the likelihood of accidents. The cracks were backfilled and the area fenced. Signs were placed in the area warning the public of the potential danger of the unstable ground. This area is fee land owned by the U.S. Fuel Company; Cyprus Plateau Mining Corporation has an agreement with U.S. Fuel which allows mining impacts.

The new cracks in the northwest quarter of Section 12 were fenced and danger signs placed to warn the public of the hazards. The area is in a very rugged area where very few people travel.

VEGETATION

Subsidence in the Section 12 area has caused minimal vegetation loss. Grasses, shrubs and trees near the cracks do not appear to be affected.

Some vegetation in Section 18 has been lost to the small outcrop failures. When the area has stabilized after mining the Middle Seam, the area will be hand seeded if necessary.

SURFACE WATER AND GROUND WATER

There has been no identified impact to ground water in the Section 12 area. There is no surface water in the area.

The Section 18 area is the subject of a study of the effects of longwall mining on ground water and surface water; the study will run through 1992. The study is being undertaken in conjunction with the U.S. Geological Survey and the Division of Oil, Gas and Mining.

Some stream water has been diverted into the mine near monitoring point GS-1 because of subsidence. The stream at this location is small, averaging 13 gallons per minute. Springs and base flow from the canyon bottom recharge the stream below this point. A section of stream approximately 800 feet long has been affected. An important point to be learned from the study is whether mudstones and siltstones will expand and stop the downflow of stream water. Water rights in the stream are held by U.S. Fuel Company, with which Cyprus Plateau has an agreement allowing impacts due to mining.

A small side canyon to the North Fork of the Right Fork of Miller Creek in the southeast quarter of the northwest quarter of Section 12 had a small flow prior to mining; the flow in this stream channel was diverted into the ground presumably due to subsidence in 1989. There was flow from the channel in early July of 1990, but had no flow in September of 1990. In early July of 1991, there was a flow of 1.5 GPM coming from the channel again. The flow may be an indication that the mudstone and siltstones are healing. Additional

time is needed to monitor this channel for flows to determine healing.

A complete discussion of hydrologic impacts can be found in the 1991 Annual Hydrologic Report.

SURFACE STRUCTURES

The only impact to surface structures has been the settling of the U.S. Forest Service development road discussed previously in this report. Repairs to this road were made in 1987, and no further road damage has occurred.

PROJECTED MINING - 1992

Mining will be done in the areas as shown on Maps 1 and 2, and on Map 521.121e and Map 521.121f.

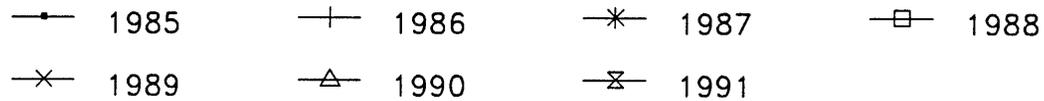
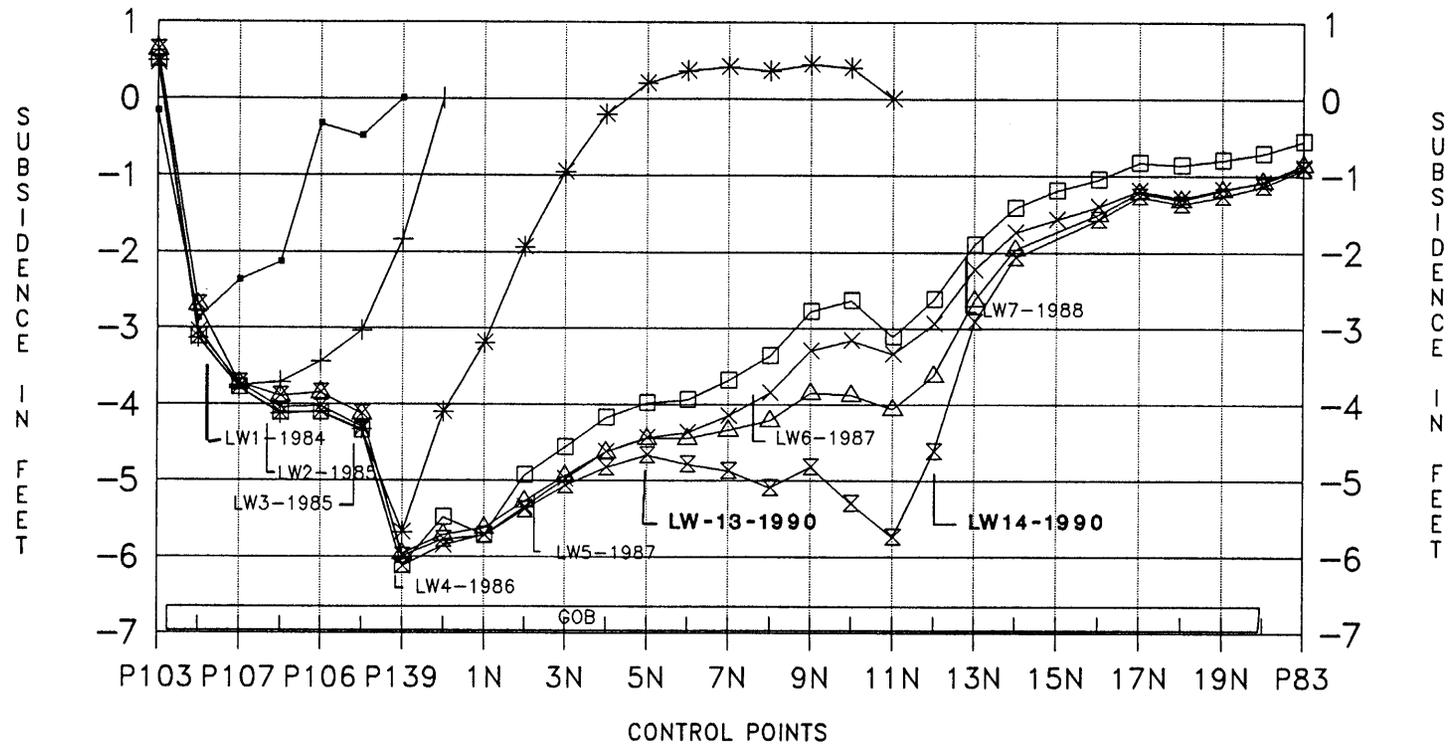
MONITORING

New monitoring points were placed and surveyed over the longwall panels in Section 14, Township 15 South, Range 7 East during 1991. These points will be used to monitor subsidence on Gentry Ridge in lease U-13097.

Monitoring in 1992 will include the following:

1. Survey monitoring points above longwall panels 4 through 7 in Section 12, as shown on Map 521.121e.
2. Survey monitoring points above longwall panels 8 through 12, and 15 and 16 in Section 18, as shown on Map 521.121e and Map 521.121f.
3. Survey monitoring points above longwall panels 18 through 22 as shown on Map 521.121f.
4. Take ground based photographs of the cliff in Section 18.
5. Visual observations of the ground surface above all mined areas for surface effects of mining.

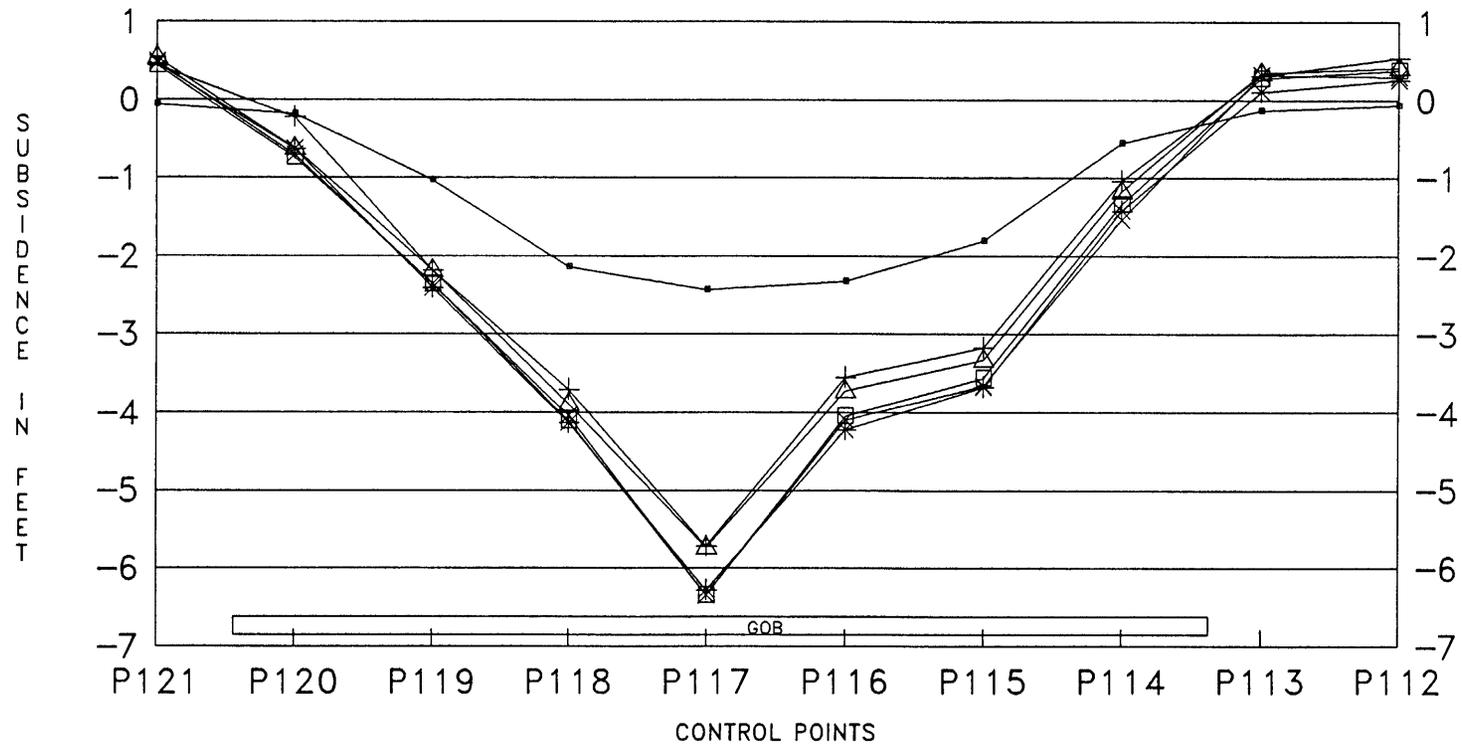
FIGURE 1
CROSS SECTION A-A



NOTE -1- CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

2- LW_-1985 INDICATES CENTER OF LONGWALL PANELS & YEAR MINED
3- LW1 THRU LW7 ARE IN WATTIS SEAM
4- LW13 & LW14 ARE IN THIRD SEAM

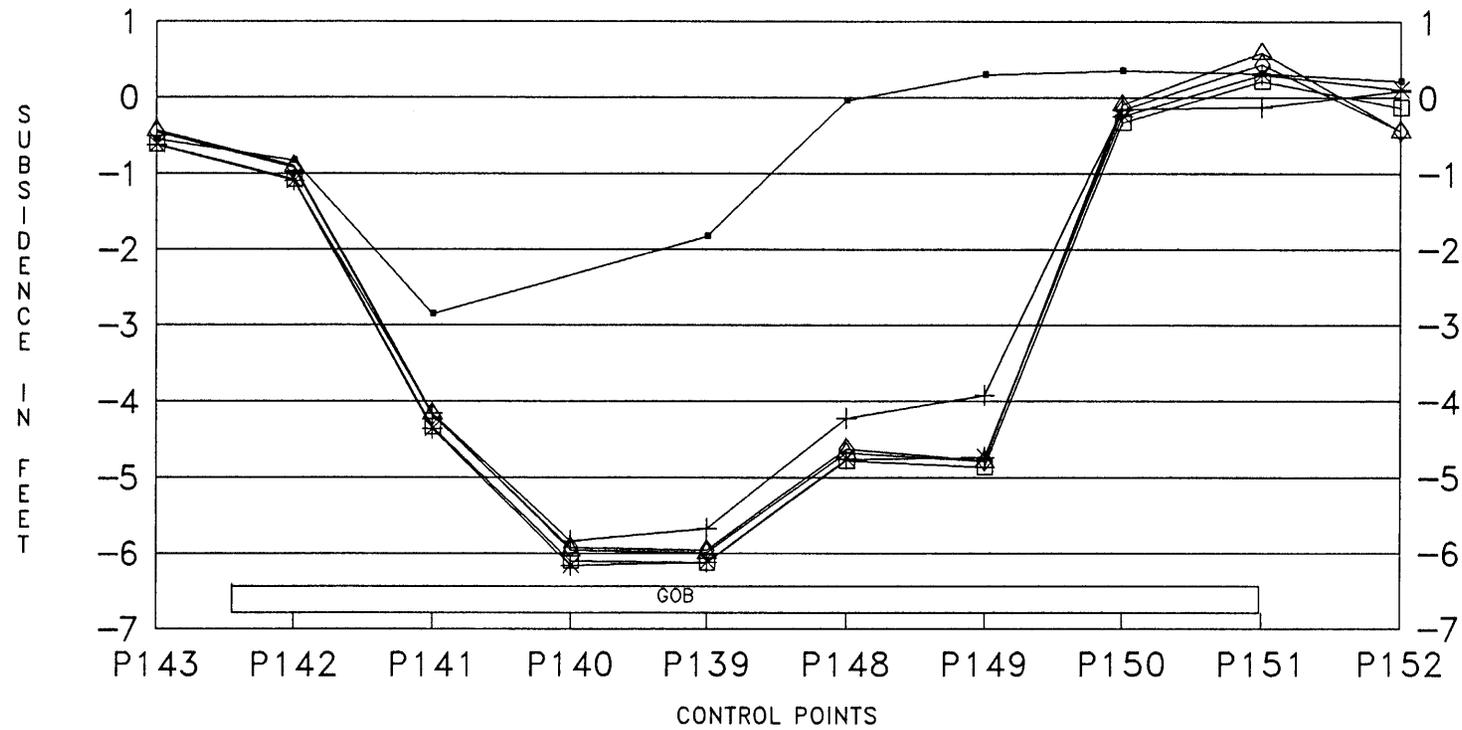
FIGURE 2
CROSS SECTION B-B LONGWALL PANEL 2



—●— 1985 YEAR 1	—+— 1986 YEAR 2	—*— 1987 YEAR 3
—□— 1988 YEAR 4	—×— 1989 YEAR 5	—△— 1990 YEAR 6

NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

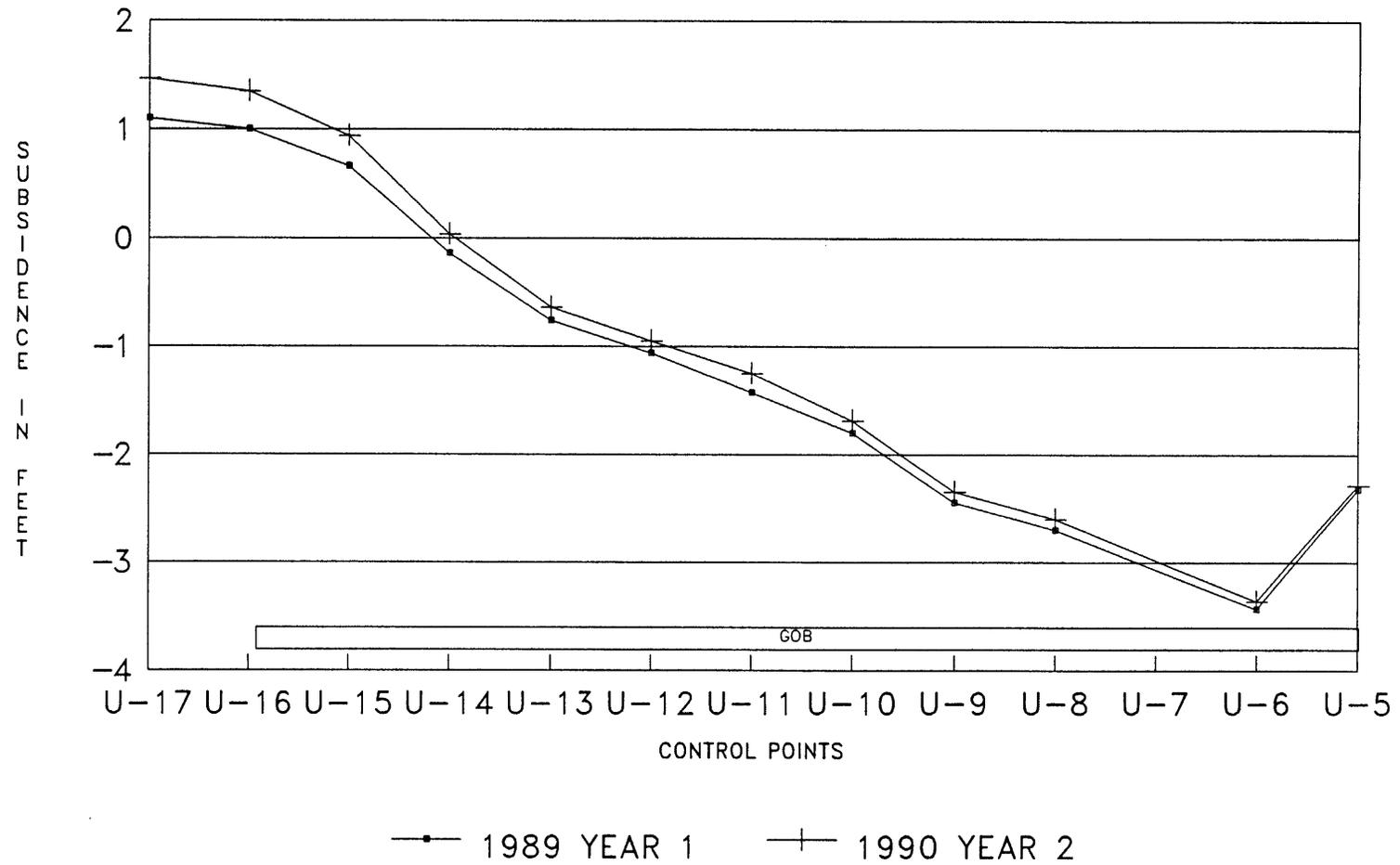
FIGURE 3
CROSS SECTION C-C LONGWALL PANEL 4



—●—	1986 YEAR 1	—+—	1987 YEAR 2	—*—	1988 YEAR 3
—□—	1989 YEAR 4	—◇—	1990 YEAR 5	—△—	1991 YEAR 6

NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

FIGURE 4
U-NORTH NEAR-STREAM PROFILE



NOTE - CONTROL POINTS ARE NOT TO SCALE
HORIZONTALLY - SHOWN IN RELATIVE
POSITION TO EACH OTHER

FIGURE 5
 U-NORTH SUBSIDENCE MONITORING
 HORIZONTAL AND VERTICAL MOVEMENT GRAPH
 STATION U1

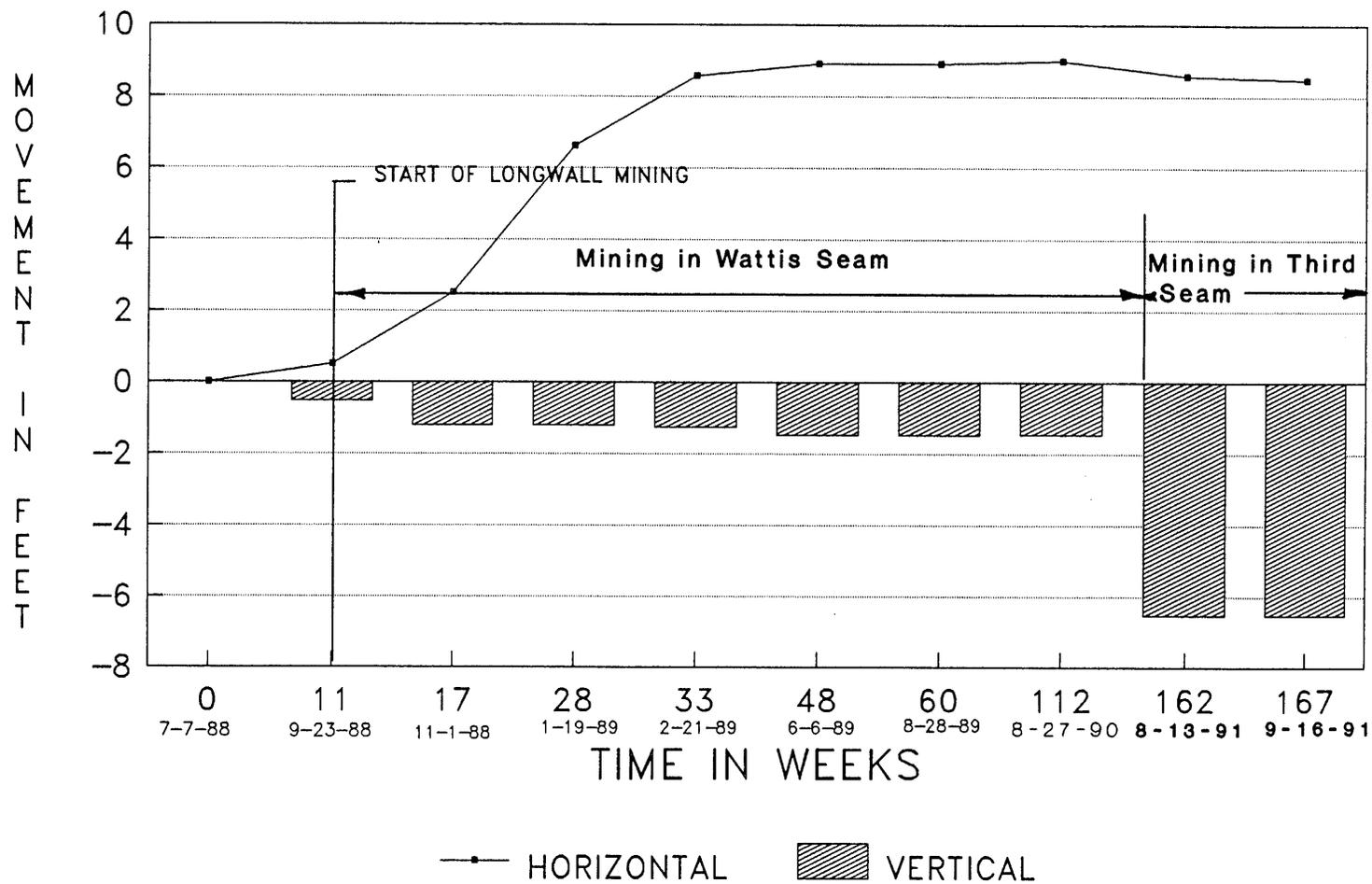


FIGURE 6
 U-NORTH SUBSIDENCE MONITORING
 HORIZONTAL AND VERTICAL MOVEMENT GRAPH
 STATION U2

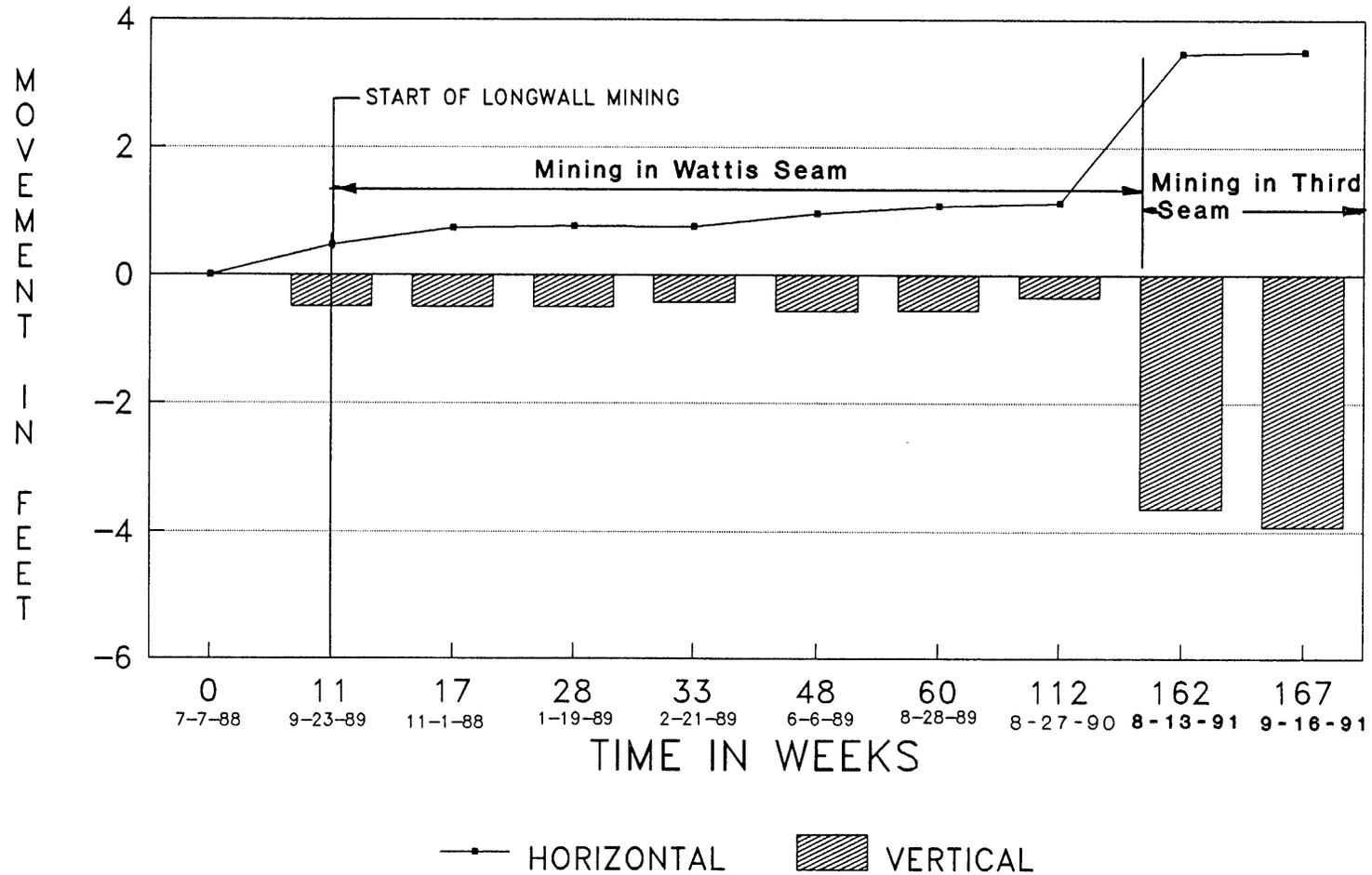


FIGURE 7
 U-NORTH SUBSIDENCE MONITORING
 HORIZONTAL AND VERTICAL MOVEMENT GRAPH
 STATION U3

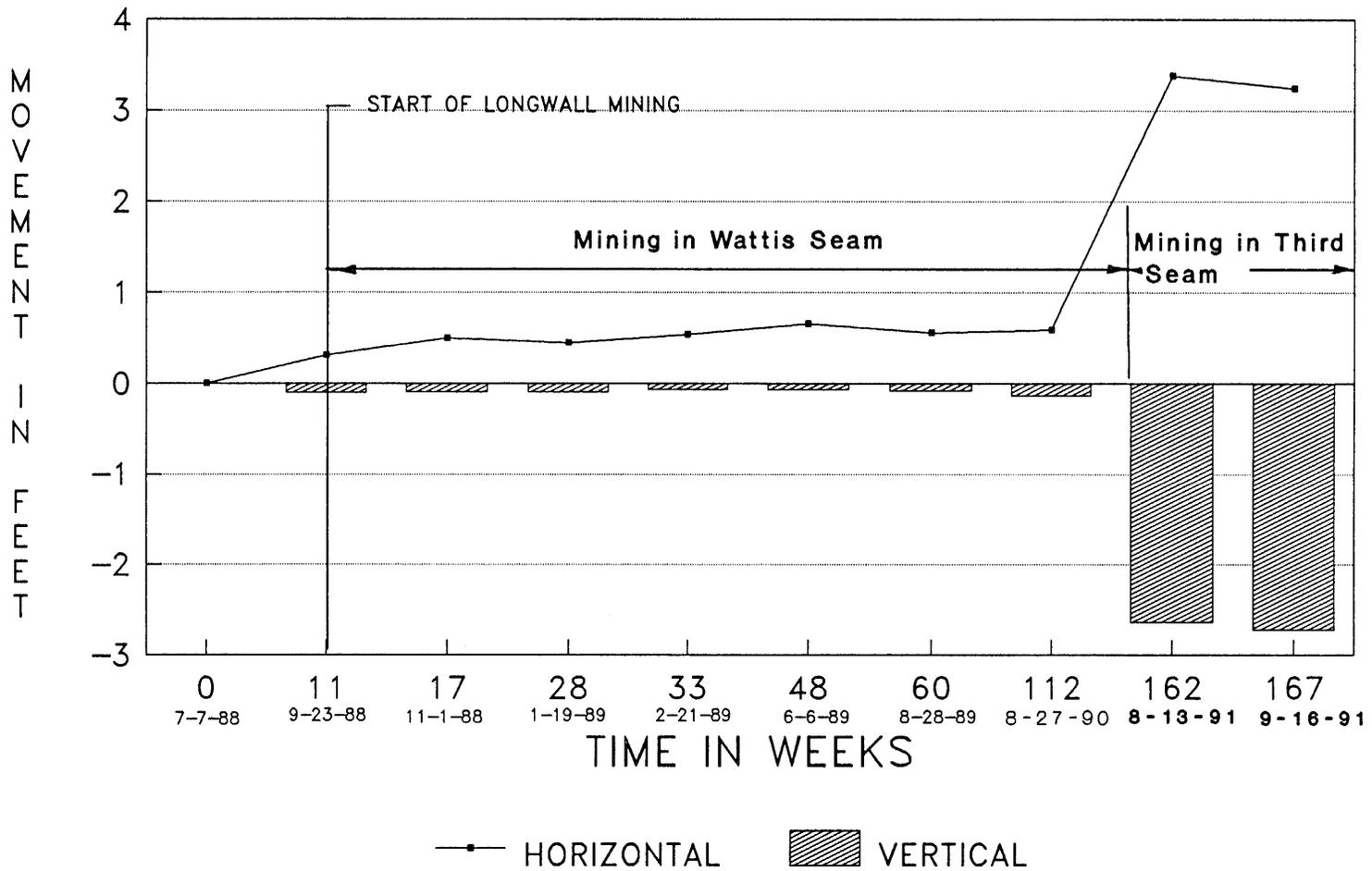


FIGURE 8
 U-NORTH SUBSIDENCE MONITORING
 HORIZONTAL AND VERTICAL MOVEMENT GRAPH
 STATION U4

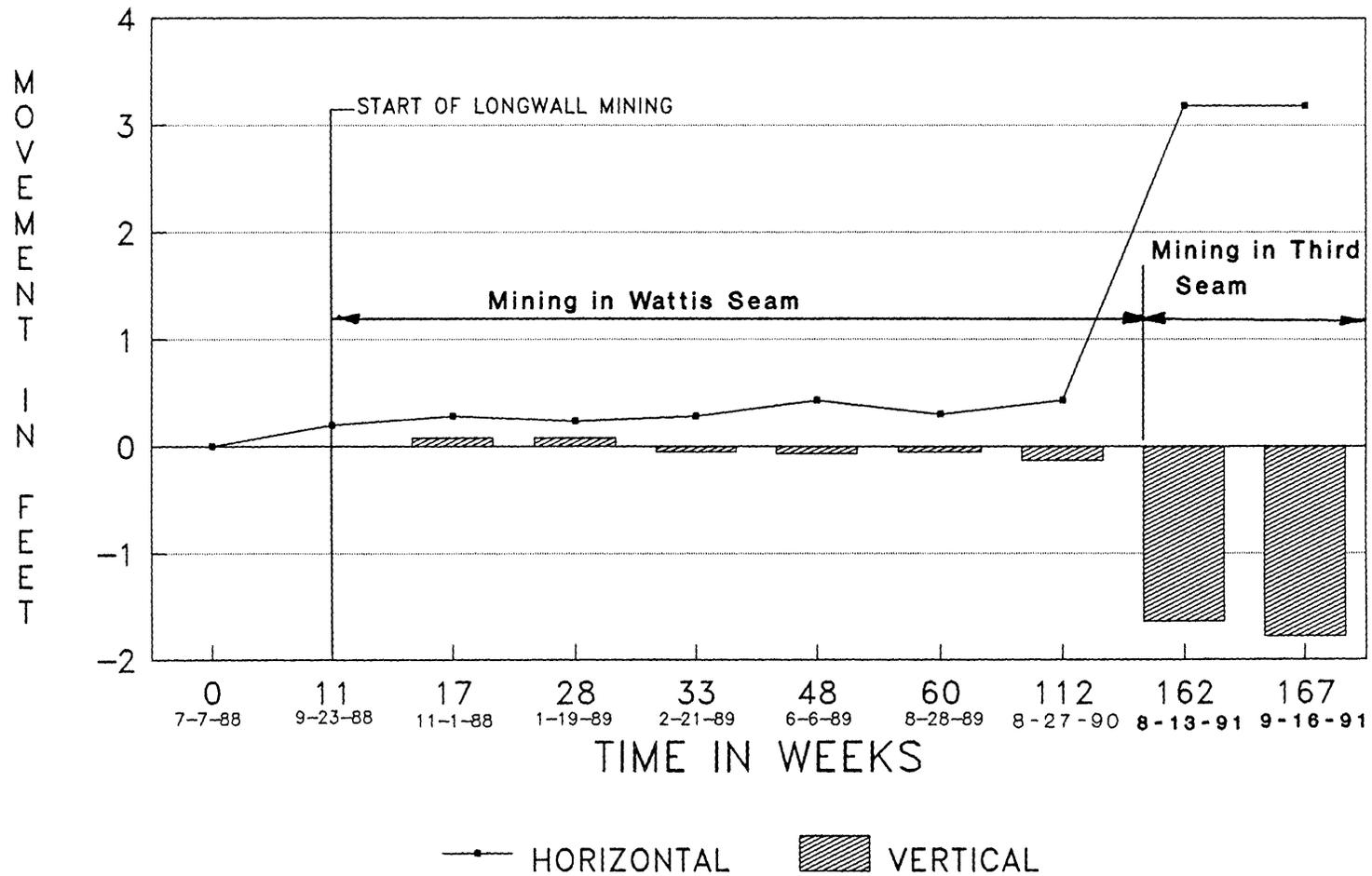


FIGURE 9
U-NORTH SUBSIDENCE MONITORING
HORIZONTAL AND VERTICAL MOVEMENT GRAPH
STATION GS-1

